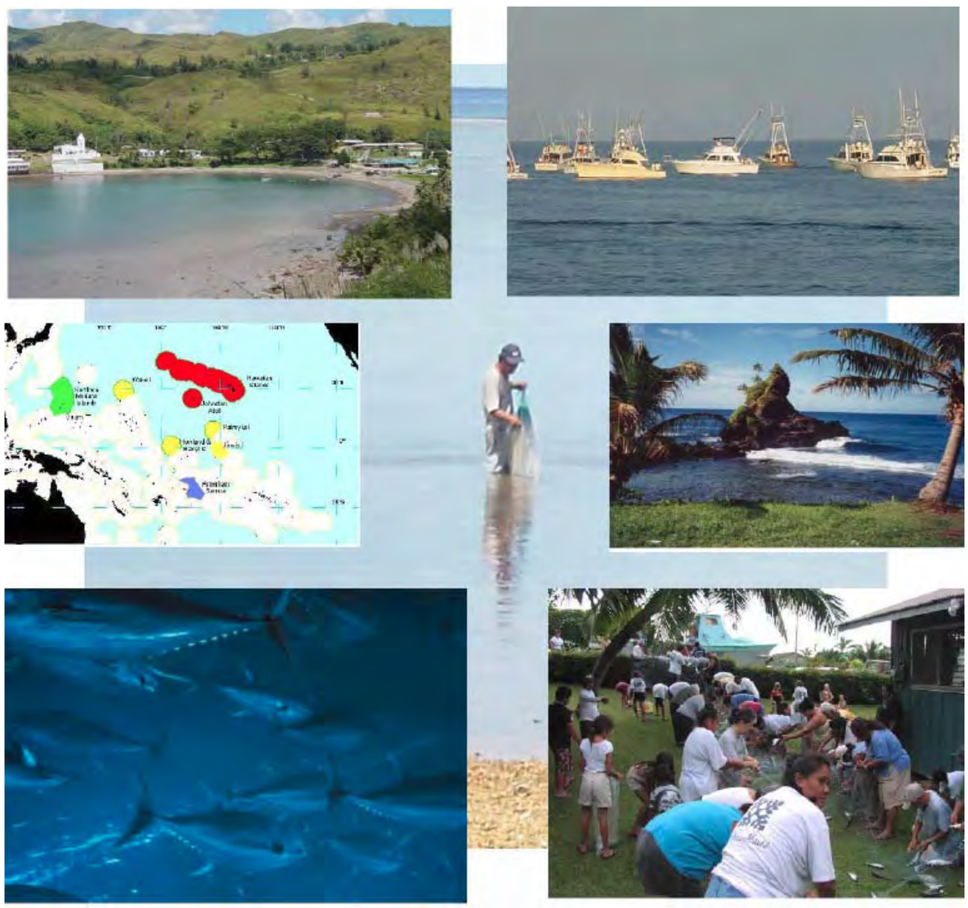
Final Programmatic Environmental Impact Statement

Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans



Prepared by:

National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Pacific Islands Region

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

September 24, 2009

Cover: All photos by Western Pacific Regional Fishery Management Council (WPRFMC), unless otherwise noted.

Center: Guam Net Fisherman.
Top Left: Umatac Bay, Guam.
Top Right: Start of the 2003 Hawaii International Billfish Tournament.
Center Right: American Samoa.
Bottom Right: Hana, Maui community fish sharing.
Bottom Left: School of yellowfin tuna. (*Photo:* OAR/National Undersea Research Program, National Oceanic and Atmospheric Administration, Department of Commerce.)
Center Left: Map of Western Pacific Region - highlight shows areas managed by the WPFMC.

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

OCT 2 2009

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act (NEPA), we enclose for your review, a Final Programmatic Environmental Impact Statement (FPEIS) entitled, "Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans," dated September 24, 2009.

This FPEIS was prepared by the Western Pacific Fisheries Management Council (Council) in coordination with NMFS in accordance with NEPA. It describes and evaluates the potential environmental impacts of a proposal and alternatives for the establishment of an institutional framework that would facilitate a shift of fisheries management in the Western Pacific Region from species-based management toward ecosystem-based management. The Council has recommended that the National Marine Fisheries Service (NMFS) implement the following proposed federal actions: Alternative 1D, approve and implement four place-based demersal and one pelagic Fishery Ecosystem Plans (FEPs); and Alternative 2B, approve and implement modifications to the management unit species (MUS) for the FEPs.

Implementing these alternatives would authorize the Council to shift the fisheries management framework in the Western Pacific Region to a place-based ecosystem approach. The approval and implementation of the five place-based FEPs including a Pelagic FEP for the Western Pacific Region would initially be made without substantive changes to current fishing regulations, other than a reorganization. Under the preferred Alternative 2B, fishery MUS to be managed within the FEPs would be defined as "those current management unit species that are known to be present within each FEP boundary." This would not result in a substantial change to the FEP MUS.

This revised fishery management framework was developed to enable fishermen, natural resource managers, scientists, and other interested parties to gain a greater understanding of ecosystem structures and functions, and provide for more effective and efficient protection and management of the nation's fishery resources and marine ecosystems.

The ecosystem framework is intended to simplify the development and implementation of future conservation and management measures for marine ecosystems and fisheries. There are a number of fisheries that are currently operating under the species-based fishery management plans, and this shift would be done in a manner that is understandable to fishery participants and with minimal regulatory burden to the participants.

The impact analysis showed that the proposed reorganization is largely an administrative action as there would be no new fishery management measures implemented under the proposed action or the alternatives. The move to reorganize fishery management plans into fishery ecosystem plans is not expected to result in adverse impacts on the human environment or on the fisheries of the Western Pacific Region under any of the alternatives. Over the long-term, it is expected that ecosystem management of fisheries would result in an enhanced understanding of multiple factors that affect fisheries, provide an enhanced means of coordination among and within interested agencies and participants, and therefore, is expected to have positive effects by providing for long term sustainability of the fishery resources of the Western Pacific Region.

Additional copies of the FPEIS may be obtained from the Responsible Program Official identified below. A digital copy of the FPEIS document is available electronically through the websites of the Western Pacific Fishery Management Council at www.wpcouncil.org and NOAA's NMFS Pacific Islands Regional Office at www.fpir.noaa.gov .

NOAA is not required to respond to comments received during the agency's 30 day comment period as a result of the issuance of the FPEIS. However, comments received by November 30, 2009, will be reviewed and considered for their impact on the issuance of a record of decision (ROD). Please send comments to the responsible official identified below.

Responsible Program Official:

William L. Robinson
Regional Administrator
Pacific Islands Regional Office
National Marine Fisheries Service
National Oceanic and Atmospheric Administration
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814-4700
Telephone: (808) 944-2200 Fax: (808) 973-2941

Sincerely,

for Paul N. Doremus, Ph.D.
NOAA NEPA Coordinator

Enclosure

Final Programmatic Environmental Impact Statement
Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans

September 24, 2009

Responsible Agency:

Department of Commerce, National Oceanic and Atmospheric Administration
National Marine Fisheries Service
Pacific Islands Region
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814-4700

Contact:
William L. Robinson, Regional Administrator

Responsible Council:

Western Pacific Regional Fishery Management Council
1164 Bishop St., Suite 1400
Honolulu, HI 96813

Contact:
Kitty M. Simonds, Executive Director

Western Pacific Fishery Management Plans: Bottomfish and Seamount Groundfish, Coral Reef Ecosystems, Crustaceans, Precious Corals, and Pelagics. Proposed replacement Fishery Ecosystem Plans (FEPs) are separate documents attached as Appendix G.

Abstract: The Western Pacific Fishery Management Council (Council) and the National Marine Fisheries Service (NMFS) are proposing to replace the existing species-based Fishery Management Plans (FMPs) with geographic, or place-based, Fishery Ecosystem Plans (FEPs) for fisheries in the Western Pacific Region. The FEPs would encompass demersal fishery management for four archipelagic areas: American Samoa, the Mariana Archipelago (including Guam and the Commonwealth of the Northern Mariana Islands), Hawaii, and the U.S. Pacific Remote Island Areas. A fifth FEP would encompass pelagic fisheries of all areas. Alternatives to the proposed action and potential environmental impacts are disclosed in this Final Programmatic Environmental Impact Statement (FPEIS). Alternatives considering which species will be included as Management Unit Species (MUS) in the FEPs are also evaluated. The FPEIS discusses impacts on target and non-target stocks including bottomfish, precious corals, coral reef ecosystem species, and crustaceans; Essential Fish Habitat and Habitat Areas of Particular Concern; protected species; fishery participants and communities; and administration and enforcement. None of the alternatives or the actions considered, as part of the alternatives, would change existing fisheries, or impact continuing activities under the respective FEPs. All of the current fisheries in the Western Pacific Region that are covered by the management measures of the FEPs have been reviewed for compliance with applicable laws. None of the actions considered would result in irreversible or irretrievable commitments of resources and none would result in significant or unavoidable adverse impacts.

Final Programmatic Environmental Impact Statement Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans

EXECUTIVE SUMMARY

On December 20, 2005, at its 130th meeting, the Western Pacific Regional Fishery Management Council (Council or WPRFMC) recommended the final action of a shift in fishery management for the Western Pacific Region from a species-based approach to an ecosystem-focused, place-based approach. This recommendation stemmed from an increasing awareness that fisheries should be managed within a geographic, or place-based[1], structure rather than one that regulates fisheries by species. However, ecosystem approaches to fisheries management are in their developmental stages and the proposed shift in management structure would accordingly be an incremental first step towards the long-term goal of place-based marine ecosystem conservation and management. It is anticipated that future management actions would utilize and build on information acquired as a result of shifting to a place-based approach.

The proposed action in this Final Programmatic Environmental Impact Statement (FPEIS) is the approval and implementation of Fishery Ecosystem Plans (FEPs) by the Secretary of Commerce for federally managed fisheries that operate in the Western Pacific Region. The action considered here replaces the existing Fishery Management Plans (FMPs) with FEPs and establishes the institutional framework for future ecosystem-based fishery management actions. These FEPs are ecosystem-based fishery management plans subject to review and approval by the Secretary of Commerce pursuant to Section 304 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

This FPEIS analyzes the impacts on the human environment of replacing the existing FMPs with FEPs for the Western Pacific Region (American Samoa, the Mariana Islands, Hawaii, the U.S. Pacific Remote Island Areas or PRIA[2], and Pelagics). A previous Draft PEIS (DPEIS) dated October 27, 2005, was circulated for public review from November 10, 2005 to December 26, 2005 (70 FR 68443; November 10, 2005). After considering comments on the 2005 draft, WPRFMC and NMFS decided to expand the scope of the Programmatic EIS to include analyses of impacts related specifically to the approval and implementation of fishery ecosystems plans in the Western Pacific Region. A second

[1] The terms “geographic” and “place-based” are used interchangeably throughout this document.
[2] In its usual usage, the term “U.S. PRIA” refers to the U.S. insular possessions including Howland, Baker, and Jarvis Islands; Johnston Atoll; Kingman Reef; Wake Island; Palmyra Atoll; and Midway Island. However, because Midway is located in the Hawaiian Archipelago, it would not be part of the PRIA Fishery Ecosystem Plan.

Draft PEIS dated March 30, 2007, together with draft FEPs, was distributed for public review from April 13 to May 29, 2007 (72 FR 18644; April 13, 2007).

Purpose and Need

The purpose of the proposed action is to establish an institutional framework that would facilitate a shift to an ecosystem approach to fisheries management in the Western Pacific Region. This would be accomplished through the approval and implementation of place-based FEPs, without any substantive changes to current fishing regulations. This shift would enable increased understanding and protection of ecosystem structures and functions and is needed to provide the management framework that would simplify the development and implementation of future conservation and management measures for marine ecosystems and their fishery resources. Because there are currently a number of fisheries operating under the existing species-based fishery management plans, this shift should be done in a manner that is understandable to fishery participants and with minimal regulatory burden.

The proposed Federal action consists of the following components:

> ***Component 1:*** The implementation of one or more place-based fishery ecosystem plans that delineate specific boundaries and support a shift to an ecosystem approach to fisheries management in the Western Pacific Region. The new fishery ecosystem plan or plans would replace existing species-based fishery management plans. Included in Component 1 is the associated reorganization of existing species-based FMP regulations into place-based FEP regulations.
>
> ***Component 2:*** The designation of appropriate management unit species (MUS) to be managed under each FEP.

Three additional administrative components related to the Council's advisory structure role in regional coordination and international management and research are discussed in this document in order to assist the Council in determining its optimal organizational structure and procedures commensurate with a shift to ecosystem management. These components are not considered Federal actions.

Alternatives

Components 1 and 2 are regulatory in nature and are considered the Federal action in this document. Components 3, 4, and 5 are nonregulatory (i.e., they have no regulatory effect), and their consideration is included to assist the Council in identifying an appropriate advisory structure and coordination activities under an ecosystem-based fishery management structure. Component 2 is contingent upon selecting one of the action alternatives under Component 1. The following table provides a brief description of the alternatives considered in detail for each component.

Table ES-1: Alternatives considered in detail.

Alternative	Description
Component 1: (Federal Regulatory Action)	***Replace FMPs with FEPs***. Included in Component 1 for Alternatives 1B through 1E is the associated reorganization of existing species-based FMP regulations into place-based FEP regulations.
Alternative 1A – No Action	Do not approve or implement FEPs; Do not replace FMPs with FEPs
Alternative 1B	For one area only, approve and implement an FEP, which will replace existing FMPs
Alternative 1C	Approve and implement FEPs that include EEZ waters around each archipelagic area (American Samoa, Hawaii, Mariana Islands, PRIA), these FEPs will replace existing FMPs; Retain the Pelagics FMP for the domestic pelagic fisheries operating on the surrounding high seas
Alternative 1D - Preferred	Approve and implement four demersal FEPs and one Pelagic FEP, which will replace existing FMPs
Alternative 1E	Approve and implement FEPs for each biogeographic and pelagic zones, which will replace existing FMPs
Component 2: (Federal Regulatory Action)	***List of Management Unit Species (MUS)***
Alternative 2A – No Action	Do not change the current MUS lists
Alternative 2B - Preferred	Define FEP MUS as those current MUS that are *known*[3] to be present within each FEP boundary
Alternative 2C	Define FEP MUS as those current MUS *known* to occur within the boundaries of the FEP, *plus* incidentally caught and associated species that are known to occur within each FEP boundary
Alternative 2D	Define FEP MUS as those current MUS *believed*[4] to potentially occur, *plus* incidentally caught and associated species believed to potentially occur within each FEP boundary

[3] For the purpose of this EIS, *known* is used as a species generally recognized as being established within a particular ecosystem.

[4] For the purpose of this EIS, *believed* is used as an opinion that a species exists within a particular ecosystem or a similar ecosystem of the western Pacific region, especially when there is no absolute proof of its existence or reality.

Table ES-1 (continued)

Alternative:	**Description**
Component 3: (Council Action)	***Council Advisory Structure***
Alternative 3A - No Action	Do not change the current advisory structure
Alternative 3B	Add a single FEP Plan Team to the current advisory structure
Alternative 3C	Replace the current FMP advisory panels, plan teams, and five standing committees with FEP advisory panels, FEP plan teams, and FEP standing committees
Alternative 3D - Preferred	Replace the current FMP advisory panels, plan teams, and five standing committees with FEP advisory panels, FEP standing committees, and two FEP plan teams
Component 4: (Council Action)	***Regional Coordination***
Alternative 4A - No Action	Do not establish Ocean Council type groups
Alternative 4B - Preferred	Establish Regional Ecosystem Advisory Council Committees
Alternative 4C	Participate in and support existing Ocean Council type groups
Alternative 4D	Establish independent Regional Ecosystem Councils
Component 5: (Council Action)	***International Coordination***
Alternative 5A - No Action	Continue to participate in international fisheries management fora and international workshops
Alternative 5B - Preferred	Increase participation in international fisheries management fora and establish meetings/workshops with neighboring nations of island areas of the Western Pacific Region
Alternative 5C	Do not participate in international management fora

In general, each component's alternatives range from no action or *status quo* to the implementation of a detailed and specific approach to the component at hand. Alternatives selected as “preferred” by the Council are identified for each component. Several alternatives were also considered but regarded as unreasonable and were therefore eliminated from detailed study.

Reasons the Council Recommends the Preferred Alternatives

The U.S. Pacific island-based pelagic fisheries and the four demersal fisheries (bottomfish, crustaceans, precious corals and coral reef resources) are currently managed under FMPs. Whereas the 1996 Sustainable Fishery Act amendments to the Magnuson-Stevens Fishery Conservation and Management Act (MSA) require considerations of fishery impacts on other species not managed under FMPs (e.g., bycatch reduction), there are several limitations of the current management framework (i.e., species-based FMPs) that appear to constrain the Council in recommending conservation for a wider range of marine resources as well as protecting marine ecosystems.

Current stock assessments generally do not explicitly recognize the significant natural variability in marine resources and habitats, although some models do incorporate spatial and temporal environmental effects. Under place-based FEPs, stock assessments will increasingly and explicitly separate environmentally-driven resource variability (e.g., inter-annual, decadal, long-term ocean regime shifts) from fishery-driven and habitat-driven effects on target stocks and other components of ecosystems, thus improving fishery science and management.

In addition, the majority of current monitoring under FMPs accounts for major resource removals by fishing, but not by other sources such as coastal development, which has destroyed or severely degraded inshore fish habitat and associated stocks around the more heavily populated islands of the U.S. Pacific. Through regional coordination efforts under place-based FEPs, all sources of resource removal or degradation would be considered, including those related to shoreline modification, waste discharge, watershed erosion, storm runoff, and other terrestrial activities. FEP-based monitoring would ultimately include ecosystem indicators and models that take into account non-fishing uses, their impacts on resources, and tradeoffs among different user groups who depend on the same resource.

As discussed in Chapter 1, the purpose of the proposed Federal Action in this PEIS is to establish an institutional framework that would allow a shift to an ecosystem approach for fisheries management in the Western Pacific Region. This would be accomplished, in part, through the approval and implementation of place-based FEPs (Component 1 of the proposed Federal Action). Component 1 also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations without significant modification to the rules that apply to managing each respective fishery. The FEPs are currently being finalized and are available from the Council or NMFS. The draft FEPs are attached as Appendix G to the FPEIS.

For Component 1, among the action Alternatives (Alternatives 1B, 1C, 1D and 1E), Alternatives 1C and 1D are most similar in their expected impacts. Both of these alternatives would facilitate a practical ecosystem approach to fisheries management in the Western Pacific Region so that the full range of fisheries' and other activities' impacts on marine ecosystems could be addressed in a manner that coherently considers each archipelago's biological resources, physical conditions, socioeconomic needs, and cultural traditions. However, Alternative 1D recognizes the highly mobile and often migratory nature of pelagic stocks and fisheries, whereas Alternative 1C does not. Alternative 1D would establish a single Pelagic FEP that would span the entire region managed. Alternatives 1B and 1E were not selected as the Preferred Alternative because of their negative impacts on management, administration and enforcement, and impacts on fishery participants and communities.

Component 2 (selection of Management Unit Species or MUS) is also regulatory in nature and considered part of the Federal action in this document. Component 2 is contingent upon selecting one of the action alternatives under Component 1. All alternatives under Component 2 (Alternatives 2A, 2B, 2C, and 2D) consider changes to the MUS list. Alternative 2A was not selected as the Preferred Alternative because of its negative impacts on management, administration and enforcement, and impacts on fishery participants and communities. In particular, under Alternative 2A, there would be some demersal species identified as MUS in an FEP for which they were not actually present. Under Alternative 2B, the Preferred Alternative, the MUS list for each archipelagic FEP would consist of any MUS currently on any of the four existing demersal FMP MUS lists that are known to occur within the range of that particular FEP. The MUS list for the Pelagic FEP will be identical to the Pelagics FMP MUS list. Alternative 2B is similar to Alternative 2A but would eliminate the confusion that could result from the inclusion on the MUS list of species not physically present in a given FEP area. Alternatives 2C and 2D were rejected primarily because of their impacts on management, administration and enforcement, and because these alternatives would add species to the MUS lists that would require monitoring and annual evaluation.

The Preferred Alternative for both Federal action components would promote a holistic view of marine resources through increased examination of metapopulation resource dynamics (interactions among spatially separated populations of the same species) and linkages between upland watershed activities, coastal habitats, and nearshore waters. This in turn would lead to enhanced understanding and improved management of the relationships between different fish stocks and users of those stocks. In general, species-based FMPs focus on individual stocks of fish or related species and the people who harvest them. However, fish and fishermen do not act in isolation, and fishermen may be active in several fisheries targeting different resources over years or even seasonally.

Furthermore, the harvests of one species often influence the dynamics of fish markets (and subsequent fishing effort) for others. Place-based FEPs would provide fishery managers with comprehensive information on all fishery impacts within a given area and allow improved decision making with fewer unintended consequences due to poorly understood connections. By operating within an ecosystem context, fishery managers would also be better positioned to anticipate likely physical and biological responses to changing environmental conditions. Rather than reacting to changes after they occur, they would be able to determine appropriate management actions to prevent adverse impacts on marine ecosystems. In addition, greater stability and predictability of fishery resources are more likely to be the outcomes of fishery management decisions when resources are considered in the aggregate rather than as independent units.

The ecosystem approach under the Preferred Alternative may improve the management of coastal resources at both Federal and local levels through changes in the structure of resource management plans and the process by which these plans are developed and implemented. There is potential for jurisdictional disputes; however, it is the Council's role to provide guidance and clarification on mandated responsibilities and management authorities to preclude governance issues from occurring. Because the organizational structure for developing and implementing a FEP is broader than for an FMP, and will incorporate more local community input, it is more likely to make better use of local knowledge and experience in management strategies and tactics. This will strengthen cooperation and voluntary compliance with management measures, which is especially important in the Western Pacific Region where, due to the vast areas that need to be covered, enforcement capabilities are sometimes limited.

The southern and western Pacific Ocean is dotted with thousands of islands governed by several nations. American Samoa, for example, is surrounded by the EEZs of five independent nations, and the PRIA (Wake, Howland, Baker, Jarvis, Palmyra, and Kingman Reef) are geologically part of larger archipelagic island chains. Several targeted pelagic species are considered highly migratory and management of these resources is increasingly becoming an international issue. As marine ecosystems are generally considered "open" systems and large scale changes can be observed within smaller units, international coordination as well as cooperation among the Council, regional fishery management organizations (RFMOs), U.S. Department of State, NMFS, and neighboring nations of island areas in the Western Pacific Region will be a necessary component of the successful implementation of an ecosystem approach to fisheries management.

Final Programmatic Environmental Impact Statement Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans

Table of Contents

Appendices

List of Figures

List of Tables

Acronyms and Abbreviations

ACHPPM	Army Center for Health Promotion and Preventive Medicine
APA	Administrative Procedures Act
BMUS	Bottomfish Management Unit Species
CCL	Curved Carapace Length
CFR	Code of Federal Regulations
CHCRT	Currently Harvested Coral Reef Taxa
CMUS	Crustaceans Management Unit Species
CNMI	Commonwealth of the Northern Mariana Islands
CRE	Coral Reef Ecosystem
CRM	Coastal Resources Management (Division in the CNMI)
CWA	Clean Water Act
CWB	Continental Water Boundary
CZCS	Coastal Zone Color Scanner
CZMA	Coastal Zone Management Act
DAWR	Division of Aquatic and Wildlife Resources (Government of Guam)
DFW	Division of Fish and Wildlife (Commonwealth of the Northern Mariana Islands
DMWR	Department of Marine and Wildlife Resources (Government of American Samoa)
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
ENSO	El Niño Southern Oscillation
EPA	Environmental Protection Agency
EPAP	Ecosystem Principles Advisory Panel
ESA	Endangered Species Act
FAD	Fish Aggregation Device
FAO	Food and Agriculture Organization
FBNMS	Fagatele Bay National Marine Sanctuary
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
FSM	Federated States of Micronesia
HAPC	Habitat Areas of Particular Concern
HE	Halmahera Eddy
HMRFS	Hawaii Marine Recreational Fisheries Survey
IATTC	Inter-American Tropical Tuna Commission
ICES	International Council for the Exploration of the Sea
IQA	Information Quality Act
ITCZ	Intertropical Convergence Zone

lb	Pounds
LME	Large Marine Ecosystem
ME	Mindanao Eddy
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Areas
MRFSS	Marine Recreation Fisheries Statistical Survey
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
MUS	Management Unit Species
NEPA	National Environmental Policy Act
NGCC	New Guinea Coastal Current
NHRC	North Hawaiian Ridge Current
NMFS	National Marine Fisheries Service
nm	Nautical Miles
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NPC	North Pacific Current
NPTZ	North Pacific Transition Zone
NWHI	Northwestern Hawaiian Islands
NWR	National Wildlife Refuge
OI	Optimal Interpolation
OLE PID	Office of Law Enforcement Pacific Islands Division
OY	Optimum Yield
PBEC	Pacific Basin Environmental Consultants
PF	Polar Front
PHCRT	Potentially Harvested Coral Reef Taxa
PIFSC	Pacific Islands Fisheries Science Center
PIRO	Pacific Islands Regional Office
PMP	Preliminary Management Plan
PMUS	Pelagic Management Unit Species
PRA	Paperwork Reduction Act
PRIA	U.S. Pacific Remote Island Areas
RAIOMA	Resource Assessment Investigation of the Mariana Archipelago
RFA	Regulatory Flexibility Act
RFMC	Regional Fishery Management Council
SAF	Sub Antarctic Front
SAFZ	Subarctic Frontal Zone
SCL	Straight Carapace Length
SECN	South Equatorial Current (southern branch)
SECS	South Equatorial Current (northern branch)

SFA	Sustainable Fisheries Act
SPCZ	South Pacific Convergence Zone
SSC	Scientific and Statistical Committee
STCC	South Tropical Countercurrent
STF	Subtropical Front
STFZ	Subtropical Frontal Zone
mt	Metric Tons
UH SOEST	Univ. of Hawaii School of Ocean and Earth Science and Technology
USCG	United States Coast Guard
USFWS or FWS	U.S. Fish and Wildlife Service
VMS	Vessel Monitoring Systems
WCPFC	Western and Central Pacific Fisheries Commission
WGB	Weddell Gyre Boundary
WPRFMC	Western Pacific Regional Fishery Management Council
XBT	Expendable Bathythermograph

This page left blank intentionally.

Chapter 1. INTRODUCTION, PURPOSE AND NEED, BACKGROUND INFORMATION

This Final Programmatic Environmental Impact Statement (FPEIS) provides decision-makers and the public with an evaluation of the environmental, social, and economic effects of replacing the five existing Western Pacific Fishery Management Plans (FMPs for Bottomfish and Seamount Groundfish, Coral Reef Ecosystems, Crustaceans, Precious Corals, and Pelagics) with geographic-based (hereafter referred to as place-based) Fishery Ecosystem Plans (FEPs). The FPEIS also provides the Secretary of Commerce (Secretary) with information relevant for his review and potential approval of the FEPs in accordance with the provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

1.1. Introduction

On December 20, 2005, at its 130th meeting, the Western Pacific Fishery Management Council (Council) took final action to recommend a shift in management for fisheries of the Western Pacific Region from a species-based approach to an ecosystem-focused, place-based approach. This change stems from an increasing awareness that fisheries should be managed within a place-based (geographically delineated ecosystems) structure rather than one that regulates fisheries by species. As discussed here, ecosystem approaches to fisheries management are in their developmental stages and the proposed shift in management structure would accordingly be an incremental first step towards this long-term goal of place-based marine ecosystem conservation and management. It is anticipated that future management actions would utilize and build on information acquired as a result of shifting to such an approach.

The proposed action is the approval and implementation of FEPs by the Secretary of Commerce for federally managed fisheries that operate in the Western Pacific Region. The action considered here replaces the existing FMPs with FEPs and establishes the institutional framework for future fishery management actions within the context of a geographic ecosystem. These FEPs are ecosystem-based fishery management plans subject to review and approval by the Secretary of Commerce pursuant to Section 304 of the Magnuson-Stevens Fishery Conservation and Management Act (MSA).

The analysis presented here is compliant with the National Environmental Policy Act (NEPA; 42 U.S.C. 4321 et seq.), its corresponding regulations (40 CFR §§1500–1508), and National Oceanic and Atmospheric Administration (NOAA) Administrative Order 216-6 (Environmental Review Procedures for Implementing the National Environmental Policy Act).

This FPEIS examines alternative approaches to fishery ecosystem plans and presents a discussion of the environmental impacts of implementing the alternatives. Chapter 1 presents an overview, describes the purpose and need, and provides background information. Alternatives are described in detail in Chapter 2. The environmental consequences of these alternatives are described in Chapter 4.

Chapter 3 contains a description of the affected environment that is intended to help the reader understand the environmental consequences evaluation presented in Chapter 4. Chapter 5 summarizes the analysis of various environmental management issues. Chapter 6 documents the preparers of the FPEIS and public review components of this NEPA process. Chapter 7 contains the references cited in this analysis. Chapter 8 contains a glossary of terms used in this FPEIS and generally pertaining to fisheries management in the Western Pacific Region.

The appendices include the list of the current management unit species (MUS) for the Preferred Alternative under Component 2 (introduced in Section 1-1), summaries of workshops the Council convened to explore ecosystem science and management, relevant laws and executive orders, and copies of public comment letters and responses to these letters received during two public reviews of draft PEIS documents.

The proposed Western Pacific Region place-based FEPs (see Figure 1-1) would replace existing FMPs. Draft FEPs were distributed to the public for their information with the draft Programmatic EIS in 2007, in order to demonstrate the reorganization of FMPs into FEPs. No new management actions are being proposed as part of this proposal to reorganize the fishery management regime. The final draft FEPs are available at the Council's website at www.wpcouncil.org or by mail from the Council[5]. Copies of the final draft FEPs are attached as Appendix G to the FPEIS.

In the future, as changes to fishery management are required, proposed fishery management actions would undergo separate public review, environmental impact analysis, and NEPA compliance, as appropriate, before amending FEPs.

1.2. Purpose and Need

The purpose of the proposed action is to establish an institutional framework that facilitates a shift to an ecosystem approach to fisheries management in the Western Pacific Region. This would be accomplished through the approval and implementation of place-based FEPs, without any substantive changes to current fishing regulations. This shift would enable increased understanding and protection of ecosystem structures and functions and is needed to provide the management framework that would simplify the development and implementation of future conservation and management measures for marine ecosystems and their fishery resources. Because there are currently a number of fisheries operating under the existing species-based fishery management plans, this shift should be done in a manner that is understandable to fishery participants and which has minimal regulatory burden. The proposed Federal action consists of the following two components:

> ***Component 1:*** The implementation of one or more geographic, or place-based, fishery ecosystem plans that delineate specific boundaries and support a shift to an ecosystem approach to fisheries in the Western Pacific Region. The new fishery ecosystem plan or plans would replace existing species-based fishery management plans. Included in Component 1 is

[5] WPFMC, 1164 Bishop Street, Suite 1400, Honolulu, Hawaii 96813

the associated reorganization of existing species-based FMP regulations into geographic-based FEP regulations.

Component 2: The designation of appropriate management unit species to be managed under each FEP.

Three additional non-federal fishery management administrative components are discussed in this document to assist the Council in determining its optimal organizational structure and procedures commensurate with a shift to ecosystem management. These include the Council's advisory structure and role in regional coordination, international management, and research. These components are not considered Federal actions.

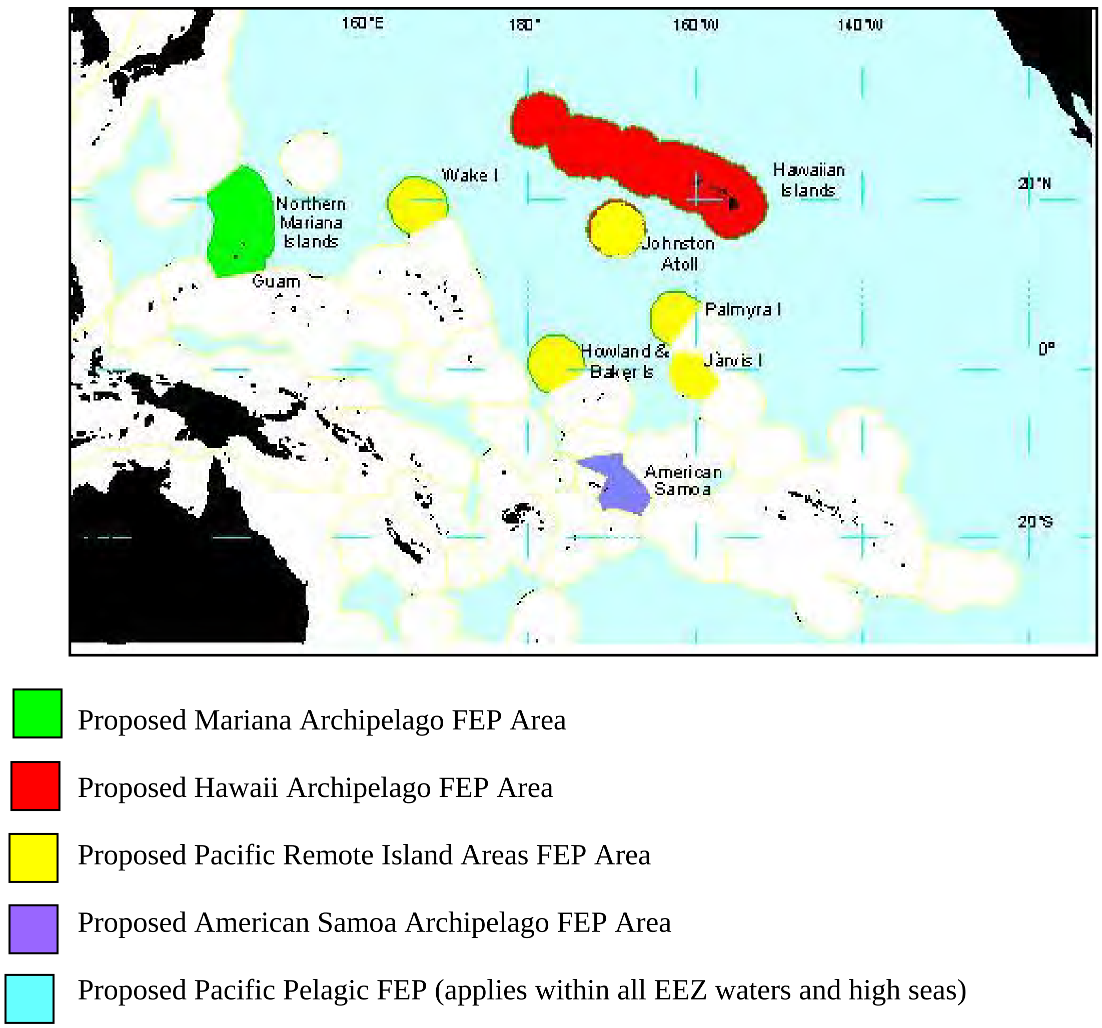


Figure 1-1. Western Pacific Region and Proposed FEP Areas.

1.3. Background Information

This FPEIS analyzes the impacts on the human environment of replacing the existing FMPs with FEPs for the Western Pacific Region. FEPs would cover American Samoa, the Mariana Islands, Hawaii, the U.S. Pacific Remote Island Areas (PRIA[6]), and the pelagic environment within the U.S. EEZ and on the high seas. The proposal was coordinated with the public through a number of public meetings and opportunities for review. The initial “Notice of Intent to Prepare an EIS” was published on October 18, 2004 (69 FR 61351), together with a notice of public scoping meetings. An initial Draft PEIS, dated October 27, 2005, was available for a 45-day public comment period from November 10 to December 26, 2005 (70 FR 68443; November 10, 2005). A revised analysis of the impacts related specifically to the approval and implementation of fishery ecosystems plans in the Western Pacific Region was published in a second Draft PEIS dated March 30, 2007, which was available for a 45-day public comment period from April 13 to May 29, 2007 (72 FR 18644; April 13, 2007). To assist the public during the review of the second Draft PEIS, draft Fishery Ecosystem Plans (FEPs) representing the preferred alternatives were made available with the Draft PEIS. The final draft FEPs are included in this FPEIS in Appendix G and are also on the Council’s website at http://www.wpcouncil.org or are available by mail from the Council[7]. If the decision is made to move toward the ecosystem approach for fishery management in the Western Pacific Region, the FEPs will be implemented subject to Secretarial review and approval.

The Western Pacific Region includes several geographic areas with distinct cultures, communities, and marine resources. For thousands of years, the indigenous people of these Pacific islands relied on healthy marine ecosystems to sustain themselves and their island communities. This remains true today as Pacific island communities continue to depend on the ecological, economic, and social benefits of healthy marine ecosystems.

On international, national, and local levels, institutions and agencies that manage marine resources are moving toward an ecosystem approach to fisheries management. As stated in Pikitch et al. (2004), increased concern regarding the potential impacts of fishing and nonfishing activities on the marine environment, and a greater understanding of the relationships between ecosystem changes and population dynamics, have fostered support for a holistic approach to fisheries management that is science-based and forward thinking.

NOAA defines an ecosystem approach as “management that is adaptive, specified geographically, takes account of ecosystem knowledge and uncertainties, considers multiple external influences, and strives to balance diverse social objectives” (NOAA 2004). The Food and Agriculture Organization of the United Nations states that the purpose of an ecosystem approach to fisheries management is “to plan, develop and manage fisheries in a manner that

[6] In its usual usage, the PRIA of the United States includes Baker, Howland, and Jarvis Islands; Johnston Atoll; Kingman Reef; Wake Island; Palmyra Atoll; and Midway Island. However, because Midway is located in the Hawaiian Archipelago, it would not be part of the PRIA Fishery Ecosystem Plan.

[7] Western Pacific Regional Fishery Management Council, 1164 Bishop St., Suite 1400, Honolulu, HI 96814.

addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from a full range of goods and services provided by marine ecosystems" (Garcia et al. 2003).

In 1998, the U.S. Congress charged NMFS with establishing the Ecosystem Principles Advisory Panel (Panel; EPAP), which was responsible for assessing the extent to which ecosystem principles were being used in fisheries management and recommending how to further ecosystem principle use to improve the status and management of marine resources. The Panel was composed of members of academia, fishery and conservation organizations, and fishery management agencies.

The EPAP identified the following principles as important when considering and identifying marine ecosystems and adopting an ecosystem approach to management:

- The ability to predict ecosystem behavior is limited.
- An ecosystem has real thresholds and limits that, when exceeded, can affect major system restructuring.
- Once thresholds and limits have been exceeded, changes can be irreversible.
- Diversity is important to ecosystem functioning.
- Multiple scales interact within and among ecosystems.
- Components of ecosystems are linked.
- Ecosystem boundaries are open.
- Ecosystems change with time.

The EPAP reached consensus that FEPs should be developed and implemented to manage U.S. fisheries and marine resources (EPAP 1999). According to the EPAP, an FEP should contain and implement a management framework to control harvests of marine resources on the basis of available information regarding the structure and function of the ecosystem in which such harvests occur. The Panel recommended, for consideration by the regional fishery management councils (RFMCs), the following eight management and policy measures to further develop FEPs:

- Delineate the geographic extent of the ecosystem(s) that occur(s) within RFMC authority, including characterization of the biological, chemical, and physical dynamics of those ecosystems, and then "zone" the area for alternative uses.
- Develop a conceptual model of the food web.
- Describe the habitat needs of different life history stages for all plants and animals that represent the "significant food web" and how they are considered in conservation and management measures.
- Calculate total removals—including incidental mortality—and show how they relate to standing biomass, production, optimum yields, natural mortality, and trophic structure.
- Assess how uncertainty is characterized and what kinds of buffers against uncertainty are included in conservation and management actions.
- Develop indices of ecosystem health as targets for management.
- Describe available long-term monitoring data and how they are used.

- Assess the ecological, human, and institutional elements of the ecosystem that most significantly affect fisheries and that are outside Council/Department of Commerce authority.

In recognition of the Panel's findings, the Council recommended the initiation of an incremental shift toward an ecosystem approach for fisheries of the entire Western Pacific Region[8]. The first phase of this incremental shift (replacing the five FMPs with FEPs) would establish the appropriate institutional framework and foundation (place-based FEPs) for future fisheries management under an ecosystem approach. Although the proposed Federal action does not purport to adopt the EPAP's ecosystem principles, management measures, or polices, this action is necessary to create the infrastructure for future place-based management. This shift in focus to place will also facilitate ecosystem science and research that will enhance the understanding of and impacts on marine ecosystems. Subsequent phases of fishery management actions will expand on the FEP foundation using the best available information and adaptive management. Such phases may include, but are not limited to: the establishment of ecosystem indicators linked to various management responses, the development of ecosystem models, the establishment of community-based management and monitoring measures, the implementation of explicit upper limits on total removals, and other similar phased actions.

1.3.1. The Magnuson–Stevens Fishery Conservation and Management Act and the Regional Fishery Management Councils

The 1976 Magnuson Fishery Conservation and Management Act (also known as the Magnuson Act and later renamed the Magnuson–Stevens Fishery Conservation and Management Act [MSA]) established exclusive U.S. jurisdiction from the seaward boundary of the territorial sea out to 200 nautical miles from shore for the purposes of managing U.S. fishery resources. Subsequently, Presidential Proclamation 5030 (March 10, 1983), established this area as the U.S. exclusive economic zone (EEZ) and 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." This increased jurisdiction over the EEZ provided a basis for expanded exploration, exploitation, scientific research, and protection of the marine environment and was recognized in the 1996 amendments to the MSA.

The MSA is the principal federal statute regarding the management of U.S. domestic marine fisheries. The purposes of the MSA include the following: the conservation and management of the fishery resources of the United States; the protection of essential fish habitat (EFH); the establishment of regional fishery management councils; the preparation and implementation of fishery management plans; the promotion of domestic, commercial, and recreational fishing; the support and encouragement of international fishery agreements; and the development of fisheries that are underutilized or not utilized. With respect to FEPs, the Magnuson-Stevens Fishery

[8] At its 130th meeting held December 20, 2005, the Council took final action to recommend implementation of place-based FEPs for the Western Pacific Region.

Conservation and Management Reauthorization Act of 2006 recognizes the importance of integrating ecosystem approaches in fisheries management.

The MSA established both required and discretionary provisions of an FMP and created ten National Standards to ensure that any FMP or FMP amendment is consistent with the MSA. Each FMP contains a suite of management measures that together characterize the fishery management regime. These measures are either a framework type measure that allows for annual or periodic adjustments using a streamlined implementation process, or are conventional measures that are fixed in the FMP and its implementing regulations and require a formal plan or regulatory amendment to change.

The Sustainable Fisheries Act of 1996 (SFA; Public Law 104-297) reauthorized and made significant amendments to the MSA. The SFA included provisions aimed at the development of sustainable fishing practices in order to guarantee a continued abundance of fish and continued opportunities for the U.S. fishing industry. The SFA included requirements that fishery management measures prevent overfishing, ensure the rebuilding of overfished stocks, achieve optimum yields from U.S. fisheries, minimize bycatch, take into account the importance of fishery resources to fishing communities, identify and conserve essential fish habitat, address impacts on fish habitat, and promote the safety of human life at sea.

The SFA emphasized the need to protect fish habitat. Under the law, regional Councils prepared amendments identifying EFH as areas necessary to manage fish species for their basic life functions. The EFH provisions of the MSA require NMFS to provide recommendations to Federal and State agencies for conserving and enhancing EFH for any actions that may adversely impact EFH.

The MSA created eight regional fishery management councils to provide advice and recommendations to the Secretary through the U.S. Department of Commerce, NOAA, and NMFS. The fishery management councils are responsible for the preparation and transmittal to the Secretary of appropriate, science-based FMPs (and amendments to those plans) for fisheries under their jurisdiction. The Secretary may approve, disapprove, or partially approve each FMP or amendment and, if approved, implement them through federal regulations and enforcement. Under the MSA, the Western Pacific Fishery Management Council has management responsibility for U.S. fisheries in the Pacific Ocean seaward of American Samoa, CNMI, Guam, Hawaii, and the PRIA (16 U.S.C. §302(a)(H)). The Council has 13 voting members, eight of which are appointed by the Secretary, and five of which are the principal Federal, and State, Territory or Commonwealth officials with fishery management responsibility. The Council also includes non-voting representatives from the U.S. Department of State, the U.S. Fish and Wildlife Service, and the U.S. Coast Guard.

Fisheries that operate within the EEZ waters and high seas in the Western Pacific Region are currently managed under five FMPs: Bottomfish and Seamount Groundfish, Coral Reef Ecosystems, Crustaceans, Precious Corals, and Pelagics. Under the preferred alternatives in this proposed action, these existing FMPs would be replaced with FEPs applicable to fisheries in the American Samoa Archipelago, Mariana Archipelago, Hawaiian Archipelago, PRIA and the Pacific Pelagics. The Secretary would consider the existing criteria used to evaluate new FMPs and amendments to FMPs to evaluate the FEP’s consistency with the MSA.

Under the MSA, the Secretary reviews FMPs or amendments transmitted by the regional fishery management councils for consistency with the National Standards and other provisions of the MSA, and with other applicable laws (16 U.S.C. §304(a)(1)) including the following:

- National Environmental Policy Act (NEPA)
- Endangered Species Act (ESA)
- Marine Mammal Protection Act (MMPA)
- Administrative Procedures Act (APA)
- Regulatory Flexibility Act (RFA)
- Information Quality Act (IQA)
- Coastal Zone Management Act (CZMA)
- Paperwork Reduction Act (PRA)
- Executive Order 12898: Environmental Justice
- Executive Order 13132: Federalism
- Executive Order 12630: Taking
- Executive Order 13158: Marine Protected Areas

A description of each of the laws and Executive Orders listed above is provided in Appendix D.

1.3.1.1. Fishery Management Plans of the Western Pacific Region

1.3.1.1.1. Bottomfish and Seamount Groundfish FMP

The Bottomfish and Seamount Groundfish FMP was implemented in 1986 with the following management measures:

1. Prohibition of certain destructive fishing techniques, including explosives, poisons, trawl nets, and bottom-set gillnets;
2. establishment of a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts (which has been extended until August, 31, 2010 [69 FR 51400]);
3. implementation of a permit system for fishing for bottomfish in the EEZ around the Northwestern Hawaiian Islands (NWHI); and
4. establishment of 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.

Table 1-1 reflects the amendments to the Bottomfish and Seamount Groundfish FMP since 1986.

Table 1-1. Amendments to the Bottomfish and Seamount Groundfish FMP.

Amendments		
No.	**Effective Date**	**Action**
1	1987	Establishes potential limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the FMP.
2	1988	Divides the EEZ around the NWHI into two management zones: the Hoomalu Zone to the northwest and the Mau Zone to the southeast. The amendment also establishes a limited access system for the Hoomalu Zone.
3	1991	Supplanted by Amendment 6, Amendment 3 defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20 percent.
4	1991	Requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nautical mile "protected species study zone" around the NWHI. This notification allows federal observers to be placed on board bottomfish vessels.
5	1999	Establishes a limited access system for the Mau Zone and a framework for a Community Development Program.
6	1999	Identifies and describes EFH for managed species of bottomfish, discusses measures to minimize bycatch and bycatch mortality in the bottomfish fishery, provides new criteria for identifying when overfishing has occurred, and describes fishing communities in the region.
7	2004	Brings the Bottomfish FMP into conformity with the Coral Reef Ecosystems FMP by prohibiting fishing for Bottomfish MUS (BMUS) in the Coral Reef Ecosystems FMP's no-take areas. Amends the BMUS list to exclude species now managed under the Coral Reef Ecosystems FMP.
8	2006	Includes CNMI and the PRIA in the FMP (i.e., bottomfish fisheries in these areas are now subject to applicable FMP regulations).
9	2006	Prohibits vessels 50ft and larger from harvesting BMUS within 50 nm of Guam and requires federal permits and reporting for Guam-based bottomfish vessels 50ft or larger.
14	2008	Establishes management measures to end overfishing of the Deep 7 bottomfish species in the Main Hawaiian Islands (MHI). Establishes Federal permit and reporting requirements for non-commercial bottomfish fishermen in the MHI, non-commercial bag limits, an annual Total Allowable Catch (TAC), and a seasonal closure for Deep 7 bottomfish species.

1.3.1.1.2. Coral Reef Ecosystems FMP

A final rule implementing the Coral Reef Ecosystems FMP was published on February 24, 2004 (69 FR 8336). The management measures of the Coral Reef Ecosystems FMP include the following:

1. Designation of Howland, Baker, Jarvis Islands, Rose Atoll, and Kingman Reef as no-take marine protected areas (MPAs). Palmyra and Johnston Atolls and Wake Island are designated as low-use MPAs where fishing is allowed only under special fishing permits;
2. implementation of a federal permit and reporting system for controlling and monitoring the harvest of certain Coral Reef Ecosystem MUS for which there is little or no information. The FMP also uses data collected under existing local reporting systems to monitor the harvest of currently fished Coral Reef Ecosystems MUS;
3. prohibitions on the use of destructive and nonselective fishing gears;
4. prohibitions on the harvest of coral and live rock, but limited take is allowed under the permit system for collection of seed stock by aquaculture operations and religious/cultural use by indigenous peoples;
5. adaptive management approach using a framework process for rapid regulatory modifications in the event of major changes within coral reef ecosystems or coral reef fisheries;
6. consideration of the historical and cultural dependence on coral reef resources by indigenous people; and
7. identification of coral reef related research needs for each island area, including socioeconomic and cultural research for future potential allocation of resources.

To date, the Coral Reef Ecosystem FMP has not been amended.

1.3.1.1.3. Crustaceans FMP

The Crustaceans FMP was implemented in 1983 (48 FR 5560; February 7). Initial management measures of the FMP include the following:

1. Prohibitions on fishing for spiny lobster within 20 nautical miles of Laysan Island and within the EEZ landward of the 10-fathom curve as depicted on National Ocean Survey Charts Numbers 19022, 19019, and 19016;
2. implementation of minimum size limits;
3. requirements for gear design;
4. prohibition on retention of ovigerous females; and
5. requirements for federal catch reporting.

The following table reflects the amendments to the Crustaceans FMP since 1983.

Table 1-2. Amendments to the Crustaceans FMP

Amendments		
No.	**Effective Date**	**Action**
1	1983	Adopts State of Hawaii regulations for the EEZ around the main Hawaiian Islands (MHI).
2	1984	Specifies gear requirements such as trap opening dimensions.
3	1986	Clarifies size restrictions such as definitions for minimum size and tail length.
4	1987	Prohibits all lobster fishing in certain closed areas in the NWHI.
5	1987	Establishes a minimum size for retained slipper lobsters and requires escape panels in traps in the NWHI.
6	1991	Defines recruitment overfishing.
7	1992	Establishes a closed season, limited access system, and adjustable annual harvest quota for the NWHI.
8	1994	Eliminates the use-it-or-lose-it landing requirement for NWHI permit holders.
9	1996	Revises the NWHI annual harvest guideline to represent 13 percent of the exploitable population, which represents a 10 percent chance of overfishing the lobster stock at a particular permit area. Removes minimum size and condition restrictions in the NWHI fishery, and establishes a retain-all fishery in which every lobster brought aboard is counted against the annual harvest guideline.
10	1999	Identifies and describes EFH for Crustacean MUS, discusses measures to minimize bycatch and bycatch mortality, provides criteria for determining when overfishing has occurred, and describes fishing communities in the region.
11	2004	Brings the Crustaceans FMP into conformity with the Coral Reef Ecosystems FMP by prohibiting fishing for Crustaceans MUS (CMUS) in the Coral Reef Ecosystems FMP no-take areas. Amends the CMUS list to exclude species now managed under the Coral Reef Ecosystems FMP.
12	2006	Includes CNMI and the PRIA in the FMP and establishes federal permitting and reporting requirements for crustacean fisheries operating in those areas.
13	2008	Establishes permit and reporting requirements for deepwater shrimp fishing and adds deepwater shrimp to the Crustaceans MUS.

1.3.1.1.4. *Precious Corals FMP*

The Precious Corals FMP was implemented in 1983 (48 FR 39229; September 29). The FMP management measures include the following:

1. Establishment of harvest quotas for known precious coral beds;
2. implementation of minimum size limits for pink coral;
3. gear restrictions;
4. closed areas; and
5. fishing seasons.

Since 1983, the Precious Corals FMP has been amended several times (Table 1-3).

Table 1-3. Amendments to the Precious Corals FMP.

Amendments to the Precious Corals FMP		
No.	**Effective Date**	**Action**
1	1988	Applies the management measures of the FMP to U.S. Pacific Insular Areas other than Guam, American Samoa, and the Northern Mariana Islands by incorporating them into a single exploratory permit area; expands the Precious Corals MUS list to include any coral of the genus *Corallium*; and outlines provisions for experimental fishing permits.
2	1991	Defines a bed as overfished with respect to recruitment when the total spawning biomass (all species combined) has been reduced to 20 percent of its unfished condition.
3	1998	Establishes a framework procedure for adjustment of management measures.
4	1999	Identifies and describes EFH for managed species of precious corals, discusses measures to minimize bycatch and bycatch mortality in the precious corals fishery, provides criteria for identifying when overfishing has occurred, and describes fishing communities in the region.
5	2004	Prohibits the harvest of Precious Corals MUS in the no-take marine protected areas designated under the Coral Reef Ecosystem FMP (waters shallower than 50 fathoms around Jarvis Island, Howland Island, Baker Island, Kingman Reef, and Rose Atoll).
6	2006	Includes CNMI in the FMP and establishes federal permitting and reporting requirements for precious corals fisheries operating around the CNMI.
7	2008	Designates the Au’au Channel black coral bed as an established bed with a harvest quota. Implements a 5-year gold coral moratorium for the western Pacific.

1.3.1.1.5. Pelagics FMP

The Pelagic Fisheries of the Western Pacific Region FMP (Pelagics FMP) was implemented on February 27, 1987 (52 FR 5983). At the time the Pelagics FMP was drafted, the U.S. government was in the process of attempting to limit foreign longline fishing effort within the EEZ, and encouraging more domestic harvesting and utilization of fishery resources. The Pelagics FMP replaced a previous preliminary management plan (PMP), which governed foreign longline fishing in the EEZ of the Western Pacific Region. Management measures originally put in place under the Pelagics FMP included the following:

1. Establishment of a triggering mechanism to institute new area closures for foreign longline vessels in the EEZ;
2. elimination of existing quotas on foreign longline catches in the EEZ;
3. requires federal longline catch reports, including interactions with protected species in the EEZ;
4. prohibition on the use of drift gill nets in the EEZ (except by domestic vessels fishing under an experimental permit); and
5. in cooperation with the U.S. State Department, establishment of a process to obtain data on the incidental catch of pelagic fishes in the EEZ by tuna pole-and-line and purse seine[9] vessels.

A subsequent rule, effective November 26, 1990 (55 FR 42967), requires that catch-and-effort data for species managed under the FMP (Pelagic MUS) be reported to the State of Hawaii, the Territory of American Samoa, and the Territory of Guam in compliance with the respective laws and regulations of each area.[10]

Over the years, the FMP has been amended several times. Table 1-4 summarizes these amendments to the Pacific Pelagics FMP.

Table 1-4. Amendments to the Pelagics FMP.

Amendments to the Pelagics FMP		
No.	**Effective Date**	**Action**
1	1991	Provides: (a) a measurable definition of recruitment overfishing for billfishes, mahimahi, wahoo, and oceanic sharks; (b) a revised definition of optimum yield (OY); and (c) a revised set of objectives to conform to the MSA.

[9] The original Pelagics FMP contained no restrictions on foreign or domestic purse seine or pole-and-line tuna vessels, as tuna were not yet included as fish under the MSA or as MUS under the FMP. Amendment 6 to the FMP added tuna and related species to the FMP and closed the U.S. EEZ to foreign purse seine and pole-and-line tuna vessels. The U.S. tuna purse seine fleet in the Western Pacific is generally managed under the South Pacific Tuna Treaty, although provisions of the Pelagics FMP apply to U.S. purse seine vessels fishing within the U.S. EEZ.

[10] At that time, the CNMI was not yet included in the management area of the Pelagics FMP.

Amendments to the Pelagics FMP		
No.	**Effective Date**	**Action**
2	1991	(Proceeded by an emergency rule.) Requires longline and transshipping vessel owners to obtain permits for their vessels, and requires vessel operators to maintain and submit to NMFS logbook data on their fishing and transshipping activities. Extends the jurisdiction of the FMP to include the CNMI. Adds tuna to Pelagic MUS (PMUS) list. Establishes a protected species zone in the NWHI such that vessel operators intending to fish in this zone must notify NMFS in advance and carry an observer if requested. Requires notification of NMFS within 12 hours of return to port after any transshipment activity or landing.
3	1991	(Proceeded by an emergency rule.) Prohibits longline fishing within 50 nm of the NWHI as well as within corridors between those islands. Abrogates the requirement for observers established in Amendment 2. Requires notification of NMFS when transiting the protected species zone.
4	1991	(Proceeded by an emergency moratorium and establishment of a control date for possible use in a limited entry program.) Extends until April 1994 a moratorium on the issuance of new permits to participate in the Hawaii-based longline fishery. Provides a framework under which vessel monitoring systems (VMS) may be required.
5	1992	(Proceeded by an emergency rule.) Prohibits longline fishing within 75 nm of the islands of Oahu, Kauai, Niihau, and Kaula, and within 50 nm of the islands of Hawaii, Maui, Kahoolawe, Lanai, and Molokai. A longline closure of approximately 50 nautical miles is also implemented around Guam and its offshore banks. Establishes framework procedures to adjust the size of the closed areas and modify criteria for exemptions.
6	1992	Adds tuna and related species to the FMP. Extends closed areas and requirements applicable to foreign longline vessels to foreign bait boats and purse seine vessels.
7	1994	Establishes a limited entry program for the Hawaii longline fishery for pelagic species. Includes broad framework measures for more efficient management of the fishery.
8	1999	Establishes a permit and reporting requirement for the pelagic troll and handline fishery in the PRIA.
9	Abandoned	(Draft amendment 9 considered establishing limits on shark landings and was rendered moot by the Shark Finning Prohibition Act.)
10	2004	Prohibits fishing for PMUS in the Coral Reef Ecosystems FMP no-take MPA. Amends the list of PMUS.

Amendments to the Pelagics FMP		
No.	**Effective Date**	**Action**
11	2005	Establishes a limited entry program for the American Samoa longline fishery.
15	2008	Designates three species of pelagic squid as management unit species, and establishes permitting and reporting requirements for squid jig fishing vessels over 50 ft (15.4 m) in length.
18	2009	Removes the effort (set) limit, eliminates set-certificates, while continuing sea turtle hard caps, circle hooks, mackerel bait, and 100% observer coverage in the Hawaii-based shallow set longline fishery targeting swordfish.
FRAMEWORK AMENDMENTS		
No.	**Effective Date**	**Action**
1	2002	Prohibits vessels greater than 50 feet in length overall from fishing for PMUS between 3 and 50 nautical miles around the islands of American Samoa.
2	2002	(Proceeded by an emergency rule.) Requires Hawaii longline limited access vessels operating north of 23° N to employ a line-setting machine with weighted branch lines (45g minimum) or use basket style gear, and to use blue-dyed bait and strategic offal discards during setting and hauling longlines. Also requires certain seabird handling techniques and attendance by owners and operators at an annual protected species workshop conducted by NMFS.
REGULATORY AMENDMENTS		
1	2002	Prohibits targeting of swordfish north of the equator by Hawaii longline vessels, closes all fishing to longline vessels during April and May in waters south of the Hawaiian Islands (from 15° N to the equator and from 145° W to 180°), and prohibits the landing or possessing of more than 10 swordfish per trip by longline (limited entry or general) vessels and possession of light sticks. Vessels with a freeboard more than 3 feet must carry line clippers, dip nets, and wire or bolt cutters. Float lines must be longer than 20 meters. If monofilament longline is used, must have at least 15 branch lines between floats. If basket-style gear is used, must have at least 10 branch lines between floats. Deepest point of main longline between any 2 floats must be 100 meters. Vessel operators must attend and be certified at a protected species workshop.
2	2002	Establishes permit and reporting requirements for any U.S. fishing vessel that uses troll or handline gear to harvest PMUS in the EEZ around the PRIA.

Amendments to the Pelagics FMP		
No.	**Effective Date**	**Action**
3	2004	Reopens the swordfish-directed component of the Hawaii-based longline fishery and eliminates the seasonal closure for longline fishing in an area south of the Hawaiian Islands. For swordfish fishing, requires circle hooks and mackerel-type bait, annual fleet-wide limits on interactions with leatherback and loggerhead sea turtles, an annual fleet-wide limit on fishing effort, and other mitigation measures including the requirements for setting at night when fishing above 23° N.

For the complete list of regulations pertaining to each FMP as well as other fisheries regulations that apply to the Western Pacific Region, see 50 CFR Part 665.

1.4. National Environmental Policy Act

NEPA (42 U.S.C. 4331, et seq.) establishes a national environmental policy, provides an interdisciplinary framework for environmental planning by Federal agencies, provides opportunities for public involvement in agency decision-making, and contains procedures to ensure that Federal decision-makers take environmental factors into account. NEPA does not require that the most environmentally desirable alternative be chosen, but does require that the environmental effects of the alternatives be analyzed for the benefit of decision-makers and the public.

NEPA has two principal purposes:

1. To require Federal agencies to evaluate the potential environmental effects of any major planned Federal action to ensure that public officials make well-informed decisions about the potential impacts.

2. To promote public awareness of potential impacts at the earliest planning stages of major Federal actions by requiring Federal agencies to prepare a detailed environmental evaluation for any major Federal action significantly affecting the quality of the human environment.

NEPA requires an assessment of the biological, social and economic consequences of major Federal actions and provides members of the public with an opportunity to be involved in and to 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 actions taken.

Federal fishery management actions subject to NEPA requirements include the approval (under the MSA) of FMPs, FMP amendments, and regulations implementing FMPs. Such approval requires preparation of the appropriate level of NEPA analysis (Categorical Exclusion, Environmental Assessment, or Environmental Impact Statement). On the basis of a review of NEPA and NOAA Administrative Order 216-6, NMFS and the Council have determined that a Programmatic EIS level analysis is the appropriate level of analysis to inform the agency decisions considered here: replacement of the Western Pacific FMPs with one or more FEPs, and adjustment of the MUS lists as appropriate. The actions are administrative and the scope of the analysis is broad and at the program-level. This document describes the proposed action and alternatives and evaluates the impacts on the human environment. Future proposals to amend fishery management measures would undergo separate NEPA analysis as appropriate and at such time as the proposals are developed.

1.4.1. Action Agency: National Marine Fisheries Service

The action agency for this action is NMFS (also known as NOAA Fisheries Service). NMFS is a line office of the U.S. Commerce Department's NOAA, and is the primary federal agency responsible for stewardship of the nation's living marine resources and their habitats. NMFS is represented in the Western Pacific Region by its Pacific Islands Regional Office (PIRO) and Pacific Islands Fisheries Science Center (PIFSC), both located in Honolulu, Hawaii.

1.4.2. Roles and Responsibilities of the Federal Government, Council, State, Territories, and Commonwealth in Fisheries Management in the Western Pacific Region

The Magnuson-Stevens Fishery Conservation and Management Act (MSA) specifically established the boundaries of the U.S. Exclusive Economic Zone (EEZ) within which the U.S. Congress granted primary jurisdiction to NOAA over management of fisheries resources. The National Marine Fisheries Service (NMFS) administers the nation's fishery management programs in accordance with the MSA and other applicable laws. The Western Pacific Fishery Management Council is the advisory group that develops and oversees fishery management in the Western Pacific Region through recommendations to NMFS.

The U.S. Environmental Protection Agency (EPA) is responsible for reviewing major Federal actions significantly affecting the quality of the human environment, including FMPs and FMP amendments (Amendments) as developed under the MSA where those plans and amendments are subject to the EIS requirement of the NEPA.

The U.S. Army Corps of Engineers (ACOE) manages the planning, designing, building and operating of water resources and other civil works projects (e.g., navigation, flood control, environmental protection, disaster response, etc.). The ACOE is also in charge of the Clean Water Act (CWA) Section 404 permits for authorized discharge of sediment into waters of the U.S., including wetlands. With regard to commercial fishing, the ACOE is most often involved in near shore projects such as wharf construction and harbor improvements.

NOAA's Ocean Service (NOS) co-manages the Hawaiian Islands Humpback Whale National Marine Sanctuary, manages the Fagatele Bay National Marine Sanctuary in American Samoa, and co-administers the Papahanaumokuakea Marine National Monument in the Northwestern Hawaiian Islands (NWHI).

The Department of the Interior, through the U.S. Fish and Wildlife Service (USFWS or FWS) manages ten National Wildlife Refuges throughout the Western Pacific Region. The FWS is a co-trustee with the State and NOAA of the Papahanaumokuakea Marine National Monument in the NWHI, which was established in 2006.

The Department of Defense, through the Air Force, Army, Navy, and Marine Corps, controls access and use of various marine waters throughout the region (e.g., Pearl Harbor, certain areas off of Guam).

The Territory of American Samoa, the Territory of Guam, and the State of Hawaii manage marine resources and fisheries within waters 0 to 3 miles from their shorelines, except where Federal jurisdiction preempts. In the CNMI, the submerged lands and marine resources from the shoreline to 200 miles have all been determined to be under the jurisdiction of the Federal government.

1.4.3. International Regional Fishery Management Organizations

1.4.3.1. Western and Central Pacific Fisheries Commission

The International Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean was opened for signature on September 5, 2000. The objective of the Convention is to assure the long-term conservation and sustainable use of highly migratory fish stocks in the region. The Convention was effective as of April 19, 2004, and most signatories—including the U.S.—have either ratified it or consented to its provisions. The Convention also provides for the participation of fishing entities and Territories situated within the Convention area. The Convention established a Commission for the Conservation and Management of Highly Migratory Fish Stocks in the Western and Central Pacific Ocean, now more commonly referred to as the Western and Central Pacific Fisheries Commission (WCPFC). See Figure 1-2 for a schematic of the WCPFC convention area.

1.4.3.2. Inter-American Tropical Tuna Commission

The Inter-American Tropical Tuna Commission (IATTC) was established by international convention in 1949 and is responsible for the conservation and management of tuna fisheries and other species taken by tuna fishing activity in the eastern Pacific Ocean. The convention area of the IATTC is bounded by the coasts of the Americas to longitude 150° W, and to the 50° N and 50° S lines of latitude. These boundaries were established in the Antigua Convention in 2003, which modified the original area of the IATTC established in 1949.

The organization consists of a Commission in which each member country may be represented by up to four commissioners and a Director of Investigations. The Director is responsible for drafting research programs, overseeing budgets, managing administrative support, directing technical staff, coordinating with other organizations and preparing reports to the Commission. The IATTC maintains a core staff of fishery scientists that coordinate and conduct research, manage observer programs, and collect, compile, analyze, and disseminate fishery data and scientific findings.

The Council and NMFS also work closely with other international organizations across the Pacific such as the Forum Fisheries Agency, South Pacific Regional Environment Programme, and the Secretariat for the Pacific Community.

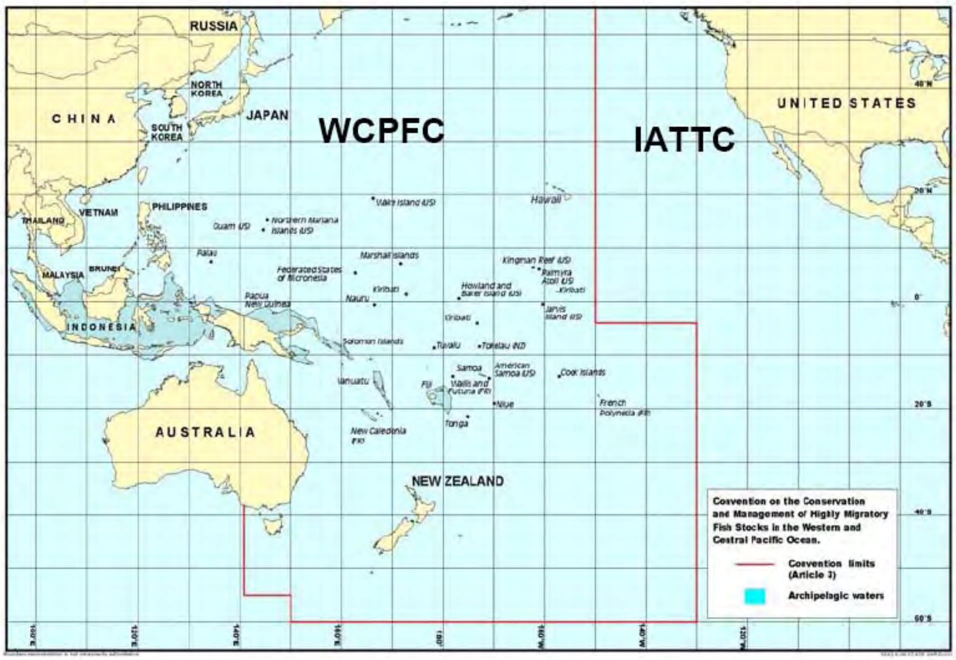


Figure 1-2. Western and Central Pacific Fisheries Commission Convention Area.

1.4.4. Public Participation in Development of the FEPs

A major function of NEPA is to ensure that Federal agencies provide for public involvement and disclosure process when making decisions that may affect the human environment. The NEPA process fosters public participation by requiring that Federal agencies conduct public scoping meetings prior to the development of a draft EIS, as well as make all draft and final EISs available for public review and comment. Public involvement occurs at a number of stages during development of FEPs and public comments are also welcome and encouraged throughout the Council and MSA process. Below are summaries of public involvement opportunities provided at various stages in the FEP and NEPA document development process.

1.4.4.1. Notice of Intent and Public Scoping

The Notice of Intent to prepare a PEIS was published in the Federal Register on October 18, 2004 (69 FR 61351). Between October and December 2004, eight public scoping meetings were advertised in local newspapers and held across the Western Pacific Region. The dates, locations and attendance of the meetings are listed in Table 1-5.

Table 1-5. EIS Public Scoping Meeting Schedule.

Date	Location	Number of Attendees
October 27, 2004	Hilo, Hawaii, HI	24
October 28, 2004	Kailua-Kona, Hawaii, HI	6
November 1, 2004	Honolulu, Oahu, HI	11
November 2, 2004	Kahului, Maui, HI	0
November 3, 2004	Lihue, Kauai, HI	1
November 16, 2004	Susupe, Saipan, CNMI	22
November 17, 2004	Hagatna, GU	23
December 8, 2004	Pago Pago, AS	19

The Council's proposed plan for an incremental, stepwise approach to ecosystem-based fisheries management was presented at each of the public scoping meetings, and similar comments were received at all the meetings. Generally, the members of the public who attended the scoping meetings were supportive of the Council's shift from species-based FMPs to place-based FEPs. Although much of the discussion at the scoping meetings was broad-based and conceptual, several comments focused on "mountain to sea" management, jurisdictional issues, indigenous rights, community-based management, education, and enforcement.

In 2005, the Council held a series of public informational meetings on its shift towards ecosystem fisheries management and the establishment of place-based FEPs as follows:

- October 22, 2005 – Pago Pago, AS
- October 25, 2005 – Susepe, Saipan, CNMI
- October 26, 2005 – Tinian, CMNI
- October 27, 2005 – Rota, CNMI
- November 1, 2005 – Honolulu, HI

Other public meetings where the Council's proposed shift toward a fisheries ecosystem approach and the establishment of FEPs was discussed include the following:

- October 13, 2005 – Joint Plan Team Meeting, Honolulu, HI
- October 18, 2005 – 90th SSC Meeting, Honolulu, HI
- November 11, 2005 – 129th Council Meeting, Tumon, GU
- December 20, 2005 – 130th Council Meeting, Honolulu, HI

In addition to opportunities to participate in Council meetings, interested and affected parties had two opportunities to provide input on the draft proposals. An initial draft PEIS dated October 27, 2005, was made available for public comment on November 10, 2005 (70 FR 68443). After considering public comments on the 2005 draft PEIS (see Appendix F for a summary of comments received on that draft), a second draft PEIS was released for public review and comment on March 30, 2007 (72 FR 18644; April 13, 2007). Comment letters regarding the 2007 draft PEIS are provided in Appendix E and a summary of comments and agency responses is provided in Chapter 6.

1.5. Topics in Ecosystem Approaches to Fisheries Management

An overarching goal of an ecosystem approach to fisheries management is to maintain and conserve the structure and function of marine ecosystems by managing fisheries in a holistic manner that considers the ecological linkages and relationships between a species and its environment, including its human uses and societal values (Garcia et al. 2003, Laffoley et al. 2004, Pikitch et al. 2004). Although the literature on the objectives and principles of ecosystem approaches to management is extensive, there remains a lack of consensus and much uncertainty among scientists and policy makers on how to best apply these often theoretical objectives and principles in a real-world regulatory environment (Garcia et al. 2003; Hilborn 2004). In many cases, it is a lack of scientific information that hinders implementation (e.g., ecosystem indicators); in others cases, there are jurisdictional and institutional barriers that must be overcome before the necessary changes can be accomplished to ensure healthy marine fisheries and ecosystems (e.g., ocean zoning). These and other topics are briefly discussed below to provide a context for the proposed actions analyzed in this document.

1.5.1. Ecosystem Boundaries

It widely recognized that ecosystems are not static, but that the structure and functions vary over time because of various dynamic processes (Christensen et al. 1996; Kay and Schneider 1994; Ecosystems Principles Advisory Panel 1999). The term “ecosystem” was coined in 1935 by A. G. Tansley, who defined ecosystems as “an ecological community together with its environment, considered as a unit” (Tansley 1935). The U.S. Fish and Wildlife Service has defined an ecosystem as “a system containing complex interactions among organisms and their non-living, physical environment” (USFWS 1994), while NOAA defines an ecosystem as “a geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics” (NOAA 2004).

Although these definitions are more or less consistent (although only NOAA explicitly includes humans as part of ecosystems), the identification of ecosystems is often difficult and dependent on the scale of observation or application. For example, ecosystems can be reasonably identified for an intertidal zone on Maui, Hawaii, as well as for the entire North Pacific Ocean. For this reason, hierarchical classification systems are often used in mapping ecosystem linkages between habitat types (Allen and Hoekstra 1992, Holthus and Maragos 1995). NOAA’s Ecosystem Advisory Panel found that although marine ecosystems are generally open systems, bathymetric and oceanographic features allow their identification on a variety of bases. In order to be used as functional management units, however, ecosystem boundaries need to be geographically based and aligned with ecologically meaningful boundaries (Food and Agriculture Organization [FAO] 2002). Furthermore, if used as a basis for management measures, an ecosystem must be defined in a manner that is both scientifically and administratively defensible (Gonsalez 1996). Similarly, Sissenwine and Murawski (2004) found that delineating ecosystem boundaries is necessary to an ecosystem approach, but that the scale of delineation must be based on the spatial extent of the system that is to be studied or influenced by management. Thus, the identification of ecosystem boundaries for management purposes may differ from those identified from purely scientific assessments, but in all cases ecosystems are geographically defined, or in other words, place-based.

1.5.2. Precautionary Approach, Burden of Proof, and Adaptive Management

There is general consensus that a key component of ecosystem approaches to resource management is the use of precautionary approaches and adaptive management (EPAP 1999). The U.N. Food and Agricultural Organization (FAO) Code of Conduct for Responsible Fisheries states that under a precautionary approach:

> "[In] the absence of adequate scientific information, cautious conservation management measures [such as] catch limits and effort limits should [be implemented and] remain in force until there is sufficient data to allow assessment of the impacts of an activity on the long-term sustainability of the stocks, whereupon conservation and management measures based on that assessment should be implemented." (FAO 1995)

This approach allows appropriate levels of resource utilization through increased buffers and other precautions where necessary to account for environmental fluctuations and uncertain impacts of fishing and other activities on the ecology of the marine environment (Pikitch et al. 2004).

A notion often linked with the precautionary approach is shifting the "burden of proof" from resource scientists and managers to those who are proposing to utilize those resources. Under this approach, individuals would be required to prove that their proposed activity would not adversely affect the marine environment, as compared to the current situation that in general allows uses unless managers can demonstrate such impacts (Hildreth et al. 2005). Proponents of this approach believe it would appropriately shift the responsibility for the projection and analysis of environmental impacts to potential resource users and fill information gaps, thus shortening the time period between management decisions (Hildreth et al. 2005). Others believe that it is unrealistic to expect fishery participants and other resource users to have access to the necessary information and analytical skills to make such assessments.

The precautionary approach is linked to adaptive management through continued research and monitoring of approved activities (Hildreth et al. 2005). As increased information and an improved understanding of the managed ecosystem become available, adaptive management requires resource managers to operate within a flexible and timely decision structure that allows for quick management responses to new information or to changes in ecosystem conditions, fishing operations, or community structures.

1.5.3. Ecological Effects of Fishing and Nonfishing Activities

Fisheries may affect marine ecosystems in numerous ways, and vice versa. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can also affect marine ecosystems through vessel disturbance, bycatch or discards, impacts on nutrient cycling, introduction of exotic species, pollution, and habitat disturbance, as well as shifts in trophic levels, species composition, or ecosystem function. Historically, federal fishery management focused primarily on ensuring long-term sustainability by preventing overfishing and by rebuilding overfished stocks. However, the reauthorization of the MSA in 1996 placed additional priority on reducing nontarget or incidental catches, minimizing fishing impacts to habitat, and eliminating interactions with protected species. As a result fisheries management has significantly improved in these areas in recent years; however, there is now an increasing emphasis on the need to account for and minimize the unintended and indirect consequences of fishing activities on other components of the marine environment such as predator–prey relationships, trophic guilds, and biodiversity (Dayton et al. 2002; Browman and Stergiou 2004a, 2004b).

For example, fishing for a particular species at a level which is below its maximum sustainable yield can nevertheless limit its availability to predators, which, in turn, may impact the abundance of the predator species. Similarly, removal of top-level predators can potentially increase populations of lower trophic level species, thus causing an imbalance or change in the community structure of an ecosystem (Pauly et al. 1998). Successful ecosystem management will require significant improvement in our understanding of the impacts of these changes and the formulation of appropriate responses to adverse changes.

Marine resources are also affected by nonfishing aquatic and land-based activities. For example, according to NOAA’s *State of Coral Reefs Ecosystems of the United States and Pacific Freely Associated States: 2005* (NOAA 2005a), anthropogenic[11] stressors that are potentially detrimental to coral reef resources include the following:

- Coastal development and runoff
- Coastal pollution
- Tourism and recreation
- Ships, boats, and groundings
- Anchoring
- Marine debris
- Aquatic invasive species
- Security training activities

[11] Anthropogenic stressors or impacts are those that originate from human activities.

Non-anthropogenic impacts such as weather cycles, hurricanes, and environmental regime changes also have an effect on the ecosystem. Although managers cannot regulate or otherwise control such events, their occurrence can often be predicted and management responses can lessen their adverse impacts.

Understanding the complex interrelationships between marine organisms and their physical environment is a fundamental component of successful ecosystem approaches to management. Obtaining the necessary information to comprehensively assess, interpret, and manage these interrelationships will require in-depth and long-term research on specific ecosystems.

1.5.4. Data and Information Needs

Numerous research and data collection projects and programs have been undertaken in the Western Pacific Region and have resulted in the collection of huge volumes of potentially valuable detailed bathymetric, biological and other data. Some of this information has been processed and analyzed by fishery scientists and managers; however, much has proven difficult to handle because of differences in collection methodologies coupled with a lack of metadata[12] or documentation of how the data were collected and coded. This has resulted in incompatible datasets as well as data that are virtually inaccessible to anyone except the primary researchers. The rehabilitation and integration of existing datasets, as well as the establishment of shared standards for the collection and documentation of new data, will be an essential part of successful and efficient ecosystem management in the Western Pacific Region.

To this end, the Council convened three workshops. The first was the Ecosystem Science and Management Planning Workshop held April 18–22, 2005 in Honolulu, Hawaii, which was attended by world-renowned ecosystem scientists as well as high-level government agency officials. The objective of this workshop was to determine the (biophysical) science and data needs to support the application of ecosystem principles in planning and management. The summary of the workshop proceedings is provided in Appendix C and the full proceedings can be obtained online from www.wpcouncil.org or by mail[13] from the Council. Key points from the workshop include the following:

- Management and policy objectives need to be clearly and precisely stated prior to data collection or modeling/analyses being initiated;
- model or analysis choice must be driven firstly by management and policy objectives, and secondly by available or obtainable data;
- adaptive management experiments, involving deliberate spatial comparisons of management measures (e.g., marine protected areas) are of crucial importance for developing and implementing ecosystem-based management approaches;
- models cannot and should not determine the management decision, which, by its very nature, is choice driven and influenced by tradeoffs;

[12] **Metadata** (Greek *meta* "about" and Latin *data* "information") are data that describe other data. Generally, a set of metadata describes a single data point or a set of data.

[13] WPFMC, 1164 Bishop Street, Suite 1400, Honolulu, Hawaii 96813.

- some data collection efforts, while labeled as ecosystem-based, may not be appropriately scaled (in terms of spatial-temporal sampling) or may not target useful variables or parameters for ecosystem-based fisheries management;
- new or different data may need to be collected, depending on clearly identified management/policy issues, and the associated analysis/modeling needs. Such data activities should include data 'mining' and data recovery from old and/or unusual sources (e.g., research theses, unpublished grey literature, old print and electronic media etc.); and
- concerted efforts are required to reduce or overcome agency specific disagreements (e.g., jurisdictional boundaries) and miscommunication in an integrative approach to move towards system management as a centralized objective.

The following recommendations were produced from the ecosystem science workshop:

1. Clearly define and articulate management and policy issues and objectives along lines of urgency and identified needs;
2. assign a centralized resource entity with sufficient seniority and appropriate financial and human resources to establish and maintain a centralized data reference and contact point (the "who, what, where, when, and how" of data);
3. review and evaluate all currently available data and data collection schemes (biological, social, economic etc.), and initiate and maintain data 'mining' and recovery activities;
4. undertake initial assessments and analyses of available data, based on key management/policy issues identified by management and stakeholders. This is primarily aimed at identifying strengths and weaknesses of current data and data collection programs, and pointing out obvious data gaps;
5. identify and initiate adaptive management experiments at ecosystem scale;
6. ensure that data collection and models/analyses for ecosystem-based management are coordinated with and driven by clearly identified management needs and issues;
7. encourage keeping all models/analyses at the simplest level possible, and avoid the temptation to build large, exceedingly complex models;
8. ensure adequate support and resources for clearly identified ecosystem-scale monitoring, research and modeling/analytical investigations; and
9. evaluate a suite of indicators (both existing fishery-based, as well as new and emerging ecosystem-based) in an evolving and adaptive process.

The second workshop the Council convened was the Ecosystem Social and Policy Science Workshop (January 2006). This workshop addressed human dimensions of ecosystems and facilitated informed discussion of social science requirements for effectively supporting an ecosystem approach to fisheries management in the Western Pacific Region. Participants included social science experts with experience in marine resources management issues as well as fishery managers and scientists. Based on presentations made at the workshop, the preparers of the proceedings recommended the following steps to incorporate social science methods, models, and principles in the development and implementation of an appropriate ecosystem approach.

1. *Establish a venue for choosing priorities and specific management measures*. Establishment of a venue for Council, NMFS, and regional social scientists to work toward (a) prioritization of FEP objectives vis-à-vis social science applications, and (b) identification of specific management measures and related information needs to meet those objectives, may serve to resolve complexity.
2. *Design research to meet prioritized objectives and information needs*. Once prospective management measures are identified in association with the prioritized objectives, expertise should ideally be applied to formulate specific plans for conducting social research in the region as needed to assess the possible effects of implementing those measures. Given that extant data may contribute both to the design of the research and to the necessary analyses, the first and indispensable step in the process would be compilation and organization of relevant data.
3. *Implement a research and monitoring strategy.* In cases where existing data are insufficient for assessing the prospective management measures, a strategy for sponsoring and conducting the necessary research and analyses should be implemented.
4. *Develop and implement liaison and performance evaluation programs.* There is utility in establishing means by which resource user groups may readily interact and communicate on a regular, non-contentious, and interactive basis with management entities in the region.

A summary of the social science workshop proceedings is provided in Appendix C and the full proceedings can be obtained online at www.wpcouncil.org or by mail[14] from the Council. A third workshop on data needs for FEPs was convened in October 2006 and attended by Federal and Western Pacific Region State, Territory and Commonwealth fisheries scientists and managers. The objective of the workshop was to review data needs for FEPs. A fourth workshop was held in January 2007 to build off of the recommendations and discussions generated in the April 2005 and January 2006 ecosystem workshops.[15] The ecosystem management models in this FPEIS and embodied in the FEPs incorporate the output from those workshops and other reviews during public comment periods.

1.5.5. Use of Indicators and Models

Ecosystem-based management is enhanced by the ability to understand and predict environmental changes, as well as the development of measurable characteristics (e.g., indices or indicators) related to the structure, composition, or function of an ecological system (de Young et al. 2004, EPAP 1999, Marine Fisheries Advisory Committee Ecosystem Approach Task Force 2003).

1.5.5.1. Indicators

The development and use of indicators are integral parts of an ecosystem approach to management as they provide a relatively simple mechanism to track complex trends in ecosystems or ecosystem components. Indicators can be used to help define what is changing

[14] WPRFMC, 1164 Bishop Street, Suite 1400, Honolulu, Hawaii 96813.
[15] Workshop report can be found on the Council's website: www.wpcouncil.org

and to what extent (state variables; e.g., coral reef biomass); why is it changing (pressure variables; e.g., bleaching); and why it is important and what should be done (response variables; e.g., management measures). This pressure–state–response framework provides a mechanism for causal change analyses of complex phenomena in the marine environment, and can clarify the presentation and communication of such analyses to a wide variety of stakeholders (R.Wakeford, MRAG, personal communication).

While much has been written on potential marine ecosystem indicators (FAO 1999; ICES 2000, 2005), to date there are no established reference points for optimal ecosystem structures, composition, or functions. Because of the subjective nature of describing or defining the desirable ecosystems that would be associated with such reference points (e.g., a return to some set of prehistoric conditions vs. an ecosystem capable of sustainable harvests); this remains a topic of much discussion.

1.5.5.2. Models

The ecosystem approach is regarded by some as endlessly complicated as it is assumed that managers need to completely understand the detailed structure and function of an entire ecosystem in order to implement effective ecosystem-based management measures (Browman and Stergiou 2004a, 2004b). Although true in the ideal, interim approaches to ecosystem management need not be overly complex to achieve meaningful improvements.

Increasing interest in ecosystem approaches to management has led to significant increases in the modeling of marine ecosystems, using various degrees of parameter and spatial resolution. Ecosystem modeling of the Western Pacific Region has progressed from simple mathematical models to dynamically parameterized simulation models[16] (Polovina 1984; Polovina et al. 1994; Polovina et al. 2004).

While physical oceanographic models are well developed, modeling of trophic ecosystem components has lagged primarily because of the lack of reliable, detailed, long-term data. Consequently, there is no single, fully integrated model that can simulate all of the ecological linkages between species and the environment (de Young et al. 2004).

De Young et al. (2004) also examined the challenges of ecosystem modeling and presented several approaches to incorporating uncertainty into such models. However, Walters (2005) cautioned against becoming overly reliant on models to assess the relative risks of various management alternatives and suggests that modeling exercises should be used as aids in experimental design rather than as precise prescriptive tools.

1.5.6. Single-Species Management vs. Multi-species Management

A major theme in ecosystem approaches to fisheries management is the movement from conventional, single-species management to multi-species management (Mace 2004; Sherman and Alexander 1986). Multi-species management is generally defined as management based on

[16] A computer simulation or a computer model that attempts to simulate an abstract model of a particular system.

the consideration of all fishery impacts on all marine species rather than focusing on the maximum sustainable yield for any one species. The fact that many of the ocean’s fish stocks are believed to be overexploited (FAO 2002) has been used by some as evidence that single-species models and single-species management have failed (Hilborn 2004, Mace 2004). However, Hilborn (2004) noted that some of the species that were historically overexploited (e.g., whales, bluefin tuna) were not subject to any management measures, single-species or otherwise. In other cases (e.g., northern cod), it was not the models that failed but the political process surrounding them (Hilborn 2004). Thus, a distinction must be made between the use of single-species or multi-species models and the application of their resultant management recommendations. Ecosystem management requires that a full range of fishery impacts be considered when formulating management measures, and both single-species and multi-species models are valuable tools in this analysis.

Although successful ecosystem management will require the holistic analysis and consideration of marine organisms and their environment, the use of single-species models and management measures will remain an important part of fishery management (Mace 2004). If applied to all significant fisheries within an ecosystem, conservative single-species management has the potential to address many ecosystem management issues (ICES 2000, Witherell et al. 2000, Murawski 2005). Recognizing the lack of a concise blueprint to implement ecosystem indicators and models, there is growing support for building upon traditional single-species management to incrementally integrate and operationalize ecosystem principles through the use of geographically parameterized indicators and models (Browman and Stergiou 2004a, 2004b; Sissenwine and Murawski 2004). At this time the agency is reporting the status of stocks based on single species and multi-species stock complexes as it moves towards ecosystem-based fishery management.

1.5.7. Ocean Zoning

The use of ocean zoning to regulate fishing and nonfishing activities has been a second major theme in the development of marine ecosystem management theory (Browman and Stergiou 2004a, 2004b). In general, these zones are termed Marine Protected Areas (MPAs) and are implemented for a wide variety of objectives ranging from establishing wilderness areas to protecting economically important spawning stocks (Lubchenco et al. 2003). On May 26, 2000, Executive Order 13158 (Marine Protected Areas) was issued for the purpose of strengthening and expanding the nation’s existing system of MPAs to “enhance the conservation of our Nation’s natural and cultural marine heritage and the ecologically and economically sustainable use of the marine environment for future generations.” The Executive Order also established an MPA Federal Advisory Committee charged with providing expert advice and recommendations on the development of a national system of MPAs. In June 2005, this Committee released its first report, which includes a range of objectives and findings including the need for measurable goals, objectives, and assessments for all MPAs (NOAA 2005b). Today, MPAs can be found throughout the Western Pacific Region and are considered an important tool for marine resource management. Ongoing research and outreach are anticipated to result in the implementation of additional MPAs as ecosystem research provides additional insights regarding appropriate MPA locations and structures to achieve specific objectives.

1.5.8. Interagency Cooperation

To be successful, ecosystem approaches to management must be designed to foster intra-agency and interagency cooperation and communication (Schrope 2002). As discussed in Section 1.2.3, the Western Pacific Region includes various federal, state, commonwealth, territory, and local government agencies, as well as international management bodies with marine management authority. Given that these many agencies (or groups) either share or each have jurisdiction over certain areas or activities, reaching consensus on how best to balance resource use with resource protection is essential to resolving currently fragmented policies and conflicting objectives. The U.S. Ocean Action Plan (issued in response to the report of the U.S. Ocean Commission on Policy) recognized this need and established a new cabinet level Committee on Ocean Policy (U.S. Ocean Action Plan 2004) to examine and resolve issues regarding coordination among federal and local government agencies. In the Western Pacific Region, coordination between federal, state and local governments will be especially important to the successful implementation of an ecosystem approach to fisheries management.

1.5.9. Community-Based Management

Communities are created when people live or work together for a long enough time to generate local societies. Community members associate to meet common needs and express common interests, and relationships built over many generations lead to common cultural values and understandings through which people relate to each other and to their environment. At this point, collective action may be taken to protect local resources if they appear threatened, scarce, or subject to overexploitation. This is known as community-based resource management.

As ecosystem principles shift the focus of fishery management from species to places, increased participation from the primary stakeholders (i.e., community members) can enhance marine management by (a) incorporating local knowledge regarding specific locations and ecosystem conditions; (b) encouraging the participation of stakeholders in the management process, which has been shown to lead to improved data collection and compliance; and (c) improving relationships between communities and often centralized government agencies (Dyer and McGoodwin 1994).

Top-down management tends to center on policy positions that polarize different interest groups and prevent consensus (Yaffee 1999). In contrast, “place”—a distinct locality imbued with meaning—has value and identity for all partners and can serve to organize collaborative partnerships. Despite often diverse backgrounds and frequently opposing perspectives, partners are inspired to take collective on-the-ground actions organized around their connections and affiliations with a particular place (Cheng et al. 2003).

In August 2004, President George W. Bush issued Executive Order 13352 to promote partnerships between federal agencies and states, local governments, tribes, and individuals that will facilitate cooperative conservation and appropriate inclusion of local participation in Federal decision making regarding the nation’s natural resources. Similarly the U.S. Ocean Action Plan (2004) found that “local involvement by those closest to the resource and their communities is critical to ensuring successful, effective, and long-lasting conservation results.”

1.5.10. An Incremental Approach

Fishery scientists and managers have recognized that a comprehensive ecosystem approach to fisheries management must be implemented through an incremental and collaborative process (Jennings 2004, NOAA 2004, Sissenwine and Murawski 2004). As described previously, successful ecosystem management will require an increased understanding of a range of social and scientific issues such as biological and trophic relationships, ecosystem indicators and models, and socioeconomic factors. While work on some of these issues has been conducted, there is a need for increased efforts in ecosystem research as well as for understanding of how information derived from such research should be incorporated into fishery management decisions.

It is clear from the EPAP's recommendations, as well as the outcomes of the Council's workshops, there is much work to be done to fully implement an ecosystem approach to fisheries management in the Western Pacific Region. Therefore, an incremental approach toward full implementation is realistic at this time, and future fishery management actions will use new information as it becomes available. Linked to the new information will be the development of management tools that advance the implementation of ecosystem approaches to fisheries management in the Western Pacific Region. Examples of such tools may include the use of food webs in predictive models and the use of indicators to monitor ecosystem conditions.

Although the administrative and operational costs to advance the implementation of ecosystem science and management in the Western Pacific Region are unknown at this time, adequate funding support will be needed to enable the Council and NMFS to effectively shift from a species-based resources management approach to an ecosystem approach. It will also take increased coordination among the Council, NMFS, and state and local government agencies to fully implement effective ecosystem management. As new information becomes available, and adaptive management through the Council process occurs, future actions will be analyzed and implemented in compliance with all applicable laws (including NEPA) as required under the MSA.

Chapter 2. ALTERNATIVES

2.1. Introduction

This chapter presents the alternatives considered in this analysis. These alternatives represent a reasonable range of actions for the first phase of incremental steps towards the implementation of an ecosystem approach to fishery management. Alternatives under the following five components were identified: (1) moving toward ecosystem management by replacing existing FMPs with FEPs and (2) considering which species would be managed under each FEP; (3) Council advisory structure; (4) regional coordination; and, (5) international coordination.

Components 1 and 2 are regulatory in nature and considered the Federal action in this document. Components 3, 4, and 5 are non-regulatory (i.e., they have no regulatory effect), and their consideration is included to assist the Council in identifying an appropriate advisory structure and coordination activities under an ecosystem-based fishery management structure. Component 2 is contingent upon selecting one of the action alternatives under Component 1. Table 2-1 provides a brief description of the alternatives considered in detail for each component.

The EEZ around the CNMI, the PRIA, Hawaii, Guam, and American Samoa is established by international law to be from 0 to 200 miles from the shoreline. The MSA authorizes the Secretary of Commerce to manage and regulate the fisheries resources of the states, territories and possessions of the United States within the Federal waters of the EEZ. This is generally 3-200 nm except in the CNMI and PRIA where the Federal waters begin at the shoreline and extend from 0-200 nm.

Table 2-1. Alternatives Considered in Detail.

Alternatives Considered in Detail	
Alternatives	**Description**
Component 1: Consideration of ecosystem management in place of species-based management	***Replace FMPs with FEPs.*** Included in Component 1 for Alternatives 1B through 1E is the associated reorganization of existing species-based FMP regulations into place-based FEP regulations.
Alternative 1A - No Action	Continue species-based FMP fishery management. Do not approve or implement FEPs; Do not replace FMPs with FEPs.
Alternative 1B	For one area only, approve and implement an FEP, which would replace existing FMPs.

Alternatives Considered in Detail	
Alternatives	**Description**
Alternative 1C	Approve and implement FEPs that include EEZ waters around each archipelagic area (American Samoa, Hawaii, Marianas, and PRIA); these FEPs would replace existing FMPs; Retain the Pelagics FMP for the domestic pelagic fisheries operating on the surrounding high seas.
Alternative 1D – Preferred Alternative	Approve and implement four demersal FEPs and one pelagic FEP, which would replace existing FMPs.
Alternative 1E	Approve and implement FEPs for each biogeographic and pelagic zone, which would replace existing FMPs.
Component 2:	***List of Management Unit Species (MUS)***
Alternative 2A - No Action	Do not change the current MUS lists.
Alternative 2B – Preferred Alternative	Define FEP MUS as those current MUS that are *known*[17] to be present within each FEP boundary.
Alternative 2C	Define FEP MUS as those current MUS *known* to occur within the boundaries of the FEP, *plus* incidentally caught and associated species that are known to occur within each FEP boundary.
Alternative 2D	Define FEP MUS as those current MUS *believed*[18] to potentially occur, *plus* incidentally caught and associated species believed to potentially occur within each FEP boundary.
Component 3:	***Council Advisory Structure***
Alternative 3A - No Action	Do not change the current advisory structure.
Alternative 3B	Add a single FEP Plan Team to the current advisory structure.

[17] For the purpose of this FPEIS, "*known*" is used to refer to a species generally recognized as being established within a particular ecosystem.

[18] For the purpose of this FPEIS, "*believed*" is used to refer to an opinion that a species exists within a particular ecosystem or a similar ecosystem of the Western Pacific Region, especially when there is no absolute proof of its existence or reality.

Alternatives Considered in Detail	
Alternatives	**Description**
Alternative 3C	Replace the current FMP advisory panels, plan teams, and five standing committees with FEP advisory panels, FEP plan teams, and FEP standing committees.
Alternative 3D – Preferred Council Action	Replace the current FMP advisory panels, plan teams, and five standing committees with FEP advisory panels, FEP standing committees, and two FEP plan teams.
Component 4:	***Regional Coordination***
Alternative 4A - No Action	Do not establish Ocean Council type groups.
Alternative 4B – Preferred Council Action	Establish Regional Ecosystem Council Committees.
Alternative 4C	Participate in and support existing Ocean Council type groups.
Alternative 4D	Establish independent Regional Ecosystem Councils.
Component 5:	***International Coordination***
Alternative 5A - No Action	Continue to participate in international fisheries management fora and international workshops.
Alternative 5B – Preferred Council Action	Increase participation in international fisheries management fora and establish meetings/workshops with neighboring nations of island areas of the Western Pacific Region.
Alternative 5C	Do not participate in international management fora.

The alternatives considered in detail are described below. In general, each component's alternatives range from no action or status quo to the implementation of a detailed and specific approach to the component at hand. Alternatives selected as “preferred” by the Council are identified for each component. Several alternatives were also considered but regarded as not reasonable and were therefore eliminated from detailed study. These alternatives and the reasons that they were not considered in detail are also summarized below.

2.2. Component 1: Replace the Existing FMPs with FEPs

As discussed in Chapter 1, the purpose of the proposed Federal action is to establish an institutional framework that would allow a shift to an ecosystem approach to fisheries management in the Western Pacific Region. This would be accomplished, in part, through the Secretarial approval and implementation of place-based FEPs (Component 1 of the Federal action). Although Component 1 of the proposed Federal action also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations, no substantive changes to current fishing regulations would occur in any of the alternatives as part of the Federal action. Under Alternative 1D, the Preferred Alternative, once the Secretary has approved the FEPs, the FEPs would replace the existing FMPs as the operating management plans for the existing fisheries and would be subject to the MSA, as well as other applicable laws.

As described in Chapter 1, an ecosystem can be defined as a geographically specified system of organisms (including humans), the environment, and the processes that control its dynamics. Ecosystems can be considered at various geographic scales, from a coral reef ecosystem with its diverse species and benthic habitats to a large marine ecosystem such as the Pacific Ocean. From a marine ecosystem management perspective, defining the boundary of an ecosystem is challenging as it depends on many factors such as, but not limited to: oceanographic conditions (e.g., water circulation, salinity, temperature, and substrate); in addition to biological considerations of various marine species including life history characteristics, habitat requirements, geographic ranges, and genetic connectivity. Additionally, processes that affect and influence abundance and distribution of natural resources such as climate cycles, extreme natural events, and acute or chronic anthropogenic impacts must be considered. Substantial consideration must also be given to social, economic, and political constraints.

Description of Fishery Ecosystem Plans (FEPs)

The proposed FEPs would not substantively change existing regulations or management; rather at this stage they would just reorganize the existing fishery management measures into geographically defined management plans. The geographically-based FEPs would replace the FMPs and provide the underlying management plan for fisheries in the Western Pacific Region, pursuant to the MSA. The proposed FEPs would establish a framework under which the Council and NMFS would improve their abilities to incorporate ecosystem science and principles in management decisions, consistent with the MSA. To achieve this outcome, the Council has adopted the following objectives for the FEPs.

> *Objective 1:* To maintain biologically diverse and productive marine ecosystems and foster the long-term sustainable use of marine resources in an ecologically and culturally sensitive manner through the use of a science-based ecosystem approach to resource management.
>
> *Objective 2:* To provide flexible and adaptive management systems that can rapidly address new scientific information and changes in environmental conditions or human use patterns.
>
> *Objective 3:* To improve public and government awareness and understanding of the marine environment in order to reduce unsustainable human impacts and foster support for responsible stewardship.

> *Objective 4:* To encourage and provide for the sustained and substantive participation of local communities in the exploration, development, conservation, and management of marine resources.
>
> *Objective 5:* To minimize fishery bycatch and waste to the extent practicable.
>
> *Objective 6:* To manage and co-manage protected species, protected habitats, and protected areas.
>
> *Objective 7:* To promote the safety of human life at sea.
>
> *Objective 8:* To encourage and support appropriate compliance and enforcement with all applicable local and federal fishery regulations.
>
> *Objective 9:* To increase collaboration with domestic and foreign regional fishery management and other governmental and nongovernmental organizations, communities, and the public at large to successfully manage marine ecosystems.
>
> *Objective 10:* To improve the quantity and quality of available information to support marine ecosystem management.

Description of the procedures that would be used to approve the Fishery Ecosystem Plans (FEPs):

The procedures the Secretary would use to review and approve the FEPs are outlined in the MSA. As provided for under the MSA, Section 302 (h)(1), for each fishery under the Council's authority that requires conservation and management, the Council shall prepare and submit to the Secretary a fishery management plan (for the purpose of MSA, FEPs are considered fishery management plans). Section 303 of the MSA provides the required provisions of a fishery management plan. Section 304 of the MSA outlines the actions of the Secretary for reviewing fishery management plans as submitted by the Council.

In particular, Section 304 (a) REVIEW OF PLANS reads, in part, as follows:

> (1) Upon transmittal by the Council to the Secretary of a fishery management plan or plan amendment, the Secretary shall–
>
> > (A) immediately commence a review of the plan or amendment to determine whether it is consistent with the national standards, the other provisions of this Act, and any other applicable law; and
> >
> > (B) immediately publish in the Federal Register a notice stating that the plan or amendment is available and that written information, views, or comments of interested persons on the plan or amendment may be submitted to the Secretary during the 60-day period beginning on the date the notice is published.

(2) In undertaking the review required under paragraph (1), the Secretary shall–

> (A) take into account the information, views, and comments received from interested persons;
>
> (B) consult with the Secretary of State with respect to foreign fishing; and
>
> (C) consult with the Secretary of the department in which the Coast Guard is operating with respect to enforcement at sea and to fishery access adjustments referred to in section 303(a)(6).

(3) The Secretary shall approve, disapprove, or partially approve a plan or amendment within 30 days of the end of the comment period under paragraph (1) by written notice to the Council. A notice of disapproval or partial approval shall specify–

> (A) the applicable law with which the plan or amendment is inconsistent;
>
> (B) the nature of such inconsistencies; and
>
> (C) recommendations concerning the actions that could be taken by the Council to conform such plan or amendment to the requirements of applicable law.

If the Secretary does not notify a Council within 30 days of the end of the comment period of the approval, disapproval, or partial approval of a plan or amendment, then such plan or amendment shall take effect as if approved.

Under all alternatives for Component 1 that are being considered in detail, continuing adaptive management actions may occur to refine the fishery management plan boundaries if and when supported by scientific data, management requirements, or management authority. Any such future actions, if proposed as part of the regulatory or management structure under the MSA, would be considered in accordance with all applicable laws, including NEPA.

2.2.1. Component 1: Alternatives Considered in Detail

2.2.1.1. Alternative 1A (No Action): Do not approve or implement FEPs; do not replace FMPs with FEPs

This alternative represents the status quo under which FEPs would not be approved or implemented, and the existing five FMPs and their corresponding regulatory structures would not be changed. As promulgated under the MSA, the councils are responsible for the preparation of FMPs or amendments to those FMPs for each fishery under their authority that requires conservation and management. The councils transmit these FMPs to NMFS, acting on behalf of the Secretary, for review and approval, disapproval, or partial approval. Once approved, NMFS implements the FMP or FMP amendment through regulations and enforcement. Federal fisheries in the Western Pacific Region are currently managed under five species-based FMPs: Pelagics, Bottomfish and Seamount Groundfish, Coral Reef Ecosystems, Crustaceans, and Precious

Corals. Under this alternative, fishery operations would continue to be adaptively managed under each FMP in accordance with the MSA and other applicable laws and statutes.

2.2.1.2. Alternative 1B: For one area only, approve and implement an FEP, which would replace existing FMPs

A demersal[19] FEP for the Mariana Archipelago was selected as an example under this alternative, and the other archipelagos of the Western Pacific Region could be substituted for the Mariana FEP for the purposes of this analysis. Under this alternative, for the Federal waters of the Mariana Archipelago (i.e., the EEZ waters of Guam and the Commonwealth of the Northern Mariana Islands combined), all demersal marine resources and the associated habitats would be delineated as a distinct ecosystem. The fisheries associated with that demersal ecosystem would be managed under a Mariana Archipelago FEP. The management of the pelagic marine resources and habitats within the Federal waters of the Mariana Archipelago, along with the remaining areas within the Western Pacific Region would continue to be managed under the existing five species-based FMPs (Table 2-2). Under Alternative 1B, existing regulations relevant to the Mariana Archipelago would be reorganized as ecosystem-based regulations specific to that area. Although the regulations would be reorganized under Alternative 1B, no substantive changes would be made to current fishing regulations as part of Alternative 1B.

Table 2-2. Current and Proposed Management Structure Under Alternative 1B.

Current Management Structure	Proposed Management Structure under Alternative 1B
Bottomfish FMP	***Bottomfish FMP*** *No Change - Except for the elimination of relevant portions of the Bottomfish FMP that would be included in the Mariana Archipelago FEP.*
Coral Reef Ecosystem FMP	***Coral Reef Ecosystem FMP*** *No Change - Except for the elimination of relevant portions of the Coral Reef Ecosystem FMP that would be included in the Mariana Archipelago FEP.*
Crustaceans FMP	***Crustaceans FMP*** *No Change - Except for the elimination of relevant portions of the Crustaceans FMP that would be included in the Mariana Archipelago FEP.*
Precious Corals FMP	***Precious Corals FMP*** *No Change - Except for the elimination of relevant portions of the Precious Corals FMP that would be included in the Mariana Archipelago FEP.*

[19] "Demersal" applies to species living on or near the bottom of the sea.

Current Management Structure	Proposed Management Structure under Alternative 1B
Pelagics FMP	**Pelagics FMP** *No Change. Mariana Archipelago pelagic species would not be included in the Mariana Archipelago FEP and would continue to be managed under the Pacific Pelagics FMP.*
Portions of various FMPs	**Mariana Archipelago FEP** *Would include relevant portions from the current Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, and Precious Corals FMP.*

2.2.1.3. Alternative 1C: Approve and implement FEPs that include EEZ waters around each archipelagic area (American Samoa, Hawaii, Mariana, and PRIA); these FEPs would replace existing FMPs. Retain the Pelagics FMP for the domestic pelagic fisheries operating on the surrounding high seas.

Under Alternative 1C, the fisheries currently managed under the species-based FMPs would be replaced by FEPs covering all Federal waters surrounding each of the Western Pacific Region's geographic areas (Table 2-3). Because of their close proximity, ecological links, and social connections, Federal waters and the associated marine resources surrounding Guam and the Northern Mariana Islands would be delineated as an ecosystem and the fisheries associated with this area would be managed under a Mariana Archipelago FEP. For the same reasons, Federal waters surrounding the Hawaiian Islands would be delineated as an ecosystem and managed under a Hawaiian Archipelago FEP. Federal waters surrounding the islands of American Samoa would be delineated as an ecosystem and managed under an American Samoa Archipelago FEP. Federal waters around the U.S. Pacific Remote Islands, some of which are part of the Line and Phoenix Islands, would be managed under the PRIA FEP.

The Secretary of Commerce has the authority to manage the nation's fishery resources throughout the U.S. Exclusive Economic Zone (EEZ). With the exception of the waters around CNMI and the PRIA, the boundaries of the FEPs would encompass all Federal waters from 3 to 200 miles from shore for each of the Western Pacific Region's archipelagic areas. The Federal waters of the EEZ around CNMI and the PRIA are recognized from 0 to 200 miles from the shore. In practice, although CNMI has no jurisdiction over the management (including conservation) of fishery resources, the Federal government coordinates with the local government in its management programs.

Because state and territorial waters do not exist in the PRIA, jurisdiction over nearshore fishery resources and habitat is the responsibility of the U.S. Department of Commerce. The U.S. Fish and Wildlife Service (FWS) has the authority to regulate activities within the PRIA National Wildlife Refuges (NWRs). NOAA has exclusive jurisdiction to manage the nation's fishery resources throughout the PRIA EEZs.

Within the EEZ boundaries, both the demersal and pelagic fisheries would be managed under the proposed FEPs (Table 2-4). Under Alternative 1C, the management of the domestic Pacific pelagic fisheries operating within areas outside of the Western Pacific Region's archipelagic EEZ areas, as defined in Table 2-3, would remain under the Pelagics FMP. In addition, existing regulations relating to the current FMPs would be reorganized to reflect the boundaries under each FEP. Although the regulations would be reorganized under Alternative 1C, no substantive changes would be made to current fishing regulations as part of Alternative 1C.

Table 2-3. Delineated Ecosystems for FEPs Under Alternative 1C.

FEP	Delineated Ecosystem//Management Area
American Samoa Archipelago	All Federal waters surrounding American Samoa.[20]
Mariana Archipelago	All Federal waters surrounding Guam and CNMI.
Hawaii Archipelago	All Federal waters surrounding Hawaii.
Pacific Remote Island Areas (PRIA)	All Federal waters surrounding Howland Island, Baker Island, Jarvis Island, Johnston Island, Kingman Reef, Palmyra Atoll, and Wake Island.

Note: See Figure 1-1 for a map of the Western Pacific Region and the boundaries of the ecosystems under each proposed FEP.

Table 2-4. Current and Proposed Management Structure Under Alternative 1C.

Current Management Structure:	Proposed Management Structure under Alternative 1C:
Bottomfish FMP	**American Samoa Archipelago FEP** *Would include relevant portions from the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, the Precious Corals FMP, and the Pelagics FMP.*
Coral Reef Ecosystem FMP	**Mariana Archipelago FEP** *Would include relevant portions from the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, the Precious Corals FMP, and the Pelagics FMP.*

[20] Because of the ecological and cultural connections between independent Samoa and America Samoa, an advisory relationship with independent Samoa would be sought to facilitate the development of collaborative management activities.

Current Management Structure:	Proposed Management Structure under Alternative 1C:
Crustaceans FMP	**Hawaii Archipelago FEP** *Would include relevant portions from the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, the Precious Corals FMP, and the Pelagics FMP.*
Precious Corals FMP	**Pacific Remote Island Areas FEP** *Would include relevant portions from the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, the Precious Corals FMP, and the Pelagics FMP.*
Pelagics FMP	**Pacific Pelagics FMP** *No change to existing Pelagics FMP management measures. Relevant portions of the Pelagics FMP would be included under the American Samoa FEP, Mariana FEP, Hawaii FEP, and Pacific Remote Island Areas FEP.*

2.2.1.4. Alternative 1D - Preferred Alternative: Approve and implement four demersal FEPs and one pelagic FEP, which would replace existing FMPs

Under Alternative 1D, the Preferred Alternative, the four geographic ecosystems would be as described in Alternative 1C. The fisheries currently managed under the species-based FMPs would be replaced by FEPs covering all Federal waters surrounding each of the Western Pacific Region's geographic areas (Table 2-5). Because of their close proximity, ecological links, and social connections, Federal waters and the associated marine resources surrounding Guam and the Northern Mariana Islands would be delineated as a single ecosystem and the fisheries associated with this area would be managed under a Mariana Archipelago FEP. For the same reasons, Federal waters surrounding the Hawaiian Islands would be delineated as an ecosystem and managed under a Hawaii Archipelago FEP. Federal waters surrounding the islands of American Samoa would be delineated as an ecosystem and managed under an American Samoa Archipelago FEP. Federal waters around the U.S. Pacific Remote Island Areas, some of which are part of the Line and Phoenix Islands, would be managed under the PRIA FEP.

Five FEPs would be approved and implemented and replace the existing FMPs. Four demersal FEPs would cover demersal fisheries within each geographic ecosystem, and the Pacific Pelagic FEP would include the associated pelagic marine resources within all Federal waters and the management of the U.S. domestic pelagic fisheries occurring in the high seas of the Western Pacific Region.

The Secretary of Commerce has the authority to manage the nation's fishery resources throughout the U.S. Exclusive Economic Zone (EEZ). Within the Western Pacific Region, and with the exception of the waters around the CNMI and the PRIA, the boundaries of the FEPs would encompass all Federal waters from 3 to 200 miles from shore. The Federal waters of the EEZ around the CNMI and the PRIA are recognized from 0 to 200 miles from the shore. In practice, although the CNMI has no jurisdiction over the management (including conservation) of fishery resources, the Federal government coordinates with the local jurisdiction in its management programs.

Because state and territorial waters do not exist in the PRIA, jurisdiction over nearshore fishery resources and habitat is the responsibility of the U.S. Department of Commerce. The U.S. Fish and Wildlife Service (FWS) has the authority to regulate activities within the PRIA National Wildlife Refuges (NWRs). NOAA has exclusive jurisdiction to manage the nation's fishery resources throughout the PRIA EEZs.

Alternative 1C and Alternative 1D (the Preferred Alternative) are similar, with the following exceptions: (1) Alternative 1D would establish a Pacific Pelagic FEP, which would replace the current Pelagics FMP; and (2) under Alternative 1D (the Preferred Alternative), the pelagic ecosystem and the management of the pelagic fisheries within the boundaries of the four archipelagic FEPs would remain with the Pacific Pelagic FEP. Alternative 1C would split pelagic fisheries management between the FEP plans covering pelagics within the U.S. EEZ, and pelagic fisheries occurring outside of the U.S. EEZ that would be managed under a Pelagics FMP. Alternative 1D, by contrast, would keep the management of domestic pelagic fisheries under a single Pacific Pelagic FEP. The boundary of the Pacific Pelagic FEP would overlap with the boundaries of the four demersal FEPs; however, the Pacific Pelagic FEP would specifically manage those resources and habitats associated with the pelagic ecosystem (Table 2-5). In addition, existing regulations relating to the current FMPs would be reorganized to reflect the boundaries of the FEPs (Table 2-6). Although the existing fishery regulations would be reorganized, no substantive changes would be made to current fishing regulations as part of Alternative 1D.

Table 2-5. Delineated Ecosystems and FEPs Under Alternative 1D, the Preferred Alternative.

FEP	Delineated Ecosystem
American Samoa Archipelago	Federal waters surrounding American Samoa[21] - Demersal Ecosystem.
Mariana Archipelago	Federal waters surrounding Guam and CNMI - Demersal Ecosystem.
Hawaii Archipelago	Federal waters surrounding Hawaii - Demersal Ecosystem.
Pacific Remote Island Areas (PRIA)	Federal waters surrounding Howland Island, Baker Island, Jarvis Island, Johnston Island, Kingman Reef, Palmyra Atoll, and Wake Island - Demersal Ecosystem.
Pacific Pelagic	All Federal waters and domestic pelagic fisheries operating in the high seas surrounding American Samoa, the CNMI, Guam, Hawaii and the PRIA - Pelagic Ecosystem.

[21] Because of the ecological and cultural connections between Independent Samoa and America Samoa, an advisory relationship with independent Samoa would be sought to facilitate the development of collaborative management activities.

Table 2-6. Current and Proposed Management Structure under Alternative 1D - the Preferred Alternative.

Current Management Structure:	Proposed Management Structure:
Bottomfish FMP	**American Samoa Archipelago FEP** *Would include relevant portions of the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, and the Precious Corals FMP. Demersal ecosystem only.*
Coral Reef Ecosystem FMP	**Mariana Archipelago FEP** *Would include relevant portions of the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, and the Precious Corals FMP. Demersal ecosystem only.*
Crustaceans FMP	**Hawaii Archipelago FEP** *Would include relevant portions of the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, and the Precious Corals FMP. Demersal ecosystem only.*
Precious Corals FMP	**Pacific Remote Island FEP** *Would include relevant portions of the Bottomfish FMP, Coral Reef Ecosystem FMP, Crustaceans FMP, and the Precious Corals FMP. Demersal ecosystem only.*
Pelagics FMP	**Pelagic FEP** *Would include all relevant portions of the Pelagics FMP for all areas in the Western Pacific Region including American Samoa, the CNMI, Guam, Hawaii, and the PRIA; Pelagic ecosystem only.*

The draft FEPs proposed under Alternative 1D, are available from the Council's website at www.wpcouncil.org or by mail[22] from the Council. Additionally, a Compact Disc containing electronic copies of the draft FEPs are included with this FPEIS (Appendix G).

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

2.2.1.5. Alternative 1E: Approve and implement FEPs for each biogeographic and pelagic zone which would replace existing FMPs

Under this alternative, major biogeographic zones for each island area and all demersal and pelagic marine resources and habitats associated with those (not necessarily in contiguous zones) would be delineated as distinct ecosystems and the fisheries associated with them would be managed under separate FEPs. Specifically, within each island area the coral reef ecosystem, the deep reef slope benthic ecosystem, the bank-seamount ecosystem, the deep ocean floor ecosystem, and the pelagic environment would be delineated as separate and distinct ecosystems and managed under separate FEPs. Additionally, under Alternative 1E, the management of the domestic pacific pelagic fisheries operating outside one of these biogeographic and pelagic FEPs for each island area would be managed under a Pacific Pelagic FEP.

To illustrate the application of this alternative in the CNMI, all coral reef ecosystems from Uracas to Rota would be delineated as an ecosystem and managed under a CNMI Coral Reef Ecosystem FEP. Similarly, the fisheries associated with the seamounts located west of CNMI would be managed under a CNMI Bank-Seamount FEP. In addition, existing fishery regulations relating to the current FMPs would be reorganized to reflect the boundaries of the FEPs (Table 2-7). The regulations would be reorganized and no substantive changes would be made to current fishing regulations as part of Alternative 1E.

Table 2-7. Current and Proposed Management Structure under Alternative 1E.

<table>
<tr><th>Current Management Structure</th><th>Proposed Management Structure</th></tr>
<tr><td>Bottomfish FMP</td><td rowspan="5">American Samoa Coral Reef FEP
American Samoa Bank and Seamount FEP
American Samoa Deep Reef Slope FEP
American Samoa Deep Ocean Floor FEP
American Samoa Pelagic FEP

CNMI Coral Reef FEP
CNMI Bank and Seamount FEP
CNMI Deep Reef Slope FEP
CNMI Deep Ocean Floor FEP
CNMI Pelagic FEP

Guam Coral Reef FEP
Guam Bank and Seamount FEP
Guam Deep Reef Slope FEP
Guam Deep Ocean Floor FEP
Guam Pelagic FEP

Hawaii Coral Reef FEP
Hawaii Bank and Seamount FEP
Hawaii Deep Reef Slope FEP
Hawaii Deep Ocean Floor FEP
Hawaii Pelagic FEP

PRIA Coral Reef FEP
PRIA Bank and Seamount FEP
PRIA Deep Reef Slope FEP
PRIA Deep Ocean Floor FEP
PRIA Pelagic FEP

Pacific Pelagic FEP</td></tr>
<tr><td>Coral Reef Ecosystem FMP</td></tr>
<tr><td>Crustaceans FMP</td></tr>
<tr><td>Precious Corals FMP</td></tr>
<tr><td>Pelagics FMP</td></tr>
</table>

2.2.2. Component 1: Alternatives Considered but Eliminated From Further Detailed Study

2.2.2.1. FEP for Entire Pacific Ocean Ecosystem

Under this alternative, the entire Pacific Ocean, including all marine resources and habitats found within, would be delineated as a single ecosystem and the fisheries managed under a single

Pacific Ocean FEP regardless of jurisdiction or claim to continental shelf resources or submerged lands by states and territories of the United States or foreign coastal nations. While such a delineation would provide a theoretical mechanism for implementing the broadest application of an ecosystem approach to management, it is anticipated that the regulated area would be of such scope and complexity it would preclude flexible and effective management. In addition, there are numerous nations within the Pacific Ocean that are not subject to the MSA that assert jurisdiction over their respective territorial seas and EEZs. The Council's lack of authority over these countries and inability to control their actions would further preclude effective management under such a broad approach. Similarly, asserting Federal management authority over submerged lands and marine resources of coastal states would conflict with the interests of those states. Finally, this approach presents an additional challenge of requiring that management considerations for pelagic species be combined with those for benthic species, an approach that would be difficult to implement, not only because of the scale of this proposal, but also because of the divergent scientific principles applied with regard to the different types of species. For these reasons, this alternative was not considered in further detail.

2.2.2.2. FEP for Insular Pacific- Hawaii Large Marine Ecosystem

This alternative would utilize the definitions of large marine ecosystems (LME) presented by Sherman and Alexander (1986). LMEs are regions of ocean space encompassing coastal areas from river basins and estuaries to the seaward boundaries of continental shelves and the outer margins of the major current systems. However, most of these features are not prevalent in the Western Pacific Region. Currently, the only delineated LME in the Western Pacific Region is the Insular Pacific LME defined by Morgan (1989) and only includes waters from the shoreline out to 200 nm surrounding the Hawaiian Archipelago, including all marine resources and habitats found within. Under this alternative, only one FEP, the Hawaii LME FEP would be established. However, the State of Hawaii would still retain primary management authority for marine resources from 0 to 3 miles within this FEP.

Under this alternative, fisheries within the Hawaiian Archipelago would shift to an LME-based management approach that would require fully coordinated Federal and state actions to ensure consistent management. All other areas in the Western Pacific Region would continue to be managed through the species-based FMPs and would not shift to an ecosystem approach. This alternative poses several problems: (1) effective management within the Hawaiian LME FEP would require similar regulations at the Federal and state levels, as well as management and enforcement coordination; (2) fishery management regulations would impose species-based requirements in some areas but an ecosystem approach in the fisheries within the Hawaiian LME FEP, possibly leading to confusion; and (3) the Council and NMFS would face additional regulatory burdens when considering management proposals because a species-based approach would be required for some areas but an ecosystem approach would be required for the fisheries managed under the Hawaiian LME FEP. Consequently, for these reasons, as well as its similarity to Alternative 1B, this alternative is not considered in further detail.

2.2.2.3. FEPs for Each Island, Atoll, Seamount, or Other Major Benthic Feature

Under this alternative, Federal waters and associated marine habitats and resources around each island, atoll, reef, seamount, bank, or other major benthic feature in the Western Pacific Region would be delineated as a separate and discrete ecosystem and the fisheries within these ecosystems managed under a separate and discrete FEP. Local, state, territorial, and commonwealth governments would retain primary management authority for marine resources from 0 to 3 miles.

To illustrate the application of this alternative in the Hawaiian Archipelago, the islands of Hawaii, Maui, Kahoolawe, Lanai, Oahu, Molokai, Kauai, Niihau, Nihoa, Necker, French Frigate Shoals, Laysan, Lisianski, Maro Reef; the Pearl and Hermes, Midway, and Kure Atolls; and Pioneer and Raita Banks would each be delineated as a distinct ecosystem and managed under a separate FEP. Under this alternative, FEPs would be developed for hundreds of locations throughout the Western Pacific Region. Taking such an approach would provide a mechanism to develop very discrete management measures tailored specifically to meet the needs of an area on the basis of the scientific information regarding that particular location.

However, such a detailed level of management would significantly burden management agencies, enforcement personnel, and could be difficult for users to comply with. It would also increase the need for site-specific scientific data, administration, management, and personnel in order to be successful. While this may be appropriate in the future, constraints on funding and capacity to support such a management regime make it impracticable at this time. For this reason, this alternative is not considered in further detail.

2.2.2.4. Umbrella FEP for the Western Pacific Region

Under the “umbrella FEP” approach, FEPs would be a consolidation of individual fishery management plans. An FEP would contain information on the structure and function of the ecosystem in which fishing activities occur, so that managers could be aware of the effects that their decisions have on the ecosystem, and the effects other components of the ecosystem may have on fisheries. The goal of this approach would be to improve consideration of ecosystem principles in individual FMPs. While this approach is currently being developed by other fishery management councils (i.e., North Pacific and South Atlantic Fishery Management Councils), unlike the other regions, the Western Pacific Region is composed of distinct and distant archipelagos, each with different species and ecological conditions. This unique aspect of the Western Pacific Region allows for adoption of an ecosystem-based approach for each archipelago rather than one combined area which would simply consolidate existing FMPs under one document. Moreover, the umbrella approach would impose an additional level of complexity to the management of fisheries in the Western Pacific Region by maintaining the existing FMPs but providing for the consideration of ecosystem elements in a separate plan. Full adoption of ecosystem-based plans was considered a better means of achieving the purpose of the Federal action with less complexity. For these reasons, this alternative is not considered in further detail.

2.2.2.5. Amending the Existing FMPs to Adopt an Ecosystem Approach and Implement FEPs

Under this alternative, the existing FMPs would be amended to adopt an ecosystem approach through the implementation of FEPs. This alternative would amend the existing fishery management plans rather than replacing the FMPs with fishery ecosystem management plans. This alternative would require an ongoing series of "omnibus" amendments to implement future place-based measures. This would require significant agency resources and result in a complex regulatory process that would likely be confusing to stakeholders. Also, merely amending the existing species based plans would not accurately reflect the fundamental shift to ecosystem based management, and for these reasons, this alternative is not considered in further detail.

2.3. Component 2: Management Unit Species (MUS)

Section 3 of the MSA contains the definition of terms. Section 3 of the MSA defines the term "stock of fish" as meaning a species, subspecies, geographical grouping, or other category of fish capable of management as a unit. Consistent with National Standard 3 of the MSA, the MUS lists currently contained in the Council's existing FMPs consist of those species that are caught in the region in quantities sufficient to warrant management or specific monitoring by NMFS and the Council. Each of the existing Western Pacific Region FMPs has a specific list of MUS to which its regulations apply. Each of the FMPs is applied throughout the entire Western Pacific Region, and, therefore, the MUS of each plan are presently made up of those species that are significantly harvested by fisheries across the region. The Council relies on the best available scientific information in making decisions about which species to include in an MUS list. Changes to the species that are included in an MUS list are made through the Council process and further coordinated with the public by NMFS.

The primary impact of including species in an MUS list is that the species (i.e., the fishery targeting that species) can be directly managed. In an ecosystem approach to fishery management, the need for a list of MUS under each FEP remains, and the species listed in each FEP should reflect the status of those species within a particular FEP's boundaries. In addition, MUS managed under each FMP are currently categorized into stocks or stock complexes for the purposes of stock assessments and determinations regarding overfishing and overfished conditions. For example, because of the genetic connectivity between the NWHI and the MHI, Hawaii stocks managed under the Bottomfish and Seamount Groundfish FMP are classified as one multi-species complex. Although the Council has preliminarily discussed including CNMI bottomfish stocks with those around Guam in a Mariana multi-species bottomfish stock complex, because of a lack of information, none of the alternatives considered here would do so or otherwise change the current stock and stock complex geographic classifications or overfishing control rules and reference points now in effect.

2.3.1. Component 2: Alternatives Considered in Detail

For each alternative considered for component 2 (MUS species), no new species are proposed to be added to the MUS lists within FEPs. The alternatives consider the organization of MUS as FMPs are reorganized into FEPs under the proposed action alternatives. Future changes to the lists of MUS species within an FEP would be through the established Council process.

2.3.1.1. Alternative 2A: No Action—Do Not Change the Current MUS Lists

Under this alternative, the existing list of MUS from the five existing FMPs would remain unchanged (see Appendix A). Using this approach, the MUS lists for all FEPs would be identical and would be made up of the current MUS regardless of whether the species is known to exist within the particular FEP's boundaries.

2.3.1.2. Alternative 2B: Preferred Alternative—Define FEP MUS as Those Current MUS That Are Known to be Present Within Each FEP Boundary

Under this alternative, each FEP would include as MUS only those current bottomfish and seamount MUS, crustacean MUS, precious corals MUS, coral reef ecosystems MUS and pelagic MUS that are known to be present within each FEP boundary.

2.3.1.3. Alternative 2C: Define FEP MUS as Those Current MUS Known To Occur Within the Boundaries of the FEP, Plus Incidentally Caught and Associated Species That Are Known to Occur Within Each FEP Boundary

Under this alternative, each FEP would include as MUS those target, incidentally caught, and associated species (species that occupy the same or similar niche, such as prey competitors or habitat competitors) that are known to occur within each FEP boundary.

2.3.1.4. Alternative 2D: Define FEP MUS as Those Current MUS Believed to Potentially Occur, Plus Incidentally Caught and Associated Species Believed to Potentially Occur Within Each FEP Boundary

Under this alternative, each FEP would include as MUS those target, incidentally caught, and associated species (species that occupy the same or similar niche such as prey competitors or habitat competitors) that are believed to potentially occur within each FEP boundary.

2.3.2. Component 2: Alternatives Considered but Eliminated From Further Detailed Study

2.3.2.1. Define FEP MUS as All Species Believed to Occur Within the FEP Boundary

Under this alternative, all species (primary producer to top-level predator) believed to occur within each FEP boundary would be included on that FEP's MUS list. While principles of an ecosystem approach to fisheries management direct managers to consider predator–prey relationships for each target species, they do not require managers to specifically manage all species within an ecosystem. Because there are literally thousands of species that are believed to occur in a particular FEP boundary, and in light of the fact that there is no commercial or recreational interest to harvest most of these, the inclusion of all of these species in an MUS list would serve no function and impose an unnecessary burden on fishery managers and scientists. Therefore, this alternative was eliminated at this time without further study.

2.3.2.2. Define FEP MUS as All Species Known to Occur Within the FEP Boundary

Under this alternative, all species (primary producer to top-level predator) known to occur within each FEP boundary would be included on that FEP's MUS list. This alternative would require managers to identify as a MUS any and all species known to occur within the boundary of an FEP. For the reasons discussed above, this alternative was eliminated at this time without further detailed study.

2.4. Component 3: Council Advisory Structure

The Council's current advisory process follows the MSA and includes the general public, fishery participants and support sectors, social and biological scientists, and local and Federal resource managers in the development of its fishery management recommendations. The existing structure for these advisory bodies is based on a combination of species and stakeholder interest groupings. For example, Plan Teams exist for each of the five species-based FMPs, while Advisory Panels are organized around commercial, recreational and subsistence fisheries, and other interest groups. Given the place-based nature of ecosystem management, several alternatives for modifying the existing structure toward a more geographic orientation are considered in this FPEIS to assist the Council. These alternatives are not part of the Federal action. Important decision criteria are the overall budget implications associated with funding additional advisory bodies from the Council's budget, which is authorized under the MSA. The annual budget varies somewhat dependent on Congressional considerations.

2.4.1. Component 3: Alternatives Considered in Detail

2.4.1.1. Alternative 3A: No Action - Do Not Change the Current Council Advisory Structure

Under this alternative, the Council's current advisory structure would not change to one reflecting the geographical orientation of ecosystem management and the need for increased participation by land-based interests. The Council would continue to utilize its existing five Plan Teams, Advisory Panels, Scientific and Statistical Committee (SSC), and Standing Committees to provide scientific and management recommendations to the Council. The structure and responsibilities of each group would remain as described below.

Plan Teams

The Council's five Plan Teams provide input and guidance in the development of FMPs and review information pertaining to the performance of the fisheries and the status of the stocks managed under each FMP. Plan Teams meet at least once annually and are made up of individuals from local and Federal marine resource management agencies and nongovernmental organizations. Plan Teams are led by Chairs who are appointed by the Council Chair after consultation with the SSC and the Executive Standing Committee. Plan Team findings and recommendations are reported to the Council at their regular meetings.

Advisory Panels

The Council's Advisory Panels advise the Council on fishery management problems; provide input to the Council regarding fishery management planning efforts; and advise the Council on the content and likely effects of management plans, amendments, and management measures. Advisory Panel membership is arranged by fishery sector, with two representatives from each island area selected by the Council Chair to serve on each panel (except for Hawaii, which has four representatives on each panel because of its larger population; see Table 2-8). Advisory Panel members are fishermen and other knowledgeable stakeholders who meet at the direction of the Council to provide continuing and detailed participation by industry members and other members of the public.

Table 2-8. Current Council Advisory Panel Structure.

	Commercial Panel	**Recreational Panel**	**Subsistence Panel**	**Ecosystems and Habitat Panel**
American Samoa	Two members	Two members	Two members	Two members
Guam	Two members	Two members	Two members	Two members
Hawaii	Four members	Four members	Four members	Four members
CNMI	Two members	Two members	Two members	Two members

Scientific and Statistical Committee

The Council's SSC is composed of scientists (currently 17) from local and Federal agencies, academic institutions, and other organizations. Appointed by the Council, these scientists represent the range of disciplines required for the scientific oversight of fishery management in the Western Pacific Region. The role of the SSC is to (1) identify scientific resources required for the development of FMPs and amendments and recommend resources for Plan Teams; 2) provide multidisciplinary review of management plans or amendments and advise the Council on their scientific content; (3) assist the Council in the evaluation of such statistical, biological, economic, social, and other scientific information as is relevant to the Council's activities, and recommend methods and means for the development and collection of such information; and (4) advise the Council on the composition of Plan Teams.

Standing Committees

The Council's 12 Standing Committees (Pelagics, Crustaceans, Bottomfish and Seamount Groundfish, Precious Corals, Ecosystems and Habitat, International Fisheries, Enforcement, Vessel Monitoring Systems, Fishery Rights of Indigenous People, Executive, Budget and Program, and Research) are composed of Council members and meet on the first day of each Council meeting to review available information and data for components to be considered by the Council. The recommendations of the Standing Committees, along with the recommendations from all of the other advisory bodies described above, are then presented to the full Council for the members' consideration prior to taking action on specific measures or recommendations.

Under the No Action alternative, these existing advisory bodies would continue to be responsible for considering and integrating ecosystem impacts when providing advice to the Council on the development and implementation of FMPs or FEPs.

2.4.1.2. Alternative 3B: Add a Single FEP Plan Team to the Current Advisory Structure

Under this alternative, the existing Advisory Panels, Plan Teams, SSC, and Standing Committees would be maintained and one new FEP Plan Team would be established to monitor the development and implementation of FEP(s) for the Western Pacific Region. The FEP Plan Team would be made up of scientists from local and Federal agencies, academic institutions, and other sources with expertise in the following areas: (1) fish stock assessment; (2) habitat; (3) oceanography; (4) ecosystem modeling; (5) socioeconomics; (6) geographic information systems; and (7) marine ecology and ecosystem dynamics. The FEP Plan Team would identify ecosystem components for all management actions and provide appropriate advice to the Council and its advisory bodies regarding these components.

The FEP Plan Team would likely consist of five to seven members that would coordinate and consult directly with selected agencies and organizations for each geographic region regarding

FEP development and implementation. The existing advisory bodies would continue their duties as assigned with respect to industry components, fisheries science, statistical analyses, and environmental impacts for each FEP.

2.4.1.3. Alternative 3C: Replace the Current FMP Advisory Panels, Plan Teams, and Five Standing Committees with FEP Advisory Panels, FEP Plan Teams, and FEP Standing Committees

Under this alternative, the existing Advisory Panels, FMP Plan Teams, and five Standing Committees (Pelagics, Crustaceans, Bottomfish and Seamount Groundfish, Precious Corals, and Ecosystems, and Habitat) would be replaced with FEP-based Advisory Panels and FEP Plan Teams based on each FEP's boundaries (e.g., a Hawaii Archipelago FEP Plan Team, Mariana Archipelago Advisory Panel). The single SSC would continue to function as at present. The FEP Advisory Panels, Plan Teams, and Standing Committees would assume all of the duties and responsibilities of the existing groups, including the review of fisheries catch and effort data and the development of appropriate management measures based on ecosystem principles. Each FEP Plan Team would develop annual reports for all fisheries within the FEP boundaries for which it is responsible, and all groups would provide advice to the Council as under the current process described in Alternative 3A.

2.4.1.4. Alternative 3D - Preferred Alternative: Replace the Current FMP Advisory Panels, Plan Teams, and Five Standing Committees With FEP Advisory Panels, FEP Standing Committees, and Two FEP Plan Teams

As in Alternative 3C, this alternative would replace the existing Advisory Panels and five of the Standing Committees with FEP Advisory Panels and FEP Standing Committees. However, this alternative would replace the existing five FMP Plan Teams with a single Demersal FEP Plan Team and a single Pacific Pelagic FEP Plan Team that would each be responsible for overseeing the development and implementation of all Demersal and Pelagic FEPs, respectively. All groups would provide advice to the Council as under the current process described in Alternative 3A. Under this alternative, the existing SSC structure would be maintained.

2.4.2. Component 3: Alternatives Considered but Eliminated From Further Detailed Study

Include International Representatives on Existing Advisory Bodies

Under this alternative, the structure of the Council's advisory bodies would remain the same but they would each include additional representatives from various sectors and government agencies from the U.S. Pacific Islands as well as from foreign countries or island groups within or bordering the Pacific Ocean. Although this could increase the reach and scope of the Council's recommendations, the logistical and fiscal implications of this alternative are unclear. The Council does receive reports from members of a number of international fishery management groups. Because information is already available to the Council and the expenditure of resources would not substantially improve the Council's capabilities, this alternative was rejected from further detailed study.

Establish Local Marine Expertise Advisory Bodies

Under this alternative, the structure of the Council's existing advisory bodies would remain the same, but an additional Local Marine Expertise advisory body would be created for Hawaii. Its members would consist of stakeholders, scientists, and managers from Hawaii. This alternative could provide additional expertise to the management of the Hawaii area; however, because no LMEs have been identified for the remaining waters of the Western Pacific Region, there would be no corresponding advisory bodies for the non-Hawaii areas. Because this would create an imbalance among advisory bodies and require additional coordination that duplicates existing opportunities for individuals with local expertise to participate in Council processes, this alternative was rejected from further detailed consideration.

2.5. Component 4: Regional Coordination

In the Western Pacific Region, management of ocean and coastal activities is administered by a number of agencies at the Federal, state, county, and even village level. Many individual agencies administer programs and initiatives that address sometimes overlapping ocean and coastal components. In some instances, programs and initiatives are also in conflict with one another. A primary reason for including regional coordination as a component for consideration in the establishment of FEPs is its ability to address nonfishing impacts on marine ecosystems. A common sentiment expressed in public scoping was a need for coordinated and consistent management from "mountain to sea." The primary objective for including and analyzing regional coordination options is to develop a mechanism by which the Council may participate in broader ecosystem initiatives such as these. The alternatives considered are not part of the Federal action.

As noted by the U.S. Commission on Ocean Policy and the President's U.S. Ocean Action Plan, the first step in enhancing the management of oceans and coasts is improving coordination among Federal programs and those of state, local, and county departments and agencies. While there has been some progress made to increase interagency coordination through the establishment of memorandums of agreements and the formation of ad hoc committees, task forces, and interagency working groups, a formalized long-term process between NOAA, the Council, and other Federal, state, and local agencies is still needed. Alternatives considered here would provide the Council a mechanism to actively participate in broader ecosystem initiatives that consider the impacts of land-based and nonfishing activities on the marine environment. The mechanism considered is the establishment and participation in Councils or Committees made up of representatives from Federal, state, local, and county agencies, as well as private entities, which are responsible for the permitting or implementation of both land- and ocean-based activities that affect marine ecosystems. This would allow member agencies to share information on programs and activities and to coordinate management efforts or resources to address nonfishing-related components beyond the jurisdiction of the Council that could affect ocean and coastal resources. As there are no statutory requirements regarding the development and function of regional coordination groups, all groups considered below would have an advisory capacity and their recommendations would not be obligatory to member agencies.

2.5.1. Component 4: Alternatives Considered in Detail

2.5.1.1. Alternative 4A: No Action - Do Not Establish Ocean Council Type Groups

Under this alternative, the Council would not establish or support additional Ocean Council type groups, but would continue to provide information regarding the impacts of land-based and nonfishing activities through its membership on the existing Hawaii Ocean and Coastal Committee, and as requested on an ad hoc basis.

2.5.1.2. Alternative 4B - Preferred Alternative: Establish Regional Ecosystem Council Committees

Under this alternative, the Council would establish Regional Ecosystem Advisory Committees (REACs) made up of Council members and representatives from Federal, state, and local government agencies; businesses; and nongovernmental organizations that have responsibility or interest in land-based and nonfishing activities that potentially affect the marine environment.

Committee membership would be by invitation and would provide a mechanism for the Council and member agencies to share information on programs and activities and to coordinate management efforts or resources to address fishing and nonfishing-related components of the ecosystem that may affect ocean and coastal resources within and beyond the jurisdiction of the Council. Committee meetings would coincide with regularly scheduled Council meetings, and recommendations made by the REAC committee to the Council would be advisory, as would recommendations made by the Council to member agencies. Under the MSA, the Council has the authority to create such advisory panels and committees (16 U.S.C § 1852).

2.5.1.3. Alternative 4C: Participate in and Support Ocean Council Type Groups

Under this alternative, the Council would not establish any new committees or other groups, but would instead participate in and support the establishment of Ocean Council type groups established by the governor of each inhabited island area served by the Council (i.e., American Samoa, Guam, Hawaii, and the Commonwealth of the Northern Mariana Islands). Such a group has been established by the governor of Hawaii (the Hawaii Ocean and Coastal Committee) and is made up primarily of local and county agencies with oversight of development, ocean recreation, tourism, and natural resource management. This committee is tasked with the development of policies to improve the permitting and implementation of actions that affect ocean and coastal resources under its combined jurisdiction. Federal agencies, including the Council, are members of this committee that was established in 2005.

2.5.1.4. Alternative 4D: Establish Independent Regional Ecosystem Councils

Under this alternative, the Council, NOAA, and NMFS would together establish and administer independent Regional Ecosystem Councils to supplement the existing decision-making process. These Regional Ecosystem Councils would be made up of executive level representatives from Federal, state, and local government agencies; businesses; and nongovernmental organizations that have responsibility or interest in land-based and nonfishing activities that potentially affect the marine environment.

The Regional Ecosystem Councils would provide a mechanism for the Council and other member agencies to share information on programs and activities and to coordinate management efforts or resources to address nonfishing-related components beyond the jurisdiction of the Council that could affect ocean and coastal resources. Regional Ecosystem Council meetings would coincide with regularly scheduled Council meetings, and recommendations to the Council would be advisory, as would recommendations made by the Council to other member agencies.

2.6. Component 5: International Coordination

The Council is an active participant in the development and implementation of international agreements regarding marine resources. These include agreements made by the Inter-American Tropical Tuna Commission (of which the United States is a member) and the Western and Central Pacific Fisheries Commission (of which the United States is a cooperating nonmember). The U.S. delegation that attends meetings of these international commissions is headed by representatives from NMFS and the U.S. Department of State. The Council also participates in and promotes the formation of regional and international arrangements for assessing and conserving all marine resources throughout their range, including the ecosystems and habitats that they depend on (i.e., the Forum Fisheries Agency and the Secretariat of the Pacific Community’s Oceanic Fisheries Programme). The Council is developing similar linkages with the Southeast Asian Fisheries Development Center and its turtle conservation program. The Council participates in various international workshops and seminars such as the ongoing International Fishers’ Forum (three forums since 2000), the 2005 South Pacific Commission/Western Pacific Regional Fishery Management Council/Food and Agriculture Organization (United Nations) Workshop on Legislation and Community-Based Management, the International Marine Debris Conference series (four since 1986), and the 2004 Asia Pacific Economic Cooperation Seminar on Derelict Fishing Gear and Related Marine Debris.

The western and central Pacific Ocean is dotted with thousands of islands governed by several nations. American Samoa, for example, is surrounded by the EEZs of five independent nations, and the PRIA are part of larger archipelagic island chains. As marine ecosystems are generally considered “open” systems, and large-scale impacts can be observed within smaller units, international coordination will be a necessary component of successful implementation of an ecosystem approach within the Western Pacific Region. The following alternatives represent a range of nonregulatory actions that the Council has considered in relation to its participation in discussions and meetings that are international in scope, but have implications for local management of marine resources.

2.6.1. Component 5: Alternatives Considered in Detail

2.6.1.1. Alternative 5A: No Action - Continue to Participate in International Fisheries Management Fora and International Workshops

Currently, the Council participates in two international Pacific pelagic fisheries management bodies: the Western and Central Pacific Fisheries Commission and the Inter-American Tropical Tuna Commission. The Council also participates in various international workshops and seminars as discussed previously. Under this alternative, the Council would continue work with the U.S. Department of State and the NMFS's Office of International Affairs to maintain its current level of participation in international commissions, meetings, workshops, and seminars.

2.6.1.2. Alternative 5B - Preferred Alternative: Increase Participation in International Fisheries Management Fora and Establish Meetings/Workshops with Neighboring Nations of Island Areas of the Western Pacific Region

Under this alternative, the Council's level of participation in international commissions, meetings, workshops, and seminars would be increased to include the establishment of meetings and workshops with neighboring nations of Western Pacific Region island areas. For example, the EEZ of American Samoa is bounded by the EEZs of five neighboring countries, and Samoa (Upolu Island) is located only 70 kilometers west of American Samoa (Tutuila Island). The PRIA of Palmyra and Jarvis lie within the Line Island Archipelago, of which Kiribati governs the remaining islands. Discussions and meetings between the Council and fishery managers of neighboring nations would facilitate information exchange and promote coordination of fishery ecosystem management components. Under this alternative, the Council would work with the U.S. Department of State and the NMFS's Office of International Affairs on proper protocols to facilitate meetings and workshops with neighboring nations.

2.6.1.3. Alternative 5C: Do Not Participate in International Management Fora

Under this alternative, the Council would not participate in international meetings, workshops, and seminars.

Chapter 3. AFFECTED ENVIRONMENT

3.1.Introduction

Chapter 3 describes the natural and human environment and resources potentially affected by the alternatives described in Chapter 2. The information presented in Chapter 3 represents a general summary of the potentially affected environment that the impact analysis in Chapter 4 will use as the environmental baseline.

3.2. Physical Environment

The following discussion presents a broad summary of the physical environment of the Pacific Ocean. The dynamics of the Pacific Ocean's physical environment have direct and indirect effects on the occurrence and distribution of life in marine ecosystems.

3.2.1. The Pacific Ocean

The Pacific Ocean is the world's largest body of water. Named by Ferdinand Magellan as *Mare Pacificum* (Latin for "peaceful sea"), the Pacific Ocean covers about one third of Earth's surface (approximately 69 million square miles). From north to south, it is over 9,000 miles long; from east to west, the Pacific Ocean is nearly 12,000 miles wide (on the Equator). The Pacific Ocean contains several large seas including: on its western margin, the Celebes Sea, Coral Sea, Japan Sea, Philippine Sea, Sea of Okhotsk, South China Sea, and the Tasman Sea; in the north, the Bearing Sea; and, in the east, the Sea of Cortez.

3.2.2. Geology and Topography

Pacific islands have been formed by geologic processes associated with plate tectonics, volcanism, and reef accretion. The theory of plate tectonics provides that Earth's outer shell, the "lithosphere," is constructed of more than a dozen large solid "plates" that migrate across the planet surface over time and interact at their edges. The plates sit above a solid rocky mantle that is hot, and capable of flow. Figure 3-1 is a schematic diagram of Earth's lithospheric plates. These are made of various kinds of rock with different densities and can be thought of as pieces of a giant jigsaw puzzle, where the movement of one plate affects the position of others. Generally, the oceanic portion of plates is composed of basalt enriched with iron and magnesium which is denser than the continental portion composed of granite enriched with silica.[23]

Tectonic processes and plate movements define the contours of the Pacific Ocean. Generally, the abyssal plain or seafloor of the central Pacific basin is relatively uniform, with a mean depth of about 4,270 m (14,000 feet).[24] Within the Pacific basin, however, are underwater plate boundaries that define long mountainous chains, submerged

[23] http://academic.reed.edu/chemistry/courses/chem391/401/earth.pdf (accessed January 2007).
[24] http://www.physicalgeography.net/fundamentals/8o.html (accessed January 2007).

volcanoes, islands and archipelagos, and various other physical features that influence the movement of water and the occurrence and distribution of marine organisms.

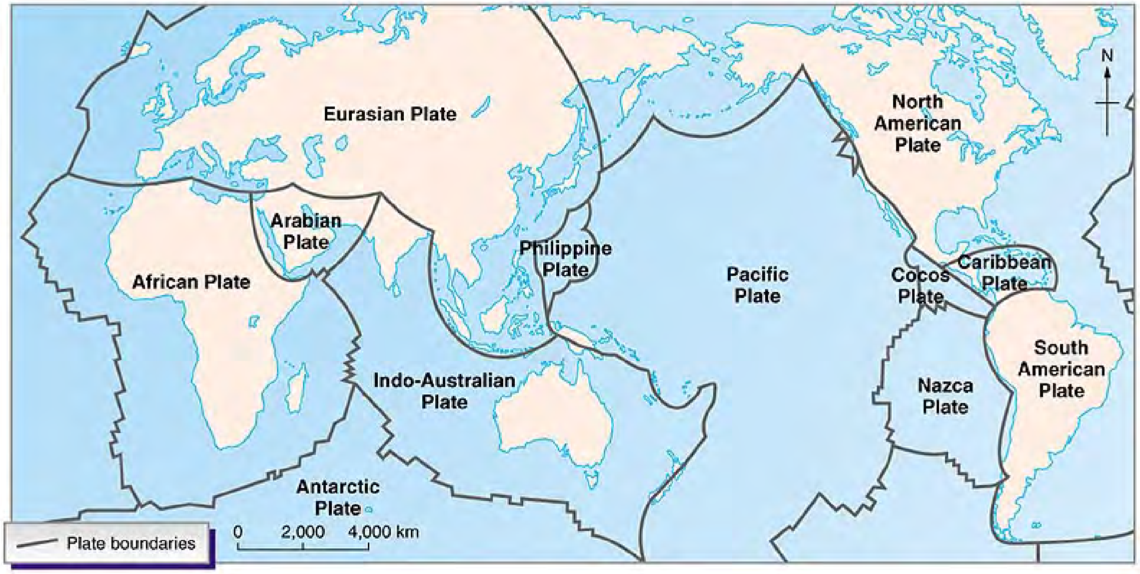


Figure 3-1. Schematic Diagram of Earth's Lithospheric Plates.
Source: Dr. C.H. Fletcher III, UH Dept. of Geology and Geophysics, personal communication, December 2005.

Divergent plate boundaries —locations where lithospheric plates separate from each other—form "spreading centers" where new seafloor is constructed atop high mid-ocean ridges. These ridges stretch for thousands of miles[25] and are characterized by active submarine volcanism and earthquakes. At these ridges, magma is generated at the top of the mantle immediately underlying an opening, or rift, in the lithosphere. As magma pushes up under the spreading lithosphere it inflates the ridges until a fissure is created and lava erupts onto the sea floor (Fryer and Fryer 1999). The erupted lava, and its subsequent cooling, forms new seafloor on the edges of the separating plates. This process is responsible for the phenomenon known as "seafloor spreading," where new ocean floor is constantly forming and sliding away from either side of the ridge.[26]

Convergent plate boundaries are locations where two plates move together and one plate, usually composed of denser basalt, subducts or slides beneath the other, which is composed of less dense rock, and is recycled into the mantle. When two plates of equivalent density converge, the rock at the boundary fractures and shears like the front ends of two colliding cars, and forms a large mountain range. The Himalayan Range has this origin. There are three different types of plate convergence: 1) ocean-continent convergence, 2) ocean-ocean convergence, and 3) continent-continent convergence

[25] http://www.washington.edu/burkemuseum/geo_history_wa/The Restless Earth v.2.0.htm (accessed July 2005)
[26] Ibid

(Fryer and Fryer 1999). A well known example of ocean-ocean convergence is observed in the western Pacific, where the older and denser Pacific Plate subducts under the younger and less dense Philippine Plate at a very steep angle. This results in the formation of the Marianas Trench, which at nearly 11 km (approximately 36,000 feet) is the deepest point of the seafloor.[27] Ocean-ocean convergent boundary movements may result in the formation of island arcs, where the denser (generally older) plate subducts under the less dense plate. Melting in the upper mantle above the subducting plate generates magma that rises into the overlying lithosphere and may lead to the formation of a chain of volcanoes known as an island arc.[28] The Indonesian Archipelago has this geologic origin, as does the Aleutian Island chain.

Transform boundaries, a third type of plate boundary, occur when lithospheric plates neither converge nor diverge, but shear past one another horizontally, like two ships at sea that rub sides. The result is the formation of very hazardous seismic zones of faulted rock, of which California's San Andreas Fault is an example (Fryer and Fryer 1999).

In addition to the formation of island arcs from ocean-ocean convergence, dozens of linear island chains across the Pacific Ocean are formed from the movement of the Pacific Plate over stationary sources of molten rock known as hot spots (Fryer and Fryer 1999). A well known example of hot spot island formation is the Hawaiian Ridge-Emperor Seamounts chain that extends some 6,000 km from the "Big Island" of Hawaii (located astride the hotspot) to the Aleutian Trench off Alaska where ancient islands are recycled into the mantle.[29] Although less common, hot spots can also be found at mid-ocean ridges, exemplified by the Galapagos Islands in the Pacific Ocean.[30]

The Pacific Ocean contains nearly 25,000 islands which can be simply classified as high islands or low islands. High islands, like their name suggests, extend higher above sea level, and often support a larger number of flora and fauna and generally have fertile soil. Low islands are generally atolls built by layers of calcium carbonate secreted by reef building corals and calcareous algae on a volcanic core of a former high island that has submerged below sea level. Over geologic time, the rock of these low islands has eroded or subsided to where all that is remaining near the ocean surface is a broad reef platform surrounding a usually deep central lagoon (Nunn 2003).

3.2.3. Ocean Water Characteristics

Over geologic time, the Pacific Ocean basin has been filled in by water produced by physical and biological processes. A water molecule is the combination of two hydrogen atoms bonded with one oxygen atom. Water molecules have asymmetric charges exhibiting a positive charge on the hydrogen sides and a negative charge on the oxygen side of the molecule. This charge asymmetry allows water to be an effective solvent, thus the ocean contains a diverse array of dissolved substances. Relative to other molecules,

---

[27] http://www.soest.hawaii.edu/coasts/chip/ch02/ch_2_7.asp (accessed July 2005)
[28] Ibid
[29] http://pubs.usgs.gov/publications/text/Hawaiian.html (accessed July 2005)
[30] http://pubs.usgs.gov/publications/text/hotspots.html#anchor19620979 (accessed July 2005)

water takes a great deal of heat to change temperature, thus the oceans have the ability to store large amounts of heat. When water evaporation occurs, large amounts of heat are absorbed by the ocean (Tomczak and Godfrey 2003). The overall heat flux observed in the ocean is related to the dynamics of four processes: (a) incoming solar radiation, (b) outgoing back radiation, (c) evaporation, and (d) mechanical heat transfer between ocean and atmosphere (Bigg 2003).

The major elements (greater than 100 ppm) present in ocean water include chlorine, sodium, magnesium, calcium, and potassium, with chlorine and sodium being the most prominent, and their residue (e.g., sea salt [NaCl]) is left behind when seawater evaporates. Minor elements (1 to 100 ppm) include bromine, carbon, strontium, boron, silicon, and fluorine. Trace elements (greater than 1 ppm) include nitrogen, phosphorus, and iron (Levington 1995).

Oxygen is added to seawater by two processes: (a) atmospheric mixing with surface water and (b) photosynthesis. Oxygen is subtracted from water through processes such as the respiration of bacterial decomposition of organic matter (Tomczak and Godfrey 2003).

3.2.4. Ocean Layers

On the basis of the effects of temperature and salinity on the density of water (as well as other factors such as wind stress on water), the ocean can be separated into three layers: (a) the surface layer or mixed layer, (b) the thermocline or middle layer, and (c) the deep layer. The surface layer generally occurs from the surface of the ocean to depth of around 400 meters or less, depending on location (e.g., 0 to 150 m in the central Pacific), and is an area where the water is mixed by currents, waves, and weather. The thermocline is generally from 400 to 800 meters and is where water temperatures significantly differ from the surface layer, thus forming a temperature gradient that inhibits mixing with the surface layer. More than 90 percent of the ocean by volume occurs in the deep layer, which is generally below 800 meters and consists of water temperatures around 0 to 4° C. The deep zone is void of sunlight and experiences high water pressure (Levington 1995).

The temperature of ocean water is important to oceanographic systems. For example, the temperature of the mixed layer has an affect on the evaporation rate of water into the atmosphere, which in turn is linked to the formation of weather. The temperature of water also produces density gradients within the ocean that prevent mixing of the ocean layers (Bigg 2003). See Figure 3-2 for a generalized representation of water temperatures and depth profiles.

The amount of dissolved salt or salinity varies between ocean zones as well as across oceans. For example, the Atlantic Ocean has higher salinity than the Pacific Ocean, largely due to the saline input of the Mediterranean Sea where evaporation exceeds both precipitation and fresh water influx from large rivers. The average salt content of the ocean is 35 parts per thousand, but can vary at different latitudes depending on evaporation and precipitation rates. Salinity is lower near the equator than at middle latitudes because of higher rainfall amounts. Salinity also varies with depth, causing vertical salinity gradients (Bigg 2003). See below for a generalized representation of salinity at various ocean depths.

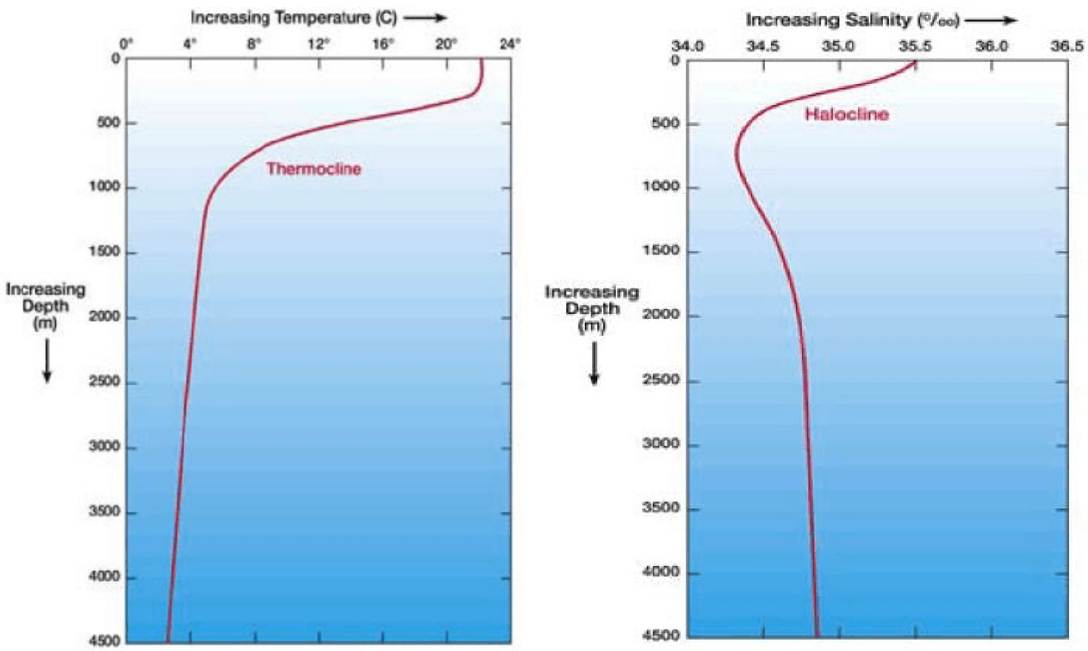


Figure 3-2. Temperature and Salinity Profiles of the Ocean.

Sources: http://www.windows.ucar.edu/tour/link=/earth/Water/temp.html&edu=high (accessed July 2005) and http://www.windows.ucar.edu/tour/link=/earth/Water/salinity_depth.html&edu=high (accessed July 2005).

3.2.5. Ocean Depth Zones

The ocean can be separated into the following five zones (see Figure 3-3) relative to the amount of sunlight that penetrates through seawater: (a) epipelagic, (b) mesopelagic, (c) bathypelagic, (d) abyssopelagic, and (e) hadalpelagic. Sunlight is one of the principal factors for determining the amount of primary production (phytoplankton) in marine ecosystems. Because sunlight diminishes with ocean depth, the amount of sunlight penetrating seawater, as well as its affect on the occurrence and distribution of marine organisms is important. The epipelagic zone extends to nearly 200 meters in the ocean. The mesopelagic zone occurs between 200 meters and 1,000 meters and is sometimes referred to as the “twilight zone.” Although the light that penetrates to the mesopelagic zone is extremely faint, this zone is home to a wide variety of marine species. The bathypelagic zone occurs from 1,000 meters to 4,000 meters, and the only visible light seen is the product of marine organisms producing their own light, which is called “bioluminescence.” The next zone is the abyssopelagic zone (4,000 m–6,000 m), where there is extreme pressure and the water temperature is near freezing. This zone does not provide habitat for very many creatures except small invertebrates such as squid and basket stars. The last zone is the hadalpelagic (6,000 meters and below) and occurs in trenches and canyons. Surprisingly, marine life such as tubeworms and starfish are found is this zone, often near hydrothermal vents.

Figure 3-3. Depth Profile of Ocean Zones.

Source: Image reproduced by WPRFMC 2005. Concept from http://www.seasky.org/monsters/sea7a4.html (accessed July 2005).

3.2.6. Ocean Water Circulation

The circulation of ocean water is a complex system involving the interaction between the oceans and atmosphere. The system is primarily driven by solar radiation, which results in wind being produced from the heating and cooling of ocean water and the evaporation and precipitation of atmospheric water. Except for the equatorial region, which receives a nearly constant amount of solar radiation, the latitude and seasons affect how much solar radiation is received in a particular region of the ocean. This, in turn, has an effect on sea-surface temperatures and the production of wind through the heating and cooling of the system (Tomczak and Godfrey 2003).

3.2.7. Surface Currents

Ocean surface currents can be thought of as organized flows of water that can exist on a pan-oceanic scale with water being transported from one part of the ocean basin to another (Levington 1995). In addition to water, ocean currents also transport plankton, heat, salts, oxygen, and carbon dioxide. Wind is the primary force that drives ocean surface currents. The sun and moon also influence ocean water movements by creating tidal flow, which is more readily observed in coastal areas rather than in open ocean environments (Tomczak and Godfrey 2003). Figure 3-4 shows the major surface currents of the Pacific Ocean.

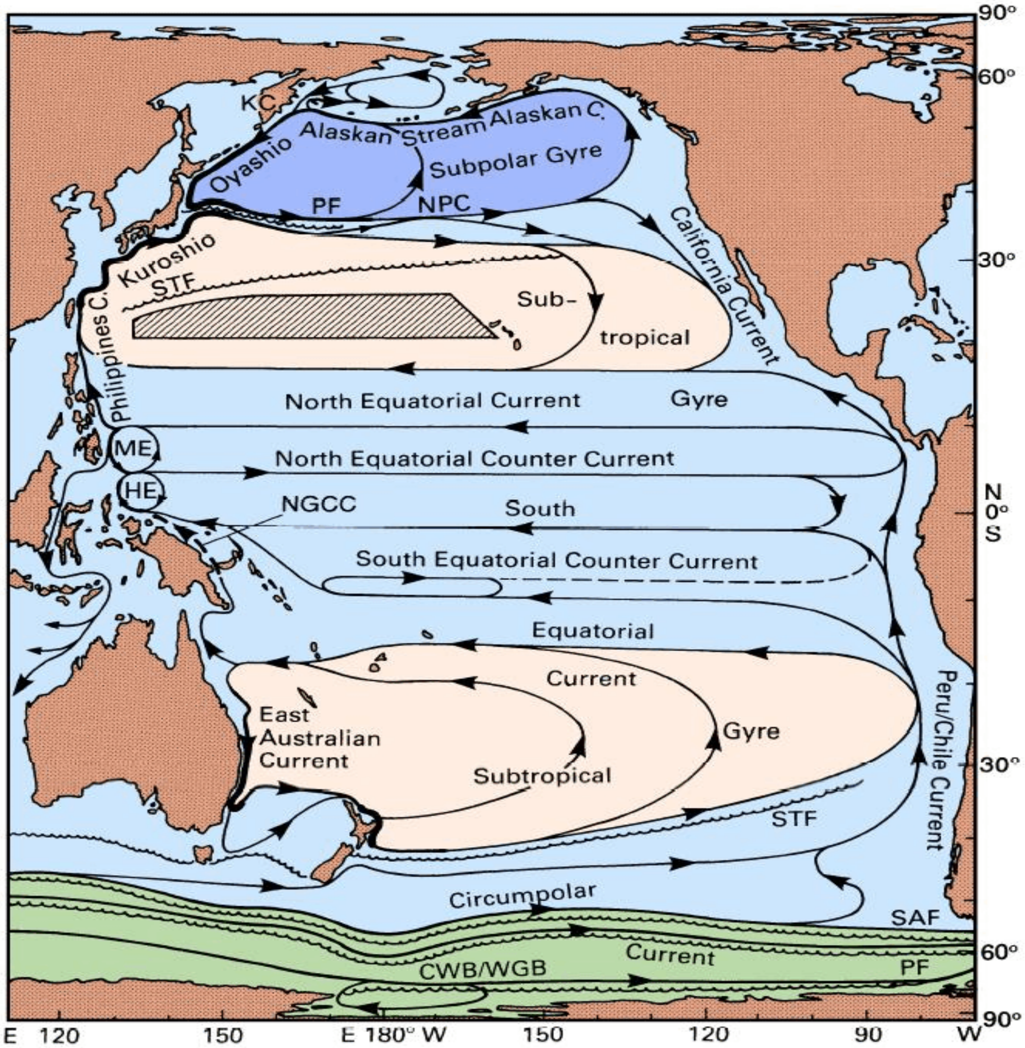


Figure 3-4. Major Surface Currents of the Pacific Ocean.
Source: Tomczak and Godfrey 2003.

Note: Abbreviations are used for the Mindanao Eddy (ME), the Halmahera Eddy (HE), the New Guinea Coastal (NGCC), the North Pacific (NPC), and the Kamchatka Current (KC). Other abbreviations refer to fronts: STF (Subtropical Front), SAF (Subantarctic Front), PF (Polar Front), and CWB/WGB (Continental Water Boundary/Weddell Gyre Boundary). The shaded region indicates banded structure (Subtropical Countercurrents). In the western South Pacific Ocean, the currents are shown for April–November when the dominant winds are the Trades. During December–March, the region is under the influence of the northwest monsoon, flow along the Australian coast north of 18° S and along New Guinea reverses, the Halmahera Eddy changes its sense of rotation, and the South Equatorial Current joins the North Equatorial Countercurrent east of the eddy (Tomczak and Godfrey 2003).

3.2.8. Transition Zones

Transition zones are areas of ocean water bounded to the north and south by large-scale surface currents originating from subarctic and subtropical locations (Polovina et al. 2001). Located generally between 32° N and 42° N, the North Pacific Transition Zone (NPTZ) is an area between the southern boundary of the Subartic Frontal Zone (SAFZ) and the northern boundary of the Subtropical Frontal Zone (STFZ; see Figure 3-5). Individual temperature and salinity gradients are observed within each front, but generally the SAFZ is colder (approximately 8° C) and less salty (approximately 33.0 ppm) than the STFZ (18° C, approximately 35.0 ppm, respectively). The NPTZ supports a marine food chain that experiences variation in productivity in localized areas due to changes in nutrient levels brought on, for example, by storms or eddies. A common characteristic among some of the most abundant animals found in the Transition Zone such as flying squid, blue sharks, Pacific pomfret, and Pacific saury is that they undergo seasonal migrations from summer feeding grounds in subarctic waters to winter spawning grounds in subtropical waters. Other animals found in the NPTZ include swordfish, tuna, albatross, whales, and sea turtles (Polovina et al. 2001).

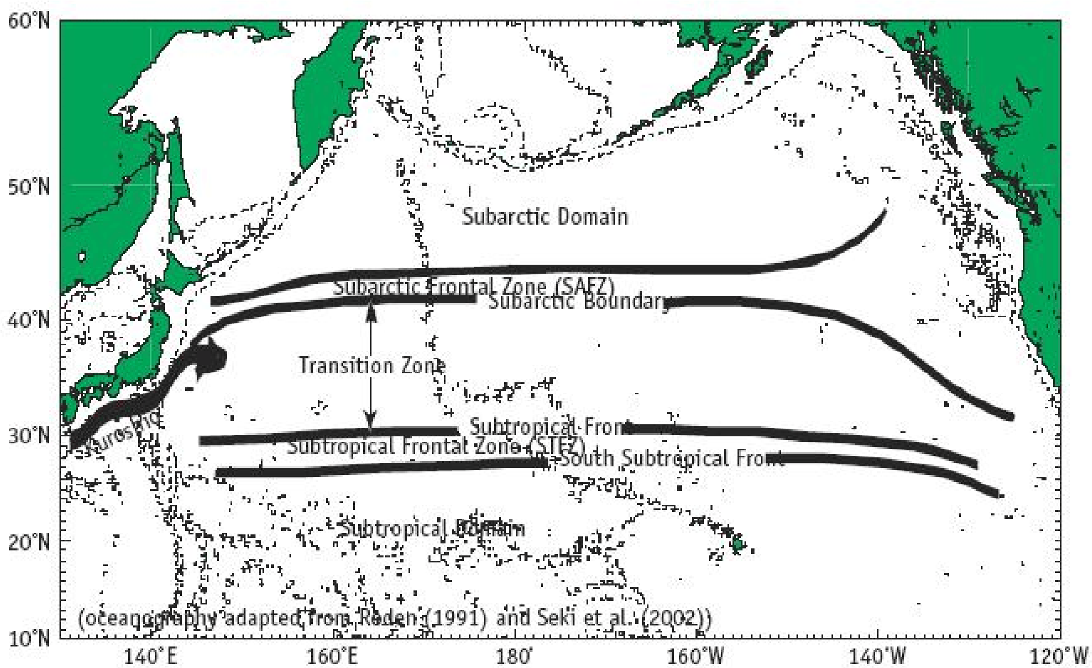


Figure 3-5. North Pacific Transition Zone.
Source: http://www.pices.int/publications/special_publications/NPESR/2005/File_12_pp_201_210.pdf (accessed July 2005).

3.2.9. Eddies

Eddies are generally short to medium term water movements that spin off of surface currents and can play important roles in regional climate (e.g., heat exchange) as well as the distribution of marine organisms. Large-scale eddies spun off of the major surface currents often blend cold water with warm water, the nutrient-rich with the nutrient poor, and the salt laden with fresher waters (Bigg 2003). The edges of eddies, where the mixing is greatest, are often targeted by fishermen as these are areas of high biological productivity. In the Hawaiian Islands, the prevailing northeasterly trade winds combined with the topography of the area generate eddies on the leeward (western) sides of the islands. These eddies have been observed to last 50 to 70 days and have been attributed with enhancing the upwelling of nutrients into the euphotic zone and to increasing levels of primary productivity, as compared to non-eddy areas (Seki et al. 2001). As geostrophic surface currents are sometimes weak or nonexistent, eddies can also play an important role for larval transport of many organisms (E. Firing, UH SOEST, personal communication, July 2005). See Figure 3-6 for examples of compiled satellite based data to monitor an eddy.

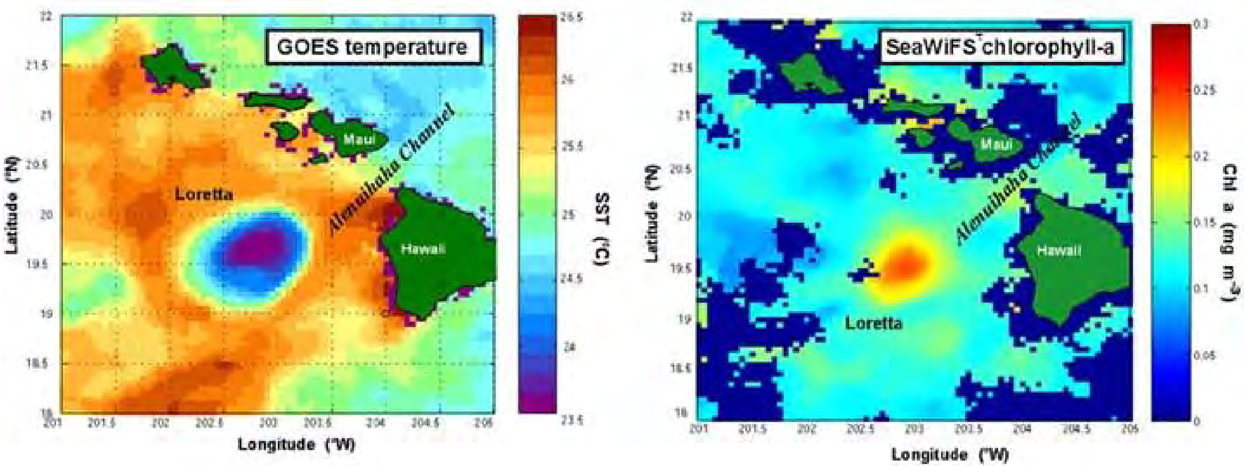


Figure 3-6. Example of an Eddy West of the Hawaiian Islands.

Source: http://www.gsfc.nasa.gov/topstory/20010413oceaneddy.html (accessed August 2006).
Note: The above eddy, named Lorretta, persisted in waters west of Hawaii Island for nearly eight months. Lorretta upwelled cool, nutrient rich water that resulted in increases in primary productivity (i.e., chlorophyll).

3.2.10. Deep-Ocean Currents

As described in Tomczak and Godfrey (2003), deep-ocean currents or thermohaline movements result from the effects of salinity and temperature on the density of seawater. In the Southern Ocean, for example, water exuded from sea ice is extremely dense because of its high salt content. The movement of the dense water is influenced by bathymetry as it sinks to the bottom and flows “down slope,” thus filling up the deep polar ocean basins. For example, the Arctic Ocean does not contribute much of its dense water to the Pacific Ocean due to the narrow shallows of the Bering Strait. Generally, the deep-water currents flow through the Atlantic Basin, around South Africa, into the Indian Ocean, past Australia, and into the Pacific Ocean. This process has been labeled the “ocean conveyor belt,” taking nearly 1,200 years to complete one cycle. The movement of the thermohaline conveyor belt is believed to affect global weather patterns (Gelbspan 2004), and has been the focus of much research. See Figure 3-7 for a simplified schematic diagram of the deep-ocean conveyor belt system.

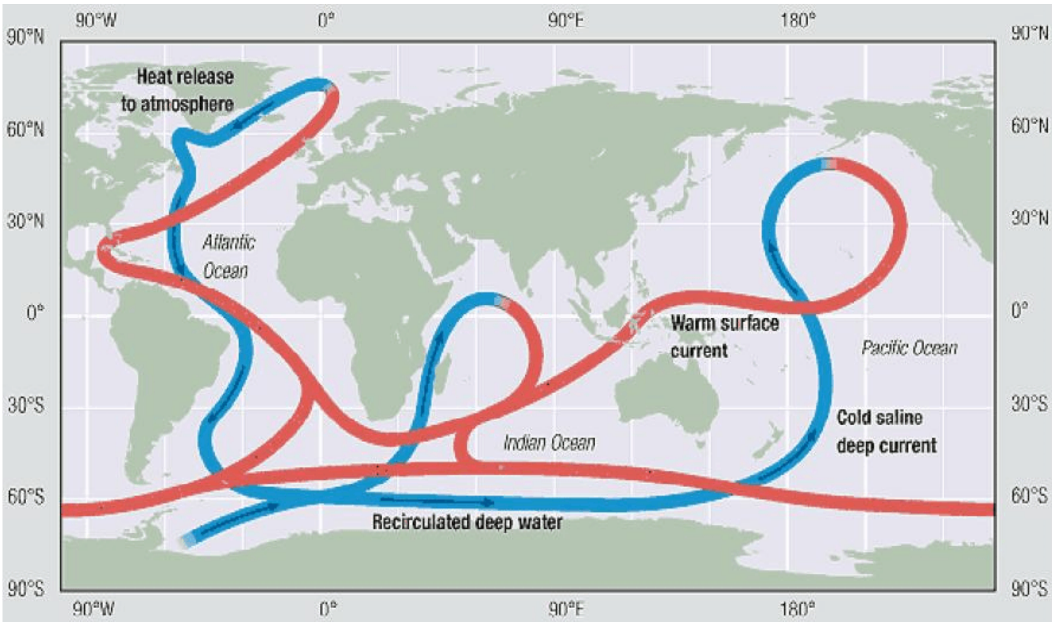


Figure 3-7. Deep-Ocean Water Movement.
Source: U.N. GEO Yearbook 2004.

3.2.11. Prominent Pacific Ocean Meteorological Features

The air–sea interface is a dynamic relationship in which the ocean and atmosphere exchange energy and matter. This relationship is the basic driver for the circulation of surface water (through wind stress) as well as for atmospheric circulation (through evaporation). The formation of weather systems and atmospheric pressure gradients are linked to exchange of energy (e.g., heat) and water between air and sea (Bigg 2003).

Near the equator, intense solar heating causes air to rise and water to evaporate, thus resulting in areas of low pressure. The air that has risen in the equatorial region fans out into the higher troposphere layer of the atmosphere and settles back toward Earth at middle latitudes. As the air settles toward Earth, it creates areas of high pressure known as subtropical high-pressure belts. One of these high-pressure areas in the Pacific is called the “Hawaiian High Pressure Belt,” which is responsible for the prevailing trade wind pattern observed in the Hawaiian Islands (Sturman and McGowan 2003).

Air flowing from higher trade wind pressure areas moves to low pressure areas such as the Intertropical Convergence Zone (ITCZ) and the South Pacific Convergence Zone (SPCZ), which are located around 5° N and 30° S, respectively. Converging trade winds in these areas do not produce high winds, but instead often form areas that lack significant wind speeds. These areas of low winds are known as the "doldrums." The convergence zones occur near ridges of high sea-surface temperatures, with temperatures of 28° C and above, and are areas of cloud accumulation and high rainfall amounts. The high rainfall amounts reduce ocean water salinity levels in these areas (Sturman and McGowan 2003).

The Aleutian Low Pressure System is another prominent weather feature in the Pacific Ocean and is caused by dense polar air converging with air from the subtropical high-pressure belt. As these air masses converge around 60° N, air is uplifted creating an area of low pressure. When the relatively warm surface currents (Figure 3-4) meet the colder air temperatures of subpolar regions, latent heat is released, which causes precipitation. The Aleutian Low is an area where large storms with high winds are produced. Such large storms and wind speeds have the ability to affect the amount of mixing and upwelling between ocean layers (e.g., mixed layer and thermocline; Polovina et al. 1994).

The dynamics of the air–sea interface do not produce steady states of atmospheric pressure gradients and ocean circulation. As discussed in the previous sections, there are consistent weather patterns (e.g., ITCZ) and surface currents (e.g., NPC); however, variability within the ocean–atmosphere system results in changes in winds, rainfall, currents, water column mixing, and sea-level heights. These can have profound effects on regional climates as well as on the abundance and distribution of marine organisms.

One example of a shift in ocean–atmospheric conditions that can affect global fisheries in the Pacific Ocean is the El Niño Southern Oscillation (ENSO). ENSO is linked to climatic changes in normal prominent weather features of the Pacific and Indian Oceans, such as the location of the intertropical convergence zone (ITCZ). ENSO, which can occur every 2 to 10 years, results in the reduction of normal trade winds, which reduces the intensity of the westward-flowing equatorial surface current (Sturman and McGowan 2003). In turn, the eastward-flowing countercurrent tends to dominate circulation, bringing warm, low-salinity, and low-nutrient water to the eastern margins of the Pacific Ocean. As the easterly trade winds are reduced, the normal nutrient-rich upwelling system does not occur, leaving warm surface water pooled in the eastern Pacific Ocean.

The impacts of ENSO events are strongest in the Pacific through disruption of the atmospheric circulation, generalized weather patterns and fisheries. ENSO affects the ecosystem dynamics in the equatorial and subtropical Pacific by considerable warming of the upper ocean layer, rising of the thermocline in the western Pacific and deepening of the thermocline in the east, strong variations in the intensity of ocean currents, low trade winds with frequent westerlies, high precipitation at the dateline and drought in the western Pacific (Sturman and McGowan 2003). ENSO events have the ability to significantly influence the abundance and distribution of organisms within marine ecosystems. Human communities also experience a wide range of socioeconomic impacts from ENSO such as changes in weather patterns resulting in catastrophic events (e.g., mudslides in California because of high rainfall amounts), as well as reductions in fisheries harvests (e.g., collapse of the anchovy fishery off Peru and Chile; Levington 1995; Polovina 2005).

Changes in the Aleutian Low Pressure System are another example of how interannual variation in a prominent Pacific Ocean weather feature profoundly affects the abundance and distribution of marine organisms. Polovina et al. (1994) found that between 1977 and 1988, the intensification of the Aleutian Low Pressure System in the North Pacific resulted in a deeper mixed-layer depth, which led to higher nutrients levels in the top layer of the euphotic zone. This, in turn, led to an increase in phytoplankton production that resulted in higher productivity levels (higher abundance levels for some organisms) in the NWHI. Changes in the Aleutian Low Pressure System, and the resulting effects on phytoplankton productivity, have been observed on decadal scales (10 years), as well as for longer periods such as 20 to 30 years. The phenomenon is often referred to as the "Pacific Decadal Oscillation (PDO)," a term coined by Dr. Steven Hare (Hare 1996).

3.2.12. Pacific Island Geography

The Pacific islands can be generally grouped into three major areas: (a) Micronesia, (b) Melanesia, and (c) Polynesia. The islands of Japan and the Aleutian Islands in the North Pacific are generally not included in these three areas, thus they are not included or described here as this analysis focuses on the Western Pacific Region and its ecosystems. Information used in this section was obtained from the online version of the U.S. Central Intelligence Agency's World Fact Book (2005).[31]

3.2.12.1. Micronesia

Micronesia, which is primarily located in the western Pacific Ocean, is made up of hundreds of high and low islands within six archipelagos: (a) Caroline Islands, (b) Marshall Islands, (c) Mariana Islands, (d) Gilbert Islands, (e) Phoenix Islands, and (f) Line Islands.

The Caroline Islands (approximately 640 square miles) are composed of many low coral atolls, with a few high islands. Politically, the Caroline Islands are separated into two countries: Palau and the Federated States of Micronesia (FSM). Palau contains six island groups (approximately 458 square miles) composed of volcanic and coral islands. The population of Palau is estimated to be around 20,000 and the capitol is located in Koror. Palau's EEZ is 232,861 square miles.

The FSM contains hundreds of low lying coral islands (approximately 278 square miles) separated into four groups. The population of FSM is around 110,000 with the most populated states being Yap, Pohnpei (capitol), Kosrae, and Chuuk. FSM's EEZ is 1,156,944 square miles.

[31] http://www.cia.gov/cia/publications/factbook/index.html

The Marshall Islands (approximately 180 square miles) are made up of 34 low-lying atolls separated by two chains: the southeastern Ratak Chain and the northwestern Ralik Chain. The population of the Marshall Islands is around 60,000, with Ebeye being one of the most densely populated islands in the Pacific. The capital is Majuro. The EEZ around the Marshall Islands is 768,561 square miles.

The Mariana Islands (approximately 396 square miles) are composed of 15 volcanic islands that are part of a submerged mountain chain that stretches nearly 1,500 miles from Guam to Japan. Politically, the Mariana Islands are split into the Territory of Guam and the CNMI, both of which are U.S. possessions (See sections 3.5.2 and 3.5.3). The EEZ around Guam and CNMI are 81,470 square miles and 292,717 square miles, respectively.

Nauru (approximately 8 square miles), located southeast of the Marshall Islands, is a raised coral reef atoll rich in phosphate. The island has a population of around 13,500 people and the Republic of Nauru is considered the smallest independent nation in the world. Nauru’s EEZ is 119,106 square miles.

The Republic of Kirabati consists of 33 low lying coral islands (approximately 315 square miles) within three major island chains (Gilbert, Phoenix, Line) separated by hundreds of miles. The population of Kiribati is nearly 105,000 people. The Gilbert Islands are located south of the Marshall Islands and are made up of 16 low-lying atolls, including Tarawa, the capital of Kiribati. The Phoenix Islands, located to the southwest of the Gilbert Islands, are composed of eight coral atolls. Howland and Baker Islands (U.S. possessions) are located within the Phoenix Archipelago. The Line Islands, located in the central South Pacific, are made up of ten coral atolls, of which Kiritimati is the largest in the world (approximately 250 square miles). The U.S. possessions of Kingman Reef, Palmyra Atoll, and Jarvis Island are part of the Line Islands. Kiribati has one of the largest EEZs in the Pacific at 1,328,913 square miles.

3.2.12.2. Melanesia

Melanesia is composed of several archipelagos that include the following: (a) Fiji Islands, (b) New Caledonia, (c) Solomon Islands, (d) New Guinea, (e) Bismark Archipelago, (f) Louisiade Islands, (g) Tobriand Islands, (h) Maluku Islands, (i) Torres Strait Islands, and (j) Vanuatu Islands.

Located approximately 3,500 miles northeast of Sydney, Australia, the Fiji Archipelago (approximately 18,700 square miles) is composed of nearly 800 islands; the largest islands are volcanic in origin and the smallest islands are coral atolls. The two largest islands, Viti Levu and Vanua Levu, make up nearly 85 percent of the total land area of the Republic of Fiji. Fiji’s population is estimated at 905,949 people and the capitol is located in Suva. Fiji’s EEZ is 495,369 square miles.

Located nearly 750 miles east–northeast of Australia, is the volcanic island of Grande Terre or New Caledonia (approximately 6,300 square miles). New Caledonia is French Territory and includes the nearby Loyalty Islands and the Chesterfield Islands, which are groups of small coral atolls. The population of New Caledonia is approximately 219,246 people and the capitol is located in Noumea. The EEZ around New Caledonia is 549,170 square miles.

The Solomon Islands (approximately 27,500 square miles) are located northwest of New Caledonia and east of Papua New Guinea. Thirty volcanic islands and several small coral atolls make up this former British colony, which is now a member of the Commonwealth of Nations. The Solomon Islands are made up of smaller groups of islands such as the New Georgia Islands, the Florida Islands, the Russell Islands, and the Santa Cruz Islands. Approximately 1,500 miles separate the western and eastern island groups of the Solomon Islands. The population of the Solomon Islands is approximately 552,438 people and the capitol is located in Honiara. The Solomon Islands' EEZ is 613,711 square miles.

New Guinea is the world's second largest island and is thought to have separated from Australia around 5000 BC. New Guinea is split between two nations: Indonesia (west) and Papua New Guinea (east). Papua New Guinea (approximately 178,700 square miles) is an independent nation that also governs several hundred small islands within several groups. These groups include the Bismark Archipelago and the Louisiade Islands, which are located north of New Guinea, and the Tobriand Islands, which are southeast of New Guinea. Most of the islands within the Bismark and Lousiade groups are volcanic in origin, whereas the Tobriand Islands are primarily coral atolls. Papua New Guinea's population is estimated at 5,670,544 people and the capitol is located in Port Moresby. Papua New Guinea's EEZ is 927,545 square miles.

The Maluku Islands (east of New Guinea) and the Torres Strait Islands (between Australia and New Guinea) are also classified as part of Melanesia. Both of these island groups are volcanic in origin. The Maluku Islands are under Indonesia's governance, while the Torres Strait Islands are governed by Australia.

The Vanuatu Islands (4,700 square miles) comprise an archipelago that is located to the southeast of the Solomon Islands. There are 83 islands in the approximately 500 mile-long Vanuatu chain, most of which are volcanic in origin. The population of Vanuatu is approximately 208,869 people and the capitol is located in Port-Vila. Vanuatu's EEZ is 256,087 square miles

3.2.12.3. Polynesia

Polynesia is composed of several archipelagos and island groups including (a) New Zealand and associated islands, (b) Tonga, (c) Samoa Islands, (d) Cook Islands (e) Tuvalu, (f) Tokelau, (g) Territory of French Polynesia, (h) Pitcairn Islands, (i) Easter Island (Rapa Nui), and (j) Hawaii.

New Zealand (approximately 103,470 square miles) is composed of two large islands: North Island and South Island and several small-island groups and islands. North Island (approximately 44,035 square miles) and South Island (approximately 58,200 square miles) extend for nearly 1,000 miles on a northeast–southwest axis, and have a maximum width of 450 miles. The other small island groups within the former British colony include the Chatham Islands and the Kermadec Islands. The Chatham Islands are a group of ten volcanic islands located 800 kilometers east of South Island. The four emergent islands of the Kermadec Islands are located 1,000 kilometers northeast of North Island and are part of a larger island arc with numerous subsurface volcanoes. The Kermadec Islands are known to be an active volcanic area where the Pacific Plate subducts under the Indo-Australian Plate. The population of New Zealand is approximately 4,076,140 people and the capitol is located in Wellington. New Zealand’s EEZ is 1,339,411 square miles.

The Tonga Islands (approximately 290 square miles) are located 450 miles east of Fiji and consist of 169 islands of volcanic and raised limestone origin. The largest island, Tongatapu (approximately 260 square miles), is home to two thirds of Tonga’s population of approximately 106,000 people. Tonga’s EEZ is 254,672 square miles.

The Samoa Archipelago is located northeast of Tonga and consists of seven major volcanic islands, several small islets, and two coral atolls. The largest islands in this chain are Upolu (approximately 436 square miles) and Savaii (approximately 660 square miles). Upolu and Savaii and its surrounding islets and small islands are governed by the Independent State of Samoa with a population of approximately 178,000 people. Samoa’s EEZ is 49,402 square miles.

Tutuila (approximately 55 square miles), the Manua Islands (a group of four volcanic islands with a total land area of less than 20 square miles), and two coral atolls (Rose Atoll and Swains Island) are governed by the U.S. Territory of American Samoa. More than 90 percent of American Samoa’s population (approximately 68,000 people) lives on Tutuila. The EEZ around American Samoa is 156,246 square miles.

To the east of the Samoa Archipelago are the Cook Islands (approximately 90 square miles), which are separated into the Northern Group and Southern Group. The Northern Group consists of six sparsely populated coral atolls and the Southern Group consists of seven volcanic islands and two coral atolls. Rorotonga (approximately 26 square miles), located in the Southern Group, is the largest island in the Cook Islands and also serves as the capitol. From north to south, the Cook Islands spread nearly 900 miles, and the distance between the most distant islands is nearly 450 miles. The population of the Cook Islands is approximately 21,388 people and the EEZ is approximately 755,781 square miles.

Approximately 600 miles northwest of the Samoa Islands is Tuvalu (approximately 10 square miles), an independent nation made up of nine low-lying coral atolls. None of the islands have elevation higher than 14 feet, and the total population of the country is approximately 11,000 people. Tuvalu's coral island chain extends for nearly 360 miles and the country has an EEZ of 289,500 square miles.

East of Tuvalu and north of Samoa are the Tokelau Islands (approximately 4 square miles). Three coral atolls make up this territory of New Zealand, and a fourth atoll (Swains Island) is of the same group, but is controlled by the U.S Territory of American Samoa. Tokelau has a population of approximately 1,392 people and an EEZ of 123,343 square miles.

The 32 volcanic islands and 180 coral atolls of the Territory of French Polynesia (approximately 1,622 square miles) are made up of the following six groups: Austral Islands, Bass Islands, Gambier Islands, Marquesas Islands, Society Islands, and the Tuamotu Islands. The Austral Islands are a group of six volcanic islands in the southern portion of the territory. The Bass Islands are a group of two islands in the southernmost part of the territory, with their volcanism appearing to be much more recent than that of the Austral Islands. The Gambier Islands are a small group of volcanic islands in the southeastern portion of the territory and are often associated with the Tuamotu Islands because of their relative proximity; however, they are a distinct group because they are of volcanic origin rather than being coral atolls. The Marquesas Islands are an isolated group of islands located in the northeast portion of the territory, and are approximately 1,000 miles northeast of Tahiti. All but one of the 17 Marquesas Islands are volcanic in origin. The Society Islands are a group of several volcanic islands that include the Island of Tahiti. Tahiti is home to nearly 70 percent of French Polynesia's population of approximately 275,578 people. The capitol city of Papeete is located on Tahiti. The Tuamotu Islands, of which there are 78, are located in the central portion of the territory and are the world's largest chain of coral atolls. French Polynesia has one of the largest EEZs in the Pacific Ocean at nearly 1,835,669 square miles.

The Pitcairn Islands (governed by the United Kingdom) are a group of five islands thought to be an extension of the Tuamotu Archipelago. Pitcairn Island is the only volcanic island, with the others being coral atolls or uplifted limestone. Henderson Island is the largest in the group; however, Pitcairn Island is the only one that is inhabited with approximately 45 people. The EEZ around Pitcairn Island is 323,325 square miles.

Easter Island, a volcanic high island located approximately 2,185 miles west of Chile, is thought to be the eastern extent of the Polynesian expansion. Easter Island, which is governed by Chile, has a total land area of 63 square miles and a population of approximately 3,790 people. The EEZ around Easter Island is 275,475 square miles.

The northern extent of the Polynesian expansion is the Hawaiian Islands, which are made up of 137 islands, islets, and coral atolls. The exposed islands are part of a great undersea mountain range known as the Hawaiian-Emperor Seamount Chain, which was formed by a hotspot within the Pacific Plate. The Hawaiian Islands extend for nearly 1,500 miles from Kure Atoll in the northwest to the Island of Hawaii in the southeast. The Hawaiian Islands are often grouped into the Northwestern Hawaiian Islands (Nihoa to Kure) and the Main Hawaiian Islands (Hawaii to Niihau). The total land area of the 19 primary islands and atolls is approximately 6,423 square miles, and the more than 75 percent of the 1.2-million population lives on the island of Oahu. The EEZ around Hawaii is 810,232 square miles.

3.3. Biological Environment

This section contains general descriptions of marine trophic levels, food chains and food webs. A broad description of the types of marine organisms found within this environment is provided, as well as a description of organisms important to fisheries. Protected species are also described in this section.

3.3.1. Marine Food Chains, Trophic Levels, and Food Webs

Food chains are often thought of as a representation of the basic flow of organic matter and energy through a series of organisms. Food chains in marine environments are generally segmented into the following six trophic levels: primary producers, primary consumers, secondary consumers, tertiary consumers, quaternary consumers, and decomposers.

Generally, primary producers in the marine ecosystems are organisms that fix inorganic carbon into organic carbon compounds using external sources of energy (i.e., sunlight). Such organisms include single-celled phytoplankton. These organisms share common cellular structures called “chloroplasts,” which contain chlorophyll. Chlorophyll is a pigment that absorbs the energy of light to drive the biochemical process of photosynthesis. Photosynthesis results in the transformation of inorganic carbon into organic carbon such as carbohydrates, which are used for cellular growth.

Primary consumers in the marine environment are organisms that feed on primary producers. Secondary, tertiary, and quaternary consumers in the marine environment are organisms that feed on primary consumers and include fish, mollusks, crustaceans, mammals and other carnivorous and omnivorous organisms. Decomposers live off dead phytoplankton and animals and are essential in food chains as they break down organic matter and make it available for primary producers (Valiela 2003).

Marine food webs are simplified representations of overall patterns of feeding among organisms. An example of a marine food web is presented in Figure 3-8. The openness of marine ecosystems, lack of specialists, long lifespans, and large size changes and food preferences across the life histories of many marine species make marine food webs more complex than their terrestrial and freshwater counterparts (Link 2002). Nevertheless, food webs are important tools in understanding ecological relationships among organisms.

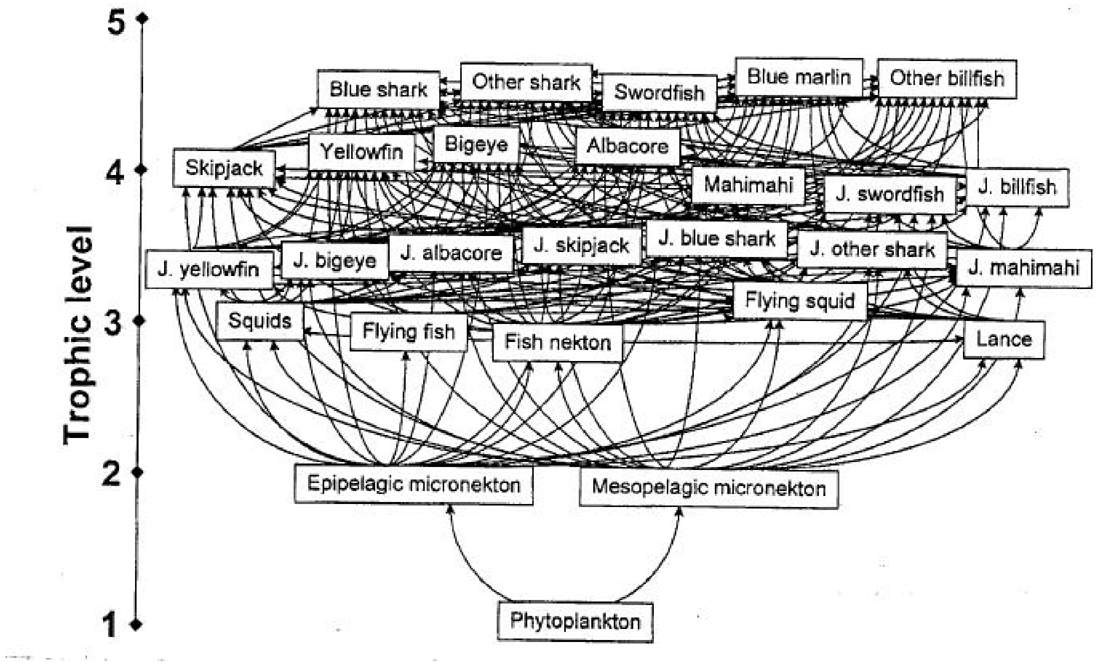


Figure 3-8. Central Pacific Pelagic Food Web.
Source: Kitchell et al. 1999.

3.3.2. Benthic Environment

The word benthic comes from the Greek word */benthos/* or "depths of the sea." The benthic or demersal environment is quite general in that it is regarded as pertaining to habitats of the sea floor extending from the high-tide mark to the deepest depths of the ocean. The benthos is home to a wide range of marine organisms that form complex community structures. This section presents a simple description of the following benthic zones: (a) intertidal, (b) subtidal (e.g., coral reefs), (c) banks and seamounts, (d) deep-reef slope, and (e) deep-ocean bottom (see Figure 3-9). "Demersal fisheries" primarily target benthic organisms (e.g., lobster, bottomfish, coral reef organisms, etc.), but may include species that inhabit the water column or the surface at some portion of their life cycles.

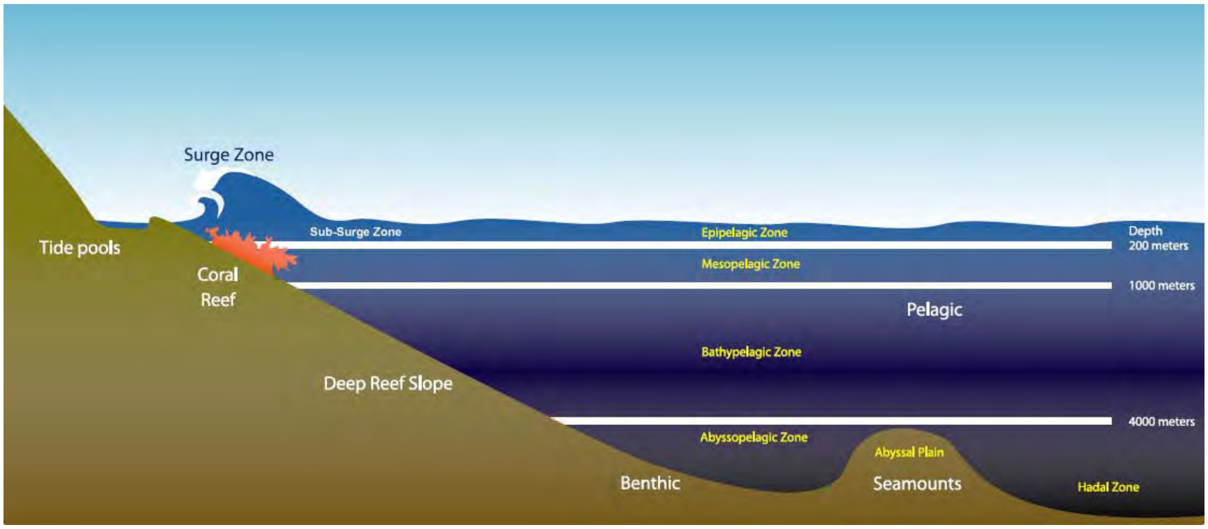


Figure 3-9. Benthic Environment and Associated Ocean Zones.
Source: WPRFMC 2005.

3.3.2.1. Intertidal Zone

The intertidal zone is a relatively small margin of seabed that exists between the highest and lowest extent of the tides. Because of wave action on unprotected coastlines, the intertidal zone can sometimes extend beyond tidal limits due to the splashing effect of waves. Vertical zonation among organisms is often observed in intertidal zones, where the lower limits of some organisms are determined by the presence of predators or competing species, whereas the upper limit is often controlled by physiological limits and species' tolerance to temperature and drying (Levington 1995). Organisms that inhabit the intertidal zone include algae, seaweeds, mollusks, crustaceans, worms, echinoderms (starfish), and cnidarians (e.g., anemones).

Many organisms in the intertidal zone have adapted strategies to combat the effects of temperature, salinity, and desiccation due to the wide-ranging tides of various locations. Marine algae are the primary producers in most intertidal areas. Many primary consumers, such as snails, graze on algae growing on rocky substrates in the intertidal zone. Secondary and tertiary consumers in intertidal zones include starfish, anemones, and seabirds. Because of the proximity of the intertidal zone to the shoreline, intertidal organisms are important food items to many human communities. In Hawaii, for example, intertidal limpet species (snails; *Cellana* spp.) such as *'opihi* (*Cellana exarata*) have long been eaten by native Hawaiian communities. In addition to mollusks, intertidal seaweeds are also important food items for Pacific Islanders.

3.3.2.2. Seagrass Beds

Seagrasses are found in many marine ecosystems and are a regular feature of many inshore areas adjacent to coral reefs in the Pacific. According to Hatcher et al. (1989), seagrasses stabilize sediments because leaves slow current flow, thus increasing sedimentation of particles. The roots and rhizomes form a complex matrix that binds sediments and stops erosion. Seagrass beds provide habitat for certain commercially valuable shrimps as well as habitat for reef-associated species such as surgeonfishes (Acanthuridae) and rabbitfishes (Siganidae). Seagrasses are also important sources of nutrition for higher vertebrates such as green sea turtles. A concise summary of the seagrass species found in the western tropical South Pacific is given by Coles and Kuo (1995). From the fisheries perspective, the fishes and other organisms harvested from the coral reef and associated habitats, such as mangroves, seagrass beds, shallow lagoons, bays, inlets and harbors, and the reef slope beyond the limit of coral reef growth, contribute to the total yield from coral reef associated fisheries.

3.3.2.3. Mangrove Forests

Mangroves are terrestrial shrubs and trees that are able to live in the salty environment of the intertidal zone. In their native habitat, their prop roots form important substrate on which sessile organisms can grow, and they provide shelter for fishes. Mangroves are believed to also provide important nursery habitat for many juvenile reef fishes. The natural eastern limit of mangroves in the Pacific is American Samoa. In the environments in which mangroves are native, such as in areas of the Pacific, mangroves have important cultural and economic uses. The plant is used as wood for building, charcoal, and tannin, and the mangrove stands can stabilize areas where sedimentation is occurring. They may be important as nursery grounds for peneaeid shrimps and some inshore fish species. They may also provide a habitat for some commercially valuable crustaceans.

The red mangrove (*Rhizophora mangle*) was introduced into Hawaii in 1902 and has become the dominant plant within a number of large protected bays and coastlines on both Oahu and Molokai (Gulko 1998). Oriental Mangrove (*Bruguiera gymnorrhiza*), another introduction, is known from Oahu and Molokai and is rapidly spreading in some areas. Mangroves are invasive species in Hawaii where they have become established on all the major Hawaiian Islands. Chimner et al. (2006) found that mangroves are still expanding at a rapid rate on Oahu and have colonized many different landforms including tidal flats, riverbanks, fishponds, canals, embayments, lagoons, and some reef areas that are protected from strong waves and currents. Mangroves change water quality, alter food chains, and displace vegetation in areas where native waterbirds breed (Enoki 2004). Numerous research and restoration projects are being implemented to monitor and quantify mangrove expansion, and control mangroves through removal and efforts to prevent re-establishment.

3.3.2.4. Coral Reefs

Coral reefs are carbonate rock structures at or near sea level that support viable populations of reef-building corals. Apart from a few exceptions in the Pacific Ocean, coral reefs are confined to the warm tropical and subtropical waters lying between 30° N and 30° S. Coral reef ecosystems are some of the most diverse and complex ecosystems on Earth. Their complexity is manifest on all conceptual dimensions, including geological history, growth and structure, biological adaptation, evolution and biogeography, community structure, organism and ecosystem metabolism, physical regimes, and anthropogenic interactions (Hatcher et al. 1989).

Coral reefs and reef-building organisms are confined to the shallow upper euphotic zone. Maximum reef growth and productivity occur between 5 and 15 meters (Hopley and Kinsey 1988) and maximum diversity of reef species occurs at 10 to 30 meters (Huston 1985). Thirty meters has been described as a critical depth below which rates of growth (accretion) of coral reefs are often too slow to keep up with changes in sea level. This was true during the Holocene transgression over the past 10,000 years, and many reefs below this depth drowned during this period. Coral reef habitat does extend deeper than 30 meters, but few well-developed reefs are found below 50 meters. Many coral reefs are bordered by broad areas of shelf habitat (reef slope) between 50 and 100 meters that were formed by wave erosion during periods of lower sea level. These reef slope habitats consist primarily of carbonate rubble, algae and microinvertebrate communities, some of which may be important nursery grounds for some coral reef fish, as well as a habitat for several species of lobster. However, the ecology of this habitat is poorly known, and much more research is needed to define the lower depth limits of coral reefs, which by inclusion of shelf habitat, could be viewed as extending to 100 meters.

The symbiotic relationship between the animal coral polyps and algal cells (dinoflagellates) known as zooxanthellae is a key feature of reef building corals. Incorporated into the coral tissue, these photosynthesizing zooxanthellae provide much of the polyp’s nutritional needs, primarily in the form of carbohydrates. Most corals supplement this food source by actively feeding on zooplankton or dissolved organic nitrogen, because of the low nitrogen content of the carbohydrates derived from photosynthesis. Because of reef-building coral’s symbiotic relationship with photosynthetic zooxanthellae, reef-building corals do not generally occur at depths greater than 100 meters (300 feet; Hunter 1995).

Primary production on coral reefs is associated with phytoplankton, algae, sea grasses, and zooxanthellae. Primary consumers include many different species of corals, mollusks, crustaceans, echinoderms, gastropods, sea turtles, and fish (e.g., parrot fish). Secondary consumers include anemones, urchins, crustaceans, and fish. Tertiary consumers include eels, octopus, barracudas, and sharks.

The corals and coral reefs of the Pacific are described in Wells and Jenkins (1988) and Veron (1995). The number of coral species declines in an easterly direction across the western and central Pacific, which is in common with the distribution of fish and invertebrate species. More than 330 species are contained in 70 genera on the Australian Barrier Reef, compared with only 30 coral genera present in the Society Islands of French Polynesia, and 10 genera in the Marquesas and Pitcairn Islands. Hawaii, by virtue of its isolated position in the Pacific, also has relatively few species of coral. Approximately 66 species of scleractinian (hard) corals in 17 genera are known from Hawaii. The main Hawaiian Islands lack most of the branching or "tabletop" *Acropora* species that form the majority of reefs elsewhere in the Pacific. The *Acropora* species provide a large amount of complex three-dimensional structure and protected habitat for a wide variety of fishes and invertebrates. As a consequence, Hawaiian coral reefs provide limited "protective" three-dimensional space. This is thought to account for the exceptionally high rate of endemism among Hawaiian marine species. Furthermore, many believe that this is the reason certain fish and invertebrate species look and act very differently from similar members of the same species found in other parts of the South Pacific (Gulko 1998).

3.3.2.4.1. Coral Reef Productivity

Coral reefs are among the most biologically productive environments in the world. The global potential for coral reef fisheries has been estimated at nine million metric tons per year, which is impressive given the small area of reefs compared with the extent of other marine ecosystems, which collectively produce between 70 and 100 million metric tons per year (Munro 1984, Smith 1978). An apparent paradox of coral reefs, however, is their location in the low-nutrient areas of the tropical oceans. Coral reefs themselves are characterized by the highest gross primary production in the sea, with sand, rubble fields, reef flats, and margins adding to primary production rates. The main primary producers on coral reefs are the benthic microalgae, macroalgae, symbiotic microalgae of corals, and other symbiont-bearing invertebrates (Levington 1995). Zooxanthellae living in the tissues of hard corals make a substantial contribution to primary productivity in zones rich in corals due to their density, greater than 10^6 cells cm^{-2} of live coral surface, and the high rugosity of the surfaces on which they live, as well as their own photosynthetic potential. However, zones of high coral cover make up only a small part of entire coral reef ecosystems, and so contribution to total coral reef primary productivity is small (WPRFMC 2001).

Although the ocean's surface waters in the tropics generally have low productivity, these waters are continually moving. Coral reefs, therefore, have access to open-water productivity and thus, particularly in inshore continental waters, shallow benthic habitats such as reefs are not always the dominant sources of nutrients for fisheries. In coastal waters, detrital matter from land, plankton, and fringing marine plant communities are particularly abundant. There may be passive advection of particulate and dissolved detrital carbon onto reefs, as well as active transport onto reefs via fishes that shelter on reefs but that feed in adjacent habitats. There is, therefore, greater potential for nourishment of inshore reefs than offshore reefs by external sources, and this inshore nourishment is enhanced by large land masses (Birkeland 1997a, 1997b).

For most of the Pacific Islands, rainfall typically ranges from 2.0 to 3.5 meters per year. Low islands, such as atolls, tend to have less rainfall and may suffer prolonged droughts.

Furthermore, when rain does fall on coral islands that have no major catchment area, there is little nutrient input into surrounding coastal waters and lagoons. Lagoons and embayments around high islands in the South Pacific are likely to be more productive than atoll lagoons. There are, however, some exceptions to the typical amount of rainfall on atolls; Palmyra Atoll and Rose Atoll receive up to 4.3 meters of rain per year. However, overall the productivity of high-island coastal waters, particularly where there are lagoons and sheltered waters, is possibly reflected in the greater abundance of small pelagic fishes such as anchovies, sprats, sardines, scads, mackerels, and fusiliers. In addition, the range of different environments that can be found in the immediate vicinity of the coasts of high islands also contributes to the greater range of biodiversity found in such locations.

3.3.2.4.2. Coral Reef Communities

A major portion of the primary production of the coral reef ecosystem comes from complex interkingdom relationships of animal/plant photosymbioses hosted by animals of many taxa, most notably stony corals. Most of the geological structure of reefs and habitat is produced by these complex symbiotic relationships. Complex symbiotic relationships for defense from predation, removal of parasites, building of domiciles, and other functions are also prevalent. About 32 of the 33 animal phyla are represented on coral reefs (only 17 are represented in terrestrial environments), and this diversity produces complex patterns of competition. The diversity also produces a disproportionate representation of predators, which have strong influences on lower levels of the food web in the coral reef ecosystem (Birkeland 1997a).

In areas with high gross primary production—such as rain forests and coral reefs—animals and plants tend to have a higher variety and concentration of natural chemicals as defenses against herbivores, carnivores, competitors, and microbes. Because of this tendency, and the greater number of phyla in the system, coral reefs are now a major focus for bioprospecting, especially in the southwest tropical Pacific (Birkeland 1997b).

Typically, spawning of coral reef fish occurs in the vicinity of the reef and is characterized by frequent repetition throughout a protracted time of the year, a diverse array of behavioral patterns, and an extremely high fecundity. Coral reef species exhibit a wide range of strategies related to larval dispersal and ultimately recruitment into the same or new areas. Some larvae are dispersed as short-lived, yolk-dependent (lecithotrophic) organisms, but the majority of coral reef invertebrate species disperse their larvae into the pelagic environment to feed on various types of plankton (planktotrophic; Levington 1995). For example, larvae of the coral *Pocillopora damicornis*, which is widespread throughout the Pacific, has been found in the plankton of the open ocean exhibiting a larval life span of more than 100 days (Levington 1995). Because many coral reefs are space limited for settlement, planktotrophic larvae are a likely strategy to increase survival in other areas (Levington 1995). Coral reef fish experience their highest predation mortality in their first few days or weeks, thus rapid growth out of the juvenile stage is a common strategy.

The condition of the overall populations of particular species is linked to the variability among subpopulations: the ratio of sources and sinks, their degrees of recruitment connection, and the proportion of the subpopulations with high variability in reproductive capacity. Recruitment to populations of coral reef organisms depends largely on the pathways of larval dispersal and “downstream” links.

3.3.2.4.3. Reproduction and Recruitment

The majority of coral reef associated species are very fecund, but temporal variations in recruitment success have been recorded for some species and locations. Many of the large, commercially targeted coral reef species are long lived and reproduce for a number of years. This is in contrast to the majority of commercially targeted species in the tropical pelagic ecosystem. Long-lived species adapted to coral reef systems are often characterized by complex reproductive patterns like sequential hermaphroditism, sexual maturity delayed by social hierarchy, multi-species mass spawnings, and spawning aggregations in predictable locations (Birkeland 1997b).

3.3.2.4.4. Growth and Mortality Rates

Recruitment of coral reef species is limited by high mortality of eggs and larvae, and also by competition for space to settle out on coral reefs. High predation intensity is due to a disproportionate number of predators, which limits juvenile survival (Birkeland 1997b). In response, some fishes, such as scarids (parrotfish) and labrids (wrasses), grow rapidly compared with other coral reef fishes. But they still grow relatively slowly compared with pelagic species. In addition, scarids and labrids may have complex haremic territorial social structures that contribute to the overall effect of harvesting these resources. It appears that many tropical reef fishes grow rapidly to near-adult size, and then often grow relatively little over a protracted adult life span; they are thus relatively long lived. In some groups of fishes, such as damselfish, individuals of the species are capable of rapid growth to adult size, but sexual maturity is still delayed by social pressure. This complex relationship between size and maturity makes management of these species more difficult (Birkeland 1997b).

3.3.2.4.5. Community Variability

High temporal and spatial variability is characteristic of reef communities. At large spatial scales, variation in species assemblages may be due to major differences in habitat types or biotopes. Seagrass beds, reef flats, lagoonal patch reefs, reef crests, and seaward reef slopes may occur in relatively close proximity, but represent notably different habitats. For example, reef fish communities from the geographically isolated Hawaiian Islands are characterized by low species richness, high endemism, and exposure to large semiannual current gyres, which may help retain planktonic larvae. The NWHI are further characterized by (a) high-latitude coral atolls; (b) a mild temperate to subtropical climate, where inshore water temperatures can drop below 18° C (64° F) in late winter; (c) species that are common on shallow reefs and attain large sizes, which to the southeast occur only rarely or in deep water; and (d) inshore shallow reefs that are largely free of fishing pressure (Maragos and Gulko 2002).

3.3.2.5. Deep Reef Slopes

As most Pacific islands are oceanic islands versus continental islands, they generally lack an extensive shelf area of relatively shallow water extending beyond the shoreline. For example, the average global continental shelf extends 40 miles, with a depth of around 200 feet (Postma and Zijlstra 1988). While lacking a shelf, many oceanic islands have a deep reef slope, which is often angled between 45° and 90° toward the ocean floor. The deep reef slope is home to a wide variety of marine organisms that are important fisheries target species, such as snappers and groupers. Biological zonation does occur on the reef slope and is related to the limit of light penetration beyond 100 meters. For example, reef-building corals can be observed at depths less than 100 meters, but at greater depths gorgonian and black corals are more readily observed (Colin et al. 1986).

3.3.2.6. Banks and Seamounts

Banks are generally volcanic structures of various sizes and occur both on the continental shelf and in oceanic waters. Coralline structures tend to be associated with shallower parts of the banks as reef-building corals are generally restricted to a maximum depth of 100 meters. Deeper parts of banks may be composed of rock or coral rubble, sand, or shell deposits. Banks thus support a variety of habitats, which in turn support a variety of fish species (Levington 1995).

These types of assemblages may be regarded as consisting of metapopulations that are associated with specific features or habitats and are interconnected through larval dispersal. From a genetic perspective, individual patch assemblages may be considered as the same population; however, in many locations, not enough is known about exchange rates to distinguish discrete populations.

Seamounts are undersea mountains, mostly of volcanic origin, which rise steeply from the sea bottom to below sea level (Rogers 1994). On seamounts and surrounding banks, species composition is closely related to depth. Deep-slope fisheries typically occur in the 100 to 500-meter depth range. A rapid decrease in species richness typically occurs between 200 and 400 meters deep, and most fishes observed there are associated with hard substrates, holes, ledges, or caves (Chave and Mundy 1994). Territoriality is considered to be less important for deep-water species of serranids, and lutjanids tend to form loose aggregations. Adult deep-water species are believed to not normally migrate between isolated seamounts.

Seamounts have complex effects on ocean circulation. One effect, known as the Taylor column, relates to eddies trapped over seamounts to form quasi-closed circulations. It is hypothesized that this helps retain pelagic larvae around seamounts and maintain the local fish population. Although evidence for retention of larvae over seamounts is sparse (Boehlert and Mundy 1993), endemism has been reported for a number of fish and invertebrate species at seamounts (Rogers 1994). Wilson and Kaufman (1987) concluded that seamount species are dominated by those on nearby shelf areas, and that seamounts act as stepping stones for transoceanic dispersal. Snappers and groupers both produce pelagic eggs and larvae, which tend to be most abundant over deep reef slope waters, while larvae of Etelis snappers are generally found in oceanic waters. It appears that populations of snappers and groupers on seamounts rely on inputs of larvae from external sources.

3.3.2.7. Deep-Ocean Floor

At the end of a reef slope lays the dark and cold world of the deep ocean floor. Composed of mostly mud and sand, the deep ocean floor is home to deposit feeders and suspension feeders, as well as fish and marine mammals. Compared with shallower benthic areas (e.g., coral reefs), benthic deep-slope areas are lower in productivity and biomass. Because of the lack of sunlight, primary productivity is low, and many organisms rely on deposition of organic matter that sinks to the bottom. The occurrence of secondary and tertiary consumers decreases the deeper one goes due to the lack of available prey. With increasing depth, suspension feeders become less abundant and deposit feeders become the dominant feeding type (Levington 1995).

Although most of the deep seabed is homogenous and low in productivity, there are hot spots teeming with life. In areas of volcanic activity such as the mid-oceanic ridge, thermal vents exist that spew hot water loaded with various metals and dissolved sulfide. Bacteria found in these areas are able to make energy from the sulfide (chemotrophs), and are considered primary producers. A variety of organisms either feed on these bacteria directly or contain the bacteria in special organs within their bodies called “trophosomes.” Types of organisms found near these thermal vents include crabs, limpets, tubeworms, and bivalves (Levington 1995).

3.3.2.8. Benthic Species of Economic Importance

The following subsections provide brief descriptions of species harvested in noteworthy numbers in the Western Pacific Region. These species, and the fisheries that harvest them, have been most recently discussed in detail in a 2005 Final EIS for the Bottomfish FMP (WPRFMC 2005a), the 2007 Supplemental EIS for Amendment 14 to the Bottomfish FMP which was developed to end bottomfish overfishing in the Main Hawaiian Islands (WPRFMC 2007a), a 2001 Final EIS for the Coral Reef Ecosystems FMP (WPRFMC 2001), a 2002 Environmental Assessment for the Precious Corals FMP (WPRFMC 2002), and a 2000 Environmental Assessment for the Crustaceans FMP (WPRFMC 2000). Please see those documents, which can be accessed at www.wpcouncil.org or by contacting the Council[32] for further information.

[32] WPRFMC. 1164 Bishop St. Ste. 1400. Honolulu, HI. 96813.

3.3.2.8.1. Coral Reef Associated Species

The most commonly harvested species of coral reef associated organisms include the following: surgeonfishes (Acanthuridae), triggerfishes (Balistidae), jacks (Carangidae), soldierfishes/squirrelfishes (Holocentridae), wrasses (Labridae), parrotfishes (Scaridae), octopus (*Octopus cyanea*, *O. ornatus*), goatfishes (Mullidae), and giant clams (Tridacnidae). Studies on coral reef fisheries are relatively recent, commencing with the major study by Munro and his coworkers during the late 1960s in the Caribbean (Munro 1983). Even today, only a relatively few in-depth studies on reef fisheries are available.

It was initially thought that the maximum sustainable yields for coral reef fisheries were in the range of 0.5 to 5 t km^{-2} yr^{-1}, based on limited data (Marten and Polovina 1982, Stevenson and Marshall 1974). Much higher yields of around 20 t km^{-2} yr^{-1}, for reefs in the Philippines (Alcala 1981, Alcala and Luchavez 1981) and American Samoa (Wass 1982), were thought to be unrepresentative (Marshall 1980), but high yields of this order have now been independently estimated for a number of sites in the South Pacific and Southeast Asia (Dalzell and Adams 1997, Dalzell et al. 1996). These higher estimates are closer to the maximum levels of fish production predicted by trophic and other models of ecosystems (Polunin and Roberts 1996). Dalzell and Adams (1997) suggested that the average MSY for Pacific reefs is estimated to be 16 t km^{-2} yr^{-1} based on 43 yield estimates where the proxy for fishing effort was population density.

However, Birkeland (1997b) has expressed some skepticism about the sustainability of the high yields reported for Pacific and Southeast Asian reefs. Among other examples, he noted that the high values for American Samoa reported by Wass (1982) during the early 1970s were followed by a 70 percent drop in coral reef fishery catch rates between 1979 and 1994. Saucerman (1995) ascribed much of this decline to a series of catastrophic events over the same period. This began with a crown-of-thorns (*Acanthaster planci*) starfish infestation in 1978, followed by hurricanes in 1990 and 1991, which reduced the reefs to rubble, and a coral bleaching event in 1994, probably associated with the El Niño phenomenon. These various factors reduced live coral cover in American Samoa from a mean of 60 percent in 1979 to between 3 and 13 percent in 1993 (Saucerman 1995).

Furthermore, problems still remain in rigorously quantifying the effects of factors on yield estimates such as primary productivity, depth, sampling area, or coral cover. Polunin et al. (1996) noted that there was an inverse correlation between estimated reef fishery yield and the size of the reef area surveyed, based on a number of studies reported by Dalzell (1996). Arias-Gonzales et al. (1994) have also examined this feature of reef fisheries yield estimates and noted that this was a problem when comparing reef fishery yields. The study noted that estimated yields are based on the investigator’s perception of the maximum depth at which true reef fishes occur. Small pelagic fishes, such as scads and fusiliers, may make up large fractions of the inshore catch from a particular reef and lagoon system, and if included in the total catch can greatly inflate the yield estimate. The great variation in reef yield summarized by authors such as Arias-Gonzales et al. (1994), Dalzell (1996), and Dalzell and Adams (1997) may also be due in part to the different size and trophic levels included in catches.

Another important aspect of the yield question is the resilience of reefs to fishing, and recovery potential when overfishing or high levels of fishing effort have been conducted on coral reefs. Evidence from a Pacific atoll where reefs are regularly fished by community fishing methods, such as leaf sweeps and spearfishing, indicates that depleted biomass levels may recover to preexploitation levels within 1 to 2 years. In the Philippines, abundances of several reef fishes have increased in small reserves within a few years of their establishment (Russ and Alcala 1994) although recovery in numbers of fish is much faster than recovery of biomass, especially in larger species such as groupers. Other studies in the Caribbean and Southeast Asia (Polunin et al. 1996) indicate that reef fish populations in relatively small areas have the potential to recover rapidly from depletion in the absence of further fishing.

Estimating the recovery from, and reversibility of, fishing effects over large reef areas appears more difficult to determine. Where growth overfishing predominates, recovery following effort reduction may be rapid if the fish in question are fast growing, as in the case of goatfish (Garcia and Demetropolous 1986). However, recovery may be slower if biomass reduction is due to recruitment overfishing because it takes time to rebuild adult spawning biomasses and high fecundities (Polunin and Morton 1992). Furthermore, many coral reef species have limited distributions and may be confined to a single island or a cluster of proximate islands. Widespread heavy fishing could cause global extinctions of some such species, particularly if there is also associated habitat damage.

3.3.2.8.2. Crustaceans

Crustaceans are harvested on small scales throughout the inhabited islands of the Western Pacific Region. The most common crustacean harvests include lobster species of the taxonomic groups Palinuridae (spiny lobsters) and Scyllaridae (slipper lobsters). Adult spiny lobsters are typically found on rocky substrate in well-protected areas, in crevices, and under rocks. Unlike many other species of *Panulirus*, the juveniles and adults of *P. marginatus* are not found in separate habitats apart from one another (MacDonald and Stimson 1980; Parrish and Polovina 1994). Juvenile *P. marginatus* recruit directly to adult habitat; they do not utilize separate shallow water nursery habitat apart from the adults as do many Palinurid lobsters (MacDonald and Stimson 1980; Parrish and Polovina 1994). Juvenile and adult *P. marginatus* shelter differently from one another (MacDonald and Stimson 1980). Similarly, juvenile and adult *P. penicillatus* also share the same habitat (Pitcher 1993).

Pitcher (1993) observed that, in the southwestern Pacific, spiny lobsters are typically found in association with coral reefs. Coral reefs provide shelter as well as a diverse and abundant supply of food items, he noted. Pitcher also stated that in this region, *P. penicillatus* inhabits the rocky shelters in the windward surf zones of oceanic reefs, an observation also noted by Kanciruk (1980). Other species of *Panulirus* show more general patterns of habitat utilization. At night, *P. penicillatus* moves onto the reef flat to forage.

Spiny lobsters are nonclawed, decapod crustaceans with slender walking legs of roughly equal size. Spiny lobster have a large spiny carapace with two horns and antennae projecting forward of their eyes, and a large abdomen terminating in a flexible tailfan (Uchida et al. 1980). The appearance of the slipper lobster is notably different than that of the spiny lobster.

Uchida and Uchiyama (1986) provided a detailed description of the morphology of slipper lobsters (*S. squammosus* and *S. haanii*) and note that the two species are very similar in appearance and are easily confused.

Generally, the different species of the genus *Panulirus* have the same reproductive behavior and life cycle (Pitcher 1993). The male spiny lobster deposits a spermatophore or sperm packet on the female's abdomen (WPRFMC 1983). In *Panulirus* sp., the fertilization of the eggs occurs externally (Uchida et al. 1980). The female lobster scratches and breaks the mass, releasing the spermatozoa (WPRFMC 1983). Simultaneously, ova are released from the female's oviduct and are then fertilized and attach to the setae of the female's pleopods[33] (Pitcher 1993, WPRFMC 1983). At this point, the female lobster is ovigerous, or "berried" (WPRFMC 1983). The fertilized eggs hatch into phyllosoma larvae after 30 to 40 days (MacDonald 1986; Uchida and Uchiyama 1986). Spiny lobsters are very fecund (WPRFMC 1983). The release of the phyllosoma larvae appears to be timed to coincide with the full moon and in some species at dawn (Pitcher 1993). In *Scyllarides* sp. fertilization is internal (Uchida and Uchiyama 1986).

Very little is known about the planktonic phase of the phyllosoma larvae of *Panulirus marginatus* (Uchida et al. 1980). After hatching, the "leaf-like" larvae (or phyllosoma) enter a planktonic phase (WPRFMC 1983). The duration of this planktonic phase varies depending on the species and geographic region (WPRFMC 1983). The planktonic larval stage may last from 6 months to 1 year from the time of the hatching of the eggs (MacDonald 1986, WPRFMC 1983).

Johnston (1968) suggested that fine-scale oceanographic features, such as eddies and currents, serve to retain lobster larva within island areas. In the NWHI, for example, lobster larvae settlement appears to be linked to the north and southward shifts of the North Pacific Central Water type (MacDonald 1986). The relatively long pelagic larval phase for palinurids results in very wide dispersal of spiny lobster larvae; palinurid larvae can be transported up to 2,000 miles by prevailing ocean currents (MacDonald 1986).

[33] Pleopod: an abdominal limb in a crustacean, used for swimming.

3.3.2.8.3. Reef Slope, Bank, and Seamount Species

3.3.2.8.3.1. Bottomfish

The families of bottomfish and seamount fish that often are targeted by fishermen include snappers (Lutjanidae), groupers (Serranidae), jacks (Carangidae), and emperors (Lethrinidae). See Section 1.6 for a complete list of the Western Pacific Region's MUS. Distinct depth associations are reported for certain species of emperors, snappers, and groupers, with some groupers restricted to feeding in deep water (Parrish 1987). The emperor family (Lethrinidae) are bottom-feeding carnivorous fish found usually in shallow coastal waters on or near reefs, with some species observed at greater depths (e.g., *L. rubrioperculatus*). Lethrinids are not reported to be territorial, but may be solitary or form schools. The snapper family (Lutjanidae) is largely confined to continental shelves and slopes, as well as corresponding depths around islands. Adults are usually associated with the bottom. The genus *Lutjanus* is the largest of this family, consisting primarily of inhabitants of shallow reefs. Species of the genus *Pristipomoides* occur at intermediate depths, often schooling around rocky outcrops and promontories (Ralston et al. 1986), while *Eteline* snappers are deep-water species. Groupers (Serranidae) are relatively larger and mostly occur in shallow areas, although some occupy deep-slope habitats. Groupers in general are more sedentary and territorial than snappers or emperors, and are more dependent on hard substrata. In general, groupers may be less dependent on hard-bottom substrates at depth (Parrish 1987). For each family, schooling behavior is reported more frequently for juveniles than for adults. Spawning aggregations may, however, occur even for the solitary species at certain times of the year, especially among groupers.

A commonly reported trend is that juveniles occur in shallow water and adults are found in deeper water (Parrish 1989). Juveniles also tend to feed in different habitats than adults, possibly reflecting a way to reduce predation pressures. Not much is known on the location and characteristics of nursery grounds for juvenile deep-slope snappers and groupers. In Hawaii, juvenile opakapaka (*P. filamentosus*) have been found on flat, featureless shallow banks, as opposed to high-relief areas where the adults occur. Similarly, juveniles of the deep-slope grouper, hāpuʻupuʻu (*Epinephelus quernus*), are found in shallow water (Moffitt 1993). Ralston and Williams (1988), however, found that for deep-slope species, size is poorly correlated with depth.

The distribution of adult bottomfish 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 major bottomfish species tends 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 depth intervals.

Depth alone does not assure satisfactory habitat. Both the quantity and quality of habitat at depth are important. Bottomfish are typically distributed in a nonrandom 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. (1993b) 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, as well as through different prey preferences. Tagging studies by Okamoto revealed that some bottomfish species are capable of moving between islands and banks as adults, though, in general, bottomfish have limited ranges (Okamoto 1982).

3.3.2.8.3.2. Precious Corals

Currently, there are minimal harvests of precious corals in the Western Pacific Region. From the 1970s to early 1990s, however, precious corals were targeted and an FMP was implemented in 1983 (see Section 1.4). The commonly harvested precious corals include pink coral (*Corallium secundum*, *Corallium regale*, *Corallium laauense*), gold coral (*Narella* spp., *Gerardia* spp., *Calyptrophora* spp.), bamboo coral (*Lepidisis olapa*, *Acanella* spp.), and black coral (*Antipathes dichotoma*, *Antipathes grandis*, *Antipathes ulex*).

In general, the Western Pacific Region's precious corals share several ecological characteristics: they lack symbiotic algae in tissues (they are ahermatypic), and most are found in deep water below the euphotic zone; they are filter feeders; and many are fan shaped to maximize contact surfaces with particles or microplankton in the water column. Because precious corals are filter feeders, most species thrive in areas swept by strong-to-moderate currents (Grigg 1993). Although precious corals are known to grow on a variety of hard substrate, they are most abundant on substrates of shell sandstone, limestone, or basaltic rock with a limestone veneer.

All precious corals are slow growing and are characterized by low rates of mortality and recruitment. Natural populations are relatively stable, and a wide range of age classes is generally present. This life history pattern (longevity and many year classes) has two important consequences with respect to exploitation. First, the response of the population to exploitation is drawn out over many years. Second, because of the great longevity of individuals and the associated slow rates of turnover in the populations, a long period of reduced fishing effort is required to restore the ability of the stock to produce at the MSY if a stock has been over exploited for several years.

Because of the great depths at which they live, precious corals may be insulated from some short term changes in the physical environment; however, not much is known regarding the long term effects of changes in environmental conditions, such as water temperature or current velocity, on the reproduction, growth, or other life history characteristics of the precious corals (Grigg 1993).

3.3.3. Pelagic Environment

Pelagic species are closely associated with their physical and chemical environments. Suitable physical environment for these species depends on gradients in temperature, oxygen, or salinity, all of which are influenced by oceanic conditions on various scales. In the pelagic environment, physical conditions such as isotherm and isohaline boundaries[34] often determine whether the surrounding water mass is suitable for pelagic fish, and many of the species are associated with specific isothermic regions. Additionally, areas of high trophic turnover as are found in oceanographic fronts[35] and eddies are important habitat for foraging, migration, and reproduction for many species (Bakun 1996).

The pelagic ecosystem is very large compared with any other marine ecosystem. Biological productivity in the pelagic zone is highly dynamic, characterized by advection of organisms at lower trophic levels and by extensive movements of animals at higher trophic levels, both of which are strongly influenced by ocean climate variability and mesoscale hydrographic features.

Phytoplankton contribute more than 95 percent of primary production in the marine environment (Valiela 1995). Phytoplankton, which by definition require exposure to sunlight for photosynthesis, primarily live in the upper 100 meters of the euphotic zone and include organisms such as diatoms, dinoflagellates, coccolithophores, silicoflagellates, and cyanobacteria. Although some phytoplankton have structures (e.g., flagella) that allow them some movement, generally phytoplankton distribution is controlled by current movements and water turbulence.

Diatoms can be either single celled or form chains with other diatoms. They are mostly found in areas with high nutrient levels such as coastal temperate and polar regions. Diatoms are the largest contributor to primary production in the ocean (Valiela 1995). Dinoflagellates are unicellular (one-celled) organisms that are often observed in high abundance in subtropical and tropical regions. Coccolithophores, which are also unicellular, are mostly observed in tropical pelagic regions (Levington 1995). Cyanobacteria, or blue-green algae, are often found in warm nutrient-poor waters of tropical ocean regions.

---

[34] "Isotherm" refers to areas with generally the same temperature. "Isohaline" refers to areas with roughly the same salinity.

[35] "Oceanographic fronts" are areas between currents with steep temperature and salinity gradients.

Oceanic pelagic fish such as skipjack and yellowfin tuna and blue marlin prefer warm surface layers, where the water is well mixed by surface winds and is relatively uniform in temperature and salinity. Other fish such as albacore, bigeye tuna, striped marlin, and swordfish prefer cooler, more temperate waters, often meaning they occur at higher latitudes or greater depths. Preferred water temperature often varies with the size and maturity of pelagic fish, and adults usually have a wider temperature tolerance than subadults. Thus, during spawning, adults of many pelagic species usually move to warmer waters, the preferred habitat of their larval and juvenile stages. Large-scale oceanographic events (such as El Niño) change the characteristics of water temperature and productivity across the Pacific, and these events have a significant effect on the habitat range and movements of pelagic species. Tuna are commonly most concentrated near islands and seamounts that create divergences and convergences, which concentrate forage species, and also near upwelling zones along ocean current boundaries and along gradients in temperature, oxygen, and salinity. Swordfish and numerous other pelagic species tend to concentrate along food-rich temperature fronts between cold upwelled water and warmer oceanic water masses (NMFS 2001).

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

3.3.3.1. Pelagic Species of Economic Importance

The most commonly harvested pelagic species in the Western Pacific Region are: tuna (*Thunnus obesus*, *Thunnus albacares*, *Thunnus alalunga*, *Katsuwonus pelamis*), billfish (*Tetrapturus auda*, *Makaira mazara*, *Xiphias gladius*), dolphinfish (*Coryphaena hippurus*, *C. equiselas*), and wahoo (*Acanthocybium solandri*). Pelagic fish live in tropical and temperate waters throughout the world's oceans. They are capable of long migrations that reflect complex relationships to oceanic environmental conditions. These relationships are different for larval, juvenile, and adult stages of life. The larvae and juveniles of most species are more abundant in tropical waters, whereas the adults are more widely distributed. Geographic distribution varies with seasonal changes in ocean temperature. In both the Northern and Southern Hemispheres, there is seasonal movement of tuna and related species toward the higher latitudes in the warmer seasons and a return toward the equator in the colder seasons. In the western Pacific, some species of adult pelagic fish range from as far north as Japan to as far south as New Zealand. Albacore, striped marlin, and swordfish can be found in cooler waters at latitudes as far north as 50° N, and as far south as 50° S. As a result, fishing for these species is conducted year-round in tropical waters, and seasonally in temperate waters (NMFS 2001).

Migration patterns of pelagic fish stocks in the Pacific Ocean are not easily categorized, despite extensive tag-and-release projects for many of the species. This is particularly evident for the more tropical tuna species (e.g., yellowfin, skipjack, and bigeye) that appear to roam extensively within a broad expanse of the Pacific centered on the equator. Although tagging and genetic studies have shown that some interchange does occur, it appears that short life spans and rapid growth rates restrict large-scale interchange and genetic mixing of eastern, central, and far-western Pacific Ocean stocks of yellowfin and skipjack tuna. Morphometric studies of yellowfin tuna also support the hypothesis that populations from the eastern and western Pacific derive from relatively distinct substocks in the Pacific. The stock structure of bigeye in the Pacific is poorly understood, but a single Pacific-wide population is assumed. The movement of the cooler water tuna (e.g., bluefin and albacore) is more predictable and defined, with tagging studies documenting regular, well-defined seasonal movement patterns relating to specific feeding and spawning grounds. The oceanic migrations of billfish are poorly understood, but the results of limited tagging work conclude that most billfish species are capable of transoceanic movement, and some seasonal regularity has been noted (NMFS 2001).

In the ocean, light and temperature diminish rapidly with increasing depth, especially in the region of the thermocline. Many pelagic fish make vertical migrations through the water column. They tend to inhabit surface waters at night and deeper waters during the day, but several species make extensive vertical migrations between surface and deeper waters throughout the day. Certain species, such as swordfish and bigeye tuna, are more vulnerable to fishing when they are concentrated near the surface at night. Bigeye tuna may visit the surface during the night, but generally, longline catches of this fish are highest when hooks are set in deeper, cooler waters just above the thermocline (275–550 m or 150–300 fm). Surface concentrations of juvenile albacore are largely concentrated where the warm mixed layer of the ocean is shallow (above 90 m or 50 fm), but adults are caught mostly in deeper water (90–275 m or 50–150 fm). Swordfish are usually caught near the ocean surface but are known to venture into deeper waters. Swordfish demonstrate an affinity for thermal oceanic frontal systems that may act to aggregate their prey and enhance migration by providing an energetic gain through moving the fish along with favorable currents (Olson et al. 1994).

3.3 Essential Fish Habitat and Habitat Areas of Particular Concern

For each FMP and list of MUS (see Section 2.1), the Council has declared essential fish habitat (EFH) and habitat areas of particular concern (HAPC; 64 FR 19068). The Council and NMFS must ensure that any activities being conducted in such areas do not adversely affect, to the extent possible, EFH or HAPC for any MUS. Table 3-1 represents the EFH and HAPC for all Western Pacific MUS.

As the table shows, Western Pacific EFH and 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, Precious Corals, Crustacean, and Coral Reef Ecosystem MUS. Areas of ocean bottom have been designated EFH and HAPC for Precious Corals, Crustaceans, Bottomfish, and Coral Reef Ecosystem MUS. The use of explosives, poisons, trawl nets, and other destructive gears that may adversely affect any EFH or HAPC in the Western Pacific Region is prohibited. No fishery under Council jurisdiction has been found to adversely affect the EFH or HAPC of any Western Pacific Region MUS.

Table 3-1. EFH and HAPC for Western Pacific Region MUS.

FMP	EFH (Juveniles and Adults)	EFH (Eggs and Larvae)	HAPC
Bottomfish and Seamount Groundfish	**Bottomfish:** Water column and bottom habitat down to 400 meters **Seamount Groundfish (adults only):** Water column and bottom from 80 to 600 m, bounded by 29°–35° N and 171°E–179° W	**Bottomfish:** Water column down to 400 m **Seamount Groundfish (including juveniles):** epipelagic zone (0–200 m) bounded by 29°–35° N and 171° E–179° W	**Bottomfish:** All escarpments and slopes between 40 and 280 meters, and three known areas of juvenile *ōpakapaka* habitat **Seamount Groundfish:** Not identified
Coral Reef Ecosystem	Water column and benthic substrate to a depth of 100 meters	Water column and benthic substrate to a depth of 100 meters	All MPAs identified in FMP, all PRIA, many specific areas of coral reef habitat
Crustaceans	**Lobsters** Bottom habitat from shoreline to a depth of 100 meters **Deepwater shrimp** The outer reef slopes at depths between 300-700 m	Water column down to 150 meters Water column and associated outer reef slopes between 550 and 700 m	All banks with summits less than 30 meters No HAPC designated for deepwater shrimp
Precious Corals	Keāhole Point, Makapuu, Kaena Point, Westpac, Brooks Bank, and 180 Fathom Bank deepwater precious coral (gold and red) beds and Milolii, Au’au Channel, and S. Kauai black coral beds	NA	Makapuu, Westpac, and Brooks Bank deepwater precious coral beds and the Au’au Channel black coral bed

FMP	EFH (Juveniles and Adults)	EFH (Eggs and Larvae)	HAPC
Pelagics	Water column down to 1,000 meters	Water column down to 200 meters	Water column above seamounts and banks down to 1,000 meters

3.4. Protected Species

To varying degrees, protected species in the Western Pacific Region face various natural and anthropogenic threats to their continued existence. These threats include ecosystem regime shifts (i.e., rapid reorganizations of ecosystems), habitat degradation, poaching, fisheries interactions, vessel strikes, disease, and behavioral alterations from various disturbances associated with human activities.

3.4.1. Sea Turtles

All Pacific sea turtles are designated under the U.S. Endangered Species Act (ESA) as either threatened or endangered. The breeding populations of Mexico's olive ridley sea turtles (*Lepidochelys olivacea*) are currently listed as endangered, while all other ridley populations are listed as threatened. Leatherback sea turtles (*Dermochelys coriacea*) and hawksbill turtles (*Eretmochelys imbricata*) are also classified as endangered. Loggerhead (*Caretta caretta*) and green sea turtles (*Chelonia mydas*) are listed as threatened (the green sea turtle is listed as threatened throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico). These five species of sea turtles are highly migratory or have a highly migratory phase in their life history (NMFS 2001). Generally, impacts to sea turtles in the Western Pacific Region include natural causes of ecosystem variability (e.g., regime shifts), and predation, as well as anthropogenic impacts that include loss and degradation of habitat (especially nesting and foraging sites), illegal poaching, disturbance (e.g., from tourism, coastal development, etc.), fishery interactions (e.g., hookings or gear entanglements), and marine debris entanglements.

A Biological Opinion (Opinion) was issued in February 2004 by NMFS following a consultation under section 7 of the ESA on the ongoing operation of the Western Pacific Region's pelagic fisheries as managed under the Pelagics FMP (NMFS 2004a). That Opinion concluded these pelagic fisheries are not likely to jeopardize the continued existence of any sea turtles under NMFS's jurisdiction. Another Opinion, issued in October 2005, focused on the deep-set (tuna targeting) sector of the Hawaii-based longline fishery and reached the same conclusion (NMFS 2005a). These issues are similarly discussed in a 2001 FEIS (NMFS 2001) and a 2004 Supplemental EIS prepared as part of the ongoing implementation of the Pelagics FMP. Please refer to those EISs and Opinions for additional details on the life history, status, threats, and impacts to Pacific sea turtles. Non-pelagic fisheries managed by the Council are not believed to adversely impact sea turtles due to the gear types used and species targeted. In the Hawaii longline shallow-set fishery that mainly targets swordfish, recent fishing gear requirements, including circle hooks and mackerel-type bait, have greatly reduced sea turtle interactions. In association with proposed Amendment 18, NMFS completed an updated review of the impacts of the Hawaii-based shallow-set longline fishery on sea turtles (NMFS 2008b) that determined the fishery, as proposed to be amended would not jeopardize the continued existence of listed sea turtles. A 3-year incidental take statement (ITS) has provisions for sea-turtle and shallow-set longline fishery interactions. NMFS is currently reviewing the American Samoa longline fishery to ensure compliance with the provisions of the ESA as this ITS was exceed in 2006, 2007 and 2008.

3.4.1.1. Leatherback Sea Turtles

Leatherback turtles (*Dermochelys coriacea*) are widely distributed throughout the oceans of the world and are found in waters of the Atlantic, Pacific, and Indian Oceans; the Caribbean Sea; and the Gulf of Mexico (Dutton et al. 1999). Increases in the number of nesting females have been noted at some sites in the Atlantic (Dutton et al. 1999), but these increases are far outweighed by local extinctions, especially of island populations, and the demise of once-large populations throughout the Pacific, such as in Malaysia (Chan and Liew 1996) and Mexico (Sarti et al. 1996, Spotila et al. 1996). In other leatherback nesting areas, such as Papua New Guinea, Indonesia, and the Solomon Islands, there have been no systematic, consistent nesting surveys, so it is difficult to assess the status and trends of leatherback turtles at these beaches. In all areas where leatherback nesting has been documented, current nesting populations are reported by scientists, government officials, and local observers to be well below abundance levels of several decades ago. The collapse of these nesting populations was most likely precipitated by a tremendous overharvest of eggs coupled with incidental mortality from fishing (Sarti et al. 1996).

Leatherback turtles are the largest of the marine turtles, with a shell length often exceeding 150 centimeters and front flippers that are proportionately larger than in other sea turtles. These flippers span 270 centimeters in an adult (NMFS and FWS 1998c). The leatherback is morphologically and physiologically distinct from other sea turtles, and it is thought that its streamlined body, with a smooth dermis-sheathed carapace and dorso-longitudinal ridges, may improve laminar flow.

Leatherback turtles lead a completely pelagic existence, foraging widely in temperate waters except during the nesting season when gravid females return to tropical beaches to lay eggs. Males are rarely observed near nesting areas, and it has been proposed that mating most likely takes place outside of tropical waters, before females move to their nesting beaches (Eckert and Eckert 1988). Leatherbacks are highly migratory, exploiting convergence zones and upwelling areas in the open ocean, along continental margins, and in archipelagic waters (Eckert 1998). In a single year, a leatherback may swim more than 10,000 kilometers (6,200 miles) (Eckert 1998).

Satellite telemetry studies indicate that adult leatherback turtles follow bathymetric contours over their long pelagic migrations and typically feed on cnidarians (jellyfish and siphonophores) and tunicates (pyrosomas and salps), and their commensals, parasites, and prey (NMFS and FWS 1998c). Because of the low nutrient value of jellyfish and tunicates, it has been estimated that an adult leatherback would need to eat about 50 large jellyfish (equivalent to approximately 200 liters) per day to sustain its nutritional needs (Duron 1978). Compared with greens and loggerheads, which consume approximately 3 to 5 percent of their body weight per day, leatherback turtles may consume 20 to 30 percent of their body weight per day (Davenport and Balazs 1991).

Females are believed to migrate long distances between foraging and breeding grounds, at intervals of typically 2 to 4 years (Spotila et al. 2000). The mean re-nesting interval of females on Playa Grande, Costa Rica, is believed to be 3.7 years, while in Mexico, 3 years was the typical reported interval (NMFS 2004a). In Mexico, the nesting season generally extends from November to February, although some females arrive as early as August (Sarti et al. 1996). Most of the nesting on Las Baulas takes place from the beginning of October to the end of February (Reina et al. 2002). In the western Pacific, nesting peaks on Jamursba-Medi Beach (Papua, Indonesia) from May to August; on War-Mon Beach (Papua) from November to January (Starbird and Suarez 1994); in peninsular Malaysia during June and July (Chan and Liew 1996); and in Queensland, Australia, in December and January (Limpus and Reimer 1994).

Migratory routes of leatherback turtles originating from eastern and western Pacific nesting beaches are not entirely known. However, satellite tracking of postnesting females and genetic analyses of leatherback turtles caught in U.S. Pacific fisheries or stranded on the west coast of the U.S. present some strong insights into at least a portion of their routes and the importance of particular foraging areas. Current data from genetic research suggest that Pacific leatherback stock structure (natal origins) may vary by region. Because of the fact that leatherback turtles are highly migratory and that stocks mix in high-seas foraging areas, and based on genetic analyses of samples collected by both Hawaii-based and west-coast-based longline observers, leatherback turtles inhabiting the northern and central Pacific Ocean are comprised of individuals originating from nesting assemblages located south of the equator in the western Pacific (e.g., Indonesia, Solomon Islands) and in the eastern Pacific along the Americas (e.g., Mexico, Costa Rica; Dutton et al. 1999).

Recent information on leatherbacks tagged off the west coast of the United States has also revealed an important migratory corridor from central California to south of the Hawaiian Islands, leading to western Pacific nesting beaches. Leatherback turtles originating from western Pacific beaches have also been found along the U.S. mainland. There, leatherback turtles have been sighted and reported stranded as far north as Alaska (60° N) and as far south as San Diego, California (NMFS and FWS 1998c). Of the stranded leatherback turtles that have been sampled to date from the U.S. mainland, all have been of western Pacific nesting stock origin (NMFS 2004a).

3.4.1.2. Loggerhead Sea Turtles

The loggerhead sea turtle (*Caretta caretta*) is characterized by a reddish brown, bony carapace, with a comparatively large head, up to 25 centimeters wide in some adults.

Adults typically weigh between 80 and 150 kilograms, with average curved carapace length (CCL) measurements for adult females worldwide between 95 and 100 centimeters CCL (Dodd 1988) and adult males in Australia averaging around 97 centimeters CCL (Limpus 1985, Eckert 1993). Juveniles found off California and Mexico measured between 20 and 80 centimeters (average 60 cm) in length (Bartlett 1989, in Eckert 1993). Skeletochronological age estimates and growth rates were derived from small loggerheads caught in the Pacific high-seas driftnet fishery. Loggerheads less than 20 centimeters were estimated to be 3 years old or less, while those greater than 36 centimeters were estimated to be 6 years old or more. Age-specific growth rates for the first 10 years were estimated to be 4.2 cm/year (Zug et al. 1995).

For their first years of life, loggerheads forage in open-ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans, mollusks, fish, and algae. The large aggregations of juveniles off Baja California have been observed foraging on dense concentrations of the pelagic red crab *Pleuronocodes planipes* (Nichols et al. 2000). Data collected from stomach samples of turtles captured in North Pacific driftnets indicate a diet of gastropods (*Janthina* spp.), heteropods (*Carinaria* spp.), gooseneck barnacles (*Lepas* spp.), pelagic purple snails (*Janthina* spp.), medusae (*Vellela* spp.), and pyrosomas (tunicate zooids). Other common components include fish eggs, amphipods, and plastic items (Parker et al. 2002).

Loggerheads in the North Pacific are opportunistic feeders that target items floating at or near the surface, and if high densities of prey are present, they will actively forage at depth (Parker et al. 2002). 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 (reviewed in Dodd 1988). Subadults and adults are found in nearshore benthic habitats around southern Japan, as well as in the East China Sea and the South China Sea (e.g., Philippines, Taiwan, and Vietnam).

The loggerhead sea turtle is listed as threatened under the ESA throughout its range, primarily due to direct take, incidental capture in various fisheries, and the alteration and destruction of its habitat. In general, during the last 50 years, North Pacific loggerhead nesting populations have declined 50-90 percent (Kamezaki et al. 2003). From nesting data collected by the Sea Turtle Association of Japan since 1990, the past 9 years of estimates of the number of nesting females in studied rookeries are as follows: 1998–2,479 nests, 1999–2,255 nests, and 2000–2,589 nests, 2001–3,122 nests, 2002–4,035 nests, 2003–4,568 nests, 2005–5167 nests, 2006–2,833 nests, 2007–3,660 nests, 2008–6,500-10,000 nests, respectively, were recorded on Japanese beaches (Matsuzawa 2005; NMFS 2008b).

In the South Pacific, Limpus (1982) reported an estimated 3,000 loggerheads nesting annually in Queensland, Australia, during the late 1970s. However, long-term trend data from Queensland indicate a 50 percent decline in nesting by 1988 to 1989 due to incidental mortality of turtles in the coastal trawl fishery. This decline is corroborated by studies of breeding females at adjacent feeding grounds (Limpus and Reimer 1994). Currently, approximately 300 females nest annually in Queensland, mainly on offshore islands (Capricorn-Bunker Islands, Sandy Cape, and Swains Head; Dobbs 2001). In southern Great Barrier Reef waters, nesting loggerheads have declined approximately 8 percent per year since the mid-1980s (Heron Island), while the foraging ground population has declined 3 percent and comprised less than 40 adults by 1992. Researchers attribute the declines to recruitment failure due to fox predation of eggs in the 1960s and mortality of pelagic juveniles from incidental capture in longline fisheries since the 1970s (Chaloupka and Limpus 2001).

3.4.1.3. Green Sea Turtles

Green sea turtles (*Chelonia mydas*) are distinguished from other sea turtles by their smooth carapace with four pairs of lateral “scutes” (turtle shell plates or scales), a single pair of prefrontal scales, and a lower jaw edge that is coarsely serrated. Adult green turtles have a light to dark brown carapace, sometimes shaded with olive, and can exceed 1 meter in carapace length and 100 kilograms in body mass. Females nesting in Hawaii averaged 92 centimeters in straight carapace length (SCL), while at Olimarao Atoll in Yap, females averaged 104 centimeters in curved carapace length and approximately 140 kilograms in body mass. In the rookeries of Michoacán, Mexico, females averaged 82 centimeters in CCL, while males averaged 77 centimeters in CCL (NMFS and FWS 1998a). Based on growth rates observed in wild green turtles, skeletochronological studies, and capture–recapture studies, all in Hawaii, it is estimated that an average of at least 25 years would be needed to achieve sexual maturity (Eckert 1993).

Although most adult green sea turtles appear to have a nearly exclusively herbivorous diet, consisting primarily of seagrass and algae (Wetherall 1993), those along the east Pacific coast seem to have a more carnivorous diet. Analysis of stomach contents of green turtles found off Peru revealed a large percentage of mollusks and polychaetes, while fish and fish eggs, jellyfish, and amphipods made up a smaller percentage (Bjorndal 1997). Seminoff et al. (2000) found that 5.8 percent of gastric samples and 29.3 percent of the fecal samples of east Pacific green turtles foraging in the northern Sea of Cortéz, Mexico, contained the remains of the fleshy sea pen (*Ptilosarcus undulatus*).

Green sea turtles are a circumglobal and highly migratory species, nesting and feeding in tropical/subtropical regions. Their range can be defined by a general preference for water temperature above 20° C. Green sea turtles are known to live in pelagic habitats as posthatchlings/juveniles, feeding at or near the ocean surface. The nonbreeding component of this species can lead a pelagic existence many miles from shore. The breeding component of this species lives primarily in bays and estuaries, and is rarely found in the open ocean. Most migration from rookeries to feeding grounds is via coastal waters, with females migrating to breed only once every 2 years or more (Bjorndal 1997).

Tag returns of eastern Pacific green turtles (often reported as black turtles) establish that these turtles travel long distances between foraging and nesting grounds. In fact, 75 percent of tag recoveries from 1982 to 1990 were from turtles that had traveled more than 1,000 kilometers from Michoacán, Mexico. Even though these turtles were found in coastal waters, the species is not confined to these areas, as indicated by 1990 sightings records from a NOAA research ship. Observers documented green turtles 1,000 to 2,000 statute miles from shore (Eckert 1993). The east Pacific green is also the second-most sighted turtle in the east Pacific during tuna cruises; they frequent a north–south band from 15° N to 5° S along 90° W and an area between the Galapagos Islands and the Central American Coast (NMFS and FWS 1998a).

In a review of sea turtle sighting records from northern Baja California to Alaska, Stinson (1984, in NMFS and FWS 1998a) determined that the green turtle was the most commonly observed sea turtle on the U.S. Pacific coast, with 62 percent reported in a band from southern California and southward. The northernmost (reported) year-round resident population of green turtles occurs in San Diego Bay, where about 30 to 60 mature and immature turtles concentrate in the warm water effluent discharged by a power plant. These turtles appear to have originated from east Pacific nesting beaches, on the basis of morphology and preliminary genetic analysis (NMFS and FWS 1998a). California stranding reports from 1990 to 1999 indicate that the green turtle is the second most commonly found stranded sea turtle (48 total, averaging 4.8 annually, NMFS 2004a).

Stinson (1984) found that green turtles will appear most frequently in U.S. coastal waters when temperatures exceed 18° C. An east Pacific green turtle was tracked along the California coast by a satellite transmitter that was equipped to report thermal preferences of the turtle. This turtle showed a distinct preference for waters that were above 20° (S. Eckert, unpublished data). Subadult green turtles routinely dive to 20 meters for 9 to 23 minutes, with a maximum recorded dive of 66 minutes (Lutcavage et al. 1997a).

The nonbreeding range of green turtles is generally tropical, and can extend approximately 500 to 800 miles from shore in certain regions (Eckert 1993). The underwater resting sites include coral recesses, undersides of ledges, and sand bottom areas that are relatively free of strong currents and disturbance from natural predators and humans. In the MHI, these foraging and resting areas for adults usually occur at depths greater than 10 meters, but probably not normally exceeding 40 meters. Available information indicates that the resting areas are in proximity to the feeding pastures. In the Pacific, the only major (greater than 2,000 nesting females) populations of green turtles occur in Australia and Malaysia. Smaller colonies occur in the insular Pacific islands of Polynesia, Micronesia, and Melanesia (Wetherall 1993) and on six small sand islands at French Frigate Shoals, a long atoll situated in the middle of the Hawaiian Archipelago (Balazs et al. 1994).

Green turtles were listed as threatened under the ESA on July 28, 1978, except for breeding populations found in Florida and the Pacific coast of Mexico, which were listed as endangered. Using a precautionary estimate, the number of nesting female green turtles has declined by 48 to 67 percent over the last three generations (approximately 150 years; Troeng and Rankin 2005). Causes for this decline include harvest of eggs, subadults, and adults; incidental capture by fisheries; loss of habitat; and disease. The degree of population change is not consistent among all index nesting beaches or among all regions. Some nesting populations are stable or increasing (Balazs and Chaloupka

2004, Chaloupka and Limpus 2001, Troeng and Rankin 2005). However, other populations or nesting stocks have markedly declined. Because many of the threats that have led to these declines have not yet ceased, it is evident that green turtles face a measurable risk of extinction (Troeng and Rankin 2005).

Green turtles in Hawaii are considered genetically distinct and geographically isolated; although a nesting population at Islas Revillagigedos in Mexico appears to share the mtDNA haplotype that commonly occurs in Hawaii. In Hawaii, green turtles nest on six small sand islands at French Frigate Shoals, a crescent-shaped atoll situated in the middle of the Hawaiian Archipelago (Northwestern Hawaiian Islands; Balazs et al. 1992). Ninety to 95 percent of the nesting and breeding activity occurs at French Frigate Shoals, and at least 50 percent of that nesting takes place on East Island, a 12-acre island. Long-term monitoring of the population shows that there is strong island fidelity within the regional rookery. Low-level nesting also occurs at Laysan Island, Lisianski Island, and on Pearl and Hermes Reef (NMFS 1998).

After years of exploitation, protection under the ESA and recovery programs have resulted in the nesting population of Hawaiian green turtles showing a gradual but definite increase (Balazs 1996; Balazs and Chaloupka 2004). In three decades, the number of nesting females at East Island increased from 67 nesting females in 1973 to 467 nesting females in 2002. Nester abundance increased rapidly at this rookery during the early 1980s, leveled off during the early 1990s, and again increased rapidly during the late 1990s to the present. This trend is very similar to the underlying trend in the recovery of the much larger green turtle population that nests at Tortuguero Costa Rica (Bjorndal et al. 1999). The stepwise increase of the long-term nester trend since the mid-1980s is suggestive, but not conclusive, of a density-dependent adjustment process affecting sea turtle abundance at the foraging grounds (Balazs and Chaloupka 2004; Bjorndal et al. 2000). Balazs and Chaloupka (2004) concluded that the Hawaiian green sea turtle stock is well on the way to recovery following 25 years of protection. This increase is attributed to increased female survivorship since the harvesting of turtles was prohibited, in addition to the cessation of habitat damage at the nesting beaches since the early 1950s (Balazs and Chaloupka 2004).

3.4.1.4. Hawksbill Sea Turtles

Hawksbill sea turtles (*Eretmochelys imbricata*) are circumtropical in distribution, generally occurring from latitudes 30° N to 30° S within the Atlantic, Pacific, and Indian Oceans and associated bodies of water (NMFS and FWS 1998b). Hawksbills have a unique diet of sponges (Meylan 1985, 1988). While data are somewhat limited on their diet in the Pacific, it is well documented that in the Caribbean hawksbill turtles are selective spongivores, preferring particular sponge species over others (Dam and Diez 1997b). Foraging dive durations are often a function of turtle size, with larger turtles diving deeper and longer. At a study site also in the northern Caribbean, foraging dives were made only during the day and dive durations ranged from 19 to 26 minutes at depths of 8–10 meters. At night, resting dives ranged from 35 to 47 minutes in duration (Dam and Diez 1997a).

As a hawksbill turtle grows from a juvenile to an adult, data suggest that the turtle switches foraging behaviors from pelagic surface feeding to benthic reef feeding (Limpus 1992). Within the Great Barrier Reef of Australia, hawksbills move from a pelagic existence to a "neritic" life[36] on the reef at a minimum CCL of 35 centimeters. The maturing turtle establishes foraging territory and will remain in this territory until it is displaced (Limpus 1992). As with other sea turtles, hawksbills will make long reproductive migrations between foraging and nesting areas but otherwise they remain within coastal reef habitats (Meylan 1999). In Australia, juvenile turtles outnumber adults 100:1. These populations are also sex biased, with females outnumbering males 2.57:1 (Limpus 1992).

Along the far western and southeastern Pacific, hawksbill turtles nest on the islands and mainland of southeast Asia, from China to Japan, and throughout the Philippines, Malaysia, Indonesia, Papua New Guinea, the Solomon Islands (McKeown 1977), and Australia (Limpus 1982).

The hawksbill turtle is listed as endangered throughout its range. In the Pacific, this species was rapidly approaching extinction primarily due to the harvesting of the species for its meat, eggs and shell, as well as the destruction of nesting habitat by human occupation and disruption (NMFS and FWS 1998b). Along the eastern Pacific Rim, hawksbill turtles were common to abundant in the 1930s (Cliffton et al. 1982). By the 1990s, the hawksbill turtle was rare to absent in most localities where it was once abundant (Cliffton et al. 1982). Hawksbill turtle populations are benefitting from proactive conservation and recovery programs but still face threats.

3.4.1.5. Olive Ridley Sea Turtles

Olive ridley turtles (*Lepidochelys olivacea*) are olive or grayish green above, with a greenish white underpart, and adults are moderately sexually dimorphic (NMFS and 1998e). Olive ridleys lead a highly pelagic existence (Plotkin 1994). These sea turtles appear to forage throughout the eastern tropical Pacific Ocean, often in large groups, or flotillas. In a 3-year study of communities associated with floating objects in the eastern tropical Pacific, Arenas et al. (1992) found that 75 percent of sea turtles encountered were olive ridleys and were present in 15 percent of the observations, thus implying that flotsam may provide the turtles with food, shelter, and/or orientation cues in an otherwise featureless landscape. It is possible that young turtles move offshore and occupy areas of surface-current convergences to find food and shelter among aggregated floating objects until they are large enough to recruit to the nearshore benthic feeding grounds of the adults, similar to the juvenile loggerheads mentioned previously.

While it is true that olive ridleys generally have a tropical range, individuals do occasionally venture north, some as far as the Gulf of Alaska (Hodge and Wing 2000). The postnesting migration routes of olive ridleys, tracked via satellite from Costa Rica, traversed thousands of kilometers of deep oceanic waters ranging from Mexico to Peru

[36] Neritic refers to shallower waters.

and more than 3,000 kilometers out into the central Pacific (Plotkin 1994). Stranding records from 1990 to 1999 indicate that olive ridleys are rarely found off the coast of California, averaging 1.3 strandings annually (NMFS 2004a).

The olive ridley turtle is omnivorous, and identified prey include a variety of benthic and pelagic prey items such as shrimp, jellyfish, crabs, snails, and fish, as well as algae and sea grass (Marquez 1990). It is also not unusual for olive ridley turtles in reasonably good health to be found entangled in scraps of net or other floating synthetic debris. Small crabs, barnacles, and other marine life often reside on debris and are likely to attract the turtles. Olive ridley turtles also forage at great depths, as a turtle was sighted foraging for crabs at a depth of 300 meters (Landis 1965, in Eckert et al. 1986). The average dive times for adult females and males are reported to be 54.3 and 28.5 minutes, respectively (Plotkin 1994, in Lutcavage and Lutz 1997b).

Declines in olive ridley populations have been documented in Playa Nancite, Costa Rica; however, other nesting populations along the Pacific coast of Mexico and Costa Rica appear to be stable or increasing, after an initial large decline due to harvesting of adults. Historically, an estimated 10-million olive ridleys inhabited the waters in the eastern Pacific off Mexico (Cliffton et al. 1982, in NMFS and FWS 1998e). However, human-induced mortality led to declines in this population. Beginning in the 1960s, and lasting over the next 15 years, several million adult olive ridleys were harvested by Mexico for commercial trade with Europe and Japan (NMFS and FWS 1998e). Although olive ridley meat is palatable, it is not widely sought. The eggs, however, are considered a delicacy, and egg harvest is considered one of the major causes for its decline. Fisheries for olive ridley turtles were also established in Ecuador during the 1960s and 1970s to supply Europe with leather (Green and Ortiz-Crespo 1982). In the Indian Ocean, Gahirmatha Beach in India may have once supported the largest nesting population of olive ridleys; however, this population continues to be threatened by nearshore trawl fisheries. Direct harvest of adults and eggs, incidental capture in commercial fisheries, and loss of nesting habits are the main threats to the olive ridley’s recovery.

3.4.2. Marine Mammals Listed under ESA

Cetaceans listed as endangered under the ESA that have been observed in the Western Pacific Region include the humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), and sei whale (*B. borealis*). In addition, one endangered pinniped, the Hawaiian monk seal (*Monachus schauinslandi*), occurs in the region. Generally, impacts to marine mammals in the Western Pacific Region include naturally caused ecosystem variability (e.g., regime shifts), shark predation, habitat degradation (e.g., birthing and calving areas), wildlife viewing activities that disrupt behavior, fishery interactions (e.g., gear entanglements), marine debris entanglements, and vessel collisions. Fisheries managed under the Council’s FMPs have been determined by NMFS to not jeopardize the continued existence of any ESA listed marine mammal.

3.4.2.1. Humpback Whale

Humpback whales (*Megaptera novaeangliae*) can attain lengths of 16 meters. Humpback whales usually winter in nearshore waters of 100 fathoms or less. Mature females are believed to conceive on the breeding grounds one winter and give birth the following winter. Genetic and photo identification studies indicate that within the U.S. EEZ in the North Pacific, there are at least three relatively separate populations of humpback whales that migrate between their respective summer/fall feeding areas to winter/spring calving and mating areas (Hill and DeMaster 1999). The Central North Pacific stock of humpback whales winters in the waters of the Main Hawaiian Islands (Hill et al. 1997). It is not unusual to observe humpback whales during the months of October to May in the nearshore waters off of the Main Hawaii Islands. Another northern hemisphere stock of humpbacks uses the northwestern part of the Philippine Sea in winter. Some animals of this stock move south to the Northern Mariana Islands, including Saipan and Guam. Sightings have been reported in Guam in January and February (Reeves et al. 1999). At least six well-defined breeding stocks of humpback whales occur in the Southern Hemisphere. Humpbacks arrive in American Samoa from the south between June and December (Reeves et al.1999). This area is probably another calving area and mating ground for the New Zealand group of Antarctic humpbacks.

There is no precise estimate of the worldwide humpback whale population. The humpback whale population in the North Pacific Ocean basin is estimated to contain 6,000 to 8,000 individuals (Calambokidis et al. 1997). The Central North Pacific stock appears to have increased in abundance between the early 1980s and early 1990s; however, the status of this stock relative to its optimum sustainable population size is unknown (Hill and DeMaster 1999).

3.4.2.2. Sperm Whale

The sperm whale (*Physeter macrocephalus*) is the most easily recognizable whale due to the log-like head comprising about 40 percent of its total body length. The current average body length for male sperm whales is about 15 meters, with females reaching up to 12 meters. Sperm whales are characterized by their brown/gray coloration, relatively short dorsal fin, wrinkled appearance of tail stock, and unique blow pattern. Sperm whales are the only whales that blow forward and to the left.

Sperm whales are found in tropical to polar waters throughout the world (Rice 1989). They are among the most abundant large cetaceans in the region. Sperm whales have been sighted around several of the Northwestern Hawaiian Islands (Rice 1960) and off the main islands of Hawaii (Lee 1993). In the early to mid-nineteenth century, Hawaii was the center of the whaling operations targeting sperm whales. The sounds of sperm whales have been recorded throughout the year off Oahu (Thompson and Freidl 1982). Sightings of sperm whales were made during May–July in the 1980s around Guam, and in recent years strandings have been reported on Guam (Reeves et al. 1999). Historical observations of sperm whales around Samoa occurred in all months except February and March (Reeves et al. 1999).

3.4.2.3. Blue Whale

The blue whale (*Balaenoptera musculus*) is the largest living animal. Blue whales can reach lengths of 30 meters and weights of 160 tons (320,000 lb), with females usually being larger than males of the same age. They occur in all oceans, usually along continental shelves, but can also be found in the shallow inshore waters and on the high seas. There have been at least two sightings of blue whales reported by Hawaii-based longline vessel crews to the north of Hawaii, and acoustic recordings made off Oahu and Midway Islands have reported blue whales somewhere within the EEZ around Hawaii (Thompson and Freidl 1982). The stock structure of blue whales in the North Pacific is uncertain (Forney et al. 2000). The status of this species in Hawaii waters relative to the optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney et al. 2000).

3.4.2.4. Fin Whale

Fin whales (*Balaenoptera physalus*) are found throughout all oceans and seas of the world from tropical to polar latitudes (Forney et al. 2000). Although it is generally believed that fin whales make poleward feeding migrations in summer and move toward the equator in winter, few actual observations of fin whales in tropical and subtropical waters have been documented, particularly in the Pacific Ocean away from continental coasts (Reeves et al. 1999). There has been at least one sighting of fin whales—a mixed group of adults and calves—almost due south of Oahu between 18 and 19 degrees latitude. This sighting was documented by an observer aboard a Hawaii-based longline vessel.

There is insufficient information to accurately determine the population structure of fin whales in the North Pacific, but there is evidence of multiple stocks. The status of fin whales in Hawaii waters relative to the optimum sustainable population is unknown, and there are insufficient data to evaluate trends in abundance (Forney et al. 2000).

3.4.2.5. Sei Whale

Sei whales (*Balaenoptera borealis*) have a worldwide distribution but are found mainly in cold temperate to subpolar latitudes rather than in the tropics or near the poles (Horwood 1987). They are distributed far out to sea and do not appear to be associated with coastal features. Two sei whales were tagged in the vicinity of the Northern Mariana Islands (Reeves et al.1999). Sei whales are rare in Hawaiian waters. The International Whaling Commission only considers one stock of sei whales in the North Pacific, but some evidence exists for multiple populations (Forney et al. 2000). In the southern Pacific most observations have been south of 30° S (Reeves et al. 1999).

There are no data on trends in sei whale abundance in the North Pacific (Forney et al. 2000). It is especially difficult to estimate their numbers because they are easily confused with Bryde's whales, which have an overlapping, but more subtropical, distribution (Reeves et al. 1999).

3.4.2.6. Hawaiian Monk Seal

The Hawaiian monk seal (*Monachus schauinslandi*) is a tropical seal endemic to the Hawaiian Islands. Today, the entire population of Hawaiian monk seals is about 1,300 to 1,400 and occurs mainly in the NWHI. The six major reproductive sites are French Frigate Shoals, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, and Kure Atoll. Small populations at Necker Island and Nihoa Island are maintained by both reproduction and immigration, and an increasing number of seals are distributed throughout the Main Hawaiian Islands, where they are also reproducing.

The subpopulation of monk seals on French Frigate Shoals has shown the most change in population size, increasing dramatically in the 1960s–1970s and declining in the late 1980s–1990s. In the 1960s–1970s, the other five subpopulations experienced declines. However, during the last decade the number of monk seals increased at Kure Atoll, Midway Atoll, and Pearl and Hermes Reef, while the subpopulations at Laysan Island and Lisianski Island remained relatively stable. The recent subpopulation decline at French Frigate Shoals is thought to be caused by male aggression, shark attack, entanglement in marine debris, loss of habitat, and decreased prey availability. The Hawaiian monk seal is assumed to be well below its optimum sustainable population, and since 1985 the overall population has declined approximately 3 percent per year (Forney et al. 2000).

3.4.2.7. Other Marine Mammals

All marine mammals are protected under the MMPA. Table 3-2 lists known non-ESA listed marine mammals that occur in the Western Pacific Region.

Table 3-2. Non-ESA Listed Marine Mammals of the Western Pacific Region.

Common Name	Scientific Name
Blainsville beaked whale	*Mesoplodon densirostris*
Bottlenose dolphin	*Tursiops truncatus*
Bryde’s whale	*Balaenoptera edeni*
Cuvier’s beaked whale	*Ziphius cavirostris*
Dall’s porpoise	*Phocoenoides dalli*
Dwarf sperm whale	*Kogia simus*
False killer whale	*Pseudorca crassidens*
Fraser’s dolphin	*Lagenodelphis hosei*
Killer whale	*Orcinus orca*
Longman’s beaked whale	*Indopacetus pacificus*
Melon-headed whale	*Peponocephala electra*
Minke whale	*Balaenoptera acutorostrata*
Pacific white-sided dolphin	*Lagenorhynchus obliquidens*
Pygmy killer whale	*Feresa attenuata*
Pygmy sperm whale	*Koiga 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*

The MMPA (50 CFR § 229) requires all commercial fisheries to be placed in one of three categories, based on the relative frequency of incidental serious injuries and mortalities of marine mammals in each fishery:

- Category I designates fisheries with frequent serious injuries and mortalities incidental to commercial fishing;
- Category II designates fisheries with occasional serious injuries and mortalities;
- Category III designates fisheries with a remote likelihood or no known serious injuries or mortalities.

With the exception of the Hawaii-based longline fishery (Category I), all Western Pacific Region fisheries are classified as Category III fisheries under the MMPA (73 FR 73032; December 1, 2008). Please see the ESA and additional NEPA analyses listed in Section 3.4.2 for more information on marine mammals in the Western Pacific Region.

3.4.3. Seabirds

Seabirds are widely distributed throughout the Western Pacific Region, and generally are high trophic level predators. Generally, impacts to seabirds include naturally caused ecosystem variability (e.g., shifts in oceanographic, climate, and prey regimes), habitat degradation (e.g., nesting areas), invasive species (e.g., rats and cats), fishery interactions (e.g., hookings and gear entanglements), marine debris ingestion and entanglements, and collisions with airplanes. The only documented Western Pacific Region fishery interactions with seabirds have been with the Hawaii-based longline fleet and NWHI bottomfish fishery, which are known to inadvertently hook and entangle boobies and black-footed and Laysan albatrosses. On rare occasions, wedge-tailed and sooty shearwaters are also incidentally caught by these Hawaii longline vessels (NMFS 2005b). Please see the additional NEPA analyses listed in Section 3.4.1 as well as the 2005 Final EIS under the Pelagics FMP (NMFS 2005b) for more information on the seabirds in the Western Pacific Region. In addition, two Biological Opinions issued by the U.S. Fish and Wildlife Service[37] provide detailed information on short-tailed, Laysan, and black-footed albatrosses (USFWS 2002 and 2004). The Opinions document the determination that the Hawaii-based longline fishery is not likely to jeopardize the continued existence of the ESA-listed short-tailed albatross.

[37] The U.S. Fish and Wildlife Service (USFWS or FWS) is the primary agency with authority and responsibility to manage endangered seabirds.

3.4.3.1. Short-Tailed Albatross

The short-tailed albatross (*Phoebastria immutabilis*) is the largest seabird in the North Pacific, with a wingspan of more than 3 meters (9 feet) in length. It is characterized by a bright-pink bill with a light-blue tip and defining black line extending around the base. The plumage of a young fledgling (i.e., a chick that has successfully flown from the colony for the first time) is brown, and at this stage, except for the bird's pink bill and feet, the seabird can easily be mistaken for a black-footed albatross. As the juvenile short-tailed albatross matures, the face and underbody become white and the seabird begins to resemble a Laysan albatross. In flight, however, the adult short-tailed albatross is distinguished from the Laysan albatross by a white back and by white patches on the wings, as opposed to the Laysan albatross which has a brown back and dorsal coloration on its wings. As the short-tailed albatross matures, the white plumage on the crown and nape changes to a golden yellow.

Historically, the short-tailed albatross ranged along the coasts of the entire North Pacific Ocean from China, including the Japan Sea and the Okhotsk Sea (Sherburne 1993), to the west coast of North America. Prior to the harvesting of the short-tailed albatross at their breeding colonies by Japanese feather hunters, this albatross was considered common year-round off the western coast of North America (Robertson 1980). Between 1885 and 1903, an estimated five million short-tailed albatrosses were harvested from the Japanese breeding colonies for the feather, fertilizer, and egg trade, and by 1949, the species was thought to be extinct (Austin 1949). In 1950, ten short-tailed albatrosses were observed nesting on Torishima Island (Tickell 1973).

The short-tailed albatross is known to breed only in the western North Pacific Ocean, south of the main islands of Japan. Although at one time there may have been more than ten breeding locations, today there are only two known active breeding colonies: Minami Tori Shima Island and Minami-Kojima Island (Hasegawa 1979). On December 14, 2000, one short-tailed albatross was discovered incubating an egg on Yomejima Island of the Ogasawara Islands (southernmost island among the Mukojima Islands). A few short-tailed albatrosses have also been observed attempting to breed, although unsuccessfully, at Midway Atoll in the NWHI.

In 2000, the breeding population of the short-tailed albatross was estimated at approximately 600 breeding age birds, with an additional 600 immature birds, yielding a total population estimate of 1,200 individuals (65 FR 46643; July 31, 2000). At that time, short-tailed albatrosses were estimated to have an overall annual survival rate of 96 percent and a population growth rate of 7.8 percent (65 FR 46643, July 31, 2000). More recently NMFS estimated the global population at approximately 1,900 individuals (P. Sievert, personal communication as cited in NMFS 2005b). The Torishima population was estimated to have increased by 9 percent between the 2003 to 2004 and 2004 to 2005 seasons (Harrison 2005).

The short-tailed albatross was first listed under the Endangered Foreign Wildlife Act in June 1970. On July 31, 2000, the United States Fish and Wildlife Service extended the endangered status of the short-tailed albatross to include the species' range in the U.S. The primary threats to the species are destruction of breeding habitat by volcanic eruption or mud- and landslides, reduced genetic variability, limited breeding distribution, plastics ingestion, contaminants, airplane strikes, and incidental capture in longline fisheries in the western and far northern Pacific.

The short-tailed albatross population is growing annually, likely the result of effective habitat protection and management. Active breeding colonies are found on Torishima, south of Honshu Island, Japan and Minami-kojima in the Senkaku islands north of Taiwan. An estimated 80-85% of the breeding short-tailed albatrosses occur in a single colony on Torishima. The current worldwide population is estimated at 2,771 individuals (G. Blogh, FWS pers. comm. to L. Van Fossen, NMFS, 2008). Based on breeding pair counts, the short-tailed albatross population appears to be increasing by seven percent annually (Naughton et al. 2008). In 2006, there were 341 breeding pairs counted at Torishima (Hasegawa 2007a), and 382 breeding pairs were counted there in 2007 (Hasegawa 2007b). No critical habitat has been established for the short-tailed albatross.

3.4.3.2. Newell's Shearwater

The Newell's shearwater (*Puffinus auricularis newelli*) is listed as threatened under the ESA. Generally, the at-sea distribution of the Newell's shearwater is restricted to the waters surrounding the Hawaiian Archipelago, with preference given to the area east and south of the main Hawaiian Islands. The Newell's shearwater has been listed as threatened because of its small population, approximately 14,600 breeding pairs, its isolated breeding colonies, and the numerous hazards affecting them at their breeding colonies (Ainley et al. 1997). The Newell's shearwater nests in the mountainous areas between 500 and 2,300 feet on Kauai.[38] Major threats include urban development and introduced predators like rats, cats, dogs, and mongooses (Ainley et al. 1997).

Shearwaters are most active in the day and skim the ocean surface while foraging. During the breeding season, shearwaters tend to forage within 50 to 62 miles (80 to 100 km) of their nesting burrows (Harrison 1990). Shearwaters also tend to be gregarious at sea, and the Newell's shearwater is known to occasionally follow ships (Harrison 1990). Shearwaters feed by surface seizing and pursuit plunging (Warham 1990). Often shearwaters will dip their heads under the water to sight their prey before submerging.

Shearwaters are extremely difficult to identify at sea, as the species is characterized by mostly dark plumage, long and thin wings, a slender bill with a pair of flat and wide nasal tubes at the base, and dark legs and feet. Like the albatross, the nasal tubes at the base of the bill enhance the bird's sense of smell, assisting them to locate food while foraging (Ainley et al. 1997).

[38] http://www.fws.gov/pacificislands/wesa/ao.html

3.4.3.3. Other Seabirds

Other seabirds found in the region include the black-footed albatross (*Phoebastria nigripes*), Laysan albatross (*Phoebastria immutabilis*), masked booby (*Sula dactylatra*), brown booby (*Sula leucogaster*), red-footed booby (*Sula sula*), wedge-tailed shearwater (*Puffinus pacificus*), Christmas shearwater (*Puffinus nativitatis*), petrels (*Pseudobulweria* spp., *Pterodroma* spp.), tropicbirds (*Phaethon* spp.), frigatebirds (*Fregata* spp.), and noddies (*Anous* spp.).

Seabirds and shorebirds are protected under the Migratory Bird Treaty Act. The Council considers impacts of fishery management on seabirds through coordination with NMFS and the USFWS.

3.5. The Western Pacific Region

Under the MSA, the WPRFMC has fishery management responsibility for fisheries in the Pacific Ocean seaward of American Samoa, CNMI, Guam, Hawaii, and the PRIA (Figure 3-10). The Western Pacific Region, which is the largest fisheries management area in the United States, includes nearly 1.5 million square nautical miles of EEZ waters. This section provides information on each island area including summaries of local marine features, resources, fisheries, and economies. For more information, refer to the additional NEPA analyses listed in Section 3.4.1.

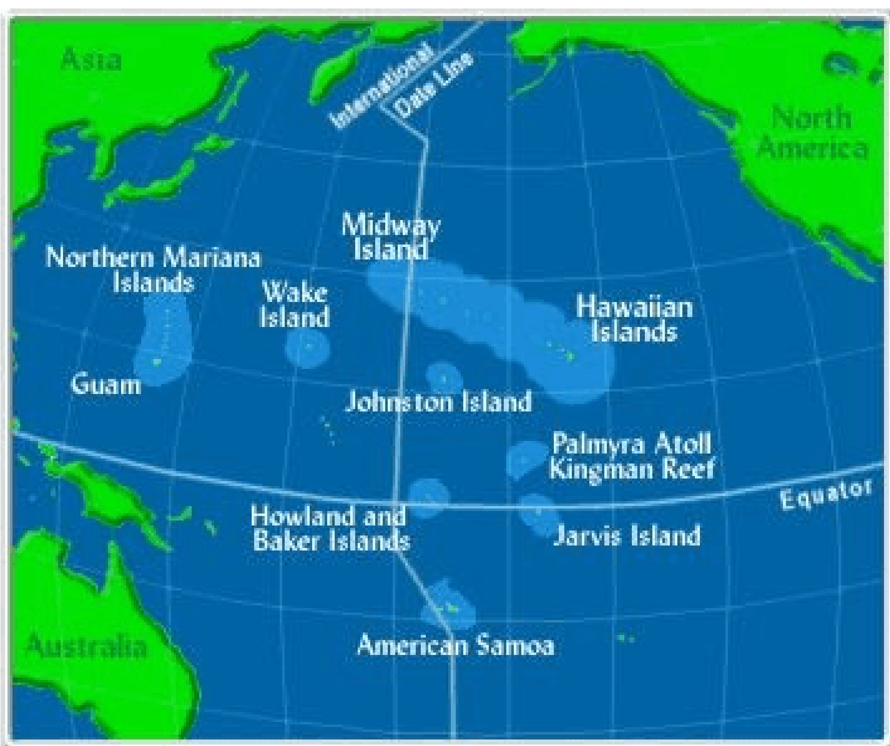


Figure 3-10. The Western Pacific Region.
Note: The U.S. EEZ is highlighted in light blue.

3.5.1. American Samoa

American Samoa has been a U.S. territory since 1899. Pago Pago has one the best naturally-formed deep water harbors in the Pacific. Over eighty nine percent of the people in American Samoa are considered native Samoan. This population is descended from the aboriginal people, who, prior to discovery by Europeans, occupied and exercised sovereignty in the area now known as Samoa. Western Samoa is now Independent Samoa. Eastern Samoa is known as American Samoa. New Zealand occupied Western Samoa in 1914, and in 1962 Western Samoa gained independence. In 1997, Western Samoa changed its name to Samoa. The demarcation between Samoa and American Samoa is mostly political as cultural and commercial exchanges between families living and commuting between American Samoa and Samoa is common.

Approximately 95 percent of the landmass in American Samoa is held under the traditional land tenure system and under the direct authority of the Samoan chiefs known as “matai.” Under this system, traditional land cannot be purchased or sold, and the current reigning chief from within the family unit has final say over the disposition of a family's holdings. This system ensures the passage of assets to future generations and serves as the catalyst in the preservation of the Samoan culture.

The five volcanic islands, which are the major inhabited islands of American Samoa, are Tutuila, Aunuu, Ofu, Olosega, and Tau. American Samoa is surrounded by approximately 156,246 square miles of U.S. EEZ waters. Tutuila, the largest island (55 square miles), is the center of government and business and is nearly bisected by Pago Pago Harbor, the deepest and one of the most sheltered embayments in the South Pacific. Aunuu, a satellite of Tutuila, lies one-quarter mile off the coast. The three islands of Ofu, Olosega, and Tau are collectively referred to as the Manua islands (with a total land area of less than 20 square miles) and lie 70 miles east of Tutuila. Swains Island, with a population of approximately 30, lies 200 miles north of Tutuila, and the uninhabited Rose Atoll is 60 miles east of Manua. Tutuila, Manua, and Rose Atoll are between 14° and 15° S latitude, and Swains Island lies at 11° S latitude. Swains Island is, geographically, a member of the Tokelau archipelago. The region was believed to be relatively geologically inactive with few seamounts or guyots in comparison to other Polynesian states. However, new anecdotal evidence indicates that the region is volcanically active, with new seamounts being formed. The majority of islands rise from deep (4,000 m) oceanic depths.

Rose Atoll is both a National Wildlife Refuge and a Marine National Monument.

American Samoa experiences southeast trade winds that result in frequent rains and a warm tropical climate. The year-round air temperatures range from 70° to 90° F. Humidity averages 80 percent during most of the year. The average rainfall at Pago Pago International Airport is 130 inches per year, while Pago Pago Harbor, only 4.5 miles away, receives an average of 200 inches of rainfall per year (Territorial Planning Commission and Department of Commerce 2000).

3.5.1.1. Marine Environment – American Samoa

3.5.1.1.1. Coral Reefs

The coral reef area (includes seagrass beds and sandy and rocky rubble areas) in American Samoa is estimated at 55 square kilometers (within 10-fm curve) and 464 square kilometers (within 100-fm curve), respectively (Rohmann et al. 2005). Within the 10-fathom curve, the estimated coral reef area of Tutuila is 35.8 square kilometers, Ofu-Olesega is 3.8 square kilometers, Tau is 3.7 square kilometers, Rose Atoll is 8.0 square kilometers, and Swains Island is 3.5 square kilometers (Rohmann et al. 2005). The structure and development of most of these reefs, except the submerged banks, has been well described (Green 1997, Maragos et al. 1994).

The conditions of coral reef communities in American Samoa have also been well described by numerous quantitative and qualitative surveys, including the following: Birkeland et al. 1987, 1994, 1996; Green 1996; Green and Craig 1996; Hunter et al. 1993; Maragos 1994; Maragos et al. 1994; Mundy 1996. In general, the reefs adjacent to human population centers (e.g., Tutuila Island) appear to be in worse condition than those on less populated or unpopulated islands (e.g., the Manua Group and the two remote atolls; Green 1996).

The reefs of American Samoa have been badly damaged by a combination of natural and anthropogenic disturbances in the past two decades. These include a severe outbreak of the crown-of-thorns starfish in the 1970s, four major cyclones in the last 18 years, and mass coral bleaching events in 1994, 2002, and 2003 (Maragos et al. 1994, Green et al. 1999, Craig et al. 2005). In some locations (especially Pago Pago Harbor), these reefs also appear to have been degraded by a combination of anthropogenic processes, including coastal construction, sedimentation, eutrophication, and chemical and solid waste pollution (Craig et al. 2005, Green 1996, Maragos et al. 1994).

Long-term monitoring shows that these disturbances have resulted in major changes to the coral and fish communities near the island over the past 20–80 years (Green et al. 1999). The rate of recovery of the coral reef communities on Tutuila appears to be quite variable. The reefs in Fagatele Bay National Marine Sanctuary (FBNMS) and at most other locations are recovering well from these disturbances (Birkeland et al. 1987, 1994, 1996; Green 1996). In contrast, the reefs in Pago Pago Harbor and at several other locations around the island are not (Birkeland et al. 1987, 1994, 1996; Mundy 1996). Differences in water quality among sites may be partly responsible for these differences among the reefs. For example, the reefs in good condition, including those at FBNMS, Leone, Fatumafuti, and Vatia, appear to have good water quality. By comparison, the reefs that are in poor condition appear to have poor water quality, including high sediment loads and the presence of chemical pollutants (Green 1996, Maragos et al. 1994, Mundy 1996). Poor quality reefs include most of the reefs in Pago Pago Harbor and some reefs on the northwest shore (Green 1996, Maragos et al. 1994, Mundy 1996). Threats to the health of Tutuila's coral reefs include coral bleaching, coastal alterations from human development, fishing pressure, loss of wetlands, soil erosion and sedimentation, solid and hazardous waste disposal, and pollution (Craig et al. 2005).

In general, the reefs on the other less populated islands appear to be in good condition. Aunuu Island has suffered the same natural disturbances as Tutuila, including coral bleaching and tropical storms; however, reefs there are relatively protected from anthropogenic effects, and have been observed to recover quickly from the area's frequent storms (Green 1996, Mundy 1996).

The reefs of the Manua Islands (Ofu, Olosega, and Tau) were severely damaged by Hurricane Tusi in 1987. The starfish invasion in the 1970s and the recent coral bleaching event also affected these reefs, but the extent of the damage is unclear (Green 1996). Several studies over the past 10 years have shown that the reefs of the Manua Group tend to be in better condition than those around Tutuila (Green 1996, Itano and Buckley 1988, Maragos et al. 1994, Mundy 1996). In fact, Green (1996) and Mundy (1996) reported that some of the reefs in Manua were among the best surveyed in the archipelago, including reefs on Ofu (Asaga), Olosega (Sili and Olosega Village), and Tau (Lepula and Afuli). The shallow lagoon in the National Park of American Samoa is also in particularly good condition (Green 1996, Hunter et al. 1993). In general, anthropogenic effects are less pronounced in the Manua Islands because of the lower population on these islands. However, the future of some of these reefs is threatened by road construction immediately adjacent to the shoreline on all three islands (Green 1996, Green and Mundy 1995). Intermittent, moderate- to-large infestations of the crown-of-thorns starfish may also threaten the condition of some of these reefs in the future, especially on Ofu and Olosega (Mundy 1996, Zann 1995).

3.5.1.1.2. Benthic Habitat

Because of the steepness of the offshore slope around Tutuila and the other islands that make up American Samoa, most of the available benthic habitat is composed of fringing coral reefs, a limited reef slope, and a few offshore banks (Craig et al. 2005). The islands are fringed by narrow reef flats (50 to 500 m) that drop to a depth of 3 to 6 meters and descend gradually to 40 meters. From this depth, the ocean bottom drops rapidly, reaching depths of 1,000 meters within 1 to 3 kilometers from shore. The following four banks around Tutuila have been identified: Taputapu, Mataula, Leone West Banks, and Steps Point (Severance and Franco 1989).

3.5.1.1.3. Pelagic Habitat

The waters surrounding the Samoa Archipelago are an area of modest productivity relative to areas to the north and west. The region is traversed by two main currents: the southern branch of the westward-flowing South Equatorial Current during June–October and the eastward-flowing South Equatorial Counter Current during November to April. Surface temperatures vary between 27° and 29° C and are highest in the January to April period. The upper limit of the thermocline in ocean areas is relatively shallow (27° C isotherm at a 100-meter depth), but the thermocline itself is diffuse (lower boundary at a 300-meter depth).

3.5.1.1.4. Surface Currents

As discussed in Section 3.1.6, ocean circulation is mainly driven by winds and changes in temperature and salinity that affect seawater density. Divergent currents bring nutrient-rich waters to the surface, which promotes phytoplankton growth, whereas convergent currents may accumulate forage items important for species distribution. The Westwind Drift (40° to 50° S) and the equatorial current system create an anticlockwise current flow or gyre in the South Pacific. From the equator to 20° S, four main currents or countercurrents are recognized (Bigelow 1997).

The northern branch of the South Equatorial Current (SECN) flows westward between 10° N and 7° S at a mean speed of 30 cm/sec and is 200 meters thick. The southern branch of the South Equatorial Current (SECS) flows westward between 11° and 14° S at a mean speed of 5 cm/sec and is 200 meters thick (Bigelow 1997).

Between these two westward-flowing currents is the eastward-flowing South Equatorial Countercurrent (SECC) at 7° S to 11° S. The SECC has a mean speed of 20 cm/sec and is 50-100 meters thick. South of 15° S, the South Tropical Countercurrent (STCC) flows eastward (Bigelow 1997).

Current systems in the South Pacific are not simple latitudinal features, as vertical profiles of the equatorial western Pacific show a complex and dynamic stratification of currents (Delcroix et al. 1992). Current velocity fields affecting the American Samoa EEZ are weak, with maximum velocity of about 25 cm/sec (52 cm/sec = 1 knot). In general, current velocities appear southwesterly in the north (5° to 10° S) and southerly between 10° and 15° S. The northern branch of the SEC (the SECN) is the strongest current in the South Pacific. The SECN flows westward and usually attains its maximum velocities within 5° of the equator during March and April (Picaut and Tournier 1991). The SECN mainly affects the American Samoa EEZ from January to June.

The southern branch of the SEC (the SECS) flows westward, but is weaker than the SECN. In the central Pacific, it may fragment into a series of vortexes (Picaut and Tournier 1991). The SECS is evident to the north of 20° S each month and is strongest from May to October. The SECC shares a northern boundary, with the westward-flowing SECN and a southern boundary with the westward-flowing SECS. From observational oceanographic studies in the western Pacific, the SECC flows eastward, and in June or July its area of maximum velocity shifts abruptly from 10° S to 7° S; it may fragment into branches that interrupt the flow of the SECN. In the central Pacific, the SECC is evident to the south of 10° S during November to April, during which time the velocity of the SECS is reduced. From May to October, the SECS strengthens and the SECC is not evident in the climatology.

3.5.1.1.5. Water Temperatures

Although a 100-meter deep pool of uniformly warm (greater than 29° C) water extends over the equatorial western Pacific within 10° N to 10° S (Delcroix et al. 1992), virtually all of the EEZ waters around American Samoa lie farther to the south than the western Pacific warm pool in the more saline and cooler waters of the subtropical south Pacific. Bimonthly sea-surface temperature fields were estimated from a climatology based on an optimal interpolation (OI) analysis of in situ ship and buoy data collected from 1950 to 1979 (Reynolds and Smith 1994). In American Samoa, the SST is warmest during January and February and coolest during July and August. Part of the northern portion of the American Samoa EEZ is isothermal (29° C) during January to June. Sea-surface temperatures show a north–south gradient, and seasonal variation increases with latitude.

A sea-surface temperatures time series was estimated from 1982 to 1996 for an area north and south of 15° S. Monthly sea-surface temperatures were estimated from blended in situ (ship and buoy) sea-surface temperature data and satellite retrievals (Reynolds and Smith 1994). Throughout the time series, the southern area had a greater annual range in sea-surface temperatures (2° to 5° C) than the northern area (0.5° to 1.50° C). The three major El Niño, or warm events, that occurred over the time series (1982 to 1983, 1986 to 1987, and 1991 to 1995) resulted in 10° C cooler winter sea-surface temperatures in the southern area than in normal years. The one major La Niña, or cold event, that occurred in 1988 to 1989 resulted in cooler summer sea-surface temperatures in the northern area than in normal years, but had little affect on the southern area (Reynolds and Smith 1994).

While sea-surface temperature is a convenient indicator of water temperature, the subsurface thermal structure has a greater influence on the horizontal and vertical distribution of some economically important species, including tuna. Two measurements used by oceanographers to characterize the subsurface thermal structure are the depth of the mixed layer and the depth of the lower boundary of the thermocline. The mixed layer is a relatively homogeneous layer of nearsurface water where the temperature remains constant with depth, while the thermocline is a region in the water column where temperature declines rapidly over a relatively small depth range. In tropical waters, the depth of the 27° C isotherm is commonly used as the lower boundary of the mixed layer (Cayre et al. 1989); however, the lower boundary of the thermocline is more difficult to define. For the purposes of this document, the depth of the 15° C isotherm is considered as the lower thermocline depth as suggested by Toole et al. (1988).

Subsurface temperature data, compiled from expendable bathythermographs (XBTs), were used by Bigelow (1997) to develop a time series profile of temperature with depth for the neighboring Cook Islands between 1982 and 1996. A total of 2,665 profiles were taken from a large area of the Cook Islands EEZ (5° to 25° S, 170° to 150 ° W). During this period, 15 profiles were made per month. The isotherm depths show very different time series patterns for the two areas. In the northern area, at a range of latitudes similar to American Samoa’s EEZ, isotherms were 50 to 100 meters shallower after the strong ENSO event of 1982 to 1983. In contrast, isotherm depths showed little temporal variability in the southern area. The average depth of the 27° C isotherm in the northern area was 100 meters. The lower boundary of the thermocline was deeper in the southern area (330 m) compared with the northern area (275 m; Bigelow 1997).

The latitudinal distribution of oxygen with depth was derived from a climatology study based on historical research ship data (Levitus 1982). There is a latitudinal gradient in dissolved oxygen as northern latitudes have less oxygen at a given depth than southern latitudes. In waters south of 15° S, oxygen concentrations are generally high (greater than 3.5 ml O2/liter above 300 m) and should not limit the vertical distribution of tuna. In contrast, catchability of yellowfin and bigeye is increased between 5° and 10° S because dissolved oxygen concentrations are low (less than 3.0 ml O2/liter below 250 m), which effectively restricts their vertical habitat (Bigelow 1997).

A monthly productivity climatology model derived from the Coastal Zone Color Scanner (CZCS), and based on data from 1978 to 1986, gives an indication of relative productivity. Within the Pacific, primary production is high in the equatorial western Pacific and the tropical eastern Pacific. In contrast, oceanic waters near American Samoa are low in productivity (approximately 0.05 mg/m^3) compared with the Society Islands in French Polynesia (greater than 0.1 mg/m^3). There is little intra-annual variation in productivity within the American Samoa fishing zone, but waters to the northeast of 10° S have high productivity during winter months (May to August; Bigelow 1997).

A long-term shift in the physical environment of the equatorial Pacific Ocean began in 1977 (Miller et al. 1994). Conditions included more clouds, more rainfall, warmer sea-surface temperatures, and weaker trade winds, similar to a weak decadal El Niño state. These conditions were most pronounced in the central equatorial Pacific, thus American Samoa was close to the center of this shift, which persisted until 1999 (J. Polovina, PIFSC, personal communication as cited in WPRFMC 2003).

3.5.1.2. Protected Species – American Samoa

3.5.1.2.1. Sea Turtles

The information regarding sea turtles in American Samoa has come from opportunistic tagging of turtles and from dead (stranded) turtles. Hawksbill and green turtles are the most common species found in local waters. There is one record of a leatherback turtle that was incidentally captured about five kilometers south of Swains Island and three records of olive ridleys (two dead and one live sighting; Utzurrum 2002). Hawksbill and green turtle populations have declined precipitously in American Samoa (Grant et al. 1997). Despite federal and territorial laws prohibiting the killing of sea turtles and an extensive education program, some sea turtles and eggs were harvested illegally in American Samoa (Grant et al. 1997). In addition to direct take of turtles and eggs, degradation of nesting habitat by coastal construction, environmental contaminants, and increased human presence are viewed as the major problems to the recovery of green and hawksbill turtle populations. Beach mining and beach erosion are also detrimental because the islands of American Samoa have very few beaches suitable for turtle nesting habitat. American Samoa's human population is one of the fastest growing of the Pacific Islands (USFWS and NMFS 1998a, 1998b), and the people of the Samoan Archipelago have traditionally harvested sea turtles for food and the shell. On the basis of recent surveys, the total number of nesting female sea turtles (hawksbill and green turtle species combined) is estimated to be approximately 120 (Utzurrum 2002). A voluntary observer program on American Samoa based longline vessels did not see any interactions with sea turtles on 76 observed longline sets during 2002.

The American Samoa observer program, implemented as part of the American Samoa longline limited entry program, has provided information on interactions between sea turtles and the American Samoa longline fishery. The longline fishery observer program in American Samoa began in 2006 and coverage rates have averaged between 7 and 8 percent since its inception. During the period from April 2006 to May 2008, approximately 8 percent of the sets deployed by this fishery were monitored by observers. During this time period observers reported five green sea turtle interactions, all resulting in mortalities, during longline operations in this fishery (four in 2006/07 and one in 2008

3.5.1.2.2. Green Sea Turtle

As discussed in Section 3.4, the life cycle of the green sea turtle involves a series of long-distance migrations back and forth between their feeding and nesting areas (Craig 2002). In American Samoa, their only nesting area is at Rose Atoll. When they finish laying their eggs there, the green turtles leave Rose Atoll and migrate to their feeding grounds elsewhere in the South Pacific. After several years, the turtles will return to Rose Atoll to nest again. Every turtle returns to the same nesting and feeding areas throughout its life, but that does not necessarily mean that all turtles nesting at Rose Atoll will migrate to exactly the same feeding area.

Two green turtles with tagged flippers, and three that were tracked by satellite after nesting at Rose Atoll, were recovered in Fiji (Balazs et al. 1994). In addition, a green turtle with tagged flippers from Rose Atoll was found dead in Vanuatu less than one year later (G. H. Balazs 1994, cited in Grant et al. 1997).

3.5.1.2.3. Hawksbill Sea Turtle

Hawksbill turtles are most commonly found at Tutuila and the Manua Islands. They are known to nest at Rose Atoll and Swains Island (Utzurrum 2002).

3.5.1.2.4. Leatherback Sea Turtle

In 1993, the crew of an American Samoa government vessel engaged in experimental longline fishing pulled up a small freshly dead leatherback turtle about 5.6 kilometers south of Swains Island. This is the first leatherback turtle seen by the vessel's captain in 32 years of fishing in the waters of American Samoa. The nearest known leatherback nesting area to the Samoan Archipelago is the Solomon Islands (Grant 1994).

3.5.1.2.5. *Olive Ridley Sea Turtle*

Olive ridley turtles are uncommon in American Samoa, although there have been at least three sightings. Necropsy of one recovered dead olive ridley found that it was injured by a shark, and may have recently laid eggs, indicating that there may be a nesting beach in American Samoa (Utzurrum 2002).

3.5.1.2.6. *Loggerhead Sea Turtle*

In 2006, there were two interactions observed between loggerhead turtles and American Samoa-based longline fishing gear.

3.5.1.2.7. *Marine Mammals and Seabirds*

Southern Pacific Humpback whales have been observed around Fagatele Bay National Marine Sanctuary between June and September. Moreover, sperm whales are occasionally seen in the Sanctuary and around Tutuila as well. Several species of dolphins also frequent the sanctuary waters. In addition, there are anecdotal observations of both false killer whales and short-finned pilot whales occasionally stealing bait and fish from American Samoa-based longline gear. There are no pinnipeds (i.e., seals and sea lions) known to occur in American Samoa.

3.5.1.2.8. *Seabirds*

Table 3-3 presents the seabirds found in American Samoa. Twelve species of migratory seabirds reside on Rose Atoll. The bristle-thighed curlew (*Numenius tahitiensis*) is a migratory species listed by the IUCN Red List Category as “Vulnerable” because of a small, declining population (estimated to be 7,000 birds worldwide). The primary threat is predation occurring on wintering grounds (BirdLife International 2009). This migratory shorebird resides on Rose Atoll in American Samoa. In addition, the Newell’s shearwater is regarded as a visitor to American Samoa.

Table 3-3. Seabirds Known to Be Present Around American Samoa.

Common Name	Scientific Name
Resident Seabirds (breeding birds):	
Puffinus pacificus	Wedge-tailed shearwaters
Puffinus lherminieri	Audubon’s shearwater
Puffinus nativitatis	Christmas shearwater
Pseudobulweria rostrata	Tahiti petrel
Pterodroma heraldica	Herald petrel
Pterodroma brevipes	Collared petrel
Sula sula	Red-footed booby
Sula leucogaster	Brown booby

Common Name	Scientific Name
Sula dactylatra	Masked booby
Phaethon lepturus	White-tailed tropicbird
Phaethon rubricauda	Red-tailed tropicbird
Fregata minor	Great frigatebird
Fregata ariel	Lesser frigatebird
Sterna fuscata	Sooty tern
Anous stolidus	Brown noddy
Anous minutus	Black noddy
Procelsterna cerulea	Blue-gray noddy
Gygis alba	Common fairy-tern (white tern)
Visitors/Vagrants	
Puffinus tenuirostris	Short-tailed shearwater
Pterodroma inexpectata	Mottled petrel
Pterodroma alba	Phoenix petrel
Fregetta grallaria	White-bellied storm petrel
Nesofregetta fuliginosa	Polynesian storm petrel (Pratt considers this a resident)
Larus atricilla	Laughing gull
Sterna sumatrana	Black-naped tern

3.5.1.3. Fisheries of American Samoa

Under the authority of the MSA, the Council developed (and the Secretary of Commerce approved) criteria to determine overfishing (fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region. Currently, no fishery in American Samoa has been determined to be experiencing overfishing or to be overfished.[39]

3.5.1.3.1. Demersal Fisheries – American Samoa

3.5.1.3.1.1. Coral Reef Ecosystem Fisheries – American Samoa

Coral reef fishes and invertebrates are harvested in American Samoa by various gear types including hook and line, spear gun, and gillnets. Approximately 25,000 pounds of coral reef species were reported landed by domestic commercial fisheries in 2003 (NMFS 2004b). Resources such as giant clams, parrotfish, surgeonfish, and jacks are believed to be low in abundance (Craig et al. 2005). MSY has not been estimated for the American Samoa coral reef fishery MUS.

[39] Status of U.S. Fisheries, 2005. http://www.nmfs.noaa.gov/docs/Report_text_FINAL3.pdf

3.5.1.3.1.2. Crustaceans Fisheries – American Samoa

Spiny lobster (*Panulirus penicillatus*) is the main target species of this fishery. Lobsters around American Samoa do not appear to enter traps and, thus, are hand harvested. They are typically speared at night by free divers hunting for finfish near the outer slope. Virtually all harvests, to date, have occurred in territorial waters. Annual commercial landings expanded from a market survey are estimated to be 1,000 -1,500 lbs without taking subsistence and recreational catches into account[40].

A Federal permit is required to harvest Crustacean MUS in the EEZ around American Samoa and permit holders are required to participate in local reporting systems. This is an open access fishery, and as of June 2007 one Federal permit had been issued. No catch or effort information is available to date for this operation. All previous harvests of Crustacean MUS are believed to have occurred in territorial waters.

Amendment 13 to the Crustaceans FMP designated deepwater shrimp of the genus *Heterocarpus* as management unit species under the FMP, and required Federal permits and reporting for deepwater shrimp fishing in the U.S. EEZ, including American Samoa. The species complex includes all eight species of deepwater shrimp in the western Pacific (*Heterocarpus ensifer, H. laevigatus, H. sibogae, H. gibbosus, H. lepidus, H. dorsalis, H. tricarinatus* and *H. longirostris*). The monitoring program (permits and logbooks) is intended to improve understanding of these fisheries and their impact on marine ecosystems. Although currently there are no resource concerns regarding western Pacific deepwater shrimp, the designation of these shrimp as management unit species provides a basis for management of the fisheries, if warranted in the future.

Deepwater shrimp fisheries have been sporadic and short-lived throughout the Pacific since the 1960s. Most of these fishing ventures have been unprofitable due to frequent gear loss, a product with a short shelf life and history of inconsistent quality, and the rapid localized depletion of stocks leading to low catch rates. However, interest in the deepwater shrimp fishery continues.

The sea floor drops away steeply around Tutuila and the other islands and banks of American Samoa. Depths reach 1,000 m within 3 km of the shoreline. *Heterocarpus* habitat is limited to a narrow band of steep reef slope around the emergent islands and offshore banks. The abundance of *Heterocarpus* around American Samoa is currently unknown, but *H. ensifer* and *H. laevigatus* were found between 250 and 700 m in Western Samoa. No deepwater shrimp fishery has ever been reported in American Samoa, and currently, there are no plans to establish one.

MSY has not been estimated for the American Samoa crustacean fisheries.

[40] WesPac Fisheries Information Network. http://www.pifsc.noaa.gov/wpacfin/as/Pages/as_data_8.php

3.5.1.3.1.3. Bottomfish Fisheries – American Samoa

Long before the arrival of Europeans in the islands of Samoa, the indigenous people of those islands 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) according to 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–foot 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-foot alia catamaran, designed by the Food and Agriculture Organization of the United Nations, 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 deepwater snapper to Hawaii, caused another notable increase in bottomfish landings (Itano 1996). Between 1982 and 1988, the bottomfish fishery made up 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.

Today, the bottomfish fishery of American Samoa consists of approximately 19 part-time vessels that typically jig overnight using skipjack tuna as bait (WPRFMC 2004a, 2004b). The fishing technology employed by the fleet continues to be relatively unsophisticated. Most vessels are aluminum alia catamarans less than 30 feet in length and many of the boats are outfitted with wooden hand reels that are used for both trolling and bottomfish fishing. In 1999, less than 10 percent of the boats carried a depth recorder, electronic fish finder or global positioning system (Severance et al. 1999). Because few boats carry ice, they typically fish within 20 miles of shore. In recent years, however, a growing number of fishermen in American Samoa have been acquiring larger (greater than 35 feet) vessels with capacity for chilling or freezing fish and a much greater fishing range.

In recent years, commercial landings of bottomfish accounted for almost all of the total bottomfish catch. The amount of bottomfish caught for recreational or subsistence purposes was very small. In 2002, there were no recreational or charter landings recorded. The commercial catch declined significantly in 1987, recovered slightly in 1988, but then decreased dramatically again during the early 1990s (Figure 3-11). The overall decline was due to the effects of hurricanes that struck Samoa in 1987, 1990, and 1991, as well as 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 percent of the 17-year average and was the smallest catch since 1992. This decline was primarily due to a shift by highliners in the local fleet from bottomfish fishing to fishing for pelagic species with longline gear. Since 1998, some alias have returned to bottomfish fishing when longline catches and prices for pelagic species declined. In 2003, 19 vessels took 291 trips and landed 26,200 pounds of bottomfish in American Samoa. Of this, 25,509 pounds were sold for total ex-vessel revenue of $25,012 (WPRFMC 2004a, 2004b).

In 2005 a total of 16 local boats landed an estimated 21,157 pounds of both commercial and recreational bottomfish in the territory, where 30 percent of the total landing was sold commercially. Revenues from the commercial fishery in 2005 were estimated at $16,744, with all catch being sold locally. The majority of the catch consisted of emperors and snappers. MSY for deepwater bottomfish around American Samoa is estimated at 74,970 lb (WPRFMC 2005). Figure 3-11 provides historical data on commercial bottomfish harvests in American Samoa.

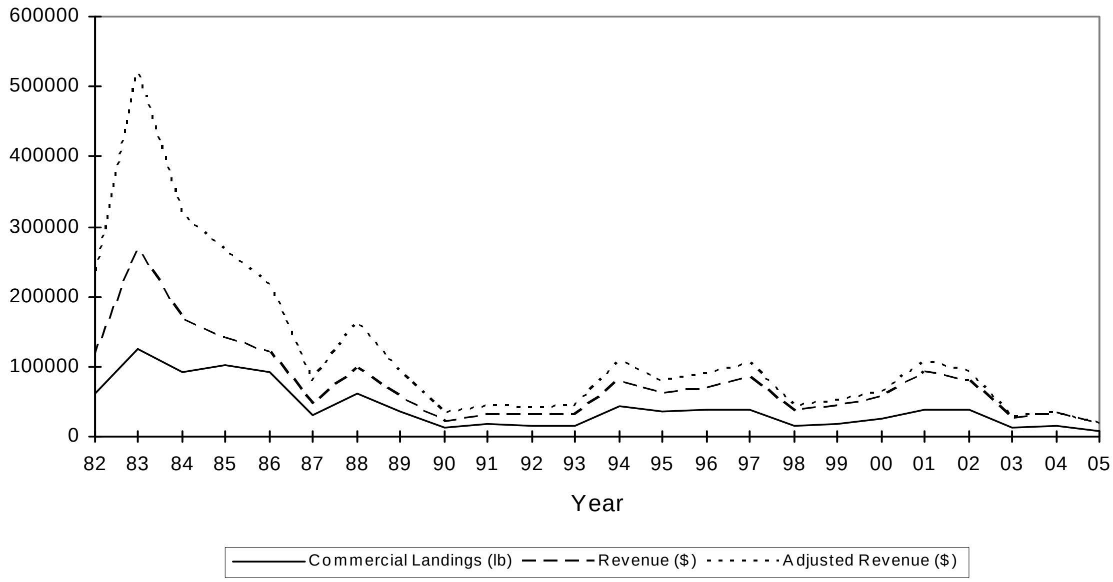


Figure 3-11. Bottomfish Landings and Value in American Samoa 1982 to 2005
Source: WPRFMC 2006

3.5.1.3.2. Precious Corals Fisheries – American Samoa

There are no known historical or current precious coral fisheries in American Samoa. MSY for precious corals around American Samoa has not been estimated.

To prevent overfishing and stimulate research on gold corals, fishing for, taking, or retaining any gold coral (live or dead) in any precious coral permit area is prohibited through June 30, 2013. This includes all EEZ waters of the Western Pacific Region. Additional research results on gold coral age structures, growth rates, and correlations between length and age will be considered by the Council and NMFS prior to the expiration of the 5-year moratorium.

3.5.1.3.3. Pelagic Fisheries – American Samoa

The harvest of pelagic fish has been a part of the way of life in the Samoan Archipelago since the islands were first settled some 3,500 years ago (Severance and Franco 1989). Subsistence fishing continues to the present, but the importance of pelagic fisheries as a source of income and employment is increasing. Commercial ventures are diverse, ranging from small-scale vessels having very limited range to large-scale vessels catching tuna in the EEZ and distant waters and delivering their catches to canneries based in American Samoa. Total pelagic landings by American Samoa based longline, troll, and handline vessels were approximately 11 million pounds in 2003 (Figure 3-12), with longline landings making up nearly 99 percent of this total (WPRFMC 2004a). During

2003, nearly 90 percent of these longline landings were albacore, with yellowfin, bigeye, and skipjack tuna making up the majority of the remainder (WPRFMC 2004a, 2004b). In 2004, there was a decrease in tuna landings of 19.2 percent and an increase of 12.4 percent in the total landings for other pelagic species (Figure 3-12; WPRFMC 2005).

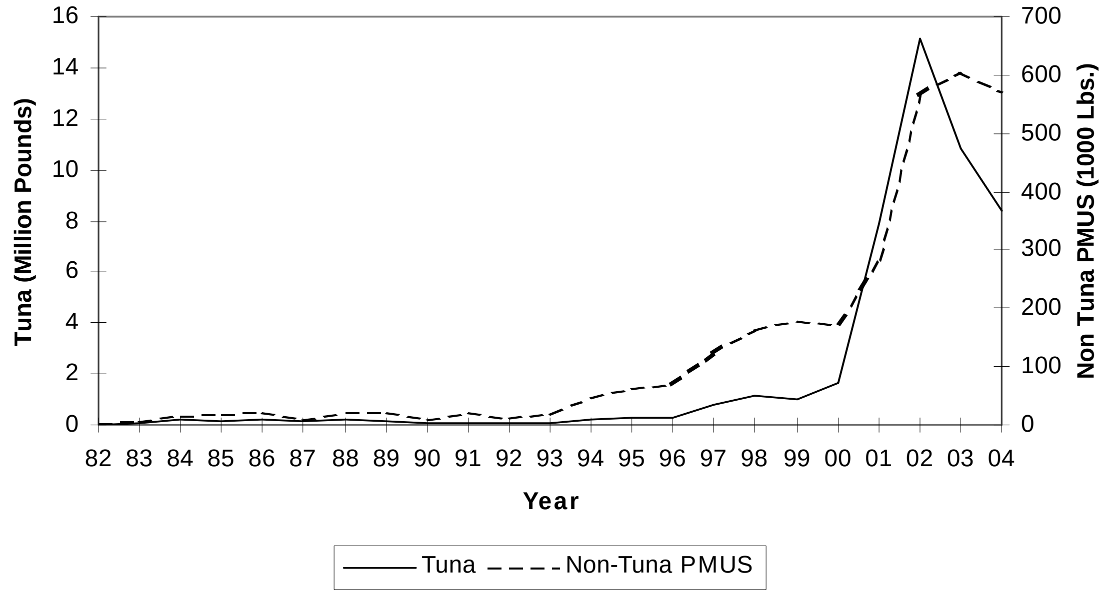


Figure 3-12. Tuna and Non-tuna PMUS Landings in American Samoa 1982 to 2004. Source: WPRFMC 2005.

3.5.1.3.3.1. Small-Scale Longline Fishery – American Samoa

Most participants in the small-scale domestic longline fishery are indigenous American Samoans with vessels under 50 feet in length, most of which are alia boats under 40 feet in length. The stimulus for American Samoa’s commercial fishermen to shift from troll or handline gear to longline gear in the mid-1990s (see Figure 3-12) was the fishing success of 28-foot alia catamarans that engaged in longline fishing in the EEZ around Independent Samoa. Following this example, the fishermen in American Samoa deploy a short monofilament longline, with an average of 350 hooks per set, from a hand-powered reel (WPRFMC 2000b). The number of alias fishing in American Samoa has decreased significantly in recent years, from 27 in 2002 to 9 in 2004 (WPRFMC 2005).

3.5.1.3.3.2. Large-Scale Longline Fishery – American Samoa

American Samoa’s domestic longline fishery expanded rapidly in 2001. Much of the recent (and anticipated future) growth was due to the entry of monohull vessels larger than 50 feet in length. The number of permitted longline vessels in this sector increased from three in 2000 to 30 by March 21, 2002 (DMWR, unpublished data). Of these, five permits (33 percent of the vessel size class) for vessels between 50.1 feet and 70 feet and five permits (33 percent of the vessel size class) for vessels larger than 70 feet were believed to be held by indigenous American Samoans as of March 21, 2002 (T. Beeching, DMWR, personal communication to P. Bartram, WPFMC Consultant, March 2002). Economic barriers have prevented more substantial indigenous participation in the large-scale sector of the longline fishery. The lack of capital appears to be the primary constraint to substantial indigenous participation in this sector (DMWR 2002).

While the smallest (less than or equal to 40 feet) vessels average 350 hooks per set, a vessel more than 50 feet long can set 5 to 6 times more hooks and has a greater fishing range and capacity for storing fish (8 to 40 mt as compared with 0.5 to 2 mt on a small-scale vessel). Larger vessels are also outfitted with hydraulically powered reels to set and haul mainline, and modern electronic equipment for navigation, communications, and fish finding. Most vessels are presently being operated to freeze albacore onboard rather than to land chilled fish. After the Hawaii longline swordfish fishery closure in 2000, a handful of Hawaii-based vessels relocated to American Samoa, but there are some vessels that move between Hawaii and American Samoa depending on market conditions. Large vessels have participated in the American Samoa longline fishery from diverse ports and fisheries, including the U.S. West Coast (six), Gulf of Mexico (three), and foreign countries (four under U.S. ownership; O'Malley and Pooley 2002). In 2004, 29 large vessels fished in the American Samoa EEZ (WPRFMC 2005). In 2005, the American Samoa limited entry longline program was established, requiring a limited entry permit to fish in the EEZ around American Samoa (70 FR 29646).

3.5.1.3.3.3. Distant-Water Purse Seine Fishery – American Samoa

The U.S. purse seine fleet operating in the central and western Pacific uses large nets to capture skipjack, yellowfin, and bigeye tuna near the ocean surface, in free-swimming schools and around fish aggregation devices (FADs) deployed by the fleet. These vessels often land their catches at canneries based in American Samoa. These large vessels (200–250 feet length) could not be economically operated for longline fishing, but some former participants in the U.S. purse seine fishery have acquired more suitable vessels and have participated in the American Samoa based longline fishery (NMFS 2001).

3.5.1.3.3.4. Distant-Water Jig Albacore Fishery – American Samoa

Domestic albacore jig vessels also supply tuna to the canneries in American Samoa. Since 1985, about 50 to 60 U.S. vessels have participated in the high-seas jig fishery for albacore. This fishery occurs seasonally (December to April) in international waters at 35° to 40° S latitude. The vessels range in length from 50 to 120 feet, with the average length about 75 feet. The vessels operate with crews of 3 to 5 and are capable of freezing 45 to 90 tons of fish (WPRFMC 2000).

3.5.1.3.3.5. Troll and Handline Fishery – American Samoa

From October 1985 to the present, catch-and-effort data in American Samoa fisheries have been collected through a creel survey that includes subsistence and recreational fishing, as well as commercial fishing. However, differentiating commercial troll fishing activity from noncommercial activity can be difficult.

Recreational fishing strictly for sport or pleasure is uncommon in American Samoa. Most fishermen normally harvest pelagic species for subsistence or commercial sale. However, tournament fishing for pelagic species began in American Samoa in the 1980s. Between 1974 and 1998, 64 fishing tournaments were held in American Samoa (Tulafono 2001). Most of the boats that participated were alia catamarans and small skiffs. Catches from tournaments are often sold, as most of the entrants are local small-scale commercial fishermen. In 1996, 3 days of tournament fishing contributed about 1 percent of the total domestic landings. Typically, 7 to 14 local boats carrying 55 to 70 fishermen participated in each tournament, which were held two to five times per year (Craig et al. 1993).

The majority of tournament participants have operated 28-foot alia, the same vessels that engage in the small-scale longline fishery. With more emphasis on commercial longline fishing since 1996, interest in the tournaments has waned (Tulafono 2001), and in 2001 the pelagic fishing effort shifted markedly from trolling to longlining (see Figure 3-13). However, with the recent decrease in alia longline activity, there are more alia available to go trolling, but the price of the gas is likely impeding trolling activity.

Catch-and-release recreational fishing is virtually unknown in American Samoa. Landing fish to meet cultural obligations is so important that releasing fish would generally be considered a failure to meet these obligations (Tulafono 2001).

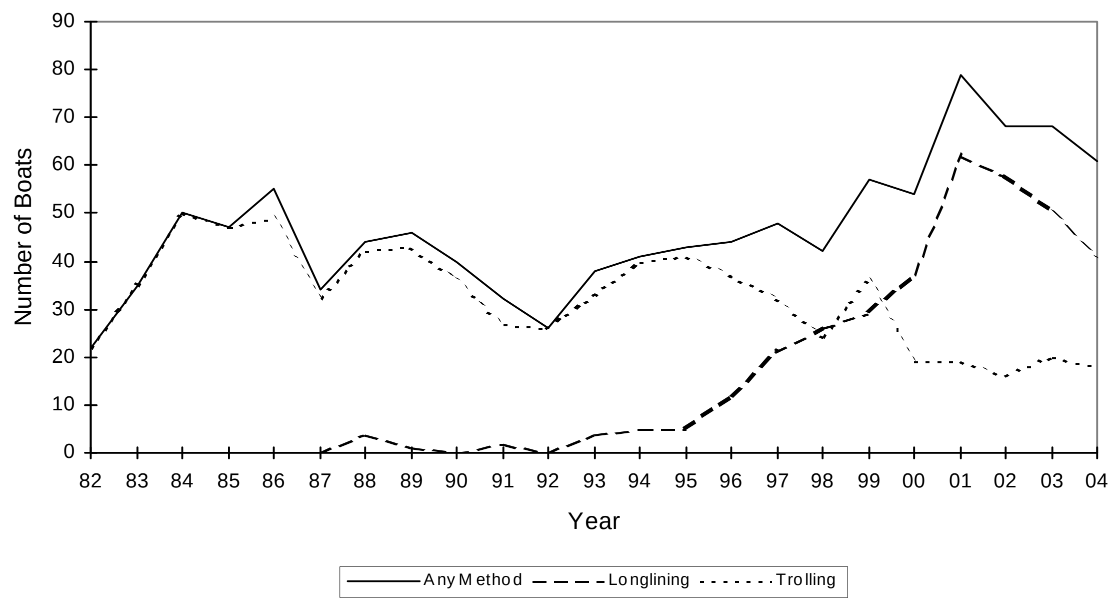


Figure 3-13. Trolling and Longlining in American Samoa.
Source: WPRFMC 2005.

American Samoa has been unable to develop a significant tourist industry that could support charter fishing (Territorial Planning Commission and Department of Commerce 2000). American Samoa is not known for producing large game fish. Few, if any, charter boats are in operation (Tulafono 2001), so no data are collected specifically for the charter fishing sector.

3.5.1.4. Communities – American Samoa

American Samoan dependence on fishing undoubtedly goes back as far as the peopled history of the islands of the Samoan Archipelago, about 3,500 years ago (Severance and Franco 1989). Many aspects of the culture have changed in contemporary times, but American Samoans have retained a traditional social system that continues to strongly influence and depend on the culture of fishing. Centered around an extended family (*aiga*) and allegiance to a hierarchy of chiefs (*matai*), the social system is rooted in the economics and politics of communally held village land. It has effectively resisted Euro-American colonial influence and has contributed to a contemporary cultural resiliency unique in the Pacific Islands region (Severance et al. 1999).

From the time of the Deeds of Cession to the present, despite increasing Western influences on American Samoa, native American Samoans have expressed a very strong preference for and commitment to the preservation of their traditional matai, aiga, and communal land system, which provides for social continuity, structure, and order. The traditional system is ancient and complex, containing nuances that are not well understood by outsiders (Territorial Planning Commission and Department of Commerce 2000).

Traditional American Samoan values still exert a strong influence on when and why people fish, how they distribute their catch, and the meaning of fish within the society. When distributed, fish and other resources move through a complex and culturally embedded exchange system that supports the food needs of aiga, as well as the status of both matai and village ministers (Severance et al. 1999).

Under the MSA, the islands of American Samoa are recognized as a fishing community. However, American Samoa's history, culture, geography, and relationship with the United States are vastly different from those of a typical community in the continental United States and are closely related to the heritage, traditions, and culture of neighboring independent Samoa. The seven islands that make up American Samoa were ceded in 1900 and 1904 to the United States and governed by the U.S. Navy until 1951, when administration was passed to the U.S. Department of the Interior. The DOI continues to provide technical assistance, represent territorial views to the federal government, and oversee federal expenditures and operations. American Samoa elected its first governor in 1978 and is represented by a nonvoting member of Congress.

Tutuila, American Samoa's largest island is the center of government and business and is home to 90 percent of the Territory's population which is estimated to be 63,000 people.

American Samoan natives born in the Territory are classified as U.S. nationals and are categorized as native Americans by the U.S. government (Territorial Planning Commission and Department of Commerce 2000). The population density is about 320 people/km^2, and the annual population growth rate is nearly 3 percent, with projected population doubling in only 24 years. The net migration rate from American Samoa was estimated as 3.75 migrants/1,000 population in the year 2000 (Central Intelligence World Fact Book 2005).

The only U.S. territory south of the equator, American Samoa is considered unincorporated because the U.S. Constitution does not apply in full, even though it is under U.S. sovereignty (Territorial Planning Commission and Department of Commerce 2000). American Samoa's vision for its future is not fundamentally different from that of any other people in the United States, but American Samoa has additional objectives that are related to its covenant with the United States, its own constitution, and its distinctive culture (Territorial Planning Commission and Department of Commerce 2000). A central premise of ceding eastern Samoa to the United States was to preserve the rights and property of the islands' inhabitants. American Samoa's constitution makes it government policy to protect persons of American Samoan ancestry from the alienation of their lands and the destruction of the Samoan way of life and language. It provides for protective legislation and encourages business enterprise among persons of American Samoan ancestry (Territorial Planning Commission and Department of Commerce 2000).

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 two fish canneries on Tutuila. These two primary income sources have given rise to a third: a service sector that derives from and complements the first two. In 1993, the latest year for which the American Samoan government compiled detailed labor force and employment data, the government employed 4,355 persons (32.2 % of total employment), two canneries 3,977 persons (29.4 %), and the remainder of the service economy 5,211 persons (38.4 %). As of 2000, there were 17,644 people 16 years and older in the labor force, of which 16,718, or 95 percent, were employed. [41]

A large proportion of the territory's work force is from Western Samoa, which is now officially called Samoa (Bank of Hawaii 2000). While it would be true to say that Western Samoans working in the territory are legal 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. Its estimated per capita income of $9,332 (male)[42] is almost twice the average for all Pacific Island economies, although it is less than half of the per capita

---

[41] http://www.census.gov/Press-Release/www/2002/amsamstatelevel.pdf
[42] Ibid

income in Guam, where proximity to Asia has led to development of a large tourism sector. Sixty-one percent of the population in 1999 was at or below poverty level.[43]

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 50 years old. 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 American Samoan government has estimated 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 (Bank of Hawaii 2000). 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 Galeai 1987). Even a substantial portion of the raw tuna processed by StarKist 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. 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).

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 with cannery deliveries by the U.S. purse seine fleet, U.S. albacore fleet, 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 domestic longline fishery is sold to the canneries.

Local fishermen have indicated an interest in participating in the far more lucrative overseas market for fresh fish. To date, however, inadequate shoreside ice and cold

[43] Ibid

storage facilities in American Samoa, as well as infrequent and expensive air transportation links, have been restrictive factors.

Using information obtained from industry sources for a presentation to the American Samoa Legislature (Faleomavaega 2002), canning the 3,100 metric tons of albacore landed in American Samoa by the domestic longline fishery in 2001 is estimated to have generated 75 jobs, $420,000 in wages, $5 million in processing revenue, and $1.4 million in direct cannery spending in the local economy. Ancillary businesses associated with the tuna canning industry also contribute significantly to American Samoa's economy.

American Samoa's position in the industry is being eroded by forces in the world economy and in the tuna canning industry itself. Whereas wage levels in American Samoa are well below those of the United States, they are considerably higher than in other canned tuna production centers around the world. To remain competitive, U.S. tuna producers are purchasing more raw materials, especially precooked loins, from foreign manufacturers. Tax benefits to U.S. canneries operating in American Samoa have also been tempered in recent years by the removal of a provision in the U.S. tax code that previously permitted the tax-free repatriation of corporate income in U.S. territories. Trends in world trade, specifically reductions in tariffs, are reducing the competitive advantage of American Samoa's duty-free access to the U.S. canned tuna market. In early 2009, one of the two canneries in American Samoa, Chicken of the Sea/Samoa Packing, announced that it would be shutting down operations. The cannery closure resulted in serious economic challenges for the government and communities of American Samoa.

Despite the long history of the tuna canning industry in American Samoa, processing and marketing of pelagic fish by local enterprises have not yet developed beyond a few short-term pilot projects. However, the government's comprehensive economic development strategy (Territorial Planning Commission and Department of Commerce 2000) places a high priority on establishing a private sector fish processing and export operations.

3.5.2. Commonwealth of the Northern Mariana Islands

Located between 14˚ and 21˚ N, the Commonwealth of the Northern Mariana Islands (CNMI) encompasses 14 islands and many banks stretching over 400 nautical miles (760 km) in a north–south direction. The total land area of all 14 islands is approximately 477 square kilometers. Within the EEZ and approximately 120 nautical miles west of the island chain, is the West Mariana Ridge, a line of seamounts running parallel to the main islands. The islands north of Saipan are called the northern islands; several of these are designated as wildlife conservation areas, including the islands of Uracas, Maug, Ascunsion, and Guguan. Seamounts in the West Mariana Ridge include Pathfinder Reef, Bank D, Bank C, and Arakane Reef. Comprised of raised limestone and classified as geologically "older," the southern islands include Rota, Aguijan, Tinian, Saipan, and Farallon de Medinilla. The southern islands include White Tuna Reef, ESE Reef, and Sonome Reefs – all north of Farallon de Medinilla.

The "younger" and still volcanically active northern islands include Anatahan, Sarigan, Guguan, Alamagan, Pagan, Agrihan, Asuncion, Maug, and Farallon de Pajaros. The northern islands also include the following: Uracas Bank north of Uracas, Pakapaka Reef, Malakis Reef, 300 Reef, Dump Coke Bank, and Zealandia Banks – all south of Anatahan. More than 99.5 percent of the population occurs on the southern islands of Saipan, Tinian, and Rota, with 89 percent living on Saipan (U.S. Census Bureau 2000). Aguijan is the only uninhabited southern island.

The CNMI archipelago lies within the tropical zone. The average air temperatures are consistently around 80° F, with little variation. Prevailing winds in the CNMI are northeasterly trade winds, averaging near 10 knots; however, southeasterly winds are observed in summer months, and west and northwesterly winds are observed during winter months. Average annual rainfall in the southern islands and the northern islands is around 82 inches and 75 inches, respectively. Because of the Mariana Islands' position in the western Pacific, typhoons occur almost every year in the vicinity (Eldredge 1983).

3.5.2.1. Marine Environment - CNMI

3.5.2.1.1. Coral Reefs - CNMI

The total coral reef area in CNMI is 124 square kilometers within the 10-fm curve and 476 square kilometers within the 100-fm curve (Rohmann et al. 2005). The older southern islands have fringing and/or barrier reefs, while the volcanically active northern islands have relatively little coral reef (Eldredge 1983).

The southern islands support a variety of marine habitat types. Saipan's potential coral reef area within the 10-fathom contour is 58 square kilometers and includes fringing reefs, inshore and offshore patch reefs, and a well-developed barrier reef/lagoon system along most of the leeward coast (Eldredge 1983, Gourley 1997, Rohmann et al. 2005). Saipan Lagoon also comprises some large areas of well-developed seagrass beds, as well as a small area of mangroves (Gourley 1997).

The coral reefs within the 10-fathom curve of Rota (12 km^2), Tinian, and Agrijan (18 km^2) are less well developed than those on Saipan, and are generally restricted to small fringing reef systems (Eldredge 1983, Gourley 1997, Rohmann et al. 2005). Generally, the coral reefs around Tinian are more developed on the western (leeward) coastline and have greater species diversity than those on the eastern (windward) coast which receive more force from breaking waves (PSDA 1997). Rota also has some well-developed reefs, especially in Sasanhaya Bay on the south side, and some offshore reefs on the north and west sides of the island (PSDA 1997).

Farallon de Medinilla is an uninhabited island with 2 square kilometers of potential coral reef area within the 10-fathom curve (Rohmann et al. 2005). The island has been used as a military bombardment range for the last 30 plus years (Eldredge 1983, PSDA 1997, Starmer et al. 2005). In general, there is no fringing reef or shallow coastal zone because deep water surrounds much of the island and the submarine slope appears to be very steep (PSDA 1997). There is a coral reef platform approximately 30 to 100 ft wide on the southwest side of the island and some well-developed wall structures in the nearshore areas of Farallon de Medinilla. The combination of this vertical profile and wave action on the windward side of the island probably explains the limited coral reef biota in shallow water on that side (PSDA 1997). As such, marine resources are mostly concentrated on the leeward side of the island, where the substrate drops gradually seaward (PSDA 1997).

The northern islands are relatively young (1–1.5 million years) and include active volcanoes on the islands of Pagan (erupted in 1981), Anatahan (erupted in 2003), Guguan, Asuncion, Agrihan and Uracas (Asakura et al. 1994). In general, reef development is poor or nonexistent on the northern islands (Eldredge 1983), with Pagan having the greatest potential coral reef area at 11 square kilometers within the 10-fathom curve (Rohmann et al. 2005). Most of the reefs that do exist tend to be narrow, rocky reefs on steep slopes, with coral communities growing on volcanic substrata because there is little true coral reef development (Birkeland 1997b, Donaldson 1995, Eldredge 1983). However, there are a few small “embryonic” or “apron” reefs on these islands, which may have some reef formation but do not reach sea level (Birkeland 1997b). These include areas at depths of greater than 25 meters at western Anatahan, southern Sarigan, and parts of Pagan (Donaldson 1995, Donaldson et al. 1994). Eldredge et al. (1977a) also reported a well-developed fringing reef on the west side of Maug.

These differences in the development of reefs throughout the Mariana Islands appear to be related to the age and geology of the islands, because coral growth is just as vigorous in both the north and south (Birkeland 1997b). For example, geological faulting of large areas in the older Southern Marianas (e.g., west coast of Saipan) has created large, oblique, shallow water surfaces, which have supported extensive reef growth and the development of reef flats and lagoons over time (Birkeland 1997b). In contrast, the islands in the north are younger with quite vertical profiles, which do not provide the basis for extensive reef development (Birkeland 1997b).

Low-to-moderate numbers of crown-of-thorns starfish (*Acanthaster planci*), a coral-eating starfish, are believed to have been responsible for substantial coral mortality on some reefs around Saipan over the past two decades. This includes areas in Saipan Lagoon (Duenas and Swavely 1985, Richmond and Matson 1986), the Obyan-Naftan area (Randall et al. 1988), and Laulau Bay (PBEC 1984).

Starfish outbreaks have also been recorded on the other islands, including occasional small-scale outbreaks on Rota since the 1980s (CRM 1996). There have also been reports of starfish causing damage to reefs on the northern islands of CNMI, including Maug and Alamagan (Eldredge 1983).

The CNMI’s coral reefs have experienced some damage from the frequent typhoons in the area, and coral bleaching has occurred in 1994, 2001, and 2003. In addition, coral reefs in some locations appear to have been affected by human activities, including fishing, sedimentation, and nutrient loading (Starmer et al. 2005).

Available information suggests that the current condition of the coral reefs in the southern islands of the CNMI is quite variable (Starmer et al. 2005). Most appear to be in good condition, except in some heavily populated areas where the reefs have been degraded by human activities. A major management focus is the reefs in Saipan Lagoon, because the surrounding area encompasses nearly all of the Commonwealth’s population, tourism industry, commercial activity, subsistence fishing, and water-oriented recreation (Duenas and Swavely 1985).

In general, it appears that the reefs in the northern islands are also in good condition because of their isolation from human population centers (Birkeland 1997b). The exceptions are localized areas that may have been affected by volcanic or military activities (e.g., Pagan and Farallon de Medinilla).

3.5.2.1.2. Deep Reef Slope, Banks, and Seamount Habitat- CNMI

A total of 579 square kilometers of banks and reefs has been estimated in the EEZ surrounding the CNMI (Hunter 1995). Of this area, 534 square kilometers are outside 3 nautical miles. The submerged seamounts 120 nautical miles west of the emergent islands have been estimated to have a total of 50 to 60 square kilometers of viable habitat to support bottomfish populations (WPRFMC 2005).

3.5.2.1.3. Pelagic Habitat - CNMI

Generally, the major surface current affecting the CNMI is the North Equatorial Current (see Figure 3-4), which flows in a westward direction through the islands. The Subtropical Counter Current affects the northern islands, and currents there generally flow in an easterly direction (Eldredge 1983). Depending on the season, sea surface temperatures near the Northern Mariana Islands vary between 80.9° and 84.9° F. The mixed layer extends to between depths of 300 and 400 feet (Eldredge 1983).

3.5.2.2. Protected Species - CNMI

3.5.2.2.1. Sea Turtles - CNMI

Both green and hawksbill turtles are known to occur in waters around the CNMI and leatherback and olive ridley sea turtles are believed to occasionally transit the area (Starmer et al. 2005).

3.5.2.2.2. Green Sea Turtle

Based on nearshore surveys conducted jointly by the CNMI Division of Fish and Wildlife (DFW) and NMFS around the Southern Islands (Saipan was surveyed in 1999 and Rota and Tinian in 2001), it was estimated that 1,000–2,000 green sea turtles forage in these areas (Kolinksi et al. 2004). The green sea turtle is a traditional food of the native population, and although harvesting them is illegal, divers have been known to take them at sea and others have taken nesting females (NMFS and USFWS 1998a). Turtle egg poaching occurs in the CNMI. Nesting beaches and seagrass beds on Tinian and Rota are in good condition, but beaches and seagrass beds on Saipan have been impacted by hotels, golf courses, and general tourist activities.

3.5.2.2.3. Hawksbill Sea Turtle

Although hawksbill turtles have occasionally been sighted in the past around the CNMI, they were not observed in a detailed assessment conducted in 1999, nor were they observed in ten aquatic surveys along the shores of Tinian in 1995. According to the 1998 Pacific Sea Turtle Recovery Team Recovery Plan for the hawksbill turtle (NMFS and USFWS 1998b), there are no reports of hawksbill nesting in the CNMI. This does not rule out the possibility of a few hawksbill nests as nesting surveys on small pocket beaches in remote areas of the CNMI have never been done. A single hawksbill sighting occurred in 1996 during the detonation of a piece of unexploded ordinance off of Rota. The turtle was recovered near the explosion site and subsequently died of internal injuries that were the result of the blast (Trianni 1998).

3.5.2.2.4. Marine Mammals and Seabirds – CNMI

3.5.2.2.4.1. Cetaceans

Humpback whales (*Megaptera novaeangliae*) and sperm whales (*Physeter macrocephalus*) are known to appear between Saipan and Farallon de Medinilla. Sightings of Risso’s dolphin (*Grampus griseus*), Cuvier’s beaked whale (*Xiphias cavirostris*), pygmy sperm whale (*Kogia breviceps*), pilot whale (*Globicephala melaena*), striped dolphin (*Stenella coeruleoalba*), and the pan-tropic whitebelly spinner dolphin (*Stenella longirostris longirostris*) occur in the waters around the CNMI.

3.5.2.2.4.2. Pinnipeds and Sirenians

No pinniped or sirenian species are known to occur in CNMI waters**.**

3.5.2.2.4.3. Seabirds

According to Pratt et al.(1987), the following seabirds that are known to interact with fisheries operations have been sighted and are considered residents of the CNMI: wedge-tailed shearwater (*Puffinus pacificus*), white-tailed tropicbird (*Phaethon lepturus*), red-tailed tropicbird (*Phaethon lepturus*), masked booby (*Sula dactylatra*), and brown booby (*Sula leucogaster*).

The following seabirds have been sighted and are considered visitors to the CNMI: streaked shearwater (*Calonectris leucomelas*), short-tailed shearwater (*Puffinus tenuirostris*), Christmas shearwater (*Puffinus nativitatis*), Newell's shearwater (*Puffinus auricularis*), Audubon's shearwater (*Puffinus iherminieri*), Leach's storm-petrel (*Oceanodroma leucorhoa*), Matsudaira's storm-petrel (*Oceanodroma matsudairae*), and the red-footed booby (*Sula sula*). Of these, only the Newell's shearwater is listed as endangered. There have been no sightings of the endangered short-tailed albatross (*Diomedea albatrus*) in the CNMI, although the CNMI is within the range of the only breeding colony at Tora Shima Island, Japan.

3.5.2.3. Fisheries of CNMI

Under the authority of the MSA, the Council established (and the Secretary of Commerce approved) criteria to determine overfishing (fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region. Currently, no fishery in the CNMI has been determined by NMFS to be experiencing overfishing or to be overfished.[44] For more information on these fisheries see the additional NEPA analyses listed in Section 3.4.1.

3.5.2.3.1. Demersal Fisheries - CNMI

3.5.2.3.1.1. Coral Reef Fisheries - CNMI

Coral reef fisheries in the CNMI occur year-round and mostly around the Southern Islands of Saipan, Rota, and Tinian. Finfish and invertebrates are the primary targets, but small quantities of seaweed are also taken. In 2003, commercial landings of coral reef fish were approximately 136,000 lb and included harvests of parrotfish, surgeonfish, goatfish, snappers, and emperors. Little is known of the coral reef fisheries in the northern islands of the CNMI, but the catch is believed to be minor. In 1995, the nearshore reefs around six of the northern islands (especially Anatahan and Sarigan) were fished commercially for several months. During that time, these areas yielded over 30,000 lb of reef fish and 380 hand-harvested spiny lobsters.

Several hundred to thousands of fishermen fish for coral reef species in the CNMI, but only a small portion of them fish commercially. The fishery consists mostly of

[44] Status of U.S. Fisheries, 2005. http://www.nmfs.noaa.gov/docs/Report_text_FINAL3.pdf

recreational and subsistence fishermen (i.e., those who do not sell, barter, or trade their catch). In 2007, about 125 fishermen sold reef fish on Saipan (no data collected from Rota or Tinian), but the number of actual fishermen may be higher because many fishermen consolidate their fish and sell them under one name, and not all commercial fishermen report to CNMI Division of Fish Wildlife (Ray Roberto, CNMI DFW, personal communication, 2008).

Upwards of 150 vessels may be involved in the commercial coral reef fishery, many of which also participate in the bottomfish fishery. These vessels range in size from small, human powered vessels to mid-sized vessels (less than 30 ft in length), and occasionally larger vessels (over 30 ft in length).

Most commercial coral reef fishing is done by free divers using spears. (Spearfishing with scuba is illegal in the CNMI.) Divers and hook-and-line fishermen target coral reef species, either from shore or from boats. Hook-and-line fishermen typically use spinning rods and reels with light test monofilament lines (less than 50 lb test) with 1 to 4, small J-style hooks (much smaller than those used in the bottomfish fishery). Throw nets are the only nets legally allowed in the inshore waters of the CNMI without a special permit. Gill nets and surround nets are occasionally used for special occasions, but require a special permit, and the nets are required to be tended constantly (Ray Roberto, CNMI DFW, personal communication, 2008). The commercial coral reef fishery also includes about 10 charter vessels that take tourists to fish for coral reef species. These vessels fish using hook-and-line with one line per customer, and 2-4 J-style hooks per line. The CNMI is currently re-establishing an inshore creel survey program at Saipan Lagoon to improve data on the coral reef fishery.

Generally, coral reef fisheries in the CNMI are believed to be in good condition, but local depletion likely occurs in some areas of Saipan (Starmer et al. 2005). MSY has not been estimated for the CNMI coral reef fishery.

3.5.2.3.1.2. Crustacean Fisheries - CNMI

The CNMI crustacean fisheries consist primarily of a nearshore lobster fishery, but a short-lived deepwater shrimp (*Heterocarpus* spp.) fishery was active during the 1980s and could resume in the future.

The CNMI commercial lobster fishery is small and monitoring is based on voluntary reporting to the CNMI DFW. Reported commercial landings in 2004 totaled 1,337 kg and were worth an estimated $19,408. However, because the number of participants in the lobster fishery is not well known, the unreported commercial and recreational catch could increase these figures. Reported catches are taken almost exclusively within 3 nm of the inhabited southern islands. The fishery primarily targets spiny lobster in shallow waters. Because the bathymetry typically drops off steeply, most lobster habitats are relatively small and very close to shore. Thus, the vessels typically used in the CNMI commercial lobster fishery are small, usually less than 9.1 m long, and the typical trip length is less than a day.

Because lobsters do not readily go into traps in the Marianas, most lobster harvest in the CNMI is done by hand, incidental to spear fishing. Some lobsters are also taken from the reef surrounding Farallon de Medinilla in the Northern Islands. There, bottomfish fishermen occasionally dive for lobsters, mostly for personal consumption, while anchored overnight. The directed commercial fishery is relatively small, with 493 pounds of commercial landings estimated for 2003 (NMFS 2004b). However, unreported commercial and noncommercial catches could raise this figure.

A second fishery for crustacean species occurred in the 1990s, mostly on grounds around Saipan and Tinian. The fishery trapped deepwater shrimp, with fishing occurring on flat areas near steep banks at depths greater than 350 meters (Ostazeski 1997). Two fishing companies began fishing for deepwater shrimp in May of 1994. Three species of pandalid shrimp are known to occur at varying depths around the Mariana Archipelago: *Heterocarpus ensifer* (366–550 m), *H. laevigatus* (550–915 m), and *H. longirostris* (> 915 m). *H. laevigatus* is the largest and the most commercially valuable species. Subsequently, it is the most targeted.

Amendment 13 to the Crustacean FMP designated deepwater shrimp of the genus *Heterocarpus* as management unit species under the FMP, and required Federal permits and reporting for deepwater shrimp fishing in the U.S. EEZ, including the CNMI (WPRFMC 2008a). The species complex includes all eight species of deepwater shrimp in the western Pacific (*Heterocarpus ensifer, H. laevigatus, H. sibogae, H. gibbosus, H. lepidus, H. dorsalis, H. tricarinatus* and *H. longirostris*). The monitoring program (permits and logbooks) is intended to improve understanding of these fisheries and their impact on marine ecosystems. Although currently there are no resource concerns regarding western Pacific deepwater shrimp, the designation of these shrimp as management unit species provides a basis for management of the fisheries, if warranted in the future.

Deepwater shrimp fisheries have been sporadic and short-lived throughout the Pacific since the 1960s (Hastie and Saunders 1992). The fisheries have been unregulated, and there has been no comprehensive collection of information on the fishery. Most of these fishing ventures have been unprofitable. The reasons for this are manifold. Gear loss has been a common problem and made many past ventures unprofitable. A second difficulty is the short shelf life and a history of inconsistent product quality, leading to fluctuating market demand for the product. Lastly, these fisheries generally experience local depletion on known fishing grounds, which leads to much lower catch rates. While other banks might have abundant stocks, unfamiliarity with them could lead to even greater gear loss.

Traps are the primary method used to harvest deepwater shrimps in the western Pacific, but must comply with gear provisions that reduce bycatch. Trawls do not work well in areas with the steep bathymetry that is typical for the region, and are prohibited by fishery regulations in the Western Pacific Region. Several types of traps have been used.

Some consist of a steel frame that is covered with wire or plastic mesh, or with netting. Some are boxes made of plastic-coated wire mesh panels or formed plastic shells.

Trap shapes include boxes, ovals, half-cylinders, and pyramids. The traps used in the Hawaiian Islands have been 0.91 m tall pyramids with 1.83 m^2 bases, with a single entrance at the top. Two types of traps have been used in the CNMI. One type was a hinged plastic 1.22 by 0.91 m oval shell about 0.61 m tall, with an entrance on each side. The other trap consisted of a light weight metal frame covered with netting. Trap entrances are funnel shaped and inward pointing. The small end of the entrance is about 15.24 cm wide.

Traps have typically been baited with mackerel, set during the day, left out overnight, and recovered the next day. The traps in Hawaii were deployed individually, whereas in the NMI, several traps were deployed strung out on a line. Traps are connected to the surface by long float lines and marked with buoys. Hawaiian traps used 1.91 cm polypropylene float lines with two large floats spaced several yards apart on the surface.

Typically, fishery operations consisted of one to four vessels. Vessels lengths ranged from 7.5 to 40 m. Based on the Hawaii fishery, a 30-meter vessel could carry about 50 traps, but typically set about 30 traps per night.

Between May of 1994 and February of 1996, 12,160 kilograms of deepwater shrimp were landed in the CNMI. Of these, more than 97 percent were *Heterocarpus laevigatus*, with the remainder being *Heterocarpus ensifer*. Bycatch included a few deepwater eels (*Synaphobranchus* spp.) and dogfish sharks. A large number of two species of Geryonid crabs were also caught. The crabs are a marketable incidental catch and could contribute to the success of any deepwater shrimp fishery. Strong currents, rough bottom topography, and fishing depth all contribute to the potential for gear loss, which has been experienced by this fishery in the past.

Shrimp trapping was conducted at 22 islands and banks during the NMFS Resource Assessment Investigations of the Mariana Archipelago (RAIOMA) cruises. Depth and area distribution were observed for the three major species of pandalid shrimp. Average size, size at maturity, reproductive cycles, and sex ratios were analyzed and determined. Growth and mortality were also calculated. From analysis of catch-per-unit effort, determination of suitable habitat and the above parameters, total biomass and sustainable yield were calculated.

The CNMI DFW conducted a data collection project specifically for the deepwater shrimp fishery between May of 1994 and June of 1995. Catch-and-effort data were gathered for both types of traps, as well as bycatch data. Depth ranges for the fishery as well as depth of greatest abundance were recorded. Sex ratios and reproductive cycles were determined from 1,533 *H. laevigatus* examined (Ostazeski 1997). Research has also been conducted to create a depletion model that would estimate catch ability and help determine the commercial viability of this fishery. Moffitt and Polovina (1987) estimated

676.6 tons of *Heterocarpus laevigatus* biomass and an MSY of 162 tons per year for the combined EEZ waters around Guam and CNMI.

3.5.2.3.1.3. Bottomfish Fishery - CNMI

The bottomfish fishery can be broken down into two sectors: shallow water (100 to 500 ft) and deepwater (greater than 500 ft). There are approximately 150 local small vessels (less than 24 ft) used for commercial, subsistence, and recreational fishing. Generally, fewer than ten vessels between 30 and 60 ft sporadically participate in the deepwater bottomfish fishery. In 2006 there were six active vessels, and in 2007 only one was active in the fishery.

The shallow water fishery is mostly commercial, but also includes subsistence fishermen. Shallow water bottomfish fishermen primarily target the redgill emperor (*Lethrinus rubrioperculatus*) and reef fishes. Most small-scale fishermen navigate without a Global Positioning System (GPS), fathometer, or nautical charts, instead relying on landmarks to locate fishing areas. Fishermen deploy their fishing lines as hand lines, or use home-fabricated hand reels or electric reels. This type of fishing usually results in a lower catch-per-unit-effort (CPUE) as compared to other fishing techniques such as pelagic trolling. Many of these fishermen make multi-purpose trips, trolling on their way to reefs where they fish for shallow water bottomfish and reef fish. Fishing trips are usually conducted during daylight hours, with vessels returning before or soon after sunset. Vessels that fish in the northern islands tend to make multi-day trips because of the travel time required to access the fishing grounds. Because reef fish are worth more now than in previous years, an increasing number of small-scale fishermen are targeting reef species rather than bottomfish.

Vessels 30 ft and larger in length are primarily commercial, and target deepwater snappers, such as species in the genera *Etelis* and *Pristipomoides*, and groupers such as *Epinephelus octofasciatus*. These vessels are commonly referred to as “highliners.” In 1997, two large vessels began fishing for deepwater bottomfish in the northern islands. Since then, effort has fluctuated between two and six vessels, with four to six vessels over 40 ft fishing for bottomfish around the CNMI each year between 2000 and 2006. In 2007, there was one vessel active in this fishery. These vessels are capable of fishing trips up to 10 days long. They tend to focus their effort around CNMI’s northern islands as far north as Pagan Island and Zealandia Bank, but are also known to fish in waters around the southern islands and nearby banks like Esmeralda. Two trips per month is average during the non-summer months, with vessels increasing their activity to three trips per month during the summer.

The basic bottomfish gear configuration consists of a main line with a 5 to 10 lb weight attached to the end and several 1.5 ft long branchlines with circle hooks attached above the weight at 1.5 to 3 ft intervals. Most fishermen use braided Dacron mainlines, but some still use monofilament. Circle hooks are preferred because they are self-setting and they are less prone to snag on the bottom. Squid or cut fish are preferred baits. A chum bag containing chopped bait may also be suspended above the highest hook to attract fish. The gear is dropped to the bottom, and retrieved only after several fish are hooked.

The fishing configuration used on vessels smaller than 30 ft varies, and available information is mostly anecdotal. In most cases, there are two fishermen and two lines per boat with 6-12 circle hooks per line. Hook size varies, depending on the depth fished and the species targeted, but 8/0 to 18/0 hooks are most common. Although some handlines and home-built hand reels are still used, most fishermen use electric reels to deploy and recover fishing lines, which are typically braided Dacron, although some still use monofilament line.

Large bottomfish vessels are typically equipped with GPS, fathometers, and up to eight electric or hydraulic reels that deploy braided Dacron lines with 20 to 30 circle hooks per line. Hook size varies, but 18/0 hooks are commonly used.

Landings of bottomfish decreased in 2002 (34.3 percent fewer pounds in 2002 than in 2001) from the fishery's 2001 peak landings, but increases in landings were observed in 2004 (see Figure 3-14). This fishery continues to show a high turnover with changes in the highliners participating in the fishery and an increased number of local fishermen focusing on reef fishes in preference to bottomfishes. Fishermen are also moving towards an increasing number of multi-purpose trips that focus primarily on reef fishes and catch pelagic species while in transit. In doing so, the shallow water bottomfish complex continues to be exploited, but as part of the exploitation of reefs near the populated islands. Redgill emperor ("mafute") is the most frequently harvested and easily identified species in this complex, although a variety of snappers and groupers are also harvested (M. Trianni, DFW, personal communication).

Over the last 6 years, 64 percent of mafute fishermen and 62 percent of onaga fishermen making commercial sales participated for only a single year, and no fishermen participated in all six years (regardless of how small the sales) (WPRFMC 2005). Fishermen utilizing larger vessels have greater access to the deepwater bottomfish resources, especially in the northern islands of the CNMI. However, this sector of the industry requires more investment, consistent long-term effort, and knowledge to recoup start-up costs than does the shallow water bottomfish sector. This industry could continue to expand with support from a training program in bottomfishing that addresses the following: proper fish handling and maintenance of product quality; use of fathometers, nautical charts, and modern electronic equipment such as global positioning systems (GPS), fish finders, and electric reels; anchoring techniques; marketing; and financial planning. Moreover, side-band sonar mapping of the banks used by commercial fishermen from Farallon de Medinilla to Rota should assist the growth of this sector (M. Trianni, DFW, personal communication). It is estimated that in 2005, 70,034 lb of commercial landings of bottomfish were made, with a total ex-vessel value of $189,478 (see Table 3-4; WPRFMC 2005).

Table 3-4. Bottomfish Landings in CNMI 1983 to 2003.

Year	Landings Total (Lb)	CPUE (Lb/Trip)	CPI	CPI Adjusted Revenue ($)	CPI Adjusted Price ($/Lb)	Number of Fishermen
1983	28,529	43	140.90	97,052	3.40	90
1984	42,664	70	153.20	131,265	3.08	101
1985	40,975	117	159.30	117,717	2.87	62
1986	29,911	104	163.50	93,538	3.13	55
1987	49,715	169	170.70	142,838	2.87	46
1988	47,313	181	179.60	130,336	2.75	28
1989	24,438	73	190.20	73,965	3.03	31
1990	12,927	81	199.33	42,354	3.28	33
1991	7,093	47	214.93	25,281	3.56	19
1992	10,598	59	232.90	30,877	2.91	36
1993	18,461	84	243.18	52,235	2.83	20
1994	25,469	74	250.00	76,905	3.02	32
1995	36,101	93	254.48	128,991	3.57	34
1996	66,387	119	261.98	230,216	3.47	71
1997	64,143	137	264.95	217,078	3.38	68
1998	59,022	148	264.18	206,111	3.49	50
1999	55,991	156	267.80	204,633	3.65	53
2000	45,258	56	273.23	128,120	2.83	72
2001	71,256	68	271.01	218,462	3.07	74
2002	46,765	101	271.55	135,146	2.89	53
2003	41,903	89	268.92	120,315	2.87	59
2004	54,474	104	271.28	142,362	2.61	43
2005	70,034	76	271.90	189,478	2.71	62
Average	41,279	98		127,908	2.60	52
Standard Deviation	19,101	39		61,905	0.61	22

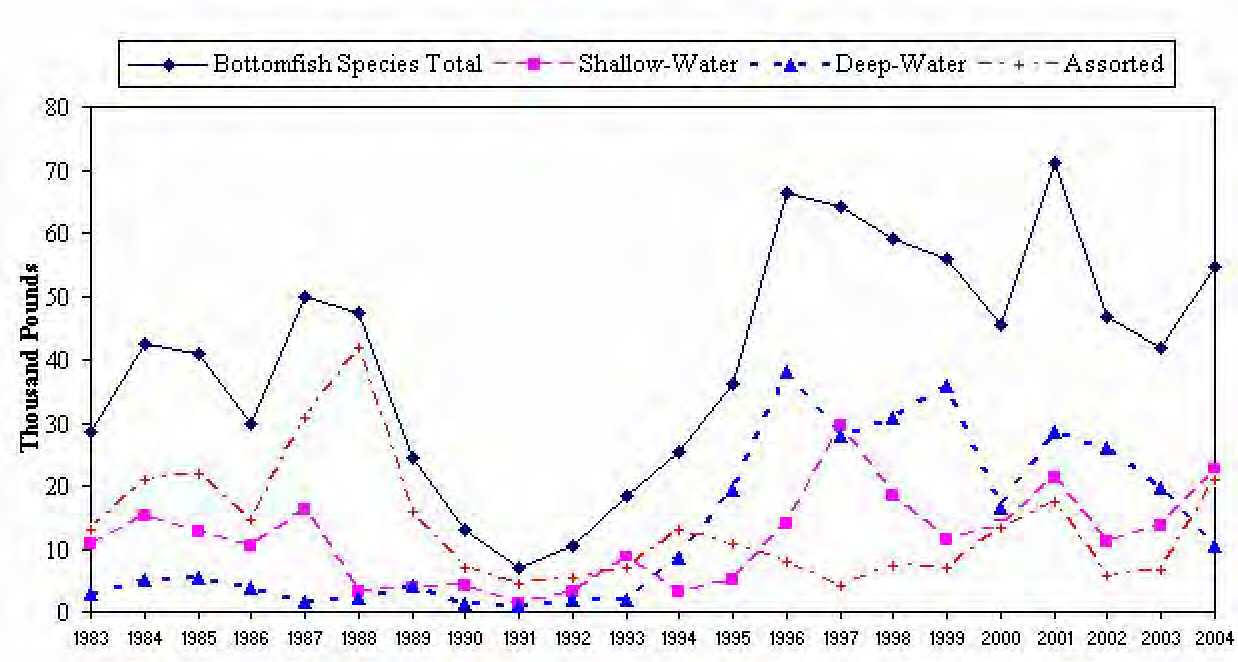


Figure 3-14. Bottomfish Landings in CNMI 1983 to 2003.
Source: WPRFMC 2005.

Commercial landings of shallow water bottomfish appear to have peaked between 1996 and 2001 and were again headed upwards in 2004 and 2005. It is likely that there was a comparable peak in landings between 1984 and 1987, but this result is difficult to discern because of the large number of bottomfish that were categorized as “assorted bottomfish” during the earlier period. Commercial landings of emperor (mafute' of the family Lethrinidae) have fluctuated widely over the last 20 years, particularly over the last eight years. In 2002, commercial landings of mafute' fell below the 20-year mean to their lowest level since 1995. In 2003 they increased slightly but remained below the 21-year mean. In 2004 commercial mafute' landings increased by 136 percent from 2003 and they increased again by 18 percent in 2005.

Table 3-5 provides a summary of commercial bottomfish landings from the CNMI fishery over time. Commercial landings of jacks from shallow areas (itemized as “jacks,” amberjack [*Seriola dumerili*], giant trevally [*Caranx ignobilis*], brassy trevally [*C. papuenis*], and black jack [*C. lugubris*] on the sales invoices) appear to have slowly increased over the last 10 years, with the highest landings reported in 2003. Commercial landings of jacks were up 57 percent in 2002 but were down 87 percent by 2004. However 2005 landings increased by 313 percent. The category “jacks” includes any carangids sold and includes both BMUS species and *Carangoides orthogrammus*, *Caranx melampygus*, *C. papuensis*, and *C. sexfasciatus*. Commercial landings of amberjack were slightly lower in 2005 than the previous year. Giant trevally and black jack were reported in 2002 for the first time and brassy trevally was reported in 2003 for the first time, both likely as a result of being added to the new sales invoice.

Jobfish (*Aprion virescens*) have been reported in eight of the last 20 years, and 2004 commercial landings were the highest ever reported, surpassing the previous year by 100 percent. Commercial uku landings were down slightly in 2005 and landings of blueline snapper (*Lutjanus kasmira*) and humpback snapper (*Lutjanus gibbus*) were much higher than last year, but these species are often lumped within assorted reef fishes and so this increase may be overstated.

Table 3-5. CNMI Commercial Landings of Bottomfishes in Pounds.

year	btm_as	empr	jack_as	amber	giant_j	brass_j	blk_jack	uku	jack_s	taape	snapr
1983	12,998	9,555	1,031	0	0	0	0	0	1,031	0	175
1984	20,971	13,925	906	0	0	0	0	0	906	0	259
1985	21,904	11,676	962	135	0	0	0	81	1,098	0	81
1986	14,528	9,250	818	0	0	0	0	363	818	0	363
1987	30,929	15,568	607	0	0	0	0	0	607	0	0
1988	41,823	3,078	0	0	0	0	0	0	0	0	0
1989	15,891	3,963	0	0	0	0	0	0	0	0	0
1990	6,931	4,021	0	0	0	0	0	0	0	0	0
1991	4,296	1,212	175	0	0	0	0	0	175	0	0
1992	5,543	2,338	337	0	0	0	0	450	337	0	450
1993	7,055	8,083	454	0	0	0	0	0	454	0	0
1994	13,002	1,870	1,169	0	0	0	0	16	1,169	0	16
1995	10,779	4,276	596	0	0	0	0	171	596	0	171
1996	7,846	11,990	1,697	0	0	0	0	152	1,697	0	152
1997	3,998	25,445	3,482	0	0	0	0	526	3,482	0	526
1998	7,351	13,853	2,362	317	0	0	0	1,746	2,679	0	1,746
1999	7,004	8,419	2,019	343	0	0	0	683	2,363	0	683
2000	13,451	11,223	2,142	28	0	0	0	190	2,169	0	190
2001	17,485	16,987	3,761	21	0	0	0	425	3,782	0	425
2002	5,718	5,364	4,584	184	48	52	0	389	4,868	352	771
2003	6,526	7,999	3,685	322	26	725	138	597	4,896	75	672
2004	20,831	18,889	477	488	91	27	931	1,194	2,015	102	1,499
2005	**26,128**	**22,240**	**1,969**	**411**	**84**	**0**	**1,405**	**1,102**	**3,868**	**758**	**1,860**
Average	14,043	10,053	1,445	98	11	35	108	352	1,696	56	437
Stnd. Dev.	9,567	6,650	1,348	160	27	151	343	463	1,559	171	559

Legend for Table 3-5: Btm_As: Assorted bottomfish; empr: Emperor (mafute'); jack_a: As jacks; amber: Amberjack; giant_j: Giant trevally; blk_jack: Black jack; uku: Jobfish; jack_s: All shallow water jacks; taape: Blueline snapper; and shallow water snappers

Review of Bycatch

Almost all fishes caught in the CNMI are considered food fishes, including many that show a high incidence of ciguatera (e.g., lyretail grouper [*Variola louti*] and red snapper [*Lutjanus bohar*]). Bycatch estimates for CNMI bottomfish fisheries as shown in Table 3-6, are derived from interviews of fishermen during boat-based creel surveys. The interviews are divided into vessels engaged in non-charter (including commercial, noncommercial, and subsistence fishermen) and charter fishing.

In 2003, the non-charter sector reported zero incidences of bycatch. For the charter sector, only a single charter vessel was engaged in bottomfish fishing and reported a 19.57 percent bycatch rate (WPRFMC 2003b). Catch rates in this sector must remain high to ensure that the clientele are satisfied with the charter. For this reason, small fishes are often released alive so that they may be recaptured on subsequent charters. All bycatch reported in this sector was released alive.

Table 3-6. Bycatch in the CNMI Bottomfish Fishery.

Species Name	Interview with Bycatch	All Interview	Released Alive	Total Catch	Bycatch Percentage
Non-Charter	**2**	**220**			0.91%
Dogtooth Tuna			1	18	5.56%
Blueline Snapper			4	213	1.88%
Blackjack			1	29	3.45%
All Species with Bycatch			**6**	**260**	**2.31%**
Compared with All Caught				**5756**	**.10%**
Charter	**12**	**84**			14.29%
Redgill Emperor			6	240	2.50%
Triggerfish (misc.)			55	165	33.33%
Emperor (mafute/misc.)			7	129	5.43%
Red Snapper			5	9	55.56%
Blueline Snapper			3	64	4.69%
Lyretail Grouper			5	19	26.32%
Flagtail Grouper			4	116	3.45%
Maitai (blk-tipped Grper)			4	139	2.88%
Jobfish (uku)			1	5	20.00%

Species Name	Interview with Bycatch	All Interview	Released Alive	Total Catch	Bycatch Percentage
All Species with Bycatch			**90**	**886**	**10.16%**
Compared with All Caught				**1247**	**7.22%**

Source: WPFMC 2005 Bottomfish Annual Report.

There are no reported interactions with protected species (e.g., sea turtles, marine mammals, birds) in the CNMI bottomfish fishery.

CNMI Bottomfish MSY

A Resource Assessment Investigation of the Mariana Archipelago (RAIOMA) was conducted in 1982-1985 to assess the bottomfish and other resources of the Mariana Archipelago (Polovina et al. 1985). Sampled areas were divided into three regions: the Northern Islands, the Southern Islands and the Western Seamounts. These studies resulted in several publications describing the bottomfish complexes and included maximum sustainable yield (MSY) estimates for deep-slope bottomfish species in each area as presented in Table 3-7.

Table 3-7. Annual MSY estimates for CNMI deep-slope bottomfish.

Area	MSY (pounds)
Northern Islands: Maug, Asuncion, Agrihan, Pagan, Alamagan, Guguan, Sarigan, Anatahan, 38-fathom, Esmeralda	64,577
Southern Islands: Farallon de Medinilla, Saipan, Tinian, Aguijan, Rota	110,641
Western Seamounts: Bank C, Bank D, Pathfinder, Arakane, Bank A	9,036
Total	184,254

Source: Polovina et al. 1985.

Given an annual MSY of 184,254 pounds, and a recent (2001-2005) average annual commercial catch of approximately 20,000 pounds (with the majority coming from the Southern Islands, which have an estimated annual MSY of approximately 111,000 pounds), CNMI deep-slope bottomfish do not appear to be subject to overfishing nor to be overfished. Unknown recreational catches would increase annual landings, but it is believed unlikely that these would be enough to cross or even approach any of the MSY estimates.

3.5.2.3.2. Precious Corals Fisheries – CNMI

Little is known about the presence of precious corals in the waters around the CNMI. The amount of habitat where precious corals can grow is limited throughout the archipelago because of the steep topography. Black coral grows in relatively shallow waters of 30–100 meters, while pink, gold, and bamboo corals grow in deeper waters of 300–1,500 meters (Grigg 1993). Reports of a fishery from pre–World War II suggest that large quantities of high-quality *Corallium* spp.

were taken in waters north of Pagan Island (Takahashi 1942, as cited in Grigg and Eldredge 1975). Since then, no known precious coral harvests have occurred within EEZ waters around CNMI.

During the 1970s, surveys for precious coral in the waters surrounding the CNMI were performed (Grigg and Eldridge 1975). The study focused on the presence of pink and red corals (*Corallium* spp.) and black coral (*Antipathes* spp.). Although few precious coral resources were found in these surveys, precious corals likely exist (in sparse aggregations) in both the nearshore waters (0–3 nm) and the offshore waters (3–200 nm).

To prevent overfishing and stimulate research on gold corals, fishing for, taking, or retaining any gold coral (live or dead) in any precious coral permit area is prohibited through June 30, 2013. This includes all EEZ waters of the Western Pacific Region. Additional research results on gold coral age structures, growth rates, and correlations between length and age will be considered by the Council and NMFS prior to the expiration of the 5-year moratorium.

3.5.2.3.3. Pelagic Fisheries - CNMI

The CNMI's pelagic fisheries occur primarily from the island of Farallon de Medinilla south to the Island of Rota. Trolling is the primary fishing method utilized in the pelagic fishery. The pelagic fishing fleet consists mostly of vessels less than 24 feet in length, which usually have a limited 20-mile travel radius from Saipan. The current Commercial Purchase Database system documents commercial sales on Saipan only, however, data collection systems for Rota and Tinian islands are being established. The existing database lacks information on fishing method, gear, location, and effort. There is currently no Federal logbook system in effect and information on charter vessel catches is mostly lacking because these vessels rarely sell their catches. There is also a small subsistence fishery on Saipan in which a portion of the landings are sold to cover trip expenses.

The primary target and most marketable species for the pelagic fleet is skipjack tuna (67 percent of 2004 commercial landings). Yellowfin tuna and mahimahi are also easily marketable species, but they are seasonal. During their migrations, these fish are usually found close to shore and provide easy targets for the local fishermen. In addition to the economic advantages of being near shore and their relative ease of capture, these species are widely accepted by all ethnic groups, which has kept market demand fairly high. Figure 3-15 presents historical data on pelagic landings near CNMI. It is estimated that in 2004, 68 fishery participants made 235,382 pounds of commercial landings of pelagic species, with a total ex-vessel value of $466,490 (WPRFMC 2005).

There has been some effort to build the longline fishery in CNMI to exploit the tuna resources and the proximity to the Asian market. Currently, there are 2 U.S. longline vessels active in the CNMI.

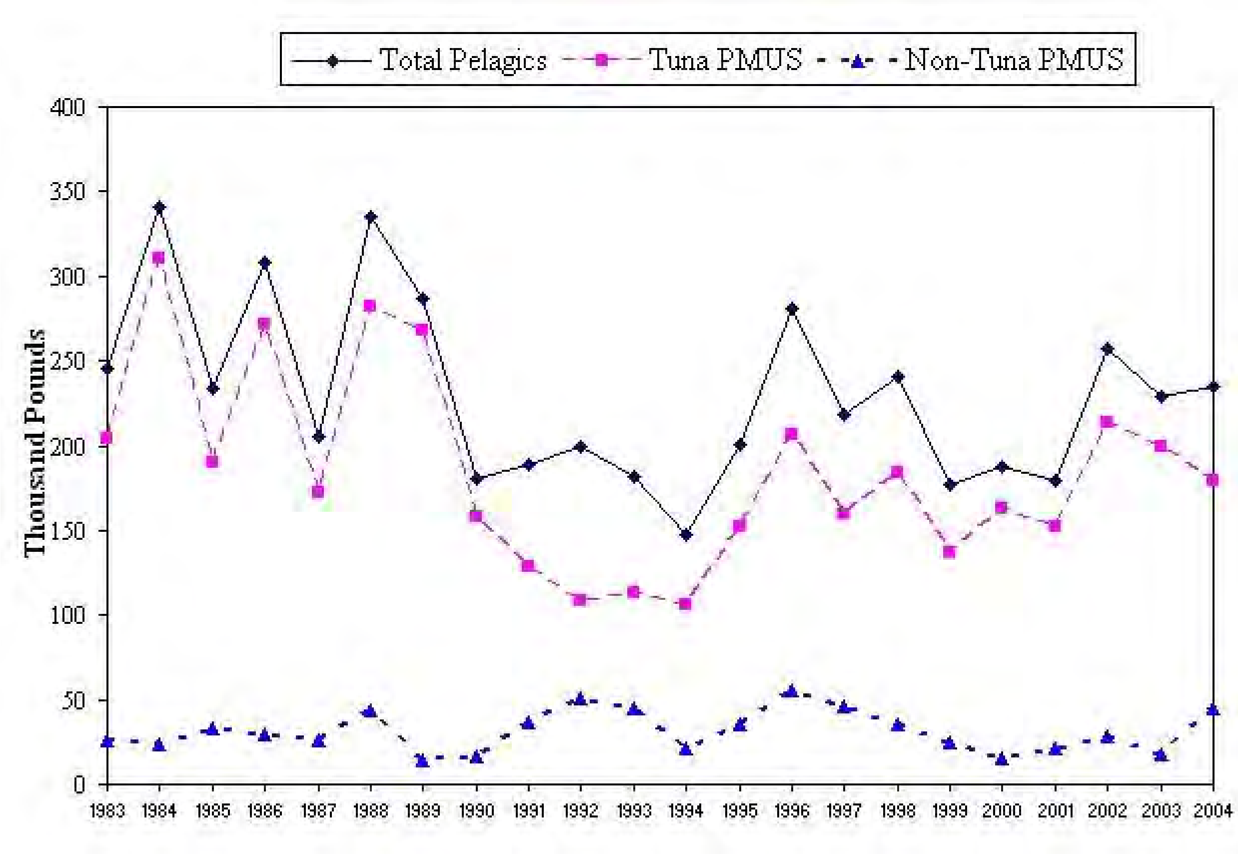


Figure 3-15. Pelagic Landings in CNMI 1983 to 2004.
Source: WPRFMC 2005 Pelagic Annual Report.

3.5.2.4. Communities- CNMI

Fishery resources have played a central role in shaping the social, cultural, and economic fabric of the CNMI. The aboriginal peoples indigenous to these islands relied on seafood as their principal source of protein and developed exceptional fishing skills. Later immigrants to the islands from East and Southeast Asia also possessed a strong fishing tradition. Under the MSA, the CNMI is defined as a fishing community.

The CNMI consists of 14 islands, five of which are inhabited, with a total land area of 176.5 square miles spread over approximately 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 of the Northern Mariana Islands 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.

Per capita income in the CNMI in 1999 was $9,151. The median household income for the CNMI as a whole was $22,898. For Saipan, the median household income was $19,698 in the first quarter of 1999, as compared with $21,457 in 1990. The commonwealth had an unemployment rate in 1999 of 5.5 percent. Forty-six percent of the CNMI population was at or below poverty in 1999 (U.S. Census Bureau 2000).

In 2000, CNMI had 20,378 men ages 16 and over in the labor force, of whom 96 percent, or 19,458, were employed. There were 24,093 women ages 16 and over in the labor force, of which 97 percent were employed (U.S. Census Bureau 2000). The economy of the CNMI has historically benefited 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 (Bank of Hawaii 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 (Bank of Hawaii 1999c).

More recently, garment production has been an important industry, with shipments of $1 billion to the United States under duty and quota exemptions during 1999 (Bank of Hawaii 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. The end of the quota on foreign textiles in 2005 may cause garment manufacturers to move to China, which has some competitive advantages (Bank of Hawaii 2004).

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 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. Between 1994 and 1998, the annual ex-vessel value of commercial landings of bottomfish and pelagic species has averaged about $473,900, of which bottomfish accounts for about 28 percent of the total revenues (WPRFMC 1999). 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.

3.5.3. Guam

At 560 square kilometers, Guam is the largest and most populated (approximately 160,000) island in Micronesia. Guam has a tropical climate with average air temperatures around 80° F and relative humidity around 90 percent near the coast. Prevailing winds are northeasterly trade winds that average around 10 knots. Guam’s annual average rainfall amount is around 90 inches, with more than 75 percent of the rain occurring in the wet season between July and November (Eldredge 1983). Because of its position in the western Pacific Ocean, Guam experiences a high number of tropical cyclones during its wet season. For example, between 1948 and 1975, more than 70 cyclones came within 200 miles of Guam. Of those 70, 26 were categorized as typhoon strength (greater than 64 knot (74 mph) winds; Eldredge 1983). Over the past 10 years, Guam has been directly hit by four typhoons with sustained winds of more than 150 mph (Porter et al. 2005).

3.5.3.1. Marine Environment - Guam

3.5.3.1.1. Coral Reefs - Guam

Approximately 50 percent of Guam’s 153-kilometer shoreline is surrounded by well-developed coral reefs (Myers 1997, Randall and Myers 1983). Most of the reefs are fringing reefs (up to 600-m wide), except for the broad barrier reef enclosing the shallow Cocos Lagoon at the southwest tip of the island (Eldredge 1983, Randall and Myers 1983). A raised barrier reef (Cabras Island), a greatly disturbed barrier reef (Luminao Reef), and a coral bank (Calalan Bank) enclose the deep lagoon of Apra Harbor (Randall and Myers 1983). Patch reefs are also associated with Anae Island on the southwest coast and at Pugua Patch Reef (or Double Reef) on the northwest coast (Randall and Myers 1983). Most of the reef flats, lagoons, patch reefs, and outer reef slopes surrounding Guam are located within territorial waters (Hunter 1995, Myers 1997). There are some high quality nearshore reef areas under Federal jurisdiction in northern and central Guam.

The potential coral reef area around Guam is estimated at 108 square kilometers within the 10-fm curve and 276 square kilometers within the 100-fm curve, respectively (Rohmann et al. 2005). Most of the reefs are located in territorial waters (0 to 3 nm), while reefs located at the offshore banks are in Federal waters.

The health of Guam’s coral reefs varies considerably, with impacts ranging from anthropogenic to natural sources. Coral bleaching events have not been a major threat to Guam’s coral reefs as only two have been observed since 1970 (Porter et al. 2005).

Typhoons are frequent on Guam (up to five major typhoons per year: Birkeland 1997b, Eldredge 1983, U.S. Department of Agriculture 1995) and cause some damage to the reefs (Birkeland 1997b, Randall and Eldredge 1977). However, the reefs on Guam tend to experience less physical damage from these storms than is the case in other areas, because corals in exposed locations are "adapted" to these rough conditions and grow in low-profile growth forms (Birkeland 1997b, Randall and Eldredge 1977). As such, severe typhoon damage to the reefs on Guam tends to be localized in areas that are usually protected from heavy wave action by the shape of the coastline (Birkeland 1997b).

Several outbreaks of the crown-of-thorns starfish have also occurred on Guam over the past few decades (Birkeland 1997b). One outbreak in the 1960s caused severe catastrophic mortality (90 %) of reef slope corals along 38 kilometers of Guam's northwest coast (Chesher 1969; Colgan 1981, 1982; Randall 1971, 1973). However, by 1981, the reefs had started to recover from the starfish invasion and coral cover was high again (65 %; Colgan 1987). Occasional earthquakes and El Niño events have also been known to cause substantial damage to the reefs on Guam (Birkeland 1997b). However, the biggest threat to Guam's reefs appears to be from anthropogenic effects, including overfishing and habitat degradation due to poor land use practices, urbanization, and development (Myers 1997). Sedimentation and overfishing are probably the most serious problems causing coral reef degradation on Guam (Birkeland 1997b, Myers 1997). For example, Birkeland (1997b) reported that the rates of coral replenishment have been substantially reduced on Guam over the past 20 years, possibly as a result of increased sedimentation and the overfishing of herbivores (Birkeland 1997b). As a result of the loss of living cover and the lack of replenishment of these reefs, coral cover on the island has declined substantially over time (Birkeland 1997b). This effect has been most pronounced on the reef slopes, and coral cover is still reasonably high in some places on the reef flat (Birkeland 1997b). Other anthropogenic impacts that may have affected coral reef health on Guam include industrial pollution, nonpoint source pollution, oil spills, sewage, and coastal construction (Myers 1997).

Current opinion is that coral reef health varies around the island of Guam. In general, many of the reefs on the southern part of the island are threatened by good reef access and high runoff of sediments onto the reefs from large rivers in southern Guam (Myers 1997, Porter et al. 2005). One example is the reef between Facpi Point and Umatac on the southwest side of the island, which has been repeatedly buried by sediment since the late 80s (R. Myers, R. Richmond, and S. Amesbury, personal communication, as cited in Green 1997). By contrast, the reefs on the northern part of the island (e.g., Ritidian Point and Pati Point) tend to be in better condition because there are fewer people, less development, less access to the reef, and no rivers (R. Myers, C. Birkeland, S. Amesbury, and R. Sakomoto, personal communication, as cited in Green 1997).

Very little is known about the coral reef resources on the banks of submerged Federal waters around Guam because the resources are in remote locations and difficult to access (Myers 1997). The small amount of information that is available is based on anecdotal observations by scientists and fishermen who have made one or more dives on the banks (e.g., C. Birkeland and E. Poppe Jr.; personal communication, as cited in Green 1997). In general, the coral reefs at Rota, Santa Rosa, and White Tuna Banks are thought to be in good condition, while fishery resources at Galvez Bank are believed to be in lower abundance because it is closer to Guam and more heavily fished (J. Cruz, WPRFMC Guam Coordinator, personal communication, July 2005).

3.5.3.1.2. Deep Reef Slope, Banks, and Seamount Habitat - Guam

Deepwater banks are located at several locations around the island, four of which are located in Federal waters: Rota Bank to the north and Galvez, Santa Rosa, and White Tuna Bank to the south (Donaldson 1995, Hunter 1995, Myers 1997).

3.5.3.1.3. Pelagic Habitat - Guam

Generally, the major surface current affecting Guam is the North Equatorial Current (see Figure 3–4), which flows westward through the islands. Sea surface temperatures off Guam vary between 80.9° and 84.9° F, depending on the season. The mixed layer extends to depths between 300 and 400 feet (Eldredge 1983).

3.5.3.2. Protected Species Guam

3.5.3.2.1. Sea Turtles - Guam

Both hawksbill and green sea turtles are known to nest on Guam, and there have been occasional sightings of leatherback turtles as well. Nesting surveys for green sea turtles have been done on Guam since 1973 by the GDAWR, with the most consistent data having been collected since 1990. There have been up to 60 nesting females observed annually, with a generally increasing trend over the past 12 years. Aerial surveys done in 1999–2000 also found an increase in green sea turtle sightings around Guam (Cummings 2002).

3.5.3.2.2. Marine Mammals and Seabirds - Guam

3.5.3.2.2.1. Cetaceans

Humpback whales (*Megaptera novaeangliae*), sperm whales (*Physeter macrocephalus*), Risso’s dolphins (*Grampus griseus*), Cuvier’s beaked whales (*Xiphias cavirostris*), pygmy sperm whales (*Kogia breviceps*), pilot whales (*Globicephala melaena*), striped dolphins (*Stenella coeruleoalba*), and the pantropic whitebelly spinner dolphins (*Stenella l. longirostris*) have been sighted around Guam.

3.5.3.2.2.2. Pinnipeds and Sirenians

No pinniped species are known to occur in Guam waters.

A single dugong was observed in Cocos Lagoon, Guam in 1975. . Dugongs are members of the Sirenia order, which include sea cows and manatees, and have a distribution from the east African coast to islands in the southwestern Pacific. Several sightings were reported in 1985 on the southeastern side of Guam. Since that time, however no reports of dugong sightings have been made.

3.5.3.2.2.3. Seabirds

The following seabirds that may be associated with fishery operations are reported to be residents of Guam: wedge-tailed shearwater (*Puffinus pacificus*), white-tailed tropicbird (*Phaethon lepturus*), red-tailed tropicbird (*Phaethon lepturus*), masked booby (*Sula dactylatra*), and brown booby (*Sula leucogaster*). Other species believed to be visitors to Guam include the following: streaked shearwater (*Calonectris leucomelas*), short-tailed shearwater (*Puffinus tenuirostris*), Christmas shearwater (*Puffinus nativitatis*), Newell's shearwater (*Puffinus auricularis*), Audubon's shearwater (*Puffinus iherminieri*), Leach's storm-petrel (*Oceanodroma leucorhoa*), Matsudaira's storm-petrel (*Oceanodroma matsudairae*), and the red-footed booby (*Sula sula*).

3.5.3.3. Fisheries of Guam

Under the authority of the MSA, the Council established (and the Secretary of Commerce approved) criteria to determine overfishing (fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region. Currently, no fishery in Guam has been determined by NMFS to be experiencing overfishing or to be overfished.[45] For more information on these fisheries please see the additional NEPA analyses listed in Section 3.4.1.

3.5.3.3.1. Demersal Fisheries – Guam

3.5.3.3.1.1. Bottomfish Fisheries – Guam

There are two distinct bottomfish fisheries on Guam that can be separated by depth and species composition. The shallow water complex (less than 500 feet) makes up a larger portion of the total bottomfish effort, and the harvest usually comprises reef-dwelling snappers, groupers, and jacks of the genera *Lutjanus*, *Lethrinus*, *Aprion*, *Epinephelus*, *Variola*, *Cephalopholis*, and *Caranx*. The deepwater complex (greater than 500 feet) consists primarily of groupers and snappers of the genera *Pristipomoides*, *Etelis*, *Aphareus*, *Epinephelus*, and *Cephalopholis*.

Bottomfish fishing on Guam is a combination of recreational, subsistence, and small-scale commercial fishing. The fishery can be highly seasonal, with effort significantly increasing when sea conditions are calm, generally during the summer months. During these periods, bottomfish fishing activity increases substantially on the offshore banks (in the EEZ), as well as on the east side of the island (in territorial waters); areas that are inaccessible to small boats during most of the year due to rough seas.

The Guam bottomfish fishery is described as having three main components based on their target depths: shallow water (60 to 150 ft), mid-water (200 to 300 ft), and deepwater (700 to 900 ft). In 2006, there were about 260 bottomfish vessels on Guam, including about 12 large highliners.

Shallow water bottomfish fishermen operate vessels 16 to 30 ft in length, the majority of which are less than 25 ft in length. The fishery is conducted during the day, almost exclusively within

[45] Status of U.S. Fisheries, 2005. http://www.nmfs.noaa.gov/docs/Report_text_FINAL3.pdf

territorial waters. Only about 30 boats are involved in the commercial component of the shallow water fishery, and most participants are recreational or subsistence fishermen who seldom sell their catch. Bottomfish fishing normally takes place between morning and evening pelagic trolling sessions, and lasts about four hours. Fishermen typically use two to four spinning reels, with 30 to 40 lb test monofilament line, with 1-3 8/0 circle hooks per line. These fishermen tend to target a mix of coral reef and bottomfish species. More fishermen participate in the shallow water fishery than in the deep water fishery because of the lower expenses of the fishery and relative ease of fishing close to shore. Less than 20 percent of the total shallow water marine resources harvested in Guam are taken from Federal waters, primarily because the offshore banks are deep, remote, less accessible due to weather, and subject to strong currents. Depredation of bottomfish catches by sharks is also a larger problem in the offshore areas than in territorial waters around Guam.

The mid-water bottomfish fleet consists of approximately twelve boats (20 to 30 ft in length). These vessels, which typically have 2-3 people on board, usually fish overnight on the banks and reefs within 30 nm of Guam when the weather is good. The typical fishing configuration is 2-4 electric reels and/or manual rods and reels per boat. Fishermen tend to use 60 lb test braided Dacron fishing line, but 80 lb test monofilament is also common. Each line is rigged with a large weight at the bottom with 3-4, 14/0 to 18/0 circle hooks baited with skipjack tuna or squid.

The Guam deepwater bottomfish fishermen are primarily commercial and are commonly referred to as “highliners.” There are currently about 12 active commercial vessels (over 25 ft in length) that make two-day trips to offshore banks and seamounts around Guam. Generally, these banks are only accessible during calm weather in the summer months (May to August/September). Galvez Bank is the closest and most heavily fished. In contrast, the other banks (White Tuna, Santa Rosa and Rota) are remote and can only be fished during exceptionally good weather. These vessels typically fish during the day and operate two electric reels with 150 lb test braided Dacron line. Each line is rigged with an average of five hooks, but up to 30 hooks have been deployed on a single line. The majority of the vessels use 18/0 circle hooks. Skipjack tuna or squid are the most commonly used baits.

Charter fishing has been a substantial component of the fishery since 1995, accounting for about 15–20 percent of all bottomfishing trips from 1995 through 2004 (WPRFMC 2005). Charter vessels typically make multiple two-to-four hour trips on a daily basis. The charter fleet includes both vessels that engage in both trolling and bottomfishing trips and larger bottomfishing-only vessels that can accommodate as many as 35 patrons per trip. These larger vessels consistently fish in the same general area and release most of their catch, primarily small triggerfish, small groupers, and small goatfish. They occasionally keep larger fish and use a portion of the catch to serve as sashimi for their guests.

The Agana Boat Basin is centrally located on the western leeward coast and serves as the island’s primary launch site for boats fishing areas off the central and northern leeward coasts and the northern banks. The Merizo boat ramp, Seaplane Ramp in Apra Harbor, Umatac boat ramp, and Agat Marina are boat launch sites that provide access to the southern coast, Apra Harbor, Cocos Lagoon, and the southern banks. The Agat Marina, in particular, located between the Agana Boat Basin and the Merizo boat ramp, provides trailered boats from the northern and central areas of the island a closer and more convenient launch site to the southern fishing grounds. At Ylig Bay, a paved parking area and maintenance of the brush along the highway have helped increase the number of boats accessing the east side of the island.

Table 3-8. Guam Bottomfish Fishery Statistics.

Year	Landings[1] Total (Lb)	CPUE (Lb/Hour)	CPI	Adjusted Revenue ($)	Adjusted Price ($/Lb)	Number of Boats
1980			134.0	48,454	5.14	
1981			161.4	65,681	6.20	
1982	37,639	7.1	169.7	44,514	6.41	154
1983	47,119	6.2	175.6	214,911	5.81	106
1984	58,095	7.4	190.9	130,429	5.60	144
1985	88,113	5.7	198.3	148,563	5.30	161
1986	36,774	5.2	203.7	60,412	4.99	118
1987	45,924	5.9	212.7	62,364	4.93	139
1988	62,273	5.0	223.8	75,052	4.71	198
1989	82,756	5.5	248.2	107,472	5.47	223
1990	78,349	4.5	283.5	100,301	5.30	226
1991	69,619	4.8	312.5	57,129	5.07	246
1992	82,682	5.8	344.2	49,660	4.66	236
1993	95,815	4.2	372.9	44,585	4.37	360
1994	103,046	5.5	436.0	135,823	4.47	298
1995	103,344	2.5	459.2	55,004	3.98	402
1996	138,621	4.1	482.0	22,812	3.09	408
1997	100,105	3.6	491.4	36,082	3.40	332
1998	100,736	2.7	488.9	55,031	3.73	354
1999	117,067	3.2	497.9	124,485	4.05	411
2000	138,398	3.7	508.1	85,841	3.92	312
2001	117,177	3.9	501.2	95,539	3.63	337
2002	68,289	3.0	504.5	62,597	3.42	351
2003	92,880	4.7	521.4	39,450	3.36	481
2004	72,844	4.0	563.2	73,466	2.93	347
2005	**61,601**	**4.8**	**563.2**	**69,186**	**3.18**	**233**
Average	83,303	4.7	355.7	79,417	4.50	274
Standard Deviation	28,806	1.3	149.1	43,083	1.00	106

1 Landings by boat-based bottomfishing activity only and includes both deepwater and shallow water bottomfish.

Source: WPRFMC 2006

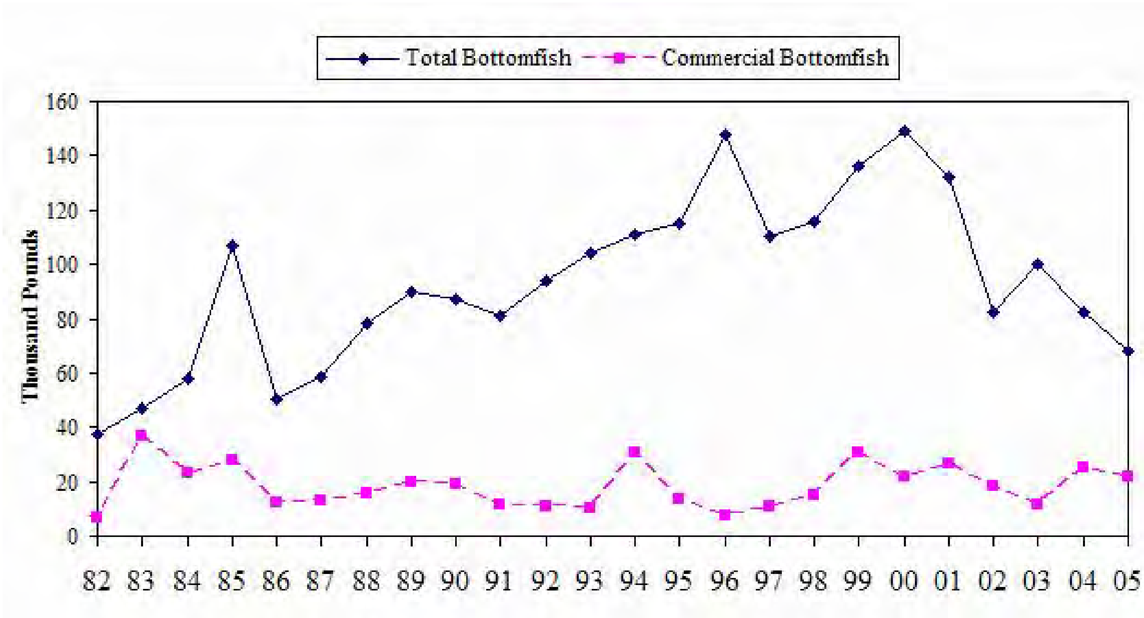


Figure 3-16. Guam Bottomfish Landings.
Source: WPRFMC 2006.

Table 3-9. Expanded Boat-Based Creel Survey Composition of Bottomfish Management Unit Species (BMUS) for 2005.

Management Unit Species	Harvest (lb)
BMUS	
Lehi (*A. rutilans)*	2,090
Uku (*A. virescens)*	4,791
Ehu (*E. carbunculus)*	3,488
Onaga (*E. coruscans)*	15,309
Yellowtail Kalekale (*P. auricilla)*	1,069
Opakapaka (*P. filamentosu)*	458
Yelloweye Opakapaka (*P. flavipinnis)*	265
Gindai (*P. zonatus)*	637
Ta'ape (*L. kasmira)*	479
Giant Trevally (*C. ignobilis)*	217
Black Jacks (*C. lugubris)*	482
Amberjack (*S. dumerili)*	288
Blacktip Grouper (*E. fasciatus)*	1,495
Lyretail Grouper (*V. louti)*	2,479
Redgill Emperor (*L.*	2,214

Management Unit Species	Harvest (lb)
rubrioperculatus)	
BMUS Total	**35,761**
Non-BMUS Bottomfish	
Other Snappers	1,558
Other Jacks	7,718
Other Groupers	6,778
Other Emperors	8,804
Non-BMUS Bottomfish Total	**24,858**
Non-Specific Bottomfish	
Misc Bottomfish	0
Shallow Bottomfish	975
Deep Bottomfish	6
Non-Specific Bottomfish Total	**981**
Bottomfish Total	**61,601**

Source: WPRFMC 2006

Catch composition of the shallow-bottomfish complex (or coral reef species) is dominated by lethrinids. Other important components of the bottomfish catch include lutjanids, carangids, serranids, and sharks. Holocentrids, mullids, labrids, scombrids, and balistids are minor components. It should be noted that at least two of these species (*Aprion virescens* and *Caranx lugubris*) also go into deeper waters, and some of the catch of these species occurs in the deepwater fishery. It is reported that in 2005, 233 domestic vessels landed 61,601 pounds of bottomfish in Guam (Table 3-8) with an ex-vessel value of $69,186 (WPRFMC 2005). MSY for Guam's deepwater bottomfish fishery has been estimated at 56,863 lb (Polovina and Ralston 1986). As seen in Table 3-9, 35,761 lb of BMUS were reported caught in 2005, which includes both deepwater and shallow water bottomfish. Current catches of deepwater BMUS are believed to be below their MSY. The MSY for shallow water BMUS has not been estimated. Bycatch in the non-charter and charter Guam bottomfish fishery is summarized in Table 3-10.

Table 3-10. Guam Bottomfish Fishery Bycatch (2005): Non-charter and Charter.

Species Name	Number Released			Total Caught	Bycatch (%)
	Alive	Dead or Injured	Both		
Non-Charter					
Epinephelus howlandi	2		2	3	66.67
Epinephelus merra	1		1	20	5.00
Non-Charter Bycatch Total	3		3	23	13.04
Comparison with All Species Caught				1,434	0.21
Charter					
Serranidae	3		3	3	100.00
Epinephelus fasciatus	6		6	23	26.09

Species Name	Number Released			Total Caught	Bycatch (%)
	Alive	Dead or Injured	Both		
Mullidae	16		16	16	100.00
Mulloidichthys flavolineatus	8		8	8	100.00
Parupeneus multifasciatus	10		10	11	90.91
Balistidae	4		4	5	80.00
Melichthys vidua	10		10	10	100.00
Odonus niger	5		5	5	100.00
Rhinecanthus rectangulus	1		1	1	100.00
Charter Bycatch Total	63		63	82	76.83
Comparison with All Species Caught				235	26.81
All Bycatch Total	66		66	105	62.85
Comparison with All Species				1,669	3.95

3.5.3.3.1.2. Coral Reef Ecosystem Fisheries - Guam

Guam's coral reef fisheries are culturally and economically important. The gear most often used to harvest coral reef resources includes hook and line, cast nets, spears, and surround nets. The most common fish harvested include the following families: Kyphosidae (rudderfish), Acanthruidae (surgeonfish), Lethrinidae (emperors), Scaridae (parrotfish), and Labridae (wrasses). Invertebrate harvests include octopus, spiny lobster, trochus shells, conch shells, and reef crabs. Total coral reef fish landings for 2002 and 2003 were estimated at 273,799 pounds and 306,626 pounds, respectively (See Table 3-11). No MSY estimates are available for Guam's coral reef ecosystem management unit species.

Table 3-11. Estimated Harvest of Top 10 Families for Inshore and Offshore Guam FisheriesDuring 2002 and 2003.

Inshore*				**Offshore****			
2002		**2003**		**2002**		**2003**	
Family	**Catch** (lb)	**Family**	**Catch** (lb)	**Family**	**Catch** (lb)	**Family**	**Catch** (lb)
Kyphosidae (Rudderfishes)	20,823	Acanthuridae (Surgeonfishes)	27,920	Lethrinidae (Emperors)	29,915	Lethrinidae (Emperors)	25,590
Siganidae (Rabbitfishes)	19,300	Carangidae (Jacks)	21,337	Acanthuridae (Surgeonfish)	20,523	Acanthuridae (Surgeonfish)	18,620
Acanthuridae (Surgeonfish)	17,129	Siganidae (Rabbitfishes)	12,408	Scaridae (Parrotfishes)	16,438	Scaridae (Parrotfishes)	18,141
Carangidae (Jacks)	14,938	Mullidae (Goatfishes)	11,818	Carangidae (Jacks)	12,192	Carangidae (Jacks)	21,117
Lethrinidae (Emperors)	9,856	Scaridae (Parrotfishes)	9,464	Serranidae (Groupers)	6,562	Serranidae (Groupers)	23,621
Mullidae (Goatfishes)	8,679	Lethrinidae (Emperors)	5,174	Lutjanidae (Snappers)	3,319	Lutjanidae (Snappers)	6,791
Lutjanidae (Snappers)	5,966	Diodontidae (Porcupinefish)	3,627	Sphyraenidae (Barracudas)	3,491	Sphyraenidae (Barracudas)	7,345
Serranidae (Groupers)	4,765	Scombridae (Mackerels)	2,875	Labridae (Wrasses)	3,060	Labridae (Wrasses)	5,229
Mugilidae (Mullets)	4,378	Serranidae (Groupers)	2,824	Mullidae (Goatfishes)	5,150	Scombridae (Mackerels)	7,548
Belonidae (Needlefishes)	4,329	Carcharhinidae (Requiem Sharks)	2,767	Siganidae (Rabbitfish)	3,055	Carcharhinidae (Requiem Sharks)	3,590

Sources: Gutierrez 2003; Flores 2003; DAWR unpublished data.
Note: Inshore data excludes seasonal runs of juvenile siganids and bigeye scads

3.5.3.3.1.3. Crustacean Fisheries - Guam

Fishing for crustaceans around Guam occurs mostly in locally-managed territorial waters and usually by subsistence or recreational fishermen. However, in 2004, two Federal permits were registered to vessels to fish for spiny and slipper lobsters in the EEZ around Guam. The current activities of these vessels, if any, remains unknown. A short-lived and unregulated deepwater shrimp (*Heterocarpus* spp.) fishery was active around Guam during the 1970s. The future of that fishery is uncertain, but management measures are in place that require permits and logbooks.

Lobsters around Guam are hand harvested, with virtually all harvests occurring in territorial waters. An estimated total of 1,009 kg of spiny lobsters, with a total ex-vessel value of $7,279 were commercially harvested in 2003, and 905 kg were commercially harvested in 2004.

No MSY value for the Guam lobster fishery has been estimated.

3.5.3.3.1.4. Precious Corals Fishery - Guam

There is no precious coral fishery currently operating around Guam, nor have there been any reported or observed landings of precious corals harvests from EEZ waters around Guam. No MSY values for precious corals around Guam have been estimated.

To prevent overfishing and stimulate research on gold corals, fishing for, taking, or retaining any gold coral (live or dead) in any precious coral permit area is prohibited through June 30, 2013. This includes all EEZ waters of the Western Pacific Region. Additional research results on gold coral age structures, growth rates, and correlations between length and age will be considered by the Council and NMFS prior to the expiration of the 5-year moratorium.

3.5.3.3.1.5. Pelagic Fisheries - Guam

Guam's pelagic fisheries consist of primarily small, recreational, trolling boats that are either towed to boat launch sites or berthed in marinas. These boats are used to fish only within local waters, either within EEZ waters around Guam or on some occasions in the adjacent EEZ waters around the Northern Mariana Islands. In recent years, there has been an increase in the number of longline vessels in Guam.

Domestic annual pelagic landings in Guam have varied widely, ranging between 322,000 and 937,000 pounds in the 23-year time series. The 2004 total pelagic landings were approximately 691,366 pounds, an increase of 36 percent compared with 2003. Of this total, it is estimated that 285,545 pounds were sold for a total ex-vessel revenue of $433,911 (WPRFMC 2005).

Landings consisted primarily of five major species: mahimahi (*Coryphaena hippurus*), wahoo (*Acanthocybium solandri*), bonita or skipjack tuna (*Katsuwonus pelamis*), yellowfin tuna (*Thunnus albacares*), and Pacific blue marlin (*Makaira mazara*). Other minor pelagic species caught include rainbow runner (*Elagatis bipinnulatus*), great barracuda (*Sphyraena barracuda*), kawakawa (*Euthynnus affinis*), dogtooth tuna (*Gymnosarda unicolor*), double-lined mackerel *(Grammatorcynus bilineatus*), oilfish (*Ruvettus pretiosus*), and three less common species of barracuda. Sailfish and sharks were also known to be caught during 2004, but these species were not encountered during offshore creel surveys.

There are wide year-to-year fluctuations in the estimated landings of the five major species. The 2004 mahimahi catch increased more than 134 percent from 2003, reaching its highest level since 1998. Wahoo catch totals increased 83 percent from 2003, which was its sixth highest total during the 23-year recording period. Pacific blue marlin landings decreased 28 percent from 2003, and were 24 percent below the 23-year average. Supertyphoon Pongsona’s direct hit on Guam in December 2002, and subsequent negative impact on fishing during the first quarter of 2003, probably account for the low numbers of mahimahi caught during 2003. Participation and effort generally increased in 2004, with the number of trolling boats up by 8 percent (WPRFMC 2005).

The number of boats involved in Guam’s pelagic or open-ocean fishery gradually increased from 193 in 1983, to 469 in 1998. This number decreased until 2001 and has been increasing ever since. There were 401 boats active in Guam’s domestic pelagic fishery in 2004. A majority of the fishing boats are less than 10 meters (33 feet) in length and are usually owner operated by fishermen who earn a living outside of fishing. Most fishermen sell a portion of their catch at one time or another and it is difficult to make a distinction between recreational, subsistence, and commercial fishers. A small, but significant, segment of Guam’s pelagic fishery is made up of marina-berthed charter boats that are operated primarily by full-time captains and crews. These operations were responsible for 22 percent of all domestic pelagic fishing trips from Guam in 2004 (WPRFMC 2005). Figure 3-17 provides the estimated annual total domestic pelagics catch in Guam.

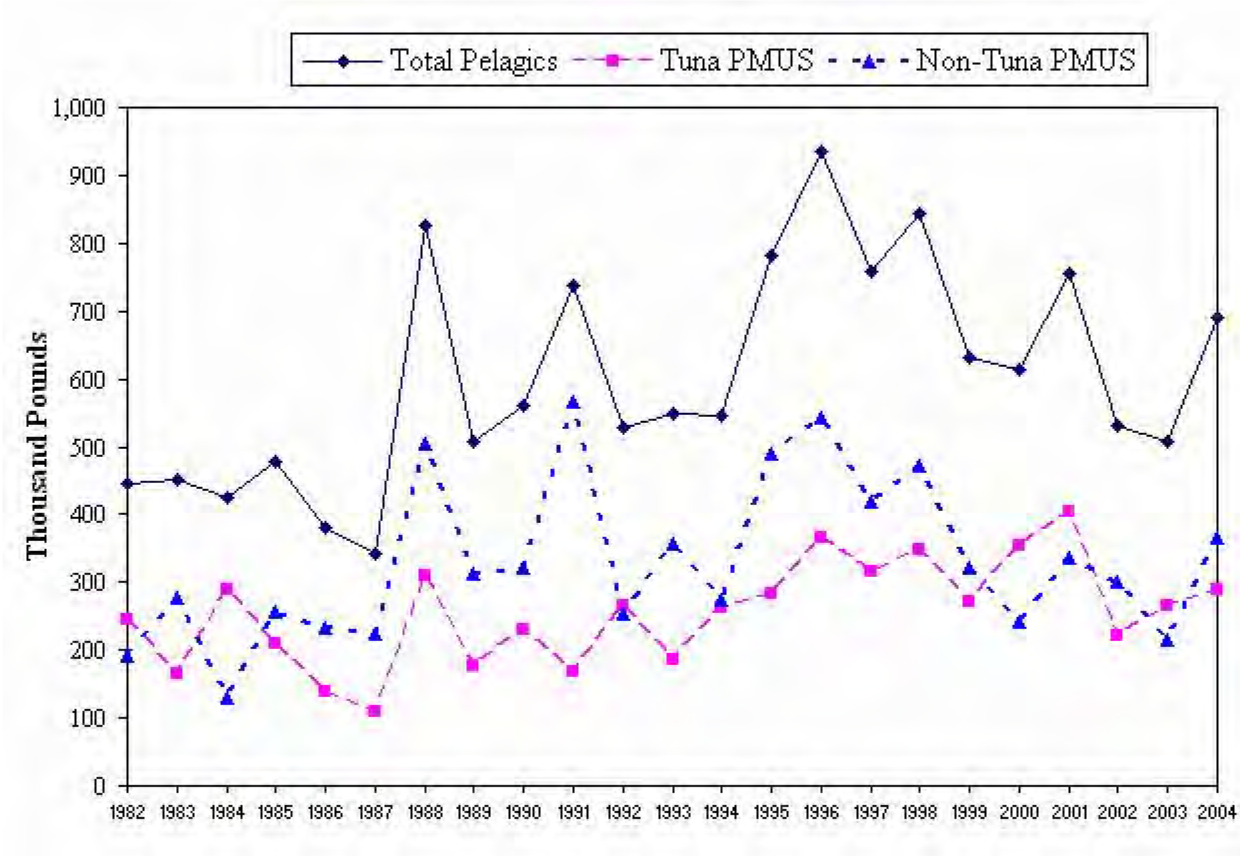


Figure 3-17. Estimated Annual Total Domestic Pelagics Catch in Guam 1982 to 2004.
Source: WPRFMC 2005 Pelagics Annual Report.

3.5.3.4. Fishing Communities – Guam

Under the MSA, Guam is designated as a fishing community. However, Guam's history, culture, geography, and relationship with the United States are vastly different from those of a typical fishing community in the continental United States.

Over the centuries of acculturation beginning with the Spanish conquest in the late seventeenth century, many elements of traditional Chamorro culture in Guam were lost. But certain traditional values, attitudes, and customs were retained to become a part of contemporary life. Amesbury et al. (1989, p. 48) noted that the practice of sharing one's fish catch with relatives and friends during Christian holidays is rooted in traditional Chamorro 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."

On the basis of creel surveys of fishermen, only about one quarter to one third of the inshore catch is sold. The remainder enters noncommercial channels (Knudson 1987). Reef and bottomfish continue to be important for social obligations, such as fiestas and food exchange with friends and families. One study found a preference for inshore fish species in noncommercial exchanges of food (Amesbury and Hunter-Anderson 1989).

The social obligation to share one's fish catch extends to part-time and full-time commercial fishermen. Such gifts are often reef fish or shallow water bottomfish (Amesbury and Hunter-Anderson 1989). Even when fish are purchased informally by friends, neighbors, or relatives of the fisherman, the personal marketing tends to restrain the price asked (WPRFMC 2003).

Domestic fishing on Guam supplements family subsistence, which is gained by a combination of small-scale gardening, ranching, and wage work (Amesbury and Hunter-Anderson 1989). The availability of economic activities such as part-time fishing is among the major reasons that Guam has not experienced more social problems during times of economic hardship and increasing unemployment. The subsistence component of the local economy has gained significance in recent years with the downturn in Guam's major industries and increasing unemployment.

Fishing in Guam continues to be important not only in terms of contributing to the subsistence needs of the Chamorro people but also in terms of preserving their history and identity. Fishing assists in perpetuating traditional knowledge of marine resources and the maritime heritage of the Chamorro culture.

The Island of Guam was ceded to the United States following the Spanish American War of 1898 and has been an unincorporated territory since 1949. Guam's population is approximately 155,000 people.[46] The main income sources on Guam include tourism, national defense, and trade and services. Per capita income in Guam was $12,722 in 2000, up from $10,152 in 1991.[47] Median household income was $38,769 in 2000, up from $31,118 in 1991. Twenty-three percent of the population in 2000 was at or below the poverty level.[48]

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 7 percent in 2000, with 39,143 men age 16 and over in the labor force and 29,751 women age 16 and over in the labor force.[49]

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 (Bank of Hawaii 1999b). In the 1990s, however, the military's contribution to Guam's economy waned and was largely replaced by Asian tourism. Guam's macroeconomic situation exhibited considerable growth between 1988 and 1993 as a result of rapid expansion of the tourism 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

[46] http://www.census.gov/Press-Release/www/2002/guamstatelevel.pdf
[47] Ibid.
[48] Ibid.
[49] Ibid.

(Bank of Hawaii 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 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.

In the 1990s, after three decades of troop reductions, the military presence on the island diminished to the lowest level in decades. But with the post–9/11 emphasis on homeland security, the war in Iraq, and repositioning of military assets from Asia and the mainland United States, military spending on Guam has rebounded significantly, and the effects have been felt throughout the economy, including in employment and housing prices (Los Angeles Times, July 25, 2004). The U.S. military is in the process of increasing military presence on Guam which is expected to have an important economic impact on Guam.

Guam used to be major regional fish transshipment center and resupply 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, Guam 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 in the late 1980s, Guam became an important port for Japanese and Taiwanese longline fleets. However, in recent years, Japanese and Taiwanese longline fleets have reduced their port of calls and offloading in Guam. 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). Some people believe this is due to the prohibition on landing shark fins without corresponding carcasses at U.S. ports (P. Dalzell, WPRFMC, personal communication). As a result of fluctuations in the tourism industry and cuts in military expenditures in Guam, the importance of economic diversification has increased.

3.5.4. Hawaii

In the central North Pacific Ocean, roughly 2,500 miles southwest of North America, lies the Hawaiian Archipelago. This 137-island chain stretches nearly 1,500 miles from Kure Atoll in the NWHI to the island of Hawaii at the southern tip of the inhabited MHI. The total land area of the Hawaiian Islands is 6,423 square miles. The NWHI make up roughly 1,000 miles of the 1,500-mile long archipelago, and are composed of volcanic islands, atolls, shoals, and submerged banks.

The NWHIs include the northernmost coral reef ecosystem (Kure Atoll) on the planet. The water temperatures experienced there are assumed to be the lower limit for corals to thrive and reefs to grow (approximately 65° F). Grigg (1982) suggested that Kure Atoll lies at the “Darwin Point” for reef development, a geographical limit beyond which corals and coralline algae can no longer deposit enough calcium carbonate to keep up with the subsidence of the area’s volcanic base. It is theorized that reefs at latitudes higher than the Darwin Point fail to remain at sea level and sink below the photic zone within which growth can occur (Grigg 1982).

The Hawaii Archipelago is subject to high wave energy produced from weather systems generated off the Aleutian Islands and other areas of the North Pacific. Such waves can have major effects on the nearshore environment. For example, high wave energies can break off pieces of coral, move underwater boulders, shift large volumes of sand, and erode islands (Grigg 1976).

Because of its position in the North Pacific, Hawaii (more specifically the NWHI) also acts as a sink for a multitude of marine debris originating from Pacific-rim countries. Perhaps the most damaging is derelict fishing gear such as nets and rope that are believed to be carried by ocean currents from North Pacific trawl fisheries. Other types of debris include materials made from rubber and plastics (e.g., lighters). Marine debris impacts the nearshore environment of the NWHI by choking and breaking coral reefs, entangling marine life, and carrying invasive species. Since 1996, NMFS has led a multiagency cleanup effort that has removed nearly 450 metric tons of derelict fishing nets and other debris from the NWHI (J. Asher, PIFSC, personal communication, July 2005). In recent years, the effort has removed more than 100 tons of marine debris per year. The total amount of marine debris accumulating each year in the NWHI is difficult to quantify, but is estimated to be 50 tons or more (S. Balwani, PIFSC, personal communication, July 2005).

3.5.4.1. Marine Environment - Hawaii

3.5.4.1.1. Coral Reefs - Hawaii

The total potential coral reef area in Hawaii (MHI and NWHI) is estimated to be 2,826 square kilometers within the 10-fathom curve, and 20,437 square kilometers within the 100-fathom curve. This comprises approximately 8 percent and 14 percent, respectively, of all U.S. coral reef ecosystems (Rohmann et al. 2005). The MHI represent the younger portion of the Hawaiian Archipelago, and have less well-developed fringing reefs that have not subsided as far below sea level as those in the NWHI (Smith 1993). The potential coral reef area surrounding the MHI is estimated at 1,231 square kilometers within the 10-fathom contour (Rohmann et al. 2005).

Grigg (1997) summarized the condition of the reefs on each island and concluded that 90 percent of Hawaii’s reefs are healthy. However, there are increasing problems with excessive levels of fishing and environmental degradation associated with a growing human population, urbanization, and development (Friedlander 1996; Grigg 2002; J. Maragos, USFWS, personal communication, as cited in Green 1997). Focal points for coral reef degradation in Hawaii include reefs adjacent to urban areas, coastal recreational developments (e.g., hotels, golf courses), and ocean outfalls (Jokiel and Cox 1996, in Friedlander 1996; J. Maragos personal communication, as cited in Green 1997).

A combination of natural and anthropogenic factors, including wave energy, depth, sedimentation, turbidity, light, nutrient concentration, and other biological factors, control coral reef community structure in Hawaii (Grigg 2002). Most coastline areas in the state are exposed to the open ocean, and the reefs in these areas are frequently disturbed by wave-induced mortality (Grigg 2002). As such, the only significant buildup of reefs in the MHI is found in areas that are reasonably sheltered from open ocean swells and at depths that are not constrained by sea level (Grigg 2002). Such areas are typically restricted to embayments and areas sheltered from wave exposure by nearby islands (Grigg 2002). Examples include the Kona Coast of Hawaii, the south coast of west Maui, the north coast of Lanai and Kauai, Kaneohe Bay, Hanauma Bay, and Barber's Point on Oahu (Des Rochers 1992; J. Maragos, personal communication, as cited in Green 1997). In most places, the modern Holocene reefs consist of only a thin veneer on top of the older Pleistocene reefs, which suggests that no accretion of living corals is taking place (Grigg 2002). Slow coral growth, low rates of recruitment, and sedimentation have also been proposed as factors that have contributed to the slow rate of coral reef formation in Hawaii (Friedlander 1996).

In general, impacts related to anthropogenic factors, such as point-source and nonpoint-source pollution, tend to be of most significance in wave-sheltered environments or in areas with high residence time such as embayments and lagoons (Friedlander et al. 2005, Grigg 2002). In cases in which the ecology of reefs is under primary or dominant control by wave's forces, the potential effects of pollution may be less pronounced, except with respect to aesthetic values or water quality and human health (Grigg 2002). Friedlander (1996) and Grigg (1997) both noted that excessive fishing is a serious problem throughout the MHI. Grigg (1997) also found that each of the MHI is characterized by other specific and localized threats to coral reef health.

3.5.4.1.1.1. Oahu Coral Reefs

Oahu, being the population center of Hawaii, ranks highest among the MHI in terms of coral reef resource problems and the need for better long-term management. Most of the open coastline of Oahu is fringed by coral reefs with low natural coral cover due to wave action. The best reef development is found in embayments or sheltered areas, such as Kaneohe Bay or Hanauma Bay. Reef communities are generally healthy except for local areas where shoreline use is high or in some embayments where water circulation is restricted. Point and nonpoint source pollution has degraded many of these environments, and overexploitation of coral reef fishes has reduced fish abundance. Notwithstanding these problems, Grigg reported that many improvements in coastal environments have occurred on Oahu in recent years. All shallow, nearshore sewage discharges have been replaced by deepwater outfalls, and better land management practices and the curtailment of dredging and filling activities have greatly reduced sedimentation problems to coral reefs island wide (Grigg 2002).

3.5.4.1.1.2. Maui Coral Reefs

Most coral reefs on Maui are also under primary control of wave forces. Healthy reefs can be found off Honokowai on the western end and the stretch of coastline between Olowalu and Papawai off the south coast of West Maui. Both of these areas were sheltered from the effects of

Hurricane Iniki in 1992, and coral cover ranges from 50 to 80 percent (depth: 10 to 20 m). Other pristine reefs also exist at 30 to 40 meters in the Au'au Channel where they are totally sheltered from wave stress. Exposed areas, some with reefs containing more than 50 percent coral cover, were devastated by Hurricane Iniki, which resulted in mortality of up to 100 percent (E. Brown, UH, personal communication, as cited in Grigg 2002).

The two most significant environmental problems affecting coral reefs on Maui are excessive fishing and increases in various species of invasive algae, which may be related to nutrient loading, periodic natural upwelling, the low abundance of urchins, or high fishing pressure on herbivorous fishes (Grigg 2002).

3.5.4.1.1.3. Lanai Coral Reefs

Virtually all of the reefs near Lanai are in a healthy condition, although those near the northern half experience episodic mortally as the result of sediment runoff (Grigg 2002; J. Maragos, personal communication as cited in Green 1997). None of Lanai's reefs seem to experience pollution, and most experience fishing pressure (Grigg 2002).

3.5.4.1.1.4. Molokai Coral Reefs

The south coast of Molokai supports the longest fringing reef in Hawaii (approximately 35 miles long; J. Maragos, USFWS, personal communications cited in Green 1997). The condition of this reef varies from poor to excellent; with much of the reef degradation associated with sedimentation due to poor land use practices (J. Maragos, USFWS, personal communication, as cited in Green 1997). The reefs of Molokai have been subjected to widespread and high fishing levels as well as sedimentation, although other anthropogenic effects on these reefs appear to be minimal (Grigg 2002). There was an outbreak of the crown-of-thorns starfish (*Acanthaster planci*) off the southeast coast in 1972, and an attempt was made to eradicate the outbreak (Branham et al. 1972, in Grigg 2002). However, it appears that the starfish returned to its normal abundance level naturally over a period of several years (Grigg 2002).

3.5.4.1.1.5. Kahoolawe Coral Reefs

Kahoolawe was used as a military target for live firing and bombing for years, which resulted in high rates of sedimentation onto the reefs). The reefs are now in a state of recovery since the bombing ceased in 1994. Interestingly, little ordinance can be found on any reefs around Kahoolawe today, suggesting rapid overgrowth by coral and/or high accuracy of the military target practice (Grigg 2002).

3.5.4.1.1.6. Hawaii Coral Reefs

The Island of Hawaii (known locally as the Big Island) is still geologically active. The reefs on this island are dramatically different on the windward and leeward coasts. Reefs on the windward side (except in Hilo Bay) are controlled by wave stress, and are characterized by early successional reef stages (i.e., scattered coral colonies or thin veneers on basalt foundations; Grigg 2002; J. Maragos, USFWS, personal communication as cited in Green

1997). In contrast, rich coral reef communities exist along the sheltered leeward side of the island (Grigg 2002; J. Maragos, personal communication as cited in Green 1997). However, Grigg noted that the reefs along the leeward shore are subject to severe storms with a periodicity of approximately 40 years, which may explain why fringing reefs are not well developed in this area. Human impacts have also had some effect on the reefs of this island. Reefs on the Hamakua Coast have been degraded by sugarcane waste waters in the past, while excessive fishing, aquarium fish collecting, and ground water intrusion have caused serious human impacts on the reefs on the leeward coast (Grigg 2002).

3.5.4.1.1.7. Kauai Coral Reefs

Kauai is the oldest and wettest island in the MHI, and Grigg (1997) suggested that sedimentation may be responsible for the lack of well-developed fringing reefs around most of the island. Grigg noted that the reefs that are most heavily impacted by sediments are those that are in shallow or enclosed areas that have restricted circulation. In contrast, the healthiest reefs were found on the exposed northeast and north coasts where the sediment is washed away by waves and currents (Grigg 2002; J. Maragos, USFWS, personal communication as cited in Green 1997). Grigg also noted that some of the best reefs on the island exist in deep water (15 to 25-m deep) in areas with the least exposure to sediment-laden streams (e.g., reefs of Poipu and Makahuena). However, these reefs have been impacted by hurricanes in recent years (Ewa in 1982 and Iniki in 1992; Grigg 2002). In addition to the recent reefs, fossil limestone reefs are present off the southern shore off Kauai (30 to 70-m deep), where abundant populations of the black coral *Antipathes dichotoma* can be found. In addition to sedimentation, human impacts that are perceived to be a problem on the reefs of Kauai include high fishing pressure and poor water quality (Grigg 2002).

3.5.4.1.1.8. Niihau Coral Reefs

Little is known about the reefs on the small, privately owned island of Niihau. However, they are believed to be in good condition, especially along the western coast (J. Maragos, USFWS, personal communication as cited in Green 1997).

3.5.4.1.1.9. Penguin Bank Coral Reefs

The reef habitat in Federal waters in the MHI is restricted to Penguin Bank and Kaula Rock (Hunter 1995). Very little is known of the condition of the reefs in these locations, although they are presumed to be in good condition because of their remoteness to human population areas. On the basis of interpretations of navigational charts, Hunter (1995) suggested that Penguin Bank supports areas of coral or coralline algae at a depth of approximately 50 meters. In deeper waters (50 to 100 m), the reef on Penguin Bank is dominated by coralline algae, *Halimeda*, bryozoans, and pen shells; corals are present in low abundances (Agegian and Abbott 1985, in Hunter 1995).

3.5.4.1.1.10. NWHI Coral Reefs

The NWHI comprise a multitude of reef areas (Hunter 1995; Maragos and Gulko 2002), including the following: numerous islands or reefs (French Frigate Shoals, Kure, Laysan, Lisianski, Maro Reef, Midway Atoll, Necker Island, Nihoa Island, Pearl and Hermes Atoll, and Gardner Pinnacles); two seamounts (Ladd and Nero); several banks (Brooks, Northhampton, Pioneer, Raita, Saint Rogatien, and Salmon); and eight shoals (Gambia Shoal and seven unnamed shoals, including three between Nihoa and Necker and one north of St. Rogatien). In general, these coral reefs are in excellent condition with unique biodiversity and high standing stock of many reef fishes, probably because of their isolation, protected status, and harsh seasonal weather conditions (Friedlander 1996). The pristine condition of this resource is likely to continue because they are distant from land-based sources of pollution and are protected from any large-scale human activities in the region (Friedlander 1996, Maragos and Gulko 2002). The potential coral reef area surrounding the NWHI is estimated at 1,595 square kilometers within the 10-fathom contour (Rohmann et al. 2005).

Many reefs in the NWHI are made up of calcareous algae (Green 1997). A peak in coral species diversity occurs in the middle of the Hawaiian Archipelago at French Frigate Shoals and Maro Reef (Grigg 1983). 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 are higher in the NWHI, and fish communities in the NWHI are dominated by apex predators (sharks and jacks), whereas those in the MHI are not (Friedlander and DeMartini 2002). Some fish species that are common in parts of the NWHI are rare in the MHI (Green 1997). In 2006, President George W. Bush established the NWHI Marine National Monument, later renamed the Papahanaumokuakea Marine National Monument, and instructed the Secretaries of Commerce and Interior to co-manage the marine resources within monument boundaries (71 FR 36447; June 26, 2006). These two federal agencies and the State of Hawaii are co-administrators of the Monument. For more information on the monument see http://www.hawaiireef.noaa.gov/.

3.5.4.1.2. Deep Reef Slope, Banks, and Seamount Habitat - Hawaii

Within the Hawaiian Islands Archipelago, there are numerous banks and seamounts, with more located in the NWHI than in the MHI. In the MHI, the largest bank is Penguin Bank, which is located southeast of Oahu.

3.5.4.1.3. Pelagic Habitat - Hawaii

The archipelago’s position in the Pacific Ocean lies within the clockwise rotating North Pacific Subtropical Gyre, extending from the northern portion of the North Equatorial Current into the region south of the Subtropical High, where the water moves eastward in the North Pacific Current. At the pass between the MHI and the NWHI, there is often a westward flow from the region of Kauai along the lee side of the lower NWHI. This flow, the North Hawaiian Ridge

Current (NHRC), is extremely variable and can also be absent at times. The analysis of 10 years of shipboard acoustic Doppler current-profiler data collected by the NOAA research vessel *Townsend Cromwell* shows the mean flow is through the ridge between Oahu and Nihoa, extending to a depth of 200 meters (Firing and Brainard 2006).

Imbedded in the mean east-to-west flow is an abundance of mesoscale eddies created from a mixture of wind, current, and seafloor interactions. The eddies can rotate either clockwise or counterclockwise and have important biological impacts. For example, eddies create vertical fluxes, with regions of divergence (upwelling) and convergence (downswelling). At regions of divergence, the thermocline shoals and deep nutrients are pumped into surface waters enhancing phytoplankton production. At regions of convergence the thermocline deepens. Sea surface temperatures around the Hawaiian Archipelago experience seasonal variability, but generally vary between 18° and 28° C (64° to 82° F), with the colder waters occurring more often in the NWHI.

Significant sources of inter-annual physical and biological variation around Hawaii are El Niño and La Niña events. During an El Niño, the normal easterly trade winds weaken, resulting in a weakening of the westward equatorial surface current and a deepening of the thermocline in the central and eastern equatorial Pacific. Water in the central and eastern equatorial Pacific becomes warmer and more vertically stratified with a substantial drop in surface chlorophyll.

Physical and biological oceanographic changes have also been observed on decadal time scales. These low-frequency changes, termed *regime shifts*, can impact the entire ocean ecosystem. Recent regime shifts in the North Pacific occurred in 1976 and 1989, with both physical and biological (including fishery) impacts (Polovina 1996, Polovina et al. 1995). In the late 1980s, an ecosystem shift from high carrying capacity to low carrying capacity occurred in the NWHI. The shift was associated with the weakening of the Aleutian Low Pressure System (North Pacific) and the Subtropical Counter Current. The ecosystem effects of this shift were observed in lower nutrient and productivity levels and decreased abundance of numerous species in the NWHI, including the spiny lobster, the Hawaiian monk seal, various reef fish, the red-footed booby, and the red-tailed tropic bird (Demartini et al. 2002, Polovina and Haight, 1999).

3.5.4.2. Protected Species - Hawaii

3.5.4.2.1. Sea Turtles - Hawaii

Green and hawksbill turtles are known to occur in nearshore waters around Hawaii, and loggerhead, leatherback, and olive ridley turtles have been incidentally caught by Hawaii-based pelagic longline vessels (NMFS 2005a).

3.5.4.2.1.1. Leatherback Sea Turtles

Leatherback turtles are not known to nest in the Hawaiian Islands; however, anecdotal reports indicate that they have been sighted within EEZ waters (NMFS 2001).

3.5.4.2.1.2. Loggerhead Sea Turtles

Loggerhead turtles occur around the Hawaiian Islands and there have been loggerhead migrations tracked that include transits through the Hawaiian Archipelago (Wallace et al. 1999).

3.5.4.2.1.3. Green Sea Turtles

The Hawaii population of green sea turtles is the only Pacific population known to be increasing, with both the foraging population and nesting populations showing 30-year increasing trends (Balazs and Chaloupka 2004).

3.5.4.2.1.4. Hawksbill Sea Turtles

Hawksbill turtles are known to reside and nest in the MHI, primarily on several small beaches on the Island of Hawaii (Balazs et al. 1992, Katahira et al. 1994). Although the local population has increased, there are still only a few dozen sea turtles that nest each year (Balazs 2002).

3.5.4.2.1.5. Olive Ridley Sea Turtles

There have been two reports of single nests in Hawaii. The first was in 1985 on Maui, but the eggs did not hatch (Balazs and Hau 1986); the second was in 2002 on the Island of Hawaii.

3.5.4.2.2. Marine Mammals and Seabirds - Hawaii

3.5.4.2.2.1. Humpback Whales

Humpback whales occur off all eight Main Hawaiian Islands during the winter breeding season, but particularly within the shallow waters of the four-island region (Kahoolawe, Molokai, Lanai, and Maui including Penguin Bank); the northwestern coast of the Island of Hawaii; and the waters around Niihau, Kauai, and Oahu.

3.5.4.2.2.2. Hawaiian Monk Seals

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 occur on Necker Island and Nihoa Island, and NMFS researchers have also observed monk seals at Gardner Pinnacles and Maro Reef. The 2004 U.S. Pacific Marine Mammal Stock Assessment estimates that there are 1,304 monk seals in the Hawaiian Islands with at least 52 of those occurring in the MHI (Carretta et al. 2004).

3.5.4.2.2.3. Other Marine Mammals

Sperm whales, rough-toothed dolphins, Risso's dolphins, bottlenose dolphins, pantropical spotted dolphins, spinner dolphins, striped dolphins, pygmy killer whales, false killer whales, melon-headed whales, short-finned pilot whales, Bryde's whales, Blainsville's beaked whales, and pygmy sperm whales are known to occur around Hawaii.

3.5.4.2.2.4. Seabirds

Many seabird species occur around Hawaii. Seabirds that are generally of concern to fishing operations include short-tailed, black-footed, and Laysan albatrosses; Christmas, Newell's, flesh-footed, wedge-tailed, and sooty shearwaters; and masked, brown, and red-footed boobies. The bristle-thighed curlew (*Numiensis tahitiensis*) is a migratory shorebird that is present in the Hawaiian Archipelgago during the winter months. The species is listed by the IUCN Red List Category as "Vulnerable" because of a small, declining population (estimated to be 7,000 birds worldwide). The primary threat is predation occurring on wintering grounds (BirdLife International 2009).

3.5.4.3. Fisheries of Hawaii

Under the authority of the MSA, the Council established (and the Secretary of Commerce approved) criteria to determine overfishing (i.e., fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region. Since 2000, the NWHI lobster fishery has been closed because of uncertainty in lobster stock assessments. On December 15, 2004, the Council was notified by letter that the Secretary of Commerce had determined on June 14, 2004, that overfishing of bigeye tuna (*Thunnus obesus*) was occurring throughout the Pacific Ocean (69 FR 78397). On May 25, 2005, it was determined that the Hawaii Archipelago multi-species bottomfish complex was subject to overfishing as defined in the MSA, with the MHI being the area where the overfishing problem primarily occurs (70 FR 34452, June 14, 2005). On March 16, 2006, the Council was notified by letter that the Secretary of Commerce had determined that overfishing is occurring on the yellowfin tuna (*Thunnus albacares*) stock in the western and central Pacific Ocean (71 FR 14837). As required under the MSA, the Council has made management recommendations to address these overfishing determinations. NMFS is now processing these recommendations and accompanying NEPA analyses.

3.5.4.3.1. Demersal Fisheries - Hawaii

3.5.4.3.1.1. Coral Reef Ecosystem Fisheries - Hawaii

In recent decades, there has been a notable decline in nearshore fishery resources in the MHI (Shomura 1987). Excessive fishing is considered to be one of the major causes of this decline (Grigg 2002, Harman and Katekaru 1988). Coastal construction, sedimentation, and other effects of urbanization have also caused extensive damage to coral reefs and benthic habitat near the populated islands.

The majority of the total commercial catch of inshore fishes, invertebrates, and seaweed comes from nearshore reef areas around the MHI. Nearshore reefs in the MHI are the focus of commercial reef ornamentals harvesting and black coral collecting (Friedlander 1996).

Although precise fishing locations are not reported, fishing gear types that mainly target inshore and coastal pelagic species accounted for about 10 percent (1.5 million lb) of total annual commercial fish catches from 1990 to 1995. Recreational and subsistence catches are not reported in Hawaii, but creel surveys at Kaneohe, Hanalei, and Hilo Bays suggest that these catches are at least equivalent to the reported commercial catch and may be two or three times greater (Friedlander 1996).

Commercial catches of coral reef fish include surgeonfishes (20 %), goatfishes (13 percent), squirrelfishes (11 percent), unicornfishes (8 %), and parrotfishes (8 %; DeMello 2004). Crabs, octopus, seaweed, limpets, and other types of coral reef associated species are also harvested regularly. No MSY values have been estimated for Hawaii’s coral reef fisheries.

There is a long history of coral reef fishing in the NWHI. Iverson et al. (1990) found extensive evidence of fishing by the ancient Hawaiians as far north as Necker Island. Starting in the 1920s, a handful of commercial boats ventured into the NWHI to fish for shallow and deepwater bottomfish, spiny lobsters, and other reef and inshore species. Black-lipped pearl oysters at Pearl and Hermes Reef in the NWHI were overfished in the late 1920s, and although there seems to be some pearl oyster recruitment occurring, the population has not recovered to preexploitation levels (Keenan et al. 2006). From the late 1940s to the late 1950s, there was a large commercial fishery for akule and reef fish (e.g., ulua) around French Frigate Shoals and Nihoa Island.

During the 1960s, and as recently as 1978, Asian fleets harvested tuna, billfish, precious corals, and groundfish in and around the NWHI using longliners, pole-and-line vessels, draggers, and trawlers. Foreign fishing in now prohibited throughout the archipelago. Currently, there are no active coral reef fisheries in the NWHI.

3.5.4.3.1.2. Crustacean Fisheries - Hawaii

Lobster

Ula (lobster) was a traditional source of food for native Hawaiians and was sometimes used in early religious ceremonies (Titcomb 1972). After the arrival of Europeans in Hawaii, the lobster fishery became by far the most productive of Hawaii’s commercial shellfish fisheries. It was reported that the MHI commercial lobster catch in 1901 was 131,200 pounds (Cobb 1902). By the early 1950s, the commercial catch of spiny lobsters (*P. penicillatus*) around the MHI had dropped by 75 to 85 percent (Shomura 1987).

In the late 1970s, NMFS, the U.S. Fish and Wildlife Service, Hawaii’s DAR, and the University of Hawaii’s Sea Grant Program joined in a cooperative agreement to conduct a 5-year assessment of the biotic resources of the NWHI. The survey reported that Necker Island and Maro Reef had sufficiently large stocks of lobsters to support some commercial exploitation (Uchida and Tagami 1984).

Shortly after, several commercial vessels began lobster-trapping operations. A period of low catches was followed by a rapid increase in landings as more vessels entered the fishery and markets were developed (Polovina 1993). In the mid-1980s, the NWHI lobster fishery was Hawaii’s most lucrative fishery (Pooley 1993).

Trapping activity fell in 1987 principally because of the exit of several large vessels from the fishery (Samples and Sproul 1988), but landings reached a record high in 1988 when wind and sea conditions allowed for an extended period of fishing in the upper bank areas where spiny lobsters tend to congregate (Clarke 1989).

In 1990, however, lobster catch rates fell dramatically, although overfishing is not thought to be responsible for the decline (Polovina and Mitchum 1992). Rather, the decrease was found to be most likely due to a climate-induced change in oceanic productivity (Polovina et al. 1994). Nevertheless, the 1990 season showed that there was excessive fishing capacity in the industry given the reduced population size (Polovina and Haight 1999). Responding to this concern, the Council established a limited access program and a fleet-wide seasonal harvest guideline (or quota) in 1991 that significantly altered fishing operations (Kawamoto and Pooley 2000).

From 1992 through 1997, Necker Island accounted for 48 to 64 percent of the total NWHI lobster fishery effort, and Gardner Pinnacles and Maro Reef accounted for most of the rest (WPRFMC 1999). In 1998, separate harvest guidelines were calculated for each of four fishing areas (Necker Island Lobster Grounds, Gardner Pinnacles Lobster Grounds, Maro Reef Lobster Grounds, and general NWHI lobster grounds) to prevent localized depletion.

By 1999, all participants in the NWHI lobster fishery used plastic dome-shaped, single-chambered traps with two entrance funnels located on opposite sides. By regulation, all traps have escape vents to allow unwanted organisms to exit. The traps are typically fished in strings of several hundred that are set before sunset in depths from 20 to 70 meters, and are retrieved the next day. Both spiny and slipper lobsters may be caught in the same trap, but fishermen can affect the proportion of each species by selecting the trapping area and depth (Polovina 1993). Almost all lobsters harvested from the NWHI were sold as a frozen tails; however, from 1996 to 1998, the fleet also landed a significant quantity of live lobsters.

Between 1985 and 1991, total landings showed varying trends. Beginning in 1992, landings were capped by the harvest guidelines (see Figure 3-18).

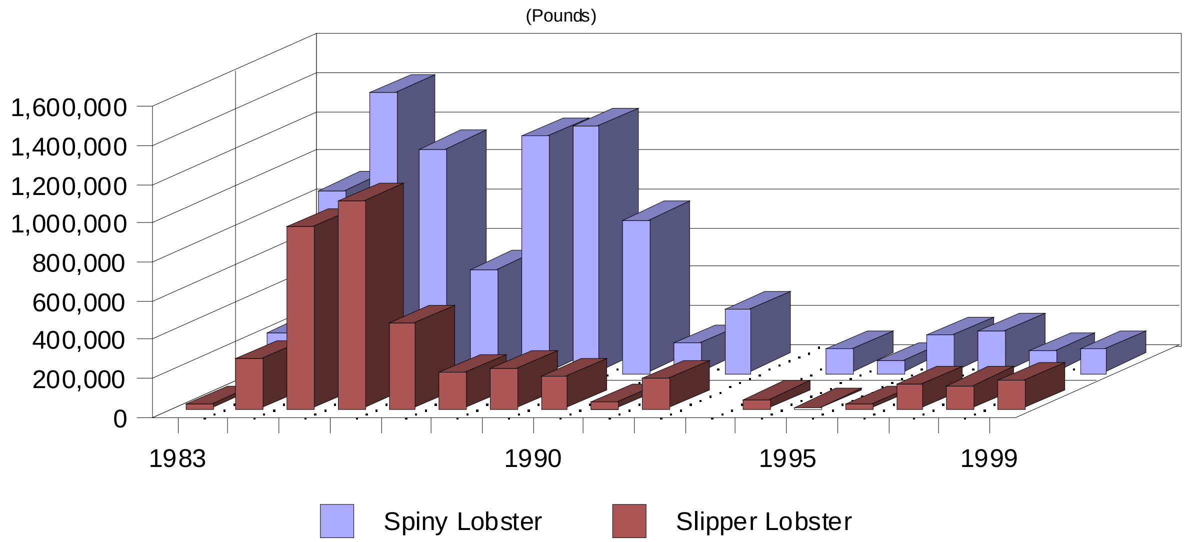


Figure 3-18. NWHI Lobster Fishery Landings 1983 to 1999.
Source: PIFSC 2003 unpublished data.

Nontargeted species account for a small percentage of the total catch in the NWHI lobster fishery, as the traps are designed for high selectivity. Using data from 1976 to 1991 (wire traps) and 1986 to 2003 (plastic traps) from research cruises in the NWHI, Moffitt et al. (2006) examined the diversity of catch composition. The traps used for the research were more conservative than commercial traps as they did not have escape vents, but otherwise they conformed to fishery regulations. Both wire and plastic traps were found to be highly selective; that is, they primarily caught lobsters. Wire traps caught a total of 82 species over the study period, of which the two target species of lobsters accounted for 90.5 percent by number. Plastic traps caught a total of 258 species over the study period, of which 73.1 percent by number were the lobster species. Because lobsters are one of the larger organisms captured, they would be a much higher percentage of the total catch if measured by weight. Of the organisms that were caught incidentally, hermit crabs made up the largest component, which was followed by moray eels and small reef fish.

Octopus abundance in the traps was also evaluated because of its potential as a prey species for the Hawaiian monk seal. Eighty-three individuals were captured during the entire 1986–2003 study period, and examination of the data showed no significant decline or increase in their capture rate over time. Based on the data, the study found that it is highly unlikely that lobster-trapping activities have lowered octopus abundance to such a degree that monk seal populations would be negatively impacted (Moffitt et al. 2006).

Overall, Moffitt et al. (2006) concluded that lobster-trapping activities are responsible for changes in abundance of a few species (target species have declined, and some crab species have increased because of competitive replacement) of the benthic community in the NWHI, but do not appear to have resulted in major changes to the ecosystem. Moffitt et al. (2006) also observed that gear lost in this fishery has not been found to be “ghost fishing” (still catching organisms), and although direct damage to the benthic habitat by the traps has not been studied, it is not likely to be substantial because of the low-relief, hard substrate that characterizes the fishing grounds.

Since 1999, NMFS has not issued harvest guidelines for the NWHI lobster fishery because of uncertainties in accurate lobster stock assessments. In 2006, President George W. Bush essentially closed the fishery permanently in his proclamation establishing the NWHI Marine National Monument by instructing the Secretary of Commerce to ensure that any commercial lobster fishing permit shall be subject to a zero annual harvest limit (71 FR 36447; June 26, 2006).

Deepwater shrimp

Eight species of *Heterocarpus* have been reported throughout the tropical Pacific (*Heterocarpus ensifer, H. laevigatus, H. sibogae, H. gibbosus, H. lepidus, H. dorsalis, H. tricarinatus, and H. longirostris*). These shrimp are generally found at depths of 200 to 1,200 meters on the outer reef slopes that surround islands and deepwater banks. Species distribution tends to be stratified by depth with some overlap. The deepwater trap fisheries have primarily targeted *Heterocarpus ensifer* and *H. laevigatus*. Western Pacific commercial trap fisheries for deepwater shrimp are intermittent. There were small-scale fisheries in Guam during the 1970s and some activity in the CNMI during the mid-1990s.

In Hawaii, an intermittent deepwater shrimp fishery began in 1967 (Tagami and Ralston 1988) and continues to vary from year to year with an average of three vessels reporting the catch of deepwater shrimp to the state of Hawaii. Vessels ranged in size from 7.5 to 40 m in length, though the number of smaller vessels increased as larger vessels left the fishery (Tagami and Barrows 1988). To date, the highest landings (~175,000 lb) of deepwater shrimp in Hawaii occurred in 1984; however, in 1989 nearly 270,000 lb were landed, with an estimated ex-vessel value of more than $1 million. In 2005, vessels from the Pacific Northwest fished for *Heterocarpus* spp. in Hawaii and landed over 100,000 lb. Between 1982 and 2005, the cumulative landings of *H. laevigatus* amounted to over 1.5 million lb, while during the same time period *H. ensifer* landings totaled over 20,000 lb.

Deepwater shrimp fisheries have been sporadic and short-lived throughout the Pacific since the 1960s (Hastie and Saunders 1992). The fisheries have been unregulated, and there has been no comprehensive collection of information on the fishery. Most of these fishing ventures have been unprofitable. The reasons for this are manifold. Gear loss has been a common problem and made many past ventures unprofitable. A second difficulty is the short shelf life and a history of inconsistent quality, leading to fluctuating market demand for the product. Lastly, these fisheries generally experience local depletion on known fishing grounds, which leads to much lower catch rates. While other banks might have abundant stocks, unfamiliarity with them could lead to even greater gear loss.

Traps are the primary method used to harvest deepwater shrimps in the western Pacific. Trawls do not work well in areas with the steep bathymetry that is typical for the region. Several types of traps have been used. Some consist of a steel frame that is covered with wire or plastic mesh, or with netting. Some are boxes made of plastic-coated wire mesh panels or formed plastic shells.

Trap shapes include boxes, ovals, half-cylinders, and pyramids. The traps used in the Hawaiian Islands have been 0.91 m tall pyramids with 1.83 m^2 bases, with a single entrance at the top. Traps have typically been baited with mackerel, set during the day, left out overnight, and recovered the next day. The traps in Hawaii were deployed individually, whereas in the NMI, several traps were deployed strung out on a line. Traps are connected to the surface by long float lines and marked with buoys. Hawaiian traps used 1.91 cm polypropylene float lines with two large floats spaced several yards apart on the surface.

Typically, fishery operations consisted of one to four vessels. Vessels lengths ranged from 7.5 to 40 m. Based on the Hawaii fishery, a 30-meter vessel could carry about 50 traps, but typically set about 30 traps per night.

Currently, there is little information about bycatch associated with the deepwater shrimp (*Heterocarpus* spp.) fishery and what is known comes primarily from research sampling.

Lobsters harvested in the Hawaiian Archipelago are marketed as fresh product or as frozen lobster tails, with each vessel processing its catch at sea. In general, shrimp are considered luxury food items; therefore care in handling is practiced. Smaller vessels normally wash the shrimp and store them in iced sea-water for transportation to protect the shrimp from enzyme-induced reactions (King 1993). Larger vessels have the space on board to process the shrimp by quick freezing them, which preserves their quality and allows them to be easily exported. Local markets, restaurants, and hotels use whole, fresh, chilled shrimp. Shrimp tails are less likely to be used because of low meat recovery rates, which is not commercially attractive (Oishi 1983). The domestic processing capacity and domestic processing levels will equal or exceed the harvest for the foreseeable future.

3.5.4.3.1.3. Bottomfish Fisheries - Hawaii

Bottomfish fishing was a part of the economy and culture of the indigenous people of Hawaii 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.

The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers (e.g., opakapaka), carangids (e.g., jacks), and a single species of grouper (hapuupuu) concentrated at depths of 30–150 fathoms. The fishery can be divided into two geographical areas: the inhabited MHI with their surrounding reefs and offshore banks, and the NWHI, a 1,200-nautical chain of largely uninhabited islets, reefs, and shoals. Bottomfish fishing grounds within federal waters around the MHI include Middle Bank, most of Penguin Bank, and approximately 45 nautical miles of 100-fathom bottomfish habitat in the Maui–Lanai–Molokai complex. For management purposes, the NWHI fishery has been separated into the closer Mau Zone between 165° W and 161° 20' W, and the more northwestern Hoomalu Zone to the west of 165° W. Participants in the

NWHI bottomfish fishery are commercial, while those in the MHI fishery will fish both commercially and non-commercially.

The basic design of the handline gear used in the MHI bottomfish fisheries consists of a main line with a 2 - 4 kg weight attached to the terminus. Several 40-60 cm long branchlines with circle hooks baited with squid or other cut bait are attached above the weight at 0.5-1.0 meter intervals. A chum bag containing chopped fish or squid may be suspended above the highest of these hooks. The gear is retrieved after several fish are hooked.

Circle hooks used in the bottomfish fishery are flat by design. Offset hooks 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 mouth the bait and spit it out. Fishermen use the circle hook for its self-setting ability and for its curved design that makes it difficult for the fish to rid itself of the hook once it is 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. An additional characteristic of the circle hook design that appeals to fishermen is that it is less prone to snagging on rocky or hard substrate bottoms and difficult to snag on flat or smooth surfaces. This characteristic minimizes the loss of gear (K. Kawamoto, PIFSC, personal communication).

The "Deep 7" species are the most commercially important bottomfish in Hawaii, and as such are the primary target of most bottomfish fishermen in Hawaii. The "Deep 7" bottomfish are onaga (*Etelis coruscans*), ehu (*E. carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*P. sieboldii*), opakapaka (*P. filamentosus*), lehi (*Aphareus rutilans*), and hapu'upu'u (*Epinephelus quernus*). Other species such as uku (*Aprion virescens*), white ulua (*Caranx ignobilis*), and kahala (*Seriola dumerili*) are also taken. The ability to target particular species varies widely depending on the skill of each fisherman. 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). Opakapaka 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. Hapu'upu'u 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. Because of potential ciguatera toxicity, however, ulua are not usually targeted. Kahala are one of the least valuable bottomfish because large specimens have a reputation for carrying the ciguatera toxin and high densities of parasites in the flesh.

Commercially-important deepwater bottomfish inhabit the deep slopes of islands and banks between depths of 100 and 400 meters (about 55 to 220 fathoms). The distribution of adult bottomfish is highly correlated with suitable physical habitat, which generally includes high-relief areas with water movement. Fishermen target specific areas by drifting or anchoring their vessels, taking into consideration ocean currents (both surface and at depth), wind speed, wind direction and sea conditions. These environmental constraints limit the time during which bottomfish fishing can be conducted.

MHI Commercial Bottomfish Fishery

Commercial bottomfish vessels are required to obtain a State of Hawaii commercial marine license through the DAR, DLNR. Commercial vessel operators are required to report catch, effort, and location information on a monthly basis. There are currently 2,355 commercial bottomfish vessels registered with DLNR (unpublished data, DLNR-DAR 2007). Some 300 fishermen reported catching and selling bottomfish (i.e., commercial fishing) in 2006 (Moffitt et al., 2006).

The number of fishermen engaged in commercial bottomfish fishing in the MHI increased dramatically in the 1970s and 1980s, but then declined in the early 1990s. It rebounded somewhat in the late 1990s, but in 2002 reached its lowest level since 1977. The recent 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.

The breakdown of vessel types by each island is shown in Table 3-12. Registered vessels range in size from 8 - 65 ft in length. However, the vast majority of the registered vessels lie in the range of 14 to 30 ft in length. The largest size class is 19 ft.

Table 3-12. Bottomfish Vessel Registration by Island and by Commercial Status.

Category	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Commercial	342	723	7	17	337	907
Non-commercial	159	1,311	29	10	152	242
Total by Island	501	2,034	36	27	489	1,149
Total Commercial						2,355
Total Non-commercial						1,881
Percent (%) Non-commercial by Island	31.7	64.5	19.4	37.0	31.1	21.1
TOTAL PERCENT (%) NON-COMMERCIAL						44.4

Source: Hawaii DAR unpublished data

Fishermen who make trips longer than 24 hours are mostly full-time commercial fishermen. They typically operate larger boats than the part-time commercial/non-commercial fishermen and are able to fish during rough weather and venture further from port to fish less-exploited areas off Kauai, Niihau, and east Maui that are less accessible to the small boat fishermen.

The majority of participants in MHI fisheries shift target species groups and from the bottomfish fishery to other fisheries, primarily the pelagic troll and handline fisheries, 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. Seasonal price variability of bottomfish 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. These pelagic species are often caught by pelagic gear when bottomfish vessels are transiting to the bottomfish areas.

The Main Hawaiian Islands

MHI Non-commercial Bottomfish Fishery

According to the State's bottomfish fishing vessel registration requirement, in 2007 there were 4,236 vessels registered to fish for bottomfish in Hawaii, with 1,881 of those being non-commercial (Unpublished data, DLNR-DAR 2007). The majority of the non-commercial fishery participants are based on Oahu. The DAR bottomfish fishing registry is not updated on a regular basis so it is difficult to know exactly how many of these vessels are actively fishing.

Statistics for the non-commercial bottomfish fishery are limited as there is currently no requirement for recreational saltwater fishing licenses or catch reporting. Over the years, surveys have been conducted, but no systematic collection of non-commercial fisheries data has been sustained. The NMFS Marine Recreational Fisheries Statistical Survey, active in other parts of the country, was discontinued in Hawaii in the mid-1980s. Recently, however, this program has returned as the Hawaii Marine Recreational Fishing Survey (HMRFS), and it collects data using a dual survey approach consisting of random telephone surveys and a fisherman intercept survey conducted at boat launch ramps, small boat harbors, and shoreline fishing sites. To date, however, an insufficient number of intercepts of bottomfish fishermen have occurred to allow catch and effort determinations for this fishery.

In 2005, the HDAR surveyed Hawaii's registered bottomfish vessel owners by mail. The survey was mailed to 3,678 fishermen who were registered with the State bottomfish fishery. The return rate was approximately 22 percent. Of the 802 completed questionnaires, 38 percent said they actually fished for deepwater bottomfish in the previous year. Forty-eight percent said they sometimes fish for deepwater bottomfish, but had not done so during the previous year. Fourteen percent said they do not bottomfish at all. Of those who fished, most fished with another person (results ranged from one to five), fished two lines (results ranged from one to five) with, most often, five hooks per line (results ranged from one to 13). Bottomfish fishing effort varied cyclically over an annual cycle with the most effort occurring during November and December, and least effort during April and May. Weekends and holidays were the favored days for bottomfish fishing. Penguin Banks was the preferred fishing area.

At this time it is not possible to accurately estimate what the total non-commercial landings are. Nevertheless, it is likely that landings by non-commercial bottomfish vessels average much less than landings by commercial bottomfish fishermen because of differences in vessel capability, fishing skill, and avidity. There are limited data from the HMRFS program and some concerns about the sampling methods; statistical algorithms employed to develop non-commercial catch totals are being refined. The HMRFS program may be able to provide this estimate in the future with a revised HMRFS sampling protocol and data analysis and more bottomfish fisherman intercepts. New requirements for reporting Deep 7 bottomfish catch by non-commercial fishermen will also provide better data.

NWHI Commercial Bottomfish Fishery

Bottomfish fishing in the NWHI is conducted solely by commercial fishermen, and the vessels used tend to be larger (although required to be 60 feet or less) than those fishing around the MHI, as the distance to fishing grounds is greater. Participation in the NWHI bottomfish fishery is controlled through limited access programs in each of the two sub-management zones (Mau and Hoomalu). 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. Permits may not be sold, leased, or chartered. On the basis of the biological, economic, and social characteristics of the bottomfish fisheries in the two zones, the long-term target fleet sizes for the Hoomalu and Mau Zones were determined to be seven and ten vessels, respectively. In 2004, four vessels fished in the Hoomalu Zone, and five vessels fished in the Mau Zone. All of these vessels are independent, owner-operated fishing operations. In 2005, four vessels operated in each zone, for a total of eight operating in the NWHI. The NWHI bottomfish fishery will close on June 15, 2011, in accordance with the provisions of the Papahanaumokuakea Marine National Monument, which was established in the NWHI through Presidential Proclamation No. 8031 on June 15, 2006.

Bottomfish gear and fishing strategies are highly selective for desired species and sizes. In addition, the use of bottom trawls, bottom gillnets, explosives, and poisons are forbidden under the Bottomfish and Seamount Groundfish FMP.

Overview of Hawaii Bottomfish Landings and Sales

On the basis of recent (1998 to 2002) harvest data, commercial bottomfish catches in the MHI fishery represent approximately 60 percent of the total commercial bottomfish harvest in Hawaii (WPRFMC 2004a, 2004b). Data for 2003 indicate that a total of 272,569 pounds of commercial landings were made by 325 vessels in the MHI, with a total ex-vessel value of $1,460,000 (Figures 3-19 and 3-20). Mau Zone landings for 2003 were estimated to total 77,000 pounds, with a total ex-vessel value of $356,769, while Hoomalu Zone landings were 145,000 pounds, with a total ex-vessel value of $494,450 (WPRFMC 2005). The bottomfish MSY for the MHI is estimated at 353,435 lb. Bottomfish MSY values for the Mau and Hoomalu Zones are estimated at 97,904 lb and 339,728 lb, respectively (Moffitt et al. 2006). In 2008, the total commercial catch of MHI Deep 7 bottomfish was restricted to 178,000 lb; and in 2009, the total allowable catch was restricted to 241,000 lb.

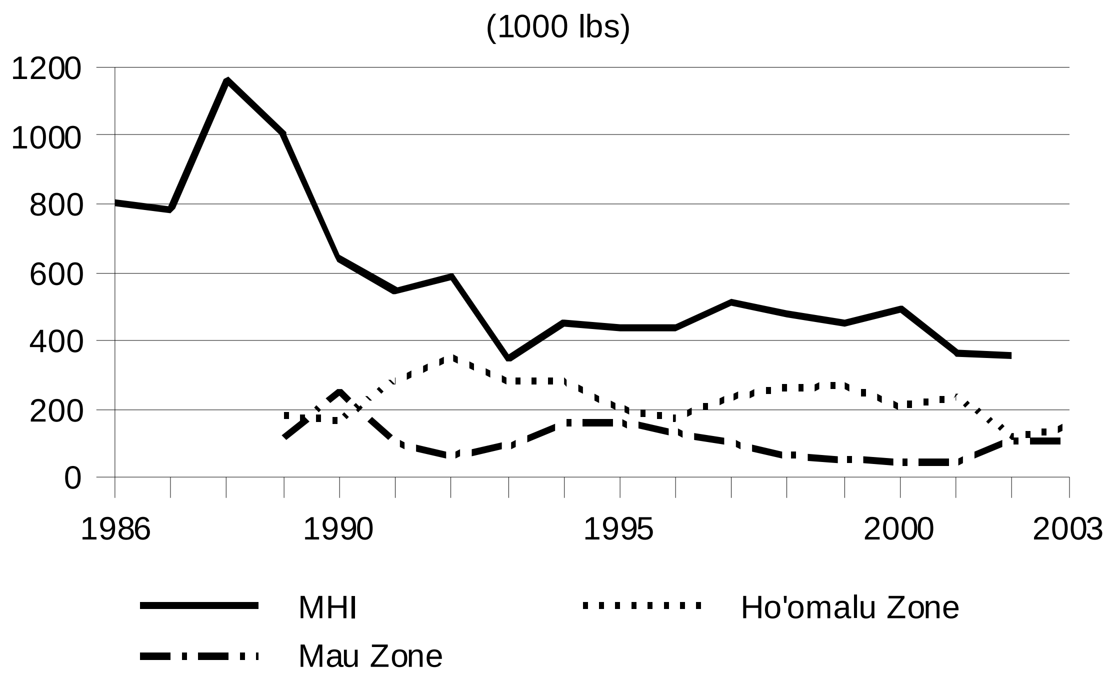


Figure 3-19. MHI and NWHI Bottomfish Landings 1986 to 2003.
Source: WPRFMC 2004c; 2003 Bottomfish Annual Report.

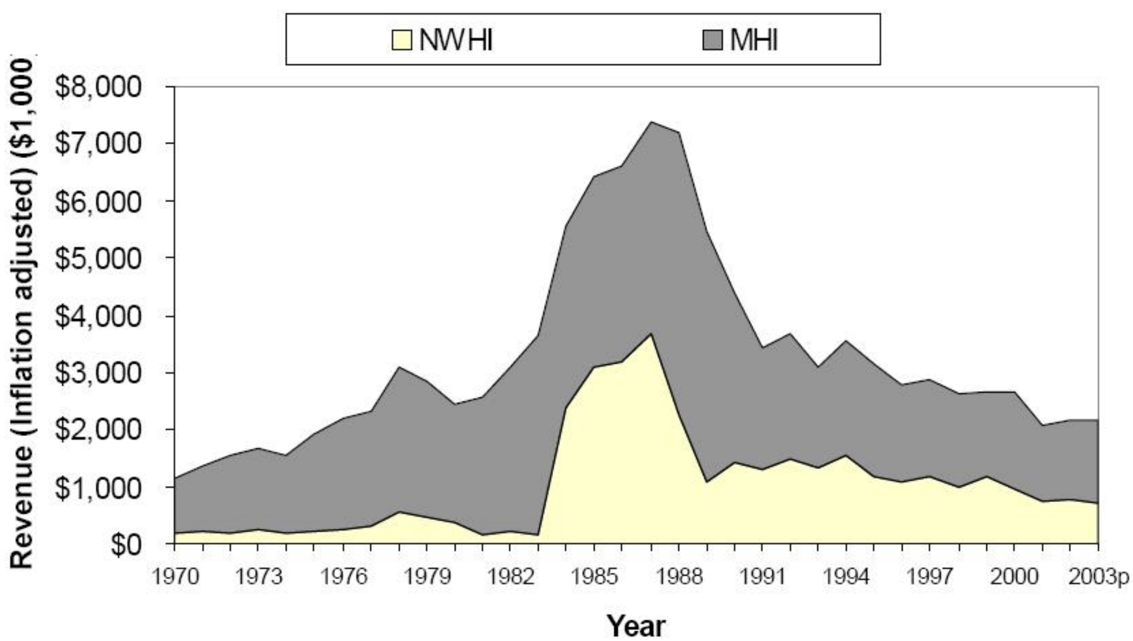


Figure 3-20. Hawaii Bottomfish Revenue (Inflation Adjusted) by Area 1970 to 2003.
Source: WPRFMC 2004c.

Nearly all bottomfish caught in the NWHI fisheries are sold through the Honolulu fish auction (United Fishing Agency, Ltd.). Bottomfish caught in the MHI fishery are sold in a wide variety of market outlets (Haight et al. 1993a). Some fish are marketed through the fish auction and intermediary buyers on all islands. Sales of MHI bottomfish also occur through less formal market channels such as local restaurants, hotels, grocery stores, and individual consumers. Unsold fish are consumed by fishermen and their families, given to friends and relatives as gifts, and bartered in exchange for various goods and services.

Onaga and opakapaka make up the largest valued landings in each area for most years (ignoring the highly fluctuating landings of uku); NWHI ex-vessel prices were $4.53 and $4.79 per pound, respectively, in 2003 while MHI prices were $5.89 and $5.01, respectively. However, the NWHI landings comprise a higher percentage of these higher priced species compared with the MHI, so the difference in revenues for individual species by area is flattened by the different species compositions between the two areas (see Figure 3-21).

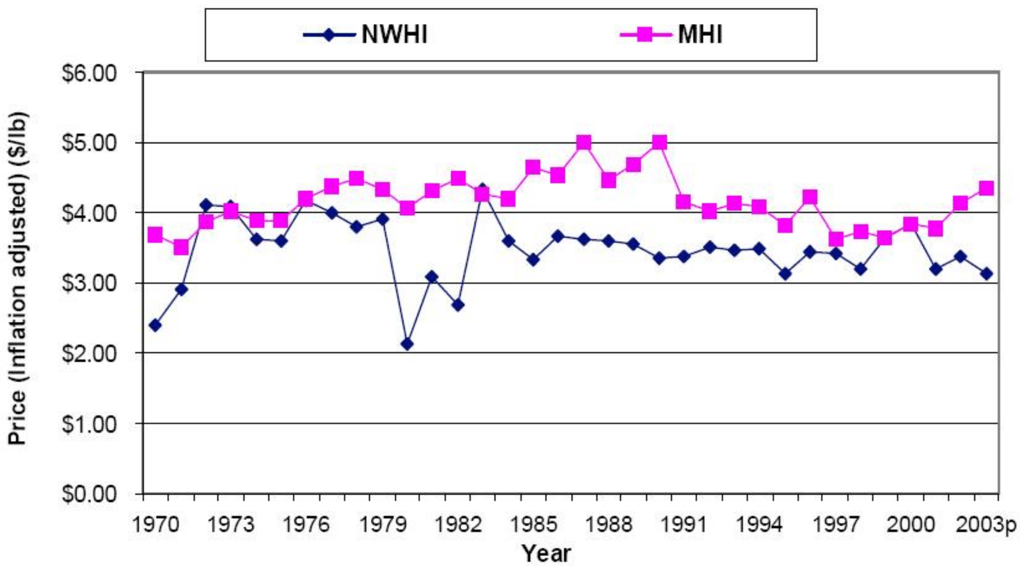


Figure 3-21. Average Prices for NWHI and MHI BMUS Landings 1970 to 2003.
Source: WPRFMC 2004c.

According to U.S. Customs data for the Port of Honolulu, 801,000 pounds of snapper were imported in 2003 and were worth $2.26 million ($2.82 per pound). This exceeded the domestic supply and thus was a significant factor upon which to base local ex-vessel prices (WPRFMC 2004c). Tonga and Australia were the largest sources of fresh snapper, with Fiji and New Zealand also being major sources. 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 Hawaii has also increased. A decade ago, for example, fresh snapper was exported to Hawaii mainly from within the South Pacific region. In recent years, Tonga and Australia were the largest sources of imported fresh snapper, along with Fiji and New Zealand, but snapper and other types of bottomfish have also been received from Indonesia, Samoa, Solomon Islands, Chad, Japan, Kiribati, Mozambique, Philippines, and Vietnam.[50]

[50]http://www.st.nmfs.gov/pls/webpls/trade_dist_allproducts_mth.results?qtype=IMP&qmonthfrom=01&qmonthto=01&qyearfrom=1996&qyearto=2005&qproduct=%25&qdistrict=32&qsort=COUNTRY&qoutput=TABLE (January 2007).

Hawaii bottomfish fishery status and regulations

In 2005, it was determined that the Hawaii Archipelago multi-species bottomfish complex was experiencing overfishing as defined in the MSA, with the MHI the area where the overfishing problem primarily occurs (70 FR 34452; June 14, 2005). A more recent stock assessment found that the Hawaii archipelagic bottomfish stocks are in better condition than the previous analysis (Brodziak et al. 2009).

Amendment 14 to Hawaii's Bottomfish FMP became effective April 1, 2008 (73 FR 18450), with the permit and reporting requirements effective as of August 18, 2008 (73 FR 41296). Amendment 14 implemented the following requirements for vessel-based bottomfish fishing in the MHI:

(1) Federal bottomfish permits are required for vessel owners and fishermen to conduct vessel-based non-commercial fishing for any bottomfish management unit species (BMUS), not just Deep 7 species, in Federal waters around the MHI (except customers of charter fishing trips).

(2) Operators of non-commercial fishing vessels are required to submit daily Federal logbooks that document bottomfish fishing effort and catch for each fishing trip, and vessel owners share the responsibility for submitting the logbooks in a timely manner. The data from these logbooks will be the basis for calculating non-commercial fishing effort and harvest of BMUS, bycatch, and interactions with protected species.

(3) A closed season was implemented between May and August of 2008. During this closure, fishing for Deep 7 species was prohibited in Federal waters. Fishing for bottomfish species other than Deep 7 species was not prohibited during the closed season.

(4) An annual total allowable catch (TAC) management system was established for the MHI commercial bottomfish fishery. The TAC will be determined each fishing year using the best available scientific information, commercial and non-commercial fishing data, and other information, and will consider the associated risk of overfishing. NMFS will publish in the Federal Register by August 31 the TAC for the upcoming fishing year, and will use other means to notify permit holders of the TAC. When the TAC is projected to be reached, NMFS will publish notification in the Federal Register and use other means to notify permit holders that the fishery will be closed on a specified date, providing fishermen with two weeks advance notice of the closure. The TAC for the 2007-08 fishing year (October 2007 through April 2008) was set at 178,000 lb (80,740 kg) of Deep 7 species. Progress toward the 2007-08 TAC was determined by the catch reported by holders of Hawaii commercial marine license (CML). When the 2007-08 TAC was reached, the commercial and non-commercial fisheries for Deep 7 bottomfish were closed. Based on the latest stock assessment, the 2008-2009 TAC was set at 241,000 lbs.

There is no prohibition on fishing for other bottomfish species throughout the year. NMFS intends to repeal the Federal non-commercial bag limits once the data collected from the non-commercial bottomfish fishery are determined to be adequate to include in the annual TAC calculation.

Non-commercial fishermen are allowed to catch, possess, and land as many as five Deep 7 fish combined, per person, per fishing trip regardless of whether the fish were caught in State or Federal waters. The State of Hawaii also has a similar bag limit for non-commercial fishing but is not cumulative with the Federal bag limit.

At the Council's request, NMFS issued a final notice of specifications for the MHI Deep 7 bottomfish fishery (74 FR 6998) which specified a Total Allowable Catch of 241,000 lb of Deep 7 species caught by commercial fishermen in waters around the Main Hawaiian Islands during the 2008-2009 fishing year.

The Presidential Proclamation of June 15, 2006, closed commercial fisheries within the monument's boundaries immediately except for the NWHI commercial bottomfish fishery which will close by June 15, 2011. However, Native Hawaiian cultural practices, including subsistence fishing, may be permitted to continue. Although the commercial bottomfish and associated pelagic fishing operations in the NWHI may continue over the five-year period, they would be subject to a landing limit on each species complex. No more than 350,000 pounds of bottomfish and no more than 180,000 pounds of pelagic fish may be landed within a given year. Furthermore, over the next five years, all bottomfish fishing operations in the NWHI must comply with new area closures, vessel monitoring and reporting requirements in addition to existing regulations.

3.5.4.3.1.4. Precious Corals Fisheries - Hawaii

The collection of black coral from depths of 30–100 meters by scuba divers has continued in Hawaii since black coral beds were discovered off Lahaina, Maui, in the late 1950s, although harvest levels have fluctuated with changes in demand. Since 1980, virtually all of the black coral harvested around the Hawaiian Islands has been taken from a bed located in the Au'au Channel. Most of the harvest has come from State of Hawaii waters, and no black coral diver has ever received a federal permit to harvest precious coral in the EEZ. However, a substantial portion of the black coral bed in the Au'au Channel is located in the EEZ. In 1999, concern about the potential for greater harvesting pressure on the black coral resources led the State of Hawaii to prohibit taking the harvest of black coral with a base diameter of less than three-quarter inches from state waters. A Regulatory Amendment to the FMP in 2007, eliminated an exemption to harvest of black corals that have a minimum base diameter of ¾ of an inch for fishermen that reported harvest to the State of Hawaii prior to April 17, 2002. (72 FR 58259). Currently, live black corals may only be harvested at a minimum base diameter of 1 inch or minimum height of 48 inches. The Au'au Channel Bed became an established bed in 2008 through Amendment 7 to the Precious Corals FMP (73 FR 47098).

After two decades of minimal activity, the domestic fishery for pink, gold, and bamboo precious corals in the EEZ of Hawaii resumed in December 1999. One company used two one-man submersibles to survey and harvest pink and gold corals at depths between 400 and 500 meters during 1999 and 2001; however, they did not continue their operations after that time and the actual harvests cannot be reported here because of data confidentiality policies that prohibit the publication of proprietary information unless there are at least three separate operations included in the dataset.

In 1988, the domestic fishing vessel *Kilauea* used a tangle net dredge (now prohibited) to harvest beds at Hancock Seamount. Their catch, however, consisted mostly of dead or low-quality pink coral, and the operation was soon discontinued. In the mid-1980s, a company experimented with manned submersibles equipped with spotlights, cameras, and a variety of maneuverable tools to harvest individual colonies, chosen by size and quality prior to cutting, in a highly controlled and efficient manner (Carleton 1987).

The Western Pacific Region's gold coral fishery is currently dormant, although research on gold coral remains active. Recent research has called into question current assumptions about the correlation between linear and axial growth rates of gold coral. Based on recommendations from fishery scientists and as a precautionary measure, at its December 21, 2006 meeting, the Council took final action to recommend a five-year moratorium to fish for, take, or retain any gold coral in any precious coral permit area. This moratorium includes all waters of the U.S. Exclusive Economic Zone of the Western Pacific Region and is currently in effect through June 30, 2013 (73 FR 47098). During the moratorium, an associated research program will collect data on the age structure, growth rate, and correlations between length and age.

Between 1990 and 1997, the annual harvest of black coral in Hawaii varied from a low of 864 pounds to a high of 6,017 pounds, with a yearly average of 3,084 pounds (Table 3-13). Landings and ex-vessel values of the black corals recently harvested in Hawaii cannot be presented because of the low number of active harvesting operations (fewer than three).

Because the Precious Corals FMP allows harvest only by selective gear (i.e., with submersibles or by hand), Federal precious coral fisheries in Hawaii have no bycatch.

Table 3-13. Volume and Value of Black Coral Landings in Hawaii 1990 to 1997.

Year	Harvested (lb)	Sold (lb)	Value ($)
1990	2,349	2,169	31,575
1991	2,305	2,250	35,080
1992	2,398	2,328	46,560
1993	864	769	15,380
1994	4,354	4,209	84,180
1995	6,017	5,912	122,765
1996	4,865	1,703	41,325
1997	1,520	415	10,394

Source: Hawaii Division of Aquatic Resources unpublished data.
Note: Years 1998 to present are not provided due to data confidentiality policies.

The naming of black coral as the Hawaii state gem in 1987 increased consumer interest in this precious coral. However, the quantity of black coral required by jewelry manufacturers in Hawaii has dropped considerably because the jewelry items produced are smaller and of higher quality and because modern cutting procedures have become much more efficient (Carleton 1987). In 1976, Grigg estimated a black coral MSY of 5,000 kg/yr (Grigg 1976). Recently, Grigg discovered a greater impact to the black coral resource from an invasive soft coral, *Carijoa riisei*, and based on that, coupled with harvesting impacts, estimated a reduced MSY of 3,750 kg/yr (Grigg 2004) for this area.

A worldwide glut of *Corallium* produced during the boom years of the early 1980s caused the market value of pink coral to fall. Consequently, many fishermen dropped out of the fishery and the worldwide supply of deepwater precious corals has dwindled. The precious corals jewelry industry in Hawaii has been estimated to be worth at least $25 million in annual revenue (Grigg 1993).

3.5.4.3.2. Pelagic Fisheries- Hawaii

Hawaii’s pelagic fisheries, which include the longline, troll and handline, offshore handline, and the aku boat (poleline) fisheries are the state’s largest and most valuable (Figures 3-22 and 3-23). The target species are tunas and billfish, but a variety of other species are also important (e.g., mahimahi, ono). Collectively, these pelagic fisheries made approximately 22 million pounds of commercial landings with a total ex-vessel value nearly $50 million in 2004 (WPFMC 2005).

The largest component of pelagic catch in 2004 was tuna. Bigeye tuna was the largest component of the commercial catch, and has increased almost fivefold from its 1987 catch. Swordfish was the largest component of the billfish catch from 1990 through 2000, but it was replaced by blue marlin in the next years and by striped marlin in 2003. Mahimahi was the largest component of the nontuna and nonbillfish catch though ono (wahoo) and moonfish catches have increased to comparable levels in recent years (WPFMC 2005).

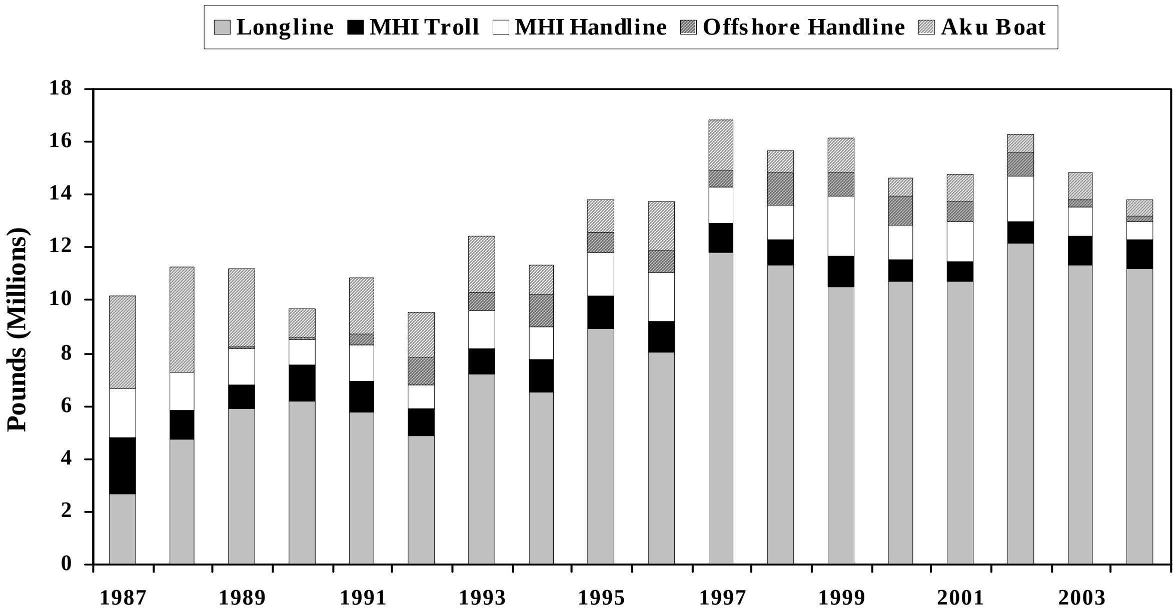


Figure 3-22. Hawaii Commercial Pelagic Catch by Gear Type, 1987 to 2004.
Source: WPRFMC 2005; 2004 Pelagic Annual Report.

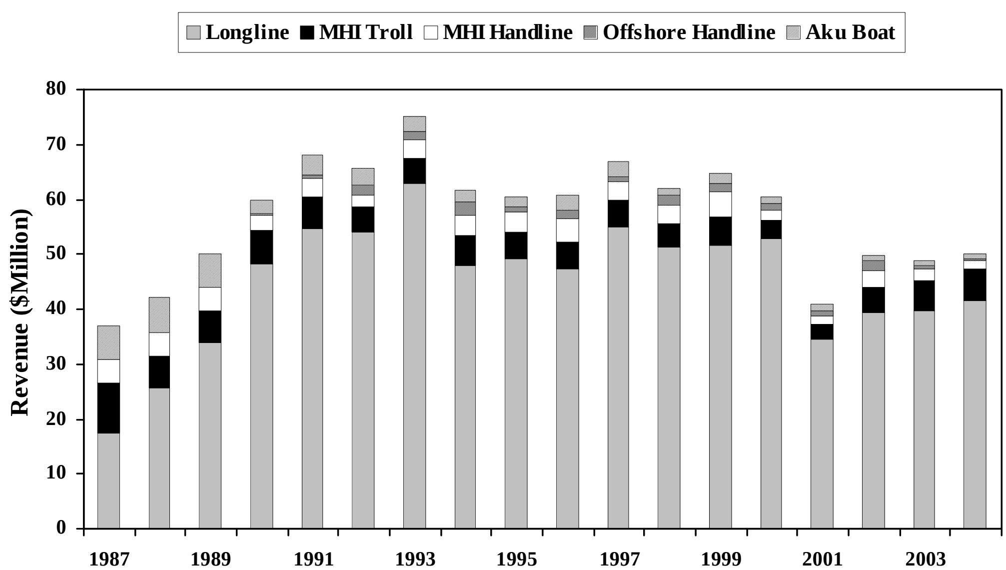


Figure 3-23. Hawaii Pelagic Revenue by Gear Type, 1987 to 2004.
Source: WPRFMC 2005; 2004 Pelagic Annual Report.

The total number of recreational fishers in Hawaii is unknown but there are about 14,300 small vessels in Hawaii, of which about 90 percent are registered as 'pleasure craft.' McConnell and Haab (2001) estimated that 6,600 of these vessels might be used for recreational fishing. Out of a sample of 1,008 respondents from these 6,600 vessel owners in a phone survey, 17 percent indicated that their vessel was either not being used or was not used for fishing. Based on these data it is estimated that Hawaii's recreational small boat fleet numbers about 5,500 vessels. The Hawaii Marine Recreational Fisheries Survey (HMRFS) has been sampling recreational catches since 2003. The data indicate that little to no bigeye tuna is caught by recreational fishers, while yellowfin landings have been estimated to range between 2,270 and 5,050 tons, with a three year mean of 3,295 tons. However, caution must be exercised in interpreting the figures from the HMFRS program, which are generated through the product of catch per trip from intercept surveys at landing sites, and a random digit dialing phone survey to estimate effort in trips. The National Research Council review of the entire NMFS Marine Recreational Fisheries Statistical Survey (MRFSS) has been highly critical of the sampling methods and statistical algorithms employed to develop recreational catch totals. As such, this Council has recommended that HMRFS catch estimates should not be used for management purposes until these problems have been fixed. Nonetheless, Hawaii's recreational pelagic fishery is believed to catch notable amounts of yellowfin tuna, billfish, and other PMUS such as mahimahi and ono (wahoo).

The Council was notified by letter on December, 15, 2004, that the Secretary of Commerce had determined that overfishing of bigeye tuna (*Thunnus obesus*) was occurring Pacific-wide. As indicated in the MSA, and required by the implementing regulations for National Standard 1 (50 CFR 600.310(e)(3), the Council was requested by the Secretary to take remedial action (i.e., recommend to NMFS an amendment to its Pelagics Fishery Management Plan) within one year. More recently in August 2005, the Scientific Committee of the Western and Central Pacific Fisheries Commission reviewed a stock assessment that indicated that yellowfin tuna (*Thunnus albacares*) in the Western and Central Pacific Ocean also appears to being subjected to overfishing.

Pacific bigeye and yellowfin tunas occur in the waters of multiple nations and the high seas and are fished by the fleets of other nations in addition to those of the U.S. The capacity for unilateral action by the U.S. to prevent overfishing, as required under National Standard 1 of the Magnuson-Stevens Act (16 U.S.C. 1851(a)(1), is limited as is the capacity for actions taken by the Councils to end overfishing, as required under 50 CFR 600.310(e)(4)(i)) (69 FR 78397). Bigeye tuna catches by commercial fisheries under the Council's jurisdiction in 2004 amounted to 5,163 metric tonnes (t), or 2.3 percent of the 2004 total Pacific-wide bigeye catch. Similarly, 2004 yellowfin tuna catches by commercial fisheries under the Council's jurisdiction amounted to 2,383 t or about 0.35 percent of the 2004 total Pacific-wide yellowfin catches, and 0.58 percent of the yellowfin caught in the WCPO. The Council has recommended management action for research, monitoring and management of international and domestic fisheries that would end overfishing of Pacific bigeye and WCPO yellowfin tunas in a cost-effective and equitable manner. The Council completed Amendment 14 to the Pelagics FMP to address overfishing of bigeye and yellowfin tuna on August 23, 2006 and a proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved; however, the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS. These recommendations were based on the best available science including the most recent stock assessments (July 2004 and August 2005 for bigeye and yellowfin tuna respectively), and in light of the fact that any unilateral management action on U.S.-based vessels can only have minimal direct impacts on stocks as they harvest only 2.3 percent of the total Pacific bigeye catch and less than 1 percent of the total Pacific yellowfin catch. For more information on this issue, please visit www.wpcouncil.org or contact the Council[51].

3.5.4.4. Fishing Communities - Hawaii

The most recent estimate of the contribution of the commercial, charter, and recreational fishing sectors to Hawaii's 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 0.25 percent of total state output ($47.4 billion), 0.17 percent of household income ($20.2 billion), and 0.19 percent of employment (757,132 jobs). In contrast to the sharp decline in some traditional mainstays of Hawaii's economy, such as large-scale agriculture, the fishing industry has been fairly stable for the past few decades. For example, total revenues in Hawaii's pelagic, bottomfish, and lobster fisheries in 1998 were about 10 percent higher than 1988 revenues (adjusted for inflation) in those fisheries.

The Hawaii longline fishery is by far the most economically important of Hawaii's commercial fisheries, accounting for 77 percent of the estimated ex-vessel value of the total commercial fish landings in the state in 2003 (WPRFMC 2004a, 2004b).

Income generation in Hawaii is dominated by tourism, federal defense spending, and, to a lesser extent, agriculture. Tourism is by far the leading industry in Hawaii in terms of generating jobs and contributing to gross state product. The World Travel and Tourism Council (1999) estimated that tourism in Hawaii directly generated 134,300 jobs in 1999. This figure represents 22.6 percent of the total workforce.

For 2002, the Department of Business, Economic Development and Tourism (2003) estimated that direct and indirect visitor contribution to the state economy was 22.3 percent. A bit less than half of that (10.2 %) was generated in Waikiki. Total visitor expenditures in Hawaii were $9,993,775,000. Tourism's direct and indirect contribution to Hawaii's gross state product in 2002 was estimated at $7,974,000,000, or 17.3 percent of the total. Directly and indirectly, tourism accounted for 22.3 percent of all civilian jobs, and 26.4 percent of all local and state taxes.

Department of Defense expenditures are also important to Hawaii's economy. Defense expenditures in Hawaii are expected to contribute substantially to Hawaii's economy due to ongoing military operations and support. As of late July 2004, Hawaii expected to receive $496.7 million in defense-related spending. When combined with funds earmarked for construction that are contained in a measure before the Senate, Hawaii stands to receive more than $865 million in defense dollars, which do not include funds for day-to-day operations or payroll (Inouye 2004).

[51] WPRFMC. 1164 Bishop St. Ste. 1400, Honolulu, HI. 96813.

Agricultural products include sugarcane, pineapples, nursery stock, livestock, and macadamia nuts. In 2002, agriculture generated a total of $510,672,000 in sales. Agricultural employment decreased from 7,850 workers in 2000 to 6,850 in 2003.

Table 3-14. Statistical Summary of Hawaii's Economy: 1995 to 1999, 2002.

Category	Units	1995	1996	1997	1998	1999	2002
Civilian labor force	Number	576,400	590,200	592,000	595,000	594,800	582,200
Unemployment	Percent	5.9	6.4	6.4	6.2	5.6	4.2
Gross state product in 1996 dollars	Millions (in dollars)	37,963	37,517	37,996	38,015	38,047	38,839 (2001)
Manufacturing sales	Millions (in dollars)	2,045	1,724	1468.8	NA	NA	NA
Agriculture (all crops and livestock)	Millions (in dollars)	492.7	494.6	486.5	492.6	512,992	510,672
Construction completed	Millions (in dollars)	3,153.3	3,196.4	2,864.9	NA	NA	NA
Retail sales	Millions (in dollars)	15,693.3	16,565	16,426	NA	NA	NA
Defense expenditures	Millions (in dollars)	3,782.5	3,883.5	4,074.9	4,103.7	4,174.2	4,293,459

Source: Bank of Hawaii, 1999a; Department of Business, Economic Development and Tourism 1999, 2003.

Median household income in Hawaii was calculated to be $30,040 (or 97 percent) of the national average in 2002. Hawaii per capita income as a percentage of the national average has fallen steadily since 1970 (Department of Business, Economic Development and Tourism 2003). In 1999, approximately 10 percent of Hawaii's families were below the poverty level, compared with approximately 12 percent nationally, according to data from the 2000 census[52]. Civilian employment decreased from 411,250 in 1991 to 396,050 in 2002, which is a decrease from a 98 percent employment rate to a 96 percent rate.

[52] http://quickfacts.census.gov/qfd/states/15000.html

For several decades, Hawaii benefited from the strength of regional economies around the Pacific that supported the state's dominant economic sector and principal source of external receipts—tourism (Bank of Hawaii 1999a). In addition, industries of long-standing importance in Hawaii, such as the Federal military sector and plantation agriculture, also experienced significant growth. However, Hawaii'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 Hawaii 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 because of high production costs. Employment in Hawaii sugar production fell by 20 percent between 1990 and 1993 and by an additional 50 percent from 1994 to 1995 (Yuen et al. 1997). Net out-migration became the norm in Hawaii, notwithstanding the state's appeal as a place to live. In 1998, the statewide unemployment rate was 6.2 percent, and unemployment on the island of Molokai reached 15 percent (Department of Business, Economic Development and Tourism 1999).

As a consequence of the economic upheaval of the 1990s and the extensive bankruptcies, foreclosures, and unemployment, Hawaii never entered the period of economic prosperity that many U.S. mainland states experienced. Between 1998 and 2000, Hawaii's tourism industry recovered substantially, mainly because the strength of the national economy promoted growth in visitor arrivals from the continental United States (Brewbaker 2000).

By 2002, an improving economy resulted in a statewide unemployment rate of 4.4 percent, with Molokai down to 8.6 percent (Department of Business, Economic Development and Tourism 2003). Despite downswings in tourism in the past few years because of 9/11, the SARS scare, Japanese economic issues, and world political conditions, tourism in Hawaii is improving to the point that there were fears that there would not be enough hotel rooms to accommodate all of the Japanese tourists who wanted to come for O Bon season[53] in August 2004 (Schafers 2004).

However, efforts to diversify the economy and thereby make it less vulnerable to future economic downturns have met with little success. To date, economic development initiatives such as promoting Hawaii as a center for high-technology industry have attracted few investors, and it seems unlikely that any new major industry will develop in Hawaii in the near future to significantly increase employment opportunities and broaden the state's economy beyond tourism, the military, and construction.

Bank of Hawaii summarized the recent general trends as of August, 2008. At midyear, 2008, Hawaii's economic growth had slowed to a crawl due to higher oil prices, falling tourism, and falling residential investment. The decrease in tourism is fueled by both decreased domestic demand and a reduction in the number of trans-Pacific flights resulting from the shutdown of Aloha Airlines and ATA, which previously represented 15-20 percent of the available seats to Hawaii. Hawaii's unemployment rate rose to 3.5 percent in June 2008 on a seasonally-adjusted basis, while job growth slowed to a few tenths of one percent, well below the rate necessary to generate enough labor force absorption to prevent the unemployment rate from rising. Since then, Hawaii's unemployment rate has continued to rise and as of September 2008, hit 4.5%. Honolulu's inflation rate was 4.9 percent in first half 2008, up slightly from the 4.8 percent for

[53] Festival of Souls, a Japanese cultural event.

all of 2007. While shelter costs began to moderate, energy costs rose significantly. Household fuels and utilities costs rose 36.4 percent.

3.5.5. Pacific Remote Island Areas

3.5.5.1. Baker Island

Baker Island, which is part of the Phoenix Islands Archipelago, is located 13 miles north of the equator at 0° 13' N and 176° 38' W and approximately 1,600 nautical miles to the southwest of Honolulu. The total amount of emergent land area of Baker Island is 1.4 square kilometers (Central Intelligence Agency World Fact Book 2005).

3.5.5.1.1. Coral Reefs – Baker Island

Within the 10-fathom curve, the potential coral reef area of Baker Island is estimated at 5.2 square kilometers (Rohmann et al. 2005). At Baker Island, the following numbers of coral reef associated organisms are reported to occur: 91 species of corals, 13 genera of algae, and 247 species of coral reef fishes (Brainard et al. 2005, USFWS 2007a). Although environmental and anthropogenic stressors such as climate change and coral bleaching, diseases, tropical storms, and marine debris remain, the coral reef ecosystem around Baker Island appears to be healthy and productive (Brainard et al. 2005).

3.5.5.1.2. Deep Reef Slope – Baker Island

Baker Island is a seamount surrounded by a narrow-fringing reef that drops steeply very close to the shore. To date, data on the habitat of Baker Island's deep- reef slope and the marine life it supports are unavailable.

3.5.5.1.3. Pelagic Habitat – Baker Island

Because of its position near the equator, Baker Island lies within the westward-flowing South Equatorial Current. Baker Island also experiences an eastward-flowing Equatorial Undercurrent that causes upwelling of nutrient and plankton rich waters on the west side of the island (Brainard et al. 2005). Sea-surface temperatures of pelagic EEZ waters around Baker Island are often near 30° C.[54] Although the depth of the mixed layer in the pelagic waters around Baker Island is seasonally variable, average mixed layer depth is around 100 meters (R. Moffitt, PIFSC, personal communication, July 2005).

3.5.5.1.4. Protected Resources – Baker Island

3.5.5.1.4.1. Sea Turtles

Green sea turtles and hawksbill sea turtles have been observed foraging in the nearshore areas around Baker Island (USFWS 2007a). However, they have not been observed nesting on the

[54] http://oceanwatch.pifsc.noaa.gov

island (Beth Flint, USFWS personal communication, July 2005). Other species of sea turtles may occur in the EEZ waters around Baker Island, but to date, data on species type or their abundance are not available.

3.5.5.1.4.2. Marine Mammals and Seabirds

A resident population of bottlenose dolphins is reported to occur near Howland and Baker Islands (Brainard et al. 2005). Although other cetaceans such as sperm whales are believed to occur around Baker Island, information on the species and their abundance are currently unavailable. In the summer of 2005, researchers from the NMFS's Southwest Science Center conducted a cruise to record the occurrence of marine mammals around the PRIA. The data from that research cruise are presently being analyzed.

3.5.5.1.4.3. Seabirds

Baker Island provides feeding and resting habitat for large numbers of Pacific migratory seabirds and is an important central Pacific migratory shorebird habitat. Eleven species of seabirds breed at Baker Island (USFWS 2007a).

3.5.5.1.5. Social Environment – Baker Island

In the early nineteenth century, several whaling ships landed on the island, including the *Gideon Howard* for whose captain, Michael Baker, the island is named. Captain Baker later sold his rights to the island to the American Guano Company, which extensively mined the island's phosphate deposits from 1859 to 1878. In 1935, American colonists attempted to settle the island and built dwellings, a lighthouse, and planted trees and shrubs.[55] The settlement was abandoned due to World War II. Baker Island was designated a National Wildlife Refuge in 1974, and is administered by the FWS for DOI in accordance with Title 50 regulations. Currently, Baker Island is uninhabited.

The Council's Coral Reef Ecosystem FMP (69 FR 8336) established a no-take MPA from 0 to 50 fathoms around Baker Island.

On January 6, 2009, President George W. Bush designated Baker Island as a Unit of the Pacific Remote Islands Marine National Monument.

3.5.5.2. Howland Island

Howland Island, which is also part of the Phoenix Islands Archipelago, is located 48 miles north of the equator at 0° 48' N and 176° 38' W, and 36 nautical miles north of Baker Island. The island, which is the emergent top of a seamount, is fringed by a relatively flat coral reef that drops off sharply. Howland Island is approximately 1.5 miles long and 0.5 miles wide. The island is flat and supports some grasses and small shrubs. The total land area is 1.6 square kilometers (Central Intelligence Agency World Fact Book 2005).

[55] http://www.janeresture.com/baker (accessed July 2005).

3.5.5.2.1. Coral Reefs – Howland Island

The potential coral reef area within the 10-fathom curve of Howland is estimated 3.0 square kilometers (Rohmann et al. 2005). At Howland Island, the following numbers of coral reef associated organisms are reported to occur: 97 species of corals, nine genera of algae, and 324 species of coral reef fishes (Brainard et al. 2005, USFWS 2007b). Although environmental and anthropogenic stressors such as climate change, coral bleaching, diseases, tropical storms, and marine debris remain, the coral reef ecosystem around Howland Island appears healthy and productive (Brainard et al. 2005).

3.5.5.2.2. Deep Reef Slope – Howland Island

Howland Island is a seamount surrounded by a narrow-fringing reef that drops steeply very close to the shore. To date, data on the habitat of Howland Island's deep reef slope and the marine life it supports are unavailable.

3.5.5.2.3. Pelagic Habitat – Howland Island

Because of its position slightly north of the equator, Howland Island lies within the margins of the eastward-flowing North Equatorial Counter Current and the margins of the westward-flowing South Equatorial Current. Sea-surface temperatures of pelagic EEZ waters around Baker Island are often near 30° C.[56] Although the depth of the mixed layer in the pelagic waters around Howland Island is seasonally variable, average mixed layer depth is around 70 meters to 90 meters (R. Moffitt, PIFSC, personal communication).

3.5.5.2.4. Protected Resources – Howland Island

3.5.5.2.4.1. Sea Turtles

Green sea turtles and hawksbill sea turtles are reported to occur in the nearshore reef areas of Howland Island (USFWS 2007b). However, the abundance and occurrence of other sea turtles around Howland Island are currently unknown.

3.5.5.2.4.2. Marine Mammals and Seabirds

A resident population of bottlenose dolphins is reported to occur near Howland and Baker Islands (Brainard et al. 2005). Although other cetaceans such as sperm whales are believed to occur in the EEZ around Howland Island, information on the species and their abundance are currently unknown. In the summer of 2005, researchers from the NMFS's Southwest Science Center conducted a cruise to record the occurrence of marine mammals around the PRIA. The data from that research cruise are presently being analyzed.

[56] http://oceanwatch.pifsc.noaa.gov

3.5.5.2.4.3. Seabirds

Howland Island provides feeding and resting habitat for large numbers of Pacific migratory seabirds and is important central Pacific migratory shorebird habitat. Eleven species of seabirds breed at Howland Island (USFWS 2007b).

3.5.5.2.5. Social Environment – Howland Island

In 1924, Bishop Museum archaeologist Kenneth Emory discovered several Polynesian structures, as well as stone paths and pits, and concluded that Baker Island was known to early Polynesians.[57] Throughout the whaling era of the early nineteenth century, several ships are believed to have landed at Howland Island. In 1857, Howland Island was claimed by the American Guano Company, which mined several hundred thousand tons of guano between 1857 and 1878. American colonists landed on the island in 1935 and later built a runway that was planned to be used by Amelia Earhart on her circumnavigation flight in 1937. Earhart was supposed to land on Howland on July 2, 1937, as a stopover during her flight from Lau, New Guinea, to Oahu, Hawaii. However, Earhart never arrived nor was she heard from again. The lighthouse at Howland Island is called Amelia Earhart light.[58] In 1942, following attacks on the island by Japanese forces, the American colonists were removed. Since that time, the island has remained uninhabited. In 1974, management authority of the refuge was transferred to the U.S. Fish and Wildlife Service. Howland Island NWR is managed by the FWS for DOI in accordance with Title 50 regulations. Currently, Howland Island is uninhabited. There is, designated in the Council's Coral Reef Ecosystems FMP (69 FR 8336), a no-take MPA from 0 to 50 fathoms around Howland Island.

On January 6, 2009, President George W. Bush designated Howland Island as a Unit of the Pacific Remote Islands Marine National Monument. Subsequent Secretarial Order 3284 clarified administrative responsibilities of the Departments of Interior (Fish and Wildlife) and Commerce (NMFS) in the Monument.

3.5.5.3. Jarvis Island

Jarvis Island, which is part of the Line Island Archipelago, is located at 0° 23' S, 160° 01' W and approximately 1,300 miles south of Honolulu and 1,000 miles east of Baker Island. Jarvis Island is a relatively flat (15 to 20-ft beach rise), sandy coral island with a total land area of 4.5 square kilometers. It features a very dry climate with limited rainfall (Central Intelligence World Fact Book 2005).

3.5.5.3.1. Coral Reefs – Jarvis Island

Jarvis Island is surrounded by a narrow-fringing reef. The potential coral reef area within the 10-fathom curve is estimated at 3.0 square kilometers (Rohmann et al. 2005). At Jarvis Island, the following numbers of coral reef associated organisms are reported to occur: 50 species of

[57] http://www.bishopmuseum.org/exhibits/pastExhibits/1995/hawaiilo/hawbaker.html
[58] http://www.janeresture.com/howland (accessed July 2005)

corals, 10 genera of algae, and 252 species of coral reef fishes (Brainard et al. 2005, USFWS 2007c). Although environmental and anthropogenic stressors such as climate change, coral bleaching, diseases, tropical storms, and marine debris remain, the coral reef ecosystem around Jarvis Island appears healthy and productive (Brainard et al. 2005).

3.5.5.3.2. Deep Reef Slope – Jarvis Island

Jarvis Island is surrounded by a narrow fringing reef that drops steeply very close to the shore. To date, data on the habitat of Jarvis Island's deep reef slope and the marine life it supports are unavailable.

3.5.5.3.3. Pelagic Habitat – Jarvis Island

Because of its position below the equator, Jarvis Island lies within the South Equatorial Current, which runs in a westerly direction. Sea surface temperatures of pelagic EEZ waters around Jarvis Island are often 28° to 30° C.[59] Although depth of the mixed layer in the pelagic waters around Jarvis Island is seasonally variable, average mixed layer depth is around 80 meters (R. Moffitt, PIFSC, personal communication).

3.5.5.3.4. Protected Resources – Jarvis Island

3.5.5.3.4.1. Sea Turtles

Green sea turtles and hawksbill sea turtles are reported from the nearshore reef areas of Jarvis Island (USFWS 2007c). Their abundance as well as the occurrence of other sea turtles around Jarvis Island are currently unknown.

3.5.5.3.4.2. Marine Mammals and Seabirds

A resident population of bottlenose dolphins is reported to occur near Jarvis Island (Brainard et al. 2005). Although other cetaceans such as sperm whales are believed to occur in the EEZ around Jarvis Island, the species and their abundance are currently unknown. In the summer of 2005, researchers from the NMFS's Southwest Science Center conducted a cruise to record the occurrence of marine mammals around the PRIA. The data from that research cruise are currently being analyzed.

3.5.5.3.4.3. Seabirds

Jarvis Island provides feeding and resting habitat for large numbers of Pacific migratory seabirds and is an important central Pacific migratory shorebird habitat. Eleven species of seabirds breed at Jarvis Island, including nearly 3 million pairs of sooty terns (USFWS 2007c).

[59] http://oceanwatch.pifsc.noaa.gov

3.5.5.3.5. Social Environment – Jarvis Island

Between 1859 and 1878, Jarvis Island was extensively mined for its rich guano deposits by the American Guano Company. In 1889, Great Britain annexed the island and leased it to a British mining company, which did not extract large amounts of guano. In 1935, American colonists reclaimed Jarvis as an American possession and built a group of buildings that they named Millerstown. Jarvis was abandoned by the colonists due to attacks from Japanese forces during World War II, and since 1974 it has been a National Wildlife Refuge administered by the U.S. Fish and Wildlife Service. Jarvis Island NWR is managed by the FWS for DOI in accordance with Title 50 regulations. There is, designated in the Council's Coral Reef Ecosystems FMP (69 FR 8336), a no-take MPA from 0 to 50 fathoms around Jarvis Island.

On January 6, 2009, President George W. Bush designated Jarvis Island as a Unit of the Pacific Remote Islands Marine National Monument. Subsequent Secretarial Order 3284 clarified administrative responsibilities of the Departments of Interior (Fish and Wildlife) and Commerce (NMFS) in the Monument.

3.5.5.4. Palmyra Atoll

Palmyra Atoll comprises approximately 52 islets surrounding three central lagoons. This low-lying coral atoll system is approximately 1,056 nm south of Honolulu and is located at 5° 53' N latitude and 162° 05' W longitude. Palmyra Atoll occurs at the northern end of the Line Island Archipelago, situated halfway between Hawaii and American Samoa. Palmyra Atoll is located in the ITCZ, an area of high rainfall (see Section 3.1.1.1).

3.5.5.4.1. Coral Reefs – Palmyra Atoll

Palmyra Atoll is surrounded by extensive reef flats on all sides. The potential coral reef area within the 10-fathom curve around Palmyra Atoll is estimated at 47.2 square kilometers (Rohmann et al. 2005). At Palmyra Atoll, the following numbers of coral reef associated organisms are reported to occur: 170 species of corals, 13 genera of algae, and 343 species of coral reef fishes (Brainard et al. 2005). Palmyra Atoll is observed to have a higher diversity of corals, anemones, and fishes than other PRIA because it is located within the eastward-flowing Equatorial Counter Current which flows from areas in the western Pacific with high levels of biodiversity (Brainard et al. 2005).

3.5.5.4.2. Deep Reef Slope – Palmyra Atoll

Data on the deep reef slope around Palmyra and the marine life it supports are unavailable. However, the area of deep reef slope is not believed to be extensive.

3.5.5.4.3. Pelagic Habitat – Palmyra Atoll

Because of its relative proximity to the equator, Palmyra Atoll is subject to the North Equatorial Counter Current, which flows in an eastward direction. Sea surface temperatures of pelagic EEZ waters around Palmyra Atoll are often 27°–30° C.[60] Although the depth of the mixed layer in the pelagic waters around Palmyra Atoll is seasonally variable, average mixed layer depth is around 90 meters (R. Moffitt, PIFSC, personal communication).

3.5.5.4.4. Protected Resources – Palmyra Atoll

3.5.5.4.4.1. Sea Turtles

Both green sea turtles and hawksbill sea turtles have been observed at Palmyra Atoll, with only the green sea turtle observed to nest on Cooper's Island, which is the largest island within the Palmyra Atoll system (U.S. Fish and Wildlife Service 1998).

3.5.5.4.4.2. Marine Mammals and Seabirds

Pilot whales and bottlenose dolphins have been observed in the lagoon of Palmyra (Fefer 1987), and the Hawaiian monk seal was sighted in 1990 (Redmond 1990). Melon headed whales, which primarily feed on squid, have been observed on the southwestern side of Palmyra Atoll. Palmyra's southwestern side is likely an area of higher productivity because the main channel into the lagoon is located there and is believed to be the major output source of nutrient-rich lagoon waters (Brainard et al. 2005).

3.5.5.4.4.3. Seabirds

Palmyra Atoll supports 29 species of migratory seabirds and shorebirds and has the largest nesting colonies of red-footed boobies and black noddies in the central Pacific (U.S. Fish and Wildlife Service 1998). The islets of the atoll are important habitat for the bristle-thighed curlew (*Numenius tahitiensis*), a shorebird that is considered vulnerable due to declining numbers.

3.5.5.4.5. Social Environment

Palmyra has had an interesting history involving shipwrecks, pirates, and buried treasure, and a double murder in the mid-1970s. Palmyra first became an American possession when it was claimed by the American Guano Company in 1859. In 1862, King Kamehameha IV claimed Palmyra for the kingdom of Hawaii. In 1898, when the U.S. annexed the Territory of Hawaii, President McKinley also included Palmyra Atoll. In 1912, a judge from Honolulu bought all of Palmyra Atoll, which he later sold to the Fullard-Leo family. From 1940 to 1946, the U.S. Navy took control of Palmyra and used it as a naval aviation facility. In 1947, the U.S. Supreme Court returned ownership of Palmyra to the Fullard-Leo family from the U.S. Navy. In 1961, President Kennedy assigned the U.S. Department of Interior to have civil administration over Palmyra. In 2000, The Nature Conservancy (TNC) bought Palmyra Atoll from the Fullard-Leo family and in July 2004 established the Palmyra Atoll Research Consortium (PARC). Palmyra Atoll is managed cooperatively by the U.S. Fish and Wildlife Service and The Nature Conservancy, which owns Cooper Island within the refuge. The USFWS administers the atoll as

[60] http://oceanwatch.pifsc.noaa.gov

a National Wildlife Refuge for DOI in accordance with Title 50 regulations. The Coral Reef Ecosystems FMP (69 FR 8336) established a low-use MPA from 0 to 50 fathoms around Palmyra Atoll.

On January 6, 2009, President George W. Bush designated Palmyra Atoll as a Unit of the Pacific Remote Islands Marine National Monument. Subsequent Secretarial Order 3284 clarified administrative responsibilities of the Departments of Interior (Fish and Wildlife) and Commerce (NMFS) in the Monument.

3.5.5.5. Kingman Reef

Kingman Reef, which is located 33 nautical miles northwest of Palmyra Atoll at 6° 23' N and 162° 24' W, is a series of fringing reefs around a central lagoon. Kingman Reef does not have any emergent land that supports vegetation. Small, impermanent islets of coral rubble may be found atop the eastern portion of the reef (USFWS 2001a).

3.5.5.5.1. Coral Reefs – Kingman Reef

The potential coral reef area within the 10-fathom curve Kingman Reef is estimated at 20.9 square kilometers (Rohmann et al. 2005). At Kingman Reef, 155 species of corals, 15 genera of algae, and 225 species of reef fishes are reported to occur (Brainard et al. 2005).

3.5.5.5.2. Deep Reef Slope – Kingman Reef

Data on the deep reef slope around Kingman Reef and the marine life it supports are unavailable. However, the area of deep reef slope is not believed to be extensive.

3.5.5.5.3. Pelagic Habitat – Kingman Reef

Because of its relative proximity to the equator, Palmyra Atoll and Kingman Reef lie in the North Equatorial Countercurrent, which flows in a west to east direction. Sea-surface temperatures of pelagic EEZ waters around Palmyra Atoll are often 27° to 30° C.[61] Although the depth of the mixed layer in the pelagic waters around Kingman Reef is seasonally variable, average mixed layer depth is around 80 meters (R. Moffitt, PIFSC, personal communication).

3.5.5.5.4. Protected Resources – Kingman Reef

3.5.5.5.4.1. Sea Turtles

Green sea turtles and hawksbill sea turtles are likely found at Kingman Reef, as both species are found at nearby Palmyra Atoll.

[61] http://oceanwatch.pifsc.noaa.gov (accessed July 2005)

3.5.5.5.4.2. Marine Mammals and Seabirds

Because of its close proximity to Palmyra Atoll, bottlenose dolphins, pilot whales, melon headed whales, and other cetaceans are likely to occur around Kingman Reef.

3.5.5.5.4.3. Seabirds

Some seabirds that nest at Palmyra are likely to forage in waters around Kingman Reef. However, there is no permanent emergent land at Kingman Reef and no suitable seabird nesting habitat there. There is limited habitat for shorebirds on spits.

3.5.5.5.5. Social Environment

In 2001, management authority of Kingman Reef was transferred to the U.S. Fish and Wildlife Service (FWS). Kingman Reef National Wildlife Refuge is managed by the FWS for DOI in accordance with Title 50 regulations. The Coral Reef Ecosystems FMP (69 FR 8336) established a low-use MPA from 0 to 50 fathoms around Kingman Reef.

On January 6, 2009, President George W. Bush designated Kingman Reef as a Unit of the Pacific Remote Islands Marine National Monument. Subsequent Secretarial Order 3284 clarified administrative responsibilities of the Departments of Interior (Fish and Wildlife) and Commerce (NMFS) in the Monument.

3.5.5.6. Johnston Atoll

Johnston Atoll is located at 16° 44' N latitude and 169° 31' W longitude and approximately 720 nautical miles southwest of Honolulu. French Frigate Shoals in the NWHI is the nearest land mass (approximately 450 nm to the northwest), and because of its proximity to the Hawaiian Islands, there is believed to be genetic and larval connectivity between Johnston Atoll and the Hawaiian Islands. Johnston Atoll is an egg-shaped coral reef and lagoon complex residing on a relatively flat, shallow platform approximately 21 miles in circumference (205 km^2). Johnston Atoll comprises four small islands totaling 2.8 square kilometers. Johnston Island, the largest and main island, is natural in origin, but has been enlarged by dredge and fill operations. Sand Island is composed of a naturally formed island (eastern portion) connected by a narrow, man-made causeway to a dredged coral island (western portion). The remaining two islands, North Island and East Island, are completely manmade from dredged coral (U.S. Air Force 2004).

3.5.5.6.1. Coral Reefs – Johnston Atoll

The potential coral reef area within the 10-fathom curve of Johnston Atoll is estimated at 150 square kilometers (Rohmann et al. 2005). Johnston Atoll, with only 45 Scleractinian and Hydrozoan corals present, has fewer coral species than are found in the Hawaiian Islands. The reef is composed of alternating sand/loose coral and live coral, with the most dominant coral species present being table coral (*Acropora*). The coral *Montipora* is also widely found. Johnston Atoll supports the deepest reef-building corals (*Leptoseris*) on record and large populations of deepwater hydrozoan corals (U.S. White House 2009). Approximately 300 species of fish have been recorded in the nearshore waters and reefs of Johnston Atoll. This number is smaller than that of other islands in the Central Pacific, and is likely due to Johnston Atoll's small size and remote location. One species of angelfish, *Centropyge nahackyi,* is endemic (U.S. Air Force 2004).

3.5.5.6.2. Deep Reef Slope – Johnston Atoll

Data on the deep reef slope around Johnston Atoll and the marine life it supports are limited. However, the area of deep reef slope is not believed to be extensive.

3.5.5.6.3. Pelagic Habitat – Johnston Atoll

Sea surface temperatures of the EEZ waters around Johnston Atoll are often 27°–30° C.[62] Although the depth of the mixed layer in the pelagic waters around Johnston Atoll is seasonally variable, average mixed layer depth is around 80 meters (R. Moffitt, PIFSC, personal communication).

3.5.5.6.4. Protected Resources – Johnston Atoll

3.5.5.6.4.1. Sea Turtles

Green and hawksbill sea turtles have been observed at Johnston Atoll. It is estimated that nearly 200 green sea turtles forage near its southern shore. However, it is thought that green sea turtles do not nest on Johnston Atoll (U.S. Air Force 2004).

3.5.5.6.4.2. Marine Mammals and Seabirds

The following marine mammals have been observed at Johnston Atoll: Hawaiian monk seal, humpback whale, Cuvier's beaked whale, spinner dolphin, and bottlenose dolphin (U.S. Air Force 2004).). Sperm, blue, sei, and North Pacific right whales have been reported from the waters of the atoll (U.S. White House 2009). Most marine mammals observed near Johnston Atoll occur outside the lagoon, however one Cuvier's beaked whale has been seen inside the lagoon. Nine Hawaiian monk seals were translocated to Johnston Atoll from Laysan Island in 1984, and one or two of these tagged seals have repeatedly been observed at Johnston Atoll (U.S. ACHPPM and Raytheon 2000).

3.5.5.6.4.3. Seabirds

The following table provides a list of seabirds observed at Johnston Atoll.

[62] http://oceanwatch.pifsc.noaa.gov

Table 3-15. Seabirds of Johnston Atoll.

Scientific Name	Common Name
Fregata minor	Great frigatebird
Sula leucogaster	Brown booby
Sula dactylatra	Masked booby
Sula sula	Red-footed booby
Phaethon rubricauda	Red-tailed tropicbird
Phaethon lepturus	White-tailed tropicbird
Puffinus nativitatis	Christmas shearwater
Puffinus pacificus	Wedge-tailed shearwater
Bulweria bulwerii	Bulwer's petrel
Sterna fuscata	Sooty tern
Sterna lunata	Gray-backed tern
Gygis alba	White tern
Anous minutus	Black noddy
Anous stolidus	Brown noddy
Winter Residents	
Numenius tahitiensis	Bristle-thighed curlew
Pluvialis fulva	Pacific golden-plover
Arenaria interpres	Ruddy turnstone
Calidris alba	Sanderling
Heteroscelus incanus	Wandering tattler
Procelsterna cerulea	Blue-gray noddy

Source: U.S. Air Force 2004.

3.5.5.6.5. Social Environment – Johnston Atoll

Although both the United States and Great Britain annexed Johnston Atoll in the mid-1850s, only the United States (American Guano Company) mined phosphates from the island (Central Intelligence Agency World Fact Book 2005). President Calvin Coolidge designated Johnston Atoll as a Federal bird refuge in 1926, and in 1934, Franklin Roosevelt placed the atoll under U.S. Navy administration. In 1948, Johnston Atoll was managed by the U.S. Air Force, which in the 1950s and 1960s used the area for high-altitude nuclear tests. Until 2000, Johnston Atoll was managed by the U.S. Department of Defense as a storage and disposal site for chemical weapons. In 2004, cleanup and closure of the storage and disposal facilities was completed. Today, the FWS continues to manage Johnston Atoll as a National Wildlife Refuge for the DOI in accordance with Title 50 regulations. There is, designated in the Council's Coral Reef Ecosystems FMP (69 FR 8336), a low-use MPA from 0 to 50 fathoms around Johnston Atoll.

On January 6, 2009, President George W. Bush designated Johnston Island as a Unit of the Pacific Remote Islands Marine National Monument. Subsequent Secretarial Order 3284 clarified administrative responsibilities of the Departments of Interior (Fish and Wildlife) and Commerce (NMFS) in the Monument.

3.5.5.7. Wake Island

Wake Island is an atoll located at 19° 18' N latitude and 166° 35' E longitude, and is the northernmost atoll of the Marshall Islands Archipelago, located approximately 2,100 miles west of Hawaii. Wake Island has a total land area of 6.5 square kilometers and comprises three islets: Wake, Peale, and Wilkes Islands.

3.5.5.7.1. Coral Reefs – Wake Island

The potential coral reef area within the 10-fathom curve around Wake is estimated at 22.9 square kilometers (Rohmann et al. 2005). Three hundred and twenty three species of reef fish have been recorded at Wake, as well as a diverse assemblage of commercially important species of tuna, snappers, jacks, and groupers (U.S. White House 2009). Sharks, particularly the gray reef, are reportedly abundant. The giant clam (*T. maxima*) is reported to be abundant in the lagoon. Fishing is prohibited within the lagoon. There is, designated in the Council Coral Reef Ecosystem FMP (69 FR8336), a low-use MPA from 0 to 50 fathoms around Wake Island.

3.5.5.7.2. Deep Reef Slope – Wake Island

Data on the deep reef slope around Wake Island and the marine life it supports are unavailable. However, the area of deep reef slope is not believed to be extensive because the outer reef slope descends sharply to great depth.

3.5.5.7.3. Pelagic Habitat – Wake Island

Sea surface temperatures of EEZ waters around Wake Island are often 27°–30° C.[63] Although the depth of the mixed layer in the pelagic waters around Wake Atoll is seasonally variable, average mixed layer depth is around 80 meters (R. Moffitt, PIFSC, personal communication).

3.5.5.7.4. Protected Resources – Wake Island

3.5.5.7.4.1. Sea Turtles

Green sea turtles are reported in the nearshore areas around Wake Island. However, their abundance and the occurrence of other sea turtles are unknown.

3.5.5.7.4.2. Marine Mammals and Seabirds

Spinner dolphins, Pacific bottlenose dolphins (*Tursiops truncatus*), and Cuvier's beaked whales (*Ziphius cavirostris*) are thought to occur in waters around Wake Island.

[63] http://oceanwatch.pifsc.noaa.gov (accessed July 2005).

3.5.5.7.4.3. Seabirds

Wake Island supports 12 species of resident nesting seabirds and 6 species of migratory seabirds (U.S. White House 2009).

3.5.5.7.5. Social Environment – Wake Island

The written historical record provides no evidence of prehistoric populations on Wake Island, but Marshall Islanders are believed to have occasionally visited Wake Island, giving it the name, Enenkio. The island was annexed by the United States in 1899. Before the 1930s, the only visitors were scientists and survivors of shipwrecks. The U.S. Navy received administrative control of Wake in 1934 and established an air base on the atoll in January 1941. Wake Island figured prominently in World War II, and the Japanese overtook U.S. forces on Wake in 1941. The United States reoccupied the atoll after the war, and administrative authority was held by the Federal Aviation Administration until 1962. It was then transferred to the Department of the Interior, which in turn assigned authority to the U.S. Air Force. Since 1994, the Department of the Army has maintained administrative use of Wake Island. This area is closed to the public and permission is needed to enter the area. There is, designated in the Council's Coral Reef Ecosystems FMP (69 FR 8336), a low-use MPA from 0 to 50 fathoms around Wake Island.

On January 6, 2009, President George W. Bush designated Wake Island as a Unit of the Pacific Remote Islands Marine National Monument.

3.5.5.8. PRIA Fisheries

Most of the PRIA are protected both by their isolation as well as through their status as National Wildlife Refuges and Marine National Monuments. Nevertheless, nearshore fishing has occurred at Johnston Atoll, Wake Island and Palmyra Atoll. The catch at these locations is primarily surgeonfish, goatfish, rudderfish, wrasses, parrotfish, and soldierfish (Irons et al. 1990). Several outbreaks of ciguatera have been reported on Johnston that were attributed to dredging operations. This has limited the take of fish for food, although catch and release fishing is still common. Commercial fishing occurs in the EEZs of Palmyra Atoll and Kingman Reef.

3.5.5.8.1. Bottomfish Fisheries - PRIA

In 1998, two Hawaii-based troll and handline vessels, and one demersal longline vessel targeting sharks, fished in the EEZ around Palmyra and Kingman Reef. These vessels targeted both pelagic and bottomfish species, including yellowfin and bigeye tuna, wahoo, mahimahi, deep slope snappers and sharks (WPRFMC 2000). One vessel made seven trips to these areas in 1999, targeting the two-spot snapper, *Lutjanus bohar*, at Kingman Reef, of which they caught 40,000 pounds total. The fishermen tested much of the catch for ciguatera without a single positive and shipped the catch to New York and Florida. They stopped fishing after results of a single specimen submitted for testing to the University of Hawaii's School of Medicine showed slight traces of ciguatera.

Very little bottomfish research has been conducted in the PRIA to date. An assessment was conducted at Johnston Atoll in 1965, looking at the effects of dredging. The Coral Reef Initiative of 1995–1996 conducted general assessments of the reefs surrounding the PRIA and a joint coral reef assessment investigation between the U.S. Fish and Wildlife Service and NMFS PIFSC is ongoing. Ship-based research trips to Howland, Baker and Jarvis Islands, and Palmyra Atoll and Kingman Reef were conducted in 2000, 2001, and 2002. These investigations focused on the status of the shallow water habitat including percentage of live reef coverage, biodiversity, and reef species stock assessments. As the assessments are being conducted with towed-sled scuba techniques, the deepwater habitat, including habitats for many of the commercially valuable snappers, is still unexplored. To date, no data have been published from these cruises. No MSY values have been estimated for PRIA bottomfish resources.

3.5.5.8.2. Crustacean Fisheries - PRIA

A few fishermen have expressed interest in fishing for lobsters in the PRIA, and at least two have attempted it. In 1999, one vessel left Hawaii to explore the lobster fishery in Palmyra/Kingman waters. However, tropical lobsters (green spiny, *P. penicillatus*) do not enter traps readily, and the lobster harvest was unsuccessful as 800 traps were deployed and no lobsters were caught. They also dove on the reef to try to catch lobsters by hand, but were not very successful and returned with only 20 lobster tails. This venture was also believed to attempt to target the red crab (*Chaceon* spp.), but no information on that catch was made available. In addition, the vessel targeted deepwater shrimp (*Heterocarpus* sp.) and red crab at 300 to 800 meters around Palmyra and Kingman. Reportedly, the operation did not lose many traps, and CPUE was very high, at approximately 30 kilograms per trap. No MSY values have been estimated for PRIA crustacean resources.

3.5.5.8.3. Precious Corals Fisheries - PRIA

No precious corals harvester has received a Federal permit to harvest corals from the EEZ surrounding the PRIA since the implementation of the Precious Corals FMP in 1980; however, this does not preclude any future permit issuance. The U.S. EEZ surrounding the PRIA has been defined, for the purposes of precious corals fisheries management, as an Exploratory Precious Coral Permit area.

To prevent overfishing and stimulate research on gold corals, fishing for, taking, or retaining any gold coral (live or dead) in any precious coral permit area is prohibited through June 30, 2013. This includes all EEZ waters of the Western Pacific Region. Additional research results on gold coral age structures, growth rates, and correlations between length and age will be considered by the Council and NMFS prior to the expiration of the 5-year moratorium.

3.5.5.8.4. Pelagic Fisheries - PRIA

As many tropical pelagic species (e.g., skipjack tuna) are highly migratory, the fishing fleets targeting them often travel great distances. Although the EEZ waters around Johnston Atoll and Palmyra Atoll are more than 750 nm and 1,000 nm away from Honolulu, respectively, the Hawaii longline fleet does seasonally fish in those areas. For example, the EEZ around Palmyra is often visited by Hawaii-based longline vessels targeting yellowfin tuna, whereas at Johnston Atoll, albacore tuna is often caught in greater numbers than yellowfin or bigyeye tuna. Similarly, the U.S. purse seine fleet also targets pelagic species (primarily skipjack tuna) in the EEZs around some PRIA, specifically, the equatorial areas of Howland, Baker, and Jarvis Islands. The combined amount of fish harvested from these areas from the U.S. purse seine fleet on average is less than 5 percent of their total annual harvest.

3.6. Administration and Enforcement

3.6.1. Western Pacific Regional Fishery Management Council

As mentioned in Section 1.2, the Council is one of eight regional fisheries management councils that provide advice and recommendations to the Secretary through the U.S. Department of Commerce, NMFS. The fishery management councils are responsible for the preparation and transmittal to the Secretary of appropriate, science-based FMPs (and amendments to those plans) for fisheries under their jurisdiction. Under the MSA, the Western Pacific Fishery Management Council has management responsibility for U.S. fisheries in the Pacific Ocean 3 to 200 nm offshore of American Samoa, Guam, Hawaii, and in the Pacific Ocean from 0 to 200 nm offshore of the CNMI, and the PRIA (16 U.S.C. §302(a)(H)). The Council has 13 voting members, eight of which are knowledgeable about conservation and management, or commercial and recreational harvests and are appointed by the Secretary; and five of which are the principal Federal, and State, Territory or Commonwealth officials with fishery management responsibility. The Council also retains three non-voting members that include: U.S. Department of State, U.S. Fish and Wildlife Service, and the U.S. Coast Guard. The Council's office is located in Honolulu, HI and is staffed with an Executive Director, 10 staff responsible for various program areas, and 5 administrative workers. The Council also maintains island coordinators in American Samoa, the CNMI, and Guam.

3.6.2. NMFS Pacific Islands Regional Office

The Pacific Islands Regional Office manages programs that support both domestic and international conservation and management of living marine resources within the Pacific. The Pacific Islands Region is comprised of American Samoa, Guam, Hawaii, the Northern Mariana Islands, and other U.S. Pacific islands. The Pacific Islands Regional Office is responsible for assisting the Council in the development of fishery management plans and amendments, drafting and implementing federal fishery regulations, issuing federal fishing permits, and monitoring fisheries through its observer program. Other major responsibilities include the conservation and recovery of protected species, the preservation and restoration of marine habitats, and the coordination with international organizations to implement and monitor fishery agreements and treaties. The Pacific Islands Regional Office has one field office located in Pago Pago, American Samoa, and staff located in Guam and the CNMI.

3.6.3. NMFS Pacific Islands Science Center

Headquarted in Honolulu, Hawaii, the Pacific Islands Fisheries Science Center (PIFSC) administers scientific research and monitoring programs that support the domestic and international conservation and management of living marine resources. PIFSC has taken a leading role in marine research on ecosystems, both in the insular and pelagic environments. It is implementing a multidisciplinary research strategy including an ecosystem observation system and scientific analysis to support ecosystem approaches to management and restoration of living marine resources. The Pacific Islands Science Center conducts a wide range of activities including, but not limited to the following:

- Resource surveys and stock assessments
- Economic and sociological studies
- Oceanographic research and monitoring
- Critical habitat evaluation
- Life history and ecology studies
- Advanced oceanographic and ecosystem modeling and simulations

3.6.4. NMFS Office of Law Enforcement Pacific Islands Division

Based in Honolulu, Hawaii, NMFS's Office of Law Enforcement Pacific Islands Division (OLE PID) conducts investigations of alleged violations of NOAA statutes and regulations, including the MSA, the Lacey Act, the Shark Finning Prohibition Act, the Marine Mammal Protection Act, and the ESA, on the basis of case packages forwarded from the U.S. Coast Guard. NMFS OLE PID employs around nine enforcement agents and two officers. A fundamental tool utilized by NMFS OLE PID is a Vessel Monitoring System (VMS), which is an automated real-time, satellite-based tracking system that transmits near-continuous position reports from vessels at sea with VMS units on board. Vessel monitoring is used in the American Samoa longline, Hawaii longline, and NWHI bottomfish fisheries.

3.6.5. U.S. Coast Guard

The U.S. Coast Guard's (USCG) Fourteenth District (Honolulu) jurisdiction is the U.S. EEZ as well as the high seas in the Western and Central Pacific. At over 10 million square miles, its area of responsibility is the largest of any USCG District. The USCG patrols the region with airplanes, helicopters, and surface vessels, as well as monitors vessels through VMS. The USCG also maintains patrol assets on Guam.

3.7. Fishery Management Plans

The following is a discussion of the NEPA documents associated with the current species-based FMPs. Impacts of the fisheries to the human environment have been analyzed in prior NEPA documents associated with the species-based FMPs; each of the original five species-based

FMPs has its own associated NEPA documents, which are incorporated herein by reference. This section summarizes these prior NEPA analyses to provide a fuller view of the current impacts to the fisheries of the Western Pacific Region.

FMPs are dynamic and are often amended in response to changes in the fisheries and management unit species they are used to manage and conserve, respectively. Impacts of the following amendments or regulatory amendments to the FMPs have been analyzed in prior NEPA documents. Implementation of future amendments or regulatory amendments to these FMPs or FEPs will be subject to the appropriate NEPA analysis and other applicable law at the time of their consideration. Several amendments or regulatory amendments to these FMPs are currently in development as this Final Programmatic EIS is being prepared.

3.7.1. Bottomfish FMP

Bottomfish fisheries in the Federal waters of the State of Hawaii, the Territories of American Samoa and Guam, the Commonwealth of the Northern Mariana Islands, and several central and western Pacific islands/atolls that are U.S. island possessions (referred to in the FMPs as Pacific Remote Island Areas or PRIA) are managed under the Bottomfish FMP, established in 1986 (July 31, 1986; 51 FR 27413; Correction: August 26, 1986; 51 FR 30367). NEPA documents for the various amendments and regulatory amendments to the Bottomfish FMP are outlined in Table 3-16 and many of these documents are available at the NMFS PIR website (http://www.fpir.noaa.gov/), or by contacting NMFS Sustainable Fisheries Division in Honolulu at telephone: (808) 944-2260.

An updated analytical review of the impacts of the bottomfish fisheries throughout the region, under the Bottomfish FMP, was completed in a 2005 EIS (NMFS 2005c). The 2005 EIS provides a comprehensive analysis of the environmental impacts of various alternatives for management of Federal bottomfish fisheries in the Western Pacific Region. Major conclusions of the 2005 EIS are listed on pages 4 and 5 in the summary and include the following:

> Target Species - Bottomfish management unit species (BMUS) under the Bottomfish FMP are not currently overfished[64]. There are management measures in place to ensure overfishing in the MHI does not occur (Brodziak et al. 2009).
>
> Non-target Species - Bottomfish fishing gear and operational practices are relatively selective for target species.
>
> Threatened and Endangered Species Listed under the Endangered Species Act - Direct interaction between the NWHI bottomfish fishery and the endangered Hawaiian monk seal is comprised of a rare and accidental hooking event. There has been no interaction with the endangered short-tailed albatross that is known to occasionally visit the NWHI. Likewise, there have been no interactions between the fishery and threatened green sea turtles. Indirect interactions through competition between the bottomfish fishery and the

[64] Seamount groundfish managed under the Bottomfish FMP was determined to be overfished in 1986 when the Bottomfish FMP was established and the fishery has been closed under a moratorium since that time.

Hawaiian monk seal for seal prey species are minimal and are unlikely to affect the recovery of the monk seal population.

Other Marine Mammals –Bottlenose dolphins have been observed stealing bait and catch from NWHI bottomfish vessels. These interactions are unlikely to harm individuals or populations.

Essential Fish Habitat, Biodiversity and Ecosystems - All alternatives involving continued fishing have the potential to affect habitat through anchor damage or vessel grounding. Bottomfish fishing has been found not to adversely affect EFH, biodiversity, or ecosystems of the NWHI or the MHI.

Commercial, Recreational and Charter Fishing Sectors – Commercial and recreational bottomfishing occurs in the Hawaiian Archipelago and is being managed to end overfishing in the Main Hawaiian Islands (WPFMC 2007). Approximately 60 percent of the commercial bottomfishing occurs in the MHI, with the rest taking place in the NWHI (WPRFMC, 2007; page 3-40). All commercial bottomfishing in the NWHI will end on June 15, 2011, due to the establishment of the Papahanaumokuakea Marine National Monument. Very little information is available on the relative amount of harvest of bottomfish by recreational fishermen in the MHI. Management measures in Amendment 14 (WPRFMC 2007a) provide for reporting by non-commercial fishermen and will provide better tracking of the recreational bottomfishing harvest in the MHI. Some charter fishing for bottomfish occurs in the MHI; one estimate found that the charter boat fleet earns about $342,675 in a year from bottomfish charter trips (Hamilton and Huffman 1997, cited in WPRFMC (2007)).

WPRFMC (2007a) reported that 222,000 lb of NWHI bottomfish with a value of $851,219 were sold in 2003, and 272,569 lb of MHI bottomfish with a value of $1,450,000 were sold in 2003. The total economic output from bottomfishing in Hawaii was estimated as $10,780,667 (WPRFMC 2007a; page 3-104).

Fishing Communities: The State of Hawaii is a fishing community under the FMP.

Native Hawaiian Community -a 1995 and 1996 survey of small boat owners who engage in Hawaii's commercial and non-commercial fisheries, including the troll, pelagic handline and bottomfish handline fisheries, included people of Japanese, mixed with part-Hawaiian, and Caucasian ancestry to be the leading participants in these fisheries (Hamilton and Huffman (1997), cited in WPRFMC 2007; page 3-107). Part Hawaiians made up 16 percent of the MHI small-boat owners surveyed.

Administration and Enforcement - Closure of the NWHI bottomfish fishery in 2011, as required by the Marine National Monument designation, will reduce or eliminate most of the administrative costs associated with managing the bottomfish fishery in the NWHI. Enforcement costs would be less affected because other threats to biological resources and habitats would remain. Enforcement costs related to the new fishing regulations to prevent overfishing in the MHI have increased.

At the time this document is being prepared, a Record of Decision has not been issued for the 2005 EIS (NMFS 2005c). Since the 2005 EIS analysis of the impacts of the fisheries summarized above, there have been several developments that may have altered the impact analysis and actual impacts of the bottomfish fisheries on the biological environment, and these include recent amendments to the Bottomfish FMP. There have been four amendments to the Bottomfish FMP since 2005, Amendments 8, 9, 10, and 14 (Table 3-16). These amendments were analyzed for the impacts of the bottomfish fisheries on the environment. A discussion of these amendments follows.

Prior to Amendment 8 (September 12, 2006), the Federal waters that encompass the CNMI were not included in the FMPs for Bottomfish, Crustaceans, or Precious Corals. Similarly, Federal waters that encompass the PRIA were not included in the Bottomfish or Crustaceans FMPs. As discussed in Chapter 3, vessels have been known to fish for bottomfish and crustaceans in the Federal waters around the CNMI and PRIA, but this fishing typically occurs on a small scale. Until recently, there were no bottomfish fisheries operating in the PRIA. Moreover, currently there are no precious corals fisheries operating in the CNMI. Amendment 8 to the Bottomfish FMP addressed potential bottomfish fisheries operating in these areas. The amendment established monitoring systems and management mechanisms to implement specific regulatory controls should the need arise. The associated environmental assessments to Amendment 8 updated the analysis of the impacts of the bottomfish fisheries and management regime on the environment in the CNMI and PRIA.

Amendment 9 (November 2, 2006) to the Bottomfish FMP prohibits large vessels, that is, those 50 feet (15.2 meters) in length or longer, from fishing for bottomfish in Federal waters within 50 nautical miles (92.6 kilometers) around Guam, and established Federal permitting and reporting requirements for these large bottomfish fishing vessels. The associated environmental assessment for Amendment 9 updated the analysis of the impacts of the bottomfish fishery and management regime on the environment around Guam.

As noted earlier, the 2005 EIS also concludes that "[b]ottomfish species managed under the Bottomfish FMP are currently not overfished." However, concurrent with the completion of the 2005 EIS, NMFS informed the Council that the Hawaii archipelagic bottomfish multi-species stock complex, which occurs in both Federal and State jurisdictions throughout the Hawaiian Archipelago, was determined to be experiencing overfishing. An updated stock assessment completed by NMFS Pacific Islands Fisheries Science Center (Moffitt et al. 2006) concluded that only the MHI bottomfish stocks were being subject to overfishing. A more recent stock assessment of the Hawaii archipelagic bottomfish stocks concluded that the stock complex is not subject to overfishing (Brodziak et al. 2009).

Amendment 14 to the Bottomfish FMP implements the Council's recommendation to end overfishing of bottomfish in the Hawaiian Archipelago (WPRFMC 2007a). Effective April 1, 2008, non-commercial permits and reporting, non-commercial bag limits and a total allowable catch (TAC) limit was established for bottomfish fishermen fishing in Federal waters of the Main Hawaiian Islands. The 2007-2008 fishery was closed until September 1, 2008 and upon opening, Federal non-commercial permits and reporting were required. The associated Supplemental

Environmental Impact Statement for Amendment 14 (December 19, 2007) updated the analysis of the impacts of the bottomfish fisheries and management regime on the environment within the Hawaiian Archipelago. The 2007-08 MHI bottomfish fishery reached the TAC of 178,000 lb in April, 2008. The 2008-09 MHI bottomfish fishery was closed in July 2009, when the fishery reached the 2008-09 TAC of 241,000 lb.

Bottomfish FMP [1]

Table 3-16. Amendments, Regulatory Amendments and the Associated National Environmental Policy Act Documents for the Bottomfish Fishery Management Plan in the Western Pacific Region.

Bottomfish FMP Amendments and NEPA			
Fishery Management Plan (FMP)/Amendment /Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Bottomfish and Seamount Groundfish Fishery Management Plan.	Establishment of a new FMP.	July 31, 1986; 51 FR 27413 Correction: August 26, 1986; 51 FR 30367.	Environmental Assessment.
Amendment 1	Extension of Plan Framework to Include EEZs of American Samoa and Guam; Extension of Management Team Annual Report Deadline.	October 14, 1987; 52 FR 38103.	Environmental Assessment.
Amendment 2	Limited Entry Vessel Participation for NWHI.	August 9, 1988; 53 FR 29907.	Environmental Assessment.
Amendment 3	Overfishing Definition Per Dept. of Commerce's Revised FMP Guidelines.	January 23, 1991; 56 FR 2503.	Environmental Assessment.
Amendment 4	Vessel Operator Requirement to Notify NMFS for NWHI Trips.	May 30, 1991; 56 FR 24351.	Environmental Assessment.

Bottomfish FMP Amendments and NEPA			
Fishery Management Plan (FMP)/Amendment /Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 5	Establishment of Limited Entry Program for Mau Zone of NWHI.	May 28, 1999; 64 FR 22810.	Environmental Assessment.
Amendment 6	Redefinition of Overfishing Per MSA Re-approval. Amendment 6 is contained in the "Magnuson-Stevens Act Definitions and Required Provisions."	April 19, 1999; 64 FR 19067.	Environmental Assessment.
Amendment 7	This amendment prohibits fishing for Bottomfish Management Unit Species in the Coral Reef Ecosystems (CRE) FMP's no-take areas.	February 24, 2004; 69 FR 8336.	Environmental Impact Statement. Notice of availability published on May 10, 2002 (67 FR 31801).
Bottomfish and Seamount Fishery Management Plan	An updated analytical review of the FMP.	Notice of Availability of Final EIS June 17, 2005; 70 FR 35275.	Environmental Impact Statement
Amendment 8	Inclusion of EEZ waters around Northern Mariana Islands and Pacific Remote Island Areas (PRIA).	September 12, 2006; 71 FR 53605.	Environmental Assessment
Amendment 9	Limit large vessels in Federal waters around Guam .	November 2, 2006; 71 FR 64474.	Environmental Assessment

Bottomfish FMP Amendments and NEPA			
Fishery Management Plan (FMP)/Amendment /Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 10	CNMI Bottomfish fishery closed areas for medium and large bottomfish vessels established within 50 nm of southern CNMI Islands, and from 3-10 nm in Alamagan Island; VMS; reporting	December 12, 2008; 73 FR 75615	Environmental Assessment
Amendment 11	Reserved by the Council for later use.	[-]	[-]
Amendment 12	Reserved by the Council for later use.	[-]	[-]
Amendment 13	Reserved by the Council for later use.	[-]	[-]
Amendment 14: Supplemental Bottomfish and Seamount Fishery Management Plan.	Measures to end Bottomfish Overfishing in the Hawaiian Archipelago.	April 4, 2008; 73 FR 18450	Final Supplemental Environmental Impact Statement.
Regulatory Amendment	Federal Requirement for Reporting Catch.	October 25, 1990; 55 FR 42966.	Categorical Exclusion.
Regulatory Amendment	Extension of Fishing Moratorium for Hancock Seamount Fishery.	August 27, 1992; 57 FR 36907.	Categorical Exclusion.
Regulatory Amendment	Protected Species. Workshop requirement for NWHI Operators.	June 2, 1993; 58 FR 26255	Categorical Exclusion.

Bottomfish FMP Amendments and NEPA			
Fishery Management Plan (FMP)/Amendment /Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Regulatory Amendment	Impose a 2-year moratorium on issuing new permits for harvesting bottomfish in the Mau Zone of the Northwestern Hawaiian Islands.	February 26, 1997; 62 FR 8637.	Categorical Exclusion
Regulatory Amendment	Extension of the moratorium on harvesting seamount groundfish from the Hancock Seamount in the Northwestern Hawaiian Islands until August 31, 2004.	June 29, 1998; 63 FR 35162.	Categorical Exclusion.
Regulatory Amendment	Extension of the moratorium on harvesting seamount groundfish from the Hancock Seamount in the Northwestern Hawaiian Islands until August 31, 2010	August 19, 2004; 69 FR 51400	Categorical Exclusion.

[1] Lightly shaded row(s) within each section signify National Environmental Policy Act documents on the Fishery Management Plan.

3.7.2. Precious Corals FMP

Precious coral fisheries in the Federal waters of the State of Hawaii, the Territories of American Samoa and Guam, the CNMI and several central and western Pacific islands/atolls that are U.S. island possessions or PRIA, are managed under the Fishery Management Plan for Precious Coral Fisheries in the Western Pacific Region (Precious Corals FMP). NEPA documents for the various amendments and regulatory amendments to the Precious Corals FMP, which was established in 1983, are outlined in Table 3-17.

An EIS was completed for the approval and implementation of the Precious Corals FMP in 1983. The Precious Corals FMP has been amended six times since 1983 (in 1988, 1991, 1998, 1999, 2004, and 2006). Each NEPA document associated with these amendments primarily focused on the Federal action related to the particular amendment (Table 3-17). Recent amendments, Amendments 5, 6, and 7, include an updated analysis of the impacts of the precious corals fisheries and management regime on the human environment within the affected areas. A discussion of these amendments follows.

Amendment 5 (February 24, 2004) prohibits precious coral harvests in No-take Marine Protected Areas as designated by the Coral Reef Ecosystem FMP. Amendment 6 (September 12, 2006) includes the Federal waters that encompass the CNMI and PRIA under the Precious Corals FMP. Amendment 6 established monitoring systems and management mechanisms to implement specific regulatory controls should the need arise. The associated environmental assessment for Amendment 6 updated the analysis of the impacts of the Federal precious corals fisheries and management regime on the human environment in the CNMI and PRIA.

As discussed in Section 3.5, most of the recent precious corals harvest under the Precious Corals FMP has been in State of Hawaii waters. In particular, since 1980, virtually all of the black coral harvested within the Hawaiian Archipelago has been taken from the Au’au Channel Bed. Even though a substantial portion of the Au’au Channel Bed is located in Federal waters and therefore is under the jurisdiction of the Precious Corals FMP, all reported harvest has been confined to the waters of the State of Hawaii.

A regulatory amendment to the Precious Corals FMP (Amendment 6) was developed for the fisheries in Federal waters of the Au’au Channel Bed (see details Table 3-17). The regulatory amendment recommended by the Council permanently remove an exemption that allows for harvest of black corals with a minimum base diameter of three-quarters of an inch by persons who reported harvest to the State of Hawaii within five years prior to the effective date of March 18, 2002. An associated environmental assessment to this regulatory amendment was completed and it updated the analysis of the impacts of Federal fisheries and the management regime on the human environment around the Hawaiian Archipelago.

Amendment 7 established the Au`au Channel Bed, and implemented a 5 year moratorium on the harvest of gold corals in the western Pacific. The moratorium includes all waters of the U.S. Exclusive Economic Zone of the Western Pacific Region and is currently in effect through June 30, 2013 (73 FR 47098).

It is also noted that the Council announced its intention to prepare an EIS on the Federal management of precious corals in the Western Pacific Region on February 9, 2000 (65 FR 6352). The scope of the EIS analysis was to include all activities related to the conduct of the precious corals fisheries and examine the impacts of precious corals harvesting on, among other things, protected species. However, with the elimination of the NWHI precious corals fishery (which is discussed later), the need for a comprehensive analysis of Federal fisheries operating under the Precious Corals FMP throughout the Western Pacific Region has been diminished substantially. As mentioned above, the Council completed Amendment 7, a regulatory amendment to the Precious Corals FMP for the Federal precious corals fisheries within the Au’au Channel Bed.

The associated environmental assessment updated the analysis of the impacts of the only then currently active precious corals fisheries within the region.

Precious Corals FMP [1]

Table 3-17. Amendments, Regulatory Amendments and the Associated National Environmental Policy Act Documents for the Precious Corals Fishery Management Plan in the Western Pacific Region.

Precious Corals FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment /Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Precious Coral Fishery Management Plan	Establishment of a new FMP.	September 29, 1983; 48 FR 39229.	Environmental Impact Statement.
Amendment 1	Designation of single Exclusive Economic Zone (EEZ) Exploratory Area.	July 21, 1988; 50 FR 27519.	Environmental Assessment.
Amendment 2	Definition of Precious Coral Overfishing.	January 28, 1991; 56 FR 3072.	Environmental Assessment.
Amendment 3	Establishment of Framework Procedures for New Management Measures.	October 19, 1998; 63 FR 55809.	Environmental Assessment.
Amendment 4	Overfishing Redefinitions and Provisions Following MSA Re-approval. Amendment 4 is contained in the "Magnuson-Stevens Act Definitions and Required Provisions."	April 19, 1999; 64 FR 19067.	Environmental Assessment.

Precious Corals FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment /Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 5	Prohibition of Coral Harvest in No-take Marine Protected Areas Designated by Coral Reef Ecosystems (CRE) FMP.	February 24, 2004; 69 FR 8336.	Environmental Impact Statement. A notice of availability was published on May 10, 2002 (67 FR 31801).
Amendment 6	Inclusion of EEZ Waters around Northern Mariana Islands and Pacific Remote Island Areas (PRIA).	September 12, 2006; 71 FR 53605.	Environmental Assessment.
Regulatory Amendment	Removes a minimum size exemption for Black Coral.	October 15, 2007; 72 FR 48259.	Environmental Assessment.
Regulatory Amendment	Notification of control date of Dec 21, 2006, for Black Coral fishing in the Au'au Channel near Maui, Hawaii.	March 2, 2007; 72 FR 9500.	N/A
Amendment 7	Designation of the Au'au Channel as an Established Black Coral Bed, Harvest Quota, and Moratorium on the Harvest of Gold Corals in the Western Pacific Region.	September 12, 2008; 73 FR 47098	Environmental Assessment.

[1] Lightly shaded row(s) within each section signify National Environmental Policy Act documents on the Fishery Management Plan.

3.7.3. Coral Reef Ecosystem FMP

On June 14, 2002, NMFS partially approved the Coral Reef Ecosystem FMP and parallel amendments to the Bottomfish FMP, Pelagics FMP, Precious Corals FMP, and the Crustaceans FMP. The Coral Reef Ecosystem FMP was approved by NMFS, with the exception of that portion of the Coral Reef Ecosystem FMP that applied to fishing in Federal waters around the NWHI. NMFS disapproved that portion of the plan because it was inconsistent with, or duplicate to, certain provisions of Executive Orders 13178 and 13196, which together established the NWHI Coral Reef Ecosystem Reserve. A final rule implementing the Coral Reef Ecosystems FMP was published on February 24, 2004 (69 FR 8336). Prior to the implementation of the Coral Reef Ecosystem FMP, coral reef ecosystem fisheries in federally managed waters of the western Pacific were unregulated under the MSA.

The Coral Reef Ecosystem FMP applies ecosystem principles to fisheries management to conserve and protect coral reef fisheries, their ecosystems, and associated habitats. The Coral Reef Ecosystem FMP adopted a precautionary approach by preventing harmful activities and adverse impacts to the environment before those impacts could occur. The 2004 Coral Reef Ecosystems FMP established a coral reef ecosystem regulatory area, marine protected areas, permitting and reporting requirements, a no-anchoring zone, gear restrictions, and a framework regulatory process.

The Coral Reef Ecosystem FMP established the framework that could institute management measures rapidly in response to changes in the coral reef fishery. At the time of its inception, it was anticipated that the Coral Reef Ecosystem FMP would maintain the sustainability of target and non-target species; safeguard against substantial damage to the ocean and coastal habitats and/or EFH; protect endangered or threatened species, marine mammals, and critical habitat; help ensure public health and safety; prevent the occurrence of cumulative adverse effects that could have a substantial effect on the target species or non-target species; promote biodiversity and ecosystem function within the affected area; and minimize, if not eliminate, negative social or economic impacts. Although state and territorial regulations control most impacts from coral reef fisheries in near-shore areas, the establishment of the Coral Reef Ecosystem FMP allows for framework measures to be established to complement state and territorial regulations, as appropriate, for adjacent Federal waters.

The Coral Reef Ecosystem FMP was primarily a precautionary plan, as limited fisheries were occurring within the Federal waters. Prior to the implementation of the Coral Reef Ecosystem FMP, it was estimated that approximately 1 percent, 8 percent, 11 percent, and 10 percent of the total ex-vessel value of the harvest of coral reef resources was taken from Federal waters within American Samoa, Guam, Hawaii, and the CNMI, respectively (p. 68 of the Coral Reef Ecosystems FMP). By the definition used in the FMP, this harvest did not include fisheries for finfish, crustaceans, and precious corals in benthic environments deeper than 50 fathoms, or in the pelagic fisheries. As of February 2006, no permits to participate in the coral reef fisheries within Federal waters have been issued.

An informal consultation under the ESA was concluded for the Coral Reef Ecosystems FMP on March 7, 2002. As a result of the informal consultation, the NMFS Regional Administrator determined that fishing activities conducted under this FMP are not likely to adversely affect endangered or threatened species or critical habitat under NMFS's jurisdiction. On May 22, 2002, the U.S. Fish and Wildlife Service concurred with this determination that the activities conducted under the Coral Reef Ecosystems FMP are not likely to adversely affect listed species under their exclusive jurisdiction (i.e., seabirds and terrestrial plants) and listed species that are under shared jurisdiction with NMFS (i.e., sea turtles).

The Coral Reef Ecosystem FMP has not been amended to date.

Coral Reef Ecosystem FMP

Table 3-18. Amendments, Regulatory Amendments and the Associated National Environmental Policy Act Documents for the Coral Reef Ecosystem Fishery Management Plan in the Western Pacific Region.

Coral Reef Ecosystem FMP and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment/ Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Coral Reef Ecosystem Fishery Management Plan	Establishment of a new FMP.	February 24, 2004; 69 FR 8336.	Environmental Impact Statement. A notice of availability was published on May 10, 2002 67 FR 31801.

3.7.4. Crustaceans FMP

Since 1983, the crustacean fisheries within the Federal waters in the Western Pacific Region have been managed under the Fishery Management Plan for Crustacean Fisheries of the Western Pacific Region (Crustaceans FMP)[65]. There have been 12 amendments to the Crustaceans FMP since 1983 (Table 3-19). The most recent amendment to the Crustaceans FMP was Amendment 12 (September 12, 2006; 71 FR 53605). Amendment 12 established new permitting and reporting requirements for vessel operators targeting crustacean species within the Federal waters of the PRIA (shoreline to 200 miles) and from 3 to 200 miles of the CNMI.

Similar to the Precious Corals FMP, on December 17, 1999 (64 FR 70680), the Council announced its intention to prepare an EIS on the Federal management of crustaceans in the Western Pacific Region. The scope of the EIS analysis was to include all activities related to the conduct of the Federal crustacean fisheries and examine the impacts of crustacean harvest on, among other things, protected species. At the time, the only major Federal crustacean fishery for the Western Pacific Region was occurring in the NWHI. Of particular concern were the potential direct, indirect, and cumulative impacts of the crustacean (commercial lobster) fishery in the

[65] The initial FMP was for spiny lobsters but later it became Crustaceans FMP when slipper lobsters and kona crabs were included as MUS.

NWHI on Hawaiian monk seals. Although it was determined direct impacts on seals had occurred from the crustacean fishery gear, indirect impacts through a reduction of the prey base of monk seal were undocumented.

However, the crustacean fishery in the NWHI has been closed since 2000. This closure was reinforced by the President's proclamation establishing the Papahanaumokuakea Marine National Monument in the Northwestern Hawaiian Islands (Proclamation 8031; June 15, 2006). The President's proclamation closed most fisheries within the monument's boundaries immediately (including any potential crustacean fishery) and established that the NWHI bottomfish fishery be closed by June 15, 2011. With the elimination of the potential for a NWHI crustacean fishery, the need for a comprehensive analysis of the fisheries operating under the Crustaceans FMP was diminished substantially. Very few crustacean fisheries currently occur in the Federal waters of the Western Pacific Region.

Crustaceans FMP [1]

Table 3-19. Amendments, Regulatory Amendments, and the Associated National Environmental Policy Act Documents for the Western Pacific Region Crustaceans Fishery Management Plan.

Crustaceans FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Crustaceans Fishery Management Plan	Establishment of a new FMP.	February 7, 1983; 48 FR 5560.	Environmental Impact Statement (EIS).
Amendment 1	Coordination of Main Hawaii Island (MHI) EEZ Commercial Lobster Fishery with MHI State Regulations.	November 23, 1983; 48 FR 52922.	Environmental Assessment.
Amendment 2	Regulation of Trap Opening Measurement.	January 4, 1984; 49 FR 407.	Environmental Assessment.
Amendment 3	Replacement of Minimum Carapace Length with Minimum Tail Length and Elimination of 15 Percent Undersize Allowance.	March 12, 1986; 51 FR 8506.	Environmental Assessment.

Crustaceans FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 4	Prohibition of Fishing in Refuge Areas.	March 25, 1987; 52 FR 9496.	Environmental Assessment.
Amendment 5	Inclusion of Slipper Lobster Management.	December 15, 1987; 52 FR 47573.	Environmental Assessment.
Amendment 6	Adoption of Overfishing Definition Per MSA Renewal.	January 28, 1991; 56 FR 3071.	Environmental Assessment.
Amendment 7	Fishery Restrictions in Response to Serious CPUE Declines.	April 27, 1992; 57 FR 10437.	Environmental Assessment.
Amendment 8	Adjustments to Facilitate Monitoring and Management.	[December 12, 1994; 59 FR 56004].	Environmental Assessment.
Amendment 9	Adoption of Constant Harvest Rate Method for Quota	July 5, 1996; 61 FR 35145.	Environmental Assessment.
Amendment 10	Redefinition of Overfishing Per MSA Re-approval. Amendment 10 is contained in the "Magnuson-Stevens Act Definitions and Required Provisions."	April 19, 1999; 64 FR 19067.	Environmental Assessment.
Amendment 11	Crustaceans Amendment for Coral Reef Ecosystem Plan.	February 24, 2004; 69 FR 8336.	Environmental Impact Statement. A notice of availability was published on May 10, 2002; 67 FR 31801.

Crustaceans FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 12	Inclusion of EEZ Waters around Northern Mariana Islands and Pacific Remote Island Areas (PRIA).	September 12, 2006; 71 FR 53605.	Environmental Assessment.
Amendment 13	Addition of *Heterocarpus* spp. as MUS under the Crustaceans FMP.	November 21, 2008; 73 FR 70603	Environmental Assessment.
Regulatory Amendment	Revises Amendment 5.	December 30, 1988; 53 FR 52998.	Categorical Exclusion.
Regulatory Amendment	Implement a vessel monitoring system (VMS) program in the crustaceans fishery of the Northwestern Hawaiian Islands (NWHI).	July 1, 1997; 62 FR 35448.	Categorical Exclusion.
Regulatory Amendment	Implement three management measures, including allowing fishing vessels in the Northwestern Hawaiian Islands (NWHI) lobster fishery with vessel monitoring system (VMS) units to transit the prohibited Crustaceans. Permit Area 1.	April 27, 1998; 63 FR 20539.	Categorical Exclusion.

Crustaceans FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Regulatory Amendment	This rule allocates the overall 1998 Northwestern Hawaiian Islands (NWHI) harvest guideline.	July 29, 1998; 63 FR 40377.	Categorical Exclusion.
Regulatory Amendment	Bank-specific harvest guidelines for the NWHI crustacean fisheries.	July 8, 1999; 64 FR 36820.	Environmental Assessment

[1] Lightly shaded row(s) within each section signify National Environmental Policy Act documents on the Fishery Management Plan.

3.7.5. Pelagics FMP

The Federal pelagic fisheries in the Western Pacific Region are managed under the Pelagics FMP, which was established in 1987. NEPA documents for the various amendments and regulatory amendments to the Pelagics FMP are outlined in Table 3-20. It is noted that an updated analytical review of the impacts of the pelagic fisheries under the Pelagics FMP, throughout the region, was completed in 2001.

The 2001 EIS provided a comprehensive analysis of the environmental impacts of various alternatives for management of U.S. pelagic fisheries in the Western Pacific Region. The fisheries analyzed in the 2001 EIS include longline fisheries in Hawaii and American Samoa; commercial troll fisheries in Hawaii, American Samoa, Guam and the CNMI; charter troll fisheries in Hawaii, Guam and CNMI; commercial pelagic handliners in Hawaii; recreational troll fishing in Hawaii, American Samoa, Guam and the CNMI; and the commercial pole-and-line skipjack fishery in Hawaii.

Based on the 2001 EIS, the associated Record of Decision provides a summary of the environmental impacts of the alternatives, along with the rational for the selection of the identified Preferred Alternative. In terms of the expected impacts of the selected alternative, the most relevant environmental resources were fish stocks, sea turtles, seabirds, and marine mammals. Potential impacts on ocean and coastal habitat, biodiversity, and ecosystem function were also assessed. The Record of Decision for the 2001 EIS found the following for the selected alternative, Alternative 4.

> Fish stocks - Fish stocks that would be affected include tunas (bigeye, yellowfin, skipjack, albacore), billfishes (swordfish, blue marlin, striped marlin), and sharks. Fishing effort by the Hawaii-based longline fishery on these stocks and consequent fishing mortality are relatively predictable. The environmental impacts of the pelagic fisheries under the Pelagics FMP with respect to target stocks, as well as stocks of other species targeted and incidentally caught, are as expected in accordance with established harvest limits. This is because the fishing mortality is likely minor compared to total mortality of the stocks.
>
> Sea turtles - The 2001 EIS discusses the anticipated interaction and mortality rates of direct impacts of pelagic fishery gear and operations (managed under the Pelagics FMP) on sea turtles. The indirect effects of interactions on sea turtle populations are less certain. The analyses of these effects were addressed in a 2004 biological opinion that concluded that the anticipated interactions are not likely to jeopardize the continued existence of affected sea turtle species.
>
> Seabirds - Most seabird interactions in the Hawaii-based longline fisheries are with Laysan and blackfooted albatrosses. No interactions with the ESA-listed short-tailed albatross have been observed or reported in the pelagic fishery. Albatross interactions occur primarily in the relatively high latitudes, mostly between 25° and 40° N. latitude. A

2000 biological opinion on the Hawaii-based longline fishery issued by the U.S. Fish and Wildlife Service for the short-tailed albatross concluded that the fishery as managed in 2000 was not likely to jeopardize the continued existence of the short-tailed albatross. The selected alternative in the 2001 EIS was more restrictive, with respect to seabirds, than the management regime in place at that time.

Marine mammals - A number of marine mammal species, some of them ESA-listed, occur in the region where the Hawaii-based longline fishery occurs. However, according to the 2001 EIS, the marine mammal interaction rates and resultant adverse impacts are not expected to be substantial, in part because marine mammal interactions in the fishery are relatively rare.

Habitat - Given the inert nature of the gear used to longline and the deployment of the gear in the epipelagic zone far from coastal waters, the selected alternative was not expected to adversely affect coastal or ocean habitat, including EFH and HAPC.

Biodiversity and ecosystem function - Given that the Hawaii-based longline fishery catches a very small fraction of the total international catch and biomass in the tropical and subtropical pelagic ecosystems, the selected alternative was not expected to significantly adversely affect ecosystem function.

There have been at least two amendments and one regulatory amendment to the Pelagics FMP since the 2001 EIS (Table 3-19). Both of these amendments, Amendments 10 and 11, have associated environmental assessments. The regulatory amendment has an associated EIS completed in April 2005. A discussion of these amendments and regulatory amendment follows.

Amendment 10 (February 24, 2004) prohibits pelagic fisheries in No-take Marine Protected Areas as designated by the Coral Reef Ecosystem FMP. Amendment 11 (May 24, 2005) established a limited entry system for pelagic longline vessels fishing in the waters of the U.S. EEZ around American Samoa.

Amendment 11 was intended to establish management measures that would stabilize effort in the fishery to avoid a ‘‘boom and bust’’ cycle that could disrupt community participation and limit opportunity for substantial participation in the fishery by indigenous islanders. An environmental assessment associated with Amendment 11 analyzes the impacts of the fisheries and management regime on the human environment around American Samoa.

On November 15, 2005, NMFS issued a final rule (70 FR 69282) for a regulatory amendment to the Pelagics FMP to reduce and mitigate interactions between sea turtles and fisheries managed under the Pelagics FMP. The regulatory amendment has an associated environmental assessment, and included requirements for attending protected species workshops; for handling, resuscitating, and releasing sea turtles that are hooked or entangled in fishing gear; and for fishing gear configuration. The regulatory amendment was implemented in part to comply with the terms and conditions of a 2004 biological opinion on the impacts of pelagic fishery gear and operations on sea turtles.

In the biological opinion issued on February 23, 2004, NMFS concluded that the fisheries managed under the Pelagics FMP, with terms and conditions, were not likely to jeopardize the continued existence of sea turtles or other species listed as threatened or endangered under the ESA. Among other things, the terms and conditions of the 2004 Biological Opinion require the following:

(1) owners and operators of vessels registered for use under longline general permits to attend protected species workshops annually,

(2) owners and operators of vessels registered for use under longline general permits to carry and use dip nets, line clippers, and bolt cutters, and follow handling, resuscitation, and release requirements for incidentally hooked or entangled sea turtles, and

(3) operators of non-longline vessels using hooks to target pelagic management unit species to follow sea turtle handling, resuscitation, and release requirements, as well as to remove the maximum amount of the gear possible from incidentally hooked or entangled sea turtles.

In addition to recommending the above three measures, the Council also recommended that NMFS include a fourth measure to extend to all longline vessels managed under the Pelagics FMP that may shallow-set north of the equator the conservation benefits derived from the use of circle hooks, mackerel-type bait, and dehookers. The fourth measure also removes incentives for owners of Hawaii-based longline vessels to give up their permits in favor of general permits or for the purpose of avoiding the requirement to use circle hooks, mackerel bait, etc., when shallow setting north of the equator.

On December 19, 2005, NMFS issued a final rule (70 FR 75075) for a regulatory amendment to implement measures to further reduce the incidental catch of seabirds in the Hawaii-based longline fishery. Depending on the fishing method and area where the vessels operate, owners, and operators of longline fishing vessels must either side-set (deploy longline gear from the side of the vessel rather than from the stern) or use a combination of other seabird mitigation measures to prevent seabirds from being accidentally hooked, entangled, and killed during fishing operations. The NEPA document for this regulatory amendment was titled ‘‘Final Environmental Impact Statement, Seabird Interaction Avoidance Methods under the Fishery Management Plan for Pelagics Fisheries of the Western Pacific Region and Pelagic Squid Fishery Management under the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region and the High Seas Fishing Compliance Act,’’ dated April, 2005. The associated Record of Decision established the selection of the Preferred Alternative of the 2005 EIS (with slight modification) to cost-effectively further reduce the potentially harmful effects of the Hawaii-based longline fishery on seabirds.

Regarding bigeye tuna managed under the Pelagics FMP, on December 15, 2004, the Council was notified by letter that the Secretary of Commerce had determined on June 14, 2004, that overfishing of bigeye tuna was occurring throughout the Pacific Ocean (69 FR 78397). On March 16, 2006, the Council was notified by letter that the Secretary of Commerce had determined that overfishing is occurring on the yellowfin tuna stock in the western and central Pacific Ocean (71 FR 14837). The Council completed Amendment 14 to the Pelagics FMP to address overfishing of bigeye and yellowfin tuna on August 23, 2006 and a proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved; however, the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS.

Amendment 15 was implemented in December 2008 (73 FR 70600) and included pelagic squid in the Council's existing Pelagics Fishery Management Plan to ensure monitoring of these species, and to establish mechanisms for their management should it become necessary. The amendment includes pelagic squid as Management Unit Species and establishes permitting and reporting requirements for the Western Pacific Region squid jig fisheries. Permit and reporting requirements are currently under review by the Office of Management and Budget.

Pelagics FMP [1]

Table 3-20. Amendments, Regulatory Amendments and the Associated National Environmental Policy Act Documents for the Pelagics Fishery Management Plan in the Western Pacific Region.

Pelagics FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Pelagics Fishery Management Plan	Establishment of new FMP.	February 27, 1987; 52 FR 5983 Correction: August 25, 1987; 52 FR 32015.	Environmental Assessment.
Amendment 1	Definition of Pelagics Overfishing.	March 7, 1991; 56 FR 9686.	Environmental Assessment.
Amendment 2	Redefinition of FMU, Requirement of Longline Fishing Permits and Observer Coverage in NWHI.	May 31, 1991; 56 FR 24731.	Environmental Assessment.

Pelagics FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 3	Extension of PSZ for Longline Fishery.	October 18, 1991; 56 FR 52214.	Environmental Assessment.
Amendment 4	Extension of Longline Moratorium.	October 16, 1991; 56 FR 51849.	Environmental Assessment (not CE).
Amendment 5	Permanent Establishment of MHI Area Closures.	March 2, 1992; 57 FR 7661.	Environmental Assessment.
Amendment 6	Inclusion of Tuna in FMU and Regulation of Consistent Foreign and Domestic Vessel Regulations.	November 27, 1992; 57 FR 48564.	Environmental Assessment.
Amendment 7	Transformation of Moratorium to Limited-Entry Permit Program.	June 24, 1994; 59 FR 26979.	Environmental Impact Statement.
Amendment 8	Permit and Reporting Requirement for the Pelagic Troll and Handline Fishery in PRIA.	April 19, 1999; 64 FR 19067.	Environmental Assessment.
Amendment 9	Shark Quota in Longline Fishery and Prohibition of Bottom Longline Gear.	Was never submitted for Secretarial review	N/A
Final Environmental Impact Statement Fishery Management Plan Pelagic Fisheries of the Western Pacific Region, March 30, 2001.	Review of the management of fisheries governed by the Pelagics FMP.	The notice of availability of the Final EIS was published on April 6, 2001; 66 FR 18243.	Environmental Impact Statement.

Pelagics FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 10	Pelagics Amendment for Coral Reef Ecosystem Plan.	February 24, 2004; 69 FR 8336.	Environmental Assessment.
Amendment 11	Measure to Limit Pelagic Longline Fishing Effort in the Exclusive Economic Zone around American Samoa.	May 24, 2005 70 FR 29646	Environmental Assessment.
Amendment 12	Reserved for later use.	[-]	[-]
Amendment 13	Reserved for later use - Council.	[-]	[-]
Amendment 14	Bigeye and Yellowfin Tuna Overfishing - Recommendation of Management, Monitoring, and Research Actions for International Fisheries, Including Implementation of New Permit and Reporting Requirements for Hawaii-based Non-longline Vessels	October 12, 2006; 72 FR 33442. (Proposed rule withdrawn, partial approval of FMP Amendment 14).	Environmental Assessment.

Pelagics FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Amendment 15	Includes pelagic squid as Management Unit Species and establishes permitting and reporting requirements for the Western Pacific Region squid jig fisheries.	November 21, 2008; 73 FR 70600. [permit and reporting requirements are awaiting approval by the Office of Management and Budget]	Environmental Assessment.
Amendment 18	Remove effort limits, eliminate set certificates, and establish updated sea turtle interaction caps in accordance with 2008 Biological Opinion.	Under consideration	FSEIS 2009
Regulatory Amendment	Reporting Requirements for Catch and Effort to State Agencies.	October 25, 1990; 55 FR 42967.	Categorical Exclusion
Regulatory Amendment	Revision of Regulations Governing Identification of Longline Floats and Buoys.	March 16, 1993; 58 FR 14170.	Categorical Exclusion
Regulatory Amendment	Removal of Regulations Governing Exclusive Economic Zone off the Commonwealth of the Northern Mariana Islands and West Coast of U.S. Mainland.	September 23, 1993; 58 FR 49438.	Categorical Exclusion

Pelagics FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Regulatory Amendment	Requirement for Longline Fishery Vessel Operators to Accommodate Observers.	April 19, 1994; 59 FR 18499.	Categorical Exclusion
Regulatory Amendment	Implementation of Experimental Vessel Monitoring Program in Pelagic Longline Fishery around Hawaii.	November 15, 1994; 59 FR 58789.	Categorical Exclusion.
Regulatory Amendment	Sea Turtle Take Mitigation Measures Including Pelagic Longline Gear Restrictions and Seasonal Area Closures.	67 FR 40232; June 12, 2002.	Environmental Assessment.
Regulatory Amendment	Establishing Permit and Reporting Requirements for the Pelagic Troll and Handline Fishery in the U.S. Remote Island Areas.	September 4, 2002; 67 FR 56497.	Environmental Assessment.
Regulatory Amendment	Management Measures to Implement New Technologies for the Western Pacific Pelagic Longline Fisheries.	April 2, 2004; 69 FR 17329.	Supplemental Environmental Impact Statement.

Pelagics FMP Amendments and NEPA Documents.			
Fishery Management Plan (FMP)/ Amendment / Regulatory Amendment	**Proposed Federal Action Analyzed**	**Final Rule**	**Associated National Environmental Policy Act Document**
Regulatory Amendment	Sea Turtle Mitigation Measures, Gear and Handling Requirements, Protected Species Workshop Attendance, and Shallow-Setting Restrictions	November 15, 2005; 70 FR 69282.	Environmental Assessment.
Regulatory Amendment	Additional Measures to Reduce the Incidental Catch of Seabirds in the Hawaii-Based Longline Fishery.	December 19, 2005; 70 FR 75075.	Environmental Impact Statement.
Regulatory Amendment	Remove Delay in Closing Hawaii-Based Shallow-Set Longline Fishery.	February 26, 2007; 72 FR 8289.	Environmental Assessment.
Regulatory Amendment	Allow vessel operators to use Electronic Logbooks for Reporting Catch and Effort.	April 17, 2007; 72 FR 19123.	Categorical Exclusion.

[1] Lightly shaded row(s) within each section signify National Environmental Policy Act documents on the Fishery Management Plan.

Chapter 4. ENVIRONMENTAL CONSEQUENCES

4.1. Introduction

Chapter 4 presents discussions of potential direct, indirect, and cumulative effects for each alternative. The chapter is organized by the five action components:

Component 1. Moving toward ecosystem management by replacing some or all of the existing Fishery Management Plans (FMPs) with Fishery Ecosystem Plans (FEPs).

Component 2. Consideration of which species would be managed under each FEP.

Component 3. Council advisory structure.

Component 4. Regional coordination.

Component 5. International coordination (Table 4-1).

The discussion under each component is further organized by alternative. As discussed in Chapter 2, Components 1 and 2 are regulatory in nature and considered the Federal action in this document. Components 3, 4, and 5 are nonregulatory (i.e., they have no regulatory effect), and their consideration is included to assist the Council in identifying an appropriate advisory structure and coordination activities under an ecosystem-based fishery management structure. Component 2 is contingent upon selecting one of the action alternatives under Component 1 (Alternatives 1B through 1E).

Table 4-1. Descriptions of the Components and List of Alternatives Considered in Detail.

Components	Alternatives
Component 1: Moving toward ecosystem management, replace all or some FMPs with FEPs	Alternatives 1B-1E (Alternative 1A is the No Action alternative)
Component 2: Species to be managed under each FEP	Alternatives 2A-2D
Component 3: Council Advisory Structure	Alternatives 3A-3D
Component 4: Regional Coordination	Alternatives 4A-4D
Component 5: International Coordination	Alternatives 5A-5C

4.2. Component 1: Replace FMPs with FEPs

As stated in Chapter 1, the purpose of the proposed Federal action in this EIS is to establish an institutional framework that facilitates a shift to an ecosystem approach for fisheries management in the Western Pacific Region. The shift would be accomplished, in part, through the approval and implementation of place-based FEPs, without any substantive changes to current fishing regulations. Component 1 considers the associated reorganization of existing species-based FMP regulations into place-based FEP regulations. For each alternative under Component 1 the impacts are discussed by area, as follows: American Samoa, Marianas, Hawaii, PRIA, and pelagic. For each area the potential impacts on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, environmental justice populations, and enforcement and administration are discussed.

The structure of the discussion for Component 1 is intended to allow a reader interested in just one alternative and one area to focus on the description of the environmental consequences specific to that alternative and area.

4.2.1. Alternative 1A, the No Action Alternative

The following sections discuss the potential impacts of Alternative 1A, the No Action Alternative, on the physical environment, the biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration.

Federal fisheries in the Western Pacific Region are currently managed under five species-based FMPs: Bottomfish; Precious Corals; Coral Reef Ecosystems; Crustaceans; and Pelagics. Alternative 1A would continue fisheries management under these existing species-based FMPs and their corresponding regulations. The existing FMPs would not be changed and the proposed FEPs would not be approved or implemented. Under Alternative 1A, Federal fisheries would continue to be adaptively managed under each FMP in accordance with the MSA and other applicable laws.

4.2.1.1. American Samoa

The following sections discuss the current impacts of Alternative 1A on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to American Samoa.

4.2.1.1.1. Physical Environment

The physical environment of American Samoa is comprised of its geology and topography as well as surrounding ocean layers, ocean depth zones, ocean water circulation, surface currents, transition zones, eddies, and deep-ocean currents. Under Alternative 1A, Federal fisheries within the American Samoa archipelago would continue to be adaptively managed under the existing species-based FMPs.

As discussed in Chapter 3, and in detail in Section 3.5.1.1, existing fisheries operating under the species-based FMPs in the American Samoa archipelago may affect marine ecosystems in a variety of ways. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can affect marine ecosystems through vessel disturbances, bycatch or discards, impacts on nutrient cycling, or introduction of exotic species, pollution, and habitat disturbance. The day-to-day operation of a fishing vessel can produce a number of waste products, including oil, sewage, garbage, and lost gear, any of which may have a negative impact on the marine environment. However, no long-term significant impacts on the physical environment from waste products directly related to fishery operations conducted under the FMPs, within the American Samoa archipelago, have been documented.

Additionally, the accidental grounding of fishing vessels can adversely affect marine habitat and coral reefs. Potential impacts of a vessel striking the bottom include physical harm to the marine substrate, and the possible subsequent break-up of the vessel would release fuel and oil that could result in pollution of the marine environment and mortality of marine life. However, groundings of fishing vessels operating in the Western Pacific Region are infrequent. In the occasional cases of vessel groundings in the past, some short-term localized damage to the marine substrate did take place, but no long-term impacts on the surrounding marine environment have been documented.

4.2.1.1.2. Biological Environment

The affected biological environment of the American Samoa archipelago includes the benthic environment and the pelagic environment. Alternative 1A would not change the current institutional framework of FMPs, the accompanying regulations, or fishery management strategies.

The affected biological environment of the American Samoa archipelago is discussed generally in Section 3.2 and in more detail in Section 3.5.1. The Territory of American Samoa manages all marine resources and regulated fisheries within the territorial waters 0 to 3 miles from its shoreline. Fisheries in the EEZ (3 to 200 miles offshore) of the American Samoa archipelago are regulated under the FMPs. Under the authority of the MSA, the Council developed and recommended (and the Secretary of Commerce approved) criteria to determine overfishing (fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region, including those for American Samoa. Where MSY has been determined for a demersal fishery within the American Samoa archipelago, no demersal fishery has been determined to be experiencing overfishing or to be overfished. Under Alternative 1A, the status and trends of target and non-target species stocks would continue to be evaluated annually.

A discussion of the biological impacts of the demersal fisheries specific to the EEZ of the American Samoa archipelago under each of the FMPs follows.

4.2.1.1.2.1. Biological Impacts on Bottomfish

Biological impacts of the bottomfish fisheries in the EEZ surrounding American Samoa are managed under the Bottomfish FMP and were comprehensively addressed in a 2005 EIS (June 17, 2005; 70 FR 35275), as updated for select areas in subsequent NEPA documents (see Table 3-16). The 2005 EIS contains relevant analysis of the impacts of the American Samoa fisheries (see Sections 3.4.3.2 and 3.5.2 and Chapter 4 of the 2005 EIS [June 17, 2005; 70 FR 35275]) to the biological environment under Alternative 1A, the No Action Alternative.

As discussed in Chapter 3, and in more detail in Section 3.5.1.3, the bottomfish fishery of American Samoa currently consists of approximately 19 part-time fishing vessels. Since few boats carry ice, the bottomfish fishing fleet typically fishes within 20 miles of shore. In recent years, however, a growing number of fishermen in American Samoa have been acquiring larger (greater than 35 feet in length) vessels with the capacity for chilling or freezing fish, and as a result, these vessels have a much greater fishing range.

In 2005, a total of 16 boats from American Samoa landed an estimated 21,157 pounds of both commercially and recreationally caught bottomfish, and approximately 30 percent of the total landing was sold commercially. Revenues from the commercial bottomfish fishery in 2005 were estimated at $16,744, including all catch that was sold locally. The percentage of the American Samoa bottomfish harvest that comes from the EEZ is not known. Federal permits are not required to participate in the bottomfish fisheries in the EEZ that encompasses the American Samoa archipelago. However, the current annual commercial and recreational harvest levels (21,157 pounds) are well below the estimated MSY for deepwater bottomfish around American Samoa of 74,974 pounds.

Based on the low level of participation in recent years, the current estimates of the harvest being well below MSY, and the trend in harvest in this fishery, it is anticipated that future harvest from the bottomfish fishery within the American Samoa archipelago would continue to have limited biological impacts under the status quo. NMFS and the Council are working closely with the Government of American Samoa, Department of Marine and Wildlife Resources (DMWR), on cooperative monitoring and reporting programs that will detect any substantial changes in participation or harvest in the current bottomfish fisheries originating from American Samoa.

Under Alternative 1A, the No Action Alternative, federally managed bottomfish fisheries in the American Samoa archipelago would continue to be adaptively managed under the Bottomfish FMP to provide for sustainable fishing of bottomfish. No changes would occur to the regulations affecting the American Samoa fisheries under Alternative 1A. The biological impacts of the current Bottomfish FMP on the American Samoa archipelago would continue as discussed in Section 3.5.1 and as previously analyzed in the 2005 EIS (June 17, 2005; 70 FR 35275), as updated for select areas in subsequent NEPA documents (see Table 3-16). Implementation of future management plan amendments or regulatory amendments to the Bottomfish FMP that may affect the American Samoa fisheries would be subject to the appropriate NEPA analysis and other applicable law at the time of their consideration.

4.2.1.1.2.2. Biological Impacts on Precious Corals

As discussed in Section 3.5.1, there are no known historical or current precious corals fisheries in American Samoa. An estimate of MSY for precious coral around American Samoa has not been determined; however, an OY of 1,000 kg (all precious coral species combined) has been set for Permit Area X-P-AS, which encompasses the EEZ waters around American Samoa. A Federal permit is required to participate in precious corals fisheries in the EEZ (3 to 200 miles offshore) that encompasses American Samoa. There is no limit to the number of permits that may be issued, however, and the annual harvest for Permit Area XP-AS is 1,000 kg (all precious corals species combined). All harvest of precious corals must be done using selective gear such as manned or unmanned submersibles. Non-selective fishing gear such as tangle nets is prohibited. No exploratory permits have been issued to date. Based on the lack of participation in this Federal fishery in recent years and the selective gear requirement, it is anticipated that the biological impacts of any future fishery under the Precious Corals FMP within the American Samoa archipelago would continue to be very limited or have no biological impact.

Under Alternative 1A, the No Action Alternative, the precious corals fisheries in the American Samoa archipelago would continue to be adaptively managed to provide for sustainability of precious corals resources under the Precious Corals FMP. Under this alternative, no changes would occur to the federal regulations affecting the American Samoa fisheries. In the event that a precious corals fishery occurs within the EEZ of the American Samoa archipelago, the fishery would be cooperatively monitored by NMFS, the Council, and the Government of American Samoa, DMWR. Implementation of future management plan amendments, or regulatory amendments to the Precious Corals FMP affecting the American Samoa fisheries, would be subject to the appropriate NEPA analysis and other applicable law at the time of their consideration.

4.2.1.1.2.3. Biological Impacts on Coral Reef Ecosystems

Biological impacts on the coral reef fishes and invertebrates of American Samoa under Alternative 1A would include current and potential landing levels. Coral reef fishes and invertebrates are harvested in American Samoa by various gear types including hook-and-line, spear gun, and gillnets. In 2003, approximately 25,000 pounds of coral reef species were reported landed by domestic commercial fisheries in American Samoa. Prior to the implementation of the Coral Reef Ecosystem FMP, it was estimated that approximately 1 percent of the total ex-vessel value of the harvest of coral reef resources is taken from the EEZ (3 to 200 miles offshore) that encompasses American Samoa (p. 68 of the Coral Reef Ecosystems FMP). An estimate of MSY for the coral reef fisheries around American Samoa has not been determined. A Federal permit is required for participation in the coral reef fisheries in the EEZ around American Samoa for "Potentially Harvested Coral Reef Taxa" (see Appendix A). There is no limit to the number of permits that may be issued; however, applications are evaluated on a case-by-case basis and fishing activities and harvests may be restricted as a permit condition. Since the implementation of the Coral Reef Ecosystem FMP, no Federal permits have been issued.

Besides permitting requirements, the 2004 Coral Reef Ecosystems FMP established a coral reef ecosystem regulatory area, marine protected areas, permit reporting requirements, no-anchoring zones, gear restrictions, and a framework regulatory process. In 2002, an EIS (May 10, 2002; 67 FR 31801) was prepared for the Coral Reef Ecosystems FMP. There have been no amendments to this FMP to date (see Table 3-17). NMFS and the Council are working closely with the American Samoa DMWR on cooperative monitoring and reporting programs that will detect any changes in participation or harvest in the current coral reef fisheries within the EEZ. Based on the lack of permit participation and limited harvest in this Federal fishery historically, it is anticipated that the future harvest from the coral reef fishery under the Coral Reef Ecosystems FMP would continue to have a very limited or no effect on the biological environment of the American Samoa archipelago.

Under Alternative 1A, the No Action Alternative, Federal coral reef fisheries in the American Samoa archipelago would continue to be adaptively managed to provide for sustainability of coral reef ecosystem resources under the Coral Reef Ecosystem FMP. No changes would occur to the Federal regulations affecting the American Samoa fisheries under this alternative. The biological impacts of the current coral reef fisheries under the Coral Reef Ecosystem FMP on the American Samoa archipelago would continue as discussed in Section 3.5.1 and as previously analyzed in the 2002 EIS (May 10, 2002; 67 FR 31801). Implementation of future management plan amendments or regulatory amendments to the Coral Reef Ecosystem FMP affecting American Samoa would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.1.2.4. Biological Impacts on Crustaceans

As discussed in Section 3.5.1.3, within the American Samoa archipelago spiny lobster is the main crustacean harvested, and is taken primarily by spear at night near the outer slope of the reefs by free divers while they are diving for finfish. Total annual commercial landings estimated from surveys average 1,271 pounds. Subsistence and recreational catches of lobster in the American Samoa archipelago are not known at this time. However, the harvest of lobster primarily occurs in the territorial waters of American Samoa (0 to 3 miles offshore). An estimate of MSY for the crustacean fisheries around American Samoa has not been determined. A Federal permit (Permit Area 3) is required to participate in the lobster fisheries in the EEZ (3 to 200 miles offshore) that encompasses American Samoa. There is no limit to the number of permits that may be issued. There is no harvest limit placed on the lobster fishing permit. Since the implementation of the Crustaceans FMP, two permits have been issued for Permit Area 3. There are no active permits in the fishery as this FPEIS is being prepared. There also are permit and reporting requirements for deepwater shrimp fishing in the American Samoa EEZ.

Under Alternative 1A no changes would occur to the Federal regulations affecting the American Samoa crustacean fisheries. Based on the low level of participation and limited harvest historically in this Federal permit fishery, it is anticipated that the impact of future crustacean fisheries managed under the Crustaceans FMP on the biological environment of the American Samoa archipelago would be limited. Any crustacean fisheries within the EEZ would be cooperatively monitored by NMFS, the Council, and the American Samoa DMWR. Implementation of future management plan amendments or regulatory amendments to the Crustaceans FMP affecting American Samoa would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.1.3. Essential Fish Habitat

Under the status quo, the affected essential fish habitat (EFH) and habitat areas of particular concern (HAPC) are designated in the existing species-based FMPs. For bottomfish and crustaceans, EFH has been designated based on the preferred depth ranges of specific life stages. In the case of crustaceans, the designation is further refined based on productivity data. The precious corals EFH designation combines depth and bottom type as indicators, but it is further refined based on the known distribution of the most productive areas for these organisms. The affected EFH and HAPC for the Western Pacific Region are discussed in more detail in Section 3.3.

Under Alternative 1A, American Samoa fisheries would continue to be managed under existing FMPs. Alternative 1A would not change current Federal fisheries regulations or designations of EFH or HAPC within the American Samoa archipelago. Thus, no changes would occur to the existing regulations affecting the American Samoa fisheries. The impacts of the current fishing activities under existing FMPs on EFH and HAPC within the American Samoa archipelago would continue as discussed in Section 3.3 and below.

Adverse fishing impacts on these habitat areas may include physical or biological alterations to the substrate and loss of, or injury to, benthic organisms, prey species and their habitat, or other components of the ecosystems. However, the predominant fishing gear types (hook-and-line, longline, troll, traps, and submersibles) used in the fisheries cause few fishing-related impacts on the benthic habitat and other EFH occupied and used by coral reef species, bottomfish, crustaceans, or precious corals. In addition, the current management regime prohibits the use of bottom trawls, bottom-set nets, explosives, and poisons.

The following are potential sources of fishery-related impacts on EFH that may occur during normal fishing operations:

- Anchor damage from vessels attempting to maintain position over productive fishing habitat;
- heavy weight and line entanglement occurring during normal hook-and-line fishing operations; and,
- lost gear (leaders, hooks, and weights) by fishing vessels.

Implementation of future management plan amendments or regulatory amendments to the current FMPs that may affect the EFH and HAPC within the American Samoa archipelago would be subject to appropriate the NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.1.4. Protected Species

Under Alternative 1A, the American Samoa archipelago fisheries would continue to be managed under the existing five species-based FMPs, no changes would occur to the existing regulations affecting the fisheries within the American Samoa archipelago, and no additional impacts to protected species would be expected. The impacts on protected species from the fisheries managed under the existing FMPs within the American Samoa archipelago would continue as discussed in Section 3.5.1.2.

The Council and NMFS must balance the needs of the fishing industries with the need to reduce interactions with protected species. NMFS evaluates the potential impact of proposed fishery management regulations and future potential fishery actions that may affect species listed as threatened or endangered under the Endangered Species Act (ESA), and considers the impacts to marine mammals and seabirds. By law, fishery activities within the U.S. EEZ that affect listed species cannot jeopardize the continued existence of that species. All fishery management actions are reviewed for compliance with the provisions of the ESA through a Section 7 consultation, and the impacts to listed species are articulated in the resultant biological opinion or other determination. Fishery management actions are also reviewed for compliance with the Marine Mammal Protection Act.

In a March 18, 2002 Biological Opinion, NMFS determined that the American Samoa bottomfish fisheries were not likely to adversely affect listed marine mammal and sea turtle populations (NMFS 2002a). A March 7, 2002 informal consultation under the ESA determined that the American Samoa coral reef fisheries were not likely to adversely affect endangered species or their critical habitat (NMFS 2002b). Similarly, NMFS determined that the crustacean fisheries are not likely to adversely affect any ESA-listed species or critical habitat in American Samoa (NMFS 2007b). Following consultations under section 7 of the ESA, NMFS has determined that the precious coral fisheries will not adversely affect any ESA-listed species or critical habitat in American Samoa (NMFS 1978, NMFS 2008c).

Alternative 1A would continue data collection programs (e.g., logbooks, observers) within the American Samoa archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated through area closures, and gear and handling requirements. Implementation of future management plan amendments or regulatory amendments to these FMPs would be reviewed to determine their potential to affect protected species within the American Samoa archipelago and would be subject to the appropriate NEPA analysis and other statutes, such as the ESA and MMPA, at the time of their consideration.

4.2.1.1.5. Fishery Participants and Communities

American Samoa has been defined as a fishing community under the MSA. Under Alternative 1A, the fisheries within EEZ waters around the American Samoa archipelago would continue to be managed under the five existing FMPs. No changes would occur to the regulations affecting the American Samoa archipelago fisheries. The impacts of the current FMPs on the fishery participants and communities within the American Samoa archipelago would continue as discussed in Chapter 3, and in detail in Section 3.5.1.4. Under Alternative 1A, the No Action Alternative, federally managed fisheries of American Samoa would continue to be adaptively managed to provide for sustainability under the existing species-based FMPs.

Implementation of future management plan amendments or regulatory amendments to these FMPs affecting the fishery participation and communities within American Samoa would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Administration and Enforcement

In the Western Pacific Region, the management of ocean and coastal activities is conducted by a number of agencies and organizations at the Federal, state, county, and village or community levels. These groups administer programs and initiatives that address often overlapping and sometimes conflicting ocean and coastal issues.

Numerous research and data collection projects and programs have been undertaken and have resulted in the collection of huge volumes of potentially valuable detailed bathymetric and biological data, among other data. Some of this information has been processed and analyzed; however, much has proven difficult to utilize and integrate due to differences in collection methodologies coupled with a lack of metadata or documentation of how the data were collected and coded. This has resulted in incompatible datasets, as well as data that are virtually inaccessible to anyone except the primary researchers.

Under Alternative 1A, the fisheries within EEZ waters around the American Samoa archipelago would continue to be managed under the five existing FMPs. No changes would occur to the regulations affecting the American Samoa archipelago fisheries under this alternative. The impacts of the current FMPs on the fishery administration and enforcement within the American Samoa archipelago would continue as discussed in Chapter 3, and in detail in Section 3.6. Concerns of incompatible or inaccessible datasets as discussed above would continue under this alternative. Implementation of future management plan amendments or regulatory amendments to these FMPs on the administration and enforcement affecting American Samoa would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.2. Mariana Archipelago

The following sections discuss the current impacts of Alternative 1A, the No Action alternative, on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Mariana Archipelago (Guam and CNMI combined).

4.2.1.2.1. Physical Environment

The physical environment of the Mariana Archipelago is comprised of its geology and topography as well as surrounding ocean layers, ocean depth zones, ocean water circulation, surface currents, transition zones, eddies, and deep-ocean currents. Under Alternative 1A, the No Action Alternative, federally managed fisheries within the Mariana Archipelago would continue to be adaptively managed to provide for sustainability under the existing species-based FMPs.

As discussed in Chapter 3, and in more detail in Section 3.5.2.1 for CNMI and Section 3.5.3.1 for Guam, current fisheries operating under the species-based FMPs in the Mariana Archipelago may affect marine ecosystems in a variety of ways. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can also affect marine ecosystems through vessel disturbance, bycatch or discards, impacts on nutrient cycling, or introduction of exotic species, pollution, and habitat disturbance. The day-to-day operation of a fishing vessel can produce a number of waste products, including oil, sewage, garbage, and lost gear, any of which may have a negative impact on the marine environment. However, no long-term significant impacts on the physical environment from waste products directly related to fishery operations conducted under the FMPs, within the Mariana Archipelago, have been documented.

Additionally, the accidental grounding of fishing vessels can adversely affect marine habitat and coral reefs. Potential impacts of a vessel striking the bottom include physical harm to the marine substrate, and the possible subsequent break-up of the vessel would release fuel and oil that could result in pollution of the marine environment and mortality of marine life. However, groundings of fishing vessels operating in the Western Pacific Region are infrequent. In these occasional cases of vessel groundings in the past, some short-term localized damage to the marine substrate did take place, but no long-term significant impacts on the surrounding marine environment have been documented.

4.2.1.2.2. Biological Environment

The affected biological environment of the Mariana Archipelago includes the benthic environment and the pelagic environment. Alternative 1A would not change the current institutional framework of FMPs, accompanying regulations, or fishery management strategies. Thus, this alternative would not introduce additional impacts beyond those impacts on the biological environment already analyzed.

The areas of the Mariana Archipelago managed under the FMPs include the waters of both the CNMI and Guam. The affected biological environment of the Mariana Archipelago is discussed generally in Section 3.2, in more detail in Section 3.5.1 for CNMI, and in Section 3.5.3 for Guam.

Similar to American Samoa as discussed above, the Territory of Guam has sole management authority for submerged lands, marine resources and regulated fisheries within the territorial waters from 0 to 3 miles from its shorelines. This is not the same for CNMI where the submerged lands from the shoreline (0) to 200 miles offshore of CNMI have all been determined to be under the jurisdiction of the Federal Government. Despite this Court ruling, the CNMI government retains its authority (and existing fishing regulations) to regulate fishing activities by CNMI residents via the issuance of business licenses and landing restrictions. Accordingly, existing Federal permitting and reporting requirements apply to fishing activities for those fisheries operating in that portion of the EEZ from 3 to 200 miles offshore surrounding the CNMI. NMFS and the Council work closely with the marine resource management agencies of the CNMI (Department of Land and Natural Resources, Division of Fish and Wildlife, or DFW) and the Territory of Guam (Division of Aquatic and Wildlife Resources or DAWR) on cooperative monitoring and reporting programs for Federal fisheries, including those occurring within 0 to 3 miles of the shoreline of the CNMI.

Where MSY has been estimated for a demersal fishery in the Mariana Archipelago, none has been determined to be experiencing overfishing or to be overfished. Under Alternative 1A, the status and trends of target and non-target species would continue to be evaluated annually. A discussion of the biological impacts of the demersal fisheries specific to the EEZ of the Mariana Archipelago under each of the FMPs follows..

4.2.1.2.2.1. Biological Impacts on Bottomfish

Biological impacts of the bottomfish fisheries managed under the Bottomfish FMP throughout the region, including those for the fisheries in the EEZ of the Mariana Archipelago, were addressed in a 2005 EIS (June 17, 2005; 70 FR 35275) that was developed by the WPRFMC (2005a). This was updated for select areas in subsequent NEPA documents (see Table 3-16) that contain relevant analysis of the impacts under Alternative 1A, the No Action alternative. The Mariana Archipelago includes the waters that encompass both the CNMI and Guam and each will be discussed separately.

Commonwealth of the Northern Mariana Islands

As discussed in Section 3.5.2.3, the CNMI bottomfish fisheries are categorized into two segments: deep (greater than 500 feet) and shallow (less than 500 feet) water fisheries. The deepwater fishery is primarily commercial, whereas the shallow water fishery includes commercial, recreational, and subsistence fishermen. The CNMI DFW and Guam DAWR work cooperatively with NMFS and the Council to monitor fisheries. In the CNMI bottomfish fisheries, there are approximately 150 skiffs used for subsistence and recreational fishing and 8 vessels, ranging from 29 to 70 feet, used commercially within the EEZ around CNMI. As discussed in Chapter 3, this fishery has a high turnover rate of participants as an increasing number of local fishermen are focusing more on reef fishes in preference to bottomfish.

In 2004, it is estimated that 54,474 pounds of commercial landings of bottomfish were made, with a total ex-vessel value of $142,362 in the CNMI bottomfish fisheries. Recreational and subsistence bottomfish harvests for the CNMI are unknown. All of the CNMI bottomfish harvest occurs in the EEZ (0 to 200 miles offshore). Federal permits are not required to participate in the bottomfish fisheries in the EEZ of CNMI.[66] However, the total combined harvest is estimated to be under the MSY of 184,254 pounds of bottomfish estimated for the CNMI bottomfish fisheries (see Table 3-4). NMFS and the Council are working closely with the CNMI DFW on cooperative monitoring and reporting programs that will detect any substantial changes in participation or harvest in current fisheries.

Fishery regulations now prohibit vessels >40’ from fishing for bottomfish closer than 50 nm from the southern islands of CNMI, and within 10 nm of Alamagan Island.

Guam

Similar to the CNMI, there are two distinct Guam bottomfish fisheries. The shallow water component is the larger of the two in terms of participation because of the lower expenditure for effort and relative ease of fishing close to shore. Participants in the shallow water component

[66] The Council has recommended permit and reporting requirements for all commercial bottomfish fishermen operating within the EEZ around CNMI. The regulatory package is currently being processed by NMFS.

seldom sell their catch because they fish mainly for recreational or subsistence purposes. As discussed in Section 3.5.3, it is estimated that less than 20 percent of the total shallow water marine resources harvested in Guam are taken outside 3 miles from shore, thus in Federal waters. The commercially oriented vessels tend to be longer than 25 feet, and their effort is usually concentrated on the deepwater bottomfish complex. It is reported that in 2005, 233 domestic vessels landed 61,601 pounds of bottomfish in Guam, with an ex-vessel value of $69,186. Of this harvest, 35,761 pounds were both deepwater and shallow water Bottomfish MUS (see Table 3-8), with the remaining harvest made up of non-Bottomfish MUS. Recreational and subsistence bottomfish harvests for Guam are unknown. The percentage of the Mariana Archipelago bottomfish harvest from Guam that occurs in the EEZ (3 to 200 miles offshore) is not known. However, total harvest of deepwater Bottomfish MUS is estimated to be under the MSY established for Guam's deepwater bottomfish fishery of 56,863 pounds. An estimate of MSY for the shallow water bottomfish fisheries around Guam has not been determined. NMFS and the Council are working closely with Guam DAWR on cooperative monitoring and reporting programs that will detect any substantial changes in participation and harvest in current bottomfish fisheries.

With the exception of large vessels (50 feet or longer), Federal permits are not required to participate in the bottomfish fisheries in the EEZ around Guam. Amendment 9 (November 2, 2006; 71 FR 64474) to the Bottomfish FMP prohibited large vessels, that is, those 50 feet (15.2 meters) or longer, from fishing for bottomfish in Federal waters within 50 nautical miles (92.6 kilometers) around Guam, and established Federal permitting and reporting requirements for these large bottomfish fishing vessels. The associated environmental assessments to Amendment 9 updated the analysis of the impacts of the bottomfish fisheries and management regime on the human environment around Guam.

Mariana Archipelago

Where MSY has been estimated for demersal fisheries in the Mariana Archipelago (the CNMI and Guam), none have been determined to be experiencing overfishing or to be overfished. Under Alternative 1A, the status and trends of target and non-target species would continue to be evaluated annually.

Under Alternative 1A, the Mariana Archipelago fisheries within the EEZ would continue to be managed under the current framework, regulations, and management strategies and subject to adaptive management under the Bottomfish FMP. No changes would occur to the regulations affecting the Mariana Archipelago bottomfish fisheries under this alternative. The impacts of the current Federal bottomfish fisheries within the Mariana Archipelago on the biological environment would continue as discussed in Section 3.5.2 for CNMI and Section 3.5.3 for Guam, respectively. Impacts were previously analyzed in the 2005 EIS (June 17, 2005; 70 FR 35275) and updated for select areas in subsequent NEPA documents (see Table 3-16). Implementation of future management plan amendments or regulatory amendments to the Bottomfish FMP that may affect the Mariana Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Biological Impacts on Precious Corals

The Mariana Archipelago includes the waters that encompass both the CNMI and Guam. As discussed in Section 3.5.2 for CNMI, there are no known precious corals fisheries that are currently operating in the EEZ of CNMI (0 to 200 miles offshore). Furthermore, as discussed in Section 3.5.3 for Guam, there is no precious corals fishery currently operating within the territorial waters of Guam (0 to 3 miles offshore), nor have there been any reported landings of precious corals harvests from the EEZ around Guam (3 to 200 miles offshore). An estimate of MSY for precious corals around the Mariana Archipelago has not been determined; however, an OY of 1,000 kg (all precious corals species combined) has been set for Permit Areas XP-G (EEZ waters around Guam) and XP-CNMI (EEZ waters around the CNMI). Annual harvests for each area are limited to 1,000 kg (all precious corals species combined), and the use on non-selective gear is prohibited. A Federal permit is required to participate in precious corals fisheries in the EEZ of 3 to 200 miles that encompass both the CNMI and Guam. There is no limit to the number of permits that may be issued. No Federal permits have been issued to date.

Amendment 6 (September 12, 2006; 71 FR 53605) to the Precious Corals FMP established new permitting and reporting requirements for vessel operators targeting precious corals within the EEZ, 3 to 200 miles offshore only, of the CNMI (see Table 3-16). The intent of the amendment is, in the event a fishery is initiated, to improve the understanding of the ecology of these precious corals and the activities and harvests of the vessel operators that may target them. The associated environmental assessments to Amendment 6 and Amendment 7 provided an updated analysis of the impacts of the potential precious corals fisheries and management regime on the biological environment around the CNMI (WPFMC 2007b; 2008b).

Under Alternative 1A, the Mariana Archipelago precious corals fisheries would continue to be managed under the current framework, regulations and management strategies and subject to adaptive management under the Precious Corals FMP. No changes would occur to the Federal regulations affecting the Mariana Archipelago precious corals fisheries under this alternative. In the event that a precious corals fishery were to begin within the Mariana Archipelago, the fishery would be cooperatively monitored by NMFS, the Council, CNMI, DFW and the Territory of Guam, DAWR.

Based on the lack of permits issued and no reported harvest in the Federal permit fishery, it is anticipated that the future impacts on the biological environment of the Mariana Archipelago by Federal fisheries under the Precious Corals FMP would continue to be limited or insignificant. NMFS and the Council are working closely with CNMI, DFW and Guam, DAWR on cooperative monitoring and reporting programs that will detect any changes in participation or harvest in precious corals fisheries. Implementation of future management plan amendments or regulatory amendments to the Precious Corals FMP that may affect the Mariana Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.2.2.2. Biological Impacts on Coral Reef Ecosystem

The 2004 Coral Reef Ecosystems FMP established a coral reef ecosystem regulatory area, marine protected areas, permitting and reporting requirements, no-anchoring zones, gear restrictions, and a framework regulatory process. In 2002, an EIS (May 10, 2002; 67 FR 31801) was prepared for the Coral Reef Ecosystems FMP. There have been no amendments to this FMP to date (see Table 3-18).

The Mariana Archipelago includes the waters that encompass both the CNMI and Guam and will be discussed separately.

Commonwealth of the Northern Mariana Islands

As discussed in Section 3.5.2, in the CNMI commercial landings of coral reef fish were approximately 136,000 pounds in 2003 and included harvests of parrotfish, surgeonfish, goatfish, snappers, and emperors. The harvest of subsistence or recreational fishermen is unknown. An estimate of MSY for the coral reef ecosystem fisheries around the CNMI has not been determined. However, coral reef fisheries in the CNMI are believed to be in good condition, but local depletion may be occurring in some areas.

A Federal permit is required to participate in the coral reef fisheries in the CNMI for Potentially Harvested CREMUS (see Appendix A) from 3 to 200 miles offshore. There is no limit to the number of permits that may be issued, however applications are evaluated on a case-by-case basis and fishing activities and harvests may be restricted as a permit condition. A Federal permit is not required to harvest other CREMUS. Additionally, a Federal permit is not required to harvest coral reef fishes or invertebrates within the EEZ from the shoreline (0) to 3 miles offshore of the CNMI. No CNMI Federal permits have been issued to date. NMFS and the Council are working closely with the CNMI, DFW on cooperative monitoring and reporting programs that will detect any changes in participation in coral reef fisheries within the EEZ (0 to 200 miles offshore).

Guam

As discussed in Section 3.5.3, in Guam total coral reef fish landings for 2002 and 2003 were estimated at 273,799 pounds and 306,626 pounds, respectively. The harvest of subsistence or recreational fishermen is unknown. An estimate of MSY for coral reef fisheries around Guam has not been determined. However, coral reef fisheries in Guam are believed to be in good condition.

Prior to the implementation of the Coral Reef Ecosystems FMP, it was estimated that approximately 8 percent of the total ex-vessel value of the harvest of coral reef resources was taken from the EEZ (3 to 200 miles offshore) surrounding Guam (p. 68 of the Coral Reef Ecosystems FMP; May 10, 2002; 67 FR 31801). A Federal permit is required to participate in the coral reef fisheries in the EEZ that surrounds Guam (3 to 200 miles offshore) for Potentially Harvested Coral Reef Taxa. There is no limit to the number of permits that may be issued, however applications are evaluated on a case-by-case basis. Fishing activities and harvests may be restricted as a permit condition. Since the implementation of the Coral Reef Ecosystem FMP no Federal permits have been issued. NMFS and the Council are working closely with the Territory of Guam, DAWR on cooperative monitoring programs that will detect any changes in participation or harvest in coral reef fisheries.

Mariana Archipelago

Under Alternative 1A, the status and trends of target and non-target species would continue to be evaluated annually. Under Alternative 1A, the Mariana Archipelago fisheries would continue to be managed under the current framework, regulations, and management strategies and subject to adaptive management under the Coral Reef Ecosystem FMP. No changes would occur to the regulations affecting the Mariana Archipelago coral reef fisheries under this alternative. The biological impacts of the current Coral Reef Ecosystems FMP on the Mariana Archipelago would continue as discussed in Section 3.5.2 for the CNMI and Section 3.5.3 for Guam and as previously analyzed in the 2002 EIS (May 10, 2002; 67 FR 31801). Implementation of future management plan amendments or regulatory amendments to the Coral Reef Ecosystem FMP affecting the Mariana Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Biological Impacts on Crustaceans

The Mariana Archipelago includes the waters around both the CNMI and Guam and are discussed separately below. A more detailed discussion of the fisheries managed under the Crustaceans FMP within the Mariana Archipelago may be found in Section 3.5.2 for the CNMI and Section 3.5.3 for Guam.

Commonwealth of the Northern Mariana Islands

The CNMI crustacean fisheries primarily target spiny lobster in nearshore waters, with reported catches taken almost exclusively within the 0 to 3 mile zone of the inhabited southern islands. Beyond 3 miles offshore, the topography in most locations drops off steeply. The directed commercial fishery is relatively small, with 493 pounds of commercial landings estimated for 2003. The level of harvest for the subsistence or recreational fisheries is unknown. As mentioned earlier, EEZ waters around the CNMI extend from 0 to 200 miles offshore. With regard to the crustacean fisheries, a Federal permit is required to participate in the lobster fisheries within 3 to 200 miles offshore of the CNMI. There is no limit to the number of permits that may be issued. No Federal permits have been issued to date. No Federal permit is required to participate in the crustacean fisheries from the shoreline to 3 miles offshore of the CNMI.

Amendment 12 (71 FR 53605; September 12, 2006) to the Crustaceans FMP established permitting and reporting requirements for vessel operators targeting lobsters within the EEZ, from 3 to 200 miles offshore only, of the CNMI (see Table 3-19). The intent of the amendment was to improve the understanding of the ecology of these species and of the activities and harvests of the vessel operators that may target them. The associated environmental assessment to Amendment 6 provided an updated analysis of the impacts of the lobster fisheries and management regime on the biological environment around the CNMI. Amendment 13 to the

Crustaceans FMP added deepwater shrimp as MUS and required permits and reporting (73 FR 70603; November 21, 2008).

Guam

Fishing for crustaceans around Guam occurs primarily in territorial waters, usually in the subsistence or recreational fisheries. In 2003 it is estimated that a total of 2,225 pounds of spiny lobsters with a total ex-vessel value of $7,279 were commercially harvested from the territorial waters (0 to 3 miles offshore) around Guam. The level of harvest for the subsistence or recreational fisheries is unknown A Federal permit is required to participate in the lobster fisheries within the EEZ, 3 to 200 miles offshore of Guam. There is no limit to the number of permits that may be issued. In 2004, two such Federal permits were issued to vessels. There is no harvest limit placed on the permit. No Federal permits were issued to fish for lobsters in the Federal water around Guam in either 2005 or 2006. There is also a permit and reporting requirement for deepwater shrimp fishing in the Guam EEZ.

Mariana Archipelago

Under Alternative 1A, the Mariana Archipelago crustacean fisheries would continue to be managed under the current framework, regulations, and management strategies, and subject to adaptive management under the Crustaceans FMP. No changes would occur to the regulations affecting the Mariana Archipelago crustacean fisheries under this alternative. An estimate of the MSY for the deepwater caridean shrimp, *Heterocarpus laevigatu*s, has been made for the Mariana Archipelago (CNMI and Guam combined) Federal fisheries, which is 162 tons per year. Mariana Archipelago deepwater caridean shrimp are not experiencing overfishing or nor are they being overfished at this time.

Under Alternative 1A, the status and trends of target and non-target species would continue to be evaluated annually. Based on the limited permits issued historically and no reported harvest in the Federal permit fishery, it is anticipated that the future impacts on the biological environment of the Mariana Archipelago by Federal fisheries under the Crustaceans FMP would continue to be limited or insignificant, including impacts from the deepwater caridean shrimp fishery. NMFS and the Council are working closely with the Territory of Guam, DAWR on cooperative monitoring programs that will detect any changes in participation in crustacean fisheries. Implementation of future management plan amendments or regulatory amendments to the Crustaceans FMP affecting the Mariana Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.2.3. Essential Fish Habitat

Under Alternative 1A, EFH and HAPC are designated in the existing species-based FMPs. For bottomfish and crustaceans, the preferred depth ranges of specific life stages are used to designate EFH. In the case of crustaceans, the designation is further refined based on productivity data. The precious corals designation combines depth and bottom type as indicators, but is further refined based on the known distribution of the most productive areas for these organisms. The affected EFH and HAPC for the Western Pacific Region are discussed in Chapter 3, and in detail in Section 3.3.

Under Alternative 1A, Mariana Archipelago fisheries would continue to be managed under existing FMPs. Alternative 1A would not change current Federal regulations or designations of EFH or HAPC within the Mariana Archipelago. Thus, no changes would occur to the existing regulations affecting the Mariana Archipelago fisheries. The impacts of the current activities under existing FMPs on EFH and HAPC within the Mariana Archipelago would continue as discussed below and in more detail in Section 3.3.

Adverse fishing impacts on these habitat areas may include physical or biological alterations to the substrate and loss of, or injury to, benthic organisms, prey species, and their habitat or other components of the ecosystems. However, the predominant fishing gear types, hook-and-line, longline, troll, traps, and submersibles, used in the Mariana Islands fisheries cause few fishing-related impacts on the benthic habitat and other EFH occupied and used by coral reef species, bottomfish, crustaceans, or precious corals. In addition, the current management regime prohibits the use of bottom trawls, bottom-set nets, explosives, and poisons.

The following are potential sources of fishery-related impacts on EFH that may occur during normal fishing operations:

- Anchor damage from vessels attempting to maintain position over productive fishing habitat;
- heavy weight and line entanglement occurring during normal hook-and-line fishing operations; and,
- lost gear (leaders, hooks, and weights) by fishing vessels.

Implementation of future management plan amendments or regulatory amendments to the current FMPs that may affect the EFH and HAPC within the Mariana Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.2.4. Protected Species

Under Alternative 1A, the Mariana Archipelago fisheries would continue to be managed under the existing five species-based FMPs. No changes would occur to the existing regulations affecting the fisheries within the Mariana Archipelago, and no additional impacts on protected species would be expected. The impacts on protected species from the fisheries managed under the existing FMPs within the Mariana Archipelago would continue as discussed in Section 3.5.2 and Section 3.5.3 for the CNMI and Guam, respectively.

The Council and NMFS must balance the needs of the fishing industries with the need to reduce interactions with protected species. NMFS evaluates the potential impact of proposed fishery management regulations and future potential fishery actions that may affect species listed as threatened or endangered under the ESA, and considers the impacts to marine mammals and seabirds. By law, fishery activities within the U.S. EEZ that affect listed species cannot jeopardize the continued existence of that species. All fishery management actions are reviewed for compliance with the provisions of the ESA through a Section 7 consultation, and the impacts to listed species are articulated in the resultant biological opinion. Fishery management actions are also reviewed for compliance with the Marine Mammal Protection Act.

Biological opinions on FMPs:

In a March 18, 2002 Biological Opinion, NMFS determined that the CNMI and Guam bottomfish fisheries were not likely to adversely affect listed marine mammal and sea turtle populations. A March 7, 2002 informal consultation under the ESA determined that the CNMI and Guam coral reef fisheries were not likely to adversely affect threatened or endangered species or their critical habitat. A May 24, 1996 Biological Opinion determined that the Mariana Archipelago's crustacean fisheries will not adversely affect threatened or endangered species or their critical habitat. Because of the selective methods used to harvest precious coral, an October 5, 1978 Biological Opinion determined that Guam's precious corals fishery is no threat to endangered species or their critical habitat. A July 21, 1988 informal consultation under the ESA determined that the CNMI precious corals fishery was not likely to adversely affect listed species.

Alternative 1A would continue the cooperative (NMFS, the Council, CNMI, DFW and Guam, DAWR) data collection programs (e.g., logbooks, observers) within the Mariana Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated through area closures, and gear and handling requirements. Implementation of future management plan amendments or regulatory amendments to these FMPs would be reviewed to determine their potential to affect protected species within the Mariana Archipelago and would be subject to the appropriate NEPA analysis and other statutes such as the ESA or MMPA at the time of their consideration.

Fishery Participants and Communities

The CNMI and Guam have each been defined as fishing communities under the MSA. Under Alternative 1A Federal fisheries within the Mariana Archipelago would continue to be managed under the current five species-based FMPs. No changes would occur to the regulations affecting the Mariana Archipelago fisheries under this alternative. The impacts of the current FMPs on the fishery participants and communities within the Mariana Archipelago would continue as discussed in Section 3.5.2 and Section 3.5.3 for the CNMI and Guam, respectively. Implementation of future management plan amendments or regulatory amendments to these FMPs that could impact these communities would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Administration and Enforcement

In the Western Pacific Region, the management of ocean and coastal activities is conducted by a number of agencies and organizations at the Federal, state, county, and village or community levels. These groups administer programs and initiatives that address often overlapping and sometimes conflicting ocean and coastal issues.

Numerous research and data collection projects and programs have been undertaken and have resulted in the collection of huge volumes of potentially valuable detailed bathymetric and biological data, among other data. Some of this information has been processed and analyzed by fishery scientists and managers; however, much has proven difficult to utilize and integrate due to differences in collection methodologies coupled with a lack of metadata or documentation of how the data were collected and coded. This has resulted in incompatible datasets, as well as data that are virtually inaccessible to anyone except the primary researchers.

Under Alternative 1A the fisheries within EEZ waters around the Mariana Archipelago would continue to be managed under the existing five species-based FMPs. No changes would occur to the regulations affecting the Mariana Archipelago fisheries under this alternative. The impacts of the current FMPs on fishery administration and enforcement within the Mariana Archipelago would continue as discussed in Section 3.6. Concerns of incompatible or inaccessible datasets would continue as discussed above under this alternative. Implementation of future management plan amendments or regulatory amendments to the FMPs on the administration and enforcement affecting the Mariana Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.3. Hawaiian Archipelago

The following sections discuss the potential impacts of Alternative 1A on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Hawaiian Archipelago.

4.2.1.3.1. Physical Environment

The physical environment of the Hawaiian Archipelago is comprised of its geology and topography as well as surrounding ocean layers, ocean depth zones, ocean water circulation, surface currents, transition zones, eddies, and deep-ocean currents. Under Alternative 1A, the No Action Alternative, Federal fisheries within the Hawaiian Archipelago would continue to be adaptively managed under the species-based FMPs.

As discussed in Chapter 3, and in more detail in Section 3.5.4.1, existing fisheries operating under the current species-based FMPs in the Hawaiian Archipelago may affect marine ecosystems in a variety of ways. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can affect marine ecosystems through vessel disturbance, bycatch or discards, impacts on nutrient cycling, or introduction of exotic species, pollution, and habitat disturbance. The day-to-day operation of a fishing vessel can produce a number of waste products, including oil, sewage, garbage, and lost gear which may have a negative impact on the marine environment. However, no long-term significant impacts on the physical environment from waste products directly related to fishery operations conducted under the FMPs, within the Hawaiian Archipelago, have been documented.

Additionally, the accidental grounding of fishing vessels can adversely affect marine habitat and coral reefs. Potential impacts of a vessel striking the bottom include physical harm to the marine substrate, and the possible subsequent break-up of the vessel would release fuel and oil that could result in pollution of the marine environment and mortality of marine life. However, groundings of fishing vessels operating in the Western Pacific Region are infrequent. In these occasional cases of vessel groundings in the past, some short-term localized damage to the marine substrate did take place, but no long-term significant impacts on the surrounding marine environment have been documented.

4.2.1.3.2. Biological Environment

The affected biological environment of the Hawaiian Archipelago includes the benthic environment and the pelagic environment. Alternative 1A would not change the current institutional framework of FMPs, accompanying regulations, or fishery management strategies. Thus, this alternative would not introduce additional impacts beyond those impacts on the biological environment already analyzed. The affected biological environment of the Hawaiian Archipelago is discussed generally in Section 3.2 and in more detail in Section 3.5.4.

A discussion of the impacts of the demersal fisheries on the biological environment specific to the Hawaiian Archipelago under each of the FMPs follows.

4.2.1.3.2.1. Biological Impacts on Bottomfish

Biological impacts of the bottomfish fisheries (managed under the Bottomfish FMP) throughout the region, including those for the fisheries in the Hawaiian Archipelago, were addressed in a 2005 EIS (June 17, 2005; 70 FR 35275), as updated for selected areas in subsequent NEPA documents (see Table 3-16). One such subsequent NEPA document is the WPRFMC (2007a) Final Supplemental Environmental Impact Statement (FSEIS) for Amendment 14. The FSEIS for Amendment 14 updated the description of the affected fisheries environment and analysis of the impacts of Federal fisheries under the Bottomfish FMP on the biological environment within the Hawaiian Archipelago. Additionally, a recent Presidential proclamation (discussed below) also impacts the conduct of the Federal bottomfish fishery within the NWHI.

The Hawaiian Archipelago can be divided in two management areas, the MHI and the NWHI (comprised of Mau and Hoomalu Zones). As discussed in Section 3.5.4., based on recent harvest data, commercial bottomfish catches in the MHI fishery represent approximately 60 percent of the total commercial bottomfish harvest within the Hawaiian Archipelago. The harvest of bottomfish from subsistence and recreational fishermen is unknown. Based on recent bottomfish surveys, it is estimated that approximately 52 percent of the productive MHI deep-slope bottomfish habitat (100-400 m) is within the Federal waters of the EEZ. As of April 1, 2008, MHI non-commercial fishermen are required to carry a Federal permit and report their catch to NMFS.

The commercial bottomfish harvest in the NWHI occurs in the EEZ (3 to 200 miles offshore) and is managed under the Bottomfish FMP. A Federal permit is required to participate in the bottomfish fisheries within the NWHI. The maximum number of permits that may be issued for the Federal NWHI bottomfish fishery is 9. As mentioned earlier, pursuant to the executive proclamation on June 15, 2006 establishing the Northwestern Hawaiian Islands National Marine Monument, most fisheries within the NWHI were closed (71 FR 51134; August 29, 2006). The proclamation will close the Federal bottomfish fisheries in the NWHI in 2011 and placed the fishery on an annual landing limit until that time.

In 2004, the MHI commercial bottomfish fishery caught 366,358 pounds of bottomfish. Commercial bottomfish landings for 2004 in the NWHI (Mau and Hoomalu Zones combined) were 264,785 pounds. The total Hawaiian Archipelago bottomfish commercial landings in 2004 were 627,927 pounds. Limited data exists on subsistence or recreational harvests; however, some studies have indicated that the recreational MHI bottomfish catch may be as much as double the MHI commercial catch (Zeller et al. 2009). The non-commercial permit and reporting requirements implemented by Amendment 14 will allow fisheries scientists to obtain information on the non-commercial catch. As described in Chapter 3, the MHI fishery is managed under an annual total allowable catch (TAC) specification. The 2009 TAC was 241,000 lb. of Deep 7 bottomfish, which was reached by the fishery in July 2009.

The MSA requires the Secretary of Commerce to annually report to Congress on the status of fisheries within each regional fishery management council's geographical area of authority and identify those fisheries that are overfished or approaching a condition of being overfished (16 U.S.C 1854(e)(1)). Based on MSA National Standard 1 guidelines, a stock or population is subject to overfishing if the fishing mortality rate exceeds the maximum fishing mortality threshold (MFMT) for one year (50 CFR 600.310). The MFMT for Hawaii's Bottomfish MUS complex is specified in Amendment 6 of the Bottomfish FMP. In 2005, NMFS determined that overfishing of the bottomfish multi-species complex was occurring within the Hawaiian Archipelago. On behalf of the Secretary of Commerce, the NMFS Regional Administrator for the Pacific Islands Regional Office (PIRO) notified the Council of this overfishing determination on May 27, 2005 (70 FR 34452; June 14, 2005).

The Council recommended and prepared Amendment 14 to the Bottomfish FMP to end overfishing of the bottomfish complex in the Hawaiian Archipelago. The NEPA analysis for this amendment was completed in December 2007, and a Record of Decision was announced on January 11, 2008 (73 FR 2027). Amendment 14 established permit and reporting requirements for non-commercial fishermen in the MHI, a total allowable catch (TAC), and non-commercial bag limits. The intent of these management measures was to end overfishing on the Deep 7 bottomfish species by reducing fishing mortality by 24% and improve monitoring of the fishery.

Under Alternative 1A, the Hawaiian Archipelago Federal bottomfish fisheries would continue to be managed under the existing framework, regulations, and management strategies, and be subject to adaptive management under the Bottomfish FMP. NMFS and the Council work closely with the State of Hawaii (specifically Hawaii Division of Aquatic Resources) on cooperative monitoring and reporting programs for fisheries in the Hawaiian Archipelago. No changes would occur to the regulations affecting the Hawaiian Archipelago fisheries under this alternative. The impacts of the current Hawaiian Archipelago bottomfish fisheries on the biological environment would continue as discussed in Section 3.5.4 and as previously analyzed in the 2005 EIS (June 17, 2005; 70 FR 35275), as updated in the NEPA document for Amendment 14 (see Table 3-16). Implementation of future management plan amendments or regulatory amendments to the Bottomfish FMP that may affect the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Biological Impacts on Precious Corals

As discussed in Section 3.5.4, most of the recent harvest under the Precious Corals FMP has come from the waters of the State of Hawaii. Since 1980, virtually all of the black coral harvested around the Hawaiian Islands has been taken from the Au’au Channel Bed. The reported harvest from this bed has been confined to the waters of the State of Hawaii (0 to 3 miles offshore). However, the State of Hawaii estimates that approximately 15 percent of the black coral harvested from the Au’au Channel Bed is collected from further than 3 miles off the shoreline (DLNR 1979). A substantial part of the Au’au Channel Bed is located in the EEZ (3 to 200 miles offshore) and is under the jurisdiction of the Precious Corals FMP. A Federal permit is required to participate in the precious corals fishery within the EEZ waters around the Hawaiian Archipelago, including the portion of the Au’au Channel Bed within Federal waters. There is no limit to the number of permits that may be issued. Only two Federal permits have ever been issued. One permit was issued in 2005 and another in 2006. No harvest of precious corals in the EEZ was reported under these permits in either year.

Under Alternative 1A the impacts of the Federal precious corals fisheries within the Hawaiian Archipelago, as managed under the Precious Corals FMP, would continue as discussed in Section 3.5.4. The Hawaiian Archipelago Federal precious corals fisheries would continue to be managed under the current framework, regulations, and management strategies, and be subject to adaptive management under the Precious Corals FMP. No changes would occur to the existing regulations affecting the Hawaiian Archipelago precious corals fisheries under this alternative. The biological impacts of the Hawaiian Archipelago precious corals fisheries would continue as discussed in Section 3.5.4.

Based on the historically low level of participation and the lack of reported harvest in this Federal permit fishery, it is anticipated that the future biological impacts of the Federal precious corals fisheries within the Hawaiian Archipelago under the Precious Corals FMP would continue to be limited or insignificant. NMFS and the Council are working closely with the State of Hawaii HDAR on cooperative monitoring and reporting programs that will detect any changes in participation or harvest in the precious corals fisheries. Implementation of future management plan amendments or regulatory amendments to the Precious Corals FMP affecting the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.3.2.2. Biological Impacts on Coral Reef Ecosystems

The 2004 Coral Reef Ecosystems FMP established a coral reef ecosystem regulatory area, marine protected areas, permitting and reporting requirements, no-anchoring zones, gear restrictions, and a framework regulatory process. In 2002, an EIS (May 10, 2002; 67 FR 31801) was prepared for the Coral Reef Ecosystems FMP. There have been no amendments to this FMP to date (see Table 3-18).

Prior to the implementation of the Coral Reef Ecosystem FMP, it was estimated that approximately 11 percent of the total ex-vessel value of the harvest of coral reef resources is taken from the EEZ within the Hawaiian Archipelago (WPFMC 2002). Recreational and subsistence catches are unknown, but select creel surveys suggest that these catches are at least similar to, if not greater than, the reported commercial catch. An estimate of MSY for the coral reef ecosystem fisheries within the Hawaiian Archipelago has not been determined. A Federal permit is required to participate in the coral reef fisheries for Potentially Harvested Coral Reef Taxa in the EEZ that encompasses the Hawaiian Archipelago, from 3 to 200 miles offshore. There is no limit to the number of permits that may be issued, however applications are evaluated on a case-by-case basis, and fishing activities and harvests may be restricted as a permit condition. Since the implementation of the Coral Reef Ecosystem FMP, no Federal permits have been issued.

The Hawaiian Archipelago coral reef ecosystem fisheries would continue to be adaptively managed under the Coral Reef Ecosystem FMP. Under Alternative 1A, the status and trends of coral reef species would continue to be evaluated annually. NMFS and the Council are working closely with the State of Hawaii HDAR on cooperative monitoring and reporting programs that will detect any changes in participation in coral reef fisheries within the EEZ. No changes would occur to the regulations affecting the Hawaiian Archipelago fisheries under Alternative 1A. The impacts of the current Hawaiian Archipelago coral reef fisheries to the biological environment would continue as discussed in Section 3.5.4 and as previously analyzed in the 2002 EIS (May 10, 2002; 67 FR 31801). Implementation of future management plan amendments or regulatory amendments to the Coral Reef Ecosystem FMP affecting the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Biological Impacts on Crustaceans

The Hawaiian Archipelago can be divided into two management areas, the MHI and the NWHI. A Federal permit is required to participate in the lobster fishery in the EEZ, from 3 to 200 miles offshore, surrounding the MHI (Crustaceans Permit Area 2). There is no limit to the number of permits that may be issued. There is no harvest limit placed on the permit. An estimate of MSY for crustacean fisheries in the MHI has not been determined. At the time this FPEIS is being prepared, there are no active permit holders for the MHI lobster fishery. There also are permit and reporting requirements for deepwater shrimp fishing in the Hawaiian Islands EEZ.

Recreational and subsistence catches for crustaceans are unknown. Because of uncertainty in the lobster stock assessment model, the crustacean fishery in the NWHI has been closed since 2000. In addition, the President’s proclamation on June 15, 2006 established an immediate closure of most fisheries within the NWHI Marine National Monument, including any potential crustacean fishery (71 FR 51134; August 29, 2006).

Under Alternative 1A, the Hawaiian Archipelago fisheries would continue to be managed under the Crustaceans FMP. The crustacean fishery in the NWHI is closed. Based on the historically low level of participation in the Federal MHI crustacean fisheries and associated harvest trends, it is anticipated that the future biological impacts of the Federal crustacean fisheries within the Hawaiian Archipelago under the Crustaceans FMP would be limited or have no impacts. NMFS and the Council are working closely with the State of Hawaii HDAR on cooperative monitoring and reporting programs that will detect any changes in participation in the crustacean fisheries. Implementation of future management plan amendments or regulatory amendments to the Crustaceans FMP affecting the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.3.3. Essential Fish Habitat

As discussed in Section 3.3, EFH and HAPC for the region are designated in the species-based FMPs. For bottomfish and crustaceans, the preferred depth ranges of specific life stages are used to designate EFH. In the case of crustaceans, the designation is further refined based on productivity data. The precious corals designation combines depth and bottom type as indicators, but it is further refined based on the known distribution of the most productive areas for these organisms.

Under Alternative 1A, Hawaii fisheries would continue to be managed under existing FMPs. Alternative 1A would not change existing Federal fisheries regulations or designations of EFH or HAPC within the Hawaiian Archipelago. Thus, no changes would occur to the regulations affecting the Hawaii fisheries. The impacts of the current activities under existing FMPs on EFH and HAPC within the Hawaiian Archipelago would continue as discussed below. These impacts have also been discussed in more detail in Section 3.3.

Adverse fishing impacts on these habitat areas may include physical or biological alterations to the substrate and loss of, or injury to, benthic organisms, prey species, and their habitat or other components of the ecosystems. However, the predominant fishing gear types—hook-and-line, longline, troll, traps, and submersibles—used in the Hawaii fisheries cause few fishing-related impacts on the benthic habitat occupied and used by coral reef species, bottomfish, crustaceans, or precious corals. The current management regime prohibits the use of bottom trawls, bottom-set nets, explosives, and poisons. In addition, the use of non-selective gear to harvest precious corals in the MHI is prohibited.

The following are potential sources of fishery-related impacts on benthic habitat that may occur during normal fishing operations:

- Anchor damage from vessels attempting to maintain position over productive fishing habitat;
- heavy weight and line entanglement occurring during normal hook-and-line fishing operations;
- remotely-operated vehicle tether damage to precious corals during harvesting operations; and,
- lost gear (leaders, hooks, and weights) by fishing vessels.

Implementation of future management plan amendments or regulatory amendments to the current FMPs that may affect the EFH and HAPC within the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.3.4. Protected Species - Hawaii

Under Alternative 1A, the Hawaiian Archipelago fisheries would continue to be managed under the existing five species-based FMPs. No changes would occur to the existing regulations affecting the fisheries within the Hawaiian Archipelago and no additional impacts on protected species would be expected. The impacts on protected species from the fisheries managed under the current FMPs within the Hawaiian Archipelago would continue as discussed in Section 3.5.4 and below.

As mentioned earlier, the Hawaiian Archipelago can be divided into two management areas, the MHI and the NWHI. Pursuant to the Presidential Proclamation on June 15, 2006 establishing the Northwestern Hawaiian Islands National Marine Monument, most fisheries within the NWHI Monument were closed. Commercial bottomfish operations in the NWHI Monument will cease by June 15, 2011. Until that time, all current bottomfish fishing operations in the NWHI must comply with limited access permit conditions, vessel size restrictions, landing limits, area closures, vessel monitoring, and reporting requirements.

As discussed in Chapter 3, there is a concern that invasive marine and terrestrial species may be introduced into sensitive environments by fishing vessels transiting from populated islands and grounding on shallow reef areas. Of most concern is the potential for unintentional introduction of rats (*Rattus* spp.) to the remote islands in the NWHI that harbor endemic land birds and indigenous seabirds. However, no invasive species introductions due to activity under FMPs have been documented. Additionally, with the establishment of the NWHI monument and the associated closures of NWHI fisheries, this concern would be reduced.

The Council and NMFS must balance the needs of the fishing industries with the need to reduce interactions with protected species. NMFS evaluates the potential impact of proposed fishery management regulations and future potential fishery actions that may affect species listed as threatened or endangered under the ESA, and considers the impacts to marine mammals and seabirds. By law, fishery activities within the U.S. EEZ that affect listed species cannot jeopardize the continued existence of that species. All fishery management actions are reviewed for compliance with the provisions of the ESA through a Section 7 consultation, and the impacts to listed species are articulated in the resultant biological opinion. Fishery management actions are also reviewed for compliance with the Marine Mammal Protection Act.

In a 2002 Biological Opinion, NMFS determined that the MHI bottomfish fisheries were not likely to adversely affect listed marine mammal and sea turtle populations (NMFS 2002a). A 2008 Biological Opinion for Amendment 14 to the Bottomfish FMP determined that the Hawaii bottomfish fishery would not likely adversely affect monk seals; and may adversely affect green sea turtles (through unavoidable collisions with vessels), but is not likely to jeopardize sea turtles or adversely affect any other ESA-listed species or critical habitat (NMFS 2008a). A March 7, 2002 informal consultation under the ESA determined that the Hawaii coral reef fisheries were not likely to adversely affect any threatened or endangered species or their critical habitat (NMFS 2002b). A May 24, 1996 Biological Opinion determined that the MHI crustacean fisheries will not adversely affect threatened or endangered species or their critical habitat (NMFS 1996). Because of the selective methods used to harvest precious corals, an October 5, 1978 Biological Opinion determined that the Hawaii precious corals fishery is no threat to endangered species or their habitat. An updated consultation resulted in the finding that the conduct of the Hawaii precious corals fisheries under the FMP would not adversely affect any ESA listed species (NMFS 2008c).

With regard to the NWHI, in 2000, NMFS was sued over the management of the bottomfish and crustacean fisheries within the NWHI. In the U.S. District Court of Hawaii ruling[67] on November 15, 2000, the court ruled that the lack of proper analysis of the impacts of the bottomfish and crustacean fisheries on the Hawaiian monk seal population violated NEPA and Section 7 of the ESA. As a result, the court enjoined the continuation of the bottomfish and lobster fishery in the NWHI until a comprehensive EIS and new Section 7 consultation is completed.

The lobster fishery in the NWHI has been closed since 2000. Reinforcing this closure was the President's proclamation on June 15, 2006 that established an immediate closure of most fisheries within the NWHI Marine National Monument, including any potential crustacean fishery. The 2006 Presidential proclamation also closed the bottomfish fisheries in the NWHI Marine National Monument by 2011, and placed the fishery on an annual landing limit until then. The biological impacts of the bottomfish fisheries managed under the Bottomfish FMP throughout the region, including those for the bottomfish fisheries in the NWHI, were addressed in a 2005 EIS (70 FR 35275; June 17, 2005), and updated in subsequent NEPA documents (see Table 3-16). These documents contain relevant analysis of the impacts of the fisheries on the Hawaiian monk seal population. In a March 18, 2002 Biological Opinion, NMFS determined that the NWHI bottomfish fisheries were not likely to adversely affect listed marine mammal and sea turtle populations. The 2002 Biological Opinion did not contain an Incidental Take Statement for any listed species. Until the NWHI bottomfish fishery is closed (in 2011), if a listed species were to be taken by the NWHI bottomfish fishery, reconsultation under Section 7 of the ESA would be required.

Alternative 1A would continue data collection programs (e.g., logbooks, observers) within the Hawaiian Archipelago fisheries through which interactions with protected species can be recorded. If warranted, the implementation of area closures and gear and handling requirements through FMP amendments can prevent, reduce, or mitigate potential interactions. Future management plan amendments or regulatory amendments to these FMPs would be reviewed to determine the potential to affect protected species within the Hawaiian Archipelago and would be subject to the appropriate NEPA analysis and other statutes such as the ESA and MMPA at the time of their consideration.

[67] U.S. District Court of Hawaii, Greenpeace Foundation, et. al. v. Minetta, Civil No 00-00068SPKFIY.

Fishery Participants and Communities

Within the Hawaiian Archipelago, each of the inhabited Hawaiian Islands (Niihau, Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii) has been defined as a fishing community under the MSA. Under Alternative 1A Federal fisheries within the Hawaiian Archipelago would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting the Hawaiian Archipelago fisheries under this alternative, and it is expected that the Hawaii fisheries would continue to be managed sustainably. The impacts of the FMPs on the fishery participants and communities within the Hawaiian Archipelago would continue as discussed in Chapter 3, and in more detail in Section 3.5.4. Implementation of future management plan amendments or regulatory amendments to these FMPs that could impact these fishing participants or communities would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Administration and Enforcement

In the Western Pacific Region, the management of ocean and coastal activities is conducted by a number of agencies and organizations at the Federal, state, county, and village or community levels. These groups administer programs and initiatives that address often overlapping and sometimes conflicting ocean and coastal issues.

Numerous research and data collection projects and programs have been undertaken and have resulted in the collection of huge volumes of potentially valuable detailed bathymetric and biological data, among other data. Some of this information has been processed and analyzed by fishery scientists and managers; however, much has proven difficult to utilize and integrate due to differences in collection methodologies coupled with a lack of metadata or documentation of how the data were collected and coded. This has resulted in incompatible datasets as well as data that are virtually inaccessible to anyone except the primary researchers.

Under Alternative 1A the fisheries within the EEZ of the Hawaiian Archipelago would continue to be managed under the current five species-based FMPs. No changes would occur to the regulations affecting the Hawaiian Archipelago Federal fisheries under this alternative. The impacts of the current FMPs on the fishery administration and enforcement within the Hawaiian Archipelago would continue as discussed in Chapter 3, and in more detail in Section 3.6. Concerns of incompatible or inaccessible datasets would continue. Implementation of future management plan amendments or regulatory amendments to this FMP on the administration and enforcement affecting the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.4. PRIA

The following sections discuss the potential impacts of Alternative 1A on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the PRIA.

4.2.1.4.1. Physical Environment

The physical environment of the PRIA is comprised of its geology and topography as well as surrounding ocean layers, ocean depth zones, ocean water circulation, surface currents, transition zones, eddies, and deep-ocean currents. Under Alternative 1A, the No Action Alternative, Federal fisheries within the PRIA would continue to be adaptively managed under the species-based FMPs.

As discussed in Chapter 3, and in more detail in Section 3.5.5, existing fisheries operating under the current species-based FMPs in the PRIA may affect marine ecosystems in a variety of ways. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can also affect marine ecosystems through vessel disturbance, bycatch or discards, impacts on nutrient cycling, or introduction of exotic species, pollution, and habitat disturbance. The day-to-day operation of a fishing vessel can produce a number of waste products, including oil, sewage, garbage, and lost gear, any of which may have a negative impact on the marine environment. However, no long-term significant impacts on the physical environment from waste products directly related to fishery operations conducted under the FMPs within the PRIA have been documented.

Additionally, the accidental grounding of fishing vessels can adversely affect marine habitat and coral reefs. Potential impacts of a vessel striking the bottom include physical harm to the marine substrate, and the possible subsequent break-up of the vessel would release fuel and oil that could result in pollution of the marine environment and mortality of marine life. However, groundings of fishing vessels operating in the PRIA are rare. In the occasional cases of vessel groundings in the past, some short-term localized damage to the marine substrate did take place, but no long-term significant impacts on the surrounding marine environment have been documented.

4.2.1.4.2. Biological Environment

The affected biological environment of the PRIA includes the benthic environment and the pelagic environment. Alternative 1A would not change the current institutional framework of FMPs, accompanying regulations or management strategies. Thus, this alternative would impact the biological environment as discussed in Chapter 3, and in detail in Section 3.5.5. The affected biological environment of the PRIA, by island, atoll, or reef, is discussed generally in Section 3.2 and in more detail in Section 3.5.5. All the submerged lands and marine resources within the PRIA from the shoreline (0 miles) to 200 miles offshore are under the jurisdiction of the Federal government.

A discussion of the biological impacts of the demersal fisheries specific to the EEZ of the PRIA under each of the FMPs follows.

4.2.1.4.2.1. Biological Impacts on Bottomfish

Biological impacts of the bottomfish fisheries managed under the Bottomfish FMP throughout the region, including those for Federal fisheries within the PRIA, were addressed in a 2005 EIS

(70 FR 35275; June 17, 2005), as updated for selected areas in subsequent NEPA documents (see Table 3-16). These documents contain relevant analysis of the impacts to PRIA bottomfish resources under Alternative 1A.

A Federal permit is required to participate in the PRIA bottomfish fisheries. Limited bottomfish fisheries have occurred under such a Federal permit. As discussed in Section 3.5.5, in 1998, two Hawaii-based troll and handline vessels and one demersal longline vessel fished in the EEZ (0 to 200 miles offshore) around Palmyra and Kingman Reef. These vessels targeted both pelagic and bottomfish species. In 1999, one vessel made seven trips to these areas. The vessel stopped fishing after results of a single specimen submitted for testing to the University of Hawaii's School of Medicine indicated the presence of ciguatera. No Federal permits were issued in 2000 through 2006 for the Federal bottomfish fishery within the PRIA.

An estimate of MSY for the Federal bottomfish fisheries within the PRIA has not been determined. All bottomfish fisheries within EEZ waters around the PRIA require a Federal permit and are monitored via Federal logbooks. Under Alternative 1A, the status and trends of target and non-target species would continue to be evaluated annually.

A renewed interest in this fishery occurred in 2007. As of January 26, 2007, three bottomfish permits were issued, with three more in process for the PRIA (W. Ikehara, Permit Specialist, NMFS, pers. com., January 26, 2007). These permits were issued in accordance with Amendment 8 to the Bottomfish FMP (71 FR 53605; September 12, 2006), which established new permitting and reporting requirements for vessel operators targeting bottomfish species around the PRIA. The intent of the amendment was to improve understanding of the ecology of these species and the activities and harvests of the vessel operators that target them. The associated Environmental Assessment to Amendment 8 provided an updated analysis of the impacts of the Federal bottomfish fisheries and management regime on the biological environment around the PRIA.

Under Alternative 1A, the PRIA fisheries would continue to be managed under the Bottomfish FMP's current framework, regulations, and management strategies, and be subject to adaptive management under the Bottomfish FMP. No changes would occur to the regulations affecting the PRIA fisheries under this alternative. The biological impacts of the current bottomfish fisheries within the PRIA would continue as discussed in Section 3.5.5 and as previously analyzed in the 2005 EIS (June 17, 2005; 70 FR 35275), as updated for selected areas in subsequent NEPA documents (see Table 3-16). Implementation of future management plan amendments or regulatory amendments to the Bottomfish FMP that may affect the PRIA would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Biological Impacts on Precious Corals

There are no known precious corals fisheries operating in the EEZ of the PRIA (0 to 200 miles offshore). An estimate of MSY for precious corals around the PRIA has not been determined; however, an OY of 1,000 kg (all precious coral species combined) has been set for Permit Area XP-PI, which encompasses the EEZ waters around the PRIA. A Federal permit is required to participate in precious corals fisheries in the EEZ that encompass the PRIA and the annual harvest for Permit Area XP-PI is 1,000 kg (all precious coral species combined). There is no limit to the number of permits that may be issued.

Amendment 6 (71 53605; September 12, 2006) to the Precious Corals FMP established new permitting and reporting requirements for vessel operators targeting precious corals in the EEZ (0 to 200 miles offshore) of the PRIA. The intent of the amendment was to improve the understanding of the ecology of these species and the activities and harvests of the vessel operators that target them. No Federal permits for precious corals harvesting in the PRIA have been issued to date. The associated Environmental Assessment to Amendment 6 provided an updated analysis of the impacts of the potential precious corals fisheries and management regime on the biological environment around the PRIA.

Under Alternative 1A, the PRIA precious corals fisheries would continue to be managed under the Precious Corals FMP's current framework and regulations. No changes would occur to the existing regulations affecting the PRIA precious corals fisheries under this alternative. Based on the lack of participation and harvest trend in this Federal permit fishery, it is anticipated that the future impacts of the precious corals fisheries under the Precious Corals FMP within the PRIA would continue to be limited or insignificant.

Participation in the precious corals fisheries within the EEZ of the PRIA requires a Federal permit and logbook, which will be cooperatively monitored by NMFS and the Council. Under Alternative 1A, the status and trends of precious coral species would continue to be evaluated annually. Implementation of future management plan amendments or regulatory amendments to the Precious Corals FMP that may affect the PRIA would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.4.2.2. Biological Impacts on Coral Reef Ecosystem

There are no known coral reef fisheries operating in the EEZ of the PRIA (0 to 200 miles offshore). A Federal permit is required to participate in the coral reef fisheries for all coral reef Potentially Harvested Coral Reef Taxa, and for Currently Harvested Coral Reef Taxa in low-use marine protected areas (Johnston Atoll, Palmyra Atoll, and Wake Island). There is no limit to the number of permits that may be issued; however, applications are evaluated on a case-by-case basis, and fishing activities and harvests may be restricted as a permit condition. No Federal permits have been issued to date. An estimate of MSY for the Federal coral reef fisheries within the PRIA has not been determined.

Besides permitting requirements, the 2004 Coral Reef Ecosystems FMP established a coral reef ecosystem regulatory area, marine protected areas, permit reporting requirements, no-anchoring zones, gear restrictions, and a framework regulatory process. In 2001, an EIS was prepared for the Coral Reef Ecosystems FMP (WPRFMC 2001). There have been no amendments to this FMP to date (see Table 3-18). Based on the lack of participation and the associated harvest trend in this Federal permit fishery, it is anticipated that the future impacts of the fisheries under the Coral Reef Ecosystem FMP, within the PRIA, would continue to be limited.

Under Alternative 1A, the status and trends of coral reef species would continue to be evaluated annually. Implementation of future management plan amendments or regulatory amendments to the Coral Reef Ecosystem FMP that may affect the PRIA would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Biological Impacts on Crustaceans

A Federal permit is required to participate in the lobster fisheries in the EEZs around each PRIA area. In the past, a few fishermen have expressed interest in fishing for lobsters within the PRIA, and at least two have attempted it. As discussed in Section 3.5.5, in 1999, one vessel was unsuccessful and no lobsters were caught. In addition, the vessel targeted deepwater shrimp and red crab at 300 to 800 meters around Palmyra Atoll and Kingman Reef. Reportedly, the catch-per-unit-effort was considered a good catch rate. There is now a permit and reporting requirement for deepwater shrimp fishing in the PRIA EEZs. An estimate of MSY for any of the Federal crustacean fisheries within the PRIA has not been determined.

Amendment 12 (September 12, 2006; 71 53605) to the Crustaceans FMP established permitting and reporting requirements for vessel operators engaged in fishing for lobsters in the EEZ (0 to 200 miles offshore) of the PRIA. The intent of the amendment was to improve the understanding of the ecology of these species and the activities and harvests of the vessel operators that target them. However, no Federal permit for lobster fishing in the PRIA has been issued since 1999. The associated Environmental Assessment to Amendment 12 provided an updated analysis of the impacts of the Federal crustacean fisheries and management regime on the biological environment around the PRIA.

Participation in the lobster fisheries within the EEZ of the PRIA requires a Federal permit and reporting, which will be cooperatively monitored by NMFS and the Council. Fishing for deepwater shrimp in the EEZ also requires a permit and reporting. Based on the historically low participation level and associated harvest trend in these federally permitted fisheries, it is anticipated that the future biological impacts of the PRIA crustacean fisheries under the Crustaceans FMP would continue to be limited or insignificant. Under Alternative 1A, the status and trends of crustacean species would continue to be evaluated annually. Implementation of future management plan amendments or regulatory amendments to the Crustaceans FMP that may affect the PRIA would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.4.3. Essential Fish Habitat

As discussed in Section 3.3, EFH and HAPC for the region are designated by the status quo species-based FMPs. For bottomfish and crustaceans, the preferred depth ranges of specific life stages are used to designate EFH. In the case of crustaceans, the designation is further refined based on productivity data. The precious corals designation combines depth and bottom type as indicators, but it is further refined based on the known distribution of the most productive areas for these organisms.

Under Alternative 1A, PRIA fisheries would continue to be managed under existing FMPs. Alternative 1A would not change current Federal fisheries regulations or designations of EFH or HAPC within the PRIA. Thus, no changes would occur to the regulations affecting the PRIA fisheries. The impacts of the current activities under existing FMPs on EFH and HAPC within the PRIA would continue as discussed below. These impacts also are discussed in Section 3.3.

Adverse fishing impacts on these habitat areas may include physical or biological alterations to the substrate and loss of, or injury to, benthic organisms, prey species, and their habitat or other components of the ecosystems. However, the predominant fishing gear types—hook-and-line, longline, troll, and traps, used in the PRIA fisheries cause few fishing-related impacts on the benthic habitat occupied and used by coral reef species, bottomfish, crustaceans, or precious corals. In addition, the current management regime prohibits the use of bottom trawls, bottom-set nets, explosives, and poisons.

The following are potential sources of fishery-related impacts on benthic habitat that may occur during normal fishing operations:

- Anchor damage from vessels attempting to maintain position over productive fishing habitat;
- heavy weight and line entanglement occurring during normal hook-and-line fishing operations; and,
- lost gear (leaders, hooks, and weights) by fishing vessels.

Most of the physical and biological environment of the PRIA is protected by their isolation, FMP regulations, and status as National Wildlife Refuges. Implementation of future management plan amendments or regulatory amendments to the current FMPs that may affect the EFH and HAPC within the PRIA would be subject to the appropriate NEPA analysis and other applicable law at the time of their consideration.

4.2.1.4.4. Protected Species

Under Alternative 1A, the PRIA fisheries would continue to be managed under the existing five species-based FMPs. No changes would occur to the regulations affecting the fisheries within the PRIA, and no additional impacts on protected species would be expected. The impacts on protected species from the fisheries managed under the FMPs, within the PRIA, would continue as discussed in Section 3.5.5.

As mentioned earlier, there is a concern that invasive marine and terrestrial species may be introduced into sensitive environments by fishing vessels transiting from populated islands and grounding on shallow reef areas. Of most concern is the potential for unintentional introduction of rats (*Rattus* spp.) to the remote and largely uninhabited U.S. islands in the central and western Pacific, i.e., PRIA that harbor endemic land birds and indigenous sea birds. However, no invasive species introductions due to activity under FMPs have been documented. The Council and NMFS will continue to educate fishermen on the need to prevent alien species introductions to remote areas.

The Council and NMFS must balance the needs of the fishing industries with the need to reduce interactions with protected species. NMFS evaluates the potential impact of proposed fishery management regulations and future potential fishery actions that may affect species listed as threatened or endangered under the Endangered Species Act (ESA), and considers the impacts to marine mammals and seabirds. By law, fishery activities within the U.S. EEZ that affect listed species cannot jeopardize the continued existence of that species. All fishery management actions are reviewed for compliance with the provisions of the ESA through a Section 7 consultation, and the impacts to listed species are articulated in the resultant biological opinion. Fishery management actions are also reviewed for compliance with the Marine Mammal Protection Act.

In a March 8, 2002 Biological Opinion, NMFS determined that the PRIA bottomfish fisheries were not likely to adversely affect listed marine mammal and sea turtle populations (NMFS 2002a). A March 7, 2002 informal consultation under the ESA determined that the PRIA coral reef fisheries were not likely to adversely affect threatened or endangered species or their habitat critical habitat (NMFS 2002b). A 2007 Biological Opinion determined that the PRIA crustacean fisheries will not adversely affect threatened or endangered species or their critical habitat (NMFS 2007a). There is currently no federally-permitted fishing for precious corals MUS in the PRIA, therefore, there has been no consultation under the ESA or coordination under the MMPA to date.

Under Alternative 1A, NMFS and the Council would continue to monitor the PRIA fisheries and where applicable, prevent, reduce, and mitigate impacts on protected species through area closures and gear and handling requirements. Implementation of future fishery management amendments or regulatory amendments to these FMPs would be reviewed to determine the potential to affect protected species within the PRIA and would be subject to the appropriate NEPA analysis and other statutes such as the ESA or MMPA at the time of their consideration.

Fishery Participants and Communities

There are no communities within the PRIA defined as a fishing community under the MSA. The impacts of the current FMPs on the limited fishery participants within the PRIA would continue as discussed in Section 3.5.5. Implementation of future management plan amendments or regulatory amendments to FMPs that could impact PRIA fishery participants would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.4.5. Administration and Enforcement

Federal fisheries within the PRIA would continue to be managed under the current five FMPs. No changes would occur to the regulations affecting the PRIA Federal fisheries under this alternative. The impacts of the current FMPs on fishery administration and enforcement within the PRIA would continue as discussed in Section 3.6. Implementation of future management plan amendments or regulatory amendments to this FMP affecting the PRIA would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.5. Pelagic Fisheries

The U.S. pelagic fisheries in the Western Pacific Region are currently managed under the Pelagics FMP, which was established in 1987. A comprehensive analytical review of the impacts of the fisheries under the Pelagics FMP was completed in 2001 (April 6, 2001; 66 FR 18243). Since 2001, the impacts of the Federal actions recommended by the Council in amendments or regulatory amendments to this FMP have been analyzed in associated NEPA documents (see Table 3-19).

The following sections discuss the potential impacts of Alternative 1A (the No Action Alternative) on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the fisheries operating under the Pelagics FMP.

4.2.1.5.1. Physical Environment

Under Alternative 1A, pelagic fisheries would continue to be managed under the Pelagics FMP. The Pelagics FMP encompasses all areas of pelagic fishing operations in the waters of the U.S. EEZ or on the high seas. The Pelagics FMP also applies to any U.S. domestic vessel authorized to do the following: (1) fish for, possess, or transship Pelagic MUS within the waters of the U.S. EEZ of the Western Pacific Region; or (2) land Pacific Pelagic MUS within the states, territories, commonwealths, or unincorporated U.S. island possessions (i.e., the PRIA) of the Western Pacific Region. Alternative 1A would not change the Pelagics FMP’s regulations or management measures. Thus, this alternative would not introduce additional impacts beyond those impacts on the biological environment already occurring.

Pelagic species are closely associated with their physical environment. Suitable physical environments for these species include temperature, oxygen, or salinity conditions, all of which are influenced by oceanic conditions on various scales. In the pelagic environment, physical conditions such as isotherm and isohaline boundaries often determine whether the encompassing water mass is suitable for pelagic fish, and many of the species are associated with specific isothermic regions. Additionally, areas of high trophic transfer as found in fronts and eddies are important habitat.

The physical structure of the Pacific Ocean is, however, far from static. Large-scale climatological events such as El Niño and La Niña and longer-term fluctuations, termed regime shifts, operating on decadal time scales affect oceanic circulation patterns, upwelling of nutrients and ultimately the productivity of the ecosystem. Such fluctuations may have profound impacts on fisheries.

Fisheries may also affect marine ecosystems. Populations of fish and other ecosystem components can be affected by the selectivity, magnitude, timing, location, and methods of fish removals. Fisheries can affect marine ecosystems through vessel disturbance, bycatch or discards, impacts on nutrient cycling, or introduction of exotic species, pollution, and habitat disturbance. The day-to-day operation of a fishing vessel can produce a number of waste products, including oil, sewage, garbage, and lost gear, any of which may have a negative impact on the marine environment. However, no long-term significant impacts on the physical environment from waste products directly related to fishery operations conducted under the Pelagics FMP have been documented.

Additionally, the accidental grounding of fishing vessels can adversely affect marine habitat and coral reefs. Potential impacts of a vessel striking the bottom include physical harm to the marine substrate, and the possible subsequent break-up of the vessel would release fuel and oil that could result in pollution of the marine environment and mortality of marine life. However, groundings of fishing vessels operating in the Western Pacific Region are infrequent. In the occasional cases of vessel groundings in the past, some short-term localized damage to the marine substrate did take place, but no long-term impacts on the surrounding marine environment have been documented.

4.2.1.5.2. Biological Environment

The format for this section, the impacts of the pelagic fisheries on the biological environment under Alternative 1A, is slightly different than the format used for the demersal fisheries above. This section starts with a general discussion of the impacts on the biological environment. This general discussion is followed by specific discussions of the impacts of the pelagic fisheries specific to archipelagic region: American Samoa, Mariana (CNMI and Guam will be discussed separately), Hawaii, and the PRIA.

Under Alternative 1A, pelagic fisheries would continue to be managed under the Pelagics FMP. No changes would occur to the regulations affecting the Federal pelagic fisheries under this alternative. The impacts on the biological environment from fisheries managed under the Pelagics FMP would continue as discussed in Section 3.5 and as previously analyzed in NEPA documents for the Pelagics FMP (April 6, 2001; 66 FR 18243), as updated for selected areas in subsequent NEPA documents (see Table 3-20).

Pelagic fishing has a long history in the Pacific Ocean. The fisheries operating under the Pelagics FMP target stocks that are Pacific-wide in distribution. However, they account for a very small percentage of the total catch of these pelagic species taken in the Pacific Ocean by other countries. For example, bigeye tuna catches by commercial fisheries under the Council's jurisdiction in 2004 amounted to 5,163 metric tonnes (t), or just 2.3 percent of the 2004 total Pacific-wide bigeye tuna catch. Similarly, 2004 yellowfin tuna catches by commercial fisheries under the Council's jurisdiction amounted to 2,383 t or about 0.35 percent of the 2004 total Pacific-wide yellowfin tuna catches, and 0.58 percent of the yellowfin tuna caught in the WCPO. Any changes in catch due to changes in fishery regulations under the Pelagics FMP will likely be obscured by natural variation and catches made by the much larger non-U.S. sectors of the Pacific fleet targeting pelagic species (e.g., foreign purse seiners). Domestic pelagic fisheries are highly dependent on the status of the broad, Pacific-wide condition of the Pelagics MUS stocks.

Under the authority of the MSA, the Council developed and recommended (and the Secretary of Commerce approved) criteria to determine overfishing (fishing mortality) and overfished (stock biomass) conditions for fisheries of the Western Pacific Region. As noted earlier, NMFS determined on June 14, 2004, that overfishing of bigeye tuna was occurring throughout the

Pacific Ocean (69 FR 78397). On March 16, 2006, the Council was notified by letter that the Secretary of Commerce had determined that overfishing is occurring on the yellowfin tuna stock in the western and central Pacific Ocean (71 FR 14837). Amendment 14 to the Pelagics FMP was developed to address this issue. The associated environmental assessment for Amendment 14 provided an update of the analysis of the impacts of the pelagic fisheries and management regime on the human environment. A notice of availability for Amendment 14 was published in the Federal Register on February 15, 2007 (72 FR 7385) and a proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved; however, the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS. These recommendations were based on the best available science including the most recent stock assessments (July 2004 and August 2005 for bigeye and yellowfin tuna respectively), and in light of the fact that any unilateral management action on U.S.-based vessels can only have minimal direct impacts on stocks as they harvest only 2.3 percent of the total Pacific bigeye catch and less than 1 percent of the total Pacific yellowfin catch.

Several non-targeted and associated species are caught in the pelagic fisheries of the region. In the Hawaii-based longline fishery, the highest discards are of sharks (blue) and oilfish. Current reporting methods for bycatch include Federal logbooks, information collected from NMFS observer programs and various catch reporting systems that are compiled by the Western Pacific Fishery Information Network (WPacFIN). These data are sufficient to provide estimates of the amount and type of bycatch in fisheries managed under the Pelagics FMP. Currently there are insufficient data for most of these non-targeted species to provide estimates of stock recruitment relationships or biological reference points, but none of these species are believed to be depleted as a result of fisheries managed under the Pelagics FMP.

A discussion of the impacts of the pelagic fisheries on the biological environment specific to the EEZ waters that surround each of the archipelagos follows.

American Samoa

Commercial ventures for pelagic species in American Samoa are diverse, ranging from small-scale vessels having very limited range to large-scale vessels catching tuna in the waters of the U.S. EEZ and into the high-seas. Total pelagic landings by American Samoa based longline, troll, and handline vessels were approximately 11 million pounds in 2003, with longline landings making up nearly 99 percent of this total.

As discussed in Section 3.5.1, recent and anticipated future growth in this fishery has been attributed to the entry of mono-hull vessels larger than 50 feet in length. A Federal limited entry permit is required for participation in the pelagic longline fisheries in the EEZ surrounding American Samoa (3 to 200 miles offshore). As of August, 2006, a total of 60 American Samoa Longline Limited Entry Permits were issued. American Samoa Longline Limited Entry Permits are good for three years. No Federal permit is required for smaller troll or handline vessels targeting pelagic species in the EEZ of American Samoa.

Amendment 11 (May 24, 2005; 70 FR 29646) to the Pelagics FMP established a limited entry system for pelagic longline vessels fishing in waters of the U.S. EEZ around American Samoa. Amendment 11 was intended to establish management measures that would stabilize effort in the fishery to avoid disruptions to community participation and limitation of opportunities for substantial participation in the fishery by indigenous islanders. An associated environmental assessment for Amendment 11 updated the analysis of the impacts of the fisheries and management regime on the human environment around American Samoa.

As mentioned earlier, NMFS determined that overfishing of bigeye tuna and on yellowfin tuna stock was occurring throughout the Pacific Ocean, which includes the EEZ around American Samoa. The associated environmental assessment for Amendment 14 provided an update of the analysis of the impacts of the pelagic fisheries and management regime on the human environment. A proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved however; the Council’s recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS.

Additionally it is noted that in 2006, 2007 and in 2008, the American Samoa longline pelagic fishery exceeded the sea turtle annual take limits as established in the February 23, 2004 Biological Opinion. Consequently, consultation under the ESA is under review by NMFS for the American Samoa longline pelagic fisheries, as well as for Western Pacific troll, pole and line, and handline fisheries, which share the same take limits.

NMFS and the Council are working closely with the American Samoa DMWR on cooperative monitoring and reporting programs that will detect any changes in participation or harvest in the pelagic fisheries in American Samoa. Under Alternative 1A, the pelagic fisheries would continue to be adaptively managed under the Pelagics FMP. No changes would occur to the regulations affecting the American Samoa pelagic fisheries under this alternative. The impacts of the current Pelagics FMP on the biological environment would continue as discussed in Section 3.5.1, as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), and as updated in subsequent NEPA documents that may affect this area (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP affecting American Samoa would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Commonwealth of the Northern Mariana Islands

There are three permits that allow the use of longlines to target pelagic species within the EEZ surrounding the CNMI: the Hawaii Longline Limited Entry Permit, the American Samoa Longline Limited Entry Permit, and the Western Pacific Longline General Permit. These Federal permits require the owner/operator of the permit to report the location and harvest of all longline sets made under the permit.

The Hawaii Longline Limited Entry Permit: This permit is required to target pelagic species using longline gear in the EEZ waters around Hawaii, or to land or transship longline-caught pelagic species shoreward of the outer boundary of the EEZ waters around Hawaii. It may also be used to fish for (or land) pelagic species using longline gear in EEZ waters around the CNMI, Guam, and the PRIA. A maximum of 164 Hawaii Longline Limited Entry Permits may be issued under this limited access program.

The American Samoa Longline Limited Entry Permit: This permit is required to target pelagic species using longline gear in the EEZ waters around American Samoa, or to land those fish caught by longline in the EEZ around American Samoa. Holders of Hawaii Longline Limited Entry Permits and Western Pacific Longline General Permits may land longline-caught fish in American Samoa provided that those fish were not caught in the EEZ waters around American Samoa.

The Western Pacific Longline General Permit: This permit may be used to fish for (or land) pelagic species using longline gear in the EEZ waters around the CNMI, Guam, and the PRIA. In 2006 (as of August 1), a total of 34 Western Pacific Longline General Permits was issued. The permits may be renewed annually, and there is no limit to the number of permits that may be issued.

No Federal permit is required for the pelagic fisheries in the EEZ within 3 miles offshore of the CNMI or for smaller troll or handline vessels. As mentioned earlier, NMFS determined that overfishing of bigeye tuna and yellowfin tuna stocks was occurring throughout the Pacific Ocean, which includes the EEZ around the CNMI. The associated environmental assessment for Amendment 14 provided an update of the analysis of the impacts of the pelagic fisheries and management regime on the human environment. A proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved however; the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS.

NMFS and the Council are working closely with the CNMI DFW on cooperative monitoring and reporting programs that will detect any changes in participation in current pelagic fisheries within the EEZ around CNMI (0 to 200 miles offshore) or on the high seas. Under Alternative 1A, the pelagic fisheries within the EEZ of the CNMI would continue to be adaptively managed under the Pelagics FMP. No changes would occur to the regulations affecting the pelagic fisheries under this alternative. The biological impacts of the current Pelagics FMP would continue as discussed in Section 3.5.2 and as previously analyzed in the 2001 EIS for the Pelagics FMP (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents for affected areas (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP that may affect the biological environment of CNMI would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Guam

As discussed in Section 3.5.3, the pelagic fisheries in the EEZ surrounding Guam consist of primarily small, recreational, trolling boats that are either towed to boat launch sites or berthed in marinas and fish either within local waters, within EEZ waters around Guam or on some occasions in the adjacent U.S. EEZ waters around CNMI. Domestic annual pelagic landings in Guam have varied widely. The 2004 total pelagic landings were approximately 691,366 pounds, an increase of 36 percent over the 2003 landings. Of this total, it is estimated that 285,545 pounds were sold for total ex-vessel revenues of $433,911. The number of boats involved in Guam's pelagic fishery has gradually increased from 193 in 1983 to a peak of 469 in 1998. There were 401 vessels active in Guam's pelagic fishery in 2004. A Federal permit is required to participate in the pelagic longline fisheries in the EEZ (3 to 200 miles offshore) surrounding Guam.

As described above, there are three permits that allow the use of longlines to target pelagic species within the EEZ surrounding Guam: the Hawaii Longline Limited Entry Permit, Western Pacific Longline General Permit, and American Samoa Longline Limited Entry Permit. These Federal permits require the owner/operator of the permit to report the location and harvest of all sets made under the permit.

As mentioned earlier, NMFS determined that overfishing of bigeye tuna and on yellowfin tuna stock was occurring throughout the Pacific Ocean, which includes the EEZ waters around Guam. The associated environmental assessment for Amendment 14 provided an update of the analysis of the impacts of the pelagic fisheries and management regime on the human environment. A proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved however; the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS.

NMFS and the Council are working closely with the Guam DAWR on cooperative monitoring and reporting programs that will detect any changes in participation in pelagic fisheries within the EEZ of Guam (3 to 200 miles offshore). Under Alternative 1A, the pelagic fisheries within the EEZ surrounding Guam would continue to be adaptively managed under the Pelagics FMP. No changes would occur to the regulations affecting the pelagic fisheries under this alternative. The impacts of the current Pelagics FMP on the biological environment would continue as discussed in Section 3.5.3 and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP that may affect Guam would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Hawaii

As discussed in Section 3.5.4, Hawaii's pelagic fisheries, which include the longline, troll and handline, offshore handline, and the aku boat (pole and line) fisheries, are the State's largest and most valuable. The largest component of pelagic catch in 2004 was tuna, and bigeye tuna was the largest component of this commercial tuna catch. Approximately 11 million pounds of pelagic fish were harvested by the Hawaii-based longline fishery (see Figure 3-22). The total number of recreational fishermen in Hawaii is unknown, but there are about 14,300 small vessels in Hawaii, and it is estimated that 6,600 of these vessels may be used for recreational fishing.

A Federal permit is required to participate in the pelagic longline fisheries in the EEZ (3 to 200 miles offshore) of the Hawaiian Archipelago. A maximum of 164 Hawaii Longline Limited Entry Permits may be issued. No Federal permit is required for smaller troll or handline vessels.

As mentioned earlier, NMFS had determined that overfishing of bigeye tuna and on yellowfin tuna stocks was occurring throughout the Pacific Ocean, which includes the EEZ of Hawaii. The associated environmental assessment for Amendment 14 provided an update of the analysis of the impacts of the pelagic fisheries and management regime on the human environment. A proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved however; the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS.

NMFS and the Council are working closely with the State of Hawaii HDAR on cooperative monitoring programs that will detect any changes in participation in pelagic fisheries within the EEZ of Hawaii (3 to 200 miles offshore) or on the high seas. Under Alternative 1A, the pelagic fisheries within the EEZ of Hawaii would continue to be adaptively managed under the Pelagics FMP. No changes would occur to the regulations affecting the pelagic fisheries under this alternative. The biological impacts of the current Pelagics FMP would continue as discussed in Section 3.5.4 and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP affecting the Hawaiian Archipelago would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

Pacific Remote Island Areas

A Federal permit is required to participate in the pelagic longline fisheries in EEZ waters (3 to 200 miles offshore) around the PRIA. As discussed in Section 3.5.5, some fishermen from the Hawaii longline fleet do seasonally fish in the EEZ around some of the PRIA (e.g., Palmyra Atoll).

There are three Federal permits that allow the use of longlines to target pelagic species within the EEZ waters around the PRIA: the Hawaii Longline Limited Entry Permit, the American Samoa Longline Limited Entry Permit, and the Western Pacific Longline General Permit. All permits require the permit holder to report the location and harvest of all sets made under the permit through Federal logbooks.

In addition, a Federal permit is also required for troll or handline vessels targeting pelagic species within EEZ waters around the PRIA. No Federal permits were issued for the PRIA from 2000 through 2006. As of January 26, 2007, three PRIA pelagic troll and handline permits have been issued, with three more applications being processed by NMFS.

As mentioned earlier, NMFS determined that overfishing of bigeye tuna and on yellowfin tuna stocks was occurring throughout the Pacific Ocean, which includes the EEZ around the PRIA of the central Pacific. The associated environmental assessment for Amendment 14 provided an update of the analysis of the impacts of the pelagic fisheries and management regime on the human environment. A proposed rule to implement its recommendations was published on March 29, 2007 (72 FR 14761). The amendment was only partially approved however; the Council's recommendation for international management action to end overfishing of bigeye and yellowfin stocks was approved by NMFS.

Under Alternative 1A, the pelagic fisheries within the EEZ of the PRIA would continue to be adaptively managed under the Pelagics FMP. No changes would occur to the regulations affecting the pelagic fisheries under this alternative. Most of the physical and biological environment of the PRIA is protected by their isolation, FMP regulations, and their status as National Wildlife Refuges. The biological impacts of the current Pelagics FMP would continue as discussed in Section 3.5.5 and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP affecting the PRIA would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.6. Essential Fish Habitat

Under Alternative 1A, the pelagic fisheries of the Western Pacific Region would continue to be managed under the existing Pelagics FMP. No changes would occur to the regulations affecting the pelagic fisheries under this alternative. The impacts of the fisheries managed under the Pelagics FMP on EFH or HAPC would continue as discussed in Section 3.3 as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), and as updated in subsequent NEPA documents (see Table 3-20).

A large amount of information exists on the effects of environmental fluctuations on the productivity and distribution of pelagic species. At the present time, these environmental influences are thought to be the major factors affecting the essential habitat for pelagic species. No data currently exist that indicate that the pelagic fisheries managed under the Pelagics FMP have a discernable effect on the pelagic environment, or the essential habitat for pelagic species, that could be detectable against the background of cyclical large-scale oceanographic events that drive the pelagic ecosystem.

EFH is considered those waters and substrate necessary to a species or species group or complex, for spawning, breeding, feeding, or growth to maturity. As discussed in Section 3.3, the designated habitat of pelagic species is the open-ocean water column, and managed fisheries employ variants of mid-water seine nets and hook-and-line gear that have a low incidence of gear loss. As a result, there is little impact to EFH from fisheries managed under the Pelagics FMP. Although certain amounts of gear loss may be a hazard to some species due to entanglement, there is a limited direct impact on pelagic habitat. Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP affecting EFH or HAPC would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.6.1. Protected Species

Under Alternative 1A the pelagic fisheries would continue to be managed under the Pelagics FMP. No changes would occur to the existing regulations affecting the pelagic fisheries under this alternative.

As discussed in Section 3.4, all Pacific sea turtles are designated under the Endangered Species Act (ESA) as either threatened or endangered. These species of sea turtles are highly migratory, or have a highly migratory phase in their life history, and therefore, are susceptible to being incidentally caught by fisheries operating in the Pacific Ocean. Cetaceans listed as endangered under the ESA and that have been observed in the Western Pacific Region include the following: the humpback whale, sperm whale, blue whale, fin whale, and sei whale. In addition, one endangered pinniped, the Hawaiian monk seal, occurs in the region. Regulations under the Pelagics FMP require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species.

The Council and NMFS must balance the needs of the fishing industries with the need to reduce interactions with protected species. NMFS evaluates the potential impact of all proposed fishery management regulations and subsequent potential fishery actions that may affect species listed as threatened or endangered under the ESA, and considers the impacts to marine mammals and seabirds. By law, fishery activities within the U.S. EEZ that affect listed species cannot jeopardize the continued existence of that species. All fishery management actions are reviewed for compliance with the provisions of the ESA through a Section 7 consultation, and the impacts to listed species are articulated in the resultant biological opinion or other determination. Fishery management actions are also reviewed for compliance with the Marine Mammal Protection Act.

Biological opinions for pelagic fishery management proposals include:

> On November 18, 2002, the U.S. Fish and Wildlife Service (FWS) issued an ESA biological opinion on the potential impacts of the entire Hawaii-based domestic longline fishery on the short-tailed albatross. The FWS concluded that the fishery is not likely to jeopardize the continued existence of the short-tailed albatross.
>
> NMFS issued an ESA biological opinion on February 23, 2004, following a consultation under Section 7 of the ESA on the ongoing operation of the Western Pacific Region’s pelagic fisheries as managed under the Pelagics FMP. With terms and conditions, NMFS concluded that the fisheries were not likely to jeopardize the continued existence of any threatened or endangered species under the jurisdiction of NMFS or destroy or adversely modify critical habitat that had been designated for them. However, the American Samoa longline pelagic fisheries in 2006 exceeded the annual sea turtle take limit as established in the February 23, 2004 Biological Opinion. Consequently, consultation under the ESA will be reinitiated by NMFS for the pelagic fisheries of American Samoa.
>
> On October 8, 2004, the FWS issued an ESA biological opinion on the potential impacts of the shallow-set sector of the Hawaii-based pelagic longline fishery on the short-tailed

albatross. The FWS concluded that the shallow-set sector is not likely to jeopardize the continued existence of the short-tailed albatross.

On October 4, 2005, NMFS issued an ESA biological opinion on the ongoing operations of the deep-set sector of the Hawaii-based longline fishery. The opinion concluded that the deep-set sector was not likely to jeopardize the continued existence of humpback whales, or green, leatherback, loggerhead, or olive ridley sea turtles in the area.

On July 16, 2008, NMFS concluded in an informal consultation that the addition of three pelagic deepwater squid species as MUS and permit and reporting requirements for the squid jig fishery would not adversely affect ESA-listed marine species.

On October 15, 2008, a Biological Opinion was issued that concluded that the proposed Amendment 18 to the Pelagics FMP, which would remove annual set limits, eliminate set-certificates and change the annual loggerhead and leatherback sea turtle interaction "hard caps" to 46 and 19 interactions, respectively, is not likely to jeopardize the continued existence of ESA-listed species or affect critical habitat.

Alternative 1A would continue pelagic fishing operations in compliance with existing ESA biological opinions, and the current level of interactions with protected species would not be expected to change. Implementation of future management plan amendments or regulatory amendments to this FMP would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.6.2. Fishery Participants and Communities

Each of the inhabited Hawaiian Islands (Niihau, Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii) has been defined as a fishing community under the MSA. Also defined as fishing communities are American Samoa, Guam, and the CNMI. Under Alternative 1A, the region's pelagic fisheries would continue to be managed under the Pelagics FMP. No changes would occur to the regulations affecting the fisheries under this alternative. The impacts of the Pelagics FMP on the fishery participants and communities within the region would continue as discussed in Section 3.5 and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP affecting the fishery participants and communities of the region would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.1.6.3. Administration and Enforcement

In the Western Pacific Region, the management of ocean and coastal activities is conducted by a number of agencies and organizations at the Federal, state, territorial, county, and village levels. These groups administer programs and initiatives that address often overlapping and sometimes conflicting ocean and coastal issues. Management of pelagic fisheries is complicated because it targets highly migratory species that often travel through jurisdictional boundaries.

Numerous research and data collection projects and programs have been undertaken in the Western Pacific Region and have resulted in the collection of huge volumes of potentially valuable detailed bathymetric and biological data, among other data. Some of this information has been processed and analyzed; however, much has proven difficult to utilize and integrate due to differences in collection methodologies coupled with a lack of metadata or documentation of how the data were collected and coded. This has resulted in incompatible datasets as well as data that are virtually inaccessible to anyone except the primary researchers.

Under Alternative 1A, the abovementioned concerns would continue. The fisheries targeting pelagic species would continue to be managed under the Pelagics FMP. No changes would occur to the existing regulations affecting these pelagic fisheries. The impacts of the Pelagics FMP on the fishery administration and enforcement within the region would continue as discussed in Section 3.6 and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents (see Table 3-20). Implementation of future management plan amendments or regulatory amendments to the Pelagics FMP affecting the fishery administration and enforcement within the region would be subject to the appropriate NEPA analysis and other applicable laws at the time of their consideration.

4.2.2. Alternative 1B, Implement One FEP (Mariana Archipelago FEP)

Under Alternative 1B, the demersal fisheries in the Mariana Archipelago (Guam and CNMI) would be managed under one FEP, the Mariana FEP. The pelagic fisheries within the Mariana Archipelago and the Federal fisheries in the remaining areas of the Western Pacific Region would continue to be managed under the existing five species-based FMPs. Under Alternative 1B, existing regulations relevant to the demersal fisheries within the Mariana Archipelago would be reorganized into ecosystem-based regulations specific to that area. Although the regulations would be reorganized under Alternative 1B, no substantive changes would occur to current fishing regulations.

4.2.2.1. American Samoa Archipelago

The following sections discuss the potential impacts of Alternative 1B on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the American Samoa Archipelago.

4.2.2.1.1. Physical Environment

Under Alternative 1B, the fisheries in the American Samoa Archipelago would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting these fisheries. When compared to Alternative 1A (the status quo), establishing the Mariana FEP under this alternative would not alter the impacts on the physical environment by any fisheries in the American Samoa Archipelago operating under these FMPs. Thus, the impacts of Alternative 1B to the American Samoa Archipelago physical environment would be similar to impacts of Alternative 1A, the No Action Alternative.

4.2.2.1.2. Biological Environment

Under Alternative 1B, the Federal fisheries in the American Samoa Archipelago would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Thus, the impacts of Alternative 1B to the American Samoa Archipelago biological environment would be similar to the impacts of Alternative 1A, the No Action Alternative.

4.2.2.1.3. Essential Fish Habitat

In comparison to Alternative 1A, implementing Alternative 1B would not be expected to cause any additional adverse impacts on EFH or HAPC for species in American Samoa. Implementation of the Mariana FEP under Alternative 1B would not be expected to affect the fishing operations or harvest of any fisheries in American Samoa; rather it would simply reorganize the four species-based FMPs for demersal fisheries in the Mariana Archipelago into a geographically-defined ecosystem plan for this one area, the Mariana Archipelago. This FEP would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey in American Samoa. Implementing Alternative 1B would not result in a change in fishing gear or strategy in American Samoa, therefore, EFH and HAPC impacts would be as described for Alternative 1A.

4.2.2.1.4. Protected Species

Under Alternative 1B, impacts on protected species would continue in American Samoa as described in Alternative 1A and in Section 3.5.1. Listed species would continue to be given protection in accordance with the MSA, MMPA, ESA, and other applicable laws. Under Alternative 1B, the fisheries in American Samoa would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Thus, the impacts of Alternative 1B to the protected species in American Samoa would be similar to those under Alternative 1A, the No Action Alternative.

4.2.2.1.5. Fishery Participants and Communities

Under Alternative 1B, the fisheries in American Samoa would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Thus, the impact of Alternative 1B to fishery participants and communities in American Samoa would be similar to the impacts of Alternative 1A, the No Action Alternative.

Administration and Enforcement

Under Alternative 1B, the Federal fisheries in American Samoa would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. However, under Alternative 1B, scientists and managers would need to adapt to the place-based and multi-species nature of the proposed Mariana FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities, on the marine environment. Additionally, management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations.

Many of these managers and scientists involved with the Mariana FEP would likely be involved in the fisheries associated with American Samoa. However, the impacts of Alternative 1B on managers and scientists are not expected to be large as they increasingly are taking into account ecosystem characteristics and functions when making research and management recommendations and decisions. The impacts on enforcement under this alternative are also not expected to be large as no substantive changes to current fishing regulations, boundaries, or fishing operations would occur in American Samoa.

4.2.2.2. Mariana Archipelago

The following sections discuss the potential impacts of Alternative 1B on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Mariana Archipelago.

4.2.2.2.1. Physical Environment

Under Alternative 1B, the demersal fisheries within the Mariana Archipelago, currently managed by the species-based FMPs, would be managed under the proposed Mariana FEP. The pelagic fisheries within the Mariana Archipelago and the domestic pelagic fisheries outside the waters of the U.S. EEZ of the Mariana Archipelago would continue to be managed under the existing Pelagics FMP. However, the boundaries of the proposed FEP are not physically apparent. The boundaries under either the current FMPs or the proposed FEP are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. In the short-term, establishing the Mariana FEP under this alternative would not alter the impacts on the physical environment by any fisheries in the Mariana Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

Alternative 1B also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur in Alternative 1B. Thus, with regard to the physical environment, there would be no substantial differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the Mariana Archipelago.

4.2.2.2.2. Biological Environment

Implementation of the Mariana FEP to manage Federal demersal fisheries in the Mariana Archipelago would continue to have potential positive and negative impacts on target and non-target species. Negative impacts would be the impact of fishing on target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would be an anticipated improvement in fishery ecosystem management. However, implementation of the archipelagic-based FEP for demersal fisheries within the Mariana Archipelago is not expected to affect the population of target and non-target stocks nor the fishing operations or harvest of any Federal fisheries operating under the current species-based FMPs. Thus, the impacts of the Mariana FEP for Federal demersal fisheries would be similar to the impacts under Alternative 1A. The status and trends of target and non-target species within the Mariana Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1B would also replace the current FMP’s regulation structure for demersal fisheries within the Mariana Archipelago with a FEP regulation structure. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no significant differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve the management of these resources. The implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to the appropriate NEPA analysis at the time any substantial changes are proposed.

4.2.2.2.3. Essential Fish Habitat

Alternative 1B would not cause additional impacts on EFH or HAPC for species in the Mariana Archipelago. Implementation of the Mariana FEP for demersal fisheries is not expected to affect the fishing operations or harvest of any Federal fisheries within the Mariana Archipelago; rather it would simply reorganize the current species-based FMPs for demersal fisheries into a geographically-defined ecosystem management plan. Furthermore, similar to the No Action Alternative, the implementation of the Mariana FEP would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters or substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the Mariana Archipelago. The current management regime under the FMPs protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1B would not result in a change in fishing gear or management measures, therefore, impacts to EFH and HAPC would be similar to those under Alternative 1A.

4.2.2.2.4. Protected Species

The implementation of the archipelagic-based Mariana FEP under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Under Alternative 1B, current FMP regulations requiring fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species would not change. Existing, previous ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any ESA-listed species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in substantive changes to fishing regulations, it would maintain the same level of protection and impacts to protected species as the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) within the Mariana Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Finally, future management action proposals under Alternative 1B would include consideration of impacts on protected species as appropriate in accordance with the ESA, MMPA, and other applicable laws.

4.2.2.2.5. Fishery Participants and Communities

Alternative 1B would replace the current FMPs for Mariana demersal fisheries with an archipelagic-based Mariana FEP. No substantial change to the current regulations or fisheries would occur under the proposed Mariana FEP. However, one of the objectives of the Mariana FEP would be to recognize and increase inclusion of local expertise in the management and conservation of marine resources, which may consequently help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action Alternative, the implementation of the Mariana FEP under this alternative would be beneficial, as over time it would integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

Additionally, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward placed-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create an FEP for demersal fisheries within the Mariana Archipelago only. The remainder of the Western Pacific Region would continue to operate under existing species-based FMPs, as would the pelagic fisheries based in the Mariana Archipelago. This alternative could cause some confusion to Mariana Archipelago fisheries participants and others as they switch to ecosystem management for Mariana demersal fisheries and remain with a species-based FMP for the pelagic fisheries. For example, those fishing regulations applicable to the Mariana Archipelago demersal fisheries would be grouped together in one subpart of the Code of Federal Regulations (CFR), while those applicable to other areas would remain in their respective species-based CFR subparts.

4.2.2.2.6. Administration and Enforcement

Under Alternative 1B, no substantive changes would occur to the regulations affecting the Federal fisheries within the Mariana Archipelago. However, under Alternative 1B, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Mariana FEP and increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1B.

Impacts of Alternative 1B on enforcement and management agencies would not be expected to be adverse as the fishery boundaries, fishery operations, and associated regulations would not change. However, in the long-term, under Alternative 1B, voluntary compliance with regulations could be enhanced as fishery participants become more involved in the fishery management process. Additionally, the increased inclusion of community members with local expertise and knowledge about the conservation of marine resources, which would be encouraged by an ecosystem-based approach, would be expected to enhance management of the Mariana archipelagic fisheries.

4.2.2.3. Hawaiian Archipelago

The following sections discuss the potential impacts of Alternative 1B on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Hawaiian Archipelago.

4.2.2.3.1. Physical Environment

Under Alternative 1B, the fisheries in the Hawaiian Archipelago would continue to be managed under the five species-based FMPs. No changes would occur to the regulations or management strategy affecting these Federal fisheries. Thus, the impacts of Alternative 1B to the Hawaiian Archipelago physical environment would be similar to those under Alternative 1A, the No Action Alternative.

4.2.2.3.2. Biological Environment

Under Alternative 1B, the Federal fisheries in the Hawaiian Archipelago would continue to be managed under the five species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Thus, the impacts of Alternative 1B to the Hawaiian Archipelago physical environment would be similar to those under Alternative 1A, the No Action Alternative. As in Alternative 1A, all stock status and trends would continue to be evaluated annually, with changes to the management of these fisheries considered as new information becomes available. Also, as in Alternative 1A, regardless of the geographic categorization of stocks, issues of local depletion could be considered for management response as necessary.

4.2.2.3.3. Essential Fish Habitat

In comparison to Alternative 1A, approving and implementing Alternative 1B would not be expected to cause any additional adverse impacts on EFH or HAPC for species in the Hawaiian Archipelago. Implementation of the Mariana FEP, under Alternative 1B, would not affect the fishing operations or harvest of any Federal fisheries in the Hawaiian Archipelago; rather it would simply reorganize the species-based FMPs for demersal fisheries in the Mariana Archipelago into a geographically-defined ecosystem plan for that one area, the Mariana Archipelago. This alternative would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters or substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey in the Hawaiian Archipelago. Implementing Alternative 1B would not result in any substantive change in fishing regulations for the Federal fisheries in the Hawaiian Archipelago, therefore, EFH and HAPC impacts would not change from those under Alternative 1A.

4.2.2.3.4. Protected Species

Under Alternative 1B, the Federal fisheries in the Hawaiian Archipelago would continue to be managed under the species-based FMPs. No changes would occur to existing regulations that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Under Alternative 1B, impacts on protected species would be similar to those under Alternative 1A. Under Alternative 1B, listed species would continue to be given protection in accordance with the MSA, MMPA, ESA, and other applicable laws. Thus, the impacts of Alternative 1B to the protected species in the Hawaiian Archipelago would be similar to those under Alternative 1A, the No Action Alternative.

4.2.2.3.5. Fishery Participants and Communities

Each of the inhabited Hawaiian Islands (Niihau, Kauai, Oahu, Maui, Molokai, Lanai, and Hawaii) has been defined as a fishing community under the MSA. Under Alternative 1B, the Federal fisheries in the Hawaiian Archipelago would continue to be managed under the species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. The impacts of Alternative 1B to fishery participants and communities in the Hawaiian Archipelago would be similar to those under Alternative 1A, the No Action Alternative.

Administration and Enforcement

Under Alternative 1B, the Federal fisheries in the Hawaiian Archipelago would continue to be managed under the species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Under Alternative 1B, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Mariana FEP. Scientists and managers increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Many of these managers and scientists involved with the Mariana FEP would likely be involved in the Federal fisheries associated with the Hawaiian Archipelago. However, the impacts of Alternative 1B on managers and scientists are not expected to be significant as they increasingly are taking into account ecosystem characteristics and functions when making research and management recommendations and decisions. The impacts on enforcement under this alternative are also not expected to be adverse as no changes to current fishing regulations, boundaries, or fishing operations and associated regulations for the Federal fisheries would occur in the Hawaiian Archipelago.

4.2.2.4. PRIA

The following sections discuss the potential impacts of Alternative 1B on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the PRIA.

4.2.2.4.1. Physical Environment

Under Alternative 1B, the Federal fisheries in the PRIA would continue to be managed under the species-based FMPs. No changes would occur to the regulations affecting these fisheries. Thus, the impacts of Alternative 1B to the physical environment of the PRIA would be similar to those under Alternative 1A, the No Action Alternative.

4.2.2.4.2. Biological Environment

Under Alternative 1B, the Federal fisheries in the PRIA would continue to be managed under the species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Thus, the impacts of Alternative 1B to the PRIA's physical environment would be similar to those under Alternative 1A, the No Action Alternative. As in Alternative 1A, all stock status and trends would continue to be evaluated annually, with changes to the management of these fisheries considered as new information becomes available.

4.2.2.4.3. Essential Fish Habitat

In comparison to Alternative 1A, implementing Alternative 1B would not be expected to cause any additional impacts on EFH or HAPC for species in the PRIA. Implementation of the Mariana FEP, under Alternative 1B, would not affect the fishing operations or catches of any fisheries in the PRIA; rather it would simply reorganize the species-based FMPs for demersal fisheries into a geographically-defined ecosystem plan for this one area, the Mariana Archipelago. This one FEP would not likely lead to substantial physical or biological alterations of the oceanic and coastal habitat, or result in any alteration of waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey in the PRIA. Implementing Alternative 1B would not result in any substantive change in fishing regulations in the PRIA, therefore, EFH and HAPC would receive the same level of protection as under Alternative 1A.

4.2.2.4.4. Protected Species

Under Alternative 1B, the Federal fisheries in the PRIA would continue to be managed under the species-based FMPs. No changes would occur to existing regulations that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Under Alternative 1B, impacts on protected species in the PRIA would be similar to those under Alternative 1A. Under Alternative 1B, listed species would continue to be given protection in accordance with the MSA, MMPA, ESA, and other applicable laws.

4.2.2.4.5. Fishery Participants and Communities

There are no communities within the PRIA that are defined as a fishing community under the MSA. Under Alternative 1B, the fisheries in the PRIA would continue to be managed under the species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Thus, the impacts of Alternative 1B to fishery participants in the PRIA would be similar to those under Alternative 1A, the No Action Alternative.

4.2.2.4.6. Administration and Enforcement

Under Alternative 1B, the fisheries in the PRIA would continue to be managed under the species-based FMPs. No changes would occur to the regulations affecting these fisheries under this alternative. Under Alternative 1B, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Mariana FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Many of these managers and scientists involved with the Mariana FEP will likely be involved in the Federal fisheries associated with the PRIA. However, the impacts of Alternative 1B on managers and scientists are not expected to be adverse as they increasingly are taking into account ecosystem characteristics and functions when making research and management recommendations and decisions. The impacts on enforcement under this alternative are also not expected to be adverse as no substantive changes to current fishing regulations, boundaries, or fishing operations would occur in the PRIA.

4.2.2.5. Pelagics

The following sections discuss the potential impacts of Alternative 1B on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the fisheries operating under the existing Pelagics FMP.

Under Alternative 1B, the Federal demersal fisheries in the Mariana Archipelago would be managed under one FEP, the Mariana FEP. The pelagic fisheries based in the Mariana Archipelago would continue to be managed under the existing Pelagics FMP. Thus, spatially, the pelagic fisheries within the EEZ of the Mariana Archipelago would continue to overlap with the demersal fisheries under the proposed Mariana Archipelago FEP.

4.2.2.5.1. Physical Environment

Under Alternative 1B, the pelagic fisheries in the Mariana Archipelago would continue to be managed under the Pelagics FMP. No changes would occur to the regulations or management measures affecting the pelagic fisheries. When compared to Alternative 1A, establishing the Mariana FEP for demersal fisheries under this alternative would not alter the impacts on the physical environment by any Federal pelagic fisheries operating in the Mariana Archipelago or on the high-seas. Thus, the impacts of the Federal pelagic fisheries under Alternative 1B to the Mariana Archipelago physical environment would be similar to those under Alternative 1A, the No Action Alternative.

4.2.2.5.2. Biological Environment

Implementation of the Mariana FEP for the demersal fisheries within the Mariana Archipelago would not affect the fishing operations or harvest of any pelagic fisheries operating under the current Pelagics FMP. Thus, the impacts of operating the pelagic fisheries under Alternative 1B would be similar to those under Alternative 1A and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents of affected areas (see Table 3-20). The status and trends of target and non-target species would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1B would also replace the current species-based regulation structure for the demersal fisheries of the Mariana Archipelago with a regulation structure of an archipelagic-based FEP. No substantive changes are proposed under Alternative 1B to the regulations or to the demersal fisheries of the Mariana Archipelago through this structural reorganization. Thus, with regard to the biological environment for pelagic species, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve management of these resources. However, implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to the appropriate NEPA analysis and other applicable laws at that time.

4.2.2.5.3. Essential Fish Habitat

When compared to Alternative 1A, the No Action Alternative, Alternative 1B would not be expected to cause any additional impacts on EFH or HAPC for species currently managed under the Pelagics FMP. Furthermore, this FEP for demersal fisheries within the Mariana Archipelago would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey. This alternative would not result in any substantive change in fishing regulations, therefore, under this alternative the EFH and HAPC for the pelagic fisheries would experience the same level of impacts as under the No Action Alternative.

4.2.2.5.4. Protected Species

The implementation of the archipelagic-based FEP for demersal fisheries within the Mariana Archipelago would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Thus, under Alternative 1B impacts would be similar to those under the No Action Alternative and impacts to protected species would continue as discussed in Section 3.5 and as previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243). Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any ESA-listed species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in substantive changes to fishing regulations, it would maintain the same level of protection and impacts to protected species as the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) within the Mariana Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and prevented, reduced, or mitigated, where applicable. Finally, future management action proposals under Alternative 1B would include consideration of impacts on protected species as appropriate in accordance with the ESA, MMPA, and other applicable laws.

4.2.2.5.5. Fishery Participants and Communities

Replacing the current demersal species-based FMPs within the Mariana Archipelago with an FEP would not change regulations under the current Pelagics FMP. However, an objective of the FEP approach is the explicit recognition and increased inclusion of local expertise in the management and conservation of marine resources, which consequently may help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to Alternative 1A, the No Action Alternative, the implementation of the one FEP for demersal fisheries under this alternative would be anticipated to positively impact fishery participants and communities in the Mariana Archipelago. The long-term impacts of implementing this one FEP would also be positive as it would integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create an FEP for demersal fisheries within the Mariana Archipelago only. The remainder of the Western Pacific Region would continue to operate under existing species-based FMPs, as would the pelagic fisheries based in the Mariana Archipelago. This alternative could cause some confusion to participants in the fisheries as they switch to ecosystem management for the Mariana demersal fisheries and remain with a species-based FMP for the pelagic fisheries. For example, those fishing regulations applicable to the Mariana Archipelago demersal fisheries would be grouped together in one subpart of the Code of Federal Regulations (CFR), while those applicable to other areas would remain in their respective species-based CFR subparts.

4.2.2.5.6. Administration and Enforcement

Under Alternative 1B, the pelagic fisheries throughout the region would continue to be managed under the species-based Pelagics FMP. No changes would occur to the regulations affecting the pelagic fisheries under this alternative. However, under Alternative 1B, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Mariana FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly have been considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1B. The impacts on enforcement under this alternative would not be expected to be adverse as no substantive changes to current fishing regulations, boundaries, or fishing operations would occur for the pelagic fisheries.

4.2.3. Alternative 1C, Implement Four FEPs

Under Alternative 1C, existing FMPs would be replaced by four FEPs that include EEZ waters around each archipelagic area; the Pelagics FMP would be retained but would apply to domestic pelagic vessels operating on the surrounding high seas. Thus, individual FEPs would be implemented for the Marianas, Hawaii, and American Samoa, and the PRIA. The boundary of each FEP would encompass all Federal waters from 3 to 200 miles offshore from the seaward boundary for each of the Western Pacific Region's archipelagic areas, except the CNMI and the PRIA. For those areas, the FEPs would encompass waters 0 to 200 miles offshore. Within the FEP boundaries, both the demersal and pelagic fisheries would be managed under the proposed FEPs (Table 2-4). The management of the domestic pacific pelagic fisheries operating outside of the Western Pacific Region's archipelagic areas, as defined in Table 2-3, would remain under the Pelagics FMP; however, the Pelagics FMP would be renamed the Pacific Pelagics FMP. Existing regulations relating to the current FMPs would be reorganized to reflect the boundaries under each FEP. Although the regulations would be reorganized under Alternative 1C, no substantive changes would occur to current fishing regulations.

4.2.3.1. American Samoa Archipelago

The following sections discuss the potential impacts of Alternative 1C on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the American Samoa Archipelago FEP area.

4.2.3.1.1. Physical Environment

Under Alternative 1C, all fisheries, both demersal and pelagic species, within the American Samoa Archipelago area that are currently managed by the five species-based FMPs would be managed under the proposed American Samoa FEP. The domestic pelagic fisheries operating outside the waters of the U.S. EEZ would be managed under the Pacific Pelagics FMP. However, these boundaries are not physically apparent. The boundaries under the FMPs and the proposed FEP are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1C also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur under Alternative 1C. Thus, with regard to the impacts on the physical environment of the American Samoa Archipelago in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.3.1.2. Biological Environment

Implementation of the American Samoa FEP to manage fisheries in the U.S. EEZ around American Samoa, in combination with the Pacific Pelagics FMP, would have potential positive and negative impacts on target and non-target species. Negative impacts would be reduction of target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would be an anticipated improvement in fishery ecosystem management. However, implementation of the place-based American Samoa FEP under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the American Samoa FEP on the biological environment would be similar to those under Alternative 1A. The status and trends of target and non-target species within the American Samoa area would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1C would replace the current species-based FMPs’ regulation structure with an FEP regulation structure for the American Samoa area. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization under Alternative 1C. Thus, with regard to the biological environment in the short-term, there would be no significant differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species is expected to improve management of these resources. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to the appropriate NEPA analysis at the time changes are proposed.

4.2.3.1.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1C would not cause any additional adverse impacts on EFH or HAPC for species in the American Samoa FEP. Implementation of the FEP would not affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into one geographically-defined ecosystem management plan. Furthermore, when compared to the No Action Alternative, the implementation of the American Samoa FEP would not likely lead to any substantial additional physical or biological alterations to the oceanic and coastal habitat, or result in detrimental alterations to waters or substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in American Samoa. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1C would not result in any substantial change to fishing regulations, therefore, EFH and HAPC would maintain the same level of impacts as described for Alternative 1A.

4.2.3.1.4. Protected Species

The implementation of the American Samoa FEP under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify their critical habitat.

Since this alternative would not result in any substantive change to fishing regulations in fishing gear or strategy, this alternative would maintain the same level of protection for protected species as under the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) within the American Samoa fisheries through which interactions with protected species can be monitored by NMFS, and, where applicable, prevented, reduced, or mitigated. Future management action proposed under Alternative 1C would include consideration of impacts on protected species, as appropriate, in accordance with applicable laws and regulations at the time that changes are proposed.

4.2.3.1.5. Fishery Participants and Communities

Alternative 1C would replace the current FMPs with a place-based American Samoa FEP. No substantial change to the current regulations or fisheries would occur under the proposed FEP. However, one of the objectives of the American Samoa FEP would be increased recognition and inclusion of local expertise in the management and conservation of marine resources, which consequently may help reduce the effects of some exogenous factors on fishery participants and communities. When compared to the No Action Alternative, the implementation of the American Samoa FEP under this alternative would positively impact fishery participants and communities in American Samoa. The anticipated long-term impacts of implementing the American Samoa FEP would also be positive as the FEP would integrate scientific information and human needs in a manner that would increase the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create an American Samoa FEP, which would include both demersal and pelagic species. The domestic pelagic fisheries operating in the high seas of the Western Pacific Region would continue to operate under the existing species-based Pelagics FMP.

As noted earlier, pelagic species are highly migratory. It is anticipated that this alternative could cause some confusion to participants targeting these highly migratory species as they switch from the high seas Pacific Pelagics FMP to the proposed place-based FEP. This would especially be true if regulations for the pelagic fisheries were to become inconsistent, or overly specific, between the proposed place-based FEP and the domestic pelagic fisheries on the high seas. Thus, Alternative 1C poses a potential negative impact on fishery participants targeting pelagic species under the American Samoa FEP and the Pacific Pelagics FMP.

4.2.3.1.6. Administration and Enforcement

Under Alternative 1C, no substantive changes would occur to the regulations affecting the fisheries in American Samoa. However, under Alternative 1C, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed American Samoa FEP. Managers and scientists increasingly would be asked to consider fishery interactions in the American Samoa fisheries, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries’ ecosystems would probably remain unchanged under Alternative 1C.

Alternative 1C could produce adverse effects on enforcement agencies if future regulations developed for the pelagic fisheries become overly specific or inconsistent with the proposed American Samoa FEP and the domestic pelagic fisheries operating on the high seas, managed under the Pacific Pelagics FMP.

4.2.3.2. Mariana Archipelago

The following sections discuss the potential impacts of Alternative 1C on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Mariana Archipelago.

4.2.3.2.1. Physical Environment

Under Alternative 1C, all fisheries, for both demersal and pelagic species, within the Mariana Archipelago currently managed by the five species-based FMPs would be managed under the proposed Mariana Archipelago FEP. The domestic pelagic fisheries outside the waters of the

U.S. EEZ (i.e., on the high seas) would be managed under the Pacific Pelagics FMP. However, these boundaries are not physically apparent. The boundaries under the FMPs or the proposed FEP are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1C also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur under Alternative 1C. Thus, with regard to the physical environment of the Mariana Archipelago in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.3.2.2. Biological Environment

Implementation of the Mariana FEP, in combination with the Pacific Pelagics FMP, would have potential impacts on target and non-target species. However, implementation of the archipelagic-based Mariana FEP under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of approving and implementing the Mariana FEP would be similar to those under Alternative 1A. The status and trends of target and non-target species within the Mariana Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1C would replace the current species-based FMP regulation structure with an FEP regulation structure for the Mariana Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization under Alternative 1C. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve management of these resources. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws.

4.2.3.2.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1C would not cause impacts on EFH or HAPC for species in the Mariana FEP. Implementation of the FEP would not be expected to affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into one geographically-defined ecosystem management plan. Furthermore, when compared to the No Action Alternative, the implementation of the Mariana FEP would not likely lead to substantial physical or biological alterations of the oceanic and coastal habitat, or result in any alteration of waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed Mariana FEP. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1C would not result in any substantive change to fishing regulations, therefore, EFH and HAPC would maintain the same level of impacts as described for Alternative 1A.

4.2.3.2.4. Protected Species

The implementation of the archipelagic-based Mariana FEP under this alternative would not change existing regulations, including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in any substantial change to fishing regulations it would maintain the same level of protection for protected species as under the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) within the Mariana Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Future management actions proposed under Alternative 1C would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.3.2.5. Fishery Participants and Communities

Alternative 1C would replace the current FMPs with an archipelagic-based Mariana Archipelago FEP. No substantive change to the current regulations or fisheries would occur under the proposed FEP. However, one of the objectives of the Council in promoting a Mariana Archipelagic FEP is to increase recognition and inclusion of local expertise in the management and conservation of marine resources, which may consequently help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action Alternative, the implementation of the Mariana FEP under this alternative would positively impact fishery participants and communities in the Mariana Archipelago by increasing the availability of local knowledge in the fishery management decisionmaking process. The anticipated long-term impacts of implementing the Mariana FEP would also be positive as the FEP would integrate scientific information and human needs in a manner that would increase the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create a Mariana FEP, which would include both demersal and pelagic species. The domestic pelagic fisheries operating in the high seas of the Western Pacific Region would continue to operate under the existing species-based Pelagics FMP.

As noted earlier, pelagic species are highly migratory. It is anticipated that this alternative could cause some confusion to participants targeting these highly migratory species as they switch from the high seas Pacific Pelagics FMP to the proposed archipelagic-based FEP. This would especially be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed archipelagic-based FEP. Thus, Alternative 1C poses a potential negative impact on fishery participants targeting pelagic species under the Mariana FEP and the Pacific Pelagics FMP.

4.2.3.2.6. Administration and Enforcement

Under Alternative 1C, no substantive changes would occur to the regulations affecting the fisheries within the Mariana Archipelago. However, under Alternative 1C, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Mariana FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, respectively. This current heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1C.

Alternative 1C could produce adverse affects on enforcement agencies if future regulations developed for the pelagic fisheries become overly specific or inconsistent with the proposed Mariana FEP.

4.2.3.3. Hawaiian Archipelago

The following sections discuss the potential impacts of Alternative 1C on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Hawaiian Archipelago.

4.2.3.3.1. Physical Environment

Under Alternative 1C, all fisheries, for both demersal and pelagic species, within the Hawaiian Archipelago currently managed by the five species-based FMPs would be managed under the proposed Hawaii FEP. The domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagics FMP. However, these boundaries are not physically apparent. The boundaries under FMPs or proposed FEP are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1C also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur in Alternative 1C. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the Hawaiian Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.3.3.2. Biological Environment

Implementation of the Hawaii FEP to manage fisheries in the Hawaiian Archipelago, in combination with the Pacific Pelagics FMP, would have potential positive and negative impacts on target and non-target species. However, implementation of the archipelagic-based Hawaii FEP under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of approving and implementing the Hawaii FEP would be similar to those under Alternative 1A. The status and trends of target and non-target species within the Hawaiian Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1C would replace the current species-based FMP regulation structure with an FEP regulation structure for the Hawaiian Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization under Alternative 1C. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve management of these resources. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to the appropriate NEPA analysis at the time changes are proposed.

4.2.3.3.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1C would not cause impacts on EFH or HAPC for species in the Hawaii FEP. Implementation of the FEP would not affect the fishing operations or catches of any fisheries; rather, it would simply reorganize the current species-based FMPs into one geographically-defined ecosystem management plan. Furthermore, when compared to the No Action Alternative, the implementation of the Hawaii FEP would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed Hawaii FEP. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1C would not result in any substantive change to fishing regulations, therefore, EFH and HAPC would maintain the same level of impacts as described for Alternative 1A.

4.2.3.3.4. Protected Species

The implementation of the archipelagic-based Hawaii FEP under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in any changes to fishing regulations, it would maintain the same level of protection and impacts for protected species as under the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) within the Hawaiian Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Future management actions proposed under Alternative 1C would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.3.3.5. Fishery Participants and Communities

Alternative 1C would replace the current FMPs with an archipelagic-based Hawaii FEP. No substantial change to the current regulations or fisheries would occur under the proposed FEP. However, one of the objectives of the Hawaii FEP would be to increase recognition and inclusion of local expertise in the management and conservation of marine resources, which consequently may help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action Alternative, the implementation of the Hawaii FEP under this alternative would positively impact fishery participants and communities in the Hawaiian Archipelago. The anticipated long-term impacts of implementing the Hawaii FEP would also be positive as the FEP may integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create a Hawaii FEP, which would include both demersal and pelagic species. The domestic pelagic fisheries operating in the high seas of the Western Pacific Region would continue to operate under the existing species-based Pelagics FMP.

As noted earlier, pelagic species are highly migratory. It is anticipated that this alternative could cause some confusion to participants targeting these highly migratory species as they switch from the high seas Pacific Pelagics FMP to the proposed archipelagic-based FEP. This would especially be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed archipelagic-based FEP and the domestic pelagic fisheries on the high seas. Thus, Alternative 1C would pose a potential negative impact on fishery participants targeting pelagic species under the Hawaii FEP and the Pacific Pelagics FMP.

4.2.3.3.6. Administration and Enforcement

Under Alternative 1C, no substantive changes would occur to the regulations affecting the fisheries within the Hawaiian Archipelago. However, under Alternative 1C, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Hawaii FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the Hawaiian Archipelago, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, respectively; this current heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1C.

Alternative 1C could produce adverse affects on enforcement agencies if future regulations developed for the pelagic fisheries become overly specific or inconsistent with the proposed Hawaii FEP and the domestic pelagic fisheries on the high seas, managed under the Pacific Pelagics FMP.

4.2.3.4. PRIA

The following sections discuss the potential impacts of Alternative 1C on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the PRIA.

4.2.3.4.1. Physical Environment

Under Alternative 1C, all fisheries, for both demersal and pelagic species, within the PRIA currently managed by the five species-based FMPs would be managed under the proposed PRIA FEP. The domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagics FMP. However, these boundaries are not physically apparent. The boundaries under the FMPs or the proposed FEP are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1C also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur under Alternative 1C. Thus, with regard to the physical environment in the short-term, there would be no significant differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the PRIA. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would be expected to improve our understanding and conservation of the physical environment.

4.2.3.4.2. Biological Environment

Implementation of the PRIA FEP to manage fisheries in the PRIA, in combination with the Pacific Pelagics FMP, would have potential positive and negative impacts on target and non-target species. However, implementation of the archipelagic-based PRIA FEP under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of approving and implementing the PRIA FEP would be similar to those under Alternative 1A. The status and trends of target and non-target species within the PRIA would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1C would replace the current species-based FMP regulation structure with an FEP regulation structure for the PRIA. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization under Alternative 1C. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve management of these resources. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to the appropriate NEPA analysis at the time amendments are proposed.

4.2.3.4.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1C would not be expected to impact EFH or HAPC for species in the PRIA FEP. Implementation of the FEP would not affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into one geographically-defined ecosystem management plan. Furthermore, when compared to the No Action Alternative, the implementation of the PRIA FEP would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters or substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed PRIA FEP. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1C would not result in any substantive change in fishing regulations; therefore, EFH and HAPC would maintain the same level of impacts as under the No Action alternative.

4.2.3.4.4. Protected Species

The implementation of the archipelagic-based PRIA FEP under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in any substantive changes to fishing regulations, this alternative would maintain the same level of protection and impacts for protected species as under the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) within the PRIA fisheries through which interactions with protected species can be monitored by NMFS, and, where applicable, prevented, reduced, or mitigated. Future management actions proposed under Alternative 1C would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.3.4.5. Fishery Participants and Communities

Alternative 1C would replace the current FMPs with an archipelagic-based PRIA FEP. No substantive change to the current regulations or fisheries would occur under the proposed FEP. Under the MSA, there are no identified fishing communities within the PRIA, and fishermen engaged in fisheries in the PRIA would continue to have opportunities to have input on fishery management decisions affecting PRIA areas.

When compared to the No Action Alternative, the implementation of the PRIA FEP under this alternative would be anticipated to positively impact fishery participants in the PRIA. The anticipated long-term impacts of implementing the PRIA FEP would also be positive as the FEP may integrate scientific information and human needs in a manner that increases the involvement of participants in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create a PRIA FEP, which would include both demersal and pelagic species. The domestic pelagic fisheries operating in the high seas of the Western Pacific Region would continue to operate under the existing species-based Pelagics FMP.

As noted earlier, pelagic species are highly migratory. It is anticipated that this alternative could cause some confusion to participants targeting these highly migratory species as they switch from the high seas Pacific Pelagics FMP to the proposed archipelagic-based FEP. This would especially be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed archipelagic-based FEP. Thus, Alternative 1C would pose a potential negative impact on fishery participants targeting pelagic species under the PRIA FEP and the Pacific Pelagics FMP.

4.2.3.4.6. Administration and Enforcement

Under Alternative 1C, no substantive changes would occur to the regulations affecting the fisheries within the PRIA. However, under Alternative 1C, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed PRIA FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the PRIA, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1C.

Alternative 1C could produce adverse affects on enforcement agencies if future regulations developed for the pelagic fisheries were to become overly specific or inconsistent with the proposed PRIA FEP.

4.2.3.5. Pelagics

The following sections discuss the potential impacts of Alternative 1C on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the fisheries operating under the current Pacific Pelagics FMP.

4.2.3.5.1. Physical Environment

Under Alternative 1C, all fisheries taking place in the U.S. EEZ, involving both demersal and pelagic species, would be managed by the proposed archipelagic-based FEPs. The domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagics FMP. When compared to the No Action Alternative (Alternative 1A) as a baseline, replacing the species-based FMPs with the four archipelagic-based FEPs and one Pacific Pelagics FMP would not impact the physical environment of marine ecosystems under any of the action alternatives. The boundaries are not physically apparent as established under either the current FMPs or the proposed archipelagic-based FEPs in this alternative. The boundaries under species-based FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. No substantive changes to current fishing regulations or operations would occur in any of the alternatives. Thus, with regard to the physical environment in the short-term, there are no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.3.5.2. Biological Environment

Implementation of the archipelagic-based FEPs, for both demersal and pelagic species, and the one Pacific Pelagics FMP would have potential positive and negative impacts on targeted pelagic species and non-target species. Negative impacts would be the impact of fishing on target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would be an anticipated improvement in fishery ecosystem management. However, implementation of Alternative 1C would not affect the fishing operations or catches of any fisheries operating under the current Pacific Pelagics FMP. Thus, the impacts of pelagic fisheries under Alternative 1C would be similar to those under Alternative 1A, which has been previously analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243), as updated in subsequent NEPA documents (see Table 3-20). The status and trends of target and non-target species would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1C also would replace the current structure of the regulations under the species-based Pelagics FMP with a regulation structure of four archipelagic-based FEPs and a Pacific Pelagics FMP. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve management of these resources. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at the time changes were being considered.

4.2.3.5.3. Essential Fish Habitat

When compared to the No Action Alternative, none of the action alternatives would impact EFH or HAPC for species currently managed under the Pacific Pelagics FMP. Furthermore, the four archipelagic-based FEPs, as proposed under this alternative, would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters or substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey. This alternative would not result in any substantive change in fishing regulations, therefore, under this alternative the EFH and HAPC would maintain the same level of impacts as under the No Action Alternative.

4.2.3.5.4. Protected Species

The implementation of the archipelagic-based FEPs under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in a change in fishing gear or strategy, this alternative would maintain the same level of protection and impacts for protected species as under the No Action Alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) for pelagic fisheries, through which interactions with protected species can be monitored by NMFS, and, where applicable, prevented, reduced, or mitigated. Future management actions under Alternative 1C would receive consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.3.5.5. Fishery Participants and Communities

Alternative 1C would replace the current FMPs with four archipelagic-based FEPs and one Pacific Pelagics FMP. No substantial change to the current regulations or fisheries would occur under the proposed FEPs. However, one of the objectives of each of the archipelagic-based FEPs is the increased recognition and inclusion of local expertise in the management and conservation of marine resources, which consequently may help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action Alternative, the implementation of the archipelagic-based FEP under this alternative is anticipated to positively impact fishery participants and communities in the region. The anticipated long-term impacts of implementing the FEPs would also be positive as the FEPs would integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create four archipelagic-based FEPs, which would include both demersal and pelagic species. The domestic pelagic fisheries operating in the high seas but that are based within the Western Pacific Region would continue to operate under a Pacific Pelagics FMP.

As noted earlier, pelagic species are highly migratory. It is anticipated that this alternative could cause some confusion to participants targeting these highly migratory species as fishermen switch from the high seas Pacific Pelagics FMP to the proposed archipelagic-based FEPs. This would especially be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed archipelagic-based FEPs. Thus, Alternative 1C would pose a potential negative impact on fishery participants targeting pelagic species.

4.2.3.5.6. Administration and Enforcement

Under Alternative 1C, no substantive changes would occur to the regulations affecting the pelagic fisheries. However, under Alternative 1C, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed FEPs. Managers and scientists would increasingly be asked to consider fishery interactions within the Hawaiian Archipelago, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups would also be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1C.

Pelagic species are highly migratory species. Alternative 1C could produce adverse affects on enforcement agencies if future regulations developed for the pelagic fisheries were to become overly specific or inconsistent with the proposed archipelagic-based FEP~~.~~

4.2.4. Alternative 1D - Implement Five FEPs (Preferred)

Under Alternative 1D, the Preferred Alternative, the boundaries of the four archipelagic ecosystems (American Samoa, Hawaii, Mariana, and PRIA) as described in Alternative 1C, would be defined and four FEPs for demersal fisheries would be approved and implemented. Additionally, a fifth FEP, the Pelagic FEP, would also be approved and implemented. The Pelagic FEP would include the marine resources associated with pelagic species within all U.S. EEZs and the management of the U.S. domestic pelagic fisheries on the high seas of the Western Pacific Region. Alternative 1C and Alternative 1D are very similar, with the following exceptions: (1) Alternative 1D would establish a Pelagic FEP, which would replace the current Pelagics FMP, and (2) under Alternative 1D, the management of the pelagic fisheries within the boundaries of the four archipelagic-based FEPs would remain with the Pelagic FEP, and archipelagic FEPs would cover management of all demersal fisheries in each archipelagic area.

The boundary of the Pelagic FEP would overlap with the boundaries of the four FEPs for demersal fisheries; however, the Pelagic FEP would specifically manage those resources and habitats associated with the pelagic ecosystem (see Table 2–5). In addition, under Alternative 1D, existing regulations relating to the current FMPs would be reorganized to reflect the boundaries of the FEPs (see Table 2–6). Although the existing fishery regulations would be reorganized, no substantive changes would be made to them.

The Draft FEPs, as proposed under Alternative 1D, are available from the Council's website at www.wpcouncil.org or by mail[68] from the Council. Additionally, a Compact Disc containing electronic copies of the draft FEPs is included with this FPEIS.

4.2.4.1. American Samoa Archipelago

The following sections discuss the potential impacts of Alternative 1D on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the American Samoa area.

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

4.2.4.1.1. Physical Environment

Under Alternative 1D, the demersal fisheries within the American Samoa Archipelago, currently managed by the four demersal species-based FMPs, would be managed under the proposed American Samoa FEP. The pelagic fisheries within the American Samoa Archipelago and the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1D also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur under Alternative 1D. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the physical environment of the American Samoa marine ecosystem. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.4.1.2. Biological Environment

Implementation of the American Samoa FEP, in combination with the Pelagic FEP, would have potential positive and negative impacts on target and non-target species. Negative impacts would include reduction of target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would include an anticipated improvement in fishery ecosystem management. However, implementation of the archipelagic-based FEP for demersal fisheries within the American Samoa Archipelago under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the demersal American Samoa FEP and the associated Pelagic FEP would be no different from those of Alternative 1A, the No Action alternative. The status and trends of target and non-target species within the American Samoa Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1D would also replace the current species-based FMP regulation structure for demersal fisheries with an FEP regulation structure within the American Samoa Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve the management of these resources. However, the implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to the appropriate NEPA analysis at the time amendments are proposed.

4.2.4.1.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1D would not impact EFH or HAPC for species in the American Samoa FEP. Implementation of the American Samoa FEP would not affect the fishing operations or catches of any fisheries within the American Samoa Archipelago; rather it would simply reorganize the current demersal species-based FMPs into a geographically-defined ecosystem management plan. Furthermore, when compared to the No Action Alternative, the implementation of the American Samoa FEP would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, or growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed American Samoa FEP. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1D would not result in substantive changes in fishing regulations, therefore, EFH and HAPC would maintain the same level of impacts as described for Alternative 1A.

4.2.4.1.4. Protected Species

The implementation of the archipelagic-based American Samoa FEP under the preferred alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in substantive changes to fishing regulations, it would maintain the same level of impacts to protected species as under the No Action alternative. In addition, it would continue current data collection programs (e.g., logbooks, observers) for pelagic fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Future management actions under Alternative 1D would receive consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.4.1.5. Fishery Participants and Communities

Alternative 1D would replace the current FMPs with an archipelagic-based American Samoa FEP. No substantive change to the current regulations or fisheries would occur under the proposed American Samoa FEP. However, one of the objectives of the American Samoa FEP is to increase recognition and inclusion of local expertise in the management and conservation of marine resources, which may consequently help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action Alternative, the implementation of the American Samoa FEP under this alternative would be beneficial as it would integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

Additionally, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward placed-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. When compared to the other Action Alternatives, it is anticipated that this alternative would cause the least amount of confusion to participants in the fisheries, as the entire Western Pacific Region would switch from FMPs to placed-based FEPs, with no substantive changes in the regulations.

4.2.4.1.6. Administration and Enforcement

Under Alternative 1D, no substantive changes would occur to the regulations affecting the fisheries within the American Samoa Archipelago. However, under Alternative 1D, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed American Samoa FEP. Managers and scientists would be asked to increasingly consider fishery interactions within the American Samoa Archipelago, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups would be asked more and more often to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists are already frequently considering ecosystem characteristics and functions when conducting research and making management decisions, respectively, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1D.

With regard to the fisheries within the American Samoa Archipelago in the short-term, impacts of Alternative 1D on enforcement and management agencies would not be adverse as the fishery boundaries, fishery operations, and regulations would not change. However, in the long-term, under Alternative 1D, compliance with regulation could be increased in the communities of American Samoa as the participants voluntarily become more involved in fishery management. Additionally, the increased inclusion of community members with local expertise and knowledge about the conservation of the marine resources, which would be encouraged by an ecosystem-based approach, would be expected to enhance management of American Samoa fisheries.

4.2.4.2. Mariana Archipelago

The following sections discuss the potential impacts of Alternative 1D on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Mariana Archipelago.

4.2.4.2.1. Physical Environment

Under Alternative 1D, the demersal fisheries within the Mariana Archipelago, currently managed under the four demersal species-based FMPs, would be managed under the proposed Mariana FEP. The pelagic fisheries within the Mariana Archipelago and the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1D also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur under Alternative 1D. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the Mariana Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve information available for understanding and conserving the physical environment.

4.2.4.2.2. Biological Environment

Implementation of the Mariana FEP to manage fisheries in the Mariana Archipelago, in combination with the Pelagic FEP, would have potential positive and negative impacts on target and non-target species. Negative impacts would be the impact of fishing on target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would include an anticipated improvement in fishery ecosystem management. However, implementation of the archipelagic-based FEP for demersal species within the Mariana Archipelago under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. The status and trends of target and non-target species within the Mariana Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1D would replace the current species-based FMP regulation structure for demersal fisheries with an FEP regulation structure for the Mariana Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve the management of these resources. However, the implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at the time that amendments are proposed.

4.2.4.2.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1D would not impact EFH or HAPC for species in the Mariana Archipelago. Implementation of the Mariana FEP would not affect the fishing operations or catches of any fisheries within the Mariana Archipelago; rather it would simply reorganize the current demersal species-based FMPs into a geographically-defined ecosystem management plan. Furthermore, when compared to the No Action alternative, the implementation of the Mariana Archipelago FEP would not lead to substantial physical or biological alterations of the oceanic and coastal habitat, or result in any alteration of waters and substrate necessary for spawning, breeding, feeding, or growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed American Samoa FEP. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1D would not result in substantive change in fishing regulations; therefore, there would be no change to impacts on EFH and HAPC.

4.2.4.2.4. Protected Species

The implementation of the archipelagic-based Mariana FEP under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in a change in fishing gear or strategy, this alternative would result in no substantial change in impacts to listed species. Implementing the Mariana FEP would allow for the continuation of data collection programs (e.g., logbooks, observers) within the Mariana Archipelago fisheries, which would help managers to monitor interactions with protected species. Future management actions proposed under Alternative 1D would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.4.2.5. Fishery Participants and Communities

Alternative 1D would replace the current FMPs with an archipelagic-based Mariana FEP. No substantive change to the current regulations or fisheries would occur under the proposed Mariana FEP. However, one of the objectives of the Mariana FEP would be to increase recognition and inclusion of local expertise in the management and conservation of marine resources, which consequently may help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action alternative, the implementation of the Mariana FEP under this alternative is anticipated to be beneficial as it would integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

Additionally, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward placed-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. When compared to the other action alternatives, it is anticipated that this alternative would cause the least amount of confusion to participants in the fisheries, as the entire Western Pacific Region would switch from FMPs to placed-based FEPs, with no substantive changes in the regulations.

4.2.4.2.6. Administration and Enforcement

Under Alternative 1D, no substantive changes would occur to the regulations affecting the fisheries within the Mariana Archipelago. However, under Alternative 1D, managers and scientists would need to adapt to the place-based and multispecies nature of the proposed Mariana FEP. Managers and scientists increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would continue under Alternative 1D.

With regard to the fisheries within the Mariana Archipelago, in the short-term, impacts of Alternative 1D on enforcement agencies would not be adverse as the fishery boundaries, fishery operations, and management and regulations would not change. However, in the long-term under Alternative 1D, compliance with regulations could be increased in the communities of the Mariana area as the participants voluntarily become more involved in fishery management. Additionally, the increased inclusion of community members with local expertise and knowledge about the conservation of marine resources, which would be encouraged by an ecosystem-based approach, is expected to enhance management of the Mariana fisheries.

4.2.4.3. Hawaiian Archipelago

The following sections discuss the potential impacts of Alternative 1D on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Hawaiian Archipelago.

4.2.4.3.1. Physical Environment

Under Alternative 1D, the demersal fisheries within the Hawaiian Archipelago, currently managed by the four demersal species-based FMPs, would be managed under the proposed Hawaii FEP. The pelagic fisheries within the Hawaiian Archipelago and the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1D also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur in Alternative 1D. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action alternative on the Hawaiian Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would be expected to improve our understanding and conservation of the physical environment.

4.2.4.3.2. Biological Environment

Implementation of the Hawaii FEP to manage fisheries in the Hawaiian Archipelago, in combination with the Pelagic FEP, would have potential positive and negative impacts on target and non-target species. However, implementation of the archipelagic-based FEP for demersal species within the Hawaiian Archipelago under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the demersal Hawaii FEP and the associated Pelagic FEP would be similar to those under Alternative 1A. The status and trends of target and non-target species within the Hawaiian Archipelago would continue to be evaluated as in the current Annual Report to Congress series, using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1D would also replace the current species-based FMP regulatory structure for demersal fisheries with an FEP regulatory structure for the Hawaiian Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, in regards to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve the management of these resources. However, the implementation of ecosystem science, principles, and management actions through future amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at that time.

4.2.4.3.3. Essential Fish Habitat

Similar to Alternative 1A, implementing Alternative 1D would not cause adverse impacts on EFH or HAPC for species in the Hawaiian Archipelago. Implementation of the Hawaii FEP would not affect the fishing operations or catches of any fisheries within the Hawaiian Archipelago; rather it would simply reorganize the current demersal species-based FMPs into a geographically-defined ecosystem management plan. Furthermore, similar to the No Action alternative, the implementation of the Hawaii FEP would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, or growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed Hawaii FEP. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1D would not result in any substantive changes to fishing regulations; therefore, EFH and HAPC would maintain the same level of impacts as under the No Action Alternative.

4.2.4.3.4. Protected Species

The implementation of the archipelagic-based Hawaii FEP under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in a change in fishing gear or strategy, this alternative would maintain the same level of protection for protected species as under the No Action Alternative. In addition, implementing the Hawaii FEP would allow for the continuation of data collection programs (e.g., logbooks, observers) within the Hawaiian Archipelago fisheries through which interactions with protected species can be monitored by NMFS. Future management actions under Alternative 1D would consider impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.4.3.5. Fishery Participants and Communities

Alternative 1D would replace the current FMPs for demersal fisheries with an archipelagic-based Hawaii FEP. No substantive change to the current regulations or fisheries would occur under the proposed Hawaii FEP. However, one of the objectives of the Hawaii FEP is to increase recognition and inclusion of local expertise in the management and conservation of marine resources, which consequently may help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. Similar to the No Action alternative, the implementation of the Hawaii FEP under this alternative is anticipated to be beneficial, as it would integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

Additionally, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward placed-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. When compared to the other action alternatives, it is anticipated that this alternative would cause the least amount of confusion to participants in the fisheries, as the entire Western Pacific Region would switch from FMPs to placed-based FEPs, with no substantial changes in the regulations.

4.2.4.3.6. Administration and Enforcement

Under Alternative 1D, no substantive changes would occur to the regulations affecting the fisheries within the Hawaiian Archipelago. However, under Alternative 1D, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Hawaii FEP. Managers and scientists would be asked to increasingly consider fishery interactions within the Hawaiian Archipelago, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists are increasingly considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1D.

With regard to the fisheries within the Hawaiian Archipelago, in the short-term, impacts of Alternative 1D on enforcement agencies are not expected to be significant as the fishery boundaries, fishery operations, and regulations would not change. However, in the long-term under Alternative 1D, compliance with regulation could be increased in the communities of Hawaii as the participants voluntarily become more involved in fishery management. Additionally, the increased inclusion of community members with local expertise and knowledge about the conservation of marine resources, which would be encouraged by an ecosystem-based approach, is expected to enhance management of Hawaii's fisheries.

4.2.4.4. PRIA

The following sections discuss the potential impacts of Alternative 1D on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the PRIA.

4.2.4.4.1. Physical Environment

Under Alternative 1D, the demersal fisheries within the PRIA, currently managed under the four demersal species-based FMPs, would be managed under the proposed PRIA FEP. The pelagic fisheries within the PRIA and the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. Alternative 1D also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations; however, no substantive changes to current fishing regulations would occur in Alternative 1D. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the PRIA. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.4.4.2. Biological Environment

Implementation of the PRIA FEP to manage fisheries in the PRIA, in combination with the Pelagic FEP, would have potential positive and negative impacts on target and non-target species. However, implementation of the archipelagic-based FEP for demersal fisheries within the PRIA under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. The status and trends of target and non-target species within the PRIA would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1D would replace the current species-based FMP regulation structure for demersal fisheries with an FEP regulation structure for the PRIA. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve the management of these resources. However, the implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws.

4.2.4.4.3. Essential Fish Habitat

Similar to Alternative 1A, Alternative 1D would not cause adverse impacts on EFH or HAPC for species managed under the PRIA FEP. Implementation of the PRIA FEP would not affect the fishing operations or catches of any fisheries within the PRIA; rather it would simply reorganize the current demersal species-based FMPs into a geographically-defined ecosystem management plan. Furthermore, similar to the No Action alternative, the PRIA FEP would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed PRIA FEP. The current management regime under the FMPs protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1D would not result in any substantive change to fishing regulations; therefore, EFH and HAPC would experience the same level of protection as currently occurs under the species-based FMPs.

4.2.4.4.4. Protected Species

The implementation of the archipelagic-based PRIA FEP under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in a change in fishing gear or strategy, this alternative would maintain the same level of protection for protected species as under the No Action Alternative. In addition, implementing the PRIA FEP would allow for the continuation of data collection programs (e.g., logbooks, observers) within the PRIA fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Future management actions under Alternative 1D would receive consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.4.4.5. Fishery Participants and Communities

Alternative 1D would replace the current FMPs for demersal fisheries with an archipelagic-based PRIA FEP. No substantial change to the current regulations or fisheries would occur under the proposed PRIA FEP. There are no fishing communities as defined under MSA within the PRIA. When compared to the No Action Alternative, the implementation of the PRIA FEP under this alternative is anticipated to be beneficial as it may integrate scientific information and human needs in a manner that increases the involvement of participants in the management and conservation of marine resources.

Additionally, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward placed-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. When compared to the other Action Alternatives, it is anticipated that this alternative would cause the least amount of confusion to participants in the fisheries, as the entire Western Pacific Region would switch from FMPs to placed-based FEPs, with no substantial changes in the regulations.

4.2.4.4.6. Administration and Enforcement

Under Alternative 1D, no substantive changes would occur to the regulations affecting the fisheries within the PRIA. However, under Alternative 1D, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed PRIA FEP. Managers and scientists would be asked to increasingly consider fishery interactions within the PRIA, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups would be asked to increasingly consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists are increasingly considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1D.

With regard to the fisheries within the PRIA, in the short-term, impacts of Alternative 1D on enforcement agencies would not be significant as the fishery boundaries, fishery operations, and regulations would not change. However, in the long-term under Alternative 1D, compliance with regulations could be increased as PRIA fishery participants become more involved in fishery management.

4.2.4.5. Pelagic

The following sections discuss the potential impacts of Alternative 1D on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the fisheries operating under the current Pelagics FMP.

4.2.4.5.1. Physical Environment

Under Alternative 1D, the demersal fisheries would be managed under the four proposed archipelagic-based FEPs. The pelagic fisheries within the boundaries of these archipelagic-based FEPs and the domestic pelagic fisheries operating outside the waters of the U.S. EEZ would be managed under the Pelagic FEP. When compared to the No Action Alternative as a baseline, replacing the five species-based FMPs with the five FEPs would not impact the physical environment of marine ecosystems under any of the Action Alternatives. The boundaries are not physically apparent as established under either the current FMPs or boundaries established under the proposed FEPs in this alternative. The boundaries under species-based FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. No substantive changes to current fishing regulations or operations would occur. Thus, with regard to the physical environment for the pelagic fisheries in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action alternative. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.4.5.2. Biological Environment

Implementation of the five FEPs would have potential positive and negative impacts on targeted pelagic species and non-target species. However, implementation of Alternative 1D is not expected to affect the fishing operations or catches of any fisheries operating under the current Pelagics FMP. No substantive changes to the regulations or the fisheries are proposed under Alternative 1D. Thus, the impacts of operating the pelagic fisheries under Alternative 1D would be similar to impacts under Alternative 1A, which has previously been analyzed in the 2001 EIS (April 6, 2001; 66 FR 18243) and in subsequent NEPA documents (see Table 3-20). The status and trends of target and non-target species would continue to be evaluated annually using existing criteria and thresholds for defining "overfishing" and "overfished" conditions as currently applied to individual stocks or stock complexes.

Thus, in regards to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve the management of the pelagic resources. However, implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to the proposed Pelagic FEP would be subject to NEPA and other applicable laws.

4.2.4.5.3. Essential Fish Habitat

Similar to the No Action Alternative, Alternative 1D would not impact EFH or HAPC for species managed currently under the Pelagics FMP. Furthermore, the five FEPs that are proposed under this alternative would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey. Alternative 1D would not result in a change in fishing gear or strategy, therefore, under this alternative the EFH and HAPC would maintain the same level of protection as under the No Action alternative.

4.2.4.5.4. Protected Species

The implementation of the archipelagic-based FEPs under this alternative would not change existing regulations, including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in a substantive change to fishing regulations, this alternative would maintain the same level of protection and impacts to protected species as under the No Action Alternative. In addition, implementing the FEPs would allow for the continuation of data collection programs (e.g., logbooks, observers) through which interactions with protected species can be monitored by NMFS and, where applicable, prevented, reduced, or mitigated. Finally, future management actions under Alternative 1D would receive consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.4.5.5. Fishery Participants and Communities

Alternative 1D would replace the current five species-based FMPs with five FEPs. No substantial change to the current regulations or fisheries would occur under the proposed FEPs. However, one of the objectives of the Pelagic FEP is the recognition and increased inclusion of local expertise in the management and conservation of marine resources, which may consequently help reduce the effects of some exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities. When compared to the No Action Alternative, implementing the Pelagic FEP would be beneficial as it may integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

Additionally, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward placed-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. When compared to the other Action Alternatives, it is anticipated that this alternative would cause the least amount of confusion to participants in the fisheries, as the entire Western Pacific Region would switch from FMPs to placed-based FEPs, with no substantial changes in the regulations.

4.2.4.5.6. Administration and Enforcement

Under Alternative 1D, no substantive changes would occur to the regulations affecting the pelagic fisheries. However, under Alternative 1D, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed Pelagic FEP. Managers and scientists would be asked to increasingly consider fishery interactions with other species, as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups would also be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists are increasingly considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1D.

With regard to the pelagic fisheries, in the short-term, impacts of Alternative 1D on enforcement and management agencies are not expected to be significant as the pelagic fisheries boundaries, fishery operations, and regulations would not change. Under Alternative 1D in the long-term, compliance with regulations could be increased as communities and participants voluntary become more involved in fishery management. Additionally, the increased inclusion of community members with local expertise and knowledge about the conservation of marine resources, which would be encouraged by an ecosystem-based approach, would enhance management of the pelagic fisheries of the Western Pacific Region.

4.2.5. Alternative 1E - Approve and Implement FEPs for Each Biogeographic and Pelagic Zone Which Would Replace Existing FMPs

Under Alternative 1E, major biogeographic zones for each island jurisdiction and all marine resources and habitats associated with those not necessarily contiguous zones would be delineated as distinct ecosystems and the fisheries associated with them would be managed under separate FEPs. Specifically, within each archipelagic area, the coral reef ecosystem, the deep-reef benthic ecosystem, the seamount ecosystem, and the pelagic environment would be delineated as separate and distinct ecosystems and managed under separate FEPs.

For example, in the Hawaiian Archipelago, five biogeographic-based FEPs would be established: the Hawaii Coral Reef; the Hawaii Bank and Seamount; the Hawaii Deep Reef Slope; the Hawaii

Deep Ocean Floor; and the Hawaii Pelagics. Under Alternative 1E, existing fishery regulations relating to the current FMPs would be reorganized to reflect the boundaries of these FEPs (Table 2-7). Although the regulations would be reorganized, no substantive changes would occur to current fishing regulations.

4.2.5.1. American Samoa Archipelago

The following sections discuss the potential impacts of Alternative 1E on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the American Samoa Archipelago.

4.2.5.1.1. Physical Environment

Under Alternative 1E, there would be five biogeographic-based FEPs approved and implemented for the American Samoa Archipelago. These would include: the American Samoa Coral Reef FEP, the American Samoa Bank and Seamount FEP, the American Samoa Deep Reef Slope FEP, the American Samoa Deep Ocean Floor FEP, and the American Samoa Pelagic FEP (see Table 2-7). In addition, the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment.

Alternative 1E would also reorganize the existing species-based FMP regulations into biogeographic-based FEP regulations. However, no substantive changes to current fishing regulations would occur in Alternative 1E. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the American Samoa Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.5.1.2. Biological Environment

Implementation of the five biogeographic-based FEPs to manage fisheries in the American Samoa Archipelago, in combination with the Pacific Pelagic FEP, would have potential positive and negative impacts on target and non-target species. Negative impacts would be the impact of fishing on target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would be an anticipated improvement in fishery ecosystem management. However, implementation of these biogeographic-based FEPs for the American Samoa Archipelago would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the five biogeographic-based American Samoa FEPs and the associated Pacific Pelagic FEP on the biological environment of the American Samoa Archipelago would be similar to those under Alternative 1A. The status and trends of target and non-target species within the American Samoa Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1E would also replace the current species-based FMP regulation structure with a biogeographic-based FEP regulation structure for the American Samoa Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve management of these resources.

However, the smaller ecosystems, semi-unique units, could result in management of the biological environment that fails to fully consider the interconnectedness of these smaller ecosystems within the larger archipelagic or pelagic environment. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at the time changes are proposed.

4.2.5.1.3. Essential Fish Habitat

When compared to Alternative 1A, the No Action Alternative, Alternative 1E would not cause any adverse impacts on EFH or HAPC for species in the American Samoa Archipelago. Implementation of the five biogeographic-based FEPs would not be expected to affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into a biogeographic-based ecosystem management plan. Furthermore, similar to the No Action Alternative, the implementation of the five biogeographic-based FEP would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause few fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed five biogeographic-based American Samoa FEPs. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1E would not result in a change in fishing gear or strategy, therefore, EFH and HAPC would maintain the same level of protection as currently under the FMPs.

4.2.5.1.4. Protected Species

The implementation of the biogeographic-based American Samoa FEPs under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in any substantive changes in fishing regulations, this alternative would maintain the same level of protection and impacts to protected species as under the No Action Alternative. In addition, implementing the biogeographic-based American Samoa FEPs would allow for the continuation of data collection programs (e.g., logbooks, observers) within the American Samoa Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated through area closures. Future management actions under Alternative 1E would receive consideration of impacts on protected species as appropriate in accordance with ESA and other laws and regulations.

4.2.5.1.5. Fishery Participants and Communities

When compared to the No Action Alternative, the implementation of the five biogeographic-based American Samoa FEPs is anticipated to positively impact fishery participants and communities in the American Samoa Archipelago by increasing their participation in fishery management decisionmaking; thereby better utilizing local knowledge. The anticipated long-term impacts of implementing the biogeographic-based American Samoa FEPs would also be beneficial as it would integrate scientific information and human needs in a manner that would increase the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create five biogeographic-based American Samoa FEPs. In addition, the domestic pelagic fisheries operating in the high seas of the Western Pacific Region would operate under a Pacific Pelagic FEP.

Under this alternative, fishery participants would be responsible for determining which of these biogeographic-based FEP regulations pertain to the areas in which their fishing operations occur. If a fishing operation spans a number of biogeography-based FEPs that encompass the American Samoa Archipelago, the participant would need to be familiar with regulations (e.g., specifying gear or bait type, targeting, or allowable catch) that may differ for each of these biogeographic-based FEPs.

Alternative 1E would be the most confusing of all of the alternatives in Component 1 to fishery participants and would increase their regulatory burden. This especially would be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed biogeographic-based FEPs.

4.2.5.1.6. Administration and Enforcement

Under Alternative 1E, no substantive changes would occur to the regulations affecting the fisheries within the American Samoa Archipelago. However, under Alternative 1E, managers and scientists would need to adapt to the biogeographic-based and multi-species nature of the proposed five American Samoa FEPs. Managers and scientists increasingly would be asked to consider fishery interactions within the American Samoa Archipelago, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would probably remain unchanged under Alternative 1D.

With regard to enforcement, whereas current fishery regulations for fishing operations in the American Samoa Archipelago would remain unchanged, future regulations would have the potential for being complicated. Enforcement and management agencies would need to adapt to regulating five biogeographic-based FEPs within the American Samoa Archipelago, and consider the consistency and practicality of these regulations, as participants often would be subject to multiple regulations. For instance, pelagic species are highly migratory and would be managed and regulated under the Hawaii Pelagics, Guam Pelagics, CNMI Pelagics, Mariana Pelagics, American Samoa Pelagics, and Pacific Pelagic FEPs. Enforcement agencies would potentially be burdened to adapt to the multiplicity of regulations that pertain to pelagic species. The smaller ecosystems, semi-unique units, could result in management that fails to fully consider the interconnectedness of these smaller ecosystems within the larger archipelagic or pelagic environment. Furthermore, this alternative would create 26 FEPs, of which 5 FEPs would be within the American Samoa Archipelago. Each FEP would have separate regulations, which would require separate amendments whenever regulations are modified. Additionally, each FEP would require annual stock assessments. When compared to the other alternatives, including the No Action alternative, the additional administrative costs needed to manage Western Pacific Regional fisheries under Alternative 1E would be high.

4.2.5.2. Mariana Archipelago

The following sections discuss the potential impacts of Alternative 1E on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Mariana Archipelago.

4.2.5.2.1. Physical Environment

Under Alternative 1E, there would be five biogeographic-based FEPs approved and implemented for the Mariana Archipelago. These would include: the Mariana Coral Reef FEP, the Mariana Bank and Seamount FEP, the Mariana Deep Reef Slope FEP, the Mariana Deep Ocean Floor FEP, and the Mariana Pelagic FEP (see Table 2-7). In addition, the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment.

Alternative 1E would also reorganize the existing species-based FMP regulations into biogeographic-based FEP regulations. However, no substantive changes to current fishing regulations would occur under Alternative 1E. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the Mariana Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.5.2.2. Biological Environment

Implementation of the five biogeographic-based FEPs to manage fisheries in the Mariana Archipelago, in combination with the Pacific Pelagic FEP, would have potential positive and negative impacts on target and non-target species. However, implementation of these biogeographic-based FEPs for the Mariana Archipelago would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the five biogeographic-based Mariana FEPs and the associated Pacific Pelagic FEP on the biological environment would be similar to those under Alternative 1A. The status and trends of target and non-target species within the Mariana Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1E would also replace the current species-based FMP regulation structure with a biogeographic-based FEP regulation structure for the Mariana Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would be expected to improve management of these resources. However, the smaller ecosystems, semi-unique units, could result in management of the biological environment that fails to fully consider the interconnectedness of these smaller ecosystems within in the larger archipelagic or pelagic environment. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at the time that changes are proposed.

4.2.5.2.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1E would not be expected to cause adverse impacts on EFH or HAPC for species in the Mariana Archipelago. Implementation of the five biogeographic-based FEPs would not affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into a biogeographic-based ecosystem management plan. Furthermore, when compared to the No Action alternative, the implementation of the five biogeographic-based FEP would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, or growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause negligible fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed five biogeographic-based Mariana FEPs. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1E would not result in a change in fishing gear or strategy, therefore, EFH and HAPC would maintain the same level of protection that is currently provided under the FMPs.

4.2.5.2.4. Protected Species

The implementation of the biogeographic-based Mariana FEPs under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in a change in fishing regulations, this alternative would maintain the same level of protection and impacts to protected species as under the No Action alternative. In addition, implementing the biogeographic-based Mariana FEPs would allow for the continuation of data collection programs (e.g., logbooks, observers) within the Mariana Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Finally, future management actions proposed under Alternative 1E would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.5.2.5. Fishery Participants and Communities

When compared to the No Action Alternative, the implementation of the five biogeographic-based Mariana FEPs would positively impact fishery participants and communities in the Mariana Archipelago by increasing their participation in fishery management decisionmaking; thereby better utilizing local knowledge. The anticipated long-term impacts of implementing the biogeographic-based Mariana FEPs would also be beneficial as the FEPs would integrate scientific information and human needs in a manner that would increase the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create five biogeographic-based Mariana FEPs. In addition, the domestic pelagic fisheries operating in the high seas of the Western Pacific Region would operate under a Pacific Pelagic FEP.

Under this alternative fishery participants would be responsible for determining which of these biogeographic-based FEP regulations pertain to the areas in which their fishing operations occur. If a fishing operation spans a number of biogeography-based FEPs that encompass Mariana Archipelago, the participant would need to be familiar with regulations (e.g., specifying gear or bait type, targeting, or allowable catch) that may differ for each of these biogeographic-based FEPs.

Alternative 1E would be the most confusing of all of Component 1's alternatives to fishery participants and would increase their regulatory burden. This especially would be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed biogeographic-based FEPs.

4.2.5.2.6. Administration and Enforcement

Under Alternative 1E, no substantive changes would occur to the regulations affecting the fisheries within the Mariana Archipelago. However, under Alternative 1E, managers and scientists would need to adapt to the biogeographic-based and multi-species nature of the proposed five Mariana FEPs. Managers and scientists increasingly would be asked to consider fishery interactions within the Mariana Archipelago, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would remain unchanged under Alternative 1E.

With regard to enforcement, whereas current fishery regulations for fishing operations in the Mariana Archipelago would remain unchanged, future regulations would have the potential to become overly complicated. Enforcement and management agencies would need to adapt to regulating five biogeographic-based FEPs within the Mariana Archipelago and consider the consistency and practicality of these regulations, as participants often would be subject to multiple regulations. For instance, pelagic species are highly migratory and would be managed and regulated under the Hawaii Pelagics, Guam Pelagics, CNMI Pelagics, Mariana Pelagics, American Samoa Pelagics, and Pacific Pelagic FEPs. Enforcement agencies would potentially be burdened to adapt to the multiplicity of regulations that pertain to pelagic species. The existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management that fails to fully consider the interconnectedness of these smaller ecosystems within the larger archipelagic or pelagic environment. Furthermore, this alternative would create 26 FEPs, of which 5 FEPs would be within the Mariana Archipelago. Each FEP would have separate regulations, which would require separate amendments whenever regulations are modified. Additionally, each FEP would require annual stock assessments. When compared to the other alternatives, including the No Action alternative, the additional administrative costs to manage fisheries in such a complicated manner would be high.

4.2.5.3. Hawaiian Archipelago

The following sections discuss the potential impacts of Alternative 1E on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the Hawaiian Archipelago.

4.2.5.3.1. Physical Environment

Under Alternative 1E, there would be five biogeographic-based FEPs approved and implemented for the Hawaiian Archipelago. These would include: the Hawaii Coral Reef FEP, the Hawaii Bank and Seamount FEP, the Hawaii Deep Reef Slope FEP, the Hawaii Deep Ocean Floor FEP, and the Hawaii Pelagic FEP (see Table 2-7). In addition, the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagic FEP, consistent with international agreements. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment.

Alternative 1E would also reorganize the existing species-based FMP regulations into biogeographic-based FEP regulations. However, no substantive changes to current fishing regulations would occur under Alternative 1E. Thus, with regard to the physical environment in the short-term, there would be no significant differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the Hawaiian Archipelago. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.5.3.2. Biological Environment

Implementation of the five biogeographic-based FEPs to manage fisheries in the Hawaiian Archipelago, in combination with the Pacific Pelagic FEP, would have potential positive and negative impacts on target and non-target species. Negative impacts would be the impact of fishing on target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would include an anticipated improvement in fishery ecosystem management. However, implementation of these biogeographic-based FEPs for the Hawaiian Archipelago would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the five biogeographic-based Hawaii FEPs and the associated Pacific Pelagic FEP on the biological environment of the Hawaiian Archipelago would be similar to those under Alternative 1A. The status and trends of target and non-target species within the Hawaiian Archipelago would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1E would also replace the current species-based FMP regulation structure with a biogeographic-based FEP regulation structure for the Hawaiian Archipelago. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve management of these resources. However, the existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management of the biological environment that fails to fully consider the interconnectedness of these smaller ecosystems within in the larger archipelagic or pelagic environment. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at the time changes are proposed.

4.2.5.3.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1E would not cause adverse impacts on EFH or HAPC for species in the Hawaiian Archipelago. Implementation of the five biogeographic-based FEPs would not affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into a biogeographic-based ecosystem management plan. Furthermore, similar to the No Action Alternative, the implementation of the five biogeographic-based FEPs would not likely lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, or growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause negligible fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed five biogeographic-based Hawaii FEPs. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1E would not result in a change in fishing gear or strategy, therefore, EFH and HAPC would maintain the same level of protection as that currently provided under the FMPs.

4.2.5.3.4. Protected Species

The implementation of the biogeographic-based Hawaii FEPs under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in any substantive changes in fishing regulations, this alternative would maintain the same level of protection and impacts to protected species as under the No Action alternative. In addition, implementing the biogeographic-based Hawaii FEPs would allow for the continuation of data collection programs (e.g., logbooks, observers) within the Hawaiian Archipelago fisheries through which interactions with protected species can be monitored by NMFS, and, where applicable, prevented, reduced, or mitigated. Finally, future management actions proposed under Alternative 1E would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.5.3.5. Fishery Participants and Communities

When compared to the No Action alternative, the implementation of the five biogeographic-based Hawaii FEPs is anticipated to positively impact fishery participants and communities in the Hawaiian Archipelago by increasing their participation in fishery management decisionmaking; thereby better utilizing local knowledge. The anticipated long-term impacts of implementing the biogeographic-based Hawaii FEPs would also be beneficial as the FEPs may integrate scientific information and human needs in a manner that would increase the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create five biogeographic-based Hawaii FEPs. In addition, the domestic pelagic fisheries operating in the high seas of the Western Pacific Region would operate under a Pacific Pelagic FEP.

Under this alternative fishery participants would be responsible for determining which of these biogeographic-based FEP regulations pertain to the areas in which their fishing operations occur. If a fishing operation spans a number of biogeography-based FEPs that encompass the Hawaiian Archipelago, the participant would need to be familiar with regulations (e.g., specifying gear or bait type, targeting, or allowable catch) that may differ for each of these biogeographic-based FEPs.

Alternative 1E would be the most confusing of all of Component 1’s alternatives to fishery participants and would increase their regulatory burden. This would especially be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed biogeographic-based FEPs.

4.2.5.3.6. Administration and Enforcement

Under Alternative 1E, no substantive changes would occur to the regulations affecting the fisheries within the Hawaiian Archipelago. However, under Alternative 1E, managers and scientists would need to adapt to the biogeographic-based and multi-species nature of the proposed five Hawaii FEPs. Managers and scientists increasingly would be asked to consider fishery interactions within the Hawaiian Archipelago, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fishery ecosystems would remain unchanged under Alternative 1E.

With regard to enforcement, whereas current fishery regulations for fishing operations in the Hawaiian Archipelago would remain unchanged, future regulations would have the potential to become overly complicated. Enforcement and management agencies would need to adapt to regulating five biogeographic-based FEPs within the Hawaiian Archipelago, and consider the consistency and practicality of these regulations, as participants often would be subject to multiple regulations. For instance, pelagic species are highly migratory and would be managed and regulated under the Hawaii Pelagics, Guam Pelagics, CNMI Pelagics, Mariana Pelagics, American Samoa Pelagics, and Pacific Pelagic FEPs. Enforcement agencies would potentially be burdened to adapt to the multiplicity of regulations that pertain to pelagic species. The existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management that fails to fully consider the interconnectedness of these smaller ecosystems within in the larger archipelagic or pelagic environment. Furthermore, this alternative would create 26 FEPs, of which 5 FEPs would be within the Hawaiian Archipelago. Each FEP would have separate regulations, which would require separate amendments whenever regulations are modified. Additionally, each FEP would require annual stock assessments. When compared to the other alternatives, including the No Action alternative, the additional administrative costs to manage fisheries in such a complicated manner would be high.

4.2.5.4. PRIA

The following sections discuss the potential impacts of Alternative 1E on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the PRIA.

4.2.5.4.1. Physical Environment

Under Alternative 1E, there would be five biogeographic-based FEPs approved and implemented for the PRIA: the PRIA Coral Reef FEP, the PRIA Bank and Seamount FEP, the PRIA Deep Reef Slope FEP, the PRIA Deep Ocean Floor FEP, and the PRIA Pelagic FEP (see Table 2-7). In addition, the domestic pelagic fisheries outside the waters of the U.S. EEZ would be managed under the Pacific Pelagic FEP. However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current FMPs or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment.

Alternative 1E would also reorganize the existing species-based FMP regulations into biogeographic-based FEP regulations. However, no substantive changes to current fishing regulations would occur under Alternative 1E. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the PRIA. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.5.4.2. Biological Environment

Implementation of the five biogeographic-based FEPs to manage fisheries in the PRIA, in combination with the Pacific Pelagic FEP, would have potential positive and negative impacts on target and non-target species. Negative impacts would be the impact of fishing on target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would be an anticipated improvement in fishery ecosystem management. However, implementation of these biogeographic-based FEPs for the PRIA would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the five biogeographic-based PRIA FEPs and the associated Pacific Pelagic FEP on the biological environment of the PRIA would be similar to those under Alternative 1A. The status and trends of target and non-target species within the PRIA would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1E would also replace the current species-based FMP regulation structure with a biogeographic-based FEP regulation structure for the PRIA. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action alternative. In the long-term, increased consideration of fishery interactions and nonfishery impacts on target and nontarget species would improve management of these resources. However, the existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management of the biological environment that fails to fully consider the interconnectedness of these smaller ecosystems within the larger archipelagic or pelagic environment. Implementation of ecosystem science, principles, and management actions through future management plan amendments or regulatory amendments to this FEP would be subject to NEPA and other applicable laws at that time.

4.2.5.4.3. Essential Fish Habitat

When compared to Alternative 1A, implementing Alternative 1E would not cause adverse impacts on EFH or HAPC for species in the PRIA. Implementation of the five biogeographic-based FEPs would not affect the fishing operations or catches of any fisheries; rather it would simply reorganize the current species-based FMPs into a biogeographic-based ecosystem management plan. Furthermore, when compared to the No Action alternative, the implementation of the five biogeographic-based FEPs would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, and growth of harvested species or their prey.

The predominant fishing gear types (hook-and-line, troll, traps) used in the Western Pacific Region cause negligible fishing-related impacts on the benthic habitat of bottomfish, crustaceans, coral reefs, and precious corals in the proposed five biogeographic-based PRIA FEPs. The current management regime, under the FMPs, protects habitat through prohibitions on the use of bottom-set nets, bottom trawls, explosives, and poisons. Implementing Alternative 1E would not result in a change in fishing gear or strategy, therefore, EFH and HAPC would maintain the same level of impacts as the No Action alternative.

4.2.5.4.4. Protected Species

The implementation of the biogeographic-based PRIA FEPs under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

This alternative would not result in any substantive changes in fishing regulations and would maintain the same level of protection and impacts to protected species that is currently provided under the No Action alternative. Additionally, implementing the biogeographic-based PRIA FEPs would allow for the continuation of data collection programs (e.g., logbooks, observers) for fisheries operating in the PRIA through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Finally, future management actions under Alternative 1E would continue to have impacts on protected species evaluated in accordance with applicable laws and regulations.

4.2.5.4.5. Fishery Participants and Communities

When compared to the No Action alternative, the implementation of the five biogeographic-based PRIA FEPs would positively impact fishery participants in the PRIA by allowing the management of fisheries on an ecosystem-basis. There is no fishing community defined under MSA for the PRIA. The anticipated long-term impacts of implementing the biogeographic-based PRIA FEPs would also be beneficial as it may integrate scientific information and human needs in a manner that increases the involvement of participants in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create five biogeographic-based PRIA FEPs. In addition, the domestic pelagic fisheries operating in the high seas of the Western Pacific Region would operate under a Pacific Pelagic FEP.

Under this alternative fishery participants would be responsible for determining which of these biogeographic-based FEP regulations pertain to the areas in which their fishing operations occur. If a fishing operation spans a number of biogeography-based FEPs that encompass the PRIA, the participant would need to be familiar with regulations (e.g., specifying gear or bait type, targeting, or allowable catch) that may differ for each of these biogeographic-based FEPs.

Alternative 1E would be the most confusing of all of Component 1’s alternatives to fishery participants and would increase their regulatory burden. This would especially be true if regulations for the pelagic fisheries were to become overly specific or inconsistent with the proposed biogeographic-based FEPs.

4.2.5.4.6. Administration and Enforcement

Under Alternative 1E, no substantive changes would occur to the regulations affecting the fisheries within the PRIA. However, under Alternative 1E, managers and scientists would need to adapt to the biogeographic-based and multi-species nature of the proposed five PRIA FEPs. Managers and scientists increasingly would be asked to consider fishery interactions within the PRIA, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fisheries' ecosystems would remain unchanged under Alternative 1E.

With regard to enforcement, whereas current fishery regulations for fishing operations in the PRIA would remain unchanged, future regulations would have the potential to become overly complicated. Enforcement and management agencies would need to adapt to regulating five biogeographic-based FEPs within the PRIA and consider the consistency and practicality of these regulations, as participants often would be subject to multiple regulations. For instance, pelagic species are highly migratory and would be managed and regulated under the Hawaii Pelagics, Guam Pelagics, CNMI Pelagics, Mariana Pelagics, American Samoa Pelagics, and Pacific Pelagic FEPs. Enforcement agencies would potentially be burdened to adapt to the multiplicity of regulations that pertain to pelagic species. The existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management that fails to fully consider the interconnectedness of these smaller ecosystems within in the larger archipelagic or pelagic environment. Furthermore, this alternative would create 26 FEPs, of which 5 FEPs would be within the PRIA. Each FEP would have separate regulations, which would require separate amendments whenever regulations are modified. Additionally, each FEP would require annual stock assessments. When compared to the other alternatives, including the No Action alternative, the additional administrative costs to manage fisheries in such a complicated manner would be high.

4.2.5.5. Pelagic

The following sections discuss the potential impacts of Alternative 1A on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration, specific to the fisheries operating under the current Pelagics FMP.

4.2.5.5.1. Physical Environment

Under Alternative 1E, there would be five FEPs approved and implemented to manage the pelagic fisheries: the Hawaii Pelagics, Guam Pelagics, CNMI Pelagics, Mariana Pelagics, American Samoa Pelagics, and Pacific Pelagic FEPs (see Table 2-7). However, the boundaries of the proposed FEPs are not physically apparent. The boundaries under either the current Pelagics FMP or the proposed FEPs are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment.

Alternative 1E would also reorganize the existing species-based FMP regulations into these FEP regulations. However, no substantive changes to current fishing regulations would occur under Alternative 1E. Thus, with regard to the physical environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative to the pelagic environment. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.

4.2.5.5.2. Biological Environment

Implementation of the five FEPs to manage the pelagic fisheries in the Western Pacific Region would have potential positive and negative impacts on target and non-target species. Negative impacts would include reduction of target and non-target stocks, which would continue to be managed for sustainability. Positive impacts would include an anticipated improvement in fishery ecosystem management. However, implementation of these FEPs under this alternative would not affect the fishing operations or catches of any fisheries operating under the current FMPs. Thus, the impacts of the five FEPs would be similar to those under Alternative 1A. The status and trends of target and non-target species would continue to be evaluated annually using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes.

Alternative 1E would also replace the current species-based FMP regulatory structure with biogeographic-based FEP regulations. No substantive changes are proposed to the regulations or to the fisheries through this structural reorganization. Thus, with regard to the biological environment in the short-term, there would be no differences between the direct and indirect impacts of this alternative and the impacts of the No Action Alternative. Since implementing this alternative would not alter the regulatory nature of the current pelagic fisheries, the impacts of this alternative would be similar to those under Alternative 1A. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment. However, the existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management of the biological environment that fails to fully consider the interconnectedness of these smaller ecosystems within in the larger pelagic environment.

4.2.5.5.3. Essential Fish Habitat

When compared to Alternative 1A implementing Alternative 1E would not cause adverse impacts on EFH or HAPC for pelagic species. Implementation of the five FEPs for pelagic species would not affect the fishing operations or catches of any current pelagic fishery; rather the action would simply reorganize the current Pelagics FMP into five FEPs. Furthermore, when compared to the No Action Alternative, the implementation of the five FEPs would not lead to substantial physical or biological alterations to the oceanic and coastal habitat, or result in any alteration to waters and substrate necessary for spawning, breeding, feeding, or growth of harvested species or their prey. Implementing Alternative 1E would not result in a change in fishing gear or strategy, therefore, EFH and HAPC would maintain the same level of protection as currently afforded under the Pelagics FMP.

4.2.5.5.4. Protected Species

The implementation of the biogeographic-based FEPs under this alternative would not change existing regulations including those that require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Existing ESA biological opinions imposed terms and conditions to reduce and mitigate interactions with protected species and have concluded that the fisheries operating under the current FMPs are not likely to jeopardize the continued existence of any threatened or endangered species or adversely modify critical habitat that has been designated for them.

Since this alternative would not result in any substantive change in fishing regulations, this alternative would maintain the same level of protection and impacts to protected species as under the No Action Alternative. In addition, implementing the biogeographic-based FEPs would allow for the continuation of data collection programs (e.g., logbooks, observers) through which interactions with protected species can be monitored by NMFS, and where applicable, prevented, reduced, or mitigated. Finally, future management actions proposed under Alternative 1E would include consideration of impacts on protected species as appropriate in accordance with applicable laws and regulations.

4.2.5.5.5. Fishery Participants and Communities

When compared to the No Action alternative, the implementation of the five FEPs for pelagic species under this alternative is anticipated to positively impact fishery participants and communities in the Hawaiian Archipelago by increasing their participation in fishery management decisionmaking; thereby better utilizing local knowledge. The anticipated long-term impacts of implementing the FEPs would also be positive as the FEPs may integrate scientific information and human needs in a manner that increases the involvement of local communities in the management and conservation of marine resources.

However, as mentioned in Chapter 1, a consideration of the Federal action is that this shift toward ecosystem-based FEPs should be done in a manner that is understandable to fishery participants and with minimal regulatory burden. This alternative would create five FEPs for pelagic species. Under this alternative fishery participants would be responsible for determining which of these five FEPs for pelagic species regulations pertain to the areas in which their fishing operations occur. This would add an unnecessary burden to the pelagic fishermen targeting these highly migratory species. This would especially be true if regulations for the pelagic fisheries in the future were to become overly specific or inconsistent with the proposed archipelagic-based FEPs.

4.2.5.5.6. Administration and Enforcement

Under Alternative 1E, no substantive changes would occur to the regulations affecting the pelagic fisheries within the Western Pacific Region. However, under Alternative 1E, scientists increasingly would be asked to consider fishery interactions with other species, as well as the impacts of nonfishery activities on the marine environment. Management plan teams and other advisory groups would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions, and this heightened attention to fishery ecosystems would probably remain unchanged under Alternative 1E.

With regard to enforcement, whereas current fishery regulations for pelagic fishing operations would remain unchanged, future regulations would have the potential to become overly complicated. Enforcement and management agencies would need to adapt to regulating five FEPs for pelagic species, and consider the consistency and practicality of these regulations, as participants often would be subject to multiple regulations. Under Alternative 1E, pelagic species would be managed and regulated under the Hawaii Pelagics, Guam Pelagics, CNMI Pelagics, Mariana Pelagics, American Samoa Pelagics, and Pacific Pelagic FEPs. Enforcement agencies would potentially be burdened to adapt to the multiplicity of regulations that pertain to pelagic species. The existence of so many FEPs for smaller ecosystems, semi-unique units, could result in management that fails to fully consider the interconnectedness of these smaller ecosystems within in the larger pelagic environment. Furthermore, this alternative would create 26 FEPs, of which 5 FEPs would be associated with the pelagic fisheries. Each FEP would have separate regulations, which would require separate amendments whenever regulations are modified. Additionally, each FEP would require annual stock assessments. When compared to the other alternatives, including the No Action alternative, the additional administrative costs to manage fisheries in such a complicated manner would be high.

4.3. Component 2: Species to Be Managed Under Fishery Ecosystem Plans

Component 2 is regulatory in nature and considered part of the Federal action in this document. Component 2 is contingent upon selecting one of the action alternatives under Component 1. For each alterative under Component 2 the potential impacts on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration are discussed.

4.3.1. Alternative 2A: No Action—Do Not Change the Current MUS Lists

4.3.1.1. Physical Environment

Under Alternative 2A, the current lists of MUS contained in the four existing demersal FMPs would be combined and used in each of the demersal FEPs. The species currently managed under the Pelagics FMP would not change and that MUS list would apply to the Pelagic FEP. The MUS lists currently contained in the existing FMPs include those species that are caught in quantities sufficient to warrant management or specific monitoring by NMFS and the Council. Species caught in lesser amounts are also monitored; however, they are not generally included in the annual evaluations of stocks that are currently required for MUS under the MSA. The primary impact of inclusion of species in an MUS list is that the species (i.e., the fishery targeting that species) can be directly managed. Impacts on the physical environment of fisheries on non-MUS species are regulated through NMFS's list of allowable gears for each fishery. In the short term, current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3-1. In the long term, management changes would continue to be considered via the MSA process or through changes to NMFS's list of allowable gears.

4.3.1.2. Biological Environment

Impacts on target and nontarget stocks under Alternative 2A are anticipated to be the same as those described in Chapter 3. Again, the MUS lists currently contained in the Council's existing FMPs are based on those species that are caught in quantities sufficient to warrant management or specific monitoring and the primary impact of inclusion of species in an MUS list is that the species (i.e., the fishery targeting that species) can be directly managed. Under this alternative, changes to the MUS list would continue to be considered as a part of the existing adaptive approach to management.

4.3.1.3. Essential Fish Habitat

Under Alternative 2A, the existing fishery regulations would remain unchanged, and designated EFH and HAPC in the Western Pacific Region would remain the same. Impacts of current fisheries' activities on EFH and HAPC would be similar to those described in Chapter 3 and the No Action alternative, as described in Chapter 4. Under Alternative 2A, EFH and HAPC designations would not be affected because the current list of MUS would remain unchanged.

4.3.1.4. Protected Species

In the short term, impacts on protected species are anticipated to be the same as those described in Chapter 3 and Chapter 4 for the No Action alternative. Current regulations and MUS lists would remain unchanged, fisheries would be adaptively managed under the MSA, and full consideration of impacts on protected species would continue to be given in accordance with the MSA, MMPA, ESA, NEPA, and other applicable laws. In the long term, consideration of expanded MUS lists could result in increased monitoring and management of resources of importance to protected species.

4.3.1.5. Impacts on Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities, as it would not change current fishery regulations. If the decision is made to implement FEPs, the inclusion of some demersal MUS in FEPs for areas in which they are not actually present could be confusing to fishery participants, local communities, and other stakeholders.

4.3.1.6. Administration and Enforcement

This alternative would not have any immediate impacts on management, administration, or enforcement, which would continue as described in Chapter 3. Because not all MUS are present throughout the region, this alternative would result in the inclusion of some species that are not actually present in some FEP areas. Although unlikely to have any management impacts, their inclusion could be confusing to fishery scientists, managers, and enforcement personnel. In addition, as discussed previously, current MSA requirements specify that annual evaluations be prepared for stocks managed by the Council. It is not clear how these evaluations would account for the inclusion of species that are not present within a given FEP area.

4.3.2. Alternative 2B: Define FEP MUS as Those Existing MUS That Are Known to Occur Within Each FEP Boundary (Preferred)

4.3.2.1. Physical Environment

Under Alternative 2B, those MUS currently listed under the existing five FMPs and known to occur within each selected FEP area would be combined to form the MUS list for each FEP. In the short term, impacts on the physical environment would be anticipated to be the same as those described for Alternative 2A and in Chapter 3, as the removal from the MUS list of species not physically present does not change the effectiveness of existing management measures for a given area. Current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3-1. In the long term, management changes would continue to be considered via the MSA process, which would apply to fisheries targeting the refined MUS list or through changes to NMFS's list of allowable gears.

4.3.2.2. Biological Environment

Impacts on target and nontarget stocks under Alternative 2B would be anticipated to be the same as those described in Alternative 2A and Chapter 3. Again, the removal from the MUS list of species not physically present would not change the effectiveness of existing management measures for a given area. Under this alternative, changes to the MUS list would continue to be considered as a part of the existing adaptive approach to management under the MSA.

4.3.2.3. Essential Fish Habitat

Under Alternative 2B, the existing fishery regulations and designations of EFH or HAPC in the Western Pacific Region would remain unchanged. Impacts of current fisheries' activities on EFH and HAPC would be similar to those under the No Action alternative. Under Alternative 2B, EFH and HAPC designations would not be affected because the current list of MUS known to be present in the current FMPs would remain unchanged.

4.3.2.4. Protected Species

Impacts on protected species would be anticipated to be the same as those described under Alternative 2A and in Chapter 3, as the removal from the MUS list of species not physically present would not change the effectiveness of existing management measures for a given area. Current regulations would remain unchanged, fisheries would be adaptively managed, and full consideration of impacts on protected species would continue to be given in accordance with the MSA, MMPA, ESA, NEPA, and other applicable laws.

4.3.2.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, it would eliminate the confusion that could result from the inclusion on the MUS list of species not physically present in a given FEP area.

4.3.2.6. Administration and Enforcement

This alternative would slightly reduce impacts on management, administration, and enforcement as compared with Alternative 2A because it would avoid the confusion that could result from the inclusion on the MUS list of species not physically present and would eliminate the issue of how to address them in the annual evaluations required under the MSA.

4.3.3. Alternative 2C: Define FEP MUS as the Existing MUS Plus Incidentally Caught and Associated Species That Are Known to Occur Within Each FEP Boundary

4.3.3.1. Physical Environment

Under Alternative 2C, each FEP would include as MUS those target, incidentally caught, and associated species (species that occupy the same or a similar niche such as prey competitors or habitat competitors) that are known to occur within each FEP boundary. In the short term, impacts on the physical environment would be the same as those described for Alternative 2A and in Chapter 3, as the removal from the MUS lists of species not physically present would not change the effectiveness of existing management measures for a given area. Current regulations would remain unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3-1. In the long term, management changes would continue to be considered via the MSA process, which would apply to fisheries targeting the expanded MUS list or through changes to NMFS's list of allowable gears.

4.3.3.2. Biological Environment

Because fishery managers' direct management authority is limited to operations affecting listed MUS, this alternative would allow fishery operations to be more easily constrained if found to impact any fishery-related species known to occur within the FEP boundary. However, because incidentally caught and associated species are not currently subject to significant harvest levels and the impact on them of reducing (or increasing) harvests of target species is unknown, it is uncertain at this time what fishery management actions would be appropriate for their management.

4.3.3.3. Essential Fish Habitat

Under Alternative 2C, the existing fishery regulations would remain unchanged, as would designations of EFH or HAPC in the Western Pacific Region. Impacts of current fishing activities on EFH and HAPC would be similar to those under the No Action alternative. Under Alternative 2C, EFH and HAPC designations would not be affected because the current list of MUS known to be present would remain unchanged. Also, those species that are incidentally caught would also be listed as MUS under Alternative 2C; however, potential additions to the listed MUS are not expected to adversely affect the EFH or HAPC under currently managed areas.

4.3.3.4. Protected Species

Impacts on protected species would be the same as those described under Alternative 2A and in Chapter 3, as the removal from the MUS list of species not physically present would not change the effectiveness of existing management measures for a given area. The addition of incidentally caught and associated species to the MUS lists would not have any impact on protected species as they are not the target of fishery operations and are not harvested in significant numbers. Current regulations would remain unchanged, fisheries would continue to be adaptively managed, and full consideration of impacts on protected species would continue to be given in accordance with the MSA, MMPA, ESA, NEPA, and other applicable laws.

4.3.3.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, it would eliminate the confusion that could result from the inclusion of species not physically present in a given FEP area.

4.3.3.6. Administration and Enforcement

This alternative would increase impacts on management, administration, and enforcement as compared with Alternative 2A because it would add species to the MUS lists that would require monitoring and annual evaluation. The number of additional species would vary depending on the location and the definition of FEP boundaries; however, there could potentially be several thousand species.

4.3.4. Alternative 2D: Define FEP MUS as the Existing MUS Plus Incidentally Caught and Associated Species That Are Believed to Potentially Occur Within Each FEP Boundary

4.3.4.1. Physical Environment

Under Alternative 2D, each FEP would include as MUS those target, incidentally caught, and associated species (species that occupy the same or a similar niche such as prey competitors or habitat competitors) that are believed to potentially occur within each FEP boundary. In the short term, impacts on the physical environment would be the same as those described for Alternative 2A and in Chapter 3, as the removal from MUS of species not physically present would not change the effectiveness of existing management measures for a given area. Current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3-1. In the long term, management changes would continue to be considered via the MSA process, which would apply to fisheries targeting the expanded MUS list or through changes to NMFS's list of allowable gears.

4.3.4.2. Biological Environment

Because fishery managers' direct management authority is limited to operations affecting listed MUS, this alternative would allow fishery operations to be more easily constrained if found to affect any fishery-associated species believed to potentially occur in each FEP boundary. However, because incidentally caught and associated species are not currently subject to significant harvest levels and the impact on them of reducing (or increasing) harvests of target species is unknown, additional research would be needed in many cases to determine what fishery management actions would be appropriate for their management.

4.3.4.3. Essential Fish Habitat

Under Alternative 2D, the existing fishery regulations and designations of EFH or HAPC in the Western Pacific Region would remain unchanged. Impacts of current fisheries' activities on EFH and HAPC would be similar to the 2A alternative. Under Alternative 2D, EFH and HAPC designations would be adaptively managed according to the existing definitions for the current MUS believed to potentially occur, incidentally caught, and associated species believed to potentially occur within each FEP boundary.

4.3.4.4. Protected Species

Impacts on protected species would be the same as those described under Alternative 2A and in Chapter 3, as the removal from MUS of species not physically present would not change the effectiveness of existing management measures for a given area. The addition of incidentally caught and associated species to the MUS lists would not have any impact on protected species as these species are not the target of fishery operations and are not harvested in significant numbers. Current regulations would remain unchanged, fisheries would continue to be adaptively managed, and full consideration of impacts on protected species would continue to be given in accordance with the MSA, MMPA, ESA, NEPA, and other applicable laws.

4.3.4.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, it may cause some confusion if there were a large number of species "believed" to be within a given FEP area.

4.3.4.6. Administration and Enforcement

This alternative would significantly increase impacts on management, administration, and enforcement as compared with Alternative 2A because it would add species to the MUS lists that would require monitoring and annual evaluation. The number of additional species would vary depending on the location and the definition of FEP boundaries; however, there could potentially be several thousand species.

4.4. Component 3: Council Advisory Process

The Council's current advisory process follows the MSA and includes the general public, fishery participants and support sectors, social and biological scientists, and local and Federal resource managers in the development of Federal fishery management recommendations. The existing structure for these advisory bodies is based on a combination of species and stakeholder interest groupings. Given the place-based nature of ecosystem management, several alternatives for modifying the existing structure toward a more geographic orientation are considered under Component 3.

Component 3 is nonregulatory (i.e., has no regulatory effect) and is included in this EIS to assist the Council in identifying an appropriate advisory process under an ecosystem-based fishery management structure. For each alterative under Component 3 the potential impacts on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration are discussed.

4.4.1. Alternative 3A: No Action—Do Not Change the Current Advisory Structure

4.4.1.1. Physical Environment

Under Alternative 3A, the Council's current advisory structure would not change to one reflecting the geographical orientation of ecosystem management and the need for increased participation by land-based interests. The Council would continue to utilize its existing species-based Plan Teams, Advisory Panels, Standing Committees, and the SSC to provide scientific and management recommendations to the Council. This alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3-1. In the long term, management changes would continue to be considered via the MSA process or through changes to NMFS's list of allowable gears.

4.4.1.2. Biological Environment

Under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be the same as those described in Chapter 3.

4.4.1.3. Essential Fish Habitat

Under Alternative 3A, impacts on essential fish habitat would remain as described in Chapter 3. Essential Fish Habitat and HAPC would continue to be designated and adaptively managed under the MSA process.

4.4.1.4. Protected Species

Under Alternative 3A, impacts on protected species would remain as described in Chapter 3. Fisheries would be adaptively managed under the MSA, with full consideration of impacts on protected species given in accordance with all applicable laws.

4.4.1.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, the misalignment of species-based Plan Teams and place-based FEPs could result in some confusion for those who participate in the fishery management process.

4.4.1.6. Administration and Enforcement

Impacts on management and administration could be significant under Alternative 3A, depending on the FEP boundaries selected. If archipelagic or other place-based FEP boundaries were implemented, an ecosystem-based approach would require that the existing species-based Plan Teams meet together to discuss each FEP's ecosystem and the impacts of all active fisheries on each ecosystem. Given that there are currently five Plan Teams and potentially five or more FEPs, the cost of these large meetings in time and money could be high. In addition, this alternative would result in a misalignment between the species-based Plan Teams and Standing Committees and the place-based FEPs that could result in fragmented stock assessments, annual reports, and management recommendations. Impacts on enforcement would be anticipated to be unchanged as current regulations would remain in place.

4.4.2. Alternative 3B: Add a Single FEP Plan Team to the Current Advisory Structure

4.4.2.1. Physical Environment

Under this alternative, the existing Advisory Panels, species-based Plan Teams, SSC, and Standing Committees would be maintained, and one new FEP Plan Team would be established to monitor the development and implementation of FEP(s) for the Western Pacific Region. In the short term, this alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered via fishery regulations or through changes to NMFS's list of allowable gears. In the long term, the addition of an FEP Plan Team that would oversee all of the FEPs would improve our understanding and management of fishery impacts on the physical environment; however, it is not clear whether a single plan team could effectively monitor all FEPs to completely achieve this result.

4.4.2.2. Biological Environment

In the short term under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be anticipated to be the same as those described in Chapter 3. In the long term, the addition of an FEP Plan Team that would oversee all of the FEPs would improve our understanding and management of fishery impacts on target and nontarget stocks;

however, it is not clear whether a single plan team could effectively monitor all FEPs to completely achieve this result.

4.4.2.3. Essential Fish Habitat

Under Alternative 3B, impacts on essential fish habitat would remain as described in Chapter 3. EFH and HAPC would continue to be designated and adaptively managed under the existing regulations.

4.4.2.4. Protected Species

Under Alternative 3B, short-term impacts on protected species would remain as described in Chapter 3. In the long term, fisheries would be adaptively managed under the MSA, with full consideration of impacts on protected species given in accordance with all applicable laws. In the long term, the addition of an FEP Plan Team that would oversee all of the FEPs would be anticipated to improve our understanding and management of fishery impacts on protected species; however, it is not clear whether a single plan team could effectively monitor all FEPs to completely achieve this result.

4.4.2.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, the addition of a single FEP Plan Team could either clarify the FEP management process for those who wish to participate in it or could lead to confusion by overlaying the existing species-based Plan Teams and creating unclear lines of communication.

4.4.2.6. Administration and Enforcement

Impacts on management and administration would be anticipated to be moderate under Alternative 3B. In the short term, the establishment and implementation of a single additional FEP Plan Team would not represent a major cost. In the long term, the addition of an FEP Plan Team that would oversee all of the FEPs would be anticipated to improve our understanding and management of fisheries in the Western Pacific Region; however, it is not clear whether a single plan team could effectively monitor all FEPs to achieve this result. Impacts on enforcement would be anticipated to be unchanged as current regulations would remain in place.

4.4.3. Alternative 3C: Replace the Current FMP Advisory Panels, Plan Teams, and Five Standing Committees With FEP Advisory Panels, FEP Plan Teams, and FEP Standing Committees

4.4.3.1. Physical Environment

Under Alternative 3C, the existing Advisory Panels, FMP Plan Teams, and five Standing Committees (Pelagics, Crustaceans, Bottomfish and Seamount Groundfish, Precious Corals, and Ecosystems and Habitat) would be replaced with FEP Advisory Panels and FEP Plan Teams based on each FEP's boundaries (e.g., a Hawaii FEP Plan Team, a Mariana Archipelago Advisory Panel). The single SSC would continue to function as at present. The FEP Advisory Panels, Plan Teams, and Standing Committees would assume all of the duties and responsibilities of the existing groups, including the review of fisheries catch-and-effort data and the preliminary development of appropriate management measures based on ecosystem principles.

Each FEP Plan Team would develop annual reports for all fisheries within the FEP boundaries for which they are responsible, and all groups would provide advice to the Council as under the current process described in Alternative 3A and Chapter 3. In the short term, this alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered via fishery regulations or through changes to NMFS's list of allowable gears. In the long term, the change to a place-based advisory structure that is aligned with the FEPs would be anticipated to substantially improve our understanding and management of fishery impacts on the physical environment through the holistic consideration of all impacts within a given area by each FEP advisory group.

4.4.3.2. Biological Environment

In the short term under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be anticipated to be the same as those described in Alternative 3A and Chapter 3. In the long term, the change to a place-based advisory structure that is aligned with the FEPs would improve our understanding and management of fishery impacts on target and nontarget species through the holistic consideration of all impacts within a given area by each FEP advisory group.

4.4.3.3. Protected Species

Under Alternative 3C, short-term impacts on protected species would remain as described in Alternative 3A and Chapter 3. In the long term, fisheries would be adaptively managed under the MSA, with full consideration of impacts on protected species given in accordance with all applicable laws. In the long term, the change to a place-based advisory structure that is aligned with the FEPs would improve our understanding and management of fishery impacts on protected species through the holistic consideration of all impacts within a given area by each FEP advisory group.

4.4.3.4. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, the implementation of a place-based advisory structure that is aligned with the FEPs would be anticipated to enhance opportunities for participation in the management process by fishery participants and communities as there would be clearly defined advisory groups with responsibility for each FEP area with which to interact. The alignment of the advisory groups with the geographic locations of fisheries and communities would also be anticipated to increase the sense of shared ownership and investment in the management of marine resources by both residents and managers as FEP advisory bodies would have responsibility for a place rather than a species or stakeholder interest.

4.4.3.5. Administration and Enforcement

Impacts on management and administration are anticipated to be negative under Alternative 3C. The transition to a place-based advisory structure would entail significant and ongoing costs, as to be successful each FEP Plan Team would need to include members with local expertise in each of the five species groups managed by the Council. Because of the remoteness of the Pacific Islands region and limited number of major universities or other research institutions, finding a sufficient number of members to participate in each of the FEP Plan Teams would be difficult and would likely require recruitment from other areas. These recruits may or may not have training or knowledge of local conditions, and their participation would entail significant travel time and costs. If the FEP Plan Teams were comprised of only the limited number of available local experts (i.e., current FMP Plan Team members), then each member would likely have to serve on numerous FEP Plan Teams. This would represent a significant increase in their responsibilities and time commitments. Impacts on enforcement would be anticipated to be unchanged as current regulations would remain in place.

4.4.4. Alternative 3D: Replace the Current FMP Advisory Panels, Plan Teams, and Five Standing Committees With FEP Advisory Panels, FEP Standing Committees, and Two FEP Plan Teams (Preferred)

4.4.4.1. Physical Environment

As in Alternative 3C, this alternative would replace the existing Advisory Panels and five of the Standing Committees with FEP Advisory Panels and FEP Standing Committees. However, this alternative would replace the existing five FMP Plan Teams with a single Demersal FEP Plan Team and a single Pelagic FEP Plan Team that would each be responsible for overseeing the development and implementation of all demersal and pelagic FEPs, respectively. All groups would provide advice to the Council as under the current process described in Chapter 3. In the short term this alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered via the MSA or through changes to NMFS's list of allowable gears. In the long term, the change to a place-based advisory structure that is aligned with the FEPs would improve our understanding and management of fishery impacts on the physical environment through the holistic consideration of all impacts within a given area by each FEP advisory group.

4.4.4.2. Biological Environment

In the short term under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be anticipated to be the same as those described in Chapter 3. In the long term, the change to a place-based advisory structure that is aligned with the FEPs would improve our understanding and management of fishery impacts on target and nontarget species through the holistic consideration of all impacts within a given area by each FEP advisory group.

4.4.4.3. Essential Fish Habitat

Under Alternative 3D, impacts on essential fish habitat would remain as described in Chapter 3. EFH and HAPC would continue to be designated and adaptively managed under the MSA.

4.4.4.4. Protected Species

Under Alternative 3D, short-term impacts on protected species would remain as described in Chapter 3. In the long term, fisheries would be adaptively managed under the MSA, with full consideration of impacts on protected species given in accordance with applicable laws. In the long term, the change to a place-based advisory structure that is aligned with the FEPs would improve our understanding and management of fishery impacts on protected species through the holistic consideration of all impacts within a given area by each FEP advisory group.

4.4.4.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. The increased alignment of the advisory groups with interrelated fisheries would also be anticipated to increase the sense of shared ownership and investment in the management of marine resources by both residents and managers as FEP advisory bodies would now be tasked with a broad range of fisheries (e.g., all demersal fisheries) rather than a single species or interest.

4.4.4.6. Administration and Enforcement

Impacts on management and administration are not anticipated to be substantial under Alternative 3D; however, the short-term transition to a place-based advisory structure would entail some costs. This alternative would result in the combination of current demersal Plan Teams (Bottomfish, Crustaceans, Precious Corals, and Coral Reef Ecosystems) to make up the single Demersal Plan Team that would be responsible for all FEPs for demersal fisheries. The current Pelagics FMP Plan Team would become the Pelagic FEP Plan Team with no changes. Long-term positive impacts are expected under this alternative as additional costs are anticipated to be minimal and could even be reduced as the Council staff would only have to staff and brief two Plan Teams on current issues as opposed to the existing five. In addition, the utilization of the same FEP Plan Team across all demersal FEPs would be anticipated to increase the transfer of experience and knowledge between FEP areas while maintaining the holistic consideration of all impacts within a given area. Similarly, the continued utilization of a single Pelagics Plan Team would be anticipated to maintain the current broad and integrated approach to the management of migratory species that range across the Western Pacific Region. Impacts on enforcement would be anticipated to be unchanged as current regulations would remain in place.

4.5. Component 4: Regional Coordination

In the Western Pacific Region, management of ocean and coastal activities is administered by a number of agencies at the Federal, state, county, and village level. Many individual agencies administer programs and initiatives that address sometimes overlapping ocean and coastal components. A primary reason for including regional coordination as a component for consideration in the establishment of FEPs is its ability to address nonfishing impacts on marine ecosystems.

Component 4 is nonregulatory (i.e., has no regulatory effect) and is included in this EIS to assist the Council in identifying appropriate coordination activities under an ecosystem-based fishery management structure. For each alterative under Component 4 the potential impacts on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration are discussed.

4.5.1. Alternative 4A: No Action—Do Not Establish Ocean Council Type Groups

4.5.1.1. Physical Environment

Under this alternative, the Council would not establish or support additional Ocean Council type groups (composed of multiple agencies, community groups, NGOs, and private business) but would continue to provide information regarding the impacts of land-based and nonfishing activities through its membership on the existing Hawaii Ocean and Coastal Committee and as requested on an ad hoc basis. This alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. However, not considering the full range of impacts of nonfishing activities on marine ecosystems could result in habitat damage or loss of marine resources. Management changes would continue to be considered via the MSA process or through changes to NMFS's list of allowable gears.

4.5.1.2. Biological Environment

Under Alternative 4A, current regulations would be unchanged, and impacts on target and nontarget stocks would be the same as those described in Chapter 3. However, not considering the full range of impacts of nonfishing activities on marine ecosystems could result in habitat damage or loss of marine resources.

4.5.1.3. Essential Fish Habitat

Under Alternative 4A, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concerns would continue to be designated and adaptively managed under the MSA.

4.5.1.4. Protected Species

Under this alternative, impacts on protected species would remain as described in Chapter 3. Fisheries would be adaptively managed under the MSA, with full consideration of impacts on protected species given in accordance with other applicable laws.

4.5.1.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. However, not considering the full range of impacts of nonfishing activities on marine ecosystems could result in stock depletion, habitat damage, and the degradation or loss of marine resources on which fishery participants and communities depend.

4.5.1.6. Administration and Enforcement

This alternative would not have any impacts on management, administration, or enforcement, which would continue as described in Chapter 3.

4.5.2. Alternative 4B: Establish Regional Ecosystem Council Committees (Preferred)

4.5.2.1. Physical Environment

Under this alternative, the Council would establish Regional Ecosystem Advisory Committees made up of executive-level representatives from Federal, state, and local government agencies, businesses, and nongovernmental organizations that have responsibility or interest in land-based and nonfishing activities that potentially affect the marine environment. Committee membership would be by invitation and would provide a mechanism for the Council and member agencies to share information on programs and activities and to coordinate management efforts or resources to address nonfishing-related issues that could affect ocean and coastal resources within and beyond the jurisdiction of the Council. These committees would be considered advisory panels under the MSA. Committee meetings would coincide with regularly scheduled Council meetings, and recommendations made by the committee to the Council would be advisory, as would recommendations made by the Council to member agencies. In the short term, this alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered via the MSA or through changes to NMFS's list of allowable gears. In the long term, the establishment of Regional Ecosystem Committees would enhance the Council's ability to coordinate with member management agencies to address non–fishing-related issues that could impact the physical environment.

4.5.2.2. Biological Environment

In the short term under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be anticipated to be the same as those described in Chapter 3. In the long term, the establishment of Regional Ecosystem Committees would enhance the Council's ability to coordinate with member management agencies to address nonfishing-related issues that could impact target and nontarget stocks.

4.5.2.3. Essential Fish Habitat

Under Alternative 4B, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concerns would continue to be designated and adaptively managed under the MSA.

4.5.2.4. Protected Species

Under Alternative 4B, short-term impacts on protected species would remain as described in Chapter 3. In the long term, fisheries would be adaptively managed under the FEPs, with full consideration of impacts on protected species given in accordance with the MSA, MMPA, ESA, NEPA, and other applicable laws. In the long term, the establishment of Regional Ecosystem Committees would enhance the Council's ability to coordinate with member management agencies to address nonfishing-related issues that could impact protected species.

4.5.2.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. The establishment of Regional Ecosystem Committees would provide additional venues for engagement in the management process and may attract new participants who would bring additional expertise and local perspectives to that process, thus further improving the status and management of marine fisheries.

4.5.2.6. Administration and Enforcement

Impacts on management and administration would be significant under Alternative 4B. The creation of one or more Regional Ecosystem Committees would entail some ongoing travel and time costs related to hosting and staffing committee meetings. These would vary according to the size and number of the committees. More significantly, the establishment of Regional Ecosystem Committees would enhance the Council's ability to coordinate with member management agencies in efforts to address nonfishing-related issues and would improve our understanding and management of fisheries in the Western Pacific Region. There may be jurisdictional (local vs. Federal governance) issues that may arise; however, it would be the Council's role to provide clarification on mandated responsibilities for committee participants to preclude jurisdictional contentions. Impacts on enforcement would be anticipated to be unchanged as current regulations would remain in place.

4.5.3. Alternative 4C: Participate in and Support Ocean Council Type Groups

4.5.3.1. Physical Environment

Under this alternative, the Council would not establish any new committees or other groups but would instead participate in and support the establishment of Ocean Council type groups established by the governor of each inhabited island area served by the Council (i.e., American Samoa, Guam, Hawaii, and the CNMI). Such a group has been established by the Governor of Hawaii (the Hawaii Ocean and Coastal Committee) and is made up primarily of local and county agencies with oversight of development, ocean recreation, tourism, and natural resource management. In the short term, this alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered via the MSA or through changes to NMFS's list of allowable gears. In the long term, participation in Ocean Council type groups throughout the Western Pacific Region would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related issues that could impact the physical environment. However, it is uncertain if or when the region's non-Hawaii governors would establish such Ocean Council type groups. If they are not established, the non-Hawaii regions would not see these benefits under this alternative.

4.5.3.2. Biological Environment

In the short term under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be the same as those described in Chapter 3. In the long term, participation in Ocean Council type groups throughout the Western Pacific Region would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related issues that could impact target and nontarget stocks. However, it is uncertain if or when the region's non-Hawaii governors would establish such Ocean Council type groups. If they are not established, the non-Hawaii regions would not see these benefits under this alternative.

4.5.3.3. Essential Fish Habitat

Under Alternative 4C, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concerns would continue to be designated and adaptively managed under the MSA.

4.5.3.4. Protected Species

Under Alternative 4C, short-term impacts on protected species would remain as described in Chapter 3. In the long term, fisheries would be adaptively managed under the MSA, with full consideration of impacts on protected species given in accordance with the MSA, MMPA, ESA, NEPA, and other applicable laws. In the long term, participation in Ocean Council type groups throughout the Western Pacific Region would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related issues that could impact protected species. However, it is uncertain if or when the region's non-Hawaii governors would establish such Ocean Council type groups. If they are not established, the non-Hawaii regions would not see these benefits under this alternative.

4.5.3.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. Support and participation by the Council in Ocean Council type groups throughout the Western Pacific Region could encourage their development in the non-Hawaii areas. If successful, this would provide additional venues for engagement in the management process and may attract new participants who would bring additional expertise and local perspectives to that process, thus further improving the status and management of marine fisheries.

4.5.3.6. Administration and Enforcement

Impacts on management and administration would be moderate to uncertain under Alternative 4C. Involvement in Ocean Council type groups would entail some travel and time costs related to group meetings. These would vary according to the number of groups and meetings, but would generally be low as the meetings would not be hosted or staffed by the Council or NOAA. In the long term, participation in Ocean Council type groups would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related issues in a manner that would improve the status and management of marine fisheries. However, it is uncertain if or when the region's governors (excluding Hawaii) would establish such Ocean Council type groups. If they are not established, these areas would not see these benefits under this alternative. Impacts on enforcement would be unchanged as current regulations would remain in place under this alternative.

4.5.4. Alternative 4D: Establish Independent Regional Ecosystem Councils

4.5.4.1. Physical Environment

Under this alternative, the Council, NOAA, and NMFS would establish and administer independent Regional Ecosystem Councils to supplement the existing decision-making process. These Regional Ecosystem Advisory Councils would be made up of executive-level representatives from Federal, state, and local government agencies, businesses, and nongovernmental organizations that have responsibility for or other interest in land-based and nonfishing activities that affect the marine environment. In the short term, this alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered through the MSA regulatory process or through changes to NMFS's list of allowable gears. In the long term, participation in independent Regional Ecosystem Advisory Councils would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related issues that could impact the physical environment. However, it is uncertain if or when NOAA and NMFS would establish such Regional Ecosystem Advisory Councils. If they are not established, the short-term impacts of this alternative would be the same as those described for Alternative 4A, but over the long-term, the failure to consider the full range of impacts of nonfishing activities on marine ecosystems could result in degradation of the physical environment.

4.5.4.2.Biological Environment

In the short term under this alternative, current regulations would be unchanged and impacts on target and nontarget stocks would be the same as those described in Chapter 3. In the long term, participation in independent Regional Ecosystem Advisory Councils would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related activities that could impact target and nontarget stocks. However, it is uncertain if or when NOAA and NMFS would establish such Regional Ecosystem Advisory Councils. If they are not established, the impacts of this alternative would be the same as those described for Alternative 4A.

4.5.4.3. Essential Fish Habitat

Under Alternative 4D, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concerns would continue to be designated and adaptively managed under the MSA.

4.5.4.4. Protected Species

Under Alternative 4D, short-term impacts on protected species would remain as described in Chapter 3. In the long term, fisheries would be adaptively managed under the MSA with full consideration of impacts on protected species given in accordance with all other applicable laws. In the long term, participation in independent Regional Ecosystem Advisory Councils would enhance the Council's ability to positively influence and coordinate management efforts or resources to address nonfishing-related issues that could impact protected species. However, it is uncertain if or when NOAA and NMFS would establish such Regional Ecosystem Advisory Councils. If they are not established, the impacts of this alternative would be the same as those described for Alternative 4A.

4.5.4.5. Fishery Participants and Communities

This alternative would not have any direct impacts on fishery participants or communities as it would not change current fishery regulations. Support and participation by the Council in independent Regional Ecosystem Advisory Councils could facilitate development of such groups. If successful, this would provide additional venues for engagement in the management process and may attract new participants who would bring additional expertise and local perspectives to that process, thus further improving the status and management of marine fisheries. However, it is uncertain if or when NOAA and NMFS would establish such Regional Ecosystem Advisory Councils. If they are not established over time, the failure to consider the full range of impacts of nonfishing activities on marine ecosystems could result in stock depletion, habitat damage, and the degradation or loss of marine resources on which fishery participants and communities depend.

4.5.4.6. Administration and Enforcement

Impacts on management and administration would be anticipated to be moderate to uncertain under Alternative 4D. Involvement in independent Regional Ecosystem Advisory Councils would entail some travel and time costs related to group meetings. These would vary according to the number of groups and meetings. In the long term, participation in independent Regional Ecosystem Advisory Councils would enhance the Council's ability to positively influence and coordinate management efforts or resources to address non–fishing-related issues that could impact the physical environment. However, it is uncertain if or when NOAA and NMFS would establish such Regional Ecosystem Advisory Councils. If they are not established, the impacts of this alternative would be the same as those described for Alternative 4A (no action). No impacts on enforcement would be anticipated as current regulations would remain in place under this alternative.

4.6. Component 5: International Coordination

As discussed in Chapter 2, the Council is an active participant in the development and implementation of international agreements regarding marine resources. The Council also participates in and promotes the formation of regional and international arrangements for assessing and conserving all marine resources throughout their range, including the ecosystems and habitats that they depend on. As marine ecosystems are generally considered "open" systems, and large-scale impacts can be observed within smaller units, international coordination would be a necessary component of successful implementation of an ecosystem-based approach within the Western Pacific Region.

Component 5 is nonregulatory (i.e., has no regulatory effect) and is included in this EIS to assist the Council in identifying appropriate coordination activities under an ecosystem-based fishery management structure. The alternatives under Component 5 represent a range of nonregulatory actions that the Council has considered in relation to its participation in discussions and meetings that are international in scope. For each alterative under Component 5 the potential impacts on the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration are discussed.

4.6.1. Alternative 5A—No Action

4.6.1.1. Physical Environment

Under this alternative, the Council would continue to participate in international management fora such as the Western and Central Pacific Fisheries Commission, as well as workshops and seminars (e.g., International Fishers Forums). This alternative would not have any impact on the physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered under the MSA process.

4.6.1.2. Biological Environment

The Council's current level of participation and involvement in international management fora positively impacts target and nontarget species through shared stock management coordination among nations. In 2000, for example, the Council played an integral role in the development of the Multilateral High Level Conference to establish the Convention on the Conservation and Management of Highly Migratory Fish Stocks in the Central and Western Pacific Region. The Western and Central Pacific Fisheries Commission, as well as the Inter-American Tropical Tuna Commission, meet annually, and the Council plays a critical role in advising the U.S. delegation at these meetings on issues relating to the conservation and management of highly migratory pelagic stocks that occur in the Western Pacific Region. Issues considered at such meetings include stock assessments, data and information collections, and enforcement. Under Alternative 5A, the Council would continue its involvement in these fora.

4.6.1.3. Essential Fish Habitat

Under Alternative 5A, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concerns would continue to be designated and adaptively managed under the MSA.

4.6.1.4. Protected Species

The Council's continued participation in international management fora under Alternative 5A would positively impact protected species. Currently, the Council actively participates in international meetings and workshops aimed at reducing bycatch of protected species in fisheries. For example, the Council has played an integral role in each of the International Fishers' Forums (2000, 2002, and 2005) that bring together fishers from all over the world to discuss and share methods on ways to reduce protected species bycatch. Through cooperative research and conservation efforts, the Council also participates in international programs aimed at reducing sea turtle interactions with fisheries through gear modifications (e.g., circle hooks). It also supports sea turtle conservation work by local communities (e.g., work in Papua New Guinea to protect sea turtle nesting sites).

4.6.1.5. Fisheries Participants and Communities

The Council's current level of participation in international management fora beneficially impacts fisheries participants and communities by representing Western Pacific Region fisheries participants and communities that may be affected by international management decisions. The

Council's international work on protected species bycatch reduction and conservation also beneficially impacts fishery participants by exporting effective gear methods to other fishing nations to help the recovery of threatened and endangered species populations. Increasing the populations of rare species indirectly benefits fishery participants and communities that would otherwise be affected by regulations/closures of fisheries that could result from interactions with protected species with critically low populations. The Council represents various constituencies (i.e., commercial, recreational, and subsistence sectors), and Council meetings provide a mechanism for the general public to be involved in fishery management decisions. Therefore, the Council's participation in international fora also benefits fishery participants and communities by keeping them aware of international management issues (e.g., stock assessments, gear methods) that may affect them locally. These benefits would continue under this alternative.

4.6.1.6. Administration and Enforcement

The Council's current level of participation in international management fora requires staff time to help plan international meetings, write papers, and travel to and from various locations. The amount of resources or staff time dedicated to international management fora make up a small percentage of the resources or staff time dedicated to domestic fishery issues. These costs would remain unchanged under this alternative.

4.6.2. Alternative 5B—Increase Level of Participation in International Management Fora and Establish Meetings/Workshops With Neighboring Nations of Western Pacific Region Island Areas (Preferred)

4.6.2.1. Physical Environment

This alternative is not expected to impact the physical environment as destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes as a result of informational exchange or requirements from international commissions would continue to be considered under the MSA process, as appropriate.

4.6.2.2. Biological Environment

Increasing the Council's participation and involvement in international management fora and establishing meetings/workshops with neighboring nations is expected to positively impact target and nontarget species through informational exchange regarding shared stock management and coordination among nations.

4.6.2.3. Essential Fish Habitat

Under Alternative 5B, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concern would continue to be designated and adaptively managed under the MSA.

4.6.2.4. Protected Species

Increasing the Council's participation and involvement in international management fora and establishing meetings/workshops with neighboring nations would positively impact protected species through informational exchange and shared strategies on reducing interactions between fisheries and protected species. The Council has already initiated programs to export to various countries gear methods that have been successful in reducing protected species interactions (e.g., circle hooks in the Ecuador small boat longline fleet). The Council is also working with community groups to establish and improve on sea turtle conservation efforts (e.g., Papua New Guinea leatherback sea turtle nesting beach conservation). Similarly, establishing meetings and workshops between neighboring island nations in the Western Pacific Region would positively impact protected species through the sharing of information regarding the management of protected species that are in both the U.S. EEZ and the neighboring EEZs.

4.6.2.5. Fishery Participants and Communities

Alternative 5B's increased level of Council participation in international management fora and the establishment of meetings/workshops with neighboring nations would beneficially impact fisheries participants and communities by keeping them aware of international management issues (e.g., stock assessments, gear methods) as well as the current status of fisheries in neighboring nations.

4.6.2.6. Administration and Enforcement

This alternative is anticipated to impact management and administration by increasing Council staff time to prepare reports, coordinate meetings, and travel to and from meeting locations. Administrative costs would increase under this alternative to pay for meeting travel. Coordination of meetings/workshops between Western Pacific Region island areas and neighboring nations would also likely involve staff time. Enforcement costs are not expected to increase over current levels.

4.6.3. Alternative 5C—Do Not Participate in International Management Fora and Establish Meetings/Workshops with Neighboring Nations of Western Pacific Region Island Areas

4.6.3.1. Physical Environment

Under this alternative, the Council would stop participating in international management fora such as the Western and Central Pacific Fisheries Commission and the Inter-America Tropical Tuna Commission, and would stop holding, sponsoring, or participating in international workshops and meetings (e.g., International Fishers Forums). This alternative would not directly impact the Western Pacific Region's physical environment as current regulations would be unchanged, destructive gear types would continue to be prohibited, and definitions of EFH and HAPC would remain as described in Table 3–1. Management changes would continue to be considered under the MSA. However, efforts by the Council to educate other nations and fishermen as to the importance of prohibiting the use of destructive gear types or fishing methods such as dynamite, bleach, and poisons would cease under this alternative.

4.6.3.2. Biological Environment

Alternative 5C could have negative impacts on target and nontarget species, as ending the Council's input to and participation in international management fora, meetings, and workshops would represent a reduction in the information and management recommendations available to these groups. The Council represents a wide range of fishery managers, scientists, and participants with many years of experience and expertise. The loss of their participation could result in suboptimal management, conservation, and science regimes that would lead to negative impacts on target and nontarget species.

4.6.3.3. Essential Fish Habitat

Under Alternative 5C, impacts on essential fish habitat would remain as described in Chapter 3. Essential fish habitat and habitat areas of concerns would continue to be designated and adaptively managed under the MSA.

4.6.3.4. Protected Species

This alternative could have negative impacts on protected species. The Council represents a wide range of fishery managers, scientists, and participants with many years of experience and expertise. The loss of the Council's input to and participation in international management fora, meetings, and workshops (e.g., International Fishers' Forums) would reduce the information and management recommendations available to these groups. That loss could result in suboptimal management, conservation, and scientific regimes that would lead to negative impacts on protected species.

4.6.3.5. Fisheries Participants and Communities

This alternative would reduce the Council's ability to represent or engage fishery participants in international management fora, meetings, and workshops. It would also reduce the availability of information generated from these meetings that is currently provided by the Council to fishery participants and communities, as well as to the general public. In addition, the cessation of the Council's international work on protected species bycatch reduction and conservation would negatively impact protected species, which in turn could lead to additional fishery regulations or closures.

4.6.3.6. Administration and Enforcement

This alternative would reduce administrative costs for travel and associated staff time requirements. On the other hand, management, administration, and enforcement costs would all potentially increase as the loss of the Council's input could result in suboptimal management, conservation, and science regimes that would lead to increased costs due to a loss of efficiency or cost-effectiveness in the domestic implementation of these regimes.

4.7. Economic Effects

4.7.1. Baseline to Determine Economic Effects

The no-action alternatives were used as a baseline for the discussion of economic impacts resulting from the replacement of species-based fishery management under the current FMPs with ecosystems management under the proposed FEPs. All no-action alternatives described above would yield no change from those economic impacts that would occur under the current fishery management regime, i.e., the status quo.

4.7.2. Direct Economic Impacts to the Fishing Sector

Only the alternatives under Components 1 and 2 could have regulatory effects resulting in economic gains or losses to directed fisheries. The short term economic impacts of this proposed action on the directed fisheries, based on the preferred alternatives 1D and 2B, are zero since there would be no new restrictions or additional requirements in terms of regulatory compliance. The permitting and reporting requirements that currently exist under the FMPs are species/archipelago-based and would continue unaltered under the FEPs' management regime. There would be no short term requirements to revise fisheries regulations associated with MUS since the FEPs would incorporate identical MUS as are found in the current FMPs. The longer-term economic impacts to directed fisheries are indeterminate. Those impacts would depend on specific management measures implemented for the various FEPs. However, the requirements for fisheries management under the currently reauthorized MSA would continue to be a dominant factor affecting the economics of all directed fisheries associated with the various MUS. In addition to the MSA, the Endangered Species Act and Marine Mammal Protection Act could also affect the economic returns from the directed fisheries depending upon fishing restrictions. A good example of ESA influence on directed fisheries is the turtle cap that has been put on the Hawaii-based shallow-set longline fishery.

The implementation of either Alternatives 1B or 1C would also result in zero impact in the short term. However, the implementation of Alternative 1E, which would implement several FEPs associated with each biogeographic and pelagic zone, could result in the requirement for fish harvesting vessels to obtain new permits and perform associated recordkeeping for harvesting MUS resulting in additional compliance costs for those affected entities. This alternative could result in additional regulations and not a simple reorganization of the regulations as would the preferred. The implementation of alternatives 2C or 2D could also directly and indirectly result in additional requirements in terms of an expansion of management responsibilities for designated ecosystems and the resulting economic impacts of increased management.

4.7.3. Indirect Economic Effects

In the short term, there would be no indirect economic impacts to the economy from implementation of the preferred alternatives. However, implementation of Alternatives 1E, 2C, or 2D could result in additional economic impacts to other sectors of the economy indirectly attributable to additional economic impacts to the directed fisheries. There could also be a commensurate increase in government costs depending upon the type and scope of management measures required under these non-preferred alternatives. In the longer term, indirect economic impacts resulting from changes in directed fishing activity and other ecosystem services resulting from revisions to FEPs are indeterminate. Those long-term impacts would depend upon specific management measures and how those measures would impact the directed fisheries, the ecosystem, and other sectors of the economy.

4.7.4. Economic Impacts of Required Institutional Changes

Components 3, 4, and 5 and associated alternatives represent initial institutional changes required as part of the reorganized management structure. These changes would result in reorganized plan teams and a revised committee structure, which are all related to Council functions. Most of these requirements could be met with existing staff and resources. However, there may be additional costs in meeting the obligations set out in the proposed action. Conceivably, additional staff or consulting services may be required to assure that forthcoming FEPs are consistent with applicable statues and executive orders. There would be no additional costs to NMFS at this time since available staff would be adequate to meet the requirements presented by the proposed action.

4.7.5. Overall Economic Effects

Economic impacts from implementation of this proposed action would be minimal, reflecting only minor additional costs associated with institutional changes required to implement the new management structure. The potential impacts of longer term institutional requirements are discussed below.

4.7.6. Future Economic Considerations

By initiating FEPs, the Council has taken the first step toward the greater goal of comprehensive ecosystem management by developing a more efficient vehicle which could be utilized to enumerate distinctions between fisheries specific management and the holistic approach identified with ecosystems management. Recognizing that the reorganization of the management structure is only an initial step toward ecosystems management, many proponents of ecosystem-based approaches to marine resource management envision future management regimes with ecosystems as the central management focus as opposed to a narrower focus on individual fisheries. Under this scenario, the economic impact to an ecosystem from regulation could be measured by estimating the changes in the aggregate value of the various components or services, including directed commercial fisheries, associated with specific rulemaking.

If the FEP type of management leads to better management and uses of the marine resources, then there might be long term direct and indirect benefit to the fisheries. Meanwhile, there would be costs associated with required institutional changes for any possible changes in regulations. However, measurements of these benefits are a complex task. While the value of directed fisheries may be measured in dollars per pound or the potential to earn dollars per pound, many ecosystem indicators or factors are not readily measurable. For instance, there are use values associated with swimming, surfing, recreational fisheries, etc. that are quite difficult to measure even with available data. There are also non-use (existence) values associated with the protection of endangered species and option and quasi-option values associated with the preservation of natural habitats. In addition to the requirements to develop more precise and timely models to monitor and predict social and economic value produced by a given ecosystem, there would also be a need to enhance our understanding of marine and coastal systems to develop predictive models that depend on endogenous ecological relationships between and among the indicators or factors present in the ecosystem.

Furthermore, there would also be issues with developing and implementing the appropriate institutional organizations required to manage marine-based ecosystems. As a starting point, adequate ecosystems management would most likely require agreements among those institutions– federal, state, or local, that currently hold management authorities over some portion of the marine or human environment. However, management by agreement could create inefficiencies associated with timeliness of regulations and costs of repetitive use of identical resources, especially labor.

Nonetheless, it is also clear that while laying the foundation for future ecosystems management by implementing FEPs may not result in immediate changes to net benefits, there will be a requirement to estimate net benefits in the form of net present values for each suite of management measures implemented under the FEPs based on changes to the values of ecosystems as well as individual fisheries.

4.7.7. Summary

No foreseeable economic gains or losses to direct fisheries are expected to result from implementing either of the preferred alternatives 1D and 2B since the FEPs do not call for any new restrictions or additional requirements in terms of regulatory compliance. Short term economic impacts based on alternatives 1B, 1C, 1D and 2B can be regarded as zero for reasons discussed in the direct and indirect economic impacts sections above (Sections 4.6.2 and 4.6.3). No Action alternatives 1A, 2A, 3A, 4A and 5A, by definition, represent the status quo or baseline condition and are included for informational and comparative purposes.

NMFS recognizes that the pursuit of a more holistic approach to ecosystems management for the U.S. Western Pacific Region may affect the long-term net benefits at the institutional level once the FEPs are implemented. Net benefits of ecosystem management are indeterminate at present, and it could take years or even decades before impacts could be truly measured. It would seem on the surface that optimal economic returns from an ecosystem would be more likely if the ecosystem were managed by one institution. However, some economists argue that decentralization of present institutions to community-type management would eliminate the requirement to attempt a one-size-fits-all solution that lacks the flexibility to manage ecosystems efficiently recognizing that each ecosystem is unique and contains its own dynamics. No matter which institutional organization prevails in the future, it is clear that there will be social costs associated with institutional reorganization. In theory, institutional transaction costs may even be lowered if decentralized, cooperative ecosystem management structures evolve within the Western Pacific Region.

Short-term economic impacts resulting from this particular action under the preferred alternatives may be negligible in terms of net national benefits. Longer-term impacts are indeterminate although stability and sustainability of ecosystems is currently seen as the platform for long term benefits both socially and economically.

4.8. Environmental Justice

On February 11, 1994, President William J. Clinton issued Executive Order (E.O.) 12898, “Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations.” The Order provides that “each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations.” E.O. 12898 also provides for agencies to collect, maintain, and analyze information on patterns of subsistence consumption of fish, vegetation, or wildlife to determine whether that agency action may also affect subsistence patterns of consumption and indicate the potential for disproportionately high and adverse human health or environmental effects on subsistence patterns of consumption by low-income populations and minority populations. A memorandum by President Clinton that accompanied E.O. 12898 made it clear that environmental justice should be considered when conducting NEPA analyses by stating the following: “Each Federal agency should analyze the environmental effects, including human health, economic, and social effects of Federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA.”[69]

As described in Chapter 3, the inhabited island areas of the Western Pacific Region are home to indigenous people of Samoan, Chamorro, Carolinian, or Hawaiian ancestry. In addition, each inhabited island of the Western Pacific Region has been defined as a fishing community in accordance with provisions of the MSA. The PRIA are not inhabited and do not have fishing communities as defined under the MSA. As described in Chapter 3, the economic conditions of the Western Pacific Region are such that there is relatively little diversification within economies, with tourism being the most important contributor. However, many indigenous, as well as nonindigenous people of Western Pacific Region islands depend on healthy ecosystems for subsistence as well as for social and economic benefits.

In addition to indigenous populations within communities, the fisheries of the Western Pacific Region have participants of different ethnicities, some of whom require consideration under the minority provisions of the Executive Order. For example, the Hawaii-based longline fleet includes sizable proportions of Korean-Americans and Vietnamese-Americans, as well as individuals of a variety of other ethnicities. Previous FMPs and research have identified environmental justice issues among minority members of a commercial fleet. Subsequent monitoring of these fishermen and their families was conducted to describe the range of social and cultural effects of pelagic fishery management changes at the individual, family, community, and industry levels (Allen and Gough 2006). Allen and Gough’s 2006 study described the economic, social, and cultural impacts of a fishery closure (in this case, the Hawaii-based swordfish fishery) on minority fishers and family members. The study identified 5 interrelated categories of environmental justice issues that resulted from the swordfish fishery closure: (1) changes in household income, (2) changes in psychological well-being, (3) effects on family cohesion, (4) fragmentation of the community, and (5) cumulative impacts.

Similar issues for all minority and low-income fishery participants were considered in the context of the current proposed action. Because none of the alternatives include changes to management measures that would significantly or adversely affect fishery participants or their fishing activities, and because in the future, ecosystem management would enhance fisheries management, a determination was made that restructuring species-based FMPs into place-based FEPs and reorganizing MUS species are largely administrative actions that would not affect household income. No alternative would result in changes to psychological well-being, family cohesion, fragmentation of the community, or have significant cumulative adverse impacts on environmental justice communities. None of the alternatives includes management measures or administrative outcomes that would significantly adversely affect current subsistence activities.

[69] Memorandum from the President to the Heads of Departments and Agencies. Comprehensive Presidential Documents No. 279 (February 11, 1994).

The Federal actions contemplated in this FPEIS are designed to enhance fisheries management by allowing the consideration of fisheries management within an ecosystem context. As Chapters 1 and 4 describe, an ecosystem-based approach to fisheries management would initially involve shifting from species management to place-based management. In the long term, the role of indigenous peoples, fishery participants, and community members in fisheries management would be strengthened by the change to place-based ecosystem management. Traditional and accumulated knowledge of local island fishermen is especially rich (Johannes 1981) and the Council's transition to an ecosystem and place-based approach is designed to access their understanding of the marine environment. The place-based approach would facilitate and strengthen the role of communities in fishery management decisions.

In conclusion, the proposed actions are primarily administrative and would reorganize existing species-based FMPs into place-based FEPs, and include appropriate MUS species in the FEPs. The ecosystem approach to management would eventually allow for enhanced participation by members of the community and is expected to result in better fisheries management over time. None of the alternatives is expected to result in adverse environmental impacts that would disproportionately or adversely affect low income or minority populations, nor would any of the alternatives significantly adversely affect subsistence activities. In both the long and short term, the reorganization of fishery management plans into place-based fishery ecosystem plans is expected to enhance management of the nation's fishery resources to ensure long-term sustainability of the fisheries throughout the Western Pacific Region, which would have positive benefits for all members of the fishing community including those considered under provisions of E.O. 12898.

4.9. Cumulative Effects

NEPA requires that the potential cumulative effects of a proposed action, as well as the cumulative effects of the alternatives to the proposed action, be analyzed in an EIS. Cumulative effects are defined as those combined effects on the human environment that result from the incremental impact of the proposed action when added to other past, present, and reasonably foreseeable future actions, regardless what Federal or nonfederal agency or person undertakes such other actions (40 CFR 150.8.7). The following cumulative effects analysis is organized by the following issues: the physical environment, biological environment, essential fish habitat, protected species, fishery participants and communities, and enforcement and administration.

The geographic scope of this analysis is the Western Pacific Region. For the purposes of this analysis, past management actions refer to previous Council/NMFS actions. External factors or actions are not considered Council/NMFS actions. This analysis does not specifically take into account ecosystem variability (e.g., Pacific Decadal Oscillation), which significantly influences the distribution and abundance of marine species and their habitats. Large scale ecosystem variability is part of the environment that the Council continually considers in managing the fisheries of the Region.

4.9.1. Physical Environment – Cumulative Effects

4.9.1.1. Past Council/NMFS Actions

The existing Western Pacific FMPs prohibit the use of destructive fishing methods (e.g., bottom trawl nets, explosives, fish poisons, etc.) that were used in the past. In 1999, the Council designated essential fish habitat (EFH) and habitat areas of particular concern (HAPC) for each management unit species in the region (64 FR 19068). In accordance with the MSA, the Council and NMFS must ensure that any activities do not adversely affect, to the extent possible, EFH or HAPC for any MUS. By prohibiting destructive fishing methods and ensuring that activities do not adversely affect EFH and HAPC, negative impacts on the physical environment from authorized fishing activities are negligible.

4.9.1.2. Reasonably Foreseeable Council/NMFS Actions

There are no reasonably foreseeable Council/NMFS actions that would significantly affect the physical environment or EFH or HAPC for any Western Pacific MUS.

4.9.1.3. External Factors/Actions Potentially Impacting the Physical Environment

External factors potentially impacting the physical environment in the U.S. EEZ include land-based pollution and runoff, harbor dredging, ocean drilling and mining, ocean dumping, shipping activities, marine debris including derelict fishing gear, mariculture, military exercises, other recreational and commercial maritime activities, as well as research vessel activities. The effects of such factors are observable in site specific areas and are highly variable within the Western Pacific Region. All of these factors are part of the environmental background that affects fishery resources and fisheries and that are continually considered by the Council in managing the fisheries of the Region and will continue to be considered in the future, regardless of which alternative is selected for implementation. With the exception of land based pollution and runoff as well as harbor dredging, the impacts of these factors on the physical habitat are believed to be negligible.

4.9.1.4. Potential Effects of the Alternatives on Physical Environment

4.9.1.4.1. Alternatives for FEP Boundaries

As described in Section 4.1, the delineation of fishery management boundaries would not impact the physical environment of marine ecosystems. The boundaries established under the FMPs (Alternative 1A) or as proposed for the FEPs (Alternatives 1B, 1C, 1D and 1E) do not exist as tangible boundaries, but are strictly geographic representations designated on maps and would not involve placing anything structural in the water or physical environment. The continuation of FMPs or the implementation of FEPs, which in essence would manage marine resources by controlling fishing impacts (human activities), partially regulate the use of vessels and regulate specific gear types that may be used in the conduct of a particular fishery. While potential impacts on the physical environment exist under normal fishing vessel operations—groundings resulting in spilled fuel/oil, garbage and wastes, and habitat damage through anchoring—the occurrence of such events is rare and the vessels authorized to fish under FMP permits must comply with national and international maritime law (e.g., U.S. Clean Water Act, MARPOL[70]). The implementation of the FEPs (Alternatives 1B, 1C, 1D, and 1E) would not change any regulations that prohibit destructive fishing practices and non-selective gear types.

4.9.1.4.2. Alternatives for Species Managed Under FEPs

The current lists of MUS under existing FMPs (Alternative 2A) do not impact the physical environment, nor would the designation of MUS lists specific to place-based FEPs (Alternatives 2B, 2C, and 2D) have any impact on the physical environment.

4.9.1.4.3. Alternatives for Council Advisory Structure

Alternatives to modify the Council advisory structure to be in line with FEPs would have no direct, indirect, or cumulative impacts on the physical environment.

4.9.1.4.4. Alternatives for Regional Coordination

Regional coordination on ecosystem issues among the Council, Federal, state, and local agencies as well as nongovernment groups could potentially have positive impacts on the physical environment because of enhanced communication and understanding between agencies and stakeholder groups that is expected under the ecosystem approach to fishery management. Such coordination would improve the information available to consider potential cumulative impacts of future fishery management decisions.

4.9.1.4.5. Alternatives for International Coordination

Increasing the Council's level of participation in international management fora in partnership and coordination with NMFS, as well as establishing meetings between neighboring nations could have positive impacts on the physical environment because of enhanced communication and understanding between agencies and stakeholder groups

[70] International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978.

4.9.1.5. Potential Cumulative Effects on the Physical Environment

The potential cumulative effects on the physical environment from the designation of: 1) FEP management boundaries, 2) species managed under each FEP, 3) Council advisory structure, 4) regional coordination, and 5) international coordination, are anticipated to be positive in terms of improving fishery management to provide for sustainable fishing in the Western Pacific Region. The designation of place-based FEPs coupled with appropriate Council advisory groups and regional and international coordination mechanisms are expected to have long term positive effects on the physical environment.

4.9.2. Biological Environment – Potential Cumulative Effects

4.9.2.1. Past Council/NMFS Actions

As described in Chapter 1, FMPs have been established and implemented for coral reef ecosystems, bottomfish and seamount groundfish, precious corals, crustaceans, and pelagics. The FMPs require permits and catch reporting for the majority of managed fisheries. Annual stock assessments are conducted by NMFS for target species, and bycatch of nontarget species is monitored by NMFS through catch reports as well as data collected by fishery observers. Fishing effort and capacity for several fisheries have been regulated through limited access programs as well as maximum vessel length regulations. Fishing methods such as trawls and drift nets which indiscriminately capture marine organisms are prohibited in the Western Pacific Region.

4.9.2.2. Reasonably Foreseeable Future Council/NMFS Actions

The MSA fishery management process is an adaptive management process. As needs for management actions arise, appropriate measures will be developed by the Council and, as approved by the Secretary of Commerce, implemented by NMFS. The shift towards ecosystem fisheries management would likely include future actions that would consider the dynamic variability of ocean ecosystems and could include the use of physical or biological indicators. As greater scientific information becomes available, future management actions could also include expanding MUS lists to include food web linkages such as predator-prey relationships.

4.9.2.3. External Factors/Actions Potentially Impacting the Biological Environment

The external factors or actions that have impacted, may be impacting, or may have impacts on marine biota in the future include habitat degradation from land-based pollution and runoff, dredging of harbors and other coastal areas, ocean tourism activities, ocean drilling and mining, shipping activities, research vessel activities, marine debris, and derelict fishing gear (i.e., ghost fishing). The effects of the human activities listed above are largely unquantifiable and unknown; however, habitat degradation due to land run-off is believed to be adversely affecting the biological environment in some areas. In accordance with the MSA, fisheries are managed to be sustainable, and that management continually considers external factors.

4.9.2.4. Potential Effects of the Alternatives on the Biological Environment

4.9.2.4.1. Alternatives for Approving and Implementing FEPs

As described in Section 4.1, the continuation of existing fishery management measures and FMP boundaries (Alternative 1A) or the boundaries of FEPs (Alternatives 1B, 1C, 1D, and 1E) would not have any direct effects on the biological environment as these boundaries are simply geographic representations on maps. However, the continuation of FMPs or implementation of FEPs to manage fisheries would have potential positive impacts on target and nontarget species. Although FMPs and FEPs would allow the harvest of target and nontarget species, positive impacts on the biological environment from FMPs or FEPs under all the alternatives would result from data collection (e.g., logbooks, observers) as well as controls on fishing gears and fishing effort (e.g., limited entry, maximum vessel lengths, closed areas) that otherwise would not be in place.

Under all of the alternatives, the status and trends of target and nontarget species stocks would continue to be evaluated using existing criteria and thresholds for defining “overfishing” and “overfished” conditions as currently applied to individual stocks or stock complexes. Under the FEP alternatives (Alternatives 1B, 1C, 1D, and 1E), management of the existing stock complexes would be unchanged; however, as more information becomes available regarding intra-species and inter-specific linkages within FEP areas, increased consideration of fishery interactions and nonfishery impacts on the biological environment would improve management of these resources. It would be more difficult to manage the inter- and intra-species linkages within the FEP areas under Alternative 1E because the number of plans would increase the management complexity. Therefore Alternative 1E would result in a reduced level of positive impacts on the biological environment as compared with the other Component 1 alternatives.

4.9.2.4.2. Alternatives for Species Managed Under FEPs

MUS lists currently contained under existing FMPs include those species that are caught in quantities sufficient to warrant management or specific monitoring, and the primary impact of inclusion of species is that the species (i.e., the fishery targeting that species) can be directly managed. Continued reliance on existing MUS lists (Alternative 2A) would have no impact on the biological environment as all major species and species groups are included in those lists. Alternative 2B would not affect the biological environment as the MUS lists would include those current MUS known to be present within each FEP area. Alternatives 2C and 2D, however, would add incidentally caught species that are not currently MUS. Although information is collected on nontarget species through data collection programs (i.e., mandatory logbooks, voluntary creel surveys), the inclusion of these species on MUS lists would require that MSY, EFH, and HAPC be designated for each new MUS, and their harvests included in annual reports. For this reason, adding new species to the MUS lists could result in positive impacts on those species because of increased monitoring, stock assessments, and potentially new management measures. However, because these species are not targeted or harvested in appreciable quantities, nor have they been identified as keystone species, the necessity of related management measures is difficult to ascertain.

4.9.2.4.3. Alternatives for Council Advisory Structure

Alternatives to continue or modify the Council's current advisory structure would have no direct impacts on the biological environment as these would be administrative changes only. Indirect positive effects would occur from Alternative 3D as the Council's advisory structure would be appropriately aligned under a place-based approach and increased emphasis would be placed on local management issues regarding the biological environment.

4.9.2.4.4. Alternatives for Regional Coordination

A lack of regional coordination (Alternative 4A) on ecosystem issues among the Council, Federal, state, and local agencies as well as nonbusiness and nongovernment groups would potentially have negative impacts on the biological environment because of poor communication and understanding between agencies and stakeholder groups. On the other hand, increased regional coordination (Alternatives 4B, 4C, and 4D) would enhance communication and understanding amongst agencies and stakeholder groups, thereby having positive impacts on the biological environment.

4.9.2.4.5. Alternatives for International Coordination

Continued (Alternative 5A) or increased (Alternative 5B) Council participation in international management fora as well as establishing meetings between neighboring nations would potentially have positive impacts on the biological environment because of the enhanced communication and understanding between agencies and stakeholder groups that could result. Decreased or no (Alternative 5C) Council participation would have negative impacts on the biological environment as communication between domestic and international fishery managers would be difficult.

4.9.2.4.6. Potential Cumulative Effects on the Biological Environment

None of the alternatives considered within the five components would result in negative cumulative effects on the biological environment. The implementation of FMPs and FEPs allow managers to control fishery harvests, establish data collection programs, and evaluate stocks on an annual basis. The cumulative effects of implementing FEPs, reorganizing MUS lists, modifying the Council's advisory structure, enhancing regional coordination, and increasing international coordination, when added to the effect of exogenous factors, are not anticipated to result in adverse affects to the biological environment. In fact the contrary is anticipated to occur under the preferred alternatives, that is, positive cumulative effects for target and nontarget species are expected due to the shift towards place-based fisheries ecosystem management that enhances understanding and results in improved management of marine ecosystems.

4.9.3. Essential Fish Habitat

4.9.3.1. Past Council/NMFS Actions

As described in Chapter 1, FMPs have been established and implemented for coral reef ecosystems, bottomfish and seamount groundfish, precious corals, crustaceans, and pelagics. The FMPs require permits and catch reporting for the majority of managed fisheries. Annual stock assessments are conducted by NMFS for target species, and catch of nontarget species is monitored through catch reports as well as through data collected by fishery observers. Fishing effort and capacity for several fisheries have been regulated through limited access programs as well as maximum vessel length regulations. Destructive fishing methods such as bottomtrawls, poisons, and explosives which may damage EFH and HAPC are prohibited in the Western Pacific Region.

4.9.3.2. **Reasonably Foreseeable Future Council/NMFS Actions**

The MSA fishery management process is inherently an adaptive management process. As needs for management actions arise, appropriate measures will be developed by the Council and, as approved by the Secretary of Commerce, implemented by NMFS. The shift towards ecosystem fisheries management will likely include actions that will consider the dynamic variability of ocean ecosystems and may include the use of physical or biological indicators.

4.9.3.3. External Factors/Actions Potentially Impacting EFH

The external factors or actions that have impacted, may be impacting, or may have impacts in the future include habitat degradation from land-based pollution and runoff, dredging of harbors and other coastal areas, ocean tourism activities, ocean drilling and mining, shipping activities, research vessel activities, marine debris, and derelict fishing gear (i.e., ghost fishing). The effects of the human activities listed above are largely unquantifiable and unknown; however, habitat degradation due to runoff is believed to adversely affect nearshore EFH and/or HAPC.

4.9.3.4. Potential Effects of the Alternatives on EFH

4.9.3.4.1. Alternatives for Approving and Implementing FEPs

As described in Section 4.1, the continuation of existing management measures and FMP boundaries (Alternative 1A) or the delineation FEP boundaries (Alternatives 1B, 1C, and 1D) would not have any direct effects on EFH or HAPC as these boundaries are simply geographic representations on maps.

4.9.3.4.2. Alternatives for Species Managed Under FEPs

MUS lists currently contained under existing FMPs include those species that are caught in quantities sufficient to warrant management or specific monitoring, and the primary impact of inclusion of species is that the species (i.e., the fishery targeting that species) can be directly managed. Continued reliance on existing MUS lists (Alternative 2A) would have no impact on EFH or HAPC as all major species and species groups are included in those lists.

4.9.3.4.3. Alternatives for Council Advisory Process

Alternatives to continue or modify the Council's current advisory structure would have no direct impacts on EFH or HAPC as these would be administrative changes. Indirect positive effects would occur from Alternative 3D as the Council's advisory structure would be appropriately aligned under a place-based approach and increased emphasis would be placed on local management issues regarding EFH and HAPC.

4.9.3.4.4. Alternatives for Regional Coordination

A lack of regional coordination (Alternative 4A) on ecosystem issues among the Council, Federal, state, and local agencies as well as nonbusiness and nongovernment groups would potentially have negative impacts on EFH and HAPC because of poor communication and understanding between agencies and stakeholder groups. On the other hand, increased regional coordination (Alternatives 4B, 4C, and 4D) would enhance communication and understanding amongst agencies and stakeholder groups, thereby having positive impacts on EFH and HAPC.

4.9.3.4.5. Alternatives for International Coordination

Continued (Alternative 5A) or increased (Alternative 5B) Council participation in international management fora, as well as establishing meetings between neighboring nations, would potentially have positive impacts on EFH or HAPC because of enhanced communication and understanding between agencies and stakeholder groups. Decreased or no (Alternative 5C) Council participation would potentially have negative impacts on EFH and HAPC as communication between domestic and international fishery managers would be difficult.

4.9.3.5. Potential Cumulative Effects on EFH and HAPC

None of the alternatives considered within the five components would result in negative cumulative effects on EFH or HAPC. FMPs and FEPs both contain provisions that allow managers to control fishery harvests, establish data collection programs, and evaluate stocks on an annual basis. The cumulative effects of implementing FEPs, reorganizing MUS lists, modifying the Council's advisory structure, enhancing regional coordination, and increasing international coordination, when added to the effect of exogenous factors, are not anticipated to result in adverse affects to EFH or HAPC. In fact the contrary is anticipated; under the preferred alternatives, positive cumulative effects for EFH and HAPC are expected as a shift toward place-based fisheries ecosystem management would enhance understanding and improve management of marine ecosystems.

4.9.4. Protected Species

4.9.4.1. Past Council/NMFS Actions Impacting Sea Turtles

As discussed in Section 3.4.1, all fisheries managed under the existing FMPs have undergone reviews for their impacts on protected species. All sea turtles in the Western Pacific Region are listed either as threatened or endangered under the ESA. Biological Opinions are prepared by NMFS under Section 7 of the ESA to determine whether or not fisheries are likely to jeopardize the continued existence of any ESA-listed species. No fishery managed by the Council under the existing FMPs has been found likely to jeopardize the continued existence or critical habitat of any sea turtle populations in the Western Pacific Region.

The Hawaii-based longline fishery interacts with sea turtles, and the Council and NMFS have taken measures to significantly reduce sea turtle interactions in that fishery. In 2004, NMFS implemented Council-recommended regulations to require the use of circle hooks and mackerel-type bait in the Hawaii-based longline shallow-set sector. These measures have significantly reduced sea turtle interactions. Additionally, hard limits of 16 leatherback interactions and 17 loggerhead interactions, and mandatory 100 percent observer coverage were implemented for this sector. Under the hard limits, the shallow-set sector is closed immediately when either hard limit is reached. If neither is reached, the shallow-set sector is closed annually after the completion of the total allowable sets (2,120). In March 2006, the shallow-set sector of the longline fleet reached the hard limit for loggerhead sea turtle interactions and was closed for the remainder of the calendar year. In addition, all Hawaii-based longline vessels must carry and use mitigation gear to properly release sea turtles as well as attend annual protected species workshops. More detailed discussions on the impacts of Council-managed fisheries on sea turtles can be found in the additional NEPA and ESA analyses listed in Section 3.4.1.

4.9.4.2. Reasonably Foreseeable Future Council/NMFS Actions Impacting Sea Turtles

Through data collected from observer programs and other sources, the Council and NMFS will continue to monitor interactions between fisheries and sea turtles. NMFS will continue to evaluate sea turtle populations under the ESA and will require mitigation measures as appropriate. The Council and NMFS will continue to conduct sea turtle conservation activities both domestically and internationally. The Council will continue to support sea turtle nesting beach conservation (e.g., Papua New Guinea, Japan) as well as continue to help coordinate International Fishers Forums with the objective of reducing bycatch in fisheries.

4.9.4.3. External Factors/Actions Potentially Impacting Sea Turtles

The Recovery Plans for Pacific sea turtles (NMFS and FWS, 1998a, 1998b, 1998c, 1998d, 1998e, 1998f) describe over 26 factors that impact sea turtles, which can be generalized into five categories:

- Direct take of eggs and female adult turtles at nesting sites;
- degradation of nesting habitat;
- pollution of marine habitat (including marine debris);
- vessel collisions; and
- incidental capture in fisheries not managed by the Council.

Despite efforts by government agencies, nongovernment organizations, and community groups to mitigate the effects of several of the external factors, the prognosis for the future survival and recovery of some sea turtle populations remains bleak. A multi-national, holistic (covering all turtle life phases) framework for sea turtle conservation is considered essential to their recovery (Bellagio Conference 2004).

Throughout much of the Pacific, the impacts of fisheries are being reduced because of the international transfer of gear types and management measures that reduce and mitigate interactions with sea turtles. However, incidental sea turtle catch continues to be largely unabated in Asian pelagic longline fisheries operating in the North Pacific. For example, at a bycatch working group meeting of the IATTC, held in Kobe, Japan on January 14–16, 2004, a member of the Japanese delegation stated that, based on preliminary data from 2000, the Japanese tuna longline fishery has been estimated to interact with approximately 6,000 sea turtles, with a 50 percent mortality rate (NMFS 2005a). As the average turtle interaction rate is approximately 10 times higher in shallow-set longline sets than in deep-set longlines sets, incidental sea turtle catches are likely even higher in Taiwanese and Chinese pelagic shallow-set longline fisheries than in the Japanese deep-set fishery (NMFS 2005a).

International codes of conduct, regional memoranda of understanding and voluntary plans of action to reduce sea turtle bycatch on the high seas need to be supported by the active engagement of longline industries at the fishermen’s level (Simonds 2003). In practical terms, this means continuing to verify the effectiveness of specific longline gear modifications and transferring this technology through fishing associations and industry working relationships (Simonds 2003).

4.9.4.4. Past Council/NMFS Actions Impacting Marine Mammals

As discussed in Chapter 3, the MMPA requires that all commercial FMP fisheries be evaluated by NMFS for impacts on marine mammals and be designated Category I, II, or III (with Category III having the lowest impact). 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. Under existing regulations, all fishers participating in Category I or II fisheries must register under the MMPA, obtain an Authorization Certificate, pay a fee of $25, and report any interactions with marine mammals. Additionally for Category I fisheries, fishers may be subject to a take reduction plan and requested to carry an observer (68 FR 20941).

In the Western Pacific Region, the Hawaii-based deep-set longline fishery is listed as a Category I fishery, primarily due to concerns over interactions between the fishery and false killer whales (*Pseudorca crassidens*) within EEZ waters around the Hawaiian Islands. Both the deep-set and shallow-set sectors of the Hawaii-based longline fishery are in compliance with the MMPA in that the fisheries are subject to observer coverage and participants must obtain an Authorization Certificate and report any interactions. The Hawaii-based shallow-set longline fishery is listed as a Category II fishery. All other fisheries in the Western Pacific Region are classified as Category III fisheries (see 68 FR 20941 for further information about fisheries classifications under the MMPA).

Some marine mammals (e.g., Hawaiian monk seals and humpback whales) occurring in the Western Pacific Region are also protected under the ESA, and NMFS must ensure that fisheries managed by the Council are not likely to jeopardize the continued existence of any threatened or endangered species or result in adverse impacts on the critical habitat of such species. Biological opinions prepared by NMFS have concluded that no fisheries managed by the Council are likely to jeopardize the continued existence or critical habitat of any ESA-listed marine mammal populations in the Western Pacific Region.

4.9.4.5. Reasonably Foreseeable Future Council/NMFS Actions Impacting Marine Mammals

Through data collected from observer programs and other sources, the Council and NMFS will continue to monitor interactions between managed fisheries and marine mammals. NMFS scientists in association with other researchers will continue to collect biological samples to refine stock definitions as well as conduct surveys to monitor populations. The Council and NMFS will continue to conduct workshops with participation from fishermen to develop mitigation methods as appropriate, and NMFS will continue to conduct mandatory annual protected species workshops for all longline permit holders that teach how to identify marine mammals and how to reduce and mitigate interactions.

4.9.4.6. External Factors/Actions Potentially Impacting Marine Mammals

A comprehensive discussion of the external factors affecting Hawaiian monk seals is provided in the 2005 EIS (June 17, 2005; 70 FR 35275). These factors include natural occurrences such as male aggression and mobbing, shark predation, disease, and ecosystem productivity regime shifts, as well as anthropogenic impacts such as sea wall entrapments, hookings, research activities, marine debris, and vessel groundings.

External factors affecting other marine mammals such as whales and dolphins include the following: (a) incidental take in fisheries; (b) collisions with ship traffic, ship disturbance, and ship noise; and (c) marine debris and waste disposal.

4.9.4.7. Potential Marine Mammal Interactions with Fisheries

Nearshore gillnet fisheries in Hawaii have been reported to interact with some dolphin species (e.g., bottlenose dolphins); however, the rate of interactions or severity of interactions is not well known (Forney 2004). Dolphins and false killer whales are also known to strip bait and catches from fishing lines without becoming hooked or entangled. Additionally, monk seal drownings in nearshore (reef) nets have been documented in Hawaii.

4.9.4.8. Ship Traffic, Disturbance, and Anthropogenic Noise Potentially Impacting Marine Mammals

Collisions with vessels and disturbance from low-frequency noise are potential threats to cetaceans and other marine mammals. Increasing levels of anthropogenic noise in the world's oceans may have an adverse effect on marine mammals. The Marine Mammal Commission is currently assessing the acoustic impact of underwater sound on marine mammals.

4.9.4.9. Marine Debris and Waste Disposal Potentially Impacting Marine Mammals

External activities that may have adverse effects on marine mammal habitat include the dispersal of marine debris, large oil spills, and other types of marine pollution. Petroleum has the potential to be toxic to marine mammals if it is inhaled, ingested, or absorbed through the skin, mucous membranes, or eyes, or if it inhibits feeding by fouling the baleen plates of whales. Hydrocarbons can also bioaccumulate in zooplankton and fish eaten by marine mammals and other wildlife. Any detrimental effects of marine pollution on their prey species would also affect marine mammals. Aside from large, catastrophic spills, the long-term effects of low levels of petroleum exposure are unknown.

Marine debris can be toxic to marine mammals if ingested, or it can entangle them, leading to decreased ability to breathe, feed, breed, swim, or haul out. The animals affected may be more vulnerable to predators or diseases, thereby reducing their ability to survive, care for their young, and reproduce. These factors can have significance in local areas where there are high concentrations of marine debris, thus contributing to cumulative effects on marine mammals.

4.9.4.10. Past, Present, and Reasonably Foreseeable Council/NMFS Actions Affecting Seabirds

The birds that have most interacted with fisheries managed under the FMPs have been boobies and albatrosses. From 1990 to 1993 and from 2003 to the present, the NWHI bottomfish fishery has been observed by NMFS's observer program. A main objective of NMFS's observer program is to monitor fisheries for interactions with protected species. Prior to 1999, the Hawaii-based pelagic longline fisheries managed under the Council's Pelagics FMP were estimated to interact with around 2,000 albatross (black-footed and Laysan), primarily in the shallow-set fishery that targets swordfish. The short-tailed albatross, which is listed as endangered under the ESA, is thought to forage in areas where the Hawaii-based longline vessels fish. However, no interactions between the short-tailed albatross and the Hawaii-based longline fleet have ever been reported or observed. In 2002, the Council amended the Pelagics FMP to require Hawaii-based longline vessels to use known seabird mitigation measures that are expected to reduce seabird interaction rates significantly. In 2005 the Council amended the Pelagics FMP to allow longline vessels to side-set in lieu of most required alternative measures. Side-setting has been proven to nearly eliminate seabird interactions with longline vessels.

The Council and NMFS will continue to monitor seabird interactions with managed fisheries, and if a management need arises, will recommend/implement appropriate measures.

4.9.4.11. External Actions Potentially Impacting Seabirds

Exogenous factors known to impact seabird populations include the following: a) degradation of nesting habitats that include lead and other toxins (e.g., polychlorinated biphenyls) left over from military activities in the NWHI, as well as invasive species such as rats that consume seabird eggs, and b) marine debris and plastics—albatross often consume floating plastics and pass the objects on to chicks while feeding. Non-U.S. pelagic longline fisheries are also likely to be an external factor impacting seabird populations. However, detailed impacts are unknown.

4.9.4.12. Potential Effects of the Alternatives on Protected Species

4.9.4.12.1. Alternatives for Approving and Implementing FEP

As described in Section 4.1, the delineation of FMP (Alternative 1A) or FEP boundaries (Alternatives 1B, 1C, and 1D) would not have any direct effects on protected species as FMP or FEP boundaries are simply geographic representations on maps. Although continuing the FMPs or implementing FEPs does allow for low-level interactions between fisheries and protected species, existing regulations require fishing vessels to employ a range of gear types and fishing methods to reduce and mitigate interactions with protected species. Data collection programs (e.g., logbooks, observers) under which interactions with protected species can be monitored would be maintained under all of Component 1’s alternatives.

4.9.4.12.2. Alternatives for Management Unit Species

Maintaining the current lists of MUS (Alternative 2A), reorganizing the current lists based on FEP boundaries (Alternative 2B), or adding incidentally caught species to MUS lists (Alternatives 2C and 2D) would have no direct impacts on protected species. The benefit of MUS lists is that management measures can be adopted to reduce or increase harvests of such species. However, expanded MUS lists could result in the increased monitoring and management of resources important to protected species. The proposed reorganization would not add or delete MUS species from MUS lists. The reorganization would require refinement of MUS lists within an FEP to ensure only known (or believed) occurrences are included, depending on the alternative selected. Future changes to the MUS lists would undergo additional coordination and review.

4.9.4.12.3. Alternatives for Council Advisory Structure

Alternatives that would modify the Council advisory structure to be in line with FEPs would have no direct impacts on protected species as the alternatives address administrative topics.

4.9.4.12.4. Alternatives for Regional Coordination

Regional coordination on ecosystem issues between the Council, Federal, state, territorial, and local agencies, as well as nongovernment groups, could potentially have positive impacts on protected species because of enhanced communication and understanding between agencies and stakeholder groups.

4.9.4.12.5. Alternatives for International Coordination

Increasing the Council's level of participation in international management fora as well as establishing meetings between neighboring nations could have positive impacts on protected species because of enhanced communication and understanding between agencies and stakeholder groups.

4.9.4.13. Potential Cumulative Effects on Protected Species

Exogenous factors that impact protected species include habitat degradation from land-based pollution and runoff, direct harvests outside the control of U.S. jurisdiction, ocean tourism activities, ocean drilling and mining, shipping activities, research activities, and marine debris and derelict fishing gear (i.e., entanglements). Currently, all operating fisheries managed under Western Pacific FMPs are in compliance with MSA, ESA, MMPA, as well as NEPA, and the level of interactions between protected species and Western Pacific fisheries have been found to not jeopardize the continued existence of any protected species or result in any adverse impact to the critical habitat of such species. The transition to place-based FEPs would be the Council's first step towards an ecosystem management approach, and the current regulations would be unchanged. However, subsequent actions would be developed under an adaptive management strategy for the relevant FEPs.

There are no anticipated adverse cumulative effects on protected species as a result of the Council establishing FEPs and associated MUS lists as well as reorganizing its advisory structure and developing mechanisms for regional and international coordination. A major objective of shifting toward place-based FEPs is to allow greater focus on the ecosystem and the species and communities of which it is comprised. Broader understanding of a particular ecosystem by all stakeholders will likely provide benefits to protected species.

4.9.5. Fishery Participants and Communities

4.9.5.1. Past, Present, and Reasonably Foreseeable Future Council/NMFS Actions Impacting Fishery Participants and Communities

Soon after the MSA was promulgated in 1976, the Council began developing FMPs for fisheries of the Western Pacific Region. In 1983, the Precious Corals and Crustaceans FMPs were approved by the Secretary of Commerce, with FMPs for Bottomfish and Seamount Groundfish, Pelagics, and Coral Reef Ecosystems approved in later years. FMPs do not “open” fisheries, but on the contrary, serve as mechanisms for the Council and NMFS to respond to management issues. Before FMPs, fishery participants were subject to little to no regulation, whereas through the FMPs and subsequent amendments, fishery participants have become subject to increasing regulation. Such regulations include but are not limited to permit and reporting requirements, gear requirements, maximum vessel lengths, limited entry programs, observers, VMS, and protected species mitigation measures. See section 1.2.3 for a description of the Council’s FMPs and management measures.

The 1996 reauthorization of the MSA required that the Council identify fishing communities under its jurisdiction. A fishing community, as defined by the MSA, means “a community which is substantially dependent or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes vessel owners, operators, and crew and Unites States fish processors that are based in such a community” (16 U.S.C. § 1802). The Council has identified American Samoa, Guam, CNMI, and each of the inhabited Hawaiian Islands, respectively, as fishing communities. The MSA requires that the Council or Secretary of Commerce describe the likely effects, if any, of conservation and management measures on fishing communities when developing FMPs or FMP amendments (16 U.S.C. §1853).The impacts of Council/NMFS actions on fishery participants are often transferred to fishing communities. For example, restricting access to a fishery through a limited entry program could have socio-economic effects on fishermen that do not qualify for a limited entry permit. Observable effects on fishing communities from the regulation of fishery participants depend on the number of fishery participants affected and to what degree they are affected.

Fishery management measures implemented under the FMPs have impacted fishing participants and fishing communities on various levels. The Council and NMFS will continue to assess the impact of management actions on fishery participants and fishing communities, and where possible, minimize negative effects while developing appropriate measures for the conservation and management of fishery resources.

4.9.5.2. External Factors Affecting Fishery Participants and Communities

There are wide-ranging factors (that change over time) that affect fishing participants as well as fishing communities. Current factors include high fuel costs, increased seafood imports, and restricted access to traditional fishing grounds. High fuel costs affect fishing participants in that it is simply increasingly expensive to go fishing. The effect is that fishery participants reduce fishing trips, switch to less fuel-intensive fisheries, or simply do not go fishing at all. The amount of imported seafood is also increasing, and the U.S. now imports nearly 70 percent of consumed seafood.[71] Increased seafood imports are significant as it relates to market competition, where a glut of fish products can flood the market and lower ex-vessel prices. Once market channels are lost to imported seafood products it may also be hard for fishery participants to regain those channels.

Another factor affecting fishery participants is that the establishment of no-take marine protected areas is on the rise in the Western Pacific Region. The effect of these no-take areas is that they often eliminate access to traditional fishing grounds. Therefore, if a fishery participant wants to fish, and their traditional area is closed, then they must find new fishing areas which could mean increased travel times and result in higher associated costs as well as increased competition between other fishery participants as effort increases in available fishing areas. Increased travel distances from home to fishing locations in some cases also pose safety risks as fishermen may travel to unfamiliar areas or to areas prone to adverse weather and sea conditions.

Regional economies also have the ability to affect fishery participants and communities. For example, in recent years Hawaii has seen a boom in development projects on islands such as Maui and Hawaii. Increased construction jobs are believed to have lead to decreased participation in some fisheries (e.g., MHI bottomfish). Reduced participation in fisheries can affect fishing communities or jobs that depend on fisheries, leading to increased seafood imports to supply demand. This is observed in the MHI bottomfish example, where in 2001, bottomfish imports surpassed local bottomfish landings for the first time, a trend that continues today.

4.9.5.3. The Effects of the Alternatives on Fishery Participants and Communities

4.9.5.3.1. Alternatives for Approving and Implementing FEPs

As the alternatives for FEP boundaries (other than Alternative 1A, the No Action alternative) focus on establishing a new institutional structure for implementing practical steps toward an ecosystem approach and current FMP regulations would not be changed, but simply reorganized dependent on the FEP boundaries, no short-term impacts on fishery participants or communities

71 http://www.fas.usda.gov/ffpd/Fish-Circular/Market_News/IATR_Seafood_Imports.pdf

are expected. The anticipated long-term impacts of implementing FEPs (Alternatives 1B, 1C, and 1D) could be positive as an ecosystem approach would integrate scientific information and human needs in a manner that would substantially increase the involvement of local communities in the management and conservation of marine resources.

4.9.5.3.2. Alternatives for Managed Species

Because Alternative 2A would maintain the current MUS list and Alternative 2B would maintain the current list, but organize it in a manner to be specific to the FEPs, these alternatives would have no direct or indirect effects on fishery participants or communities. Alternatives 2C and 2D, which would add a substantial number of new species to the MUS lists, might result in indirect effects on fishery participants and community members by leading them to believe that the ocean and its marine resources are overregulated and that they no longer have the freedom or right to fish. Such feelings could result in reduced participation, which in turn could affect the availability of locally caught fish to community members.

4.9.5.3.3. Alternatives for Council Advisory Structure

None of the alternatives would have any direct impacts on fishery participants or communities as they would not change current fishery regulations. The alignment of the advisory groups with place-based fisheries management (Alternative 3D) would be anticipated to increase the sense of shared ownership and investment in the management of marine resources by both residents and managers.

Because the implementation of FEPS is anticipated to positively impact fishery participants and communities, their additive impacts are not expected to adversely affect local fishery participants and communities. On the contrary, one objective of the FEP approach is the explicit recognition and increased inclusion of local expertise in the management and conservation of marine resources, which in turn may help reduce the effects of some adverse exogenous factors (i.e., factors outside the control of fishery managers) on fishery participants and communities.

4.9.5.3.4. Alternatives for Regional Coordination

Alternatives that would lead to increased regional coordination (Alternatives 4B, 4C, 4D) would be expected to improve the status of marine ecosystems through enhanced understanding of a wider range of impacts on fishery resources and habitat and the potential implementation of measures to mitigate such impacts. Alternative 4A (no action) would not provide such mechanisms to enhance understanding of the ecosystem impacts.

4.9.5.3.5. Alternatives for International Coordination

Increasing the Council's level of participation in international management fora as well as establishing meetings between neighboring nations (Alternative 5B) would provide additional venues for fishery participants and international managers to exchange scientific and management information. This may attract new contributors who would bring additional expertise and perspectives to that process, thus further improving the status and management of marine fisheries throughout the Western Pacific Region.

4.9.5.4. Potential Cumulative Effects on Fishery Participants and Communities

The exogenous factors that fisheries participants and communities face include rising fuel costs, competition from seafood imports, loss of access to traditional fishing areas, and changes in the regional economy. Shifting from species-based FMPs to place-based FEPs as well as enhancing regional and international coordination is expected to improve fisheries management by incorporating ecosystem considerations. One objective of moving towards ecosystem based management under a place-based FEP management regime is to maintain fishing opportunities for fishery participants and associated benefits to fishing communities while not disrupting the function of the ecosystem. The cumulative effects on fishing participants and communities are unknown, but anticipated to be beneficial.

4.9.6. Administration and Enforcement

No substantive changes would occur to the regulations affecting the Federal fisheries under any of the alternatives. However, managers and scientists would need to adapt to the place-based and multi-species nature of the proposed FEP. Managers and scientists would be able to more rigorously consider fishery interactions as well as the impacts of nonfishery activities on the marine environment. Additionally, management plan teams and other advisory groups increasingly would be asked to consider these indirect and often complex impacts when making recommendations. However, fisheries managers and scientists increasingly are considering ecosystem characteristics and functions when conducting research and making management decisions. This current heightened attention to fisheries' ecosystems is expected to persist under each of the alternatives.

Enforcement agencies currently operate throughout the Western Pacific Region. The need for enforcement and management may decrease as participants voluntarily become more involved in fishery management. Additionally, the increased inclusion of local expertise and knowledge in the conservation of the marine resources would improve the success of the management of the fisheries. Thus, the cumulative effects of a shift toward ecosystem-based fisheries management on administration and enforcement are unknown, but are expected to be beneficial.

4.10. Reasons for Choosing the Preferred Alternatives

The U.S. Pacific island-based pelagic fisheries and the four demersal fisheries (bottomfish, crustaceans, precious corals, and coral reef resources) are currently managed under FMPs. While the 1996 Sustainable Fishery Act amendments to the MSA require consideration of fishery impacts on species not explicitly managed under FMPs (e.g., bycatch reduction), there are several limitations to the current management framework (i.e., species-based FMPs) that appear to constrain the Council in developing holistic conservation and management measures for a wider range of marine resources and marine ecosystems.

Current stock assessments generally do not explicitly recognize the significant natural variability in marine resources and habitats, although some models do incorporate spatial and temporal environmental effects. Under place-based FEPs, stock assessments increasingly and explicitly would separate environmentally-driven resource variability (e.g., inter-annual, decadal, long-term ocean regime shifts) from fishery-driven and habitat-driven effects on target stocks and other components of ecosystems, and thus would be expected to improve the fishery science that is applied to fisheries management in the region.

In addition, the majority of current monitoring under the FMPs accounts for major resource removals by fishing, but not by other sources such as coastal development which has destroyed or severely degraded inshore fish habitat and associated stocks around the more heavily populated islands of the U.S. Pacific. Through regional coordination efforts under place-based FEPs, consideration of all sources of resource removal would be simplified, including those related to shoreline modification, waste discharge, watershed erosion, storm runoff and other terrestrial activities. FEP monitoring would ultimately include ecosystem indicators and models which take into account non-fishing uses, their impacts on resources, and even the tradeoffs among different user groups who depend on the same resource.

As discussed in Chapter 1, the purpose of the proposed Federal action in this EIS is to establish an institutional framework that will facilitate a shift to an ecosystem approach for fisheries management in the Western Pacific Region. This will be accomplished, in part, through the approval and implementation of place-based FEPs, Component 1 of the proposed Federal action. Component 1 also includes the reorganization of existing species-based FMP regulations into place-based FEP regulations.

With respect to the alternatives under Component 1 (Alternatives 1B, 1C, 1D and 1E), Alternatives 1C and 1D are most similar in their impacts (Table 4-2). Both of these alternatives would facilitate a practical ecosystem approach to fisheries management in the Western Pacific Region so that the full range of fisheries’ impacts and other activities on marine ecosystems would be addressed in a manner that coherently considers each archipelago’s biological resources, physical conditions, socioeconomic needs and cultural traditions. However, Alternative 1D recognizes the highly mobile and often migratory nature of pelagic stocks and fisheries. Alternative 1D would establish a single Pelagic FEP that would span the entire Western Pacific Region. Alternatives 1B and 1E are not preferred because of their negative impacts on management, administration, enforcement, fishery participants, and communities.

Component 2 is also regulatory in nature and considered part of the Federal action in this document. Component 2 is contingent upon selecting one of the action alternatives under Component 1. All alternatives under Component 2 (Alternatives 2A, 2B, 2C, and 2D), consider changes to the MUS list. Alternative 2A is not preferred because of its negative impacts on management, administration, enforcement, fishery participants and communities. In particular, under Alternative 2A, there would be some demersal species identified as MUS in an FEP for an area in which they are not actually present. Under Alternative 2B, the Preferred Alternative, the MUS list for each archipelagic FEP would consist of all MUS currently on any of the four existing demersal FMP MUS lists and that are known to occur within the range of that particular FEP. The MUS list for the pelagic FEP would be identical to the Pelagics FMP MUS list. Alternative 2B is similar to Alternative 2A but would eliminate the confusion that could result from the inclusion on the MUS list of species not physically present in a given FEP area. Alternatives 2C and 2D were rejected primarily because of their impacts on management, administration, and enforcement, and because they would add species to the MUS lists that would require potentially expensive monitoring and annual evaluation with no apparent benefit.

The Preferred Alternative for both components would promote a holistic view of marine resources through increased examination of metapopulation resource dynamics (interactions among spatially separated populations of the same species) and linkages between upland watershed activities, coastal habitats, and nearshore waters. This, in turn, would lead to an enhanced understanding and improved management of the relationships between different fish stocks and users of those stocks. In general, species-based FMPs focus on individual stocks of fish or related species and the people who harvest them. However, fish and fishermen do not act in isolation, and fishermen may be active in several fisheries targeting different resources over years or even seasonally.

Furthermore, the harvests of one species often influence the dynamics of fish markets (and subsequent fishing effort) for others. The Preferred Alternatives would provide fishery managers with comprehensive information on all fishery impacts within a given area and allow improved decision making with fewer unintended consequences due to poorly understood connections. By operating within an ecosystem context, fishery scientists and managers would also be better positioned to anticipate likely physical and biological responses to changing environmental conditions and to determine appropriate management actions to forestall adverse impacts on marine ecosystems, rather than reacting to changes after they occur. In addition, greater stability and predictability is more likely when resources are considered in aggregate rather than as independent units.

The ecosystem approach under the Preferred Alternative is expected to improve the management of coastal resources at both Federal and local levels through changes in the structure of resource management plans and the process by which these plans are developed and implemented. There is potential for jurisdictional disputes. However, it is the Council’s role to provide guidance and clarification on mandated responsibilities and management authorities to preclude governance issues from occurring. Because the organizational structure for developing and implementing FEPs is broader than for FMPs, and incorporates more local community input, it is likely to make better use of local knowledge and experience in management strategies and tactics. This will strengthen cooperation and voluntary compliance with management measures, which is especially important in the Western Pacific Region where enforcement capabilities are often limited.

The southern and western Pacific Ocean is dotted with thousands of islands governed by several nations. American Samoa, for example, is surrounded by the EEZs of five independent nations and several of the PRIA are part of larger archipelagic island chains. Several targeted pelagic species are considered highly migratory and management of these resources is increasingly becoming an international issue. As marine ecosystems are generally considered “open” systems and large scale changes can be observed within smaller units, international coordination as well as cooperation among the Council, RFMOs, the U.S. Department of State, NMFS, and neighboring nations in the Western Pacific Region will be necessary for the successful implementation of an ecosystem approach to fisheries management under the Preferred Alternatives.

Table 4-2. Comparison of the Potential Impacts of the Action Alternatives to Alternative 1A, the No Action Alternative.

Issue	Area	Alternative 1A - No Action (Baseline)	Alternative 1B	Alternative 1C	Alternative 1D (Preferred)	Alternative 1E
Brief Description		Continue 5 FMPs. Do not develop place-based FEPs.	Develop 1 FEP, continue 5 FMPs	Develop 4 FEPs, continue 1 FMP	Transition to 5 FEPs	Develop 26 FEPs
Number of FMP(s) and FEP(s)		5 FMPs 0 FEPs	5 FMPs 1 FEP	1 FMP 4 FEPs	0 FMPs 5 FEPs	0 FMPs 26 FEPs
Impacts to the Physical Environment	AmSamoa Mariana Hawaii PRIA Pelagic	As described in Chapter 3	In the short-term, establishing the FEP(s) under these alternatives would not alter the impacts to the physical environment by any Federal fisheries. In the long-term, increased consideration of fishery interactions and non-fishery impacts on the physical environment associated with the successful implementation of an ecosystem management approach would improve our understanding and conservation of the physical environment.			
Impacts to the Biological Environment	American Samoa Mariana Hawaii PRIA Pelagic	As described in Chapter 3	In the short-term, there would be no differences between the direct and indirect impacts of these alternatives on the biological environment and the impacts of the No Action Alternative. In the long-term, place-based plans would allow for increased consideration of fishery interactions and nonfishery impacts on target and nontarget species and therefore, would improve management of these resources.			
Impacts to Essential Fish Habitat or HAPC	American Samoa Mariana Hawaii PRIA Pelagic	As described in Chapter 3	The implementation of the FEP(s) under the action alternatives would not change current Federal fisheries regulations or designations of EFH or HAPC. Therefore, there would be no impacts to EFH and HAPC as a result of implementing any of the action alternatives. The current EFH and HAPC for the Western Pacific Region would be identified in the respective FEPs.			

Issue	Area	Alternative 1A - No Action (Baseline)	Alternative 1B	Alternative 1C	Alternative 1D (Preferred)	Alternative 1E
Brief Description		Continue 5 FMPs. Do not develop place-based FEPs.	Develop 1 FEP, continue 5 FMPs	Develop 4 FEPs, continue 1 FMP	Transition to 5 FEPs	Develop 26 FEPs
Impacts to Protected Species	American Samoa Mariana Hawaii PRIA Pelagic	As described in Chapter 3	The implementation of the FEP(s) under these alternatives would not change any fishing regulations (including those that reduce and mitigate interactions with protected species). Thus, it is expected that the same low level of interactions with protected species would continue. Protected species would continue to receive the same level of protection as under the No Action Alternative.			
Impacts to fishery participants and communities	American Samoa		No difference between this alternative and the No Action Alternative.	Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnotes 1 and 3.	Positive impacts – see Footnotes 1 and 3. Negative impacts – see Footnote 4.
Impacts to fishery participants and communities	Mariana		Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnotes 1 and 3.	Positive impacts – see Footnotes 1 and 3. Negative impacts – see Footnote 4.
Impacts to fishery participants and communities	Hawaii		No difference between this alternative and the No Action Alternative.	Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnotes 1 and 3.	Positive impacts – see Footnotes 1 and 3. Negative impacts – see Footnote 4.

Issue	Area	Alternative 1A - No Action (Baseline)	Alternative 1B	Alternative 1C	Alternative 1D (Preferred)	Alternative 1E
Brief Description		Continue 5 FMPs. Do not develop place-based FEPs.	Develop 1 FEP, continue 5 FMPs	Develop 4 FEPs, continue 1 FMP	Transition to 5 FEPs	Develop 26 FEPs
Impacts to fishery participants and communities	PRIA		No difference between this alternative and the No Action Alternative.	Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnotes 1 and 3.	Positive impacts – see Footnotes 1 and 3. Negative impacts – see Footnote 4.
Impacts to fishery participants and communities	Pelagic		Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnote 1. Negative impacts – see Footnote 2.	Positive impacts – see Footnotes 1 and 3.	Positive impacts – see Footnotes 1 and 3. Negative impacts – see Footnote 4.
Administration and Enforcement	American Samoa		No significant difference between this alternative and the No Action Alternative.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5. Negative impacts – see Footnotes 6 & 7.
Administration and Enforcement	Mariana		Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5. Negative impacts – see Footnotes 6 & 7.

Issue	Area	Alternative 1A - No Action (Baseline)	Alternative 1B	Alternative 1C	Alternative 1D (Preferred)	Alternative 1E
Brief Description		Continue 5 FMPs. Do not develop place-based FEPs.	Develop 1 FEP, continue 5 FMPs	Develop 4 FEPs, continue 1 FMP	Transition to 5 FEPs	Develop 26 FEPs
Administration and Enforcement	Hawaii		No significant difference between this alternative and the No Action Alternative.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5. Negative impacts – see Footnotes 6 & 7.
Administration and Enforcement	PRIA		No significant difference between this alternative and the No Action Alternative.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5. Negative impacts – see Footnotes 6 & 7.
Administration and Enforcement	Pelagic		Positive impacts (see Footnote 5)	Positive impacts – see Footnote 5. Negative impacts – see Footnote 8.	Positive impacts – see Footnote 5.	Positive impacts – see Footnote 5. Negative impacts – see Footnotes 6 & 7.

Footnote 1: Impacts are anticipated to be beneficial as the alternative would allow fisheries managers to integrate scientific information and human needs in a manner that would substantially increase the involvement of local communities in the management and conservation of marine resources.

Footnote 2: May cause some confusion to participants in the fisheries as they switch to ecosystem management for the demersal and pelagic fisheries within each archipelago and remain with a species-based FMP for the high-seas pelagic fisheries.

Footnote 3: When compared to Alternatives 1B and 1C, the alternative would cause less confusion to the participants because the entire Western Pacific Region would switch from FMPs to placed-based FEPs.

Footnote 4: Participants would be responsible for determining which of the 26 FEP regulations pertain to the areas in which their fishing operations occur and for which species. Therefore, this alternative may have a negative impact in the long-term if regulations for the fisheries were to become overly specific or inconsistent among the 26 FEPs.

Footnote 5: In the short term, impacts on enforcement and management agencies are not expected to be adverse because fishery boundaries, fishery operations, and regulations would not change. In the long-term, voluntary compliance would be expected to increase as community-based participants become more involved in fishery management. Therefore, the long term impacts of this alternative on enforcement would be expected to be positive.

Footnote 6: Enforcement personnel would be responsible for knowing which of the 26 FEP regulations pertain to each area and species. May have a negative impact in the long-term if regulations for the fisheries were to become overly specific or inconsistent, given that there would be 26 FEPs to administer.

Footnote 7: The smaller ecosystems and semi-unique management units called for by this alternative could result in management that fails to fully consider the interconnectedness of these smaller ecosystems within the larger archipelagic or pelagic environment.

Footnote 8: Implementing the alternative may have a negative impact in the long-term if regulations for the pelagic fisheries were to become overly specific or inconsistent between the proposed demersal and pelagic archipelagic-based FEPs.

Chapter 5. ENVIRONMENTAL MANAGEMENT ISSUES

5.1. Introduction

This chapter summarizes an analysis of certain environmental management issues. These issues include effective use or conservation of some types of resources, consistency with other planning efforts, and mitigation of unavoidable impacts.

5.2. Short-Term Uses versus Long-Term Productivity

Short-term uses are generally those that determine the present quality of life for the public. The quality of life for future generations depends on long-term productivity—the capability of the environment to provide ecosystem benefits on a sustainable basis. As described in Chapter 1, the purpose of an ecosystem approach to fisheries "is to plan, develop and manage fisheries in a manner that addresses the multiple needs and desires of societies, without jeopardizing the options for future generations to benefit from a full range of goods and services provided by marine ecosystems" (Garcia et al. 2003). As the actions considered in this FPEIS represent the first phase of the Council's incremental shift toward an ecosystem approach, the very nature of this shift is to plan and manage fisheries to meet the needs of today's communities while ensuring that sustainable fishery resources are available to future generations. By design, the essence of an ecosystem approach is to balance today's needs with the needs of future generations; that is, achieve a balance between short-term uses while ensuring long-term productivity.

5.3. Irreversible and Irretrievable Commitment of Resources

Irreversible commitments of resources are actions that disturb either a nonrenewable resource or a renewable resource to the point that it can only be renewed over a long period of time *(*decades, for example). Loss of biodiversity may be viewed as an irreversible resource commitment. An *irretrievable commitment* is the loss of opportunities for production or use of a renewable resource for a short-to-medium period of time (years).

None of the actions considered in this FPEIS would result in irreversible commitments or irretrievable commitments of resources. The actions considered represent the first phase of the Council's incremental shift toward an ecosystem approach, which by design, would plan for and enable fishery managers to manage fisheries in a way that would avoid irreversible and irretrievable commitments of resources.

5.4. Energy Requirements and Conservation Potential of the Alternatives

Section 1502.16 (e) of the National Environmental Policy Act (NEPA) requires that environmental consequences be considered with respect to energy requirements and conservation potential of various alternatives and mitigation measures.

Since the proposed shift to ecosystem management would not directly affect fish harvesting or processing efforts nor indirectly impact energy consumption in managed ecosystems or any other sectors of the economy, there would be no change to energy consumption as a result of reorganizing the FMPs into FEPs, or reorganizing MUS species lists.

However, future actions that could be implemented under the various FEPs could result in longer-term and cumulative impacts on energy consumption, especially the consumption of fossil fuels, depending upon specific ecosystems-based management measures and resulting energy requirements for the directed fisheries, ecosystems, and other sectors of the economy. Catch restrictions or area closures for specific fisheries based on fish stock abundance and availability would certainly impact energy requirements for directed fisheries in terms of fuel consumption and indirectly impact energy requirements in those sectors of the economy that rely on the availability of fish (e.g., processors, retail fish outlets, and restaurants). Future changes to management measures would consider impacts on energy requirements, as needed.

It is important to recognize that energy requirements associated with fisheries and other segments of the ecosystem are also dependent to a great extent upon exogenous factors such as fuel price and availability and general technological gains. Increases in fuel prices could limit the rents available to a fishery and, in turn, cause reductions in fishing effort resulting in lower fuel consumption. Advancements in fish finding technology or other acoustic technologies could achieve reductions in energy costs per unit of effort to produce fish or other resources from a desired ecosystem. In addition, technological improvements in fishing gear could result in decreased energy costs per unit of fishing effort while supporting other ecosystem goals.

While this management action does not directly impact energy use, it is important to note that as FEPs are developed and ecosystem-based management measures are introduced, the energy requirements of each management action would be analyzed for their impacts to the consumption of fossil fuels and other forms of energy consistent with NEPA requirements.

5.5. Urban Quality, Historic Resources, and Design of the Built Environment, Including Reuse and Conservation Potential of the Alternatives

Because the actions considered in this FPEIS are strictly administrative and do not involve actions involving material construction of any type, the alternatives would not affect urban quality, historic resources, or design of the built environment.

5.6. Cultural Resources and Conservation Potential of the Alternatives

None of the proposed alternatives would result in changes to the impacts of Federal fisheries on cultural artifacts or historic sites listed on or eligible for listing on the National Register of Historic Sites. As Chapters 1 and 4 describe, an ecosystem approach to fisheries management involves shifting from species-based management to place-based management. In doing so, the role within fisheries management of indigenous peoples, fishery participants, and community members would likely be strengthened. Traditional and accumulated knowledge of local island fishermen is especially rich (Johannes 1981), and the Council's transition to an ecosystem approach would be designed to access their understanding of the marine environment.

5.7. Possible Conflicts Between the Alternatives and Other Plans

There are no known potential conflicts between the alternatives and other plans as this would be the first phase of the Council's incremental shift toward an ecosystem approach and no new management measures are being proposed. There are ongoing fishery management actions being considered, but they would not hinder or be affected by the reorganization to place-based fishery management, or by a change in MUS species. Moving toward an ecosystem approach would involve intra- and interagency coordination and there are no known plans by any of the affected agencies that might conflict with the Council's shift toward an ecosystem approach.

5.8.Adverse Effects That Cannot Be Avoided

Because the proposed alternatives would not result in changes to fishing operations of the Western Pacific Region, there are no known adverse effects that cannot be avoided. However, adverse effects of conducting the fisheries have already been considered and provisions are in place to avoid or reduce the severity of impacts. Future fishery management actions would undergo separate environmental effects analysis at such time as the actions are proposed.

5.9.Possible Mitigation Methods for Unavoidable Adverse Effects

There are no unavoidable adverse effects and therefore, there are no mitigation methods required or proposed.

5.10. Consideration of Climate Change

Fisheries of the Western Pacific Region take place in coastal, nearshore, and open ocean environments that are dynamic and subject to the impacts of climate change as well as existing large scale and long term environmental variability as described in Chapter 3. Since 2007, as fishery management plan amendments were developed, the potential impacts of climate change on the effectiveness of the species-based fishery management measures have been considered. Overall, there has been little specific research done for species managed in the Western Pacific Region. A general summary is provided here.

5.10.1. Overview of climate change concerns

In its 2007 report, the Intergovernmental Panel on Climate Change (IPCC) stated that warming of the global climate system is occurring. This is shown by observations of marked increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC 2007). In the time period between 1850–1899 and 2001–2005, the total global temperature increase was 0.76°C [0.57°C to 0.95°C]. However, the linear warming trend observed during the last 50 years was nearly twice that observed over the last 100 years (IPCC 2007).

Considerable evidence shows that these recent climatic changes have affected a large range of organisms with diverse geographical distributions (Walther et al. 2002). There is a high confidence, based on substantial new evidence, that observed changes in marine systems are associated with rising water temperatures, as well as related changes in ice cover, salinity, oxygen levels, and circulation. These changes include shifts in ranges and changes in algal, plankton, and fish abundance (IPPC 2007b). Between 1961 and 2003, global ocean temperatures have risen by 0.10°C from the surface to a depth of 700 m (Bindoff et al. 2007). Observations have shown the ocean is absorbing up to 80% of the heat added to the climate system, increasing average temperatures to a depth of 3000 m (IPCC 2007). This heat absorption has caused a thermal expansion contribution to sea level rise of 1.6 ± 0.5 mm/year from 1993-2003; which when combined with loss of mass from glaciers, ice caps and the Greenland and Antarctic Ice Sheets accounts for 2.8 ± 0.7 mm/year (Bindoff et al. 2007). This does not, however, account for all of the total observed sea level rise (3.1 ± 0.7 mm/year) during that same period (Bindoff et al. 2007).

Changes in precipitation and evaporation over the oceans are suggested by freshening of mid- and high latitude waters together with increased salinity in low latitude waters (IPCC 2007). While there is evidence that key oceanic water masses are changing, it is not clear whether ocean circulation is experiencing similar changes. The Pacific Ocean, in particular, has been warming and freshening overall, with the exception of salinity increases in the subtropical upper ocean, where strong evaporation dominates (Bindoff et al. 2007).

Between 1750 and 1994, the oceans absorbed about 42% of all emitted carbon dioxide (CO_2) (IPCC 2007). As a result, the total inorganic carbon content of the oceans increased by 118 ±19 gigatons[72] of carbon over this period and is continuing to increase.

The increase in oceanic carbon content causes calcium carbonate ($CaCO_3$) to dissolve at greater depths and led to a 0.1 unit decrease in surface ocean pH from 1750–1994 (IPCC 2007). The rate of decrease in pH over the past 20 years accelerated to 0.02 units per decade (IPCC 2007). A decline in pH, along with the concomitant decreased depth at which calcium carbonate dissolves, will likely impair the ability of marine organisms to use carbonate ions to build their shells or other hard parts (The Royal Society 2005, Caldeira and Wickett 2005, Doney 2006, Kleypas et al., 2006).

In general, it has been shown that large scale climate cycles can impact winds, currents, ocean mixing, temperature regimes, nutrient recharge, and affect the productivity of all trophic levels in the North Pacific Ocean (Polovina et al. 1994). These impacts are expressed as variability in stock size, recruitment, growth rates, or other factors.

5.10.2. Potential climate change impacts on coral reef ecosystems

It is difficult to distinguish between the effects of global climate and local nonclimate influences on reef condition and vulnerability. Stresses associated with climate change, such as high-temperature episodes that promote coral bleaching, reduced calcification, and changes in ocean

[72] A *gigaton* is equal to one billion tons of elemental carbon. One gigaton is approximately 12% of the entire carbon emissions of the planet (http://www.holisticmanagement.org/n7/Carbon_Calculator/Gigaton_Carbon2.html)

and atmospheric circulation, both present a set of challenges for coral reef health and may exacerbate other stresses not directly related to climate. These stresses can be disease, predation, and the cumulative effects of other nonclimate stresses (Buddenmeier et al. 2004). Anomalies of less than 1°C may exceed physiological tolerances and result in large-scale coral bleaching (Walther et al. 2002). This is in part due to physiological dysfunction and loss of crucial dinoflagellate symbionts.

Furthermore, changes in the CO_2 concentration of seawater through well-known processes of air sea gas exchange alter the pH (an index of acidity) and the concentrations of carbonate and bicarbonate ions. The oceans currently absorb about a third of the anthropogenic CO_2 inputs to the atmosphere, resulting in significant changes in seawater chemistry that affect the ability of reef organisms to calcify (Houghton et al. 2001). Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment.

5.10.3. Potential climate change impacts on pelagic fish species

The seasonal north-south movements of many large pelagics in the NPTZ appear to track the similar peak migration of primary productivity. Using remotely-sensed chlorophyll[73] concentrations from satellite observations, Polovina et al. (2008) have found that over the past decade primary productivity in the subtropical and transition zone has declined an average of 1.5% per year with about a 3% per year decline occurring at the southern limit of the NPTZ. The expansion of the low chlorophyll waters is consistent with global warming scenarios based on increased vertical stratification in the mid-latitudes. Expanding oligotrophic[74] portions of the subtropical gyres in the world's oceans in time will lead to a reduction in chlorophyll density and carrying capacity in the larger subtropical gyres, thus impacting the abundance of pelagic species. For example, a recent scientific study using an enhanced version of the spatial ecosystem and population dynamics model (SEAPODYM[75]) suggests that by the end of this century, ocean temperatures in the WCPO will increase to levels that will not support bigeye populations in the WCPO (J. Sibert, PFRP, pers. comm. July 2008). Participants in an international program called CLIOTOP (climate impacts on oceanic top predators) are currently gathering information on climate change and its effects on pelagic ecosystems. Within this group, the SEAPODYM model is being applied to investigate the future management of tuna stocks and other highly migratory species in the context of climate and ecosystem variability, as well as to investigate potential changes due to greenhouse warming.

[73] Chlorophyll is the green pigment found in phytoplankton that absorbs light energy to intiate the process of photsynthesis.

[74] Meaning waters where relatively little plant life or nutrients occur, but are rich in dissolved oxygen.

[75] The model based on advection-diffusion-reaction equations explicitly predicts spatial dynamics of large pelagic predators, while taking into account data on several mid-trophic level components, oceanic primary productivity and physical environment.

5.10.4. Potential climate change impacts on bottomfish and precious coral fisheries

Not much is known about the impacts of climate change on bottomfish and precious coral resources. These deepwater organisms may not be impacted due to sea level rise, but changes in ocean circulation patterns, ocean water acidity, and temperature changes would affect these resources directly and indirectly, though there is no specific information regarding what the impacts could be. If deep water temperatures rise, there could be a change in growth rates or the occurrence of precious corals. Changes in water quality or currents could affect not only the target resources, but predators, parasites, and reproductive rates.

5.10.5. Potential climate change impacts on crustacean fisheries

The impact of climate change on crustacean fisheries (e.g., deepwater shrimp, lobsters) of the western Pacific region has not been well studied. Crustatacean stocks will continue to be monitored as part of crustacean fishery management.

5.10.6. Potential impacts of climate change on sea turtles

As highly migratory, wide-ranging organisms that are biologically tied to temperature regimes, sea turtles are vulnerable to the effects of global climate change in various aspects of their physiology and behavior. As migratory species, the effects of climate change are amplified since changes in foraging grounds, breeding grounds, and migratory pathways may occur at different rates and produce varied challenges (Robinson et al. 2008). These effects must be considered in addition to all other anthropogenic impacts on sea turtle populations. The major ways climate change is expected to affect sea turtles are: 1) changes in hatchling sex ratios as a result of these species' temperature-dependent sex determination; 2) loss of nesting beach habitat due to sea level rise; 3) alterations to foraging habitats and prey resources; 4) changes in phenology and reproductive capacity that correlate with fluctuations in sea surface temperature (SST), and 5) potential changes in migratory pathways and range expansion.

5.10.7. Potential impacts of climate change on seabirds

The largest colonies of nesting seabirds in U.S. Pacific EEZ of the Western Pacific Region are found on low atolls. Sea level rise has the potential to adversely impact seabird colonies by reducing suitable nesting and roosting habitat. Other impacts of climate change on migratory birds include potential changes in the location and abundance of prey species. Without information about the magnitude of sea level rise or other large scale oceanographic changes, actual impacts are difficult to accurately forecast. U.S. Fish and Wildlife Service representatives on the Council and other scientists involved in the fishery management process will continue to provide information about the status of seabirds and advise the Council about potential cumulative impacts of fishery management actions being considered.

5.10.8. Climate change and fisheries ecosystem management

Climate change would not affect the Council's ability to manage any of the fisheries of the Western Pacific Region under any of the proposed alternatives. Future impacts of climate change have been considered in view of the potential cumulative impacts on fishery target and non-target species and protected resources. Continuing research, improved fishery data collection and analysis, required coordination with NMFS on the impact of fisheries on protected resources, and adaptive fishery ecosystem management will help ensure the long-term sustainability of the fisheries and ecosystem, even in light of occurring and potential climate changes. Ongoing research on fish stocks and protected species including sea turtles, marine mammals, and seabirds will continue and will help scientists and fishery managers to detect changes in the status, distribution, and interactions between the fisheries and resources of management concern.

Chapter 6. PREPARERS, DISTRIBUTION OF THE EIS, AND RESPONSES TO PUBLIC COMMENTS

6.1. Preparers of the EIS

This FPEIS was prepared by:

Western Pacific Regional Fishery Management Council Staff

Joshua DeMello,	Fishery Analyst Education: B.S. University of Hawaii (UH), Hilo
Marcia Hamilton	Economist Education: B.S. UH-Hilo, M.S. UH, Manoa
Eric Kingma	NEPA Coordinator Education: B.A. Lewis and Clark College, M.P.A. UH, Manoa
Jarad Makaiau	Former Habitat Coordinator Education: B.S. UH, Manoa

National Marine Fisheries Service Staff

Frances Ajo	Former NEPA Technical Writer, Sustainable Fisheries, Pacific Islands Regional Office (PIRO) Education: B.A. Washington University, St. Louis M.A. UH, Manoa
Ethan Brown	Compliance Associate, Sustainable Fisheries, PIRO Education: B.A. Western Washington University
Karla Gore	Former Fishery Management Specialist, PIRO Education: B.S. Western Washington University M.M.A. University of Washington, Seattle
Phyllis Ha	NEPA Specialist, Sustainable Fisheries, PIRO Education: B.A., M.S., UH, Manoa
Jarad Makaiau	Fishery Policy Analyst, Sustainable Fisheries, PIRO Education: B.S. UH, Manoa
Myles Raizin	Fishery Economist, Sustainable Fisheries, PIRO Education: B.S. University of Massachusetts, Lowell

M.S. University of Wisconsin, Madison.

Keith Schultz — Former NEPA Specialist, Sustainable Fisheries, PIRO
Education: B.S. University of Minnesota, St. Paul

Brett Wiedoff — Fishery Policy Analyst, Sustainable Fisheries, PIRO
Education: B.S. University of Wisconsin, Stevens Point

Other Preparers

Dr. Charles Fletcher, III, Dept. of Geology and Geophysics, UH, Manoa, assisted in drafting Section 3.1.2.

Kim Maison, Sea Turtle Biologist, Joint Institute for Marine and Atmospheric Research, provided a report on climate change impacts to sea turtles and the overview of climate change section.

Other Reviewers:

The preparers acknowledge the reviews of many colleagues on the Council staff; NMFS Pacific Islands Fishery Science Center; NOAA Office of Program Planning and Integration; and NMFS Pacific Islands Regional Office for review and input on the PEIS. George Krasnick, TEC, Inc., also reviewed the FPEIS.

6.2. Distribution of EIS

The following is a partial list of agencies and other organizations that were provided copies of the Draft PEIS.

Federal Agencies

U.S. Environmental Protection Agency (EPA)

- U.S. EPA, Region IX, San Francisco, CA
- U.S. EPA, Office of Federal Activities, Washington, D.C.

U.S. Dept. of Commerce, National Oceanic and Atmospheric Administration (NOAA)

- Office of General Counsel, Pacific Islands Region, NOAA, Honolulu, HI
- NOAA Endangered Species Division, Silver Spring, MD
- NOAA Enforcement Division, Silver Spring, MD
- National Marine Fisheries Service (NMFS), Office of Law Enforcement, Pacific Islands Division, Honolulu, HI
- NMFS Pacific Islands Fisheries Science Center, Honolulu, HI
- NMFS Pacific Islands Regional Office, Honolulu, HI

U.S. Dept. of Homeland Security
U.S. Coast Guard (14th District), Honolulu, HI

U.S. Dept. of Interior
Office of Environmental Affairs, Washington, D.C.
U.S. Fish and Wildlife Service, Region 1, Portland, OR

U.S. Dept. of State
Office of Marine Conservation, Washington, D.C.

U.S. Congressional Delegates

Congressional Delegate	American Samoa
Representative	Commonwealth of the Northern Mariana Islands
Senators	Hawaii
Representatives	Hawaii
Congressional Delegate	Guam

State, Territorial, and Commonwealth Leaders, Executive Agencies, and Programs

American Samoa

Governor	American Samoa
Director	American Samoa, Department of Marine and Wildlife Resources
Director	Feleti Barstow Public Library

Commonwealth of the Northern Mariana Islands (CNMI)

Governor	CNMI
Director	CNMI Division of Fish and Wildlife
Director	CNMI Division of Environmental Quality
Director	CNMI State Library, Joeten-Kiya Public Library

Guam

Governor	Guam
Director	Guam Dept. of Agriculture
Director	Guam Division of Aquatic and Wildlife Resources
Director	Guam Bureau of Statistics and Plans
Director	Guam Public Library System: Nieves M. Flores Memorial Library

Hawaii

Governor	Hawaii

Director	Hawaii Coastal Zone Management Program
Director	Hawaii Department of Land and Natural Resources
Director	Hawaii Division of Aquatic Resources, DLNR
Director	Hawaii Office of Environmental Quality Control
Administrator	Office of Hawaiian Affairs
Director	Hawaii State Main Library

Council Groups

Executive Directors	Regional Fishery Management Councils
Council Members	Western Pacific Regional Fishery Management Council, Honolulu, HI

Advisory Groups

Executive Director	Marine Mammal Commission, Bethesda, MD
Executive Director	NOAA Fisheries, Marine Fisheries Advisory Committee

Media

News Editor	Associated Press, Hawaii
Editor	Environment Hawaii
Editor	Hawaii Fishing News
Editor	Hawaii Tribune-Herald
Editor	Honolulu Advertiser
Editor	Honolulu Star Bulletin
Editor	Honolulu Weekly
Editor	Kauai Times
Editor	Maui News
Editor	Molokai Advertiser-News
Editor	The Garden Island, Kauai
Editor	Marianas Variety
Editor	Samoa News
Editor	Pacific Daily News

Others

KAHEA: The Hawaiian-Environmental Alliance
‘Ilio ‘ulaokalani Coalition
Environmental Defense
Marine Conservation Biology Institute
The Ocean Conservancy, Director of Ecosystems Protection

6.2 Summary of Public Comments, Responses and Associated Actions

This section presents a summary of the public comments received on two Draft Programmatic Environmental Impact Statements (DPEISs) entitled, "Toward an Ecosystem Approach for the Western Pacific Region: From Species-based Fishery Management Plans to Place-based Fishery Ecosystem Plans." The ecosystem-based fishery management project was first announced to the public in 2005 through a Notice of Intent to Prepare an EIS (69 FR 61351, October 18, 2004). Public scoping meetings provided early opportunities for public involvement.

The first draft PEIS, dated October 27, 2005, was made available for a 45-day public review and comment period in 2005 (70 FR 68443, November 10, 2005). A total of 770 comments was received. Seven of these were unique letters, 242 were signed copies of one letter ("Hold Wespac Accountable"), and 521 were signed copies of a second letter ("I Support Strong NWHI Protection"). Appendix F contains a copy of the unique letters and one copy of the two form letters along with a summary table with comments and NMFS' responses to the comments.

Public comments on the initial draft were considered and changes incorporated into a revised Draft PEIS dated March 30, 2007. This revised DPEIS was distributed for a 45-day public review and comment period in April 2007 (72 FR 18644; April 13, 2007). NMFS received five letters of comment on the 2007 draft. Copies of the comment letters are provided in Appendix E, and responses to the most recent public comments are provided in Table 6-1 below.

All comments were considered in preparing this final PEIS. This FPEIS includes updated information from recently authorized fishery management actions (which underwent separate compliance review), minor typographic corrections and text clarifications, and responses to comments that are summarized in Table 6-1. None of the comments on the 2007 draft resulted in a substantial change to the range of alternatives considered, the environmental impact analysis, or a change to the preferred alternative for either the two Federal action components or to the Council's three proposed actions.

Table 6–1 presents a summary of public comments received on the 2007 Draft Programmatic Environmental Impact Statement, "Toward an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans," dated March 30, 2007[76]. The response and action taken are also summarized. Five comment letters were received and are provided in Appendix E.

Table 6-1. Summary of Public Comments and Agency Responses to Comments on the 2007 Draft Programmatic EIS.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.				
No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
1	Letter, public comment period May 29, 2007 Paul Bassler Territory of Guam, Department of Agriculture	Issue 1 Data collection methodology	Council jurisdiction of Guam does not begin until three (3) miles from Guam shores, while the Council's jurisdiction begins at the shoreline of the Northern Mariana Islands. Data comparison, analysis, and results may not be comparable between Guam and the CNMI using the existing data collecting methodology.	The resource management agencies on Guam and CNMI currently collect fisheries information through boat-based and shoreline creel surveys. Existing creel survey data programs would not be affected by the proposed action. Likewise, there would be no change in data collection methods as a result of implementing any of the proposed actions. Data on marine fisheries would continue to be collected by both the local government and NMFS. The Council and NMFS will continue working with CNMI and the Territory of Guam to improve fisheries data collection programs for use by the Council, and Federal and local resource agencies in making future fishery conservation and management decisions. Future data collection programs can be adjusted to allow data comparisons between areas with different jurisdictional extents. The comment was noted and considered, and no change was made to the Final Programmatic EIS (FPEIS) as a result of this comment.

[76] A previous Draft Programmatic EIS (Draft PEIS) dated October 27, 2005, was circulated for public review and comment from November 10 to December 26, 2005 (70 FR 68443). After considering public comments on the 2005 draft the Council and NMFS decided to expand the document which resulted in a revised Draft PEIS dated March 30, 2007. Public comments received, responses, and associated actions on the previous Draft PEIS (October 2005) are summarized in Appendix F and are not included in this table.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
2	Letter, public comment period May 29, 2007 Paul Bassler Territory of Guam, Department of Agriculture	Issue 2 History and management of Marine Protected Areas (MPAs) on Guam	Page 4-53 correctly states that community involvement in the reduction of exogenous factors (e.g., improperly placed marine preserves) is a goal to achieve. The Guam DAR requests the wording of this statement be amended. The agency requests clarification that the selection of Guam's marine preserves involved input from fishery experts (longtime shore-based fishermen), data analysis from years of creel data, and was a response to decreasing fishery CPUE. The preserve establishment proposal was presented at three (3) public meetings, and garnered more support from local fishermen than what the Draft PEIS seems to imply. Guam DAR notes that it implemented these five marine preserves as a response from local experts (e.g., longtime fishermen). In addition, these marine preserves fall outside the jurisdiction of the Council and should be deleted from this document.	"Exogenous factors" are processes that may affect a fishery, but are outside the jurisdiction of the Council, NMFS, or a local fishery management agency's purview. The wording "improperly placed MPAs" was used as a general possible scenario and was not intended to refer to or disparage MPAs that have been established in Guam's waters or elsewhere. This was given as a generic example of exogenous factors. The FEP process would likely help address exogenous factors in order to promote healthy nearshore fisheries. The inclusion of Guam DAR's comment in the Final PEIS will provide background on the substantial planning and coordination Guam DAR undertook in conjunction with the establishment of Guam's MPAs. A definition of "exogenous factors" was added to the glossary, Chapter 8. The parenthetical example was removed from the text.
3	Letter, public comment period May 29, 2007 Paul Bassler Territory of Guam, Department of	Issue 3 Management of land-based impacts on fisheries	Related to the previous comment, is the effect of land-based impacts on coral reef degradation. However, the Department of Agriculture has no authority to regulate these activities (e.g., sedimentation from fires and runoff, clearing activities authorized by other agencies, pollutants entering the marine environment by storm drainage pipes, non-fishing activities, fishing pressure, etc.). The success of an ecosystem-based approach must	Ecosystem-based approaches must involve a broad range of government agencies and stakeholders. For this reason, the Council has created regional ecosystem advisory committees (REACs) with the primary objective of bringing issues that involve a wide variety of impacts and management authorities to the table for discussion and action. The REACs play a very important role in the refinement and success of FEPs. See Sections 2.4.1 and 4.5.2 for more information on the Council's REACs. The comment and concerns were noted. Because the proposed

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	Agriculture		not merely identify these effects as they are well-documented. These effects must have plans in place to eliminate their impacts if an ecosystem-based plan has any chance of success.	Council organization does provide a means to address these concerns in the future, and because the proposed plans are outside of the scope of the proposed action, no changes were made to the PEIS as a result of this comment.
4	Letter, public comment period May 29, 2007 Paul Bassler Territory of Guam, Department of Agriculture	Issue 4. Data collection - limitations of existing voluntary fish catch and fish sales data	One significant challenge for Guam's data collection efforts is ensuring that enough data is collected in order to give an accurate picture of Guam's fisheries. However, since data collected from fishermen and establishments are strictly voluntary, fishermen and commercial dealers have opted to withhold fishery data, despite the number of fishermen that represent Guam on various levels of the Council family. A strong effort to go beyond "encouraging" these representatives to increase fishermen and fish vendor participation should be done. An example is a letter from one of Guam's members to the 16 member Council of his intent to no longer provide Agriculture with data necessary to evaluate Guam's local fishery. This response appears to be clearly contradictory to this ecosystem-based approach, which is dependent on "Best Available Data."	There are data collection procedures that are already in place and these reporting requirements will not change as a result of taking the initial steps to implement an ecosystem approach to fishery management. Fishery management depends on data and so, in the future, as a separate action, there may be need to modify fishery reporting requirements if data are not being collected adequately under the current programs. The Council and NMFS support the existing fisheries data collection system on Guam, but also recognize the problematic nature of voluntary data collection programs. The place-based ecosystem management approach is expected to improve voluntary data reporting participation within fisheries as community participation in decision making and outreach programs would be enhanced. Because changes to data collection programs are not part of the scope of the proposed action, no changes were made to the FPEIS.
5	Letter, public comment period May 29, 2007	Issue 5 Funding for fishery-related law	DAR is constrained by funding in order to adequately enforce fishery laws. The agency continues to seek Federal funds to fund fishing law enforcement. An ecosystem-based management plan may be of no use if law	The Council and NMFS support the Territory of Guam’s effort to enhance its fisheries enforcement capabilities and realize the agency faces funding challenges. Law enforcement is crucial for effective fishery management, and all fisheries management agencies face challenges in obtaining adequate funding. The MSA provides states

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	Paul Bassler Territory of Guam, Department of Agriculture	enforcement	enforcement is inadequate. Since Guam is currently in a state of fiscal austerity, a creative source of funding acquired from federal sources is necessary.	and territories the opportunity to enter into cooperative and joint enforcement agreements (JEAs) that provide funds to local enforcement agencies. JEAs can be a useful source of funding for the Territory of Guam. The Council and NMFS strongly support the continued collaboration with the Territory of Guam on effective law enforcement strategies. The need for law enforcement, the efficacy of law enforcement actions, and funding sources would not change as a result of implementing the proposed action. Therefore, no change was made to the FPEIS as a result of this comment.
6	Letter, public comment period 5/23/07 Anne Miller, Director Office of Federal Activities U.S. EPA	Comment	EPA supports the ecosystem approach to fisheries management and agrees with the preferred FEP Boundary alternative (Issue I: Fishery Ecosystem Boundaries: Alternative 1D). This approach should provide significant positive long-term impacts to the fisheries. Overall rating by EPA is LO – Lack of Objection to the proposed action.	The support for the FEP approach to management and Boundary Alternative 1D and the LO rating were noted. Alternative 1D remains the preferred FEP boundary alternative. No changes were made to the FPEIS as a result of this comment.
7	Letter, public comment period 5/23/07 Anne Miller, Director Office of Federal Activities	Issue 1. Trophic interactions (predator-prey relationships)	It would be helpful if the FPEIS discussed in greater detail how fishery interactions (i.e., predator-prey relationships) will be factored into the decision making process to add or remove species to the list of management unit species in FEPs.	Changes to the species that are included in a management unit species (MUS) list are made through the Council process and are further coordinated with the public by NMFS. Input on factors to consider when adding fish species to an MUS list can be provided during the Council's public process. In addition to its members' expertise, the Council relies on input from the Scientific and Statistical Committee, Council staff, NMFS, and other experts to determine the best means of considering whether or not a fish species should be included in the MUS list.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	U.S. EPA			Under the proposed action, there would be no formal change to the *status quo* concerning how fishery interactions are factored into the fishery management decision making process, including decisions on what species are considered when managing fishery resources. The Council will continue to rely on the best available scientific information in making its decisions. Where key information is needed to understand complex environmental interactions and inform decisions, the Council will continue to seek support for research. Methodologies for modeling marine ecosystems are improving and have progressed from simple mathematical models to dynamic parameterized simulations. These advances would continue to improve fisheries management under the FEPs. The FPEIS was changed by adding a statement to section 2.3 explaining that no changes are being proposed as well as the general process whereby changes are made to the MUS list.
8	letter, public comment period 5/23/07 Anne Miller, Director Office of Federal Activities U.S. EPA	Issue 2. Environment al Justice evaluation elaboration.	The Draft PEIS mentions Environmental Justice (EJ) issues and cites Allen and Gough 2006, but it is unclear whether EJ communities would or would not be adversely impacted by proposed actions. EPA recommends that the FPEIS explain in greater detail what the specific EJ issues were that were identified by the Allen and provide a summary of the overall findings of that study. It would be helpful if the FPEIS further supported the statement that the proposed action [would] "facilitate and strengthen the role of such groups [minority ethnicity fishing communities] within the fishery management process."	Section 4.8 provides an analysis of environmental justice impacts. The section documents that many communities and fishing participants which may be affected by fishery management decisions may be subject to additional consideration under the provisions of Executive Order 12898. The 2006 Allen and Gough study elucidated the economic, social, and cultural impacts of a closure of the Hawaii-based swordfish fishery on Vietnamese-American fishers and their families. Their study identified five interrelated categories of environmental justice issues that resulted from the fishery closure: (1) changes in household income, (2) changes in psychological well-being, (3) effects on family cohesion, (4) fragmentation of the community, and (5) cumulative impacts. Similar issues were considered in the context of the current action.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				The proposed restructuring of the species-based fishery management plans into place-based FEPs does not include changes to management measures. The change toward a place-based fishery management system would not affect household income, and would not result in changes to psychological well-being, family cohesion, fragmentation of the community, or have cumulative impacts on affected environmental justice communities. This clarification was added to section 4.8. Section 4.8 acknowledges that traditional ecological knowledge held by indigenous communities of the Western Pacific Region would be considered through the proposed place-based fisheries management process. As stated in section 4.8, the transition to a place-based approach is designed to access the traditional and accumulated knowledge of local island fishermen. Many of the island group fishermen belong to minority populations, and the FEP process is expected to improve community involvement in fishery management decisions. Minor changes were made to clarify Section 4.8.
9	Email 5/23/07 Michael Trianni,	1	Comment is on the following statement, which is stated under Alternative 1C and implicit in 1B, 1D, and 1E "The Federal waters around CNMI and the PRIA are recognized as 0 to 200 miles from shore. Within these boundaries, both the demersal and pelagic fisheries would be managed under the proposed FEPs" (p. 2-8 Draft PEIS).	The extent of CNMI's interest in submerged lands seaward of the Commonwealth is well established by Northern Mariana Islands v. U.S., 399 F.3d 1057 (9th Cir. 2005) / cert. denied / Northern Mariana Islands v. U.S., 547 U.S. 1018 (2006). That case upheld the lower court's finding that the "United States possesses paramount rights in and powers over the waters extending seaward of the ordinary low water mark of the Commonwealth coast and the lands, minerals, and other things of value underlying such waters." The lower court further found that "laws of the Commonwealth that are contrary to these rights are preempted by federal law and are of no force and effect." Thus, with regard to Federal conservation and management under

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
			With regards to the CNMI, this statement is problematic in that it proposes potential conflict with current Commonwealth laws and regulatory measures for marine resource management. The implementation of either Alternative 1C or 1D (or even 1B and 1E) will significantly impact the management efforts of the various natural resource agencies in the Commonwealth, given the aforementioned statement. Although the legal status of the CNMI EEZ has currently been interpreted to be Federal waters for the purposes of submerged lands, the issue regarding marine resources is not so clear. It has been legally interpreted that Federal ownership of the CNMI EEZ does not pertain to marine resources, and a recent court case in the CNMI regarding the management authority of the CNMI Division of Fish and Wildlife (DFW), given the Federal interpretation of ownership of the EEZ, was resolved in favor of the DFW. Therefore, the inclusion of alternatives that emphatically state that marine resources in the CNMI EEZ from 0-200 will be managed under the proposed FEP may be inappropriate.	the Magnuson-Stevens Fishery Conservation and Management Act, the authority of the United States within the Exclusive Economic Zone (EEZ) surrounding the CNMI extends from a line coterminous with the low water mark of the Commonwealth coast seaward to 200 nautical miles. At the same time, the inner boundary of the EEZ as defined by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. Section 1802 (11)), is also well established by the seaward boundary of CNMI. CNMI does not have exclusive jurisdiction over the management (including conservation) of fishery resources. The Secretary of Commerce has the authority to manage the nation's fishery resources throughout the U.S. EEZ. In practice, the Federal Government attempts to defer to local jurisdiction while retaining its authority to include these resources in its management programs. Clarifying language was added to the FPEIS (section 2.2) to clarify the extent of the EEZ from 0-200 m in the CNMI. Additional language within the description of the alternatives states that: "In practice, although the CNMI has no jurisdiction over the management (including conservation) of fishery resources, the Federal government coordinates with the local government in its management programs."
10	Email 5/23/07 Michael Trianni,	2.	Does this statement make sense? "For example, the Atlantic Ocean has higher salinity levels than the Pacific Ocean because of input from the Mediterranean Sea (several large rivers flow into the Mediterranean)" (p. 3-4).	The FPEIS was revised at section 3.2.4 to read: "For example, the Atlantic Ocean has higher salinity than the Pacific Ocean, largely due to the saline input of the Mediterranean Sea where evaporation exceeds both precipitation and fresh water influx from large rivers."

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.				
No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
11	Email 5/23/07 Michael Trianni,		It is widely recognized that Dr. Steven Hare, presently of International Pacific Halibut Commission coined the term "Pacific Decadal Oscillation." Revision of top paragraph on p. 3-12 and additional paragraph to follow provided.	Revisions were made to section 3.2.11 to fully credit Dr. Hare's work and the information provided by the commenter has been added to the glossary in Chapter 8.
12	Email 5/23/07 Michael Trianni,		As this section (p. 3-30) deals with bottomfish habitat requirements, perhaps it would be appropriate to mention the tagging work of Henry Okamoto that demonstrated that bottomfish species do and may move between islands and banks as adults.	Information on Okamoto's bottomfish tagging studies in Hawaii has been added to the Final PEIS in the section on adult bottomfish habitat and range (section 3.3.2.8.3.1).
13	Email 5/23/07 Michael Trianni,		The island of Uracas is located north of 20 degrees so the latitudinal range should be extended to 21^0 N. Only the islands of Uracas, Maug, Ascunsion and Guguan are wildlife conservation areas (p. 3-71).	The first sentence of Section 3.5.2 in the FPEIS is revised to read: "Located between 14˚ and 21˚ N, the Commonwealth of the Northern Mariana Islands (CNMI) encompasses 14 islands and many banks...." Another revision in the same paragraph now reads: "The islands north of Saipan are called the northern islands; several of these have been designated as wildlife conservation areas, including the islands of Uracas, Maug, Ascunsion, and Guguan."
14	Email 5/23/07 Michael Trianni,		On p. 3-71 and 3-72: Bank A, Pathfinder Reef, Bank D, Bank C and Arakane Reef are part of the West Mariana Ridge (WMR) that also includes Stingray Shoals. They are located ~110-120 miles west of the main island chain and are no closer to the northern islands than they are to the southern islands. In fact, some of those banks are closer to the southern island chain. In this section it should also be mentioned that extensions of the northern and southern islands include, for the northern islands; Uracas Bank north of Uracas, Pakapaka Reef, Malakis Reef, 300 Reef, Dump	The paragraph is revised to read: "Seamounts in the West Mariana Ridge include Pathfinder Reef, Bank D, Bank C, and Arakane Reef." "The northern islands also include the following: Uracas Bank north of Uracas, Pakapaka Reef, Malakis Reef, 300 Reef, Dump Coke Bank, and Zealandia Banks–all south of Anatahan."

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
			Coke Bank, Zealandia Banks all south of Anatahan. For the southern islands; White Tuna Reef, ESE Reef and Sonome Reefs all north of FDM. Most of these, with the possible exception of Pakapaka Reef, all contain habitat that falls within the Coral Reef Ecosystem. On p. 3-72, The Tropic of Cancer begins at 23°30' (23.5°) N latitude. All of the islands and shallow reefs/banks of the CNMI fall within the tropical zone.	"The southern islands include White Tuna Reef, ESE Reef, and Sonome Reefs, all north of Farallon de Medinilla." The passage was amended to read, "The CNMI lies within the tropical zone."
15	Email 5/23/07 Michael Trianni,		On p. 3-72, in the CNMI the eastern island aspect is the windward side and the western island aspect the leeward side, and therefore the reefs are much better developed on the western (leeward) side of the island. It is backwards in the DEIS, and if the source you cite actually has it stated incorrectly, another source should be cited. Off the SW side of FDM there is a well developed extensive reef platform from ~30 to 100 feet. Also, the nearshore coastline of FDM is comprised of wall features, some with well-developed reef structures.	The sentence was revised to read, "Generally, the coral reefs around Tinian are more developed on the western (leeward) coastline and have greater species diversity than those on the eastern (windward) coast which receive more force from breaking waves." Regarding reefs at Farallon de Medinilla, the passage was revised to read, "In general, there is no fringing reef or shallow coastal zone because deep water surrounds much of the island and the submarine slope appears to be very steep (PSDA 1997). There is a coral reef platform approximately 30 to 100 ft wide on the southwest side of the island and some well-developed wall structures in the nearshore areas of Farallon de Medinilla."
16	Email 5/23/07 Michael Trianni,		On p. 3-73, The last sentence of the paragraph at the top of the page states "Farallon de Medinilla is near a large shallow bank 1 mile north of the island (about 18 meters)." It is not	This last sentence was removed from the FPEIS.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.				
No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
			clear what this means. There is a shallow reef north of the island that rises to ~18 feet, but there is no “large shallow bank 1 mile north of the island” that is implied to be 18 meters deep? A very large bank surrounds FDM that falls within the 100-meter contour line. To the north the 100-meter contour line is about 15 kilometers away. The depth range is mostly about 50-80 meters. A “large shallow bank 1 mile north of the island” at about 18 meters depth does not make sense. The reference to the crown-of-thorns starfish (COTS) as “pernicious” is misleading. The COTS is a natural predator of corals. It has evolved within the context of the coral reef ecosystem and to call it “pernicious” implies that its natural behavior is somehow ‘bad’. The study of COTS has thus far been limited to a narrow time scale (the advent of scuba as a scientific tool) from a direct cause-effect perspective. In fact, long-term benefits COTS are to the corals they feed upon and the coral reef ecosystem as a whole has not been addressed. The cause(s) of COTS outbreaks is poorly understood, although outbreaks seem to exhibit a partly cyclic pattern. Although other species that feed on live coral such as the Humphead parrotfish (*Bolbometopon muricatum*) are held in high esteem and have attained a protected status in some regions, there is a distinct double-standard that is	The sentence was revised by removing the word “pernicious” and clarified by adding “coral-eating starfish…”

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
			applied to COTS that is not improved by the implications contained in the term "pernicious".	
17	Email 5/23/07 Michael Trianni,		On p. 3-75 The pan-tropical whitebelly spinner dolphin (*Stenella longirostris longirostris*) is the only known cetacean in the CNMI that forms resident pods amongst the main island chains. It has also frequently stranded on occasion see: Trianni MS and CK Kessler. 2002. Incidence and strandings of the Spinner Dolphin, *Stenella longirostris*, in Saipan Lagoon. Micronesica 34(2) 249-260.	In the FPEIS, the discussion on cetaceans found in waters around CNMI was revised to read as follows: "In waters around the CNMI, the pan-tropical whitebelly spinner dolphin (*Stenella longirostris longirostris*) is the only known cetacean and forms resident pods among the main island chains. It has stranded on occasion (Trianni and Kessler 2002)."
18	Email 5/23/07 Michael Trianni,		Section 3.4.1 appears to refer to sea turtles, and does not have any additional information on CNMI fisheries?	The FPEIS includes a general discussion of sea turtles in the affected environment (Pacific Ocean EEZ) in section 3.4.1. Specific discussion of sea turtles in waters around the CNMI occurs in section 3.5.2 of the FPEIS. A discussion of CNMI fisheries is found in section 3.5.2. NMFS and the Council added the locations to the headers to clarify which archipelagic areas were being discussed.
19	Email 5/23/07 Michael Trianni,		On p. 3-77, the sea cucumber harvest moratorium is for *all* sea cucumbers, and not just *Actinopyga mauritiana*. This section appears rather short in comparison to other sections that follow. To have a very small paragraph on CNMI Coral Reef Fisheries in a Coral Reef Ecosystem DEIS *seems* unfortunate, but I am no expert on DEIS protocols.	The sentence was revised to state that the moratorium applies to all sea cucumbers. The descriptions of fisheries in the FPEIS are summaries of information that are available in the previously published FEPs and other documents which are cited in the FPEIS. The scope of the FPEIS is not limited to coral reef ecosystem, therefore a brief summary of CNMI's coral reef fishery is appropriate and no additional changes were made to the FPEIS.
20	Letter 6/22/07, Sean P. Lynch,	1	The CNMI ASSISTANT Attorney General (CNMI AAG) commented on what the CNMI believes is a fundamental defect in the	The extent of CNMI's interest in submerged lands seaward of the Commonwealth is well established by <u>Northern Mariana Islands v. U.S.</u>, 399 F.3d 1057 (9th Cir. 2005) / cert. denied / <u>Northern Mariana</u>

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	Assistant Attorney General, CNMI Office of the Attorney General		jurisdictional analysis within the Draft PEIS. The matter of jurisdiction was found to be pervasive throughout WESPAC documents and the CNMI AAG believes a correction is in order. 1. Generally, CNMI objects to the characterization of NOAA's jurisdiction under the MSA as extending from the shoreline. The CNMI AG asserts that the CNMI government has exclusive jurisdiction from the coastline out to 12 miles from the coastline. [Note that the CNMI AG qualifies the "coastline" to include "all waters, submerged lands, and natural resources to a depth of at least 10 fathoms and include[ing] certain coastal features."] 2. The CNMI further asserts that this 12 mile exclusive state or territorial jurisdiction is the same for Hawaii, Guam, and American Samoa. 3. Finally, the CNMI AG requests that the agency comply with its duties under Executive Order 13132 with regard to the federalism implications associated with the proposed action.	Islands v. U.S., 547 U.S. 1018 (2006). That case upheld the lower court's finding that the "United States possesses paramount rights in and powers over the waters extending seaward of the ordinary low water mark of the Commonwealth coast and the lands, minerals, and other things of value underlying such waters." The lower court further found that "laws of the Commonwealth that are contrary to these rights are preempted by federal law and are of no force and effect." Thus, with regard to Federal conservation and management under the Magnuson-Stevens Fishery Conservation and Management Act, the authority of the United States within the Exclusive Economic Zone surrounding the CNMI extends from a line that is coterminous with the low water mark of the Commonwealth coast seaward to 200 nautical miles. At the same time, the inner boundary of the EEZ as defined by the Magnuson-Stevens Fishery Conservation and Management Act, as amended (16 U.S.C. Section 1802 (11)), is also well established by the seaward boundary of CNMI. To the extent the Draft PEIS suggested that the CNMI government does not have jurisdiction over internal waters, it was unintentional and inaccurate. While the precise extent of such internal waters has not been established (e.g., the coastline cited above has not been plotted or legally described with any accuracy), there has been no dispute over the ownership of the lands underlying such internal waters, and CNMI retains jurisdiction over them. This may, in some instances, include areas beyond the ordinary low water mark. CNMI does not have jurisdiction over the management (including conservation) of fishery resources. The Secretary of Commerce has the authority to manage the nation's fishery resources throughout the EEZ. In practice, although the CNMI has no jurisdiction over the

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				management (including conservation) of fishery resources, the Federal government coordinates with the local government in its management programs. The document has been edited to indicate clearly the CNMI authority (See Chapter 2, description of Alternatives 1C and 1D). The following clarification language was added to the FPEIS: "The Secretary of Commerce has the authority to manage the nation's fishery resources throughout the U.S. Exclusive Economic Zone (EEZ). With the exception of the waters around CNMI and the PRIA, the boundaries of the FEPs would encompass all Federal waters from 3 to 200 miles from shore for each of the Western Pacific Region's archipelagic areas. The Federal waters of the EEZ around CNMI and the PRIA are recognized from 0 to 200 miles from the shore. In practice, although CNMI has no jurisdiction over the management (including conservation) of fishery resources, the Federal government coordinates with the local government in its management programs." 1. As to Hawaii, American Samoa, and Guam, other laws have established their respective jurisdictions at 3 geographic miles from the shoreline. These are not exclusive jurisdictions, however, in terms of fishery resources management. The jurisdiction is shared and overlaps with the Secretary of Commerce's legal authority to administer fishery management and conservation actions throughout the U.S. EEZ. In practice, the Federal Government attempts to defer to local jurisdiction, while retaining its authority to include the resources in its management programs. 2. The Federal Government will comply with all of its legal obligations, including Executive Order 13132. The proposed action

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				analyzed in the FPEIS makes no substantive regulatory changes to the existing fisheries management regimes. The only change is to shift from a fishery-based management approach to a place-based or ecosystem based management approach. This would, in no way, affect the existing jurisdictional boundaries. Section 2.2 (Description of the alternatives) includes the clarification that: "The EEZ around the CNMI, the PRIA, Hawaii, Guam, and American Samoa is established by international law to be from 0 to 200 nautical miles from the shoreline. The MSA authorizes the Secretary of Commerce to manage and regulate the fisheries resources of the states, territories and possessions of the United States within the Federal waters of the EEZ."
21	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior,	Issue 1. Measures to account for other species occupying the same niche as the target species and that interact with the target species.	From an ecosystem management perspective it may be more appropriate to include an alternative that accounts for other species occupying the same niche as the target species and that interact with the target species. Hence, adaptive management measures should be specified to ensure that all ecosystem-important species will be included in the FEPs and measures to include species that prove important to managing species within each FEP.	The proposed action would only establish the institutional framework and foundation for future fishery ecosystem management. The proposed action contains no new management measures or substantive changes to the existing fishery regulations (emphasis added). With respect to adaptive management measures, fishery conservation and management mandates require NMFS and the Council to ensure that the impacts of fishery programs on protected species and other affected species and the environment are considered appropriately. As a result, monitoring and adaptive management measures are built into all fishery management programs, whether under FMPs or proposed FEPs. Examples vary with fishery but may include limits in terms of interactions or total catch, gear-season-area restrictions, and other measures intended to conserve the fishery resource, including wildlife species that may

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				occur in proximity to management unit species. It should be noted that some monitoring measures are obligatory and some are voluntary – such as reporting. Refinements to fishery management measures are constantly being developed, although none is being considered under the proposed action. In the future, under the framework of the proposed FEPs, it is envisioned that trophic interactions (e.g., predator-prey relationships) and other secondary effects of a fishery management program (such as impacts on protected marine wildlife and species that are caught accidentally) will be considered in the context of adaptive management based on an increase in our knowledge and understanding of managed ecosystems. The FPEIS documents that the proposed action to reorganize the FMPs into FEPs is an initial step (Section 1.5) and in the future additional information will be available to fishery managers including new MUS species that need to be managed in the FEP.
22	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior	Issue 2. Detailed monitoring plans.	Monitoring plans need to be developed and implemented; potential ways how the information from the plans will impact the ecosystem management approach need to be identified.	The proposed action would only establish the institutional framework and foundation for future fishery ecosystem management. No new management measures, including the establishment of monitoring plans, are proposed at this time. However, under the framework of the proposed FEPs, as fisheries scientists, fishermen, and fishery managers increase their knowledge and understanding of the managed ecosystems in the western Pacific, the Council may consider the development of monitoring plans and address information collection needs for effective ecosystem management. Because new monitoring plans and information collection programs are outside the scope of the proposed action, no changes were made to the FPEIS after considering this comment.
23	Letter, public comment period	Issue 3. Funding for	Some level of detail should be provided on how NMFS and the Council would provide sustained	The proposed action would only establish the institutional framework and foundation for future fishery ecosystem management. No new

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior	monitoring plans should be detailed.	funding to ensure that species managed under the FEPs will be adequately monitored and that the adaptive management approach is working to a sufficient degree to protect managed species and ecosystem.	management measures, including the establishment of monitoring plans, are considered in the proposed action. Therefore, details on funding monitoring plans under the proposed FEPs are premature. In the future, when changes are proposed to fishery management measures, provisions for ensuring monitoring measures will be part of the detailed disclosures. Because a new monitoring activity is outside the scope of the proposed action, no changes were made to the FPEIS in response to this comment.
24	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior	Issue 4. Implementation of ecosystem management	Ecosystem management is generally viewed as moving in the right direction. This approach is different from species-based management and could well be beneficial to fisheries and marine ecosystems in and around the Pacific Islands National Park Service units. However, care is advised with respect to the complete ramifications and potential implementation of this or related documents. Further consultation and discussion is needed in the DPEIS with respect to addressing the implementation of ecosystem management within the applicable terrestrial and marine jurisdictional framework.	The FPEIS describes the Councils existing and proposed Council advisory structure alternatives. The Council receives local and regional input from a variety of scientific, technical, fishermen, and members of the general public through both the existing and proposed advisory structure. A shift from species-based FMPs to place-based FEPs would continue to allow input on fisheries management measures from a broad spectrum of interested parties. Ecosystem-based approaches for resource management must involve a broad range of government agencies and stakeholders. For this reason, the Council created regional ecosystem advisory committees (REACs) with the primary objective of bringing issues that involve a wide variety of impacts and management authorities to the table for discussion and action. The REACs would play a crucial role in the development and refinement of the FEPs. See Section 2.4.1 and Section 4.5.2 for more information on the Council's REACs. Other interested parties would have ample opportunities to participate in the fisheries management process through the open public venues that would allow input at various stages in the planning process.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				The FPEIS includes several discussions that acknowledge the need to consult with others when implementing ecosystem management. The Council's processes are quite inclusive and allow involvement from local, state, Federal agencies and the public. Because the proposal is an initial step toward ecosystem management through the reorganization of FMPs into place-based ecosystem plans with no new fishery management measures being proposed, because the proposed reorganized Council process would allow continue involvement from interested parties, and because the proposed ecosystem management would permit enhanced participation in local fisheries management, no additional changes to the FPEIS were made as a result of this comment.
25	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior	Issue 5.	The DPEIS does not acknowledge previous comments provided by DOI on December 27, 2005, on an earlier version of the DPEIS. Nor does the DPEIS reflect changes that address the management issues identified by the FWS. The issues relate to a lack of adequate NEPA analyses of anticipated impacts to fish and wildlife resources managed by the FWS, as mandated, in submerged lands and waters within the 10 NWRs in the central Pacific Ocean. Also, the DPEIS fails to explain why consultation with FWS to resolve these issues did not occur.	NMFS and the Council reviewed the NEPA analysis for adequacy regarding anticipated impacts of the initial move to ecosystem management on fish and wildlife resources managed by FWS in the 10 central Pacific Ocean NWRs. The conclusion reached is that the proposed shift in the fisheries management regime in the Western Pacific Region from species-based FMPs to place-based FEPs is primarily an administrative change (i.e., establishment of an institutional framework). Existing fishery regulations would continue unchanged. Because there are no new or substantive management measures being proposed, NMFS and the Council determined that none of the alternatives would have an impact on fish and wildlife resources in the 10 central Pacific Ocean NWRs. NMFS is committed to ensuring that commercial fishing permittees operating in the PRIA are informed of fishing regulations. To assist the FWS inform permittees of regulations associated with the national wildlife refuges in the PRIA, NMFS will advise all permittees to contact the FWS and also provide the permittee names and

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				contact information to the FWS. In the long term, agencies involved in fisheries management in the PRIAs would have enhanced opportunities to participate in fisheries management decisions. The following text was added to section 2.2.1 (Alternatives 1C and 1D) to explain the FWS authority in the refuge waters. "The U.S. Fish and Wildlife Service (FWS) has the authority to regulate activities within the PRIA National Wildlife Refuges (NWRs). NOAA has exclusive jurisdiction to manage the nation's fishery resources throughout the PRIA EEZs.
26	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior	Issue 6.	The Pacific Remote Island Areas (PRIA) National Wildlife Refuges (NWRs), which include the U.S. coral reefs, submerged lands, and territorial seas, are administered by FWS for DOI, under general regulations at Title 50 for the National Wildlife Refuge system. Although these are significant facts relevant to the proposed action, they are not fully considered in the analysis of impacts associated with the proposed action presented in the DPEIS.	The proposed PRIA FEP covers the conservation and management of fisheries resources within the U.S. EEZ around the PRIA. The inner boundary of the EEZ is defined in the MSA as "a line coterminous with the seaward boundary of each of the coastal States." (MSA (16 U.S.C. 1802) section 3, 99-659.) The PRIA "Social Environment" sections of the FPEIS (sections 3.5.5) were modified to indicate that the PRIA NWRs are managed by the FWS for DOI in accordance with Title 50 regulations. Regulations of the PRIA NWRs are promulgated by the DOI/FWS and are actions beyond the scope of the PEIS. For all alternatives in the PEIS, including the preferred alternative, there would be no change to the current management activities of DOI/FWS, NMFS, or the Council as a result of the proposed action, i.e., replacement of species-based FMPs with place-based FEPs.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				NMFS will continue to implement fishery management regulations that are currently in effect throughout the PRIA EEZ, and the FWS will continue to manage its Refuges in accordance with the regulations they promulgate. The proposed reorganization of existing fishery management plans would not change impacts on DOI areas in the National Wildlife Refuge System, so no changes were made to the FPEIS after considering this comment.
27	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior	Issue 7	The DPEIS does not evaluate the potential cumulative effects of the proposed action in relation to past, present, and potential actions of the FWS in managing six NWRs in the PRIA.	NMFS and the Council re-evaluated the potential cumulative effects of the proposed action in relation to the past, present, and reasonably foreseeable potential actions of the FWS in managing six NWRs in the PRIA as contained in the draft Comprehensive Conservation Plans for Howland, Baker and Jarvis Islands, National Wildlife Refuges, and the Conceptual Management Plans for Palmyra Atoll and Kingman Reef NWRs (the reader is referred to http://www.fws.gov). The proposed change in fisheries management in the western Pacific from species-based FMPs to place-based FEPs is an administrative change and current fishery regulations would continue unchanged. Because there are no new fishery management actions being proposed, NMFS and the Council determined that none of the alternatives would have cumulative effects on FWS management of the PRIA NWRs, and no changes were made to the FPEIS after considering this comment.
28	Letter, public comment period	Issue 8. Refuge closed to	Waters within the boundaries of the NWRs in the PRIA are closed to commercial fishing. The commenter wrote, “If implemented, the	The shift in fisheries management approach in the western Pacific from species-based FMPs to place-based FEPs is only an administrative change, and existing fishery regulations would

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior,	commercial fishing; and potential cumulative effects on existing management programs.	proposed action would result in establishment of a governmental process that would require public and private resources and effort to pursue authorization of actions that are not compatible with the purposes for which the NWRs were established, in accordance with National Wildlife Refuge System requirements found at 50 CFR 29. Clearly, the proposed action has potential to result in significant cumulative effects on existing management of federally protected resources of national importance. By not analyzing cumulative effects of such potential significance, the DPEIS falls short of being a document that would foster good decisions…”	continue unchanged. The Council and NMFS recognize the authority under which FWS manages all national wildlife refuges, including those in the PRIA. The proposed action would not change the ability of FWS to carry out its mandate; therefore the proposed action would have no impact on the management programs of the FWS. The shift to FEPs would continue to foster cooperation and coordination among NMFS, the Council and FWS in areas where there are refuges established. FWS would continue to have input into the management actions and proposals of the Council and NMFS under the place-based FEPs, just as they do at present. The FWS, represented on the Council as a non-voting member, has direct input to all management actions proposed by the Council. The Council and NMFS analyzed the potential cumulative impacts of the institutional and framework shift to FEPs and determined that none of the Federal action alternatives would result in cumulative adverse effects on the existing management of the PRIA refuges, and therefore, no changes were made to the PEIS.
29	Letter, public comment period June 8, 2007 Willie R. Taylor, Director, Office of Environmental Policy and Compliance	Issue 9. Shared management; relation to other laws; consultations with FWS	It is recommended that the following section be added to the FPEIS, Record of Decision, and related implementing regulations: *Relation to other laws.* “To ensure consistency between management regime of different regimes of different Federal agencies with shared management responsibilities of fishery resources within the PRIA regulatory area, fishing is not allowed in any waters withdrawn as a National Wildlife Refuge by the President	The Council and NMFS recognize the authority of FWS, under the National Wildlife Refuge System Administration Act of 1966, as amended, to regulate Refuge activities. Text was inserted in the FPEIS to reflect FWS’s authority. The Magnuson-Stevens Fishery Conservation and Management Act specifically established the boundaries of the U.S. Exclusive Economic Zone within which the U.S. Congress granted exclusive jurisdiction to NOAA over management of fisheries resources.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	U.S. Dept. of the Interior.		or the Secretary of the Interior unless specifically authorized by regulations issued by the Service." It is recommended that NMFS consult with FWS prior to finalizing the DPEIS on the legal requirements for approval of action permitted with the NWRs and include a summary of results of this consultation in the FPEIS. Also, it is recommended that all cases in which proposed actions would affect NWRs in the PRIA identified and incorporated into the analysis presented in the FPEIS along with all relevant information on the outcome of any consultations with FWS on such proposed actions.	NMFS will be reorganizing the current western Pacific fishing regulations at 50 CFR 665 as a complementary action to the proposed establishment of the FEPs to enable the Council to fully shift to geographically-based fishery management. Establishment of the FEPs or reorganization of the regulations does not involve new management measures. The FEPs only establishes the institutional framework and foundation for future fishery ecosystem management by replacing the current species-based fishery management plans with geographically-based fishery ecosystem plans. This framework will be mirrored by the re-organized regulations. Therefore the FEPs or reorganized regulations would not affect the ability of FWS to carry out its mandated management of the PRIA NWRs. The incremental shift in management approach (i.e., replacement of the five FMPs with FEPs), represents a *status quo* for the current fishery management program. As such, the proposed action would not alter the historical or current fishing operations and activity patterns in the PRIA. In conclusion, no substantive changes to the Pacific fishing regulations, including those recommended by the FWS, are being proposed with the replacement of western Pacific FMPs with FEPs. Inasmuch as the FWS is a member of the Council, it will continue to be included in all consultations and deliberations on management measures specifically proposed under the FEPs that could potentially affect the NWRs in the central Pacific Ocean.
30	Letter, public comment period June 8, 2007 Willie R. Taylor,	Issue 10.	In summary the DOI related that it found deficiencies in the DPEIS that "precluded meaningful NEPA analysis of anticipated impacts to fish and wildlife resources managed by the Service …. Within 10 National Wildlife Refuges in the Central Pacific Ocean."	NMFS and the Council re-evaluated the FPEIS and its soundness as a basis for "meaningful analysis" of anticipated impacts to fish and wildlife resources managed by the Service within the NWR refuges in light of the proposed management plan administrative restructuring. The FPEIS discloses the background, purpose and need for the proposed action, describes a proposal and a range of reasonable

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
	Director, Office of Environmental Policy and Compliance U.S. Dept. of the Interior		Other comments were on cumulative effects on Service actions to conserve and protect fishery resources in the PRIA NWRS (addressed above – see Issue 7); and effects on FWS management of the NWRs (addressed above – see Issue 8). DOI asserts that NMFS continues to propose activities that are incompatible with NWR System requirements found at 50 CFR 29 (addressed above, see Issue 8)]. DOI requested a through and complete analysis of the effects of the proposed action on NWRs in the PRIA.	alternatives to the proposed action, describes the affected environment, and considers potential direct, indirect, secondary and cumulative impacts of the alternatives on the environment. The Council is authorized under the MSA to develop fishery management plans for the Western Pacific Region. The current proposed action is to replace existing species-based fishery management plans (FMPs) with place-based fishery ecosystem plans (FEPs). The proposed FEPs would govern the conservation and management of fisheries resources in the U.S. EEZ in the western Pacific Ocean. The affected area includes some areas that are established as national wildlife refuges in the Pacific Remote Islands Area. That fact has been disclosed and the impacts of the proposed action on the NWR management by FWS were considered. The finding is that the change from species-based FMPs to place-based FEPs is an administrative action. This change would not establish any new fishery management measures; and there would be no change to existing FWS management of the natural resources in the NWRs as a result of implementing any of the Federal action alternatives for ecosystem management or for MUS species. The ability of the FWS to promulgate and enforce regulations relating to Refuge management would remain unchanged, regardless of which alternative is selected for implementation. NMFS and FWS would continue to collaborate and coordinate their respective management activities relative to the PRIA under the FEPs, as under the existing FMPs. If new conservation and management measures are proposed by NMFS or FWS, impacts of proposed new measures would be evaluated under applicable laws.

Table 6-1. Summary of Public Comments on the 2007 Draft Programmatic EIS, Responses, and Associated Actions.

No.	Source, Date, Commenter & Affiliation:	Issue Number:	Issue:	Response:
				Because the Refuges and DOI management authorities are disclosed in the FPEIS, no new management measures are addressed, and because future management measures would be coordinated with the DOI, to the extent applicable, and other interested parties including the public, no additional changes were made as a result of this comment. Responses to other DOI comments will have partially addressed the comment.

Chapter 7. REFERENCES

Adams, T., P. Dalzell, and E. Ledua. 1999. Ocean resources. *In*: M. Rappaport (Ed.), *The Pacific Islands Environment and Society*. The Bess Press, Honolulu, HI.

Ainley, D.G., T.C. Telfer, and M.H. Reynolds. 1997. Townsends' and Newell's shearwater (*Puffinus auricularis*). *In*: A. Poole and F. Gill (Eds.), *The Birds of North America, No. 297* (18 pp.). The American Ornithologists' Union, the Academy of Natural Sciences. Washington, D.C.

Alcala, A.C. 1981. Fish yield of coral reefs of Sumilon Island, central Philippines. *Bulletin of the National Research Council of the Philippines.* 36:1–7.

Alcala, A.C. and T. Luchavez. 1981. Fish yield of a coral reef surrounding Apo Island, central Visayas. pp: 69-73 *In: Proceedings of the Fourth International Coral Reef Symposium*.

Allen, T.F.H. and T.W. Hoekstra. 1992. *Toward a unified ecology*. Columbia University Press, New York, NY.

Allen, S. and A. Gough. Monitoring Environmental Justice Impacts: Vietnamese-American Longline Fishermen Adapt to the Hawaii Swordfish Fishery Closure. Human Organization Vol. 65: No. 3, pp 319–328.

Amesbury, J. and R. Hunter-Anderson. 1989. *Native fishing rights and limited entry in Guam.* Western Pacific Regional Fishery Management Council, Honolulu, HI.

Amesbury, J., R. Hunter-Anderson, and E. Wells. 1989. *Native fishing rights and limited entry in the CNMI*. Western Pacific Regional Fishery Management Council, Honolulu, HI.

Arenas, P. Hall, and M. Garcia. 1992. The association of tunas with floating objects and dolphins in the eastern Pacific Ocean. *In*: *Association of fauna with floating objects and dolphins in the EPO Inter-American tropical tuna commission* (unpublished, 38 pp.). Inter-American Tropical Tuna Commission , La Jolla, CA.

Arias-Gonzales, J.E., R. Galzin, J. Nielson, R. Mahon, and K. Aiken. 1994. Reference area as a factor affecting potential yield of coral reef fishes. *NAGA: The ICLARM Quarterly.* 17(4):37–40.

Asakura, A., T. Ohba, S. Miyano, T. Furuki, T. Kurozumi, and H. Harada. 1994. Outline of the biological expedition to the Northern Mariana Islands, Micronesia. *Nat. Hist. Res*. Special Issue 1: 1-11.

Austin, O. 1949. The status of Steller's albatross. *Pacific Science.* 3:283–295.

Balazs, G.H. 1996. Behavioral changes within the recovering Hawaiian green turtle population. Pp: 16-20 *In*: J.A. Keinath, D.E. Barnard, J. A. Musick, and B. A. Bell (Compilers), *Proceedings of the 15th Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Tech. Memo. NMFS-SEFSC-387.

Balazs, G.H. 2002. *Proceedings of the Western Pacific Sea Turtle Cooperative Research and Management Workshop*. February 5–8 2002, Honolulu, HI. Western Pacific Fishery Management Council.

Balazs, G.H. and M. Chaloupka. 2004. Thirty-year recovery trend in the once depleted Hawaiian green sea turtle stock. *Biological Conservation*. 117:491–498.

Balazs, G.H., P. Craig, B.R. Winton, and R.K. Miya. 1994. Satellite telemetry of green turtles nesting at French Frigate Shoals, Hawaii, and Rose Atoll, American Samoa. Pp: 184-187 *In*: K.A. Bjorndal, A.B. Bolten, D.A. Johnson, and P.J. Eliazar (Eds.), *Proceedings of 14th Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Tech. Memo. NMFSSEFSC-351.

Balazs, G.H. and S. Hau. 1986. Geographic distribution: *Lepidochelys olivacea* in Hawaii. *Herpetology Review*. 17(2):51.

Balazs, G.H., H.F. Hirth, P.Y. Kawamoto, E.T. Nitta, L.H. Ogren, R.C. Wass, and J.A. Wetherall. 1992. *Interim recovery plan for Hawaiian sea turtles.* Honolulu Laboratory, Southwest Fisheries Science Center. NMFS, NOAA, Honolulu. SWFSC Admin. Rept. H-92-01.

Balazs, G.H., P.Siu, and J. Landret. 1995. Ecological aspects of green turtles nesting at Scilli Atoll in French Polynesia. In Twelth Annual Sea Turtle Symposium. NOAA Technical memorandum NMFS-SEFSC-361; p. 7-10

Bakun A. 1996. *Patterns in the ocean*. La Jolla, CA: California Sea Grant College/CIB.

Bank of Hawaii. 1997. *American Samoa economic report.* Bank of Hawaii, Honolulu, HI.

Bank of Hawaii. 2000. *American Samoa economic report.* Bank of Hawaii, Honolulu, HI.

Bank of Hawaii. 2002. *American Samoa economic report.* Bank of Hawaii, Honolulu, HI.

Bank of Hawaii. 1999a. *Hawaii 1998: Annual economic report* (Vol. 47). Bank of Hawaii, Honolulu, HI.

Bank of Hawaii. 1999b. *Guam economic report: October 1999*. Bank of Hawaii, Honolulu, HI.

Bank of Hawaii. 1999c. *Commonwealth of the Northern Mariana Islands* economic report: October 1999. Bank of Hawaii, Honolulu, HI.

Bank of Hawaii. 2004. *Commonwealth of the Northern Mariana Islands economic report: October 2004.* Bank of Hawaii, Honolulu, HI.

Bartlett, G. 1989. Juvenile *Caretta* off Pacific coast of Baja California. *Noticias Caguamas. 2*:1-10.

Bellagio Conference on Sea Turtles, Steering Committee. 2004. What can be done to restore Pacific turtle populations? *The Bellagio Blueprint for Action on Pacific Sea Turtles*. Bellagio Conference Center, 17-22 November 2003.

Bigelow, K. 1997. Cook Islands National Fisheries Assessment. Oceanic Fisheries Programme Center Report No. 10. South Pacific Forum Secretariat.

Bigg, G. 2003. *The Oceans and Climate* (2nd ed.).Cambridge University Press, Cambride, England.

Bindoff, N.L., J. Willebrand, V. Artale, A, Cazenave, J. Gregory, S. Gulev, K. Hanawa, C. Le Quéré, S. Levitus, Y. Nojiri, C.K. Shum, L.D. Talley and A. Unnikrishnan. 2007. Observations: Oceanic Climate Change and Sea Level. In: *Climate Change 2007: The Physical Science Basis*. *Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change* (Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M. Tignor and H.L. Miller (Eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY.

BirdLife International. 2009. Bristle-thighed Curlew. http://www.birdlife.org/datazone/species/. Retrieved 2/2/09.

Birkeland, C. (Ed.). 1997a. *Life and Death of Coral Reefs.* Chapman and Hall, NY.

Birkeland, C. 1997b. Status of coral reefs in the Marianas. In: R.W. Grigg and C. Birkeland (Eds.), *Status of Coral Reefs in the Pacific.*University of Hawaii Sea Grant College Program, Honolulu, HI.

Birkeland, C., R. Randall, R, Wass, B, Smith, and S. Wilkens. 1987. Biological resource assessment of the Fagatele Bay National Marine Sanctuary. NOAA Technical Memorandum NOS MEMD 3. 232 pp.

Birkeland, C., R. Randall, and S. Amesbury. 1994. Coral and Reef-fish Assessment of the Fagatele Bay National Marine Sanctuary. Report to the National Oceanic and Atmospheric Administration, U.S. Department of Commerce. 126 pp.

Bjorndal, K.A. 1997. Foraging ecology and nutrition of sea turtles. *In*: P.L. Lutz and J.A. Musick (Eds.), *The biology of sea turtles*. CRC Press, Boca Raton, FL.

Bjorndal, K.A., A.B. Bolten, and M.Y. Chaloupka. 2000. Green turtle somatic growth model: Evidence for density dependence. *Ecological Applications*. 10:269–282.

Bjorndal, K.A., J.A. Wetherall, A.B. Bolten, and J.A. Mortimer 1999. Twenty-six years of green turtle nesting at Tortuguero, Costa Rica: An encouraging trend. *Conservation Biology*. 13:126–134**.**

Boehlert, G.W. and B.C. Mundy. 1993. Ichthyoplankton assemblages at seamounts and oceanic islands. *Bulletin of Marine Science.* 53(2):336–361.

Brainard, R., J. Maragos, R. Schroeder, J. Kenyon, P. Vroom, S. Godwin, R. Hoeke, G. Aeby, R. Moffitt, M. Lammers, J. Gove, M. Timmers, S. Holzworth, and S. Kolinski. 2005. The state of coral reefs of the Pacific Remote Island Areas. *In*: J. Waddell (Ed.), *The state of coral reef ecosystems of the Unites States and Pacific Freely Associated States: 2005.* NOAA Tech. Memo.NOS NCC11.

Brewbaker, P. 2000. *Hawaii economic trends: January 2000.* Honolulu, HI: Bank of Hawaii.

Brodziak, J., R. Moffitt, and G. DiNardo. 2009. Hawaiian bottomfish assessment update for 2008. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-09- 02, 93 p.

Browman, H.I. and K.I. Stergiou. 2004a. Introduction: Perspectives on ecosystem-based approaches to the management of marine resources. *Marine Ecology Progress Series*. 274:269–303.

Browman, H.I. and K.I. Stergiou. 2004b. Marine protected areas as central element of ecosystem-based management: Defining their location, size, and number. Perspectives on ecosystem-based approaches to the management of marine resources. *Marine Ecology Progress Series*. 274:269–303.

Buddemeier, R.W., J.A. Kleypas, and R.B. Aronson. 2004. Coral Reefs and Global Climate Change: Potential Contributions of Climate Change to Stresses on Coral Reef Ecosystems. Pew Center on Global Climate Change, Arlington, VA. 56 pp.

Calambokidis J., G. Steiger, J. Straley, T. Quinn II, L. Herman, S. Cerchio, D. Salden, M. Yamaguchi, F. Sato, J. Urban, R. Jacobsen, O. von Ziegesar, K. Balcomb, C. Gabriele, M. Dahlheim, N. Higashi, S. Uchida, J. Ford, Y. Miyamura, P. de Guevara, S. Mizroch, L. Schlender, and K. Rasmussen. 1997. *Abundance and population structure of Humpback whales in the North Pacific Basin (Final Report)*. Cascadia Research Collective. Contract #50ABNF500113 Report.

Caldeira, K. and M.E. Wickett. 2005. Ocean model predictions of chemistry changes from carbon dioxide emissions to the atmosphere and ocean. *Journal of Geophysical Research*, 110(C09S04).

Carretta, .J.V., K.A. Forney, M.M. Muto, J. Barlow, J. Baker, B. Hanson, and M. Lowry. 2004. *U.S. Pacific marine mammal stock assessments 2004.* NOAA-TM-NMFS-SWFSC-375.

Carleton, C. 1987. *Report on a study of the marketing and processing of precious coral products in Taiwan, Japan and Hawaii*. South Pacific Forum Fisheries Agency Report No. 87/13.

Cayre, R., A. Pianet, A. Morlier and J.M. Stretta. 1989. Thons et environment. Proceedings of the ORSTROM Working Group on Tunas and Environment. Paris, 12-15 September 1988. 26 pg.

Central Intelligence Agency World Fact Book. 2005. www.cia.gov/cia/publications/factbook/

Chaloupka, M. and C. Limpus. 2001. Trends in the abundance of sea turtles resident in southern Great Barrier Reef waters. *Biological Conservation. 102*:235–249.

Chan E. and H. Liew. 1996. Decline of the leatherback population in Terengganu, Malaysia, 1956–1995. *Chelonian Conservation Biology.* 2(2): 196–203.

Chave, E.H. and B.C. Mundy. 1994. Deep-sea benthic fish of the Hawaiian Archipelago, Cross Seamount, and Johnston Atoll. *Pacific Science.* 48:367–409.

Chesher, R.H. 1969. Destruction of Pacific corals by the sea star, *Acanthaster planci*. Science. 165:280–283.

Cheng, A.S., L.E. Kruger, and S.E. Danew. 2003. "Place" as an integrating concept in natural resource politics: propositions for a social science research agenda. *Soc. Natur. Resour.* 16:87-104.

Chimner, R.A., B. Fry, M.Y. Kaneshiro, and N. Cormier. 2006. Current extent and historical expansion of introduced mangroves on O`ahu, Hawai`i. Pac. Sci. 60(3): 377-384.

Christensen, N.L., A.M. Bartuska, J.H. Brown, S. Carpenter, C. Dantonio, R. Francis, J. F. Franklin, J.A. Macmahon, R.F. Noss, D.J. Parsons, C.H. Peterson, M.G. Turner, and R.G. Woodmansee. 1996. The report of the Ecological Society of America committee on the scientific basis for ecosystem applications. *Ecological Applications*. 6(3):665–691.

Clarke, R. 1989. NMFS SWFSC Honolulu Laboratory Administrative Report H-89-5.

Cliffton K., D. Cornejo, and R. Felger. 1982. Sea turtles of the Pacific coast of Mexico. *In:* K. Bjorndal (Ed.), *Biology and conservation of sea turtles* (pp. 199–209). Washington, DC: Smithsonian Institution Press.

Cobb, J. 1902. Commercial fisheries of the Hawaiian Islands (Extracted from the U.S. Fish Commission Report for 1901). Washington, DC: U.S. Government Printing Office.

Coles, R. and Kuo, J. 1995. Seagrasses. *In:* J.E. Maragos, M.N., Peterson, L.C. Eldredge, J.E. Bardach, and H.F. Takeuchi (Eds.), *Marine and coastal biodiversity in the tropical island Pacific segion, Vol. 1, Systematics and information management priorities* (pp. 39–57). Honolulu, HI: East–West Center.

Colgan, M.W. 1981. *Long-term recovery process of a coral community after a catastrophic disturbance*. University of Guam Marine Laboratory, Tech. Rept. No. 76.

Colgan, M.W. 1982. Succession and recovery of a coral reef after predation by *Acanthaster planci* (L.). *Proceedings of the Fourth International Coral Reef Symposium*: *Manila.* 2:333–338.

Colgan, M.W. 1987. Coral reef recovery on Guam (Micronesia) after catastrophic predation by *Acanthaster planci*. *Ecology*. 68(6): 1592-1605.

Colin, P.L., D.M Devaney, L. Hills-Colinvaux, T.H. Suchanek, and J.T. Harrison, III. 1986. Geology and biological zonation of the reef slope, 50–360 m depth at Enewetak Atoll, Marshall Islands. *Bulletin of Marine Science.* 38(1):111–128.

Coutures, E. 2003. The biology and artisanal fishery of lobsters of American Samoa. *DMWR Biological Report Series, No. 103.*

Craig, P. (Ed.). 2002. Natural history guide to American Samoa. National Park of American Samoa and Department of Marine and Wildlife Resources. 78 p.

Craig P., B. Ponwith., F. Aitaoto, and D. Hamm. 1993. The commercial, subsistence and recreational fisheries of American Samoa. *Marine Fisheries Review*. 55 (2), 109-116.

Craig, P., G. Dinonato, D. Fenner, C. Hawkins. 2005. The state of coral reef ecosystems in American Samoa. *In:* J. Waddell (Ed.), *The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005*. NOAA Tech, Memo, NOS NCC11.

CRM. 1996. *Nonpoint source marine monitoring program: First year progress report*. Draft report by Division of Coastal Resources Management, CNMI.

Cummings, V. 2002. Sea turtle conservation in Guam. In: I. Kinan (Ed.), *Proceedings of the Western Pacific Sea Turtle Cooperative Research and Management Workshop*. February 5–8, 2002, Honolulu, HI.

Dalzell, P. 1996. Catch rates, selectivity and yields of reef fishing. *In:* N. V. C. Poulnin and C. Roberts (Eds.), *Tropical reef fisheries* (pp. 161–192). London: Chapman and Hall.

Dalzell, P. and T. Adams. 1997. Sustainability and management of reef fisheries in the Pacific Islands. *Proceedings of the Eighth International Coral Reef Symposium* (pp. 2027–2032).

Dalzell, P., T.J.H. Adams, and N.V.C. Polunin. 1996. Coastal fisheries in the Pacific islands. *Oceanography and Marine Biology: An Annual Review 1996*. 34:395–531.

Dam R. and C. Diez. 1997a. Diving behavior on immature hawksbill turtle (*Eretmochelys imbricata*) in a Caribbean reef habitat. *Coral Reefs.* 16:133–138.

Dam R. and C. Diez. 1997b. Predation by hawksbill turtles on sponges at Mona Island, Puerto Rico. *Proceedings of Eighth International Coral Reef Symposium* (Vol. 2, 1412–1426).

Davenport J., and G. Balazs. 1991. Fiery bodies—Are pyrosomas an important component of the diet of leatherback turtles? *British Herpetological Society Bulletin.*31:33–38.

Dayton, P.K., S.F. Thrush, and F.C. Coleman. 2002. *Ecological effects of fishing in marine ecosystems of the United States.* Arlington, VA: Pew Oceans Commision.

Delcroix, T., G. Eldin, M.H. Radenac, J. Toole and E. Firing. 1992. Variation of the western equatorial Pacific Ocean, 1986-1988. *Journal of Geophysical Research* 97: 5423-5445.

DeMartini, E., F. Parrish, and R. Boland. 2002. *Comprehensive evaluation of shallow reef fish populations at French Frigate Shoals and Midway Atoll, Northwestern Hawaiian Islands.* NOAA Tech. Memo. NOAA Fisheries.

DeMello, J. K. 2004. Commercial marine landings from fisheries on the coral reef ecosystem of the Hawaiian Archipelago. In A. M. Friedlander (Ed.), *Status of Hawaii's coastal fisheries in the new millennium* (pp. 160–173). Proceedings of a symposium sponsored by the American Fisheries Society, Hawaii Chapter, Honolulu, HI.

Department of Business, Economic Development and Tourism. 1999. *The State of Hawaii data book: 1998.* State of Hawaii Department of Business, Economic Development and Tourism, Honolulu.

Department of Business, Economic Development and Tourism. 2003. *The State of Hawaii data book: 2002.* http://www2.hawaii.gov/dbedt/index.cfm?section=READ_Databook445

Department of Marine and Wildlife Resources (DMWR). 2002. Reports on the NMFS logbook program for the American Samoa longline fishery, 1st, 2nd, 3rd and 4th quarters 2001. American Samoa Government.

Des Rochers, K. 1992. The impact of an oil spill on Hawaii's natural environment: A general overview. In: *Oil spills at sea: Potential impacts on Hawaii.* Report prepared for the State of Hawaii Department of Health by the University of Hawaii Sea Grant Program. Report No. CR-92-06.

de Young, B., M. Heath, F. Werner, F. Chai, B. Megrey, and P. Monfrey. 2004. Challenges of modeling ocean basin ecosystems. *Science*. 304:1463–1466.

Dobbs, K. 2001. *Marine turtles in the Great Barrier Reef World Heritage Area: A compendium of information and basis for the development of policies and strategies for the conservation of marine turtles* (1st ed.). Townsville, Queensland, Australia: Great Barrier Reef Park Authority.

Dodd, C.K., Jr. 1988. Synopsis of the biological data on the loggerhead sea turtle *Caretta caretta* (Linnaeus 1758). *U.S. Fish and Wildlife Service Biological Report*. 88(14).

Donaldson, T.J. 1995. Comparative analysis of reef fish distribution patterns in the Northern and Southern Mariana Islands. *Natural History Research.* 2: 227–234.

Donaldson, T.J., R.F. Myers, J.T. Moyer, and P.J. Schupp. 1994. Zoogeography of fishes of the Mariana, Ogasawara and Izu Islands: A preliminary assessment. *Natural History Research: Special Issue.* 1: 303–332.

Doney, S.C. 2006. The dangers of ocean acidification. *Scientific American*, 294(3), 58-65.

Duenas and Swavely, Inc. 1985. *Saipan Lagoon use management plan*. Prepared for the CNMI Coastal Resources Management Office (Four-volume set).

Duron, M. 1978. *Contribution a l'etude de la biologie dedermochelys coriacea dans les pertuis charentais.* Doctoral dissertation, L'Universite de Bordeaux.

Dutton, P., B. Bowen, D. Owens, A. Barragán, and S. Davis. 1999. Phylogeography of the leatherback turtle (*Dermochelys coriacea*). *Journal of Zoology.* 248:397–409.

Dyer, C. and J.R. McGoodwin (Eds.). 1994. *Folk management in the world's fisheries.* Niwot, CO: University of Colorado Press.

Eckert, K.L. 1993. *The biology and population status of marine turtles in the North Pacific Ocean.* Final Report to National Marine Fisheries Service, Southwest Fisheries Science Center.

Eckert, K.L. and S.A. Eckert. 1988. Pre-reproductive movements of leatherback turtles (*Dermochelys coriacea*) nesting in the Caribbean. *Copeia.* 2:400–406.

Eckert, S. A. 1998. Perspectives on the use of satellite telemetry and other electronic technologies for the study of marine turtles, with reference to the first year-long tracking of leatherback sea turtles. *In:* S.P. Epperly and J. Braun (Eds.), *Proceedings of the Seventeenth 21 Annual Sea Turtle Symposium* (p. 294). NOAA Tech. Memo. NMFS-SEFC-415.

Eckert S. A., D. Nellis, K. Eckert, and G. Kooyman. 1986. Diving patterns of two leatherback sea turtles (*Dermochelys coriacea*) during interesting intervals at Sandy Point, St. Croix, U.S. Virgin Islands. *Herpetologica.* 42:381–388.

Ecosystem Principles Advisory Panel. 1999. *Ecosystem-based fishery management: A Report to Congress.* Washington, DC: U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service.

Eldredge, L.G. 1983. Summary of environmental and fishing information on Guam and the Commonwealth of the Northern Mariana Islands: Historical background, description of the islands, and review of the climate, oceanography, and submarine topography. *In*: *Resources Assessment Investigation of the Mariana Archipelago, 1980–1985*. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii.

Enoki, T. 2004. Management of Forest Ecosystems on Islands: the mangrove in Hawaii as an alien species. The Okinawan J. of Am. Stud. No. 1: 62-66.

Faleomavaega, E.F.H. 2002. *Statement before the American Samoa legislature*.

Fefer, S.I. 1987. *Trip report to Palmyra Atoll, 16–30 September 1987.* Unpublished Trip Report. U.S. Fish and Wildlife Service, Honolulu, HI.

Firing, J. and R.E. Brainard. 2006. Ten years of shipboard ADCP measurements along the Northwestern Hawaiian Islands. *Atoll Research Bulletin.* 543:347-363.

Flores, T. 2003. Offshore Fisheries Survey 2003. Annual Report. Government of Guam, Department of Agriculture, Division of Aquatic and Wildlife Resources. 11pp.

Food and Agriculture Organization of the United Nations. 1995. *Code of conduct for responsible fisheries.* Rome.

Food and Agriculture Organization of the United Nations. 1999. Indicators for sustainable development of marine capture fisheries. *FAO guidelines for responsible fisheries. No. 8*. Rome.

Food and Agriculture Organization of the United Nations. 2002. *FAO guidelines on the ecosystem approach to fisheries*. Rome.

Forney, K.A. 2004. Estimates of cetacean mortality and injury in two U.S. Pacific longline fisheries 1994–2004. Admin. Rep. LJ-04-07. Southwest Fisheries Science Center, National Marine Fisheries Service.

Forney K., J. Barlow, M. Muto, M. Lowry, J. Baker, G. Cameron, J. Mobley, C. Stinchcomb, and J. Carreta. 2000. *Draft U.S. Pacific Marine Mammal Stock Assessments: 2000*. La Jolla, CA: NMFS Southwest Fisheries Science Center.

Friedlander, A.M. 1996. *Assessment of the coral reef resources of Hawaii with emphasis on waters of federal jurisdiction*. Report to Western Pacific Regional Fishery Management Council, Honolulu, HI.

Friedlander, A and E. DeMartini. 2002. Contrasts in density, size, and biomass of reef fishes between the northwestern and the main Hawaiian islands: the effects of fishing down apex predators. *Mar. Ecol. Prog. Ser*. 230: 253-264.

Friedlander, A.M., G. Aeby, E. Brown, A. Clark, S. Coles, S. Dollar, C. Hunter, P. Jokiel, J. Smith, B. Walsh, I. Willams, and W. Wiltse. 2005. The state of coral reef ecosystems in the Main Hawaiian Islands. *In*: J. Waddell (Ed.), *The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005*. NOAA Tech, Memo, NOS NCC11.

Fryer, G.J. and P. Fryer. 1999. Geology. *In:* M Rapaport (Ed.), Pacific Islands Environment and Society. Bess Press, Honolulu, HI.

Garcia, S., and A. Demetropolous. 1986. Management of Cyprus fisheries. *FAO Fisheries Technical Paper 250*. United Nations Fish and Agriculture Organization, Rome.

Garcia, S. M., A. Zerbi, C. Aliaume, T. Do Chi, and G. Lasserre. 2003. The ecosystem approach to fisheries: Issues, terminology, principles, institutional foundations, implementation, and outlook. *FAO Fisheries Technical Paper No. 443*. Food and Agriculture Organization of the United Nations.

Gelbspan, R. 2004. *Boiling point*. New York: Basic Books.

Gilman, E., H.V. Lavieren, J. Ellison, V. Jungblut, L. Wilson, F. Areki, G. Brighouse, J. Bungitak, E. Dus, M. Henry, M. Kilman, E. Matthews, I. Sauni Jr., N Teariki-Ruatu, S. Tukia, and K. Yuknavage. 2006. Pacific Island mangroves in a changing climate and rising sea. UNEP Regional Seas Reports and Studies No. 179. United Nations Environment Programme, Regional Seas Programme, Nairobi, Kenya.

Gonsalez, O. J. 1996. Formulating an ecosystem approach to environmental protection. *Environmental-Management*. 20(5):597–605.

Gourley, J. 1997. *The Commonwealth of the Northern Mariana Islands: An assessment of the coral reef resources under local and federal jurisdiction*. Report to Western Pacific Regional Fishery Management Council. Honolulu, HI.

Grant, G.S. 1994. Juvenile leatherback turtle caught by longline fishing in American Samoa. *Marine Turtle Newsletter*. 66:3–5.

Grant, G.S., P. Craig, and G.H. Balazs. 1997. Notes on juvenile hawksbill and green turtles in American Samoa. *Pacific Science*. 51(1):48–53.

Green, A. 1996. Status of the coral reefs of the Samoan Archipelago. Department of Marine and Wildlife Resources Biological Report Series, P.O. Box 3730, Pago Pago, American Samoa. 96799, 125 pp.

Green, A. 1997. *An assessment of the status of the coral reef resources, and their patterns of use in the U.S. Pacific Islands*. Final report prepared for the Western Pacific Regional Fishery Management Council, Honolulu, HI.

Green, A. and C. Mundy. 1995. Biological assessment of the coral reefs adjacent to the proposed road development on Ta'u Island, Manu'a Islands. Department of Marine and Wildlife Resources Biological Report Series, P.O. Box 3730, Pago Pago, American Samoa. 96799. 6 pp.

Green, A. and P. Craig. 1996. Rose Atoll: a refuge for giant clams in American Samoa? Department of Marine and Wildlife Resources Biological Report Series, P.O. Box 3730, Pago Pago, American Samoa. 96799. 55 pp.

Green, D. and F. Ortiz-Crespo. 1982. Status of sea turtle populations in the central eastern Pacific. *In*: K. Bjorndal (Ed.), *Biology and conservation of sea turtles* (pp. 1–583). Washington, DC: Smithsonian Institution Press.

Grigg, R. 1976. Fishery management of precious and stony corals in Hawaii. Sea Grant Tech. Rept. UNIHI-SEAGRANT-TR-77-03, University of Hawaii, Honolulu.

Grigg, R. 1982. Darwin Point: A threshold for atoll formation. *Coral Reefs.* 1;29-34.

Grigg, R. 1983. Community structure, succession and development of coral reefs in Hawaii. *Marine Ecology Progress Series. 11*:1–14.

Grigg, R. 1993. Precious coral fisheries of Hawaii and the U.S. Pacific Islands. *Marine Fisheries Review. 55*(2):50–60.

Grigg, R.W. 2002. Precious Corals in Hawaii: Discovery of a New Bed and Revised Management Measures for Existing Beds. Mar. Fish. Rev. 64(1):13-20.

Grigg, R.W., and L.G. Eldredge. 1975. *The commercial potential of precious corals in Micronesia. Part —The Mariana Islands*. University of Guam, Marine Laboratory Tech. Rep. 18. Sea Grant Publication UGSG-75-01.

Gulko, D. 1998. *Hawaiian coral reef ecology*. Honolulu, HI: Mutual Publishing.

Gutierrez, J.T. 2003. Fisheries participation, effort, and harvest surveys. Government of Guam, Department of Agriculture, Division of Aquatic and Wildlife Resources. 24 pp.

Haight, W. 1989. *Trophic relationships, density and habitat associations of deepwater snappers (Lutjanidae) at Penguin Bank, Hawaii*. Master's thesis, University of Hawaii.

Haight, W., D. Kobayashi, and K. Kawamoto. 1993a. Biology and management of deepwater snappers of the Hawaiian Archipelago. *Marine Fisheries Review. 55*(2):20–27.

Haight, W., J. Parrish, and T. Hayes. 1993b. Feeding ecology of deepwater lutjanid snappers at Penguin Bank, Hawaii: depth, time of day, diet, and temporal changes. *Transactions of the American Fisheries Society. 122*(3):338–347.

Hamnett, M.P. and C.L. Anderson. 2000. Impact of ENSO events on tuna fisheries of the U.S. affiliated Pacific Islands. University of Hawaii (Honolulu): Joint Institute for Marine and Atmospheric Research; Pelagic Fisheries Research Program.

Hamnett M. and W. Pintz. 1996. *The contribution of tuna fishing and transshipment to the economies of American Samoa, the Commonwealth of the Northern Mariana Islands, and Guam*. Pelagic Fisheries Research Program. SOEST 96-05. JIMAR Contribution 96-303.

Hare, S.R. 1996. Low frequency climate variability and salmon production. Ph.D. Dissertation, School of Fisheries, University of Washington, Seattle, WA.

Harman, R. and A. Katekaru. 1988. 1987 Hawaii commercial fishing survey. Honolulu, HI: State of Hawaii Department of Land and Natural Resources Division of Aquatic Resources, Honolulu.

Harrison, C.S. 1990. *Seabirds of Hawaii: Natural history and conservation*. Ithaca, NY: Cornell University Press.

Harrison, C.S. 2005. *Pacific Seabirds*. Volume 32.

Hasegawa H. 1979. Status of the short-tailed albatross of Torishima and in the Senkaku Retto in 1978–79. *Pacific Seabird Group Bulletin.* 6:806–814.

Hasegawa H. 2007a. “Short-tailed Albatrosses on Torishima in 2006-07.” Email to Thorn Smith, Alaska Longliners Association, January 13, 2007.

Hasegawa H .2007b “RE:Report of Hasegawa’s latest survey survey on Torishima.” E-mail to Greg Balogh, UWFWS, December 12, 2007.

Hastie, L. and W. Saunders. 1992. On the distribution and fishery potential of the Japanese Red Crab *Chaceon granulatus* in the Palauan Archipelago, Western Caroline Islands. *Marine Fisheries Review.* 54 (1):26–32.

Hatcher, B.G., R.E. Johannes, and A I. Robertson. 1989. Review of research relevant to the conservation of shallow tropical marine ecosystems. *Oceanography and Marine Biology: An Annual Review*. 27: 337-414.

Hilborn, R. 2004. Ecosystem-based fisheries management: The carrot for the stick? Perspectives on ecosystem-based approaches to the management of marine resources. *Marine Ecology Progress Series*. 274:269–303.

Hildreth, R., M.C. Jarman, and M. Landlas. 2005. Roles for precautionary approach in marine resources management. *In*: A. Chircop. and M. McConnel (Eds.), *Ocean Yearbook 19* (pp. 33–61). Chicago and London: University of Chicago Press.

Hill P. and D. DeMaster. 1999. *Alaska marine mammal stock assessments 1999*. Seattle, WA: National Marine Mammal Laboratory, NMFS Alaska Fisheries Science Center.

Hill P., D. DeMaster, and R. Small. 1997. *Alaska marine mammal stock assessments 1996/U.S.pacific marine mammal stock assessments: 1996.* Seattle, WA: National Marine Mammal Laboratory, NMFS Alaska Fisheries Science Center. NOAA Tech. Memo. NMFS/NOAA-0TM-NMFS-AFSC-78.

Hodge R. and B. Wing. 2000. Occurrence of marine turtles in Alaska waters:1960–1998. *Herpetological Review*. 31:148–151.

Holthus, P.F. and J.E. Maragos. 1995. Marine ecosystem classification for the tropical island Pacific. *In:* J.E. Maragos, M.N. Peterson, L.G. Eldredge, J.E. Bardach, and H.E. Takeuchi (Eds.), *Marine and coastal biodiversity in the tropical island Pacific region* (pp. 239–278). Honolulu, HI: Program on Environment, East–West Center.

Hopley, D. and D.W. Kinsey. 1988. The effects of a rapid short-term sea level rise on the Great Barrier Reef. *In:* G. I. Pearman (Ed.), *Greenhouse: Planning for a climate change* (pp. 189–201). New York: E. J. Brill.

Horwood J. 1987. *The sei whale: Population biology, ecology and management*. London: Croom Helm.

Houghton, J.T., Y. Ding, D.J. Griggs, M. Noguer, P.J. van der Linden, and D. Xiaosu (Eds.) 2001. *IPCC Third Assessment Report: Climate Change 2001: The Scientific Basis.* Cambridge University Press, Cambridge, UK, 944 pp. retrieved from: [http://www.grida.no/climate/ipcc_tar/wg1/index.htm] [Also see: Summary for Policymakers and Technical Summary, 98 pp.]

Hunter, C. 1995. *Review of coral reefs around American Flag Pacific Islands and assessment of need, value, and feasibility of establishing a coral reef fishery management plan for the Western Pacific Region*. Final report prepared for Western Pacific Regional Fishery Management Council. Honolulu.

Hunter, C.L., A.M. Friedlander, W.M. Magruder, and K.Z. Meier.1993. Ofu reef survey: baseline assessment and recommendations for long-term monitoring of the proposed National Park, Ofu, American Samoa. Final report to the U.S. National Park Service, Pago Pago, American Samoa. 92 pp.

Huston, M.A. 1985. Patterns of species diversity on coral reefs. *Annual Review of Ecological Systems* 6:149–177.

ICES. 2000. Ecosystem effects of fishing: Proceedings of an ICES/SCOR Symposium.*ICES. Journal of Marine Science*. 57(3):465–791.

ICES. 2005*. ICES Journal of Marine Science*. 62(4):307–614.

Inouye, D. 2004. Congress passes bill with nearly half-billion dollars for defense related initiatives in Hawaii. July 30, 2004, http://inouye.senate.gov/.

IPCC (Intergovernmental Panel on Climate Change). 2007. Summary for Policymakers. In: *Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change (*Solomon, S., D. Qin, M. Manning, Z. Chen, M. Marquis, K.B. Averyt, M.Tignor and H.L. Miller (Eds.), Cambridge University Press, Cambridge, United Kingdom and New York, NY.

Irons, D.K., R.K. Kosaki. and J.D. Parrish. 1990. Johnston Atoll Resource Survey Final Report - Phase Six (21 July 89 - 20 July 90). Dept. of the Army, U.S. Army Engineer District, Honolulu, Fort Shafter, Hawaii.

Itano, D. 1996. The development of small-scale fisheries for bottomfish in American Samoa (1961–1987). *South Pacific Commission Fisheries Newsletter No. 76 and No. 77.*

Itano, D. and T. Buckley. 1988. The coral reefs of the Manu'a Islands, American Samoa. Department of Marine and Wildlife Resources Biological Report Series. 28 pp.

Iversen, R., T. Dye, and L. Paul. 1990. Native Hawaiian fishing rights. Phase 2 Main Hawaiian Islands and the Northwestern Hawaiian Islands. Western Pacific Regional Fishery Management Council, Honolulu.

Jennings, S. 2004. The ecosystem approach to fishery management: A significant step towards sustainable use of the marine environment? Perspectives on ecosystem-based approaches to the management of marine resources. *Marine Ecology Progress Series*. 274:269–303.

Johannes, R.E. 1981.Words of the lagoon: fishing and marine lore in the Palau district of Micronesia. University of California Press: Berkeley.

Jokiel, P.L. and E. Cox. 1996. Assessment and monitoring of U.S. coral reefs in Hawaii and central Pacific. *In*: M.P. Crosby, G.R. Gibson, and K.W. Potts (Eds.), A coral reef symposium on practical, reliable, low cost monitoring methods for assessing the biota and habitat conditions of coral reefs. NOAA Office of Coastal Resource Management, Silver Spring, MD.

Kamezaki, N., Y. Matsuzawa, O. Abe, H. Asakawa, T. Fujii, K. Goto, S. Hagino, M. Hayami, M. Ishii, T. Iwamoto, T. Kamata, H. Kato, J. Kodama, Y. Kondo, I. Miyawaki, K. Mizobuchi, Y. Nakamura, Y. Nakashima, H. Naruse, K. Omuta, M. Samejima, H. Suganuma, H. Takeshita, T. Tanaka, T. Toji, M. Uematsu, A. Yamamoto, T. Yamato, and I. Wakabayashi. 2003. Loggerhead turtles nesting in Japan. *In*: A.B. Bolten and B.E. Witherington (Eds.), *Loggerhead sea turtles* (pp. 210–217). Smithsonian Institution, Washington, D.C.

Kanciruk, P. 1980. Ecology of juvenile and adult Palinuridae (spiny lobsters). In: J.S. Cob and B.F. Philips (Eds.), *The biology and management of lobsters* (Vol. 2., pp. 59–92), Academic Press, NY.

Katahira, L. K., C. M. Forbes, A. H. Kikuta, G. H. Balazs, and M. Bingham. 1994. Recent findings and management of hawksbill nesting beaches in Hawaii. *In: The Proceedings of the 14th Annual Symposium on Sea Turtle Biology and Conservation*. NOAA Tech. Memo. NMFS-SEFSC-351.

Kawamoto, K. and S. Pooley. 2000. *Preliminary draft: Annual report of the 1999 western Pacific lobster fishery*. NMFS SWFSC Honolulu Laboratory.

Kay, J.J. and E. Schneider. 1994. Embracing complexity: The challenge of the ecosystem approach. *Alternatives.* 20(3):32–39.

Keenan, E.E., R.E. Brainard, and L.V. Basch. 2006. Historical and present status of the pearl oyster at Pearl and Hermes Atoll, Northwestern Hawaiian Islands. *Atoll Research Bulletin:* 543: 333-344.

King, M. 1993. Deepwater shrimps. In Nearshore Marine Resources of the South Pacific, A. Wright and L. Hill (eds). Suva: Institute of Pacific Studies, Honiara: Forum Fisheries Agency and Halifax: International Centre for Ocean Development, 513-538.

Kitchell, J.F, C.H. Boggs, X. He, and C.J. Walters. 1999. Keystone predators in the central Pacific. In *Alaska sea grant: Ecosystem approaches for fisheries management*. Anchorage, Alaska: University of Alaska.

Kleypas, J.A., R.A. Feely, V.J. Fabry, C. Langdon, C.L. Sabine, and L.L. Robbins. 2006. *Impacts of Ocean Acidification on Coral Reefs and Other Marine Calcifiers: a Guide for Future Research*. Workshop Report, National Science Foundation, National Oceanic and Atmospheric Administration, and the U.S. Geological Survey.

Knudson, K.E. 1987. *Non-commercial production and distribution in the Guam fishery*. University of Guam, Mangilao, Guam: Micronesian Area Research Center.

Kolinksi, S.P., L.I. IIo, and J.K. Ruak. 2004. Green turtles and their marine habitats at Tinian and Aguijan, with protections on resident turtle demograpshics in the southern arc of the Commonwealth of Northern Mariana Islands. *Micronesica* 37:95-116.

Laffoley, D.d'A., E, Maltby, M.A. Vincent, L. Mee, E. Dunn, P. Gilliland, J. Hamer, D. Mortimer, and D. Pound. 2004. The ecosystem approach: Coherent actions for marine and coastal environments: A report to the UK government. *English Nature*.

Lee T. 1993. Summary of cetacean survey data collected between the years of 1974 and 1985. NOAA Tech. Mem. NMFS 181. 184p.

Levington, J.S. 1995. *Marine biology*. New York: Oxford University Press.

Levitus, S. 1982. Climatological atlas of the world ocean. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, NOAA Professional Paper No. 13. 173 p.

Limpus, C.J. 1982. The status of Australian sea turtle populations. *In:* K.A. Bjorndal (Ed.), *Biology and conservation of sea turtles* (pp. 297–303). Smithsonian Institution Press, Washington, D.C.

Limpus, C.J. 1985. A study of the loggerhead sea turtle, *Caretta caretta,* in eastern. Australia. Ph.D. Dissertation, University of Queensland, St. Lucia, Australia.

Limpus C. 1992. The hawksbill turtle, *Eretmochelys imbricata*, in Queensland: Population structure within a southern Great Barrier Reef feeding ground. *Wildlife Research*. 19:489–506.

Limpus, C.J. and D. Reimer. 1994. The loggerhead turtle, *Caretta caretta*, in Queensland:A population in decline. *In:* R. James (Compiler). *Proceedings of the Australian Marine Turtle Conservation Workshop* (pp. 39–59). Sea World Nara Resort, Gold Coast, November 14–17, 1990. Australian Nature Conservation Agency, Australia.

Link, J.S. 2002. Does food web theory work for marine ecosystems? *Marine Ecology Progress Series*. 230:1–9.

Lubchenco, J., S.R. Palumbi, S.D. Gaines, and S. Andelman. 2003. Plugging a hole in the ocean: The emerging science of marine reserves. *Ecological Applications*. 13(Suppl.):S3–S7.

Lutcavage, M.E., P. Plotkin, B. Witherington, and P.L. Lutz. 1997a. Human impacts on sea turtle survival. Pp: 387-409 *In:* P.L. Lutz and J.A. Musick (Eds.), *The Biology of Sea Turtles* (pp. 387–409). CRC Press, Boca Raton, FL.

Lutcavage, M.E., and P.L. Lutz. 1997b. Diving physiology. *In:* P.L. Lutz and J.A. Musick (Eds.), *The Biology of Sea Turtles*. CRC Press, Boca Raton, FL.

MacDonald, C. 1986. Recruitment of the puerulus of the spiny lobster, *Panulirus marginatus,* in Hawaii. *Canadian Journal of Fisheries and Aquatic Sciences. 43*:2118–2125.

MacDonald, C. and J. Stimson. 1980. Population biology of spiny lobsters in the lagoon at Kure Atoll—Preliminary findings and progress to date. Pp: 161-174 *In:* R. Grigg and R. Pfund (Eds.), *Proceedings of the Symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands.* April 24–25, 1980, Honolulu, Hawaii, University of Hawaii, Honolulu, HI UNIHI-SEAGRANT-MR-80-04.

Mace, P. 2004. In defense of fisheries scientists, single-species models and other scapegoats: Confronting real problems. Perspectives on ecosystem-based approaches to the management of marine resources. *Marine Ecology Progress Series*. 274:269–303.

Maragos, J.E. 1994. Reef and coral observations on the impact of the grounding of the longliner *Jin Shiang Fa* at Rose Atoll, American Samoa. Report prepared for U.S. Fish and Wildlife Service, Pacific Island Office, Honolulu. Hawaii. 27 pp.

Maragos, J.E., Hunter, C.L. and K.Z. Meier. 1994. Reefs and corals observed during the 1991-1992 American Samoa coastal resources inventory. Report prepared for the American Samoa Department of Marine and Wildlife Resources, American Samoa Government. 50 pp.

Maragos, J.and D. Gulko. 2002. *Coral reef ecosystems of the Northwestern Hawaiian Islands: Interim results emphasizing the 2000 surveys*. U.S. Fish and Wildlife Service and the Hawaii Department of Land and Natural Resources. Honolulu.

Marine Fisheries Advisory Committee Ecosystem Approach Task Force. 2003. *Technical guidance for implementing an ecosystem-based approach to fisheries management.* Marine Fisheries Advisory Committee.

Marquez, M. 1990. Sea turtles of the world: *An annotated and illustrated catalogue of sea turtle species known to date*. *FAO Species Catalog: FAO Fisheries Synopsis.* 11(125).

Marshall, N. 1980. Fishery yields of coral reefs and adjacent shallow water environments. Pg. 103 *In:* P.M. Roedel and S.B. Saila (Eds), Proceedings of an International Workshop on Stock Assessment for Tropical Small Scale Fisheries. University of Rhode Island, Kingston.

Marten, G.G., and J.J. Polovina. 1982. A comparative study of fish yields from various tropical ecosystems. *In:* D. Paul and G.I. Murphy (Eds.), *Theory and management of tropical fisheries*. Manila, Philipines: ICLARM

Matsuzawa, Y. 2005. *Nesting and beach management of eggs and pre-emergent hatchlings of pacific loggerhead sea turtles on Yakushima Island, Japan: April to September 2004*. Final Report to the Western Pacific Regional Fishery Management Council: Contract No. 04-WPC-011.

McConnell, K.E., and T.C. Haab. 2001. Small boat fishing in Hawaii: Choice and economic values. *SOEST Publication 01-01, JIMAR Contribution 01-336*, 62 pp.

McKeown, A. 1977. *Marine turtles of the Solomon Islands*. Honiara: Solomon Islands: Ministry of Natural Resources, Fisheries Division.

Meylan, A. 1985. The role of sponge collagens in the diet of the Hawksbill turtle, Eretmochelys imbricata. *In:* Bairati and Garrone (Eds.), *Biology of invertebrate and lower vertebrate collagens*. Plenum Press, NY.

Meylan, A. 1988. Spongivory in hawksbill turtles: A diet of glass. *Science.* 239:393–395.

Meylan, A. 1999. International movements of immature and adult hawksbill turtles (*Eretmochelys imbricata*) in the Caribbean Region. *Chelonian Conservation and Biology* 3:189-194.

Miller, A.J., D.R. Cayan, T.P. Barnett, N.E. Graham and J.M. Oberhuber. 1994. Interdecadal variability of the Pacific Ocean: model response to observed heat flux and wind stress anomalies. *Climate Dynamics* 9: 287-302.

Moffitt, R.B. 1993. Deepwater demersal fish. Pp: 73-95 *In:* A. Wright and L. Hill (Eds.) *Nearshore Marine Resources of the South Pacific.* IPS (Suva), FFA(Honiara), ICOD (Canada).

Moffitt B. and J. Polovina. 1987. Distribution and yield of the deepwater shrimp *Heterocarpus* resource in the Marianas. *Fishery Bulletin.* 85(2): 329-349.

Moffitt B., D. Kobayashi, and G. DiNardo. 2004. Status of the Hawaiian Bottomfish Stocks, 2004. PIFSC Administrative Report H-06-01, 43 pp.

Moffitt, R.B. J. Johnson, G. DiNardo. 2006. Spatiotemporal analysis of lobster trap catches: impacts of trap fishing on community structure. *Atoll Research Bulletin.* 543:217-236.

Morgan, J. 1989. Large marine ecosystems in the Pacific Ocean. Pp: 377-394 *In:* K. Sherman, L.M. Alexander, and B.D. Gold, (Eds), Biomass Yields and Geography of Large Marine Ecosystems. AAAS Selected Symposium 111. Westview Press. Boulder CO.

Mundy, C. 1996. A quantitative survey of the corals of American Samoa. Report to the Department of Marine and Wildlife Resource, American Samoan Government.

Munro, J.L. (Ed.). 1983. Caribbean coral reef fishery resources. *ICLARM studies and reviews* (Vol. 7). Manila, The Philippines: International Center for Living Aquatic Resources Management.

Munro, J.L. 1984. Coral reef fisheries and world fish production. *NAGA: The ICLARM Newsletter.* 7(4):34.

Murawski, S. 2005. *Strategies for incorporating ecosystems considerations in ecosystem management.* Managing Our Nations Fisheries II: Focus on the future. Washington D.C. March 24-26, 2005.

Myers, R.F. 1997. *Assessment of coral reef resources of Guam with emphasis on waters of federal jurisdiction*. Report prepared for the Western Pacific Regional Fisheries Management Council.

National Marine Fisheries Service (NMFS). 1978. Biological Opinion on the Fishery Management Plan for Precious Corals Fisheries of the Western Pacific. October 5, 1978.

National Marine Fisheries Service (NMFS). 1998. Biological opinion on the Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region: Hawaii Central North Pacific longline fishery. National Marine Fisheries Service, Southwest Region.

National Marine Fisheries Service (NMFS). 2001. Final Environmental Impact Statement for the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region.

National Marine Fisheries Service (NMFS). 2002a. Biological opinion on the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. March 8, 2002.

National Marine Fisheries Service (NMFS). 2002b. Informal consultation on the Fishery Management Plan for Coral Reef Ecosystem Fisheries of the Western Pacific Region. March 7, 2002.

National Marine Fisheries Service (NMFS). 2004a. Biological Opinion for the Fishery Management Plan for the Pelagics Fisheries of the Western Pacific Region. February 23, 2004.

National Marine Fisheries Service (NMFS). 2004b. *Fisheries of the United States 2003.* Washington, DC: U.S. Government Printing Office.

National Marine Fisheries Service (NMFS). 2005a. Final Biological Opinion on Effects of Hawaii-Based Pelagic, Deep-Set Longline Fishery on listed sea turtles and humpback whales. October 4, 2005.

National Marine Fisheries Service (NMFS). 2005b. *Final Environmental Impact Statement: Seabird interaction avoidance methods and pelagic squid management.* Fishery Management Plan for the Pelagic Fisheries of the Western Pacific Region.

National Marine Fisheries Service (NMFS). 2005c. *Final Environmental Impact Statement: Bottomfish and seamount groundfish fishery of the Western Pacific Region*. May 26, 2005.

National Marine Fisheries Service (NMFS). 2007a. Informal consultation on Amendment 13 to the Fishery Management Plan for the Crustacean Fisheries of the Western Pacific Region. November 19, 2007.

National Marine Fisheries Service (NMFS). 2007b. MMPA determination for Amendment 13 to the Fishery Management Plan for the Crustacean Fisheries of the Western Pacific Region. November 19, 2007.

National Marine Fisheries Service (NMFS). 2008a. Biological Opinion on Amendment 14 to the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. NMFS, Honolulu, HI.

National Marine Fisheries Service (NMFS). 2008b. Biological Opinion on Amendment 18 to the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region. NMFS, Honolulu, HI.

National Marine Fisheries Service (NMFS). 2008c. Informal consultation on Amendment 7 to the Fishery Management Plan for Precious Corals Fisheries of the Western Pacific Region. February 5, 2008.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1998a Recovery Plan for U.S. Pacific Populations of the Green Turtle (*Chelonia mydas*). National Marine Fisheries Service: Silver Spring, MD.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1998b. Recovery Plan for U.S. Pacific Populations of the Hawksbill Turtle (*Eretmochelys imbricata*). National Marine Fisheries Service: Silver Spring, MD.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1998c. Recovery Plan for U.S. Pacific Populations of the Leatherback Turtle (*Dermochelys Coriacea*). National Marine Fisheries Service: Silver Spring, MD.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1998d. Recovery Plan for U.S. Pacific Populations of the Loggerhead Turtle (*Caretta caretta*). National Marine Fisheries Service: Silver Spring, MD.

National Marine Fisheries Service (NMFS) and U.S. Fish and Wildlife Service (USFWS). 1998e. Recovery plan for U.S. Pacific populations of the olive ridley turtle (*Lepidochelys olivacea*). National Marine Fisheries Service: Silver Spring, MD.

National Oceanic and Atmospheric Administration (NOAA). 2004. New priorities for the 21st century. *NOAA's strategic plan updated for FY 2005–FY 2010*.

National Oceanic and Atmospheric Administration (NOAA). 2005a. The State of Coral Reef Ecosystems of the United States and Pacific Freely Associated States:2005. NOAA Technical Memorandum NOS NCCOS 11.

National Oceanic and Atmospheric Administration (NOAA). 2005b. *Protecting America's Marine Environment*. A report of the Marine Protected Areas Federal Advisory Committee on Establishing and Managing a National System of Marine Protected Areas.

Naughton, M.K. Morgan and K. Rivera. 2008. Unpubl. Species Information – Short-tailed Albatross (*Phoebastaria albatrus*). Prepared for the Fourth Meeting of the Advisory Committee of the Agreement on the Conservation of Albatrosses and Petrel.s, August 22-25, 2008. Cape Town, South Africa.

Nichols, W.J., A. Resendiz, and C. Mayoral-Russeau. 1999. Biology and conservation of loggerhead turtles (*Caretta caretta*) in Baja California, Mexico. Proceedings of the 19th Annual Symposium on Sea Turtle Conservation and Biology.

Nichols, W.J., A. Resendiz, and C. Mayoral-Russeau. 2000. Biology and conservation of loggerhead turtles (*Caretta caretta*) in Baja California, Mexico. Pp: 169-171 *In: Proceedings of the 19th Annual Symposium on Sea Turtle Conservation and Biology*. March 2–6, 1999, South Padre Island, TX.

Nunn, P. 2003. Geomorphology. *In:* M. Rapaport (Ed.), *The Pacific Islands: Environment and Society*. The Bess Press, Honolulu, HI.

Oishi, F. 1983. Shrimp Industry Development Project. Division of Aquatic Resources, Department of Land and Natural Resources, State of Hawaii. 22 p.

Okamoto, H. 1982. Deep bottomfish surveys - Hawaii. Completion report prepared for the Pacific Tuna Development Foundation under Project no. 35, Deep Bottom Fishing Surveys –Hawaii Div. Aquat. Resources, Dept. Land and Natural Resources, Honolulu 21 p.

Olson D., A. Hitchcock, C. Mariano, G. Ashjian, G. Peng, R. Nero, and G. Podesta. 1994. Life on the edge: Marine life and fronts. *Oceanography*. 7(2):52–59.

O'Malley, J.M., and S.G. Pooley. 2002. A description and economic analysis of large American Samoa longline vessels. SOEST (University of Hawaii) Report 02-345.

Ostazeski, J. 1997. *The deepwater shrimp fishery of the Northern Mariana Islands.* Honolulu Laboratory, Southwest Fisheries Science Center, NMFS. Southwest Fisheries Science Center Admin. Rept. H-97-10C.

Parker, D.M., W. Cooke, and G.H. Balazs. 2002. Dietary components of pelagic loggerhead turtles in the North Pacific Ocean. Pp: 148-149 *In*: *Proceedings of the 20th Annual Sea Turtle Symposium*. February 29–March 4, 2000, Orlando, FL.

Parrish, J.D. 1987. The trophic biology of snappers and groupers. Pp: 405-464 *In*: J.J. Polovina and S. Ralston (Eds.), *Tropical snappers and groupers: Biology and fisheries management*. Westview Press, Boulder, CO.

Parrish, F. 1989. Identification of habitat of juvenile snappers in Hawaii. *Fisheries Bulletin.* 87:1001–1005.

Parrish, F. and J. Polovina. 1994. Habitat thresholds and bottlenecks in production of the spiny lobster (*Panulirus marginatus*) in the Northwestern Hawaiian Islands. *Bulletin of Marine Science.* 54(1):151–163.

Pauly, D., V. Christensen, J. Dalsgaard, R. Froese, and F. Torres, Jr. 1998. Fishing down marine food webs. *Science*. 279:860–863.

PBEC. 1984. *Biological and physical survey of Bahia Laulau, Saipan.* Report prepared by Pacific Basin Environmental Consultants Inc. for Commonwealth of the Northern Marian Islands Planning/Energy Office.

Picaut, J. and R. Tournier. 1991. Monitoring of the 1979-1985 equatorial Pacific transports with expendable bathythermograph data. *J. Geo. Res*. 96: 3263-3277.

Pikitch, E.K., C. Santora, E. Babcock, A. Bakun, R. Bonfil, D.O. Conover, P. Dayton, P. Doukakis, D. Fluharty, B. Heneman, E.D. Houde, J. Link, P.A. Livingston, M. Mangel, M.K. McAllister, J. Pope, and K.J. Sainsbury. 2004. Ecosystem-based fishery management. *Science*. 305:1–2.

Pitcher, C.R. 1993. Spiny lobster. Pp: 543-611 *In:* A. Wright and L. Hill (Eds.), *Inshore marine resources of the South Pacific: Information for fishery development and management*. FFA/USP Press, Fiji.

Plotkin, P.T. 1994. *The migratory and reproductive behavior of the olive ridley, Lepidochelys olivacea* (*Eschscholtz, 1829*)*, in the eastern Pacific Ocean*. Master's thesis, Texas A&M University.

Polunin, N.V.C. and R.D. Morton. 1992. *Fecundity–Predicting the population fecundity of local fish populations subject to varying fishing mortality*. Unpublished report, Center for Tropical Coastal Management, University of Newcastle upon Tyne, Newcastle.

Polunin, N.V.C. and C. Roberts (Eds.). 1996. *Tropical reef fisheries.* Chapman & Hall, London.

Polunin, N.V.C., C.M. Roberts, and D. Pauly. 1996. Developments in tropical reef fisheries science and management. Pp: 161-192 *In*: N.V.C. Polunin and C. Roberts (Eds.), *Tropical reef fisheries*. Chapman & Hall, London.

Polovina, J.J. 1984. Model of a coral reef ecosystem. The ECOPATH model and its application to French Frigate Shoals. *Coral Reefs.* 3: 1-11.

Polovina, J.J. 1993. The lobster and shrimp fisheries in Hawaii. *Marine Fisheries Review.* 55(2):28–33.

Polovina J.J. 1996. Decadal variation in the trans-Pacific migration of northern bluefin tuna (*Thunnus thynnus*) coherent with climate-induced change in prey abundance. *Fisheries Oceanography.* 5(2): 114-119.

Polovina, J.J. 2005. Climate variation, regime shifts, and implications for sustainable fisheries. *Bulletin of Marine Science*. 76(2): 233–244.

Polovina, J.J., G.H. Balazs, E.A. Howell, D.M. Parker, M.P. Seki, and P.H. Dutton. 2004. Forage and migration habitat of loggerhead (*Caretta caretta*) and olive ridley (*Lepidochelys olivacea*) sea turtles in the central North Pacific Ocean. *Fisheries Oceanography*. 13(1): 36-51.

Polovina, J.J., and W. Haight. 1999. *Climate variation, ecosystem dynamics, and fisheries management in the Northwestern Hawaiian Islands.* Ecosystem Approaches for Fisheries Management, Alaska Sea Grant College Program.

Polovina, J.J., E. Howell, D.R. Kobayashi, and M.P. Seki. 2001. The transition zone chlorophyll front: A dynamic global feature defining migration and forage habitat for marine resources. *Progress in Oceanography*. 49:469–483.

Polovina J.J., D. Kobayashi, D. Parker, M. Seki, and G. Balazs. 2000. Turtles on the edge: Movement of loggerhead turtles (*Caretta caretta*) along oceanic fronts, spanning longline fishing grounds in the central North Pacific, 1997–1998. *Fisheries Oceanograph.y* 9:71–82.

Polovina, J.J., E.A. Howell, and M. Abecassis. 2008. Ocean's least productive waters are expanding. Geophysical Research Letters 35, L03618, doi:10.1029/2007GL031745

Polovina, J.J. and G. Mitchum. 1992. Variability in spiny lobster *Panulirus marginatus* recruitment and sea level in the Northwestern Hawaiian Islands. *U.S. Fisheries Bulletin.* 90:483–493.

Polovina J.J., G. Mitchum, N. Graham, M. Craig, E. DeMartini, and E. Flint. 1994. Physical and biological consequences of a climate event in the central North Pacific. *Fisheries Oceanography*. 3:15–21.

Polovina, J.J., G. Mitchum, and G. Evans. 1995. Decadal and basin-scale variation in mixed layer depth and the impact on biological production in the Central and North Pacific, 1960–88. *Deep-Sea Research. 42*(10):1701–1716.

Polovina, J.J., R.B. Moffitt, S.R. Ralston, P.M. Shiota, and H.A. Williams. 1985. Fisheries resource assessment of the Mariana Archipelago, 1982-1985. *Mar. Fish. Rev*. 47(4):19-25.

Polovina, J.J. and S. Ralston. 1986. An approach to yield assessment for unexploited resources with application to the deep slope fisheries of the Marianas. *U.S. Fisheries Bulletin.* 84(4):759-70.

Pooley, S. 1993. "Economics and Hawaii's marine fisheries." *Marine Fisheries Review*. 55(2):93-101.

Porter, V., T. Lebere, M. Gawel, J. Gutierrez, D. Burdick, V. Torres, and E. Lujan. 2005. The state of coral reef ecosystems of Guam. *In:* J. Waddell (Ed.), *The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005*. NOAA Tech. Memo. NOS NCC11.

Postma, H. and J.J. Zijlstra (Eds.).1988. *Ecosystems of the World 27: Continental shelves* Amsterdam: Elsevier.

PSDA. 1997. *Draft Environmental Impact Statement: Military training in the Marianas.* U.S. Pacific Command Draft Report.

Pratt D., P. Bruner, and D. Berrett. 1987. *A Field Guide to the Birds of Hawaii and the Tropical Pacific*. Princeton University Press, New Jersey. 409 pp.

Ralston, S. 1979. *A description of the bottomfish fisheries of Hawaii, American Samoa,Guam and the Northern Marianas*. Western Pacific Regional Fishery Management Council, Honolulu.

Ralston, S., M. Gooding, and G. Ludwig. 1986. An ecological survey and comparison of bottomfish resource assessments (submersible versus hand-line fishing) at Johnston Atoll. *Fishery Bulletin. 84*(1):141–155.

Ralston, S. and H. A. Williams. 1988. *Depth distributions, growth, and mortality of deep slope fishes from the Mariana Archipelago.* NOAA Tech. Memo. NMFS.

Randall, R.H. 1971. Tanguisson-Tumon, Guam, reef corals before, during, and after the crown-of-thorns starfish (*Acanthaster planci*) predation. Master's thesis, University of Guam.

Randall, R.H. 1973. Reef physiography and distribution of corals at Tumon Bay, Guam, before crown-of-thorns starfish *Acanthaster planci* (L.) predation.

Randall and Eldredge 1977 (Cited on page 151 typhoon damage to reef.

Randall, R.H. and R.F. Myers. 1983. *Guide to the coastal resources of Guam: Vol. 2*. University of Guam Press. University of Guam Marine Laboratory Contribution No. 189.

Randall, R.H., S.D. Rogers, E.E. Irish, S.C. Wilkins, B.D. Smith, and S.S. Amesbury. 1988. *A Marine Survey of the Obyan-Naftan Reef Area*. University of Guam, Marine Laboratory: Mariana Islands.

Redmond, R.L. 1990. *Trip report: A biological survey of Baker and Howland Islands and Palmyra Atoll, September 1990.* Unpublished Trip Report. U.S. Fish and Wildlife Service, Honolulu, HI.

Reeves R., S. Leatherwood, G. Stone, and L. Eldridge. 1999. *Marine mammals in the area served by the South Pacific Regional Environment Programme (SPREP)*. Apia, Samoa: South Pacific Regional Environment Programme.

Reina, R.D., P.A. Mayor, J.R. Spotila, R. Piedra, and F.V. Paladino. 2002. Nesting ecology of the leatherback turtle, *Dermochelys coriacea*, at Parque Nacional Marino Las Baulas, Costa Rica: 1988–1989 to 1999–2000.*Copeia. 3*:653–664.

Reynolds, R.W. and T.M. Smith.1994. Improved global sea surface temperature analyses using optimal interpolation. *J. Climate.* 7:929-948.

Richmond, R.H. and E.A. Matson. 1986. *Report of a preliminary field survey of the lagoon waters adjacent to the Puerto Rico Dump Site, Saipan*. Report prepared by the University of Guam Marine Laboratory for the Coastal Resource Management Office in Saipan, CNMI.

Rice D. 1960. Distribution of bottle-nosed dolphin in the leeward Hawaiian Islands. *Journal of Aquatic Mammals.* 41:407–408.

Rice D. 1989. Sperm whale *Physeter macrocephalus.* Academic Press, New York, NY.

Robertson D. 1980. *Rare birds of the West Coast of North America*. Woodcock Publications, Pacific Grove, CA.

Robinson, R.A.; H.Q.P. Crick; J.A. Learmonth; I.M.D. Maclean; C.D. Thomas, III; F. Bairlein; M.C. Forchhammer; C.M. Francis; J.A. Gill; B.J. Godley; J. Harwood; G.C. Hays; B. Huntley; A.M. Hutson; G.J. Pierce; MM.Rehfisch; D.W. Sims; M.B. Santos; T.H. Sparks; D.A. Stroud; and M.E. Visser. 2008. Traveling through a warming world: climate change and migratory species. Endangered Species Research Preprint. Published online, June 17, 2008. Retrieved 2008-02-29 from: www.int-res.com/articles/esr2008/theme/ICC/ICCpp2.pdf

Rogers, A. D. 1994. The biology of seamounts. *Advances in Marine Biology*. 30:305–350.

Rohmann S.O., Hayes J.J., Newhall R.C., Monaco M.E. and R.W. Grigg. 2005. The area of potential shallow-water tropical and subtropical coral ecosystem in the United States. *Coral Reefs.* 24: 370-383.

Rubinstein, D. 2001. *A sociocultural study of pelagic fishing activities in Guam*. Final progress report available from University of Hawaii Joint Institute for Marine and Atmospheric Research, Pelagic Fisheries Research Program. Also available at http://www.soest.hawaii.edu/PFRP/pdf/rubinstein01.pdf

Russ, G. R., and A. C. Alcala. 1994. Marine reserves: They enhance fisheries, reduce conflicts and protect resources. *Naga: The ICLARM Quarterly*. 17(3): 4–7.

Samples, K., and J. Sproul. 1988. *An economic appraisal of effort management alternatives for the Northwestern Hawaiian Islands commercial lobster fishery*. NMFS SWFSC Honolulu Laboratory Admin. Rept. H-88-12C.

Sarti L., S. Eckert, N. Garcia, and A. Barragan. 1996. Decline of the world's largest nesting assemblage of leatherback turtles. *Marine Turtle Newsletter*. 74:2–5.

Saucerman, S. 1995. Assessing the management needs of a coral reef fishery in decline. *In*: P. Dalzell and T.J. H. Adams (Eds.), *South Pacific Commission and Forum Fisheries Agency Workshop on the Management of South Pacific Inshore Fisheries* Manuscript Collection of Country Statements and Background Papers, South Pacific Commission, Noumea.

Schafers, A. 2004. Room shortages might slow Japanese tourism. *Honolulu Star-Bulletin*. Accessed, July 4, 2004, http://starbulletin.com/2004/08/04/news/index2.htm.

Schrope, M. 2002. Troubled waters. *Nature*. 418:718–720.

Schug, D. and A. Galea'i, 1987. American Samoa: the tuna industry and the economy. *In:* Tuna Issues and Perspectives in the Pacific Islands Region, East-West Center, Honolulu.

Seki, M.P., J.J. Polovina, R.E. Brainard, R.R. Bidigare, C.L. Leonard, and D.G. Foley. 2001. Biological enhancement at cyclonic eddies tracked with GOES thermal imagery in Hawaiian waters. *Geophys. Res. Letters*.28(8):1583-1586.

Seminoff J., W. Nichole, and A. Hidalgo. 2000. *Chelonia mydas* agassizii diet.*Herpetological Review*. 31:103.

Severance, C. and R. Franco. 1989. *Justification and design of limited entry alternatives for the offshore fisheries of American Samoa, and an examination of preferential fishing rights for native people of American Samoa within a limited entry context*. Western Pacific Fishery Management Council, Honolulu.

Severance, C., R. Franco, M. Hamnett, C. Anderson, and F. Aitaoto. 1999. *Effort comes from the cultural side: Coordinated investigation of pelagic fishermen in American Samoa*. Draft report for Pelagic Fisheries Research Program, JIMAR/SOEST, University of Hawaii at Manoa, Honolulu, HI.

Sharma, K., A. Peterson, S. Pooley, S. Nakamoto, and P. Leung. 1999. *Economic contributions of Hawaii's fisheries*. SOEST 99-08/JIMAR Contribution 99-327, Pelagic Fisheries Research Program, Joint Institute of Marine and Atmospheric Research, University of Hawaii, Honolulu, HI.

Sherburne J. 1993. Status report on the short-tailed albatross *Diomedea albatrus*. Unpublished Report for FWS, Alaska Natural Heritage Program.

Sherman, K. and M. Alexander. 1986. *Variability and management of large marine ecosystems*. Westview Press, Boulder, CO.

Shomura, R. 1987. *Hawaii's marine fishery: Yesterday and today*. NMFS Southwest Fisheries Center Honolulu Laboratory Admin.Rept. No. H-87-21.

Simonds, K.M. 2003. Managing turtles and pelagic fisheries on the high seas. Conservation and sustainable management of sea turtles in the Pacific Ocean. Bellagio Conference Center. 17-22 November, 2003.

Sissenwine, M.and S. Murawski. 2004. Moving beyond "intelligent tinkering": Advancing an ecosystem approach to fisheries. Perspectives on ecosystem-based approaches to the management of marine resources. *Marine Ecology Progress Series*. 274:269–303.

Smith, S.V. 1978. Coral-reef area and the contributions of reefs to processes and resources in the world's oceans. *Nature*. 273:225–226.

Smith, M.K. 1993. An Ecological Perspective on Inshore Fisheries in the Main Hawaiian Islands *Marine Fisheries Review*. 55(2):34-49.

Spotila J., A. Dunham, A. Leslie, A. Steyermark, P. Plotkin, and F. Paladino. 1996. Worldwide population decline of *Dermochelys coriacea*: Are leatherback turtles going extinct? *Chelonian Conservation Biology*. 2(2): 209–222.

Spotila, J. R., R.D. Reina, A.C. Steyermark, P.T. Plotkin, and F.V. Paladino. 2000. Pacific leatherback turtles face extinction. *Nature*. 405:529–530.

Starbird, C.H. and M.M. Suarez. 1994. Leatherback sea turtle nesting on the north Vogelkop coast of Irian Jaya and the discovery of a leatherback sea turtle fishery on Kei Kecil Island. *P: 143 In: Fourteenth Annual Symposium on Sea Turtle Biology and Conservation*. March 1–5, 1994, Hilton Head, SC.

Starmer, J., C. Bearden, R. Brainard, T. de Cruz, R. Hoeke, P. Houk, S. Holzwarth, S. Kolinksi, J. Miller, R. Schroeder, M. Timmers, M. Trianni, and P. Vroom. 2005. The state of coral reef ecosystems of the Commonwealth of the Northern Mariana Islands. *In:* J. Waddell (Ed.), *The state of coral reef ecosystems of the United States and Pacific Freely Associated States: 2005*. NOAA Tech. Memo. NOS NCC11.

Stevenson, D.K. and N. Marshall. 1974. Generalizations on the fisheries potential of coral reefs and adjacent shallow-water environments. Pp: 147-156 in *Proceedings of the Second International Coral Reef Symposium*. University of Queensland, Brisbane.

Stinson, M.L. 1984. *Biology of sea turtles in San Diego Bay, California, and in the northeastern Pacific Ocean*. M.S. Thesis, San Diego State University, San Diego, CA.

Sturman, A.P. and H. McGowan. 2003. Climate. *In*: M. Rapaport (Ed.), *The Pacific Islands: Environment and society*. The Bess Press, Honolulu, HI.

Tagami, D.T. and S. Barrows. 1988. Deep-sea shrimp trapping for *Heterocarpus laevigatus* in the Hawaiian Archipelago by a commercial fishing vessel. NOAA Technical Memorandum, NMFS, 14 pp.

Tagami, D.T. and S. Ralston. 1988. An assessment of exploitable biomass and projection of maximum sustainable yield for *Heterocarpus laevigatus* in the Hawaiian Islands. Southwest Fisheries Center Administration Report H-88-14, 22 pp.

Tansley, A.G. 1935. The use and abuse of vegetational concepts and terms. *Ecology*.16:284–307.

Territorial Planning Commission and Department of Commerce. 2000. *American Samoa's comprehensive economic development strategy year 2000.* American Samoa Government.

The Royal Society. 2005: *Ocean Acidification Due to Increasing Atmospheric Carbon Dioxide*. The Royal Society, London, -60.

Thompson, P. and W. Freidl. 1982. A long term study of low frequency sound from several species of whales off Oahu, Hawaii. *Cetology*. 45:1–19.

Tickell, W. 1973. A visit to the breeding grounds of Steller's albatross, *Diomedea albatrus*. *Sea Swallow*. 23:1–4.

Titcomb, M. 1972. *Native use of fish in Hawaii*. University of Hawaii Press, Honolulu, HI.

Tomczak, M. and J.S. Godfrey. 2003. *Regional Oceanography: An introduction* (2nd ed.). http://gaea.es.flinders.edu.au/~mattom/regoc/pdfversion.html

Toole, J.M., E. Zou, and R.C. Millard.1988. On the circulation of the upper waters in the western equatorial Pacific Ocean. *Deep Sea Res.* 35:1451-1482.

Trianni, M. 1998. *Qualitative assessment of World War II ordinance sites in coral reef habitats at the island of Rota: A historical record*. CNMI Division of Fish and Wildlife Technical Assistance Report 98a.

Trianni M. 1998b.Unpublished report on the status of CNMI crustaceans fisheries. CNMI Divison of Fish and Wildlife.

Trianni, M.S. and C.K. Kessler. 2002. Incidence and strandings of the Spinner Dolphin, *Stenella longirostris*, in Saipan Lagoon. *Micronesica*. 34(2):249-260.

Troeng, S. and E. Rankin. 2005. Long-term conservation efforts contribute to positive green turtle (*Chelonia mydas*) nesting trend at Tortuguero, Costa Rica. *Biological Conservation.* 121:111–116.

Tulafono, R. 2001. Gamefishing and tournaments in American Samoa. Pp: 175-177 *In:* M.L. Miller, C. Daxboeck, C. Dahl, K. Kelly and P. Dalzell (Eds.), Proceedings of the 1998 Pacific Island Gamefish Tournament Symposium, held 29 July - 1 August 1998, Honolulu, HI. Western Pacific Regional Fishery Management Council.

Uchida, R. and D. Tagami. 1984. Biology, distribution, population structure, and pre-exploitation abundance of spiny lobster, *Panulirus marginatus* (Quoy and Gaimard 1825), in the Northwestern Hawaiian Islands. *In:* R. Grigg and K. Tanoue (Eds.), *Proceedings of the Second Symposium on Resource Investigations in the Northwestern Hawaiian Islands*. University of Hawaii Sea Grant Misc. Ret. UNIHI-SEAGRANT-MR-84-01.

Uchida, R., J. Uchiyama, R. Humphreys, Jr., and D. Tagami. 1980. Biology, distribution, and estimates of apparent abundance of the spiny lobster, *Panulirus marginatus* (Quoy and Gaimard), in waters of the Northwestern Hawaiian Islands: Part I. Distribution in relationship to depth and geographical areas and estimates of apparent abundance. Part II. Size distribution, legal to sublegal ratio, sex ratio, reproductive cycle, and morphometric characteristics. *In:* R. Grigg and R. Pfund (Eds.), *Proceedings of the Symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands*. April 24–25, 1980, Honolulu, Hawaii. University of Hawaii, Honolulu, HI UNIHI-SEAGRANT-MR-80-04.

Uchida, R. and J. Uchiyama. (Eds.). 1986. *Fishery Atlas of the Northwestern Hawaiian Islands.* NOAA Tech. Rep. NMFS 38.

U.S. Air Force. 2004. *Final Environmental Impact Statement: Termination of the Air Force Mission at Johnston Atoll.* May 2004.

U.S. Army Center for Health Promotion and Preventive Medicine and Raytheon Demilitarization Company (USACHPPM and Raytheon). 2000. *Johnston Atoll Chemical Agent Disposal System (JACADS), Facility Closure Campaign, RCRA Facility Assessment* (EPA ID #TT0 570 090 001).

U.S. Census Bureau. 2000. Data for the Commonwealth of the Northern Mariana Islands (CNMI). Available at http://www.census.gov/census2000/cnmi.html.

U.S. Committee on Ocean Policy. 2004. *U.S. Ocean Action Plan: the Bush Administration's response to the U.S. Ocean Commission on Policy*.

U.S. Department of Agriculture. 1995. *Resource assessment: Ugum Watershed, Guam*. Report prepared by the U.S. Deptartment of Agriculture, Natural Resources Conservation Service, Pacific Basin, Agana, Guam.

U.S. Fish and Wildlife Service. 1994. *Ecosystem approach to fish and wildlife management.* Washington, DC: U.S. Department of Interior.

U.S. Fish and Wildlife Service. 2001a. Conceptual Management Plan for the Proposed Kingman Reef National Wildlife Refuge. Appendix B *In*: Environmental Assessment for the Proposed Kingman Reef National Wildlife Refuge: Line Islands, Central Pacific Ocean. 16 pp.

U.S. Fish and Wildlife Service. 2001b. Conceptual Management Plan for the Proposed Atoll National Wildlife Refuge. Appendix C *In*: Environmental Assessment for the Proposed Palmyra Atoll National Wildlife Refuge: Line Islands, Central Pacific Ocean. 28pp.

U.S. Fish and Wildlife Service. 2002. Biological opinion of the U.S. Fish and Wildlife Service for the effects of the Hawaii-based domestic longline fleet on the short-tailed albatross (Phoebastria albatrus). November 18, 2002. Honolulu, HI.

U.S. Fish and Wildlife Service. 2004. Biological opinion on the effects of the reopened shallow-set sector of the Hawaii-based longline fishery on the short-tailed albatross (*Phoebastria albatrus*). Formal consultaion log number: 1-2-1999-F-02.2.

U.S. Fish and Wildlife Service. 2007a. Baker Island National Wildlife Refuge Draft Conservation Conservation plan and Environmental Assessment. U.S. Department of Interior.

U.S. Fish and Wildlife Service. 2007b. Howland Island National Wildlife Refuge Draft Conservation Conservation plan and Environmental Assessment. U.S. Department of Interior.

U.S. Fish and Wildlife Service. 2007c. Jarvis Island National Wildlife Refuge Draft Conservation Conservation plan and Environmental Assessment. U.S. Department of Interior.

U.S. White House. 2009. U.S. Presidential Proclamation 8336 of January 6, 2006: Establishment of the Pacific Remote Islands Marine National Monument. 74 Federal Register: 1565-1575; January 12, 2009.

Utzurrum, R. 2002. Sea turtle conservation in American Samoa. Pp: 30-31 *In*: I. Kinan (Ed.), Proc. of the Western Pacific Sea Turtle Cooperative Research and Management

Workshop, Feb. 5-8, 2002. Western Pacific Regional Fishery Management Council. Honolulu.

Valiela, I. 1995. *Marine Ecological Processes* (2nd ed.). Springer, New York, NY.

Valiela 2003 cited on page 75 not cited in this chapter

Veron, J.E.N. 1995. Corals of the tropical island Pacific region. Pp: 75-82 *In*: J.E. Maragos, M.N.A. Peterson, L.G. Eldredge, J.E. Bardach, and H.F. Tekeuchi (Eds.), *Marine and coastal Biodiversity in the tropical island Pacific region:* Vol. 1. Species systematics and information management priorities. East West Center, Honolulu, HI.

Wakeford, R. 2005. *Personal communication at the April 18–22, 2005, Ecosystem Science and Management Planning Workshop.* Convened by the Western Pacific Fishery Management Council. Honolulu, HI.

Walters, C. 2005. *Personal communication at the April18–22, 2005, Ecosystem Science and Management Planning Workshop*. Convened by the Western Pacific Fishery Management Council. Honolulu, HI.

Walther, G.R., E. Post, P. Convey, A. Menzel, C. Parmesan, T.J. Beebee, J.M. Fromentin, O. Hoegh-Guldberg, and F. Bairlein. 2002. Ecological responses to climate change. Nature 416: 389-395.

Warham, J. 1990. The shearwater genus *Puffinus*. Pp: 157-170 *In: The petrels: Their ecology and breeding system.* San Diego, CA: Academic Press.

Wass, R.C. 1982. The shoreline fishery of American Samoa: Past and present. Pp: 51-83 *In:* J.L. Munro (Ed.), *Marine and coastal processes in the Pacific: Ecological aspects of coastal zone management*. UNESCO, Jakarta, Indonesia.

Wells, S.M. and M.D. Jenkins. 1988. *Coral reefs of the world. Vol. 3: Central and Western Pacific.* United Nations Environment Programme/International Union for the Conservation of Nature.

WPRFMC (Western Pacific Regional Fishery Management Council). 1983. *Crustaceans fishery management plan*. Honolulu.

WPRFMC. 1999. *Bottomfish and seamount groundfish fisheries of the Western Pacific Region 1998 annual report*. Western Pacific Regional Fishery Management Council, Honolulu.

WPRFMC. 2000. Regulatory Amendment Establishing Permit and Reporting Requirements for the Pelagic Troll and Handline Fishery in the Remote Island Areas of the Western Pacific Region. Honolulu, HI.

WPRFMC. 2001. *Final Environmental Impact Statement for Coral Reef Ecosystems Fishery Management Plan of the Western Pacific Region.* Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2002. Environmental Assessment for Precious Corals FMP. Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2003a. Measure to limit pelagic longline fishing effort in the Exclusive Economic Zone around American Samoa. *Amendment 11 to the Pelagics Fishery Management Plan*. Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2003b. *Bottomfish and seamount groundfish fisheries of the Western Pacific Region: 2001 annual report*. Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2004a. *Bottomfish and seamount groundfish fisheries of the Western Pacific Region: 2002 annual report.* Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2004b. *Pelagic fisheries of the Western Pacific Region: 2002 annual report.* Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2004c. *Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Annual Report, 2003.* Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2005a. Bottomfish and Seamount Groundfish Fisheries FMP. Western Pacific Regional Fishery Management Council. Honolulu, HI. Brett: check that there is a document…

WPRFMC. 2005b. *Pelagic fisheries of the Western Pacific Region: 2005 annual report.* Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2006a. Bottomfish and Seamount Groundfish Fisheries FMP, Amendment 8, Western Pacific Regional Fishery Management Council. Honolulu, HI. Brett: check that there is a document…

WPRFMC. 2005b. Bottomfish and Seamount Groundfish Fisheries FMP, Amendment 9. Western Pacific Regional Fishery Management Council. Honolulu, HI. Brett: check that there is a document…

WPRFMC. 2007a. Measures to end bottomfish overfishing in the Hawaiian Archipelago. Amendment 14 to the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region including a Final SEIS. Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2007b. Amendment 6 to the Fishery Management Plan for Precious Corals Fisheries of the Westen Pacific Region.

WPRFMC. 2008a. Amendment 13 to the Fishery Management Plan for the Crustacean Fisheries of the Western Pacific Region.

WPRFMC. 2008b. Amendment 7 to the Fishery Management Plan for Precious Corals Fisheries of the Westen Pacific Region.

Wetherall, J.A. 1993. Pelagic distribution and size composition of turtles in the Hawaii longline fishing area. *In*: G.H. Balazs and S.G. Pooley (Eds.), *Research plan to assess marine turtle hooking mortality: Results of an expert workshop held in Honolulu, Hawaii, November 16–18, 1993.* SWFSC Admin. Rept. H-93-18.

Wilson, R.R. and R.S. Kaufman. 1987. Seamount biota and biogeography. *Geophysics Monographs*. 43:355–377.

Witherell, D., C. Pautzke, and D. Fluharty. 2000. An ecosystem-based approach for Alaska groundfish fisheries. *ICES Journal of Marine Science*. 57:771–777.

World Travel and Tourism Council. 1999. *WTTC tourism report 1999: How travel and tourism affects Hawaii's economy*. World Travel and Tourism Council, New York.

Yaffee, S.L. 1999. Three faces of ecosystem management.*Conservation Biology*. 13(4):713–725.

Yuen, S., B. DeBaryshe, and I. Stern. 1997. *Family adaptation to occupational loss, final report.* University of Hawaii, Honolulu: Center on the Family.

Zann, L.P. and A. Mulipola. 1995. The inshore resources of Western Samoa: Coastal inventory and fisheries database. South Pacific Commission and Forum Fisheries Agency Workshop on the Management of South Pacific Inshore Fisheries, Noumea (New Caledonia), 26 Jun - 7 Jul 1995.

Zeller, D., M. Darcy, S. Booth, M.K. Lowe, and S. Martell. 2008. What about recreational catch? Potential impact on stock assessment for Hawaii's bottomfish fisheries. Fisheries Research, 91:88-97.

Zug, G.R., G.H. Balazs, and J.A. Wetherall. 1995. Growth in juvenile loggerhead sea turtles (*Caretta caretta*) in the North Pacific pelagic habitat. *Copeia. (*2):484–487.

Chapter 8. GLOSSARY

Abyssalpelagic (or Abyssopelagic) zone: The deep sea pelagic environment from a depth of approximately 4,000-7,000 meters.

Adaptive Management: A program that adjusts regulations based on changing conditions of the fisheries and stocks.

Aphotic: Light level modifier of the deep epipelagic ocean ecosystem, and turbid regions of all other waters; areas never reached by natural light.

Archipelago: A group of islands; an expanse of water with scattered islands.

Associated Species: Those species that (a) prey upon the target species, (b) are preyed on by it, (c) compete with it for food, living space, etc., or (d) co-occur in the same fi shing area and are exploited (or accidentally taken) in the same fishery or fisheries.

Atoll: Earthform consisting of a ringlike perimeter reef area, often with a reef islet, enclosing a lagoon area.

Bank: Submerged earthform with a crest at a depth of 20–200 meters in oceanic waters and of 0–5 meters in nearshore and neritic waters.

Barrier Net: A small-mesh net used to capture coral reef or coastal pelagic fishes.

Barrier Reef: A reef growing offshore from a land mass and separated from the shoreline, often by a lagoon or estuary.

Bathypelagic Zone: The pelagic environment between depths of 1,000 meters and 4,000 meters.

Benthic: 1. Defining a habitat or organism found on the sea bottom 2. Of or pertaining to the seafloor (or bottom) of a water body.

Biological Opinion: A scientific assessment issued by the National Marine Fisheries Service or U.S. Fish and Wildlife Service, as required by the Endangered Species Act (ESA) for listed species. Determines the likelihood of an action to jeopardize the existence of a species listed under the ESA.

Biomass: Or standing stock. The total weight of a group (or stock) of living organisms (e.g., fish, plankton) or of some defined fraction of it (e.g., spawners) in an area, at a particular time.

Bioprospecting: The search for commercially valuable biochemical and genetic resources in plants, animals and microorganisms for use in food production, the development of new drugs and other biotechnology applications.

Bycatch: Any fish harvested in a fishery 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 recreational fishing.

Climate Change: A general term usually referring to the impacts of global temperature rise, which can include any change in the climate resulting from increased greenhouse gasses in Earth's atmosphere.

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 FPEIS, commercial fishing includes the commercial extraction of biocompounds.

Consensual Management: Decision making process where stakeholders meet and reach consensus on management measures and recommendations.

Coral Reef Ecosystem (CRE): Those species, interactions, processes, habitats and resources of the water column and substrate located within any waters less than or equal to 50 fathoms in total depth.

Council: The Western Pacific Regional Fishery Management Council (WPRFMC).

Critical Habitat: Those geographical areas that are essential for bringing an endangered or threatened species to the point where it no longer needs the legal protections of the Endangered Species Act (ESA), and which may require special management considerations or protection. These areas are designated pursuant to the ESA as having physical or biological features essential to the conservation of listed species.

Dealer: One who buys and sells species in the fisheries management unit without altering their condition.

Demersal Fishery: Fishing that targets marine organisms that generally live in or near the bottom of the ocean, as compared with *pelagic* fishing for fish or other species that generally occur in open waters. In the Western Pacific Region, demersal fisheries include bottomfish, crustaceans, precious corals, and coral reef ecosystem taxa.

Dip Net: A hand-held net consisting of a mesh bag suspended from a circular, oval, square or rectangular frame attached to a handle. A portion of the bag may be constructed of material, such as clear plastic, other than mesh.

Ecology: The study of interactions between an organism (or organisms) and its (their) environment (biotic and abiotic).

Ecological Integrity: Maintenance of the standing stock of resources at a level that allows ecosystem processes to continue. Ecosystem processes include replenishment of resources, maintenance of interactions essential for self-perpetuation and, in the case of coral reefs, rates of accretion that are equal to or exceed rates of erosion. Ecological integrity cannot be directly measured but can be inferred from observed ecological changes.

Economic Discards: Coral reef resources that 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.

Ecosystem: A geographically specified system of organisms (including humans), the environment, and the processes that controls its dynamics.

Ecosystem-Based Fishery Management: Fishery management actions aimed at conserving the structure and function of marine ecosystems in addition to conserving fishery resources.

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 (NEPA) to assesses alternatives and analyze the impact of proposed major Federal actions on the environment. Also used to inform and involve members of the public in agency decision making.

Essential Fish Habitat (EFH): Those waters and substrate necessary to a species or species group or complex, 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 the Magnuson Act, 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.

Exogenous factors: Processes, activities, or other situations that may affect a fishery, but are outside the jurisdiction of the Council, NMFS, or a local fishery management agency's purview. The FEP process is likely to help address exogenous factors in order to promote healthy nearshore fisheries.

Exporter: One who sends species in the fishery management unit to other countries for sale, barter or any other form of exchange (also applies to shipment to other states, territories or islands).

Ex-vessel revenues: Prices received by the harvester for fish, shellfish, and other aquatic plans and animals.

Fish: Finfish, mollusks, crustaceans and all other forms of marine animal and plant life other than marine reptiles, marine mammals and birds.

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 Ecosystem Plan: A fishery management plan that contains conservation and management measures necessary and appropriate for fisheries within a given ecosystem to prevent overfishing and rebuild overfished stocks, and to protect, restore, and promote the long-term health and stability of the fishery.

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.

Fishing Community: A community that is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs and includes fishing vessel owners, operators and crews and United States fish processors that are based in such community.

Food Web: Inter-relationships among species that depend on each other for food (predator-prey pathways).

Framework Measure: Management measure listed in an FMP for future consideration. Implementation can occur through an administratively simpler process than a full FMP amendment.

Ghost Fishing: The chronic and/or inadvertent capture and/or loss of fish or other marine organisms by lost or discarded fishing gear.

Habitat: Living place of an organism or community, characterized by its physical and biotic properties.

Habitat Area of Particular Concern (HAPC): Those areas of essential fish habitat (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 deployed and retrieved by hand: may include reels to retrieve the line.

Harvest: The catching or taking of a marine organism or fishery management unit species (MUS) by any means.

Holistic Management: Fishery management that takes into consideration the interdependent relationship between fisheries and the environment including human aspects, and that considers short-term and long-term, direct, indirect, and cumulative impacts of management actions.

Hook-and-line: Fishing gear that consists of one or more hooks attached to one or more lines.

Incidental Catch: Non-target species harvested and retained in a fishery.

Live Rock: Any natural, hard substrate (including dead coral or rock) to which is attached, or which supports, any living marine life-form associated with coral reefs.

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.

Low-Use MPA: A Marine Protected Area that is managed to allow limited fishing activities.

Main Hawaiian Islands (MHI): The islands of the Hawaiian Archipelago consisting of Niihau, Kauai, Oahu, Molokai, Lanai, Maui, Kahoolawe, Hawaii and all of the smaller associated islets lying east of 161°20' W longitude.

Marine Protected Area (MPA): An area designed to protect entire ecosystems through area-based restrictions of use and other management measures.

Maximum Sustainable Yield (MSY): The largest long-term average catch or yield that can be taken, from a stock or stock complex under prevailing ecological and environmental conditions and fishery technological characteristics (e.g., gear slectivity), and the distribution of catch among fleets.

National Marine Fisheries Service (NMFS): The component of the National Oceanic and Atmospheric Administration (NOAA), Department of Commerce, responsible for the conservation and management of living marine resources. Also known as NOAA Fisheries.

No-Take MPA: A Marine Protected Area where fishing or removal of living marine resources is prohibited unless otherwise authorized.

Northwestern Hawaiian Islands (NWHI): the islands of the Hawaiian Archipelago lying to the west of 161°20'W longitude.

Observer: any person required or authorized to be carried on a vessel for conservation and management purposes by regulations or permits under the MSA.

Optimum Yield (OY): With respect to the yield from a fishery "optimum" means the amount of fish that: (a) will provide the greatest overall benefit to the nation, particularly with respect to food production and recreational opportunities and taking into account the protection of marine ecosystems; (b) is prescribed as such on the basis of the MSY from the fishery, as reduced by any relevant economic, social or ecological factor; and (c) in the case of an overfished fishery, provides for rebuilding to a level consistent with producing the MSY in such fishery.

Overfished: A stock or stock complex is considered "overfished" when its biomass has declined below a level that jeopardizes the capacity of the stock or stock complex to produce maximum sustainable yield on a continuing basis.

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 Decadal Oscillation[77]: Fisheries scientist Steven Hare coined the term "Pacific Decadal Oscillation" (PDO) in 1996, while researching connections between Alaska salmon production cycles and Pacific climate. PDO has since been described as a long-lived El Niño-like pattern of Pacific climate variability because the two climate oscillations have similar spatial climate fingerprints, but very different temporal behavior. PDO is often observed for longer periods of time as opposed to El-Niño.

Pacific Remote Island Areas (PRIAs): Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Atoll, Wake Island and Palmyra Atoll.

Passive Fishing Gear: Gear left unattended for a period of time prior to retrieval (e.g., traps, gill nets).

Pelagic Fishery: Fishing that targets marine organisms that generally live in the water column as opposed to *demersal* fisheries whose target species generally live in or near the bottom of the ocean. In the Western Pacific Region, the pelagic fisheries include fisheries targeting tuna, billfish, and squid.

Precautionary Approach: The implementation of conservation measures even in the absence of scientific certainty that fish stocks are being overexploited.

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 ridgelike or moundlike structure built by sedentary calcareous organisms and consisting mostly of their remains. It is wave-resistant and stands above the surrounding sediment. It

[77] Hare, S.R., 1996: Low frequency climate variability and salmon production. Ph.D. Dissertation, School of Fisheries, University of Washington, Seattle, WA.

is characteristically colonized by communities of encrusting and colonial invertebrates and calcareous algae.

Reef-obligate Species: An organism dependent on coral reefs for survival.

Regulatory Discards: Any species caught that fishermen are required by regulation to discard whenever caught, or are required to retain but not sell.

Resilience: The ability of a population or ecosystem to withstand change and to recover from stress (natural or anthropogenic).

Restoration: The transplanting of live organisms from their natural habitat in one area to another area where losses of, or damage to, those organisms has occurred with the purpose of restoring the damaged or otherwise compromised area to its original, or a substantially improved, condition; additionally, the altering of the physical characteristics (e.g., substrate, water quality) of an area that has been changed through human activities to return it as close as possible to its natural state in order to restore habitat for organisms.

Rock: Any consolidated or coherent and relatively hard, naturally formed, mass of mineral matter.

Rod-and-Reel: A hand-held fishing rod with a manually or electrically operated reel attached.

Scuba-assisted Fishing: Fishing, typically by spear or by hand collection, using assisted breathing apparatus.

Secretary: The Secretary of Commerce or a designee.

Sessile: Attached to a substrate; non-motile for all or part of the life cycle.

Slurp Gun: A self-contained, typically hand-held, tube–shaped suction device that captures organisms by rapidly drawing seawater containing the organisms into a closed chamber.

Social Acceptability: The acceptance of the suitability of management measures by stakeholders, taking cultural, traditional, political and individual benefits into account.

Spear: A sharp, pointed, or barbed instrument on a shaft, operated manually or shot from a gun or sling and used in fishing.

Stock Assessment: A scientifically-based evaluation of a stock in terms of abundance and fishing mortality levels and trends, and relative to fishery management objectives and constraints if they have been specified.

Stock of Fish: A species, subspecies, geographical grouping or other category of fish capable of management as a unit.

Submersible: A manned or unmanned device that functions or operates primarily underwater and may be used to harvest coral or fish.

Subsistence Fishing: Fishing to obtain food for personal use rather than for sale or recreation.

Target Resources: Species or taxa sought after in a directed fishery.

Trophic Web: A network that represents the predator/prey interactions of an ecosystem.

Trap: A portable, enclosed, box-like device with one or more entrances used for catching and holding fish or other marine organism.

Western Pacific Regional Fishery Management Council: (WPRFMC or Council): A Regional Fishery Management Council established under the MSA, consisting of representatives from the State of Hawaii, the Territory of American Samoa, the Territory of Guam, and the Commonwealth of the Northern Mariana Islands and other entities which has authority over the fisheries in the Pacific Ocean seaward of such States, Territories, Commonwealths, and Possessions of the United States in the Pacific Ocean Area. The Council has 13 voting members including eight appointed by the Secretary of Commerce at least one of whom is appointed from each of the following areas: Hawaii, the Territories of American Samoa and Guam, and the Commonwealth of the Northern Mariana Islands.

This page left blank intentionally.