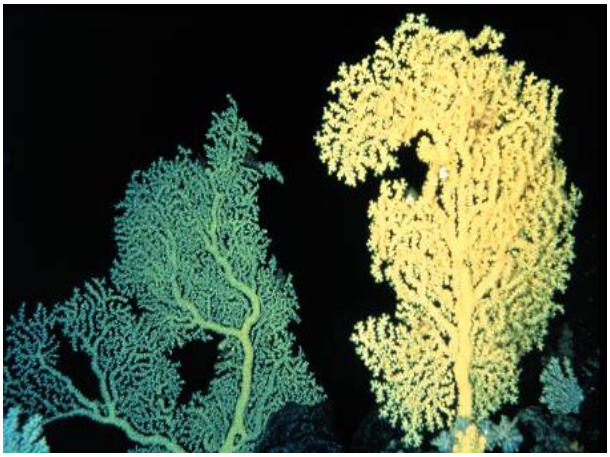
WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

DRAFT

Amendment 7 to the Fishery Management Plan for the Precious Corals Fisheries of the Western Pacific Region

Designation of the Auau Channel as an Established Black Coral Bed with a Harvest Quota and Placing a Moratorium on the Harvest of Gold Corals in the Western Pacific Region

Including an Environmental Assessment, Regulatory Impact Review and Initial Regulatory Flexibility Analysis



May 12, 2008

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

Telephone (808) 522-8220
Fax (808) 522-8226

Cover Photos:

(Left) *Black coral in the Auau Channel*. Photo by Tony Montgomery, Aquatic Biologist, State of Hawaii, Department of Land and Natural Resources, Division of Aquatic Resources

(Right) "*Gold coral is found below 300 m in tropical oceans. Gerardia sp*." Location: Pacific Ocean, offshore Hawaii. Photo Credits: J. Moore, National Oceanic and Atmospheric Administration Photo Library (http://www.photolib.noaa.gov, nur01530), National Undersea Research Program (NURP) Collection, NOAA Central Library, National Oceanic and Atmospheric Administration (NOAA), United States Department of Commerce, Government of the United States of America (USA).

SUMMARY

Black Coral
Research has revealed that the biomass of the Auau Channel black coral population has decreased by at least 25% in the last 30 years. Data collected in late 2001 during Pisces V dives showed a decline in recruitment, as well as a decrease in the relative abundance of legal sized colonies. The decline in recruitment may be related to an increase in abundance of the alien species *Carijoa riisei*. This highly invasive soft coral was found to be overgrowing large areas of black coral habitat particularly in deep water between 80-110 meters. Harvests of shallower populations have also been increasing, additionally stressing these populations. In 2005, the Council took final action to recommend that an existing minimum size exemption be revoked to allow for a longer period of recruitment of black corals in the Auau Channel.

Based on recommendations from the Precious Corals Plan Team and the Scientific and Statistical Committee, at its December 21, 2006, meeting, the Council took final action to additionally recommend that the Auau Channel black coral bed be designated under the Precious Corals Fishery Management Plan as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years). This quota would apply to black corals in both State and Federal waters of the Auau Channel, and existing gear and size restrictions would continue to apply.

Gold Coral
Past research on gold coral indicated that the linear growth rate of gold coral is approximately 6.6 centimeters per year, suggesting a relatively young age for large trees. These estimates were based on the assumption that growth rings are laid down annually as in other precious corals such as black coral and pink coral (*Corallium rubrum* and *C. secundum*). Recent research done on the aging of gold corals using radiometric dating on three samples collected from the Makapuu Bed and off of the island of Hawaii found that gold coral may grow at a much slower rate of 14-40 micrometers per year aging those samples at 450-2,740 years old (Roark et al. 2006). Research conducted on *Gerardia* species in the Atlantic have estimated the age of large gold coral trees to be 1,800 years old (Druffel et al. 1995).

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, at its December 21, 2006 meeting, the Council took final action to recommend a five-year moratorium on the harvest of gold coral in the Western Pacific Region. During the moratorium, an associated research program will collect data on the age structure, growth rate, and correlations between length and age. Additional information will be considered by the Council before lifting the moratorium, prior to the expiration of the five-year period.

Amendment 7, including a draft EA, will be made available for public review and comment from the Western Pacific Regional Fishery Management Council and through the website www.regulations.gov. NMFS will consider public comments on the draft EA that are received within the public comment period for the Precious Corals FMP Amendment 7.

Table 1: Summary of the alternatives considered, by issue

Issue	Alternative
A: Auau Channel Black Coral Harvest Quota	**A1. No Action** Black coral in the Auau Channel would continue to be regulated based on minimum sizes. The Auau Channel black coral area would not be designated as an Established Bed, and no quota would be designated for black coral in the Auau Channel. **A2. Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the entire bed (Preferred Alternative)** The Auau Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every 2 years (11,023 lb every 2 years) from both State and Federal waters combined. All other regulations would continue to apply **A3. Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years)for Federal waters only** The Auau Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every 2 years (11,023 lb every 2 years) from Federal waters only. All other regulations would continue to apply
B: Western Pacific Region Gold Coral Moratorium	**B1. No Action** Gold coral harvests would continue to be regulated based on harvest quotas by area and no moratorium would be implemented. **B2. Implement a five-year moratorium on *live and dead* gold coral harvests (Preferred Alternative)** A five-year moratorium on the harvest of *live and dead* gold corals would be implemented for the Western Pacific Region while an associated research program further examines linear/axial growth, recruitment/mortality, and deterioration rates of gold coral. **B3. Implement a five-year moratorium on *live* gold coral harvests** A five-year moratorium on the harvest of *live* gold corals would be would be implemented for the Western Pacific Region while an associated research program further examines linear/axial growth, recruitment/mortality, and deterioration rates of gold coral. **B4. Reduce gold coral harvest quotas by 50% in all precious coral beds.** Harvest quotas for gold coral would be reduced by 50% in all precious coral beds throughout the Western Pacific Region.

TABLE OF CONTENTS

SUMMARY iii
TABLE OF CONTENTS v
List of Tables vii
List of Figures vii
List of Acronyms viii
1.0 INTRODUCTION 9
1.1 Responsible Agencies 9
1.2 Overview of the Precious Corals Fishery Management Plan and Amendments 9
1.3 Public Review Process and Schedule 12
1.4 List of Preparers 12
1.5 Purpose and Need for Action 13
1.6 Management Objectives 13
2.0 MANAGEMENT ALTERNATIVES 13
2.1 Description of the Alternatives 14
2.1.1 Issue A: Auau Channel Black Coral Harvest Quota 14
2.1.1.1 Alternative A1: No Action 14
2.1.1.2 Alternative A2: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the entire bed (Preferred Alternative) 14
2.1.1.3 Alternative A3: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for Federal waters only 14
2.1.2 Issue B: Western Pacific Region Gold Coral Moratorium 14
2.1.2.1 Alternative B1: No Action 14
2.1.2.2 Alternative B2: Implement a five-year moratorium on live and dead gold corals (Preferred Alternative) 14
2.1.2.3 Alternative B3: Implement a five-year moratorium on live gold coral 15
2.1.2.4 Alternative B4: Reduce the harvest quota by 50% of gold coral in all precious coral beds. 15
2.2 Alternatives Considered but not Analyzed 15
3.0 AFFECTED ENVIRONMENT 16
3.1 Target Species 16
3.1.1 Taxonomy, Biology and Ecology 16
3.1.2 Distribution in the Western Pacific Region 20
3.1.3 Maximum Sustainable Yield 27
3.2 Non-target Species 28
3.3 Western Pacific Region Precious Coral Fisheries 29
3.3.1 Harvests 29
3.3.2 Participation 31
3.3.3 Markets 31
3.4 Protected Species 32
3.4.1 Marine Mammals 32
3.4.2 Sea Turtles 35
3.4.3 Seabirds 36
3.5 Essential Fish Habitat 36
4.0 IMPACTS OF THE ALTERNATIVES 38

4.1 Issue A: Auau Channel Black Coral Harvest Quota 38
4.1.1 Alternative A1: No Action 38
4.1.2 Alternative A2: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the entire bed (Preferred Alternative) 41
4.1.3 Alternative A3: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the Federal waters only. 43
4.2 Issue B: Western Pacific Region Gold Coral Moratorium 45
4.2.1 Alternative B1: No Action 45
4.2.2 Alternative B2: Implement a five-year moratorium on live and dead gold coral harvests (Preferred Alternative) 47
4.2.3 Alternative B3: Implement a five-year moratorium on live gold coral harvests 49
4.2.4 Alternative B4: Reduce gold coral harvest quotas by 50% of gold coral in all precious coral beds 52
5.0 CONSISTENCY WITH OTHER APPLICABLE LAWS AND STATUTES 54
5.1 National Environmental Policy Act 54
5.1.1 Purpose and Need for Action 54
5.1.2 Alternatives 54
5.1.3 Affected Environment 54
5.1.4 Impacts of the Alternatives 54
5.2 Consistency with the MSA National Standards 54
5.3 Regulatory Flexibility Act 58
5.4 Executive Order 12866 58
5.5 Coastal Zone Management Act 58
5.6 Endangered Species Act 58
5.7 Paperwork Reduction Act 58
5.8 Executive Order 13089 (Coral Reef Protection) 59
5.9 Information Quality Act 59
6.0 PROPOSED REGULATIONS 59
Table 1 to Part 665—Quotas for Precious Corals Permit Areas 60
7.0 REFERENCES 61
Appendix A: RIR 1
Au`au Channel Black Coral Harvest Quota 3
Alternative A1: No Action 3
Alternative A2: Designate the Au`au Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for the entire bed (Preferred Alternative). 3
Alternative A3: Designate the Au`au Channel black coral bed as an Established Bed with an annual harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for Federal waters only. 3
Western Pacific Region Gold Coral Moratorium 3
Alternative B1: No Action 3
Alternative B2: Implement a five-year moratorium on live and dead gold corals (Preferred Alternative) 3
Alternative B3: Implement a five-year moratorium on live gold coral 3

Alternative B4: Reduce the harvest quota by 50% of gold coral in all precious coral beds. 4
Western Pacific Region Gold Coral Moratorium 4
Appendix B: IRFA 1
Description of Alternatives 1
Au'au Channel Black Coral Harvest Quota 1
Alternative A1: No Action. 1
Alternative A2: Designate the Au'au Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for the entire bed including State and Federal waters (Preferred Alternative). 1
Alternative A3: Designate the Au'au Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for Federal waters only. 2
Western Pacific Region Gold Coral Moratorium 2
Alternative B1: No Action 2
Alternative B2: Implement a five-year moratorium on live and dead gold corals (Preferred Alternative) 2
Alternative B3: Implement a five-year moratorium on live gold coral 2
Alternative B4: Reduce the harvest quota by 50% of gold coral in all precious coral beds. 2

List of Tables

Table 1: Summary of the alternatives considered, by issue iv
Table 2: Current Western Pacific Region Precious Coral Beds and Harvest Quotas 10
Table 3: Precious Corals Management Unit Species 12
Table 4: Gold coral affected by this action as listed under the MUS of the FMP 14
Table 5: Harvest Quotas under Alternative B4 15
Table 6: Weight and Value of Black Coral Landings in Hawaii (1990-97) 30
Table 7: Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for all Western Pacific FMPs 38

List of Figures

Figure 1: Map of Hawaii Precious Coral Beds 11
Figure 2: The Auau Channel Black Coral Bed 25
Figure 3: Map of the Auau Channel 29
Figure 4: Weight of Black Coral Landed in Hawaii, 1985-2005 31

List of Acronyms

CML	State of Hawaii Commercial Marine License
CNMI	Commonwealth of the Northern Marianas Islands
CZMA	Coastal Zone Management Act
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
ESA	Endangered Species Act
EO	Executive Order
FEP	Fishery Ecosystem Plan
FMP	Fishery Management Plan
HAPC	Habitat Area of Particular Concern
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
Monument	Northwestern Hawaiian Islands National Marine Monument
MSA or MSFCMA	Magnuson-Stevens Fishery Conservation and Management Act
MSY	Maximum Sustainable Yield
MUS	Management Unit Species
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
OY	Optimum Yield
PIFSC	NMFS Pacific Islands Fisheries Science Center
PIRO	NMFS Pacific Islands Regional Office
PRA	Paperwork Reduction Act
SFA	Sustainable Fisheries Act
SPR	Spawning Potential Ratio
WPRFMC or Council	Western Pacific Regional Fishery Management Council
VMS	Vessel Monitoring System

1.0 INTRODUCTION

1.1 Responsible Agencies

The Western Pacific Regional Fishery Management Council was established by the Magnuson-Stevens Fishery and Conservation Management Act (MSA) to develop Fishery Management Plans (FMPs) for fisheries operating seaward of American Samoa, Guam, Hawaii, the Northern Mariana Islands and the U.S. possessions in the Pacific.[1] Once an FMP is approved by the Secretary of Commerce, it is implemented by federal regulations which are enforced by the National Marine Fisheries Service and the U.S. Coast Guard, in cooperation with state, territorial and commonwealth agencies. For further information contact:

Kitty M. Simonds
Executive Director
Western Pacific Regional Fishery Management Council
1164 Bishop St., Suite 1400
Honolulu, HI 96813
(808) 522-8220

William L. Robinson
Regional Administrator
National Marine Fisheries Service
Pacific Island Regional Office
1601 Kapiolani Blvd., Suite 1110
Honolulu, HI 96814
(808) 944-2200

1.2 Overview of the Precious Corals Fishery Management Plan and Amendments

The Fishery Management Plan (FMP) for the Precious Corals Fisheries of the Western Pacific Region was implemented in September 1983 (48 FR 39229). It established the plan's management unit species and management area, and it also classified several known beds (See Tables 2 and 3 and Figure 1).

Amendment 1 to the FMP became effective July 21, 1988 (50 FR 27519) and applied the management measures of the FMP to the Pacific Remote Island Areas (Palmyra and Johnston Atolls, and Wake, Kingman, Jarvis, Baker, and Howland Islands) by incorporating them into a single Exploratory Permit Area, expanded the Management Unit Species (MUS) to include all species of the genus *Corallium* (See Table 3), and outlined provisions for the issuance of experimental fishing permits designed to stimulate the domestic fishery.

Amendment 2 to the FMP became effective January 22, 1991 (56 FR 3072, January 28, 1991) and defined overfishing for Established beds.

Amendment 3 to the FMP became effective November 18, 1998 (63 FR 55809, October 19, 1998) and established a framework procedure for adjusting management measures in the fishery.

Framework Measure 1 to the FMP became effective April 17, 2002 (67 FR 11941, March 18, 2002) and revised the definitions of "live coral" and "dead coral," suspended the harvest of gold coral at Makapuu Bed, applied minimum size restrictions only to live precious corals, prohibited the harvest of black coral with a stem diameter of less than one inch or a height of less than 48 inches (with certain exceptions), prohibited the use of non-selective fishing gear to harvest precious corals, and applied the minimum size restrictions for pink coral to all permit areas. The framework measure included additional proposed measures that would have applied only to the

[1] Howland, Baker, Jarvis, Wake and Johnston Islands, Palmyra and Midway Atolls and Kingman Reef.

NWHI, but they were not approved because they were determined to be inconsistent with the management regime of the NWHI Coral Reef Ecosystem Reserve (see below).

Amendment 4 addressed new requirements under the 1996 Sustainable Fisheries Act (SFA). Portions of the amendment that were immediately approved included designations of essential fish habitat, definitions of overfishing and descriptions of bycatch and of some fishing communities. Those provisions became effective on February 3, 1999 (64 FR 19067, April 19, 1999). Remaining portions that were approved on August 5, 2003 (68 FR 46112) were provisions regarding Hawaii fishing communities.

Table 2: Current Western Pacific Region Precious Coral Beds and Harvest Quotas

Name of Bed	Type of Bed	Harvest Quota	Quota Duration
Makapuu Bed (MHI)	Established	Pink 2,000 kg Gold 0 kg Bamboo 500 kg	2 years
Keahole Point (MHI)	Conditional	Pink 67 kg Gold 20 kg Bamboo 17 kg	1 year
Kaena Point (MHI)	Conditional	Pink 67 kg Gold 20 kg Bamboo 17 kg	1 year
Brooks Bank (NWHI)	Conditional	Pink 17 kg Gold 133 kg Bamboo 111 kg	1 year
180 Fathom Bank (NWHI)	Conditional	Pink 222 kg Gold 67 kg Bamboo 56 kg	1 year
Westpac Bed (NWHI)	Refugium	Zero (0 kg)	N/A
Other EEZ waters around Hawaii, American Samoa, Guam, CNMI, PRIA	Exploratory	1,000 kg per area, all species combined (except black corals)	1 year

Note: "Established Beds" are areas for which a MSY can be estimated based on bed-specific scientific data; "Conditional Beds" are those areas for which MSY estimates have been made based on their size relative to similar Established Beds; all other EEZ waters of the Western Pacific Region are termed "Exploratory Areas," and are managed under area quotas. "Refugia" are beds with no harvest allowed.

Of relevance to the management of the NWHI precious corals fishery is the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, established December 4, 2000 through Executive Order (EO) 13178 (65 FR 76903, December 7, 2000), as modified by EO 13196 on

January 18, 2001 (66 FR 7395, January 23, 2001). The Reserve is managed by the Department of Commerce under the National Marine Sanctuaries Act. On June 15, 2006, President George W. Bush signed Presidential Proclamation No. 8031 establishing the Northwestern Hawaiian Islands Marine National Monument (NWHI monument). The proclamation set apart and reserved the Northwestern Hawaiian Islands for the purpose of protecting the historic objects, landmarks, prehistoric structures and other objects of historic or scientific interest that are situated upon lands owned and controlled by the federal Government of the United States. Proclamation No. 8031 directs the Secretary of Commerce and the Secretary of the Interior (the Secretaries) to prohibit access into the NWHI monument unless authorized, and limit or regulate virtually all activities in the area through a permit and zoning system among other measures. Precious coral harvest is prohibited within the NWHI monument.

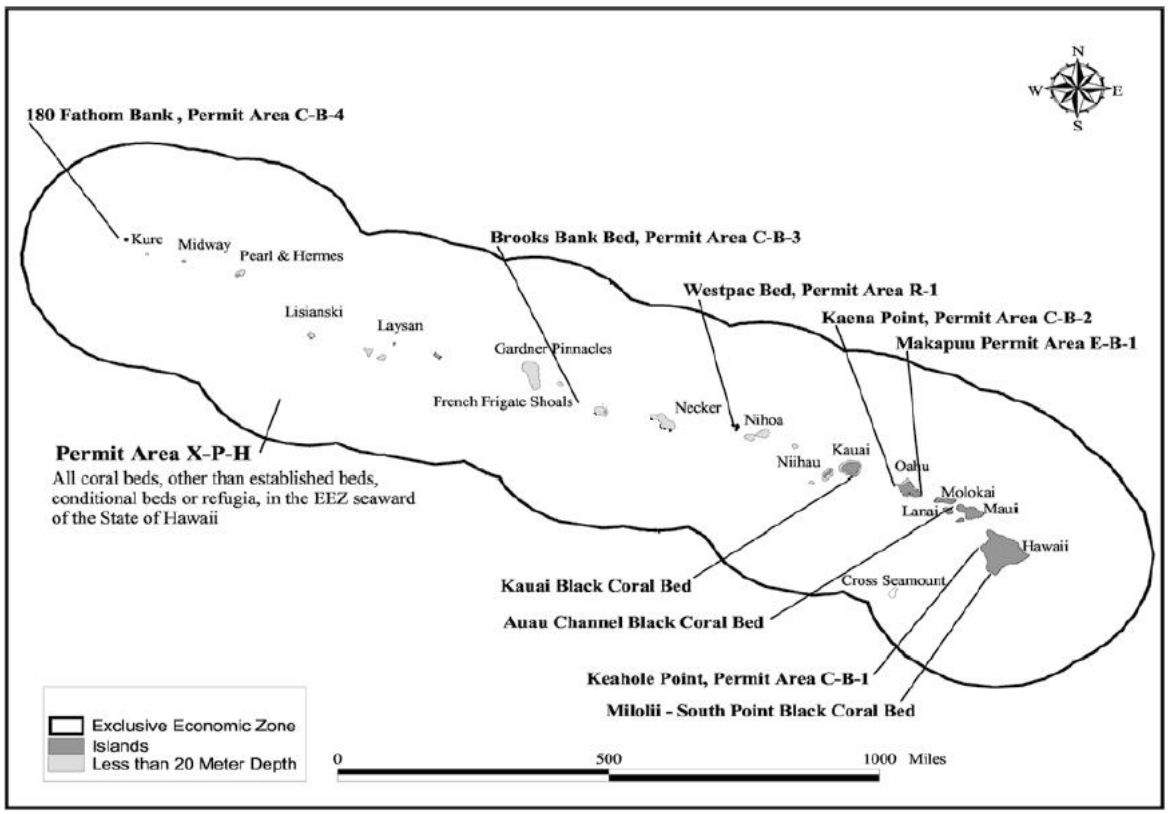


Figure 1: Map of Hawaii Precious Coral Beds

Amendment 5 to the FMP was prepared and transmitted to NMFS for approval in parallel with the FMP for Coral Reef Ecosystems of the Western Pacific Region. This amendment prohibits the harvest of Precious Coral Management Unit Species in the no-take marine protected areas established under the Coral Reef Ecosystems FMP. The Coral Reef Ecosystems establishes such areas around Rose Atoll in American Samoa, Kingman Reef, Jarvis Island, Howland Island, and Baker Island. No-take areas were also proposed for the NWHI, but all measures proposed in the Coral Reef Ecosystems FMP that would have applied to the waters around the NWHI (including Midway) were disapproved because of possible conflict and duplication with the management regime of the NWHI Coral Reef Ecosystem Reserve. Accordingly, NMFS issued a Record of Decision on June 14, 2002 that partially approved the Coral Reef Ecosystems FMP and Amendment 5 to the Precious Corals FMP. A final rule implementing the Coral Reef Ecosystem FMP (including Amendment 5 to the Precious Corals FMP) was published on February 24, 2004 (69 FR 8336).

Amendment 6 included the federal waters around the Commonwealth of the Northern Mariana Islands (CNMI) within the FMP's management area and became effective September 12, 2006 (71 FR 53605).

A Regulatory Amendment to the FMP, which became effective on November 14, 2007, eliminated an exemption that allowed the harvest of black corals that have a minimum base diameter of ¾ of an inch to those fishermen that reported harvest to the State of Hawaii prior to April 17, 2002 (72 FR 58289). Black corals may only be harvested at a minimum base diameter of 1 inch or minimum height of 48 inches.

Table 3: Precious Corals Management Unit Species

Common name	Scientific name
Pink coral (also known as red coral)	*Corallium secundum*
Pink coral (also known as red coral)	**Corallium regale*
Pink coral (also known as red coral)	*Corallium laauense*
Gold coral	*Gerardia* spp.
Gold coral	*Callogorgia gilberti*
Gold coral	*Narella* spp.
Gold coral	*Calyptrophora* spp.
Bamboo coral	*Lepidisis olapa*
Bamboo coral	*Acanella* spp.
Black coral	*Antipathes dichotoma*
Black coral	*Antipathes grandis*
Black coral	*Antipathes ulex*

* *Corallium regale* has been recently identified by taxonomic experts as *Corallium laauense*

1.3 Public Review Process and Schedule

At its 135th meeting in Honolulu, Hawaii, the Council discussed issues relevant to precious coral fisheries and took action to recommend that staff prepare an analysis of alternatives to address concerns regarding black corals in the Auau Channel, as well as regarding gold corals in the Western Pacific Region. The Council took final action on these issues at its 136th Meeting on December 21, 2006. This was a public meeting advertised in local newspapers as well as in the Federal Register (FR). Issue papers were mailed to interested parties prior to the Council meeting, and a public hearing was held during the meeting. Amendment 7, including a draft EA, will be made available for public review and comment from the Western Pacific Regional Fishery Management Council and through the website www.regulations.gov. NMFS will consider public comments on the draft EA that are received within the public comment period for the Precious Corals FMP Amendment 7.

1.4 List of Preparers

This document was prepared by (in alphabetical order):

Joshua DeMello, Fishery Analyst
Western Pacific Regional Fishery Management Council

Marcia Hamilton, Economist
Western Pacific Regional Fishery Management Council

1.5 Purpose and Need for Action

Issue A: The biomass of black coral is believed to have declined by 25% over the past 30 years in the Auau Channel, Hawaii. A combination of factors, including the rise of an invasive soft coral species, *Carijoa riisei*, (Kahng and Grigg 2005) and black coral fishing are thought to have lead to this decline. This action is intended to address the impacts of the precious coral fishery on the Auau Channel black coral resource. Designating the Auau Channel as an Established Bed and implementing a black coral harvest quota for the bed would limit harvests and allow the Council to determine if overfishing is occurring. The purpose of taking this action is to reduce the black coral harvest in an effort to prevent further decline in the biomass Under the FMP, precious coral beds for which an MSY can be estimated based on bed-specific scientific data, are designated "Established Beds." Others for which MSY estimates have been made based on their size relative to similar Established beds are called "Conditional Beds." All other EEZ waters of the Western Pacific Region are termed "Exploratory Areas," and are managed under area quotas (see Table 2).

Issue B: Recent research has revealed that the current growth rate estimates in the FMP may be overly generous. Current gold coral (see Table 4) management is based on a gold coral growth rate of approximately 6.6 cm/yr from numerous gold coral samples. Recent radiocarbon dating of three gold coral samples from Hawaii has estimated that gold coral has an axial growth rate of 14-40 micrometers per year (Roark et al. 2006), which is similar to results from radiocarbon dating of gold corals in the Atlantic (Druffel et al. 1995). Although this fishery is dormant, further research needs to be done to determine the growth rate for gold corals in the Western Pacific Region. A moratorium is needed to provide scientists time to reassess the current gold coral estimates to determine if they are adequate to prevent overfishing. Research on life history characteristics such as deterioration rate (i.e. the time it takes for a gold coral to wear down) may allow scientists to determine the approximate growth turnover of the gold coral population and provide a minimum estimate of the growth rate. The purpose of this action is to establish a moratorium for gold coral harvest as to prevent the renewal of a fishery under regulations that may not be sufficient to prevent overfishing.

1.6 Management Objectives

The objective of the action in Issue A is to sustainably manage black corals in the Auau Channel so as to avoid overfishing and achieve optimum yield. The objective of the action in Issue B is to ensure that gold corals are not overharvested due to reliance on inaccurate estimates of their growth rates.

2.0 MANAGEMENT ALTERNATIVES

This section describes the alternatives considered for each issue

2.1 Description of the Alternatives

2.1.1 Issue A: Auau Channel Black Coral Harvest Quota

2.1.1.1 Alternative A1: No Action

This alternative would continue to regulate the black coral fishery based on existing minimum size limits and gear restrictions. The Auau Channel would continue to be managed as an "Exploratory Bed" without a quota."

2.1.1.2 Alternative A2: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the entire bed (Preferred Alternative)

The Auau Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every 2 years (11,023 lb every 2 years) from both State and Federal waters combined. All other regulations would continue to apply. Minimum size regulations and gear restrictions would continue to apply. This alternative assumes the State would adopt complementary regulations for the portions of the Auau Channel Bed which lie within state waters.

2.1.1.3 Alternative A3: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for Federal waters only

The Auau Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every 2 years (11,023 lb every 2 years) from Federal waters only. All other regulations would continue to apply. Once the harvest quota is reached, Federal waters would close for the remainder of the 2-year time period. Minimum size regulations and gear restrictions would continue to apply.

2.1.2 Issue B: Western Pacific Region Gold Coral Moratorium

Table 4: Gold coral affected by this action as listed under the MUS of the FMP

Common Name	Scientific Name
Gold Coral	*Gerardia* spp.
Gold Coral	*Callogorgia gilberti*
Gold Coral	*Narella* spp.
Gold Coral	*Calyptrophora* spp.

2.1.2.1 Alternative B1: No Action

Gold coral harvests would continue to be regulated based on harvest quotas by area and gear restrictions, and no moratorium would be implemented

2.1.2.2 Alternative B2: Implement a five-year moratorium on live and dead gold corals (Preferred Alternative)

A five-year moratorium on the harvest of *live and dead* gold corals would be implemented for the Western Pacific Region while an associated research program further examines linear and axial growth, recruitment and mortality, and deterioration rates of gold coral. Bed-quotas and gear restrictions would not be required during this period. The moratorium may be renewed if the research program is not completed within the five years.

2.1.2.3 Alternative B3: Implement a five-year moratorium on live gold coral

A five-year moratorium on the harvest of *live* gold corals would be implemented for the Western Pacific Region while an associated research program further examines linear and axial growth, recruitment and mortality, and deterioration rates of gold coral. Bed-quotas and gear restrictions would not be required during this period. The moratorium may be renewed if the research program is not completed within the five years.

2.1.2.4 Alternative B4: Reduce the harvest quota by 50% of gold coral in all precious coral beds.

Harvest quotas for gold coral would be reduced by 50% in all precious coral beds throughout the Western Pacific Region. Gear restrictions would continue to apply.

Table 5: Harvest Quotas under Alternative B4

Name of Bed	Type of Bed	Original Quota	Recommended Quota	Quota Duration
Makapuu Bed (MHI)	Established	Gold 0 kg	Gold 0 kg	N/A
Keahole Point (MHI)	Conditional	Gold 20 kg	Gold 10 kg	1 year
Kaena Point (MHI)	Conditional	Gold 20 kg	Gold 10 kg	1 year
Brooks Bank (NWHI)	Conditional	Gold 133 kg	Gold 66.5 kg	1 year
180 Fathom Bank (NWHI)	Conditional	Gold 67 kg	Gold 33.5 kg	1 year
Westpac Bed (NWHI)	Refugium	Zero (0 kg)	Zero (0 kg)	N/A
Other EEZ waters around Hawaii, American Samoa, Guam, CNMI, PRIA	Exploratory Area	1,000 kg per area, all species combined (except black corals)	500 kg per area, all species combined (except black corals)	1 year

2.2 Alternatives Considered but not Analyzed

Other Time Period Closures for Gold Corals

The five year moratorium on gold corals gives the appropriate time needed for researchers to submit grant proposals, obtain funding, conduct the research, and publish the results in peer-reviewed publications. A shorter time period would not allow the appropriate funding and research cycles to be completed in time for a possible re-opening of the fishery.

At the same time, five years provides the impetus for the research to be conducted so that the fishery can be re-opened as soon as possible if the science allows. A longer time period would not provide this impetus and keep the gold coral fishery closed, even if there is no scientific

justification for the closure. At the end of the five-year period, the Council could take additional action to extend the moratorium, if such an extension were deemed necessary.

Closure of the Auau Channel Black Coral Fishery
A complete closure of the Auau Channel is not warranted based on the scientific data available. A fifty-percent reduction is based on the recommendation in Grigg 2004 and has been evaluated by fishery managers and other precious coral scientists. A complete closure of the fishery would be inconsistent with the objective of the Precious Corals FMP to achieve optimum yield.

Limited Entry
Limiting participation would not be expected to reduce harvest because there are already a very limited number of fishermen participating in the fishery. There also are a number of other management measures such as a minimum size, gear restrictions, and permitting and reporting requirements, which along with appropriate harvest quotas could manage the fishery sustainably.

3.0 AFFECTED ENVIRONMENT

3.1 Target Species

In general, western Pacific 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 suspension feeders (they require external water motion to bring them food); and many are fan shaped to maximize contact surfaces with particles or microplankton in the water column. Because precious corals are suspension 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 should be insulated from some short-term drastic changes in the physical environment. For the same reason, man-made pollution may not affect their environment, except in the unlikely event that large quantities of heavy material, such as waste from manganese nodule refining, were dumped directly on a bed. Little is known about the potential long-term effects of changes in environmental conditions, such as water temperature or current velocity, on the reproduction, growth, or other life activities of the precious corals.

3.1.1 Taxonomy, Biology and Ecology

Precious corals MUS are taxonomically classified as members of the phylum Cnidaria, which includes all of the corals, hydroids, jellyfish and sea anemones. Its members are characterized by the presence of:

- a sac-like body with only one opening for the gut;

- only two tissue layers, an outer protective layer of epidermis and an inner digestive layer, the gastrodermis, lining the gut cavity;
- an intermediate layer called the "mesoglea" or "middle jelly" consisting mostly of protein fibers and generally lacking cells; and
- explosive, stinging devices called nematocysts used in either prey capture or defense.

Within the Cnidaria, precious corals are placed in the class Anthozoa, which includes the corals, soft corals and sea anemones, all characterized by having a relatively complicated gut, compared with other cnidarians. Living tissues are composed of polyps, each with a mouth surrounded by tentacles. Some species are composed of a single polyp while others are colonies of many polyps.

Within the Anthozoa, precious corals are members of three orders in two subclasses: 1) subclass Octocorallia (or Alcyonaria), order Gorgonacea, and 2) subclass Hexacorallia (or Zoantharia), orders Zoanthidae and Antipathidae.

Members of the subclass Octocorallia are characterized by their eight tentacles. All octocorals are colonial, with each colony consisting of numerous polyps growing out of, and constituting the body of, the animal. These are all connected by a complicated system of internal tubing running through the colonial mesoglea. Octocoral MUS include the pink corals of the genus *Corallium* and the bamboo corals of the genera *Lepidisis* and *Acanella*.

Other anthozoans have their tentacles in multiples of six and are thus termed the Hexacorallia, or hexacorals. Hexacoral MUS include gold corals of the order Zoanthidea and black corals of the order Antipathidae.

Red, pink and bamboo octocorals are of the Order *Gorgonacea*. They are commonly called fan corals because their growth resembles that of a plant, with a main trunk fastened to the substrate, and lateral branching stems which may be in the same plane. Their internal skeleton is decidedly different in structure and composition from the hard skeleton of the stony, reef-building, corals. Gorgonian skeletons contain a much larger proportion of organic material, much of it proteinaceous. This gives them much more flexibility than reef-building corals. They also tend to deposit a significant amount of pigmented material into the skeleton, resulting in some skeletons being highly colored. Brown, red, pink or gold are common colors found in gorgonian skeletons. Precious coral jewelry is made from the cut and polished skeletons of large gorgonians and similar corals.

Gorgonian colonies are all derived from one another and they are all one gender. The age at reproductive maturity is 12-13 years for *Corallium secundum*. Gorgonians of both sexes release gametes into the sea. Fertilization occurs in the sea and a small planula larva develops that chooses a place of settlement. Planular larvae of most corals are not usually dispersed very far from parent colonies. The larva then metamorphoses into a juvenile and the first polyp of the colony is formed. From this point the colony is fastened to the substrate and is immobile. In colonial species, asexual reproduction also occurs through budding of the primary polyp. The duration of the larval stage is unknown for most species, but Mediterranean studies of *Corallium rubrum* suggest that their larvae remain competent for several weeks.

Corallium species live below the euphotic zone at depths between 100 and 1500 m where temperature varies between 3° and 18° C. These larvae may avoid settling deeper, where lower temperatures may prevent reproduction. As the colony grows, it generally differentiates so the

"fan" is perpendicular to the prevalent currents. Growth of many octocorals is slow and they may require over 100 years to reach maximum size.

Little information is available on the ecological associations of the precious corals or their significance to the lives of other organisms. Gorgonians are predatory, suspension-feeding, animals that catch and kill small planktonic animals with their tentacles. Particulate organic matter is also important in the diets of Gorgonians, and like other Anthozoan species, they are associated with numerous kinds of commensal invertebrates.

Gorgonians have few predators. They are, however, the food of some polyp-plucking fish, such as filefish, and of grazing snails, several types of nudibranchs and at least one polychaete annelid. Eucidarid sea urchins are known to prey on precious corals. Gorgonians also provide vertical structure in a habitat where such structure is often lacking. Consequently, they are often settled on by barnacles and other epifauna. Gorgonians, in turn, have developed strong chemicals to deter fouling and predation.

Adult pink, bamboo and gold corals are found in deep water (100-1500 m) on solid substrate where bottom currents are strong. This is in contrast to black corals, discussed below, which also typically occur on solid substrate, but generally at depths between 30 and 110m.

Zoanthidea are a small group of hearty, solitary, sometimes colonial, anemone-like anthozoans that lack a skeleton. There is a large amount of morphological variability in this order, with most species being shallow-water and mat-forming. Some species are encrusting, and may overgrow other octocorals or hexacorals. They are unlike any other anthozoans internally, having a large number of paired and unpaired septa. Zoanthid polyps can occur as single individuals in large groups or they can be joined together by a thin stolon, a thin coenenchyme or a very thick coenenchyme from which only the mouths and tentacles are visible. The coenenchyme is a gelatinous mat of fibrous protein that develops from the mesoglea and supports the polyps.

Gold coral (*Gerardia* sp.) are Zoantharian corals that belong to the family Parazoanthus. Many are parasitic species that commonly overgrow other gorgonian corals. *Gerardia* seems to prefer overgrowing the bamboo corals (*Acanella* spp.). In fact, this association may be almost obligate as few colonies of *Gerardia* have been found without an *Acanella* base within the holdfast of the gold coral colony. In Hawaii, *Gerardia* sp. is found at depths between about 350 and 450 meters and prefers steep drop-offs. Typically it settles at the very top of drop-offs within this depth range where the current appears to be enhanced. *Gerardia* is also bioluminescent and can serve as habitat for bottomfish, sometimes including arrowtooth eels (*Meadia abyssalis)*. In the NWHI, monk seals have been observed, using radio telemetry, to dive in areas where red and gold coral occur (Parrish et al. 2002), prompting a hypothesis that monk seals forage among precious corals because they provide structural relief for various fish assemblages the seals' prey on. In 2000, the National Undersea Research Laboratory conducted a study using manned and unmanned submersibles in known beds of the Western Pacific region (Parrish et al 2002). The objective of the study was to see if gold coral provided habitat for deep-water fish. Results of the study found that gold coral did not seem to aggregate a significant fish assemblage. At the Cross Seamount, the study found arrowtooth eels in areas adjacent to the coral beds, but without the presence of gold corals. Although greater fish numerical density occurred in areas with gold coral, when the known effects of bottom relief and depth are accounted for, the relationship with gold coral loses statistical significance (Parrish 2006).

Past studies estimated the linear growth rate of gold coral was approximately 6.6 centimeters per year, suggesting a relatively young age for large trees (Grigg 2002). These estimates are based on the assumption that growth rings are laid down annually as in other precious corals such as black coral and pink coral (*Corallium rubrum* and *C. secundum*). Recent research done on the aging of gold corals using radiometric dating on three samples collected from the Makapuu Bed and off of the island of Hawaii found that gold coral may grow at a much slower rate of 14-40 micrometers per year aging those samples at 450-2,740 years old (Roark et al. 2006). Research conducted on *Gerardia* species in the Atlantic have estimated the age of large gold coral trees to be 1,800 years old (Druffel et al. 1995).

Antipatharia contains the well known precious black or "thorny" coral. These tree-like corals have a thin axial skeleton with distinctive small thorns. The cenosarc, a thin veneer of animal tissue, secretes the tightly-layered central skeleton of keratinaceous protein similar to that found in animal horn and nails. Depending upon the species, the living tissue may be black, red, orange, brown, green, yellow or white. The gelatinous polyps located in this living "bark" are short and cylindrical, their six, non-retractable tentacles are armed with stinging cells.

More than 150 species of black corals have been described. Some, like the wire corals, grow as a single, spiral coil. Many others have a dendritic growth form, creating a fan shape or elaborate tangle of tree-like branches. At least 14 species of black corals are currently known from Hawaii.

Relatively little is known about the life cycle and reproduction of black corals. Like other cnidarians, black corals have life cycles that include both asexual and sexual reproduction. Asexual reproduction (budding) builds the colony by adding more living tissue that, in turn, secretes more skeleton. Regular growth rings laid down as the skeleton thickens can be used to estimate the age of the colony. Sexual reproduction involves the production of eggs and sperm to create young that can disperse and settle new areas. The larvae of several black coral species are negatively phototactic (Grigg 1964), and are most abundant in dimly lit areas, such as beneath overhangs and ledges in waters deeper than 30m. All species require firm, hard substrates free of sediment. Polyps are either male or female. The larval stage, called a planula, can drift with currents until a suitable surface is found. Once the larva settles, it metamorphoses into a polyp form and secretes skeletal material that attaches it to the seafloor. Then it begins budding, creating more polyps that will form a young colony. In one Hawaiian species that has been studied (*Antipathes dichotoma*, a MUS), the colony may grow about 2.5 inches (6.4 cm) per year. The age at reproductive maturity is 12-13 years for *Antipathes dichotoma*. Reproduction may occur annually (Grigg 1976). In 2006, growth rates of *A. dichotoma* and *Leiopathes glaberrina* samples were estimated using radio-carbon dating. The *A. dichotoma* samples growth rates ranged from130 μm/yr to1140 μm/yr and the deeper species, *L. glaberrina* radial growth rate was approximately 5 μm/yr (Roark et al. 2006). A large six-foot (1.8 m) tall coral tree is estimated to be between 30 and 40 years old. The oldest black corals observed in the Maui Auau Channel Bed are thought to be 75 years old, and it is believed that black corals may live even longer.

Western Pacific precious coral larvae are more affected by light and temperature than are adults. Larvae of *Antipathes* species occurring in Hawaii are known to be negatively phototactic, which is why they are not found shallower than 30 m. The lower limit of the *A. dichotoma* and *A. grandis* black corals coincides with the top of the thermocline in the high Hawaiian islands (Grigg 1993).

3.1.2 Distribution in the Western Pacific Region

Precious corals are known to exist in the EEZ around Hawaii and likely exist in the EEZ around American Samoa, Guam, CNMI and the PRIA, but virtually nothing is known of their distribution and abundance in these areas outside of Hawaii. In America Samoa, there are three known areas with pink coral: near Upolu and Falealupo, and at Tupuola Bank (Carleton and Philipson 1987). In the Northern Mariana Islands, Japanese fishermen have reported pink coral north of Pagen Island and near Rota and Saipan. Since these areas remain unsurveyed, no information is available regarding the abundance of coral present.

To date, beds of pink, gold and/or bamboo corals have been found in eight locations in the EEZ around Hawaii. This number includes two recently discovered beds, one near French Frigate Shoals in the NWHI, and a second on Cross Seamount, approximately 150 nm south of Oahu. The species composition and density of the corals in these beds varies considerably (Parrish in Press).The approximate areas of six of these eight beds have been determined. These beds are small; only two of them have an area greater than 1 km^2, and the largest is 3.6 km^2 in size. The Keahole Point Bed off Hawaii's Kona coast, however, has been estimated to be 4 times larger than originally thought (Grigg 2002).

There are also three known major black coral beds in the Western Pacific Region, in addition to several minor beds (Grigg 1998a). Most of these are located in Hawaii's state waters (0-3 nm). However the largest (the Auau Channel Bed) extends into federal waters (see Figure 2). There are undocumented and unconfirmed reports that precious corals have been observed or exploited in widely scattered locations in the Western Pacific Region: off American Samoa, Guam, the Northern Mariana Islands, and Wake Island, but no details are available. In some cases attempts at scientific surveys in areas referred to in such reports have failed to turn up any evidence of precious corals. Undocumented reports of large past commercial production by Japanese vessels on the Milwaukee Banks, some 500 miles beyond the northwestern extreme of the NWHI, and the large physical area of those banks, lead to conjecture that at some locations precious corals may occur in much larger aggregations than have as yet been demonstrated by scientific surveys. Asian coral fishers, who have roamed the western and central Pacific for decades, undoubtedly have undocumented and unorganized information on precious corals beds which has yet to be revealed to U.S. researchers and or resource managers. In general, the available information on precious corals occurrence and distribution is fragmentary and very incomplete, and there is a high probability that further surveying and prospecting will reveal significant additional precious corals resources in areas under U.S. jurisdiction. The beds described below are shown on Figure 1.

<u>Makapuu Established Bed</u>

Within the EEZ, the Makapuu Bed has experienced the greatest level of legal exploitation and scientific research and thus is the source of much of the available information about the region's precious corals. Density of occurrence estimates for precious corals colonies in their habitat, based on observations made at the Makapuu Bed, reveal a fairly dense habit of growth. This bed was surveyed in the 1970s, and again in 1997.

In 1971, densities of commercial species were determined in an unexploited section of the bed, and the size frequency distribution of pink coral was determined (Grigg 1976). The average density of pink coral in the Makapuu Bed was 0.022 colonies per square meter. Extrapolation of this figure to the entire bed (3.6 million m^2) results in a standing crop of 79,200 colonies. The 95% confidence limits of the standing crop are 47,200 to 111,700 colonies. Conversion of

standing crop colonies to biomass produced an estimate of 43,500 kg for *C. secundum* in the Makapuu Bed.

The estimates of density for gold coral (*Gerardia* sp.) and bamboo coral (*Lepidisis olapa*) in the Makapuu Bed were 0.003 colonies/m^2 and 0.01 colonies/m^2 respectively. However, the distributional patterns of both of these species were found to be very patchy, much more so than *C. secundum*, and the area where they occurred was only about half that for pink coral, or 1.8 million m^2. The corresponding estimates of unfished abundance for gold and bamboo colonies are 5,400 and 18,000 colonies respectively. Data for the mean weight of colonies in the populations of gold and bamboo coral in the Makapuu Bed are lacking, but rough estimates were 2.2 kg for gold coral and 0.6 kg for bamboo coral. Multiplying mean weights by densities leads to rough estimates of standing crop of about 11,800 kg for *Gerardia* sp. and 10,800 kg for *Lepidisis* sp. (Grigg 1976)

An analysis of growth rings in the cross sections of pink coral branches suggests that colony height increases about 0.9 cm/year, at least to an age of about 30 years (Grigg 1976). The largest colonies of pink coral found at Makapuu were rarely more than 60 cm in height. Gold coral colonies were seen to reach a height of about 250 cm, while *Lepidisis olapa* (bamboo coral) was observed at about 300 cm.

The natural mortality rate for pink coral was calculated by first converting the size-frequency distribution of the unfished stock to an age-frequency distribution and then determining the rate of diminution in progressively older age classes (Grigg 1976). The best estimate of the annual instantaneous mortality rate of *C. secundum* in the Makapuu Bed is 0.066. This is equivalent to an annual survival rate of about 93% in the absence of fishing. Mortality rates for gold and bamboo coral are not available because their growth rates and age structures are unknown.

Pink corals reach sexual maturity at a height of about 12 cm (13 years). However, the data are not very precise (Grigg 1976). The reproductive cycle is annual with spawning taking place during June and July. The relationship between parent stock and recruitment in pink coral is unknown. However, because pink coral is long-lived, and the population is composed of many year classes, the standing stock should be relatively stable even with moderate year-to-year fluctuations in recruitment. An estimate of steady state recruitment of the unexploited Makapuu stock was obtained by multiplying the virgin stock size (79,200 colonies) by the best estimate of instantaneous mortality (0.066). Given steady state, the instantaneous rate of recruitment should equal the instantaneous rate of natural mortality. This gives an estimate of recruitment for the Makapuu Bed of 5,277 colonies.

Biomass per recruit as a function of age was calculated in the absence of fishing using a cohort production model (Wetherall and Yong 1977). In this model, the cohort gains weight until an age is reached where growth gains are overtaken by natural mortality losses. This is the “critical age” at which the cohort reaches its maximum biomass in the absence of fishing. For pink coral the maximum biomass per recruit, attained by a cohort at age 31.4 years, is 237 gm.

Under the FMP, the MSYs for precious corals are calculated using a Beverton and Holt cohort production model (Beverton and Holt 1957) where data are available for *Corallium secundum*, and the Gulland Model (MSY = 0.4 MBo, where M=natural mortality and Bo is virgin biomass) for *Gerardia* and *Lepidisis* (Gulland 1970). According to the FMP, the estimated MSY for pink coral at Makapuu Bed is 1,000 kg/yr, and the estimated area of the Makapuu Bed is 3.6 km^2.

If fishing removes all colonies of a cohort at once, then the yield per recruit is identical to the biomass per recruit at the harvest age. Therefore, the maximum yield per recruit is achieved by harvesting all survivors in a cohort of pink coral exactly at the critical age of 31.4 years, and in this case the maximum yield per recruit is 237 gm. In practice this would require an infinite instantaneous fishing mortality rate exactly at 31.4 years. Since this is not feasible, the 237 gm/recruit is a theoretical upper limit to the harvest that may actually be obtained. More realistic figures of yield per recruit are obtained by considering a fishery that applies a steady finite fishing mortality rate to all ages in a cohort above a specified minimum harvest age. With a minimum harvest age of 30 years, the maximum yield per recruit is essentially equal to the upper limit of 237 gm, whereas with a minimum harvest age of zero years the greatest yield per recruit possible is only 119 gm. Hence, if non-selective measures are employed, the highest yield per recruit that can be expected is only half the maximum yield per recruit theoretically possible under selective harvesting. As long as recruitment is constant or independent of stock size, a fishing policy that maximizes the yield per recruit will also maximize the total yield on a sustained basis. In other words, it will also produce the maximum sustainable yield.

Amendment 4 to the FMP designated the Makapuu Bed as a habitat area of particular concern[6] for the precious corals fishery because of the ecological function it provides, the rarity of the habitat type and its sensitivity to human-induced environmental degradation. The potential commercial importance of the Makapuu Bed and the amount of scientific information that has been collected at the bed during the past three decades were also considered.

Between 1973 and 1978, a manned submersible was used to harvest 5,953 kg of pink coral and 2,097 kg of gold coral from the Makapuu Bed. In August 1997, the Hawaii Underwater Research Laboratory (University of Hawaii) and NOAA used a manned submersible to assess the extent to which the precious corals at the Makapuu Bed had recovered since the bed was last harvested over 20 years before (Grigg 1997). During this survey, the number of transects made on the Makapuu Bed was limited, and only a small portion of the bed was surveyed. However, based on the limited data obtained, it was concluded that this bed may be at least 15% larger than was suggested by previous data. The survey also showed that the recovery of pink coral has increased from 74% of the virgin biomass in 1978, to 90% in 1997. This finding supports the supposition that recruitment of pink coral is unaffected by harvesting and independent of the density of the standing stock. However, the assessment found that gold coral stocks at the Makapuu Bed may have experienced little or no recruitment. During the 1997 survey only two or three colonies of gold coral were observed. The number of transects of the Makapuu Bed made during this assessment were too limited to determine if the stock of gold coral was in an overfished condition, but the data collected suggest that the level of recruitment of gold coral at the Makapuu Bed has been low. It is uncertain, however, if the current scarcity of gold coral colonies at the bed was caused by the 1973-1978 harvests. There has been no gold coral harvest at the Makapuu Bed since, and the fishery remains dormant.

Brooks Bank Conditional Bed

[6]Habitat areas of particular concern are sub-areas of essential fish habitat that are particularly important to the long-term productivity of populations of one or more managed species, or are particularly vulnerable to degradation.

The original harvest quota listed in the FMP for pink coral at Brooks Bank was 444 kg/yr.[7] This figure was calculated using the following formula provided in the FMP for setting the quota for Conditional Beds for which site specific data are unavailable.

$$\frac{\text{MSY for Makapuu Bed}}{\text{Area of Makapuu Bed}} = \frac{\text{MSY for Conditional Bed}}{\text{Area of Conditional Bed}}$$

This bed was surveyed only once, in September 1998. On this survey, 2.1 km-long transects were conducted at a depth of 350-505 m. Red coral (*C. laauense*) was observed to be very abundant, with thousands of colonies present. Colonies occurred in 1-5 m^2 patches, and were located at depths of 430-517 m. These colonies were up to 50 cm in height and averaged 1 cm in diameter. Extrapolation of these data suggests that a conservative standing crop of 8,000 kg of *C. laauense* exists at this bed (Grigg 1998b). *C. regale* has been recently identified by taxanomic experts as *C. laauense*. If it is assumed that this species of precious coral has the same natural mortality rate as *C. secundum* at the Makapuu Bed (6.6%), an estimate of the MSY can be derived from the formula provided by Gulland (1970): MSY = 0.4MB, where M is the natural mortality rate and B is the standing crop biomass. Rounding down, it is estimated that 200 kg of *C. laauense* could be harvested annually on a sustainable basis, based on these data and assumptions. Pink coral (*C. secundum*) was observed to be moderately abundant on the east side of the bank at depths of 363-427 m, but colonies were generally small (less than 20 cm in height). Gold coral was abundant with 250 large colonies found between 392-467 m. It was estimated that there was a standing stock of 2,000 kg of live gold coral, with an equal amount observed dead. Observations of finfish in the area were rare, and there was no evidence of predation by sea urchins at this bed.

Westpac Refugium Bed

This bed was also surveyed in 1998, using 3.2 km-long transects at depths of 360-500 m. No red coral was observed, however, pink coral was abundant, with thousands of colonies in 0.3-1.0 m^2 patches. Gold coral was rare, with only two colonies observed. Finfish (mostly Polymixia) were abundant, and there was high predation by Eucidarid sea urchins, with 50% of colonies showing signs of predation.

Keahole Point Conditional Bed

The Keahole Point Bed has been a Conditional Bed since the original FMP. Keahole Point Bed is located in the federal waters off the Kona coast of the Big Island of Hawaii. Based on its radius, published in federal regulations, its area is 2.69 km^2, but recent surveying and harvesting by industry has estimated that the bed could be four times as large (Grigg 2002). Red and pink corals are found in patches, with colonies occurring intermittently and in occasional dense patches for 30 km along the 400 m depth contour.

Scientific dives in the same area occurring a few months after industry dives found no evidence of harvesting (i.e., recently sheared stumps). This led the scientists to believe that commercial divers may have been in a different area of an even larger bed. Data are still being assessed to better define the location, size and total coral stock of this bed.

[7] The final rule implementing the FMP published on 20 August 1983 lists the harvest quota for pink coral at Brooks Bank as 17 kg. This is a typographical error.

French Frigate Shoals-Gold Pinnacles Exploratory Bed

The 1998 survey also located a previously unknown bed near French Frigate Shoals, which has been named the FFS-Gold Pinnacles Bed. No red coral (*C. laauense)* was found along 2.9 km-long transects at depths of 360-575 m, and pink coral *(C. secundum*) abundance was low. Observed pink coral was generally small, averaging less than 12 cm in height (Grigg 1998b). Both live and dead gold coral were found in abundance, and 300 colonies were observed in scattered patches at depths of 365-406 m. Extrapolation of the transect data suggests that the gold coral standing crop at the FFS-Gold Pinnacles Bed is 3,000 kg.

Cross Seamount Exploratory Bed

The most recently discovered beds of precious corals were found by marine scientists examining fossil coral reefs 150 nm south of Oahu. Precious coral colonies were discovered on three of four basaltic outcroppings surveyed on Cross seamount. An estimated 324 kg of harvestable gold and 35 kg of harvestable red coral occurs at Cross Seamount. Colonies showed a normal size distribution of gold coral trees, with the largest trees three meters across (Grigg 2002). Much dead gold coral was seen on the ocean floor, and some pink coral colonies were seen growing off the dead gold coral.

Black Coral Beds

Grigg and Opresko (1977) reported 14 species of black coral known to occur in Hawaiian waters. Historically, however, commercial fishermen have harvested only three species, *Antipathes dichotoma* (almost 90% of commercial harvest), *A. grandis* (10%), and *A. ulex* (1%). The two major species (*A. dichotoma* and *A. grandis*) are found in coastal waters from Hawaii to Niihau and their range may extend into the NWHI. *A. dichotoma* is found at depths from 30 to 110 m while *A. grandis* occurs at depths from 45 to 110 m. Within their depth ranges, both species can be found highly aggregated on, or under, vertical drop-offs, terraces, or undercut notches. The growth rates for *A. dichotoma* and *A. grandis* have been estimated to be 6.42 cm per year and 6.12 cm per year respectively. Plotting gonad diameter versus colony height, Grigg (1976) estimated the size of reproductively mature *A. dichotoma* colonies to range from 64 to 80 cm. This implies an age at reproduction of 10 to 12.5 years.

There are two known major beds of black coral in the Western Pacific Region (the Auau Channel Bed and the Kauai Bed), and several minor beds. Most of these are located in Hawaii's state waters. However, the largest (the Auau Channel Bed) extends into the EEZ, and thus the Council and Hawaii share jurisdiction over this bed (see Figure 2). Grigg's estimate of the size of the Auau black coral bed is not a defined area bounded by the borders of a mapped polygon but instead was estimated based on the cumulative area of the submerged ridge features in the channel where black coral preferentially settles. Figure 2 encloses all of the black coral habitat in the channel waters and provides a regulatory definition of the boundaries of the Auau Channel bed.

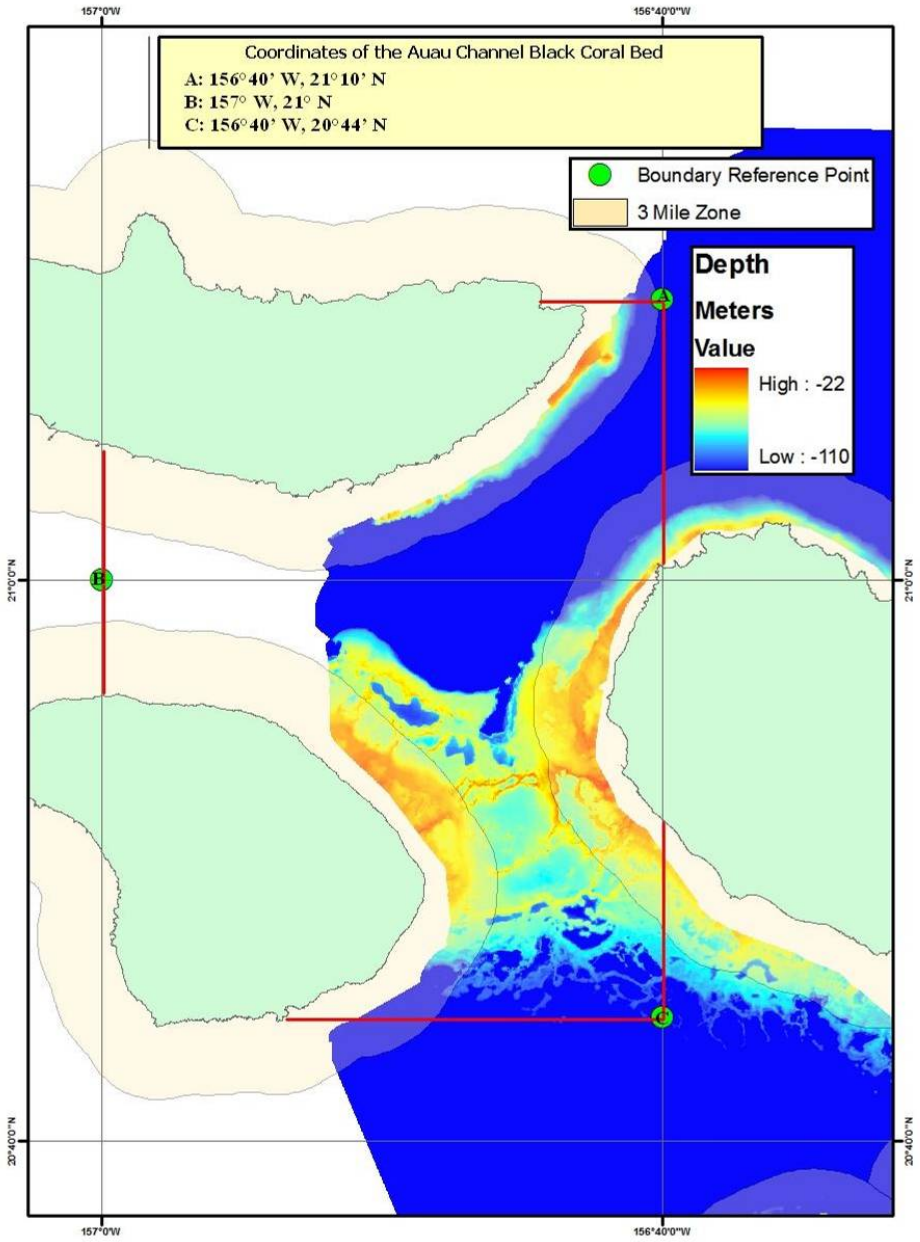


Figure 2: The Auau Channel Black Coral Bed
Source: NMFS PIFSC

The commercial harvest of black coral has occurred in the waters around Hawaii for more than three decades. Significant commercial harvest of black coral has occurred in the Auau Channel Bed and in the Kauai Bed. By 1976, Grigg had determined the aerial coverage of these beds to be 1.7 km^2 and 0.4 km^2 respectively, and MSYs (calculated using a Beverton and Holt yield production model) for the two beds were estimated to be 6,174 kg/yr and 1,480 kg/yr (Grigg 1976).

Grigg adjusted this downwards by about 20% to recommend OYs of 5,000 kg/yr and 1,250 kg/yr, respectively. These values correspond to a minimum size limit of 1.2 m (48 inches) for both species and thus allow smaller but fewer colonies to be harvested, which is consistent with economic considerations (optimum yield) and traditional fishing practices (Grigg 2001). More

recently, Grigg (2004) recommended that a reduction of MSY by 25%, or even 50%, seemed appropriate to conserve black coral resources in the Auau Channel bed. The OY for the Auau Channel analyzed in this document (5,000 kg every 2 years) is based on these estimates.

Since 1980, virtually all of the black coral harvested around the Hawaiian Islands has been taken from the Auau Channel Bed. Most of this harvest has been confined to State waters. Although a substantial part of this bed is located in the EEZ, the Hawaii Department of Land and Natural Resources estimates that about 85% of the black coral harvested is collected within three miles of the shoreline (DLNR 1979), perhaps because gear constraints have restricted divers for black coral to relatively shallow waters (75 m or less) (Grigg 2001). Amendment 4 to the FMP designated the Auau Channel as a habitat area of particular concern for the precious corals fishery because of the ecological function it provides, the rarity of the habitat type, and its sensitivity to human-induced environmental degradation. Its commercial importance was also considered.

According to a July 1998 assessment of the biological condition of the black coral in the Auau Channel, the age frequency distributions of sample populations in 1975 and 1998 are very similar (Grigg 2001). This suggests that harvesting during the intervening years has had no significant effect on recruitment. However, the black coral resources in other areas of State waters (for example, "Stonewall" off Lahaina, Maui) that are easily accessible with conventional SCUBA gear were intensely harvested in the 1970s and have not recovered significantly under the relatively light fishing pressure they are now experiencing. In 2004, the State of Hawaii Division of Aquatic Resources surveyed the black coral in the Auau Channel using Grigg's methods to collect age frequency distribution data and compare it with historical age frequency distribution data. Analysis of the survey seems to support Grigg's conclusion of diminished recruitment, however the cause of diminished recruitment is uncertain (Montgomery 2006 *in* WPRFMC 2006). The number of corals measured in this survey nearly doubled the sample size of previous survey efforts.

Black coral recruitment may be in competition with an invasive soft coral. *Carijoa riisei* or snowflake coral, was first observed in Hawaii (Pearl Harbor) in 1972. Snowflake coral is native to the western Atlantic Ocean and Caribbean and prefers relatively shallow water (>70 ft), hard substrata, and areas of moderate current flow. In a recent survey of the Auau Channel Bed by the Hawaii Undersea Research Laboratory using its Pisces submersible, *Carijoa* was observed overgrowing and killing up to 70% of the black coral trees at depth between 68-114 meters (Kahng and Grigg 2005). Although the fishery primarily harvests black coral at depths to 70 m (due conventional SCUBA safety concerns), the potentially devastating effect of snowflake coral combined with fishing pressure warrants further research on recruitment of black corals in the Auau Channel. A 2006 survey of the same area suggests that, in general, the higher incidence of overgrowth on larger colonies was consistent with previous surveys (Kahng 2006).

The introduction of new coral harvesting technology also may impact black coral resources (Grigg 1998a). To date, black coral in Hawaii has been hand harvested by a small group of divers using conventional SCUBA gear with compressed air. As noted above, the maximum depth to which divers using this gear can safely descend is less than 75 m. However, the mixed-gas diving methods and re-breathers enables SCUBA divers to dive to the maximum depth (about 110 m) at which colonies of black coral are known to occur. Other technological advances such as Global Positioning Systems (GPS) and the availability of multi-beam bathymetry maps to assist divers in harvesting black corals may have played a larger role.

The number of people participating in the commercial black coral fishery in Hawaii has typically been restricted to a small group of experienced divers because of the considerable danger involved in harvesting the coral. This select group has been getting smaller in recent years as veterans retire and no new divers take their place. There are fewer than three divers who have recently reported their catch to the State of Hawaii, although it is believed that there may be up to six divers who harvest black corals. Precious corals divers are not required to obtain a Federal permit, but the fishing vessel is required to be permitted. Currently, there is only one vessel which is Federally permitted to fish for precious corals. This attrition within the fishery may limit the quantity of black coral harvested.

3.1.3 Maximum Sustainable Yield

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

Alternatively, the Gulland (1969) method to estimate MSY is especially useful for gold and bamboo coral, where information on population dynamics is lacking. MSY is 40% of the natural mortality rate times virgin stock biomass (estimated from the product of area of the bed, average colony density and weighted average weight of a virgin colony: MSY = 0.4 x M x B). The mortality rate for pink coral (M=0.066) is used as a proxy for other species. However, with recent research on gold corals using radio-carbon dating methods to determine population dynamics, this assumption is being questioned.

The MSY for pink, gold and bamboo corals from the six beds in the Hawaii EEZ is about 3,000 kg/yr. It is likely that, at least while the fishery develops, the MHI will be the area most heavily fished. The harvest quota for the Makapuu Bed is 2,000 kg for a 2 year period. A recent resurvey, which used a newer technology enabling deeper dives, found the Makapuu Bed to be about 15% larger than previously estimated (Grigg 1997). MSY for conditional beds has been extrapolated, based on size, by comparison with that of the established beds. Amendment 2 set harvest quotas at 1,000 kg/yr each for American Samoa, Guam, CNMI and the PRIA (exploratory areas). No quotas have been determined for species of black corals.

The 1997 resurvey, by NOAA's Hawaii Underwater Research Laboratory, used a manned submersible to assess the extent to which the precious corals at the Makapuu Bed had recovered since the bed was last harvested over 20 years ago (Grigg 1997). The number of transects of the Makapuu Bed made during the assessment was limited, and only a small area of the bed was surveyed. Based on the data obtained, it was concluded that the precious corals bed may be at least 15 percent larger than was indicated by previous surveys. The survey also showed that the recovery of pink coral has increased from 74 percent of the virgin biomass in 1978 to 90 percent in 1997. This finding supports the supposition that recruitment of pink coral is unaffected by harvesting and independent of the density of the standing stock. However, the assessment found that gold coral at the Makapuu Bed may have experienced little or no recruitment. During the survey only two or three colonies of gold coral were observed. The number of transects of the

Makapuu Bed made during this assessment was too limited to determine if the stock of gold coral was in an overfished condition, but the data collected suggest that the level of recruitment of gold coral at the Makapuu Bed has been low. However, it is uncertain if the current scarcity of gold coral colonies at the bed was caused by earlier harvests. At present, there is still insufficient information on the biology of gold coral to quantify the impacts of harvesting on the recruitment of these coral species.

In 2000, the harvest quota for gold coral at the Makapuu Bed was suspended by the Council until additional information becomes available on the impact of harvesting on subsequent recruitment of gold coral at the Makapuu Bed. The benefits of this management measure cannot be quantified due to the poor understanding of the biology and population dynamics of gold coral. Suspending the quota for gold coral at Makapuu Bed is a precautionary measure expected to increase the probability that a recovery in the number of gold coral colonies at the Makapuu Bed eventually occurs.

The present status of the Auau Channel bed, the major black coral bed in Hawaii that is currently being commercially harvested, can be described as good, particularly with regard to levels of recruitment. An assessment of the biological condition of the black coral beds in the Auau Channel was conducted in 1998 (Grigg 1998a). The age frequency distributions of sample populations in 1975 and 1998 are very similar, suggesting that harvesting during the intervening years has had no significant effect on recruitment. However, more accessible black coral resources in other areas of state waters (for example, "Stonewall" off Lahaina, Maui) that were intensely harvested in the 1970s have not recovered significantly.

Scientific surveys have also identified a significant new bed at Cross Seamount. In addition, the Keahole Point Bed was found to be four times larger than its previously known size. The Kaena Point Bed, conversely, was found to be smaller than anticipated (R. Grigg pers. comm. 2000. Univ. HI).

The current minimum size limit for black coral prevents the harvest of colonies which are immature and have not reached their full potential for growth, thereby reducing the potential for overfishing to occur. Black coral colonies reach sexual maturity at 10 to 12.5 years of age, corresponding to a tree height of 25 to 31 inches (Grigg 1976). A coral colony that has attained a required height of 48 inches or basal stem diameter of 1 inch corresponds to an age of about 20 years, which is approximately 8 to 10 years after black coral colonies reach sexual maturity. Hence, the size limit provides a reproductive cushion (the difference between age at reproductive maturity and the age at first capture) for recruitment and reduces the risk of overfishing black coral resources.

3.2 Non-target Species

Little to no catches of non-target species occurs in the Western Pacific Region's precious coral fisheries. Prior to 1976, foreign fisheries utilized non-selective dredges and tangle nets. However, the FMP requires the use of selective gear to harvest corals from any precious corals permit area. Selective gear means any that can discriminate or differentiate between type, size, quality, or characteristics of living or dead corals. Black coral are hand harvested with SCUBA gear, and deep-water species of precious corals have been harvested using manned submersibles or remotely-operated vehicles (ROVs). The use of manned submersibles is a highly selective method of harvest. Minimal bycatch is also expected with the use of ROVs, although the ROV tether may damage precious corals if not carefully tended.

3.3 Western Pacific Region Precious Coral Fisheries

Most of the information in this section pertains only to the black coral fishery occurring in Auau Channel off Maui (see Figure 3), as currently, it is the only fishery harvesting precious corals management unit species in the EEZ (with the majority of harvest occurring in State of Hawaii waters). In 2001, American Marines Services Group received federal permits to harvest deep-water precious corals at the Makapuu Bed and in the Hawaii Exploratory Area. The company did not renew its permit, and the harvest levels from its operation can not be reported here because of data confidentiality requirements. In 2007, less than 3 fishermen have applied for and received federal permits to fish for precious corals in Hawaii. No precious corals harvester has received a federal permit to fish in EEZ waters surrounding American Samoa, Guam, CNMI or the PRIA since the implementation of the FMP in 1980.

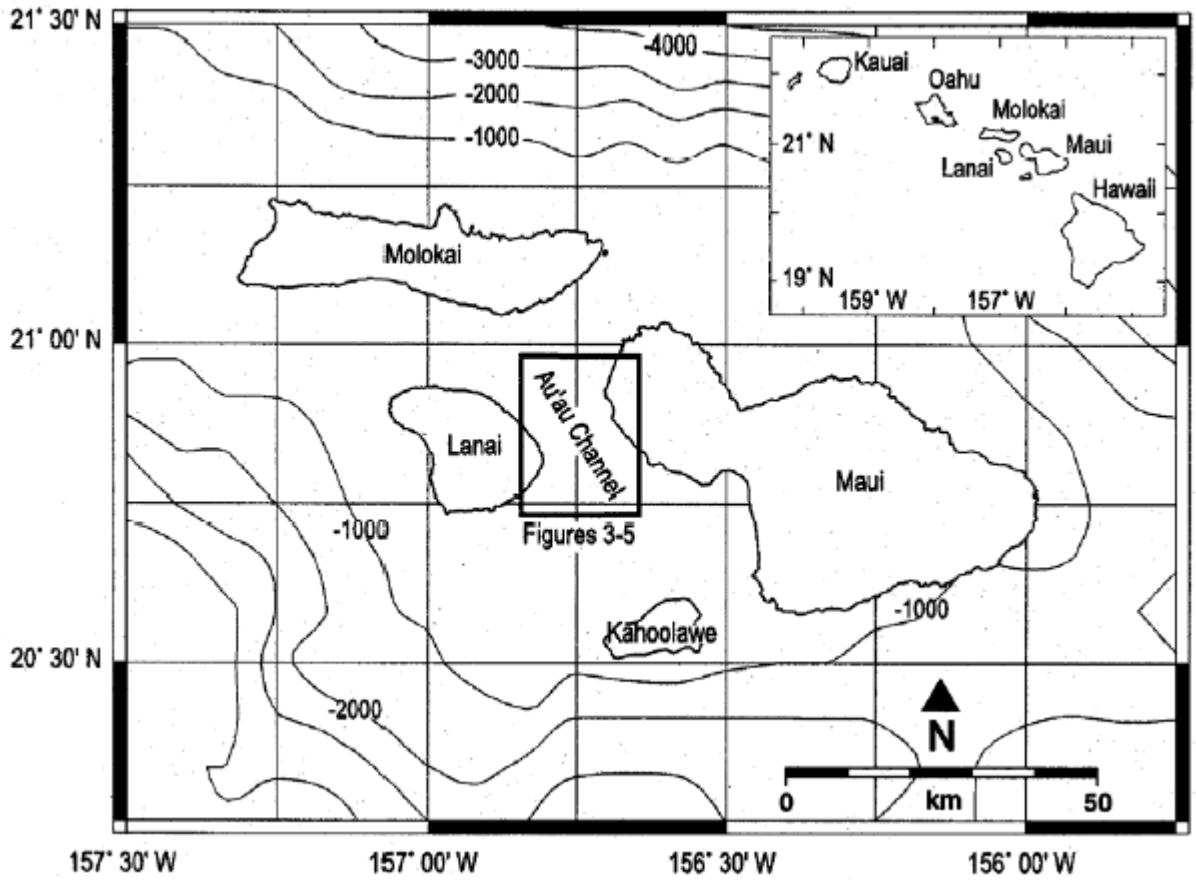


Figure 3: Map of the Auau Channel

3.3.1 Harvests

Between 1990 and 1997, the annual harvest of black coral in Hawaii varied from a low of 864 lb to a high of 6,017 lb, with a yearly average of 3,084 lb. As noted above, the harvest of black coral has occurred mainly in State of Hawaii waters. Table 6 provides historical landings and value of the black corals harvest between 1990-1997. Annual landings and value of the black corals recently harvested in Hawaii cannot be presented due to the State of Hawaii's statutory data confidentiality requirements. However, black coral fishery landings from 1985-2005 were aggregated into seven year bins that included multiple fishers to meet the confidentiality policy. During this time period, black coral landings overall increased, with the bulk of the landings occurring in the last seven years. It is believed that the majority, if not all, of the catch is caught

from the Auau Channel (WPRFMC 2006). The landings from that period of 1999-2005 were more than double the previous time period (see Figure 4).

Black coral harvesters employ selective methods when harvesting black corals. Divers use SCUBA gear to reach the black coral resource. Hand held tools are used to remove the black coral from its base rock and float bags are used to bring the harvested black coral to the surface.

In 1988, the domestic fishing vessel *Kilauea* used a tangle net dredge to harvest beds at Hancock Seamount. The owners of the *Kilauea* received a federal Experimental Fishing Permit that allowed them to collect an amount of precious corals in excess of the harvest quotas that had been established by the Council in 1980. However, their catch consisted mostly of dead or low quality pink coral, and the operation was soon discontinued (Grigg 1993). The only other domestic harvests on non-black precious corals since the inception of the FMP have been from the Makapuu Bed. The harvest levels of this operation cannot be reported here due to data confidentiality policies. The operation did not renew its permit and is no longer participating in the fishery.

Table 6: Weight and Value of Black Coral Landings in Hawaii (1990-97)

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

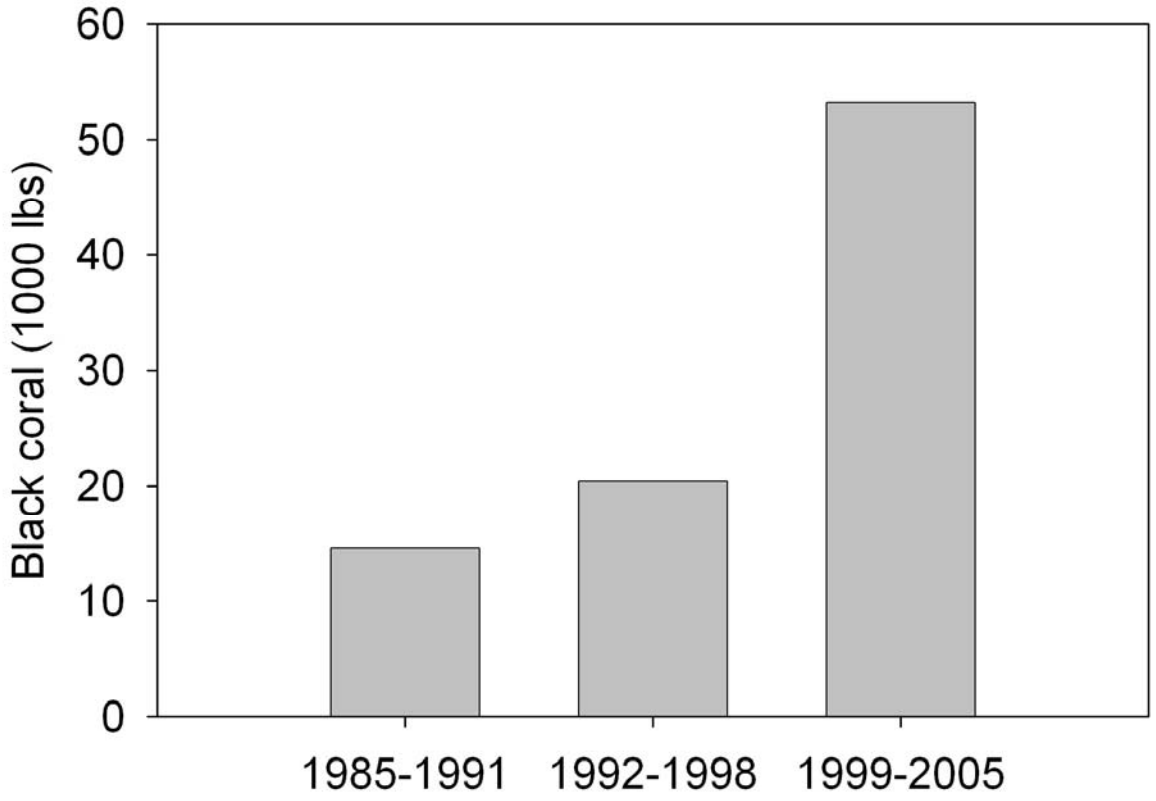


Figure 4: Weight of Black Coral Landed in Hawaii, 1985-2005.
Source: WPRFMC 2006

3.3.2 Participation

Since the inception of the black coral fishery in Hawaii in the late 1950s, generally fewer than ten individuals have been active in the fishery at any one time. Participation has probably been limited by the relatively small market for black coral in Hawaii and the extreme physical danger of harvesting operations. In 2007, there were less than three active commercial black coral harvesters in Hawaii reporting their catch to the State of Hawaii, and one vessel which was federally permitted to harvest precious corals.

There are currently no permitted operations for gold corals in the Western Pacific Region.

3.3.3 Markets

The naming of black coral as the Hawaii state "gem" in 1987 increased consumer interest in this precious coral (Grigg 1993). However, the quantity of black coral required by jewelry manufactures 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 and Philipson 1987). In addition, inexpensive black coral imported from the Philippines and elsewhere fills the demand for low quality, high volume jewelry products. Maui Divers of Hawaii, Inc., the leading manufacturer and retailer of precious corals jewelry in Hawaii, buys exclusively black coral harvested in the state.

In the past, the market for colonies of black coral small enough to fit inside the typical curio display case or household aquarium was small in comparison to the market for larger trees that are processed for jewelry (Oishi 1990). According to the Hawaii Division of Aquatic Resources, however, the demand for small, immature black coral colonies has increased with the growing popularity of household marine aquaria.

The worldwide glut of *Corallium* produced during the boom years of the early 1980s caused the market value of pink coral to fall even below breakeven prices for Taiwanese and Japanese coral fishermen (Grigg 1993). Consequently, many fishermen dropped out of the fishery and the worldwide supply of deep-water precious corals has dwindled. For the past 20 years Hawaii businesses engaged in the manufacture of deep-water precious corals jewelry have relied on local stockpiles of gold coral and imports of pink coral from foreign suppliers. Prices for precious corals have gradually increased, and specimens of the highest quality pink coral currently sell for $5,000/lb in international auctions. However, changes in the jewelry industry during the past decade may have diminished the demand for precious corals. Products such as black pearls have captured a substantial share of the market formerly held by precious corals (C. Marsh pers. comm. 2000 Maui Divers of Hawaii, Inc., Honolulu). The precious corals jewelry industry in Hawaii has been estimated to be worth up to $70 million statewide (WPRFMC 2006).

3.4 Protected Species

Protected species are considered to include those species listed as endangered or threatened under the Endangered Species Act (ESA), all marine mammals and all seabirds.

3.4.1 Marine Mammals

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

Listed Cetaceans

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

Although these whales may be found within the action area and could interact with the U.S. fisheries of the Western Pacific Region, no reported or observed interactions of these species have occurred in the precious corals fishery. Direct impacts could occur from routine vessel operations such as a low-level risk of behavioral disturbances, collisions, or entanglements with in fishing gear (e.g. tending lines associated with ROV operations, other lines used in the fishery, etc), however no such impacts have been reported or observed.

In a 1996 Biological Opinion, NMFS determined that the precious corals fishery did not jeopardize the continued existence of the listed cetaceans that occur in the Western Pacific Regions. Due to the required use of selective harvesting gear and the nature of recent fishery operations, interactions between listed cetaceans and precious coral fisheries operations are not expected.

Other Cetaceans

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

Blainsville beaked whale *(Mesoplodon densirostris*)
Bottlenose dolphin (*Tursiops truncatus)*
Bryde's whale (*Balaenoptera edeni*)
Common Dolphin (*Delphinus delphis*)
Cuvier's beaked whale (*Ziphius cavirostris*)
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)*
Pygmy killer whale (*Feresa attenuata*)
Pygmy sperm whale (*Kogia breviceps*)
Risso's dolphin *(Grampus griseus*)
Rough-toothed dolphin (*Steno bredanensis*)
Short-finned pilot whale (*Globicephala macrorhynchus*)
Spinner dolphin (*Stenella longirostris*)
Spotted dolphin (*Stenella attenuata*)
Striped dolphin (*Stenella coeruleoalba*)
Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)

Although the species listed above may be found within the action area and could interact with precious corals fisheries in the Western Pacific Region, there have been no reported or observed interactions between these species and the precious corals fisheries. Due to the requirement for the use of selective harvesting gear and the nature of recent fishery operations (i.e. harvest is conducted using hand held tools or submersibles), there is no current expectation of future interactions between these species and the precious corals fisheries.

Listed Pinniped: The Hawaiian Monk Seal

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

Under the ESA, critical habitat may be designated to afford protection or special management consideration to physical or biological features essential to the conservation of a listed species. In May 1988, NMFS designated critical habitat for the Hawaiian monk seal out from shore to 20 fathoms in 10 areas of the Northwestern Hawaiian Islands. Critical habitat for this species includes "all beach areas, sand spits and islets, including all beach crest vegetation to its deepest extent inland, lagoon waters, inner reef waters, and ocean waters out to a depth of 20 fathoms

around the following: Pearl and Hermes Reef, Kure Atoll, Midway Islands, except Sand Island and its harbor, Lisianski Island, Laysan Island, Maro Reef, Gardner Pinnacles, FFS, Necker Island, and Nihoa Island" (53 FR 18990, May 26, 1988, 50 CFR § 226.201).

Critical habitat was designated in order to enhance the protection of habitat used by Hawaiian monk seals for pupping and nursing, areas where pups learn to swim and forage, and major haul-out areas where population growth occurs.

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

The Hawaiian monk seal breeds only in the Hawaiian Archipelago, with most monk seals inhabiting the remote, largely uninhabited atolls and surrounding waters of the NWHI. More than 90 percent of all pups are born at six major breeding colonies located at French Frigate Shoals, Laysan Island, Pearl and Hermes Reef, Lisianski Island, Kure Atoll and Midway Atoll. A few births also occur annually at Necker, Nihoa, and Niihau Islands and increasingly in the main Hawaiian Islands. NMFS researchers have also observed Hawaiian monk seals at Gardner Pinnacles and Maro Reef. Although Hawaiian monk seals occasionally move between islands, females generally return to their natal colony to pup. Since 1990, there has been an apparent increase in the number of Hawaiian monk seal sightings and births in the main Hawaiian Islands (HMSRT 1999; Johanos 2000). A 2001 aerial survey determined a minimum abundance of 52 seals in the MHI (Baker and Johanos, in press). Additional sightings and at least one birth have occurred at Johnston Atoll, including eleven adult males that were translocated to Johnston Atoll (nine from Laysan Island[1] and two from FFS) over the past 30 years.

Hawaiian monk seals feed on a wide variety of teleosts, cephalopods and crustaceans, indicating that they are highly opportunistic feeders (Rice 1964; MacDonald 1982; Goodman-Lowe 1998). Research to identify prey species has been conducted using several methods: collection of potential prey items and blubber samples for fatty acid analysis; Crittercam[2] recording of

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

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

foraging behavior; correlation of dive/depth/location profiles with potential prey species habitat; and analysis of Hawaiian monk seal scat and spew samples for identifiable hard parts of prey. To date, completed studies indicate that Hawaiian monk seals prey upon diverse array of prey items, with no single species being the most significant to the continued existence of the Hawaiian monk seal.

An ongoing NMFS study using quantitative fatty acid signature analysis to identify which prey items are most important to the various age and sex components of the several island populations of Hawaiian monk seals has revealed similar results to that of Goodman-Lowe (1998). The study indicates that monk seals are opportunistic feeders that prey upon a variety of species (Iverson 2000).

Information on the foraging activities of Hawaiian monk seals is available through the analysis of dive/depth/location profiles correlated with the habitat of potential prey families. In 2000 Parrish et al. (2002) concluded that Hawaiian monk seals may forage in beds of gold coral, which may serve as habitat for prey. Monk seals were observed (satellite telemetry) to focus dives in areas where precious corals occurred. This prompted a hypothesis that patches of precious corals serve as shelter and aggregate seal prey. However, subsequent research by Parrish et al. (2006) found that although greater fish numerical density occurred in areas with gold coral, when the known effects of bottom relief, and depth are accounted for, the relationship with gold coral loses statistical significance.

There have been no reported or observed interactions between monk seals and precious corals fisheries in the Western Pacific Region. Fishery operations are conducted using hand held tools or submersibles that would not cause a hooking or entanglement.

3.4.2 Sea Turtles

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

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

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

The loggerhead turtle is a cosmopolitan species found in temperate and subtropical waters and inhabiting continental shelves, bays, estuaries and lagoons. Major nesting grounds are generally

located in warm temperate and subtropical regions, generally north of 25°N or south of 25°S latitude in the Pacific Ocean. For their first several years of life, loggerheads forage in open ocean pelagic habitats. Both juvenile and subadult loggerheads feed on pelagic crustaceans, mollusks, fish and algae. As they age, loggerheads begin to move into shallower waters, where, as adults, they forage over a variety of hard and soft bottom habitats.

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

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

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

There have been no reported or observed interactions between sea turtles and precious corals fisheries in the Western Pacific Region. Fishery operations are conducted using hand held tools or submersibles that would not cause a hooking or entanglement.

3.4.3 Seabirds

The NWHI provide most of the nesting habitat for more than 14 million Pacific seabirds. More than 99% of the world's Laysan albatross (*Phoebastria immutabilis*) and 98% of the world's black-footed albatross (*P. nigripes*) return to the NWHI to reproduce. Of the numerous species of seabirds recorded in the Western Pacific Region, only the short-tailed albatross (*P. albatrus*) is listed as endangered under the ESA. The short-tailed albatross population is the smallest of any of the albatross species occurring in the North Pacific. Land-based sighting records indicate that 15 short-tailed albatrosses have visited the NWHI over the past 60 years. Five of these visits were between 1994 and 1999 (NMFS 1999). Short-tailed albatrosses have not been observed elsewhere in the Western Pacific Region.

There have been no reported or observed interactions between seabirds and precious corals fisheries in the Western Pacific Region. Fishery operations are conducted using hand held tools or submersibles that would not cause a hooking or entanglement.

3.5 Essential Fish Habitat

The MSA identifies essential fish habitat (EFH) as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. This includes the marine and aquatic areas and their chemical and biological properties that are utilized by the organism. Substrate

includes sediment, hard bottom, and other structural relief underlying the water column along with their associated biological communities.

NMFS produced guidelines to assist in the implementation of the EFH requirements of the MSA. These guidelines state that the quality of the available data should be rated using a four level system as follows:

- Level 1: All that is known is the occurrence of a species based on distribution data for all or part of the geographic range of the species.
- Level 2: Data on habitat related densities or relative abundance of the species where available.
- Level 3: Data on growth, reproduction, or survival rates within habitats where available.
- Level 4: Data on production rates by habitat.

At present there are not enough data on relative productivity of various habitats for precious corals within the region to develop EFH designations based on Level 2, 3 or 4 data.
The designation by the Council of EFH for precious corals (Table 7) was based on the best available scientific information, which was obtained through an iterative process consisting of a series of public meetings, and through scientific, industry, and FMP panel meetings. In addition, the Council worked in close cooperation with scientists from the NMFS Southwest Fisheries Science Center, PIFSC, PIRO, and the NMFS Southwest Region Office (WPRFMC 1998). Careful judgment was used in determining the extent of EFH that should be designated to ensure that sufficient habitat in good condition is available to maintain a sustainable fishery and the managed species contribution to a healthy ecosystem. Because there are large gaps in scientific knowledge about life histories and habitat requirements of many of the managed species in the Western Pacific Region, the Council adopted a precautionary approach to ensure that enough habitat is protected to sustain the managed species. Under this precautionary approach, the Council designated the six previously known beds as EFH for precious corals. The FFS-Gold Pinnacles Bed was undiscovered at the time of the designations. Additionally, three black coral beds in the MHI are designated as EFH: - a bed between Milolii and South Point off the Island of Hawaii, a bed in the Auau Channel between Maui and Lanai; and a bed off the southern coast of Kauai.

The Council also designated HAPC based on the following criteria: ecological function of the habitat, sensitivity to anthropogenic degradation, development activities and stresses, or habitat rarity. Three of the six beds in the Hawaiian Archipelago are designated as HAPC - Makapuu, Westpac, and Brooks Bank. These three were designated as HAPC because of the ecological function they provide, the rarity of the habitat type, and their possible importance as monk seal foraging habitat. An additional area, the Auau Channel, was designated as HAPC for black coral because of its ecological function, the rarity of the habitat type, and its sensitivity to human-induced environmental degradation.

Table 7: Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for all Western Pacific FMPs

FMP	EFH (Juveniles and Adults)	EFH (Eggs and Larvae)	HAPC
Pelagics	Water column down to 1,000 m	Water column down to 200 m	Water column down to 1,000 m that lies above seamounts and banks
Bottomfish and Seamount Groundfish	Water column and bottom habitat down to 400 m	Water column down to 400 m	All escarpments and slopes between 40-280 m, and three known areas of juvenile *opakapaka* habitat
Precious Corals	Keahole Point, Makapuu, Kaena Point, Westpac, Brooks Bank, 180 Fathom Bank deep water precious corals beds and Milolii, Auau Channel and S. Kauai black coral beds	Not applicable	Makapuu, Westpac, and Brooks Bank deep water precious corals beds and the Auau Channel black coral bed
Crustaceans	Bottom habitat from shoreline to a depth of 100 m	Water column down to 150 m	All banks within the NWHI with summits less than 30 m
Coral Reef Ecosystem	Water column and benthic substrate to depth of 100 m from shoreline to outer limit of EEZ	same	All No-take MPAs in CREFMP, coral reef areas of NWHI, MHI, AS, CNMI, Guam, and the PRIAs

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

The above table describes EFH and HAPC for all managed FMPs in the Western Pacific Region. In order to refine EFH and HAPC designations additional research is needed to identify and evaluate actual and potential adverse effects on EFH, including, but not limited to direct physical alteration, impaired habitat quality/functions, and cumulative impacts from fishing. The continuation of the current precious corals fishing management regime would not adversely affect EFH or HAPC for any managed species, as it is not likely to lead to substantial physical, chemical or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey.

4.0 IMPACTS OF THE ALTERNATIVES

4.1 Issue A: Auau Channel Black Coral Harvest Quota

4.1.1 Alternative A1: No Action

Target Species

Under this alternative, a potential risk of overfishing black coral in the Auau channel would remain, as currently there is no harvest quota for this area. Auau Channel black coral would

continue to be regulated through the use of minimum sizes and a prohibition on the use of non-selective gear. If *Carijoa riisei* continues to expand, or if harvesters move to deeper depths, or more participants enter the fishery, these measures may be inadequate to prevent overfishing.

Non-Target Species
A variety of invertebrates and fish are known to utilize the same habitat as precious corals. However, there is no evidence that these species or others significantly depend on precious corals for shelter or food. In addition, under the existing FMP only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. For these reasons, this alternative would have minimal impacts on non-target species or their habitat.

Protected Species
Cetaceans
There have been no reported or observed interactions between marine mammals and the precious corals fishery in the region. The potential impacts on the Hawaiian monk seal are discussed below. There could be some impact on marine mammals from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be extremely rare and therefore constitute a low-level risk to marine mammals. The black coral fishery is comprised of a few fishermen (Section 3.3.2) who use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Cetaceans (Section 3.4.1). Under this alternative, this extremely low-level risk to marine mammals would remain.

Hawaiian Monk Seal
As described above, monk seals have been observed diving to depths where gold corals and other deep-water organisms occur (> 100 m) however there is no evidence that any precious corals are important to monk seal foraging. There could be some impact from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to monk seals. The black coral fishery is comprised of a few fishermen (Section 3.3.2) who use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Hawaiian monk seals (Section 3.4.1). Under this alternative, this extremely low-level risk to monk seals would remain.

Sea Turtles
There have been no reported or observed interactions between sea turtles and precious corals fisheries in the region. There could be some impact on sea turtles from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to sea turtles. The black coral fishery is comprised of a few fishermen (Section 3.3.2) who use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Sea Turtles (Section 3.4.3). Under this alternative, this extremely low-level risk to sea turtles would remain.

Seabirds
The precious corals fishery relies on selective harvesting gear (hand harvest and submersibles) which is not likely to result in any interactions with seabirds, and no such interactions have been reported or observed. The black coral fishery is comprised of a few fishermen (Section 3.3.2) who use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to

Sea Birds (Section 3.4.2). Consequently, this alternative is not expected to impact any seabirds species that occur in the region.

Essential Fish Habitat
Under NMFS' guidelines, impacts of an action must consider the EFH and HAPC of all managed species in the region (Table 7). Therefore, the impact of the precious corals fishery under this alternative must also consider EFH and HAPC of species managed under the respective Pelagics, Bottomfish, Crustaceans, and Coral Reef Ecosystem FMPs. EFH or HAPC in the Western Pacific Region fall under two categories: either the water column above the ocean bottom, or the ocean bottom itself. Water column EFH and HAPC have been designated for pelagic, bottomfish and crustacean MUS. Precious corals fishing activities do not directly impact the water column.

Indirect impacts to water column EFH or HAPC potentially could occur through pollutant discharges from precious corals fishing vessels. The day-to-day operations of a fishing vessel can produce a number of waste products, including oil, sewage and garbage that, if handled improperly, could affect marine habitat (WPRFMC 1998). However, vessels potentially engaging in the precious corals fishery are generally sophisticated motherships that must be able to support submersible operations. The crews on these large ships are highly-trained and tend to be drawn from high-tech marine industries rather than from traditional fisheries (WPRFMC 1998). It could be expected that regulatory awareness and the capacity to implement pollution mitigation measures would be greater for these operations than for many other types of fishing operations.

Areas of ocean bottom have been designated EFH and HAPC for precious corals, crustaceans bottomfish, and coral reef ecosystem MUS. Allowing only selective gear for the harvest of precious corals minimizes adverse impacts on benthic habitat and other living components of the ecosystem. A variety of invertebrates and fish are known to utilize the same habitat as precious corals. These species of fish include *onaga* (*Etelis coruscans*), *kāhala* (*Seriola dumerallii*) and the shrimp *Heterocarpus ensifer*. However, there is no evidence that these species depend on the coral for shelter or food.

Anchor damage can occur to coral reefs and other types of bottom habitat from vessels attempting to maintain position over productive fishing areas. It is not expected that vessels engaged in harvesting of precious corals will routinely anchor in shallow waters.

The accidental grounding of fishing boats can also adversely affect coral reefs and other types of bottom habitat. The impact of a vessel striking the bottom could physically destroy coral colonies in the immediate area, and the possible subsequent break-up of the vessel and release of fuel and oil can result in pollution of habitat and mortality of marine life. Since the harvest of precious corals occurs in deep waters, the likelihood of accidental grounding is unlikely.

Under this alternative, the continuation of the current precious corals fishing management regime would not adversely affect EFH or HAPC for any managed species, as it is not likely to lead to substantial physical, chemical or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey.

Commercial, Recreational and Charter Fishing Sectors
The impact of a no action alternative on the commercial precious corals fishery is uncertain. Continued harvests of black coral under existing FMP measures may be unsustainable and could ultimately lead to a costly fishery closure while the resources were rebuilt.

The charter and recreational fishing sectors would not be affected under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy
If continued Auau Channel black coral harvest under existing FMP measures proves to be unsustainable, more restrictive regulations could be put in place which would result in negative economic impacts. Hawaii's black coral industry has been valued at $70 million at the retail level (WPRFMC 2006) and local production of black coral is an important part of Hawaii's fishery sector.

Fishing Community
No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the number of participants in the black coral fishery off Maui is very small (3), and they do not constitute a fishing community under MSA.

Environmental Justice
Alternative 1 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the black coral fishing community would be equally affected.

Climate Change
There are no anticipated impacts from global climate change on the outcome of Alternative 1. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The limited number of vessels that participate in the fishery and the black coral fishing operations do not have significant impacts on local or global climate change.

4.1.2 Alternative A2: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the entire bed (Preferred Alternative)

The Council chose this alternative as the preferred because this option will protect the black coral resources in the Auau Channel from overfishing (National Standard 1) while allowing a currently healthy fishery to continue to operate sustainably. It was also chosen over Alternative A3 because it manages the stock across its range as mandated by National Standard 3.

Target Species
As compared to the no action alternative, under this alternative the potential risk of overfishing black corals in the Auau channel would be reduced as implementation of a harvest quota would allow immediate closure of the entire bed upon reaching that quota. This quota (5,000 kg every 2 years (11,023 lb every 2 years)) appears to be significantly lower than recent harvests and would thus reduce fishing pressure on these resources. For this alternative to be effective, the entire bed would need to be managed by the quota and the State of Hawaii would need to

implement complementary regulations in State waters of the Auau Channel as most of the harvest comes from their waters. The State of Hawaii did agree to work on complementary regulations and the inclusion of State waters in a black coral fishery quota at the 136th Council Meeting. The State of Hawaii, Dept. of Land and Natural Resources, Division of Aquatic Resources (HDAR), is currently developing a regulatory package that would increase the minimum size of take to be congruent with federal regulations as well as designating no-take areas for black coral. In addition, HDAR is currently seeking statutory authority via the State legislature to allow a black coral fishery quota to be established for the Auau Channel (D. Polhemus, 2008, HDAR, personal communication).

Non-Target Species
This alternative would have little to no impact on non-target species as only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. Reduction in the harvest of black coral resulting from the implementation of the harvest quota would not be anticipated to appreciably impact non-target species. Identification of the Auau Channel black corals as an Established Bed would be an administrative action that would not be anticipated to have any impacts on non-target species.

Protected Species
As compared to the no action alternative, no additional negative impacts to protected species would be anticipated under this alternative because this alternative would not lead to changes in fishing operations or to increased fishing effort. However, additional beneficial impacts may result due to less effort and thereby less potential for interaction with protected species. The black coral fishery is comprised of a few fishermen (Section 3.3.2) who use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to protected species (Section 3.4).

Essential Fish Habitat
As compared to the no action alternative, this alternative would not be anticipated to increase the impacts to EFH or HAPC as it would decrease fishing effort and not lead to changes in fishing operations.

Commercial, Recreational and Charter Fishing Sectors
As compared to the no action alternative, in the short-term this alternative would likely reduce the harvests of some commercial fishery participants in the Auau channel black coral fishery if the harvest quota is reached and the fishery is closed. Based on harvest and sales reports by fishery participants, it is believed that they have a significant inventory of black coral which has been harvested but not yet sold. In the short to medium-term this may provide some income to fishery participants following the closure of the Auau Channel if and when the two-year harvest guideline is reached. However this will not be additional or compensatory income as it will derive from the sale of existing inventory. In the long-term, keeping harvests below the harvest quota would contribute to the maintenance and sustainability of the fishery and avoid long term fishery closures that could result from overfishing. The charter and recreational fishing sectors would not be affected under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy
As compared to the no action alternative, in the short-term this alternative would reduce the

harvests of black coral and thus have the potential to adversely affect the regional economy. As described above, it is believed that current fishery participants have a significant inventory of black coral which is likely to be sold during times when the fishery is closed following the harvest of the two-year harvest guideline. If this is the case, the flow of black coral to the market may be relatively unaffected. In the long-term, this alternative would have a positive impact on the regional economy by contributing to the maintenance of a sustainable and profitable black coral fishery.

Fishing Community
No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the number of participants in the black coral fishery off Maui is very small (3), and they do not constitute a fishing community under MSA

Environmental Justice
Alternative 2 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the black coral fishing community would be equally affected.

Climate Change
There are no anticipated impacts from global climate change on the outcome of Alternative 3. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The limited number of vessels that participate in the fishery and the black coral fishing operations do not have significant impacts on local or global climate change.

4.1.3 Alternative A3: Designate the Auau Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every 2 years (11,023 lb every 2 years) for the Federal waters only.

Target Species
As compared to the no action alternative, under this alternative the potential risk of overfishing black corals in the Auau channel would be reduced as implementation of a harvest quota would allow immediate closure of the entire bed upon reaching that quota. This quota (5,000 kg every 2 years (11,023 lb every 2 years)) appears to be significantly lower than recent harvests and would thus reduce fishing pressure on these resources. The quota would only apply to Federal waters and would likely be relatively ineffective given that most of the harvest comes from State waters.

Non-Target Species
This alternative would have little to no impact on non-target species as only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. Reduction in the harvest of black coral resulting from the implementation of the harvest quota would not be anticipated to appreciably impact non-target species. Identification of the Auau Channel black corals as an Established Bed would be an administrative action that would not be anticipated to have any impacts on non-target species.

Protected Species
As compared to the no action alternative, no additional negative impacts to protected species would be anticipated under this alternative because this alternative would not lead to changes in fishing operations or to increased fishing effort. However, additional beneficial impacts may result due to less effort and thereby less potential for interaction with protected species. The black coral fishery is comprised of a few fishermen (Section 3.3.2) who use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to protected species (Section 3.4).

Essential Fish Habitat
As compared to the no action alternative, this alternative would not be anticipated to increase the impacts to EFH or HAPC as it would decrease fishing effort and not lead to changes in fishing operations.

Commercial, Recreational and Charter Fishing Sectors
As compared to the no action alternative, in the short-term this alternative would not likely reduce the harvests of commercial fishery participants in the Auau channel black coral fishery as most of the harvest comes from State waters. The charter and recreational fishing sectors would not be affected by under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy
As compared to the no action alternative, in the short-term this alternative would not likely reduce the harvest, as most of the harvest comes from State waters, thus maintaining the current regional economy. In the long-term, it would have a negative impact on the regional economy because the black coral harvest in State waters, where the fishery primarily is conducted, is not regulated and could endanger the sustainability of the fishery. Long term fishery closures resulting from this would negatively impact the regional economy.

Fishing Community
No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the number of participants in the black coral fishery off Maui is very small (3), and they do not constitute a fishing community under MSA

Environmental Justice
Alternative 3 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the black coral fishing community would be equally affected.

Climate Change
There are no anticipated impacts from global climate change on the outcome of Alternative 3. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The limited number of vessels that participate in the fishery and the black coral fishing operations do not have significant impacts on local or global climate change.

4.2 Issue B: Western Pacific Region Gold Coral Moratorium

4.2.1 Alternative B1: No Action

Target Species
Under this alternative, a potential risk of overfishing gold coral would remain as new scientific information regarding the growth rates of gold coral has brought the sustainability of the region's existing quotas under question. Under this alternative, any future harvests of gold coral would continue to be regulated through the existing quotas and prohibition on the use of non-selective gear.

Non-Target Species
A variety of invertebrates and fish are known to utilize the same habitat as precious corals. However, there is no evidence that these species or others significantly depend on precious corals for shelter or food. In addition, under the existing FMP only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. For these reasons, this alternative would have minimal impacts on non-target species or their habitat.

Protected Species
Cetaceans
There have been no reported or observed interactions between marine mammals and the precious corals fishery in the region. The potential impacts on the Hawaiian monk seal are discussed below. There could be some impact on marine mammals from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be extremely rare and therefore constitute a low-level risk to marine mammals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Cetaceans (Section 3.4). Under this alternative, this extremely low-level risk to marine mammals would remain.

Hawaiian Monk Seal
As described above, monk seals have been observed diving to depths where gold corals and other deep-water organisms occur (> 100 m) however there is no evidence that monk seal foraging is dependent upon gold corals. There could be some impact from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to monk seals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Hawaiian Monk Seals (Section 3.4). Under this alternative, this extremely low-level risk to monk seals would remain.

Sea Turtles
There have been no reported or observed interactions between sea turtles and precious corals fisheries in the region. There could be some impact on sea turtles from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to sea turtles. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Sea

Turtles (Section 3.4). Under this alternative, this extremely low-level risk to sea turtles would remain.

Seabirds

The precious corals fishery relies on selective harvesting gear (hand harvest and submersibles) which is not likely to result in any interactions with seabirds, and no such interactions have been observed or reported. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Seabirds (Section 3.4). Consequently, this alternative is not expected to impact any seabird species that occur in the region.

Essential Fish Habitat

Under NMFS' guidelines (Table 7), impacts of an action must consider the EFH and HAPC of all managed species in the region. Therefore, the impact of the precious corals fishery under this alternative must also consider EFH and HAPC of species managed under the respective Pelagics, Bottomfish, Crustaceans, and Coral Reef Ecosystem FMPs. EFH or HAPC in the Western Pacific Region fall under two categories: either the water column above the ocean bottom, or the ocean bottom itself. Water column EFH and HAPC have been designated for pelagic, bottomfish and crustacean MUS. Precious corals fishing activities do not directly impact the water column.

Indirect impacts to water column EFH or HAPC potentially could occur through pollutant discharges from precious corals fishing vessels. The day-to-day operations of a fishing vessel can produce a number of waste products, including oil, sewage and garbage that if handled improperly, could affect marine habitat (WPRFMC 1998). However, vessels potentially engaging in the precious corals fishery are generally sophisticated motherships that must be able to support submersible operations. The crews on these large ships are highly-trained and tend to be drawn from high-tech marine industries rather than from traditional fisheries. It could be expected that regulatory awareness and the capacity to implement pollution mitigation measures would be greater for these operations than for many other types of fishing operations.

Areas of ocean bottom have been designated EFH and HAPC for precious corals, crustaceans bottomfish, and coral reef ecosystem MUS. Allowing only selective gear for the harvest of precious corals minimizes adverse impacts on benthic habitat and other living components of the ecosystem. A variety of invertebrates and fish are known to utilize the same habitat as precious corals. These species of fish include *onaga* (*Etelis coruscans*), *kāhala* (*Seriola dumerallii*) and the shrimp *Heterocarpus ensifer*. However, there is no evidence that these species depend on the coral for shelter or food.

Anchor damage can occur to coral reefs and other types of bottom habitat from vessels attempting to maintain position over productive fishing areas. Due to the depths where precious corals are found, vessels do not routinely anchor while fishing for precious corals.

The accidental grounding of fishing boats can also adversely affect coral reefs and other types of bottom habitat. The impact of a vessel striking the bottom could physically destroy coral colonies in the immediate area, and the possible subsequent break-up of the vessel and release of fuel and oil can result in pollution of habitat and mortality of marine life. Since the harvest of precious corals occurs in deep waters, the likelihood of accidental grounding is unlikely.

Under this alternative, the continuation of the current precious corals fishing management regime would not adversely affect EFH or HAPC for any managed species, as it is not likely to lead to substantial physical, chemical or biological alterations to the habitat, or result in loss of, or injury to, these species or their prey.

Commercial, Recreational and Charter Fishing Sectors
The impact of this alternative on the commercial precious corals fishery is uncertain. Renewed harvests of gold coral measures may be unsustainable and could ultimately lead to fishery closures while the resources were rebuilt.

The charter and recreational fishing sectors would not be affected by under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy
The short-term impact of this alternative on the region's economy is uncertain because of the dormant and undeveloped status of the fishery. In the long-term, this alternative could have a positive impact on the regional economy by preserving opportunities for the future development of a sustainable and profitable gold coral fishery.

Fishing Community
No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the region's deep-water fishery is dormant.

Environmental Justice
Alternative B1 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the gold coral fishing community would be equally affected.

Climate Change
There are no anticipated impacts from global climate change on the outcome of Alternative B1. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The lack of vessels in the fishery and gold coral fishing operations do not have significant impacts on local or global climate change.

4.2.2 Alternative B2: Implement a five-year moratorium on live and dead gold coral harvests (Preferred Alternative)

The Council chose this alternative as the preferred because this option will protect gold coral resources in the Western Pacific from overfishing (National Standard 1) by closing the area to gold coral harvest while research is conducted to provide dependable growth rates and other life history information. It was also chosen over Alternative B3 because it provides clarity for enforcement personnel who would find it difficult to determine a harvested-dead coral tree from one that was harvested-alive. Alternative B2 also provides greater protection to the resource than Alternative B4 in the event that the current growth rates are deemed inadequate for management.

Target Species
As compared to the no action alternative, under this alternative the potential risk of overfishing gold corals would be removed for five years while further research into their growth rates is

conducted. Assuming that this issue is settled, at the end of that time appropriate quotas would be considered and implemented and the moratorium would be lifted. This would ensure that harvests of gold coral are sustainable and that overfishing does not occur.

Non-Target Species

A variety of invertebrates and fish are known to utilize the same habitat as precious corals. However, there is no evidence that these species or others significantly depend on precious corals for shelter or food. In addition, under the existing FMP only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. For these reasons, this alternative would have minimal impacts on non-target species or their habitat.

Protected Species

Cetaceans

There have been no reported or observed interactions between marine mammals and the precious corals fishery in the region. The potential impacts on the Hawaiian monk seal are discussed below. There could be some impact on marine mammals from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be extremely rare and therefore constitute a low-level risk to marine mammals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Cetaceans (Section 3.4). Under this alternative, this extremely low-level risk to marine mammals would remain for activities directed at non-gold corals during the five year moratorium and for activities directed at all precious corals after the moratorium.

Hawaiian Monk Seal

As described above, monk seals have been observed diving to depths where gold corals and other deep-water organisms occur (> 100 m) however there is no evidence that monk seal foraging is dependent upon gold corals. There could be some impact from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to monk seals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Hawaiian Monk Seals (Section 3.4). Under this alternative, this extremely low-level risk to monk seals would remain for activities directed at non-gold corals during the five year moratorium and for activities directed at all precious corals after the moratorium.

Sea Turtles

There have been no reported or observed interactions between sea turtles and precious corals fisheries in the region. There could be some impact on sea turtles from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to sea turtles. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Sea Turtles (Section 3.4). Under this alternative, this extremely low-level risk to sea turtles would remain for activities directed at non-gold corals during the five year moratorium and for activities directed at all precious corals after the moratorium.

Seabirds

The precious corals fishery relies on selective harvesting gear (hand harvest and submersibles) which is not likely to result in any interactions with seabirds, and no such interactions have been observed or reported. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Seabirds (Section 3.4). Consequently, this alternative is not expected to impact any seabird species that occur in the region.

Essential Fish Habitat

As compared to the no action alternative, this alternative would not be anticipated to have any additional impacts to EFH or HAPC as it would not lead to changes in fishing operations or increased fishing effort.

Commercial, Recreational and Charter Fishing Sectors

As compared to the no action alternative, in the short-term this alternative would adversely impact potential commercial harvesters of gold coral as it would prohibit all harvests of gold coral in the Western Pacific Region for five years. In the long-term, it would result in better specified gold coral quotas and thus maintain a sustainable fishery. The charter and recreational fishing sectors would not be affected under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy

In the short-term this alternative could have an adverse impact on the region's economy by prohibiting the harvest of gold coral for five years. In the long-term, this alternative would have a positive impact on the regional economy by preserving opportunities for the future development of a sustainable and profitable gold coral fishery.

Fishing Community

No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the region's deep-water fishery is dormant. In the long-term, fishing communities that engage in future harvests of gold corals would be positively impacted as that fishery would be a sustainable one.

Environmental Justice

Alternative B2 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the gold coral fishing community would be equally affected.

Climate Change

There are no anticipated impacts from global climate change on the outcome of Alternative B2. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The lack of vessels in the fishery and gold coral fishing operations do not have significant impacts on local or global climate change.

4.2.3 Alternative B3: Implement a five-year moratorium on live gold coral harvests

Target Species

As compared to the no action alternative, under this alternative the potential risk of overfishing gold corals would be removed for five years while further research into their growth rates is conducted. Assuming that this issue is settled, at the end of that time appropriate quotas would be considered and implemented and the moratorium would be lifted. This would ensure that harvests of gold coral are sustainable and that overfishing does not occur. As compared to Alternative B2**,** this alternative would allow harvests of dead gold coral (gold coral with no living polyps or tissue). Dead gold coral is thought to serve as a host for new bamboo coral recruits but not for gold coral. Therefore allowing harvest of dead gold coral would not be anticipated to have any impacts on live gold coral stocks or recruitment. Allowing the harvest of dead gold coral would have a negative impact on the target species due to the potential difficulty in distinguishing live versus dead gold coral by enforcement agencies, especially after the fact.

Non-Target Species

A variety of invertebrates and fish are known to utilize the same habitat as precious corals. However, there is no evidence that these species or others significantly depend on precious corals for shelter or food. In addition, under the existing FMP only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. As discussed above, allowing harvests of dead gold coral could remove material that can serve as a host for new bamboo coral recruits. However bamboo coral is not a targeted species and is not believed to be under stress from harvesting or other influences. For these reasons, this alternative would have minimal impacts on non-target species or their habitat.

Protected Species

Cetaceans

There have been no reported or observed interactions between marine mammals and the precious corals fishery in the region. The potential impacts on the Hawaiian monk seal are discussed below. There could be some impact on marine mammals from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be extremely rare and therefore constitute a low-level risk to marine mammals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Cetaceans (Section 3.4). Under this alternative, this extremely low-level risk to marine mammals would remain for activities directed at non-gold and dead gold corals during the five year moratorium and for activities directed at all precious corals after the moratorium.

Hawaiian Monk Seal

As described above, monk seals have been observed diving to depths where gold corals and other deep-water organisms occur (> 100 m) however there is no evidence that monk seal foraging is dependent upon gold corals.. There could be some impact from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to monk seals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Hawaiian Monk Seals (Section 3.4). Under this alternative, this extremely low-level risk to monk seals would remain for activities directed at non-gold and dead gold corals during the five year moratorium and for activities directed at all precious corals after the moratorium.

Sea Turtles

There have been no reported or observed interactions between sea turtles and precious corals fisheries in the region. There could be some impact on sea turtles from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to sea turtles. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Sea Turtles (Section 3.4). Under this alternative, this extremely low-level risk to sea turtles would remain for activities directed at non-gold and dead gold corals during the five year moratorium and for activities directed at all precious corals after the moratorium.

Seabirds

The precious corals fishery relies on selective harvesting gear (hand harvest and submersibles) which is not likely to result in any interactions with seabirds, and no such interactions have been observed or reported. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Seabirds (Section 3.4). Consequently, this alternative is not expected to impact any seabird species that occur in the region.

Essential Fish Habitat

As compared to the no action alternative, this alternative would not be anticipated to have any additional impacts to EFH or HAPC as it would not lead to changes in fishing operations or increased fishing effort.

Commercial, Recreational and Charter Fishing Sectors

As compared to the no action alternative, in the short-term this alternative would adversely impact potential commercial harvesters of gold coral as it would prohibit harvests of live gold coral in the Western Pacific Region for five years. Allowing the harvest of dead (but still commercially valuable) gold coral would provide some returns to potential fishery participants. In the long-term, it would result in better specified gold coral quotas and thus maintain a sustainable fishery. The charter and recreational fishing sectors would not be affected under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy

In the short-term this alternative could have an adverse impact on the region's economy by prohibiting the harvest of live gold coral for five years. In the long-term, this alternative would have a positive impact on the regional economy by preserving opportunities for the future development of a sustainable and profitable gold coral fishery.

Fishing Community

In the short-No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the region's deep-water fishery is dormant. In the long-term, fishing communities that engage in future harvests of gold corals would be positively impacted as that fishery would be a sustainable one.

Environmental Justice

Alternative B3 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the gold coral fishing community would be equally affected.

Climate Change
There are no anticipated impacts from global climate change on the outcome of Alternative B3. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The lack of vessels in the fishery and gold coral fishing operations do not have significant impacts on local or global climate change.

4.2.4 Alternative B4: Reduce gold coral harvest quotas by 50% of gold coral in all precious coral beds

Target Species
Under this alternative the potential risk of overfishing gold corals would be reduced but not eliminated. If gold coral growth rates are as low as predicted by recent studies (Roark et al. 2006) reducing the current quota by 50% would still prove to be unsustainable. If this reduced quota was fully exploited, it would lead to overfishing and eventually, to an overfished condition of the stock.

Non-Target Species
A variety of invertebrates and fish are known to utilize the same habitat as precious corals. However, there is no evidence that these species or others significantly depend on precious corals for shelter or food. In addition, under the existing FMP only selective gear can be used to harvest precious corals, thereby virtually eliminating the potential for catches of non-target species or degradation of their habitat. For these reasons, this alternative would have minimal impacts on non-target species or their habitat.

Protected Species
Cetaceans
There have been no reported or observed interactions between marine mammals and the precious corals fishery in the region. The potential impacts on the Hawaiian monk seal are discussed below. There could be some impact on marine mammals from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be extremely rare and therefore constitute a low-level risk to marine mammals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Cetaceans (Section 3.4). Under this alternative, this extremely low-level risk to marine mammals would remain although it could be slightly reduced.

Hawaiian Monk Seal
As described above, monk seals have been observed diving to depths where gold corals and other deep-water organisms occur (> 100 m however there is no evidence that monk seal foraging is dependent upon gold corals. There could be some impact from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to monk seals. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Hawaiian Monk

Seals (Section 3.4). Under this alternative, this extremely low-level risk to monk seals would remain although it could be slightly reduced.

Sea Turtles

There have been no reported or observed interactions between sea turtles and precious corals fisheries in the region. There could be some impact on sea turtles from routine fishing vessel operations (e.g., behavioral or physiological reactions to noise, collisions, or releases of pollutants), however such impacts would be rare therefore constitute a very low-level risk to sea turtles. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Sea Turtles (Section 3.4). Under this alternative, this extremely low-level risk to sea turtles would remain although it could be slightly reduced.

Seabirds

The precious corals fishery relies on selective harvesting gear (hand harvest and submersibles) which is not likely to result in any interactions with seabirds, and no such interactions have been observed or reported. The gold coral fishery is currently dormant (Section 3.3), participants are required to use selective gears (Section 3.3.1) and the areas fished are not known to provide habitat to Seabirds (Section 3.4). Consequently, this alternative is not expected to impact any seabird species that occur in the region.

Essential Fish Habitat

As compared to the no action alternative, this alternative would not be anticipated to have any additional impacts to EFH or HAPC as it would not lead to changes in fishing operations or increased fishing effort.

Commercial, Recreational and Charter Fishing Sectors

As compared to the no action alternative, in the short-term this alternative would adversely impact potential commercial harvesters of gold coral as it reduce allowable harvests of gold coral in the Western Pacific Region. In the long-term, this alternative would increase the potential for a sustainable fishery, albeit with reduced harvest quotas. The charter and recreational fishing sectors would not be affected under this alternative, as these sectors are not involved in the harvest of precious corals in the Western Pacific Region.

Regional Economy

This alternative could have an adverse impact on the region's economy by reducing allowable harvests of gold coral. However, as compared to the no action alternative, it would preserve the potential for future development of a sustainable and profitable gold coral fishery.

Fishing Community

In the short-term No fishing communities as defined by the MSA would be affected by this alternative as there are no communities substantially dependent on the harvest of precious corals to meet social and economic needs. As noted above the region's deep-water fishery is dormant. In the long-term, allowable harvests of gold corals by fishing communities would be reduced.

Environmental Justice

Alternative B4 would not result in a significant and disproportionate adverse impact on members of minority or low-income populations. If overfishing were to occur, all participants in the gold coral fishing community would be equally affected.

Climate Change
There are no anticipated impacts from global climate change on the outcome of Alternative B4. Due to the great depths at which they live, precious corals will likely be insulated from short term changes in the physical environment. The lack of vessels in the fishery and gold coral fishing operations do not have significant impacts on local or global climate change.

5.0 CONSISTENCY WITH OTHER APPLICABLE LAWS AND STATUTES

5.1 National Environmental Policy Act

This amendment to the Council's Precious Corals FMP has been written and organized in a manner that meets NEPA requirements, and thus this is a consolidated NEPA document, including an Environmental Assessment, as described in the NOAA Administrative Order (NAO) 216-6, Section 6.03.a.2.

5.1.1 Purpose and Need for Action

The purpose and need for this action are described in Section 1.5.

5.1.2 Alternatives

The alternatives for this action are described in Section 2.0.

5.1.3 Affected Environment

The affected environment is described in Section 3.0.

5.1.4 Impacts of the Alternatives

The impacts of the alternatives on the environment are described in Section 4.0.

5.2 Consistency with the MSA National Standards

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

The preferred alternative A2 is consistent with National Standard 1 because it implements an OY-based harvest quota for the black coral bed in the Auau Channel to prevent overfishing.

Preferred alternative B2 is consistent with National Standard 1 because it prevents possible overfishing of the resource by putting a moratorium on the fishery until biological characteristics of gold coral are determined. Fishing for gold coral that have slower growth rates may cause an over-harvest of the resource.

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

Preferred alternative A2 is consistent with National Standard 2 because it is based on the best scientific information available. Alternative A2 is consistent with research which has been conducted on black corals in the Auau Channel by the University of Hawaii, the National Marine Fisheries Service's Pacific Island Fisheries Science Center, and the State of Hawaii.

Preferred alternative B2 is consistent with National Standard 2 because it is a based on the most recent scientific data available. If gold coral growth rates are as low as predicted by recent studies (Roark et al. 2006) the resumption of the gold coral fishery at the current harvest quota would be unsustainable. If the current quota was fully exploited, it would lead to overfishing and eventually, to an overfished condition of the stock.

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

Preferred alternative A2 is consistent with National Standard 3 because black coral stocks would be managed by the Auau Channel bed area. The Precious Corals FMP manages all such coral, but these measures are tailored to address issues in a specific bed, and do not otherwise limit the existing management structure.

Preferred alternative B2 is consistent with National Standard 3 because gold coral would be managed throughout the Western Pacific Region. The Precious Corals FMP manages all such coral, but these measures are tailored to address issues in a specific bed, and do not otherwise limit the existing.

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

The restrictions associated with the preferred alternatives A2 and B2 will apply uniformly to all persons with federal permits to fish for black coral in the Western Pacific region regardless of state residency and in no way allocates fishing privileges among various fishermen. Therefore, the measures in no way discriminate among residents of different states, and are consistent with National Standard 4.

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

The preferred alternative A2 is consistent with National Standard 5 because it will regulate harvests through the use of a harvest guideline which does not require the use of any particular fishing gear or methodology. This allows fishery participants to fish in the manner which they find to be most cost-efficient. In addition, the use of a harvest guideline for the entire bed will be relatively inexpensive to administer given that there already both State and Federal permit and reporting requirements for this fishery. The measures do not substantially affect methods of harvest, or allocate resources among competing users; accordingly, the preferred alternative does not have National Standard 5 implications. To the extent that the measures make legal harvest more difficult, and less efficient, those measures apply uniformly to all EEZ harvesters, and are necessary to sustainably manage the resource.

The preferred alternative B2 is consistent with National Standard 5 because it will protect the stocks of gold coral from overharvest until the necessary research is done to establish appropriate harvest levels. Alternative B2 includes a recommendation for this research to be completed within five years, thus focusing research and minimizing adverse impacts to potential fishery participants. The measures do not substantially affect methods of harvest, or allocate resources among competing users; accordingly, the preferred alternative does not have National Standard 5 implications. To the extent that the measures make legal harvest more difficult, and less efficient, those measures apply uniformly to all EEZ harvesters, and are necessary to sustainably manage the resource.

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

Preferred alternative A2 is consistent with National Standard 6 because establishing a harvest quota for black corals would allow for future management of the black coral fishery by basing the quota on current estimates of OY. The preferred alternative takes no other action to prevent variable harvest activities in the Auau Channel or other areas subject to the FMP, nor does it prevent future variation in measures for any area where black coral exists. Accordingly, the preferred alternative is consistent with National Standard 6.

Preferred alternative B2 is consistent with National Standard 6 because a moratorium for gold corals would allow for possible future management of the gold coral fishery by allowing a temporary closure of the fishery while scientific research is conducted. The preferred alternative takes no other action to prevent variable harvest activities in the Auau Channel or other areas subject to the FMP, nor does it prevent future variation in measures for any area where gold coral exists. Accordingly, the preferred alternative is consistent with National Standard 6.

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

Preferred alternative A2 is consistent with National Standard 7 because it does not introduce additional measures which would duplicate those imposed on commercial fishermen in Hawaii, namely the need to obtain both State and Federal fishing licenses and to report all commercial catches. To the extent that the measures result in increased costs to harvest legal size coral, because it takes more time and money to find the larger coral, such increased costs are a necessary result of promoting sustainable harvest in the fishery, and the avoidance of such costs is not practicable. Therefore, the preferred alternative is consistent with National Standard 7.

Preferred alternative B2 is consistent with National Standard 7 because it does not introduce additional measures that would duplicate those imposed on fishermen in the Western Pacific Region. There are currently no gold coral fishermen in the Western Pacific Region. The preferred alternative puts a moratorium on the harvest of gold corals which would eliminate costs.

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

Preferred alternative A2 is consistent with National Standard 8 because it will have no immediate impact on fishing communities that fish for black coral. The number of participants in the black coral fishery off Maui is very small (3), and they do not constitute a fishing community under the MSA. Although this will potentially affect the amount of coral harvested in the short-term, and have adverse economic impacts on fishery participants, it is unlikely to have significant effects on any fishing communities as defined under the MSA. In the longer-term the preferred alternative is expected to allow sustained participation in the fishery, and is biologically necessary to protect the long term health and sustainability of Hawaii's EEZ black coral resources Therefore, the preferred alternative is consistent with National Standard 8.

Preferred alternative B2 is consistent with National Standard 8 because it will have no immediate impact on fishing communities that fish for gold coral because there are no current gold coral fishermen. Although this will eliminate any amount of coral harvested in the short-term, and have no economic impacts on any current fishery participants, it is unlikely to have significant effects on any fishing communities as defined under the MSA. In the longer-term the preferred alternative is expected to allow future participation in the fishery, and is biologically necessary to protect the long term health and sustainability of gold coral resources Therefore, the preferred alternative is consistent with National Standard 8.

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

Only very highly selective methods and gear, such as hand collection by divers, and collection via submersibles, are authorized in the fishery, thus there is essentially no bycatch. The preferred alternatives A2 and B2 will not alter the methods or gear allowed in the fishery, and will have no effect on the current bycatch rates in the fishery and is therefore consistent with National Standard 9.

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

The Precious Coral fishery requires harvesting by divers and submersibles at considerable depth, which is an inherently dangerous activity, resulting in potentially adverse impacts on the safety of fishermen engaged in such activity. The requirement to use such highly selective gear is necessary to protect the sustainability of the coral resources, avoid bycatch, and prevent the adverse impacts to habitat that result from the use of non selective gear such as bottom trawls. Consequently, avoidance of the adverse impacts by allowing harvest through safer less selective means is not practicable.

The preferred alternative A2 would not result in Hawaii EEZ black coral fishermen having to spend more time in such dangerous conditions. Therefore, the preferred alternative is consistent with National Standard 10.

Preferred alternative B2 is consistent with National Standard 10 because it does not promote changes to current fishing practices for gold corals or increase risks to fishery participants because the fishery would be closed for a period of five-years.

5.3 Regulatory Flexibility Act

In order to meet the requirements of the Regulatory Flexibility Act, 5 U.S.C. 601 et seq. (RFA) requires government agencies to assess the impact of their regulatory actions on small businesses and other small entities via the preparation of Regulatory Flexibility Analyses. An initial Regulatory Flexibility Act analysis has been prepared by NMFS and is attached as Appendix A.

5.4 Executive Order 12866

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

5.5 Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) requires a determination that an FMP or amendment has no effect on the land or water uses or natural resources of the coastal zone, or is consistent to the maximum extent practicable with the enforceable policies of an affected state's coastal zone management program. A copy of this document will be submitted by NMFS to the appropriate agency in Hawaii for federal consistency review under the CZMA.

5.6 Endangered Species Act

The Endangered Species Act (ESA) consultations conducted by NMFS to date have concluded that the ongoing operation of the Western Pacific Region's precious coral fisheries was not likely to jeopardize the continued existence of any threatened or endangered species under NMFS's jurisdiction or destroy or adversely modify critical habitat. The actions contained in this document are primarily administrative and do not permit any activities beyond those presently occurring. As the actions described in this document are not anticipated to result in the incidental taking of any ESA listed species, or adverse effects to their populations or habitat (see Sections 3.4 and 4.0), the Council believes that a formal consultation under Section 7 of the ESA is not required.

5.7 Paperwork Reduction Act

The purpose of the Paperwork Reduction Act (PRA) is to minimize the burden on the public and ensure that the information collected under the proposed action is needed and collected in an efficient manner (44 U.S.C. 3501(1)). The preferred alternatives in this amendment do not contain any new public paperwork or reporting requirements.

5.8 Executive Order 13089 (Coral Reef Protection)

The preferred alternatives in this document are consistent with E.O.13089, which is intended to preserve and protect the biodiversity, health, heritage, and social and economic value of U.S. coral reef ecosystems and the marine environment.

5.9 Information Quality Act

To the extent possible, this information complies with the Information Quality Act and NOAA standards (NOAA Information Quality Guidelines, September 30, 2002) that recognize information quality is composed of three elements - utility, integrity and objectivity. Central to the preparation of this amendment is objectivity which consists of two distinct elements: presentation and substance. The presentation element includes whether disseminated information is presented in an accurate, clear, complete, and unbiased manner and in a proper context. The substance element involves a focus on ensuring accurate, reliable, and unbiased information. In a scientific, financial, or statistical context, the original and supporting data shall be generated, and the analytic results shall be developed, using sound statistical and research methods.

At the same time, however, the Federal government has recognized, "information quality comes at a cost. In this context, agencies are required to weigh the costs and the benefits of higher information quality in the development of information, and the level of quality to which the information disseminated will be held." (OMB Guidelines, pp. 8452-8453).

One of the important potential costs in acquiring "perfect" information (which is never available), is the cost of delay in decision-making. While the precautionary principle suggests that decisions should be made in favor of the environmental amenity at risk (in this case, marine ecosystems), this does not suggest that perfect information is required for management and conservation measures to proceed. In brief, it does suggest that caution be taken but that it not lead to paralysis until perfect information is available. This document has used the best available information and made a broad presentation of it. The process of public review of this document provides an opportunity for comment and challenge to this information, as well as for the provision of additional information.

6.0 PROPOSED REGULATIONS

§ 665.12 Definitions.

Precious coral permit area means the area encompassing the precious coral beds in the management area. Each bed is designated by a permit area code and assigned to one of the following four categories:

(1) *Established beds.* (i) Makapuu (Oahu), Permit Area E-B-1, includes the area within a radius of 2.0 nm of a point at 21°18.0' N. lat., 157°32.5' W. long.

(ii) Auau Channel (Maui), includes the area within West and South of the point 156° 40’ W, 21° 10’ N and East of the point 157° W, 21° N and West and North of the point 156° 40; W, 20° 45’N.

Subpart F—Precious Corals Fisheries

§ 665.85 Closures.

(a) If the Regional Administrator determines that the harvest quota for any coral bed will be reached prior to the end of the fishing year, or the end of the 2-year fishing period at Makapuu Bed or Auau Channel Bed, NMFS will issue a field order closing the bed involved by publication of an action in the Federal Register, and through appropriate news media. Any such field order must indicate the reason for the closure, the bed being closed, and the effective date of the closure.

§ 665.89 Fishing moratorium on Gold Coral.

Fishing for, taking, or retaining any gold coral in any precious coral permit area is prohibited through June 30, 2013.

§ 665.90 Framework procedures.

Table 1 to Part 665—Quotas for Precious Corals Permit Areas

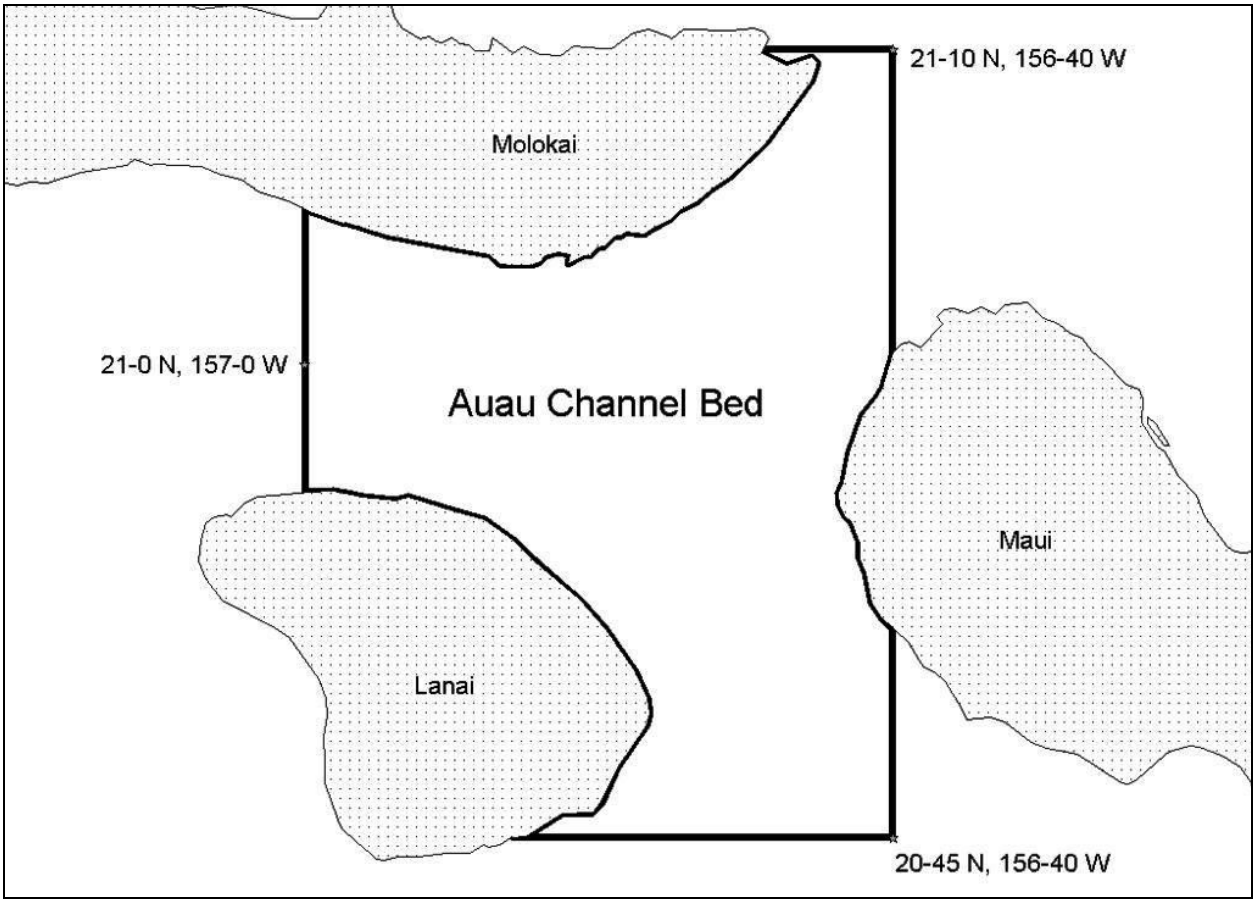
Name of coral bed	Type of bed	Harvest quota	Number of years
Makapu'u	Established	P—2,000 kg	2
		G—Zero (0 kg)	n/a
		B—500 kg	2
Auau Channel Bed	Established	BC-2,500 kg	2
Ke-ahole Point	Conditional	P—67 kg	1
		G—20 kg	1
		B—17 kg	1
Kaena Point	Conditional	P—67 kg	1
		G—20 kg	1
		B—17 kg	1
Brooks Bank	Conditional	P—17 kg	1
		G—133 kg	1
		B—111 kg	1
180 Fathom Bank	Conditional	P—222 kg	1
		G—67 kg	1
		B—56 kg	1
Westpac Bed	Refugium	Zero (0 kg)	n/a
Hawaii, American, Samoa, Guam, U.S. Pacific Island possessions.	Exploratory	X—1,000 kg (all species combined except black corals) per area	1

Notes:

1. Types of corals: P = Pink G = Gold B = Bamboo BC=Black Coral

2. No authorized fishing for coral in refugia

Figure 3 to part 665-Map of the Auau Channel



7.0 REFERENCES

Abernathy, K. and D. Siniff. 1998. "Investigations of Hawaiian monk seal, *Monachus schauinslandi*, pelagic habitat use: range and behavior." University of Minnesota, NOAA SK Report Award No. NA66FD0058.

Baker, J. and T. Johanos. 2000. "Effects of research handling on the endangered Hawaiian monk seal." Unpublished manuscript. NMFS Southwest Fisheries Science Center Honolulu Laboratory, Honolulu.

Beverton, R. and S. Holt. 1957. "On the dynamics of exploited fish populations. *Fish Invest. Minist. Agric. Fish. Food* (G.B.), Ser II 19:1-553.

Carleton, C. and Philipson, P. 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.

Druffel, E. R. M., Griffin, S., Witter, A., Nelson, E., Southon, J., Kashgarian, M., Vogel, J. 1995. "Gerardia: Bristlecone pine of the deep sea?" *Geochimica et Cosmochimica Acta.* 59(23):5031-5036.

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." NMFS Southwest Fisheries Science Center, La Jolla.

Goodman-Lowe, G., 1998. Diet of the Hawaiian monk seal (*Monachus schauinslandi*) from the Northwestern Hawaiian Islands during 1991 to 1994. Marine Biology 132:535-546.

Grigg, R. W. 1964. A contribution to the biology and ecology of the black coral, *Antipathes grandis* in Hawaii, Department of Zoology, University of Hawaii, Honolulu.

Grigg, R. W. 1976. Fishery management of precious and stony corals in Hawaii. UNIHI-SEAGRANT-TR77-03. 48 pp.

Grigg, R. 1993. "Precious coral fisheries of Hawaii and the U.S. Pacific Islands." *Marine Fisheries Review 55*(2):50-60.

Grigg, R. 1997. "Resurvey of the Makapuu precious coral bed - August 21-22, 1997." Unpublished report.

Grigg, R. 1998a. "Status of the black coral fishery in Hawaii - 1998." Report prepared under contract with Office of Scientific Authority, U.S. Fish and Wildlife Service.

Grigg, R. 1998b. "NWHI precious coral expedition - September 1998." Unpub. Rept.

Grigg, R. 2002. "Precious Corals in Hawaii: Discovery of a new bed and revised management measures for existing beds." *Marine Fisheries Review 64(1): 13-20.*

Grigg, R. W. 2004. Harvesting impacts and invasion by an alien species decrease estimates of black coral yield off Maui, Hawaii. Pacific Science, 58(1):1-6.

Grigg, R. and D. Opresko. 1977. "Order Antipatharia: black corals." Reef and Shore Fauna of Hawaii, B.P. Bishop Mus. Spec. Pub. 64(1):242-261.

Gulland, J. 1969. *Manual of methods for fish stock assessment. Pt. 1. Fish population analysis*. FAO Man. Fish. Sci. 4.

Gulland, J. 1970. "The fish resources of the ocean." FAO Tech. Paper 97, Food and Agriculture Organization, Rome.

HMSRT (Hawaiian Monk Seal Recovery Team). 1999. Hawaiian Monk Seal Recovery Team Meeting, December 6-7, 1999. Unpublished manuscript.

Iverson, S. 2000. "Hawaiian monk seals and prey species in the Northwestern Hawaiian Islands: Report on quantitative fatty acid signature analysis." Department of Biology, Dalhousie University, Halifax, Nova Scotia.

Johanos, T. 2000. "Monk seals in the Main Hawaiian Islands." *The Monachus Guardian 3*(1):57-59.

Kahng, S.E. 2006. "Ecological impacts of *Carijoa riisei* on black coral habitat." Western Pacific Regional Fishery Management Council, Honolulu, HI

Kahng, S. E. and R. W. Grigg. 2005. Impact of an alien octocoral, *Carijoa riisei*, on black corals in Hawaii. Coral Reefs, 24(4): 556-562.

MacDonald, C. 1982. "Predation by Hawaiian monk seals on spiny lobsters." *Journal of Mammalogy 63*:700.

Marine Mammal Commission. 1999. "Annual Report to Congress, 1998." Marine Mammal Commission, Bethesda, Maryland.

NMFS (National Marine Fisheries Service). 1999. "Informal Section 7 Consultation regarding establishment of permanent lobster fishing areas and allocation of the 1999 Harvest Guideline for the commercial lobster fishery in the Northwestern Hawaiian Islands." Southwest Fishery Science Center. Long Beach.

Oishi, F. 1990. "Black coral harvesting and marketing activities in Hawaii - 1990." State of Hawaii Division of Aquatic Resources, Honolulu.

Parrish, F. K. Abernathy, G. J. Marshall and B.M. Buhleier. 2002. "Hawaiian monk seals (*Monachus schauinslandi*) foraging in deep-water coral beds." *Marine Mammal Science* 18(1): 244-258.

Parrish, F. 2006. Precious Corals and Subphotic Fish Assemblages. *Atoll Research Bulletin* 543:(425-438)

Parrish F. In Press. Density and Habitat of three deep-sea corals in the lower Hawaiian chain. Bulletin of Marine Science.

Rice, D. 1964. "The Hawaiian monk Seal." *Natural History 73*:48-55.

Roark, B. E., T. P. Guilderson, R. B. Dunbar and B. L. Ingram. 2006. "Radiocarbon-based ages and growth rates of Hawaiian deep-sea corals." *Marine Ecology Progress Series* 327:1-14

Wetherall, J. A. and M. Y. Yong. 1977. Computer simulation of pink coral population dynamics and analyses of harvest policies. Part 1: Preliminary Studies. Southwest Fisheries Center Admin. Rept. 21 H, 1977 (computer printout).

WPRFMC (Western Pacific Regional Fishery Management Council). 1980. *Fishery*

Management Plan for the Precious Corals of the Western Pacific Region. Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 1998. "Magnuson-Stevens Act definitions and required provisions. Amendment 6 to the Bottomfish and Seamount Groundfish Fishery Management Plan, Amendment 8 to the Pelagic Fishery Management Plan, Amendment 10 to the Crustaceans Fishery Management Plan, Amendment 4 to the Precious Corals Fishery Management Plan." Western Pacific Regional Fishery Management Council. Honolulu, HI.

WPRFMC. 2004. Report of the Precious Corals Plan Team. Western Pacific Regional Fishery Management Council, Honolulu, HI.

WPRFMC. 2006. 2006 Black Coral Science and Management Workshop. Honolulu, HI.

Appendix A: RIR

Appendix A

Regulatory Impact Review (RIR)

This Regulatory Impact Review (RIR) provides an assessment of the costs and benefits of the proposed action and other alternatives in accordance with Executive Order 12866 (E.O. 12866) and its guidelines established in OMB Circular A-4. E.O. 12866 states:

> Federal agencies should promulgate only such regulations as are required by law, are necessary to interpret the law, or are made necessary by compelling public need, such as material failures of private markets to protect or improve the health and safety of the public, the environment, or the well-being of the American people. In deciding whether and how to regulate, agencies should assess all costs and benefits of available regulatory alternatives, including the alternative of not regulating. Costs and benefits shall be understood to include both quantifiable measures (to the fullest extent that these can be usefully estimated) and qualitative measures of costs and benefits that are difficult to quantify, but nevertheless essential to consider. Further, in choosing among alternative regulatory approaches, agencies should select those approaches that maximize net benefits (including potential economic, environmental, public health and safety, and other advantages; distributive impacts; and equity), unless a statute requires another regulatory approach.

Based on recommendations from the Precious Corals Plan Team and the Scientific and Statistical Committee, the Council at its December 21, 2006, meeting, took final action to recommend that the Au`au Channel black coral bed be designated under the Precious Corals Fishery Management Plan as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr). This quota would apply to black corals in both State and Federal waters, and existing gear and size restrictions would continue to apply. Based on recommendations from fishery scientists, the Council took final action to recommend a moratorium on the harvest of gold coral in the western Pacific. During the moratorium, an associated research program will collect data on the age structure, growth rate, and correlations between length and age. Additional information will be considered by the Council before lifting the moratorium.

Description of the Problem

Since 1980, virtually all of the black coral harvested in the western Pacific has been taken from the Au`au Channel Bed near the island of Maui. Most of this harvest has been confined to State waters. Although a substantial part of this bed is located in the EEZ, the Hawaii Department of Land and Natural Resources estimates that about 85% of the black coral harvested is collected within three miles of the shoreline (DLNR 1979), perhaps because gear constraints have restricted divers for black coral to relatively shallow waters (75 m or less). According to a July 1998 assessment of the biological condition of the black coral in the Au`au Channel, the age frequency distributions of sample populations in 1975 and 1998 are very similar. This suggests

that harvesting during the intervening years has had no significant effect on recruitment. However, the black coral resources in other areas of State waters (for example, "Stonewall" off Lahaina, Maui) that are easily accessible with conventional scuba gear were intensely harvested in the 1970s and have not recovered significantly under the relatively light fishing pressure they are now experiencing.

While it appears the harvest from the Au`au Channel Bed has not had a significant effect on black coral recruitment, competition with an invasive soft coral in this area may impact black coral recruitment in the future. *Carijoa riisei,* or snowflake coral, was first observed in Hawaii in 1972 (in Pearl Harbor), and off Maui in 1990. Snowflake coral is native to the western Atlantic Ocean and Caribbean and prefers relatively shallow water (shallower than 21 m), hard substrata, and areas of moderate current flow. In a recent survey of the Au`au Channel Bed by the Hawaii Undersea Research Laboratory and University of Hawaii scientists, *Carijoa* was observed overgrowing and killing up to 70% of the black coral trees at depth between 68-114 m. Although the fishery primarily harvests black coral at depths to 70 m (due to conventional scuba safety concerns), the potentially devastating effect of snowflake coral combined with fishing pressure warrants further research on recruitment of black corals in the Au`au Channel.

Recent research on black corals has shown that biomass of the black coral populations in the Au`au Channel have decreased almost 25% between 1976 and 2001. Comparisons of recent research to earlier surveys shows declines in both older and younger colonies, meaning that there are fewer recruits available. The cause of the reduction in biomass is still being debated, but a combination of fishing impacts and the invasion of *C. riisei* overgrowing populations at deeper sites may be having an effect upon the black coral resource. There are uncertainties regarding the causes of the decline in the Au`au Channel, but evidence suggests that a combination of factors, including impacts from fishing, is contributing to this decline.

The western Pacific gold coral fishery is currently dormant, although research on gold coral remains active. Recent research has suggested reconsideration of the current assumptions about the correlation between linear and axial growth rates of gold coral, and an understanding of these growth rates is critical to the future management of the gold coral fishery.

Management Objectives

The purpose of this action is to:

1. Sustain the harvestable population of black coral in the Au`au Channel by implementing an biennial quota; and

2. Enable researchers to identify growth rates of gold coral to allow the Council to determine a management strategy for the future growth and economic sustainability of that fishery.

Description of Affected Fisheries

A description of the affected fisheries is contained in sections 1.2 and 3.0 of Amendment 7.

Description of Alternatives

Au`au Channel Black Coral Harvest Quota

Alternative A1: No Action

This alternative would continue to regulate the black coral fishery based on minimum sizes, and not by MSY or by area.

Alternative A2: Designate the Au`au Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for the entire bed (Preferred Alternative).

The Au`au Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every two years (11,023 lb every 2 yr) from both State and Federal waters combined. All other regulations would continue to apply. Minimum size regulations and gear restrictions would continue to apply.

Alternative A3: Designate the Au`au Channel black coral bed as an Established Bed with an annual harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for Federal waters only.

The Au`au Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every two years (11,023 lb every 2 yr) from Federal waters only. All other regulations would continue to apply. Minimum size regulations and gear restrictions would continue to apply.

Western Pacific Region Gold Coral Moratorium

Alternative B1: No Action

Gold coral harvests would continue to be regulated based on harvest quotas by area and gear restrictions, and no moratorium would be implemented

Alternative B2: Implement a five-year moratorium on live and dead gold corals (Preferred Alternative)

A five-year moratorium on the harvest of *living and dead* gold corals would be implemented for the western Pacific while an associated research program further examines linear/axial growth, recruitment/mortality, and deterioration rates of gold coral. Bed-quotas and gear restrictions would not be required during this period. The moratorium may be renewed if the research program is not completed within the five years.

Alternative B3: Implement a five-year moratorium on live gold coral

A five-year moratorium on the harvest of *living* gold corals would be implemented for the western Pacific while an associated research program further examines linear/axial growth, recruitment/mortality, and deterioration rates of gold coral. Bed-quotas and gear restrictions would not be required during this period. The moratorium may be renewed if the research program is not completed within the five years.

Alternative B4: Reduce the harvest quota by 50% of gold coral in all precious coral beds.

Harvest quotas for gold coral would be reduced by 50% in all precious coral beds throughout the western Pacific. Gear restrictions would continue to apply. In 2002, the Council recommended suspending the harvest quota for gold coral at the Makapu`u Bed as a precautionary measure to increase the probability that a recovery in the number of gold coral colonies at the Makapu`u Bed eventually occurs.

Economic Impacts

Au`au Channel Black Coral Harvest Quota

Alternative A1

The short-term impact of the no-action alternative on Hawaii's economy would be expected to be unchanged or positive as it would allow continued harvests of black corals without further regulation. In the longer-term, this alternative could have a negative impact on the regional economy by allowing overfishing to occur, thus threatening opportunities for the future pursuit of a sustainable and profitable black coral fishery. It could also have a negative long-term impact if *C. riisiei* is proven to have a greater effect on black coral recruitment than is currently observed.

Alternative A2 (Preferred)

As compared to the no action alternative, in the short-term this alternative would reduce the harvests of black coral and, thus, adversely affect the regional economy. In the long-term, it would have a positive impact on the regional economy by contributing to the maintenance of a sustainable and profitable black coral fishery.

Alternative A3

As compared to the no action alternative, in the short-term this alternative would not likely reduce the harvest, as most of the harvest comes from State waters, thus maintaining the current regional economy. In the long-term, it would have a negative impact on the regional economy because the black coral harvest in State waters, where the fishery primarily is conducted, is not regulated and could endanger the sustainability of the fishery. Long term fishery closures resulting from this would negatively impact the regional economy.

Western Pacific Region Gold Coral Moratorium

Alternative B1

The short-term impact of this alternative on the region's economy is uncertain because of the dormant and undeveloped status of the fishery. In the long-term, this alternative could have a positive impact on the regional economy by preserving opportunities for the future development of a sustainable and profitable gold coral fishery.

Alternative B2 (Preferred)

In the short-term, this alternative would have impact since the fishery would go from dormant to a moratorium. In the long-term, this alternative would have a positive impact on the regional economy by preserving opportunities for the future development of a sustainable and profitable gold coral fishery.

Alternative B3

In the short-term this alternative would have impact since the fishery would go from dormant to a moratorium. In the long-term, this alternative would have a positive impact on the regional economy by preserving opportunities for the future development of a sustainable and profitable gold coral fishery.

Alternative B4

If permitted vessels chose to reenter the fishery under alternative B4 (quota reduction), it would appear that there were positive economic impacts to the economy because of the movement from no fishing to fishing. However, a 50 percent quota reduction from current quota levels could not be construed as having a positive economic impact. However, as compared to the no action alternative, it would preserve the potential for future development of a sustainable and profitable gold coral fishery by limiting future harvest.

Significance under E.O. 12866

Between 1990 and 1997, the annual harvest of black coral in Hawaii varied from a low of 864 lb to a high of 6,017 lb, with a yearly average of 3,084 lb. The aggregate value of the harvest of black coral during this time period was $327,359. From 1998-2005, the harvest more than doubled yielding an ex-vessel value of approximately $820,000. Therefore, this fishery could not be expected to be economically significant under the $100 million threshold specified in E.O. 12866.

For the purpose of determining significance under E.O. 12866, the Council has concluded that : (1) This rule is not expected to have an annual effect on the economy of more than $100 million or to adversely affect in a material way the economy, a sector of the economy, productivity, jobs, the environment, public health or safety; or state, local or tribal governments or communities; (2) this rule is not likely to create any serious inconsistencies or otherwise interfere with any actions taken or planned by another agency; (3) this rule is not likely to materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights or obligations of recipients thereof; and (4) this rule is not likely to raise novel or policy issues arising out of legal mandates, or the principles set forth in the Executive Order. Based on these findings, this rule is determined to not be significant under E.O. 12866.

Appendix B: IRFA

Appendix B

Initial Regulatory Flexibility Analysis (IRFA)

The IRFA describes the economic impact this proposed rule, if adopted, would have on small entities. A description of the action, why it is being considered, and the legal basis for this action are contained in the Summary and Section 1.0 of Amendment 7, and in the RIR. There are no recordkeeping or reporting or other compliance requirements associated with this rule. There are no Federal rules that duplicate, overlap, or conflict with this proposed rule. Furthermore, there are no disproportionate impacts from this rule by vessel size, gear type, or geographical location.

Description of Affected Entities

There are three permitted vessels in the fishery for black corals, but only two have reported landings in Hawaii. Both vessels are considered to be small entities under the Small Business Administration definition of a small entity, i.e., engaged in the business of fish harvesting, not independently-owned or operated, not dominant in its field of operation, and with annual gross receipts not in excess of $4 million. Specific net revenues by individual vessels cannot be analyzed in this IRFA due to confidentiality restraints, but potential economic impacts are discussed below. There are no disproportionate impacts between vessels participating in the fishery based on home port, vessel size, or gear type.

The fishery for gold coral also includes the same three vessels permitted to harvest black corals under a generic Precious Corals permit issued by NMFS. However, these vessels are currently dormant in the gold coral fishery having no identifiable harvest in 2006, although a modest commercial quota of 20 kg (44 lb) for sites in the Main Hawaiian Islands, and 67 kg (149 lb) for sites in the Northwestern Hawaiian Islands are specified.

Description of Alternatives

Au‘au Channel Black Coral Harvest Quota

Alternative A1: No Action.

This alternative would continue to regulate the black coral fishery based on minimum sizes, and not on MSY or by area.

Alternative A2: Designate the Au‘au Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for the entire bed including State and Federal waters (Preferred Alternative).

The Au‘au Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every two years (11,023 lb every 2 yr) from both State and Federal waters combined. All other regulations would continue to apply. Minimum size regulations and gear restrictions would continue to apply.

Alternative A3: Designate the Au‘au Channel black coral bed as an Established Bed with a harvest quota of 5,000 kg every two years (11,023 lb every 2 yr) for Federal waters only.

The Au‘au Channel black coral bed would be designated as an Established Bed and harvests would be limited to 5,000 kg every two years (11,023 lb every 2 yr) from Federal waters only. All other regulations would continue to apply. Minimum size regulations and gear restrictions would continue to apply.

Western Pacific Region Gold Coral Moratorium

Alternative B1: No Action

Gold coral harvests would continue to be regulated based on harvest quotas by area and gear restrictions, and no moratorium would be implemented

Alternative B2: Implement a five-year moratorium on live and dead gold corals (Preferred Alternative)

A five-year moratorium on the harvest of *live and dead* gold corals would be implemented for the western Pacific region while an associated research program further examines linear/axial growth, recruitment/mortality, and deterioration rates of gold coral. Bed-quotas and gear restrictions would not be required during this period. The moratorium may be renewed if the research program is not completed within the five years.

Alternative B3: Implement a five-year moratorium on live gold coral

A five-year moratorium on the harvest of *live* gold corals would be implemented for the western Pacific region while an associated research program further examines linear/axial growth, recruitment/mortality, and deterioration rates of gold coral. Bed-quotas and gear restrictions would not be required during this period. The moratorium may be renewed if the research program is not completed within the five years.

Alternative B4: Reduce the harvest quota by 50% of gold coral in all precious coral beds.

Harvest quotas for gold coral would be reduced by 50% in all precious coral beds throughout the western Pacific region. Gear restrictions would continue to apply. In 2002, the Council recommended suspending the harvest quota for gold coral at the Makapu`u Bed as a precautionary measure expected to increase the probability that a recovery in the number of gold coral colonies at the Makapu`u Bed eventually occurs.

<u>Economic Impacts to Small Entities</u>

Au‘au Channel Black Coral Harvest Quota

Alternative A1

The implementation of the no-action would have no economic impact to the two vessels currently engaged in the harvest of black corals in the Au‘au channel.

Alternative A2 (Preferred)

This alternative would reduce the harvests of black coral and thus could adversely affect both vessels currently engaged in the fishery. Due to confidentiality agreements, the amounts of the reductions both absolute and on a relative basis could not be reported here.

Alternative A3

This alternative would not likely reduce the harvest, as most of the harvest comes from State waters, thus resulting in no or little economic impact to the two vessels engaged in the fishery.

Alternatives B1, B2 (Preferred), B3, and B4

Since the gold coral fishery is currently dormant, there would be no impact to vessels from this rulemaking resulting from alternatives B1, B2, or B3. If the permitted vessels chose to reenter the fishery under alternative B4 (quota reduction), it would appear that there were positive economic impacts because of the movement from no fishing to fishing. However, a 50 percent quota reduction from current quota levels could not be construed to have positive economic impacts. For a discussion of impacts to the economy, please see the RIR in Appendix A.