UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Silver Spring, Maryland 20910

NOV 17 1998

MEMORANDUM FOR: Distribution*

FROM: Robert B. Lovell for George H. Darcy
Chief, Domestic Fisheries Division - F/SF3

SUBJECT: Amendment 5 to the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region (FMP)

The Western Pacific Fishery Management Council (Council) has submitted Amendment 5 for Secretarial review, approval, and implementation. The amendment includes a Regulatory Impact Review and Environmental Assessment. If approved and implemented, Amendment 5 would (1) restrict participation in the Mau Zone bottomfish fishery to vessel owners who hold limited access permits; (2) adopt, based on biological and economic factors, a long-term target number of 10 vessels that would be allowed to fish for bottomfish in the Mau Zone; (3) establish qualifying criteria for allocating initial limited access permits based on historic participation in the fishery (December 17, 1991, control date) and landings of bottomfish from the Mau Zone up to December 31, 1996; (4) prohibit the transfer, lease, charter or sale of permits to reduce the number of vessels in the fishery in order to achieve the target number; (5) revoke limited access permits issued to partnerships or corporations upon a change in more than 50 percent ownership in the permitted vessel or its replacement; (6) limit the amount of time a permit holder may register a limited access permit for use with a leased or chartered vessel; (7) limit the length of replacement vessels to 60 feet; (8) require permit holders to make a minimum of five landings of at least 500 pounds each of bottomfish management unit species each year from the Mau Zone to qualify for permit renewal; (9) require the Council to undertake a 5-year comprehensive review of the limited access program to determine its effectiveness in meeting the objectives of the FMP; (10) have the Council develop criteria to allow new entry into the Mau Zone when the number of permitted vessels falls below 10; and (11) reserve 20 percent of the long-term target number of limited access permits, i.e., two permits, for a Western Pacific Community Development Program that may be developed by the Council and approved by the Secretary of Commerce.

Please provide us with any written comments (including "no comments") by January 4, 1999. If you have any questions, please call Robert Gorrell or Paula Evans at (301) 713-2341.

Attachment

*Distribution

F/SF	- Matlock/Morehead	F/ST	- Fox/Trott
F/SF3	- Darcy, Gorrell, Evans, Chappell	F/ST1	- Holliday/Ward
		F/HC2	- Bigford
F/SF5	- Fricke, Brainard, Chambers	N/ORM3	- Uravitch
F/EN	- McKinney	GCF	- Macpherson
F/PR	- Montanio	GCEL	- Kuruc
F/PR2	- Cornish	GC	- Johnson
F/PR3	- Brewer	OGC	- Cohen
OPSP	- Archambault, Schreiber	Fx1	- Chaves
Fx2	- Schaefer		

Western
Pacific
Regional
Fishery
Management
Council

Amendment 5

Northwestern Hawaiian Islands Mau Zone Limited Access System

Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region

August 1998

(Includes Environmental Assessment, Regulatory Impact Review, and Proposed Regulations)

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

1.0 Introductory Material

1.1 Summary

The Mau Zone was intended to serve as an area where fishermen can gain experience fishing in the Northwestern Hawaiian Islands, thereby enhancing their eligibility for subsequent entry into the limited access system established for the Hoomalu Zone. Access to the Mau Zone remained unrestricted, except for excluding vessel owners permitted to fish in the Hoomalu Zone. More than 80 permits have been issued for the Mau Zone fishery since the implementation of the FMP. An immediate concern is the low economic returns in the fishery. Long-term concerns are continued social and economic problems associated with open access and the biological overharvesting that may result from excessive effort.

This amendment will establish a limited access system for the Mau Zone. The objectives are to ensure long-term productivity of bottomfish stocks while maintaining fishing opportunities for small-scale commercial fishermen, continue to deliver high quality products to consumers and prevent excessive fishing capacity. Consistency between the existing management regime in the Hoomalu zone and the proposed measures under this amendment was also emphasized to allow for future management options for both zones.

Target number of vessels

Taking into account various biological and economic factors, the Council determined that the long-term target number of vessels allowed in the fishery should be 10.

Initial allocation of permits

The qualifying point system for the initial allocation of permits balances historic participation with current or recent fishing activity. The control date of December 17, 1991, is used with other eligibility criteria to ensure that those who have exhibited a commitment to the fishery are allowed to maintain the continuity of their economic enterprises.

Any vessel owner who is eligible for three or more points according to the following point system shall be awarded a permit under the limited access system:

- Was the owner of a vessel that was used to make at least one landing of bottomfish management unit species (BMUS) from the Mau Zone on or before December 17, 1991 - 1.5 points.

- Was the owner of a vessel that was used to make at least one landing of BMUS from the Mau Zone in 1996 - 3.0 points; 1995 - 2.5 points; 1994 - 2.0 points; 1993 - 1.5 points; 1992 - 1.0 point; 1991 - 0.5 point.

A landing is defined for this purpose as any amount of BMUS caught in the Mau Zone and off-loaded for sale. Documentation of qualifying landings must be from properly submitted State of Hawaii landing reports. The reported landings for any given year may not be used to accumulate points unless an applicant held a valid Mau Zone permit during that year.

In addition, approximately one-fifth of the target number of permits will be reserved for use by a community development program. The Council, in consultation with National Marine Fisheries Service (NMFS), will develop criteria for community eligibility. In addition, the Council, in consultation with NMFS, will establish principles, procedures and process for soliciting, evaluating and selecting community development plans describing how the permits will be used. The number of permits allocated to the program may be periodically reviewed and changed.

The initial allocation of permits under a limited access system for the Mau Zone fishery may result in a number of participants that exceeds the long-term target number. For this reason, various permit restrictions (described below) are imposed that are expected to gradually reduce the number of fishery participants to achieve the target number.

Vessel ownership restrictions

Permit holders must be an individual, partnership or corporation. The holders must retain at least 50% ownership in the permitted vessel or its replacement. A permit holder whose vessel is unseaworthy or who does not currently own a vessel may lease or charter a vessel for up to 12 months.

Use-it-or-lose-it requirement

Permits for the Mau Zone fishery will be issued on an annual calendar basis. Participants must meet annual trip and landing criteria in order to qualify for a permit the following year. Participants must make 5 trips to the Mau Zone and land a minimum of 500 pounds per trip of BMUS from the Mau Zone in order to qualify for a permit the following calendar year. The absence of a vessel does not exempt a permit holder from the use-it-or-lose-it requirement. The Council may adjust the annual trip and landing criteria of the use-it-or-lose-it permit requirement and/or impose other requirements.

Permit transfer, lease, charter and sale restrictions

Permit recipients can not transfer, lease, charter or sell their permit.

Annual review

The Council shall undertake an annual review of the Mau Zone limited access system to determine whether adequate attrition has taken place. In the event that it has not, the Council may adjust the use-it-or-lose-it permit requirement and/or impose other requirements. If the current number of

fishery participants is less than the target number, the Council may develop opportunities for new vessels to enter the fishery.

Five-year review

The Council shall undertake a comprehensive review of the effectiveness of the limited access system five years after implementation.

Entry by new vessels

When the number of permitted vessels falls below the target number an opportunity for new participants to enter the fishery will be provided. At this time, the Council is considering establishing a lottery or qualifying point system to allow new entrants into the fishery. The lottery or point system may take into account historical participation in the Northwestern Hawaiian Islands or main Hawaiian Islands bottomfish fishery.

When the number of permitted vessels is equal to or falls below the target number the Council may also combine the Mau and Hoomalu Zones into one limited access system, and/or it may implement identical systems of permit transfer in both zones. If the two zones are combined, the Council may consider establishing other systems of transfer, including direct transfers of permits from one fisherman to another through a market mechanism subject to anti-monopoly and certain other constraints.

1.2 Table of Contents

1.0 Introductory material 1
1.1 Summary 1
1.2 Table of Contents 4
1.3 Introduction 8
1.3.1 Existing regulations 8
1.3.2 Responsible agencies 8
1.3.3 List of preparers 9
1.3.4 Public review and comment 9
2.0 Fishery management program 12
2.1 Problems for resolution 12
2.2 Management objectives 14
2.3 Management unit 14
2.4 Management alternatives 14
2.5 Summary of beneficial and adverse impacts management alternatives 14
2.6 Measures recommended to attain management objectives 16
2.6.1 Specification of optimum yield (OY) 16
2.6.2 Preferred management measure 17
2.6.2.1 Determination of target number 17
2.6.2.2 Initial allocation of permits 18
2.6.2.2.1 Qualifying point system 18
2.6.2.2.2 Community development program 20
2.6.2.3 Permit restrictions 21
2.6.2.3.1 Vessel ownership requirements 21
2.6.2.3.2 Use-it-or-lose-it requirement 22
2.6.2.3.3 Permit transfer, lease, charter and sale restrictions 22
2.6.2.4 Vessel replacement restrictions 22
2.6.2.5 Permit duration 22
2.6.2.6 Workshops on endangered and threatened species 22
2.6.2.7 Annual review 23
2.6.2.8 Five year review 23
2.6.2.9 Entry by new vessels 23
2.6.2.10 Permit fee 24
2.6.2.11 Prohibition of sale of incidentally caught bottomfish 24
2.6.2.12 Appeals 24
2.6.3 Reporting and record keeping requirements 24
2.7 Rationale and net benefit discussion 24

3.0 Analysis of the beneficial and adverse impacts of management alternatives 25
3.1 Ecological impacts 30
3.1.1 Preferred alternative 30
3.1.1.1 Bottomfish stock 30

3.1.1.2 Bottomfish habitat . . . 33
3.1.1.3 Bycatch and interactions with protected species . . . 33
3.1.1.4 Other fish stocks . . . 33
3.1.2 Indirect effort management measures . . . 33
3.1.2.1 Bottomfish stock . . . 33
3.1.2.2 Bottomfish habitat . . . 33
3.1.2.3 Bycatch and interactions with protected species . . . 33
3.1.2.4 Other fish stocks . . . 34
3.1.3 No action . . . 34
3.1.3.1 Bottomfish stock . . . 34
3.1.3.2 Bottomfish habitat . . . 34
3.1.3.3 Bycatch and interactions with protected species . . . 34
3.1.3.4 Other fish stocks . . . 34
3.2 Economic impacts . . . 34
3.2.1 Preferred alternative . . . 34
3.2.1.1 Economic performance . . . 36
3.2.1.2 Bottomfish market stability . . . 36
3.2.1.3 Harvesting sector stability . . . 36
3.2.1.4 Administrative and enforcement costs . . . 36
3.2.2 Indirect management measures . . . 36
3.2.2.1 Economic performance . . . 36
3.2.2.2 Bottomfish market stability . . . 37
3.2.2.3 Harvesting sector . . . 37
3.2.2.4 Administrative and enforcement costs . . . 37
3.2.3 No action . . . 37
3.2.3.1 Economic performance . . . 37
3.2.3.2 Bottomfish market stability . . . 38
3.2.3.3 Harvesting sector . . . 38
3.2.3.4 Administrative and enforcement costs . . . 38
3.3 Social impacts . . . 38
3.3.1 Preferred alternative . . . 38
3.3.1.1 Fairness and equity . . . 38
3.3.1.2 Opportunity for new participants to enter fishery . . . 39
3.3.1.3 Participation by Hawaiians . . . 39
3.3.1.4 Safety of fishermen . . . 39
3.3.2 Indirect effort management measures . . . 39
3.3.2.1 Fairness and equity . . . 39
3.3.2.2 Opportunity for new participants to enter fishery . . . 39
3.3.2.3 Participation by Hawaiians . . . 40
3.3.2.4 Safety of fishermen . . . 40
3.3.3 No action . . . 40
3.3.3.1 Fairness and equity . . . 40
3.3.3.2 Opportunity for new participants to enter fishery . . . 40

3.3.3.3 Participation by Hawaiians 40
3.3.3.4 Safety of fishermen 40
3.4 Evaluation of impacts relative to national standards for fishery conservation and management 40

4.0 Supporting material 42
4.1 Description of the stock(s) comprising the management unit 42
4.1.1 Species or group of species and their distribution 42
4.1.2 Abundance and present condition 42
4.1.3 Estimate of maximum sustainable yield 43
4.1.4 Probable future condition 43
4.2 Description of habitat of the stock(s) comprising the management unit 44
4.2.1 Habitat information needs 44
4.3 Description of fishing activities affecting the stock(s) comprising the management unit 44
4.3.1 History of exploitation 44
4.3.2 Domestic Activities 46
4.3.2.1 Vessel characteristics and fleet composition 46
4.3.2.2 Effort levels 46
4.3.2.3 Landings 46
4.4 Description of economic characteristics 47
4.4.1 Harvesting sector 47
4.4.2 Business and markets 49
4.5 Description of socioeconomic aspects of the commercial and recreational domestic fishing industry and community 50
4.5.1 Employment opportunities and unemployment rates 50
4.5.2 Economic dependance of communities on commercial, recreational or subsistence fishing and related activities 51
4.5.3 Distribution of income within the fishing communities 51
4.6 Description of social and cultural framework of domestic commercial and recreational fishermen and their communities 51
4.6.1 Ethnic character, family structure, and community organization 51
4.7 Safety considerations 52
4.7.1 fishery access and weather-related vessel safety 52
4.8 Existing fishery management jurisdictions, law, and policies 52
4.8.1 Rights of aboriginal Americans 52

5.0 Other applicable laws 54
5.1 National Environmental Policy Act 54
5.1.1 Conclusion and determinations 54
5.2 Paperwork Reduction Act 55
5.3 Coastal Zone Management Act 55
5.4 Endangered Species Act 55
5.5 Marine Mammal Protection Act 56

5.6 Regulatory impact review and Regulatory Flexibility Act 56
5.6.1 Statement of problem 56
5.6.2 Description of alternatives 56
5.6.3 Analysis of the benefits and costs 58
5.6.4 Regulatory Flexibility Act determination 66

6.0 References 69
6.1 Bibliography 69
6.2 Sources of data and methodology 70
6.2.1 Determination of alternative target numbers 70
6.2.2 Model for estimating catch rates 71

7.0 Proposed regulations 73

1.3 Introduction

1.3.1 Existing Regulations

The fishery management plan (FMP) for bottomfish and seamount groundfish fisheries in the western Pacific region became effective on August 27, 1986, as published in Federal Register Notice 51FR27413, July 31, 1986. The FMP prohibits certain destructive fishing techniques, including explosives, poisons, trawl nets and bottom-set gillnets, establishes a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts and implements a permit system for fishing for bottomfish in the exclusive economic zone (EEZ) around the Northwestern Hawaiian Islands (NWHI). The plan also establishes a management framework that includes adjustments, such as catch limits, size limits, area or seasonal closures, fishing effort limitation, fishing gear restrictions, access limitation, permit and/or catch reporting requirements and a rules-related notice system.

Amendment 1 includes the establishment of limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the FMP.

Amendment 2 was developed in 1988 to diminish the risk of biological overfishing and improve the economic health and stability of the bottomfish fishery in the NWHI. The amendment divides Federal waters of the NWHI into two zones: the Hoomalu Zone and the Mau Zone. A limited access system was established for the Hoomalu Zone. Access to the Mau Zone remained unrestricted, except for excluding vessel owners permitted to fish in the Hoomalu Zone. The Mau Zone is intended to serve as an area where fishermen can gain experience fishing in the NWHI, thereby enhancing their eligibility for subsequent entry into the Hoomalu Zone.

Amendment 3 defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20 percent. Amendment 3 also delineates the process by which overfishing is monitored and evaluated.

Amendment 4 requires vessel owners or operators to notify the NMFS at least 72 hours before leaving port if they would be fishing in a 50-mile study zone around the NWHI. This notification allows Federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary.

1.3.2 Responsible Agencies

The Council was established by the Magnuson Fishery Conservation and Management Act to develop management plans for fisheries operating in the U.S. EEZ around 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 that are enforced by the NMFS 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 Fishery
Management Council
1164 Bishop Street, Suite 1400
Honolulu, HI 96813
Telephone: (808) 522-8220

Charles Karnella
Pacific Islands Area Office Administrator
NMFS Pacific Island Area Office
2570 Dole Street
Honolulu, Hawaii 96822-2396
Telephone: (562) 980-4001

1.3.3 List of Preparers

This amendment was prepared by (listed alphabetically within agencies):

Western Pacific Fishery Management Council:	Mark Mitsuyasu, Donald Schug
NMFS Honolulu Laboratory:	Marcia Hamilton, Kurt Kawamoto, Donald Kobayashi, Robert Moffitt, Samuel Pooley
NMFS Pacific Island Area Office:	Raymond Clarke, Alvin Katekaru

The Council would like to thank the members of the Mau Zone Task Force for their time and commitment in helping the Council develop this amendment. Task Force members included: Gary Dill, Robert Gomes, Donald Heacock, Walter Ikehara, David Kalthoff (Chair), Alvin Katekaru, Kurt Kawamoto, Reginald Kokubun, Charles Lesniak, Samuel Pooley, Craig Severance, Clayward Tam, Timm Timony and William Wakefield.

1.3.4 Public review and comment

This amendment was developed with the assistance of a Mau Zone task force established by the Council and was reviewed by the bottomfish and seamount groundfish Plan Team, fishing industry Advisory Panel and the Scientific and Statistical Committee. A draft of this amendment was distributed for comments to all holders of Federal permits for the Northwestern Hawaiian Islands bottomfish fishery and holders of State of Hawaii Commercial Marine Licenses. Notice of the availability of a draft amendment for public review and comment was published in the Federal Register on June 3, 1998. Public meetings and hearings regarding this amendment are listed below.

Date	Meeting (Location)	Published Notice

29 July 1998	97th Council, pubic hearing (Kona)	*FR, **HNA, Hawaii Tribune Herald, West Hawaii Today
16 April 1998	95th Council, public meeting (American Samoa)	FR, HNA, American Samoa News
5 April 1998	Task Force, public meeting (Honolulu)	FR, HNA
25 March 1998	Scientific and Statistical Committee (Honolulu)	FR, HNA
11 March 1998	Bottomfish Plan Team, public meeting (Honolulu)	FR, HNA
29 January 1998	Pubic Hearing, Kauai	FR, HNA, The Garden Isle, Kauai Times
28 January 1998	Public Hearing, Oahu	FR, HNA
27 January 1998	Public Hearing, Maui	FR, HNA, Maui News
14 November 1997	94th Council, public meeting (Honolulu)	FR, HNA
11 November 1997	Scientific and Statistical Committee, public meeting (Honolulu)	FR, HNA
2 October 1997	Task Force, public meeting (Honolulu)	FR, HNA
August 21, 1997	93rd Council, public meeting (Honolulu)	FR, HNA
August 6, 1997	Scientific and Statistical Committee, public meeting (Kona)	FR, HNA
July 28, 1997	Task Force, Bottomfish Plan Team, Bottomfish Advisory Panel, public meeting (Honolulu)	FR, HNA
15 May 1997	Bottomfish Plan Team, public meeting (Honolulu)	FR, HNA
25 April 1997	92nd Council, pubic meeting (Honolulu)	FR, HNA
23 April 1997	Bottomfish Advisory Panel, public meeting (Honolulu)	FR, HNA
1 April 1997	Task Force, public meeting (Honolulu)	FR, HNA
9 April 1997	SSC, public meeting (Honolulu)	FR, HNA
28 February 1997	Task force, public meeting (Honolulu)	FR, HNA

21 November 1996	91st Council, public meeting (Honolulu)	FR, HNA
24 September 1996	Task Force, public meeting (Honolulu)	FR, HNA
9 August 1996	90th Council, public meeting (Molokai)	FR, HNA, Molokai Dispatch
23 July 1996	Task Force, public meeting (Honolulu)	FR, HNA
17 June 1996	Task Force, public meeting (Honolulu)	FR, HNA
26 April 1996	89th Council, public meeting (Honolulu)	FR, HNA

*Federal Register
**Hawaii Newspaper Agency (Honolulu Advertiser and Honolulu Star Bulletin)

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

2.0 Fishery management program

2.1 Problems for resolution

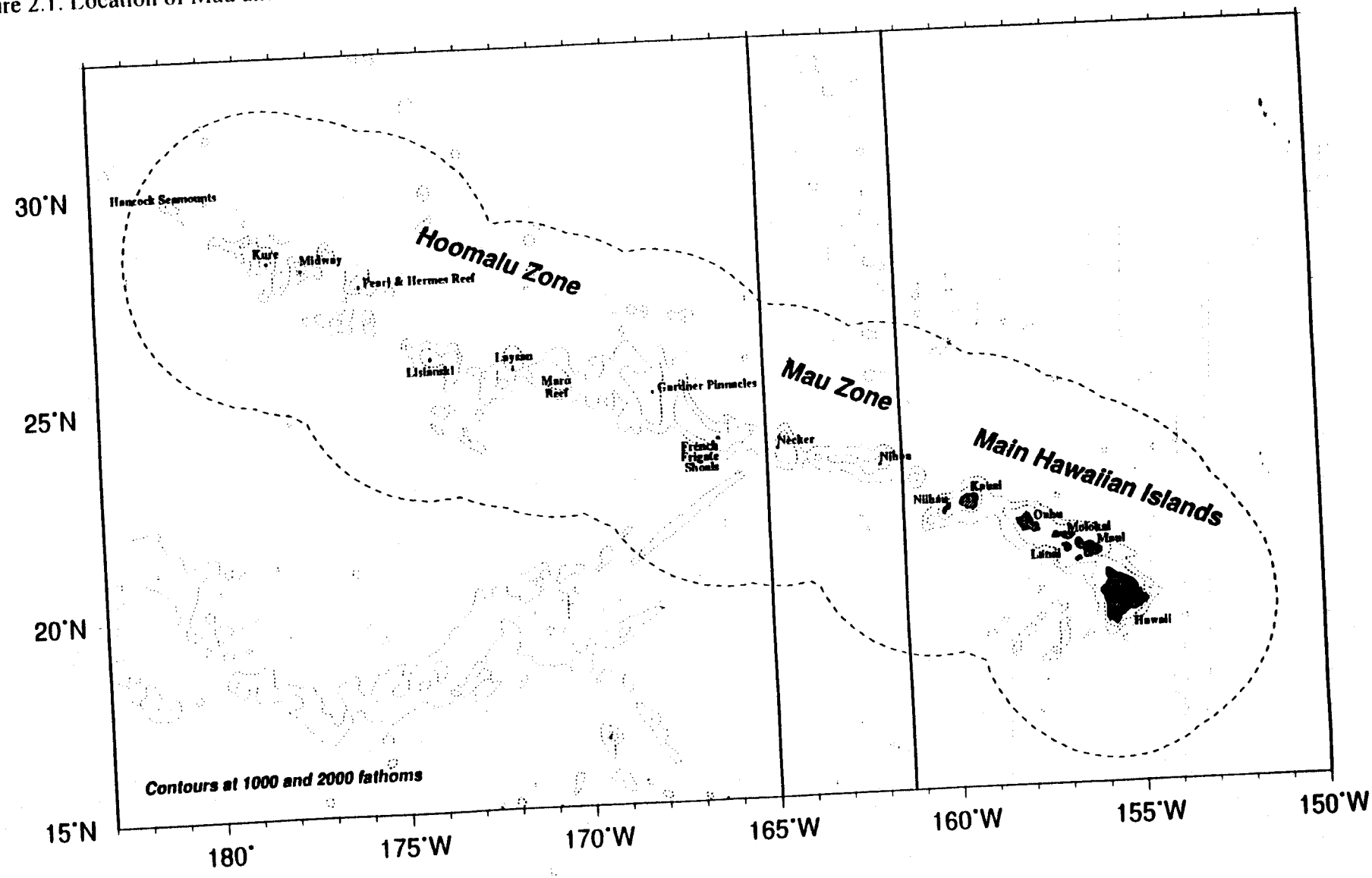
The Council first considered a system of limited access for the Mau Zone bottomfish fishery when Amendment 2 to the FMP was developed in 1988. At that time, the Council decided that there was a need for limited access only in the Hoomalu Zone (the more distant portion of the Northwestern Hawaiian Islands bottomfish fishery) and that the Mau Zone should remain open access (Figure 2.1). A permit was required to fish in the Mau Zone, but the number of permits issued was not limited. One objective of Amendment 2 was to provide opportunities for fishermen who were excluded from the Hoomalu Zone to earn Mau Zone points that could qualify them for limited entry permits should new vessels be allowed to enter the Hoomalu Zone. Maintaining the Mau Zone as open access was also important to bottomfish fishermen who relied on these fishing grounds. However, in recognition of the potential economic and biological problems associated with open access, the Council established a control date in 1991 giving notice to fishermen that a vessel entering the Mau Zone fishery after the control date might be deemed ineligible for a permit if a limited access system based on historical participation was established in the future.

While limited access effectively stabilized effort in the Hoomalu Zone, it was not long before complaints of potential overfishing and low profitability were heard with increasing frequency at meetings of Mau Zone fishermen. Economic analyses showed that instability in the species mix of the catch and the net annual influx of new vessels significantly affected the economic well-being of participants in the Mau Zone fishery (Section 4.4).The average vessel in the fleet could not cover its total annual costs, and the result was extensive economic displacement. Since 1989, more than 15 vessels have entered and left the fishery. Fishermen also expressed apprehension that the decline of bottomfish resources in the main Hawaiian Islands would prompt additional fishermen to enter the Mau Zone fishery. This potential increase in the number of participants in the Mau Zone fishery would cause further economic hardship for the vessels that have traditionally participated in the fishery.

In 1994 and 1995, the total landings of bottomfish management unit species (BMUS) in the Mau Zone fishery exceeded the estimated maximum sustainable yield (MSY) (Section 4.1). The record harvests were largely due to increased catches of uku, a species known to experience cyclical changes in stock abundance. Although the harvests in excess of MSY are not necessarily cause for immediate alarm, there is reason to be concerned about the future condition of bottomfish stocks in the Mau Zone. Fishing pressure increased by three vessels between 1995 and 1996. In addition, the instability and unpredictability of the number of vessels in the fishery from year to year makes it difficult to estimate and interpret biological parameters from catch and effort data. Consequently, the risk of localized overfishing in the Mau Zone is raised.

In response to these concerns, the Council established a two-year moratorium on new entrants into the Mau Zone, effective March 27, 1997. The moratorium capped the total number of vessels admitted into the fishery and allowed time for the Council to examine alternative management measures.

Figure 2.1. Location of Mau and Hoomalu Zones in Hawaiian Island archipelago



2.2 Management objectives

The following FMP objectives are relevant to this amendment:

- Protect against overfishing and maintain the long-term productivity of bottomfish stocks.
- Maintain existing opportunities for rewarding fishing experiences by small-scale commercial, recreational and subsistence fishermen, including native Pacific islanders.
- Maintain consistent availability of high quality products to consumers.
- Maintain a balance between harvest capacity and harvestable fishery stocks to prevent overcapitalization.

2.3 Management unit

The management unit is defined as the bottomfish complex harvested in the Mau Zone fishery of the Northwestern Hawaiian Islands. BMUS and other commonly caught bottomfish species are listed in Table 4.1.

2.4 Management alternatives

The Council considered an array of actions to achieve the management objectives, including limited access (the preferred alternative), total annual quota, minimum size limits, seasonal closures, area closures, gear restrictions, vessel landing limits, vessel trip limits and crew limits. The Council also considered the alternative of taking no action. Detailed descriptions of these alternatives are provided in Section 3.0.

It is the long term goal of the Council to simplify the management of the NWHI bottomfish fishery by joining the Mau Zone and Hoomalu Zone. However, the Council did not regard the alternative of combining the two zones into a single management regime as a practical alternative at this time. Unless the number of Mau Zone permits are immediately reduced to the target level (Section 2.6.2.1), joining the two zones would have the effect of re-creating the over-capacity in the Hoomalu Zone that regulation to date has kept in check. The Council determined that immediately reducing the number of permits to the target number would impose undue economic hardship on fishery participants. Once the number of participants in the Mau Zone fishery has stabilized the Council will consider joining the two zones.

2.5 Summary of beneficial and adverse impacts of management alternatives

A comparison of impacts between the preferred action and alternatives is more easily made when the rejected management measures are grouped together. The "no action" alternative is considered separately. Grouping of these alternatives generally follows the categorization by Anderson (1986). The principal categorization criterion is whether these measures limit effort in the fishery directly or indirectly. Regulations that limit effort directly are classified as limited-entry techniques and include license limitation (the preferred alternative), individual fishing quotas

(IFQs) and taxes on effort or fish. The Council did not consider IFQs or taxes because of the constraints imposed on the use of these measures by the Magnuson-Stevens Act. Measures that limit effort indirectly are classified as open-access techniques and include total quotas, minimum size limits, seasonal closures, area closures, gear restrictions, vessel landing limits, vessel trip limits and crew limits.

A detailed evaluation of the alternatives considered is provided in Section 3.0 and Section 5.6. Tables 2.1 and 2.2 summarize the impacts of the various management alternatives as they apply to the national standards of the Magnuson-Stevens Act and the objectives of the FMP.

The rating code is as follows:

++	=	Strong beneficial impact
+	=	Moderate beneficial impact
0	=	No impact or not applicable
-	=	Moderate negative impact
--	=	Strong negative impact

Table 2.1. Impact summary of preferred action and alternatives based on consistency with FMP objectives.

MP Objectives	Limited access (preferred action)	No action	Indirect effort limitation
Protect against overfishing	++	--	+
Maintain quality market product	++	--	-
Prevent over-capitalization	++	--	--
Maintain fishing opportunities for small-scale fishermen	++	--	--

Table 2.2. Impact summary of preferred action and alternatives based on consistency with national standards.

National Standard	Limited access (preferred action)	No action	Indirect effort limitation
Prevent overfishing	++	--	+

Based on best information	+	0	0
Manage stocks as a unit	++	0	0
No discrimination by state residency	+	+	+
Consider efficiency in use of resource	++	--	--
Management flexibility	+	0	--
Minimize administrative and enforcement costs	+	-	--
Impacts on participants and fishing community	+	-	0
Minimize bycatch	+	0	0
Promote safety of human life	0	-	-

In summary, the Council preferred a limited access system over indirect effort limitations, as limited access offers a more effective long-run solution to the problems of instability and poor economic returns in the fishery. In evaluating the management alternatives the Council also took into consideration that its long term goal is to simplify the management of the NWHI bottomfish fishery by joining the Mau Zone and Hoomalu Zone. The future consolidation of the two zones would be facilitated if the management regime for the Mau Zone fishery is compatible with the limited access system established for the Hoomalu Zone.

2.6 Measures recommended to attain management objectives

2.6.1 Specification of Optimum Yield

The optimum yield for the NWHI bottomfish fishery is defined non-numerically in the FMP as the amount of bottomfish caught by fishermen that will achieve FMP objectives to the greatest extent practicable. The objectives directly applicable to this amendment are listed in Section 2.2.

Notwithstanding the non-numeric definition of optimum yield, the Council regards the annual harvest associated with optimum yield to be less than or equal to MSY. Estimates of MSY and optimum yield are not to be construed as quotas for the fishery, but as revised yield estimates.

2.6.2 Preferred management measures

The preferred managment measure establishes a limited access system to reduce the number of permitted vessels in the Mau Zone fishery to a target number that would allow the highest level of fishery participation consistent with the management objectives. The limited access system for the Mau Zone is consistent with the current limited access system established for the Hoomalu Zone in the NWHI bottomfish fishery.

As required under Sec. 303(b)(6) of the Magnuson-Stevens Act, the Council took into account the following considerations in determining the number of vessels that will be allowed to participate in the Mau Zone fishery and the allocation of fishing privileges among various fishermen: (a) present participation in the fishery (Section 4.3); (b) historical fishing practices in, and dependence on, the fishery (Section 4.5.2); (c) the economics of the fishery (Sections 4.4 and 4.5); (d) the capability of fishing vessels used in the fishery to engage in other fisheries (Section 4.5.2); and (e) the cultural and social framework relevant to the fishery and any affected fishing communities (Section 4.6).

2.6.2.1 Determination of target number

The Council considered various biological and economic factors in determining the number of vessels that should be allowed to enter the fishery. Using the data and methodology presented in Section 6.2.1, target numbers based on three criteria were calculated (Table 2.3). All three criteria maximize the number of vessels in the fishery subject to the constraint of not exceeding MSY. Maximizing the number of vessels was considered important by current participants in the fishery in order to enable the broadest level of access possible within a limited entry system. All three criteria anticipate continuing the part-time participation in the fishery that has been the vessel operation norm. This is consistent with the FMP objective to maintain fishing opportunities for small-scale commercial fishermen and was considered to be an important factor by current fishery participants because of the multipurpose nature of the vessels that typically operate in the fishery and the limited economic profitability of these vessels.

The first criterion seeks to maintain current average vessel operations in terms of fishing effort and daily catch rates. It is the most vessels that can fish at current operating patterns without exceeding MSY. It is essentially an "operational" criterion. The second criterion seeks to increase the average daily catch rate within the MSY constraint. It "mimics" the MSY production model by targeting the MSY catch rate, and is essentially a "biological" criterion. The third criterion seeks to attain a catch rate which generates sufficient revenue to cover trip costs and that portion of fixed costs attributable to participation in the Mau Zone fishery. It is an "economic" criterion.

Table 2.3. Target number of vessels based on various criteria.

Criterion	BMUS pounds landed per vessel	Target number of vessels
1) Maintain average vessel performance	11,580	11
2) Attain MSY catch rate	13,395	10
3) Economic break-even	22,107	6

Considering these biological and economic factors, the Council set the initial target number at ten permits. The Council rejected a target number of 11 because it does not take into account possible error caused by non-reporting or under-reporting of BMUS catches by fishery participants nor does it accommodate a possible level of fishing activity higher than the 1994-1996 levels used to calculate an annual average.[1] The Council rejected a target number of six because it disregards the importance of participation in the fishery by part-time operators (Section 4.5.2), who may accrue significant non-monetary rewards from fishing in the Mau Zone. A target number of ten, on the other hand, increases the average daily catch and allows for a high level of participation by part-time operators without jeopardizing the long-term sustainability of the fishery.

After the limited access system has been in effect for five years, the Council will verify that the target number is still appropriate for current fishing activity levels, catch rates and the biological condition of the stocks (Section 2.6.2.8). If it is not, a new target will be calculated.

2.6.2.2 Initial allocation of permits

The initial allocation of permits under a limited access system for the Mau Zone is based on a qualifying point system. In addition, one-fifth of the target number of permits are reserved for use by a community development program.

2.6.2.2.1 Qualifying point system

The weighted point system balances the claims of historic participation by those fishermen who entered the fishery prior to the control date, but who may have been relatively inactive thereafter, with the economic dependence on the fishery of active newcomers. Overall, the system allows those who have exhibited a commitment to the fishery to maintain the continuity of their economic enterprise. With one exception,[2] no vessel is expected to be excluded under the point system that has fished in the Mau Zone since January 1, 1994. Given the inactivity of the vessels

---

[1]Pooley (1996) states that, if the Mau Zone fleet operates at the maximum annual level of fishing days, the MSY could be harvested by three vessels.

[2]Three permits were issued in 1997 prior to the March 27, 1997 moratorium, but only one of these permit holders participated in the Mau Zone fishery. This permit holder would not qualify under the point system.

that will not qualify to participate in the fishery, the economic consequences of being excluded are expected to be negligible.

Any vessel owner who is eligible for three or more points according to the following point system shall be awarded a permit under the limited access system:

- Was the owner of a vessel that was used to make at least one landing of bottomfish management unit species (BMUS) from the Mau Zone on or before December 17, 1991 - 1.5 points.

- Was the owner of a vessel that was used to make at least one landing of BMUS from the Mau Zone in 1996 - 3.0 points; 1995 - 2.5 points; 1994 - 2.0 points; 1993 - 1.5 points; 1992 - 1.0 point; 1991 - 0.5 point.

A landing is defined for this purpose as any amount of BMUS caught in the Mau Zone and off-loaded for sale. Documentation of qualifying landings must be from properly submitted State of Hawaii landing reports. No landing report that is submitted to the State more than one year after the landing can be used to document eligibility points. The reported landings for any given year may not be used to accumulate points unless an applicant held a valid Mau Zone permit during that year. Applicants must submit their documentation and apply for an initial permit within 45 days of the publication date of the final rule or lose their initial eligibility for a permit. An owner of two or more vessels that are each awarded three or more points can receive a Mau Zone permit for each such vessel.

Applications for a permit must be addressed to the NMFS Pacific Islands Area Office (PIAO) Administrator. The permit application must identify the vessel to be used in fishing, the owner, the captain, relief captains and other information that may be required by the PIAO Director. Partners who alternate as captain should be indicated. For partnerships or corporations, owners names and their percentages of ownership must be included. Vessel identification requirements must be met as established by the regulations. A vessel owner must designate on the initial permit application the vessel to be used in the Mau Zone fishery and must be identified as the vessel's owner on the Coast Guard documentation or state registration form. In the event that a qualifying individual does not own a vessel at the time permits are issued, a 12-month period, beginning on the date of issuance of permits, will be allowed for a vessel to be acquired. The absence of a vessel does not exempt a permit holder from the use-it-or-lose-it requirement (Section 2.6.2.3.2).

2.6.2.2.2 Community development program

The Magnuson-Stevens Act provides for the establishment of a western Pacific community development program for any fishery under the authority of the Council. This provision was added to the Act to address concerns that communities consisting of descendants of indigenous peoples in the Council's area have not been appropriately sharing in the benefits from the region's fisheries. The Council and the Secretary, respectively, have discretion to develop and to approve

programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council.

As stated in the Magnuson-Stevens Act, to be eligible to participate in a western Pacific community development program, a community must.

1) be located within the western Pacific regional fishery management area;

2) consist of community residents who are descended from the aboriginal people indigenous to the area who conducted commercial or subsistence fishing using traditional fishing practices in the waters of the western Pacific region;

3) not have previously developed harvesting or processing capability sufficient to support substantial participation in fisheries in the Council's area;

4) develop and submit a community development plan to the Council and the Secretary; and

5) meet other criteria developed by the Council that are based on traditional fishing practices in or dependence on the fishery, the cultural and social framework relevant to the fishery and economic barriers to access to the fishery. These criteria must be approved by the Secretary and published in the Federal Register.

The Council determined that a community development program should be established to enhance access by eligible communities to the Mau Zone fishery. The Council noted that communities consisting of people descended from the aboriginal people indigenous to the Hawaiian islands have long been among the most economically disadvantaged in the State (Section 4.5.1). The purpose of the community development program is to develop sustainable economic activities in eligible communities. (Hereafter, the term "Hawaiians" or "Part Hawaiians" refers to the aboriginal people indigenous to the Hawaiian Islands and any descendants of those aboriginal people, regardless of blood quantum. In the past, the Council has also used the term "Native Hawaiian" to refer to any descendant of the aboriginal inhabitants).

In determining how many permits should be reserved for the program, the Council took into account that approximately 20 percent of the State of Hawaii's population consists of "Hawaiians" or "Part Hawaiians" (Department of Business, Economic Development and Tourism 1995). Based on this initial guideline, the Council recommended that the number of permits reserved for the community development program be 20 percent of the target number of permits for the Mau Zone. Given that the target number has been determined to be ten permits (Section 2.6.2.1), two of these ten permits will be reserved for the community development program. The number of permits allocated to the program may be periodically reviewed and changed.

The Council, with the approval of the Secretary, will establish the principles and procedures for a community development program for the Mau Zone fishery in accordance with the Magnuson-Stevens Act. The program is expected to be in place before attrition reduces the number of participants in the Mau Zone fishery to the target number. In the event that the program has not been established before the target number is reached the Council will adjust the management

regime to ensure that ten vessels have an opportunity to partcipate in the fishery.

The permits held by the community development program will not be subject to the use-it-or-lose-it requirement (Section 2.6.2.3.2). However, the permits will be subject to transfer, lease, charter and sale restrictions (Section 2.6.2.3.3), and permit holders will be subject to vessel replacement restrictions (Section 2.6.2.4), workshops on endangered and threatened species (Section 2.6.2.6), permit fee (Section 2.6.2.10) and reporting and record keeping requirements (Section 2.6.3).

2.6.2.3 Permit restrictions

It is anticipated that the initial system of allocation will result in a number of potential permit holders that exceeds the target number. Based on State of Hawaii landings data, an estimated 18 vessels will qualify under the point system for entry into the Mau Zone fishery. In addition, two permits will be reserved for a community development program, resulting in an estimated 20 eligible permittees. The system of limited access established by the Council avoids imposing undue hardship on fishery participants and allows attrition resulting from market forces and freedom of choice to reduce the fleet to the target number over several years. With a minimum attrition rate of 15 percent per year (Section 3.1.1.1), the target of 10 vessels is expected to be reached within five years. To help ensure that the desired level of attrition occurs within this time frame, restrictions are imposed on vessel ownership and the transfer of permits and a use-it-or-lose-it requirement is applied.

2.6.2.3.1 Vessel ownership requirements

A permit holder can be an individual, partnership or corporation who may continue as a permit holder as long as the individual, partners or shareholders of record are listed on the original initial application and retain more than 50 percent ownership in the permitted vessel or its replacement. If the ownership of the vessel passes to persons other than those listed as the original permitted parties or falls to 50 percent or below, the permit shall lapse and be surrendered to NMFS. The purpose of this section is to prevent the use of corporate or partner ownership structures to pass fishing vessel permits from one group of individuals to another. A permit holder whose vessel is unseaworthy or who does not currently own a vessel may lease or charter a vessel for use in the Mau Zone for up to 12 months. At the end of the 12-month period the permit shall lapse (Section 2.6.2.5).

2.6.2.3.2 Use-it-or-lose-it requirement

An individual, partnership or corporation awarded a permit under the qualifying point system described in Section 2.6.2.2.1 can apply for a new permit annually as long as the permitted vessel makes a minimum of five landings of Mau Zone bottomfish during the calendar year for which the initial permit was issued and in each calendar year thereafter.

A landing of Mau Zone bottomfish is defined, for the purpose of a permit application, as catching and off-loading at least 500 pounds of bottomfish management unit species from the Mau Zone. Only one landing per fishing trip can be counted toward the landing requirement. Splitting large

landings into multiple 500 pound parts to meet this requirement is prohibited.

Appeals for a waiver of this landing requirement will be determined by the NMFS Southwest Regional Administrator, who will consult with the Council prior to making a determination. Grounds for a waiver are limited to captain incapacitation, vessel breakdowns and a vessel lost at sea. Unprofitability of the fishery is not sufficient reason to waive the landing requirement. The Council may adjust the annual trip and landing criteria of the use-it-or-lose-it permit requirement and/or impose other requirements.

2.6.2.3.3 Permit transfer, lease, charter and sale restrictions

An individual, partnership or corporation awarded a permit under the qualifying point system described in Section 2.6.2.2.1 can not transfer, lease, charter or sell their permit. If a vessel covered by a permit is sold, the permit remains with the original permittee for possible use for a replacement vessel. If the sold vessel is not replaced within 12 months from date of sale, the eligibility of the permit holder to retain or apply for a Mau Zone permit will be lost. Permit holders may hire captains to operate their vessels but may not lease or charter their vessels or permits to fish in the Mau Zone.

2.6.2.4 Vessel replacement restrictions

A permit holder's vessel may be upgraded (through vessel additions or new vessel purchases) to one of no more than 60 feet in length. This restriction on vessel size will limit increases in fishing power but not place the safety of fishery participants at risk.

2.6.2.5 Permit duration

Permits will be issued based on a calender year, January 1 through December 31.

2.6.2.6 Workshops on endangered and threatened species

Participants will still be required (Amendment 2) to participate in a NMFS-U.S. Fish and Wildlife Service workshop to ensure their familiarity with concerns involving marine mammals and endangered species.

2.6.2.7 Annual review

The Council shall undertake an annual review of the Mau Zone limited access system during which time it will examine current participation rates and landings in relationship to MSY and the target number of vessels. The objective of this review is to determine whether adequate attrition has taken place. In the event that it has not, the Council may adjust the annual trip and landing criteria of the use-it-or-lose-it permit requirement and/or impose other requirements. If the current number of participants is less than the target, the Council may develop opportunities for new participants to enter the fishery (Section 2.6.2.9)

2.6.2.8 Five-year review

The Council shall undertake a comprehensive review of the effectiveness of the limited access system five years after implementation. This evaluation will be done with the assistance and advice of the Scientific and Statistical Committee, Bottomfish Plan Team and other advisory bodies as needed. The Council will consider the extent to which FMP objectives have been met and the extent to which the target number of vessels has been reached through attrition. The Council will verify that the target is still appropriate for current fishing activity levels, catch rates and the biological condition of the stocks. If it is not, a new target will be calculated.

The Council will next compare the current participation levels to the original or revised target. If the current number of participants is more than the target, the Council will adjust the annual trip and landing criteria of the use-it-or-lose-it permit requirement and/or impose other requirements.

2.6.2.9 Entry by new vessels

The selling or leasing of permits is prohibited (Section 2.6.2.3.3). However, when the number of permitted vessels falls below the target number, an opportunity for new participants to enter the fishery will be provided. At this time, the Council is considering establishing a lottery or qualifying point system to allow new entrants into the fishery. The lottery or point system may take into account historical participation in the NWHI or main Hawaiian Islands bottomfish fishery. NMFS may require payment of a fee (see Section 2.6.2.10) to cover the costs of administering a lottery system. Establishment of a lottery or qualifying point system or an alternative way of allowing new participants into the fishery will be accomplished under framework procedures in the FMP.

When the number of permitted vessels is equal to or falls below the target number, the Council may also combine the Mau and Hoomalu Zones into one limited access system, and/or it may implement identical systems of permit transfer in both zones. If the two zones are combined, the Council may consider establishing other systems of transfer, including direct transfers of permits from one fisherman to another through a market mechanism provided that the scheme is designed so as to deter any person or entity from acquiring an excessive share of fishing privileges. The framework procedures of the FMP will be used to effect any such changes.

2.6.2.10 Permit fee

A fee will be charged for each application for a Mau Zone bottomfish fishery permit. The amount of the fee will be calculated in accordance with procedures set forth in the NOAA Finance Handbook for determining the administrative costs incurred in issuing permits. The fee will not exceed such costs and will be specified on each permit application form. Failure to pay the fee will preclude the issuance of a Mau Zone permit.

2.6.2.11 Prohibition of sale of incidentally caught bottomfish

BMUS caught in the Mau Zone by vessels engaged in other fisheries in the NWHI may not be retained unless the vessel has a Mau Zone permit. If catches are retained, the vessel involved will

be considered to be fishing for bottomfish in the Mau Zone without a permit, and appropriate penalties will be levied against the offending vessel.

2.6.2.12 Appeals

Appeals to decisions of the PIAO Administrator regarding FMP measures pertaining to the Hoomalu Zone and Mau Zone bottomfish fisheries shall be heard by the NMFS Southwest Regional Administrator, who will consult with the Council prior to making a determination. This appeals process replaces the process set forth in Section 3.17 of amendment 2.

2.6.3 Reporting and record keeping requirements

Any person who receives a permit under the limited access system must comply with reporting and record keeping requirements as described in CFR Section 660.14.

2.7 Rationale and net benefit discussion

The principal motivation for implementing a limited access system for the Mau Zone fishery is to support conservation and long-term productivity of Mau Zone bottomfish stocks. In addition, the Council believes limited access will improve the economic stability of the fishery. Implementation of the limited access system is viewed by the Council as an important component of the overall management strategy to achieve optimum yield and diminish the risk of overfishing in a cost-effective manner over the long term while allowing participation by the greatest number of fishermen possible. The moratorium has stopped the influx of new entrants into the fishery. The system of limited access decreases the large reserve of potential effort that could, under reasonably foreseeable conditions, threaten the resource. At the same time, the system allows attrition due to market forces and freedom of choice to reduce the fleet to more economically rational levels. In summary, the Council is adopting a precautionary approach by instituting fair and equitable controls before a crisis in the fishery occurs.

3.0 Analysis of the beneficial and adverse impacts of management alternatives

The purpose of this section is to assist in understanding the relative ecological, economic and social consequences of alternative management measures by providing a qualitative evaluation of the alternatives identified in this amendment. A shortage of economic and social data on fishery participants and limitations on available information concerning the potential physical effects of management alternatives on fishing activities precludes a detailed quantitative analysis of beneficial and adverse impacts. However, the analysis presented provides an adequate basis for making management decisions.

Before choosing the limited access system described in Section 2.6.2, the Council considered an array of management measures to address the problems in the Mau Zone bottomfish fishery. The alternatives examined by the Council included the following:

Total annual quotas - Quotas would place a ceiling on total annual (or any other period) harvest, and once a quota is reached, no additional fishing would be permitted. Quotas could be applied to one or more bottomfish species or to the entire mixed-species bottomfish complex in the Mau Zone or subareas of the Mau Zone. Quotas are normally filled early in a season because they usually encourage a large pulse of competitive fishing as fishermen rush to get a piece of the action. In fisheries managed under quotas, the supply of fresh fish is cut off as soon as the harvest level is reached. This would be very disruptive to Honolulu fresh fish markets because prices would be erratic, the markets would be vulnerable to import penetration during closed periods and the existing market for fresh bottomfish might be diminished.

Although quotas can prevent biological overfishing, they would not prevent overcapitalization of the harvest sector. Management by quota usually results in progressively shorter fishing seasons to prevent a growing fleet from exceeding conservation-determined quotas. If quotas were species specific, a major difficulty would be to decide what should be done once a quota was reached for a particular species in a multispecies fishery. Should all further fishing be prohibited, or should some sort of non-retention rule be instituted instead? A quota would result in a waste of fish, which must be discarded even if already dead. In addition, to be effectively enforced a quota system normally requires catch reporting or data collection on catches on a near "real-time" basis so that fishing will not continue once the quota is reached. Administrative and enforcement costs are high.

Minimum size limits - The intent of minimum size limits is to increase the yield per recruit by raising the age of entry into the fishery. An associated benefit is the augmentation or protection of the spawning stock and subsequent recruitment. A larger spawning population would be expected to increase the size of future year classes, although this outcome may not necessarily occur for several reasons: 1) environmental changes affecting the spawning-recruitment process; 2) changes in egg production, which is independent of the population density; and 3) environmental carrying capacity constraints.

Minimum size limits could be established for the major species of bottomfish in the Mau Zone. The minimum sizes would correspond to the size at onset of sexual maturity for the species' females. For some species, the size at onset of sexual maturity is known (e.g., opakapaka = 3 pounds; ehu = 1 pound), but for other species, the size at onset of sexual maturity is not known at present or may not be an appropriate management measure to use. For example, minimum size limits are not appropriate for the management of grouper (e.g., hapuupuu) because the size at onset of sexual maturity varies with population structure.

Another problem with implementing minimum size restrictions for the Mau Zone fishery is that deepwater bottomfish usually suffer damage from gas expansion as they are hauled to the surface and have little or no chance of survival if released. To avoid waste, a minimum size limit for bottomfish would need to aim to discourage the hooking of undersized fish rather than to require their release.

Finally, there is no evidence of growth overfishing for any of the Mau Zone species of bottomfish analyzed. Although recent landings of Mau Zone bottomfish have exceeded the best available estimate of MSY, size structure yield-per-recruit analyses show Mau Zone populations of opakapaka, onaga, ubu, hapuupuu. and butaguchi are not growth-overfished (Kobayashi 1997). Few small bottomfish are landed from the Mau Zone compared to the Main Hawaiian Islands.

Closed seasons - For species which are known to form spawning aggregations during a two to three month period, seasonal closures could be a very effective means of protecting stocks that are highly vulnerable to capture during spawning. However, most of the species of Mau Zone bottomfish are not known to form spawning aggregations or they spawn over an extended period.

The spawning period for opakapaka in the Mau Zone is from June through December, with peak spawning in August. For hapuupuu, the spawning period has not been determined. However, ovaries with eggs have been collected from January through April in the NWHI, indicating winter spawning. Very little is known about the reproductive biology of onaga in the Mau Zone, but it is probably similar to that of ehu whose spawning season extends from May through October. The spawning season for butiguchi in the Mau Zone has not been determined.

Unless seasonal closures are of great duration they would not be very effective in protecting most Mau Zone bottomfish stocks because they spawn throughout a large portion of the year. Closing a season for one species in a multispecies fishery means either a season closure for all species or waste of the prohibited species which must be discarded. Moreover, a seasonal closure for a particular species covering a broad area to protect spawning stocks would disrupt the supply of fresh bottomfish. For example, a seasonal closure on the harvest of Mau Zone opakapaka during its apparent late summer spawning season would cut off the supply of one of the few bottomfish species available to Hawaii consumers during the summer months. Moreover, for year-round operations, many Mau Zone fishing boats target a combination of species because seasonal availability prevents them from catching enough of any single species. A seasonal closure for any major species could disrupt the pattern of landings.

Seasonal closures are not likely to increase the fish available for harvest in the long term. Fishing effort could increase to exploit the available stock, requiring progressively shorter open seasons. Moreover, a shortened fishing season would concentrate fishing effort within the season, thereby nullifying any intended conservation gains. Finally, keeping an affected species from the fresh fish market during a closed season could reduce the market acceptance of that species during the fishing season and open the doors for substitutes through imports.

Area closures - Area closures of the bottomfish fishery in the Mau Zone could be applied to any of the numerous banks, shoals and other undersea features in the Mau Zone. Area closures could provide an opportunity to restore the balance to a multispecies fishery. The more aggressive species that are caught first, such an the hapuupuu, would have an opportunity to recover. Area closures could be applied to a portion of the mixed-species complex in the EEZ. For example, closing a nursery area where juveniles congregate would protect against premature harvest. Moreover, periodic rotation of closed areas could keep the amount of area available to fishing at more or less constant levels.

The extent to which an area closure would protect against overfishing depends on the size and location. The size of an area could range from two to three miles in diameter to an entire bank. Closure of areas large enough to encompass a significant portion of the home range of the affected species would be more effective, but observations of fishermen and scientists suggest that the extent of the home range is limited for some species (e.g., onaga, ehu) and extensive for others (e.g. uku, ulua).

Although an area closure may allow depleted stocks to recover, it precludes the possibility of fishing any undepleted stocks in the same area. This would be a detriment to fishermen who target the area for species other than those that the closure is intended to protect. Those fishermen who normally bottomfish in the areas selected for closure are likely to shift to areas or fisheries that are still open. This relocation of fishing pressure may interfere with the opportunities of existing users in the areas and fisheries remaining open. Those who must relocate bottomfish fishing activities as a result of area closures in the Mau Zone may incur increased travel times and associated vessel operating costs.

Gear restrictions - Gear restrictions to reduce fishing power in the hook and line fishery could include measures such as limits on the number of lines or hooks. However, limiting the number of lines or hooks per vessel would probably be impossible to enforce in the bottomfish fishery. Port inspections of vessels immediately prior to a fishing trip would not guarantee compliance with such a regulation because each vessel must have spare gear on board to replace any lost during a trip and the "spare" gear could be fished in addition to the legal limit of gear. At-sea enforcement of this regulation would be required because aerial surveillance could not determine the amount of gear a vessel was fishing. Even at-sea enforcement could be ineffective; a fisherman could either discard excessive gear or, if hauling, could cut his gear when approached by a surveillance boat. Even if enforceable, the effectiveness of this approach in reducing fishing effort would be temporary at best because of additional vessels entering the fishery.

Experimental bottomfishing trials with different hook sizes fished simultaneously indicate that small hooks (Nos. 28 and 30) are more effective in capturing small fish (less than 45 cm fork length) than are larger hooks (Nos. 34 and 38) (Ralston 1982). Thus, fishermen can reduce the capture of small bottomfish by using large hooks. However, even large hooks catch some small fish, so the problem cannot be avoided entirely.

Landing limits per trip - Bottomfish landings per trip could be limited for the mixed-species complex or for one or more individual species of Mau Zone bottomfish. This measure would be similar to a "bag limit." Because of the different sizes and holding capacities of vessels in the bottomfishing fleet, a single landing limit would discriminate against larger boats. Scaling of limits could be established to match the size structure of the fleet.

Fishermen could circumvent a limit on landings per trip by making more trips. However, limiting the amount of landings per trip, in essence, places a ceiling on the revenue per trip. If fishing costs remain constant or increase with inflation, profitability per trip will be reduced or eliminated, possibly reducing the feasibility of making more trips per year directed at bottomfish. Also, fishing would likely be directed at the more valuable species to maximize revenue per trip within the established time limit. This would put further pressure on opakapaka and onaga stocks.

The reduction of fishing effort per vessel would not reduce total fishing effort or fishing mortality in the long run if new boats continue to join the fishery. However, the new boats would probably have smaller harvesting capacities; an individual vessel trip poundage limit reduces the economic incentive for greater vessel catching capacity. Limits on landings per trip can be enforced by dockside activities, but enforcement manpower and budgets might have to be increased to cover all of the possible landing sites both day and night.

Limit the number of trips per year - An alternative means of restricting fishing effort per vessel is to limit the number of bottomfishing trips per year. Because of the variability in the operations of different commercial sectors of the bottomfishing fleet, the trip limits would be scaled according to fleet structure.

Fishing effort and mortality per boat might be reduced by limiting the number of trips per year, but not if fishermen made longer trips or larger catches (including smaller fish) to compensate for a limited number of trips taken. If frozen bottomfish becomes acceptable to the market, an increase in effort and mortality may occur as a result. In the long run, total fishing effort and fishing mortality would not be reduced if now entrants continued to join the fishery. Trip limits do not require dockside enforcement as extensive as poundage limits per trip. However, cross-checking fishermen's trip reports must be thorough enough to discourage cheating.

Crew limits - Limiting the number of crew members per vessel would reduce fishing power. However, the need to pay each crew member a share of the gross revenue already limits crew size on commercial vessels. Moreover, the fishing power of a vessel is related not so much to the size of the crew as to the skill of the skipper and crew, their knowledge of the topography of the

bottomfish grounds and their fish-finding ability. Vessel clearance immediately before a fishing trip would be required to aid enforcement of a crew size regulation. However, additional crew members might embark and debark outside of home port. Aerial surveillance would be only partially effective, and sufficient dockside enforcement would be prohibitively expensive.

No action - Doing nothing presupposes either that there is no problem or that a problem is not severe enough to warrant taking any action. Testimony from Mau Zone fishermen indicates that must fish harder than ever before to catch an acceptable load, and the prospects for improving this situation are not encouraging. Incentives apparently exist for continued fishery pressure despite an apparently bleak profit picture. Evidence suggests that, on average, sufficient revenue is being obtained by fishermen to cover their variable costs of fishing, but their fixed costs are not being covered. This situation, if left unchecked, will result in greater economic losses to fishermen in the short term and beyond and will lead to reduced fishery yields and further instability. A status quo alternative would prolong the existing situation and possibly result in additional problems over the long term.

A comparison of impacts between the preferred measure and alternatives described above is more easily made when the rejected management measures are grouped together. The "no action" alternative is considered separately. Grouping of these alternatives generally follows the categorization by Anderson (1986). The principal categorization criterion is whether the measures limit the total amount of effort in the fishery directly or indirectly. Regulations that limit effort directly are classified as limited-entry techniques and include license limitation (the preferred measure), individual fishing quotas (IFQs) and taxes on effort or fish. These measures constrain fishing pressure by restricting the number of vessels or fishermen allowed to participate in the fishery or by regulating the individual fishing operation through the establishment of biological limits (IFQs) or economic constraints (taxes or fees). At present, the Magnuson-Stevens Act imposes a moratorium on the creation of any new IFQ program and limits fees to those that do not exceed the administrative costs incurred in issuing permits. Because of these constraints, the Council did not consider IFQs or taxes as management options. Measures that limit effort indirectly are classified as open-access techniques and include total quotas, minimum size limits, seasonal closures, area closures, gear restrictions, vessel landing limits, vessel trip limits and crew limits.

Impacts of management alternatives are assessed under three major headings and various sub-headings derived from the national standards of the Magnuson-Stevens Act and objectives of the FMP.

Ecological impacts

- Bottomfish stock
- Bottomfish habitat
- Bycatch and interaction with protected species
- Other fish stocks

Economic impacts

- Economic performance
- Bottomfish market stability
- Harvesting sector stability
- Minimize administrative and enforcement costs

Social impacts

- Fairness and equity
- Opportunity for new participants to enter the fishery
- Participation by Hawaiians
- Safety of fishermen

3.1 Ecological impacts

3.1.1 Preferred measure

3.1.1.1 Bottomfish stock

The system of limited access decreases the large reserve of potential effort that could, under reasonably foreseeable conditions, threaten the resource. However, it is anticipated that the initial system of allocation would result in a number of potential permit holders that exceeds the target number. Based on State of Hawaii landings data, an estimated 18 vessels would qualify under the point system for entry into the Mau Zone fishery. In addition, two permits would be reserved for a community development program, resulting in an estimated 20 eligible permittees. In addition, there is the risk that some permit holders would keep their permits as long as possible in anticipation of the "windfall" profits they may receive if permits are made freely transferable. This factor, combined with the use-it-or-lose-it requirement, may have the affect of increasing fishing effort as participants make sure they qualify each year. The result would be that effort in the Mau Zone could exceed the resource capacity.

However, it unlikely that all the individuals who qualify will enter the fishery. Three of the estimated 20 eligible permittees have not fished in the Mau Zone since 1993; four have taken a total of three or less trips to the Mau Zone since that time; two do not currently own vessels; and two participate intensely in other fisheries and may be unwilling to accept the economic risk of fishing in the Mau Zone. Furthermore, even if the target number is exceeded during the first years of the limited access system, the quantity of participants in the fishery is expected to rapidly decline. As a point of comparison, after the first year (1989-90) of the limited access system in the Hoomalu Zone, the number of vessels participating in that fishery fell from eight to five. In the event that adequate attrition does not take place in the Mau Zone fishery, the Council will adjust the annual trip and landing criteria of the use-it-or-lose-it permit requirement and/or impose other requirements.

Based on data from the 1994-1996 fishing seasons (Kawamoto 1997) and a model for estimating

future catch rates (Section 6.2.2), eight-year projections of fleet size and catch rates were made under two different scenarios. The first scenario (Table 3.1) represents the "worst case" in which all of the estimated 20 eligible permittees enter the fishery during the first year of the limited access program. An attrition rate of approximately 15 percent per year occurs until the target number is reached in year five.

Table 3.1. Projected fleet size and catch rate for the Mau Zone if 20 vessels initially enter the fishery.

	Year							
	1	2	3	4	5	6	7	8
Number of active vessels	20	17	14	12	10	10	10	10
Number of fishing days/vessel/season	36	36	36	36	36	36	36	36
BMUS landings/ vessel/day (lbs)	282	204	184	190	208	240	268	293
BMUS landings/ vessel/season (lbs)	10,152	7,344	6,624	6,840	7,488	8,640	9,648	10,548
Fleet BMUS landings/ season (lbs)	203,040	124,848	92,736	82,080	74,880	86,400	96,480	105,480
Percent of MSY	158	71	54	47	46	66	73	80
Spawning potential ratio	38	27	25	25	28	32	36	39

In this scenario the catch per unit effort (CPUE)(BMUS landings per day) declines sharply and then gradually increases as total effort decreases. The projected CPUE rises above the 1997 level of 290 pounds by the eighth year. The first year in which the MSY catch rate (Section 2.6.2.1) is attained is year 19. The estimated spawning potential ratio, calculated as the ratio of the projected biomass to the carrying capacity, is 49 after 16 years and 50 after 27 years (Section 6.2.2).

The second scenario (Table 3.2) is the one more likely to occur. The number of vessels that enter the fishery in the first year is assumed to be 14, the maximum number of vessels that has ever operated in the fishery. The number of vessels in the fishery then gradually decreases until the target number is reached in the third year.

Table 3.2. Projected fleet size and catch rate for the Mau Zone if 14 vessels initially enter the fishery.

	Year							
	1	2	3	4	5	6	7	8
Number of active vessels	14	12	10	10	10	10	10	10
Number of fishing days/vessel/season	36	36	36	36	36	36	36	36
BMUS landings/ vessel/day (lbs)	282	264	271	295	315	330	341	349
BMUS landings/ vessel/season (lbs)	10,152	9,504	9,756	10,620	11,340	11,880	12,276	12,564
Fleet BMUS landings/ season (lbs)	142,128	114,048	97,560	106,200	113,400	118,800	122,760	125,640
Percent of MSY	108	87	74	81	86	91	94	96
Spawning potential ratio	38	36	36	40	42	44	46	47

In this scenario the projected CPUE rises above the 1997 level of 290 pounds by the fourth year. The first year in which the MSY catch rate (Section 2.6.2.1) is attained is year 15. The estimated spawning potential ratio, calculated as the ratio of the projected biomass to the carrying capacity, is 49 after 12 years and 50 after 27 years (Section 6.2.2). The annual and five-year reviews (Sections 2.6.2.7 and 2.6.2.8) provide opportunities to implement measures to further restrict fishing effort and catch, if necessary. Over the long term, the limited access alternative will lead to a permanent decrease in the amount of effort, thereby contributing to the conservation of Mau Zone bottomfish resources.

Another benefit from restricting the number of fishery participants is that permit holders would have a greater incentive to fish bottomfish stocks conservatively, as prudence is less likely to be negated by competing fishermen who only have a short-term interest in the fishery. The number of fishermen may be reduced to a level where they would be able to agree among themselves, tacitly or explicitly, to exercise restraint. Finally, stability in the number of vessels in the fishery would facilitate the estimation and interpretation of biological parameters from catch and effort data. More accurate information on the condition of Mau Zone bottomfish resources would decrease the risk of biological overfishing.

3.1.1.2 Bottomfish habitat

Fishermen would have an increased incentive to protect bottomfish habitat since they would benefit directly in the form of healthy sustainable catch rates. In addition, reduced fishing effort would lower the potential for vessel groundings or other accidents.

3.1.1.3 Bycatch and interaction with protected species

All new participants in the fishery will continue to be required to attend an information workshop on the protection of endangered and threatened species. In addition, limited access may indirectly reduce the amount of human interaction with endangered and threatened species by reducing fishing effort. Similarly, reduced fishing effort would result in a lower level of bycatch.

3.1.1.4 Other fish stocks

The preferred measure indirectly stabilizes and protects other local fisheries and their stocks by stabilizing participation in the Mau Zone fishery through the maintenance of substantial sustainable landings.

3.1.2 Indirect effort managment measures

3.1.2.1 Bottomfish stock

In general, indirect effort regulations are intended to prevent overfishing. However, in the absence of a limited access policy, any beneficial results from these regulations would attract additional operators and be dissipated among the larger fleet. In addition, they may not provide individuals with incentives for making long-term trade-offs for improved stock conditions. Performance would be on the basis of immediate gains; the fish an individual leaves for a later day may be taken by someone else. Under an indirect effort regulation approach potentially unlimited numbers of fisherman would be pursuing a limited resource.

3.1.2.2 Bottomfish habitat

As mentioned above, fishermen may tend to be more interested in short-term gains than in the long-term biological impacts stemming from their fishing practices. Such shortsightedness could increase the potential for habitat degradation and a lack of concern for the future condition of the environment.

3.1.2.3 Bycatch and interaction with protected species

Indirect effort management measures would allow additional vessels to enter the fishery, thereby exposing the environment to increasing amounts of fishing gear and raising the risk of human interaction with endangered and threatened species. The quantity of bycatch is expected to

increase with an increase in the number of vessels in the fishery.

3.1.2.4 Other fish stocks

Indirect effort regulations have the potential to inadvertently increase fishing pressure on other fish stocks in the Mau Zone because such regulations do not inhibit the influx of new boats. Some of these boats fishing for bottomfish may exploit other fisheries in the area. If the new boats come from outside the state, a net increase in fishing power would occur which may be directed toward fisheries that are already overexploited.

3.1.3 No action

3.1.3.1 Bottomfish stock

If no action were taken it is likely that stocks of preferred bottomfish, such as opakapaka and onaga, would decline as effort increases. Excessive fishing effort is responsible for declining bottomfish catch rates in the main Hawaiian Islands. As the State of Hawaii and Council look toward restricting access to main Hawaiian Islands bottomfish resources, fishermen may increase their effort in the NWHI to meet market demands. In addition, the instability and unpredictability of the number of vessels in the fishery from year to year makes it difficult to estimate and interpret biological parameters from catch and effort data. Consequently, the risk of biological overfishing in the Mau Zone is raised.

3.1.3.2 Bottomfish habitat

The same impact presented in Section 3.1.2.2 is applicable to the no action alternative

3.1.3.3 Bycatch and interaction with protected species

The same impact presented in Section 3.1.2.3 is applicable to the no action alternative.

3.1.3.4 Other fish stocks

The same impact presented in Section 3.1.2.4 is applicable to the no action alternative.

3.2 Economic impacts

3.2.1 Preferred measure

3.2.1.1 Economic performance

The overall economic performance of the fleet in the Mau Zone fishery is poor. For most vessels, revenues are insufficient to cover total annual costs (Section 4.4.1). While it is true that the

majority of vessels operate in other fisheries, the open access characteristic of the Mau Zone fishery precludes any improvement in economic performance. The proposed system of limited access would establish controls to stop further increases in harvest capacity and facilitate its reduction over time with a minimum of short-term economic dislocation.

Based on data from the 1994-1996 fishing seasons (Kawamoto 1997) and a model for estimating future catch rates (Section 6.2.2), the gross revenue and an average vessel after eight years were estimated for three scenarios: 1) no action resulting in a 10 percent per year increase in number of vessels; 2) a limited access system in which all of the estimated 20 eligible permittees enter the fishery during the first year; and 3) a limited access system in which the number of vessels that enter the fishery in the first year is 14 (Table 3.3). Projections are based on the following assumptions:

Number of fishing days per trip	5.5	Number of trips per season	6.6
Price per pound of BMUS ($)	3.10	Price per pound of non-BMUS ($)	2.15

Table 3.3. Estimated gross revenue of an average vessel after eight years under three scenarios.

	No Action	Limited access: 20 initial entrants	Limited access: 14 initial entrants
Number of permits	80	10	10
Number of active vessels	24	10	10
BMUS landings/ vessel/day (lbs.)	118	293	349
Other species landings/ vessel/day (lbs.)	149	149	149
Gross revenue/vessel/ season - all species ($)	24,907	44,600	50,902

If a limited access system is implemented and the number of vessels that enter the fishery in the first year is 14, it is estimated that after eight years gross revenue per vessel would be twice as high than if no action were taken and the expected increase in effort occurred. The larger income would result from the substantially higher CPUE that is predicted if effort levels are controlled. In summary, a limited access system is expected to strengthen the economic performance of the fleet, thereby improving the individual earnings of permit holders as well as the contribution of the fishery to the overall economy

3.2.1.2 Bottomfish market stability

A limited access system should improve market stability and achieve the FMP objective of maintaining high quality products to consumers. It would create conditions conducive to maintaining MSY landings over time and thereby encourage the fishery's maximum contribution possible to the local fish market and consumers on a consistent basis.

3.2.1.3 Harvesting sector stability

The preferred measure would improve stability in the harvesting sector by encouraging the presence of relatively permanent members within the fishery. Those persons receiving permits under the limited access system would be increasingly committed to the fishery as personal income begins to rise.

3.2.1.4 Administrative and enforcement costs

The preferred measure does not alter the cost of surveillance by the U.S. Coast Guard. However, self-monitoring is more likely to occur as personal interests would motivate operators to investigate bottomfish fishing activity conducted by any vessel not licensed to participate in the fishery. Cooperation between enforcement officials and fishermen would heightened under this alternative, and no additional presence of federal enforcement officials on the high seas would be anticipated. Dockside inspections would continue to be the primary enforcement mode.

The process of review and revision established within the Council would broaden. Specifically, the Council would undertake an annual review of the Mau Zone limited access system during which time it would examine current participation rates and landings in relationship to MSY and the target number of vessels. In addition, the Council would undertake a comprehensive review of the effectiveness of the limited access system five years after implementation.

3.2.2 Indirect effort management measures

3.2.2.1 Economic performance

Indirect management measures may exacerbate the problem of overcapitalization by encouraging further capital investment for vessel modifications designed to circumvent regulated inefficiency. In addition, indirect effort policies are designed to institute inefficiencies into the fishery in order to achieve biological objectives. Inefficiencies imposed on fishermen increase operators' costs of fishing and further reduce net income.

3.2.2.2 Bottomfish Market stability

Marketing channels may be disrupted under traditional command-and-control fisheries regulations (e.g., limits on fleet catch or number of trips) because of the combined effect of allowing

additional fishing boats into the fishery while constraining a specific aspect of fishing operations. Under such conditions, operators may find it justifiable to capture the majority of annual total catch in a relatively short period of time. This would result in market gluts, inconsistent supply of a quality product to consumers, low landing prices to fishermen and high prices to consumers at other times in the year.

3.2.2.3 Harvesting sector stability

Vessels more capable of operating under the regulated inefficiencies could displace existing boats, adding to a further destabilization of the fishery.

3.2.2.4 Administrative and enforcement costs

Indirect effort regulations impose operational inefficiencies at fishermen's expense. Rarely, if ever, is such action popular among fishery participants. Consequently, substantial burdens are imposed on enforcement agencies to adequately monitor compliance within the fishery.

Fishermen tend to circumvent regulated inefficiencies by modifying some other aspect of their fishing operation to increase fishing effort. Administrative costs increase in the long term as additional regulations are imposed to limit catch and maintain effective reductions in fishing effort.

3.2.3 No action

3.2.3.1 Economic performance

The no action policy would allow fishing effort to continue to increase. No mechanism would exist to reduce the number of entrants to the fishery or to constrain existing operations from expanding their vessels fishing capacity.

The economic performance of the fleet would continue to spiral downward as an increasing number of fishermen compete for a portion of a declining resource. Under the assumptions set forth in Section 3.2.1.1, a policy of no action would result in a substantial reduction in gross revenues for the average firm.

3.2.3.2 Bottomfish market stability

Consumers may suffer under a no action policy if excessive effort fishes down stocks, thereby reducing both the quality and quantity of desirable bottomfish species available to local fresh fish markets. Prices could increase to consumers for specific products, such as opakapaka, that have historically contributed a significant amount to local fresh fish markets.

3.2.3.3 Harvesting sector stability

Under a no action policy, fishing pressure in the Mau Zone would remain unstable, with fluctuating activity levels and catches.

3.2.3.4 Administrative and enforcement costs

A policy of no action would perpetuate the status quo for existing enforcement procedures without adding or reducing costs or responsibility to management agencies in the short term. However, enforcement and administrative costs in the long term could be excessive if expensive management measures are later required to protect or rebuild stocks because of past management neglect.

3.3 Social impacts

3.3.1 Preferred measure

3.3.1.1 Fairness and equity

An initial allocation of permits by means of a qualifying point system would take into account present participation in, and economic dependence on, the fishery. The point system would not cause redistribution of the access to the resource away from the part-time or smaller producers. Admitting a larger number than the target total, but retracting the permits as holders retire until the target number remains outstanding, would provide time for fishermen to make adjustments to leaving the fishery. The Council regards such voluntary withdrawal to be the fairest way to attain a balance between harvest capacity and harvestable fishery stocks.

A limited access system would stabilize the Mau Zone fishery by regulating the size of the fleet. Participant longevity could be beneficial to social relations within the group of fishery participants as well as within the Hawaii fishing community as a whole. Establishing long-term professional associations within the fishery and broader community should encourage stability and confidence by fostering personal and professional commitments.

3.3.1.2 Opportunity for new participants to enter the fishery

Should the number of permitted vessels fall below the target number, an opportunity for new participants to enter the fishery would be provided. At this time, the Council is considering establishing a lottery or qualifying point system to allow new entrants into the fishery. The lottery or point system may take into account historical participation in the NWHI or main Hawaiian Islands bottomfish fishery.

Should the number of permitted vessels equal or fall below the target number, the Council may also combine the Mau and Hoomalu Zones into one limited access system, and/or it may

implement identical systems of permit transfer in both zones. If the two zones were combined, the Council may consider establishing other systems of transfer, including direct transfers of permits from one fisherman to another through a market mechanism subject to anti-monopoly and certain other constraints.

3.3.1.3 Participation by Hawaiians

The preferred action of limited access would help ensure that the commercial value of the Mau Zone fishery could be maintained for Hawaiians as well as other ethnic groups in the state.

To the extent that a limited access system reduces the ability of Hawaiians to participate in the fishery, the benefits of the management action should be evaluated more conservatively. However, reserving a certain number of permits for use by a community development program should facilitate the entry of Hawaiians into the fishery.

3.3.1.4 Safety of fishermen

The 60-ft. restriction on vessel size would limit increases in fishing power but not place the safety of fishery participants at risk.

3.3.2 Indirect effort management measures

3.3.2.1 Fairness and equity

Indirect effort policies would promulgate inefficiency in the industry, thereby reducing fishermens operational flexibility. Operators would be put at a disadvantage in order to reduce their fishing success. Frequently, under an indirect effort policy, there is a recurring need to add more constraints because fishermen are continually circumventing the initial regulated inefficiency. In the long run, the fishery would become increasingly inflexible.

Indirect effort regulations would not encourage long-term commitment to the fishery. This may destabilize social relations among participants in the fishery as well as among members of the Hawaii fishing community as a whole.

3.3.2.2 Opportunity for new participants to enter the fishery

Indirect effort regulations would enable free and open access into the fishery. However, this type of freedom, without any constraints on increases in fishing effort, is a primary cause for the fishery's poor economic performance.

3.3.2.3 Participation by Hawaiians

Indirect effort policies may encourage further capital investment for vessel modifications designed

to circumvent regulated inefficiency. In addition, inefficiencies imposed on fishermen by these measures may increase fishing costs. Increases in capital and operating costs will fall most heavily on low-income groups. Hawaiians are the most economically disadvantaged of any ethnic group in the state.

3.3.2.4 Safety of fishermen

Indirect effort regulations could reduce the level of safety for fishermen operating in the Mau Zone. Measures such as closed seasons, catch limitations and gear restrictions may encourage fishermen to take a greater number of trips for longer periods of time during weather periods that may compromise safety of vessels and their crews.

3.3.3 No action

3.3.3.1 Fairness and equity

No action would allow maximum flexibility for fishermen at the expense of perpetuating the social, economic and biological problems associated with open access.

3.3.3.2 Opportunity for new participants to enter the fishery

The same impact presented in Section 3.3.2.2 is applicable to the no action alternative.

3.3.3.3 Participation by Hawaiians

The excessive fishing effort and decline in bottomfish stocks that would likely occur if no action were taken will result in fewer profitable fishing opportunities for Hawaiians and other fishermen.

3.3.3.4 Safety of fishermen

No action could result in safety problems at sea if gear and/or vessel conflicts develop as the number of participants increase.

3.4 Evaluation of impacts of preferred measure relative to national standards for fishery conservation and management.

National Standard 1 -- The preferred measure is expected to increase the net benefits of the fishery to the nation while preventing overfishing of the fishery resources (Sections 3.1.1.1 and 3.2.1.1).

National Standard 2 -- Based on the best scientific information available, the preferred measure would institute controls before a crisis in the fishery occurs (Section 3.1.1.1).

National Standard 3 -- The preferred measure would be consistent with the current limited access management regime established for the Hoomalu Zone in the NWHI bottomfish fishery (Amendment 2).

National Standard 4 -- The preferred measure would not discriminate between residents of different states and would be fair and equitable, reasonably calculated to promote conservation and designed to deter any person or entity from acquiring an excessive share of fishing privileges (Section 3.3.1).

National Standard 5 -- The preferred measure is expected to improve the profitability of harvest operations without endangering the long-term productivity of the bottomfish resource (Sections 3.1.1.1 and 3.2.1.1)

National Standard 6 -- The limited access system would be evaluated annually and a comprehensive assessment would be performed five years after implementation (Section 3.2.1.4).

National Standard 7 -- The preferred measure, to the extent practicable, would minimize costs (Section 3.2.1.4).

National Standard 8 -- The preferred measure would take into account the importance of fishery resources to the fishing community in order to provide for the sustained participation of such communities (Sections 3.1.1.1 and 3.2.1) and to the extent practicable, minimize adverse economic impacts on the community (Section 3.3.1).

National Standard 9 -- The preferred measure would minimize bycatch (Section 3.1.1.3).

National Standard 10 -- The preferred measure would not decrease the safety of human life at sea (Section 3.3.1.4).

4.0 Supporting material

4.1 Description of the stock comprising the management unit

4.1.1 Species or group of species and their distribution

The BMUS and other commonly caught bottomfish species are presented in Table 4.1. The first six species listed account for nearly all of the landings of Mau Zone BMUS. All of the species in Table 4.1 occur throughout the Hawaiian archipelago, but little is known about stock dynamics and interchange between bottomfish populations along the archipelago.

Table 4.1. List of common and scientific names of bottomfish species frequently caught in the Mau Zone.

Common name	Scientific name
	Bottomfish Management Unit Species (BMUS)
Uku	*Aprion virescens*
Butaguchi	*Pseudocaranx dentex*
Hapuupuu	*Epinephelus quernus*
Opakapaka	*Pristipomoides filamentosus*
Onaga	*Etelis coruscans*
Ehu	*E. carbunculus*
Kalekale	*P. sieboldii*
Gindai	*P. zonatus*
Lehi	*Aphareus rutilans*
Yellowtail kalekale	*P. auricillia*
White ulua	*Caranx ignobilis*
Black ulua	*C. lugubris*
Kahala	*Seriola dumerili*
Taape	*Lutjanus kasmira*
	Other bottomfish species
Papa ulua	*Carangoides orthogrammus*
Omilu	*Caranx melampygus*
Hogo	*Pontinus macrocephalus*

4.1.2 Abundance and present condition

Amendment 3 defined recruitment overfishing as having occurred when the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20 percent.

Spawning potential ratios (SPRs) for the principal species in the Mau Zone fishery were calculated using the methodology of Somerton and Kobayashi (1990) for dynamic SPR (Table

4.2). Virgin CPUE is estimated from the 1948-52 mean; the current CPUE estimate is a single-year estimate; the CPUE of aggregate bottomfish were calculated separately for Mau and Hoomalu Zones; virgin catch size composition is estimated from 1986-1988 NWHI catch data; current size composition is estimated from single-year catch data; and 90.25 percent non-parametric bounds confidence intervals were constructed on best and worst case bounds of SPR components (CPUE and percent immature) (Kobayashi 1996).

Table 4.2. Spawning potential ratios for principal species in the Mau Zone 1991-1996.

Species	1991	1992	1993	1994	1995	1996
Uku	42	37	35	66	46	51
Opakapaka	40	36	35	64	43	51
Onaga	41	36	36	75	49	59
Hapuupuu	47	42	39	71	46	56
Ehu	42	37	35	65	43	51

SPR estimates for all five species available are above the 0.20 level, though lower confidence limits often are near or slightly below this level. It is difficult to detect trends because of the uncertainty associated with the SPR estimates.

The correlation of SPR values among species is due to the high dependence of SPR on the CPUE component, given that the maturity component is nearly negligible. All species utilize the same aggregate bottomfish CPUE component. The maturity component is small relative to main Hawaiian Island SPR calculations because 1) the NWHI catch is primarily mature fish and 2) the current catch size composition is relatively unchanged from the best estimate of the virgin catch size composition. Presently, there are no means by which to calculate a targeted CPUE for this fishery because most bottomfish trips to the Mau Zone are mixed trips from which species specific effort can not be separated given the available data.

4.1.3 Estimate of MSY

The MSY for bottomfish in the Mau Zone is estimated to be 131,210 pounds (Kobayashi 1996). This MSY estimate is for all bottomfish species combined, as it is not yet possible to derive species-specific MSY.

4.1.4 Probable future condition

Table 4.5 shows that in 1994 and 1995 the landings of BMUS in the fishery exceeded the estimated MSY. The record harvests were largely due to increased catches of uku, a species known to experience cyclical changes in stock abundance. Although the harvest in excess of MSY is not necessarily cause for immediate alarm, there is reason to be concerned about the future

condition of bottomfish stocks in the Mau Zone. Fishing pressure increased by three vessels between 1995 and 1996. Moreover, the instability and unpredictability of the number of vessels in the fishery from year to year (Table 4.4) makes it difficult to estimate and interpret biological parameters from catch and effort data. Consequently, the risk of biological overfishing in the Mau Zone is raised.

4.2 Description of habitat of the stocks comprising the management unit

4.2.1 Habitat information needs

Research is needed to continue to identify areas important for the recruitment of juvenile bottomfish. Researchers have identified two persistent, aggregations of juvenile opakapaka in areas of low relief benthic habitat at depths of 65-100 m in the main Hawaiian Islands. The first site is located off Kaneohe Bay on Oahu and the second off the southwest coast of Molokai. Juvenile Hapuupuu have been collected during the summer months around Necker Island and Maro Reef in the NWHI. This type of research is needed in the NWHI and will provide information necessary to protect and conserve critical bottomfish nursery habitat.

4.3 Description of fishing activities affecting the stocks comprising the management unit

4.3.1 History of exploitation

Fishing for bottomfish has been a component of Hawaii's commercial fisheries since at least 1900; while subsistence bottomfish fishing has been a part of Hawaiian culture for more than a thousand years. Fishing by Hawaiians in areas of the NWHI predates by centuries any U.S. fishing activities in the area. Descriptions of early fishing practices indicate that Hawaiians harvested the same deep-sea bottomfish species as the modern fishery and used some of the same specialized gear and techniques (ie. circle type hooks, branch lines separators, etc.) employed today. Oral traditions state that Hawaiians visited Nihoa on a regular basis into the 1800s, and it is likely that they had the canoes and fishing gear to harvest bottomfish on banks in what is today the EEZ surrounding the Hawaiian Islands (Iverson *et al.* 1990). A large rotating fishhook was recovered during archaeological excavations on Nihoa Island by Emory (1928). This type of fishhook would have been used while fishing deep-water grounds for bottomfish (Iverson *et al.* 1990).

After European colonization of the Hawaiian Islands in the nineteenth century, an extensive commercial bottomfish fishery developed. By the 1930s, a fleet of vessels fished for bottomfish throughout the archipelago, with as many as five large (20 m) vessels venturing into the NWHI (Haight *et al.* 1993). The number increased to nine vessels immediately following the end of the Second World War, and landings reached a record high. In the mid-1950s, vessel losses and depressed fish prices resulting from large catches reduced the number of fishermen in the NWHI; by the 1960s only one vessel remained in operation in the NWHI.

There was renewed interest in the resources of the NWHI in the mid-1970s when state and federal agencies collaborated in a study focusing on the resources of the region (Haight *et al.* 1993). Both the supply of and demand for bottomfish expanded substantially during the 1970s and 1980s. The number of vessels fishing in the NWHI increased from five in 1978 to 28 in 1987. Increased fishing effort by new vessels in the NWHI provided a reliable supply to restaurants catering to a growing tourism trade. This led to increased prices for fishermen, who further expanded their fishing effort in response (Pooley 1993). Increased fishing pressure and fluctuating exploitation rates in the NWHI prompted the Council to impose a limited access system for the Hoomalu Zone in 1988. In recent years, the Mau Zone has seen a disproportionately greater effort, as any new entrant to the NWHI bottomfish fishery has been restricted to fishing in that area. Only three vessels harvested bottomfish in the Mau Zone in 1989, but during the 1990s, eight or more boats have participated in the fishery (Table 4.4). Approximately 80 permits for the Mau Zone fishery were issued between 1989 and the permit moratorium in 1997, 30 of which have been actually used to fish in the area. However, only one-third of the 30 vessels were active in the fishery for more than two years (Table 4.3).

In short, the Mau Zone fishery has been characterized by rapid growth and high turnover. New vessels entered the fishery during each year of the eight years examined, and the recent rate of entry has been substantially greater than the rate of exit.

Table 4.3. Mau Zone vessel entry and exit patterns 1989-1996

Vessel	1989	1990	1991	1992	1993	1994	1995	1996
1	X							
2	X							
3		X						
4		X						
5		X						
6		X						
7			X					
8		X	X					
9	X	X	X					
10		X	X					
11		X	X					
12				X				
13		X	X	X				
14					X			
15					X			
16			X			X		
17		X	X			X	X	
18				X	X	X	X	X
19		X	X	X	X	X	X	
20						X	X	X
21		X	X	X	X	X	X	X
22					X	X	X	X

23				X	X	X
24				X	X	X
25			X			X
26					X	X
27					X	X
28						X
29						X
30						X

4.3.2 Domestic Activities

4.3.2.1 Vessel characteristics and fleet composition

Vessels active in the Mau Zone fishery average 44 feet in length overall and have a 13-foot beam (Hamilton 1994). With an average fuel capacity of 1,500 gallons the vessels have a maximum range (round-trip) of 1,800 miles. The average maximum hold capacity is 4,000 pounds.

4.3.2.2 Effort levels

The amount of effort (fishing days) expended in the Mau Zone fishery has fluctuated along with the number of active vessels (Table 4.4). Mau Zone activity levels peaked in 1994 with a total of 594 fishing days as a result of a combination of relatively large fleet size and intensive activity by each vessel.

Table 4.4. Estimated effort levels in the Mau Zone 1991-1996

	1991	1992	1993	1994	1995	1996
Number of vessels[1]	14	8	8	12	10	13
Total trips	84	55	72	99	97	81
Fishing days per trip	5.9	5.9	4.9	6.0	5.1	5.5
Total fishing days	496	319	353	594	495	446

[1] Number of vessels may not coincide with data presented in Table 4.3 because of participation in the Mau Zone fishery by unpermitted vessels.

4.3.2.3 Landings

Landings of BMUS in the Mau Zone fishery are shown in Table 4.5.

Table 4.5. Total landings of Mau Zone BMUS species 1991-1996 (1,000 lbs). Percent of total landings by species is presented in parentheses.

Species	1991	1992	1993	1994	1995	1996
Uku	22	5	8	52	61	45
	(22.2)	(7.6)	(8.8)	(34.2)	(39.6)	(34.6)
Butaguchi	19	18	29	34	25	22
	(19.0)	(6.0)	(15.0)	(14.0)	(14.0)	(19.0)
Opakapaka	13	26	27	22	14	15
	(13.6)	(26.0)	(29.7)	(14.5)	(9.1)	(11.5)
Onaga	9	6	4	8	6	10
	(6.9)	(9.1)	(4.4)	(7.2)	(16.9)	(7.7)
Ehu	14	2	4	8	6	10
	(14.7)	(3.0)	(4.4)	(5.3)	(3.9)	(7.7)
Other BMUS	8	3	4	11	8	9
Total	97	66	91	152	153	130

Uku has been the mainstay of the Mau Zone fishery for the past three years. It is thought that the recent importance of uku is due to a cyclical increase in abundance. However, little is known about the biology or behavior of this species (Kawamoto 1997). The catch of opakapaka has shown a downward trend since 1992 and decreased 32 percent in the past three years. Landings of onaga fell in 1996 due to the appearance of a "burn" condition in larger onaga (Kawamoto 1997).

4.4 Description of economic characteristics

4.4.1 Harvesting sector

The total revenues earned by participants in the Mau Zone fishery are presented in Table 4.6.

Table 4.6. Ex-vessel value of Mau Zone bottomfish landings 1991-1996.

	1991	1992	1993	1994	1995	1996
Inflation adjusted ex-vessel value ($)	326,000	223,000	310,000	514,000	476,000	448,000

The instability in the species mix of the catch (Table 4.5) and the net annual influx of new vessels (Table 4.3) has significantly affected the economic performance of the Mau Zone fishery. Table 4.7 provides estimates of average gross and net revenue and fixed and variable costs for vessels operating in the Mau Zone expressed on a per trip and per season basis. The majority of vessels participate in the Mau Zone fishery during a season that generally extends from November to April. For the remainder of the year many vessels participate in other Hawaii fisheries. Due to the variety of these fishing activities and the resulting difficulty in estimating costs and returns, a Mau Zone fishing season is used as the unit of economic analysis. Fixed costs have been apportioned to Mau Zone fishing activity based on an examination of catch reports submitted between 1994 and 1996 which showed that the average vessel was expending 41% of its total annual effort (in fishing days) to Mau Zone fishing trips. Cost estimates are based on data collected by Hamilton (1994) from eight vessels active in the fishery and have been adjusted to current dollars using the Honolulu consumer price index. Catch and revenues are derived from 1994-1996 average catch rates, vessel operating patterns and ex-vessel fish prices (Kawamoto 1997). Revenues are based on all fish landed and sold, including pelagic species that are typically an important secondary target.

The analysis assumes a one-man crew including captain and 44-foot, diesel-powered vessel costing $150,000 and equipped with a refrigerated hold.

Assumptions:

Number of fishing days per trip	5.5	Number of trips per season	6.6
Catch per day of BMUS (lbs.)	319	Catch per day of non-BMUS (lbs.)	149
Price per pound of BMUS ($)	3.10	Price per pound of non-BMUS ($)	2.15
Fixed costs per season ($):		Operating costs per season ($):	
Capital	4,579	Fuel and oil	4,189
Annual repair	5,415	Ice	1,392
Vessel insurance	3,170	Bait	1,928
Administrative	1,717	Handling	4,800
Total	14,881	Provisions	2,142
		Gear and supplies	2,999

Other	2,892
Crew income	8,000
Captain income	11,500
Total	40,472

Table 4.7. Average net profit/loss per trip and season for a Mau Zone vessel

	Trip	Season
Gross revenue ($)	7,201	47,526
Net return ($)	-1,186	-7,827

The average vessel in the fleet cannot cover its total annual costs, and the result has been extensive economic displacement. Since 1989, more than 15 vessels have entered and left the fishery. It cannot be assumed that economic failure of vessels in the fishery for bottomfish in the Mau Zone will eventually reduce fishing effort to more appropriate levels. Continuing instability in the fleet can be expected in an open access fishery. Some vessels that can cover variable costs will continue to fish in the Mau Zone because of the non-monetary benefits they receive from participating in the fishery. Bankrupt vessels are sometimes bought for a fraction of their initial capital cost and return to the fishery with new owners who believe that reduced capital servicing obligations will give them a competitive edge over other fishermen. Also, vessels displaced from overfished continental U.S. fisheries have been arriving in Hawaii at a steady rate on a "look-see" basis. These owners and captains are largely unaware of economic conditions in the fishery when they first arrive in Hawaii.

4.4.2 Business and markets

Nearly all bottomfish caught in the Mau Zone are sold to the United Fishing Agency, the principal Honolulu wholesale market. Markets exist on the islands of Maui, Kauai and Hawaii, but these are relatively minor. Virtually the entire demand for bottomfish is limited to fresh fish, and the vessels frequenting the NWHI have the capacity to periodically flood the fresh fish market. A market for frozen Mau Zone bottomfish products has not developed, and this limits fishing time as well as range. The limiting factors are, first, how long a vessel can stay on the fishing grounds and still deliver high-quality fresh fish to Honolulu and, second, the amount of fishing time necessary to land a catch that will meet the vessel owner's financial obligations. The Mau Zone fishermen are thus caught in a dilemma - they must stay out long enough to cover trip expenses, but keep the trips short enough to deliver a readily saleable, high-quality fresh product.

4.5 Description of socioeconomic aspects of the commercial and recreational domestic fishing industries and communities

4.5.1 Employment opportunities and unemployment rates

The traditional mainstays of Hawaii's economy - construction, plantation agriculture and tourism - have experienced a dramatic decline in the 1990s, resulting in bankruptcies, foreclosures and unemployment. It is unlikely that, at least in the near future, any new major industry will develop in the state to significantly increase employment opportunities.

The lack of alternative sources of employment in Hawaii may increase the emphasis that the State's large number of part-time commercial fishermen place on fishing income and attract additional part-timers into the fisheries. For example, with the decline of Hawaii's sugar industry many former plantation employees are turning to fishing as a livelihood. The bottomfish fishery is particularly attractive to part-timers because of the comparatively low initial investment, low operating costs and high potential returns. However, opportunities for a greater level of participation in the bottomfish fishery are limited. Catch rates of bottomfish around the main Hawaiian Islands have declined substantially during the last decade. The State of Hawaii has recently established area closures and implemented other regulations to support the recovery of bottomfish resources in the main Hawaiian Islands. Increased fishing pressure and fluctuating exploitation rates in the NWHI prompted the Council to establish a limited access system for the NWHI Hoomalu Zone in 1988 and to impose a two year moratorium on new entrants into the Mau Zone in 1997.

The poor performance of the state economy during the last several years has had particularly severe consequences for the Hawaiian population. Hawaiians have long been among the most economically disadvantaged ethnic or racial groups in Hawaii in terms of standard of living, degree of unemployment, dependence on transfer payments and limited alternative employment opportunities. In recent years, Hawaiians have had the highest proportion of individuals living below the poverty line. In 1989, 6 percent of all the families in the state had incomes classified below the Federal poverty level (Eshima 1996). During the same period, 14 percent of Hawaiians were below the poverty line. Nearly 15 percent of Hawaiian households receive public assistance income, compared to 6.8 percent of all households in the state (Eshima 1996). In several residential areas over a third of Hawaiian households receive public assistance. The recent downturn in the State economy has further increased the economic pressure on the Hawaiian population. Stagnation in the tourism industry, for example, has decreased the number of low-wage service jobs available to Hawaiians, who typically lack marketable skills for alternative forms of employment. In addition, given the high dependence of Hawaiians on social welfare programs, cuts in federal- and state-funded assistance have a particularly adverse economic effect on this group.

4.5.2 Economic dependance of communities on commercial, recreational or subsistence fishing and related activities

The majority of participants in the Mau Zone fishery shift from species group to species group and from the bottomfish fishery to other fisheries, primarily the pelagics fishery, in response to seasonal fish abundance or fluctuations in price. Only a small percent of the fishermen fish exclusively for bottomfish during the year. Seasonal price variability causes the fishermen to concentrate their bottomfish fishing effort during December, when they can take advantage of the year-end holiday demand for red snappers, such as onaga and ehu. Although bottomfish fishing is not the only fishing activity of most Mau Zone fishery participants, it may be important to the year-round operations of some individuals.

Bottomfish fishing, together with other types of fishing, are also important to many Hawaii fishermen who have traditionally relied on the sale of fish for only a portion of their income. Without this supplement to basic incomes, many of these part-timers would face economic hardships in Hawaii's expensive economic climate. For many of these fishermen it is the plurality of their occupational endeavor that provides economic stability as well as personal satisfaction and lifestyle.

4.5.3 Distribution of income within the fishing communities

Most of the participants in the Mau Zone fishery are small businesses, mainly individual proprietorships. As noted in Section 4.4.1, the net income earned by owners, captains and crews from the fishery is modest.

4.6 Description of social and cultural framework of domestic commercial, recreational and subsistence fishermen and their communities

4.6.1 Ethnic character, family structure and community organization

As indicated in Section 4.3.1, bottomfish fishing by Hawaiians in areas of the NWHI predates by centuries any U.S. fishing activities in the area. Archival material suggests that after European colonization many Hawaiians became actively engaged in commercial fishing (Cobb 1905). However, by the turn of the century Japanese immigrants to Hawaii represented the majority of the deep-sea handline fishery participants.

Some Hawaiians participated in the commercial NWHI bottomfish fishery both as captains and crew members during the 1920s and 1930s and the post-WWII period until 1988, but the number is unknown (Iverson *et al.* 1990) [redacted] 1990) [redacted]

There is abundant historical and archaeological evidence of the social importance of bottomfish in

traditional Hawaiian culture (Iverson *et al.* 1990). This significance was of both an economic and ritual nature. Bottomfish, such as kahala, ulua and ula ula (onaga), are specifically mentioned in traditional prayers used by fishermen, and fishing for these species was associated with religious rites. The cultural significance of bottomfish species to Hawaiian society is also indicated by the growth stage names for opakapaka, white ulua, and kahala and the varietal names for ula ula and uku.

There may continue to be a strong cultural and religious connection between contemporary Hawaiians and certain species of bottomfish (Iverson *et al.* 1990). Some present-day Hawaiian consumers of these bottomfish may still associate these fish with traditional beliefs and depend upon the fish for food. Because of the high cost of some bottomfish, they may be frustrated in maintaining such a traditional connection. Industry sources report that Hawaiians purchase proportionally less bottomfish than other ethnic groups, possibly because of the relatively high cost. If Hawaiians have less disposable income, they would likely opt to purchase less costly fish species or alternative food items. It is important to note that Hawaiians have experienced a significant reduction in the availability of many traditional foods, such as bottomfish, due to high costs. The resulting changes in diet have contributed to the poor health of Hawaiians. Of all racial groups living in Hawaii, Hawaiians are the group with the highest proportion of multiple risk factors leading to illness, disability and premature death (Look and Braun 1995).

Certain species of bottomfish also hold a particular cultural interest for Hawaii's large Asian-American population. In particular, Hawaii residents of Japanese ancestry have found local species of bottomfish to be an acceptable substitute for the red tai (sea bream) of Japan as a showy and auspicious fish to be served on festive occasions. December is the peak year for landings of opakapaka, onaga, kalekale and ehu apparently as a result of increased demand of consumers for red fish during the New Year's period. This cultural demand for red-colored bottomfish also includes non-seasonal events such as weddings and birthdays.

4.7 Safety considerations

4.7.1 Fishery access and weather-related vessel safety

The preferred alternative will likely increase safety in the fishery by limiting the total number of vessels operating in the zone.

4.8 Existing fishery management juridictions, law, and policies

4.8.1 Rights of Aboriginal Americans

The Council is required to take into account the various traditional fishing practices of indigenous island residents in preparing FMPs. Moreover, in the establishment of a limited access system the Council must take into account "historical fishing practices in, and dependence on, the fishery" and "the cultural and social framework relevant to the fishery."

As indicated in Section 4.3.1, Hawaiians fished in the waters surrounding parts of the NWHI for many centuries preceding contact with Europeans. Traditional fishing grounds extended several miles offshore into the Pacific Ocean. The historic usage of offshore fishing grounds in the Hawaiian Islands, together with the importance of bottomfish fishing in traditional Hawaiian culture (Section 4.6.1), supports a claim for preferential access by Hawaiians to the area.

Apart from considerations of traditional participation in the fishery is the Council's concern that communities consisting of descendants of indigenous peoples in the Council's area have not been appropriately sharing in the benefits from the area's fisheries. The Magnuson-Stevens Act provides for the establishment of a community development program for western Pacific fisheries (Section 2.6.2.2.2). This provision is intended to increase opportunities for indigenous communities to participate in and benefit from fisheries in the Council's area. The Council and the Secretary, respectively, have discretion to develop and to approve programs for eligible communities for the purpose of enhancing access to the fisheries under the authority of the Council.

It is also important to note that the U.S. Congress has afforded special considerations to aboriginal Hawaiians in numerous statutes because of their socio-economic disadvantage and because of the federal trust obligation by virtue of Section 5 of the Admissions Act. Given the history of special legal status afforded to Hawaiians by Congress and the fact that neither the state nor federal courts have ruled on the trust obligation, it may be appropriate that provisions extending preferential fishing rights to Hawaiians be included in a limited access system.

Finally, the circumstances by which the U.S. gained control of Hawaii should be taken into consideration. In 1993, the U.S. Congress passed the Apology Bill which states that "... the indigenous Hawaiian people never directly relinquished their claims to their inherent sovereignty as a people or over their national lands to the United States, either through their monarchy or through a plebiscite or referendum." In the absence of any treaty or voluntary relinquishment, the lingering sovereign claim by Hawaiians may dictate that a higher right to the living marine resources within the U.S. EEZ surrounding the Hawaiian Islands might be justified.

5.0 Other applicable laws

5.1 National Environmental Policy Act

An environmental assessment (EA) has been prepared for this amendment. Relevant sections of the amendment are incorporated into the EA by reference.

5.1.1 Conclusions and determination

a. The amendment is expected to support development of management measures to ensure the long-term productivity of bottomfish stocks in the Mau Zone of the NWHI (Section 3.1.1.1).

b. The amendment will have no adverse impact on the habitat of the Mau Zone bottomfish species or protected species in the NWHI (Sections 3.1.1.2 and 3.1.1.3).

c. The amendment is not expected to have any negative impact on public health or safety, although information obtained as a result of the plan amendment may result in better consideration of health and safety concerns in selection of fishery conservation and management measures (Section 3.3.1.4).

d. The amendment will not directly affect any endangered or threatened species (Section 3.1.1.3).

e. The amendment will not result in cumulative, long-term, adverse impacts that could substantially affect bottomfish or protected species (Sections 3.1.1.1 and 3.1.1.3).

f. The amendment may generate controversy in that it will limit the total number of vessels that can participate in the Mau Zone bottomfish fishery. To address this potential controversy, the Council formed a task force and held numerous public meetings throughout the state to develop a process for allocating permits that is fair and equitable (Section 3.3.1.1).

g. The amendment will not have any effect upon flood plains or wetlands, nor upon any trails and rivers listed, or eligible for listing, on the National Trails and Nationwide Inventory of Rivers.

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

_____ _____

Rolland Schmitten Date

5.2 Paperwork Reduction Act

The major purpose of the Paperwork Reduction Act of 1995 is to minimize the paperwork burden on the public (i.e. fishermen) resulting from the collection of information by or for the Federal Government. The Act is intended to ensure the information collected under the proposed action is needed and is collected in an efficient manner (44 U.S.C. 3501 (1)).

The existing permit application process and forms established by the FMP are sufficient to accommodate the proposed actions. The new measures will require gathering of additional information from Mau Zone fishermen with respect to initial application and eligibility for the limited access program. Applicant eligibility would be established by submitting, with the permit application, documentation of commercial fishing experience in the Mau Zone fishery prior to December 31, 1996. For owners of two or more eligible vessels, evidence would also be required to prove that each vessel landed Mau Zone bottomfish prior to that date. Documentation to support qualified landings, also used to determine permit renewal eligibility, will be in the form of official State catch reports. The remaining requirements will be captured through slight modifications of the existing NMFS SW Region Permit Family of Forms (OMB 0648-0204).

Under the current program, NMFS issues an average 25 annual Mau Zone permits. Based on a 0.5 hour per permit federal paperwork burden, which is the same as required for the Hoomalu Zone permit, the burden for the Mau Zone has been about 12.5 hours annually. The proposed measures are designed to initially lower the total number of permits issued in the Mau Zone to between 12 and 20 permits. This will reduce the federal paperwork burden from the current annual burden of 12.5 hours to 6-10 hours. Within five years, the paperwork burden should be further reduced to 5 hours, based on the long-term target number of 10 vessels for the Mau Zone.

5.3 Coastal Zone Management Act

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

The State of Hawaii coastal zone management policies directly relating to the action proposed in this amendment are contained in the coastal ecosystems and economic resources categories of the Hawaii Revised Statues, Chapter 205a. These policies are to improve the technical basis for natural resource management and minimize adverse environmental effects from economic uses of the coastal zone resources. This amendment helps conserve the bottomfish resource in the NWHI Mau Zone and, therefore, is consistent with the Hawaii coastal zone management program's policies.

5.4 Endangered Species Act

The Endangered Species Act of 1973, as amended, prohibits the taking of endangered species

except under limited circumstances. The FMP was initially reviewed under Section 7 consultation of the Act resulting in a Biological Opinion rendered by NMFS. The Biological Opinion specified no allowable incidental take of Hawaiian monk seals. Existing regulations require all NWHI bottomfish fishermen to report interactions with protected species. The proposed action imposes observer requirements on the fishermen to obtain accurate and detailed information on possible inactions with protected species in the fishery. Amendment 4 to the FMP added mandatory observer coverage which is fully consistent and supportive of the goals and objectives of the Endangered Species Act. The proposed measures would not increase the likelihood of endangered species interactions.

5.5 Marine Mammal Protection Act

The Marine Mammal Protection Act of 1972, as amended, allows for the incidental take of marine mammals during commercial operations under certain limited circumstances. Hawaiian monk seals, being designated as a depleted species, cannot be taken. In 1989, all fisheries in Hawaii were classified as Category III under the Act, meaning that the fisheries were determined to have a remote likelihood or no known incidental taking of marine mammals. Amendment 4 to the Bottomfish and Seamount Groundfish FMP requires observers on bottomfish vessels if the NMFS determines observers are needed. The proposed amendment will not increase the likelihood of marine mammal interactions in the Mau Zone bottomfish fishery.

5.6 Regulatory impact review and Regulatory Flexibility Act

In compliance with Executive Order 12866 and the Regulatory Flexibility Act (RFA), NMFS requires the preparation of a regulatory impact review (RIR) and analysis of impacts under the RFA for all regulatory actions or for significant policy changes that are of public interest. Information presented in this section is based on the analysis of the beneficial and adverse impacts of management measure alternatives provided in Section 3.0.

5.6.1 Statement of problem

The problems to be resolved by this amendment are described in Section 2.1 of this document.

5.6.2 Description of alternatives

The Council considered the following three management alternatives for the Mau Zone of the NWHI bottomfish fishery: no action; limited entry (preferred alternative); and indirect effort limitations.

For the RIR and RFA analysis, two of the three alternatives were divided into two scenarios (A and B), while the third was not:

Alternative 1 - No action (Scenario A)

This scenario assumes that only the 13 vessels currently participating in the fishery continue to fish from the current period into the future (there may be changes in vessel participation but it

assumed here that the total number of vessels and number of fishing days remains at 1997 levels). A model for estimating future catch rates (Section 6.2.2) indicates that the present BMUS catch rate of 290 pounds per fishing day will decline to a CPUE of 253 pounds per day in year 2010 and remain there until 2018 (Figure 5.1). Beyond this year there is a continued decline in CPUE, but it is minimal. The non-BMUS CPUE continues at 149 pounds of fish per day from the current period into the future. In this scenario an overall degradation of the fishery occurs, both economically (see below) and biologically (the SPR in 2018 is predicted to be 0.34 compared to the current estimate of 0.40).

Alternative 1 - No action (Scenario B)

This scenario assumes that the 13 vessels currently participating in the fishery continue to fish and the fleet grows at the rate of 15 percent per year until a maximum of 24 participants is reached in 2006. This growth leads to a dramatic decline in BMUS CPUE, and by the year 2006/7 the accumulated harvest reduces the SPR to 0.20 (Figure 5.1). The time frame for the scenario does not continue beyond 2007 because it is assumed the Council would be compelled to take management action as the SPR decreased.

The scenario could be characterized as open access with incentives for fishermen to enter the fishery (e.g., increases in fish prices reduced opportunities in other fisheries or declines in other sources of income). Although there is no detailed information on the response of fishermen to changing biological or economic conditions in the Mau Zone fishery, the history of participation in the fishery suggests that for a variety of reasons fishermen will remain in or enter the fishery even as declining catch rates induce others to leave. Some fishermen that can cover variable costs will continue to fish in the Mau Zone because of the non-monetary benefits they receive from participating in the fishery. Bankrupt vessels are sometimes bought for a fraction of their initial capital cost and return to the fishery with new owners who believe that reduced capital servicing obligations will give them a competitive edge over other fishermen. Vessels displaced from overfished continental U.S. fisheries have been arriving in Hawaii at a steady rate on a "look-see" basis. These owners and captains are largely unaware of economic conditions in the fishery when they first arrive in Hawaii. Furthermore, as the State of Hawaii and Council look toward restricting access to the main Hawaiian Islands bottomfish resources, fishermen may increase their effort in the NWHI to meet market demands. Although the total number of vessels in the fishery may not grow at the projected rate, it is reasonable to believe that the current participants, plus a few additional entrants, could exert the equivalent fishing effort of 24 vessels in terms of fishing days (870 fishing days).

Alternative 2 - Limited entry (Scenario A)

This scenario assumes that the number of vessels that enter the fishery in the first year of the limited entry program is 14, and the number of vessels decreases at the rate of 10 percent per year to the Council target of 10 vessels, which fish into the future. The scenario is the one most likely to occur if the preferred alternative were implemented. The BMUS average daily catch rate declines to 264 pounds in 2000 (SPR = 0.36) and then rebounds to 364 pounds in 2014 (SPR = 0.50) as vessels drop out of the fishery due to economic effects (increased opportunity costs, negative returns to capital, etc.). The proposed limited access system provides no opportunities for new entrants until target participation levels are reached (as opposed to alternative scenario

1B). It is assumed that effort per vessel will not increase and that the fishery reaches a biological optimum.

Alternative 2 - Limited entry (Scenario B)

This alternative assumes that all of the estimated 20 eligible permittees enter the fishery during the first year of the limited access program and exert the same effective effort per vessel as the current participants. Participation then declines at the rate of 15% per year to the Council target of 10 vessels, which fish into the future. The scenario represents the "worst case" under the preferred alternative. The BMUS average daily catch rate declines to 184 pounds in 2001 (SPR = 0.26) as vessels meet their use-or-lose permit requirement, then rebounds to 364 pounds in 2018 (SPR = 0.50). The scenario is similar to 2A but assumes more effort is exerted as a result of increased short-term incentives for fishermen to participate (use-or-lose-it permit requirement, increased price incentives, etc.). The fishery eventually attains the same biological optimum as in 2A but does so over a longer time frame.

Alternative 3 - Indirect effort limitations

Measures that limit effort indirectly are classified as open-access techniques and include total quotas, minimum size limits, seasonal closures, area closures, gear restrictions, vessel landing limits, vessel trip limits and crew limits. Because this alternative includes a broad range of possible management measures, the impacts are evaluated only in qualitative terms.

Table 5.1. Change in the number of vessels under various management alternatives/scenarios over the time frames of the analysis, 1999-2004/1999-2018

Alternative/ Scenario	Number of Vessels	Time Frame(s)
1A	13 → 13	1999-2004/ 1999-2018
1B	13 → 24	1999-2004/ 1999-2018
2A	14 → 10	1999-2004/ 1999-2018
2B	20 → 10	1999-2004/ 1999-2018
3	n/a	n/a

5.6.3 Analysis of the benefits and costs

A net present value (NPV) analysis calculates the stream of net income over a discrete time horizon with the assumption that revenue received in later periods is not valued as much as revenue received in the current period. From the perspective of industry participants (harvesters and marketers), net revenues that can be reinvested earlier have a higher value than revenue obtained in later periods. This consideration is counterbalanced by the need to maintain the biological integrity of the stock and social preferences (ecological and economic) for its continuing existence. For each management alternatives/scenario the NPV is calculated as

follows:

$$NPV = \sum_{t=0}^{n} \frac{B_t}{(1 + r_t)^t} - \sum_{t=0}^{n} \frac{C_t}{(1 + r_t)^t}$$

where B_t represents the benefits derived for period t, C_t is the cost in period t, n is the time horizon evaluated, r_t is the discount rate for period t.

In theory, the management alternative that maximizes the sum of the positive changes of producer and consumer surplus less management and enforcement costs should be the preferred management alternative barring any overriding associated concern (national security, etc.). With the data available only a qualitative discussion of the impacts of the various management alternatives on consumer surplus and management and enforcement costs is possible.

Consumers may suffer under a no action policy if excessive effort fishes down stocks, thereby reducing both the quality and quantity of desirable bottomfish species available to local fresh fish markets. Prices could increase to consumers for specific products, such as opakapaka, that have historically contributed a significant amount to local fresh fish markets. However, a limited access system should improve market stability and achieve the FMP objective of maintaining high quality products to consumers. It will create conditions conducive to maintaining MSY landings over time and thereby encourage the fishery's maximum contribution possible to the local fish market and consumers on a consistent basis. With regard to the effects of indirect effort limitations, marketing channels may be disrupted under traditional command-and-control fisheries regulations (e.g., limits on fleet catch or number of trips) because of the combined effect of allowing additional fishing boats into the fishery while constraining a specific aspect of fishing operations. Under such conditions, operators may find it justifiable to capture the majority of annual total catch in a relatively short period of time. This results in market gluts, inconsistent supply of a quality product to consumers, low landing prices to fishermen and high prices to consumers at other times in the year.

A policy of no action would perpetuate the status quo for existing enforcement procedures without adding or reducing costs or responsibility to management agencies in the short term. However, enforcement and administrative costs in the long term could be excessive if expensive management measures are later required to protect or rebuild stocks because of past management neglect. The preferred measure of a limited access system does not alter the cost of surveillance by the U.S. Coast Guard. However, self-monitoring is more likely to occur as personal interests will motivate operators to investigate bottomfish fishing activity conducted by any vessel not licensed to participate in the fishery. Cooperation between enforcement officials and fishermen is heightened under this alternative, and no additional presence of Federal enforcement officials on the high seas is anticipated. Dockside inspections would continue to be the primary enforcement mode. Indirect effort regulations impose operational inefficiencies at fishermen's expense. Rarely, if ever, is such action popular among fishery participants. Consequently, substantial burdens are imposed on enforcement agencies to adequately monitor compliance within the fishery.

Finally, important non-fiduciary factors may not be quantitatively incorporated in the B/C analysis. For example, fishermen may have other motives to fish besides making a profit or are offsetting apparent losses in the Mau Zone fishery by activities in other fisheries or income sources. In addition, survey-data suggests that there is a segment of the fishery which can be characterized as "high-liners", and these operators appear to perform in a significantly different fashion than the "average" fishery participant.

Costs are charged even if the opportunity cost of participating in the NWHI bottomfish fishery is below break-even levels or opportunities afforded in other fisheries.

There are several decision criteria that can be used regarding NPV analysis. If the NPV is greater than zero, the alternative creates real wealth and should be considered, but typically there are a series of options, and the one that maximizes wealth should be chosen (all other factors being equal). Another decision criterion can be to compare alternatives to determine which maximizes wealth or net benefits or minimizes losses. A third decision criterion would be to compare each alternative to the no action alternative. Given the data available, what is presented is a partial analysis in which a portion of the producer surplus (that of the primary producers) is evaluated. Therefore, only comparison with the no action alternative is relevant.

The management alternatives/scenarios are evaluated using the same vessel cost-earnings simulator/data provided in Section 4.4. Input BMUS CPUE for the cost-earnings model are provided by the model described in Section 6.2 and are depicted in Figure 5.1. To be consistent with the economic analysis presented in Section 4.0, it was assumed that non-BMUS CPUE and price remain constant (149 pounds per fishing day; $2.15 per pound). The average number of fishing days per vessel also remains constant at 36.3 per year. Total fleet revenue is equal to total effort (fishing days) times BMUS CPUE times a price of $3.10/pound plus the non-BMUS catch revenue. The total and variable costs per fishing day per vessel are provided for each scenario, along with an estimation of yearly total fleet revenues. For all management alternatives/scenarios positive returns are provided to labor with one exception (1B), the implications of which are discussed below. All parameters for the management alternatives/scenarios are given in Table 5.2.

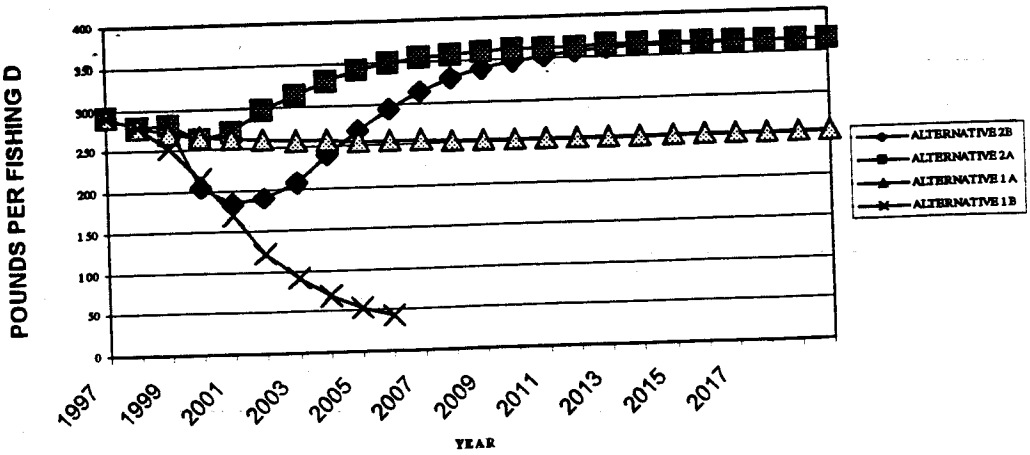


Figure 5.1. Projected BMUS CPUE in the Mau Zone fishery under various management alternatives/scenarios.

Table 5.2. Performance parameters for the Mau Zone fishery under various management alternatives/scenarios

Alternative 1 - No action (Scenario A)

1997 effort levels are assumed to remain constant through the year 2018

Year	Number of Vessels	BMUS CPUE (lbs)	Total Fishery Revenues ($)000	Total Cost Per Fishing Day ($)	Variable Cost Per Fishing Day ($)
1997	13	290	575	1,456	567
1998	13	279	559	1,431	564
1999	13	272	549	1,415	561
2000	13	267	542	1,401	561
2001	13	263	535	1,393	558
2002	13	260	532	1,384	558
2003	13	259	530	1,384	558
2004	13	258	527	1,379	556
2005	13	256	526	1,376	556
2006	13	256	526	1,376	556
2007	13	255	524	1,373	556
2008	13	254	523	1,371	556
2009	13	253	521	1,368	556
2010	13	253	521	1,368	556
2011	13	253	521	1,368	556
2012	13	253	521	1,368	556
2013	13	253	521	1,368	556
2014	13	253	521	1,368	556
2015	13	253	521	1,368	556
2016	13	253	521	1,368	556
2017	13	253	521	1,368	556

2018	13	253	521	1,368	556

Alternative 1 - No action (Scenario B)

1997 data are actual, while 1998-2007 are hypothetical. Model truncated in 2007 because fishery SPR drops below 0.20

Year	Number of Vessels	BMUS CPUE (lbs)	Total Fishery Revenues ($)000	Total Cost Per Fishing Day ($)	Variable Cost Per Fishing Day ($)
1997	13	290	575	1,456	567
1998	14	279	602	1,459	567
1999	15	262	617	1,390	558
2000	17	241	659	1,340	553
2001	19	210	670	1,269	542
2002	21	173	653	1,181	531
2003	23	137	622	1,095	520
2004	24	103	557	1,015	509

Alternative 2 - Limited entry (Scenario A)

1997 data are actual, while 1998-2018 are hypothetical

Year	Number of Vessels	BMUS CPUE (lbs)	Total Fishery Revenues ($)000	Total Cost Per Fishing Day ($)	Variable Cost Per Fishing Day ($)
1997	13	290	575	1,456	567
1998	12	279	516	1,431	564
1999	14	282	607	1,437	564
2000	12	264	496	1,493	558
2001	10	271	421	1,412	561
2002	10	295	448	1,470	569
2003	10	315	471	1,514	575
2004	10	330	488	1,560	580
2005	10	341	500	1,577	583
2006	10	349	509	1,594	586
2007	10	354	521	1,608	586
2008	10	357	523	1,616	589
2009	10	360	524	1,621	589
2010	10	361	524	1,624	589
2011	10	362	526	1,624	589
2012	10	363	526	1,630	589
2013	10	364	526	1,632	592
2014	10	364	526	1,632	592
2015	10	364	526	1,632	592
2016	10	364	526	1,632	592
2017	10	364	526	1,632	592
2018	10	364	526	1,632	592

Alternative 2 - Limited entry (Scenario B)

1997 data are actual, while 1998-2018 are hypothetical

Year	Number of Vessels	BMUS CPUE (lbs)	Total Fishery Revenues ($)000	Total Cost Per Fishing Day ($)	Variable Cost Per Fishing Day ($)
1997	13	290	575	1,456	567
1998	12	279	516	1,431	564

1999	20	282	867	1,437	564
2000	17	204	587	1,255	542
2001	14	184	453	1,205	534
2002	12	190	396	1,222	536
2003	10	208	350	1,263	542
2004	10	240	386	1,338	553
2005	10	268	418	1,406	561
2006	10	293	446	1,464	569
2007	10	313	469	1,508	575
2008	10	329	487	1,547	580
2009	10	340	499	1,574	583
2010	10	348	508	1,594	586
2011	10	353	514	1,605	586
2012	10	357	518	1,616	589
2013	10	360	525	1,621	589
2014	10	361	526	1,624	589
2015	10	362	526	1,624	589
2016	10	363	526	1,630	589
2017	10	364	526	1,632	592
2018	10	364	526	1,632	592

The near term (1999-2004) fleet revenue for the fishery under the various management alternatives is provided in Figure 5.2. Net revenue for the fleet at the various levels of participation for the management alternative for the period 1999-2013 is depicted in Figure 5.3 (all revenues stabilize after 2013 – see Table 5.2). Total revenue minus total variable (trip) costs is depicted in Figure 5.4.

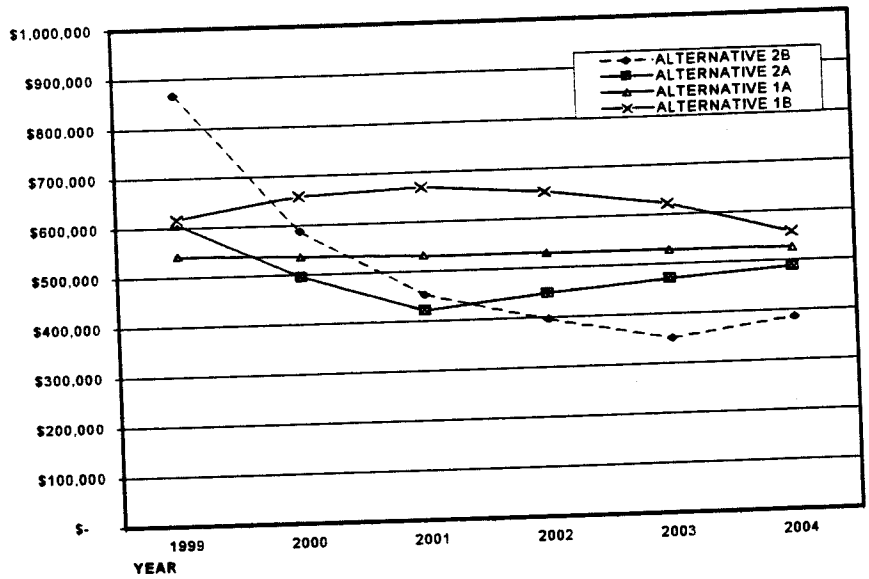


Figure 5.2. Total fleet revenue for the Mau Zone fishery under various management alternatives/scenarios

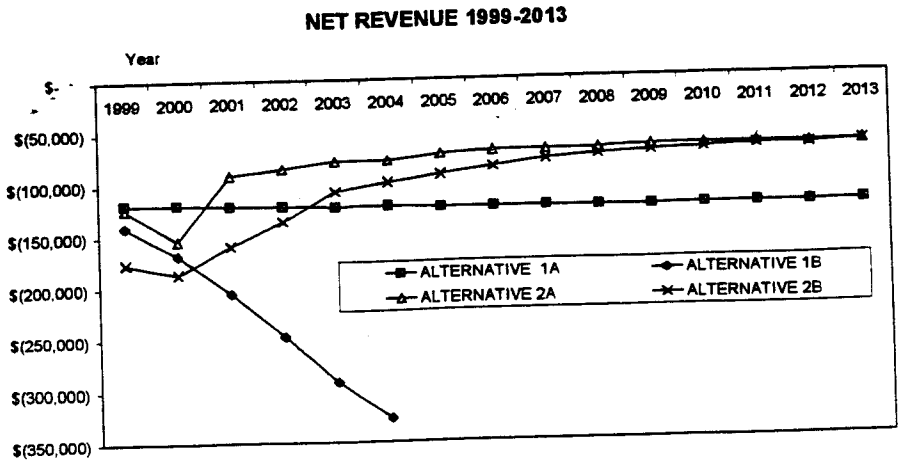


Figure 5.3. Net Fleet Revenue (Total costs - revenue) for the Mau Zone fishery under various management alternatives/scenarios.

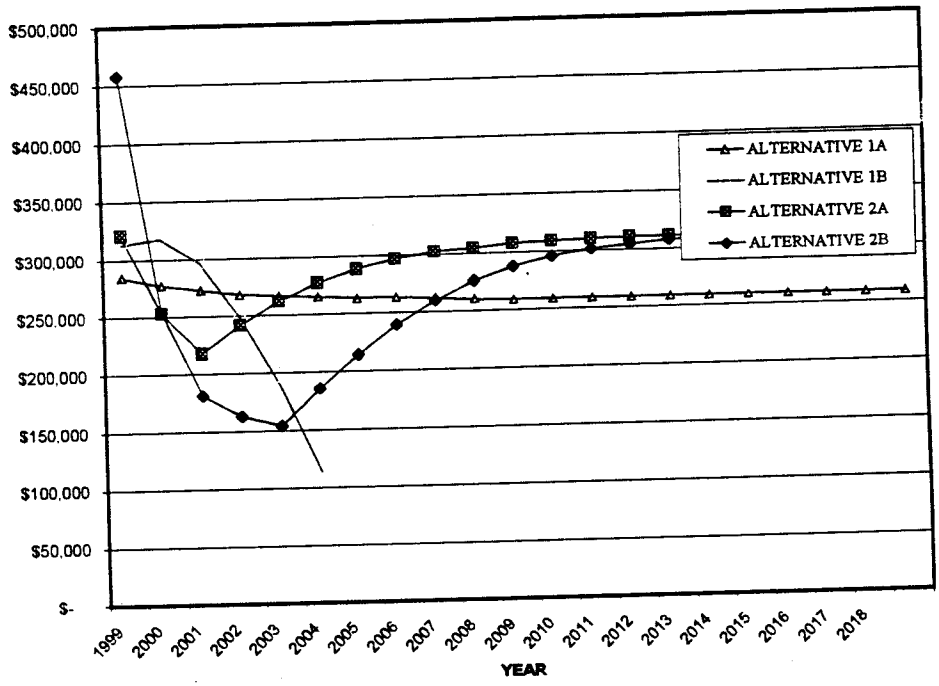


Figure 5.4. Net Fleet Revenue (Total revenues - variable costs) for the Mau Zone fishery under various management alternatives/scenarios.

The NPV for the four management scenarios is presented in Table 5.3.

Table 5.3. Net present values of management alternatives/scenarios for the Mau Zone fishery. Base year is 1997 and discount rate is 5%; values are in thousands of dollars; values in parentheses are negative; TR = total revenue, TC = total costs, TVC = total variable costs.

	TR - TC 1999-2004	TR-TC 1999-2018	TR-TVC 1999-2004	TR-TVC 1999-2018
Alternative 1A	(526)	(1,535)	1,170	3,285
Alternative 1B	(1,057)	-	1,029	-
Alternative 2A	(468)	(1,028)	1,127	3,591
Alternative 2B	(672)	(1,290)	1,077	3,306

Alternative 1B could not be evaluated in the long term because it was truncated after year 2007 when the SPR dropped below 0.20 and fishery revenue became negative. The overall results suggest that, on average, fishermen will continue to show negative returns to capital under all alternatives/scenarios. In the long-and short-term the alternative/scenario that minimizes the loss is Alternative 2A (preferred alternative and most likely scenario). When only variable costs are considered in the short term, all of the scenarios, with the exception of 1B, rank very close. When only variable costs are considered in the long run, all of the scenarios are close, with 2A showing the highest NPV.

The economic model estimates that vessel captains and crew make $286 and $197 per fishing day, respectively, at the 1997 catch of 290 pounds per day. Income rises to $375 and $261 at the MSY BMUS catch rate of 364 pounds. The returns to capital for the vessels are negative (- 4.4%) at the MSY BMUS catch rate. If the vessels are to become profitable, effort, in terms of the number of fishing days, must increase. Break-even analysis shows that at the MSY BMUS catch rate, the average vessel would have to fish 107 days per year or approximately three times the current average. At this level of effort the fishery could only support three or four vessels.

This partial analysis suggests that from the perspective of producer surplus, the preferred alternative minimizes economic losses in the Mau Zone fishery. If one assumes fishermen are participating for non-fiduciary motives and that trip expenses are used as a measure of economic viability for the fishery, then all alternatives/scenarios provide positive NPVs. In this later case, NPV in the short-run is greatest under scenario 1A. But the total difference is less than five percent between 1A, 2A and 2B (Table 5.2). If just variable costs are considered, 2A is the best option over the long run.

Changing the discount rate does not change the relative ranking of the scenarios 1A and 2A (Table 5.4). As the discount rate increases, the losses are minimized in the near-term and the benefits are minimized in the long-term

In conclusion, the preferred alternative--Alternative 2 - Limited entry (Scenario A)--appears to be the most economically efficient measure, especially in the near-term. However, if economic efficiency is an important determinant in setting target participation levels in the fishery, considerable additional adjustments in input variables (i.e. effort) are required to approach breakeven levels in the production sector (let alone approach economially efficient levels). A further consideration should be given to minimizing monitoring and enforcement costs given the relative size of the fishery and the demands placed on institutions to "manage" the fishery.

Table 5.4. Affect of changing discount rates on net present values of management scenarios 1A and 2A for the Mau Zone fishery. Base year is 1997; values are in thousands of dollars; values in parentheses are negative; TR = total revenue, TC = total costs, TVC = total variable costs

Discount Rate	TR - TC 1999-2004	TR-TC 1999-2018	TR-TVC 1999-2004	TR-TVC 1999-2018
Alternative 1A: 5%	(526)	(1,535)	1,170	3, 285
2%	(573)	(1,509)	1,273	4,298
7%	(498)	(1,304)	1,109	2,798
Alternative 2A: 5%	(413)	(938)	1,184	3,746
2%	(505)	(1,303)	1,223	4,761
7%	(446)	(894)	1,069	3,032

5.6.4 Regulatory Flexibility Act determination

NMFS considers economic impacts on small entities as significant under the RFA if the proposed action would result in 1) a reduction in annual gross revenues of more than 5 percent, for 20 percent or more of the affected small entities; 2) an increase in total costs of production of more than 5 percent as a result of an increase in compliance costs, for 20 percent or more of the affected small entities; 3) compliance costs as a percent of sales for small entities that are at least 10 percent higher than compliance costs as a percent of sales for large entities, for 20 percent or more of the affected small entities; 4) capital costs of compliance represent a significant portion of capital available to small entities, considering internal cash flow and external financing capabilities; or 5) two percent of the small business entities affected being forced to cease business operations.

Approximately 80 permits for the Mau Zone fishery were issued between 1989 and the permit moratorium, 30 of which have been used to fish in the area. However, only one-third of the 30 vessels were active in the fishery for more than two years (Table 4.3). For the purposes of the initial RFA, the entities that can reasonably be expected to be affected by the proposed action are those businesses that have been actively engaged in the fishery, in this case the 30 vessels that

fished in the Mau Zone at least once. All 30 of these vessels meet the Small Business Administration definition of a small business in commercial fishing, that is, a fish harvesting or hatchery business that is independently owned and operated and not dominant in its field of operation with annual receipts not in excess of $3,000,000.

For the initial allocation of permits the Council applies a weighted point system that balances historic participation by those fishermen who entered the fishery prior to the control date, but who may have been relatively inactive thereafter, and the economic dependence on the fishery of active newcomers. Overall, the point system allows those who have exhibited a commitment to the fishery to maintain the continuity of their economic enterprise. The system will not cause redistribution of access to the resource away from the part-time or smaller producers. Based on State of Hawaii fish landings data it is estimated that 18 vessels would qualify under the point system for entry into the Mau Zone fishery.

With one exception,[1] no vessel is expected to be excluded under the point system that has fished in the Mau Zone since January 1, 1994. Given the inactivity of the estimated 12 vessels that will not qualify to participate in the fishery, the economic consequences of being excluded are expected to be negligible.

The initial allocation of permits is likely to result in a number of participants that exceeds the target number of ten. The proposed system of limited access avoids imposing undue hardship on fishery participants and allows attrition resulting from market forces and freedom of choice to reduce the fleet to the target number over several years. Admitting a larger number than the target total, but retracting the permits as holders retire until the target number remains outstanding, provides time for fishermen to make adjustments to leaving the fishery. The Council regards such voluntary withdrawal to be the fairest way to attain a balance between harvest capacity and harvestable fishery stocks.

To help ensure that attrition occurs within an appropriate time frame, restrictions are imposed on vessel ownership and the transfer of permits and a use-it-or-lose-it requirement will be applied. According to fishermen that participate regularly in the fishery, these restrictions would have a minimal economic impact on those businesses that obtain a significant amount of their income from Mau Zone fishery landings.

For the current participants in the fishery the preferred management alternative (2A) is projected to have a 8.2 percent positive impact on BMUS generated gross revenues on a per vessel basis when compared to the no action alternative (1A) (Table 5.5). The same is true when non-BMUS revenues are included.

---

[1]Three permits were issued in 1997 prior to the March 27, 1997 moratorium, but only one of these permit holders participated in the Mau Zone fishery. This permit holder would not qualify under the point system.

Table 5.5. Economic impact of the preferred management alternative (2A) on the BMUS generated gross revenue of Mau Zone participants. TR = BMUS total revenues

Year	TR/Vessel No Action (ScenarioA)	TR/Vessel Preferred Alternative	2A/1A
1997	$32,634	$32,634	1.0
1998	$31,396	$31,396	1.0
1999	$30,608	$31,733	1.04
2000	$29,595	$29,708	0.99
2001	$29,259	$30,496	1.03
2002	$29,145	$33,196	1.13
2003	$29,033	$35,447	1.22
2004	$29,808	$38,373	1.33

This analysis indicates that the proposed regulations in this amendment do not result in significant economic impacts on a substantial number of small entities.

6.0 References

6.1 Bibliography

Anderson L. 1986. The economics of fisheries management. Baltimore: John Hopkins Univ. Press.

Cobb J. 1905. The commercial fisheries of the Hawaiian Islands, Part III. Bull. of U.S. Fish. Commission (23).

Emory K. 1928. Archaeology of Nihoa and Necker Islands. B.P. Bishop Museum Bull. (53).

Eshima M. 1996. Native Hawaiian data book. Honolulu: Office of Hawaiian Affairs.

Haight W, Kobayashi D, Kawamoto K. 1993. Biology and management of deepwater snappers of the Hawaiian archipelago. Marine Fish. Rev. 55(2):20-27.

Hamilton M. 1994. NWHI bottomfish fishery 1993 vessel activities, costs and economic returns. NMFS Southwest Fisheries Science Center Administrative Report H-94-01C.

Hilborn R. and C. Walters 1992. Quantitative fisheries stock assessment: choice, dynamics and uncertainty. New York: Chapman and Hall.

Iverson R, Dye T. and Paul L. 1990. Native Hawaiian fishing rights: phase 2 main Hawaiian Islands and the northwestern Hawaiian Islands. Honolulu: Western Pacific Fishery Management Council.

Kawamoto K. 1997. Northwestern Hawaiian Islands bottomfish fishery 1996. NMFS Southwest Fisheries Science Center Administrative Report H-97-09.

Kobayashi D. 1997. An update of maximum sustainable yield for the bottomfish fishery in the Northwestern Hawaiian Islands. NMFS Honolulu Laboratory draft manuscript.

Look M. and Braun K. 1995. A mortality study of the Hawaiian people 1910-1990. Honolulu: The Queens's Health Systems.

Pooley S. 1993. Hawaii's marine fisheries: some history, long-term trends and recent developments. Marine Fish. Rev. 55(2):7-19.

Pooley S. 1996. Economic determination of the optimal number of Northwestern Hawaiian Islands bottomfish vessels. NMFS Southwest Fisheries Science Center Administrative Report H-96-07.

Ralston S. 1982. Influence of hook size in the Hawaiian deep-sea handline fishery. Can. J. Fish. Aquat. Sci. 39(12):1297-1302.

Shomura R. 1987. Hawaii's marine fisheries resources: yesterday (1900) and today (1986). NMFS Southwest Fisheries Science Center Administrative Report H-87-21.

Somerton R. and Kobayashi D. 1990. A measure of overfishing and its application in Hawaiian bottom fisheries. NMFS Southwest Fisheries Science Center Administrative Report H-90-10.

6.2 Sources of data and methodology

6.2.1 Determination of alternative target numbers

The target numbers under three criterion were calculated using 1994-1996 catch and effort data collected by Kawamoto (1997) from the Mau Zone fishery. This data set was compiled from trips which have complete effort information available. The estimate of MSY is from Kobayashi (1997). Projected catch rates were calculated using the model presented in Section 6.2.2.

Criterion 1: Maintain average vessel performance

11,580 BMUS lbs per vessel @ 319 lbs per day

131,200 lbs(MSY)/ 11,580 lbs/vessel = 11.3 vessels

The catch rate is based on the 1994-96 average daily BMUS catch rate for Mau Zone fishery participants.

Criterion 2: Attain MSY catch rate

13,395 BMUS lbs per vessel @ 369 lbs per day

131,210 lbs(MSY)/13,395 lbs/vessel=9.8 vessels

The catch rate is the MSY catch rate estimated by the model developed by Kobayashi (1996). It exceeds the current average catch rate. An increased catch rate would be expected under a limited access system in which most fishery participants would be experienced than under the present open access situation in which vessels may enter and exit the fishery without experience at will.

Criterion 3: Economic break-even

22,107 BMUS lbs per vessel @ 609 lbss per day (estimated by model described in Section 6.2.2)

131,200 lbs.(MSY)/ 22,107 lbs./vessel=5.9 vessels

The break-even estimate was derived from cost-earnings simulators described in Pooley (1996). The catch rate may be unrealistic, but it indicates what level would be required to

meet an economic standard. By using this high catch rate, the target number of vessels is reduced. These vessels may operate at a higher level of effort than at present, but their catch rates would in reality be constrained by the carrying capacity of the fishery (i.e., MSY).

6.2.2 Model for estimating catch rates

Using the Hilborn and Walters (1992) version of the dynamic production model and parameters for catchability (q), intrinsic growth (r) and carrying capacity (k) presented in Kobayashi (1996), Mau zone catches (C) and catch rates can be projected under various effort (E) scenarios.

$$B_t = B_{t-1} + rB_{t-1}(1 - B_{t-1} / k) - C_{t-1} \qquad C_{t-1} = q\, E_{t-1}\, B_{t-1}$$

What is required is a starting biomass (B) and effort values to determine catch for a particular year and the change in biomass for calculating the following year's biomass. A proxy for SPR can be calculated as current year biomass divided by carrying capacity. This assumes no changes in size class structure, therefore, this is probably a high estimate for SPR. Biomass for 1996 can be estimated as the quotient of CPUE divided by catchability, $298/9.917 \times 10^{-4} = 300{,}494$ pounds. With carrying capacity in the Mau zone of 741,823 pounds, the rough proxy SPR value can be calculated as 41 percent.

7.0 Draft proposed regulations

§ 660.12 Definitions.

Owner, as used in subparts C, D and § 660.61(i) of this part, means a person who is identified as the current owner of the vessel as described in the Certificate of Documentation (Form CG-1270) issued by the USCG for a documented vessel, or in a registration certificate issued by a state or territory or the USCG for an undocumented vessel. As used in subparts E and F of this part, owner has the meaning in § 600.10 of this chapter.

Pacific Islands Area Office means the Pacific Islands Area Office, Southwest Region, NMFS, located at 2570 Dole Street, Honolulu, HI 96822-2396.

Qualifying landing means a landing that meets a standard required for permit eligibility under § 660.61.

1) Mau Zone A qualifying landing for permit renewal under § 660.61 (d) or eligibility points for initial limited entry permit under § 660.61(l) is a landing that contained 500 lb (226.8 kg) of bottomfish management unit species from the Mau Zone per fishing trip.

Regional Administrator means the Administrator, Southwest Region, NMFS (see Table 1 of § 600.502 for address).

§ 660.13 Permits and fees.

(a) Validity.

(1) Each permit is valid for fishing only in the specific fishery management area or subareas identified on the permit.

(2) A permit issued under § 660.61 is valid only if the vessel operator has completed a protected species workshop as required under § 660.61(b)(2).

(b) Fees.

A fee is charged for each application for a Hawaii longline limited access permit (including permit transfers and permit renewals), Hoomalu Zone limited access permit and Mau Zone limited access permit (including renewals). The amount of the fee is calculated in accordance with the procedures of the NOAA Finance Handbook, available from the Regional Administrator, for determining the administrative costs of each special product or service. The fee may not exceed such costs and is specified with each application form. The appropriate fee must accompany each application. Failure to pay the fee will preclude issuance of a Hawaii longline, Hoomalu Zone or Mau Zone limited access permit.

(c) Expiration.

(1) Permits issued under subparts C, D and F will remain valid for the period specified on the permit unless transferred, revoked, suspended or modified under 15 CFR part 904.

(2) Permits issued under subpart E expire on 2400 local time on December 31.

(d) Transfer. An application for a permit transfer as allowed under § 660.21(h), § 660.41(e) or § 660.61(c) and (d) must be submitted to the Pacific Islands Area Office as described in paragraph (c) of this section.

Subpart E--Bottomfish And Seamount Groundfish Fisheries

§ 660.61 Permits.

(a) Applicability.

(1) The owner of any vessel being used to fish for bottomfish or seamount groundfish species in the Northwestern Hawaiian Islands bottomfish fishery management subarea must have a permit issued under this section.

(b) Application.

(2) The operator of a vessel registered with a Mau Zone limited access permit or Hoomalu Zone permit must complete a protected species workshop conducted by NMFS.

(c) Mau Zone permit.

(1) Each applicant for an initial Mau Zone permit will submit a supplementary information sheet to be provided by the Pacific Islands Area Office. Each application for a Mau Zone permit will be signed by the vessel owner or a designee and include the following information:

(i) The qualification criterion that the applicant believes he or she meets for issuance of a limited access permit;

(ii) Copies of State of Hawaii fish catch reports with certification from the State that this information is accurate, to demonstrate participation in the NWHI bottomfish fishery;

(iii) If the application is filed by a partnership or corporation, the application must identify the names of the owners and their respective percentage of ownership of the partnership or corporation. If 50 percent or more of the ownership of the vessel passes to persons other than those listed in the original application, the permit will lapse and must be surrendered to the Regional Administrator.