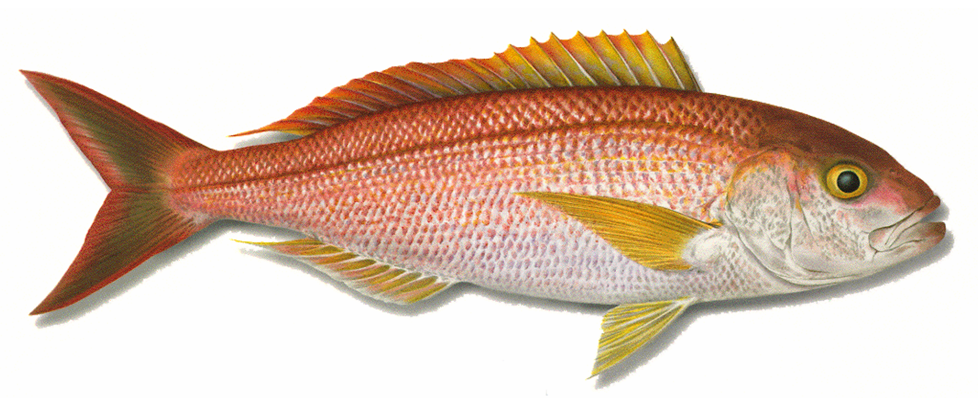
DRAFT SUPPLMENTAL ENVIRONMENTAL IMPACT STATEMENT

BOTTOMFISH AND SEAMOUNT GROUNDFISH FISHERIES OF THE WESTERN PACIFIC REGION

MEASURES TO END BOTTOMFISH OVERFISHING IN THE HAWAII ARCHIPELAGO



Opakapaka (*Pristipomoides filamentosus)*

Prepared by:

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

WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

March 30, 2006

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MAR 29 2006

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

Dear Reviewer:

In accordance with provisions of the National Environmental Policy Act of 1969, we enclose for your review the Draft Supplemental Environmental Impact Statement, Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region - Measures to End Bottomfish Overfishing in the Hawaii Archipelago (DSEIS).

On May 27, 2005, the Regional Administrator for the National Marine Fisheries Service (NMFS) Pacific Islands Region notified the Western Pacific Regional Fishery Management Council (Council) that overfishing of the bottomfish species complex is occurring within the Hawaiian Archipelago (70 FR 34452, June 14, 2005). In accordance with the Magnuson–Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act), the Council is preparing a regulatory amendment under the Fishery Management Plan for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region. to end overfishing in the bottomfish complex in the Hawaiian Archipelago. This DSEIS examines Hawaii's bottomfish fisheries, describes the alternatives being considered to end the overfishing, and identifies the impacts associated with each alternative.

Additional copies of the DSEIS may be obtained from Keith Schultz, NEPA Specialist; 1601 Kapiolani Boulevard, Suite 1110, Honolulu, Hawaii 96814, 808-944-2276. Please specify when requesting if you would prefer a hard copy of the document, otherwise a CD may be provided. The document is also accessible electronically through the NMFS Pacific Islands Regional Office website at http://swr.nmfs.noaa.gov/pir or at the Council website at http://www.wpcouncil.

Comments or questions on this document submitted during the agency's 45-day review period for the DSEIS must be received by May 30, 2006. Written comments should be submitted by mail to: William L. Robinson, Pacific Islands Regional Administrator, National Marine Fisheries Service, 1601 Kapiolani Blvd., Honolulu, HI 96814. Comments may be submitted by facsimile (fax) to 808-973-2941. Electronic comments may be submitted by e-mail to PIRBottomfishDSEIS@noaa.gov; include in the comment subject line the following document identifier: Bottomfish Overfishing DSEIS. A copy of your comments should be submitted to me by mail to the NOAA Strategic Planning Office (PPI/SP), SSMC3, Room 15603, 1315 East-West Highway, Silver Spring, Maryland 20910; by fax to 301-713-0585; or by e-mail to nepa.comments@noaa.gov.

Sincerely,

Rodney F. Weiher, Ph.D.
NEPA Coordinator

Enclosure

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

MEASURES TO END BOTTOMFISH OVERFISHING IN THE HAWAII ARCHIPELAGO

March 30, 2006

Responsible Agency:

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William L. Robinson
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Abstract:

On the basis of fishery information analyzed by the National Marine Fisheries Service's (NMFS) Pacific Islands Fisheries Science Center (PIFSC), NMFS has determined that overfishing of the bottomfish species complex is occurring within the Hawaii Archipelago. The Regional Administrator for the Pacific Islands Regional Office (PIRO) notified the Western Pacific Fishery Management Council (also known as the Western Pacific Regional Fishery Management Council or Council) of this overfishing determination on May 27, 2005. Pursuant to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the Council is required to take action within one year following NMFS' notification of the overfishing to develop measures to end the overfishing through an amendment to the Fishery Management Plan for Bottomfish and Seamount Groundfish of the Western Pacific Region (Bottomfish FMP). In May 2005, a Final Environmental Impact Statement (FEIS) on the FMP was completed by the Council and NMFS and made available to the public on June 17, 2005.

This Draft Supplemental Environmental Impact Statement (DSEIS) supplements and, as appropriate, incorporates by reference relevant sections and analysis contained in the May 2005 FEIS. Contained in this DSEIS are a range of management measures to end bottomfish overfishing in the Hawaii Archipelago. Hawaii's bottomfish are managed as a single archipelagic-wide multi-species stock complex, however, bottomfish fisheries in the Hawaii Archipelago occur in two broad management sub-areas, the Northwestern Hawaiian Islands and the Main Hawaiian Islands (MHI). The MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing. Therefore, reducing fishing mortality in the MHI would be the most effective means to end the overfishing in the Hawaii Archipelago. The management measures considered in this DSEIS (except for the No Action Alternative) target a 15 percent or greater reduction in bottomfish fishing mortality in the MHI, which is estimated to be the appropriate level of reduction to end overfishing.

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ABBREVIATIONS AND ACRONYMS

APA	Administrative Procedure Act
BMUS	Bottomfish Management Unit Species
BiOp	Biological Opinion
BRFA	Bottomfish Restricted Fishing Area
CFR	Code of Federal Regulations
cm	Centimeters
CNMI	Commonwealth of the Northern Mariana Islands
CPUE	Catch Per Unit Effort
CZMA	Coastal Zone Management Act
DBEDT	Department of Business, Economic Development and Tourism, State of Hawaii
DSEIS	Draft Supplemental Environmental Impact Statement
EEZ	Exclusive Economic Zone
EFH	Essential Fish Habitat
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
FFS	French Frigate Shoals
fm	Fathoms
FMP	Fishery Management Plan
FOIA	Freedom of Information Act
FR	Federal Register
FRFA	Final Regulatory Flexibility Analysis
ft	Feet
FWCA	Fish and Wildlife Coordination Act
GPS	Global Positioning System
HAPC	Habitat Areas of Particular Concern
HDAR	Division of Aquatic Resources, State of Hawaii
HINWR	Hawaiian Islands National Wildlife Refuge
HIR	Hawaiian Islands Reservation
HMSRT	Hawaiian Monk Seal Recovery Team
IRFA	Initial Regulatory Flexibility Analysis
kg	Kilograms
km	Kilometers
lb	Pounds
m	Meters
MFMT	Maximum Fishing Mortality Threshold
MHI	Main Hawaiian Islands
MMPA	Marine Mammal Protection Act
MPA	Marine Protected Area
MSA	Magnuson-Stevens Fishery Conservation and Management Act
MSST	Minimum Stock Size Threshold
MSY	Maximum Sustainable Yield
NDSA	Naval Defense Sea Areas

NEPA	National Environmental Policy Act
nm	Nautical Miles
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOI	Notice of Intent
NWHI	Northwestern Hawaiian Islands
NWR	National Wildlife Refuge
NWRSAA	National Wildlife Refuge System Administration Act
OMB	Office of Management and Budget
PIRO	Pacific Islands Regional Office (NMFS)
PIFSC	Pacific Islands Fisheries Science Center (NMFS)
PRA	Paperwork Reduction Act
PRIA	Pacific Remote Island Areas
RFA	Regulatory Flexibility Act
RIR	Regulatory Impact Review
SBREFA	Small Business Regulatory Enforcement Fairness Act
SFA	Sustainable Fisheries Act
SPR	Spawning Potential Ratio
SWR	State Wildlife Refuge
USCG	United States Coast Guard
USFWS	United States Fish and Wildlife Service
VMS	Vessel Monitoring System
WPacFIN	Western Pacific Fisheries Information Network
WPRFMC	Western Pacific Fishery Management Council

SUMMARY

Background and Overview

This draft supplemental environmental impact statement (DSEIS) supplements the May 2005 Final Environmental Impact Statement[1] (FEIS) on the Fishery Management Plan (FMP) for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region). Concurrent with the completion of the FEIS, the National Marine Fisheries Service (NMFS) informed the Western Pacific Fishery Management Council (also known as the Western Pacific Fishery Management Council or Council) that the Hawaii archipelagic bottomfish multi-species stock complex, which occurs in both federal and state jurisdictions throughout the archipelago, was determined to be experiencing overfishing. Bottomfish in the Hawaiian Archipelago are a collection, or complex, of deep-slope snappers, groupers, and jacks, however, the primary species of concern are the Deep 7 bottomfish species: onaga (*Etelis corsucans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hapuupuu (*Epinephelus quernes*), opakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*).

Hawaii's bottomfish fisheries are separated into two broad management sub-areas, the Main Hawaiian Islands (MHI) and the Northwestern Hawaiian Islands (NWHI) of which is separated into two smaller management zones; the Mau Zone and Hoomalu Zone. Nearly 80 percent of bottomfish habitat in the MHI are within the jurisdiction of the State of Hawaii (0 to 3 miles offshore), and historically, bottomfish fishing in the MHI has been managed by the state. The state's MHI management measures include bottomfish vessel registration, commercial fishing reporting, recreational catch limits for bottomfish two species (onaga, ehu), and 19 restricted bottomfish fishing areas. NMFS obtains commercial bottomfish fishing statistics from the State of Hawaii's Division of Aquatic Resources (HDAR).

The Magnuson–Stevens Fishery Conservation and Management Act (MSA) requires the Secretary of Commerce through NMFS to report annually to Congress on the status of fisheries within each regional fishery management council's geographical area of authority and identify those fisheries that are overfished, have overfishing occurring, or are approaching a condition of being overfished. The overfishing threshold levels for bottomfish management unit species (BMUS) stocks and populations is specified in Amendment 6[2] of the Bottomfish and Seamount Groundfish Fishery Management Plan (Bottomfish FMP). On May 27, 2005, the Regional Administrator for NMFS' Pacific Islands Region notified the Council that Hawaii's bottomfish multi-species stock complex is experiencing overfishing (within state and federal jurisdictions), with the MHI as the zone that contributes most of the problems in terms of both reduced biomass and overfishing (70 FR 34452, June 14, 2005). Pursuant to the MSA, the Council has one year from the May 27, 2005 notification to develop measures to end the overfishing through an amendment to the Bottomfish FMP (16 U.S.C. 18539(e)(3)). Because of the time it takes to obtain and process the fisheries data, stock assessments are usually conducted on annual fisheries data that is lagging behind the current calendar year. For example, the full set of 2003 bottomfish

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[1] For a copy of the May 2005 FEIS contact William L. Robinson or Kitty M. Simonds, or visit www.wpcouncil.org for an electronic version.

[2] 68 FR 46112, August 5, 2003.

data was compiled and analyzed in 2005.

Hawaii's BMUS are evaluated under the MSA as a single archipelagic-wide multi-species stock complex. Management criteria, such as whether the stock complex is overfished or whether overfishing is occurring, apply to the stock complex rather than to the three sub-area management zones or to individual species either on an archipelagic basis or within the sub-areas. Under the MSA National Standard 1guidelines, Hawaii's archipelagic bottomfish multi-species stock complex is not overfished (based on the biomass threshold using catch per unit effort [Catch-Per-Unit-Effort or CPUE] as a proxy). The current CPUE ratio is 0.82, above the threshold value of 0.7 established as the Minimum Stock Size Threshold in the Bottomfish FMP.

However, under the MSA National Standard 1 guidelines, a stock or population is subject to overfishing if the fishing mortality rate exceeds the maximum fishing mortality threshold (MFMT) for one year. Based on 2002 fishery catch and effort data analyzed by NMFS' Pacific Islands Fisheries Science Center (PIFSC), Appendix 5 to the 2003 Bottomfish and Seamount Groundfish Annual Report[3] indicated that overfishing is occurring in the Hawaii Archipelago because the ratio of current fishing mortality (F) to estimated fishing mortality at maximum sustainable yield (F_{MSY}) exceeded the MFMT of 1.0. Hawaii's archipelagic bottomfish F ratio is obtained by adding the weighted F contributions of the three management zones (MHI, Mau and Hoomalu) by using effort, amount of bottomfish fishing gear used over a given unit of time, as a proxy for fishing mortality. The archipelagic values also include a weighted factor based on the amount of bottomfish habitat in each management zone. These habitat factors are 0.447, 0.124 and 0.429 for the MHI, Mau and Hoomalu Zones, respectively.

Using 2002 fishery data and the weighted factors for each zone, Appendix 5 to the bottomfish annual report stated that the archipelagic F ratio was between 1.14 and 1.35, above the overfishing threshold of 1.0. As reported in Appendix 5, the F ratio for the MHI was 1.86 to 2.33. The F ratios for the Mau and Hoomalu Zones were 1.19 and 0.37, respectively. Since the completion of Appendix 5 in April 2005, PIFSC has received the full set 2003 bottomfish fishery data from the State of Hawaii's Division of Aquatic Resources. Based on 2003 bottomfish fishery statistics and the weighted factors for each zone, the archipelagic F ratio is determined to be 1.13, above the overfishing threshold of 1.0. Individual F ratios for MHI, Mau and Hoomalu Zones are 1.88, 0.96 and 0.39, respectively (See Appendix 2 for more information).

The MHI F ratio greatly exceeds those of the NWHI zones and indicates that the overfishing occurs as a result of excessive fishing mortality (or effort) on the BMUS complex in the MHI. Considering the 2003 catch and effort data from each zone and their weighted factors, fishing effort in the MHI should be reduced by a minimum of 15 percent to lower the archipelagic F ratio from 1.13 percent down to a threshold value of 1.00 or less (Bottomfish Plan Team April 2005). The MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing. Therefore, reducing fishing mortality in the MHI would be the most effective means to end the overfishing in the Hawaii Archipelago (70 FR 34452, June 14, 2005).

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[3] Appendix 5 to the Council's Bottomfish and Seamount Groundfish Annual Report, which also contains the status of bottomfish fisheries in the Western Pacific Region, can be obtained electronically at www.wpcouncil.org/Bottomfish/Documents/AnnualReports/2003/2003BAR-Appendix5-SatausofBott

Management of the bottomfish multi-species stock complex in the Hawaiian Archipelago is confounded by issues of single sector (commercial) representation in fisheries data in the MHI, the spatial distribution of fishing effort on the stocks, and the proxies used to measure fishing impacts. Fishing effort is heavily skewed towards the MHI, with nearly 3,600 bottomfish vessels registered in the MHI only nine bottomfish vessels operating in the NWHI. In the NWHI, the total commercial catch represents the sum total of all bottomfish fishing occurring there, while in the MHI, there is believed to be significant but unknown recreational catch which is not subject to mandatory reporting (HDAR Bottomfish Survey 2005). Only commercial catch and dealer reporting is required in the MHI.

In accordance with the MSA, federal fishery management actions (e.g. FMP amendments) are subject to the requirements of the National Environmental Policy Act (NEPA). Pursuant to NEPA regulations (40 CFR 1500 et seq.), this DSEIS was prepared because the May 27, 2005 overfishing determination added significant new circumstances and information relative to the management of Hawaii's archipelagic bottomfish multi-species stock complex. This DSEIS examines Hawaii's bottomfish fisheries, describes the alternatives being considered to end the overfishing, identifies the impacts associated with each alternative, and describes current data gaps and areas requiring further research and coordination with the State of Hawaii.

Description of the Alternatives Considered in this DSEIS

To meet the purpose and need of this proposed action (to end overfishing in the bottomfish complex in the Hawaiian Archipelago), the Council is considering several management measures or alternatives to address bottomfish fishing in the MHI, which as previously discussed, is the primary management area of concern. To determine the appropriate range of alternatives, the Council conferred with fisheries experts, Council staff, members of the fishing community, and members of the public through meetings and workshops held throughout Hawaii (see Section 1.7).

A range of alternatives was selected taking into account: (a) the best available scientific information on the bottomfish species' life history, habitat, and stock assessments; (b) the requirements of the MSA; and (c) the potential impacts to cultural, social, biological, enforcement, ecosystem, and economic factors. Under all the alternatives, HDAR's bottomfish management regime (HAR Chapter 13-4) may remain in place or could be changed by DLNR. The state's current bottomfish management regime includes: (i) 19 Bottomfish Restricted Fishing Areas (BRFAs) throughout the MHI, (ii) a recreational bag limit of 5 ehu and/or onaga per trip per person, (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish. To end the bottomfish overfishing through reducing fishing mortality by 15 percent within the MHI, the Council is considering the following management alternatives, of which, all but Alternative 2a require close coordination with the State of Hawaii and parallel regulations.

Alternative 1: No Action

Alternative 1 is to take no federal action; that is, no federal management measures would be recommended by the Council at this time.

This alternative would also allow continued open access for entry into the MHI fishery, and commercial fishermen would continue to be required to submit catch reports. Recreational fishermen would continue not to be required to submit catch reports, and the recreational catch component would continue to be unknown.

Based on new mapping information of bottomfish habitat, HDAR is in the process of reviewing its bottomfish management regime, with a focus on the Bottomfish Restricted Fishing Areas (BRFAs). Under this alternative (no federal action), the state would likely continue to propose changes to is bottomfish management regime which includes: reducing the number of BRFAs from 19 to 12, modifying the BRFA locations and generally increasing their size, and standardizing BRFA boundaries to corresponding minutes of latitude and longitude. According to HDAR, the revised BRFAs include a greater amount of quality bottomfish habitat, with some are placed closer to shore to facilitate monitoring and enforcement. It is acknowledged by Hawaii's Division of Conservation and Enforcement (DOCARE) that enforcement of the existing BRFAs has not been effectively conducted due to lack of adequate funding, staff, and assets.

Alternative 2: Area Closures

Alternative 2 contains two variations, both of which would prohibit targeting, possession, landing, or selling any of the Deep 7 species from specified closed areas. Alternative 2a would close federal waters around Penguin Bank and Middle Bank to bottomfish fishing for the Deep 7 species. Alternative 2b would overlay federal closures in areas where the State of Hawaii is proposing closed areas known as that overlap BRFAs into the federal Exclusive Economic Zone (3 to 200 nm).

Alternative 2a: Closure of Penguin Bank and Middle Bank (Secondarily Preferred)

Under Alternative 2a, all recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species (onaga, opakapaka, ehu, lehi, gindai, kalekale and hapuupuu) in or from federal waters around Penguin Bank and Middle Bank. All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to obtain permits as well as to complete and submit catch reports including their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

If the State of Hawaii does not commit to adopting seasonal closure regulations (Alternative 3) by April 15, 2006, the Council recommended the adoption of Alternative 2a. This alternative can be implemented by federal action as the vast majority of both Penguin and Middle Banks occur in federal waters (Figure 3). Together these areas represent between 16 percent and 20 percent of

MHI bottomfish landings (based on 1998 to 2004 and 1990 to 2004 data, respectively). The effectiveness of the area closures in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

Alternative 2b: Overlay Federal Closures on Proposed HDAR's Bottomfish Restricted Fishing Areas

Alternative 2b would overlay federal closures on the State of Hawaii's proposed BRFAs in federal waters (3 to 200 nm offshore). HDAR has proposed to replace the current 19 BRFAs with 12 BRFAs. The proposed 12 BRFAs are based on bottom mapping and sonar data that provide a detailed view of bottomfish Essential Fish Habitat in the 100 to 400 m depth range. It is estimated by HDAR that the proposed BRFAs will reduce fishing (landings) by at least 17 percent (see Appendix 3).

According to HDAR, monitoring of the BRFAs will mostly include fishery-independent components (e.g. video cameras) and perhaps some limited extractive sampling. In order for area closures to be effective, it is important to have adequate enforcement. Problems with the current level of enforcement by DOCARE have been noted and the proposed BRFAs have been placed closer to shore, to the extent possible, and design them with straight-line boundaries, making it easier for both fishermen and enforcement officers to determine whether fishing takes place inside or outside the closed areas. Overlaying federal closures for those proposed BRFAs that extend into the EEZ will allow for enforcement by the U.S. Coast Guard and NMFS Office of Law Enforcement.

Alternative 3: Seasonal Closure (Primarily Preferred)

Under Alternative 3, an annual summer closure would be implemented from May 1 to August 31 of each year for the entire MHI bottomfish fishery (both commercial and recreational vessels). Targeting, possessing, landing, or selling MHI Deep 7 species would be prohibited during the closed season; however, the NWHI bottomfish fishery would remain open. All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number. To achieve the needs and objectives of this action (i.e. a 15 percent reduction in MHI fishing mortality), the State of Hawaii would need to establish a parallel summer closure for state waters. Recognizing that parallel state and federal seasonal closure regulations must be promulgated in order for a seasonal closure to be effective, the Council requested that the State of Hawaii notify the Council by April 15, 2006 of its commitment to adopt seasonal closure regulations. If the State of Hawaii does not commit to adopting seasonal closure regulations, the Council recommended the adoption of Alternative 2a (Closure of Middle and Penguin Banks). The effectiveness of the seasonal closure in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

Alternative 4: Catch Limits

Alternative 4 includes two variations that would limit the commercial catch of MHI bottomfish. Alternative 4a would establish a fleet-wide total allowable catch (TAC) of bottomfish for all commercial fishing vessels in the MHI, while Alternative 4b would establish vessel-specific individual fishing quotas (IFQs) for Deep 7 bottomfish for all commercial fishing vessels in the MHI. Once either quota was reached, no targeting, possessing, landing or selling of MHI Deep 7 bottomfish (commercial or recreational) would be permitted. The NWHI bottomfish fishery would remain open.

Under both variations, all vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit catch reports including their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish a parallel requirement as both State and federal waters would have to be closed once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

Alternative 4a: TAC

Under Alternative 4a, a TAC of 198,484 pounds of the Deep 7 species (all species combined), representing a 15 percent reduction from the 2003 fleet-wide MHI bottomfish catches of these species, would be applied to the entire MHI commercial bottomfish fishery. The bottomfish fishing year would start on October 1 and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or recreational) would be permitted in the MHI. The NWHI bottomfish fishery would remain open.

Alternative 4b: IFQs

Under Alternative 4b, IFQs would be established for each MHI commercial bottomfish fisherman, allowing each fisherman to catch 85 percent of their 2003 catch of the Deep 7 species, based on reported landings. The bottomfish fishing year would start on January 1. The number of participants would be limited to past participation in the fishery and quota amounts would be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year. The recreational fishery would remain open.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. If the fisherman sold fish in excess of the number of bottomfish pounds for one stamp, he would be required to surrender a second stamp to the dealer. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season.

Under this variation, fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would need to be analyzed in real time to ensure that fishermen did not exceed their quota and to penalize those that did.

IFQs could be implemented in a number of ways, two methods are outlined here:

1. Provide equal quotas (totaling 85 percent of the fleet-wide 2003 catch) to all historical participants. Under this alternative, historical "highliners" would get the same quota as part-time fishermen, and vice versa. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to 85 percent of each and every fisherman's historical catch. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

Alternative 5: Combination Measures

Alternative 5 would mitigate potential impacts of the stand-alone alternatives above by combining modifications of those alternatives. Alternative 5 includes two variations. Alternative 5a would combine a seasonal bottomfish closure with bottomfish IFQs for certain commercial fishing vessels during the seasonal closure. Alternative 5b would combine seasonal closures with a partial closure of Penguin Bank.

Under both versions of Alternative 5, all vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit catch reports including their catches, fishing effort, and area fished.

Successful implementation and enforcement of Alternative 5 would be dependent upon coordination with the State of Hawaii as it would require parallel regulations for fishing limits and closures in both state and federal waters.

Under both versions of Alternative 5 enforcement would include shore-based monitoring of landings and sales. Imported bottomfish or bottomfish caught in the NWHI would still be available, and these would need to be certified and tracked to final point of sale. At-sea enforcement would be needed during closed seasons and to patrol the area closure in Alternative 5b. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

Alternative 5a: Seasonal Closure and IFQs

Under Alternative 5a, the MHI bottomfish fishery would be closed during an expanded seasonal closure from May 1 to September 30 of each year, except for a small number of full-time commercial bottomfish fishermen. The exempt fishermen would each receive IFQs for the Deep 7 species that they could use during the otherwise closed season (May to September). Once each exempted fisherman's quota was landed, he would be required to stop fishing until the next open season. The combined total of all IFQs would equal 23,946 pounds of the Deep 7 species (all species combined) as this is the amount that could be made available for harvest during the otherwise closed season and still maintain the overall annual reduction of 15 percent from the 2003 baseline for the entire MHI.

Each MHI commercial bottomfish fisherman exempted from the summer closure would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the vessel's IFQ for the otherwise closed season. The fisherman would be required to submit a stamp to the dealer at the point of sale. If the fisherman sold fish in excess of the number of bottomfish pounds for one stamp, he would be required to surrender a second stamp to the dealer. Once all the stamps were submitted the fisherman would be prohibited from targeting, possessing, landing or selling MHI Deep 7 bottomfish until the next open season.

As in Alternative 4, IFQs could be calculated and provided in equal amounts to all qualifying fishermen, or they could be calculated and provided such that each qualifying fisherman's quota was proportionate to his historical catch. However, in either case, the sum of the IFQs would not exceed the 23,946 pounds available.

Alternative 5b: Seasonal Closure and Area Closure

Alternative 5b would combine a seasonal closure from June 1 to August 31 of each year for the MHI with a year-round closure of the southwestern quarter of Penguin Bank. All MHI bottomfish fishermen would be prohibited from targeting, possessing landing or selling the Deep 7 species from the MHI during the summer closure. However, the year-round partial closure of Penguin Bank would enable the length of the summer closure to be reduced as compared to other alternatives. Based on historical MHI landings of deep-slope bottomfish, a summer closure from June through August would reduce landings by up to 11 percent as compared to the 2003 baseline. Based on 1998 to 2004 historical data indicating that federal waters around Penguin Bank are the source of 16 percent of MHI Deep 7 catches as compared to the 2003 baseline and lacking spatially detailed catch and effort data for this area, the closure of the southwestern quarter of Penguin Bank would be estimated to further reduce landings by an additional 4 percent. Thus the combination of the seasonal and area closures under Alternative 5b would be expected to achieve the 15 percent reduction target.

Summary of Environmental Consequences of the Alternatives Considered

For each alternative considered in detail, the potential direct and indirect impacts on each of the affected components of the human environment are described, as are the potential cumulative impacts.

Alternative 1: No Action

Alternative 1 is to take no federal action; that is, no further federal management measures would be recommended by the Council at this time. However under this and all other alternatives, HDAR's bottomfish management measures could remain in place or be changed by DLNR. Existing HDAR regulations include: bag limits for the recreational harvest of onaga and ehu (unless recreational fishing activities are closed as in some alternatives); requirements for anyone who intends to harvest any of HDAR's designated seven deep-slope bottomfish species (the Deep 7: onaga, ehu, opakapaka, gindai, lehi, kalekale, hapuupuu, and lehi) to register and mark their vessels with their registration number beginning with "BF"; and the existing 19 BRFAs which have been closed to bottomfish fishing since 1998. Under this and all other alternatives HDAR would continue to manage the BRFAs and could make changes to them. Uncertainty about the effectiveness of the State's existing BRFAs, about the final configuration of any new BRFAs (and related changes to existing area closures) and fishermen's responses to them, as well as uncertainty about trends in factors external to the fishery management regime (such as market demand and prices for fresh MHI bottomfish), hamper reliable estimations of future fishing activity. However it can be reasonably anticipated that catches of target species will be reduced if the proposed BRFAs close prime fishing areas. The distribution of impacts among fishery sectors, communities, and participants will largely be a function of where new area closures are located, and the proximity and viability of remaining open areas.

Absent any new federal or state actions, fishing activities and fishery conditions under Alternative 1 would continue as at present. If the trend of declining commercial fishing activity, apparent for the past 20 years, continues, overfishing may end by the observed reduction in effort which is used as a proxy for fishing mortality. There is, however, little flexibility under MSA National Standard 1 guidelines to preclude management measures to address an overfishing condition even though there is a historical trend in reduced fishing effort. Furthermore, fishing pressure (e.g. overfishing) may increase in future years due to markets or exogenous factors such as high fuel costs, which are believed to cause fishermen to switch from trolling to bottomfish fishing. If this continues, bottomfish stocks and catch rates may further decline and fishery participants in all sectors will see lower returns both in financial and non-market (e.g. angler satisfaction, protein sources, and social benefits) terms. If the overfishing of bottomfish in Hawaii continues, there is potential for experiencing an '"overfished" state in the bottomfish fishery, which left unchecked could cause the fishery to collapse and require the implementation of a rebuilding plan. An overfished resource and subsequent collapsed fishery would likely result in significant negative impacts on Hawaii's fishing communities and participants.

Alternative 2: Area Closures

Under Alternative 2a, all recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species (onaga, opakapaka, ehu, lehi, gindai, kalekale and hapuupuu) in or from federal waters around Penguin Bank and Middle Bank. This alternative can be implemented by federal action as the vast majority of both Penguin and Middle Banks occur entirely in federal waters. Together these areas represent between 16 percent and 20 percent of MHI Deep 7 bottomfish landings as compared to the 2003 baseline (based on 1998 to 2004 and 1990 to 2004 data, respectively).

Deepwater bottomfish within the closed areas would be protected but fishing effort (and associated mortality) could be displaced to open areas, thus reducing the potential benefits of the closures. However subsequent mortality rates may be lower if open areas have lower catch rates than Penguin and Middle Banks. The extent of effort moving to open areas is unknown, but several key factors suggest a shifting of effort would likely occur. Oahu bottomfish landings represent approximately 30 percent of the commercial MHI landings, and harvests from Penguin Bank make up a significant proportion of those landings. Additionally, because MHI bottomfish tend to command higher aggregate prices than NWHI or imported bottomfish, a shifting of effort to other areas within the MHI is likely to occur. A year-round closure of Penguin and Middle Banks would likely have disproportionate effects on fishing communities and participants on Oahu and Kauai because of the proximity of the banks to these islands. Costly at sea enforcement and air surveillance would be necessary enforce the closed areas.

Under Alternative 2b, all recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species in or from federal waters of the state's BRFAs. According to HDAR, the proposed BRFAs will reduce fishing effort by at least 15 percent. Deepwater bottomfish within the closed areas would be protected but fishing effort (and associated mortality) could be displaced to open areas, thus reducing the potential benefits of the closures. The assumptions and analysis of HDAR's proposed revisions to the BRFAs, is complex and it is difficult to predict the associated impacts. Although area closures are recognized as a valid management tool for some fisheries, there is more uncertainty in predicting the impacts associated with the proposed BRFA revisions when compared to the other alternatives. For example, the proposed closed areas will likely increase bottomfish biomass within the closed areas; however, the spillover effect to adjacent areas is unknown. The distribution of impacts among fishery sectors, communities, and participants will largely be a function of where new area closures are located, and the proximity and viability of remaining open areas. The proposed closed areas would require costly at sea and air surveillance enforcement and according to NMFS OLE, closed areas interspersed with open areas are difficult to enforce. The USCG and NMFS OLE have indicated that they lack appropriate resources to adequately enforce the proposed BRFAs (131^{st} Council Meeting, March 13 to 16, 2006),

Alternative 3: Seasonal Closure

Under Alternative 3, an annual summer closure would be implemented during May to August of each year for the entire MHI bottomfish fishery (both commercial and recreational vessels). To achieve the needs and objectives of this action (i.e. a 15 percent in the fishing mortality of MHI Deep 7 species), the State of Hawaii would need to establish a parallel summer closure for state waters.

Based on historical MHI landings, the May to August closure would be expected to reduce MHI landings by up to 17 percent as compared to the 2003 baseline. Peak spawning of deep-water bottomfish is believed to occur during the summer months, thus spawning bottomfish would be protected throughout the MHI during the closed season. Although fishing effort could shift to open periods, the extent of effort shifting to open periods is not expected to be significant as there would be a reduced number of calendar days to fish, in combination with the sensitivity of the bottomfish fishery to adverse weather conditions. Historically, the highest levels of bottomfish fishing effort occur in the winter months when there is a greater demand for bottomfish during the holiday season, as well as shift in weather patterns that result in calmer ocean conditions that are more conducive to bottomfish fishing. In addition, the closure would occur during the time when bottomfish activity has been historically low as fishermen switch to other fisheries. Both the pelagic troll (e.g. yellowfin) and the hook-and-line mackerel (akule and opelu) fisheries are at their peak during the summer period and therefore represent various recreational and commercial fishing opportunities during the bottomfish closed season.

It's believed the largest impact of a seasonal closure would be on the full-time commercial bottomfish sector, which whom depend on harvesting bottomfish for their livelihood. Impacts on fishing communities and participants would generally be evenly distributed except for some number of participants from each community who prefer year-round bottomfish fishing to other types of fishing or who prefer summer bottomfish fishing to other times of year.

Enforcement of a seasonal closure will occur mostly shore-side and at fish markets. At sea enforcement or air surveillance would still be conducted, however, at levels lower than what is required for year around area closures.

Alternative 4: Catch Limits

Both variations of Alternative 4 would provide direct control of fishing mortality and would (with parallel State regulations) be expected to achieve the target 15 percent reduction in catches of MHI Deep 7 species. However concerns have been raised regarding the determination of appropriate allowable harvest levels on an ongoing annual basis as to date not even one comprehensive stock assessment has been completed for this fishery. PIFSC has recently initiated a process to complete a comprehensive stock assessment, however the date of completion is unknown, and further the assessment model would unlikely be able to predict allowable harvest levels on an annual basis. There is also a paucity of fishery independent data, as well as difficulty in adjusting available CPUE data as highliners leave the fishery. Incorporating the existence of area closures such as the State's BRFAs has also proven problematic as the BRFAs are generally designed to close the most productive fishing areas, thus reducing available CPUE in remaining open areas. Additionally there is a lack of fishery independent data, a lack of recreational data, and difficulty in adjusting available CPUE data as highliners leave the fishery. These factors may make the use of a quota-based management program difficult.

High-grading would also be a concern under both versions of Alternative 4. High-grading to maximize value can occur within species (e.g. discarding small fish in favor of larger fish) or between species (e.g. discarding low-value species in favor of higher-value species). Deep-slope bottomfish generally have a high mortality rate resulting from embolism as they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur. A quota-based program may also lead fishery participants to make sure that they achieve quotas out of fear that future quotas (or their share of them) may otherwise be reduced. This can result in increased impacts on target species as compared to other management approaches.

The use of a commercial fleet-wide TAC under Alternative 4a would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" which temporarily reduce fresh fish prices and adversely impact commercial fishermen. Once the TAC was reached, this alternative would lead to an increased reliance on NWHI or imported bottomfish. Pending the designation of the NWHI National Marine Sanctuary, a continued NWHI bottomfish fishery is likely to be subject to reduced catch limits, or completely phase-out over a period of time. An increase reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year, a task that has historically proven to be difficult in many fisheries and industries.

The impacts of Alternative 4b on the commercial fishery sector would vary depending on how the IFQs were implemented. If equal quotas (totaling 85 percent of the fleet-wide 2003 catch) were provided to each participant, highliners would get the same quota as part-time fishermen, and vice versa. This would leave some without enough quota, while others would have unused quota. Without a method to transfer (trade) quota between fishermen, this would have disproportionately adverse impacts on the highliners. If individual quotas (equal to 85 percent of each fisherman's individual historical catch) were provided, all commercial participants would be anticipated to experience proportionately equally adverse impacts, and it is likely that more of the total quota would be used even if there were no method to transfer quota between fishermen. If individual quotas were provided to a subset of all historical participants, such as those most active in recent years, the individual quotas would not change, but some historical participants would not have any quota. The recreational (including subsistence) fishery sector would not be issued an IFQ but would continue to be subjected to the State's recreational bag limits.

Because this alternative may also lead to an increased reliance on imported bottomfish as the commercial IFQs were reached, it would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would again be lost and have to be regained each year.

Alternative 5: Combination Measures

Both variations of Alternative 5 (with parallel State regulations) would be expected to meet the 15 percent target reduction in fishing mortality to MHI Deep 7 species. Alternative 5a's expanded (May–September) summer closure would impact all fishery sectors, communities and participants; however, this is normally be a period of lower bottomfish fishing activity because of the increased availability of pelagic fish, so this impact may be relatively low. The provision of equal IFQs for use by a subset of commercial fishermen during the otherwise closed season will offset the impacts on this group. However, the allocation of equal quotas to each qualifying participant would likely leave some without enough quota, while others could have unused quota. Without a method to transfer (trade) quota between fishermen, this would have adverse impacts on the qualifying highliners.

As compared with alternatives that would result in time periods during which no MHI bottomfish were landed (resulting from seasonal closures or TACs or universal IFQs), Alternative 5a would be expected to have a strongly positive impact on the entire commercial fishery sector. It would provide a continuous supply of fresh MHI bottomfish to local markets, thus maintaining open market channels that would otherwise be expected to be filled by increased imports during the closed season. Experience has shown that if imports come to dominate market channels, it can be difficult for local producers to regain their market share as wholesalers and retailers can be reluctant to forgo their now-established supply chains.

Alternative 5b would combine a seasonal closure June to August of each year for the MHI with a year-round partial closure of Penguin Bank. Based on historical MHI landings of deep-slope bottomfish, a summer closure from June through August would reduce MHI Deep 7 landings by up to 11 percent as compared to the 2003 baseline. Data from 1998 to 2004 indicate that federal waters around Penguin Bank are the source of 16 percent of MHI Deep 7 catches as compared to the 2003 baseline. The closure of the southwestern quarter of Penguin Bank would be expected to further reduce landings by an additional 4 percent. As in Alternative 5a, deep-slope bottomfish throughout the MHI would be protected during the closed season. Fishing effort could shift to open periods, potentially reducing the benefits of the closures. In addition to the benefits of the seasonal closure, Alternative 5b would further protect target species within the closed area on the southwestern quarter of Penguin Bank.

Economic Impacts from the Alternatives

The economic effects of ending overfishing in the MHI bottomfish fishery depends largely on how fishermen and the seafood market react to the measures. For the fishermen, it is expected that they will adjust to the extent possible by shifting their effort to other time-area strata. For the market, the same applies in terms of finding substitutes for decreases in their supply of MHI bottomfish. Their primary alternatives are as follows: NWHI bottomfish, imported bottomfish, and other species (non-bottomfish). The management objective to reduce bottomfish catch in the MHI by 15 percent translates to a reduction of roughly 35,000 pounds of the deep snapper/grouper complex or $110,000 ex-vessel revenues. The aggregate impact on Hawaii's economy would be small. Using an input/output approach, as a rough order of magnitude, the total economic impact would be $300,000 in business sales with a loss of $120,000 in income.

Fishermen would have the ability to offset some of their lost revenue by substituting different target species and adjusting their fishing patterns accordingly. Obviously, the distribution of this cost across currently active (or potentially newly active) participants would differ by their current levels of fishing effort, but if there are roughly 300 active commercial bottomfish fishermen in the MHI, the average impact is minimal. However, the individual impact may be significant for the relatively few full-time bottomfish fishermen. There is a consumer price element in which any decrease in the supply of bottomfish would be expected to increase prices by a certain percentage.

Finally, the Hawaii bottomfish fishery is also important culturally to Hawaii's fishing communities, a value not entirely reflected by the seafood market. Again, NWHI bottomfish would be considered in many cases a close substitute, but substituting different snapper species from imports would not be so close a cultural substitute. More research would be required on the implications of this effect on Hawaii's communities.

Selection of a Preferred Alternative

Based on public comments received and recommendations provided by the Council's advisory panels and its Science and Statistical Committee, the Council at its 131st meeting selected Alternative 3 (Seasonal Closure) as the measure to end the bottomfish overfishing problem within the MHI. Recognizing that parallel state and federal seasonal closure regulations must be promulgated in order for a seasonal closure to be effective, the Council requested that the State of Hawaii notify the Council by April 15, 2006 of its commitment to adopt seasonal closure regulations. If the State of Hawaii does not commit to adopting seasonal closure regulations, the Council recommended the adoption of Alternative 2a (Closure of Middle and Penguin Banks), which is the only alternative that involves only federal jurisdiction that could be unilaterally approved and implemented by NMFS acting on behalf of the Secretary of Commerce. The Council also recommended at its 131st meeting, that a working group be established composed of staff from the Council, State, and Federal agencies to develop a comprehensive research, monitoring, and enforcement program to evaluate the effectiveness of the State's existing and proposed BRFAs.

Table 1: Summary Impact Comparisons of the Alternatives.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Target Species	(-) Continued overfishing. (-) Does not meet MSA requirements. (?) The impact of a revised State of Hawaii bottomfish management regime. (-) Recreational fishermen would continue not to be required to submit catch reports, and the recreational catch component would continue to be unknown	2a: (+) Anticipated to reduce landings by up to 20 percent based on historical catch. 2b: (+) Anticipated to reduce landings by up to 17 percent based on 2004 catch. (+) Closed areas may help replenish stocks in adjacent habitat (i.e. spillover). (+) Recreational catch data collection would be improved with new reporting requirements. (-) Fishing effort may increase in open areas reducing benefits of closures & depressed CPUE in those areas fished.	(+) Anticipated to reduce landings by up to 17 percent based on historical catch. (+) May protect bottomfish summer spawning aggregations & reduce mortality on spawning fish increasing biomass over time. (+) Recreational catch data collection would be improved with new reporting requirements. (-) Fishing effort may increase during open periods reducing overall benefit.	(+) Anticipated to reduce landings by up to 15 percent based on historical catch. (+) Sets hard limits on amount of fish caught. (+) Recreational and commercial catch data collection would be improved with new, timely reporting requirements. (-) Lack of robust stock assessments may lead to errors in setting harvest limits. (-) Poor, missing data on catch especially in recreational fishery may lead to errors in setting harvest limits. (-) May lead to high-grading and thus no net decrease in mortality.	(+) Anticipated reduce landings by up to 15 percent based on historical catch. (+) Both options would reduce fishing mortality. (+) Both options would reduce bottomfish landings during closed season. (+) Recreational catch data would be improved. 5a: (+) May protect bottomfish spawning aggregations & reduce mortality on spawning fish, increasing biomass over time. 5a: (-) Lack of robust stock assessments may lead to errors in setting harvest limits. 5b: (+) Closed areas may help replenish stocks in adjacent habitat (i.e. spillover). 5b: (-) Fishing effort may increase in open areas reducing benefits of closures.

Legend: (+) positive, (-) negative, (?) unknown, (n) neutral.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Nontarget Species and Bycatch	(n/+) If the decline in fishing effort continues, there may be a decline in catch of nontarget spp. (n) Bycatch data in the MHI has only recently been reported, but is estimated to be minimal, and disproportionately limited to a few number of species which likely survive when discarded.	(+) Catch of nontarget spp. would be eliminated in closed areas. (n/-) Increased effort in open areas may locally increase catch of nontarget species and bycatch in those areas. (+) Recreational catch data collection would be improved with new reporting requirements.	(n/-) Increased effort during open period may lead to increased catches of non-target species and bycatch, especially for species more abundant during the open season. (+) The minimal bycatch levels would be eliminated during closed period. (+) Recreational catch data collection would be improved with new reporting requirements	(-) If annual quota is met, effort to catch normally non-target species may increase. (n) Bycatch in deep handline fishery is minimal so reduction in bycatch would be minimal. (-) High-grading may increase bycatch, including that of target species. (+) Recreational catch data collection would be improved with new reporting requirements	(n) Bycatch is minimal so reduction in bycatch would be minimal. 5a: (-) Highgrading may increase bycatch, including that of target species. (+) Recreational catch data collection would be improved with new reporting requirements
Protected Species	(n) Rare interactions between bottomfish fishers and protected species. A decline in bottomfish fishing, it is expected that there will be a proportional reduction in the potential of an interaction.	(+) Potential minor benefits in preventing possible interactions in closed areas. (n) Impact of potential increased effort in open fishing areas likely negligible as interactions are rare.	(+) The possibility of protected species interactions would be eliminated during closed period.	(n/+) An enforced reduction in landings and possible shortened season may result in a proportional reduction of potential interactions.	(+) Possible minor benefits in preventing potential interactions.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
EFH, Biodiversity, & Ecosystem	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (n/+) Negligible or slightly positive effects by less fishing effort in closed areas. (?/-) Potential for localized negative effects if bottomfish fishing effort is too highly concentrated in open areas with suitable habitat.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (+) Potential negative impacts on EFH, biodiversity, and ecosystems would be eliminated during closure period. (?/n) The impacts of a potential increased level of effort during open season are unknown, but likely minimal.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (+/n) No likely effect on EFH or slight positive effect by less fishing presence once the TAC is reached.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (+/n) No likely effect on EFH or slight positive effect by less fishing presence once an IFQ is reached and due to no bottomfish fishing during closure period.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Fishing Sectors	(-) Continued overfishing would lead to decreased landings.	2a: (+) Closure of Penguin Bank, the most productive bottomfish area in the MHI, may result in failure of full-time bottomfish fishing and multi-fishery operations. 2a: (-) Impact to all sectors will not be distributed evenly throughout the islands; greatest impact will be to Oahu and Kauai based fishermen. 2b: (-) Proposed closures may impact small boat recreational and commercial fishermen throughout the state if force to travel farther to bottomfish.	(+) Impacts distributed evenly throughout all fishing sectors. (+) Pelagic troll or other fisheries are viable alternatives for MHI bottomfish fishers during closed season. (n) Historically there are higher monthly bottomfish landings during the proposed open season.	(+) Commercial bottomfish fishers who have correctly reported their catch will lose less than those who have not reported or have underreported their catches. (-) Fishermen with poorly documented catch records may be squeezed out of the fishery. (-) May restrict new entry into the fishery.	5a: (+) Commercial bottomfish fishers who have correctly reported their catch will lose less than those who have not reported or have under-reported. 5a: (+)(+) Pelagic troll or other fisheries are viable alternatives for MHI bottomfish fishers during closed season. 5a: (-) Fishermen with poorly documented catch records may be squeezed out of the fishery. 5a: (-) May prevent new entry into the fishery. 5b: (+) Impacts distributed evenly throughout fishing sectors, but Oahu fishing sectors likely more affected. (+) Pelagic troll fishery is a viable alternative for MHI bottomfish fishers.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Fishing Communities	(-) Continued overfishing may reduce the social and economic benefits of maintained fishing opportunities.	2a: (-) Disproportionate localized economic and social impacts to Oahu and Kauai fishing communities. 2b: (-) Potential negative impact on communities located near proposed area closures.	(+) Impacts distributed evenly across the state. (+) The fishery would not be closed during holiday season when red bottomfish are most desired by local communities. (-) Marginal impact if seasonal closure is implemented during historically low periods of fishing effort and landings.	4a: (+) A TAC would likely affect all fishing communities equally. 4b: (+) Distribution of IFQs recognizes past participation and experience in fishery. 4b: (-) For those fishing communities whose commercial fishermen have poorly documented catch records may be squeezed out of the fishery.	5a: (+) Distribution of IFQs recognizes past participation and experience in fishery. 5a: (-) For those fishing communities whose commercial fishermen have poorly documented catch records may be squeezed out of the fishery 5b: (+) Seasonal closure evenly distributes impacts across the state 5b: (-) Partial closure of Penguin Bank may result in disproportionate localized economic and social impacts to the Oahu fishing community.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Native Hawaiian Communities	(-) Continued overfishing would lead to decrease in CPUE and available bottomfish.	(-) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture, especially for those Native Hawaiians. 2b: (-) Potential negative impact on Native Hawaiian communities located near proposed area closures.	(+) Impacts distributed evenly across state. (n/-) Marginal impact if seasonal closure is implemented during historically low periods of fishing effort. (-/n) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture; however, seasonal closures were historically used by Native Hawaiians to manage marine resources.	(-) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture.	(-) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture.

	Alternative 1: No Action	**Alternative 2: Area Closures**	**Alternative 3: Seasonal Closure**	**Alternative 4: Catch Quotas**	**Alternative 5: Combination Measures**
Administration and Enforcement	(+) No impacts or additional costs. (n) Continue to monitor the status of the fishery. (-) Would continue to have limited data, especially for recreation fishing effort & landings hindering future management efforts.	2a: (+) Penguin Bank is a large area close to Oahu that will make it easier to enforce and monitor. 2a: (-) Middle Bank is farther from Oahu and would likely be monitored via air surveillance (costly) than by boat by USCG. (-) Requires a research monitoring program to be implemented to measure effectiveness. 2b: (n,-) May allow the force of federal jurisdiction to enhance state jurisdiction in the MHI, but multiple relatively small closed areas with open areas in between are difficult to enforce. 2b: (-) Historically, DOCARE has been under-funded and has lacked the ability to adequately enforce the existing BRFAs. Burdening the USCG with enforcing the proposed closed areas could negatively affect them as they have other important missions (e.g. Homeland security).	(n/-) Requires enhanced state and federal coordination. Similar rules would need to be established by both state and federal agencies. (-) Certification of imported and NWHI bottomfish will be needed. (-) Administrative and enforcement costs will increase over current levels. (+) At-sea and air enforcement, which is costly, would be minimal although necessary to monitor compliance; Bulk of monitoring can be through dockside enforcement or monitoring of markets and dealers. (+) Existing state dealer reporting program could be used to check sales and landings.	4a: (-) Closely monitoring of catch reports may require more resources. 4a: (+) Costly at-sea and air enforcement not required unless quota is met. 4a: (-) All bottomfish sold would have to be tracked to point of sale. 4b: (-) Implementing and monitoring IFQs would likely require additional resources and may be burdensome to administer. 4b: (-) Enforcement would be difficult catch fishermen who exceed their IFQ.	5a: (-) Closely monitoring of catch reports may require more resources. 5a: (-) Enforcement would be difficult catch fishermen who exceed their IFQ. 5b: (+) Penguin Bank is close to Oahu allowing it easier to enforce and monitor. 5b: (-) Enforcement of closed areas requires at-sea and air enforcement, which is costly.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Regional Economy	(-/n) Continued overfishing may eventually lead to a collapse of the bottomfish fishery in the MHI.	2a: (-/n) Closure of Penguin and Middle Banks may slightly affect the impact Oahu and Kauai fishermen's contribution to the regional economy. 2a: (-) Total Penguin Bank closure would negatively impact Oahu bottomfish fishermen's ability to supply local high quality sashimi markets. 2b: (-) Statewide closures may have slight effects on economy statewide. (-) May encourage importation of lesser quality products that will further erode the market for local bottomfish in local markets (-) May encourage increased importation of similar products that may facilitate the supplanting of the traditionally high-priced local bottomfish species.	(+) Seasonal closure would be during period of historically slow bottomfish fishing activity. (+) Winter months and important holiday seasons would remain open when red fish is most desired by local communities. (-) MHI bottomfish product would be eliminated from market during closure period. (-) MHI Bottomfish fishermen may lose foothold due to higher levels of imports.	(-) With reduced bottomfish landings there will be a loss of revenue. (-) If quotas are met, imports of bottomfish are likely to increase above the current level of an average 750,000 pounds.	5a: (+) IFQs for small proportion of commercial fishermen would provide markets with MHI bottomfish during closed season; less reliance on imports during closed season. 5b: (n/-) Partial closure of Penguin Bank may slightly impact Oahu bottomfish fishermen's' contribution the regional economy.

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CHAPTER 1: INTRODUCTION

1.1 Introduction

The Magnuson–Stevens Fishery Conservation and Management Act (MSA) is the principal federal statute providing for management of the U.S. marine fisheries including those within the exclusive economic zone (EEZ). The inner boundary of the EEZ is the seaward limit of each of the coastal states, commonwealths, territories, or possessions of the United States. The EEZ extends from this inner boundary to 200 miles offshore. The management of the fishery resources in the waters of the EEZ is vested in the Secretary of Commerce (Secretary) and in eight regional fishery management councils. Each council has authority over fisheries in specific coastal regions. The area under the jurisdiction of the Western Pacific Fishery Management Council (also known as the Western Pacific Regional Fishery Management Council or Council), which is collectively referred to as the Western Pacific Region, includes the waters of the EEZ surrounding the State of Hawaii, the Territory of American Samoa, the Territory of Guam, the Commonwealth of the Northern Mariana Islands, and the U.S. Pacific Remote Island Areas.[4]

As promulgated under the MSA, the councils are responsible for the preparation of fishery management plans (FMPs) or amendments to those FMPs for each fishery under their authority that requires conservation and management. The councils transmit these FMPs to the National Marine Fisheries Service (NMFS), acting on behalf of the Secretary, for review and approval, disapproval, or partial approval. Once approved, NMFS implements the FMP through regulations and enforcement. Federal fisheries in the Western Pacific Region are currently managed under five species-based FMPs[5]: Pelagics, Bottomfish and Seamount Groundfish, Coral Reef Ecosystems Crustaceans, and Precious corals.

1.2 FMP for Bottomfish and Seamount Groundfish

The combined FMP, environmental assessment, and Regulatory Impact Review for the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region (commonly referred to as the Fishery Management Plan for Bottomfish and Seamount Groundfish of the Western Pacific Region or Bottomfish FMP) was prepared by the Council and approved by the Secretary in 1986. The Bottomfish FMP established a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts in the Northwestern Hawaiian Islands (NWHI), the only exploitable seamount groundfish (e.g. alfonsin) habitat in the Western Pacific

[4] The U.S. Pacific Remote Island Areas (PRIA) includes Baker Island, Howland Island, Jarvis Island, Johnston Atoll, Kingman Reef, Midway Island, Wake Island, and Palmyra Atoll.

[5] On November 10, 2005 (70 FR 68443), the Environmental Protection Agency (EPA) published a notice announcing the availability for public review the Draft Programmatic Environmental Impact Statement (DPEIS)—Towards an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans, dated October 27, 2005. The proposed federal action in the DPEIS would be the realignment of the existing fishery regulations contained in the Western Pacific Region's five species-based FMPs into geographically-based fishery ecosystem plans (FEPs) regulations. At its 130th meeting (December 20, 2005), the Council adopted the FEPs and recommended that Council staff incorporate comments from local resource management agencies and from the public into the FEPs prior to transmittal to NMFS for Secretarial review. See Section 1.7.2 of this DSEIS for more information.

Region. This moratorium remains in effect until August 31, 2010 (69 FR 51400). Consequently, there currently is no seamount groundfish fishery in the Western Pacific Region. The Bottomfish FMP also implements a permit system for bottomfish fishing in the EEZ around the NWHI and establishes a bottomfish fishery management framework that includes measures 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 (see Section 3 for the list of FMP regulations). Table 2 provides the current list of Bottomfish Management Unit Species (BMUS).

Table 2: Bottomfish Management Unit Species (BMUS).

Common Name	Local Name	Scientific Name
Snappers		
Silver jaw jobfish	*Lehi* (H), *palu-gustusilvia* (S)	*Aphareus rutilans*
Grey jobfish	*Uku* (H), *asoama* (S)	*Aprion virescens*
Squirrelfish snapper	*Ehu* (H), *palu-malau* (S)	*Etelis carbunculus*
Longtail snapper	*Onaga*, *ulạula* (H), *palu-loa* (S)	*Etelis coruscans*
Blue stripe snapper	*Tạape* (H), *savane* (S); *funai* (G)	*Lutjanus kasmira*
Yellowtail snapper	*Yellowtail kalekale* (H), *palu-i iusama* (S)	*Pristipomoides auricilla*
Pink snapper	*Opakapaka* (H), *palu-tlena lena* (S), *gadao* (G)	*Pristipomoides filamentosus*
Yelloweye snapper	*Yelloweye opakapaka*, *kalekale* (H), *Palusina* (S)	*Pristipomoides flavipinnis*
Snapper	*Kalekale* (H)	*Pristipomoides sieboldii*
Snapper	*Gindai* (H, G), *palu-sega* (S)	*Pristipomoides zonatus*
Jacks		
Giant trevally	White *ulua* (H), *tarakito* (G), *sapo-anae* (S)	*Caranx ignoblis*
Black jack	Black *ulua* (H), *tarakito* (G), *tafauli* (S)	*Caranx lugubris*
Thick lipped trevally	*Pig ulua*, *butaguchi* (H)	*Pseudocaranx dentex*
Amberjack	*Kahala*	*Serioila dumerili*

Common Name	Local Name	Scientific Name
Groupers		
Blacktip grouper	*Fausi* (S), *gadau* (G)	*Epinephelus fasciatus*
Sea bass	*Hapụupụu* (H)	*Epinephelus quernus*
Lunartail grouper	*Papa* (S)	*Variola louti*
Emperors		
Ambon emperor	*Filoa-gutumumu* (S)	*Lethrinus amboinensis*
Redgill emperor	*Filoa-pạlọomumu* (S), *mafuti* (G)	*Lethrinus rubrioperculatus*
Seamount groundfish		
Alfonsin		*Beryx splendens*
Ratfish/butterfish		*Hyperoglyphe japonica*
Armorhead		*Pseudopentaceros richardsoni*

Note. G = Guam; H = Hawaii; S = American Samoa.

The Bottomfish FMP has been amended seven times since approval in 1986. These amendments are as follows:

Amendment 1 established the potential for limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam.

Amendment 2 divided the EEZ around the NWHI into two zones: the Hoomalu Zone to the northwest and the Mau Zone to the southeast. The amendment also established a limited access program for the Hoomalu Zone.

Amendment 3 defined when a stock is determined to be in an overfished condition. Amendment 3 also delineated the process by which overfishing is monitored and evaluated.

Amendment 4 established regulations which require permitted vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nautical miles “protected species study zone” around the NWHI. This notification allows federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary.

Amendment 5 established a bottomfish limited access program for the Mau Zone and a framework for a Community Development Program.

Amendment 6 identified and described essential fish habitat for managed species of bottomfish, discussed measures to minimize bycatch and bycatch mortality in the bottomfish fishery, and supplements Amendment 3 by providing criteria for identifying when overfishing has occurred in the fishery, as well as described fishing communities in the Western Pacific Region.

Amendment 7 brought the Bottomfish FMP into conformity with the Coral Reef Ecosystem Fishery Management Plan (CRE FMP) by prohibiting fishing for BMUS in the CRE FMP's no-take areas and amending the BMUS list to exclude species now managed under the CRE FMP.

Additional information on these amendments may be found in Section 2.3.1 of the Final Environmental Impact Statement—Bottomfish and Seamount Groundfish Fishery of the Western Pacific Region, dated May 2005.

1.3 Overfishing Determination

The MSA requires the Secretary of Commerce to annually report Congress on the status of fisheries within each regional fishery management council's geographical area of authority and identify those fisheries that are overfished or approaching a condition of being overfished (16 U.S.C 1854(e)(1)). Based MSA National Standard 1 guidelines a stock or population is subject to overfishing if the fishing mortality rate exceeds the maximum fishing mortality threshold (MFMT) for one year (50 CFR 600.310). The MFMT for Hawaii's bottomfish management unit species (BMUS) complex is specified in Amendment 6 of Bottomfish FMP.[6] Relying on the expertise and advice of NMFS' Pacific Islands Fisheries Science Center, NMFS has determined that overfishing of the bottomfish multi-species complex is occurring within the Hawaiian Archipelago, primarily in the Main Hawaiian Islands bottomfish management area (MHI). On behalf of the Secretary of Commerce, NMFS' Regional Administrator for the Pacific Islands Regional Office (PIRO) notified the Council of this overfishing determination on May 27, 2005 (70 FR 34452, June 14, 2005). As stated in the overfishing notification letter, "the MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing." The overfishing notification letter further states, "therefore, it is likely that reducing fishing mortality here [MHI] would be the most effective means to end overfishing in the Hawaiian Archipelago."

Bottomfish in the Hawaiian Archipelago are a collection, or complex, of deep-slope snappers, groupers, and jacks. The primary species of concern are the Deep 7 bottomfish species: onaga (*Etelis corsucans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hapuupuu (*Epinephelus quernes*), opakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*). Hawaii's bottomfish fisheries are separated into two broad management sub-areas, MHI and the Northwestern Hawaiian Islands (NWHI), of which is separated into two smaller management zones; the Mau Zone and Hoomalu Zone. Nearly 80 percent of bottomfish fishing grounds in the MHI are within the waters of the State of Hawaii (0 to 3 nm offshore), and historically, bottomfish fishing in the MHI has been managed by the state. In contrast, most bottomfish habitat in the NWHI occurs in federal waters (3 to 200 nm offshore) and therefore the NWHI bottomfish fishery has been managed under the Council's Bottomfish FMP. The state's MHI management measures include bottomfish vessel registration, restricted

[6] 68 FR 46112, August 5, 2003.

fishing gears, commercial fishing reporting, recreational catch limits (5 fish combined) for two bottomfish species (onaga and ehu), and 19 restricted fishing areas where bottomfish fishing is prohibited.

Because of the time it takes to obtain and process the fisheries data, stock assessments are usually conducted on annual fisheries data that is lagging behind the current calendar year. For example, the full set of 2002 and 2003 bottomfish data was compiled and analyzed in 2005. Under the MSA National Standard 1 guidelines, Hawaii's archipelagic bottomfish multi-species stock complex is not overfished (the biomass standard using catch per unit effort [CPUE] as a proxy). Based on 2003 data, the current CPUE ratio is 0.82, above the threshold value of 0.7 established as the Minimum Stock Size Threshold (MSST). However, MSA National Standard 1 guidelines indicate that overfishing of Hawaii's archipelagic bottomfish multi-species stock complex is occurring because the ratio of current fishing mortality (F) to estimated fishing mortality at maximum sustainable yield (F_{MSY}) is exceeding the MFMT of 1.00. Hawaii's archipelagic bottomfish F ratio is obtained by adding weighted F contributions of the three management areas (MHI, Mau and Hoomalu Zones). The weighted F contributions are calculated by taking the F values for each zone (the ratio of fishing mortality from which fishing effort is often used as a proxy) multiplied by habitat factors that are estimations of the amount of bottomfish habitat in each management zone. These habitat factors are 0.447, 0.124 and 0.429 for the MHI, Mau and Hoomalu Zones, respectively.

As reported in Appendix 5 of the 2003 Bottomfish Annual Report (which uses complete data for 2002), the 2002 individual F ratios for the MHI, Mau and Hoomalu Zones were 2.33, 1.19, and 0.37, respectively. For example, multiplying 2.33 times 0.447 results in a MHI weighted F contribution of 1.041. Multiplying 1.19 times 0.124, and 0.37 times 0.429 results in a Mau Zone F contribution of 0.147 and a Hoomalu Zone F contribution of 0.158, respectively. Therefore, the addition of the individual weighted F contributions for 2002 data was 1.35, above the archipelagic overfishing threshold of 1.0. Since the completion of Appendix 5 in April 2005, PIFSC has received the full set 2003 bottomfish fishery data from the State of Hawaii's Division of Aquatic Resources. Based on 2003 bottomfish fishery statistics and the weighted F contributions from each zone, the archipelagic F ratio is determined to be 1.13, above the overfishing threshold of 1.0. Individual F ratios (without their weighted habitat factors) for MHI, Mau and Hoomalu Zones are 1.88, 0.96 and 0.39, respectively (PIFSC 2005) (See Appendix 2 for more information).

The MHI F contribution greatly exceeds those of the NWHI zones and indicates that the overfishing occurs as a result of too much fishing mortality (or effort) on the BMUS complex in the MHI. Considering the 2003 catch and effort data from each zone and their weighted factors, the Council's Bottomfish Plan Team determined that to end the overfishing, fishing effort in the MHI should be reduced by a minimum of 15 percent to lower the archipelagic F ratio from 1.13 percent down to a threshold value of 1.00 or less (Bottomfish Plan Team April 2005). As indicated earlier, the MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing. Therefore, reducing fishing mortality in the MHI would be the most effective means to end the overfishing in the Hawaii Archipelago (70 FR 34452, June 14, 2005).

1.4 Statements of the Purpose and Need

In accordance with the MSA, the Council shall prepare and submit to the Secretary of Commerce within one year of the overfishing notification a Bottomfish FMP amendment, regulatory amendment, or proposed regulations to end overfishing for the fishery to which the identification or notice applies (16 U.S.C. 18539(e)(3)). In this case, the overfishing identification applies to Hawaii archipelagic bottomfish multi-species stock complex. The Council is preparing an amendment which will end overfishing by reducing fishing mortality for bottomfish in the Hawaiian Archipelago to below the maximum fishing mortality threshold. To achieve this objective, the fishing mortality on bottomfish in the Hawaiian Archipelago must be reduced by at least 15 percent. The MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing. Therefore, reducing fishing mortality in the MHI would be the most effective means to end the overfishing in the Hawaii Archipelago.

1.5 Proposed Federal Action

The proposed federal action is the approval of the Bottomfish FMP amendment to end overfishing of Hawaii's archipelagic bottomfish multi-species stock complex by the Secretary of Commerce and the implementation and enforcement of the amendment's regulatory measures by NMFS. Based on the Council's recommendation at its 131st meeting (March 13 to 16, 2006), the proposed federal action would be the implementation of Alternative 3, a seasonal closure between May 1st and August 31st prohibiting the targeting, possession, landing, or selling of any of Hawaii's Deep 7 bottomfish species. If the State of Hawaii does not commit to promulgate seasonal closure regulations, the Council recommended the proposed federal action be the implementation of Alternative 2a, closure of Middle and Penguin Banks to the targeting, possession, landing, or selling of any of Hawaii's Deep 7 bottomfish species from Middle and Penguin Banks.

1.6 Action Area

The action area includes the federal, Exclusive Economic Zone (EEZ, 3 to 200 nm offshore) of the Hawaiian Archipelago. For management purposes, Hawaiian Archipelago is divided into two management sub-areas: the MHI and the NWHI (See Figure 1). The Bottomfish FMP divides the federal waters of the NWHI further into two smaller management zones: the Mau Zone and the Hoomalu Zone.

The MHI are the waters surrounding inhabited Hawaiian Islands. Approximately 80 percent of bottomfish fishing grounds in the MHI are within the waters of the State of Hawaii, 0–3 miles from shore. Bottomfish fishing in the MHI is managed by the State of Hawaii using through measures that include bottomfish vessel registration, restricted fishing gears, commercial fishing reporting, recreational catch limits for onaga and ehu, and 19 restricted bottomfish fishing areas. Approximately 3,600 vessels are registered with the State of Hawaii to conduct bottomfish fishing in the MHI.

The Mau Zone is a bottomfish limited entry zone at the southeastern end of the NWHI and includes the waters surrounding the islands of Necker and Nihoa (See Figure 1). Nearly all deep water bottomfish habitat is located in federal waters in Mau Zone. Currently, four vessels are operating under the Mau Zone limited entry program.

The Hoomalu Zone is a limited entry zone at the center and western end of the NWHI, ranging from French Frigate Shoals to Kure Atoll (See Figure 1). Owners and operators of vessels bottomfish fishing in the Hoomalu Zone are limited by weather and the fresh seafood nature of the fishery. Vessels participating in this fishery typically operate on trips lasting up to three weeks. Nearly all bottomfish habitat in the Hoomalu Zone is located in federal waters (3 to 200 nm offshore). Currently, four vessels are operating under the Hoomalu Zone limited entry program.

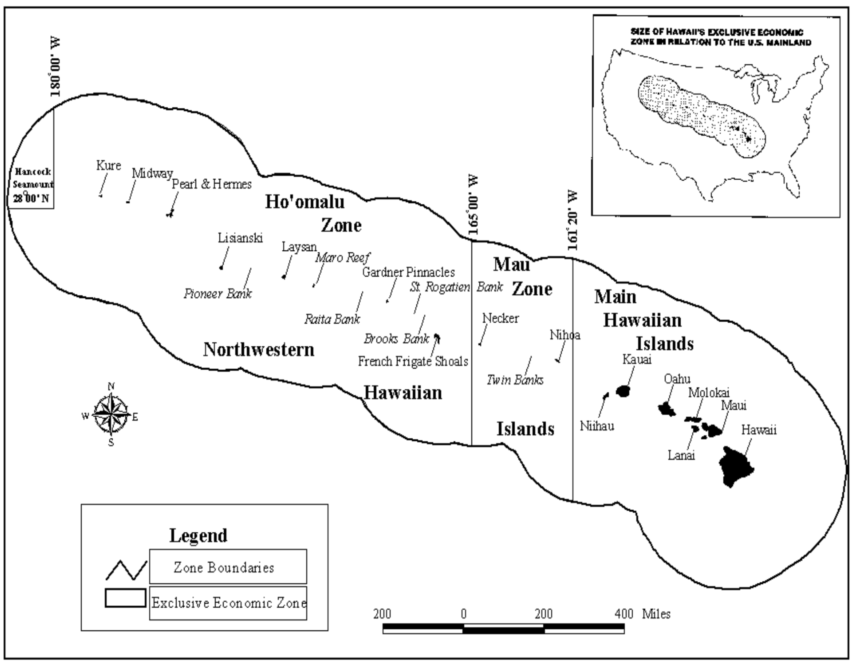


Figure 1: Map of the Hawaii Archipelago Showing the Northwestern Hawaiian Islands (NWHI) and the Main Hawaiian Islands (MHI) Bottomfish Management Areas

Despite delineation of these bottomfish management areas and zones, the bottomfish species complex in the entire Hawaiian Archipelago is evaluated under MSA as a single archipelagic-wide, multi-species stock complex.. Management criteria, such as whether overfishing is occurring applies to the stock complex rather than to the three sub-area management zones or to individual species either on an archipelagic basis or within the sub-areas. However, the condition of the BMUS complex can be further evaluated at finer scales based on the management sub-areas, and based on the evaluation at finer scales, management actions have historically been taken to address management issues within the sub-areas or zones. For example, Amendments 2 and Amendment 5 to the Bottomfish FMP, created limited access programs for the Hoomalu and Mau Zones, respectively, with the objective to reduce fishing capacity in those zones.

As discussed in Section 1.3, The MHI F ratio greatly exceeds those of the NWHI zones and indicates that the overfishing problem is primarily a result of too much fishing mortality (or effort) on the BMUS complex in the MHI. The MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing. Therefore, reducing fishing mortality in the MHI would be the most effective means to end the overfishing in the Hawaii Archipelago (70 FR 34452, June 14, 2005). Based on 2003 catch and effort data from each zone and as well as their weighted factors, the Council's Bottomfish Plan Team determined that at least a 15 percent reduction in fishing mortality (or effort) in the MHI would likely end the bottomfish overfishing in the Hawaiian Archipelago.

1.7 Public Participation

Meetings that included discussion of the bottomfish data collection, overfishing determination, and proposed solutions included the following: the 127th Council meeting held May 31 to June 2, 2005; the 129th Council meeting held November 8 to 11, 2005; the 89th Scientific and Statistical Committee (SSC) meeting held May 17 to 19, 2005; the 90th SSC meeting held October 18 to 20, 2005; the Bottomfish Plan Team meeting held April 26 to 28, 2005; other meetings with members of the Hawaii Bottomfish Plan Team were held July 18, August 3, August 8, September 27, and October 21, 2005; several targeted bottomfish fishermen meetings were held November 17, 22, and 29, November 25, 2005, and December 1, 2005; Public meetings were held the week of December 12, 13, 14, 15, and 20, 2005 in Hilo, Kona, Kauai, Maui, and Honolulu, Hawaii; respectively.

The National Environmental Policy Act (NEPA) regulations (40 CFR 1501.7) state "[t]here shall be an early and open process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action. This process shall be termed scoping." The formal scoping process for this Draft Supplemental Environmental Impact Statement (Draft SEIS) was initiated with a publication of a Notice of Intent in the *Federal Register* on November 28, 2005 (70 FR 71258). This notice invited the public to attend public scoping meetings to provide their comments and perspectives regarding the proposed action and related issues.

As announced in the Notice of Intent, local newspapers advertisements, radio announcements, and meeting flyers, 7 public scoping meetings were held across the MHI in January 2006. The dates and locations of the meetings were:

1. Lanai, Hawaii—Friday, January 6, 2006 from 6:00 to 9:00 pm at the Lanai High and Elementary School cafeteria. Lanai City, Lanai.*

2. Molokai, Hawaii—Saturday, January 7, 2006, 6:00 to 9:00 pm at the Mitchell Pauole Center Conference Room, Kaunakakai, Molokai.*

3. Hilo, Hawaii—Monday, January 9, 2006, from 6:00 to 9:00 p.m. at the University of Hawaii,

* The Lanai and Molokai meetings were not included in the November 28, 2005 *Federal Register* notice, but as well as the others, were advertised in local newspapers and meeting flyers.

Hilo Campus Center, 200 W. Kawili St., Hilo, Hawaii 96720;

4. Kona, Hawaii—Tuesday, January 10, 2006, from 6:00 to 9:00 p.m. at the King Kamehameha Hotel, 75-5660 Palani Rd., Kona, HI 96740;

5. Maui, Hawaii—Wednesday, January 11, 2006, from 6:00 to 9:00 p.m. at the Maui Beach Hotel, 170 Kaahumanu Ave., Kahului, HI 96732;

6. Oahu, Hawaii—Thursday, January 12, 2006, from 6:00 to 9:00 p.m. at the Ala Moana Hotel, 410 Atkinson Dr., Honolulu, HI 96815; and

7. Kauai, Hawaii—Friday, January 13, 2006, from 6:00 to 9:00 p.m. at Chiefess Kamakahelei Middle School, 4431 Nuhou St., Lihue, HI 96766.

1.8 Related NEPA Documents

This section briefly discusses related NEPA documents to this Draft SEIS for an amendment under the Bottomfish FMP to end overfishing in the bottomfish complex in the Hawaiian Archipelago.

1.8.1 Final Environmental Impact Statement—Bottomfish and Seamount Groundfish Fishery of the Western Pacific Region, May 2005

The environmental impact on the Bottomfish FMP was originally evaluated in an environmental assessment in 1986. Subsequent environmental assessments or NEPA categorical exclusions were completed for each of the amendments to the Bottomfish FMP since 1986. With the dated nature of the original 1986 environmental assessment, along with environmental assessments for subsequent amendments, there was a need for an updated environmental impact analysis that provided an overview of all the issues and management alternatives for the Western Pacific Region bottomfish and seamount groundfish fisheries.

Pursuant to NEPA, a Notice of Intent was issued in the *Federal Register* on August 16, 1999, to prepare an Environmental Impact Statement (EIS) for the management of the bottomfish and seamount groundfish fisheries of the Western Pacific Region (64 FR 44476). Public scoping for the draft EIS indicated that the primary management issues concerned the NWHI bottomfish fishery; therefore, the management alternatives primarily involved that fishery. The availability for public review and comment of the draft EIS was issued in the *Federal Register* on October 17, 2003 (68 FR 59787). Through the Environmental Protection Agency, NMFS published a notice announcing the availability of the Final Environmental Impact Statement (FEIS) on June 17, 2005 (70 FR 35275).

Pursuant to NEPA regulations (40 CFR 1500 et seq.), this DSEIS was prepared because the bottomfish overfishing determination added significant new circumstances and information relative to the management of Hawaii's bottomfish stocks. This Draft SEIS, which analyzes measures to end overfishing in the bottomfish complex in the Hawaiian Archipelago, supplements the 2005 FEIS. Where appropriate, this DSEIS incorporates by reference relevant sections and analysis contained in the May 2005 FEIS.[7]

1.8.2 Draft Programmatic Environmental Impact Statement – Towards an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans

On November 10, 2005 (70 FR 68443), the Environmental Protection Agency published a notice announcing the availability for public review of the Draft Programmatic Environmental Impact Statement—Towards an Ecosystem Approach for the Western Pacific Region: From Species-Based Fishery Management Plans to Place-Based Fishery Ecosystem Plans, dated October 27, 2005. The public comment period ended on December 27, 2005. Based on the preferred alternatives in the draft programmatic environmental impact statement (DPEIS), the proposed Federal action will be the realignment of the existing fishery regulations contained in the Western Pacific Region's five species-based fishery management plans (FMPs) into geographically based fishery ecosystem plan (FEP) regulations. No substantive changes to current fishing regulations would occur under the proposed Federal action. Although the FEPs and the DPEIS are under an ongoing process, the federal action proposed in that DPEIS does not preclude the Council's ability to prepare and submit to NMFS an amendment to the Bottomfish FMP to end overfishing of the bottomfish complex in the Hawaiian Archipelago.

1.9 Relevant Laws and Executive Orders

The conservation and management of the living marine resources in the United States is entrusted to NMFS, which carries out its charge under laws, treaties, and legislative mandates from the U. S. Congress and the president. The most relevant of these to the current action are briefly discussed in Appendix 1.

[7] For a copy of the May 2005 FEIS contact William L. Robinson or Kitty M. Simonds, or visit www.wpcouncil.org for an electronic version.

CHAPTER 2: ALTERNATIVES

Chapter 2 presents the alternatives being considered in this DSEIS to end bottomfish overfishing in the Hawaii Archipelago. As indicated in NMFS' notification of bottomfish overfishing in Hawaii, the MHI are where the overfishing problem primarily occurs and reducing fishing mortality in the MHI would be the most effective means to end bottomfish overfishing in the archipelago.

2.1 Alternatives Considered But Not Analyzed in Further Detail

2.1.1 The Entire Hawaii BMUS Complex

Numerous options were considered regarding the range of the species to be included in this management action. Although the overfishing control rule is applied to the entire BMUS list (see Table1), consideration was given to a narrow range of species that are of particular concern to minimize potential unnecessary impacts of this action. BMUS include species that are harvested using the hook-and-line method of fishing where weighted and baited lines are lowered and raised with electric, hydraulic, or hand-powered reels. The Bottomfish FMP applies to the U.S. Western Pacific Region and therefore includes species that are harvested in Hawaii, American Samoa, and the Mariana Islands. A number of BMUS do not occur in Hawaii.

Three separate species complexes were initially considered in this management action including the full list of species under BMUS, BMUS excluding uku, and the complex of seven deep slope species managed by the State of Hawaii (onaga, ehu, gindai, kalekale, hapuupuu, lehi, and opakapaka). The two complexes, BMUS and BMUS without uku, are not included in the alternatives to be further analyzed.

Onaga and ehu have been the BMUS of primary concern due to reduced local abundance in the MHI. Prior to adoption of the current overfishing and overfished definitions, the Bottomfish FMP overfished threshold was set at 20 percent spawning potential ratios (SPR) on an archipelagic basis, and no overfishing definition existed. Using species specific, targeted catch rates, SPRs for onaga and ehu have been, and remain, well under 20 percent in the MHI for those species. The state's BRFAs and recreational catch limits were implemented in 1998 with the intent of rebuilding the local abundance of onaga and ehu resources in the MHI. The list of prohibited species was expanded to include other deep slope bottomfish commonly caught while targeting onaga and ehu such as gindai, kalekale, hapuupuu, lehi, and opakapaka. The primary rationale for including the additional deep-slope species was due to high mortality rates generally associated with embolism while bringing the fish to the surface. Bottomfish fishermen are now familiar with the seven deep slope species managed by the state through the BRFAs and bag limits. The Council, its advisors, and the public have suggested that any new federal bottomfish management action in the MHI should be consistent with the bottomfish species managed under the state's regime.

BMUS such as taape (*Lutjanus kasmira*) and kahala (*Serioila dumerili*) are abundant and often considered a nuisance species by fishermen. White ulua, one of the most culturally and socially important species in the MHI, is targeted by a variety of gear types, including shore-based fisheries. Including these species in potential management measures to address concerns regarding deep slope bottomfish species would not be appropriate.

For example, taape was introduced from French Polynesia nearly fifty years ago to enhance nearshore fisheries. Taape has adapted well and spread rapidly throughout the archipelago (introduced in MHI and now found in the NWHI) and is commonly harvested in abundance by numerous gear types. Because of its dense populations, fishermen often raise concerns that taape competes with other important food and sport fish for prey and habitat. At numerous Council public meetings and hearings regarding bottomfish, fishermen and other interested members of the public routinely request that the state or federal fishery agencies develop a program to eradicate the species. However, recent studies have shown taape not to compete directly with bottomfish species and concluded that taape did not generally share the same depth range and feeding habits and is not a frequent predator or prey of native species (Parish et al. 2000).

Preventing the harvest of taape through the implementation of any of the alternatives considered is not scientifically warranted nor would it be well received by the fishermen or public who perceive this species as over abundant and a nuisance.

Kahala is a species that is often associated with a high incidence of ciguatera fish poisoning. Kahala was harvested commercially in Hawaii for decades prior to 1980. Peak landings (over 150,000 lbs/year) were recorded in the early 1950s. During the 1960s and early 1970s, kahala remained a significant bycatch in the handline fishery targeting high-value deep-sea snappers, like opakapaka, onaga, and uku. Landings averaged 70,000 pounds per year during this period. Although the price for kahala was low ($0.50–0.70/lb), it could be harvested in sufficient quantities to offset fishing costs when the more valuable snappers were hard to catch. Kahala landings varied seasonally, generally reaching their peak in the December– May period of the year. The full-time bottom fishermen who frequented the Penguin Bank area during the 1970s report that kahala comprised 20 to 30 percent of their annual catch. Kahala bites so aggressively on handline gear that they were often forced to fish it out of an area before they could effectively target on deep sea snappers. Since 1980–1981, kahala has been shunned by seafood marketers due potential ciguatera toxicity, and most commercial fishermen discard it when caught. Kahala is caught in the recreational fishery where fishermen can purchase a simple ciguatera test kit to determine if the fish is ciguatoxic. The test kit, distributed by Oceanit Testing Systems, Inc., can be purchased at retail outlets for about five dollars a test.

White ulua (*Caranx ignobilis*) is included in the BMUS complex and is one of the most important species targeted by shore based and small boat based fishermen. White ulua has assumed a pivotal role in ancient and contemporary Hawaiian culture. Gaffney (2000) noted that the strength of the ulua, particularly large species such as the white ulua (*Caranx ignobilis*) were greatly admired by ancient Hawaiians, and that they were used as a substitute in Hawaiian religious rites when a human sacrifice was unavailable. More recently, ulua have become an important target for shoreline recreational fishermen, and was a driving force behind the founding of several sports fishing clubs in Hawaii in the early part of the twentieth century (Gaffney 2000). White ulua is targeted with a variety of gears including shore casting, slide bait, spear, whipping, and handline. Commercial landings of ulua were as high as 600,000 pounds at the turn of the twentieth century, but have declined considerably since then (Friedlander and Dalzell 2004). Like kahala, large ulua are a concern for ciguatera poisoning and have not been largely marketed since the early 1980s.

Including the full list of BMUS under the proposed management measures is not appropriate as BMUS other than the Deep 7 such as taape and kahala are believed to healthy and their inclusion under the proposed measures will not help rebuild deep slope bottomfish stocks, namely onaga and ehu which are of most concern in the MHI.

2.1.2 Gear Restrictions

Limiting use of fishing gear (e.g. reels, hooks) on bottomfish fishing vessels could include creating limits on the number of stations or reels each vessel can use, the type of reel (electric, hydraulic, hand), the number of hooks on each line (between 5 and 12 hooks are typically used), and so forth. Such measures could attempt to control the fishing power of each vessel and therefore limit fishing effort. However, implementation of such controls in the bottomfish fishery would likely be ineffective and difficult to enforce.

Bottomfish vessels typically operate between two to four reel stations while fishing. The number of reels and hooks per line is not dependent on the size of the vessel. Small vessels can use up to four stations while large vessels can operate two. The specific configuration of the gear and number of stations used is dependent on a number of variables, including the number of fishermen, overall ocean conditions, wind speed and direction, current, tide, depth of water, topography of the fishing grounds, location of the fish, and if the vessel is drifting or anchored. Such variables make it difficult to use gear restrictions to control effort in this fishery. In addition, bottomfish reels are also used to target pelagic species at fish aggregation devices and seamounts. Therefore, prohibiting the use of this gear will impact non-bottomfish fisheries.

2.1.3 Limited Entry

Limiting access in the MHI bottomfish fishery would provide direct control over the total number of fishery participants. However, only a small percentage of commercial fishermen target and land bottomfish as their primary fishing activity. The majority of Hawaii commercial fishermen switch between the bottomfish fishery and other fisheries and land less than 1,000 pounds of bottomfish per year. Therefore, establishing a limited entry program without implementing additional output controls (landing limits) would not prevent fishing mortality from increasing through an increase in participant activity.

The State of Hawaii established a control date in 1998 when their BRFAs, recreational bag limits and bottomfish registration program were implemented. The state has not used the control date to further manage the fishery. The Council recommended, at its 127th meeting in June 2005, to implement a federal control date that was established in August 2005. Either of these control dates could be used if considering a limited entry or quota based management regime.

Criteria to establish initial limited entry participants would likely be based on historical participation in the MHI bottomfish fishery. Commercial participation would be based on official

State of Hawaii commercial marine license and catch reporting history. Recreational participation would be more difficult to determine. The state's 1998 bottomfish management regime requires any person who may fish for bottomfish (any of the seven species) to register their vessel with the Hawaii Division of Aquatic Resources (HDAR) and display the letters "BF" on their boat. This rule applied to all vessels used for bottomfish fishing, whether the owner is a recreational, subsistence or commercial fisherman. Of the 3,600 vessels registered with the HDAR, about 40 percent have declared themselves as recreational. Because recreational fishermen are not required to report their catches, the number of recreational vessels used for bottomfish fishing since 1998 is unknown. As indicated in public scoping meetings for this DSEIS, establishing a MHI limited entry program is supported by many full-time commercial fishermen; however, part-time commercial and recreational fishermen do not seem to support limited entry.

2.1.4 Rolling Closures

During several Council advisory group meetings, it was suggested that the Council consider using short, continuous, alternating open and closed fishing periods to minimize potential impacts to commercial fishermen and the markets which depend on a continuous supply of bottomfish product. The concern is that a typical three or five month seasonal closure would allow foreign imports to replace the local supply of bottomfish to retail markets and restaurants. There is concern that foreign suppliers of bottomfish, which for example often market their fish as onaga and opakapaka could make permanent inroads and shut out local suppliers.

The proposal to use rolling closures could help to minimize direct fishing and market impacts by allowing fishermen to deliver product on a consistent basis. Two variants were explored under this option. The first would call for rotating closures on a weekly basis. For example, fishermen could fish the first week of January and not fish the second, fish the third week and not the fourth, and so on. The second option would assign each state-registered fisherman an odd or even number. Fishermen would then be allowed to land fish only during their assigned even or odd weeks. The BF registration numbers or trailer license plates were suggested as means to identify fishermen.

There were a number of concerns raised with each of these variants. The primary concern for both variants would be the increased administrative burden of monitoring and enforcing such complex programs. Enforcement could be conducted dockside and in the markets. However, the 3,600 registered bottomfish fishermen primarily use trailers to launch their vessels. Vessel size ranges from 12 to 60 feet with an average of about 21 feet in length. The potential sites for ports of entry where bottomfish can be landed are numerous and would therefore be very difficult to enforce. In addition, fishermen who fish during a closed week could easily hold the fish for delivery to market the following week because of the long shelf life of most bottomfish species. If an alternating number system were to be used, fishermen could easily partner with others allowing them to switch off and rotate vessels so that they could fish continuously.

The main reason why these options are not considered in detail is because after meeting with many fishermen throughout the state during public hearings, meetings, and forums, the majority of fishermen repeatedly indicated that they would prefer a block (i.e. summer 3–month closure) during a period when other fishing opportunities are available.

2.1.5 Closure of NWHI Bottomfish Fishery

The bottomfish species complex in the entire Hawaiian Archipelago is evaluated under MSA as a single archipelagic-wide multi-species stock complex. Management criteria, such as whether overfishing is occurring on the stock complex; apply to the stock complex rather than to the three sub-area management zones or to individual species either on an archipelagic basis or within the sub-areas. However, the status of the species complex can be further evaluated at finer scales based on the management sub-areas, and based on the evaluation at finer scales, management actions have historically been taken to address issues within the sub-areas or zones. Under the National Standard 1 guidelines, Hawaii's archipelagic bottomfish multi-species stock complex is not overfished (the biomass standard using catch per unit effort [CPUE] as a proxy). The current CPUE ratio is 0.82, above the threshold value of 0.7 established as the MSST.

However, overfishing (the fishing mortality standard using fishing effort as a proxy) on an archipelagic wide basis is occurring. The 2003 archipelagic effort ratio (proxy for F/F_{MSY}) is 1.13, above the threshold value of 1.0 established as the MFMT. Looking further at the effort ratios by zone, the MHI is at 1.88, well above the targeted ratio of 1.0. Mau and Hoomalu Zone ratios are below this target level at 0.96 and 0.39, respectively (see Appendix 2 for PIFSC's most recent report on the status of Hawaii's bottomfish stocks). Therefore, reducing fishing mortality in the MHI is likely the most effective means to end overfishing in the Hawaiian Archipelago (70 FR 34452, June 14, 2005).

The overfishing problem is closely linked to excessive fishing mortality (where effort is used as a proxy) in the MHI. The contribution of each zone to the archipelagic effort ratio can be calculated by multiplying the effort ratios by the weighting factors (e.g. habitat area) for each zone. For example, using 2002 Hawaii bottomfish data, the weighted MHI F ratio contribution by itself was 1.04, above the archipelagic overfishing threshold (MFST) of 1.0 (see Section 1.3). During the same year, the weighted F ratio contributions for the Mau and Hoomalu Zones were 0.147 and 0.158, respectively. The weighted contributions to the archipelagic effort ratio in 2003 by zone were 0.84 for the MHI, 0.12 for the Mau zone (a drop from 0.147 in 2002) and 0.17 for the Hoomalu zone. At this time, there is no reason to believe that the fishing mortality metrics for the NWHI will change significantly with 2004 information. The overfishing condition in the Hawaiian archipelago bottomfish species complex is largely attributable to the MHI, not the NWHI, and therefore closing the NWHI bottomfish fishery is not believed by NMFS to not be a viable alternative that addresses the overfishing problem, excess rate of fishery mortality, observed in the MHI. Furthermore, reducing or eliminating effort in the NWHI could further exacerbate the excessive fishing mortality (or effort) in the MHI due to market demand and/or from displacing the NWHI fishing effort towards the MHI. For these reasons, closure of the NWHI bottomfish fishery is not viewed as a viable solution to end the overfishing of Hawaii's archipelagic bottomfish multi-species stock complex.

Although the small NWHI bottomfish fishery is believed to have little impact on Hawaii's bottomfish overfishing problem, as well as minimal impact to the greater NWHI coral reef or deep slope ecosystems, NOAA is currently contemplating the amount fishing, if any, is appropriate for the pending NWHI National Marine Sanctuary. An environmental impact statement is being prepared for this NWHI initiative, thus the NEPA analysis for this initiative is not available at this time. Based on a January 19, 2006 letter from Vice Admiral (Ret.) Conrad Lautenbacher, NOAA Administrator, the Council was provided an opportunity to recommend commercial and recreational fishing regulations under the MSA for bottomfish and pelagic fisheries that operate within the boundaries of the proposed NWHI sanctuary. At its 131st meeting (March 13 to 16, 2006), the Council recommended a limit of 14 commercial bottomfish permits for the NWHI (seven for the Mau Zone and seven for the Hoomalu zone), and a bottomfish harvest limit of 391,850 pounds, which represents 85 percent of the NWHI bottomfish maximum sustainable yield.

2.2 Alternatives Considered in Detail

Under all the alternatives, HDAR's bottomfish management regime would remain in place, including bag limits for the recreational harvest of onaga and ehu (unless recreational fishing activities are closed as in some alternatives), bottomfish vessel registration, and its existing or proposed network of RFAs. To end the bottomfish overfishing through reducing fishing effort by 15 percent within the MHI, the Council considered in detail the following management alternatives.

2.2.1 Alternative 1: No Action

Alternative 1 is to take no federal action; that is, no federal management measures would be recommended by the Council at this time.

Under this and all other alternatives, the State of Hawaii's bottomfish management measures, which were established in 1998 under Department of Land and Natural Resources (DLNR) administrative rule (HAR Chapter 13-94) may remain in place or could be changed by DLNR. The state's current bottomfish management regime includes: (i) 19 Bottomfish Restricted Fishing Areas (BRFAs) throughout the MHI, (ii) a recreational bag limit of 5 ehu and/or onaga per trip per person, (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish. Seven species, including deep-slope snappers and a grouper, were identified for management under the state regulations. According to HDAR, the state's current BRFAs were delineated according to bottom topography, location of reported bottomfish landings, proximity to access points and points of observation for ease of enforcement, and recommendations from fishermen, with the primary purpose being to protect critical bottomfish habitat and presumed spawning and nursery habitat areas.

This alternative would also allow continued open access for entry into the MHI fishery, and commercial fishermen would continue to be required to submit catch reports. Recreational fishermen would continue not to be required to submit catch reports, and the recreational catch component would continue to be unknown.

Based on new mapping information of bottomfish habitat, Division of Aquatic Resources, State of Hawaii (HDAR) is in the process of reviewing its bottomfish management regime, with a focus on the BRFAs. Currently proposed changes to the BRFAs by HDAR include reducing their number, modifying their locations, standardizing their boundaries to corresponding minutes of latitude and longitude, and increasing their size. Factors being considered by HDAR include facilitating GPS navigation around BRFAs, locating BRFAs close to shore to facilitate monitoring and enforcement, increasing habitat protection, and supporting larval transport and recruitment between banks and islands. Also under consideration are modifications to HDAR's existing Commercial Fisheries Statistical Area reporting grids to allow for better evaluation of the effectiveness of existing and new BRFAs.

2.2.2 Alternative 2: Area Closures

2.2.2.1 Alternative 2a: Closure of Penguin Bank and Middle Bank (Secondarily Preferred)

Under Alternative 2a, all recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species (onaga, opakapaka, ehu, lehi, gindai, kalekale and hapuupuu) in or from federal waters around Penguin Bank and Middle Bank (see Figure 3). All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to obtain permits as well as to complete and submit catch reports including their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number. The effectiveness of the closed areas in increasing the stock biomass of the Deep 7 species would be monitored and analyzed through a combination of fishery dependent (i.e. catch reports) and fishery independent data. Fishery independent data would be collected via controlled sampling experiments, submersible surveys, remote cameras (e.g. "Bot-Cam") and other methodologies. If the State of Hawaii does not commit to adopting seasonal closure alternative (Alternative 3), the Council recommended the adoption of Alternative 2a. Alternative 2a does not require parallel State of Hawaii regulations, as the vast majority of both Penguin and Middle Banks occur in federal waters.

2.2.2.2 Alternative 2b: Overlay Federal Closures on Proposed HDAR Restricted Fishing Areas

Alternative 2b would overlay federal closures on the State of Hawaii's proposed Bottomfish Restricted Fishing Areas (BRFAs) in federal waters (3 to 200 nm offshore; see Figures 2-4). In other words, federal closed areas would apply to those portions of the proposed BRFAs that extend in to the EEZ. All recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species (onaga, opakapaka, ehu, lehi, gindai, kalekale and hapuupuu) from the proposed BRFAs. The state's current BRFAs were delineated with the purposes and objectives as described in Section 2.2.1.

Recently, HDAR has undertaken a review of their management program. Although their review and final recommendation is not yet complete, the state has proposed to modify its statewide network of BFRAs According to HDAR, the state is proposing to establish 12 BRFAs that are generally larger than the existing 19 BRFAs, and are based on comprehensive bottom mapping and sonar data that provide a detailed view of bottomfish Essential Fish Habitat in the 100 to 400 m depth range. It is estimated by HDAR that the proposed BRFAs will reduce fishing mortality (landings) by at least 17 percent (see Appendix 3).

All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished.

Prior to the establishment and after the implementation of the proposed BRFAs, state and federal partners will develop and implement monitoring methodology that will allow them to determine how fishing mortality, biomass and size distribution of bottomfish are affected by the BRFAs. This monitoring will include both fishery-dependent (i.e. catch reports) and fishery-independent components.

Regarding fishery-independent monitoring, new technology will allow the state to monitor a grid of stations within appropriate bottomfish habitats throughout the main Hawaiian Islands, using baited and unbaited video cameras to directly assess species and size-distribution at selected. Some catch sampling will be needed within closed areas and consideration is being given to developing a monitoring effort that may include experimental fishing.

In order for area closures to be effective, it is important to have effective enforcement. Enforcement of the existing BRFAs by DOCARE has not been adequately conducted due to poor funding levels resulting in a lack of staffing and assets. According to HDAR the proposed BRFAs have been moved closer to shore to facilitate shore side enforcement, to the extent possible, and are designed with straight-line boundaries, making it easier for both fishermen and enforcement officers to determine whether fishing takes place inside or outside the closed areas. Federal closed areas would require at sea and air surveillance by the USCG and NMFS OLE. A comprehensive and properly resourced enforcement plan, including a Joint Enforcement Agreement between state and federal enforcement agencies, would need to be developed to adequately enforce the area closures.

Figure 2: Existing and Proposed BFRAs around Kauai, Niihau, and Kaula Rock.

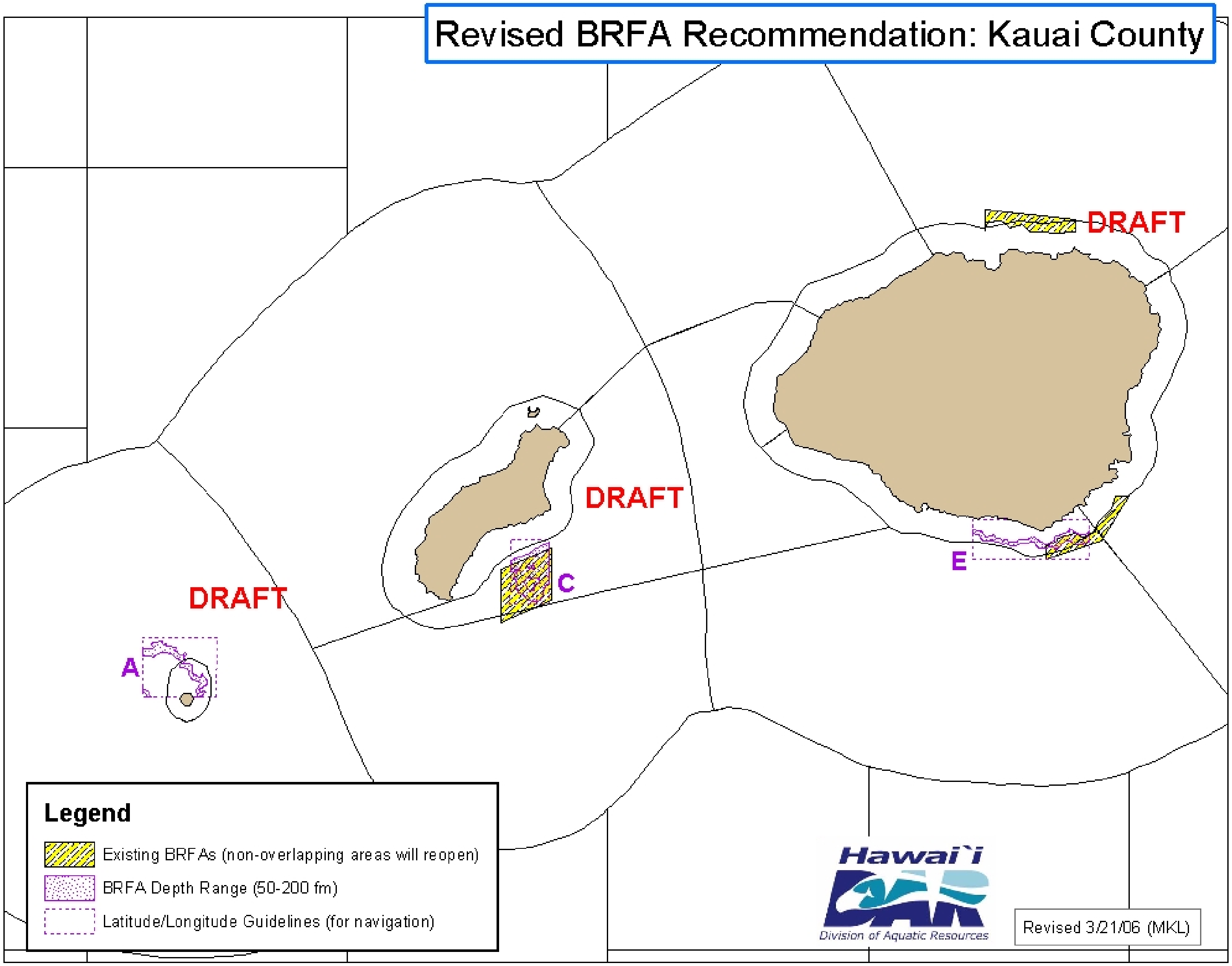


Figure 3: Existing and Proposed BRFAs around Oahu, Penguin Bank, Molokai, and Maui.

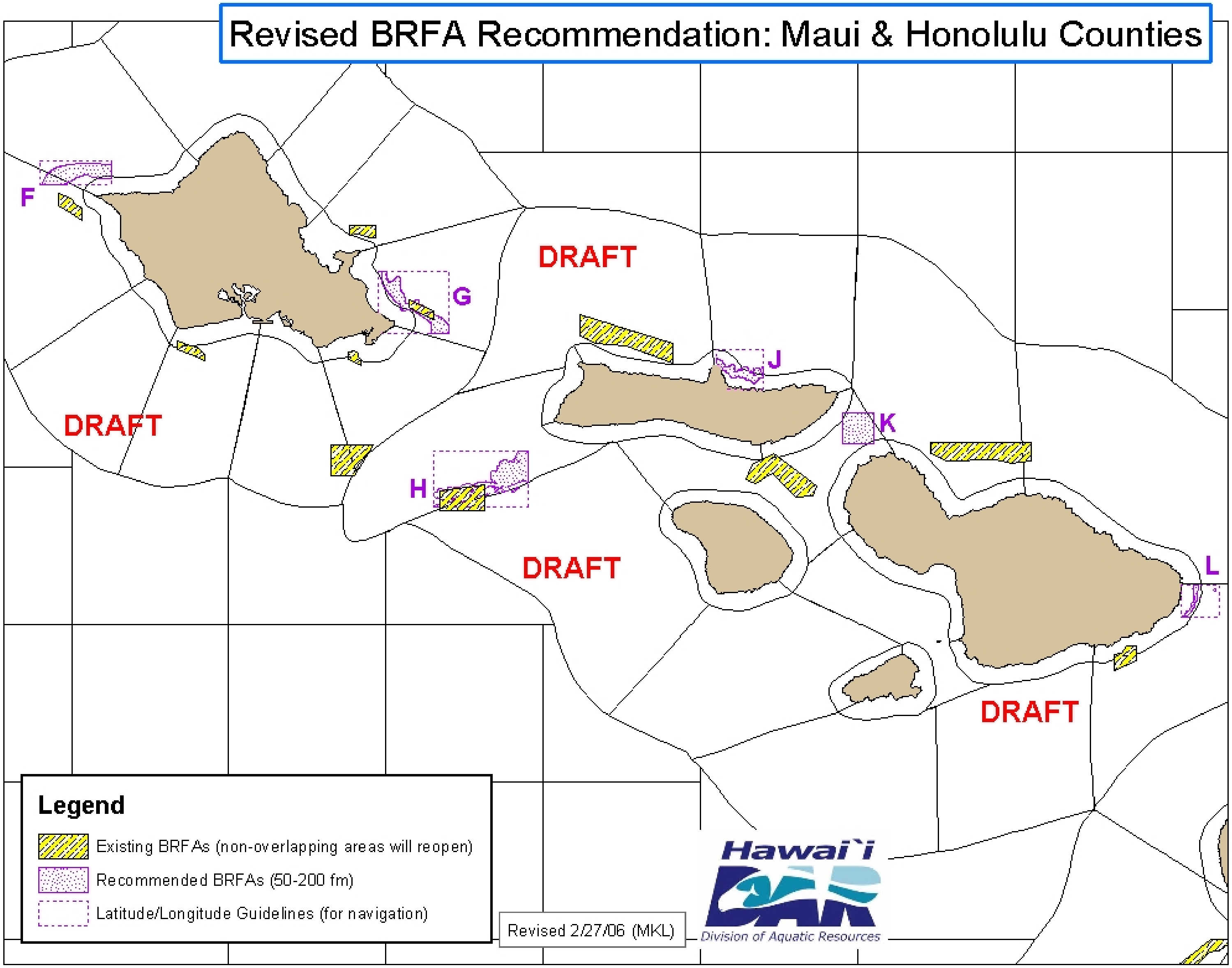
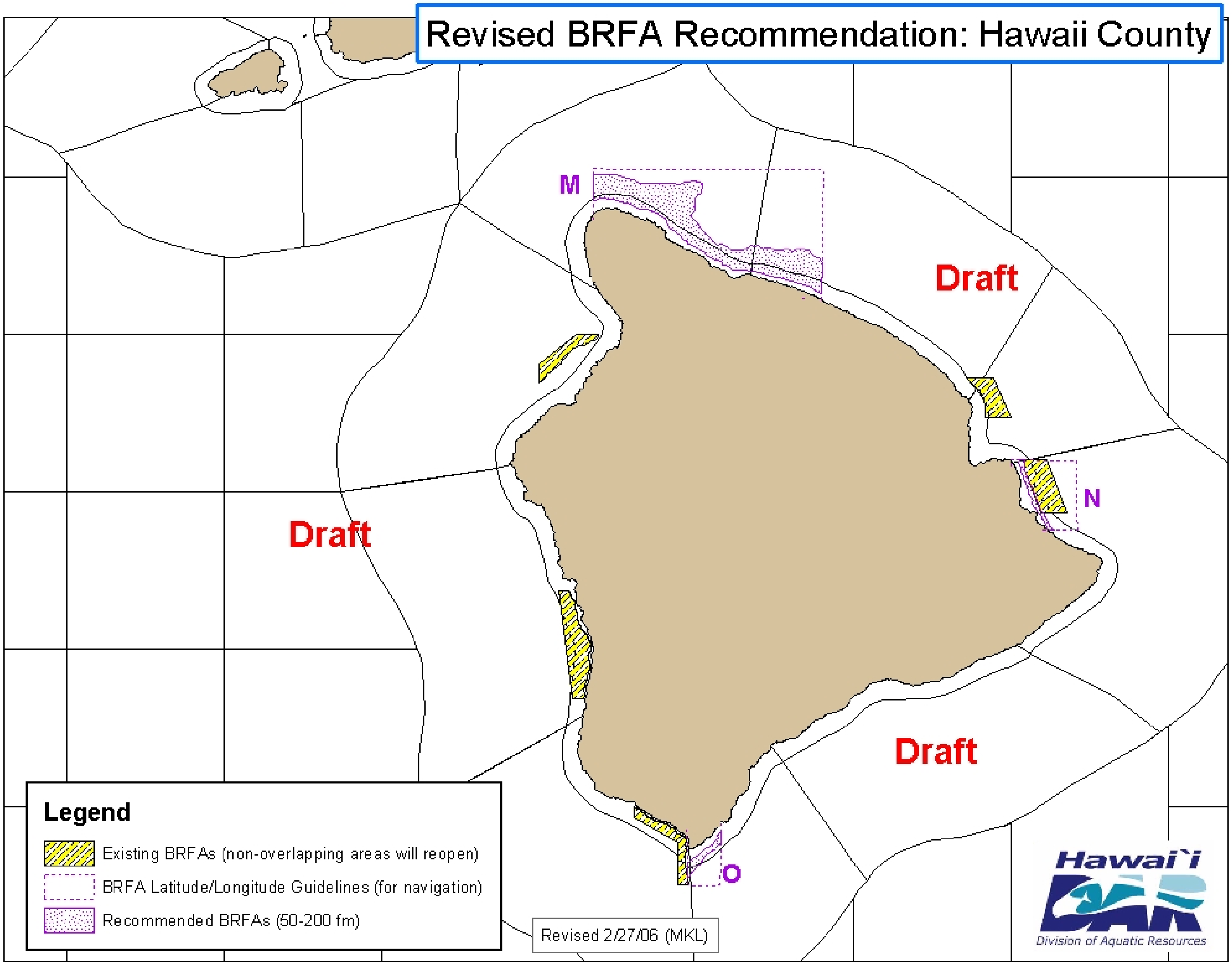


Figure 4: Existing and Proposed BRFAs around Hawaii Island.



2.2.3 Alternative 3: Seasonal Closure (Primarily Preferred)

Under Alternative 3, an annual summer closure would be implemented from May 1 to August 31 of each year for the entire MHI bottomfish fishery (both commercial and recreational vessels). Targeting, possessing, landing, or selling MHI Deep 7 species would be prohibited during the closed season; however, the NWHI bottomfish fishery would remain open. All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number. To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish a concurrent summer closure for state waters. Recognizing that parallel state and federal seasonal closure regulations must be promulgated in order for a seasonal closure to be effective, the Council requested that the State of Hawaii notify the Council by April 15, 2006 of its commitment to adopt seasonal closure regulations. If the State of Hawaii does not commit to adopting seasonal closure regulations, the Council recommended the adoption of Alternative 2a (Closure of Middle and Penguin Banks). The effectiveness of the seasonal closure in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities, which mostly would be conducted shore side. At sea enforcement or air surveillance may also occur during the closed season.

2.2.4 Alternative 4: Catch Limits

Alternative 4 includes two variations that would limit the commercial catch of MHI bottomfish. Alternative 4a would establish a fleet-wide total allowable catch (TAC) of bottomfish for all commercial fishing vessels in the MHI, while Alternative 4b would establish vessel-specific individual fishing quotas (IFQs) for Deep 7 bottomfish for all commercial fishing vessels in the MHI. Once either quota was reached, no targeting, possessing, landing or selling of MHI Deep 7 bottomfish (commercial or recreational) would be permitted. The NWHI bottomfish fishery would remain open.

Under both variations, all vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit catch reports including their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish a parallel requirement as both State and federal waters would have to be closed once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

Alternative 4a: TAC

Under Alternative 4a, a TAC of 198,484 pounds of the Deep 7 species (all species combined), representing a 15 percent reduction from the 2003 fleet-wide MHI bottomfish catches of these species (Kawamoto et al. 2005), would be applied to the entire MHI commercial bottomfish fishery. The bottomfish fishing year would start on October 1 and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or recreational) would be permitted in the MHI. The NWHI bottomfish fishery would remain open.

Alternative 4b: IFQs

Under Alternative 4b, IFQs would be established for each MHI commercial bottomfish fisherman, allowing them to catch 85 percent of their 2003 catch of the Deep 7 species, based on reported landings. The bottomfish fishing year would start on January 1. The number of participants would likely be limited to past participation in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year. The recreational fishery would remain open.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. If the fisherman sold fish in excess of the number of bottomfish pounds for one stamp, he would be required to surrender a second stamp to the dealer. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season. As is the case with other IFQ fisheries, the bottomfish stamps would be non-transferable.

Under this alternative, fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would need to be analyzed in real time to ensure that fishermen did not exceed their quota and to penalize those that did.

IFQs could be implemented in a number of ways, two methods are outlined here:

1. Provide equal quotas (totaling 85 percent of the fleet-wide 2003 catch) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen, and vice versa. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to 85 percent of each and every fisherman's historical catch. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

2.2.5 Alternative 5: Combination Measures

Alternative 5 would mitigate the potentially negative impacts of the above stand-alone alternatives above by combining modifications of them. Alternative 5 includes two variations: Alternative 5a would combine a seasonal bottomfish closure with bottomfish IFQs for a limited number of MHI commercial fishing vessels during the seasonal closure, while Alternative 5b would combine a seasonal MHI closure with a year-round closure of the southern portion of Penguin Bank.

Under both versions of Alternative 5, all vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to obtain permits as well as to complete and submit catch reports including their catches, fishing effort, and area fished.

To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish parallel requirements as fishing limits and closures would be required in both state and federal waters. The effectiveness of the combined measures in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

The effectiveness of Alternative 5b's closed area in increasing the stock biomass of the Deep 7 species would be monitored and analyzed through a combination of fishery dependent (i.e. catch reports) and fishery independent data. Fishery independent data would be collected via controlled sampling experiments, submersible surveys, remote cameras (e.g. “Bot-Cam”) and other methodologies.

Alternative 5a: Seasonal Closure and IFQs

Under Alternative 5a, the MHI bottomfish fishery would be closed during an expanded seasonal closure from May 1 to September 30 of each year, except for a small number of full-time commercial bottomfish fishermen. The exempt fishermen would each receive IFQs for the Deep 7 species that they could use during the otherwise closed season (May–September). Once each exempted fisherman’s quota was landed, he would be required to stop fishing until the next open season. The combined total of all IFQs would equal 23,946 pounds of the Deep 7 species (all species combined) as this is the amount that could be made available for harvest during the otherwise closed season and still maintain the overall annual reduction of 15 percent from the 2003 baseline for the entire MHI (Table 47).

Table 3: Estimated Reductions and Available Pounds under Alternative 5a.

Target Reduction	MHI Closure Months	Estimated Reduction in MHI Landings due to May-September closure	Pounds Available to Harvest and Still Meet 15 Percent Target Reduction
15 percent 35,027 pounds	May–September	25.25 percent 58,973	23,946

Source: Kawamoto et al. 2005.

Each MHI commercial bottomfish fisherman exempted from the summer closure would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the vessel's IFQ for the otherwise closed season. The fisherman would be required to submit a stamp to the dealer at the point of sale. If the fisherman sold fish in excess of the number of bottomfish pounds for one stamp, he would be required to surrender a second stamp to the dealer. Once all the stamps were submitted the fisherman would be prohibited from targeting, possessing, landing or selling MHI Deep 7 bottomfish until the next open season.

As in Alternative 4, IFQs could be calculated and provided in equal amounts to all qualifying fishermen, or they could be calculated and provided such that each qualifying fisherman's quota was proportionate to his historical catch. However, in either case, the sum of the IFQs would not exceed the 23,946 pounds available.

Alternative 5b: Seasonal Closure and Area Closure

Alternative 5b would combine a seasonal closure from June 1 to August 31 of each year for the MHI with a year-round partial closure of Penguin Bank. All MHI bottomfish fishermen would be prohibited from targeting, possessing landing or selling the Deep 7 species from the MHI during the summer closure. However, the year-round partial closure of Penguin Bank would enable the length of the summer closure to be reduced as compared to other alternatives. Based on historical MHI landings of deep-slope bottomfish, a summer closure from June through August would reduce landings by up to 11 percent as compared to the 2003 baseline (Kawamoto et al. 2005). Based on 1998 to 2004 historical data indicating that federal waters around Penguin Bank are the source of 16 percent of MHI Deep 7 catches as compared to the 2003 baseline (Kawamoto et al. 2005) and lacking spatially detailed catch and effort data for this area, the closure of the southwestern quarter of Penguin Bank would be estimated to further reduce landings by an additional 4 percent. Thus the combination of the seasonal and area closures under Alternative 5b would be expected to achieve the 15 percent reduction target.

Table 4 provides a summary comparison of the alternatives regarding their various requirements.

Table 4: Summary Comparison of Alternatives.

	Alt. 1: No Action	Alt. 2a: Closure of Penguin and Middle Banks	Alt. 2b: Overlay Federal Closures of State BRFAs	Alt. 3: May–August MHI Closure	Alt. 4a: Fleet-wide Commerci al TAC	Alt. 4b: IFQ for Some or Most	Alt. 5a: May–September MHI Closure w/select IFQ exemptions	Alt. 5b: June–August MHI Closure Year-Round Partial PB Closure
Continues state's bag limit, bottomfish vessel registration and BRFAs	✔	✔	✔	✔	✔	✔	✔	✔
Continues commercial catch reporting requirement	✔	✔	✔	✔	✔	✔	✔	✔
Requires catch reporting by recreational bottomfish fishermen		✔	✔	✔	✔	✔	✔	✔
Requires at-sea enforcement and aerial surveillance markings on bottomfish vessels		✔	✔	✔			✔	✔
Requires state and federal mirror regulations			✔	✔	✔	✔	✔	✔
Requires shore-based enforcement of landings and/or monitoring by		✔	✔	✔	✔	✔	✔	✔

	Alt. 1: No Action	Alt. 2a: Closure of Penguin and Middle Banks	Alt. 2b: Overlay Federal Closures of State BRFAs	Alt. 3: May–August MHI Closure	Alt. 4a: Fleet-wide Commercial TAC	Alt. 4b: IFQ for Some or Most	Alt. 5a: May–September MHI Closure w/select IFQ exemptions	Alt. 5b: June–August MHI Closure Year-Round Partial PB Closure
dealers plus certification and tracking of NWHI and imported bottomfish								
Requires fishermen to report their catches on a per-trip basis						✔	✔	
Requires issuance of bottomfish stamps							✔	

CHAPTER 3: AFFECTED ENVIRONMENT

3.1 Introduction

This chapter describes the environmental resources that may be affected by the proposed action or the alternatives. It is based primarily on the corresponding chapter in the FEIS for Bottomfish and Seamount Groundfish Fishery of the Western Pacific Region (WPRFMC 2005b), and has been updated to incorporate more recent information, including the 2003 fishery data made available in the Bottomfish FMP annual report (WPRFMC 2005c) and additional analyses conducted by PISFC staff.

The Bottomfish FMP (WPRFMC 1986), its amendments, and implementing regulations define fishery management area and sub-areas within the EEZ surrounding the State of Hawaii as follows. The inner boundary of the fishery management area is a line coterminous with the seaward boundaries of the State of Hawaii (i.e. the 3-mile limit). The outer boundary of the fishery management area is a line drawn in such a manner that each point on it is 200 nautical miles from the baseline from which the territorial sea is measured.

The federal bottomfish fishery management area in Hawaii is divided into three sub-areas (Figure 5) with the following designations and boundaries:

(1) Main Hawaiian Islands (MHI) means the EEZ of the Hawaiian Islands Archipelago lying to the east of 161°20' W longitude.

(2) Northwestern Hawaiian Islands (NWHI) means the EEZ of the Hawaiian Islands Archipelago lying to the west of 161°20' W Midway Island is treated as part of the Northwestern Hawaiian Islands Sub-area.

- (i) Hoomalu Zone means that portion of the EEZ around the NWHI west of 165°W longitude.
- (ii) Mau Zone means that portion of the EEZ around the NWHI between 161°20' W longitude and 165° W longitude.

(3) Hancock Seamount means that portion of the EEZ in the Northwestern Hawaiian Islands west of 180°00' W longitude and north of 28°00' N latitude.

As noted above, the proposed action will not affect the groundfish resources of the Hancock Seamount, and that sub-area will not be considered further in this EIS.

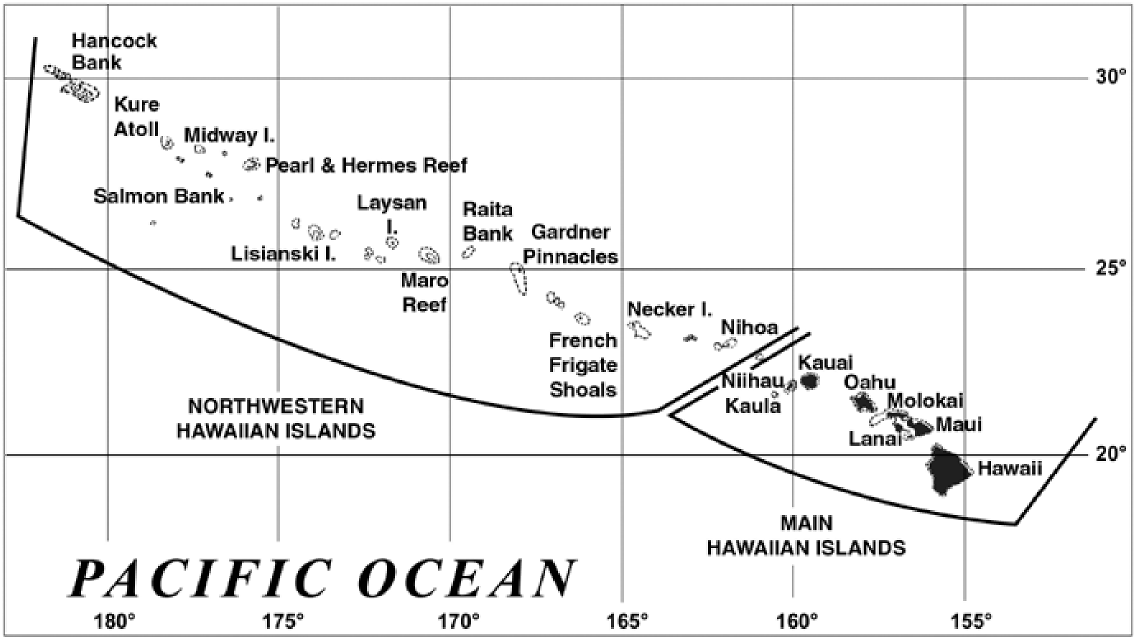


Figure 5: The Hawaii Archipelago.

3.2 Oceanographic Setting

The ocean is a three-dimensional medium stratified vertically in terms of light penetration, temperature, nutrient concentrations, and concentration of dissolved oxygen. Toward the surface is the photic zone, the waters that receive the sun's light. In Hawaii, this zone extends as deep as about 100 meters. Surface waters are mixed by the wind creating a chemically homogeneous layer varying from about 120 meters deep in winter to perhaps 30 meters deep in summer. Below this mixed layer is a zone of rapidly decreasing temperature called the thermocline. Below the thermocline, temperature decreases gradually to the bottom. Primary production by phytoplankton and benthic macroalgae consumes nutrients in the photic zone, resulting in low ambient nutrient concentrations in the mixed layer. As organisms die and sink out of the photic zone and through the thermocline, decomposition produces inorganic nutrients while consuming oxygen. Thus, the surface mixed layer is low in nutrients but high in oxygen, while the reverse is true below the thermocline.

The BMUS occupy habitat within and below the photic zone and mixed layer, although the species of most concern, onaga and ehu, tend to occupy waters deeper than 150 meters. Typically, metabolic processes are slow in such deep waters with low oxygen concentrations. Top carnivores in this cold, dark, relatively low-energy environment tend be long-lived, with slow growth rates and delayed reproductive maturity. Such is generally the case for deep-slope bottomfish, which makes them more susceptible to overfishing.

3.2.1 Currents and Eddies

The depth of the thermocline (middle layer of the ocean where differences in water temperature inhibit mixing with surface layer) varies greatly over the ocean, setting up gradients in water density and pressure that result in large-scale water movements called geostrophic currents. In the North Pacific Ocean the geostrophic currents form a large, basin-scale, clockwise movement called the North Pacific Subtropical Gyre (NPSG), centered at about 28°N. At the latitude of Hawaii, circulation is roughly east to west, reinforcing the wind-driven surface currents. Between about 18°N and 22°N, the currents are strongly influenced by the islands. According to Juvic and Juvic (1998):

> The North Equatorial Current (NEC) forks at Hawaiʻi Island; the northern branch becomes the North Hawaiian Ridge Current (NHRC) and intensifies near the islands with a typical width of 65 miles (100 km) and speed of 0.5 knots (25cm/s). West of the islands, two elongated circulations appear. A clockwise circulation is centered at 19°N, merging to the south with the southern branch of the NEC. A counterclockwise circulation is centered at 20°30'N. Between them is the narrow Hawaiian Lee Countercurrent (HLCC), extending in longitude from 170°W to 158°W. Surface currents over the western islands and northeast of the NHRC are variable, and their average is smaller than can be estimated from existing data.

Within the NPSG, the westward flowing northern edge of NEC grazes the Hawaiian Islands, mainly near the Big Island. The NHRC can be thought of as a small part of the NEC that turns northwest to flow along the windward side of the chain instead of turning southwest to pass south of Hawaii Island (E. Firing, UH-SOEST, personal communication). Ten years of shipboard acoustic Doppler current profiler data collected by the NOAA shows a mean westward flow of the NHRC through the ridge between Oahu and Nihoa, and extending along the lee side of Nihoa and Necker to depths from 20 to 250 m (Firing 2006).

The Subtropical Counter Current (STCC) is an eastward flowing surface current found typically along 24°N from 130°E to 160°W. The eastward flowing HLCC is generally located along 20°N and extends from about 150°E to just west of the Hawaiian Islands (Kobashi and Kawamura 2002). The formations of the STCC and HLCC have recently been attributed to the "wake effect" that results from the combination of the westward trades winds blowing over the Hawaiian Archipelago.[8]

Generally within the lee of the archipelago there are an abundance of mesoscale eddies created from a mixture of wind, current, and sea floor interactions. The eddies, which can rotate either clockwise or counter clockwise, have important biological impacts, and likely play an important role in larval transport (E. Firing, UH-SOEST, personal communication). Eddies create vertical fluxes, with regions of divergence (upwelling) where the thermocline shoals and deep nutrients are pumped into surface waters enhancing phytoplankton production, and also regions of convergence (downwelling) where the thermocline deepens.

[8] http://science.nasa.gov/headlines/y2002/10apr_hawaii.htm

3.2.2 Productivity Trends

Most oceanic food webs (excluding, for example, those around volcanic vents) depend on primary producers (phytoplankton and macroalgae) to convert inorganic nutrients and the sun's energy into organic compounds that are then consumed and incorporated at successively higher trophic levels. Growth rates of primary producers may be limited by the availability of light or the lack of essential nutrients. Most often in the sea, the limiting factor is the availability of nitrogen. A deep and strong thermocline is an effective barrier to the transport of inorganic nitrogen to surface waters. Climatological cycles, winds and currents, as noted above, can greatly affect the depth of the thermocline and the rate of nutrient recharge. These events and cycles may be quite transitory, with annual or longer duration, such as the El Niño–Southern Oscillation, or even longer. For example, Polovina et al. (1994) showed that decadal-scale climate changes resulted in changes in the mixed layer depth and ultimately changes in productivity of the entire ecosystem in the North Pacific Ocean. Productivity changes at all trophic levels in the NWHI varied by 30–50 percent as a result of this documented decadal-scale climate cycle. Thus, it is important to understand that the "carrying capacity" of the environment, or potential productivity of an ecosystem, is dynamic and may fluctuate considerably in response to oceanographic conditions as mediated by climatological cycles and events. In terms of bottomfish resources, these cycles may be expressed as variability in stock size, recruitment, growth rates, or other factors.

3.3 Hawaii's Deep-Water Bottomfish

3.3.1 Habitat Requirements

Commercially important deepwater bottomfish inhabit the deep slopes of island coasts and banks at depths of 100 to 400 meters. The distribution of adult bottomfish in the region is correlated with suitable physical habitat. Because of the volcanic nature of the islands within the region, most bottomfish habitat consists of steep-slope areas on the margins of the islands and banks. The habitat of the six most important bottomfish species tend to overlap to some degree, as indicated by the depth range where they are caught. Within the overall depth range, however, individual species are more common at specific depths. Depth alone, however, may not indicate satisfactory habitat, and both the quantity and quality of habitat at depth are important. Bottomfish are typically distributed in a nonrandom patchy or contagious pattern, reflecting bottom topography and oceanographic conditions. Much of the habitat within the depths of occurrence of bottomfish is a mosaic of sandy low-relief areas and rocky high-relief areas. An important component of the habitat for many bottomfish species appears to be the association of high-relief areas with water movement. In the Hawaiian Islands and at Johnston Atoll, bottomfish density has been shown to be correlated with areas of high relief and current flow (Haight 1989; Haight et al. 1993a; Ralston et al. 1986). Although the water depths utilized by bottomfish may overlap somewhat, the available resources may be partitioned by species-specific behavioral differences. In a study of the feeding habitats of the commercial bottomfish in the Hawaiian Archipelago, Haight et al. (1993b) found that ecological competition between bottomfish species appears to be minimized through species-specific habitat utilization. Species may partition the resource through depth and time of feeding activity, and through different prey preferences. Although deepwater snappers are generally thought of as top-level carnivores, several snapper species in the Pacific are known to incorporate significant amounts of zooplankton in their diets (Haight et al. 1993b).

Cooperative studies by the State of Hawaii's Department of Land and Natural Resources, the University of Hawaii, and NOAA, using submersible and remotely operated vehicles, are investigating, among other things, bottomfish habitat. Results indicate that the preferred habitat for the snapper species consists of hard substrate with a relatively large number of holes and crevices that serve as shelter for smaller fish and shrimp that onaga and ehu are presumed to feed on. In pinnacle habitats in particular, the abundance of small fish and invertebrates is similar to, if not greater than, that observed on shallow water coral reef habitats. Onaga and ehu, as well as their potential prey species, were found to be absent over sand substrates as well as hard substrates with few holes. The presence of one species of potential prey fish, longtailed slopefish (*Symphysanodon maunaloae),* appears to be highly correlated with the presence of ehu and onaga. Several potential competitor species have also been also observed in these habitats including the hogo (*Pontinus macrocephalus*), moray eels (*Gymnothorax berndti* and *G. nuttingi*), kalekale (*Pristipomoides sieboldii*), and the hapu‘upu‘u (*Epinephelus quernus*). Juvenile onaga and ehu were found in an area of small, low carbonate (limestone) features scattered over an otherwise sandy bottom. Unlike juvenile ōpakapaka, which have been found to occupy shallower depths than adults, juvenile onaga and ehu were found at the same depths as adults.

3.3.1.1 Essential Fish Habitat and Habitat Areas of Particular Concern

The MSA identifies essential fish habitat (EFH) as those waters and substrate necessary to fish for spawning, breeding, feeding, and growth to maturity. This includes the marine areas and their chemical and biological properties that are utilized by the organism. Substrate includes sediment, hard bottom, and other structural relief underlying the water column along with their associated biological communities. As part of Amendment 6 to the Bottomfish FMP, the Council designated EFH for bottomfish MUS which were approved by NMFS in 1999 (64 FR 19068; April 19, 1999).

In addition to and as a subset of EFH, the Council described habitat areas of particular concern (HAPC) based on the following criteria: ecological function of the habitat is important, habitat is sensitive to anthropogenic degradation, development activities are or will stress the habitat, or the habitat type is rare.

In considering the potential impacts of a proposed action on EFH, all designated EFH must be considered. Thus, the designated areas of EFH and HAPC for all Council FMPs are shown in Table 5.

Table 5: Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) for all Western Pacific FMPs.

FMP	EFH (Juveniles and Adults)	EFH (Eggs and Larvae)	HAPC
Pelagics	Water column down to 1,000 meters	Water column down to 200 meters	Water column above seamounts and banks down to 1,000 meters
Bottomfish and Seamount Groundfish	**Bottomfish:** Water column and bottom habitat down to a depth of 400 meters Seamount groundfish: (adults only) water column and bottom from 80 to 600 meters	**Bottomfish:** Water column down to a depth of 400 meters Seamount groundfish: (including juveniles) epipelagic zone (0 to 200 nm offshore)	**Bottomfish:** All escarpments and slopes between 40–280 meters, and three known areas of juvenile̦ ōpakapaka habitat Seamount groundfish: not identified
Precious Corals	Keahole Point, Makapuu, Kaena Point, Westpac, Brooks Bank, 180 Fathom Bank deep-water precious coral (gold and red) beds, and Milolii, Auau Channel, and S. Kauai black coral beds	NA	Makapuu, Westpac, and Brooks Bank deep-water precious corals beds and the Auau Channel black coral bed
Crustaceans	Bottom habitat from shoreline to a depth of 100 meters	Water column down to 150 meters	All banks within the NWHI with summits less than 30 meters
Coral Reef Ecosystems	Water column and benthic substrate to a depth of 100 meters	Water column and benthic substrate to a depth of 100 meters	All MPAs identified in FMP, all PRIAs, many specific areas of coral reef habitat (see FMP)

All areas are bounded by the shoreline and the outer boundary of the EEZ, unless otherwise indicated. Source: Amendment 6 to the Bottomfish FMP.

3.3.2 Management Unit Species (MUS)

3.3.2.1 Bottomfish Management Unit Species (BMUS)

The bottomfish fisheries in the region target an assemblage of species from the taxonomic groups: Lutjanidae (snappers), Serranidae (groupers), Carangidae (jacks), and Lethrinidae (emperors). Table 6 presents the list of BMUS designated under the Bottomfish FMP.

Table 6: List of Bottomfish Management Unit Species (BMUS).

Common name	Local Name	Scientific Name
Snappers		
Silver jaw jobfish	*Lehi* (H); *palu-gustusilvia* (S)	*Aphareus rutilans*
Grey jobfish	*Uku* (H); *asoama* (S)	*Aprion virescens*
Squirrelfish snapper	*Ehu* (H); *palu-malau* (S)	*Etelis carbunculus*
Longtail snapper	*Onaga*, *ulạula* (H); *palu-loa* (S)	*Etelis coruscans*
Blue stripe snapper	*Tạape* (H); *savane* (S); *funai* (G)	*Lutjanus kasmira*
Yellowtail snapper	Yellowtail, *kalekale* (H); *Palu-ị Iusama* (S)	*Pristipomoides auricilla*
Pink snapper	*Opakapaka* (H); *palụ-tlena lena* (S); *gadao* (G)	*Pristipomoides filamentosus*
Yelloweye snapper	Yelloweyẹ *ōpakapaka*, *kalekale* (H); *Palusina* (S)	*Pristipomoides flavipinnis*
Snapper	*Kalekale* (H)	*Pristipomoides sieboldii*
Snapper	*Gindai* (H,G); *palu-sega* (S)	*Pristipomoides zonatus*
Jacks		
Giant trevally	White *ulua* (H); *tarakito* (G); *sapo-anae* (S)	*Caranx ignoblis*
Black jack	Black *ulua* (H); *tarakito* (G); *tafauli* (S)	*Caranx lugubris*
Thick lipped trevally	*Pig ulua*, *butaguchi* (H)	*Pseudocaranx dentex*
Amberjack	*Kahala*	*Serioila dumerili*
Groupers		
Blacktip grouper	*Fausi* (S); *gadau* (G)	*Epinephelus fasciatus*
Sea bass	*Hapụupụu* (H)	*Epinephelus quernus*
Lunartail grouper	*Papa* (S)	*Variola louti*
Emperors		

Common name	Local Name	Scientific Name
Ambon emperor	*Filoa-gutumumu* (S)	*Lethrinus amboinensis*
Redgill emperor	*Filoa-pạlọomumu* (S); *mafuti* (G)	*Lethrinus rubrioperculatus*
Seamount groundfish		
Alfonsin		*Beryx splendens*
Ratfish/butterfish		*Hyperoglyphe japonica*
Armorhead		*Pseudopentaceros richardsoni*

Note: G = Guam; H = Hawaii; S = American Samoa.

Relatively little is known about the reproduction and early life history of deepwater bottomfish in the region. Spawning occurs over a protracted period, and peaks from July to September (Haight et al. 1993b). The eggs are released directly into the water column. The eggs hatch in three to four days, and the planktonic larval phase is thought to last at least 25 days (Leis 1987). For some species this phase may be considerably longer. For example, the pelagic stage for ʻōpakapaka is believed to be as long as six months (Moffit and Parrish 1996). Experimental work at the Hawaii Institute of Marine Biology found that ʻōpakapaka eggs incubated at temperatures characteristic of adult habitat did not hatch, but those incubated in water at surface temperatures hatched and were reared for up to 4 months (C. Kelly, HURL, personal communication). This indicates that surface currents or eddies could play an integral role in the dispersal of some bottomfish larvae.

Larval advection simulation research indicates that larval exchange may occur throughout the Hawaiian archipelago and that the amount of larval exchange between the NWHI and the MHI is correlated with the duration of the larval phase, with the highest larval exchange occurring with the longest larval phase durations (Kobayashi 1998). The direction of larval exchange is subject to oceanographic circulation patterns as well as large-scale temperature or climate variation, leading to oceanographic regime shifts of different scales (e.g. El Niño, the Pacific Decadal Oscillation). Many such oceanographic events and their resultant impacts to marine ecosystems have been described, including impacts to Pacific pelagic species (Polovina et al. 2001) and other Pacific fisheries including the Hawaiian lobster fishery (Polovina 2005). Data on actual larval exchange rates between the MHI and NWHI are lacking. Preliminary research indicates that genetic connectivity does exist between MHI and NWHI bottomfish species.

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

3.3.2.2 The Deep 7 Species

Hawaii's bottomfish fisheries target bottomfish species and species complexes at characteristic depths. At shallow depths (surface to 40 fm) uku are fished while drifting or slowly trolling over relatively flat bottom. Deeper water species complexes (e.g. ōpakapaka at 40 to 120 fm; onaga at 80 to 150 fm) are found along high-relief, deep slopes and are fished with a different method, vertical handline. In 1998, the State of Hawaii established bottomfish management regulations focused on seven of these deep-water species, including onaga, ehu, kalekale, ōpakapaka, gindai, lehi, and hapụupụu. These are termed the "Deep 7." All but hapụupụu are snappers. The paragraphs below briefly summarize information regarding the Deep 7 species.

Onaga: Large specimens of onaga will reach at least 3 feet in length and weigh up to 30 pounds. They inhabit deep, rocky bottoms offshore and are known to occur between 80 and 250 fathoms. Onaga are commonly caught on or near the bottom, in areas of steep drop-offs, ledges, and pinnacles. Onaga feed on small fishes, squids, and crustaceans, and are thought to reach sexual maturity at about 21 inches and 5 pounds, at approximately 5 years old. Females with ripe ovaries have been reported during August and September. Onaga are distributed throughout the Indo–Pacific region.

Ehu: Adult ehu will reach a length of at least 24 inches and a weight of up to about 12 pounds. They inhabit deeper offshore water beyond the reef, mainly occurring over rocky bottoms, usually between 80 and 218 fathoms. They feed on fishes and larger invertebrates such as squids, shrimps, and crabs, and reach sexual maturity at about 11.7 inches fork length, or 1 pound in weight, at approximately 3 years old. Ehu are distributed throughout the Indo–Pacific region.

Kalekale: Large specimens of kalekale can reach up to 24 inches in length and 6 pounds. Commonly, they are found at around 12 inches in length. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms usually between 40 and 200 fathoms. They feed on fish, shrimps, crabs, polychaetes, cephalopods, and urochordates. Fish of 14 inches fork length are approximately 2 pounds in weight and 5 years old. Kalekale are distributed throughout the Indo–Pacific region.

Ōpakapaka: Large specimens will reach a length of at least 3 feet and weigh up to about 20 pounds, with a maximum known age of 18 years. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms, usually between 40 and 120 fathoms. Fish apparently migrate into shallower depths near 40 fathoms at night. They feed on small fishes, squids, shrimps, crabs, pyrosomes, and zooplankton. Sexual maturity is reached at about 1.8 years and they generally spawn at about 2.2 years (1.5 pounds, 13 inches fork length). In 1989, Henry Okamoto, Hawaii Division of Aquatic Resources, initiated a tagging study to evaluate the growth and movement of deep water species, particularly opakapaka. Between 1989 and 1994, 4240 opakapaka and other bottomfish were tagged using surgically placed anchor tags with stiff nylon streamers. Fishermen have since recaptured and reported 397 opakapaka between 1989 and 2003. The study suggests that opakapaka are able to move between islands, and cross channels, with water depths of 1400 fathoms or less. Inter-island crossing of opakapaka tagged and recaptured include fish that moved from Oahu to Molokai (22 nautical miles, depths exceeding

300 fathoms), Oahu to Kauai (60 nautical miles, depths exceeding 1,400 fathoms) and Maui to Big Island (27 nautical miles, depths exceeding 1,000 fathoms). Ōpakapaka are distributed throughout the Indo–Pacific region.

Gindai: Gindai will reach up to 20 inches in length and 6 pounds in weight. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms, usually between 60 and 130 fathoms. They feed on fishes, shrimps, crabs, cephalopods, and other invertebrates. Gindai are distributed throughout the Indo–Pacific region.

Lehi: Large lehi specimens will reach a length of at least 3 feet and weigh up to about 30 pounds. They inhabit reefs and rocky bottom areas usually between 60 and 100 fathoms. They feed on fish, squid, and crustaceans. Lehi are distributed throughout the Indo–Pacific region.

Hapụupụu: This grouper reaches lengths of up to 4 feet and weighs up to 60 pounds. They occur in waters 11 to 208 fathoms deep. They feed mainly on fish and crustaceans. The hapụupụ is endemic to the Hawaiian Islands and Johnston Island.

3.3.3 Status of the Stocks

3.3.3.1 Spawning Potential Ratio

Amendment 3 to the Bottomfish FMP defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing, to the spawning stock biomass per recruit that would occur in the absence of fishing (termed spawning potential ratio, or SPR) is equal to or less than 20 percent. Given the scarcity of data, and using the best available information, the Council used to use SPR as a proxy for maximum sustainable yield (MSY). The 1996 reauthorization of the MSA by the Sustainable Fisheries Act (SFA) contained new requirements for monitoring potential overfishing, and added bycatch requirements among other things. In a supplement to Amendment 6 to the Bottomfish FMP, the Council established methods to comply with the SFA's overfishing provisions that allow calculation of MSY and other reference parameters (68 FR 16754; April 7, 2003). The details of the overfishing provisions are described in detail in this chapter. However, the Council has amassed 18 years of SPR data for Hawaii's bottomfish fisheries, and the values are useful to illustrate of the status of the bottomfish stocks in the three Hawaii management zones.

Fishery data for 2003 suggest that none of the five BMUS species for which SPR values can be calculated have SPR values below the 20 percent critical threshold that defines recruitment overfishing in the Bottomfish FMP. Estimated SPRs range from a low of 31 percent for onaga to a high of 50 percent for hapụupụu when expressed on an archipelago-wide basis. However, onaga and ehu stocks are severely stressed in the MHI. In 2003, the MHI SPR values for these species are below 20 percent (10.26 percent for onaga and 4.69 percent for ehu) using targeted CPUE figures (WPRFMC 2005c). The Council's Bottomfish Plan Team believes that targeted CPUE better represents the condition of bottomfish stocks in the MHI than aggregated CPUE. Using this measure, neither ʻōpakapaka nor uku SPRs indicate critically depleted conditions. Table 7 summarizes the archipelago-wide SPR values (using aggregate CPUE) for the most important BMUS, and Figure 6 shows these trends graphically.

Table 7: Historical Annual Archipelago-Wide SPRs (%) by BMUS Stock.

Year	Ehu	Hapụupụu	Onaga	Opakapaka	Uku
1986	41	55	53	51	58
1987	61	71	61	69	65
1988	37	56	42	49	62
1989	51	70	38	69	68
1990	44	57	36	57	52
1991	44	58	42	57	53
1992	51	67	41	68	61
1993	54	65	53	67	73
1994	38	51	39	53	52
1995	41	48	33	54	56
1996	43	49	39	52	57
1997	42	49	25	52	51
1998	38	44	22	47	50
1999	37	47	34	46	55
2000	39	49	27	52	52
2001	40	51	26	51	48
2002	37	45	26	47	45
2003	36	50	31	48	43
M	43.00	54.56	37.11	54.94	55.61
SD	6.93	8.52	10.67	7.94	7.86

Source: 2003 Bottomfish Annual Report, WPRFMC 2005c.

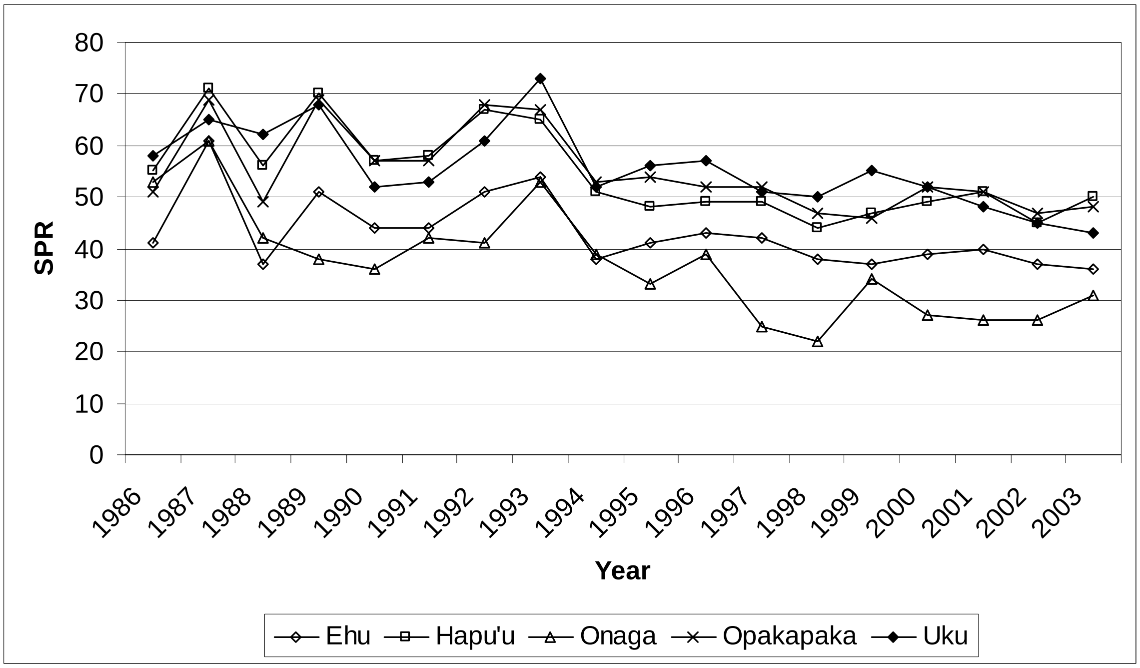


Figure 6: SPR Trends by BMUS Stock. Source: 2003 Bottomfish Annual Report, WPRMC 2005c.

While the bottomfish populations may be genetically connected throughout the archipelago, localized depletion of stocks in the MHI has been apparent for the past decade (WPRFMC 2005c). Table 8 provides a breakdown of the above SPR ratios for the three Hawaii zones using aggregate CPUE. With the exception of onaga in the Hoomalu Zone, all of the NWHI SPRs are above 50 percent. In the MHI, however, the SPRs are substantially lower, with the onaga SPR at around 10 percent.

Table 8: 2003 SPRs (%) by BMUS Stock by Zone.

Zone	Ehu	Hapụupụu	Onaga	Opakapaka	Uku
MHI	26	29	9	21	26
Mau	58	61	53	57	58
Hoomalu	62	63	46	62	63

Source: 2003 Bottomfish Annual Report, WPRMC 2005c.

3.3.3.2 Overfishing Criteria

Reauthorization of the MSA included additional requirements for the quantification of fish stock status with respect to overfishing. The MSA seeks to ensure long-term fishery sustainability by halting or preventing overfishing, and by rebuilding any overfished stocks. Overfishing occurs when fishing mortality (F) is higher than the level which produces MSY, defined as the maximum long-term average yield that can be produced by a stock on a continuing basis. A stock is deemed to be overfished when stock biomass (B) has fallen to a level substantially below the biomass producing MSY. There are two indicators that managers must monitor to determine the status of a fishery: the level of F in relation to F at MSY (F_{MSY}), and the level of B in relation to B at MSY (B_{MSY}).

The National Standard Guidelines (50 CFR §600.305 et. seq.) for National Standard 1 call for the development of control rules identifying "good" versus "bad" fishing conditions in the fishery and the stock, and describing how a variable such as F will be controlled as a function of some stock size variable such as B in order to achieve good fishing conditions. Because fisheries must be managed to achieve optimum yield (OY), not MSY, the MSY control rule is useful for specifying the required "objective and measurable criteria for identifying when the fishery is overfished." The National Standard Guidelines (50 CFR 600.310) refer to these criteria as "status determination criteria" and state that they must include two limit reference points or thresholds: one for F that identifies when overfishing is occurring, and a second for B or its proxy that indicates when the stock is overfished. The status determination criterion for F is the maximum fishing mortality threshold (MFMT), and minimum stock size threshold (MSST) is the criterion for B. If fishing mortality exceeds the MFMT for a period of one year or more, overfishing is occurring. If stock biomass falls below MSST in a given year, the stock or stock complex is overfished. A Council must take remedial action in the form of a new FMP, an FMP amendment, or proposed regulations when it has been determined by the Secretary of Commerce that overfishing is occurring, a stock or stock complex is overfished, either of the two thresholds is being approached, or existing remedial action to end previously identified overfishing has not resulted in adequate progress.

The National Standard Guidelines state that the MFMT may be expressed as a single number or as a function of some measure of the stock's productive capacity, and that it "must not exceed the fishing mortality rate or level associated with the relevant MSY control rule" (50 CFR 600.310(d)(2)(i)). The Guidelines further state that "to the extent possible, the MSST should equal whichever of the following is greater: one-half the MSY stock size, or the minimum stock size at which rebuilding to the MSY level would be expected to occur within 10 years if the stock or stock complex were exploited at the maximum fishing mortality threshold" (50 CFR 600.310(d)(2)(ii)). Although not required, warning reference points (e.g., B_{FLAG}) may be specified in advance of B or F approaching or reaching their respective thresholds. When such a reference point is reached, the Council may begin preparations for action to control F.

A target control rule specifies the relationship of F to B for a harvest policy aimed at achieving a given target. OY is one such target, and National Standard 1 requires that conservation and management measures both prevent overfishing and achieve OY on a continuing basis. OY is the yield that will provide the greatest overall benefits to the nation, and is defined on the basis of

MSY, as reduced by any relevant economic, social, or ecological factor. MSY is therefore an upper limit for OY. A target control rule can be specified using reference points similar to those used in the MSY control rule, such as F_{TARGET} and B_{TARGET}. While MSST and MFMT are limits, the target reference points are guidelines for management action, not constraints. The technical guidance for National Standard 1 states that "Target reference points should not be exceeded more than 50 percent of the time, nor on average" (Restrepo et al. 1998).

A supplement to Amendment 6 of the Bottomfish FMP, approved by NMFS in 2003 (68 FR 46112; August 5, 2003), specified how the Council would comply with the new requirements of National Standard 1. Because of the paucity of data for all bottomfish species and island areas managed under the Bottomfish FMP, the Council's control rules and overfishing thresholds are specified for multi-species complexes. Standardized values of catch per unit effort and fishing effort are used as proxies for biomass and fishing mortality, respectively. The stock status determination criteria are specified for those proxies using defaults recommended in the NMFS technical guidance for implementing National Standard 1.

The MSY control rule is specified as the MFMT. The MFMT and MSST are dependent on the natural mortality rate (M), an estimate of which is published annually in the SAFE report.

In addition to the thresholds MFMT and MSST, a warning reference point, B_{FLAG}, is also specified at a point above the MSST to provide a trigger for consideration of management action prior to B reaching the threshold.

MFMT, MSST, and B_{FLAG} are specified as follows:

MFMT: $F(B) = F_{MSY}B/cB_{MSY}$ **for** $B \leq cB_{MSY}$

$F(B) = F_{MSY}$ **for** $B > cB_{MSY}$

MSST: cB_{MSY}

B_{FLAG}**:** B_{MSY}

Where $c = \max(1 - M, 0.5)$

Standardized values of fishing effort (E) and catch-per-unit-effort (CPUE) are used as proxies for F and B, respectively, so E_{MSY}, $CPUE_{MSY}$, and $CPUE_{FLAG}$ are used as proxies for F_{MSY}, B_{MSY}, and B_{FLAG}, respectively. In cases where reliable estimates of $CPUE_{MSY}$ and E_{MSY} are not available, they are estimated from catch and effort time series, standardized for all identifiable biases. In Hawaii, archipelago-wide estimates of the reference points are calculated as the weighted averages of estimates for each of the three management zones.

A secondary set of reference points is specified to evaluate stock status with respect to recruitment overfishing. A secondary "recruitment overfishing" control rule is specified to control fishing mortality with respect to that status. The rule can be applied only to those component stocks (species) for which adequate data are available. The ratio of a current spawning stock biomass proxy ($SSBP_t$) to a given reference level ($SSBP_{REF}$) is used to determine if individual stocks are experiencing recruitment overfishing. SSBP is CPUE scaled by percent mature fish in the catch. When the ratio $SSBP_t/SSBP_{REF}$, or the "SSBP ratio" (SSBPR) for any species drops below a certain limit ($SSBPR_{MIN}$), that species would be considered to be recruitment overfished and management measures would be implemented to reduce fishing mortality on that species, regardless of the effects on other species within the stock complex. The rule would apply only when the SSBPR drops below the $SSBPR_{MIN}$, but it would continue until the ratio achieves the "SSBPR recovery target" ($SSBPR_{TARGET}$), which would be set at a level no less than $SSBPR_{MIN}$. These two reference points and their associated recruitment overfishing control rule, which prescribes a target fishing mortality rate ($F_{RO\text{-}REBUILD}$) as a function of the SSBP ratio, are as specified below, with E_{MSY} again used as a proxy for F_{MSY}.

$F_{RO\text{-}REBUILD}$: F(SSBPR) = 0 for SSBPR $\leq$ 0.01

F(SSBPR) = 0.2F_{MSY} for 0.10 < SSBPR $\leq$ $SSBPR_{MIN}$
F(SSBPR) = 0.4F_{MSY} for $SSBPR_{MIN}$ < SSBPR $\leq$ $SSBPR_{TARGET}$

$SSBPR_{MIN}$: 0.02
$SSBPR_{TARGET}$: 0.30

3.3.3.3 Maximum Sustainable Yield (MSY)

Reference values for biomass and fishing mortality are needed for application of the control rules. Since estimates of biomass and fishing mortality are not available for any of the areas involved, proxies of CPUE and effort at MSY, respectively, are used to establish reference values. The current values for CPUE and E are compared to the reference values and their ratio determines the current status of the fishery relative to control rule thresholds. The best available reference value estimates are used. Refinement of reference value estimates and standardization of catch and effort data for the bottomfish fishery are ongoing activities and those applied here will change as better data become available.

For Hawaii, the time series of data allowed the application of a simple dynamic surplus production model. A three parameter model was fit to the NWHI daily CPUE and the MHI per trip CPUE time series with parameters of intrinsic rate of increase, r; Mau zone carrying capacity, k; and MHI catchability, q. NWHI zone q values used in the model were based on standardized estimates obtained from a research depletion study carried out in the CNMI. A four-step pattern of MHI q was used to simulate changes in catchability expected from changes in technology and experience of MHI fishermen. Carrying capacity values for the Hoomalu zone and MHI were based on the Mau zone k adjusted by relative length of 100-fathom contour for the zones. The reference values obtained for each zone are presented in Table 9.

Table 9: MSY and Reference Values (CPUE and Effort at MSY) by Area.

Zone	MSY	CPUE at MSY	Effort at MSY
MHI	353,435 pounds	407 lb/trip	868 trips
Mau Zone	97,904 pounds	470 lb/day	208 days
Hoomalu Zone	339,728 pounds	431 lb/day	789 days

Source: Kobayashi and Moffitt 2005.

The control rule uses the reference values to establish thresholds. The current status of the fishery is determined by the ratio of current values of CPUE and effort compared to the reference values. The MFMT is set at the effort at MSY, such that overfishing is occurring when the current effort ratio is greater than 1.0. The biomass threshold, MSST, is defined as 1.0 minus natural mortality. Natural mortality for species of the bottomfish complex is largely unknown, therefore, estimates are used. Various sources report natural mortality estimates ranging from 0.30 to 0.90. The precautionary value of 0.30 was selected for the purpose of establishing the MSST. The resulting MSST is 0.70. The current status of the stocks for the various island areas are presented in Table 10.

Table 10: Current Status of Bottomfish in Hawaii's Management Sub-areas (2003 data).

Zone	CPUE Ratio (current/MSY)	Effort Ratio (current/MSY)
Threshold	Above 0.7	Below 1.0
Hawaii, all areas combined	0.82	1.13
MHI	0.47	1.88
Mau Zone	1.01	0.96
Hoomalu Zone	1.13	0.39

Source: PIFSC 2005; Appendix 2.

In 1998, the State of Hawaii established bottomfish restricted fishing areas encompassing approximately 20 percent of the 100 fathom contour in the MHI. Commercial CPUE and effort data thus far do not reflect any benefit in terms of increased biomass or decreased fishing mortality obtained from these closures.

Under the National Standard 1 guidelines, Hawaii's archipelagic bottomfish multi-species stock complex is not overfished (the biomass standard using CPUE as a proxy). The current CPUE ratio is 0.82, above the threshold value of 0.7 established as the MSST. However, overfishing (the fishing mortality standard using fishing effort as a proxy) is occurring. The 2003 effort ratio is 1.13, above the threshold value of 1.0 established as the MFMT.

The Secretary of Commerce informed the Council on May 27, 2005, that according to MSA National Standard 1 guidelines and the associated reference points adopted by the Council, the bottomfish multi-species stock complex in the Hawaii archipelago is experiencing overfishing. On behalf of the Secretary of Commerce, the Regional Administrator for the Pacific Islands Region notified the Council of this overfishing determination on May 27, 2005 (70 FR 34452, June 14, 2005). As stated in the overfishing notification letter, "the MHI is the zone that contributes most of the problems in terms of both reduced biomass and overfishing." The overfishing notification letter further states, "[t]herefore, it is likely that reducing fishing mortality here [MHI] would be the most effective means to end overfishing in the Hawaiian Archipelago (70 FR 3442, June 14, 2005)." The Council is required to take action end the overfishing within one year following the notification (70 FR 34552, June 14, 2005).

3.4 Fisheries

The deep-slope bottomfish fishery in Hawaii concentrates on species of eteline snappers, carangids and a single species of grouper concentrated at depths of 30 to 150 fathoms (55 to 275 m). The fishery can be divided into two geographical areas (see Figure 1) the inhabited MHI with their surrounding reefs and offshore banks; and the NWHI, a chain of largely uninhabited islets, reefs and shoals extending 1,200 nautical miles across the North Pacific. In the MHI approximately 80 percent of the bottomfish habitat lies in state waters. Bottomfish fishing grounds within federal waters (3 to 200 nm offshore) around the MHI include Middle Bank, most of Penguin Bank and approximately 45 nautical miles of 100-fathom bottomfish habitat in the Maui–Lanai–Molokai complex (Figure 7).

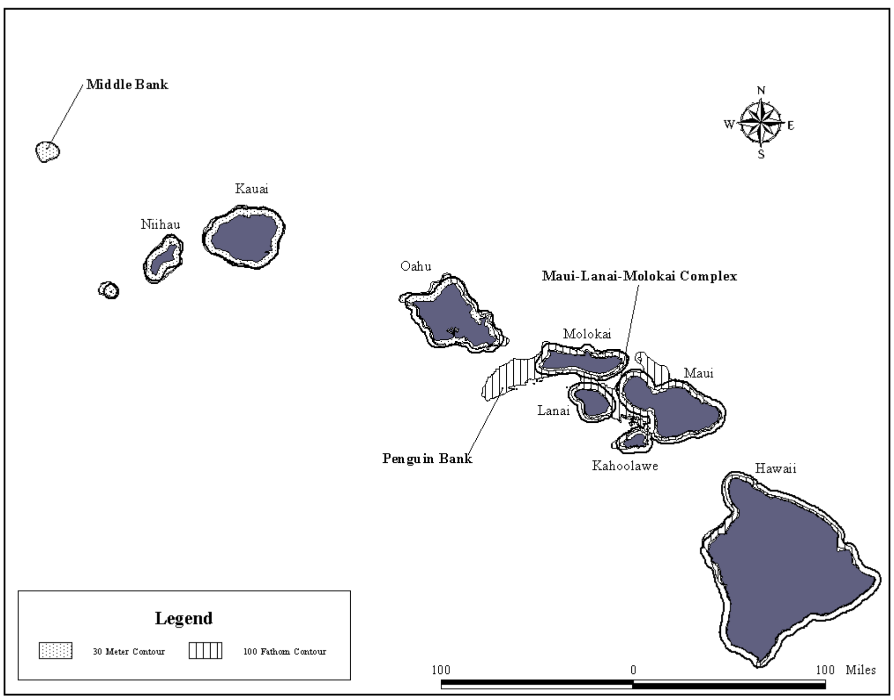


Figure 7: Bottomfish Habitat in the MHI.

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

Roughly 30 percent of the MHI commercial landings of the Deep 7 species from 1998 to 2004 are from Oahu. Maui landings from the same time period represent 36 percent, with Hawaii, Kauai and Molokai/Lanai representing 18, 10 and 5 percent, respectively (Kawamoto and Tau 2005). Specific bottomfish fishing locales favored by fishermen vary seasonally according to sea conditions and the availability and price of target species. Historically, Penguin Bank is one of the most important bottomfish fishing grounds in the MHI, as it is the most extensive shallow shelf area in the MHI and within easy reach of major population centers. Penguin Bank is particularly important for the MHI catch of uku, one of the few bottomfish species available in substantial quantities to Hawaii consumers during summer months.

3.4.1 History

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

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

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

Initially, the commercial fishing industry in Hawaii was monopolized by Native Hawaiians, who supplied the local market with fish using canoes, nets, traps, spears and other traditional fishing devices (Cobb 1902; Jordan and Evermann 1902). However, the role that Native Hawaiians played in Hawaii's fishing industry gradually diminished during the latter half of the nineteenth century as successive waves of immigrants of various races and nationalities arrived in Hawaii.

Between 1872 and 1900, the non-indigenous population increased from 5,366 to 114,345 (Office of Hawaiian Affairs 1998). Kametaro Nishimura, credited by some to be the first Japanese immigrant to engage in commercial fishing in Hawaii, began his fishing career in the islands in 1885, harvesting bottomfish such as ōpakapaka, ulua, and uku (Miyaski 1973). By the turn of the century, Japanese immigrants to Hawaii dominated the bottomfish fishery using wooden-hulled "sampans" propelled by sails or oars (Cobb 1902). The sampan was brought to Hawaii by Japanese immigrants during the late nineteenth century, and over time Japanese boat builders in Hawaii adapted the original design to specific fishing conditions found in Hawaii (Goto et al. 1983). The bottomfish fishing gear and techniques employed by the Japanese immigrants were imitations of those traditionally used by Native Hawaiians, with slight modifications (Konishi 1930).

During the early years of the commercial bottomfish fishery, vessels restricted their effort to areas around the MHI. Cobb (1902) recorded that some of the best fishing grounds were off the coast of Molokai and notes that large sampans with crews of four to six men were employed in the fishery. Typically, the fleet would leave Honolulu for the fishing grounds on Monday and return on Friday or Saturday. The fishing range of the sampan fleet increased substantially after the introduction of motor powered vessels in 1905 (Carter 1962). Fishing activity was occurring around the NWHI at least as early as 1913, when one commentator stated: "Fishing for *ulua* and *kahala* is most popular, using *bonito* for bait, fishermen seek this [sic] species in a 500 mile range toward Tori-Jima [NWHI]" (Japanese Consulate 1913, as cited in Yamamoto 1970:107). Within a few years more than a dozen sampans were fishing for bottomfish around the NWHI (Anon. 1924; Konishi 1930). Fishing trips to the NWHI typically lasted 15 days or more, and the vessels carried 7 to 8 tons of ice to preserve their catch (Nakashima 1934). The number of sampans traveling to the more distant islands gradually declined because of the limited shelter the islands offered during rough weather and the difficulty of maintaining the quality of the catch during extended trips (Konishi 1930). However, during the 1930s, at least five bottomfish fishing vessels ranging in size from 65 to 70 feet continued to operate in the waters around the NWHI (Hau 1984). In addition to catching bottomfish, the sampans harvested lobster, reef fish, turtles, and other marine animals (Iversen et al. 1990).

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

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

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

During the early 1980s, with the development of a much larger market for bottomfish, bottomfish fishermen fishing around the main Hawaiian Islands were able to obtain premium prices for their catches, and thus were motivated to increase their landings (Pooley 1993a). However, the number of vessels participating in the MHI fishery declined after reaching a peak of 583 in 1985. The decrease in fishing effort suggests that some bottomfish fishermen perceived a growing shortage of bottomfish in the MHI fishery and switched to other fisheries, particularly targeting pelagics. Currently, most fishermen landing bottomfish commercially switch between fisheries targeting seasonal abundance and market prices. Very few fishermen target bottomfish exclusively year round

In 1998, concerns generated from PIFSC and the Council's Bottomfish Plan Team about low SPR values in the MHI led the State of Hawaii to close certain areas around the MHI to bottomfish fishing, including areas of Penguin Bank within the EEZ.[9] In addition, new state rules established a recreational bag limit of five onaga or ehu, or a mix of both, per person per day. This bottomfish management regime requires any person who may fish for bottomfish (any of the seven species) to register their vessel with the HDAR and display the letters "BF" on their boat. This rule applies to all vessels used for targeting bottomfish fishing, whether the owner is a recreational/subsistence fisherman or a commercial fisherman. Of the 3,600 vessels registered with the HDAR as of August 2005, about 40 percent declared themselves recreational fishermen (HDAR Bottomfish Survey 2005). It is unknown how many of these vessels, registered as recreational, have fished for bottomfish since 1998.

Hawaii's sport fishing charter boat fleet began to develop during the early 1950s as Hawaii became an increasingly popular tourist destination (Markrich 1994). What started as a few

[9] The State of Hawaii claims the authority to manage and control the marine, seabed, and other resources within "archipelagic waters." These archipelagic waters encompass a number of bottomfish fishing grounds, such as parts of Penguin Bank, that lie inside the EEZ. An October 24, 1997, memorandum from NOAA/General Counsel Southwest Region to the Council Chairman declared that, despite any contentions by the State of Hawaii to the contrary, for purposes of federal fishery management, state waters do not extend beyond 3 miles from the coast.

charter boats operating out of harbors such as Kewalo Basin and Kona has evolved into a highly competitive industry involving nearly 200 vessels statewide (Hamilton 1998; Walker 1996). The charter boat fleet mainly targets pelagic game fish such as billfish and tuna. However, a few charter boats take bottomfish fishing trips if patrons are interested (Hamilton 1998). Most of the charter boats engaged in bottomfish fishing are based on the islands of Maui and Kauai.

3.4.2 Fishing Gear and Methods

The basic design of the handline gear used in Hawaii's bottomfish fisheries has remained essentially unchanged from gear used by early Native Hawaiians (Haight et al. 1993a). The gear consists of a main line with a 2 to 4 kilograms weight attached to the terminus. Several 40 to 60 centimeters sidelines with circle hooks are attached above the weight at 0.5 to 1.0 meters intervals. A chum bag containing chopped fish or squid may be suspended above the highest of these hooks. The gear is pulled after several fish are hooked.

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

Fishermen use the circle hook for its self-setting ability and for its curved design with its long inward pointing hook point that makes it difficult for the fish to rid itself of the hook once it is embedded. The circle hook shank is typically thicker and round in cross section (unlike the thinner straight J type hooks), which tends to minimize ripping or wearing a hole in the fish's jaw. An additional characteristic of the circle hook design that appeals to fishermen is that it's less prone to snagging on rocky or hard substrate bottoms and very difficult to snag flat or smooth surfaces. This characteristic minimizes the loss of gear (K. Kawamoto, PIFSC, personal communication).

All bottomfish fishermen in Hawaii target the same assemblage of bottomfish species. The ability to target particular species varies widely depending on the skill of each captain. Electronic navigation and fish-finding equipment greatly aid fishermen in returning to a particular fishing spot and catching desired species with little incidental catch (Haight et al. 1993a). According to Hau (1984), ʻōpakapaka is one of the primary target species due to the relatively high price it commands as a result of its constant demand at the fish auction. Hāpuʻupuʻu and white ulua are sought because of their sturdiness and ability to retain good flesh quality. In addition, white ulua can be caught in rough sea conditions when other species are difficult to capture. Because of potential ciguatera toxicity, however, ulua are not usually targeted. Kāhala are one of the least valuable bottomfish because large specimens have a reputation for carrying the ciguatera toxin, and because of high densities of parasites in the flesh.

As detailed in Section 3.3.1.1, commercially important deepwater bottomfish inhabit the deep slopes of island coasts and banks at depths of 100 to 400 meters. The distribution of adult bottomfish is highly correlated with suitable physical habitat. In addition to depth, both the quantity and quality of habitat are important and generally include locations of high-relief areas with water movement. Fishermen target specific areas by drifting or anchoring their vessels taking into consideration ocean currents (both surface and at depth), wind speed and direction and sea conditions. These environmental constraints limit the time during which bottomfish fishing can be conducted.

3.4.3 Existing Regulatory Regimes

3.4.3.1 Federal Management Regime

3.4.3.1.1 Overview of the Fishery Management Plan (FMP) and Amendments

The Fishery Management Plan for Bottomfish and Seamount Groundfish of the Western Pacific Region (Bottomfish FMP) was implemented in 1986. It prohibits certain destructive fishing techniques, including explosives, poisons, trawl nets and bottom-set gillnets; establishes a moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts; and implements a permit system for fishing for bottomfish in the EEZ around the NWHI. (The moratorium on the commercial harvest of seamount groundfish stocks at the Hancock Seamounts, the only exploitable seamount habitat in the management area, remains in effect. At its 123rd meeting (June 21–24, 2004), the Council approved an extension of the moratorium until August 31, 2010 (69 FR 51400). Consequently, there is no seamount groundfish fishery in the region. The plan also establishes a management framework that includes adjustments such as catch limits, size limits, area or seasonal closures, fishing effort limitation, fishing gear restrictions, access limitation, permit and/or catch reporting requirements and a rules-related notice system.

The Bottomfish FMP has been amended seven times since 1986. Implemented in 1987, Amendment 1 includes the establishment of potential limited access systems for bottomfish fisheries in the EEZ surrounding American Samoa and Guam within the framework measures of the Bottomfish FMP. Amendment 2 (1988) divides the EEZ around the NWHI into two zones: the Hoomalu Zone to the northwest and the Mau Zone to the southeast. The amendment also establishes a limited access system for the Hoomalu Zone. Amendment 3 (1991), which has been supplanted by Amendment 6, defines recruitment overfishing as a condition in which the ratio of the spawning stock biomass per recruit at the current level of fishing to the spawning stock biomass per recruit that would occur in the absence of fishing is equal to or less than 20 percent. Amendment 3 also delineates the process by which overfishing is monitored and evaluated. Amendment 4 (1990) requires vessel owners or operators to notify NMFS at least 72 hours before leaving port if they intend to fish in a 50 nautical miles “protected species study zone” around the NWHI. This notification allows federal observers to be placed on board bottomfish vessels to record interactions with protected species if this action is deemed necessary. Amendment 5 (1999) establishes a limited access system for the Mau Zone and a framework for a Community Development Program. Amendment 6 (1999) identifies and describes essential fish habitat for managed species of bottomfish, discusses measures to minimize bycatch and bycatch mortality in the bottomfish fishery, provides criteria for identifying when overfishing has occurred in the fishery and describes fishing communities in the region. Amendment 6 initially was only partially approved, with the provisions for bycatch, overfishing and fishing communities in Hawaii disapproved. The disapproved provisions were rewritten and the revised provisions have been implemented. Amendment 7 (2003) brings the Bottomfish FMP into conformity with the Coral Reef Ecosystem (CRE) FMP by prohibiting fishing for BMUS in the CRE FMP's no-take areas, and amending the BMUS list to exclude species now managed under the CRE FMP.

4.3.1.2 Fisheries Management Plan (FMP) Regulations

For the complete list of federal regulations for Western Pacific Region fisheries, see 50 CFR Part 660. The following can be found at 50 CFR § 660.61.

Gear Restrictions

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

Permits

(1) The owner of any vessel used to fish for BMUS in the NWHI sub-area must have a permit and the permit must be registered for use with the vessel. A single vessel cannot be registered for use with a Hoomalu Zone permit and a Mau Zone permit at the same time.
(2) Hoomalu Zone limited access permit:

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

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

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

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

(a) Point system:

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

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

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

(3) Mau Zone limited access permit:

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

(a) The NMFS Pacific Islands Regional Office (PIRO) will issue an initial Mau Zone permit to a vessel owner who qualifies for at least 3.0 points under the following point system: An owner who held a Mau Zone permit on or before December 17, 1991, and whose permitted vessel made at least one qualifying landing of BMUS on or before December 17, 1991, shall be assigned 1.5 points; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1991 shall be assigned 0.5 point; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1992 shall be assigned 1.0 point; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1993 shall be assigned 1.5 points; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1994 shall be assigned 2.0 points; an owner whose permitted vessel made at least one qualifying landing of BMUS during 1995 shall be assigned 2.5 points; and an owner whose permitted vessel made at least one qualifying landing of BMUS during 1996 shall be assigned 3.0 points. A "qualifying landing" means any amount of BMUS lawfully harvested from the Mau

Zone and offloaded for sale. No points shall be assigned to an owner for any qualifying landings reported to the State of Hawaii more than 1 year after the landing.

(b) More than one Mau Zone permit may be issued to an owner of two or more vessels provided each of the owner's vessels for which a permit will be registered for use has made the required qualifying landings for the owner to be assigned at least 3.0 eligibility points.

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

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

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

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

Prohibitions

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

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

(2) Fish for, or retain on board a vessel BMUS in the Hoomalu Zone or Mau Zone without the appropriate permit registered for use with that vessel.
(3) Serve as primary operator or relief operator on a vessel with a Mau Zone or Hoomalu Zone permit without completing a protected species workshop conducted by NMFS.
(4) Fail to notify the USCG at least 24 hours prior to making any landing of bottomfish taken in the Hoomalu Zone.
(5) Fish within any protected species study zone in the NWHI without notifying the NMFS PIRO of the intent to fish in these zones. Protected species study zones means the waters within 50 nautical miles around the following islands of the NWHI and as measured from the following coordinates: Nihoa Island 23°05' N latitude, 161°55' W longitude; Necker Island 23°35' N latitude, 164°40' W longitude; French Frigate Shoals 23°45' N latitude, 166°15' W longitude; Gardner Pinnacles 25°00' N latitude, 168°00' W longitude; Maro Reef 25°25' N latitude, 170°35' W longitude; Laysan Island 25°45' N latitude, 171°45' W longitude; Lisianski Island 26°00' N latitude, 173°55' W longitude; Pearl and Hermes Reef 27°50' N latitude, 175°50' W longitude; Midway Island 28°14' N latitude, 177°22' W longitude; and Kure Island 28°25' N latitude, 178°20' W longitude.

Notification

(1) The owner or operator of a fishing vessel must inform the NMFS PIRO at least 72 hours (not including weekends and holidays) before leaving port of his or her intent to fish within the protected species study zones. The notice must include the name of the vessel, name of the operator, intended departure and return dates, and a telephone number at which the owner or operator may be contacted during the business day (8 a.m. to 5 p.m.) to indicate whether an observer will be required on the subject fishing trip.
(2) The operator of a fishing vessel that has taken bottomfish in the Hoomalu Zone must contact the USCG, by radio or otherwise, at the 14th District, Honolulu, HI; Pacific Area, San Francisco, CA; or 17th District, Juneau, AK, at least 24 hours before landing, and report the port and the approximate date and time at which the bottomfish will be landed.

At-Sea Observer Coverage

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

Reporting and Recordkeeping

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

3.4.3.1.3 Observer Program

During the period 1990–1993, observers were placed on NWHI bottomfish vessels to monitor protected species interactions, particularly interactions with the Hawaiian monk seal. More recently, the Hawaii-based NWHI bottomfish fishery has been monitored under a mandatory observer program since October 2003. Beginning then, PIRO personnel have conducted daily shore-side dock rounds in Honolulu to determine which fishing vessels are in port. The information is used to generate an estimate of fishing effort on a real-time basis by assuming that a vessel is fishing when it is absent from the harbor. From the fourth quarter of 2003 through the second quarter of 2005, observer coverage in the bottomfish fleet has averaged 21.4 percent, and there have been no interactions with protected species and bottomfish vessels.

3.4.3.1.4 Data Collection

The NMFS Pacific Islands Fishery Science Center (PIFSC) manages the Western Pacific Fisheries Information Network (WPacFIN), a partnership with the state and territorial governments in the region for collecting, processing, analyzing, sharing, and managing fisheries data. Through the cooperative efforts of the member agencies, WPacFIN provides fisheries data and information to NMFS, the Fishery Council, and its various committees and advisory bodies to develop, implement, evaluate, and amend FMPs for the region. WPacFIN staff assists island agencies (including HDAR) in designing and implementing appropriate local fisheries data collecting, monitoring, analyzing and reporting programs, complete with associated microcomputer-based data processing systems. Staff members also help promote data standards to facilitate information analyses and reports.

In regards to bottomfish fishery-dependent data collection, the HDAR has played a central role both within the MHI as well as the NWHI. Any fisherman who sells fish in Hawaii is required to have a Commercial Marine License (CML). These licenses may be "reporting" or "non-reporting." A non-reporting license holder is typically a crewman on a vessel for which the captain does all the reporting. Reporting fishermen must submit Monthly Fishing Reports to HDAR by the tenth of the following month.

For commercial fishermen with limited-entry federal NWHI bottomfish fishing permits, a NWHI Bottomfish Trip Daily Log is required for every day fished. These forms are due to HDAR by the tenth of the month after the end of the trip. These fishermen must also complete a NWHI Bottomfish Trip Sales Report for each fishing trip, but are not required to submit the Monthly Fishing Report.

There are no mandatory reporting or permit programs for recreational fisheries in the State of Hawaii. Recreational fisheries do constitute significant harvests of fisheries resources in the state, and the lack of quality data in relation recreation fishing patterns and harvests does hamper fishery management decisions. The Hawaii Marine Recreational Fishing Survey (HMRFS) collects voluntary recreational fishing information on several fisheries in the state (e.g. shoreline pole and line); however, the HMRFS has not been effective in capturing quality data from the Hawaii recreational bottomfish fishery. In terms of landings, the recreational bottomfish fishery (those without ever having a CML and those with expired CMLs) is believed harvest at least 25 percent to 70 percent of the total bottomfish catch (HDAR Bottomfish Fishery Survey 2005).

3.4.3.1.5 Federal Enforcement

Enforcement of federal fishery regulations around Hawaii is shared by the U.S. Coast Guard and NOAA's Office of Law Enforcement. The USCG's Fourteenth District is located in Hawaii, and two high-endurance cutters are home-ported in Honolulu. These cutters perform a variety of functions, including fishery regulations enforcement, throughout the Pacific Ocean. The District's air wing is based on Oahu and consists of three C-130 aircraft and three HH-65 helicopters that are used primarily for search and rescue. The C-130s also make law enforcement flights throughout the district's area of responsibility.

The NOAA Office of Law Enforcement, Honolulu Field Office is responsible for enforcing federal laws and regulations pertaining to federally regulated fisheries and federally protected living marine resources. Four special agents, one fishery patrol officer, and three support employees routinely respond to alleged violations throughout the Hawaiian Islands and the Western Pacific Ocean. Enforcement is accomplished in cooperation with the USCG and the State of Hawaii.

3.4.3.2 State of Hawaii Management Regime

The state bottomfish fishery is managed by the Hawaii Department of Land and Natural Resources, Division of Aquatic Resources. In response to very low and decreasing SPR values for onaga and ehu in the MHI, HDAR developed and implemented new regulations for bottomfish fishing in state waters (Hawaii Administrative Rules [HAR] 13-94; effective June 1, 1998). This rule established regulations for the deep-sea bottomfish fishery managed by the state and includes gear restrictions, noncommercial bag limits, 19 areas closed to bottomfish fishing (BFRAs), requirements for registration and identification of bottomfish fishing vessels, and a control date for possible future implementation of a limited access management regime. HDAR e is currently proposing new BRFAs throughout the state (see Section 2.2.2).

3.4.3.2.1 State Regulations

State of Hawaii regulations require any person who takes marine life for commercial purposes, whether within or outside of the state, to first obtain a commercial marine license from the HDAR.

HAR 13-94, Bottomfish Management, defines "bottomfish" as seven deep-water species, including onaga, ehu, kalekale, ōpakapaka, gindai, hapụupụu, and lehi. Use or possession of nets, traps, trawls or bottomfish longlines in bottomfish fishing is prohibited. Non-commercial fishermen are limited to a maximum of five onaga or ehu, or a mix of both, per person. The rule also established 19 areas around the MHI closed to bottomfish fishing. Bottomfish fishing vessels must be registered with the state and identified with the letters "BF" and appropriate registration numbers (Department of Boating and Ocean Recreation vessel registration, federal fishery permit numbers or USCG vessel documentation number) on the vessel. A control date of June 1, 1998 was also established to potentially qualify applicants for a future limited entry program for commercial bottomfish fishing.

HAR 13-95, Rules Regulating the Taking and Selling of Certain Marine Resources, establishes a minimum size of one pound for the sale of ōpakapaka, onaga, and uku.

In September of 2005, Governor Linda Lingle, signed HAR 13 60.5, NWHI Marine Refuge, that put all State waters from Nihoa to Kure Atoll into a no extraction marine refuge. All commercial and recreational fishing is now prohibited in these waters.

3.4.3.2.2 State Data Collection

The State of Hawaii provides fishermen with a Commercial Fisheries Statistical Charts, a grid to facilitate reporting of catch by area. The inshore reporting grid areas are irregular shapes, and do not mirror known fishing grounds or habitat, and are not aligned with known management areas. The seaward boundaries of the inner grid areas generally lie two miles from shore. However, the grid has not been geo-referenced (Walter Ikehara, NMFS, formerly of HDAR, personal communication). The offshore grids are aligned by latitude and longitude on a Mercator Projection, giving standard 20 minute square grid areas. Any fisherman who sells fish in Hawaii is required to have a Commercial Marine License (CML). These licenses may be "reporting" or "non-reporting." A non-reporting license holder is typically a crewman on a vessel for which the captain does all the reporting. Reporting fishermen must submit Monthly Fishing Reports to HDAR by the tenth of the following month. Starting March 1, 2006, HDAR begun a policy where fishermen wanting to renew their annual CML have to submit all of their missing reports or HDAR will not issue the fishermen a CML. The reason for this policy is to facilitate more complete and timely reporting (R. Kokubun, HDAR, personal communication).

The shortcomings associated with reporting bottomfish based on the Commercial Fisheries Statistical grids are particularly problematic when Penguin Bank is considered. Penguin Bank (grid 331) (Figure 8) is almost entirely in federal waters and is a highly popular bottomfish fishing area. The edge of the reporting grid parallels the bank slope which is recognized as prime bottomfish habitat. Adjacent grids, such grid 429, include the bottomfish habitat on the east coast of Oahu. Fish reported in grid 429 could have come from Makapuu Point off of east Oahu or from the western edge of Penguin Bank. However, when meeting with active bottomfish fishermen who frequent Penguin Bank, they indicate that all catches taken in the Penguin Bank area are reported as coming from 331. Another problem associated with reporting grid 331 is that it does not allow for finer evaluation of fish caught from different locations on the Bank. Without good spatial data it is difficult to predict the immediate consequences of the action, and to monitor subsequent changes when the action is taken.

The problems with the existing reporting grids are clear, however HDAR has been hesitant to revise the grid system because of concerns with an inability to compare historical to new catch area information. However, the importance of improving the reporting grid to facilitate monitoring and assessments is recognized by HDAR, and options for improving the grid are under consideration.

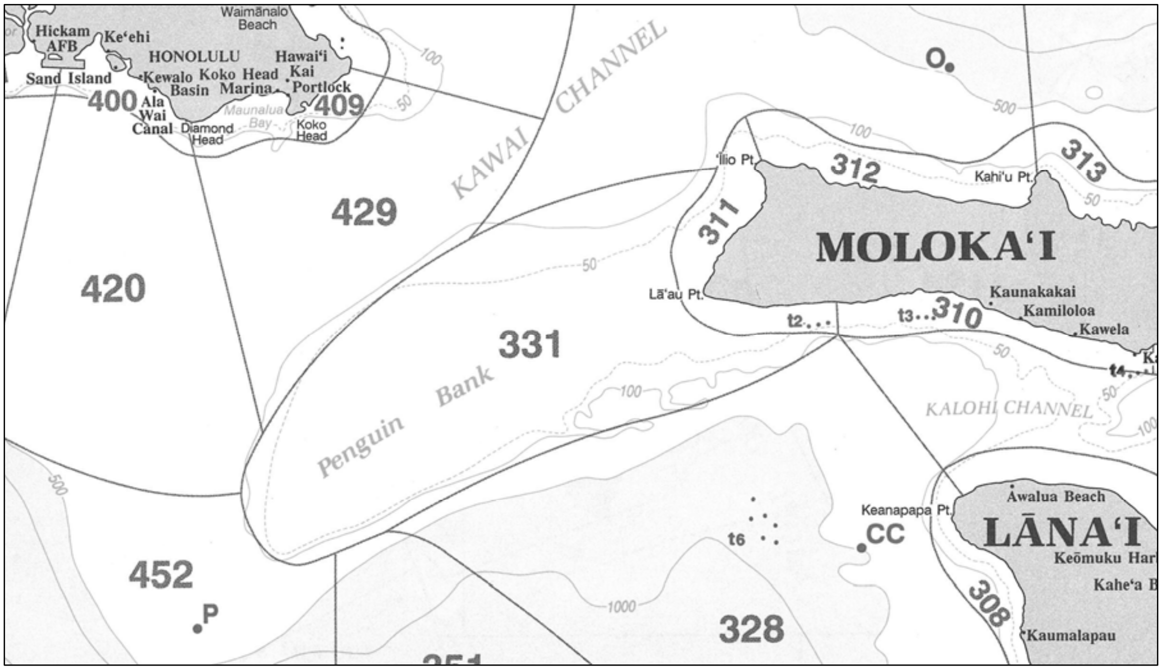


Figure 8: State of Hawaii CML Statistical Grids around Penguin Bank.

3.4.3.2.3 State Enforcement

The Board of Land and Natural Resources (BLNR), which oversees the operations of the DLNR, has police powers, and appoints and commissions enforcement officers within the Division of Conservation and Resources Enforcement. Enforcement Officers (DOCARE) enforce statutes and regulations of the state in all state lands including public lands, state parks, forest reserves, forests, aquatic life and wildlife areas, Kahoolawe Island Reserve, and any other lands and waters within the state. Violations can be dealt with through the state criminal court system, administratively, or through the BLNR. There are approximately 130 DOCARE officers in the state, and as state above, their area of responsibility is wide ranging and includes both terrestrial and marine areas. DOCARE possesses several small vessels (approximately 25 ft) and two larger vessels (approximately 35 ft).

Given the apparent lack of adequate funding to DOCARE over the past many years, DOCARE has not had the ability to properly enforce the state's existing BRFAs (G. Moniz, DOCARE, personal communication). A consistent comment heard in the public scoping meetings related to this DSEIS is that there was never any enforcement of the BRFAs, nor enforcement of the recreational bottomfish bag limit. DOCARE states that in the eight years of the state's BRFAs, they have only received two complaints about fishermen illegally fishing within a BRFA (G. Moniz, DOCARE, personal communication).

3.4.4 Commercial Fisheries

3.4.4.1 Participation and Effort

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

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

The majority of participants in the MHI fishery shift from species group to species group and from the bottomfish fishery to other fisheries, primarily the pelagic fishery, in response to seasonal fish abundance or fluctuations in price. Except for those individuals who fish commercially on a full-time basis, most fishermen usually fish for bottomfish no more than 60 days a year (WPRFMC 1996). Based on 2005 survey conducted by HDAR, Saturday is the most common day of the week to go bottomfish fishing in the MHI. Seasonal price variability causes part-time commercial fishermen to concentrate their bottomfish fishing effort during December, when they can take advantage of the year-end holiday demand for red snappers. Pelagic species are often an important secondary target during bottomfish fishing trips regardless of the season.

The number of fishermen engaged in bottomfish fishing in the MHI increased dramatically in the 1970s and 1980s, but then declined in the early 1990s, rebounded somewhat in the late 1990s, but in 2002 reached its lowest level since 1977 (Table 11; Figure 9). The decline in vessels and fishing effort may be due to the long-term decrease in catch rates in the bottomfish fishery and a shift of fishing effort towards tuna and other pelagic species.

Table 11: Number of Commercial Vessels in the MHI Bottomfish Fishery, 1948–2002.

Year	No. Vessels	Year	No, Vessels	Year	No. Vessels
1948	207	1968	116	1988	572
1949	196	1969	130	1989	537
1950	164	1970	219	1990	501
1951	126	1971	198	1991	469
1952	110	1972	185	1992	407
1953	106	1973	238	1993	403
1954	103	1974	241	1994	423
1955	108	1975	295	1995	400
1956	106	1976	306	1996	487
1957	102	1977	377	1997	502
1958	96	1978	414	1998	498
1959	76	1979	423	1999	483
1960	69	1980	461	2000	495
1961	65	1981	430	2001	404
1962	98	1982	526	2002	386
1963	110	1983	541	*2003**	325
1964	87	1984	558	*M*	465
1965	85	1985	583	*SD*	66
1966	97	1986	538		
1967	99	1987	535		

* 2003 Data Incomplete.
Source: WPRFMC 2005c..

In contrast to the MHI fishery, bottomfish fishing in the NWHI is conducted solely by part-time and full-time commercial fishermen. The vessels venturing into the NWHI tend to be larger than those fishing around the MHI, as the distance to fishing grounds is greater (Haight et al. 1993a).

The medium-sized powered vessels are 42 to 49 feet long. Because their smaller size limits fishing range and hold capacity, they usually operate in the lower (southeastern) end of the

NWHI (Mau Zone) or in the MHI. The larger powered vessels are 47 to 64 feet long. With an average fuel capacity of 1,500 gallons, the vessels have a maximum range (round trip) of 1,800 miles. The average maximum hold capacity is 4,000 pounds.

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

A 1993 survey of participants in the NWHI fishery found that vessels fishing in the Mau Zone made an average of 12.7 trips to the area to target bottomfish and 3.4 trips to target pelagic fish or a mixture of pelagic species and bottomfish (Hamilton 1994).

Because the NWHI bottomfish fishing grounds were divided into the Mau Zone and Hoomalu Zone in 1988, the Mau Zone has generally seen a greater share of the fishing effort as access to the Hoomalu Zone was restricted under a limited access program (WPRFMC 1999). Only five vessels harvested bottomfish in the Mau Zone in 1989, but during the 1990s an average of ten vessels fished in the area (Table 12). The amount of effort (fishing days) expended in the Mau Zone has fluctuated along with the number of active vessels. Mau Zone activity levels peaked in 1994 with a total of 594 fishing days as a result of a combination of relatively large fleet size and intensive activity by each vessel.

Table 12: Number of Vessels in the NWHI Bottomfish Fishery, 1984–2003.

Year	Mau	Hoomalu	Total[2]	Year	Mau	Hoomalu	Total[2]
1984	NA	NA	19	1995[1]	10	5	15
1985	NA	NA	23	1996[3]	13	3	16
1986	NA	NA	24	1997[3]	9	6	15
1987	NA	NA	28	1998[2]	7	7	13
1988	4	12	13	1999[3]	7	6	13
1989	5	5	10	2000[3]	6	5	11
1990	14	5	16	2001[3]	6	5	11
1991[1]	14	4	17	2002[3]	5	4	9
1992[1]	8	5	13	2003[3]	5	4	9
1993[1]	8	4	12	*M*	8.31	5.25	13.06
1994[1]	12	5	16	*SD*	3.36	1.98	2.59

Note. [1]Based on NMFS and HDAR data. [2] Total may not match sum of areas due to vessel participation in both areas. [3]Based on HDAR data. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Eighty-one permits to fish in the Mau Zone have been issued since 1989, but only 37 of the permits were actually used. The turnover rate has been high, with only 38 percent of the 37 active vessels fishing in the Mau Zone for more than 2 years. A limited access program was established for the Mau Zone in 1999, and ten vessels are allowed to fish in the area under the Bottomfish FMP. Permits to fish in the Mau Zone are nontransferable and subject to a use-it-or-lose-it requirement. At present, there is no procedure for issuance of new Mau Zone limited access permits. Currently, there are 4 permitted bottomfish vessels fishing the Mau Zone.

A limited access program was established for the Hoomalu Zone in 1989. Since 1995, the number of vessels allowed to fish in the area has been set at seven. Permits to fish in the Hoomalu Zone are non-transferable and subject to a use-it-or-lose-it requirement. New Hoomalu Zone limited access permits are issued based on a point system. Since 1989, 17 permits to fish in the Hoomalu Zone have been issued, of which 15 have been used. In comparison to the Mau Zone, the Hoomalu Zone exhibits more continuity in participation, but the turnover has still been fairly high. Only about half of the active vessels have fished in the Hoomalu Zone for more than two years. Currently, there are four permitted bottomfish vessels active in the fishery.

Table 13 summarizes the number of trips taken per year in each of the Hawaii bottomfish fishing zones. In the Mau Zone, the largest number of trips occurred in 1994 and 1995 at nearly 100 in each year. From 1998 to 2002 the number of trips to this zone has averaged 49, although in 2002, 76 trips were made.

The number of trips to the Hoomalu Zone peaked in its inaugural year, 1988, and has only reached 50 trips once thereafter (1998). Between 1998 and 2002, the average number of trips made there is 38 per year.

Recorded (commercial) trips in the MHI peaked at 5,091 in 1989. Prior to 1979, there had never been a year with more than 2,000 trips. The MHI fishery peaked in the period 1983–1989, when the annual number of trips averaged 4,414. The highest number of MHI annual trips since then is 3,810 in 2000. The average number of MHI trips between 1998 and 2002 is 3024. The 2003 total, although incomplete, is the lowest in 25 years (see Figure 9).

Table 13: Number of Trips in the Hawaii Bottomfish Fishery, 1988–2003.

Year	Mau	Hoomalu	Total NWHI	MHI
1988	21	72	93	4,911
1989	22	28	50	5,091
1990	55	25	80	3,242
1991[1]	84	47	131	2,895
1992[1]	55	37	92	3,401
1993[1]	72	34	106	1,977

Year	Mau	Hoomalu	Total NWHI	MHI
1994[1]	99	41	140	2,333
1995[1]	97	33	130	2,031
1996[2]	81	26	107	2,780
1997[2]	53	38	91	3,158
1998[2]	39	50	89	3,023
1999[2]	30	48	78	2,970
2000[2]	47	36	83	3,810
2001[2,3]	55	41	87	2,761
2002[2,]	76	26	102	2,556
2003[2,4]	37	39	76	1,517
M				
SD				

Note. [1]NWHI data from combination NMFS and HDAR. [2]Data from HDAR. [3]2001 data are a combination of HDAR data sets. [4]Incomplete data. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

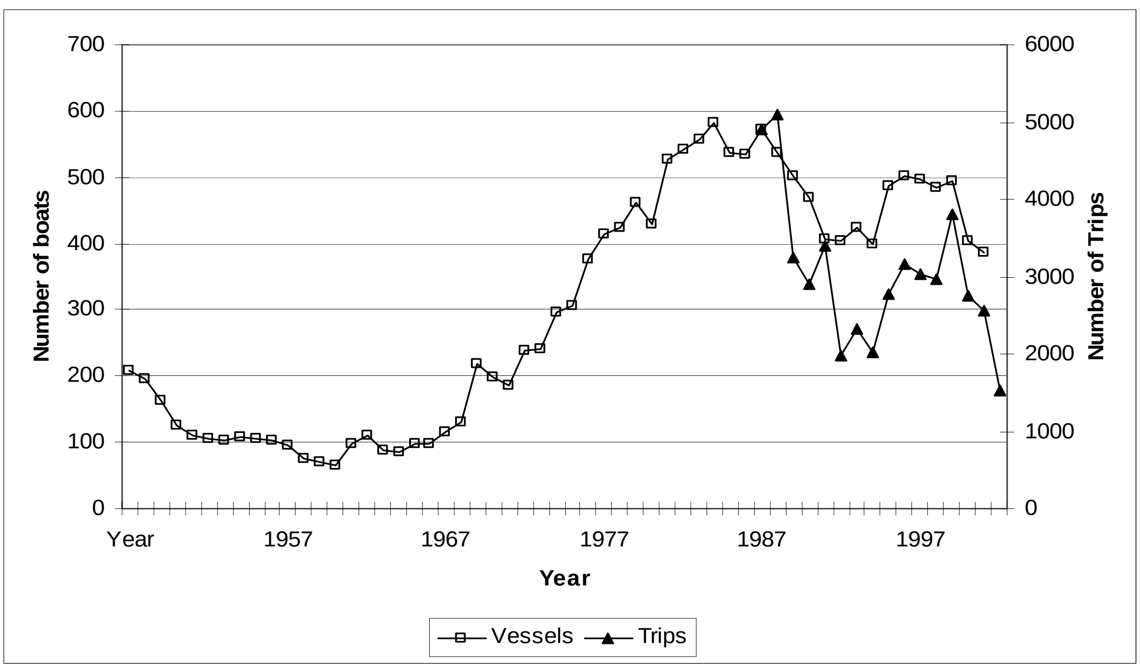


Figure 9. MHI Bottomfish Vessels and Trips by Year. Source: WPRFMC 2005c, Bottomfish 2003 Annual Report.

Table 14 summarizes the number of MHI bottomfish fishing trips by area. For the most recent years for which data are available there have been on average 445 trips to Penguin Bank, but only nine to Middle Bank.

Table 14: Summary of Number of Trips[1] by Area.

Zone Name	2000	2001	2002	2003
Hawaii (island) state water (0–2)	638	499	427	403
Hawaii (island) federal water	890	752	565	489
Hawaii (island) both	1,526	1,249	992	891
MMLK state water (0–2)	480	359	363	355
MMLK federal water	909	605	613	558
MMLK both	1,386	960	973	908
Penguin Bank federal water	480	377	496	426
MMLK plus 331 federal water	1,865	1,336	1,469	1,332
Oahu state water (0–2)	203	143	184	214
Oahu federal water	361	255	335	402
Oahu both	563	398	518	612
Kauai state water (0–2)	143	140	187	112
Kauai federal water	333	236	193	93
Kauai both	475	376	379	205
Middle Bank federal water	17	8	7	5

Note. MMLK (Maui, Molokai, Lanai, Kahoolawe) does not include Penguin Banks, until mentioned otherwise. [1] Trip/License by areas may not be additive because the fisherman may have fished in more than one area during a single trip. The more than one area per trip may be divided into state/federal or multiple areas within each broad destination. Trip = 1 day fished. Source: Kawamoto and Tao 2005.

Table 15 summarizes the number of participants using state and federal bottomfish fishing areas around the MHI. As reflected by the numbers of trips shown in Table 13, Penguin Bank is a highly popular area, used on average during the past 4 years by 61 license holders. In contrast, Middle Bank, much less accessible to smaller boats and those based farther south, was used on average by only about three license holders per year.

Table 15. Summary of Unique License Numbers[1] by Area.

Zone name	2000	2001	2002	2003
Hawaii (island) state water (0–2)	76	62	64	57
Hawaii (island) federal water	116	98	84	44
Hawaii (island) both	178	153	131	89
MMLK state water (0–2)	81	63	61	59
MMLK federal water	102	91	80	66
MMLK both	146	120	112	99
Penguin Bank federal water	77	58	59	50
MMLK plus 331 federal water	209	168	163	145
Oahu state water (0–2)	56	41	51	53
Oahu federal water	76	51	52	46
Oahu both	120	81	91	89
Kauai state water (0–2)	32	35	40	37
Kauai federal water	61	46	42	16
Kauai both	85	71	66	44
Middle Bank federal water	5	4	2	2

Note. MMLK (Maui, Molokai, Lanai, Kahoolawe) does not include Penguin Banks, until mentioned otherwise.

[1]Trip/License by areas may not be additive because the fisherman may have fished in more than one area during a single trip. The more than one area per trip may be divided into state/federal or multiple areas within each broad destination. Trip = 1 day fished. Source: Kawamoto and Tao 2005.

3.4.4.2 Landings

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

Based on recent (1999 to 2003) landings data, commercial bottomfish catches in the MHI fishery represent approximately 60 percent of the total commercial bottomfish landings in Hawaii (WPRFMC 2003). If, as has been suggested, unreported noncommercial landings, virtually all of which are from the MHI, are approximately equal to the reported commercial landings from the MHI, it would mean that about 75 percent of Hawaii's bottomfish landings are from the MHI. The annual bottomfish landings in the MHI have been fairly stable for the past 10 years (Table 16), however, in the past 3 years landings have trended downward (Figure 10) reflecting a rather sharp drop in participation.

Table 16: Commercial Bottomfish Landings in the MHI and NWHI 1984–2003 (1,000 lbs).

Year	Mau	Hoomalu	Total NWHI	MHI[2]
1984	NA	NA	661	807
1985	NA	NA	922	763
1986	NA	NA	869	810
1987	NA	NA	1,015	783
1988	NA	NA	625	1,164
1989	118	184	303	1,006
1990	249	173	421	646
1991[1]	103	283	387	548
1992[1]	71	353	424	587
1993[1]	98	287	385	348
1994[1]	160	283	443	458
1995[1]	166	202	369	440
1996[1]	133	176	309	440
1997[1]	105	241	346	513
1998[1]	66	266	332	479
1999[2]	54	269	323	455
2000	49	213	262	497
2001	50	236	286	367
2002[4]	108	120	228	362
2003[3,4]	77	145	222	273
M	107.13	228.73	336.00	494.60
SD	53.89	63.03	235.53	233.77

Note. [1]NWHI data from combination NMFS and HDAR. 2. Data from HDAR. [3]Incomplete data. [4]MHI data incomplete. Source: WPFMC 2005c, 2003 Bottomfish Annual Report.

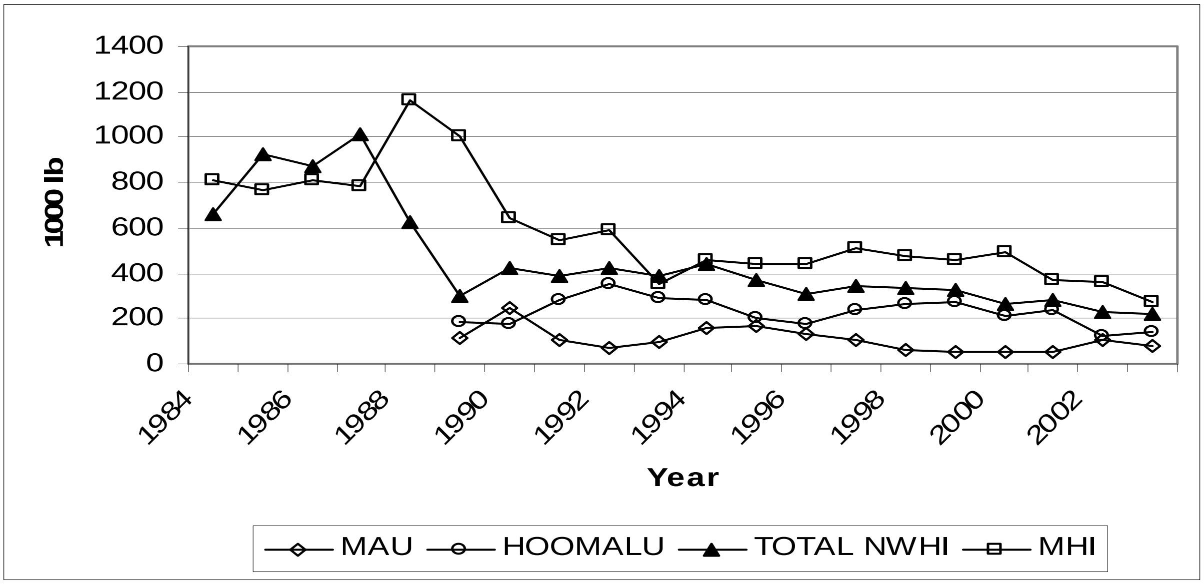


Figure 10: Commercial Bottomfish Landings in Hawaii by Year and Management Zone. Source: WPFMC 2005c, 2003 Bottomfish Annual Report.

Total NWHI bottomfish landings grew dramatically in the mid-1980s and then tailed off, stabilizing in the 1990s at a level slightly below the MHI bottomfish landings (Table 16).

The ex-vessel sales of BMUS in 2002 clearly show the substantial effects of changes in fishing strategy and participation in the fishery. The overall vessel sales reports indicate that the total NWHI BMUS landings were substantially lower in 2002 (Table 16). A single vessel dropped out of each management zone with varying effects on the overall zone landings. Although the Mau Zone lost a vessel, there were some vessels that did increase their targeting of bottomfish contrary to their usual pelagic species/mixed species targeting strategy. The BMUS landings in the Mau Zone increased by 116 percent (Table 16) while the number of trips increased by 38 percent. The Hoomalu Zone lost a single participating highliner vessel and the effects of that loss were realized in the 49 percent decrease in landings and the 36 percent decrease in the number of trips from that zone.

In 2003, the number of vessels fishing in the Mau and Hoomalu Zones remained constant from the previous year, but the number of trips taken changed substantially in both zones. In 2003, Mau Zone trips decreased by 51 percent, while Hoomalu Zone trips increased by 50 percent. These shifts in effort resulted in a 29 percent decrease in Mau Zone landings and a 21 percent increase in Hoomalu Zone landings.

In the MHI, landings peaked in the 1988 to 1989 period, coincident with the historical maximum number of recorded trips. In recent years, landings have trended downward, with the 2003 landings being the lowest since 1970, reflecting the 25-year low in number of trips.

Table 17 summarizes NWHI BMUS landings by species. From 1991 through 1998, ōpakapaka landings were greater than those of any other species in the NWHI. From 1999 through 2001, however, onaga landings were higher than those of any other species. For the two most recent years, uku landings have predominated. For comparison, Table 18 summarizes MHI BMUS landings by species over the same period. Opakapaka landings were greater than those of any other species in every year.

Table 19 summarizes bottomfish landings from areas around the MHI. Reflecting the pattern observed for effort and participation, the landings for Penguin Bank are substantial, but those for Middle Bank are the lowest for any of the areas. The Penguin Bank landings have averaged nearly 60,000 pounds annually, but there has been a general downward trend over the past four years.

Table 17: NWHI BMUS Landings by Species (1,000 lbs).

Species	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Opakapaka	79	86	145	158	145	105	79	109	87	77	53	67	36	20
Onaga	21	46	23	40	42	53	30	55	48	93	92	73	54	50
Ehu	25	20	8	11	15	8	17	15	17	17	13	14	10	10
Hapụupụu	85	59	57	59	68	54	49	57	70	59	23	31	29	36
Butaguchi	103	75	79	64	61	47	46	51	38	28	29	32	29	20
Uku	77	69	86	33	78	75	62	37	55	36	43	59	60	82
Other BMUS	23	22	18	19	27	17	25	19	15	11	9	12	11	6

Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Table 18: MHI BMUS Landings by Species (1,000 lbs).

Species	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Opakapaka	147	134	178	103	158	137	171	172	168	155	179	108	108	91
Onaga	108	89	72	43	52	49	81	83	69	72	89	54	67	50
Ehu	34	27	29	18	18	21	34	31	28	23	35	22	17	11
Hapụupụu	15	14	14	9	13	14	14	17	14	12	19	12	8	7
Uku	109	90	88	61	72	59	64	81	74	108	96	66	56	36

Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Table 19: Summary of Pounds Caught by Area.

Zone Name	2000	2001	2002	2003
Hawaii (island) state water (0–2)	31,713	21,567	16,689	22,310
Hawaii (island) federal water	47,422	39,450	29,302	24,191
Hawaii (island) both	79,135	61,017	45,991	46,501
MMLK state water (0–2)	46,304	31,909	37,430	38,616
MMLK federal water	105,527	61,962	69,338	61,407
MMLK both	151,831	93,871	106,768	100,023
Penguin Bank federal water	77,910	52,391	62,913	45,459
MMLK plus 331 federal water	229,741	146,262	169,681	145,482
Oahu state water (0–2)	6,014	4,621	6,933	9,768
Oahu federal water	31,190	17,097	19,066	19,877
Oahu both	37,204	21,718	25,999	29,645
Kauai State water (0–2)	13,203	10,082	10,665	7,272
Kauai federal water	22,028	25,676	28,822	22,104
Kauai both	35,231	35,758	39,487	29,376
Middle Bank federal water	Confidential Data[1]			

Note. MMLK (Maui, Molokai, Lanai, Kahoolawe) does not include Penguin Banks, until mentioned otherwise. [1]Trip/License by areas may not be additive because the fisherman may have fished in more than one area during a single trip. The more than one area per trip may be divided into state/federal or multiple areas within each broad destination. Trip = 1 day fished. Source: Kawamoto and Tao, 2005.

To illustrate the importance of Penguin Bank and Middle Bank to the MHI bottomfish fishery, Figure 11 plots landings of the seven major bottomfish species from those two areas as a proportion of the total MHI landings of those species. That proportion has varied from a low of 12 percent in 1999 to a high of 25 percent in 1994. The proportion was 19 percent in 2004.

There is an annual cycle of landings from Penguin and Middle Banks, as can be seen in Figure 12. Landings peak in December and January and are lowest in June and July.

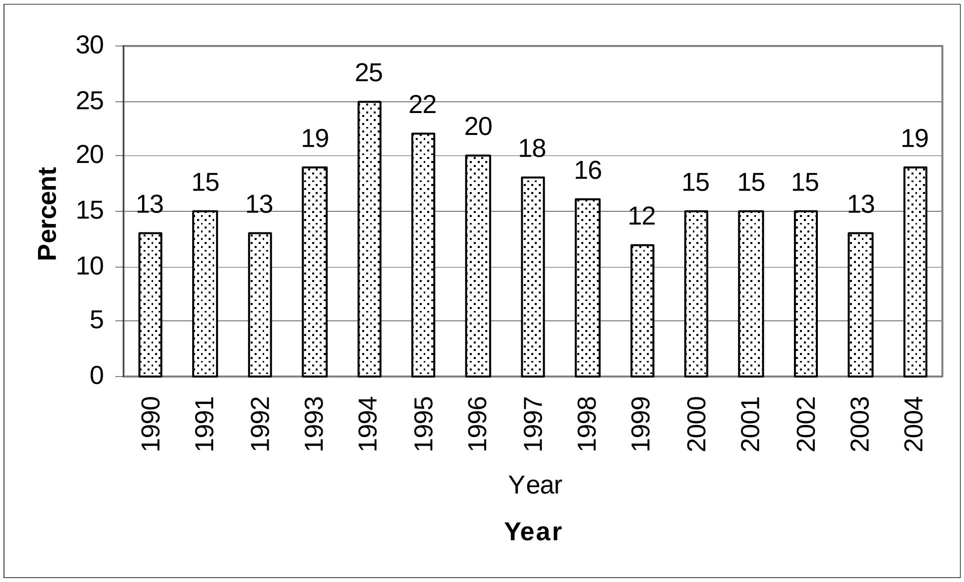


Figure 11: Landings from Penguin and Middle Banks as a Percentage of Total MHI Landings (Deep 7 Species). Source: Kawamoto and Tao, 2005.

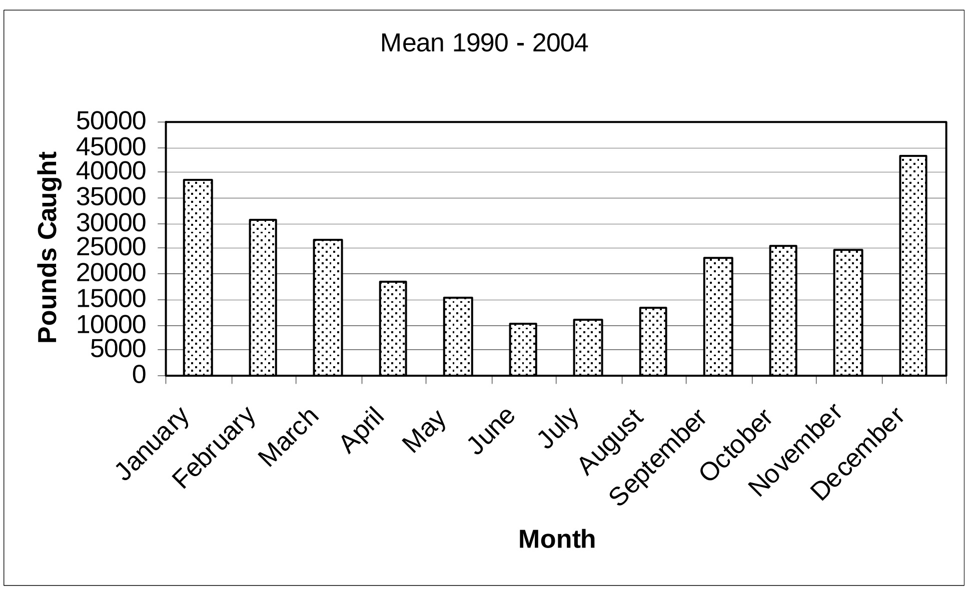


Figure 12: Monthly Landings From Penguin and Middle Banks. Source: Kawamoto and Tao, 2005.

The following tables present additional, newer analyses of landings by species and landings by month in the Hawaii bottomfish fishing zones. Tables 20 to 22 and Figure 13 show the species composition of the three bottomfish management zones in the Hawaiian Islands archipelago between 1996 and 2004. Between five and seven species form over 90 percent of catch in each management area. In the MHI, catches are dominated by opakapaka, onaga, uku, taape, papio/ulua, ehu, and kalekale, with opakapaka, onaga and uku accounting for almost two thirds of landings. Another distinguishing feature of MHI bottomfish catches is the relatively large amount of ta'ape, which forms over 13 percent of landings. Ta'ape is found in only relatively small quantities in landings from the Mau Zone and is not recorded in Hoomalu Zone landings.

Uku or the green snapper, *Aprion virescens*, is also a major component of MHI bottomfish catches, and is the most dominant feature of bottomfish catches from the Mau Zone, where it forms almost 40 percent of the catch. The other dominant species in Mau Zone catches include butaguchi, opakapaka, hapuupuu, onaga, and ehu. Butaguchi, opakapaka, and hapuupuu all make similar contributions to the catch, while onaga forms less than 10 percent of catches. In the neighboring Hoomalu Zone, onaga, and opakapaka make up just over half of the catches, with the balance of the catch formed principally by hapuupuu, uku, and butaguchi.

These catch composition data indicate quite clearly that there are major differences in the catch composition between the three zones. Opakapaka and onaga account for about half the landings from the MHI and Hoomalu Zone but are a much smaller fraction (21 percent) of the Mau Zone landings, which are dominated by shallow water bottomfish species, particularly uku and butaguchi.

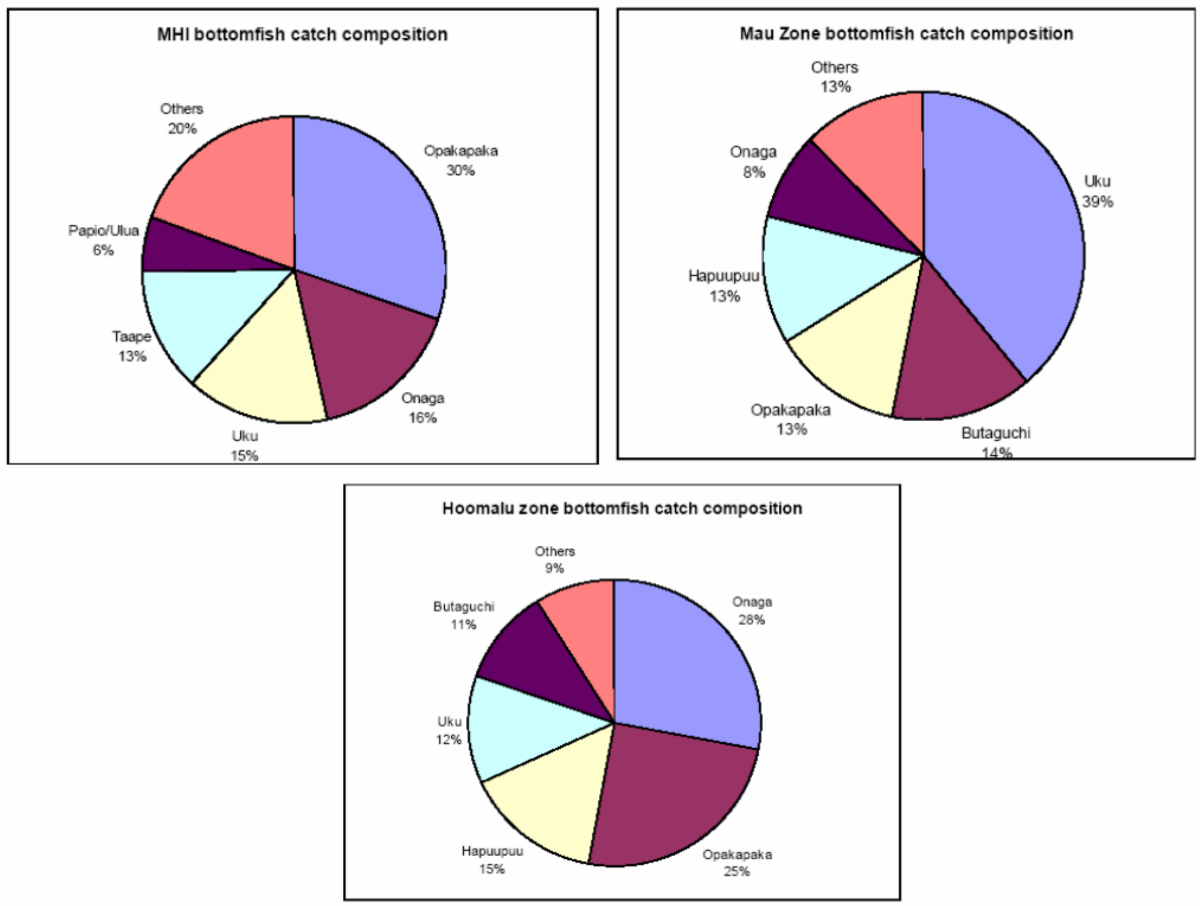


Figure 13: Average Species Composition (1996–2004) of Bottomfish Catches from the Three Bottomfish Management Zones in the Hawaii Archipelago. Source: Kawamoto and Gonzales 2005.

Table 20: MHI BMUS Pounds Caught, Totals by Species and Year, 1996–2004.

MHI Zone					Year				
Species Name	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Hapuupuu	11,466	14,215	11,346	10,106	16,183	11,105	8,411	10,208	8018
Kahala	5,526	12,108	21,805	17,599	22,573	13,823	11,336	4,886	6952
Kalekale	21,788	21,252	19,886	11,190	16,659	11,759	11,451	9,922	7785
Opakapaka	148,730	145,807	141,958	129,155	149,879	100,003	108,917	115,719	102168
Uku	53,309	67,976	61,105	89,834	80,036	57,469	56,930	44,254	67776
Ehu	28,286	25,798	23,728	19,429	29,522	20,911	17,441	15,489	22178
Onaga	67,550	69,145	58,325	60,981	74,531	54,993	68,981	71,560	85072
Papio/Ulua	35,579	41,330	40,770	25,039	23,409	24,585	20,605	1,046	1765
Lehi	8,839	12,367	8,647	9,859	10,834	10,427	9,536	8,573	6673
Gindai	3,143	2,812	3,346	2,390	3,653	3,127	2,129	2,039	2104
Taape	44,195	85,491	74,851	70,073	55,041	47,551	39,399	37,895	43528
Armorhead	0	0	0	0	0	0	0	0	0
Butaguchi	3,261	5,926	1,944	1,796	2,653	1,737	1,649	1,632	1341
Gunkan ulua	52	192	315	12	73	123	421	1,072	1038
White ulua	6,213	2,204	3,717	2,977	4,046	4,202	4114	12,255	11087
Yellow-tail kali	0	0	0	0	0	5	1	0	44

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales 2005.

Table 21: Mau Zone BMUS Pounds Caught, total by Species and Year, 1996–2004.

Mau Zone	Year								
Species Name	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Hapuupuu	20,166	13,838	7,517	5,777	4,657	4,266	17,110	17,376	11,824
Kahala	205	0	480	1,206	2,024	387	1,285	986	1,518
Kalekale	7,729	3,985	1,630	1,257	2,638	2,016	3,099	1,310	872
Opakapaka	15,632	26,586	9,428	7,918	6,987	4,182	15,405	6,372	10,609
Uku	47,610	24,621	32,152	27,144	13,033	19,086	44,679	53,177	46,769
Ehu	12,238	4,070	3,091	4,231	5,159	6,083	6,702	3,269	2,497
Onaga	10,865	17,301	1,835	3,969	3,462	3,824	9,725	6,107	9,573
Papio/Ulua	15	0	12	0	0	0	0	0	0
Lehi	201	47	43	36	575	25	26	55	0
Gindai	3,487	1,036	613	1,109	841	608	1,400	885	915
Taape	40	9	2	5	17	47	24	1	5
Armorhead	0	0	0	0	0	0	0	0	0
Butaguchi	25,289	16,461	9,113	7,229	14,365	8,328	10,391	8,741	11,558
Gunkan ulua	872	547	450	248	183	224	1169	420	283
White ulua	818	500	237	129	298	551	785	21	140
Yellow-tail Kali	49	0	25	6	0	0	6	8	11

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales 2005.

Table 22: Hoomalu Zone BMUS Pounds Caught, Totals by Species and Year, 1996–2004.

Hoomalu Zone	Year								
Species Name	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Hapuupuu	21,892	44,490	65,313	56,018	20,595	21,107	12,670	19,800	23,089
Kahala	30	48	0	100	0	320	0	0	2,017
Kalekale	1,708	3,913	3,710	3,201	1,563	1,499	1,053	1,149	1,039
Opakapaka	61,568	85,465	75,537	71,841	50,487	52,901	22,846	159,60	21,389
Uku	16,328	14,853	23,040	13,758	29,824	36,491	14,861	41,721	35,872
Ehu	6,163	11,230	14,988	14,161	8,487	8,372	3,836	7,579	7,443
Onaga	18,997	38,296	49,851	94,594	91,354	70,630	47,204	48,379	62,463
Papio/Ulua	0	0	0	0	0	0	0	7	0
Lehi	0	17	0	0	4	0	11	0	0
Gindai	1,684	4,289	4,501	2,860	1,153	1,362	1,546	1,982	2,384
Taape	0	0	0	0	0	0	0	0	0
Armorhead	0	0	12	11	8	0	0	0	4
Butaguchi	23,515	36,817	30,257	22,726	21,388	19,432	20,325	14,614	13,033
Gunkan ulua	0	0	0	0	377	0	0	0	11
White ulua	11,646	5,244	6,523	2,638	1,624	5,249	2,939	507	549
Yellow-tail Kali	0	0	0	0	0	0	0	0	0

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005.

Table 23: MHI BMUS Pounds Caught, Totals by Month and Year, 1996–2004.

MHI Zone					Year				
Month	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
January	53,913	57,773	83,724	41,694	36,722	53,068	41,446	36,027	44,366
February	31,793	49,515	50,500	38,532	76,062	39,302	30,018	29,006	27,899
March	39,422	44,093	59,069	23,414	41,962	39,919	31,590	43,604	18,747
April	27,485	49,829	21,049	23,257	21,017	15,107	41,743	22,804	24,408
May	33,442	39,580	24,274	43,720	46,075	36,673	35,601	26,174	24,551
June	29,063	19,230	27,453	41,339	45,679	22,055	20,026	28,205	19,606
July	21,726	25,949	28,874	32,397	19,217	22,966	20,091	10,465	24,401
August	36,038	35,942	32,975	27,990	26,018	16,679	16,034	14,445	24,009
September	37,985	43,304	27,091	35,115	42,427	18,703	37,909	30,453	32,537
October	42,197	39,819	32,598	41,357	24,360	26,998	17,953	38,647	31,022
November	36,172	45,343	30,030	33,580	26,445	37,458	30,072	19,419	43,451
December	48,701	56,246	54,106	68,045	83,108	32,892	38,838	37,301	52,532

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005.

Table 24: Mau Zone BMUS Pounds Caught, Totals by Month and Year, 1996–2004.

Mau Zone					Year				
Month	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
January	13,330	15,195	7,792	3,331	2,158	1,060	1,218	5,074	6,348
February	12,349	21,853	11,791	4,411	1,116	3,009	6,840	9,152	10,069
March	11,729	10,340	10,596	3,918	0	3,528	14,170	11,886	7,539
April	11,712	18,329	1,871	498	665	1,675	10,558	4,901	10,068
May	12,011	6,527	896	5,337	4,038	4,495	8,161	11,646	15,143
June	19,154	9,420	3,238	0	8,215	2,665	3,913	15,981	8,674
July	13,399	8,206	1,567	4,832	10,243	7,180	12,190	2,658	11,094
August	11,667	5,022	2,576	1,877	13,205	8,954	10,778	14,010	3,608
September	15,032	602	2,563	11,345	2,981	9,547	10,516	5,667	6,782
October	9,606	1,580	13,790	9,910	3,215	1,547	15,255	5,510	8,874
November	5,007	4,986	6,065	7,188	2,460	4,620	10,865	7,925	3,651
December	10,220	6,941	3,883	7,617	5,943	1,347	7,342	4,318	4,724

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005.

Table 25: Hoomalu Zone BMUS Pounds Caught, Totals by Month and Year, 1996–2004.

Hoomalu Zone	Year								
Month	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
January	18,379	17,395	16,112	28,454	15,890	31,447	7,455	2,570	6,551
February	8,195	10,309	17,021	21,406	20,223	21,801	10,079	16,918	6,659
March	9,074	24,540	21,509	29,789	28,657	14,234	16,061	9,062	2,220
April	14,631	25,114	18,960	24,318	21,207	19,509	6,377	21,553	18,506
May	9,630	21,267	18,457	19,028	22,054	16,522	9,621	10,101	15,688
June	14,622	11,131	20,377	30,530	13,515	17,458	8,545	13,424	14,973
July	14,182	19,297	24,165	18,433	10,188	18,678	5,178	14,123	19,954
August	11,279	20,444	23,197	26,220	20,905	12,680	10,952	11,041	17,033
September	8,791	21,655	31,516	19,868	16,180	15,042	4,538	10,448	7,413
October	22,489	25,946	35,480	16,116	22,802	16,857	16,049	11,222	22,711
November	9,821	27,014	21,265	22,922	17,867	13,801	12,384	13,630	20,084
December	22,438	20,550	25,673	24,824	17,376	19,334	20,052	17,606	17,501

Note. Pounds caught are from adjusted values whenever possible. Source: Kawamoto and Gonzales, 2005.

Table 26: Summary of Pounds Caught (Deep 7 Species) in the MHI by Month, 1990–2003.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	26,635	45,411	57,226	35,839	41,351	54,854	40,228	38,597	59,489	28,136	23,739	36,585	30,199	29918	32135
February	36,789	35,152	28,224	22,323	34,868	49,352	24,176	29,573	29,824	22,689	60,214	22,275	19,855	21031	21453
March	39,815	14,702	33,345	16,456	29,416	32,402	29,735	26,097	37,486	13,542	32,340	24,748	22,254	35563	12902
April	33,472	12,391	39,069	10,926	15,466	18,240	18,833	28,920	8,857	10,426	13,634	6,837	29,032	15322	16534
May	15,177	13,164	23,527	11,559	12,226	16,317	15,277	20,107	9,742	16,859	19,573	16,267	12,519	14874	12286
June	9,797	11,498	11,599	9,717	10,848	10,618	11,131	5,992	9,262	10,368	14,996	9,098	3,250	15,958	6734
July	28,332	19,155	14,437	10,922	14,068	10176	10,636	10,597	6,621	7,807	5,377	9,484	4,232	4,636	9216
August	27,276	17,068	11,065	17,597	21,840	8,738	19,617	1,5845	11,107	8,955	9,208	7,489	7,860	8,292	8577
September	27,078	27,643	17,595	33,102	35,029	26,225	26,579	20,317	15,341	20,368	24,220	8,736	26,709	21,294	15494
October	28,574	43,493	35,785	29,622	37,287	15,131	29,794	22,477	21,199	26,597	15,341	18,626	12,328	28,557	19691
November	37,586	29,607	23,848	22,640	14,448	28,774	26,357	30,477	17,696	24,217	17,914	26,829	24,855	12,043	35235
December	43,733	31,661	44,500	49,247	52,030	59,810	37,439	42,397	40,612	53,146	64,705	25,351	33,773	26,022	43741
Summary	354,264	300,945	340,220	269,950	318,877	330,637	289,802	291,396	267,236	243,110	301,261	212,325	226,866	233,510	233998

Note. Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and recreational bottomfish bag limits. Data sets used were all from the most recent HDAR data received in October 2005. Source: Kawamoto et al. 2005.

Table 27: Summary of Pounds Caught (Deep 7 Species) in MHI Federal Jurisdiction by Month, 1990–2004.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	5,409	6,933	5,481	7,461	7,352	12,509	11,801	7,263	16,711	3,649	3,441	6,099	4,284	3,799	5,763
February	4,800	5,822	4,497	3,742	8,978	8,906	6,348	5,517	5,147	2,197	12,468	5,270	3,600	2,023	3,003
March	5,662	1,449	4,895	3,924	7,778	7,975	6,124	2,882	5,458	1,193	7,955	6,043	3,083	5,310	457
April	4,717	3,266	4,760	1,607	3,882	6,615	4,643	4,770	1,313	1,377	2,053	1,325	4,503	1,019	1,328
May	834	3,264	3,277	1,825	3,807	6,025	1,631	3,997	1,166	2,510	713	2,073	2,020	566	2,641
June	1,049	2,048	1,606	1,317	3,993	2,746	1,759	1,538	372	997	929	747	747	2,033	0
July	2,023	2,693	1,944	1,289	7,271	2,124	1,599	2,869	402	1164	398	1240	216	104	163
August	3,670	2,470	1,114	3,800	6,381	1,985	1,924	3,198	1,099	988	194	1039	245	227	386
September	4,012	1,661	1,447	5,154	8,341	5,996	2,509	6,099	1,417	1,378	3,195	816	4,166	3,405	2,061
October	3,923	6,690	4,935	7,096	7,816	4,252	7,481	5,156	3,623	4,030	2,157	1,848	2,024	5,718	5,969
November	5,440	5,994	3,895	4,528	4,008	3,078	6,511	3,812	2,866	1,280	1,341	3,076	3,905	1,796	11,021
December	6,129	3,820	5,108	10,141	11,259	10,081	5,485	5,031	3,685	8,096	11,082	3,280	5,433	4,138	12,328
Summary	47,668	46,110	42,959	51,884	80,866	72,292	57,815	52,132	43,259	28,859	45,926	32,856	34,226	30,138	45,120

Note. Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and recreational bottomfish bag limits. Source: Kawamoto et al. 2005.

Table 28: Federal Area Pounds Caught as Percentage of the Total Deep 7 Species Pounds Caught.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	20%	15%	10%	21%	18%	23%	29%	19%	28%	13%	14%	17%	14%	13%	18%
February	13%	17%	16%	17%	26%	18%	26%	19%	17%	10%	21%	24%	18%	10%	14%
March	14%	10%	15%	24%	26%	25%	21%	11%	15%	9%	25%	24%	14%	15%	4%
April	14%	26%	12%	15%	25%	36%	25%	16%	15%	13%	15%	19%	16%	7%	8%
May	5%	25%	14%	16%	31%	37%	11%	20%	12%	15%	4%	13%	16%	4%	21%
June	11%	18%	14%	14%	37%	26%	16%	26%	4%	10%	6%	8%	23%	13%	0%
July	7%	14%	13%	12%	52%	21%	15%	27%	6%	15%	7%	13%	5%	2%	2%
August	13%	14%	10%	22%	29%	23%	10%	20%	10%	11%	2%	14%	3%	3%	5%
September	15%	6%	8%	16%	24%	23%	9%	30%	9%	7%	13%	9%	16%	16%	13%
October	14%	15%	14%	24%	21%	28%	25%	23%	17%	15%	14%	10%	16%	20%	30%
November	14%	20%	16%	20%	28%	11%	25%	13%	16%	5%	7%	11%	16%	15%	31%
December	14%	12%	11%	21%	22%	17%	15%	12%	9%	15%	17%	13%	16%	16%	28%
Summary	**13%**	**15%**	**13%**	**19%**	**25%**	**22%**	**20%**	**18%**	**16%**	**12%**	**15%**	**15%**	**15%**	**13%**	**19%**

Note. Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and recreational bottomfish bag limits. Table data are expressed percentages of pounds caught, [(PB + MB)/MHI] × 100. Source: Kawamoto et al. 2005.

Table 29: Pounds of Deep 7 Species Caught at Penguin Bank by Month, 1990–2004.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	5,409	6,933	5,481	7,088	7,352	11,533	11,759	6,476	16,711	3,649	3,441	6,099	4,284	3,799	5763
February	4,493	5,805	2,759	3,742	8,909	8,417	5,784	5,499	5,147	2,197	12,359	5,270	3,600	2,023	2955
March	5,662	1,449	3,806	2,458	7,717	7,683	5,957	2,882	5,458	1,193	7,352	6,043	3,083	5,310	457
April	4,717	3,225	4,714	1,607	3,178	5,927	4,619	4,770	1,313	1,209	2,053	1,322	4,503	1,019	1328
May	834	3,160	3,277	1,816	3,558	3,014	1,631	3,949	1,166	2,510	713	2,073	2,020	566	1890
June	1,049	1,139	1,606	1,317	3,080	2,022	1,759	1,285	372	997	603	744	606	2,033	0
July	2,017	2,684	884	1,289	5,483	1,375	1,599	2,252	402	1,164	355	1236	216	104	152
August	2,284	2,222	563	3,800	4,714	1,985	1,924	3,198	1,099	988	194	1039	245	227	386
September	3,775	1,639	874	5,154	7,136	5,735	2,446	6,099	1,417	1,378	2,026	775	4,166	3,359	2061
October	3,923	6,690	4,505	6,939	6,792	4,252	7,481	5,156	3,623	4,030	1,414	1,840	2,024	5,714	5969
November	5,408	5,688	3,874	4,528	2,877	3,014	5,746	3,812	2,866	1,280	813	3,076	3,905	1,796	11021
December	6,129	3,727	4,896	9,806	10,954	9,069	5,455	5,031	3,685	8,096	10,943	3,275	5,433	4,061	12328

Note. Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and recreational bottomfish bag limits. Area 331 is the only area designated in the State statistical reporting area as Penguin Bank. Data sets used were all from the most recent HDAR data received in October 2005.Source: Kawamoto et al. 2005.

Table 30: Pounds of Deep 7 Species Caught at Middle Bank by Month, 1990–2004.

	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
January	0	0	0	373	0	976	42	787	0	0	0	0	0	0	0
February	307	17	1,738	0	69	489	564	18	0	0	109	0	0	0	48
March	0	0	1,089	1,466	61	292	167	0	0	0	603	0	0	0	0
April	0	41	46	0	704	688	24	0	0	168	0	3	0	0	0
May	0	104	0	9	249	3,011	0	48	0	0	0	0	0	0	751
June	0	909	0	0	913	724	0	253	0	0	326	3	141	0	0
July	6	9	1,060	0	1,788	749	0	617	0	0	43	4	0	0	11
August	1,386	248	551	0	1,667	0	0	0	0	0	0	0	0	0	0
September	237	22	573	0	1,205	261	63	0	0	0	1169	41	0	46	0
October	0	0	430	157	1,024	0	0	0	0	0	743	8	0	4	0
November	32	306	21	0	1,131	64	765	0	0	0	528	0	0	0	0
December	0	93	212	335	305	1,012	30	0	0	0	139	5	0	77	0

Note: Deep 7 BMUS species list does not include uku (*Aprion virescens*). 1998 is the year that State of Hawaii instituted bottomfish species area closures and recreational bottomfish bag limits. Areas denoted as Middle Bank are 578, 579, 593, and 594. Data sets used were all from the most recent HDAR data received in October 2005. Source: Kawamoto et al. 2005.

Tables 22 to 24 and Figure 14 show the monthly landings of BMUS from the three management zones in the Hawaii Archipelago. There is a clear difference in the seasonal pattern of landings between the MHI and the two zones in the NWHI. MHI bottomfish landings peak between November and March, which reflects the demand for red snappers over the holiday season between Thanksgiving and the New Year period, which also includes the Chinese and Vietnamese new years. On the other hand, landings from the MHI are lowest in the summer months, between June and August, presumably as MHI fishermen take vacations at this time. By contrast, both the Mau and Hoomalu Zone monthly landings do not show much of a seasonal pattern, being relatively steady throughout the year, with the suggestion of a response from the Mau Zone to offset the mid-year trough in the MHI production.

Tables 25 to 30 summarize data on the Deep 7 bottomfish species complex in order to ascertain the impacts of closing those waters under federal jurisdiction in the MHI. This includes primarily penguin Bank and Middle Bank, most of which lie beyond the 3-mile limit under the jurisdiction of the State of Hawaii. Not surprisingly, Figure 15 shows that the seasonal pattern of landings observed for the MHI in Figure 14 is similar for the Deep 7 bottomfish complex. The monthly percentage of the MHI bottomfish landings formed by catches from federal waters ranges on average from 13 to 18 percent (Figure 16) with an overall average of 17 percent.

The average monthly pattern of landings of Deep 7 species from the two principal bottom-fishing grounds in federal waters are shown in Figure 17. The monthly landings at Penguin Bank reflect the trend for the MHI as a whole but with a much sharper decline during the summer months lasting from April to September. The data for the Deep 7 landings at Middle Bank are much patchier, with many months in different years with no landings from this fishing ground. However, the average trend suggests that the pattern of landings from this fishing ground is more or less the converse of the typical MHI pattern, with landings peaking between May and October.

In summary, the patterns for the MHI show that landings as a whole decline in the late spring-summer period, presumably as a result of less fishing activity as fishermen take vacations or possibly perform maintenance on their vessels. Market demand for bottomfish in this period does not appear to decline, and is compensated by production from the two NWHI fishing grounds, which are far less seasonal in their production, and possibly by an increase in production, at least in some years from Middle Bank in the MHI. Moreover, this seasonal production pattern is also reflected in bottomfish imports into the State of Hawaii, which show a response to the MHI production decline, with peaks in imports between June and September.

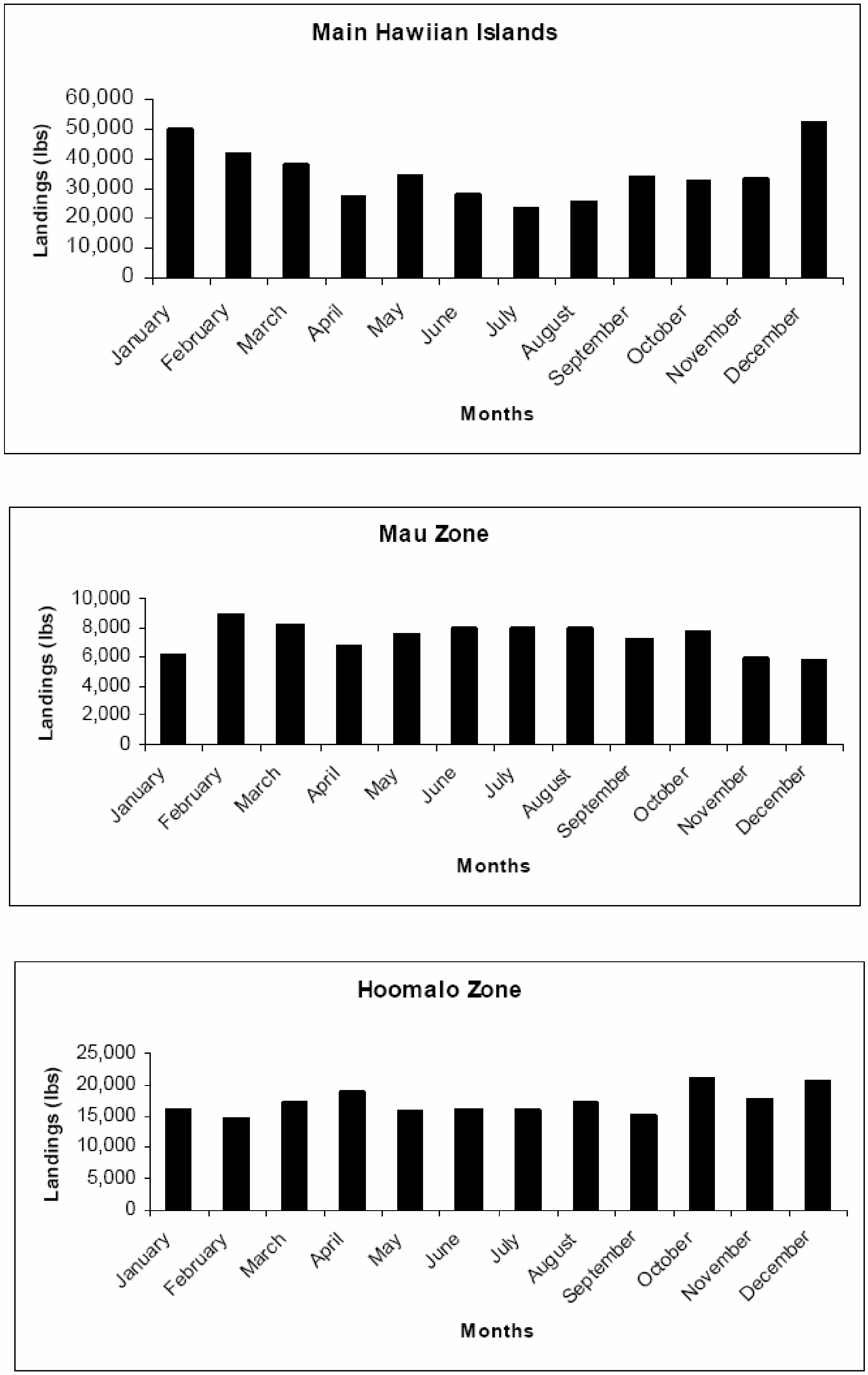
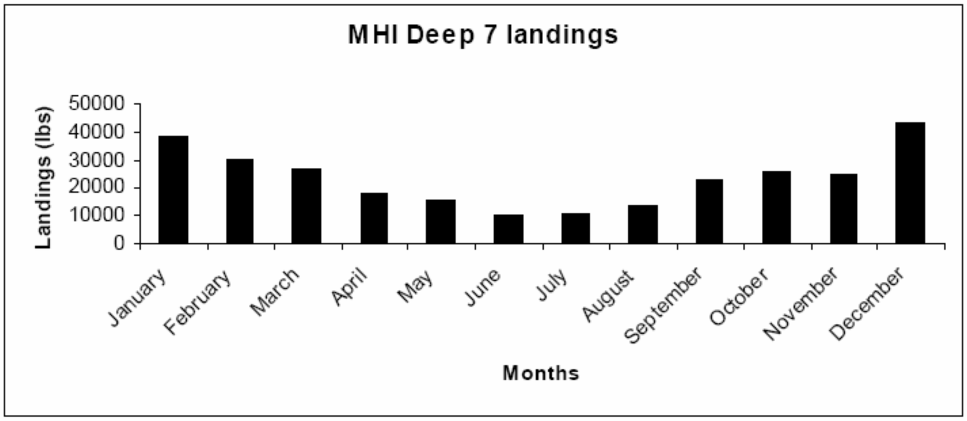


Figure 14: Average Monthly Landings between 1996 and 2004 for the Three Bottomfish Management Areas in the Hawaii Archipelago. Source: Kawamoto and Gonzales 2005.



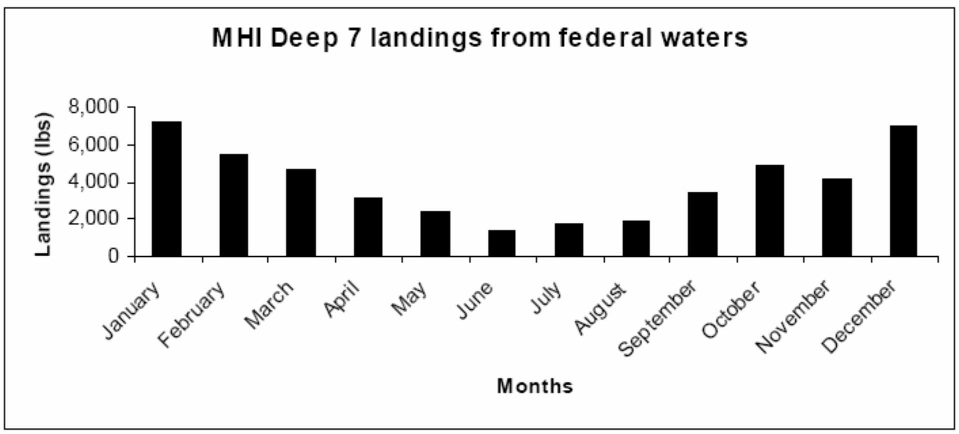


Figure 15: Average Monthly Landings of Deep 7 Species From MHI and From Federal Waters in the MHI. Source: Kawamoto et al. 2005.

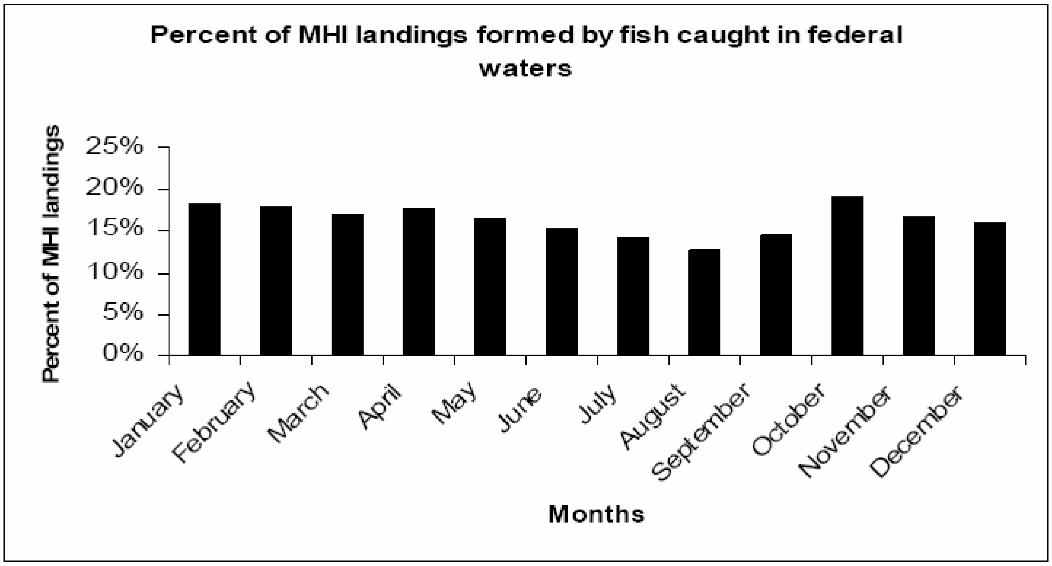
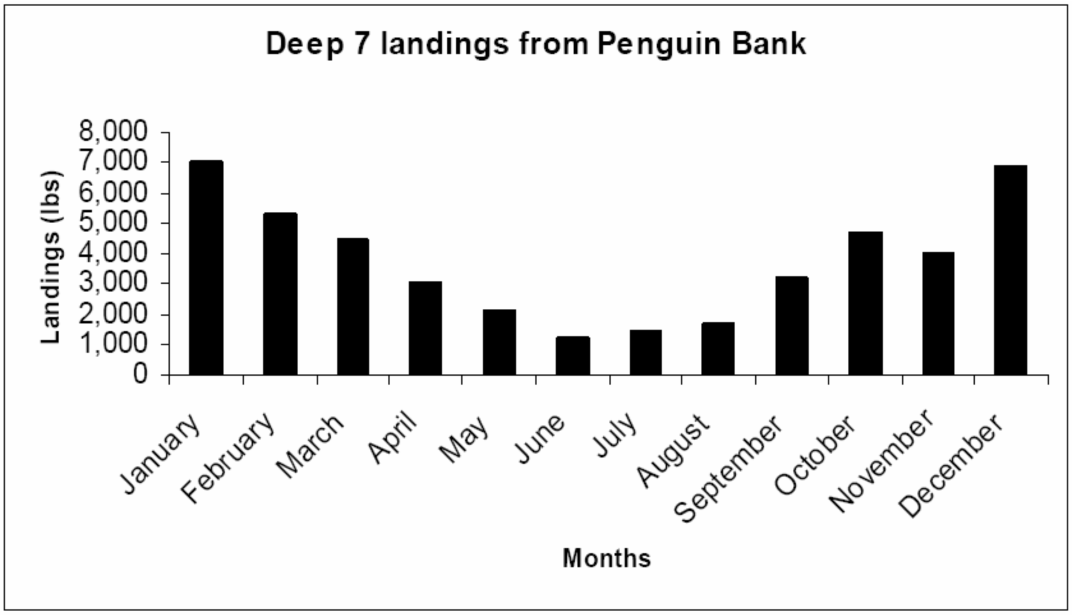


Figure 16: Average Monthly Percentage of Bottomfish Landings Formed by Fish Caught in Waters Under Federal Jurisdiction in the MHI. Source: Kawamoto et al. 2005.



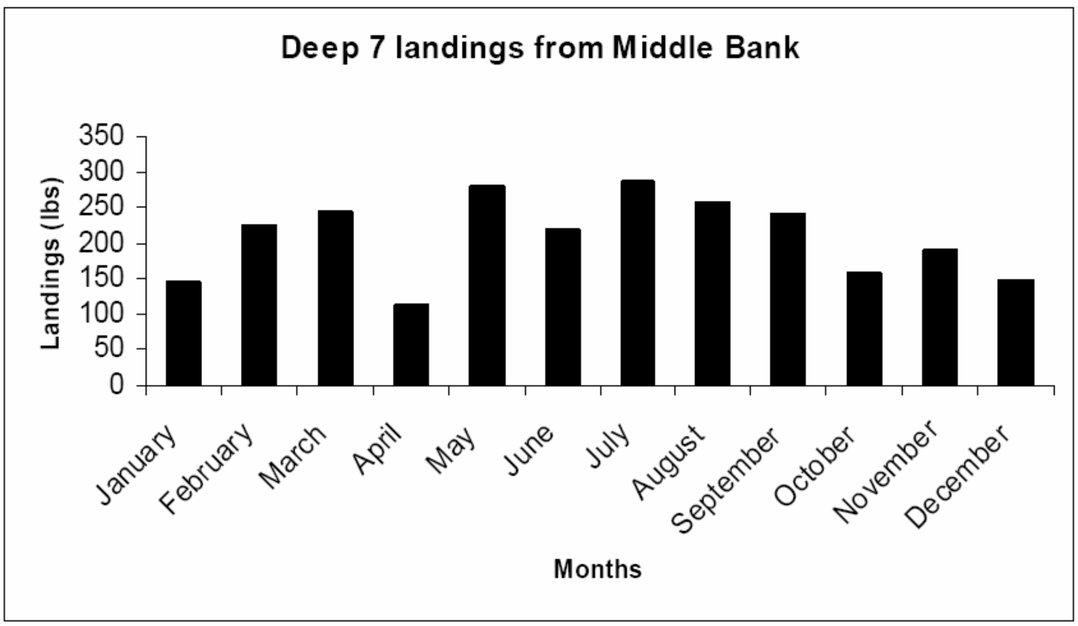


Figure 17: Landings of the Deep 7 Bottomfish Complex from the Two Principal Bottomfish fishing Under Federal Jurisdiction in the MHI. Source: Kawamoto et al. 2005.

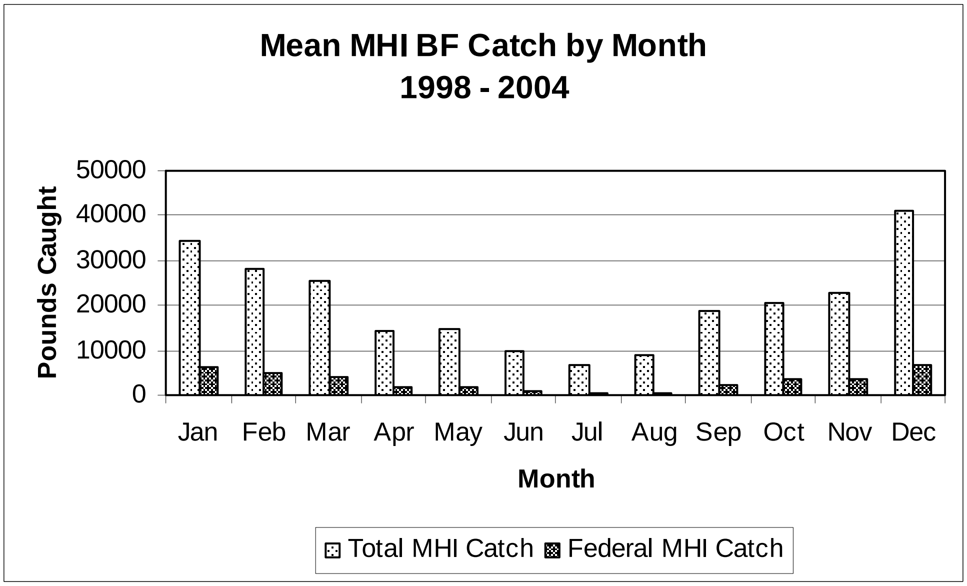


Figure 18: Mean MHI Bottomfish Catches by Month, 1998–2004. Source: Kawamoto and Gonzales 2005.

The annual cycle of landings from Penguin and Middle Banks shown in Figure 17 is also apparent in the annual cycle of landings in the entire MHI (Figure 18). The percentage of landings from federal waters in the MHI by month is shown in Figure 19.

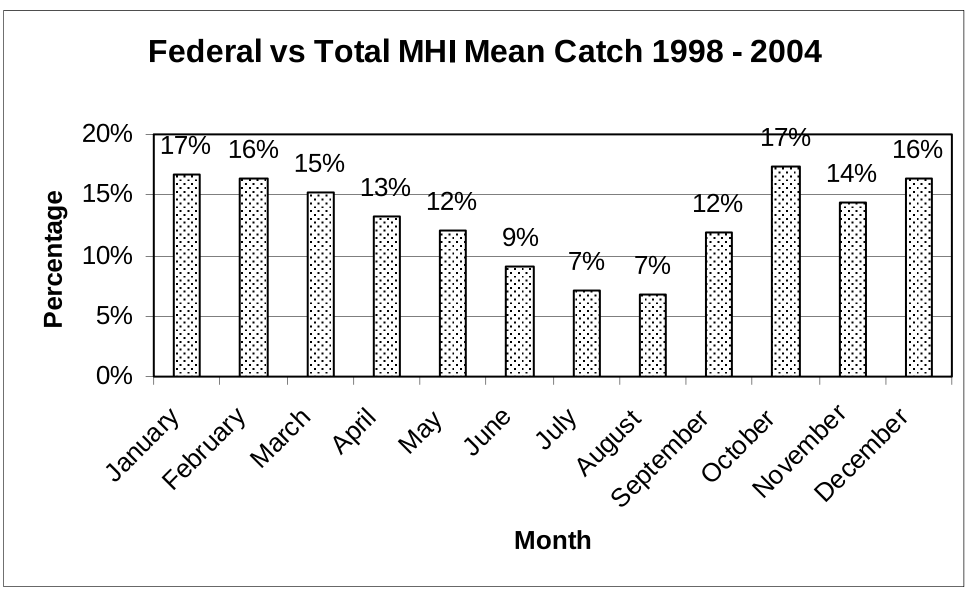


Figure 19: Federal Area Landings as a Percentage of the Total MHI Landings, 1998–2004. Source: Kawamoto et al. 2005.

3.4.4.3 CPUE

Table 31 presents a time-series of trip CPUE values in the Hawaii bottomfish fishing zones. In the MHI, highest CPUE was recorded in the mid-1950s. There seems to have been a discontinuity between 1981 and 1982 with more recent numbers being markedly lower. Absolute lowest CPUE was recorded in 1996 and 1998. The 2003 CPUE increased from that of 2002, but was still only 45 percent of the long-term mean value.

In the Mau Zone, CPUE on a per trip basis peaked in the late 1960s, with the lowest recorded value from 1993. CPUE has been relatively constant in recent years, but a 6-year high was recorded in 2003. The 2003 CPUE was 130 percent that of the mean of the previous 5 years.

In the Hoomalu Zone, trip CPUE has been relatively constant for many years. The 2003 value was the lowest seen in 19 years, but was still 90 percent of the mean of the previous 5 years. Figure 20 plots the trend in bottomfish CPUE in pounds per trip for the MHI fishery. The declining trend from 1948 to 1991 is apparent. Since 1992, the trend has been relatively stable.

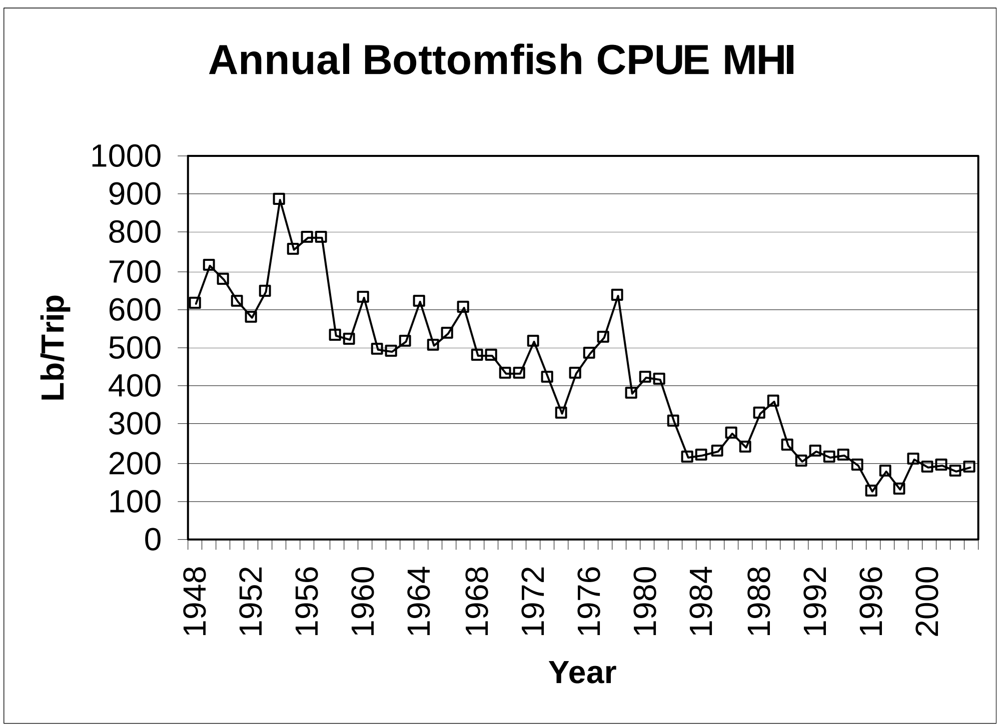


Figure 20: Bottomfish CPUE Trends in the MHI. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Table 31: Bottomfish CPUE in the MHI and NWHI, 1948–2003 (lb/trip).

Year	MHI	Mau	Hoomalu	Year	MHI	Mau	Hoomalu
1948	614	5,968	14,635	1977	527	4,387	4,000
1949	713	6,788	4,614	1978	635	4,753	3,550
1950	677	4,966	6,072	1979	380	5,361	4,951
1951	621	4.980	8,228	1980	421	6,210	6,687
1952	577	7,407	4,766	1981	416	1,336	8,167
1953	645	8,937	7,627	1982	307	NA	7,953
1954	887	6,158	8,613	1983	214	2,242	3025
1955	755	4,659	9,336	1984	220	4,308	4,085
1956	784	2,523	5,202	1985	230	4,239	5,909
1957	789	3,958	1,535	1986	274	2,206	5,301
1958	533	NA	6,254	1987	237	2,889	8,187
1959	519	NA	5,897	1988	329	2,136	4,702
1960	630	6,379	8,139	1989	361	5,412	5,328
1961	496	6,999	7,978	1990	245	4,454	4,793
1962	491	4,641	NA	1991	202	2,413	5,928
1963	518	6,410	NA	1992	228	2,092	7,388
1964	619	8,028	8,390	1993	213	1,992	8,040
1965	503	6,656	NA	1994	218	3,748	4,651
1966	536	4,413	NA	1995	193	2,460	5,544
1967	602	14,749	NA	1996	125	2,823	5,870
1968	478	6,055	NA	1997	176	3,294	5,234
1969	480	11,484	NA	1998	130	2,518	5,198
1970	433	7,111	NA	1999	209	2,926	4,605
1971	433	4,784	NA	2000	187	2,654	5,212
1972	514	2,386	NA	2001	194	2,066	5,300
1973	421	3,224	NA	2002	179	2,496	4,651
1974	329	3,367	NA	2003	190	3,293	4,481
1975	430	5,439	NA	*M*	424	4,676	6,096
1976	485	4653	NA	*SD*	196	2,493	2,187

Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Table 32: Bottomfish CPUE in the MHI and NWHI, 1984–2003 (lb/day).

Year	Mau	Hoomalu	Combined	Year	Mau	Hoomalu	Combined
1984	NA	NA	682	1995	306	582	442
1985	NA	NA	736	1996	298	563	407
1986	NA	NA	800	1997	429	574	521
1987	NA	NA	877	1998	364	527	484
1988	322	866	786	1999	337	534	486
1989	677	808	763	2000	260	601	513
1990	573	675	611	2001	283	543	467
1991	333	671	525	2002	438	412	425
1992	239	639	491	2003	508	490	496
1993	267	723	523	*M*	374	615	581
1994	353	629	526	*SD*	122	116	139

Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Calculations of partial CPUEs (CPUE by species) in the MHI for the major bottomfish species (2003 Annual Report) showed that values for all species except ōpakapaka were less than half of their early values. The decline is most apparent for ehu. If species targeting is taken into consideration, all four species for which there are sufficient data (ōpakapaka, onaga, ehu, and uku) show MHI CPUE less than or equal to 50 percent of their original values.

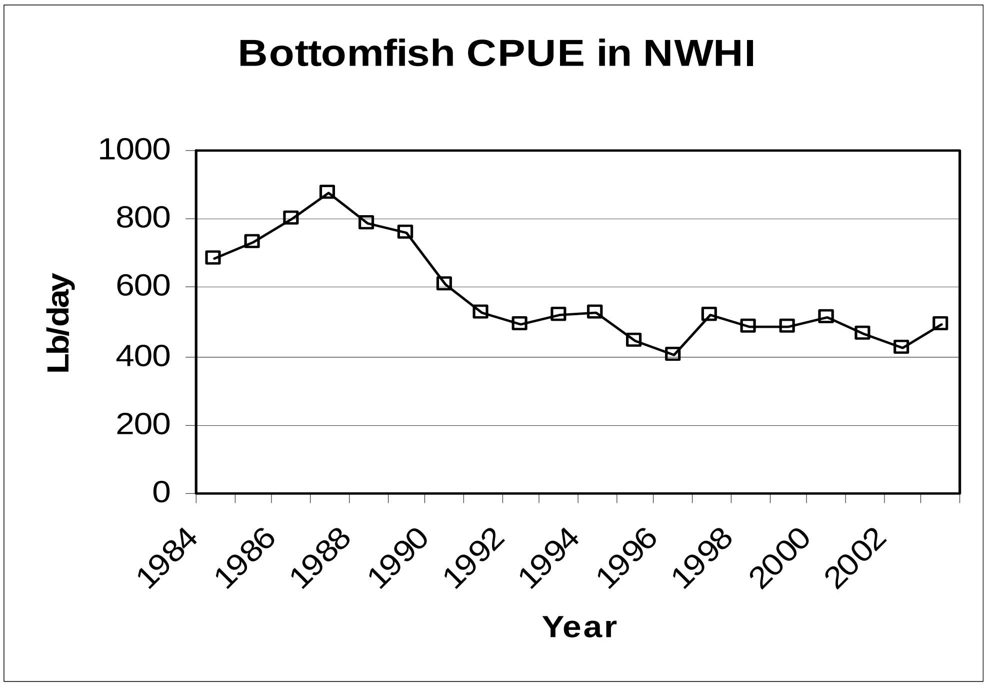


Figure 21: Bottomfish CPUE Trends in the NWHI. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

For the NWHI, a better measure of CPUE is pounds per day, due to the greater variability in the length of trips. On a catch-per-day basis (Table 32), the 2002 and 2003 CPUE in the Mau Zone were the highest since the 1989 to 1990 period. The 2003 CPUE was 151 percent of the mean of the previous 5 years. In the Hoomalu Zone, the highest daily CPUEs were also recorded in the late 1980s, but unlike the trend in the Mau Zone, CPUEs in the past two years in the Hoomalu Zone were the lowest recorded from that area. The 2003 Hoomalu daily CPUE was 94 percent of the mean for the previous 5 years. The combined CPUE trend can be seen in Figure 21.

3.4.4.4 Revenues and Prices

Inflation-adjusted gross revenue in the MHI bottomfish fishery grew steadily in the 1980s (Table 33) as a result of increases in both real prices and landings (WPRFMC 2003). However, beginning in 1990, revenue in the MHI fishery decreased sharply as both MHI bottomfish prices and landings declined. Inflation-adjusted revenue in the MHI fishery reached its lowest levels ever in 2001. Revenues from 2001 to 2003 were all below the previous low value, although the trend was upward slightly during those years. Similarly, inflation-adjusted revenues in the NWHI fishery reached their lowest levels ever in the 2001 to 2003 period, with 2003 having the lowest recorded level.

Revenue from the MHI fishery was always greater than that from the NWHI. Before the mid-1980s, MHI bottomfish revenue made up over 80 percent of the total Hawaii bottomfish revenue. The proportion declined due to a dramatic increase of NWHI bottomfish landings in the mid-1980s, and the MHI revenue was about 50 percent of the total during the period 1985–1987. Since then, revenues in both areas have declined, but revenue from the MHI fishery remains above that of the NWHI. It was 67 percent of the total in 2003.

Historically, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI, reflecting a larger proportion of preferred species and greater freshness. In the late 1990s, however, the prices appeared to converge, perhaps due to the softness of the upscale part of the Hawaii market as the state's economic recession continued (WPRFMC 1999). From 2001 through 2003, however, the price differential between MHI and NWHI fish widened considerably, possibly a result of the large increase in imported bottomfish substituting in the market for NWHI fish. The 2003 inflation-adjusted per pound price for NWHI fish was the lowest ever recorded. This was in marked contrast to the inflation-adjusted prices received for MHI bottomfish, which reached their highest level in 13 years.

Table 33: Inflation-Adjusted BMUS Revenue and Price, MHI and NWHI, 1984–2003.

Year	MHI Revenue ($1,000)	NWHI Revenue ($1,000)	MHI Price	NWHI Price
1984	3,179	2,388	4.21	3.61
1985	3,341	3,078	4.65	3.33
1986	3,432	3,178	4.53	3.66
1987	3,733	3,661	5.00	3.61
1988	4,940	2,254	4.46	3.61
1989	4,396	1,075	4.68	3.56
1990	2,978	1,416	4.99	3.35
1991	2,123	1,305	4.15	3.37
1992	2,180	1,485	4.02	3.50
1993	1,762	1,336	4.13	3.47
1994	2,009	1,548	4.09	3.50
1995	1,992	1,161	3.81	3.14
1996	1,719	1,067	4.23	3.45
1997	1,703	1,185	3.63	3.43
1998	1,631	993	3.73	3.19
1999	1,482	1,173	3.65	3.64
2000	1,717	944	3.84	3.85
2001	1,309	750	3.79	3.21
2002	1,396	777	4.13	3.39
2003	1,460	716	4.35	3.13

Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

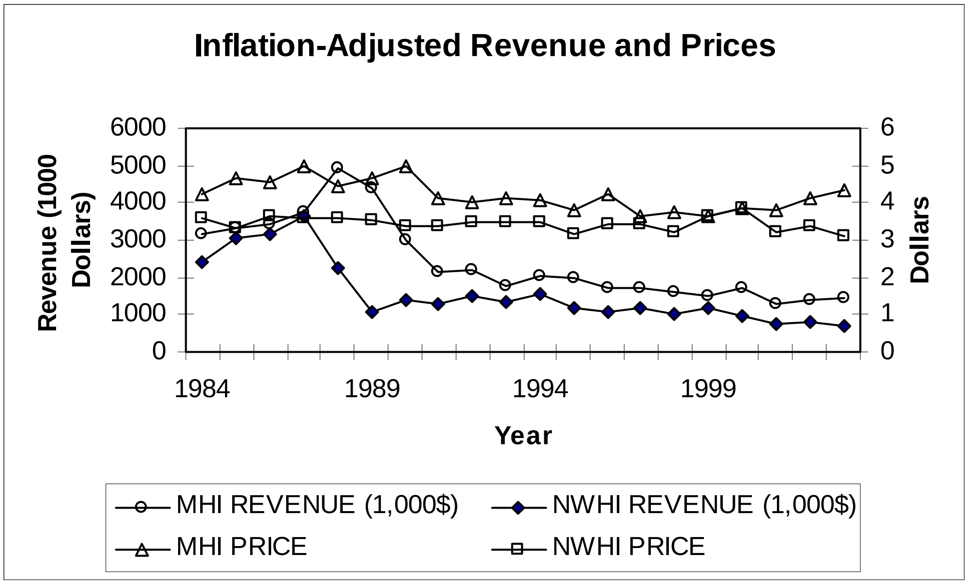


Figure 22: Annual Revenues and Average Prices by Bottomfish Management Zone. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Table 34: MHI Bottomfish Prices by Month and Year for the Deep 7 Species (2000–2004).

		Onaga			
	2000	**2001**	**2002**	**2003**	**2004**
January	6.61	5.94	6.21	6.19	6.54
February	5.12	6.34	6.19	6.46	6.37
March	6.07	5.73	6.46	5.85	6.77
April	7.55	6.95	5.59	6.20	6.90
May	7.05	7.13	6.81	6.24	6.91
June	6.78	6.61	7.74	6.25	7.39
July	**8.09**	7.48	**8.09**	**7.77**	7.22
August	7.48	**8.42**	7.43	6.73	**8.06**
September	5.64	6.78	5.70	5.23	6.70
October	6.03	5.57	5.50	5.34	5.99
November	7.05	4.98	5.62	6.25	5.70
December	6.05	7.54	6.16	7.72	6.93

Ōpakapaka	2000	2001	2002	2003	2004
January	5.09	4.33	5.24	5.67	5.57
February	4.14	4.68	5.38	5.20	5.24
March	4.62	4.55	5.72	4.76	5.63
April	**6.07**	5.02	4.76	5.47	5.54
May	5.02	5.18	5.57	5.38	5.27
June	4.86	4.75	**6.03**	5.00	5.56
July	5.30	5.11	6.08	5.52	5.39
August	5.20	5.62	5.81	5.24	5.41
September	4.40	4.94	4.93	5.05	5.36
October	4.59	4.75	4.70	4.78	4.81
November	5.31	4.34	4.48	5.12	4.69
December	4.29	**5.76**	4.84	**6.12**	**5.73**

Ehu	2000	2001	2002	2003	2004
January	4.65	3.82	4.52	4.81	4.57
February	3.60	4.52	5.20	4.16	4.92
March	4.42	4.09	4.99	4.39	5.34
April	5.27	5.05	4.27	5.12	5.24
May	4.58	4.85	4.72	4.24	4.53
June	4.36	4.62	5.74	4.10	4.78
July	**5.80**	5.09	**6.84**	5.13	3.16
August	5.21	5.26	5.54	5.37	5.27
September	4.22	5.06	4.50	4.13	**5.61**
October	4.64	4.92	4.55	4.40	4.78
November	4.80	4.11	4.50	5.24	4.34
December	4.43	**5.61**	4.32	**6.08**	5.35

Lehi	2000	2001	2002	2003	2004
January	3.21	2.98	3.48	3.61	4.06
February	3.03	3.19	3.43	**3.65**	3.38
March	3.48	2.63	3.46	3.54	3.24
April	3.43	2.78	3.02	2.97	3.05
May	3.01	2.32	3.08	2.70	2.39
June	2.68	2.47	1.87	2.65	3.83
July	2.81	3.43	**4.59**	2.62	2.95
August	3.16	**3.62**	2.38	2.87	3.48
September	3.15	2.71	2.95	3.06	3.19
October	3.09	2.84	2.87	2.76	**4.10**

November	**3.49**	2.50	2.67	3.16	3.51
December	3.03	3.19	3.02	3.27	3.54

Kalekale

	2000	**2001**	**2002**	**2003**	**2004**
January	**3.75**	2.69	3.15	2.91	3.39
February	2.58	3.23	3.77	3.21	3.37
March	2.92	3.23	**4.32**	3.02	**4.35**
April	3.49	3.27	3.22	3.33	3.73
May	3.31	3.07	3.14	2.81	3.70
June	3.25	2.94	3.29	3.10	3.93
July	3.64	2.97	3.98	1.42	3.10
August	3.49	**3.69**	4.11	2.89	3.87
September	2.87	3.12	3.34	3.19	4.14
October	3.28	3.44	3.31	3.16	3.42
November	3.54	2.64	2.88	3.18	2.93
December	2.74	3.39	2.64	**3.93**	3.21

Gindai

	2000	**2001**	**2002**	**2003**	**2004**
January	**4.36**	3.03	3.41	3.17	3.30
February	3.48	3.98	4.02	3.39	3.86
March	3.46	3.59	4.19	3.16	3.87
April	3.77	**4.02**	3.62	2.87	3.58
May	3.93	3.30	3.43	2.91	3.84
June	3.67	2.79	4.17	2.50	3.95
July	4.11	3.58	**4.65**	3.92	3.34
August	4.08	3.68	3.66	3.82	3.61
September	3.65	3.60	3.16	3.62	**4.25**
October	3.52	3.52	3.40	3.74	3.58
November	3.75	2.89	3.03	3.66	3.74
December	3.29	3.32	3.08	**4.28**	3.55

			Hapuupuu		
	2000	**2001**	**2002**	**2003**	**2004**
January	3.37	3.07	4.65	4.40	4.99
February	3.57	3.79	4.40	4.12	**5.43**
March	3.78	3.55	4.64	4.16	4.67
April	4.69	4.25	4.24	4.05	5.06
May	3.60	3.73	3.89	4.67	4.50
June	3.46	4.42	**6.47**	3.73	4.27
July	4.25	4.35	3.55	4.51	4.62
August	**4.74**	**4.79**	3.68	5.07	4.71
September	3.81	3.97	4.24	4.40	5.31
October	3.36	4.22	3.92	3.97	3.86
November	3.05	3.90	4.25	4.91	4.58
December	3.22	4.77	4.06	**5.09**	5.04

Source: Kawamoto and Gonzales 2005c.

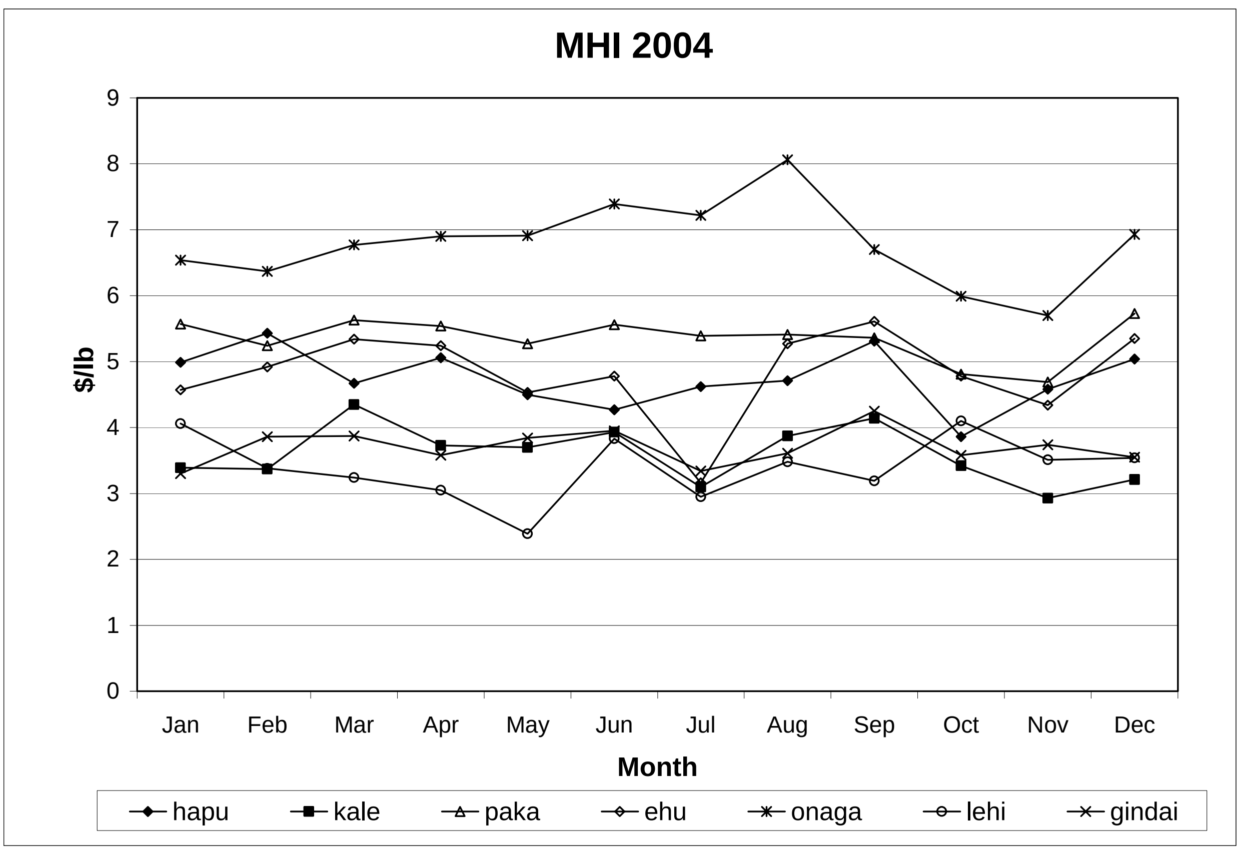


Figure 23: Average Prices by Species by Month for the MHI. Source: Kawamoto and Gonzales 2005c.

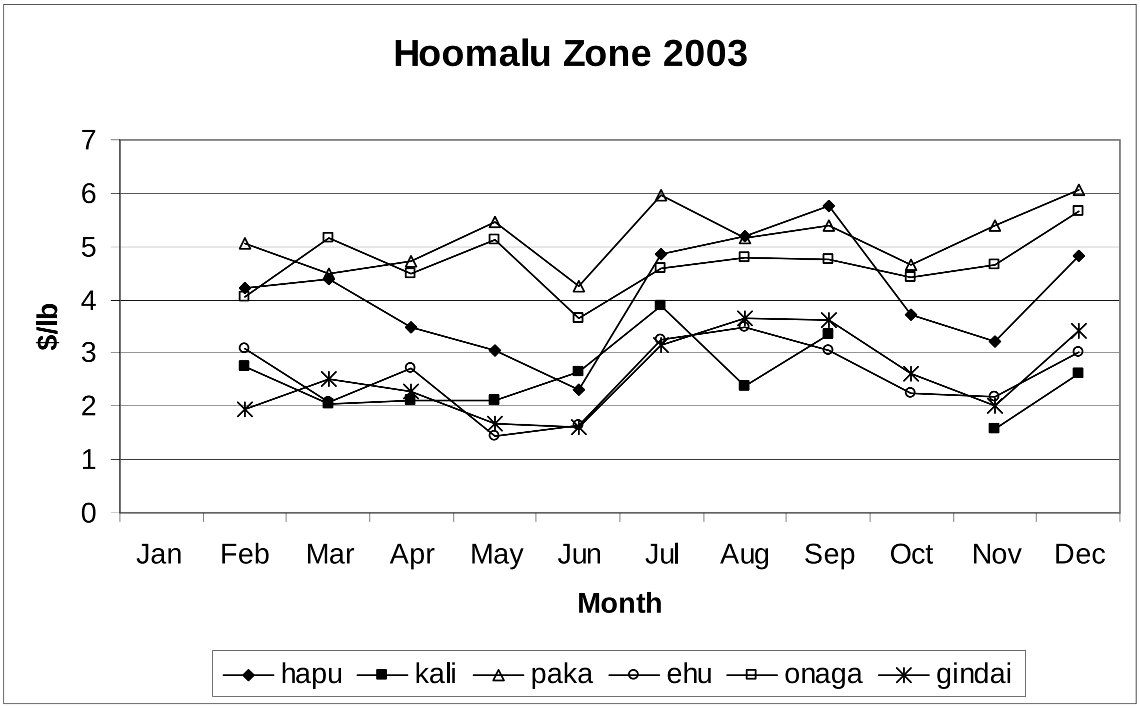


Figure 24: Average Prices by Species by Month for the Hoomalu Zone. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

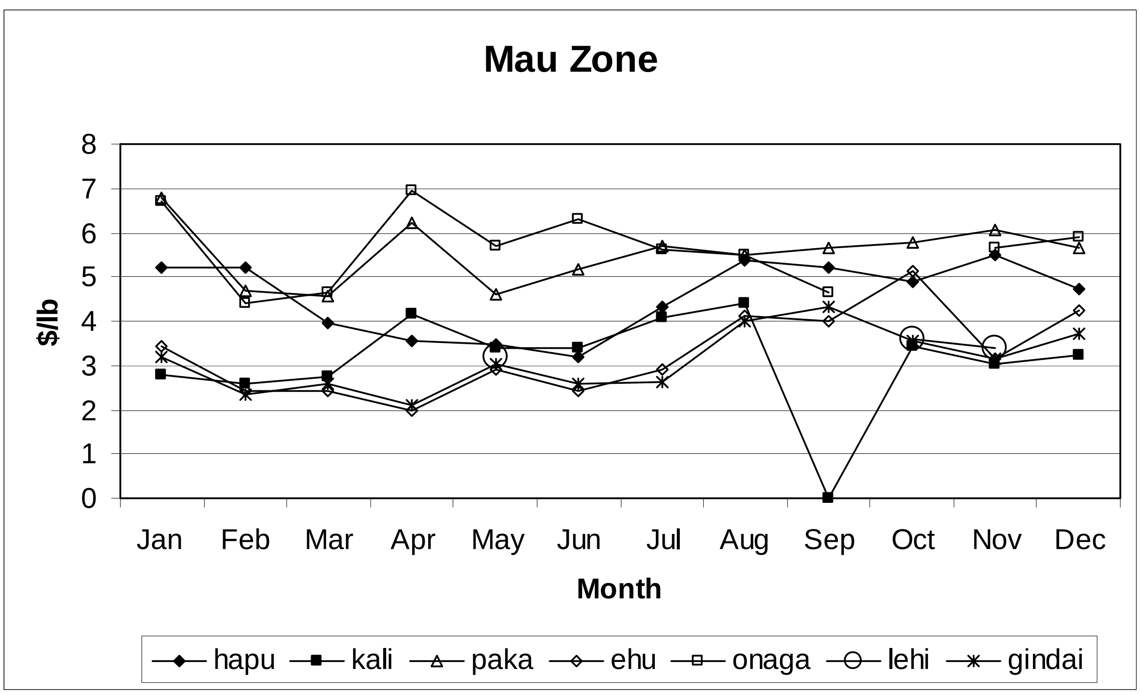


Figure 25: Average Prices by Species by Month for the Mau Zone. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

3.4.5 Processing and Marketing

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

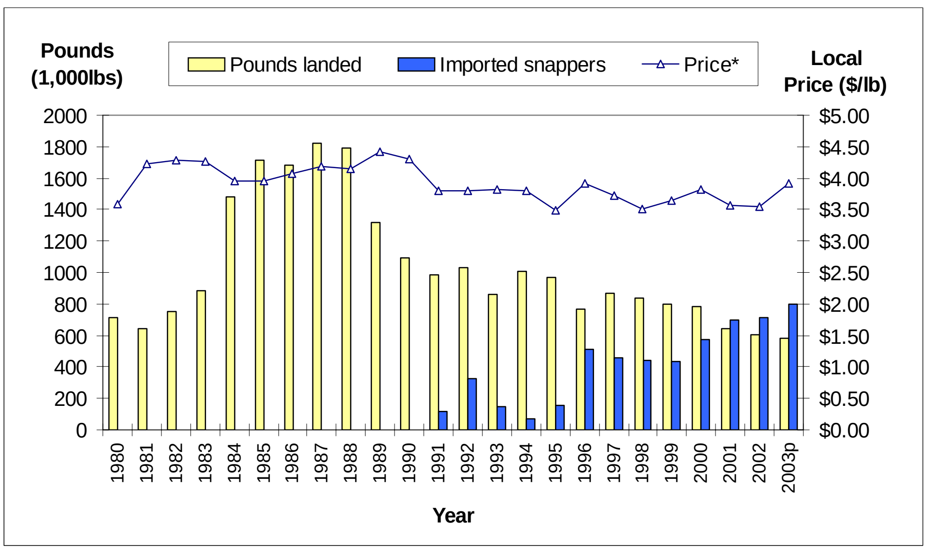


Figure 26: Hawaii Bottomfish Demand (Annual, Inflation-Adjusted Ex-Vessel Price and Supplies [Domestic Landings and Imported Fresh Snapper]), 1980–2003. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

Historically, the demand for bottomfish in Hawaii has been largely limited to fresh fish. Seventy years ago Hamamoto (1928) remarked on the fact that fish dealers in Honolulu refused to buy fish that had been harvested in the NWHI and frozen on board because the demand for this product was so low. In the last few years the price differential between frozen and fresh product has narrowed for some species of bottomfish, but it remains substantial for onaga and ehu, the two highest priced fish. Until the market for frozen bottomfish develops, participants in the NWHI fishery will be caught in the same ongoing dilemma, they must stay out long enough to cover trip expenses, but keep the trips short enough to deliver a readily saleable, high-quality product (Pan 1994). In the past, bottomfish catches from the MHI have tended to command higher aggregate prices than those caught in the NWHI, reflecting the greater freshness required by the “sashimi” grade market. Bottomfish caught around the MHI are iced for only 1 to 2 days before being landed, whereas NWHI fresh catches may be packed in ice for 10 days or more. By the late 1990s, however, the prices appeared to converge, perhaps due to the softness of the upscale part of the Hawaii market as the state’s economic recession continued (Western Pacific Regional Fishery Management Council 1999).

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

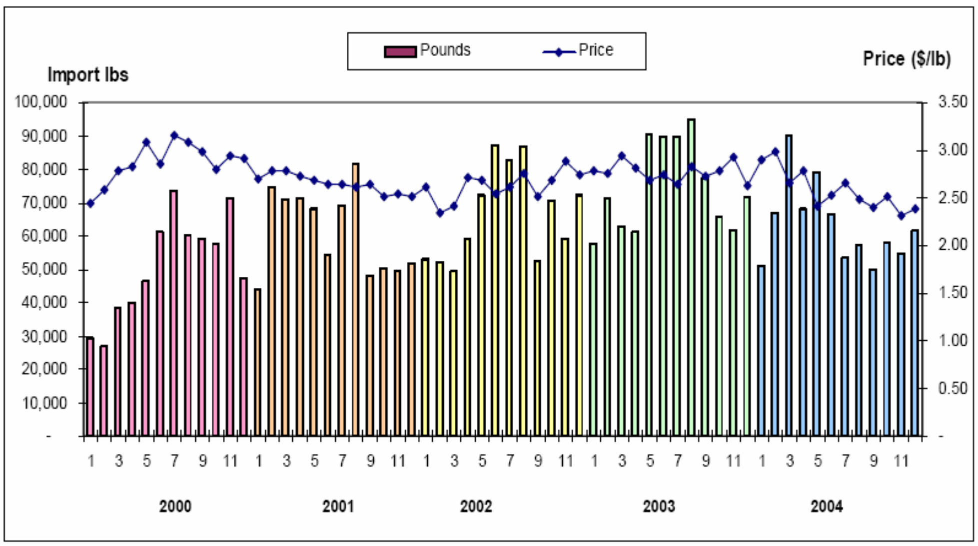


Figure 27: Monthly Imports of Bottomfish into Hawaii, 2000-2004. Source: PIFSC 2005, unpublished data.

Pooley (1987) showed that Hawaii auction market prices increase when MHI landings drop. However, during the 1990s the relationship between price and volume faltered, perhaps due to an increase in imported fresh fish that competed in the market with locally caught bottomfish (WPRFMC 1999; Figure 27). According to U.S. Customs data for the Port of Honolulu, 715,000 pounds of snapper were imported in CY 2002, worth $1.92 million ($2.68 per pound; WPRFMC 2004). This amount exceeded domestic supplies and thus was a significant factor in ex-vessel prices. Not only has the quantity of foreign-caught fresh fish increased during the last few years, but the number of countries exporting fresh fish to Hawaii has also increased. Fifteen years ago, for example, fresh snapper was exported to Hawaii mainly from within the South Pacific region. In recent years, Tonga and Australia were the largest sources of fresh snapper, with Fiji and New

Zealand also being major sources, but fresh snapper have also been received from Indonesia, Samoa, Vietnam, Chad, and Madagascar.[10]

To further explore the value of Hawaii's fresh local bottomfish, and the role imports play in the market, the Council sponsored a study of the attitudes and beliefs of Hawaii restaurateurs and executive chefs (Coffman 2004). The objectives of the study were to (a) determine the value added to NWHI bottomfish in Hawaii's restaurants and (b) determine whether NWHI bottomfish are easily substituted for both in chefs' and customers' preferences, with bottomfish from other places or other types of fish. Table 35 summarizes the quantitative information derived from interviews with 24 of Hawaii's top chefs and six seafood wholesalers.

Table 35: Hawaii Chefs and Wholesalers Perceptions of Hawaii Bottomfish.

Interview Result	Percentage of chefs interviewed
Knew if their fish was from the MHI of the NWHI	0
Only serve Hawaii-caught bottomfish	19
Try to serve Hawaii-caught bottomfish	29
Advertise bottomfish dishes as "Fresh Island Fish" of similar	29
Volunteered that the price of bottomfish is high and/or rising	29
Volunteered concern over bottomfish sustainability	73
Volunteered concern about fishing regulations driving up bottomfish prices	14
Said customers are willing to pay more for Hawaii-caught bottomfish	42.8
Said customers are not willing to pay more for Hawaii-caught bottomfish	19
Said customers expect Hawaii-caught bottomfish to be less expensive in Hawaii relative to other fish dishes	9.5
Named bottomfish on list of "most desirable fish species"	77.3
	Other Chef Responses
Average percentage of meals that are fish	48.6
Average percentage of fish meals that are bottomfish	26.5
Average price of Hawaii-caught bottomfish dish	$29.52
Average price of an imported bottomfish dish	$28.46
Average portion size of a bottomfish dish	6.78 oz
Average product yield of whole fish (usefulness increases if stock made)	50%
Average days last month with bottomfish on menu	26.8
Average days last year with bottomfish on menu	325.4
Average percentage customers who are visitors to Hawaii	40.7%

[10]http://www.st.nmfs.gov/pls/webpls/trade_dist_allproducts_mth.results?qtype=IMP&qmonthfrom=01&qmonthto=01&qyearfrom=1996&qyearto=2005&qproduct=%25&qdistrict=32&qsort=COUNTRY&qoutput=TABLE

	Percentage of Wholesalers Interviewed
Said MHI are better in quality than NWHI bottomfish	100
Said NWHI and imported bottomfish are comparable in quality	33
Said imported better than NWHI bottomfish	33
Said quality difference between imported and NWHI bottomfish depends on the country of origin	66
Said price of bottomfish is high, but steady	33

Source: WPRFMC 2004.

The survey found that it was typical for the restaurant to purchase Hawaii-caught bottomfish fillets from a wholesaler at a price of $12 to $16 per pound. NWHI bottomfish were more suitable for filleting than MHI fish because of their larger size, but the higher quality of MHI fish allowed their use for sashimi. Summary conclusions of the study were as follows:

> Bottomfish is a popular dish in most of Oahu's top-end restaurants. Several of the most noted "boutique type" restaurants only serve Hawaii-caught bottomfish. The expensive prices as well as the inconsistency of supply of both MHI and NWHI bottomfish make it difficult for most restaurants to serve only Hawaii-caught fish. Most restaurants serve a combination of Hawaii-caught and imported bottomfish. Because of obvious time factors, MHI bottomfish are considered the freshest and highest quality by most wholesalers while NWHI bottomfish can be comparable to some imports. It seems that some countries' fishermen are able to come into port soon enough, handle the fish well enough, and can fly to bottomfish over to Hawaii in a manner timely enough to rival the average quality of a bottomfish boat that comes into port for the NWHI every few weeks. The NWHI bottomfish fishery does, however, help fill the niche of Oahu restaurants who only serve Hawaii-caught fish.

3.4.6 Bycatch

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

3.4.6.1 Magnuson–Stevens Act (MSA) Definitions and Requirements

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

> The term "bycatch" means fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory

discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

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

The term "economic discards" means fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, or quality, or for other economic reasons.

The term "regulatory discards" means fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or are required by regulation to retain but not sell.

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

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

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

conservation and management measures shall, to the extent practicable, (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

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

establish a standardized reporting methodology to assess the amount and type of bycatch occurring in the fishery, and include conservation and management measures that, to the extent practicable and in the following priority:

(a) minimize bycatch; and
(b) minimize the mortality of bycatch which cannot be avoided.

3.4.6.2 Available Estimates of Bycatch and Bycatch Mortality

In Hawaii, there are two separately managed bottomfish fisheries: a strictly commercial fishery in the NWHI, and a mixed commercial, recreational and subsistence fishery in the MHI. While these fisheries use the same gear and operational methods, the motivation of the fishermen is different between the commercial operators and recreational or subsistence fishermen. This results in different bycatch characteristics. The NWHI commercial fishermen seek the highest economic return on their catch and therefore may release alive lower valued species, especially early in a trip, thereby conserving both ice and hold space.

Bottomfish fishermen in the NWHI and the MHI have been voluntarily involved with the State of Hawaii's ulua and multi-species tagging programs. Fishermen have routinely reported that even without such a program that they release many unwanted fishes alive (Kawamoto, PIFSC, personal communication). Data on bycatch in the NWHI commercial fishery is available from the logbook program, from limited observer data, and from NMFS research cruises in the NWHI.

Because the State of Hawaii and NMFS do not have permit, logbook, or catch reporting system for noncommercial marine fishermen, there are no data on bycatch for this sector. Recreational or subsistence fishermen may be more inclined to retain a greater variety of species for home consumption or distribution to relatives and friends, thus their bycatch percentages are likely substantially less that that of the commercial sector (Kawamoto, PIFSC, personal communication).

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

3.4.6.3 Bycatch in the Main Hawaiian Islands Bottomfish Fishery

A summary of the bycatch in the main Hawaiian Islands bottomfish fishery is given in Figures 29 and 30. This information is from catch and effort data submitted to HDAR by MHI commercial bottomfish fishery participants during 2003 and 2004. Bycatch as defined by the MSA and the National Standard Guidelines includes not only discards but unobserved mortality, which is defined as "mortality due to an encounter with fishing gear that does not result in capture of the fish." The State of Hawaii catch and effort report collects information on "lost" fish, i.e. fish that were lost after being hooked. In the deepwater bottomfish fishery the species identification and number of "lost" fishes are questionable as they were lost for various or unknown reasons during retrieval at depths that are not directly observable. Therefore the positive identification by species and an accounting of numbers are likely inaccurate but are necessarily used. The percentage of mortality of these "lost" fish is unknown and it is likely that not all die from the encounter. Therefore the fish "lost" numbers are considered conservative as under the MSA they are all counted as unobserved mortalities (including those that survive). Overall, bycatch in the MHI bottomfish fishery is low, with only 8.5 percent of the catch falling into the bycatch category (Figure 28).

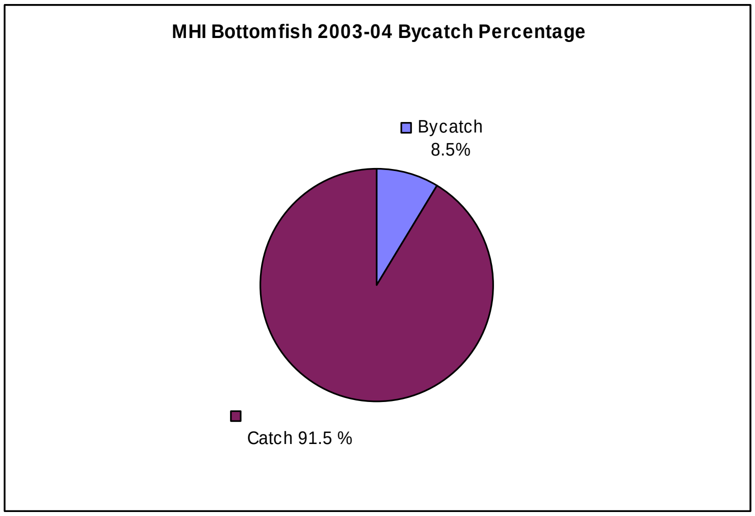


Figure 28: Ratio of Bycatch to Catch in the MHI. Source: Kawamoto and Gonzales 2006.

The average bycatch ratios and composition of the MHI bottomfish catch for 2003 and 2004 combined are presented in Figure 28. The total bycatch in the fishery for the combined years is 8.5 percent. Each individual set of species (PMUS, BMUS, and miscellaneous) contributes to this overall percentage.

PMUS catches comprise under one percent (0.9 percent) of the total catch with less than one percent (0.3 percent of total catch) being considered bycatch. The majority of the pelagic bycatch are composed of sharks (88 percent of PMUS bycatch).

The targeted BMUS species in the MHI bottomfish fishery are six snappers and one grouper, collectively known in Hawaii as the Deep 7 species complex. Very little of the targeted Deep 7 species catch (3.3 percent) is reported as bycatch. Looking at the entire BMUS complex (Deep 7 and other BMUS) the bycatch percentage rises to 7.5 percent. The majority of the BMUS bycatch is composed of kahala, butaguchi, and white ulua. All of these species are members of the jack family (Carangidae) and are not included in the Deep 7 species complex. Ninety three percent of all kahala (*Seriola dumerili* and *S. rivoliana*) were reported as bycatch. Release of kahala are high because they are known to be ciguatoxic and therefore have no market value in Hawaii.

The miscellaneous species category includes over 30 species of near-shore and pelagic fishes that are occasionally caught while bottomfish fishing. Miscellaneous species account for less than one percent (0.7 percent) of the overall bycatch while comprising 4.4 percent of the overall catch.

Table 36: Bycatch Percentage by Species Grouping for 2003-2004.

	# pieces caught	# release	# damage	# lost	tot # caught	percent bycatch	percent of catch
PMUS	317	122	0	4	443	0.3	0.9
BMUS							
"Deep 7"	39569	61	0	1541	41171	3.3	86.0
Other BMUS	2147	1950	0	47	4144	4.2	8.7
total BMUS (D-7+Other)	41716	2011	0	1588	45315	7.5	94.7
Misc. species	1760	26	0	304	2090	0.7	4.4
Totals	43793	2159	0	1896	47848	8.5	100.0

Source: Kawamoto and Gonzales 2006.

At recent public meetings conducted in support of this proposed management action, numerous comments were heard by fishermen from Hilo to Kauai regarding the significant increase in the last 3 years of fish loss to shark predation. Several fishermen reported that during certain times, no fish can be brought to the surface without it being taken by sharks.

3.4.6.4 Bycatch in the NWHI Bottomfish Fishery

The major discard species in the NWHI bottomfish fishery are given in Table 36. It should be noted that a large percentage of the snappers and the grouper listed are included as bycatch because of damage from sharks. Logbook data (State of Hawaii), and observer programs conducted by NMFS indicate that total discards (including damaged target species) account for approximately 8 to 23 percent of the total catch in bottomfish fisheries in the Hawaiian archipelago (Nitta 1999; WPRFMC 1998a). Carangids, sharks, and miscellaneous reef fish (pufferfish, moray eels, etc.) are the most numerous discard species. Two species in particular, kahala (*Seriola dumerili, S. rivoliana*) and butaguchi (*Pseudocaranx dentex*), make up the majority of the bycatch. It is believed that the discarding of these types of fish (e.g. sharks, jacks) does not result in mortality as these types of fish do not suffer from barotraumas effects when brought up from depth. Most species are not kept by vessels because of their unpalatability, however some carangids (large jacks and amberjacks) are also discarded because of concerns of ciguatera poisoning.[11] Butaguchi, which commands a low price in the Hawaii market, may be discarded in the early days of a fishing trip because this species has a poor product shelf-life. The major discard species in the NWHI bottomfish fishery as reported by NMFS observers are given in Table 37. It should be noted that a large percentage of the snappers and the grouper listed are included as bycatch because of damage from sharks.

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

In bottomfish fishing operations, the largest proportion of lost fish and gear is attributable to interactions with sharks (Nitta 1999). From time to time some fishing areas are dominated by sharks such that the majority of hooked fish are either stolen or damaged. It appears that the time periods of high incidences of predator damage to the catches are not constant over years or even areas. Predator abundance and fishery losses vary and the reasons for this occurrence are unknown. The estimated economic losses experienced by fishermen as a result of shark interference with fishing operations are substantial (Kobayashi and Kawamoto 1995). In the NWHI, the gray reef shark (*Carcharhinus amblyrhnchos*) is believed to be the species of shark that interferes most with the bottomfish catch.

Data collected by NMFS during research bottomfish fishing cruises indicate the potential species composition of bycatch in the NWHI bottomfish fishery (Figure 29). Research bottomfish fishing is less likely to exclusively successfully target commercial species; however Figure 29 indicates the specific families of species that may be caught in association with bottomfish fishing operations.

The most recent data available (WPRFMC 2004) reinforce the trends described above, including the differences in strategy between Mau and Hoomalu Zone operations. In both zones in 2002, 100 percent of the sharks and kahala were discarded. In the Mau Zone, butaguchi was frequently discarded in 2002 (22 percent), unlike in 2001 when only 1 percent was discarded. The only other significant discard was omilu (*Caranx melampygus*) at 9 percent, down from 38 percent in 2001.

Table 37: Percent Discards From Bottomfish Trips with NMFS Observers, 1990–1993.

Species	No. Caught	No. Discarded	% Discarded
Kahala	2,438	2,266	92.9
Kalekale (yellowtail)	40	22	55
Sharks	176	92	52.3
Miscellaneous fish	115	59	51.3
Ulua (white)	127	62	48.8
Miscellaneous snapper/jack	189	91	48.1
Butaguchi	3,430	1,624	47.3
Ulua (black)	23	10	43.5
Tạape	110	40	36.4
Miscellaneous fish unidentified	174	26	14.9

Species	No. Caught	No. Discarded	% Discarded
Kalekale	874	52	6
Opakapaka	5,092	107	2.1
Ehu	1,185	20	1.7
Uku	2,209	28	1.3
Hapụupụu	1,593	19	1.2
Gindai	459	3	0.7
Onaga	1,141	8	0.7
Alfonsin	1	0	0
Armorhead	1	0	0
Lehi	3	0	0

Source: Nitta 1999.

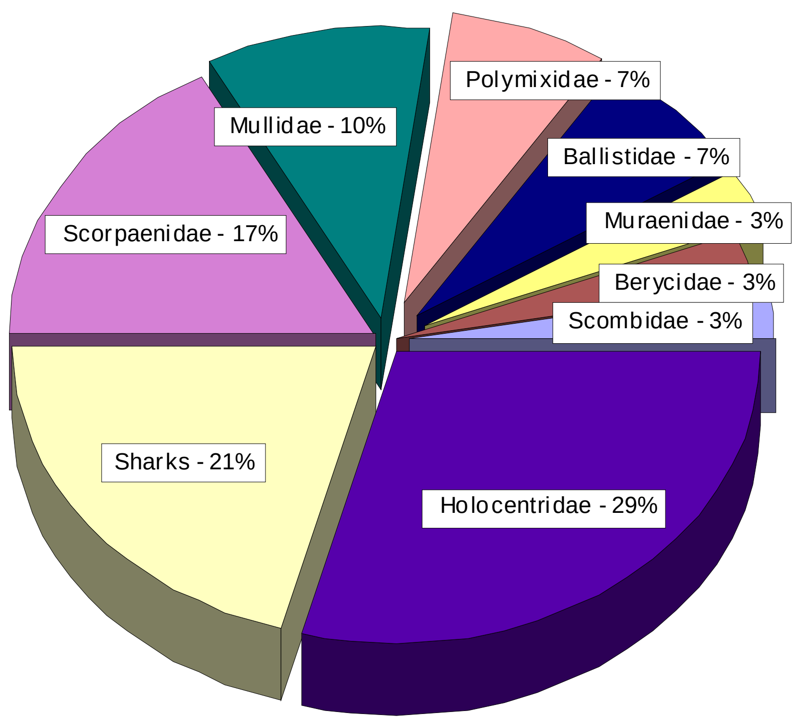


Figure 29: NMFS Research Cruise Estimates of Bottomfish Bycatch in Hawaii.
Note: Percent of total number; Source: WPRFMC 1998a.

In the Hoomalu Zone, several lesser valued species were commonly discarded, including kalekale (48 percent in 2002 and 24 percent in 2001), butaguchi (20 percent in 2002 and 32 percent in 2001) and white ulua (*C. ignoblis*; 63 percent in 2002, 70 percent in 2001). Tables 38 and 39 summarize information from the Mau and Hoomalu Zones, respectively for bycatch in 2002 and compare rates to those of 2001.

Table 38: Mau Zone Bycatch by Species in 2001 and 2002.

Species	No. Released in 2002	No. Sold in 2002	% Bycatch 2002	No. Released in 2001	% Bycatch in 2001
Pelagic MUS					
Shark	57	0	100	55	100
Tiger shark	3	0	100	1	100
Bottomfish MUS					
Ehu	2	2,070	<1	8	<1
Hapụupụu	12	1,254	1	0	0
Butaguchi	184	641	22	10	1
Black Ulua	2	81	2	0	0
Kahala	226	0	100	653	100
Miscellaneous Species					
̣Ōmilu	20	193	9	30	38
Barracuda	1	9	10	0	0

Table 39: Hoomalu Zone Bycatch by Species in 2001 and 2002.

Species	No. Released in 2002	No. Sold in 2002	% Bycatch 2002	No. Released in 2001	% Bycatch in 2001
Pelagic MUS					
Shark	8	0	100	34	100
Tiger shark	4	0	100	3	100
Bottomfish MUS					
̣Ōpakapaka	1	2206	<1	1	<1
Kalekale	439	474	48	264	24
Butaguchi	303	1248	20	767	32
White Ulua	221	128	63	532	70
Kahala	1610	0	100	3360	100
Miscellaneous Species					
̣Ōmilu	43	0	100	41	82

Source: PIFSC, unpublished data.

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

3.4.7 Recreational Fishery

Statistics for this fishery are very limited; there are no requirements for saltwater fishing licenses or catch reporting for noncommercial fishermen in Hawaii and hence there is no system for collecting quality data. Over the years, occasional surveys have been fielded, but no systematic collection of noncommercial fisheries data has been sustained. The NMFS Marine Recreational Fisheries Statistical Survey, active in other parts of the country, collected data for a period ending about 20 years ago, but was discontinued in Hawaii. Recently, this program has returned to Hawaii as the Hawaii Marine Recreational Fishing Survey (HMRFS), and is collecting data using a dual survey approach consisting of random telephone surveys and a fisherman intercept survey conducted at boat launch ramps, small boat harbors, and shoreline fishing sites. To date, however, an insufficient number of intercepts of bottomfish fishermen have occurred to allow catch and effort determinations for this fishery.

The state's bottomfish fishing registration requirement, however, does offer one way to compare the commercial and noncommercial sectors of the fishery. Each applicant is required to specify commercial or noncommercial status. As of mid-2003, there were 3,194 vessels registered to fish for bottomfish in Hawaii. The breakdown for each island is shown in Table 40.

Table 40: Registered Commercial and Noncommercial Bottomfish Vessels by Island.

	Kauai	Oahu	Molokai	Lanai	Maui	Hawaii
Commercial	271	519	1	5	271	757
Non-commercial	109	921	25	16	107	174
Total by Island	380	1443	26	21	378	933
Total Commercial						1,824
Total Noncommercial						1,352
% Noncommercial by Island	28.7	63.8	96.2	76.2	28.3	18.6
Total % Noncommercial						42.6

Note. Source: HDAR presentation to WPRFMC.

Included in the state's 1998 bottomfish regulations was a control date for a possible future limited entry bottomfish fishery. Some fishermen registered to protect their right to participate in the bottomfish fishery if they should so choose in the future. Some others registered because it was not clear to them that reef fish were not included in the regulations. The proportions of respondents in these categories are not known, and it is not known whether they registered as commercial or noncommercial vessels. From Table 39, it appears that about 40 percent of the registered bottomfish fishing vessels in Hawaii are noncommercial. Registered vessels range in size from 8 feet to 65 feet in length. However, the vast majority of the registered vessels lie in the range 14 feet to 30 feet in length. The largest size class is 19 feet, with about 380 vessels represented (HDAR presentation to WPRFMC).

Recently, the HDAR surveyed Hawaii's registered bottomfish vessel owners by mail. The return rate was about 20 percent. Of the 722 completed questionnaires, only 38 percent said they actually fished for deep-water bottomfish in the previous year. Forty-eight percent said they sometimes fish for deep-water bottomfish, but hadn't done so during the previous year. Fourteen percent said they don't bottomfish at all. Forty-four percent had either electric or hydraulic bottomfish line pullers. 38 percent had GPS units and 46 percent had depth sounders. Of those who fished, most fished with another person (range one to five), fished two lines (range one to five) with, most often, five hooks per line (range one to thirteen). Bottomfish fishing effort varied cyclically over an annual cycle with most effort during November and December, and least effort during April and May. Weekends and holidays were the favored days for bottomfish fishing. State grid number 52 (331) was by far the preferred fishing area.

Two hundred and seventy-six of the respondents (38 percent) claimed commercial status, although not all had current licenses. If this proportion holds true for the entire database, then by this estimate, 62 percent of the registered vessels are noncommercial.

From these two estimates we can crudely estimate that about half the registered bottomfish fishing vessels are noncommercial. Landings of onaga and ehu by the noncommercial sector are now restricted to five total per person, but other species are not subject to catch limits. Nevertheless, it is likely those landings by noncommercial bottomfish vessels average much less than their commercial counterparts because of differences in vessel capability, fishing skill, and avidity. At this time it is not possible to estimate what the total noncommercial landings are. In the future, more bottomfish fisherman intercepts conducted in the HMRFS may provide this estimate.

3.5 Protected Species

Protected species include those species listed as endangered or threatened under the ESA, all marine mammals listed or not as they are protected under the Marine Mammal Protection Act (MMPA), and seabirds listed or not as they are protected under the Migratory Bird Treaty Act. Appropriate information on the species' life histories, habitats and distribution, and other factors necessary to their survival, is included in the Bottomfish FEIS and is incorporated here by reference. In particular, the status of the Hawaiian monk seal and potential interactions with the NWHI bottomfish fishery are extensively discussed in the FEIS. That material is incorporated here by reference and a summary of the species' current status is included below.

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

3.5.1 Marine Mammals

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

3.5.1.1 Listed Cetaceans

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

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

3.5.1.2 Other Cetaceans

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

- Blainsville beaked whale (*Mesoplodon densirostris*)
- Bottlenose dolphin (*Tursiops truncatus*)
- Bryde's whale (*Balaenoptera edeni*)
- Cuvier's beaked whale (*Ziphius cavirostris*)
- Dwarf sperm whale (*Kogia simus*)
- False killer whale (*Pseudorca crassidens*)
- Killer whale (*Orcinus orca*)
- Melon-headed whale (*Peponocephala electra*)
- Pygmy killer whale (*Feresa attenuata*)
- Pygmy sperm whale (*Kogia breviceps*)
- Risso's dolphin (*Grampus griseus*)
- Rough-toothed dolphin (*Steno bredanensis*)
- Short-finned pilot whale (*Globicephala macrorhynchus*)
- Spinner dolphin (*Stenella longirostris*)
- Spotted dolphin (*Stenella attenuata*)
- Striped dolphin (*Stenella coeruleoalba*)
- Pacific white-sided dolphin (*Lagenorhynchus obliquidens*)
- Minke whale (*Balaenoptera acutorostrata*)

- Dall’s porpoise (*Phocoenoides dalli*)
- Fraser’s dolphin (*Lagenodelphis hosei*)
- Longman’s beaked whale (*Indopacetus pacificus*)

Of the above species, the bottomfish fishery has been documented to interact with only one species, the bottlenose dolphin (*Tursiops trucatus*; Nitta and Henderson 1993). Although the other species listed above may be found within the action area and could interact with bottomfish fisheries in the Western Pacific Region, no reported or observed incidental takes of these species have occurred in these fisheries. Therefore, NMFS determined that the bottomfish fishery is not likely to adversely affect these cetaceans. Although bottlenose dolphins have been observed stealing hooked fish off of bottomfish lines, the extent of such interactions are not known, but believed to be low. The impact of the bottomfish fishery on the behavior or foraging success of bottlenose dolphins is unknown, but not believed to be adverse.

3.5.1.3 Listed Pinniped: The Hawaiian Monk Seal

The following, which was taken from the Hawaiian Monk Seal Recovery Plan (2005), summarizes the current status of the Hawaiian monk seal (*Monachus schauinslandi*).

> *The Hawaiian monk seal was listed as an endangered species under the ESA on November 23, 1976 (FR 51612) and remains listed as endangered. Based on recent counts the current population is approximately 1300 individuals. Most of the Hawaiian monk seal population is distributed throughout the NWHI in six main reproductive subpopulations at FFS, Laysan and Lisianski Islands, Pearl and Hermes Reef, and Midway and Kure Atolls. Small numbers also occur at Necker, Nihoa, and the MHI, primarily at Niihau. Initial studies of genotypic variation (Kretzmann et al. 1997) suggest that the species is characterized by low genetic variability, minimal genetic differentiation among subpopulations and, perhaps, some naturally occuring local inbreeding. Seals have been observed on each of the main eight islands. There were at least 45 seals in the MHI in 2000 and at least 52 in 2001, based on aerial surveys of all MHI coastlines supplemented by sightings of seals from the ground (Baker and Johanos, 2004). Moreover, annual births in the MHI have evidently increased since the mid-1990s. It is possible that Hawaiian monk seals may be re-colonizing the MHI, which may have been part of their historic range. Regardless, the MHI habitat appears to be favorable for continued increases of this endangered species. Identified threats to the survival of the Hawaiian monk seal include, but are not limited to, habitat degradation, marine debris entanglement, human disturbance, disease, shark predation, vessel groundings, and interactions with fisheries.*

3.5.1.4 Other Pinniped: The Northern Elephant Seal

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

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

3.5.2 Sea Turtles

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

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

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

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

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

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

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

3.5.3 Seabirds

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

3.5.4 Bottomfish Fisheries Interactions with Protected Species

Since October 2003, the Hawaii-based bottomfish fishery has been monitored under a mandatory observer program. Data for seven calendar quarters are available on the PIRO website. During this time, observer coverage has averaged 21.4 percent. There have been no observed interactions with sea turtles or marine mammals. There have been a total of six seabird interactions, including two unidentified boobies, one brown booby, one black-footed albatross and two Laysan albatrosses. Only the black-footed albatross interaction occurred during bottomfish fishing operations. All of the other interactions were observed in transit during trolling operations.

3.6 Economic, Social, and Cultural Setting

3.6.1 Hawaii Overview

Income generation in Hawaii is characterized by tourism, federal defense spending and, to a lesser extent, agriculture. Tourism is by far the leading industry in Hawaii in terms of generating jobs and contributing to gross state product. The World Travel and Tourism Council (1999) estimated that tourism in Hawaii directly generated 134,300 jobs in 1999. This figure represents 22.6 percent of the total workforce.

For 2002, Hawaii Department of Business, Economic Development and Tourism estimated that direct and indirect visitor contribution to the state economy was 22.3 percent. A bit less than half of that (10.2 percent) was generated in Waikiki. Total visitor expenditures in Hawaii were $9,993,775,000. Tourism's direct and indirect contribution to Hawaii's gross state product in 2002 was estimated at $7,974,000,000, or 17.3 percent of the total. Directly and indirectly, tourism accounted for 22.3 percent of all civilian jobs, and 26.4 percent of all local and state taxes.

Department of Defense expenditures in Hawaii in 2002 were $4,293,459,000. Defense expenditures in Hawaii are expected to increase significantly in the near future. These expenditures fall into two broad categories: monies for the pending arrival of the Stryker force, which requires changes in facilities and additional facilities; and the renovation of old military housing as well as the construction of new military housing. As of late July 2004, Hawaii is expected to receive $496.7 million in defense-related spending. When combined with funds earmarked for construction that are contained in a measure before the Senate, Hawaii stands to receive more than $865 million in defense dollars, not including funds for day to day operations or payroll (Inouye 2004).

Agricultural products include sugarcane, pineapples (which together brought in $269.2 million in 1997), nursery stock, livestock, and macadamia nuts. In 2002, agriculture generated a total of $510,672,000 in sales. Agricultural employment decreased from 7,850 workers in 2000 to 6,850 in 2003. This change may be due to the increasing use of lots zoned for agriculture for construction of high-end homes, a trend that is evident throughout the state.

Table 41 summarizes trends in Hawaii's gross state product by industry. The fishing industry is lumped together with agriculture, forestry, and hunting. That sector of the economy generated $383 million in 2003.

Table 41: Hawaii Gross State Product by Industry, 1997–2003 ($Million).

Industry	1997	1998	1999	2000	2001	2002	2003
Total, all industries	37,546	37,614	38,702	40,176	41,720	43,806	46,671
Private industries total	29,254	29,267	30,128	31,480	32,636	33,886	36,088
Agriculture, forestry, fishing, and hunting	363	359	374	365	347	372	383
Mining	17	16	17	18	17	15	17
Utilities	868	859	860	829	876	819	878
Construction	1,687	1,662	1,627	1,817	1,911	2,099	2,329
Manufacturing	858	823	835	838	811	784	842
Wholesale trade	1,331	1,320	1,360	1,372	1,444	1,530	1,640
Retail trade	2,955	2,849	2,903	3,018	3,144	3,302	3,544
Transportation & warehousing	1,621	1,632	1,748	1,847	1,892	1,640	1,623
Information	1,149	1,189	1,262	1,328	1,340	1,283	1,303
Finance and insurance	1,770	1,679	1,670	1,863	1,938	2,062	2,176

Industry	1997	1998	1999	2000	2001	2002	2003
Real estate, rental, and leasing	6,154	6,219	6,555	6,674	6,993	7,334	7,806
Professional and technical services	1,634	1,671	1,669	1,710	1,856	1,983	2,155
Management of companies and enterprises	463	466	457	431	406	483	508
Administrative and waste services	959	974	1,073	1,166	1,261	1,405	1,541
Educational services	355	366	373	403	417	443	466
Health care and social assistance	2,372	2,471	2,517	2,666	2,838	2,986	3,216
Arts, entertainment, and recreation	485	493	488	492	508	552	574
Accommodation and food services	3,197	3,150	3,264	3,560	3,507	3,638	3,861
Other services	1,016	1,069	1,075	1,082	1,128	1,156	1,226
Government total	8,292	8,347	8,574	8,696	9,085	9,921	10,582

Source: DBEDT 2004

The latest economic trends analysis (Bank of Hawaii, October 2005) concluded the following:

> Strong Hawaii employment data through August 2005 confirm recently reported first half Honolulu inflation, yielding strong Hawaii real personal income growth, suggesting that good economic momentum continued into third quarter 2005. Flattening summer tourism numbers against seasonal capacity constraints, combined with a stronger dollar and continued travel cost pressure from rising fuel costs, support the forecast of slower visitor arrivals growth going into 2006. As noted with last month's semiannual construction forecast revisions, construction growth is also expected to slow during 2006 because of completion of the military construction ramp-up and decreases in private authorizations. But strong overall economic growth should spill over from 2005 to 2006 for Hawaii, with only a modest slowing in the local expansion's pace.

3.6.1.1 Fishing-Related Economic Activities

The harvest and processing of fishery resources play a minor role in Hawaii's economy. The most recent estimate of the contribution of the commercial, charter and recreational fishing sectors to the state economy indicated that in 1992, these sectors contributed $118.79 million of output (production), $34.29 million of household income, and employed 1,469 people (Sharma et al. 1999). These contributions accounted for only 0.25 percent of total state output ($47.4 billion), 0.17 percent of household income ($20.2 billion), and 0.19 percent of employment (757,132 jobs). However, in contrast to the sharp decline in some traditional mainstays of Hawaii's economy such as large-scale agriculture, the fishing industry has been fairly stable during the past decade. Total revenues in Hawaii's pelagic, bottomfish, and lobster fisheries in 1998 were about 10 percent higher than 1988 revenues (adjusted for inflation) in those fisheries.

Hawaii's commercial fishing sector includes a wide array of fisheries. The Hawaii longline fishery is by far the most important economically, accounting for 73 percent of the estimated ex-vessel value of the total commercial fish landings in the state in 1999 (Table 42). As shown in that table, the NWHI and MHI bottomfish fisheries account for a relatively small share of the landings and value of the state's commercial fisheries.

Table 42: Volume and Value of Commercial Fish Landings in Hawaii by Fishery, 1999.

Fishery	Pounds Landed (1,000s)	Percent of Total Pounds Landed	Ex-vessel Value ($1,000s)	Percent of Total Ex-vessel Value
Pelagic longline	28,300	75%	47,400	73%
Troll	2,960	8%	4,550	7%
Pelagic handline	2,340	6%	3,950	6%
Aku pole and line	1,450	4%	1,850	3%
MHI bottomfish handline	420	1%	1,300	2%
NWHI bottomfish handline	370	1%	1,210	2%
NWHI lobster trap	260	1%	1,040	2%
All other fisheries	1,650	4%	3,330	5%
Total	37,750	100%	64,630	100%

Source: Data compiled by PIFSC.

Another perspective on the role of bottomfish in Hawaii is to compare landings with pelagic, reef fish, and other fish. Table 43 shows the changing patterns from 2000 to 2003 (National Marine Fisheries Service 2004).

Table 43: Annual Estimated Commercial Landings in Hawaii (1,000 lbs), 2000–2003.

Year	Pelagic Fish	Bottomfish	Reef Fish	Other Fish
2000	26,763	718	199	957
2001	22,011	660	250	591
2002	22,330	621	345	662
2003	21,993	602	315	661

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

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

A more accurate assessment of current contributions of the bottomfish fishery to the economy can be obtained using the Type II output, income and employment multipliers calculated by Sharma et al. (1999) for Hawaii's (non-longline) commercial, charter and recreational fishing sectors. Applying these multipliers to an approximation of the final demand in each of the sectors involved in bottomfish fishing, it is estimated that this fishing activity contributes $10.78 million of output (production) and $2.51 million of household income to the state economy and creates the equivalent of 113 full-time jobs (Table 44).

Table 44: Estimated Output, Household Income, and Employment Generated by Bottomfish Fishing Activity in Hawaii.

Fishery	Sales ($)	Final Demand ($)	Output ($)	Household Income ($)	Employment (jobs)[1]
NWHI bottomfish fishery					
Commercial vessels[2]	1096200	580,986	1,382,747	482,218	25
MHI bottomfish fishery					
Commercial vessels[2]	1625800	861,674	2,050,784	715,189	36
Charter vessels[3]	305664	293,437	760,002	269,962	14
Recreational vessels[4]		2,827,096	6,587,134	1,046,026	38
Total			10,780,667	2,513,431	113

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

Number of recreational boats	2,490
Annual number of bottomfish fishing trips	3.81
Average trip costs	84.75
Average fixed costs: apportioned according to ratio of bottomfish fishing trips to total number of trips	213

3.6.2 Fishing Communities

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

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

The term "fishing community means a community which is substantially dependent on or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and included fishing vessel owners, operators, and crew and U.S. fish processors that are based in such community.

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

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

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

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

And furthermore:

The term “sustained participation” means continued access to the fishery within the constraints of the condition of the resource.

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

The Council prepared and submitted supplements to the amendments to address the disapproved sections of Bottomfish FMP Amendment 6, Pelagic FMP Amendment 8, Crustaceans FMP Amendment 10, and Precious Corals Amendment 4 regarding the identification of fishing communities. The fishing communities supplement (WPRFMC 2002c) reconsidered the original identifications and identified a new set of fishing communities within Hawaii. It provided additional background and analysis to justify those identifications. It does not modify the identification of American Samoa, the Northern Mariana Islands, and Guam as fishing communities, as these definitions were approved in the original SFA amendments.

With respect to Hawaii, the findings indicated that fishing and related services and industries are important to all of Hawaii’s inhabited islands that the social and economic cohesion of fishery participants is particularly strong at the island level, and that fishing communities are best not distinguished according to fishery or gear type. The most logical unit of analysis for describing the community setting and assessing community-level impacts is the island. In each of the four FMP amendments, each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai, and Hawaii is identified as a fishing community for the purposes of assessing the effects of fishery conservation and management measures on fishing communities, providing for the sustained participation of such communities, minimizing adverse economic impacts on such communities, and for other purposes under the MSA. These definitions were subsequently approved by NMFS.

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

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

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

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

3.6.2.1 Population Size and Ethnicity

The 1990 census listed the population of Hawaii as 1,108,229. This figure rose to 1,179,198 in 1995 and to 1,211,537 in 2000. The population increased by a rate of 6.9 percent between 1990 and 1999.

The state of Hawaii is divided into five counties. The county of Maui includes the islands of Kahoolawe, Lanai, Maui and Molokai. The county of Honolulu encompasses the island of Oahu and the Northwestern Hawaiian Islands excluding Midway Atoll. Kauai County consists of the islands of Kauai and Niihau. The population of each county is provided in Table 45.

Table 45: Hawaii Population by County.

Area	1990 Census	2000 Census
Hawaii State	1,108,229	1,211,537
Honolulu County, HI	836,231	874,154
Hawaii County, HI	120,317	148,677
Kauai County, HI	51,177	584,63
Maui County, HI	100,374	128,094

Source: U.S. Census Bureau.

The 2000 Census redefined the way race is measured in a number of ways, allowing individuals to identify themselves as one race or a combination of races, as well as having a separate classification system for Hispanic or Latino and race. As a result, describing the makeup of Hawaii's population is more complex. Perhaps the most accurate way to describe Hawaii's population is to report the proportions of race alone or in combination with one or more other races. In 2000, 39.3 percent of Hawaii residents described themselves as white, 2.8 percent as black or African American, 2.1 percent as American Indian or Alaska native, 58 percent as Asian, 23.3 percent as native Hawaiian and other Pacific Islander, and 3.9 percent as some other race. These proportions add up to more than 100 percent because many individuals reported more than one race. Of the 78.6 percent of residents who reported just one race, 24.5 percent listed White, 1.8 percent Black or African American, 41.6 percent Asian (including 4.7 percent Chinese, 14.1 percent Filipino, 16.7 percent Japanese, 1.9 percent Korean, and 0.6 percent Vietnamese), and 9.4 percent Native Hawaiian and other Pacific islander.

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

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

3.6.2.2 Sociocultural Setting

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

3.6.2.3 Social Aspects of Fish Harvest

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

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

Initially, commercial fishing in Hawaii was monopolized by Native Hawaiians, who supplied the local market with fish using canoes, nets, traps, spears, and other traditional fishing devices (Cobb 1902; Jordan and Evermann 1902; Konishi 1930). However, the role that Native Hawaiians played in Hawaii's fishing industry gradually diminished through the latter half of the nineteenth century. During this period, successive waves of immigrants of various races and nationalities arrived in Hawaii, thus increasing the non-indigenous population from 5,366 in 1872 to 114,345 in 1900 (Office of Hawaiian Affairs 1998). The new arrivals included Americans, Chinese, Portuguese, and Filipinos, but particularly significant in terms of having a long-term impact on the fishing industry was the arrival of a large number of Japanese. The Japanese, like the majority of the early immigrants, were contracted to work on Hawaii's sugarcane plantations. When contract terms expired on the plantations, many of the Japanese immigrants who had been skilled commercial fishermen from the coastal areas of Wakayama, Shizuoka, and Yamaguchi Prefectures in Japan turned to the sea for a living (Okahata 1971). Later, experienced fishermen came from Japan to Hawaii for the specific purpose of engaging in commercial fishing. The bottomfish fishing gear and techniques employed by the Japanese immigrants were slight modifications of those traditionally used by Native Hawaiians.

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

The adherence of Japanese immigrants to traditional cultural practices included Japanese religious observances, and many of the religious activities of communities such as Kākā'āko were centered on fishing (Miyasaki 1973). Various traditional Japanese taboos and rituals directed how a new fishing boat was to be launched, when a vessel could leave or return to port, what items could be brought on board a boat, and many other aspects of fishing behavior (Hamamoto 1928; Katamoto 1984). Over the years, succeeding generations of fishermen of Japanese ancestry in Hawaii became more "Americanized," but many Japanese fishing traditions persisted. For example, Japanese immigrant fishermen brought from Japan the Shinto practice of building a jinsha (shrine) dedicated to a deity such as Konpira-sama or Ebisu-sama (Kubota 1984; Miyasaki 1973). Today, an Ebisu jinsha constructed at Maalaea on the island of Maui during the early 1900s still stands, and fishermen of Japanese ancestry as well as others who share a common bond in fishing continue each year to ceremonially bless individual fishing vessels (Kubota 1984; T. Arine, personal communication 2000. Maui Jinsha).

In addition to ethnic and community ties, the physical danger of fishing as an occupation also engendered a sense of commonality among fishermen. Describing the captains and crews of the early sampan fleet in Hawaii, Okahata (1971, p. 208) wrote the following: "It is said that the fishermen were in a clan by themselves and were imbued with a typical seaman's reckless daring spirit of 'death lies only a floor board away.'" The extreme isolation of the NWHI and the limited shelter they offered during rough weather made fishing trips to these islands particularly hazardous. The perils of fishing in the NWHI for bottomfish and other species captured the attention of the public media (e.g. Inouye 1931; Lau 1936).

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

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

Most of the vessels that participate in the NWHI bottomfish fishery utilize harbor facilities at Kewalo Basin, a harbor located in the metropolitan Honolulu area. Three vessels operate from Port Allen Harbor on Kauai. Nearly all of the participants in the NWHI bottomfish fishery reprovision in Honolulu and offload their catch at the fish auction. In addition, most of the large-volume, restaurant-oriented wholesalers that buy, process, and distribute fishery products are located in the greater Honolulu area. Businesses whose goods and services are used as inputs in Hawaii's offshore commercial fisheries, such as ice plants, marine rail ways, marine suppliers, welders, and repair operations, are similarly concentrated in Honolulu. However, the contribution of the harvesting and processing of fishery resources to the total economic fabric of Honolulu is negligible in comparison to other economic activities in the metropolitan area, such as tourism. In other words, Honolulu is the center of a major portion of commercial fishing-related activities in the state, but it is not a community substantially dependent upon or substantially engaged in fisheries in comparison to its dependence upon and engagement in other economic sectors.

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

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

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

Even those fishermen who rely on fishing as their primary source of income have other reasons for their occupational choice besides financial gain. For example, a 1993 survey of owner–operators and hired captains who participate in the NWHI bottomfish fishery found that enjoyment of the lifestyle or work itself is an important motivation for fishing among fishery participants (Table 46).

Table 46: Motivations of 1993 Active Vessel Captains and Owners in the NWHI Bottomfish Fishery.

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

Source: Hamilton (1994).

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

Finally, some Hawaii fishermen feel a sense of continuity with previous generations of fishermen and want to perpetuate the fishing lifestyle. The aforementioned 1993 survey of participants in the NWHI bottomfish fishery found that half of the respondents who fish in the Hoomalu Zone were motivated to fish by a long-term family tradition (Table 46). This sense of continuity is also reflected in the importance placed on the process of learning about fishing from “old timers” and transmitting that knowledge to the next generation. A recent sociocultural survey of small trolling vessel captains in Hawaii found that many of those interviewed either descend from long-time fishing families or have worked in fishing or fishing-related work since they were in their teens (Glazier 1999). The average captain had almost 18 years of offshore fishing experience. The survey found that 35 percent of boat captains were taught how to fish by their fathers, grandfathers, or uncles, while 32 percent reported being taught by friends (Glazier 1999). Only 14 percent indicated that they taught themselves. Most Hawaii fishermen consider knowledge and experience to be more important factors in determining fishing success than high-tech gear. An example of the value placed on information passed down from previous generations of fishermen is the monument that one town on Oahu has recently proposed to commemorate the kūpuna (elders) of that area who are recognized for their fishing skills and knowledge (Ramirez 2000).

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

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

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

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

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

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

3.6.2.4 Social Aspects of Fish Distribution and Consumption

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

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

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

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

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

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

Many of the immigrant groups that came to Hawaii brought with them cultures in which fish are not only an integral part of the diet but are given symbolic and even transformative connotations. Certain fish communicate messages of solidarity, favor, opulence, and the like or are believed to impart specific desirable traits to the diners (Anderson 1988; Baer-Stein 1999). For example, some types of bottomfish that are red in color have found acceptance within the Japanese community in Hawaii as a substitute for red *tai* (sea bream, *Pagrus major*)—a traditional Japanese symbol of good luck and, therefore, an auspicious fish to be served on festive occasions (Hawaii Division of Aquatic Resources 1979; Shoji 1983). The red color of these fish also symbolizes prosperity and happiness.[12] The December peak in landings of opakapaka, onaga, kalekale, and ehu reflect the demand for them as an important dish in feasts celebrating *Oshogatsu* (Japanese New Year's), considered the most important cultural celebration for people of Japanese ancestry in Hawaii. Serving these fish is also important during non-seasonal events such as wedding and birthday banquets. For Hawaii residents of Chinese descent, fish or *yu* is an important item during feasts celebrating *Tin nien* (Chinese lunar New Year) and other ritual observances, as it is a homophone for abundance (Choy 1989). Fish also symbolize regeneration

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

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

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

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

3.6.2.5 Social Significance of Fishing to the Broader Community

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

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

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

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

> When it comes to selling seafood the Hawaiians have a distinct advantage. Their product comes with built-in aloha mystique, and while they've emphasized the high quality of the fish taken from their waters, they've also taken full advantage of the aura of exotic Hawaii itself in promotion on the mainland and, now, in Europe (Marris 1992, p. 75).

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

> A sustainable food system is one in which "food is grown, harvested, processed, marketed, sold, [and] consumed as close to home as possible." An emphasis on locally grown food, regional trading associations, locally owned processing, local currency, and local control over politics and regulation is found within a proximate system. A proximate food system will have "grocery stores close to home which carry local items with little or no corporately owned products to

compete," and would provide "specialty items that characterize the bioregion" (Kloppenburg et al. 2000, p. 182).

3.6.6.6 Native Hawaiian Community

Executive Order 12898, signed in 1994, requires federal agencies to address the environmental effects, including human health, economic and social effects, of federal actions on minority populations and low-income populations. This section describes environmental justice considerations and supplements the socioeconomic analyses in other sections of the EIS.

As discussed in Section 3.7.1 of the Final Environmental Impact Statement, Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region, May 2005, the individuals who participate in Hawaii's bottomfish fishery and other offshore fisheries make up an ethnically mixed group. A survey by Hamilton and Huffman (1997) of small-boat owners who engage in Hawaii's commercial and recreational fisheries, including the troll, pelagic handline, and bottomfish fisheries, found that the overall distribution of survey participants' ethnicities is similar to that found in Hawaii's statewide population in that the three most common ethnicities are Japanese, part Hawaiian, and Caucasian. Part Hawaiians made up 16 percent of the small-boat owners surveyed.

Vessels used in the NWHI bottomfish fishery were not included in the Hamilton and Huffman (1997) survey, but information on the ethnicity of some participants in this fishery is available from a 1993 survey conducted by Hamilton (1994). This earlier survey of 15 owner–operators and hired captains who participate in the NWHI bottomfish fishery found that 87 percent were Caucasian and 13 percent were part Hawaiian. However, it is likely that the ethnic composition of the deckhands aboard these vessels is much more mixed and reflects the highly diverse ethnic character of the state's total population.

With regard to the income levels of small-boat owners in Hawaii, Hamilton and Huffman (1997) reported that the mean household incomes of the survey respondents are above the state average, although the income levels of full-time fishermen tend to be less than those of recreational fishermen. Information on the household income of participants in the NWHI bottomfish fishery is unavailable.

The public scoping process for the FEIS as well as this DSEIS identified people of Hawaiian ancestry as being both a minority population and a low-income population with a particular interest in the use of the marine resources in Hawaii, including the bottomfish resources. These interests arise from complex historical and contemporary economic, social, cultural, and political circumstances that are discussed below. Given the significance of these special circumstances, impacts on the Native Hawaiian community were made a separate impact topic in the Environmental Consequences section of this document.

At present, people of Native Hawaiian ancestry make up about 21 percent of Hawaii's population (Department of Business, Economic Development and Tourism 1999). By most statistical measures, they have the lowest incomes and poorest health of any ethnic group in the state. Native Hawaiians have long been among the most economically disadvantaged ethnic or racial group in Hawaii in terms of standard of living, degree of unemployment, dependence on transfer payments, and limited alternative employment opportunities. In recent years, Native Hawaiians have had the highest proportion of individuals living below the poverty line. In 1989, 6 percent of all the families in the state had incomes classified below the federal poverty level (Office of Hawaiian Affairs 1998). During the same period, 14 percent of Native Hawaiians lived below the poverty line. Nearly 15 percent of Native Hawaiian households receive public assistance income, compared with 6.8 percent of households in the State (Office of Hawaiian Affairs 1998). In several residential areas, more than one third of Native Hawaiian households receive public assistance.

For centuries, Native Hawaiians relied on seafood as their principal source of protein. However, the availability of many traditional seafoods has been significantly diminished. Over exploitation and ecological degradation of inshore areas by pollution have had a pronounced negative impact on Native Hawaiian marine subsistence practices. Shomura (1987), for instance, noted that between 1900 and 1986, the harvest of coastal fish species in Hawaii declined by 80 percent, and catches of neritic-pelagic species declined by 40 percent. The changes in diet that resulted from loss of access to sea resources have contributed to the poor health of Native Hawaiians. Of all racial groups living in Hawaii, Native Hawaiians are the group with the highest proportion of multiple risk factors leading to illness, disability, and premature death (Look and Braun 1995).

There is abundant historical and archaeological evidence of the social importance of fishing in traditional Hawaiian culture. With specific regard to bottomfish, this significance was of both an economic and ritual nature (Iversen et al. 1990). Bottomfish such as kāhala, ulua, and ʻulaʻula (onaga) are specifically mentioned in traditional prayers used by fishermen, and fishing for these species was associated with religious rites. The cultural significance of bottomfish species to Hawaiian society is also indicated by the growth stage names for ʻōpakapaka, white ulua, kāhala, and the varietal names for ʻulaʻula and uku.

There may continue to be a strong cultural and religious connection between contemporary Native Hawaiians and certain species of bottomfish (Iversen et al. 1990). Some present-day Native Hawaiian consumers of these bottomfish may still associate these fish with traditional beliefs and with their dependence upon the fish for food. Because of the high cost of some bottomfish, they may be frustrated in maintaining such a traditional connection. Industry sources report that Native Hawaiians purchase proportionally less bottomfish than other ethnic groups, possibly because other types of fish cost less, and if Native Hawaiians have less disposable income to spend on fish, they would likely opt to purchase less costly species (Iversen et al. 1990).

CHAPTER 4: ENVIRONMENTAL CONSEQUENCES

For each alternative, the potential direct and indirect impacts (those that occur later in time or farther removed in distance) on each of the affected components of the human environment are described in Sections 4.1 through 4.5. The potential cumulative impacts of the alternatives are described in Section 4.6.

It is difficult to assess the full ramification of any of the alternatives considered because of a data-poor environment in relation to several of the environmental resource categories. Where data are lacking, a qualitative assessment of the possible consequences is presented.

4.1 Alternative 1: No Action

Alternative 1 is to take no federal action; that is, no federal management measures would be recommended by the Council at this time.

Under this and all other alternatives, the State of Hawaii's bottomfish management measures, which were established in 1998 under Department of Land and Natural Resources (DLNR) administrative rule (HAR Chapter 13-94) may remain in place or could be changed by DLNR. The state's current bottomfish management regime includes: (i) 19 Bottomfish Restricted Fishing Areas (BRFAs) throughout the MHI, (ii) a recreational bag limit of 5 ehu and/or onaga per trip per person, (iii) required bottomfish vessel registration, and (iv) prohibited use of bottom longline, nets, traps, and trawls to take bottomfish. Seven species, including deep-slope snappers and a grouper, were identified for management under the state regulations. The state's current BRFAs were delineated according to bottom topography, location of reported bottomfish landings, proximity to access points and points of observation for ease of enforcement, and recommendations from fishermen, with the primary purpose being to protect critical bottomfish habitat and presumed spawning and nursery habitat areas.

This alternative would also allow continued open access for entry into the MHI fishery, and commercial fishermen would continue to be required to submit catch reports. Recreational fishermen would continue not to be required to submit catch reports, and the recreational catch component would continue to be unknown.

Based on new mapping information of bottomfish habitat, HDAR is in the process of reviewing its bottomfish management regime, with a focus on the BRFAs. According to HDAR, the proposed changes to the BRFAs include reducing their number, modifying their locations, standardizing their boundaries to corresponding minutes of latitude and longitude, and increasing their size. Factors being considered by HDAR include facilitating GPS navigation around BRFAs, locating BRFAs close to shore to facilitate monitoring and enforcement, increasing habitat protection, and supporting larval transport and recruitment between banks and islands. Also under consideration are modifications to HDAR's existing Commercial Fisheries Statistical Area reporting grids to allow for better evaluation of the effectiveness of existing and new BRFAs. As detailed in Section 3.4.3.2.2, there are numerous shortcomings associated with the existing commercial fisheries statistical reporting grid system in relation to bottomfish habitat and location of BRFAs. The current shortcomings do not allow for evaluation of the BRFAs' effectiveness. Problems include BRFA boundaries that straddle multiple reporting grids or occupy only a portion of a single grid and reporting grid boundaries that parallel or are adjacent to 100-fathom depth contour lines.

According to HDAR, potential changes to its administrative rules regarding the BRFAs may be finalized in late 2006. As currently described, these changes would modify the 19 existing BRFAs into 12 larger BRFAs dispersed throughout the MHI.

Absent new State actions, federal action by the Secretary of Commerce would be required to end the bottomfish overfishing.

4.1.1 Target Species

Uncertainty about the effectiveness of the State's existing RFAs, about the final configuration of any new RFAs (and related changes to existing area closures) and fishermen's responses to them, as well as uncertainty about trends in factors external to the fishery management regime (such as market demand and prices for fresh MHI bottomfish), hamper reliable estimations of future fishing activity. However it can be reasonably anticipated that catches of target species will be reduced if prime fishing areas are designated as new RFAs.

Absent new State actions, short-term fishing activities under Alternative 1 would continue as described in Chapter 3. If the trend of declining commercial fishing activity, apparent for the past 20 years, continues, this would lead to an end of overfishing by proxy. There is, however, no reason to assume this scenario would occur as 2004 information indicates that this downward trend may have flattened. Thus fishing pressure (e.g. overfishing) would likely increase at least over the mid-term, as high fuel costs are believed to cause fishermen to switch from trolling to bottomfish fishing. Under this scenario the abundance of target species would further decline and federal action would likely be required to end overfishing. If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an '"overfished" state in the bottomfish fishery, which left unchecked could cause the fishery to collapse and require the implementation of a rebuilding plan.

4.1.2 Nontarget Species and Bycatch

Nontarget species are those that are caught incidentally, but retained for consumption or sale. Bycatch are those species that are caught incidentally but are not retained (i.e. discarded).

As described in Section 3.4.6, bycatch is not well reported in the MHI bottomfish fishery, but is believed to be small (8.5 percent of the total catch). Hawaii bottomfish fishing gears are highly selective and skilled bottomfish fishermen target particular species, reducing capture of nontarget species and bycatch.

Fish may be discarded because they are associated with ciguatera poisoning (e.g. kahala), are unpalatable (e.g. moray eels), are damaged (e.g. shark bites), or because they have a shorter shelf life or may fetch a relatively low price in the market (e.g. ulua). Unlike others, commonly discarded species (i.e. jacks, including ulua and kahala) are believed to not suffer baurotrama (death from air pressure differences) effects when brought up from depth and are often released alive (Kelley and Moffit 2004).

Bycatch rates in the NWHI are not directly comparable to the MHI bottomfish fishery as the latter is primarily a day trip fishery with little chance of catches exceeding available storage space. In addition there is significant recreational effort in the MHI, which may not be as adept at targeting (thus leading to higher catches of nontarget fish) and does not focus on marketable fish (believed to result in less discards of damaged or other unmarketable but still edible fish).

As described in Section 4.1.1, it can be reasonably anticipated that catches of target species will be reduced if prime fishing areas are closed under HDAR's modified BRFAs. If the decline results in a reduced market supply of fresh local bottomfish, currently low priced species may attain a higher value, with an associated greater incentive to land and sell fish that are currently discarded (e.g. butaguchi), thereby leading to possible shifting of commercial targets and concurrent reductions in bycatch.

At recent public meetings and in HDAR's bottomfish survey conducted in 2005, fishermen commented that they are experiencing more frequent catches of the introduced invasive blue line snapper or taape (*Lutjanus kasmira*). Increased catches of this non-indigenous nuisance species, however, are not an immediate management concern.

Under Alternative 1, information would continue to be collected only from the commercial fishery, and the impact of the recreational fishery on nontarget stocks would remain unknown.

4.1.3 Protected Species

General impacts to protected species under Alternative 1 were analyzed in detail in the May 2005 FEIS and are briefly summarized below. For the complete analysis, please refer to Section 4.1.3 of the FEIS. The following discussion summarizes the anticipated impacts from Alternative 1.

ESA Listed Species

Impacts to listed species are mitigated through adherence to the conservation recommendations outlined in the 2002 Biological Opinion issued by NMFS pursuant to the Endangered Species Act of 1973, as amended. In that opinion, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also found that the bottomfish fishery does not adversely affect any listed whales or sea turtles. Offshore bottomfish fisheries in the MHI are not known to interact with endangered species; however the 2002 Biological Opinion describes several monk seals that have been found with embedded hooks mostly of the type used by the shoreline ulua fishery, but monks seals have also been found with hooks similar to the type used in the bottomfish fishery (NMFS 2002)

Non-ESA Marine Mammals

The Hawaii bottomfish fishery is listed as a Category III fishery under Section 118 of the Marine Mammal Protection Act of 1972. A Category III fishery is one that has a low likelihood or no known incidental takings of marine mammals. Observer data from the NWHI Protected Species Study Zone taken in 1990 to 1993 recorded few interactions between marine mammals (monk seals and bottlenose dolphins) and bottomfish gear, primarily in the form of removal of fish and bait from fishing lines without any hookings or entanglements (Nitta and Henderson 1993). These interactions have been determined by NMFS to constitute a low-level risk to bottlenose dolphins. Observer coverage of the NWHI fishery from 2003 to the present has not recorded any interactions with marine mammals. The MHI offshore bottomfish fishery is believed not to interact with marine mammals.

Seabirds

The NWHI bottomfish fishery observer program recorded three interactions with seabirds in 2003, all of which were disentangled and released. This low level of interactions is expected to continue in the NWHI under the no-action alternative. These interactions may affect a limited number of seabirds; however, they would not be expected to result in impacts to seabird distribution, survival, or population structure. No interactions between seabirds and MHI bottomfish vessels have reported or observed, therefore it is believed MHI bottomfish fishing activities pose little to no threat to Hawaii seabird populations.

4.1.4 EFH, Biodiversity, and Ecosystems

Essential fish habitat (EFH) and habitat areas of particular concern (HAPC) that were designated for all MUS under the Council's existing FMPs are presented in Table 5. Impacts to substrate EFH and HAPC from bottomfish fishing may occur if weighted lines or baited hooks rest on the bottom substrate. This does occur during some bottomfish fishing operations; however larger onaga and opakapaka are often targeted at depths 20 meters from the bottom which reduces the opportunity for gear interactions with the substrate (Kelley and Moffit 2004). Lost fishing gear including anchor lines and anchors from bottomfish fishing activities also have the potential to impact the substrate. Research conducted in the NWHI and MHI found counts of this type of fishing debris to be low at the studied NWHI bottomfish fishing sites (Raita and St. Rogatien Banks), however no data were presented for the MHI sites (Kelley and Moffit 2004).

Potential impacts to water column EFH and HAPC from bottomfish fishing include the activity of sending a weighted handline with baited hooks and a small chum bag to bottom depths generally to 50 fathoms and below (see Section 3.4.2). This activity has been found not to adversely affect the EFH and HAPC of the water column (G. Davis, PIRO, personal communication). The use of chum has been theorized to potentially introduce parasites or disease into the water column however this has not been reported to be a problem in Hawaii's bottomfish fisheries (Kelley and Moffit 2004).

The use of explosives, poisons, trawl nets, and other destructive gears that may adversely affect EFH and HAPC is prohibited under the Bottomfish FMP.

Deep-water precious coral beds designated as EFH or HAPC are well below the depths fished or anchored in by the bottomfish fishery and thus neither direct or indirect impacts from bottomfish fishing activities are expected to affect deep-water precious corals or their habitat. Shallower black coral beds occur within the depth range fished for bottomfish and individual colonies of black coral species and could be damaged or destroyed by anchors or weights on the terminal end of the fishing line. Because black coral has a resilient exoskeleton it is unlikely that it would be damaged by any bottomfish fishing related gear except a direct hit to its base by an anchor (Kelley and Moffit 2004).

Areas of EFH and HAPC for crustacean and coral reef MUS are relatively shallow compared with the typical depths where bottomfish harvests occur. However, when fishing in deeper waters fishermen may anchor their vessels in order to maintain a position over productive fishing areas. Anchoring is generally conducted at depths from 80 to 120 meters (40 to 60 fm). At these depths, anchor damage is believed to be minimal, as much of the habitat consists of a mosaic of sandy low-relief areas and rocky high-relief areas. It is also important to note that the anchor typically used to maintain a vessel's position over a rocky area is constructed of 3/4 in. steel reinforcing rod ("rebar") fashioned in the shape of a four-sided J-hook. Because the rebar is bendable, this design helps prevent the anchor from becoming inextricably lodged on the bottom and has the added benefit of reducing damage to habitat during recovery.

Indirect impacts to water column EFH or HAPC could occur through pollutant discharges from bottomfish fishing vessels. The day-to-day operations of a fishing vessel can produce a number of waste products, including oil, sewage, and garbage that may potentially affect marine habitat. To the extent that these activities and events are subject to environmental regulations, their effects on EFH and HAPC are likely to be avoided, minimized, or mitigated.

The impact of a bottomfish fishing vessel striking the bottom could physically destroy habitat in the immediate area. The possible subsequent breakup of the vessel and release of fuel and oil could result in pollution of habitat and mortality of marine life. Such groundings are rare events, and therefore are not believed to be a significant threat to EFH or HAPC.

For the reasons mentioned above, the continuation of Hawaii bottomfish fisheries under Alternative 1 is not expected to adversely affect the EFH and HAPC for any MUS managed under the FMPs of the Western Pacific Region. Potential changes to the State's BRFAs may further reduce the potential for bottomfish fishing impacts to EFH and HAPC in the MHI.

It is believed that bottomfish fishing activities do not significantly impact bottom-dwelling invertebrates such as cnidarians (e.g. non–reef building corals), sponges, sea stars, and urchins (Kelley and Moffit 2004). The impacts of bottomfish fishing on competitors of target species (e.g. kahala, ulua) are not well understood especially because some species may simultaneously be competitors, predators, prey, and bycatch, but recent studies conducted in the NWHI do not suggest significant impacts to competitors (Kelley and Moffit 2004). The effect of bottomfish fishing on prey availability is also not well understood. However, Kelly and Moffit (2004) found that impacts on prey species are not likely to be significant at the NWHI sites they studied.

The nature of bottomfish fishing in Hawaii as a hook-and-line fishery is considered to have low collateral impacts (Morgan and Chuenpagdee 2003). In addition, existing data from studies in the MHI and NWHI have indicated bottomfish fishing activities are not significantly impacting the deep-benthic ecosystem in terms of bycatch removal, marine debris or derelict fishing gear, biodiversity, and competitor or predator release (Kelley and Moffit 2004). According to a recent interagency study, the coral reef ecosystem of the NWHI has been found to be in "pristine" condition (Maragos and Gulko 2002) despite decades of bottomfish fishing activities in the NWHI.

Under Alternative 1 current bottomfish fishing activities and (lack of) impacts would continue. However potential changes to the State's BRFAs may further reduce the potential for bottomfish fishing impacts to ecosystem functions and biodiversity in the MHI.

4.1.5 Fishery Sectors

Uncertainty about the effectiveness of the State's existing RFAs, about the final configuration of any new RFAs (and related changes to existing area closures) and fishermen's responses to them, as well as uncertainty about trends in factors external to the fishery management regime (such as market demand and prices for fresh MHI bottomfish), hamper reliable estimations of future fishing activity. However it can be reasonably anticipated that catches of target species will be reduced if prime fishing areas are designated as new RFAs. The distribution of these losses among fishery sectors will largely be a function of where new area closures are located, and the proximity and viability of remaining open areas.

Absent new State action short-term fishing activities under Alternative 1 would continue as described in Chapter 3. If the trend of declining commercial fishing activity, apparent for the past 20 years, continued, this could lead to an end of overfishing by proxy. There is, however, no reason to assume this scenario would occur. Preliminary 2004 information indicates that this downward trend may have flattened.

Fishing pressure (e.g. overfishing) would likely increase at least over the mid-term, as high fuel costs are believed to be causing fishermen to switch from trolling to bottomfish fishing. If this continues, bottomfish stocks and catch rates will further decline and fishery participants in all sectors will see lower returns both in financial and nonmarket (e.g. angler satisfaction, protein sources, and social benefits) terms. If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an '"overfished" state in the bottomfish fishery, which left unchecked could cause the fishery to collapse and require the implementation of a rebuilding plan under which little or no bottomfish fishing would be allowed for an extended period of time.

4.1.6 Fishing Communities

As described in Section 3.6.2, on the basis of the requirements of the 1996 SFA amendments to the MSA, the Council designated under its FMPs each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai, and Hawaii as fishing communities. The impact of Alternative 1 on some or all of these fishing communities would potentially be significant. If the State implements new RFAs that effectively close all available fishing areas within reach of a given community, that community or those portions thereof that rely on the bottomfish fishery to provide direct and indirect economic and cultural benefits (see Sections 3.6.2.3 to 3.6.2.5) for fishermen and their families, seafood consumers, and the broader island community, will no longer be able to participate in the bottomfish fishery. Absent new State actions, federal action would likely be required to end overfishing. If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an '"overfished" state in the bottomfish fishery, which left unchecked could cause the fishery to collapse. An overfished resource and subsequent collapsed fishery would likely result in significant negative impacts on Hawaii's fishing communities.

4.1.7 Native Hawaiian Community

In the short term, Alternative 1 would allow Native Hawaiians participating in Hawaii's bottomfish fisheries to fish at current levels and in current locations, thus providing economic and cultural benefits (Sections 3.6.2.3 to 3.6.2.5). Impacts of any new RFAs would vary depending on their size and location. Absent new State actions, federal action would likely be required to end overfishing. If the overfishing of bottomfish in Hawaii is allowed to continue, the potential is high for reaching an '"overfished" state in the bottomfish fishery, which left unchecked could cause the fishery to collapse. Under this scenario, the economic and cultural benefits observed from sustainable bottomfish resources for Native Hawaiian communities would cease, thereby negatively impacting the ability of Native Hawaiians to gain economically from catching bottomfish as well as their ability to perpetuate their cultural traditions of fishing and fish sharing among community members.

4.1.8 Administration and Enforcement

Under Alternative 1 the existing management costs of Hawaii's federal bottomfish fisheries would continue. These include the administration and enforcement costs of management of the NWHI bottomfish fishery with its limited entry system, permit requirements, gear restrictions, and at-sea observer coverage requirements.

4.2 Alternative 2: Area Closures

Alternative 2a: Penguin and Middle Banks (Secondarily Preferred)

Under Alternative 2a, all recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species (onaga, opakapaka, ehu, lehi, gindai, kalekale and hapuupuu) in or from federal waters around Penguin Bank and Middle Bank. All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to obtain permits as well as to complete and submit catch reports including their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

This alternative can be implemented by federal action as the Penguin and Middle Banks occur entirely in federal waters (Figure 3). Together these areas represent between 16 percent and 20 percent of MHI bottomfish landings as compared to the 2003 baseline (Kawamoto et al. 2005:

based on 1998-2004 and 1990-2004 data respectively, see Figure 30). The effectiveness of the area closures in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

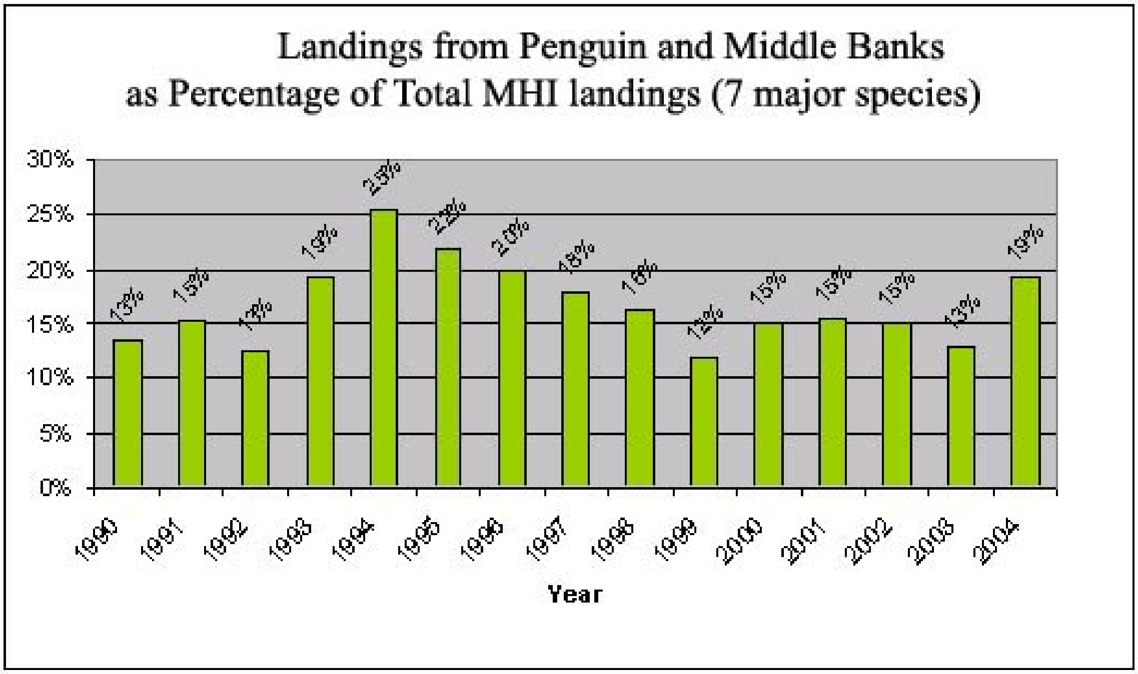


Figure 30: Landings from Penguin and Middle Banks as a Percentage of Total MHI Landings (Deep 7 Species). Source: Kawamoto et al. 2005.

The effectiveness of the closed areas in increasing the stock biomass of the Deep 7 species would be monitored and analyzed through a combination of fishery dependent (i.e. catch reports) and fishery independent data. Fishery independent data would be collected via controlled sampling experiments, submersible surveys, remote cameras (e.g. "Bot-Cam") and other methodologies.

Alternative 2b: Overlay Federal Closures on Proposed HDAR Restricted Fishing Areas

Under Alternative 2b, all recreational and commercial fishermen would be prohibited from targeting, possessing, landing, or selling any of the Deep 7 species (onaga, opakapaka, ehu, lehi, gindai, kalekale and hapuupuu) in or from federal waters in HDAR's proposed Bottomfish Restricted Fishing Areas (BRFA). Most of the proposed BRFAs have some component in federal waters (3-200 nm). BRFA P is entirely in federal waters on Penguin Bank. Existing HDAR prohibitions on the use of bottom longline, net, trap, or trawl gear to fish for the Deep 7 species, a recreational bag limit of five onaga/ehu total per fisherman per trip, and a requirement for vessel owners to register their vessels for bottomfish fishing would continue, as amended in the state's proposed modifications to their MHI bottomfish management plan.

Maps of the current and proposed BRFAs are in Appendix 3. It is estimated that the proposed closures will reduce fishing effort and mortality (landings) by at least 15 percent. The reduction was calculated from commercial fishing data. It is estimated the proposed BRFAs will reduce recreational fishing effort and mortality as well. HDAR has committed to maintaining this level of fishing mortality reduction as a minimum in their proposal, even if some of the proposed BRFAs may be modified or relocated, as they proceed through their administrative rule process to amend their existing regulations (HDAR 2006).

The assumptions and analysis of the State of Hawaii's proposed revisions to the BRFAs, Alternative 2b, are complex and it is difficult to predict the associated impacts. Although recognized as a valid management tool, there is more uncertainty in predicting the impacts associated with the proposed BRFA revisions when compared to the other alternatives.

4.2.1 Target Species

Alternative 2a would be expected to reduce MHI landings by up to 20 percent (as compared to the 2003 baseline) based on historical from Penguin and Middle Banks (Figure 30). Deepwater bottomfish within the closed areas would be protected but fishing effort (and associated mortality) could be displaced to open areas, thus reducing the potential benefits of the closures. However subsequent mortality rates may be lower if open areas have lower catch rates than Penguin and Middle Banks. The extent of effort moving to open areas is unknown, but several key factors suggest a shifting of effort would likely occur. Oahu bottomfish landings represent approximately 30 percent of the commercial MHI landings (Figure 31), and harvests from Penguin Bank make up a significant proportion of those landings. In addition, because MHI bottomfish tend to command higher aggregate prices than NWHI or imported bottomfish, a shifting of effort to other areas within the MHI is likely to occur.

Middle Bank represents about 0.5 percent of annual MHI bottomfish landings. Because of its location, it is believed that mostly Kauai-based fishermen target bottomfish at Middle Bank. Based on commercial data of the Deep 7 species from 2000 to 2003, landings from Middle Bank were about 5 percent of Kauai landings.

The closure of Penguin and Middle Banks would provide refuge for targeted species to the extent that fish remain in the closed areas. Adult bottomfish are thought to have a relatively limited range, but there is substantial variation in the extent of movement by different species during various life stages. For example, opakapaka is believed to move greater distances than onaga and unlike juvenile opakapaka, which have been found to occupy shallower depths than adults, juvenile onaga and ehu are found in the same depths and habitat as were adults. In addition, tagging studies conducted by HDAR from 1989 to 1994 found that adult opakapaka move extensively within their habitat range and cross deep inter-island channels and move between banks.

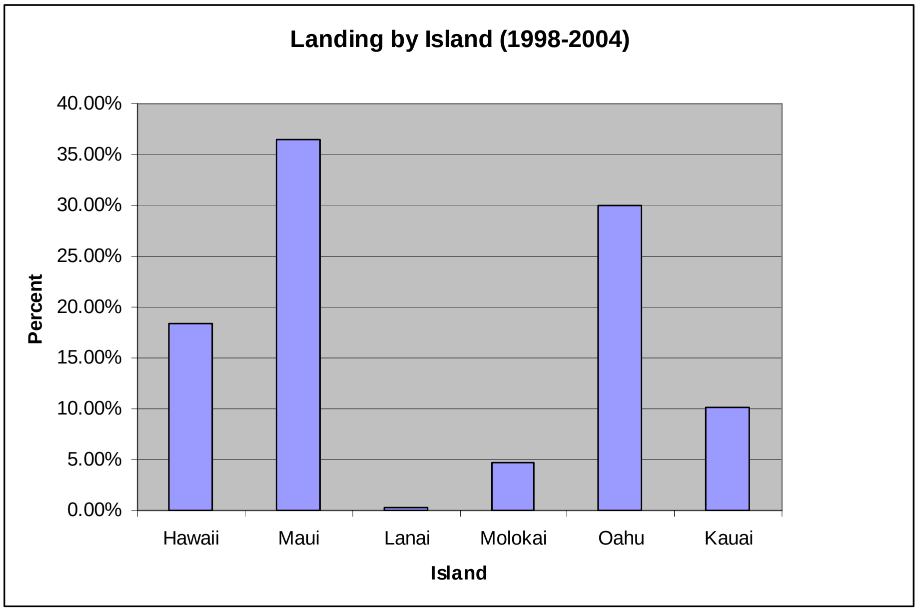


Figure 31: Percentage of MHI Commercial Landings by Island (1998 to 2004). Source: Kawamoto and Tau 2005.

Monitoring the effectiveness of this alternative in reducing fishing mortality would be difficult under the current catch reporting system which uses fairly large reporting grids. This is particularly problematic when Penguin Bank is considered. The edge of the Penguin Bank reporting grid (Grid 331; Figure 32) parallels the bank slope that meanders through prime bottomfish habitat. Adjacent grids, such Grid 429, include additional bottomfish habitat off the east coast of Oahu. Thus fish reported caught in Grid 429 could have either come from Makapuu Point off of east Oahu or from the western edge of Penguin Bank. However active bottomfish fishermen who frequent Penguin Bank have indicated that all catches taken in the Penguin Bank area are generally reported as coming from Grid 331. In addition, the size of Grid 331 does not allow for finer spatial reporting of fish caught from different locations on Penguin Bank. Without improved spatial reporting, precise estimates of reductions in fishing mortality due to the implementation of area closures would be difficult to achieve.

Reporting requirements for recreational fishermen under Alternative 2a would provide information on the catch and effort by this group. Such information is not currently collected and thus fishery scientists and managers do not know the total fishery removals taking place. Having complete information (whether spatially detailed or not) would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

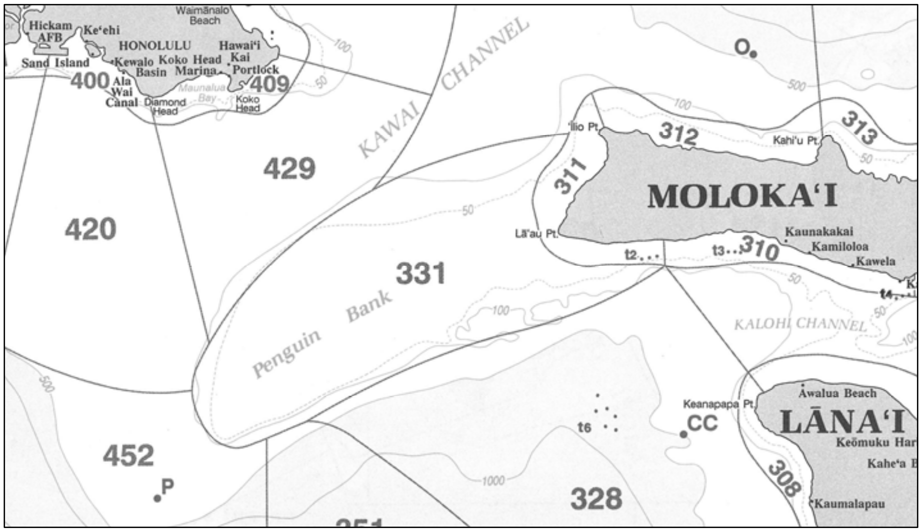


Figure 32: Commercial Fisheries Statistical Chart of Penguin Bank Area.

Alternative 2b: Federal Closures on Proposed HDAR Restricted Fishing Areas

The proposed BRFAs have been estimated by HDAR to reduce fishing mortality by at least 15 percent. Additionally, the bottomfish stock biomass may increase in the closed areas over time, because as according to HDAR, the BRFAs are being sited to protect potentially important habitat areas where the fish aggregate for feeding and spawning (HDAR 2006). Area closures have the potential advantage of providing year-round protection for the target species located within the closed area. Similar to Alternative 2a, this protection is dependent on the degree to which the target species move in and out of the closed areas.

It is expected that some shifting of effort would occur because of the proposed BRFAs. Some of the areas would be situated over currently fished bottomfish grounds and effort would shift to some of the current BRFAs that would be opened or to other open areas. It is difficult to determine the magnitude of the effort shift. However, because the areas that are proposed to be closed by the HDAR were selected based on much improved mapping, habitat, and fishing data, relative to data available when the current BRFAs were established in 1998, the areas that will be closed are estimated to be more effective at protecting quality habitat and may provide increased protection of bottomfish in those areas.

Prior to the establishment and following the implementation of the proposed BRFAs, state and federal agencies will need to develop and implement monitoring methodology that will allow for an accurate determination of how fishing mortality, biomass and size distribution of bottomfish are influenced by the BRFAs. This monitoring will include both fishery-dependent (i.e. commercial and recreational catch reports) and fishery-independent (e.g. baited bottom cameras) components.

4.2.2 Nontarget Species and Bycatch

Under Alternative 2a and 2b the catch of nontarget species as well as bycatch would be eliminated in the closed areas. Assuming that incidental catch rates are consistent throughout the MHI bottomfish fishery, this would achieve up to a 20 percent reduction (compared to the 2003 baseline) in catch of nontarget species. If the associated reduction in catches of target species results in a reduced market supply of fresh local bottomfish, currently low priced species may attain a higher value, with an associated greater incentive to land and sell fish that are currently discarded (e.g. ulua), thereby leading to possible shifting of commercial targets and concurrent reductions in bycatch. In addition, if fishing effort shifts to new or less productive open areas, nontarget catch and bycatch could increase as fishermen explore and discover new fishing grounds or techniques (i.e. shallow-water bottomfish fishing or trap fishing).

As noted in Section 4.2.1, recreational fishermen, in general, are expected to have less targeting skill than commercial fishermen, and therefore may have higher nontarget catches. They should, however, be less influenced by market value and therefore may be expected to retain more nontarget species than commercial fishermen.

Reporting requirements (including information on nontarget catches and bycatch) for recreational fishermen under Alternative 2a and 2b would improve the scientific understanding of influences on nontarget stocks and would be expected to improve fishery management.

4.2.3 Protected Species

In the 2002 Biological Opinion, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also found that the bottomfish fishery does not adversely affect any listed whales or sea turtles. Offshore bottomfish fisheries in the MHI are not known to interact with endangered or other protected species. The 2002 Biological Opinion mentions that several monk seals that have been found with embedded hooks mostly of the type used by the shoreline ulua fishery, however, monk seals have also been found with hooks similar to the type used in the bottomfish fishery (NMFS 2002). Alternatives 2a and 2b are not expected to result in any significant impacts to listed species or other protected species.

4.2.4 EFH, Biodiversity, and Ecosystems

Alternative 2a would implement an area closure around Penguin Bank and Middle Bank. As discussed in Section 4.1.4 bottomfish fishing activities have been found to not adversely affect EFH and HAPC for any MUS managed under the FMPs of the Western Pacific Region. Bottomfish vessels may potentially impact the environment through groundings or the release of pollutants and the closure of Penguin Bank and Middle Bank would eliminate such potential impacts to those areas. The effect of transferred bottomfish fishing effort and vessel activities from Penguin and Middle Banks to other areas with EFH and HAPC, as well as to other ecosystems, is unknown but not expected to be significant due to the low impacts of this fishery.

Alternative 2b would implement a wide network of area closures throughout the main Hawaiian Islands. The proposed BRFAs would enclose more than 765 square kilometers of bottomfish EFH (100 to 400 m depth) as identified by HDAR, of which about 50 percent is in federal waters. According to HDAR, this represents more than 13 percent of the total bottomfish EFH area in the main Hawaiian Islands. HDAR has stated that the proposed BRFAs also protect more than 25 percent of Potentially Important Habitat Areas, which are areas identified by HDAR as possessing underwater features such as pinnacles, cliffs, slopes, etc. and believed to be where bottomfish are generally found to aggregate or shelter.

Under Alternatives 2a and 2b, local biodiversity and ecosystems may experience some positive effects because cessation of bottomfish fishing activity within the closed areas by allowing for fish growth, undisturbed spawning, juvenile settlement and grow-out, and other benefits of non-capture within those areas.

4.2.5 Fishery Sectors

As described above, based on historical catches from Penguin and Middle Banks, it is estimated that Alternative 2a would reduce MHI landings of the Deep 7 species by up to 20 percent. There is potential for fishing effort to be displaced to open areas, although the extent of such moves is unknown. Given that approximately 30 percent of the MHI reported commercial bottomfish landings are from Oahu, and that Penguin Bank is the source of 46 percent of these landings, some shifting of effort is anticipated to occur. However, because Penguin Bank is the largest, most productive, and best known bottomfish fishing area around Oahu, it is likely that relocating fishing effort would realize reduced catch rates and thus be less attractive to fishery participants. In addition, those that do relocate would have to fish for longer periods to yield the same catches they are able to achieve from Penguin Bank. The combination of these factors implies that there is unlikely to be a complete replacement of catches due to relocated effort.

Impacts on the commercial, charter, and recreational (including subsistence) fishery sectors would be evenly distributed under Alternative 2a. However, operations based on Oahu and Kauai would be expected to be disproportionately impacted as compared with those on the other islands.

Alternative 2b may negatively impact small boat recreational and commercial fishermen as they may be displaced from their traditional fishing grounds which would be closed under the new BRFAs. This may force small boat vessels to travel farther in search of open fishing grounds, which may increase costs for fuel or pose safety risks.

Vessel registration and reporting requirements under Alternative 2a and 2b would represent an ongoing burden for commercial sectors. However, the burden of submitting catch reports for the recreational sector would be new, but not expected to be significant. In the long term the increase in information available to fishery scientists and managers should result in increased fish abundance and improved fishing opportunities.

4.2.6 Fishing Communities

As described above, this alternative would likely have disproportionate effects on the fishing communities of Oahu and Kauai. Closure of these areas may result in Oahu and Kauai fishing communities facing reductions in the direct and indirect economic and cultural benefits (Sections 3.6.2.3–3.6.2.5) for fishermen and their families, seafood consumers, and their broader island community. As fishermen from Oahu and Kauai will likely find new areas to fish or switch to other known bottomfish fishing areas, the direct impact to fishing communities under this alternative is unknown, but is thought to be more negatively substantial for Oahu because of its large population and limited available fishing areas. The Molokai fishing community could be impacted if Oahu vessels displaced from Penguin Bank relocate to areas off Molokai and compete with Molokai bottomfish fishers. Although Penguin Bank is close to Molokai, Molokai fishermen do not often bottomfish there because it is usually crowded with vessels from Oahu and the trip back to Molokai is generally rough due to high seas (Molokai fisherman, personal communication, January 7, 2006 public scoping meeting).

The effects of Alternative 2b on fishing communities is difficult to assess as Hawaii's fishing communities may respond different to the proposed BRFAs. For example, the fishing community of Maui may not be as negatively affected as the Molokai fishing community because the state is proposing to close only one area directly off Maui (near Hana), whereas the Molokai community is facing closures of three nearby bottomfish fishing grounds (i.e. 2nd and 3rd fingers of Penguin Bank, Kalaupapa, and south Molokai). Loss of access to traditional fishing grounds may negatively affect fishing communities as it may deter people from going fishing, thus reducing the social benefits of fish sharing amongst the community. Loss of specialized fishing knowledge within a fishing community can also been viewed as negative as it is a reduction in social capital that is difficult to regain by future generations.

Vessel registration and reporting requirements under Alternative 2a and 2b are not expected to have negative impacts on fishing communities despite the time commitments required. In the long term, positive impacts to fishing communities may occur from more accurate information on how many boats are bottomfish fishing, the amount of bottomfish they catch, and enhanced enforcement capabilities. Improved management of Hawaii's bottomfish would ensure that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

4.2.7 Native Hawaiian Community

The impact of a year-around closure of Penguin and Middle Banks under Alternative 2a would likely have similar impacts on Oahu and Kauai Native Hawaiian fishermen as experienced by Oahu and Kauai commercial, recreational, and charter fishing sectors, as well as Oahu and Kauai fishing communities. For Native Hawaiians, however, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any access and or traditional practice could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the area closures is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians.

The impacts on Native Hawaiians communities from Alternative 2b are expected to greater for those communities that are located near a proposed BRFA (e.g. Hana, Waianae, Ka`u). The loss of any access and or traditional practice could be viewed as a permanent loss of culture for those Native Hawaiian communities.

4.2.8 Administration and Enforcement

Administration and enforcement of Alternative 2a and 2b would require the expansion of the current reporting requirements to include requirements for recreational participants. All MHI vessel owners who target bottomfish are already required to register their vessels, however under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This will provide current information on the maximum number of fishery participants and ease enforcement by removing the "BF" markings from vessels no longer actively participating in the fishery.

In order to enforce the closed areas under Alternative 2a, additional enforcement actions would be required. As shore-based determination of the origin of MHI bottomfish landed or sold would nearly be impossible, at-sea enforcement and air surveillance by the USCG and NMFS OLE would be necessary to ensure compliance. Penguin Bank is a single large area that is located relatively close to Oahu, which is the base of U.S. Coast Guard (USCG) operations in the area. These factors would facilitate at-sea enforcement of the Penguin Bank closure. Due to its more remote location, Middle Bank would have to be monitored via aerial surveillance by the USCG. According to the USCG District 14 (Honolulu), aerial surveillance is problematic because it is difficult to determine from the air if lines are in the water. At-sea enforcement can also be difficult as well because it may be possible for fishermen to cut their lines and toss any illegal catch overboard prior to an enforcement vessel arriving on the scene. If the regulations prohibited any "BF" vessel from stopping within a closed area, enforcement capabilities would be increased, however this would obviously prevent these vessel operators from targeting shallow-water bottomfish or any other species (e.g. pelagic fish) within the closed areas..

Alternative 2b would also require at sea enforcement and air surveillance by the USCG and NMFS OLE. Problems with the current level of state enforcement for the exiting BRFAs have been noted and are primarily related to lack of resources and staff (section 3.4.3.2.3) According to HDAR, there is an incentive to place the proposed BRFAs closer to shore, to the extent possible, and design them with straight-line boundaries, making it easier for both fishermen and enforcement officers to determine whether fishing takes place inside or outside the closed areas. In order facilitate a adequate enforcement of the closed areas proposed in Alternative 2b, state and federal enforcement agencies would likely have to sign a Joint Enforcement Agreement as well as allow for cross-deputization of state and federal agents. Cross-deputization allows federal agents to enforce state laws and state agents enforce federal laws.

NMFS OLE Pacific Island Division (PID) currently has five agents working in the entire Western Pacific Region, and no enforcement assets (i.e. boats or planes). NMFS OLE PID has indicated that at their currently funding and staffing levels, it would be impossible to adequately enforce Alternative 2b (J. Fogarty, NMFS OLE PID, personal communication). NMFS OLE has suggests that both aerial and at-sea enforcement of multiple small closed areas with open areas in between make is very difficult as it enables cheating as a vessel could quickly enter and exit a closed area. The USCG District 14 has also indicated given their current resources adequate at-sea enforcement as well as air surveillance of the closed areas would nearly be impossible. Both NMFS OLE and the USCG have indicated that moving the BRFAs closure to shore does not facilitate enforcement as indisputable evidence is difficult to gather from shore and boat based operations would still be necessary.

4.3 Alternative 3: Seasonal Closure

Under Alternative 3, an annual summer closure would be implemented from May 1 to August 31 of each year for the entire MHI bottomfish fishery (both commercial and recreational vessels). Targeting, possessing, landing, or selling MHI Deep 7 species would be prohibited during the closed season; however, the NWHI bottomfish fishery would remain open. All vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to complete and submit reports of their catch, fishing effort, and area fished. In addition, each vessel would be required to be marked on an unobstructed upper surface with its registration number. To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish a parallel summer closure for state waters. The effectiveness of the seasonal closure in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

4.3.1 Target Species

Based on historical MHI landings, an annual MHI closure from May through August would be expected to reduce MHI landings by up to 17 percent as compared to the 2003 baseline (Kawamoto et al. 2005: Figure 33). Deepwater bottomfish throughout the MHI would be protected during the closed season. However, fishing effort could shift to open periods reducing the potential benefits of the closures. The extent of effort shifting to open periods is unknown. However, given that during the open period there would only be the remaining calendar days would be available to fish, combined with the sensitivity of the bottomfish fishery to adverse weather conditions, shifting of effort is expected to be minimal as compared to historical trends. Historically, the highest levels of bottomfish fishing effort occur in the winter months when there is high demand for bottomfish during the holiday season. Market forces may also be an important factor to deter effort if price per pound values drop as a result in market flooding during the open period. In addition, the closure would occur during the time when bottomfish activity has been historically low as fishermen switch to other fisheries. Both the pelagic troll (e.g. yellowfin) and the hook-and-line mackerel (akule and opelu) fisheries are at their peak during the summer period and therefore represent various recreational and commercial fishing opportunities during the bottomfish closed season.

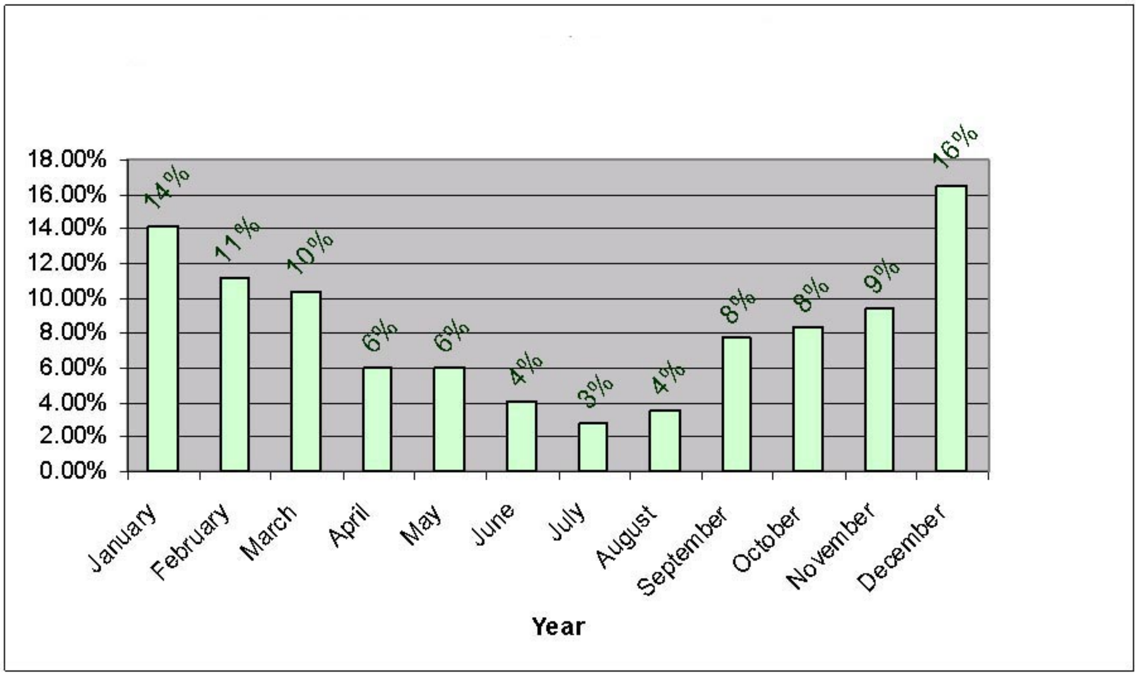


Figure 33: Percentage of MHI Landings by Month (Deep 7 Species). Source: Kawamoto and Gonzales 2005.

Although bottomfish spawn year round, there is evidence that spawning is greatest during the summer months (Haight et al. 1993). An annual May through August closure could provide additional benefits by prohibiting fishing during the peak spawning period and thus reducing fishing mortality of spawning bottomfish.

Reporting requirements for recreational fishermen under Alternative 3 would provide information on the catch and effort by this group. Such information is not currently collected and thus fishery scientists and managers do not know the total fishery removals taking place. Having complete information (whether spatially detailed or not) would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

4.3.2 Nontarget Species and Bycatch

Under Alternative 3 the catch of nontarget species and bycatch would be eliminated in the closed season. Regulatory bycatch is not expected because fishermen would most likely not be targeting bottomfish below depths of 30 fm. For example, trolling for uku often occurs at around 15 fm, therefore it would highly unlikely to catch an onaga while trolling for uku. If the associated decline in catches of target species results in a reduced market supply of fresh local bottomfish, currently low priced species may attain a higher value, with an associated greater incentive to land and sell fish that are currently discarded (e.g. ulua), thereby leading to possible shifting of commercial targets and concurrent reductions in bycatch. In addition, if fishing effort shifts to new or less productive open areas, nontarget catches and bycatch could increase as fishermen explore and discover new fishing grounds or techniques (i.e. shallow-water bottomfish fishing or trap fishing).

As noted in Section 4.2.1, recreational fishermen, in general, are expected to have less targeting skill than commercial fishermen, and therefore may have higher nontarget catches. They should, however, be less influenced by market value and therefore may be expected to retain more nontarget species than commercial fishermen.

Reporting requirements (including information on nontarget catches and bycatch) for recreational fishermen under Alternative 3 would improve the scientific understanding of influences on nontarget stocks and would be expected to improve fishery management.

4.3.3 Protected Species

In the 2002 Biological Opinion, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also found that the bottomfish fishery does not adversely affect any listed whales or sea turtles. Offshore bottomfish fisheries in the MHI are not known to interact with endangered or other protected species. The 2002 Biological Opinion mentions that several monk seals that have been found with embedded hooks mostly of the type used by the shoreline ulua fishery, however, monk seals have also been found with hooks similar to the type used in the bottomfish fishery (NMFS 2002). Alternatives 3 is not expected to result in any significant impacts to listed species or any other protected species.

Limited interactions in the NWHI bottomfish fishery (Section 3.5.4) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand, however this is not anticipated to significantly impact protected species due to the rarity of NWHI interactions and the fact that the NWHI is a limited entry fishery with only eight currently active vessels. Closing down all bottomfish fishing in the MHI during the summer months would be expected to result in fewer MHI bottomfish fishing vessels leaving port during this time period. It is possible that fishery participants would continue to fish by switching to trolling for pelagic species; however NMFS has concluded that the MHI pelagic small-boat (i.e. non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004). The MHI pelagic small-boat fishery is listed as a Category III fishery under the Marine Mammal Protection Act, with a low to no likelihood of interactions with marine mammals. Thus the relocation of MHI bottomfish effort to the pelagic small-boat fishery is not expected to result in any impacts to protected species not already considered.

4.3.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4 bottomfish fishing activities have been found to not adversely affect EFH and HAPC for any MUS managed under the FMPs of the Western Pacific Region. Implementing a seasonal closure under Alternative 3 is not expected to adversely affect EFH or HAPC due to the low impacts of this fishery. The potential for increased bottomfish fishing effort in the open season is not expected to significantly affect EFH or HAPC because hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat.

Similarly, the impacts of any increased pelagic effort during the closed season are expected to be negligible due to the use of hook-and-line gears in this fishery.

Under Alternative 3 local biodiversity and ecosystems may experience some short term positive effects because cessation of bottomfish fishing activity for the four-month period would allow for fish growth, undisturbed spawning, and other benefits of non-capture.

4.3.5 Fishery Sectors

As described above, based on historical MHI landings, it is estimated that a May–August closure of the MHI bottomfish fishery would result in up to a 17 percent reduction in landings of the Deep 7 species as compared to the 2003 baseline. As with the closed area, fishery participants may increase their fishing during the open season to compensate. However, given that May to August has historically been a time of lower bottomfish fishing activity (Figure 33), significant increases in effort during the open season are unlikely. Immediate impacts of the closure on the commercial, charter, and recreational (including subsistence) fishery sectors would be evenly distributed under Alternative 3. However, because this alternative would lead to an increased reliance on imported bottomfish during the closed season, it would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Vessel registration and reporting requirements under Alternative 3 would represent an ongoing burden on all sectors. In the long term the increase in information available to fishery scientists and managers should result in increased fish abundance and improved fishing opportunities.

4.3.6 Fishing Communities

Alternative 3 is not expected to result in significant or disproportionate negative impacts on fishing communities throughout Hawaii. As seen in Figure 34 the summer months between May and August represent the lowest amounts of monthly bottomfish landings, with the winter months of December through February having the highest landings. There would, however, likely be some number of bottomfish fishers from each community who would be negatively impacted by a summer closure as there are those who prefer year-round bottomfish fishing to other types of fishing and others who prefer summer fishing to other times of year. Under this alternative, fishery participants among the state's fishing communities will be allowed to fish for bottomfish during the remaining eight months of the year and would be able to fish for other types of fish (i.e. troll for ahi) during the summer bottomfish closure. Thus, the direct and indirect economic and cultural benefits (Sections 3.6.2.3 to 3.6.2.5) for fishermen and their families, seafood consumers, and their broader island communities are expected to be generally maintained under this alternative.

Vessel registration and reporting requirements under Alternative 3 are not expected to have negative impacts on fishing communities despite the time commitments required. In the long term, positive impacts to fishing communities may occur from more accurate information on how many boats are bottomfish fishing, the amount of bottomfish they catch, and enhanced enforcement capabilities. Improved management of Hawaii's bottomfish would ensure that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

4.3.7 Native Hawaiian Community

A May-August bottomfish closure would likely have similar impacts on Native Hawaiian fishermen as by experienced commercial, recreational, and charter fishing sectors, and Hawaii's fishing communities. For Native Hawaiians, however, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices, albeit for relatively short period during the closure, reduces their ability to practice and continue their culture. The loss of any customary access and practice has resulted could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the seasonal closure is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians. Seasonal restricted fishing periods for a variety of marine organisms were practiced under the ahupuaa system of traditional Native Hawiian resource management.

4.3.8 Administration and Enforcement

Administration and enforcement of Alternative 3 would require the expansion of the current commercial reporting requirements to include similar requirements for recreational participants. All MHI vessel owners who target bottomfish are already required to register their vessels, however under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This will provide current information on the maximum number of fishery participants and ease enforcement by removing the "BF" markings from vessels no longer actively participating in the fishery

Enforcing the summer closed season would require that a parallel closure occur in State waters because shore-based determinations of the origin (i.e. from State vs. federal waters) of MHI bottomfish landed or sold would be impossible. In addition, enforcement of this alternative would require significant shore-based monitoring of landings and sales. This would ensure that only imported bottomfish, or bottomfish harvested by federally permitted NWHI vessels, were sold during the closure period. Without parallel rules, enforcement of Alternative 3 would require extensive at-sea monitoring of federal waters during the closure period.

4.4 Alternative 4: Catch Limits

Alternative 4 includes two variations that would limit the commercial catch of MHI bottomfish. Alternative 4a would establish a fleet-wide total allowable catch (TAC) of bottomfish for all commercial fishing vessels in the MHI, while Alternative 4b would establish vessel-specific individual fishing quotas (IFQs) for Deep 7 bottomfish for all commercial fishing vessels in the MHI. Once either quota was reached, no targeting, possessing, landing or selling of MHI Deep 7 bottomfish (commercial or recreational) would be permitted. The NWHI bottomfish fishery would remain open.

Under both variations, all vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and to obtain permits, as well as to complete and submit catch reports including their catches, fishing effort, and area fished. To facilitate recognition of bottomfish registered vessels from the air, each vessel would be required to be marked on an unobstructed upper surface with its registration number.

To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish a parallel requirement as both State and federal waters would have to be closed once the limit was reached. The effectiveness of the catch limits in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

Alternative 4a: TAC

Under Alternative 4a, a TAC of 198,484 pounds of the Deep 7 species (all species combined), representing a 15 percent reduction from the 2003 fleet-wide MHI bottomfish catches of these species (Kawamoto et al. 2005), would be applied to the entire MHI commercial bottomfish fishery. The bottomfish fishing year would start on October 1 and continue until the TAC was reached. Thereafter, no fishing for Deep 7 bottomfish (commercial or recreational) would be permitted in the MHI. The NWHI bottomfish fishery would remain open.

Alternative 4b: IFQs

Under Alternative 4b, IFQs would be established for each MHI commercial bottomfish fisherman, allowing them to catch 85 percent of their 2003 catch of the Deep 7 species, based on reported landings. The bottomfish fishing year would start on January 1. The number of participants would likely be limited to past participation in the fishery and quota amounts would likely be determined based on individual historical catches. Once a commercial fisherman had landed his respective IFQ, that person would not be permitted to fish for, possess, or sell any bottomfish until the following year. The recreational fishery would remain open.

Each MHI commercial bottomfish participant with an IFQ would be issued a set of non-transferable bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the fisherman's total IFQ. The fisherman would be required to submit a stamp to the dealer at the point of sale. If the fisherman sold fish in excess of the number of bottomfish pounds for one stamp, he would be required to surrender a second stamp to the dealer. Once all the stamps were submitted the fisherman would be prohibited from fishing until the next open season.

Under this variation, fishermen would be required to continue reporting their catches and to stop fishing when their individual quota was reached. Fishery data would need to be analyzed in real time to ensure that fishermen did not exceed their quota and to penalize those that did.

IFQs could be implemented in a number of ways, two methods are outlined here:

1. Provide equal quotas (totaling 85 percent of the fleet-wide 2003 catch) to all historical participants. Under this alternative, historical highliners would get the same quota as part-time fishermen, and vice versa. Variations could provide equal quotas to a subset of all historical participants, such as those most active in recent years.

2. Provide individual quotas that are equal to 85 percent of each and every fisherman's historical catch. Under this alternative, fishermen's quotas would be relative to their individual historical catches. Variations could provide similar quotas to a subset of all historical participants, such as those most active in recent years.

4.4.1 Target Species

Both options under Alternative 4 would provide direct control of fishing mortality. However, determining appropriate allowable harvest levels on an ongoing annual basis would be difficult as to date not even one comprehensive stock assessment has been completed for this fishery. PIFSC has recently initiated a process to complete a comprehensive stock assessment, however the date of completion is unknown and the assessment model would unlikely be able to predict allowable harvest levels on an annual basis. There is also a paucity of fishery independent data, as well as difficulty in adjusting available CPUE data as highliners leave the fishery. Incorporating the existence of area closures such as the State's RFAs has also proven problematic as the RFAs are generally designed to close the most productive fishing areas, thus reducing available CPUE in remaining open areas.

High-grading would also be a concern under both versions of Alternative 4. High-grading to maximize value can occur within species (e.g. discarding small fish in favor of larger fish) or between species (e.g. discarding low-value species in favor of higher-value species). Deep-slope bottomfish generally have a high mortality rate resulting from embolism as they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur.

A quota-based program may also lead fishery participants to make sure that they achieve quotas out of fear that future quotas (or their share of them) may otherwise be reduced. This can result in increased impacts on target species as compared to other management approaches.

As discussed above, either type of quota-based system would be expected to result in some high-grading by species and size. However, high-grading of target species would more likely occur in an IFQ system than in a TAC. Under a TAC system, fishermen would compete against each other and time to land as many of the Deep 7 species as possible before the TAC is filled. This competition would likely discourage discarding of Deep 7 species. Under the IFQ system, fishermen would have the luxury of time to sort through their catch to maximize profit, potentially resulting in increased bycatch rates of, and impacts on, target species.

Reporting requirements for recreational fishermen under Alternative 4 would provide information on the catch and effort by this group. Such information is not currently collected and thus fishery scientists and managers do not know the total fishery removals taking place. Having complete information would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

4.4.2 Nontarget Species and Bycatch

Fishing strategies applied under a TAC or IFQ system are expected to result in different fishing strategies and impacts to targeted species and bycatch. Fishing under a fleet-wide TAC has been observed to create a "race to the fish" in which each fisherman attempts to maximize their individual harvest of the quota species in the shortest time period possible (i.e. before they are harvested by others). Due to limited storage capacity, this may lead to increased discards of less desirable species resulting in higher bycatch rates.

Under an IFQ system, fishermen can catch their quota of the Deep 7 species throughout the year without time constraints or pressure of competition and can limit their fishing to periods of favorable weather or high market prices. An IFQ system could encourage higher retention of nontarget species that could result in a reduction of bycatch. As fishermen know their overall Deep 7 catch will be limited, they will seek opportunities to maximize their fishing time by retaining marketable nontarget species that may have not been previously retained.

As noted in Section 4.2.1, recreational fishermen, in general, are expected to have less targeting skill than commercial fishermen, and therefore may have higher nontarget catches. They should, however, be less influenced by market value and therefore may be expected to retain more nontarget species than commercial fishermen.

Reporting requirements (including information on nontarget catches and bycatch) for recreational fishermen under Alternative 4 would improve the scientific understanding of influences on nontarget stocks and would be expected to improve fishery management.

4.4.3 Protected Species

In the 2002 Biological Opinion, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also found that the bottomfish fishery does not adversely affect any listed whales or sea turtles. Offshore bottomfish fisheries in the MHI are not known to interact with endangered or other protected species. The 2002 Biological Opinion mentions that several monk seals that have been found with embedded hooks mostly of the type used by the shoreline ulua fishery, however, monk seals have also been found with hooks similar to the type used in the bottomfish fishery (NMFS 2002). Alternatives 4a and 4b are not expected to result in any significant impacts to listed species or any other protected species.

Limited interactions in the NWHI bottomfish fishery (Section 3.5.4) would have the potential to increase if NWHI fishing activity increased to fill unmet market demand, however this is not anticipated to significantly impact protected species due to the rarity of NWHI interactions and the fact that the NWHI is a limited entry fishery with only eight currently vessels. Closing down some or all bottomfish fishing in the MHI once quotas were achieved would be expected to result in fewer MHI bottomfish fishing vessels leaving port until the next fishing season. It is possible that fishery participants would continue to fish by switching to trolling for pelagic species, however NMFS has concluded that the MHI pelagic small-boat (i.e. non-longline) fishery is not likely to jeopardize the continued existence of any listed species (NMFS 2004). The MHI pelagic small-boat fishery is listed as a Category III fishery under the Marine Mammal Protection Act, with a low to no likelihood of interactions with marine mammals. Thus the relocation of MHI bottomfish effort to the pelagic small-boat fishery is not expected to result in any impacts to protected species not already considered.

4.4.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4 bottomfish fishing activities have been found to not adversely affect EFH and HAPC for any MUS managed under the FMPs of the Western Pacific Region. Implementing a quota system under Alternative 4 is not expected to adversely affect EFH or HAPC. The precise effects of a potential "race for the fish" situation under Alternative 4a are unknown but are not be expected result in significant impacts as hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat. Implementing catch limits via a TAC or IFQs would impact the number of bottomfish removed, which could either result in fewer fish caught, or if high-grading occurs, in more fish caught. The former would have positive impacts on overall abundance with corresponding impacts on the ecosystem, while the latter would have negative impacts. The impacts of any increased pelagic effort by displaced bottomfish fishermen are expected to be negligible due to the use of hook-and-line gears in the small-boat pelagic fishery.

Under Alternative 4 local biodiversity and ecosystems may experience some positive effects due to reductions in bottomfish harvests.

4.4.5 Fishery Sectors

Alternative 4a

The use of a commercial fleet-wide TAC under Alternative 4a would be anticipated to result in a bunching of fishing effort at the beginning of each fishing year (October 1) as fishery participants would be aware that once the TAC was reached the fishery would be closed to all sectors. Given that the majority of commercial landings are already made during the winter season this is not likely to radically change these operations, however it may lead to market "floods" which temporarily reduce fresh fish prices and adversely impact commercial fishermen. Once the TAC was reached, this alternative may lead to an increased reliance on NWHI or imported bottomfish. However, the continued NWHI bottomfish fishery is likely to be subject to reduced catch limits pending the designation of the NWHI National Marine Sanctuary. Therefore, an increased reliance on imported bottomfish would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Fishery sectors (both commercial and recreational) and participants may be differentially impacted depending on their ability and willingness to "race to the fish" and some may upgrade their vessels (e.g. buy large vessels or more powerful engines for existing vessels) or fish during adverse weather in order to achieve high catches before the TAC is reached. These responses would be anticipated to result in over-capitalization (i.e. otherwise unnecessary investments to upgrade vessels) of the fishery and threats to the safety of fishery participants.

Alternative 4b

The impacts of Alternative 4b on the commercial fishery sector would vary depending on how the IFQs were implemented. If equal quotas (totaling 85 percent of the fleet-wide 2003 catch) were provided to each participant, highliners would get the same quota as part-time fishermen, and vice versa. This would leave some without enough quota, while others would have unused quota. Without a method to transfer (trade) quota between fishermen, this would have disproportionately adverse impacts on the highliners. If equal quotas were provided to a subset of all historical participants, such as those most active in recent years, those included would each have a higher quota, while those excluded would have none. The recreational (including subsistence) fishery sector would not be impacted under this alternative.

If individual quotas (equal to 85 percent of each fisherman's individual historical catch) were provided, all commercial participants would be anticipated to experience proportionately equally adverse impacts, and it is likely that more of the total quota would be used even if there were no method to transfer quota between fishermen. If individual quotas were provided to a subset of all historical participants, such as those most active in recent years, the individual quotas would not change, but some historical participants would not have any quota. The recreational (including subsistence) fishery sector would not be impacted under this alternative.

Because this alternative would also lead to an increased reliance on imported bottomfish as the commercial IFQs were reached, it would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Vessel registration and reporting requirements under both variations of Alternative 4 would represent an ongoing burden on all sectors. In the long term the increase in information available to fishery scientists and managers should result in increased fish abundance and improved fishing opportunities.

4.4.6 Fishing Communities

Alternative 4a

Because Alternative 4a would be applied fleet-wide throughout the MHI, it is likely that much of it would be harvested by Oahu-based fishermen, because that fishing community has the highest number of participants. Fishing communities from other islands could be affected if it was perceived that Oahu fishermen, for example, were harvesting most of the fish. This sentiment could lead participants from non-Oahu fishing communities to go fishing in bad weather to ensure that they get their fair share. This can result in the loss of vessels and human life and reduce the direct and indirect positive impacts fisheries communities receive from the fishery. A race to the fish situation could also flood local fish markets with bottomfish, thereby, positively impacting consumers, but negatively impacting fishermen because of low prices.

Alternative 4b

The impacts of Alternative 4b on Hawaii's fishing communities would vary depending on how the IFQs were implemented. Providing equal IFQs to all participants could impact fishing communities if the result is to remove highliners from them. Although there are likely to be relatively small numbers of highliners within any one fishing community, their loss would likely result in reduced availability of bottomfish to local markets, family members and social circles. It would also represent a significant loss of fishing knowledge from the active fishery.

Highliners would be less likely to leave the fishery if their respective IFQs were based on their individual historical catch. Therefore, the anticipated impacts on fishing communities would not be expected to be negatively significant, as fishing opportunities for commercial MHI bottomfish participants within all of Hawaii's fishing communities would be maintained at 85 percent of their current levels. Also maintained would be the direct and indirect economic and cultural benefits (Sections 3.6.2.3 to 3.6.2.5) for fishermen and their families, seafood consumers and their broader island communities.

Vessel registration and reporting requirements under both variations of Alternative 5 are not expected to have negative impacts on fishing communities despite the time commitments required. In the long term, positive impacts to fishing communities may occur from more accurate information on how many boats are bottomfish fishing, the amount of bottomfish they catch, and enhanced enforcement capabilities. Improved management of Hawaii's bottomfish would ensure that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

4.4.7 Native Hawaiian Community

Alternative 4a

The implementation of a fleet-wide bottomfish TAC could result in a fishery closure before some Native Hawaiian fishermen caught the comparable amount of bottomfish as in previous years. This could adversely impact Native Hawaiian fishermen who depend on catching bottomfish to supplement their income or to perpetuate their culture and share with their community. Broader level cultural impacts would be anticipated once the TAC is met and both commercial and recreational bottomfish fishing is prohibited until October 1. For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice has resulted could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the TAC is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians.

Alternative 4b

The implementation of IFQs would result in negative impacts to any Native Hawaiians who do not have documented records of their historical participation in the fishery. Native Hawaiian fishermen would be adversely impacted if they are given IFQs that are below their historical catches.

For Native Hawaiians, who once exercised sovereignty and self-determination in the Hawaiian Archipelago, and whose activities were governed by customary and traditional practices, any curtailment or reduction of access rights and cultural practices reduces their ability to practice and continue their culture. The loss of any customary access and practice has resulted could be viewed as a permanent loss of culture for Native Hawaiian communities. On the other hand, the objective of the IFQs is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiian communities.

4.4.8 Administration and Enforcement

Administration and enforcement of Alternative 4 would require the expansion of the current reporting requirements to include requirements for recreational participants. All MHI vessel owners who target bottomfish are already required to register their vessels, however under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This will provide current information on the maximum number of fishery participants and ease enforcement by removing the “BF” markings from vessels no longer actively participating in the fishery

Both variations of Alternative 4 would require that appropriate TACs or IFQs be determined, analyzed and published in a timely manner prior to each start of the fishing season (although it is known that current fishing mortality needs to be reduced by 15 percent, this number is likely to change over time as fishery harvests are reduced and stocks increase). As described in Section 4.4.1, the ongoing determination of these quotas would be difficult as to date not even one comprehensive stock assessment has been completed for this fishery. Problem areas include the lack of fishery independent data, difficulty in adjusting available CPUE data as highliners leave the fishery and incorporating the existence of area closures into stock assessment calculations.

The bottomfish stamp system under Alternative 4b would be administratively burdensome, both to implement and to monitor compliance as it would likely involve thousands of stamps.

Enforcement of this alternative would include increased and real time shore-based monitoring of commercial landings and sales to determine when the TAC was reached under Alternative 4a, or when each commercial participant’s IFQ was reached under Alternative 4b. Shore-based federal/state enforcement will also be required to monitor compliance of the bottomfish stamp system under Alternative 4b as dealers cannot be held wholly responsible for monitoring bottomfish stamps. Because bottomfish from the NWHI and imported bottomfish would still be available, a system to certify these fish as non-MHI fish would need to be implemented. Additional at-sea enforcement would not be required but occasional monitoring would supplement shore-side monitoring when the TAC or IFQs were reached. All vessel owners would be required to mark their vessels with the registration number to be visible from aircraft to facilitate enforcement and vessel monitoring. Joint efforts between the State of Hawaii and federal law enforcement capacities would greatly enhance enforcement of this alternative.

4.5 Alternative 5: Combination Measures

Alternative 5 would mitigate the potentially negative impacts of the above stand-alone alternatives above by combining modifications of them. Alternative 5 includes two variations: Alternative 5a would combine a seasonal bottomfish closure with bottomfish IFQs for a limited number of MHI commercial fishing vessels during the seasonal closure, while Alternative 5b would combine a seasonal MHI closure with a year-round closure of the southern portion of Penguin Bank.

Under both versions of Alternative 5, all vessel operators (both commercial and recreational) targeting bottomfish in the MHI would be required to register their vessels on an annual basis and would be required to obtain permits as well as to complete and submit catch reports including their catches, fishing effort, and area fished.

To achieve the needs and objectives of this action (i.e. a 15 percent in MHI fishing mortality), the State of Hawaii would need to establish parallel requirements as fishing limits and closures would be required in both state and federal waters. The effectiveness of the combined measures in reducing bottomfish fishing mortality would be monitored through recreational and commercial reporting as well as enforcement activities.

The effectiveness of Alternative 5b's closed area in increasing the stock biomass of the Deep 7 species would be monitored and analyzed through a combination of fishery dependent (i.e. catch reports) and fishery independent data. Fishery independent data would be collected via controlled sampling experiments, submersible surveys, remote cameras (e.g. "Bot-Cam") and other methodologies.

Alternative 5a: Seasonal Closure and IFQs

Under Alternative 5a, the MHI bottomfish fishery would be closed during an expanded seasonal closure from May 1 to September 30 of each year, except for a small number of full-time commercial bottomfish fishermen. The exempt fishermen would each receive IFQs for the Deep 7 species that they could use during the otherwise closed season (May–September). Once each exempted fisherman's quota was landed, he would be required to stop fishing until the next open season. The combined total of all IFQs would equal 23,946 pounds of the Deep 7 species (all species combined) as this is the amount that could be made available for harvest during the otherwise closed season and still maintain the overall annual reduction of 15 percent from the 2003 baseline for the entire MHI (Table 47).

Table 47: Estimated Reductions and Available Pounds under Alternative 5a.

Target Reduction	MHI Closure Months	Estimated Reduction in MHI Landings due to May-September closure	Pounds Available to Harvest and Still Meet 15 Percent Target Reduction
15 percent 35,027 pounds	May–September	25.25 percent 58,973 pounds	23,946 pounds

Each MHI commercial bottomfish fisherman exempted from the summer closure would be issued a set of bottomfish stamps, with each stamp representing a certain number of pounds of bottomfish and all the stamps totaling the vessel's IFQ for the otherwise closed season. The fisherman would be required to submit a stamp to the dealer at the point of sale. If the fisherman sold fish in excess of the number of bottomfish pounds for one stamp, he would be required to surrender a second stamp to the dealer. Once all the stamps were submitted the fisherman would be prohibited from targeting, possessing, landing or selling MHI Deep 7 bottomfish until the next open season.

As in Alternative 4, IFQs could be calculated and provided in equal amounts to all qualifying fishermen, or they could be calculated and provided such that each qualifying fisherman's quota was proportionate to his historical catch. However, in either case, the sum of the IFQs would not exceed the 23,946 pounds available.

Alternative 5b: Seasonal Closure and Area Closure

Alternative 5b would combine a seasonal closure from June 1 to August 31 of each year for the MHI with a year-round partial closure of Penguin Bank. All MHI bottomfish fishermen would be prohibited from targeting, possessing landing or selling the Deep 7 species from the MHI during the summer closure. However, the year-round partial closure of Penguin Bank would enable the length of the summer closure to be reduced as compared to other alternatives. Based on historical MHI landings of deep-slope bottomfish, a summer closure from June through August would reduce landings by up to 11 percent as compared to the 2003 baseline (Kawamoto et al. 2005). Based on 1998 to 2004 historical data indicating that federal waters around Penguin Bank are the source of 16 percent of MHI Deep 7 catches as compared to the 2003 baseline (Kawamoto et al. 2005) and lacking spatially detailed catch and effort data for this area, the closure of the southwestern quarter of Penguin Bank would be estimated to further reduce landings by an additional 4 percent. Thus the combination of the seasonal and area closures under Alternative 5b would be expected to achieve the 15 percent reduction target.

4.5.1 Target Species

Alternative 5a

Under Alternative 5a, deepwater bottomfish throughout the MHI would be protected during the closed season with the exception of the limited commercial harvest by exempted fishermen. Those fishermen who do not receive a summer quota could shift their effort to open periods, thus potentially reducing the benefits of the closures. However, shifting is expected to be low because the closure would occur during the time when bottomfish activity has been historically low as fishermen switch to other fisheries (Figure 34). Both the pelagic troll (e.g. yellowfin) and the hook-and-line mackerel (akule and opelu) fisheries are at their peak during the summer period. In addition, some bottomfish participants would receive IFQs and could thus continue fishing during the otherwise closed season. Those who did not may be reluctant to increase their bottomfish fishing activity during the winter months when waters are generally rougher.

Although bottomfish spawn year round, there is evidence that spawning is greatest during the summer months (Haight et al. 1993). An annual June through August closure could provide additional benefits by prohibiting fishing during the peak spawning period and thus reducing fishing mortality of spawning bottomfish.

Reporting requirements for recreational fishermen under Alternative 5a would provide information on the catch and effort by this group. Such information is not currently collected and thus fishery scientists and managers do not know the total fishery removals taking place. Having complete information would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

Alternative 5b

Under Alternative 5b deepwater bottomfish throughout the MHI would be protected during the closed season. Fishing effort could shift to open periods, potentially reducing the benefits of the closures. The extent of effort shifting to open periods is unknown. However, given that the closure period is timed when bottomfish activity has been historically low, participation by fishermen who in other fisheries is high (i.e. yellowfin troll fishery and hook-and-line akule and opelu), and the fisheries dependence on suitable weather, significant shifting of effort to open areas is not likely to occur. The annual June through August closure could provide additional benefits by limiting fishing during the peak spawning periods of some bottomfish species.

Alternative 5b would further protect targeted species within the year-round closed area on the southern portion of Penguin Bank. In this scenario, fishing effort could be displaced to open areas, thus reducing the benefits of the closures. The likely extent of such moves is unknown but given that 30 percent of the commercial MHI landings are made by Oahu-based boats (with Penguin Bank representing a significant proportion of these landings), and that the market demand will continue for fresh MHI bottomfish, some shifting of effort is likely to occur.

The partial closure of Penguin Bank would provide a refuge for the targeted species to the extent that they remain in the closed area. Adult bottomfish are thought to have a relatively limited range, but there is substantial variation in the extent of movement by different species during various life stages. For example, opakapaka are believed to move greater distances than onaga and unlike juvenile opakapaka, which have been found to occupy shallower depths than adults, juvenile onaga and ehu were found in the same depths and habitat as were adults. In addition, tagging studies conducted by HDAR from 1989 to 1994 found that adult opakapaka move extensively within their habitat range and cross deep inter-island channels and move between banks.

As discussed in Section 4.2.1, the shortcomings associated with reporting bottomfish based on the commercial fisheries statistical grids are particularly problematic regarding Penguin Bank. Without improved spatial reporting, precise estimates of reductions in fishing mortality due to the implementation of the area closure would be difficult to achieve.

Reporting requirements for recreational fishermen under Alternative 5b would provide information on the catch and effort by this group. Such information is not currently collected and thus fishery scientists and managers do not know the total fishery removals taking place. Having complete information (whether spatially detailed or not) would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

4.5.2 Nontarget Species and Bycatch

Alternative 5a

Under Alternative 5a, nontarget species throughout the MHI would be protected during the closed season with the exception of catches associated with the limited commercial harvest by exempted fishermen. Those fishermen who do not receive a summer quota could shift their effort to open periods, thus potentially reducing the benefits of the closures to nontarget species. However, shifting is expected to be low because the closure would occur during the time when bottomfish activity has been historically low as fishermen switch to other fisheries (Figure 33).

If the reduction in catches of target species results in a reduced market supply of fresh local bottomfish, currently low priced species may attain a higher value, with an associated greater incentive to land and sell fish that are currently discarded (e.g. ulua), thereby leading to possible shifting of commercial targets and concurrent reductions in bycatch. In addition, if fishing effort shifts to new or less productive time periods, nontarget catches and bycatch could increase as fishermen explore and discover new fishing grounds or techniques (i.e. shallow-water bottomfish fishing or trap fishing).

As noted in Section 4.2.1, recreational fishermen, in general, are expected to have less targeting skill than commercial fishermen, and therefore may have higher nontarget catches. They should, however, be less influenced by market value and therefore may be expected to retain more nontarget species than commercial fishermen.

Reporting requirements (including information on nontarget catches and bycatch) for recreational fishermen under Alternative 5a would improve the scientific understanding of influences on nontarget stocks and would be expected to improve fishery management.

Alternative 5b

Under Alternative 5b nontarget species throughout the MHI would be protected during the closed season. As discussed above, fishing effort could shift to open periods, potentially reducing the benefits of the closures.

Alternative 5b would further protect nontarget species within the year-round closed area on the southern portion of Penguin Bank. As discussed above, in this scenario fishing effort could be displaced to open areas, thus reducing the benefits of the closures.

As discussed in Section 4.2.1, the shortcomings associated with reporting bottomfish based on the commercial fisheries statistical grids are particularly problematic regarding Penguin Bank. Without improved spatial reporting, precise estimates of reductions in fishing mortality due to the implementation of the area closure would be difficult to achieve.

Reporting requirements (including information on nontarget catches and bycatch) for recreational fishermen under Alternative 5b would provide information on the catch and effort by this group. Such information is not currently collected and thus fishery scientists and managers do not know the total fishery removals taking place. Having complete information (whether spatially detailed or not) would improve the scientific understanding of influences on Hawaii's bottomfish stocks and would be expected to improve fishery management.

4.5.3 Protected Species

Alternative 5 has two variations, each is a combination of other alternatives already discussed. Alternatives 5a and 5b are not expected to result in any significant impacts to listed species or any other protected species .In the 2002 Biological Opinion, NMFS concluded that the bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat. NMFS also found that the bottomfish fishery does not adversely affect any listed whales or sea turtles. Offshore bottomfish fisheries in the MHI are not known to interact with endangered or other protected species. The 2002 Biological Opinion mentions that several monk seals that have been found with embedded hooks mostly of the type used by the shoreline ulua fishery, however, monk seals have also been found with hooks similar to the type used in the bottomfish fishery (NMFS 2002).

4.5.4 EFH, Biodiversity, and Ecosystems

As discussed in Section 4.1.4 bottomfish fishing activities have been found to not adversely affect EFH and HAPC for any MUS managed under the FMPs of the Western Pacific Region. Implementing either variation of Alternative 5 is not expected to adversely affect EFH or HAPC due to the low impacts of this fishery. The potential for increased bottomfish fishing effort in the open season is not expected to significantly affect EFH or HAPC because hook-and-line bottomfish fishing is considered to have low collateral impacts on bycatch and habitat. Similarly, the impacts of any increased pelagic effort during the closed season are expected to be negligible due to the use of hook-and-line gears in this fishery.

Under Alternative 5 local biodiversity and ecosystems may experience some short term positive effects because cessation of bottomfish fishing activity for the 5-month period would allow for fish growth, undisturbed spawning, and other benefits of non-capture.

4.5.5 Fishery Sectors

Alternative 5a

The expanded (May–September) summer closure would impact all fishery sectors; however, this is believed to normally be a period of lower bottomfish fishing activity because of the increased availability of pelagic fish, so this impact may be relatively low. The provision of equal IFQs for use by a subset of commercial fishermen during the otherwise closed season will offset the impacts on this group. However, as discussed under Alternative 4, the allocation of equal quotas to each qualifying participant would likely leave some without enough quota, while others could have unused quota. Without a method to transfer (trade) quota between fishermen, this would have adverse impacts on the qualifying highliners. Because the sum of the IFQs cannot exceed the 23,946 pounds available, the size of each fisherman's quota would be inversely related to the total number of fishermen who received IFQs (the more who are included, the smaller each one's share must be). Quotas that are too small to support even one fishing trip are clearly likely to go unused. Impacts on those commercial, sport, and recreational (including subsistence) fishermen who do not qualify for an IFQ would be adverse. As compared with alternatives that would result in time periods during which no MHI bottomfish were landed (resulting from seasonal closures or TACs or universal IFQs), this alternative would be expected to have a strongly positive impact on the entire commercial fishery sector. It would provide a continuous supply of fresh MHI bottomfish to local markets, thus maintaining open market channels that would otherwise be expected to be filled by increased imports during the closed season. Experience has shown that if imports come to dominate market channels, it can be difficult for local producers to regain their market share as wholesalers and retailers can be reluctant to forgo their now-established supply chains.

Table 47 presents a preliminary analysis of the number of fishery participants anticipated to qualify for IFQs under various minimum landing requirements. These requirements range from minimum landings of at least one pound up to 5,001 pounds of BMUS from the MHI made between May and September of any one year between 1998 and 2004 (inclusive). Based on the information available in Table 48, all minimum landing thresholds would result in qualifying participants receiving IFQs below their historical landings and would thus be expected to result in full utilization of the available quota. Information on the mean historical landings by participants who caught more than 5,001 pounds is unavailable due to confidentiality requirements which prohibit the publication of data submitted by less than three individuals or operations.

Table 48: Anticipated Participation and IFQ Levels under Various Minimum Landing Requirements.

Minimum landing requirement to qualify for May-Sept IFQ	Anticipated number of qualifying participants (based on reported May-Sept MHI landings, 1998-2004)	Anticipated May –Sept. IFQ per qualifying participant (lbs)	Historical May-Sept. mean landings by qualifying participants (lbs)
1-500 lbs	970	25	89
501-1000 lbs	91	263	691
1001-2000 lbs	43	557	1,385
2001-5000 lbs	12	1,995	3,085
More than 5001 lbs	2	11,973	confidential

Source: PIFSC unpublished data.

Alternative 5b

The impacts of Alternative 5b would be generally evenly spread across fishery sectors as it does not differentiate between commercial, sport, and recreational (including subsistence) fishermen. As compared with Alternative 5a, the impacts of the summer closure would be reduced due to its shortened duration. However, the year-round closure of the southern portion of Penguin Bank would disproportionately affect fishing operations based on Oahu and Kauai. Because this alternative would lead to an increased reliance on imported bottomfish during the closed season, it would be anticipated to have negative impacts on the entire commercial fishery sector as market channels for fresh MHI bottomfish would be lost and have to be regained each year.

Vessel registration and reporting requirements under both variations of Alternative 5 would represent an ongoing burden on all sectors. In the long term the increase in information available to fishery scientists and managers should result in increased fish abundance and improved fishing opportunities.

4.5.6 Fishing Communities

The seasonal closure under Alternative 5a is not expected to significantly negatively impact fishing communities in Hawaii, but would impact some fishermen in all communities. As seen in Figure 33, summer months between May and August represent the lowest amounts of monthly bottomfish landings, with the winter months of December through February having the highest landings. Also, under Alternative 5a, a small number of full-time commercial bottomfish fishermen would be exempt from the seasonal closure, and these exempt fishermen would each receive IFQs. As described in Alternative 4b, these IFQs could be calculated and provided in equal amounts to all qualifying fishermen, or they could be calculated and provided such that each qualifying fisherman's quota was proportionate to his historical catch. Because the IFQs would likely be provided to qualifying full-time commercial bottomfish fishermen, less negative impacts to fishing communities are expected if there is equal representation of exempted fishermen among fishing communities. However, more negative impacts could be expected if there is not equal representation. For example, if 70 percent of the exempted IFQ fishermen are Oahu-based and 30 percent are from Maui, the fishing communities of Niihau, Kauai, Molokai, Lanai, and Hawaii would not receive the social benefits of having fishery participants catching fish during the seasonal closure as would Oahu and Maui. In this scenario resentment could occur between fishing communities.

Similarly, the seasonal closure under Alternative 5b (June 1 to August 31) is not expected to significantly negatively impact fishing communities in Hawaii, but would impact some fishermen in all communities. Alternative 5b combines the seasonal closure with a year-around closure of the southern portion of Penguin Bank. As discussed in Section 4.2.7, Penguin Bank is primarily used by Oahu bottomfish fishermen. A reduction in available fishing areas to Oahu fishermen could lead them to fish in areas closer to Oahu or in areas they previously did not, such as closer to Molokai. A year-around partial closure of Penguin Banks could also impact Oahu's and Molokai's fishing communities if the closure results in significant competition for available open areas.

Both scenarios under Alternative 5 would require all vessel operators (commercial and recreational) targeting bottomfish to (a) register their vessels on annual basis, (b) obtain permits (c) complete and submit catch reports, and (d) mark their vessels on an unobstructed upper surface are not expected to negatively impact fishing communities. Although these provisions would require fishery participants to take time out of their schedule to register their vessel, fill out their permit application and catch reports, and mark their vessels, the level of impact on individual fishermen is not expected to be significant. In the long term, positive impacts to fishing communities may result because of fishery managers obtainment of accurate information on how many boats are bottomfish fishing and the amount of bottomfish being caught (from all sectors), as from mechanisms to enhance enforcement. This in turn is believed to improve management of Hawaii's bottomfish stocks so that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

Vessel registration and reporting requirements under both variations of Alternative 5 are not expected to have negative impacts on fishing communities despite the time commitments required. In the long term, positive impacts to fishing communities may occur from more accurate information on how many boats are bottomfish fishing, the amount of bottomfish they catch, and enhanced enforcement capabilities. Improved management of Hawaii's bottomfish would ensure that future opportunities to fish sustainable bottomfish stocks are provided for Hawaii's fishing communities.

4.5.7 Native Hawaiian Community

Alternative 5a

The impact of Alternative 5a on Native Hawaiians is anticipated to be similar to that which would be expected under Alternatives 3 and 4b. That is, negative economic and cultural impacts would result if Native Hawaiian commercial fishermen do not meet the criteria and are not awarded IFQs to fish during the seasonal closure. The seasonal closure may also impact Native Hawaiian bottomfish fishermen who historically have caught bottomfish during the summer months. Reduced access rights and cultural practices impact the ability of Native Hawaiians to practice and continue their culture. The loss of any customary access and practice could be viewed as a loss of culture for Native Hawaiians.

On the other hand, the objective of the measures is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians.

Alternative 5b

The seasonal closure would impact Native Hawaiian bottomfish fishermen who historically have caught bottomfish during the summer months. The year-around closure of the southern portion of Penguin Bank may disproportionately affect Native Hawaiian fishermen from Oahu due to its close proximity.

Reduced access rights and cultural practices may potentially impact the ability of Native Hawaiians to practice and continue their culture. The loss of any customary access and practice could be viewed as a loss of culture for Native Hawaiians.

On the other hand, the objective of the measures is to reduce fishing mortality, thereby ensuring a sustainable resource. A sustainable and accessible bottomfish resource would provide positive impacts to Native Hawaiians.

4.5.8 Administration and Enforcement

Administration and enforcement of Alternative 5 would require the expansion of the current reporting requirements to include requirements for recreational participants. All MHI vessel owners who target bottomfish are already required to register their vessels, however under this alternative they would be required to renew their registration annually. The vessel registration system would need to be expanded accordingly. This will provide current information on the maximum number of fishery participants and ease enforcement by removing the “BF” markings from vessels no longer actively participating in the fishery

Alternative 5a would require that appropriate IFQs be determined, analyzed and published in a timely manner prior to each start of the fishing season (although it is known that current fishing mortality needs to be reduced by 15 percent, this number is likely to change over time as fishery harvests are reduced and stocks increase). As described in Section 4.4.1, the ongoing determination of these quotas would be difficult as to date not even one comprehensive stock assessment has been completed for this fishery. Problem areas include the lack of fishery independent data, difficulty in adjusting available CPUE data as highliners leave the fishery and incorporating the existence of area closures into stock assessment calculations.

Enforcement of this Alternative 5a would include increased and real time shore-based monitoring of commercial landings and sales to determine when each commercial participant's IFQ was reached. Commercial fishermen in the MHI who are exempt from the summer closure would be issued stamps representing a certain number of pounds to track their IFQ that would place some administrative burden on the fishermen and the dealers to track and account for landings with regards to not exceeding the IFQ. Because bottomfish from the NWHI, and imported bottomfish would still be available, a system to certify these fish as non-MHI fish would need to be implemented.

Enforcing the seasonal closures under both variations of Alternative 5 would require that a parallel closure occur in State waters because shore-based determinations of the origin (i.e. from State vs. federal waters) of MHI bottomfish landed or sold would be impossible. Without parallel rules, enforcement of the seasonal closures would require extensive at-sea monitoring of federal waters during the closure period. Joint efforts between the State of Hawaii and federal law enforcement capacities would greatly enhance enforcement of this alternative.

4.6 Impacts to the Regional Economy

The economic effects of implementing conservation measures for MHI bottomfish fisheries depend largely on how fishermen and the seafood market react to those measures. For the fishermen, we expect they will adjust to the extent possible by shifting their effort to other time-area strata. For the market, the same applies in terms of finding substitutes for decreases in their supply of MHI bottomfish. Their primary alternatives are as follows: NWHI bottomfish, imported bottomfish, other species (non-bottomfish).

For the fishermen, the management objective is to reduce bottomfish catch in the main Hawaiian Islands by 15 percent, roughly 35,000 pounds of the deep snapper/grouper complex[1] or $110,000 ex-vessel. The aggregate impact on Hawaii's economy would be small. Using an input/output approach,[2] as a rough order of magnitude, the total economic impact would be $300,000 in business sales with a loss of $120,000 in income.

However, fishermen would have the ability to offset some of this cost by substituting different target species and to adjust their fishing patterns accordingly. Obviously the distribution of this cost across currently active (or potentially newly active) participants would differ by their current levels of fishing effort, but if there are roughly 300 active commercial bottomfish

[1] This analysis focuses on the seven species subject to special management consideration by the State of Hawaii. Other important bottomfish species are not included in this analysis (e.g. uku and ulua) and hence the totals here are lower than those based on the entire BMUS complex.

[2] Modifying Leung and Pooley (2002) analysis of the pelagic longline fishery.

fishermen in the MHI, the average impact is minimal ($354 per fishermen).[3] The same would be true, without the dollar figure, for recreational fishermen. The extent of that substitution cannot be estimated in advance, but the above figures would indicate the maximum cost for the fleet and per vessel.

Much of the importance of the Hawaii bottomfish fishery is that it provides a relatively unique product with the potential for a high added value in the processing chain through its appearance on the menus of white tablecloth restaurants. NWHI bottomfish would presumably be the primary source of substitution for MHI bottomfish.

Imports have averaged 750,000 pounds in recent years (2003 to 2004), with the primary sources of imported snapper being Australia and Tonga.[13] Increasing imports for the year by 35,000 pounds would represent a 5 percent increase in imports and is within the variability of that time series. The peak season for imports is May to August, which corresponds to the proposed seasonal alternative. There is also a strong negative correlation between imports and MHI landings, suggesting that when MHI landings decline, imports increase. Increasing imports for these 4 months would amount to a 12 percent increase in imports over that time period.

There is a consumer price element in which any decrease in the supply of bottomfish would be expected to increase prices by a certain percentage. Pooley (1987) computed the price flexibility coefficient to be 42 percent, meaning that a 15 percent decrease in supply would increase price by 6 percent or roughly 18 cents with an attendant decrease in consumer satisfaction.

In addition, the Hawaii bottomfish fishery is also important culturally, a value not entirely reflected by the seafood market. Again, NWHI bottomfish would be considered in many cases a close substitute, but substituting different snapper species from imports would not be a close cultural substitute. More research would be required on the implications of this effect on Hawaii’s communities, but the proposed seasonal closure alternatives do miss the primary cultural celebration (i.e. New Years). Figure 34 shows the average monthly landings of Hawaii Bottom fish. Figure 35 shows the average monthly snapper imports into Hawaii.

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[3] This figure can be compared WITH average ex-vessel returns for small boat fishermen in Hawaii of $42,000 (Hamilton 1997).

[13] NMFS foreign trade statistics: http://www.st.nmfs.gov/st1/trade/index.html

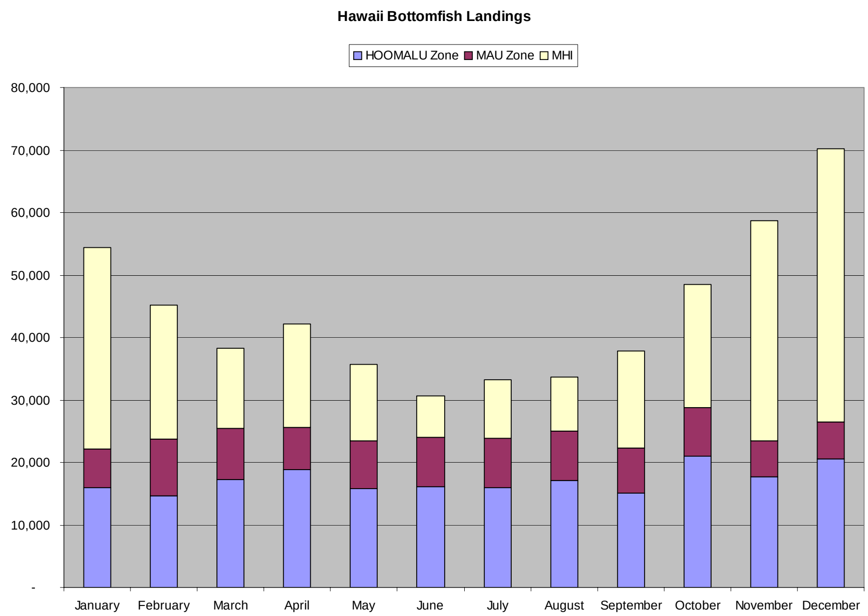

Figure 34: Average Monthly Landings of Hawaii Bottomfish. Source: WPRFMC 2005c, 2003 Bottomfish Annual Report.

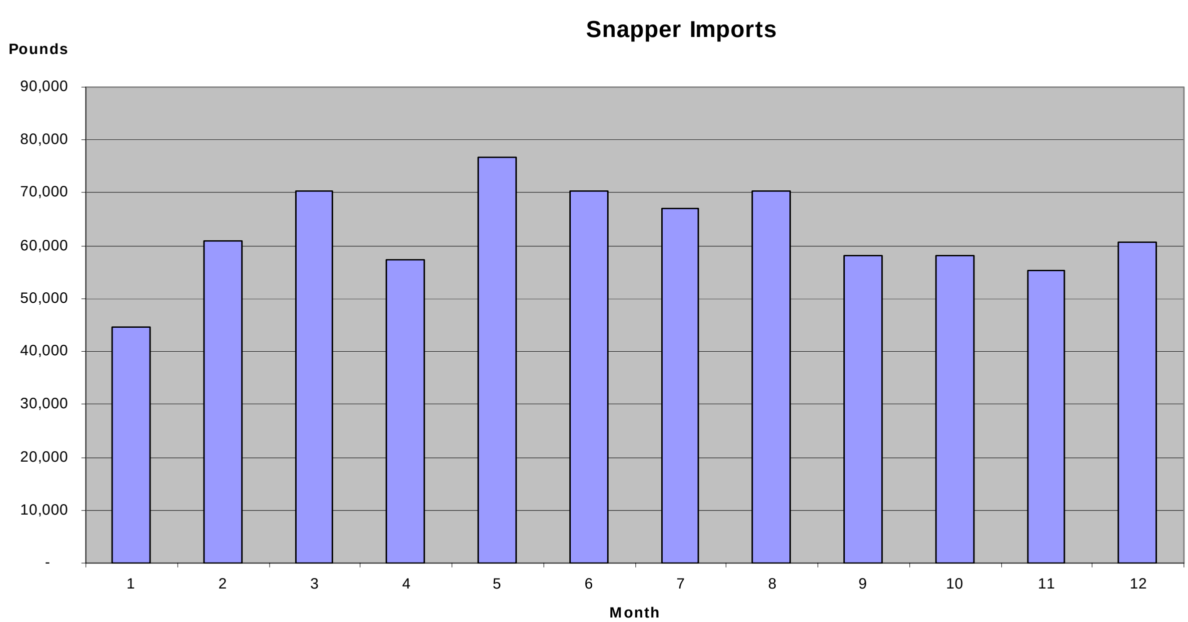

Figure 35: Average Monthly Snapper Imports to Hawaii. Source: PIFSC Unpublished Data.

4.7 Environmental Justice

On February 11, 1994, President William Clinton issued Executive Order 12898 (E.O. 12898) titled "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations." E.O. 12898 provides that "each Federal agency shall make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations." E.O. 12898 also provides for agencies to collect, maintain, and analyze information on patterns of subsistence consumption of fish, vegetation, or wildlife that agency action may also affect subsistence patterns of consumption and indicate the potential for disproportionately high and adverse human health or environmental effects on low-income populations, minority populations, and Indian tribes. A memorandum by President Clinton that accompanied E.O. 12898 made it clear that environmental justice should be considered when conducting NEPA analyses by stating the following: "Each Federal agency should analyze the environmental effects, including human health, economic, and social effects of federal actions, including effects on minority populations, low-income populations, and Indian tribes, when such analysis is required by NEPA."[14]

Impacts of the proposed bottomfish management actions on Native Hawaiians were identified through the scoping process as an issue that may have environmental justice considerations. The impacts to Native Hawaiians of each of the alternatives are discussed in Sections 4.1.7, 4.2.7, 4.3.7, 4.4.7, and 4.5.7, and 4.8.10.

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[14] Memorandum from the President to the Heads of Departments and Agencies. Comprehensive Presidential Documents No. 279 (Feb. 11, 1994).

Table 49: Summary Impact Comparisons of the Alternatives.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Target Species	(-) Continued overfishing. (-) Does not meet MSA requirements. (?) The impact of a revised State of Hawaii bottomfish management regime. (-)Recreational fishermen would continue not to be required to submit catch reports, and the recreational catch component would continue to be unknown.	2a: (+) Anticipated to reduce landings by up to 20 percent based on historical catch. 2b: (+) Anticipated to reduce landings by up to 15 percent based on 2004 catch. (+) Closed areas may be able to replenish stocks in adjacent habitat (i.e. spillover). (+) Recreational catch data collection would be improved with new reporting requirements. (-) Fishing effort may increase in open areas reducing benefits of closures & depressed CPUE in those areas fished.	(+) Anticipated to reduce landings by up to 17 percent based on historical catch. (+) May protect bottomfish summer spawning aggregations & reduce mortality on spawning fish increasing biomass over time. (+) Recreational catch data collection would be improved with new reporting requirements. (-) Fishing effort may increase during open periods reducing overall benefit.	(+) Anticipated reduce landings up to 15 percent based on historical catch. (+) Sets hard limits on amount of fish caught. (+) Recreational and commercial catch data collection would be improved with new, timely reporting requirements. (-) Lack of robust stock assessments may lead to errors in setting harvest limits. (-) Poor, missing data on catch especially in recreational fishery may lead to errors in setting harvest limits. (-) May lead to high-grading and thus no net decrease in mortality.	(+) Anticipated to reduce landings up to 15 percent based on historical catch. (+) Both options would reduce fishing mortality. (+) Recreational catch data would be improved. (+) Both options would reduce bottomfish landings during closed season. 5a: (+) May protect bottomfish spawning aggregations & reduce mortality on spawning fish, increasing biomass over time. 5a: (-) Lack of robust stock assessments may lead to errors in setting harvest limits. 5b: (+) Closed areas may replenish stocks in adjacent habitat (i.e. spillover). 5b: (-) Fishing effort may increase in open areas reducing benefits of closures.

Legend: (+) positive, (-) negative, (?) unknown, (n) neutral

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Nontarget Species and Bycatch	(n/+) If the decline in fishing effort continues, there may be a decline in catch of nontarget spp. (n) Bycatch data in the MHI has only recently been reported, but is estimated to be minimal, and disproportionately limited to a few number of species which likely survive when discarded.	(+) Catch of nontarget spp. would be eliminated in closed areas. (n/-) Increased effort in open areas may locally increase catch of nontarget species and bycatch in those areas. (+) Recreational catch data collection would be improved with new reporting requirements.	(n/-) Increased effort during open period may lead to increased catches of non-target species and bycatch, especially for species more abundant during the open season. (+) The minimal bycatch levels would be eliminated during closed period. (+) Recreational catch data collection would be improved with new reporting requirements.	(-) If annual quota is met, effort to catch normally non-target species may increase. (n) Bycatch in deep handline fishery is minimal so reduction in bycatch would be minimal. (-) Highgrading may increase bycatch, including that of target species. (+) Recreational catch data collection would be improved with new reporting requirements.	(n) Bycatch is minimal so reduction in bycatch would be minimal. 5a: (-) Highgrading may increase bycatch, including that of target species. (+) Recreational catch data collection would be improved with new reporting requirements.
Protected Species	(n) Rare interactions between bottomfish fishers and protected species. A decline in bottomfish fishing, it is expected that there will be a proportional reduction in the potential of an interaction.	(+) Potential minor benefits in preventing possible interactions in closed areas. (n) Impact of potential increased effort in open fishing areas likely negligible as interactions are rare.	(+) The possibility of protected species interactions would be eliminated during closed period.	(n/+) An enforced reduction in landings and possible shortened season may result in a proportional reduction of potential interactions.	(+) Possible minor benefits in preventing potential interactions.

	Alternative 1: No Action	**Alternative 2: Area Closures**	**Alternative 3: Seasonal Closure**	**Alternative 4: Catch Quotas**	**Alternative 5: Combination Measures**
EFH, Biodiversity, & Ecosystem	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (n/+) Negligible or slightly positive effects by less fishing effort in closed areas. (?/-) Potential for localized negative effects if bottomfish fishing effort is too highly concentrated in open areas with suitable habitat.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (+) Potential negative impacts on EFH, biodiversity, and ecosystems would be eliminated during closure period. (?/n) The impacts of a potential increased level of effort during open season are unknown, but likely minimal.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (+/n) No likely effect on EFH or slight positive effect by less fishing presence once the TAC is reached.	(n) Bottomfish fishing has a negligible impact on habitat due to gear and methods used, nor significant adverse effects on biodiversity or ecosystems. (+/n) No likely effect on EFH or slight positive effect by less fishing presence once an IFQ is reached and due to no bottomfish fishing during closure period.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Fishing Sectors	(-) Continued overfishing would lead to decreased landings.	2a: (-) Closure of Penguin Bank, the most productive bottomfish area in the MHI, may result in failure of full-time bottomfish fishing and multi-fishery operations. 2a: (-) Impact to all sectors will not be distributed evenly throughout the islands; greatest impact will be to Oahu and Kauai based fishermen. 2b: (-) Proposed closures may impact small boat recreational and commercial fishermen throughout state if forced to travel farther to bottomfish because historical fishing grounds closed.	(+) Impacts distributed evenly throughout all fishing sectors. (+) Pelagic troll or other fisheries are viable alternatives for MHI bottomfish fishers during closed season. (n) Historically there are higher monthly bottomfish landings during the proposed open season.	(+) Commercial bottomfish fishers who have correctly reported their catch will lose less than those who have not reported or have underreported their catches. (-) Fishermen with poorly documented catch records may be squeezed out of the fishery. (-) May restrict new entry into the fishery.	5a: (+) Commercial bottomfish fishers who have correctly reported their catch will lose less than those who have not reported or have under-report. 5a:(+) Pelagic troll or other fisheries are viable alternatives for MHI bottomfish fishers during closed season.. 5a: (-) Fishermen with poorly documented catch records may be squeezed out of the fishery. 5a: (-) May prevent new entry into the fishery. 5b: (+) Impacts distributed evenly throughout fishing sectors, but Oahu fishing sectors likely more affected. (+) Pelagic troll fishery is a viable alternative for MHI bottomfish fishers

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Fishing Communities	(-) Continued overfishing may reduce the social and economic benefits of maintained fishing opportunities.	2a: (-) Disproportionate localized economic and social impacts to Oahu and Kauai fishing communities. 2b: (-) Potential negative impact on communities located near proposed area closures...	(+) Impacts distributed evenly across the state. (+) The fishery would not be closed during holiday season when red bottomfish are most desired by local communities. (-) Marginal impact if seasonal closure is implemented during historically low periods of fishing effort and landings.	4a: (+) A TAC would likely affect all fishing communities equally. 4b: (+) Distribution of IFQs recognizes past participation and experience in fishery. 4b: (-) For those fishing communities whose commercial fishermen have poorly documented catch records may be squeezed out of the fishery.	5a: (+) Distribution of IFQs recognizes past participation and experience in fishery. 5a: (-) For those fishing communities whose commercial fishermen have poorly documented catch records may be squeezed out of the fishery 5b: (+) Impacts distributed evenly across the state 5b: (-) Likely disproportionate localized economic and social impacts to the Oahu fishing community.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Native Hawaiian Communities	(-) Continued overfishing would lead to decrease in CPUE and available bottomfish.	(-) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture, especially for those Native Hawaiians. 2b (-): Potential negative impact on those Native Hawaiian communities located near proposed area closures.	(+) Impacts distributed evenly across state. (n/-) Marginal impact if seasonal closure is implemented during historically low periods of fishing effort. (-/n) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture; however seasonal closures were historically used by Native Hawaiians to manage marine resources.	(-) Any government curtailment or reduction of access rights & cultural practices may be seen as a permanent loss of culture.	(-) Any government curtailment or reduction of access rights & cultural practices reduces may be seen as a permanent loss of culture.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Administration and Enforcement	(+) No impacts or additional costs. (n) Continue to monitor the status of the fishery. (-) Would continue to have limited data, especially for recreation fishing effort & landings hindering future management efforts.	2a: (+) Penguin Bank is a large area close to Oahu that will make it easier to enforce and monitor. 2a: (-) Middle Bank is farther from Oahu and would likely be monitored via air surveillance (costly) than by boat by USCG. (-) Requires a research monitoring program to be implemented to measure effectiveness. (-) Enforcement of closed areas requires at-sea and air enforcement, which is costly. 2b: (+,-) May allow the force of federal jurisdiction to enhance state jurisdiction in the MHI, but multiple relatively small closed areas with open areas in between are difficult to enforce. 2b: (-) Historically, DOCARE has been under-funded and lacked the ability to enforce the existing BRFAs. Burdening the USCG with enforcing the proposed closed areas could negatively affect them as they have other important missions (e.g. Homeland security).	(n/-) Requires enhanced state and federal coordination. Similar rules would need to be established by both state and federal agencies. (-) Certification of imported and NWHI bottomfish will be needed. (-) Administrative and enforcement costs will increase over current levels. (+) At-sea and air enforcement, which is costly, would be minimal; can be enforced through dockside enforcement or monitoring of markets and dealers. Could use existing dealer reporting program to check sales and landings	4a: (-) Closely monitoring of catch reports may require more resources. 4a: (+) Costly at-sea and air enforcement not required unless quota is met. 4a: (-) All bottomfish sold would have to be tracked to point of sale because imported. 4b: (-) Implementing and monitoring IFQs would likely require additional resources. 4b: (-) Enforcement would be difficult catch fishermen who exceed their IFQ.	5a: (-) Closely monitoring of catch reports may require more resources. 5a: (-) Enforcement would be difficult catch fishermen who exceed their IFQ. 5b: (+) Penguin Bank is close to Oahu allowing it easier to enforce and monitor. (-) Enforcement of closed areas requires at-sea and air enforcement, which is costly.

	Alternative 1: No Action	Alternative 2: Area Closures	Alternative 3: Seasonal Closure	Alternative 4: Catch Quotas	Alternative 5: Combination Measures
Regional Economy	(-/n) Continued overfishing may eventually lead to a collapse of the bottom fishery in the MHI.	2a: (-/n) Closure of Penguin and Middle Banks may slightly affect the economy of Oahu and Kauai. 2b: (-) Statewide closures may have slight effects on economy statewide. (-) May encourage importation of lesser quality products that will further erode the market for local bottomfish in local markets (-) May encourage increased importation of similar products that may facilitate the supplanting of the traditionally high-priced local bottomfish species.	(+) Seasonal closure would be during period of historically slow bottomfish fishing activity. (+) Winter months and important holiday seasons would remain open when red fish is most desired by local communities. (-) MHI bottomfish product would be eliminated from market during closure period. (-) MHI Bottomfish fishermen may lose foothold due to higher levels of imports.	(-) With reduced bottomfish landings there will be a loss of revenue. (-) If quotas are met, imports of bottomfish are likely to increase above the current level of an average 750,000 pounds.	5a: (+) IFQs for small proportion of commercial fishermen would provide markets with MHI bottomfish during closed season; less reliance on imports during closed season. 5b: (n/-) Partial closure of Penguin Bank may slightly impact Oahu bottomfish fishermen's' contribution the regional economy.

4.8 Cumulative Effects

This section describes the potential cumulative effects of the proposed action and the alternative actions considered. The Council on Environmental Quality's regulations for implementing NEPA defines cumulative effects as the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or nonfederal) or person undertakes such other actions (40 CFR 1508.7 and 1508.25). The intent of the cumulative effects analysis is to capture the total effects of many actions over time that would be missed by evaluating each action individually. This cumulative effects analysis also describes the additive and synergistic results of the actions considered in this DSEIS as they interact with factors external to the proposed actions. This evaluation addresses the direct and indirect effects of the alternatives as well as other factors that affect the physical, biological, and socioeconomic components associated with Hawaii Archipelago.

4.8.1 History of Bottomfish Fishing in Hawaii

As discussed in Section 3.4.1, the history of bottomfish fishing in Hawaii is extensive. Native Hawaiians were bottomfish fishing long before European explorers first visited the Hawaiian Islands, but the subsequent European colonization of Hawaii led to the development of a local cash economy and commercial fishing operations. By the beginning of the twentieth century, and after successive waves of immigrants arrived in Hawaii, the bottomfish fishery was dominated by Japanese fishermen who fished in the MHI as well as in NWHI. World War II effectively ceased bottomfish fishing in Hawaii, but by the late 1940s vessels were again plying the waters of the MHI and the NWHI in search of bottomfish. By the 1980s, Hawaii's bottomfish markets were paying premium prices and vessel participation in the MHI peaked at 583 in 1985. Although the average price of bottomfish has remained relatively stable since the mid-1980s (see Section 3.4.4.4), the number of vessels participating in the MHI bottomfish fishery has decreased since then as has their CPUE (see Sections 3.4.4.1 and 3.4.4.3).

4.8.2 Past Bottomfish Management Actions Potentially Contributing to Cumulative Effects

In 1986, the Bottomfish FMP was implemented to manage bottomfish fisheries of the Western Pacific Region. The Bottomfish FMP established a list of MUS as well as prohibited destructive fishing techniques (e.g. explosives, trawl nets, poisons). In 1989, the Council developed regulations under the FMP that divided the fishing grounds of the Hawaii Archipelago in following three bottomfish management sub-areas: (a) Hoomalu Zone, (b) Mau Zone, and (c) MHI (See Figure 1). Limited access programs were established for the Hoomalu Zone and Mau Zone in 1988 and 1999, respectively, to avoid "economic overfishing" (Pooley 1993b; Western Pacific Regional Fishery Management Council 1998b).

In 1998, concerns about decreasing catch rates led the State of Hawaii to close certain areas around the MHI to bottomfish fishing, including areas of Penguin Bank within waters of federal jurisdiction (i.e. the 3 to 200 nm offshore; EEZ). In addition, the State of Hawaii established a recreational bag limit of five onaga or ehu, or a mix of both, per day per (recreational) fisherman.

On December 4, 2000, President Clinton issued E.O. 13178, establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve (Reserve). The executive order was revised and finalized by E.O. 13196, issued January 18, 2001. In establishing the Reserve, the executive orders set forth a number of conservation measures, including the creation of Reserve Preservation Areas in which commercial fishing is prohibited unless otherwise specified.[5] The executive orders also directed NOAA's National Marine Sanctuary Program to under go a process (pursuant to the National Marine Sanctuaries Amendments Act of 2000) to designate the Reserve area (generally 3 to 50 nm offshore around the NWHI) as a the nation's fourteenth national marine sanctuary..

On September 29, 2005, Hawaii Governor Linda Lingle signed administrative rules (Chapter 13 60.5; Department of Land and Natural Resources) to establish all state waters (0 to 3 nm offshore) in the NWHI as a marine refuge. The rules set aside 100 percent of state waters from extractive uses, including commercial and recreational fishing, and require an entry permit for all other activities.

4.8.3 Reasonably Foreseeable Future Council, NMFS, and State of Hawaii Activities

4.8.3.1 Hawaii Bottomfish Stock Assessment

In the spring of 2006, the NMFS' Pacific Islands Fisheries Science Center will conduct a new stock assessment for the bottomfish MUS complex of the Hawaiian Islands. The new stock assessment will rely heavily on the information collected by the State of Hawaii's Division of Aquatic Resource commercial marine license catch reporting program. At this point, it is uncertain if the new stock assessment will require further reductions in bottomfish fishing effort or mortality.

4.8.3.2 Hawaii Archipelago Fishery Ecosystem Plan (FEP)

The Council is currently developing place-based Fishery Ecosystem Plans (American Samoa Archipelago FEP, Hawaii Archipelago FEP, Mariana Archipelago FEP, Pacific Pelagic FEP, and Pacific Remote Island Area FEP) for areas within the Western Pacific Region. These plans provide the institutional structure from which future fishery ecosystem management decisions will be built. As ecosystem science in the region progresses, the development and utilization of ecosystem indicators and models are likely to be powerful tools for fishery ecosystem management. In addition, the Council shift toward a place-based approach will rely on enhanced opportunities for communities to participate in management (e.g. monitoring, cooperative research).

[5] The executive orders include provisions that allow commercial bottomfish fishing and commercial and recreational trolling for pelagic species within portions of the Reserve Preservation Areas around certain islands and banks.

4.8.3.3 Hawaii Archipelago Ecosystem Research Plan

The Pacific Islands Fisheries Science Center (PIFSC) is leading an effort to develop a plan that will guide ecosystem research in the Hawaii Archipelago well into the future. The plan that is currently in preparation is likely to address ecosystem issues including the following: connectivity; invasive species; resource utilization; indicators of change (biological and physical); ecosystem modeling and forecasting; and ecosystem sustainability, resilience, and recovery. PIFSC is collaborating with the following organizations on the development of the research plan: Hawaii Institute of Marine Biology, NOAA's National Marine Sanctuary Program, State of Hawaii, U.S. Fish and Wildlife Service, University of Hawaii, and the Council. The research plan is expected to be available for public review by summer 2006.

4.8.3.4 State of Hawaii Bottomfish Restricted Fishing Areas

HDAR is currently evaluating its existing 19 bottomfish RFAs that are scattered throughout the state and has produced a proposal to modify and consolidate the existing closed areas (see Section 2.2.2 and Appendix 3) The proposed fifteen bottomfish restricted fishing areas would reduce fishing mortality by at least 15 percent. The proposed areas are distributed statewide and encompass state and federal waters. An amended Hawaii Administrative Rule to establish the modified closed areas is expected as early as the end of 2006.

4.8.3.5 NWHI National Marine Sanctuary

The National Marine Sanctuary Program is currently developing a Draft EIS and draft management plan for the proposed NWHI sanctuary. Although scientifically, the small NWHI bottomfish fishery is believed to have little impact on Hawaii's bottomfish overfishing problem, as well as minimal impacts to the greater NWHI coral reef or deep slope ecosystems, NOAA is currently contemplating the amount fishing, if any, is appropriate for the pending NWHI National Marine Sanctuary. Based on a January 19, 2006 letter from VADMR Conrad Lautenbacher, NOAA Administrator, the Council was provided an opportunity to recommend commercial and recreational fishing regulations under the MSA for bottomfish and pelagic fisheries that operate within the boundaries of the proposed NWHI sanctuary. At its 131st meeting (March 13 to 16, 2006), the Council recommended a limit of 14 commercial bottomfish permits for the NWHI (7 for the Mau Zone and 7 for the Hoomalu zone), and a bottomfish harvest limit of 391,850 pounds, which represents 85 percent of the NWHI bottomfish maximum sustainable yield At this time, it is unknown whether fishing (commercial or recreational) will be allowed within the NWHI sanctuary.

4.8.4 Cumulative Effects to Target Species

Past Management Actions

The past management actions (i.e. catch reports, closed areas, catch limits, and limited entry) have all served to increasingly regulate the bottomfish fisheries in Hawaii and thus can be viewed as positive actions for the sustainability of Hawaii's archipelagic bottomfish multi-species stock complex. However, as indicated in the purpose and need of this DSEIS, Hawaii bottomfish resources are experiencing overfishing; thus, further management action to reduce fishing effort on the stocks is required.

Reasonably Foreseeable Future Federal Actions

The future actions identified in Section 4.8.3 could positively impact target species as they involve possible actions taken to gain a better understanding of the life histories and status of bottomfish resources, the human utilization of such resources, and the ecosystem effects from the harvest of bottomfish species in Hawaii.

External Factors Potentially Impacting Target Species

External factors (outside of bottomfish management actions) that may have positive or negative direct, indirect, or cumulative effects on bottomfish resources include the following: (a) habitat degradation from sedimentation, (b) pollution, (c) vessel fuel prices (higher prices may result in shift from trolling to bottomfish fishing), (d) market (i.e. supply and demand) variability in price per pound as well as quantity of imported fish, (e) degradation of Hawaii's boat ramps, and (f) artificial habitat.

It is uncertain to what degree, if any, sedimentation or pollution have negatively impacted targeted BMUS. As described in Chapter 3, bottomfish generally are associated with areas of high relief and exposure to currents that carry prey items. The extent that natural events or non–fishing related activities have increased sedimentation of high-relief areas important to bottomfish is unknown, but is not believed to be substantial (C. Kelly, personal communication). Similarly unknown is if non-fishing activities resulting in pollution have impacted bottomfish stocks. Examples of pollution are dumping of dredge material in the ocean and discharge of wastewater from cruise ships. To the extent that activities associated with sedimentation and pollution are subject to environmental regulations, their effect on target species could be avoided, minimized, or mitigated. However, an increase over current levels in sedimentation or pollution in areas where BMUS occur would likely be detrimental to discrete bottomfish stocks, but their impact on Hawaii Archipelagic bottomfish stocks is unknown.

The effect of rising fuel prices could lead to more bottomfish fishing effort as it is generally recognized that bottomfish fishing (i.e. anchoring or drifting) uses less fuel than trolling, and therefore it is less expensive (HDAR Bottomfishers's Survey 2005, unpublished data). As fuel prices in Hawaii have greatly fluctuated in the previous 6 months, their impact on fishermen is believed to be substantial. If fuel prices are extremely high, however, fishermen may decide to not go fishing at all, resulting in positive impacts to bottomfish stocks. Medium-to-high fuel prices may encourage fishermen to bottomfish rather than to troll, which might negatively impact bottomfish stocks. In relation, medium-to-high fuel prices may encourage commercial bottomfish fishermen to fish for longer periods to catch more fish to help offset costs incurred from high fuel prices. Because of the recent volatile fuel prices, their indirect impact on Hawaii Archipelagic bottomfish stocks is unknown.

As described in Chapter 3, average bottomfish prices per pound fluctuate by species, by month, by season, and by year. Therefore, market forces such as supply and demand can also indirectly impact bottomfish where high average prices could lead to increased bottomfish fishing effort, and lower prices could lead to reduced effort.

Discussions with bottomfish fishermen in recent scoping meetings yielded opinions that Hawaii's boat ramps are in disrepair and are consequently affecting fishermen's ability to launch their boats. In view of target species, this deterrent to fishing can be seen as positive as it could decrease fishing effort.

The use of artificial reefs may provide potential positive impacts to target species; however, the extent to which several coordinating agencies will be able to successfully work together to create such reefs remains to seen.

Potential Effects of the Alternatives on Target Species

As described in Section 4.5, all of the alternatives considered with the exception of Alternative 1 (no action) are designed to reduce the excessive fishing mortality rate on the Deep 7 species of concern within the MHI by at least 15 percent of current levels. Therefore, Alternatives 2 to 5 are expected to positively impact bottomfish target stocks.

Potential Cumulative Effects on Target Species

As described above, PIFSC is in the process of conducting a new Hawaii bottomfish stock assessment, which is anticipated in the spring of 2006. Such work, however, is not expected to have any direct effect on target species. As the stock assessment has yet to be completed, the results are unknown, and its effect on the status determination of Hawaii's bottomfish stocks is also unknown. The implementation of a Hawaii Archipelago FEP will initially maintain current fishery regulations. However, future fishery management under the FEP is expected to positively impact target stocks as predicting ecosystem variability will likely play an increasingly important role in fisheries management.

The effect of a NWHI National Marine Sanctuary on target species is unknown as the amount of fishing to occur within the sanctuary is unknown. However, it is unlikely that fishing will be expanded above historical levels so the sanctuary could be viewed as contributing to positive cumulative effects on targeted species within Hawaii's bottomfish multi-species complex. The level at which external factors such as sedimentation, pollution, vessel fuel prices, and market forces potentially impact BMUS is currently unknown, but is not expected to be significant. The alternatives being considered (minus Alternative 1) are expected to reduce the excessive fishing mortality rate on the Deep 7 species of concern in the MHI. The overall cumulative effect of this and other actions described earlier on Hawaii's bottomfish multi-species stock complex is expected to be positive.

4.8.5 Nontarget Species and Bycatch

Past, Present, and Reasonably Foreseeable Federal Future Actions

The Council's Bottomfish FMP (1986) prohibits the use of explosives, poisons, trawl nets, and other destructive gears that may indiscriminately kill or capture nontarget or bycatch species. Hawaii's bottomfish fisheries only use hook and line fishing gear, which is considered to have low collateral impacts on habitat and bycatch.

The amount of nontarget species and bycatch within Hawaii's bottomfish fisheries is evaluated through two management and monitoring programs: (a) mandatory commercial catch reporting and (c) the observer program. As mentioned in Section 3.4.6.2, the State of Hawaii changed its commercial marine landings (CML) forms in 2002 to include data fields describing the number of fish released. PIFSC and the State of Hawaii have a cooperative data sharing agreement from which PIFSC is able to evaluate bottomfish catch data including nontarget species and bycatch information. The Pacific Island Regional Office's Observer Program monitored the NWHI bottomfish fishery from 1990 to 1993 and is currently monitoring the fishery since 2003.

External Factors Potentially Impacting Nontarget and Bycatch Species

One of the most important external factors regarding whether a nontarget species is retained or discarded (i.e. bycatch) is Hawaii's seafood markets. For example, the largest percentage of bycatch within the fishery is attributed to amberjack/kahala (*Seriola dumerili*). One hundred percent of kahala is discarded because of fears of ciguatera poisoning. Before the United Fishing Agency (Hawaii's primary fish auction) ceased selling kahala in 1983, nearly 72,500 pounds of kahala were landed annually in Hawaii (Dalzell, WPFMC, personal communication). Currently, the only kahala being sold in the state are ones that are farm-raised in a controlled environment and devoid of ciguatera. From the NWHI bottomfish fishery, butuguchi (*Psudeocaranx dentex*) are sometimes retained and sometimes discarded, and likely dependent on market price and when the fish was caught during the fishing trip; that is, early in the trip butaguchi may be discarded as it has poor shelf life (Section 3.4.6.2).

Potential Impacts of the Alternatives on Nontarget and Bycatch Species

As all of the alternatives (except Alternative 1) are expected to reduce bottomfish fishing effort by at least 15 percent, total catches of nontarget and bycatch species are expected to decrease proportionately. For the alternatives that deal with seasonal closures (Alternatives 3, 5a, 5b) for the Deep 7 species, depending on market demand, the targeting of uku (*Aphareus rutilans*) could increase during the closed period. The impact this could have on uku stocks is unknown, but it is not expected to be significant.

Potential Cumulative Impacts on Nontarget and Bycatch Species

Given the low amount of bycatch associated with Hawaii's bottomfish fisheries, and the fact that the largest percentage of species discarded (kahala, ulua) do not suffer from barotrauma (bloating of the swim bladder when raised from deep depth to the surface (high to low pressure, usually resulting in fish death), the effects of the alternatives added to the effects of market forces are not expected to negatively impact nontarget and bycatch species.

4.8.6 Protected Species

Marine Mammals

Hawaiian monk seals and bottlenose dolphins are the only species of marine mammals that have been identified as potentially impacted by Hawaii's bottomfish fisheries. For this reason, the cumulative impacts on those species are considered in this analysis.

Hawaiian Monk Seal

Past Federal Management Actions

The Bottomfish FMP (1986) and its amendments have established management measures to prevent, minimize, or mitigate interactions with protected species, especially the Hawaiian monk seal. For example, the Bottomfish FMP requires new Mau Zone or Hoomalu Zone permit holders to complete a protected species workshop to learn on ways to best avoid interactions. Recently, bottomfish permit holders have voluntarily agreed to attend protected species workshops conducted by NMFS, as well as agreed to a voluntary fish retention program to reduce the possibility of Hawaiian monk seals following their fishing vessels. The Bottomfish FMP also allows the NMFS Regional Administrator to place observers on NWHI bottomfish vessels, which occurred from 1990 to 1993 and from 2003 to present. The NWHI limited entry programs under the Bottomfish FMP limited the number of vessels that could participate in the fishery, which thereby decreases the overall potential for interactions with protected species in the NWHI.

Future Federal Management Actions

No management actions are being considered or planned by the Council or NMFS that may negatively impact Hawaiian monk seals or their critical habitat. The PIFSC will continue its efforts to monitor the Hawaiian monk seal population, and the PIRO will continue efforts to mitigate interactions between humans and Hawaiian monk seals.

External Factors Potentially Impacting Hawaiian Monk Seals

A comprehensive discussion on the external factors affecting Hawaiian monk seals is provided in Section 3.3.1.3 of the Bottomfish FEIS (2005). The external factors discussed include natural occurrences such as male aggression and mobbing, shark predation, disease, ecosystem productivity regime shifts, as well as anthropogenic sources such as sea wall entrapments, hookings, research activities, marine debris, and vessel groundings.

Potential Effects of the Alternatives on Hawaiian Monk Seals

In 2002, NMFS found that Hawaii's bottomfish fishery is not likely to jeopardize the continued existence of the Hawaiian monk seal or result in the destruction or adverse modification of its critical habitat (NMFS 2002). NMFS made these findings because the bottomfish fishery is expected to result in low rates of hooking and seemingly low levels of competition for fishery resources between monk seals and the bottomfish fishery. As the alternatives considered in the DSEIS would either maintain the status quo, or reduce effort of bottomfish fishing in the MHI, none of the alternatives are expected to jeopardize the continued existence of the Hawaiian monk seals or result in the destruction or adverse modification of their critical habitat.

Potential Cumulative Effects on Hawaiian Monk Seals

The Hawaiian monk seal population is far below historic levels and has declined 1.1 percent yr^{-1} on average for the past decade (NMFS 2004). NMFS has concluded that the Hawaiian monk seal total abundance is too small to protect this species from extinction in the foreseeable future (NMFS 2002). Further declines of this species may be linked to the various external factors mentioned above; however, it does not appear that Hawaii's bottomfish fisheries will play a significant role in the future status of this species. NMFS will continue to monitor monk seal populations as well as monitor for any signs of impact on monk seals from Hawaii's bottomfish fisheries.

Bottlenose Dolphins

Past, Present, and Reasonably Foreseeable Federal Actions

From 1990 to 1993 and from 2003 to present, the NWHI bottomfish fishery has been observed by NMFS' observer program. A main objective of NMFS' observer program is to monitor fisheries for interactions with protected species. As mentioned in Section 3.3, between 1990 and 1993 NMFS' NWHI bottomfish observer program observed bottlenose dolphins stealing hooked fish off bottomfish lines. Interaction rates between dolphins and the NWHI bottomfish fishery have been estimated based on observer coverage conducted from 1990–1993, and indicate that an average of 2.67 dolphin interactions, most likely involving bottlenose and rough-toothed dolphins, occurred for every 1,000 fish brought on board (Kobayashi and Kawamoto 1995). Theses interactions did not involve hookings or entanglements, but involved dolphins stealing hooked fish or bait of bottomfish lines. Between 1994 and 2002, two bottlenose dolphins were observed hooked or entangled in the Hawaii-based longline fishery outside of U.S. EEZ waters (Forney 2004).

Hawaii's bottomfish fisheries have not been found to cause mortality or serious injury to bottlenose dolphins and therefore have been classified by NMFS as a Category III fishery under the Marine Mammal Protection Act.

External Factors Potentially Impacting Bottlenose Dolphins

Because exogenous factors on bottlenose dolphins in Hawaii have not been readily identified, for the purposes of this analysis, exogenous factors identified as common to cetaceans are used and include the following: (a) incidental take in fisheries; (b) ship traffic, ship disturbance, and ship noise, and (c) marine debris and wastes disposal.

Incidental Take in Fisheries

Nearshore gillnet fisheries in Hawaii have been reported that interact with bottlenose dolphins; however, the rate of interactions or severity of interactions is not well known (Forney 2004).

Ship Traffic, Disturbance, and Anthropogenic Noise

Collisions with vessels and disturbance from low-frequency noise are potential threats to cetaceans. The increasing levels of anthropogenic noise in the world's oceans may have an adverse effect on marine mammals. The Marine Mammal Commission is currently assessing the acoustic impact of underwater sound on marine mammals, and will likely release a report sometime in 2006.[15]

Marine Debris and Waste Disposal

Activities that may have adverse effects on marine mammal habitat include the dispersal of marine debris, large oil spills, and other types of marine pollution. Petroleum has the potential to be toxic to marine mammals if it is inhaled, ingested, or absorbed through the skin, mucous membranes, or eyes, or if it inhibits feeding by fouling the baleen plates of whales. Hydrocarbons can also bioaccumulation in zooplankton and fish eaten by marine mammals and other wildlife. Any detrimental effects of marine pollution on their prey species would also affect marine mammals. Aside from large, catastrophic spills, the long-term effects of low levels of petroleum exposure are unknown.

Marine debris can be toxic to marine mammals if ingested or it can entangle them, leading to decreased ability to breathe, feed, breed, swim, or haul out. The animals affected may be more vulnerable to predators or diseases, thus reducing their ability to survive, care for their young, and reproduce. These factors can have significance in local areas where there are high concentrations of marine debris, thus contributing to cumulative effects on marine mammals.

Potential Effects of the Alternatives on Bottlenose Dolphins

As discussed earlier, Hawaii's bottomfish fisheries have not been found to cause mortality or serious injury to bottlenose dolphins and therefore have been classified by NMFS as a Category III fishery under the Marine Mammal Protection Act. As Alternative 1 would maintain the status quo, and the other alternatives would reduce fishing effort in the MHI bottomfish fishery, the alternatives considered in this DSEIS are not expected to significantly impact bottlenose dolphins.

[15] http://www.mmc.gov/sound/

Potential Cumulative Effects on Bottlenose Dolphins

The potential cumulative effects on bottlenose dolphins mostly involve impacts associated with external factors. As the Hawaii bottomfish fisheries have not been found to hook or entangle bottlenose dolphins, these fisheries are unlikely contributing to cumulative impacts on bottlenose dolphins.

Sea Turtles

As discussed in Section 4.3, interactions between sea turtles and Hawaii's bottomfish fisheries have not been reported or observed, and therefore it is surmised that bottomfish fishing operations do not adversely affect sea turtles. For this reason, the cumulative impact to sea turtles is not further discussed in this analysis. For a complete discussion on cumulative impacts to sea turtles, see the 2001 FEIS on the Fishery Management Plan for Pelagic Fisheries of the Western Pacific Region, which is available on the Council's website at www.wpcouncil.org.

Seabirds

Historically, the only types of birds that have interacted with fisheries managed under Council FMPs have been boobies and albatrosses. Although many other species of seabirds exist in Hawaii and Western Pacific Region, this analysis is limited to these two species.

Past, Present, and Reasonably Foreseeable Federal Actions

From 1990 to 1993 and from 2003 to the present, the NWHI bottomfish fishery has been observed by NMFS' observer program. A main objective of NMFS' observer program is to monitor fisheries for interactions with protected species. Prior to 1999, the Hawaii-based pelagic longline fisheries managed under the Council's Pelagics FMP were estimated to interact with around 2,000 albatross (black-footed and Laysan), primarily in the shallow-set fishery that targets swordfish. The short-tailed albatross, which is listed as endangered under the ESA, is thought to forage in areas where the Hawaii-based longline vessels fish. However, no interactions between the short-tailed albatross and the Hawaii-based longline fleet have ever been reported or observed. Between 1999 and 2003, the shallow-set component of the Hawaii-based longline fishery was not in operation, and in those years seabird interactions were lower than they were prior to 1999. In 2005, the Council amended the Pelagics FMP to require Hawaii-based longline vessels to use known seabird mitigation measures that are expected to reduce seabird interaction rates by at least 95 percent of pre-1999 levels.

External Factors Potentially Impacting Seabirds

Exogenous factors known to impact seabird populations include the following: a) degradation of nesting habitats that include lead and other toxins (e.g. polychlorinated biphenyls) left over from military activities in the NWHI, as well as invasive species such as rats that consume seabird eggs, and b) marine debris and plastics—albatross often consume floating plastics and pass the objects on to chicks while feeding. Non-U.S. pelagic longline fisheries are also likely to be an external factor substantially impacting seabird populations. However, detailed estimates are unknown.

Potential Impacts of the Alternatives on Seabirds

PIRO observer data indicate that since 2003, six interactions (three boobies, one black-footed albatross, and two Laysan albatrosses) have occurred between the seabirds and the NWHI bottomfish fishery. Out of the six, only one of those interactions occurred while operating bottomfish fishing gear, while the other five occurred while trolling. On the basis of these figures, bottomfish fishing in the NWHI constitutes a negligible risk to seabirds in the NWHI as populations of these seabirds in the NWHI range from tens of thousands (boobies, black-footed albatross) to hundreds of thousands (Laysan albatross; NMFS 2005). As seabird populations are substantially higher in the NWHI than in the MHI, and no interactions between seabirds and bottomfish fishing gear have ever been observed or reported in the MHI, the alternatives considered in this DSEIS are believed to pose no additional threat to seabird populations.

Potential Cumulative Effects on Seabird Populations

As Hawaii's bottomfish fisheries pose a negligible threat to seabird populations, maintaining their current populations or rebuilding those populations that were once substantially greater will depend on to what extent external factors impacting seabirds are reduced or mitigated.

4.8.7 EFH, Biodiversity, and Ecosystems

Past Federal Actions

Pursuant to the 1996 Sustainable Fishery Act amendments to the MSA, the Council has designated EFHs and HAPCs for each MUS listed under the Council's five FMPs (64 FR 19068; see Section 3.3.1). The Council and NMFS must ensure that any activities conducted in such areas do not adversely affect, to the extent possible, EFH or HAPC for any MUS. The use of explosives, poisons, trawl nets, and other destructive gears that may adversely affect any EFH or HAPC in the Western Pacific Region are prohibited under the Council's FMPs. No fishery under Council management or jurisdiction has been found to adversely affect the EFH or HAPC of any Western Pacific Region MUS.

Reasonably Foreseeable Future Federal Actions Potentially Affecting EFH, Biodiversity, and Ecosystems

There are no actions being planned by the Council or NMFS that are expected to adversely affect EFH or HAPC in the Western Pacific Region. The Council has begun a process to develop and implement place-based FEPs for areas within its jurisdiction. Future fishery ecosystem management actions will build upon the place-based FEPs framework and incorporate ecosystem management approaches (e.g. multi-species management, ecosystem indicators and models, and community-based management) as appropriate.

External Factors or Actions Potentially Affecting EFH, Biodiversity, and Ecosystems

External factors or actions that may potentially impact bottomfish EFH, biodiversity, and ecosystems are land-based pollution and sedimentation, ocean drilling and mining, vessel wastes, vessel groundings, oil spills, ocean dumping of toxic wastes, marine debris including derelict fishing gear, and military exercises with live ammunition. To what degree these past actions have had on bottomfish EFH, biodiversity, or ecosystems are unknown, but they are suspected to be minimal. To the extent that these or potential activities and events are subject to environmental regulations, their effects on EFH, biodiversity, and ecosystems are likely to be avoided, minimized, or mitigated.

Potential Effects of the Alternatives on EFH, Biodiversity, and Ecosystems

Submersible surveys conducted on bottomfish fishing areas in the NWHI found that bottomfish fishing operations have negligible effects on EFH, biodiversity, and the benthic ecosystem. None of the alternatives considered in this DSEIS would modify the existing regulations prohibiting the destructing fishing methods. Fishing vessel activities can produce potential negative environmental impacts from lost oil, sewage, garbage and debris, and groundings. However, none of these factors are believed to have occurred and resulted in significant negative impacts on EFH, biodiversity, or benthic ecosystems on a broad or archipelagic scale. Neither are they believed to occur frequently, thereby adversely affecting EFH and ecosystems in an additive manner. Therefore, the alternatives considered in this DSEIS are not expected to have any adverse impacts on EFH, biodiversity, and benthic ecosystems.

Potential Cumulative Effects on EFH, Biodiversity, and Ecosystems

On the basis of the above discussion, the effects of continued bottomfish fishing in Hawaii, albeit with reduced effort in the MHI over recent years, combined with external factors are not expected to result in significant negative cumulative impacts to EFH, biodiversity, and benthic ecosystems.

4.8.8 Fishery Sectors

Past Federal Management Actions

Generally, the objectives of past fisheries management measures were intended to promote sustainable fisheries and are expected to have positive impacts on fishery participants in the long-term from the benefit of maintained fishing opportunities. Nevertheless, it is believed that many fishermen in Hawaii have the sense that government regulations are "boxing them in" and reducing their ability to maintain their characteristic highly flexible fishing strategy (Hamilton et al. 1996; Polovina and Haight 1999; Pooley 1993a). This flexibility is important for many smaller and medium-sized fishing operations because of the way natural rhythms and variability influence the occurrence and season availability of various targeted species.

Reasonably Foreseeable Future Federal Management Actions

Fisheries management is an adaptive process, and fisheries management decisions potentially affecting Hawaii's bottomfish fishery sectors could arise at any time. Currently, the Council is developing FEPs for the Western Pacific Region. Future fisheries management decisions will build upon the institutional framework of place-based FEPs. Essential to successful implementation of fisheries ecosystem management are opportunities for community participation. The Council anticipates working closely with fishing communities as well as fishery sectors in furthering fishery ecosystem management in Hawaii.

The National Marine Sanctuary Program is currently developing a Draft EIS and draft management plan for the proposed NWHI sanctuary. At this time, it is unknown whether fishing (commercial or recreational) will be allowed within the NWHI sanctuary.

As identified during public scoping, commercial bottomfish fishermen in Hawaii expressed interest in learning best practices and methods associated with seafood handling, so as to maintain a high quality product and maximize price per pound values. Dependent on Congressional funding, the Council and NMFS may coordinate seafood handling workshops for Hawaii's bottomfish fishermen.

External Factors Potentially Impacting Fishery Sectors

Fuel Costs

Perhaps the single external factor most affecting Hawaii's bottomfish fishing sectors are the volatile gas prices observed earlier in 2005. Although bottomfish fishing is considered less expensive than pelagic trolling, for many areas in Hawaii, traveling to and from bottomfish fishing grounds is still expensive considering fuel costs (HDAR Bottomfishers's Survey 2005, unpublished data). If fuel prices continue to increase, Hawaii's bottomfish fishery sectors could see more competition from fishermen switching to bottomfish fishing over trolling. As fuel prices in Hawaii have greatly fluctuated in the previous 6 months, their impact on fishermen is believed to significant. When fuel prices are extremely high, many fishermen decide not to go bottomfish fishing or trolling (HDAR Bottomfishers's Survey 2005, unpublished data).

Seafood Imports

For Hawaii's commercial bottomfish sector, the effect of markets importing bottomfish from places such as Australia, New Zealand, Fiji, and Tonga impacts market prices for Hawaii bottomfish. As mentioned in Section 3.4.5, nearly 750,000 pounds of bottomfish are annually imported to Hawaii each year, with a strong negative correlation observed between MHI landings and imports—when MHI bottomfish landings are low, bottomfish imports increases.

Construction Jobs

An external factor that might be positively impacting Hawaii's fishing sector is a stronger Hawaii economy over recent years. Some islands in Hawaii have experienced dramatic increases in construction jobs over the last ten years, contributing in low unemployment rates. Within the past several years, Hawaii's construction industry has boomed and so has its high-value housing market, which has likely benefited many part-time commercial bottomfish fishermen (M. Mitsuyasu, personal communication). As seen in Section 3.4.4.1, the number of MHI bottomfish vessels and the number of bottomfish fishing trips have declined in recent years. Although one cannot determine that this is directly attributable to Hawaii's construction boom, part-time commercial fishermen may not be supplementing their income with bottomfish catches as readily as in years past. The benefit to Hawaii's fishery sectors is less competition for catches at popular bottomfish grounds.

Boat Ramps and Harbors

Discussions with bottomfish fishermen in recent scoping meetings have yielded the fact that Hawaii's boat ramps and harbors are in disrepair and affect fishermen's ability to launch or berth their boats. Fishermen have stated that the dilapidated boat ramps and harbors in need of repair are found everywhere in the MHI (M. Mitsuyasu, personal communication).

Potential Impacts of the Alternatives on Fishery Sectors

Alternative 1 (no action) would likely result in further decline of catch rates, and fishery participants in all sectors would see lower returns both in financial and nonmarket (e.g. angler satisfaction, food, and social benefits) terms. Alternative 2a (area closures around Penguin and Middle Banks) would be expected to disproportionately impact Oahu and Kauai fishery sectors as compared with those on the other islands. Alternative 2b is expected to negatively affect small boat fishermen of all sectors if they are displaced from there traditional, close to home fishing grounds. Alternative 3 (seasonal closure) is not expected to significantly impact commercial, charter, and recreational (including subsistence) fishery sectors as proposed closure is during the summer months when bottomfish landings are historically the lowest.

Alternative 4a (TAC) is expected to impact all fishery sectors proportionately, unless a situation developed in which commercial fishermen increased their effort and the TAC was disproportionately caught by commercial fishermen over recreational and charter sectors. However, given that the majority of commercial landings are already made during the winter season, this is not likely to highly change these operations. Because of the lack of detailed information on recreational (including subsistence) fishing patterns, and the varying motivations within these groups, it is not known whether they would increase effort in light of a TAC. The impacts of Alternative 4b (IFQs) on the commercial fishery sector would vary depending on how its IFQs were implemented. If equal quotas (totaling 85 percent of the fleet-wide 2003 catch) were provided, highliners would get the same quota as part-time fishermen, and vice versa. This would leave some without enough quota, while others would have unused quota. Without a method to transfer (trade) quota between fishermen, this would have disproportionately adverse impacts on the highliners. If equal quotas were provided to a subset of all historical participants, such as those most active in recent years, those included would each have a higher quota, while those excluded would have none. In this case, part-time commercial fishermen that have not been active in recent years would not have IFQs and therefore would not be able to commercially sell their fish, of which the impact could be significant. The sport and recreational (including subsistence) fishery sectors would not be impacted under this alternative.

Alternative 5a (May–September closure) would impact all fishery sectors; however, this is believed to normally be a period of lower bottomfish fishing activity due to the increased availability of pelagic fish so this impact may be relatively low. The provision of equal IFQs for use by a subset of commercial fishermen during the otherwise closed season will offset the impacts on this group. However, as discussed above, the allocation of equal quotas to each qualifying participants will likely leave some without enough quota, while others could have unused quota. Impacts on those commercial, sport, and recreational (including subsistence) fishermen who do not qualify for an IFQ would be adverse.

The impacts of Alternative 5b (June–August closure and year-around Penguin Bank partial closure) would be evenly spread across fishery sectors as it does not differentiate between commercial, sport, and recreational (including subsistence) fishermen. The year-round partial closure of Penguin Bank would disproportionately affect fishing sectors based on Oahu; however, to what degree is unknown.

Potential Cumulative Impacts on Fishery Sectors

As seen in the above discussion, the impacts of the proposed alternatives when combined with external factors suggest that Hawaii's bottomfish fishery sectors are facing substantial cumulative impacts. To what extent these cumulative impacts have on sustained opportunities for Hawaii's bottomfish fishery sectors remains to be seen.

4.8.9 Fishing Communities

Past, Present, and Reasonably Future Federal Actions

As described in Section 3.6.2, based on the requirements of the 1996 SFA amendments to the MSA, the Council designated under its FMPs, that each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai, and Hawaii is designated as a fishing community.

External Factors Impacting Hawaii's Fishing Communities

Hawaii's Economy

Some islands in Hawaii have experienced dramatic increases in construction jobs over the last several years, contribution low unemployment rates in Hawaii. Because of more available jobs, fishing communities on some islands may have reduced their dependence on fisheries. However, for islands that have experienced little growth (e.g. Molokai), fishing is still a major economic and social force within the community.

Boat Ramps and Harbors

Discussions with bottomfish fishermen in recent scoping meetings have yielded that Hawaii's boat ramps and harbors are in disrepair and affecting fishermen's ability to launch or berth their boats. Fishermen have stated that the dilapidated boat ramps and harbors in need of repair are found within in each of Hawaii's fishing communities (M. Mitsuyasu, personal communication).

Fuel Costs

Hawaii's recently volatile gas prices are impacting Hawaii's fishing communities. Although bottomfish fishing is considered less expensive than pelagic trolling, for many areas in Hawaii, traveling to and from bottomfish fishing grounds is still expensive considering fuel costs (HDAR Bottomfishers's Survey 2005, unpublished data). If fuel prices continue to increase, Hawaii's fishing communities could be impacted as it could become simply too expensive to fish.

Potential Impacts of the Alternatives on Fishing Communities

The short term affects of no action by the Council under Alternative 1 are expected to impact Hawaii's fishing communities proportionately. However, the management action by the Secretary of Commerce through NMFS is unknown and therefore its impact on Hawaii's fishing communities is also unknown. Alternative 2 is expected to disproportionately affect the fishing communities of Oahu and Kauai as it would close Penguin Banks and Middle Banks to bottomfish fishing for the Deep 7 species. The effect of Alternative 2b on fishing communities is difficult to assess as Hawaii's fishing communities may respond differently to the proposed BRFAs. Loss of access to traditional fishing grounds may negatively affect fishing communities as it may deter people from going fishing, thus reducing the social benefits of fish sharing amongst the community. Loss of specialized fishing knowledge within a fishing community can also been viewed as negative as it is a reduction in social capital that is difficult to regain by future generations.

Alternative 3 is expected to proportionately impact all of Hawaii's fishing communities. However, significant impacts are not expected as the fishing season would open during the months that have historically recorded the highest bottomfish landings. Alternative 4a would affect Hawaii's fishing communities proportionately, unless there was race to fish situation whereby the TAC was consumed disproportionately by one or more fishing communities. Depending on how the IFQs are allocated under Alternative 4b, fishing communities may be affected proportionately or disproportionately; however, the impacts are not expected to be significant. Alternative 5a is not expected to impact a fishing community, even if the IFQs are not distributed evenly throughout Hawaii's fishing communities as the open season would occur during the months that bottomfish landings are historically the highest. The year-around partial closure of Penguin Banks is expected disproportionately affect Oahu's fishing community, as Penguin Banks is the primary bottomfish fishing grounds for Oahu's bottomfish fishermen.

Potential Cumulative Effects on Hawaii's Fishing Communities

The external factor of Hawaii's relatively booming economy and low unemployment rate may be offsetting the impact of rising fuel costs or the need for members of Hawaii's fishing communities to supplement their incomes or diets with catches of bottomfish. None of the alternatives are expected to significantly affect Hawaii's fishing communities; however the response of fishing communities to a seemingly increasing regulatory environment is unknown. Given rising fuel prices, increased regulations, and degraded access points (i.e. boat ramps), members of Hawaii's fishing communities are likely facing reduced fishing opportunities. Reduced fishing opportunities may impact Hawaii's fishing communities by reducing the economic and social benefits that these communities derive from fishing and the harvest of marine resources.

4.8.10 Native Hawaiian Communities

Past, Present, and Reasonably Foreseeable Future Federal Actions

The MSA attempted to address native, indigenous rights to resources managed by the Council through Section 305 (i) (2), the Western Pacific Community Development Program (CDP) Section 305 note, and the Western Pacific Community Demonstration Project Program (CDPP). The CDP provides an opportunity for the Council to make programmatic changes to fisheries it manages to address inequities in participation in these fisheries by native fishers, however, no money is appropriated for this program. The CDPP is a regional grant program for which Congress has appropriated $500,000 per year for three to five demonstration projects by qualified native communities. These programs acknowledge that native people in the Western Pacific Region have had barriers to their full participation in fisheries managed by the Council and therefore exist to enhance their participation in fisheries.

Although the regulations have not been finalized by NMFS, the Council (1999) recommended that one fifth or 20 percent of the target number of Mau Zone limited entry permits (ten) be allocated for Native Hawaiians under the Council's CDP.

External Factors Potentially Impacting Native Hawaiians

Although there are likely other external factors affecting Native Hawaiians, two of the most common recognized are discussed below.

Diet and Health

Native Hawaiians die at younger ages than other ethnic groups residing in Hawaii; have a higher prevalence of hypertension, diabetes, and asthma than other ethnic groups; and have a higher rate of being overweight (Johnson et al. 2003). Obesity is implicated as a significant risk factor in many chronic diseases. Changing dietary behaviors to reduce obesity is a fundamental aim of most weight loss programs, including several Traditional Hawaiian Diet programs developed and tested in Hawaii over the past two decades. These programs emphasize the health and cultural values of native foods. The majority of the participants realized short-term weight loss and improvements in health, but few individuals sustained a significant weight loss. Barriers to accessing fresh, affordable food is cited as one of the major barriers to long-term adherence to traditional Hawaiian diets. Changes that would support healthier lifestyles include "increase(d) access by Native Hawaiians to the land and ocean" and support of local food producers (Fujita et al. 2004).

Education

Native Hawaiian students are perceived, by the standards of contemporary education, to be underperformers (Pacific American Foundation/Hui Malama o Mo'omomi 2003). Personalized environments and experience-based learning have been identified as two critical factors for success in the schooling of Native Hawaiian students (Kawakami and Aton 2000). For Hawaiians, the lesson and the learning of the lesson are ultimately interwoven with the situation and the environment of the learner; that is, every situation is a learning opportunity. Western educators recognized 60 years ago that Native Hawaiians have never conceived of education in terms of schooling alone or regarded education as separate from living (Wist 1940).

Kupuna (elder) wisdom is one of the essential components of the traditional Hawaiian learning that is neglected in contemporary education (Bartram et al. 2004). Unlike modern societies they typically receive information through a variety of sources such as writing and multi-media, Native Hawaiians depend on their kupuna to pass on cultural wisdom.

Potential Impacts of the Alternatives on Native Hawaiians

If the Council did not take action (Alternative 1), it is probable that the Secretary of Commerce through NMFS would take unilateral action to impose management measures designed to end overfishing in federal waters. It is not possible to predict what those measures would consist of, but they would have to reduce MHI bottomfish fishing mortality (e.g. catches) by at least 15 percent to successfully end overfishing. Depending on what measures were implemented, it is unlikely that special provisions would be conceded to Native Hawaiians.

If no management action occurred by the Council or by NMFS, and the current overfishing condition led to an overfished condition resulting in significantly low bottomfish biomass levels, the bottomfish fishery would likely collapse. Under this scenario, the economic and cultural benefits observed from sustainable bottomfish resources for Native Hawaiian communities would cease, thereby negatively impacting the ability of Native Hawaiians to gain economically from catching bottomfish as well as their ability to perpetuate their cultural traditions of fishing and fish sharing amongst community members. Similarly for the remainder of the alternatives, a reduction of access rights and cultural practices can be viewed as impacting Native Hawaiians by reducing their ability to practice and continue their culture. The loss of any customary access and practice could be viewed as a permanent loss of culture for Native Hawaiian communities.

Potential Cumulative Impacts to Native Hawaiians

As mentioned above, Native Hawaiians are facing significant impacts from relatively poor diet and health and education. Bottomfish management alternatives that reduce access to locally produced fish would add to cumulative adverse effects on Native Hawaiian diet and health as well as to further reduce fishing opportunities that allow for intergenerational teaching of Native Hawaiian youth. The cumulative effect of the proposed management alternatives in combination with the external factors is unknown, but is seemingly not positive for Native Hawaiian communities.

4.8.11 Administration and Enforcement

Past, Present, and Reasonably Foreseeable Federal Actions

The Council has been involved in managing fisheries of the Western Pacific Region since the promulgation of the MSA in 1976. Since that time, the Council has developed, and the Secretary of Commerce has approved, the following five species-based management plans: Precious Corals (1983), Crustaceans (1983), Bottomfish and Seamount Groundfish (1986), Pelagics (1987), and Coral Reef Ecosystems (2004). With the exception of the Coral Reef Ecosystems FMP, each FMP has undergone a series of amendments. In the fall of 2005, the Council underwent a process to develop and implement place-based fishery ecosystem plans, thereby amending and reorganizing the species-based FMP regulations into place-based regulations.

In 2004, Congress appropriated funds to NMFS to establish the Pacific Islands Region, whereby the fishery resources occurring in the EEZ around U.S. Pacific Islands would no longer be under the administrative purview of NMFS' Southwest Region. Also during this transformation, the Honolulu Lab became the Pacific Islands Fisheries Science Center, and the NMFS' Office of Law Enforcement Pacific Islands Division was established.

The National Marine Sanctuary Program is currently developing a Draft EIS and draft management plan for the proposed NWHI sanctuary. At this time, it is unknown whether fishing (commercial or recreational) will be allowed within the NWHI sanctuary. If fishing is allowed in the NWHI sanctuary, it is unknown what agency will manage and administer such activity and under what authority (i.e. MSA vs. NMSA).

External Factors Potentially Impacting Administration and Enforcement

External factors that potentially impact Council and NMFS management and administration are new legislation, annual budgets, and litigation. External factors potentially affecting NMFS Office of Law Enforcement include annual budgets and balancing enforcement priorities. Exogenous factors that impact the USCG include shifting priorities for which Homeland Security, search and rescue, as well as annual budgets impacting staffing and the maintenance and acquisition of assets are included.

Potential Impacts of the Alternatives on Administration and Enforcement

Alternative 1 (no action) would not impact administration and enforcement in the short term; however, no action in the long term could result in litigation or failure to manage bottomfish in a sustainable manner. The area closures under Alternatives 2a and 2b would not significantly impact administration, although it requires the promulgation of area closure regulations.

Alternatives 2a and 2b, however, would significantly impact enforcement agencies as adequate enforcement of the measure would entail at-sea or air surveillance operations. Alternative 3 would insignificantly impact administration as it would entail new regulations to be promulgated reflecting the closed season. Enforcement agencies would not be significantly impacted as enforcement during the closed season would mostly involve shore-based monitoring of landings and sales of the Deep 7 bottomfish species of concern. Alternatives 4a, 4b, and 5a would impact administration and enforcement as they would entail careful monitoring of fish catch data and an appropriate enforcement response. Alternative 5b would not significantly impact administration as it would entail seasonal and partial closure. However, enforcement agencies may be impacted as they would need to monitor the area closure by sea or by air.

Potential Cumulative Impacts to Administration and Enforcement

From the above discussion, the impacts of the management actions considered in this DSEIS, and taken in combination with past, present, and reasonably future Council and NMFS actions as well as external factors such as Congressional funding, are not expected to significantly impact administration and enforcement. However, as more and marine resource regulations are implemented and more closed areas are established, the responsibilities of the USCG and NMFS OLE also increase. This could be burdensome, especially if these enforcement agencies are forced to operate on budgets that do not account for added marine resource enforcement responsibilities. In other words, unfunded mandates can significantly burden enforcement agencies tasked with multiple missions (e.g. USCG and Homeland Security).

CHAPTER 5: ENVIRONMENTAL MANAGEMENT ISSUES

5.1 Energy Requirements and Conservation Potential of the Alternatives and Mitigation Measures

The alternatives are distinguished by the amount and/or locations of bottomfish fishing in the MHI. The vessels used to target bottomfish consume energy in the form of petroleum-based fuels and electricity. None of the alternatives are expected to result in the consumption of significant amounts of energy.

5.2 Natural or Depletable Resource Requirements and Conservation Potential of the Alternatives and Mitigation Measures

Except for the no-action alternative, all of the alternatives are designed to reduce fishing effort on Hawaii’s bottomfish stocks by at least 15 percent from 2003 levels.

5.3 Urban Quality, Historic and Cultural Resources, and Design of the Built Environment Including the Reuse and Conservation Potential of the Alternatives and Mitigation Measures

None of the alternatives would have an appreciable effect on urban quality or design of the built environment because of the small size of the bottomfish fishing fleet and its shore-side supporting infrastructure.

5.4 Possible Conflicts between the Proposed Action and Other Land Use Plans

The preferred alternative considered in this EIS does not conflict with the objectives nor provisions of the NWHI Coral Reef Ecosystem Reserve or the proposed NWHI sanctuary process because the existing FMP provides for a sustainable fishery with little bycatch and minimal effect on protected species or ecosystem integrity.

5.5 Adverse Impacts That Cannot Be Avoided

None of the alternatives propose measures that produce unavoidable adverse impacts.

5.6 The Relationship Between Local Short-Term Uses of the Human Environment and the Maintenance and Enhancement of Long-Term Productivity

With the exception of Alternative 1 (no action), all of the alternatives considered are designed to reduce fishing pressure on Hawaii’s bottomfish stocks. The objective of reducing fishing effort in the MHI is to enhance the long-term productivity of Hawaii’s bottomfish populations.

5.7 Irreversible and Irretrievable Commitments of Resources Involved in the Proposed Action

Nonrenewable resources consumed in the industry include the energy used in fishing operations and ancillary businesses, as well as the materials used to construct the physical assets used in the industry, although some of the latter would be available for reuse if taken out of use in bottomfish fishing.

5.8 Permits, Licenses, and Approvals Necessary to Implement the Proposed Action

No permits outside purview of the NMFS and State of Hawaii HDAR are required for this action. However, besides Alternative 1 (no-action) and Alternative 2a (closure of Penguin and Middle Banks) the remaining alternatives require close coordination between NMFS and the State of Hawaii as well as parallel regulations in order for successful implementation and enforcement. Close coordination involves data sharing agreements (which already exist), developing appropriate research and monitoring plans, as well as entering into Joint Enforcement Agreement.

CHAPTER 6: PREPARERS AND PUBLIC REVIEW OF THE DSEIS

6.1 Preparers of the DSEIS

This document was prepared with significant contributions from the following:

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Chapter 3: Affected Environment	Tony Beeching, Kelly Finn, Marcia Hamilton, George Kransick, Eric Kingma, Mark Mitsuyasu, Paul Dalzell
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Chapter 7: References	Eric Kingma, Kelly Finn
Appendix 1:	NMFS
Appendix 2:	PIFSC
Appendix 3:	HDAR

6.2 Distribution of the DSEIS

The following agencies, organizations, and individuals were provided review copies of the DSEIS.

Federal Agencies

Director	NMFS PIFSC
Chief	NMFS Office of Law Enforcement Pacific Islands Division
Administrator	NMFS Pacific Islands Regional Office
General Counsel	Pacific Islands Region NOAA
Admiral	U.S. Coast Guard (14th District)
Regional Administrator	U.S. Fish and Wildlife Service
Chairman	Marine and Fisheries Advisory Council
Regional Administrator	Environmental Protection Agency

U.S. Congressional Delegation

Representative	Commonwealth of the Northern Mariana Islands
Senators	State of Hawaii
Representatives	State of Hawaii
Representative	Territory of Guam
Representative	Territory of American Samoa

State/Territory/Commonwealth Agencies/Organizations

Governor	State of Hawaii
Director	American Samoa Department of Marine and Wildlife Resources
Director	CNMI Division of Fish & Wildlife
Director	CNMI Division of Environmental Quality
Director	Division of Aquatic Resources, DLNR
Director	Guam Division of Aquatic and Wildlife Resources
Director	Hawaii Coastal Zone Management Program
Director	Hawaii Department of Land and Natural Resources
Director	Hawaii Office of Environmental Quality Control
Administrator	Office of Hawaiian Affairs
Director	Public Libraries Hawaii

Other Organizations

Director	Center for Marine Conservation
Director	Earth Justice Legal Defense Fund
Director	Environmental Defense
President	Hawaii Audubon Society
President	Hawaii Bottomfish Association

President	Hawaii Fishermen’s Foundation
President	Hawaii Seafood Industry Association.
President	Hawaii Sport Fishing Club
President	Kawaihae Fishing Club
President	Keehi Sport Fishing Club
Director	Living Oceans Program, National Audubon Society
President	Māalaea Boat & Fishing Club
Commodore	Maui Trailer Boat Club
President	Marine Conservation Biology Institute
Director	The Nature Conservancy, Hawaii
President	The Ocean Conservancy
Director	Sierra Club, Hawaii
Director	United Fishing Agency, Hawaii
Director	University of Hawaii School of Law, Environmental Law
Director	University of Hawaii Institute of Marine Biology
Director	Western Pacific Fisheries Coalition
President	Windward Sport Fishing Club

Council Groups

Executive Directors	Regional Fishery Management Councils
Council Members	Western Pacific Regional Fishery Management Council
Members	WPRFMC Bottomfish & Seamount Groundfish Plan Team
Members	WPRFMC Commercial Advisory Panel
Members	WPRFMC Coral Reef Ecosystem Plan Team
Members	WPRFMC Crustaceans Plan Team
Members	WPRFMC Demonstration Projects Advisory Panel
Members	WPRFMC Ecosystem & Habitat Advisory Panel
Members	WPRFMC Pelagics Plan Team
Members	WPRFMC Precious Corals Plan Team
Members	WPRFMC Recreational Advisory Panel
Members	WPRFMC Scientific and Statistical Committee
Members	WPRFMC Subsistence/Indigenous Advisory Panel

Media

News Editor	Associated Press, Hawaii
Editor	Environment Hawaii
Editor	Hawaii Fishing News
Editor	Hawaii Tribune-Herald
Editor	Honolulu Advertiser (Oahu, Kauai, and Maui offices)
Editor	Honolulu Star Bulletin (Oahu, Kauai, and Maui offices)
Editor	Honolulu Weekly
Editor	Kauai Times
Editor	Maui News
Editor	Molokai Advertiser-News

Editor	The Garden Island, Kauai

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APPENDIX 1: RELEVANT LAWS, EXECUTIVE ORDERS, AND AGENCIES WITH JURISDICTIONAL AUTHORTIY IN THE WESTERN PACIFIC REGION

Magnuson–Stevens Fishery Conservation and Management Act

The Magnuson–Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA) is the primary law governing fisheries resources and fishing activities in federal waters. Originally enacted as the Fishery Conservation and Management Act in 1976, it has been amended frequently since 1976; most recently in 1996, by the Sustainable Fisheries Act. The primary goals at the time of enactment of the MSA were the conservation and management of U.S. fishery resources, the development of United States domestic fisheries, and the phasing out of foreign fishing activities within the U.S. EEZ.

National Environmental Policy Act

The National Environmental Policy Act (NEPA) of 1969 is the foundation of modern American environmental protection in the United States and its commonwealths, territories, and possessions. NEPA requires that federal agency decision makers, in carrying out their duties, use all practicable means to create and maintain conditions under which people and nature can exist in productive harmony and fulfill the social, economic, and other needs of present and future generations of Americans. NEPA provides a mandate and a framework for federal agencies to consider all reasonably foreseeable environmental effects of their proposed actions and to involve and inform the public in the decision-making process. NEPA compliance for fisheries management actions is further guided by regulations issued by the Council on Environmental Quality and those issued by the Department of Commerce's National Oceanic and Atmospheric Administration Administrative Order 216-6, Implementing the National Environmental Policy Act.

Endangered Species Act

The Endangered Species Act (ESA) provides broad protection for species of fish, wildlife, and plants that are listed as threatened or endangered in the United States or elsewhere. Provisions are made for listing species, as well as for recovery plans and the designation of critical habitat for listed species. The ESA outlines procedures for federal agencies to follow when taking actions that may jeopardize listed species, and contains exceptions and exemptions. Criminal and civil penalties are provided for violations of the ESA.

Marine Mammal Protection Act

The Marine Mammal Protection Act (MMPA) prohibits, with certain exceptions, the take of marine mammals in U.S. and by U.S. citizens on the high seas, and the importation of marine mammals and marine mammal products into the United States. The MMPA gives the Secretary authority and duties for all cetaceans (whales, dolphins, and porpoises) and pinnipeds (seals and sea lions, except walruses). The MMPA requires the NMFS to prepare and periodically review stock assessments of marine mammal stocks.

Fish and Wildlife Coordination Act

The Fish and Wildlife Coordination Act (FWCA) authorizes collection of fisheries data and coordination with other agencies for environmental decisions affecting living marine resources. Both formal and informal consultations, cooperative research, and data gathering programs are routinely pursued.

Coastal Zone Management Act

The Coastal Zone Management Act (CZMA) is designed to encourage and assist states in developing coastal management programs, to coordinate state activities, and to safeguard regional and national interests in the coastal zone. Section 307(c) of the CZMA requires that any federal activity affecting the land or water uses or natural resources of a state's coastal zone be consistent to the maximum extent possible with the enforceable policies of the affected state's approved coastal management program.

Administrative Procedure Act

The Administrative Procedure Act (APA) requires federal agencies to give the public prior notice of rule making and an opportunity to comment on proposed rules. General notice of proposed rule making must be published in the *Federal Register*, unless persons subject to the rule have actual notice of the rule. Proposed rules published in the *Federal Register* must include reference to the legal authority under which the rule is proposed and explain the nature of the proposal including what action is proposed, why, what are its intended effect, and any relevant regulatory history that provides the public with a well-informed basis for understanding and commenting on the proposal.

Regulatory Flexibility Act

The Regulatory Flexibility Act (RFA) requires federal agencies to assess the impacts of their proposed regulations on small entities and to seek ways to minimize economic effects on small entities that would be disproportionately or unnecessarily adversely affected. The most recent amendments to the RFA were enacted on March 29, 1996, with the Contract with America Advancement Act of 1996 (Public Law 104-121). Title II of that law, the Small Business Regulatory Enforcement Fairness Act (SBREFA), amended the RFA to require federal agencies to determine whether a proposed regulatory action would have a significant economic impact on a substantial number of small entities. For a federal agency, the most significant effect of SBREFA is that it made compliance with the RFA judicially reviewable.

Freedom of Information Act

The original Freedom of Information Act (FOIA) allowed the public to obtain government information, provided that the information is not protected by one of the nine specific FOIA exemptions, and required that an agency respond to a FOIA request within specified time limits.

Exempted information includes the following: classified secret matter of national defense or foreign policy, internal personnel rules and practices, information specifically exempted by other statutes, trade secrets and commercial and financial information, privileged interagency or intraagency memoranda or letters, personal information affecting an individual's privacy, and investigatory records for law enforcement purposes.

In 1996, the Electronic FOIA (E-FOIA) amendments changed FOIA by (among other things) extending the time limit that agencies had to respond to FOIA requests and requiring agencies to make reports available to the public by computer telecommunications or other electronic means, including listing their major information systems and a guide for obtaining information and establishing an electronic reading room that includes agency policies, staff manuals, and an index of records released under FOIA requests. NMFS compliance with FOIA is also guided by NOAA Administrative Order 205-14.

National Marine Sanctuaries Act

Under the National Marine Sanctuaries Act (NMSA), the Secretary is authorized to designate discrete areas of the marine environment as National Marine Sanctuaries to protect distinctive natural and cultural resources whose protection and beneficial use require comprehensive planning and management. The National Marine Sanctuary Program is administered by the Sanctuaries and Reserves Division of the National Oceanic and Atmospheric Administration (NOAA).

The mission of the National Marine Sanctuary Program is to identify, designate, and manage areas of the marine environment of special national significance because of their conservation, recreational, ecological, historical, research, educational, or aesthetic qualities. The goals of the program are to provide enhanced resource protection through conservation and management of the sanctuaries that complements existing regulatory authorities; to support, promote, and coordinate scientific research on, and public awareness of, the site-specific marine resources of the sanctuaries; to enhance public awareness, understanding, appreciation, and wise use of the marine environment; and to facilitate, to the extent compatible with the primary objective of resource protection, multiple uses of the national marine sanctuaries.

National Wildlife Refuge System Administration Act of 1966

The National Wildlife Refuge System Administration Act (NWRSAA) of 1966 provides for the administration and management of the national wildlife refuge system, including wildlife refuges, areas for the protection and conservation of fish and wildlife threatened with extinction, wildlife ranges, game ranges, wildlife management areas, and waterfowl production areas.

Executive Order 12866: Regulatory Planning and Review

Executive Order 12866 was signed by the president on September 30, 1993, published October 4, 1993 (58 FR 51735), and replaced E.O. 12291 and E.O. 12498. Its purpose, among other things, is to enhance planning and coordination with respect to new and existing regulations, and to make the regulatory process more accessible and open to the public. In addition, E.O. 12866 requires agencies to take a deliberative, analytical approach to rule making, including assessment of costs and benefits of the intended regulations. For fisheries management purposes, it requires NMFS to prepare (a) a regulatory impact review for regulatory actions and (b) a unified regulatory agenda twice a year that inform the public of the agency's expected regulatory actions.

Executive Order 12898: Environmental Justice

Executive Order 12898, issued in 1994, requires that federal agencies incorporate environmental justice into their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority populations and low-income populations in the United States.

Executive Order 13158: Marine Protected Areas

On May 26, 2000, this executive order, signed by then President Clinton and published on May 31, 2000 (65 FR 34909), directs the Department of Commerce and the Department of the Interior to jointly develop a national system of marine protected areas (MPAs). The purpose of the system is to strengthen the management, protection, and conservation of existing protected areas and establish new or expanded MPAs. The MPA system is to be scientifically based, representing diverse U.S. marine ecosystems and the nation's natural and cultural resources. Establishing such a system is intended to reduce the possibility that MPAs are harmed by federally approved or funded activities.

Executive Orders 13178 and 13196: Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve

On December 4, 2000, then President Clinton issued E.O. 13178 establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, pursuant to the National Marine Sanctuaries Amendments Act of 2000. The executive order was revised and finalized by Executive Order 13196, issued January 18, 2001. The principal purpose of the Coral Reef Ecosystem Reserve is the long-term conservation and protection of the coral reef ecosystem and related marine resources and species of the Northwestern Hawaiian Islands in their natural character.

The seaward boundary of the Coral Reef Ecosystem Reserve is 50 nautical miles from the approximate center geographical positions of Nihoa Island, Necker Island, French Frigate Shoals, Gardner Pinnacles, Maro Reef, Laysan Island, Lisianski Island, Pearl and Hermes Reef, Midway Atoll, and Kure Island. The inland boundary of the Reserve around each of these land areas is the seaward boundary of Hawaii State waters and submerged lands, and the seaward boundary of the Midway Atoll National Wildlife Refuge.

Marine Jurisdictions and Boundaries Issues

This section briefly discusses the complex issues surrounding marine boundary jurisdictions in the Hawaiian Archipelago. Overlaps in boundary jurisdictions and the varying regulatory authorities can create challenges in the management of fisheries. Additional information on the jurisdictions within the marine environment may be found in Appendix G of the Final Environmental Impact Statement—Bottomfish and Seamount Groundfish Fishery of the Western Pacific Region, dated May 2005.

State of Hawaii

The State of Hawaii consists of all islands, together with their appurtenant reefs and territorial waters, which were included in the Territory of Hawaii under the Organic Act of 1900. Under the Admissions Act of 1959, Congress granted to Hawaii the status of statehood and all amenities of a state, which included the reversion of title and ownership of the lands beneath the navigable waters from the mean high-tide line seaward, out to a distance of 3 miles, as stated by the Submerged Lands Act of 1953. Congress excluded Palmyra Atoll Kingman Reef and Johnston Atoll, including Sand Island, from the definition of the State of Hawaii in 1959. The federal government also retained 1,765 acres of emergent land in the NWHI, which had been set aside by E.O. 1019 in 1909, establishing the Hawaiian Islands Reservation (HIR). The HIR was later renamed the Hawaiian Islands National Wildlife Refuge (HINWR). The State of Hawaii claims jurisdiction beyond its territorial seas of 0 to 3 nautical miles by claiming archipelagic status over channel waters between the Main Hawaiian Islands. The federal government does not recognize the State's claim of archipelagic jurisdiction, but interprets the State's seaward authority to stop at 3 nautical miles from the baseline (Feder 1997).

Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve and Proposed Northwestern Hawaiian Islands National Marine Sanctuary

In May 2000, then President Clinton issued a Memorandum to implement a U.S. Coral Reef Task Force recommendation and comprehensively protect the coral reef ecosystem of the NWHI. The memorandum directed the Secretaries of Interior and Commerce, in cooperation with the State of Hawaii, and in consultation with the Council, to develop recommendations for a new, coordinated management regime to increase protection for the NWHI coral reef ecosystem and provide for sustainable use. After considering their recommendations and comments received during the public visioning process on this initiative, then President Clinton issued E.O. 13178 on December 4, 2000, establishing the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve, pursuant to the NMSA. The executive order was revised and finalized by E.O. 13196, issued January 18, 2001. Pursuant to E.O. 13178 and the NMSA, NOAA is initiating the process to designate the reserve as a national marine sanctuary (66 FR 5509, January 19, 2001). Given the ongoing nature of the sanctuary designation process, this Draft SEIS does not address the outcome of that process or possible impacts of the proposed sanctuary on all components of the human environment.

U.S. Fish and Wildlife Refuges

The U.S. Fish and Wildlife Service (USFWS) has been given authority to manage a number of National Wildlife Refuges (NWR) within the Hawaii Archipelago. The USFWS asserts the authority to manage marine resources and all activities, including fishing activities within refuge boundaries pursuant to the National Wildlife Refuge System Administration Act of 1966, as amended by the National Wildlife Refuge System Improvement Act of 1997, and other authorities.

Executive Order 1019 reserved and set apart the islands reefs and atolls from Nihoa to Kure Atoll, excluding Midway, “as a preserve and breeding ground for native birds” to be administered by the Department of Agriculture. The HIR was transferred to the Department of the Interior in 1939 and in 1940 renamed the HINWR through Presidential Proclamation 2466, with control transferred to the USFWS.

Within the HINWR, the USFWS asserts management authority over all marine resources to a depth of 10 fathoms with the exception of Necker Island, where it asserts a 20-fathom boundary. The USFWS acknowledges that all HINWR islands are part of the State of Hawaii, but asserts federal administrative authority over the NWR.

Midway Atoll NWR, established under E.O. 13022 in 1996, is located in the NWHI. The USFWS defines the refuge boundary as approximately 12 miles seaward from the shoreline, although the exact boundary is disputed. The U.S. Navy established a Naval Air Facility at Midway in 1941 and the USFWS established an overlay refuge in 1988 to manage fish and wildlife on the atoll. Through the Base Alignment Closure Act of 1990, as amended, the Naval Air Facility closed in 1993 and the property was transferred to the USFWS in 1996.

References

Feder, J. J. 1997. Memorandum from Judson Feder, NOAA General Counsel, Southwest Region to Kitty Simonds, Executive Director of the Western Pacific Regional Fishery Management Council. October 17, 1997.

APPENDIX 2: SUMMARY OF HAWAII BOTTOMFISH AND SEAMOUNT GROUNDFISH STOCKS (SEPTEMBER 2005)

Summary of Hawaii Bottomfish and Seamount Groundfish Stocks
September 2005

GENERAL BACKGROUND

Bottomfish

- Hawaiian bottomfish are a collection ("complex") of deep slope snappers, groupers, and jacks.
- Fishery features a range of vessel sizes (15-70 feet in length) that fish in deep waters (200-1,200 feet) using vertical handlines (hook and line, not longline or trawls).
- Northwestern Hawaiian Island (NWHI) bottomfish is highly valued in the Hawaii fresh fish market due to larger sizes of fish (for fillets), important for tourism-based restaurants and local cultural holiday activities.
- Fishery has been in operation at various levels since 1913. Currently there are 9 active commercial bottomfish vessels in the NWHI, 325 commercial vessels in the MHI.
- Fishery features minimal finfish by-catch and very few protected resource interactions. The most recent observer placements (2004-2005) did not observe any protected resource interactions. Submersible surveys at two NWHI bottomfishing banks found very little damage that could be associated with fishing activities.
- Imports of snappers and groupers have varied over the years in terms of volume, value, and location. In 2004, using U.S. Customs data, 765,000 pounds ($1,959,000) were imported, most from Tonga (44%), Australia (29%), and New Zealand (18%), compared to a total of 494,600 pounds ($2,177,000) from the Hawaii bottomfish fishery as a whole in 2004.

Bottomfish Stock Status Statistics

	Management Zones			Full
	MHI	Mau	Ho-omalu	Archi-pelago
These are current values in real units.				
2003 CPUE	190	476	488	-
2003 Effort	1628	199	305	-
These are the reference values in real units.				
MSY CPUE	407	470	431	-
MSY Effort	868	208	789	-
These are current values expressed as ratio of the reference values.				
CPUE Ratio	0.47	1.01	1.13	0.82
Effort Ratio	1.88	0.96	0.39	1.13
Full archipelago ratios use weighting factors based on bottomfish habitat in the management zones.				
Weights	0.447	0.124	0.429	-
These are the threshold values for MSST and MFMT.				
MSST (CPUE Ratio)	0.7	0.7	0.7	0.7
MFMT (Effort Ratio)	1	1	1	1

(at CPUE ratios < 0.7, MFMT declines linearly from 1 to 0.)

Definitions:
CPUE = catch per unit effort (pounds per day)
Effort = fishing effort (days)
MSST = minimum stock size threshold, overfished defined as lower than this threshold
MFMT = maximum fishing mortality threshold, overfishing defined as higher than this threshold

Seamount Groundfish

- Seamount groundfish fishery at Hancock Seamounts is distinct from NWHI bottomfish fishery – different species – different locations – different habitat – different gear.
  - A different complex of species (armorhead, alfonsin, and Japanese butterfish)

- Caught with different types of fishing gear (trawls) in deeper waters by distant-water foreign fishing vessels.
- Most of the fishery was in international waters but some fishing was within the U.S. Exclusive Economic Zone (EEZ) at Hancock Seamounts – roughly 150 miles west of Kure Atoll in the far western end of the NWHI.
- Seamount groundfish fishery has been subject to a fishing moratorium since 1986, when the fishery was determined to be over-fished due to over-harvesting by foreign trawlers prior to implementation of the Magnuson-Stevens Fishery Conservation and Management Act (MSFCMA) in 1976.
- No Federal permits were issued to domestic or foreign entities for this fishery.

BOTTOMFISH FISHERY MANAGEMENT

- Managed under the Western Pacific Regional Fishery Management Council's (WPRFMC's) Bottomfish and Seamount Groundfish Fishery Management Plan (FMP). [See http://www.wpcouncil.org/bottomfish.htm]

- 3 bottomfish fishery management zones in Hawaii established to distribute local fishing effort (see Figure 1):
  - All zones include the same multispecies bottomfish stock complex (see Appendix A).

  - **Main Hawaiian Islands (MHI) –** waters surrounding inhabited Hawaiian Islands
    - 80% of MHI fishing grounds are inside State waters. The zone is managed by the State of Hawaii although the WPFMC has made recommendations to the State over time concerning management in the MHI.
    - Unlimited entry; approximately 3,600 vessels are registered with the State of Hawaii to conduct bottomfishing in the MHI. Of these vessels, commercial landings are reported from only 325 vessels. No other licenses or permits are required.
    - Maximum landings occurred in 1988, at 1,166,000 pounds ($3,288,000).
    - Essentially impossible to separate MHI commercial catch into State and Federal portions with the existing data (State of Hawaii catch reports) which record catch in reporting "blocs" which range from 0 to 2 miles, 2 to 20 miles, and 20 miles out.
    - Recreational bottomfish catch data are just now being collected by the cooperative NMFS and State of Hawaii Marine Recreational Fishing Statistics Survey (HMRFSS) intercept creel census program, but few bottomfish fishers have been intercepted by the HMRFSS field staff to date. No estimates have yet been compiled of recreational bottomfish landings in Hawaii.
    - The State of Hawaii and the WPRFMC are also supporting a targeted survey of registered bottomfish fishers to: 1) determine the level of recreational bottomfishing in the MHI; and 2) obtain comments on bottomfish management options for MHI. This survey is on-going.

- **Northwestern Hawaiian Islands (NWHI)**
  - **Mau** zone **–** a small zone at the eastern end of the NWHI encompassing the islands of Nihoa and Necker. The fishery operates on trips lasting up to 2 weeks).
  - Essentially 100% of habitat in Federal waters.
  - Managed under the WPRFMC's Bottomfish and Seamount Groundfish FMP.
  - 4 vessels had permits to fish in the Mau zone when the zone was established in 1988. Maximum number of vessels was 14 in 1990-1991.
  - In 1999, limited entry program established with 7 vessels participating.
  - Currently, a total of 5 vessels can be permitted and 5 are currently permitted.
  - Maximum landings occurred in 1990 (14 active permitted vessels) at 249,000 pounds ($630,000).

- **Hoʻomalu** zone **–** a larger limited entry zone at the center and western end of the NWHI ranging from French Frigate Shoals to Kure Atoll. The fishery is a distant water fishery and fishing activity is limited by weather and the fresh seafood nature of the fishery.
  - Essentially 100% of habitat in Federal waters.
  - Managed under the WPRFMC's Bottomfish and Seamount Groundfish FMP.
  - In 1987, fishery established with limited entry program; 12 vessels participating at that time.
  - Currently, a total of 4 vessels can be permitted and 4 are currently permitted
  - Maximum landings were in 1992 (5 active permitted vessels) at 353,000 pounds ($1,030,760).

- Other management measures include limitations on vessel size, prohibitions on certain gear types, mandatory catch reporting, and mandatory observer coverage in the NWHI.
- Status of the fishery and stocks is assessed annually, and management measures enacted as deemed necessary.

Despite delineation of these three management zones, Hawaiian bottomfish are evaluated under MSFCMA National Standard 1 guidelines as a single archipelagic-wide multispecies stock complex or population. Management criteria, such as whether the stock complex is overfished or whether overfishing is occurring, apply to the stock complex as a whole population rather than to individual management zones.

However, historically and currently bottomfish population status indicators have been compiled for each of the three zones as a guide to local fishery management.

HAWAII BOTTOMFISH STOCK STATUS

<u>Historical Stock Status and Trends</u>

- Fishery status was evaluated based on a species-specific 20% SPR threshold (spawning potential ratio, an index of the reproductive capability of the stock), from 1986-2003. Species-specific SPR values were reported for the archipelago, as well as individual zones, but stock status was determined at the archipelago level. While there are limitations to the SPR approach, it was the best available method for tracking year-to-year changes in the fishery until mid-2003 when the revised National Standard 1 guideline approach was put in place.

- Under the SPR approach:
  - No stocks of bottomfish in the Hawaiian archipelago were overfished. However, in the MHI, *ehu* and *onaga* populations were reported to be locally depleted. This led to a suite of State of Hawaii regulations in 1998, including recreational bag limits and 20 closed areas throughout the MHI.
  - In the NWHI, local depletion was not reported for any species. SPRs were well above 20% for all species.

Based on the SPR measures, the bottomfish stock complex was <u>not</u> overfished in any year from 1986 to 2003.

<u>Current Stock Status</u>

- After mid-2003, under the new MSFCMA National Standard 1 guidelines, "overfishing" and "overfished" definitions were established for the Hawaii bottomfish fishery. Hawaii bottomfish are assessed as a single archipelagic multispecies stock complex for these purposes, however the status of bottomfish in each of the 3 zones continues to be assessed annually to facilitate effective conservation and management decision making.
- National Standard 1 guidelines define:
  - Overfishing -- too much fishing (relative to fishing mortality at maximum sustainable yield (MSY)); we use fishing effort (expressed as days fished) as a proxy for fishing mortality and assess overfishing annually by comparing the current overfishing metric to an established threshold (maximum fishing mortality threshold (MFMT)) for bottomfish.
  - Overfished -- not enough fish (relative to biomass at MSY); we use catch per unit effort (CPUE) expressed as pounds caught per day as a proxy for abundance; overfished status is determined annually by comparing the current overfished metric to an established threshold (minimum stock size threshold (MSST)) for bottomfish.
- Under the National Standard 1 guidelines:
  - The Hawaiian bottomfish stock is **not** overfished (the *biomass* standard); however, overfishing (the *fishing* mortality standard using fishing effort as a proxy) is occurring as reported in the 2003 annual report of the WPRFMC and in the 2004 NOAA Fisheries Status of Stocks report to Congress [http://www.nmfs.noaa.gov/sfa/domes_fish/index.htm].
  - The WPRFMC is currently developing options within its Bottomfish and Seamount Groundfish FMP to address this situation. Under the MSFCMA, the WPRFMC has one year to develop a plan to address this overfishing concern.

In summary:

> **Based on nationally- and legally-accepted definitions, in 2003, overfishing <u>was</u> occurring on the Hawaii bottomfish stock complex on an archipelagic basis but the bottomfish stock complex <u>was not</u> overfished, i.e., sufficient biomass remained. Further, as reported below, this over-fishing situation is reflected by the situation in the MHI, not the NWHI.**

<u>**Projected Stock Status and Trends**</u>

- **Archipelago-wide trends:**
  - The fishing mortality ratio indicator (i.e., fishing effort) for the archipelago has experienced significant fluctuations; since 1998 it has continually declined (see Figure 2).
  - The biomass ratio indicator for the archipelago has manifested a more stable trend with no significant change (see Figure 2).
  - Mean weights for individual fish are declining, which is expected with fishing; however, mean weights in both NWHI zones remain significantly higher than those in the heavily fished MHI. Alternative explanations exist for changes in captured fish size, such as gear configuration, gear competition, size targeting, fishing location, and fishing ability. Anecdotal information from fishermen and submersible observations of size/age related segregation of fish over the fishing grounds tend to confirm that weights are associated with fishing style.
  - Trends in landings of particular species are not used as a measure of abundance or fishery health because landings of one species can change dramatically with species targeting, market incentives, gear competition, or natural changes in the ecosystem. Good examples are the pig-lipped *ulua* (*butaguch,* a jack) and *uku (*a grey snapper*)*, which are targeted at various times of the year in response to seasonal fluctuations in demand.

- Trends in the **MHI** (see Figure 3)
  - CPUE in the MHI is relatively stable over the past decade.
  - Since 1998, reported commercial fishing effort in the MHI zone has declined by 50%; commercial participation also has declined.
  - Because of the overfishing status of the Hawaii bottomfish fishery, the WPRFMC is currently evaluating effort reduction alternatives in the EEZ portion of the MHI.

- Trends in the **Mau Zone** (see Figure 4)
  - CPUE in the Mau zone was relatively stable over the past decade but has been increasing in recent years as participation has dropped.
  - Participation in the Mau zone has declined by approximately 70% from 14 vessels in 1990 to 5 vessels in 2003 as anticipated under the limited entry system.
    - Participation is capped at current participants (however, regulatory changes have been proposed by the WPFMC to enable new Mau zone entrants)
    - Further attrition is anticipated due to current use-or-lose permit policy and the on-going uncertainty in the status of the NWHI fishery under the Executive Order.

- Significant restrictions in or closure of the Mau zone bottomfish fishing grounds are expected to concentrate effort in open areas, possibly causing further depletion in the MHI.

- Trends in the **Ho‘omalu Zone** (see Figure 5)
  - CPUE has declined over time as consistent with a sustainable fisheries population dynamics model.
  - Since 1990, participation has remained fairly constant, while effort has fluctuated and shows no discernible trend.
  - Significant restrictions in or closure of the Ho‘omalu zone bottomfish fishing grounds would be expected to concentrate effort in open areas, possibly causing increased depletion in the MHI.

DATA AND METHODOLOGY

Stock Assessment Data Sources and Data Collection Frequency

- PIFSC scientists conduct bottomfish biological stock assessments annually; these assessments are conducted under “data poor” conditions. Data poor refers to the quantity of data, not quality, and suitable assessment methodologies are available for application under such conditions.
- From 1984 to 1990, NMFS relied on shoreside monitoring at the Honolulu auction to estimate catch per trip and to track fishing effort (number of trips).
- Currently, PIFSC uses two sets of State of Hawaii commercial fishery-dependent catch data:
  - Fishing “bloc” data compiled per vessel per day for the MHI
  - Logbook data for the NWHI (available since 1991)
- From1984-1990 PIFSC utilized shoreside monitoring to compile size composition and other biological and economic information from the NWHI; recently electronic data reporting through Honolulu seafood dealers has come on-line and is available for this purpose.
- The results of the stock assessments are presented to the WPRFMC’s Bottomfish and Seamount Groundfish plan team for review and compiled in an annual report by the WPRFMC (see http://www.wpcouncil.org/bottomfish.htm #AnnualReports)
- The most current annual report is for the data year 2003. Data for 2004 are currently being compiled and evaluated.

Data and Methodology Uncertainties, Gaps, Needs

- To date, NWHI CPUEs have been reported in terms of catch per day and have not been standardized by vessel fishing power
  - NWHI fleets are extremely small (5 vessels in the Mau zone and 4 vessels in the Ho‘omalu zone). Entry or departure of one or more vessels can greatly influence the overall fishing performance of the fleet, the resultant CPUE, and as a result, estimates of biomass based on those CPUEs.
  - As a result, current CPUEs in this very small and very specialized handline fishery may be related more to fishing ability or skill, rather than fish abundance; careful standardization of commercial catch data is necessary prior to interpretation

- CPUE data at the line-hour level (optimal) for each NWHI vessel can be generated from 1997 to the present from new State of Hawaii logbook
- PIFSC staffers have developed algorithms to incorporate this improved data and will have results by November 2005 to use these new measures in calculating National Standard 1 reference points

• In January 2004, a Bottomfish Stock Assessment Workshop was held in Honolulu co-sponsored by the WPFMC and PIFSC, bringing together an ***independent scientific panel*** of stock assessment experts
  - The objective of the workshop was to evaluate the existing bottomfish data and stock assessment techniques and make recommendations for future assessments
  - Some of the recommendations included:
    - Collect biological data such as length, weight, sex, maturity, and age for key species in order to update important life history parameters
    - Implement a tagging program to determine the extent of movements
    - Initiate a routine fishery-independent survey to provide unbiased estimates of abundance (biomass)
    - Apply several stock assessment models to the data
    - If feasible, create an operational model of the fishery
    - Assess the extent of spatial structuring in Hawaiian bottomfish populations and incorporate this complexity in future assessment and management models

  - The results from this workshop are in the midst of being implemented with the assistance of independent academic stock assessment experts under contract to PIFSC who will: 1) evaluate existing bottomfish data collection programs and if necessary provide recommendations to enhance these programs; and 2) advance population modeling and stock assessment methodologies through the incorporation of spatial structure and ecosystem principles

• In the future, PIFSC will be conducting a three-stage peer-reviewed process to development of significant stock assessments: 1) a detailed review and "certification" of the available data; 2) evaluation and testing of the stock assessment models and assumptions; and 3) review of stock status and implications. This will require more formality in the stock assessment process, and as a result, lengthier time-frames until the new procedures are routinized.

-- Compiled by PIFSC fishery biology staff, September 2005, from public information sources

Glossary:

CPUE – Catch per unit effort, an index of fishing performance often utilized as a measure of fish abundance, after careful standardization.

EEZ -- Exclusive economic zone, generally the region 3 to 200 miles offshore.

FMP – federal Fishery Management Plan.

HMRFSS – Hawaii Marine Recreational Fishing Statistics Survey.

MHI – Main Hawaiian Islands, the inhabited islands in the lower portion of the Hawaiian Archipelago (Middle Bank, Niihau, Kauai, Oahu, Molokai, Kahoolawe, Maui, Lanai, Hawaii).

MFMT – Maximum fishing mortality threshold, a reference point for overfishing status in the NMFS National Standard 1 guidelines, values higher than this threshold are overfishing by definition.

MSFCMA – Magnuson Stevens Fishery Conservation and Management Act (1976 as subsequently amended).

MSST – Minimum stock size threshold, a reference point for overfished status in the NMFS National Standard 1 guidelines, values lower than this are overfished by definition.

MSY – Maximum sustainable yield, a reference point in fisheries describing a degree of resource utilization which allows maximum removal while ensuring long term sustainability.

NWHI – Northwestern Hawaiian Islands, the portion of the Hawaiian Archipelago stretching from Nihoa to Hancock Seamount.

PIFSC – NOAA Fisheries Pacific Islands Fisheries Science Center

SPR – Spawning potential ratio, a stock assessment index related to the reproductive health of a stock, no longer utilized by NMFS as a measure of “overfished” status, but remains an important stock indicator and remains in the Control Rule as a second (species specific) layer.

WPRFMC – Western Pacific Regional Fishery Management Council, the policy-making organization for the management of fisheries in the EEZ around the Territory of American Samoa, Territory of Guam, State of Hawaii, the Commonwealth of the Northern Mariana Islands, and US Pacific island possessions.

Convenient information sources

Pacific Islands Fisheries Science Center

http://www.pifsc.noaa.gov/

NOAA Fisheries Office of Sustainable Fisheries

http://www.nmfs.noaa.gov/sfa/domes_fish/index.htm

Western Pacific Fishery Management Council

http://www.wpcouncil.org/

Figure 1. Map of Hawaiian Archipelago showing location of bottomfish management zones.

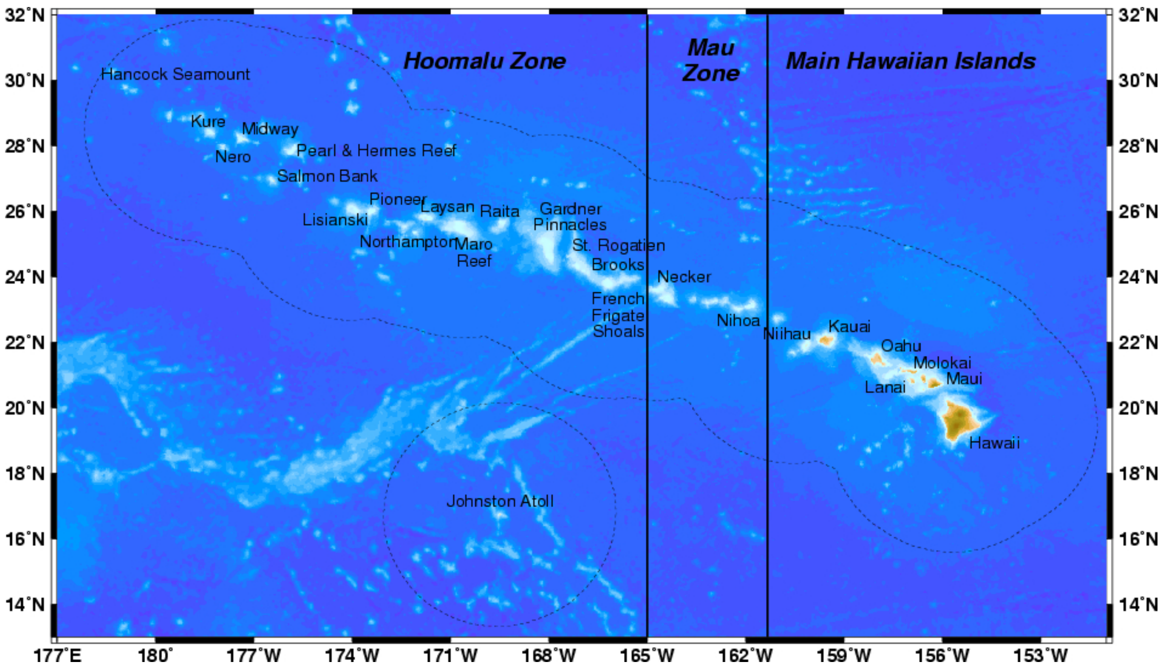


Figure 2. Hawaii bottomfish effort and biomass ratios (archipelago-wide, including all management zones).

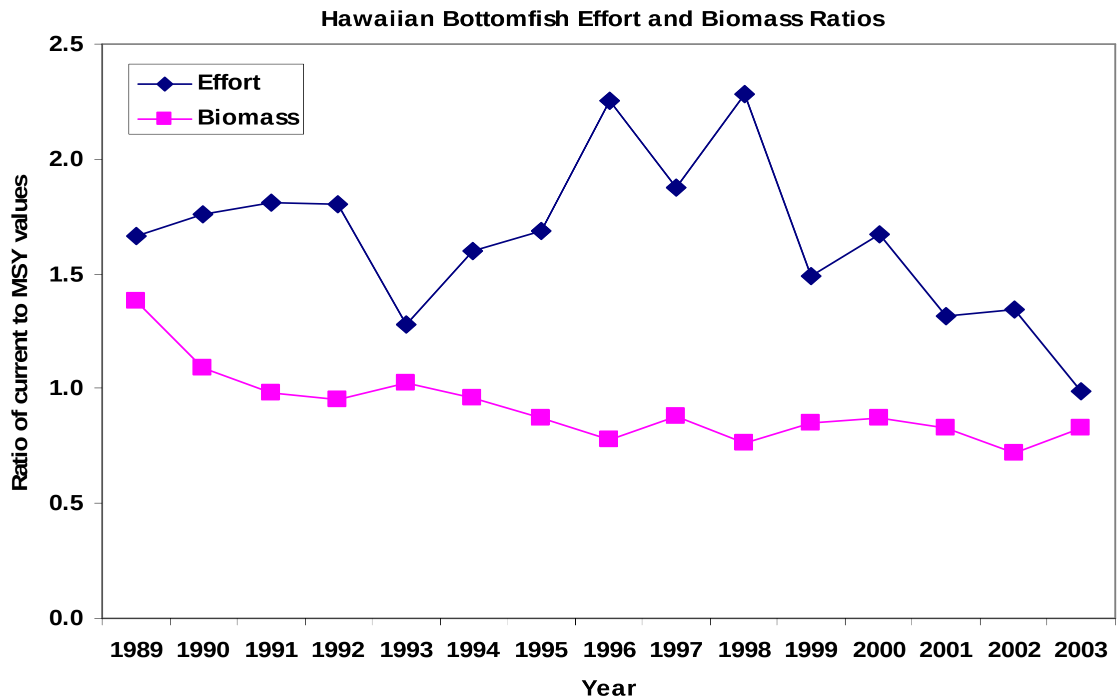


Figure 3. MHI zone fishery time series [nominal data]

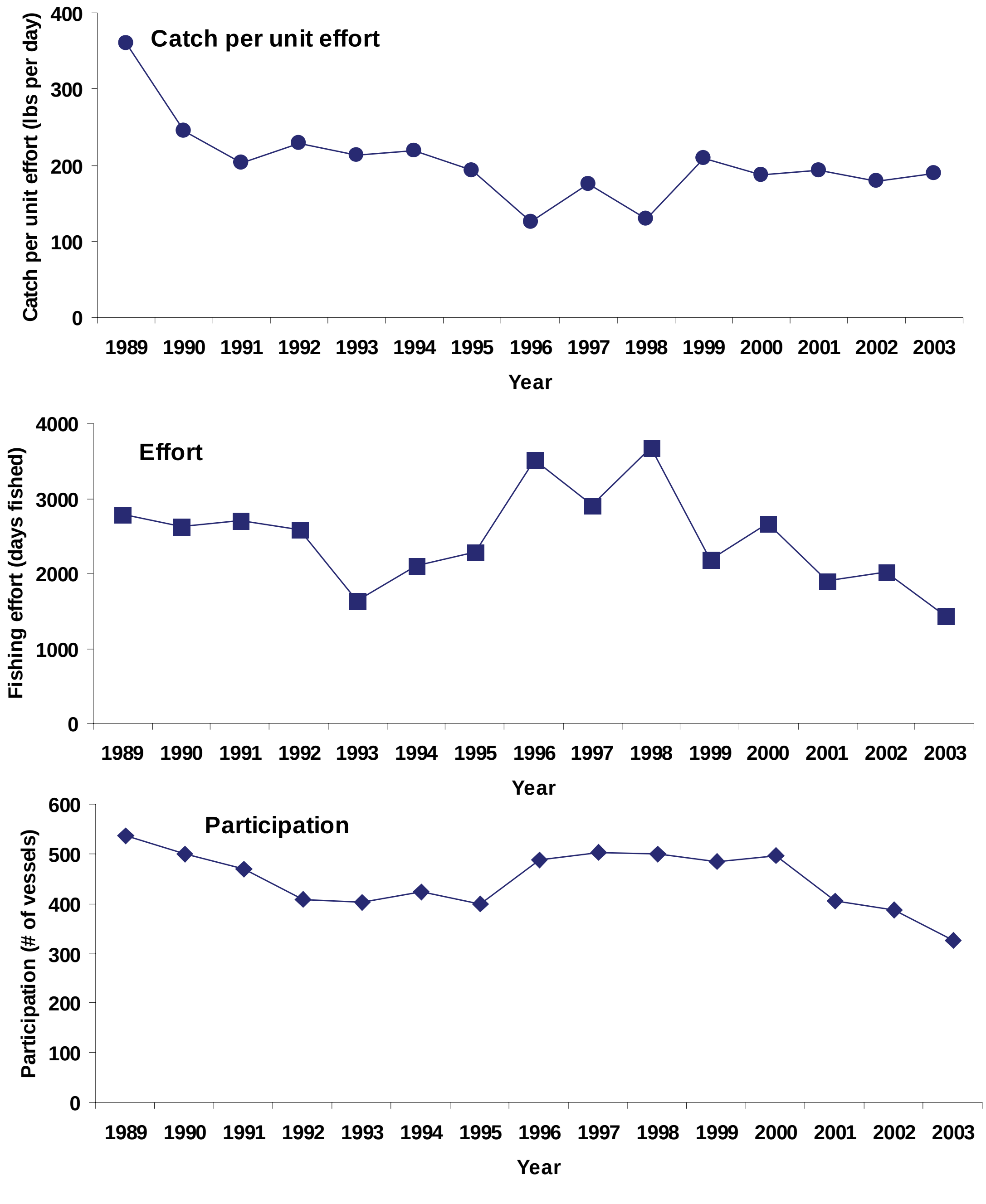


Figure 4. Mau zone fishery time series [nominal data]

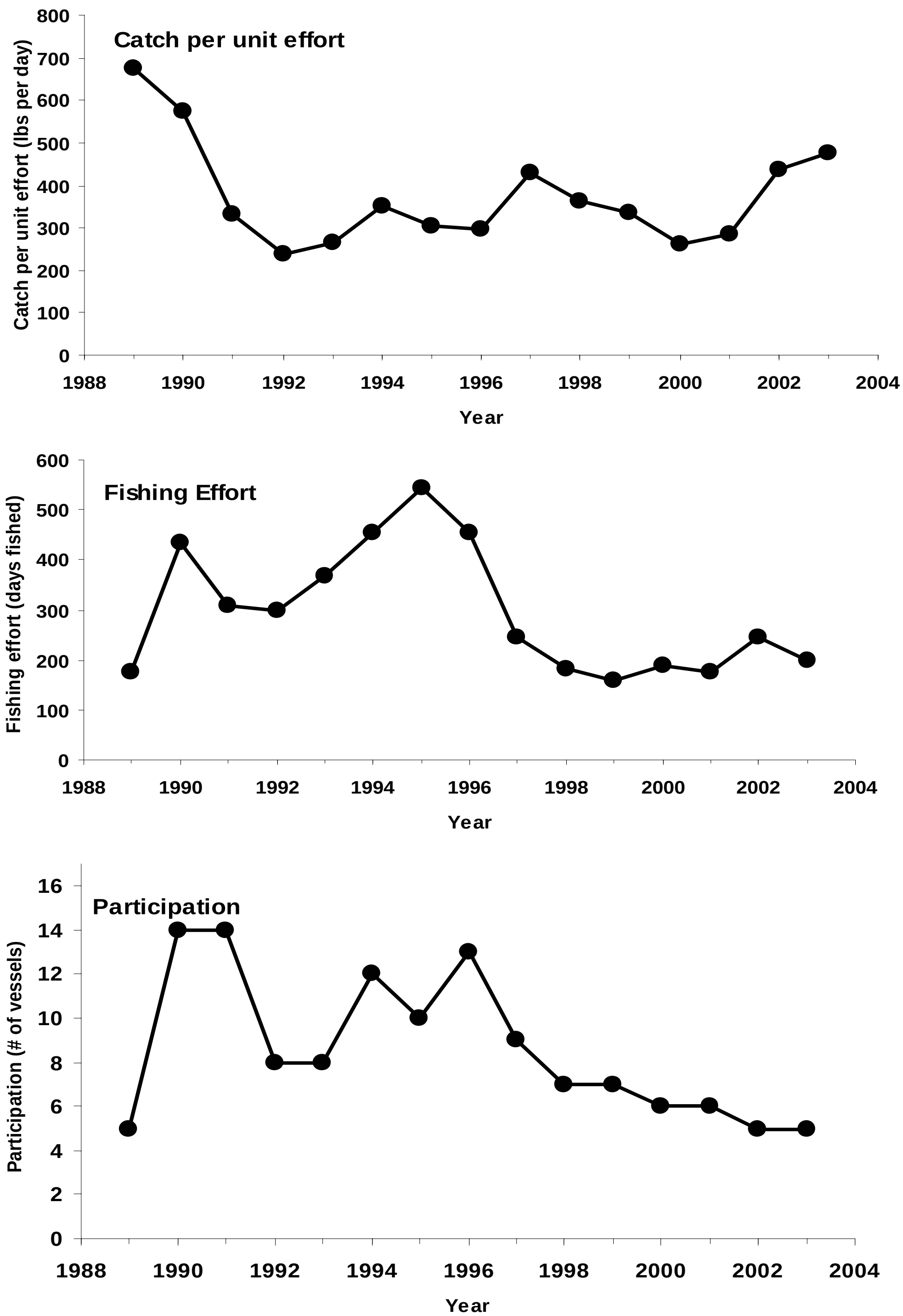
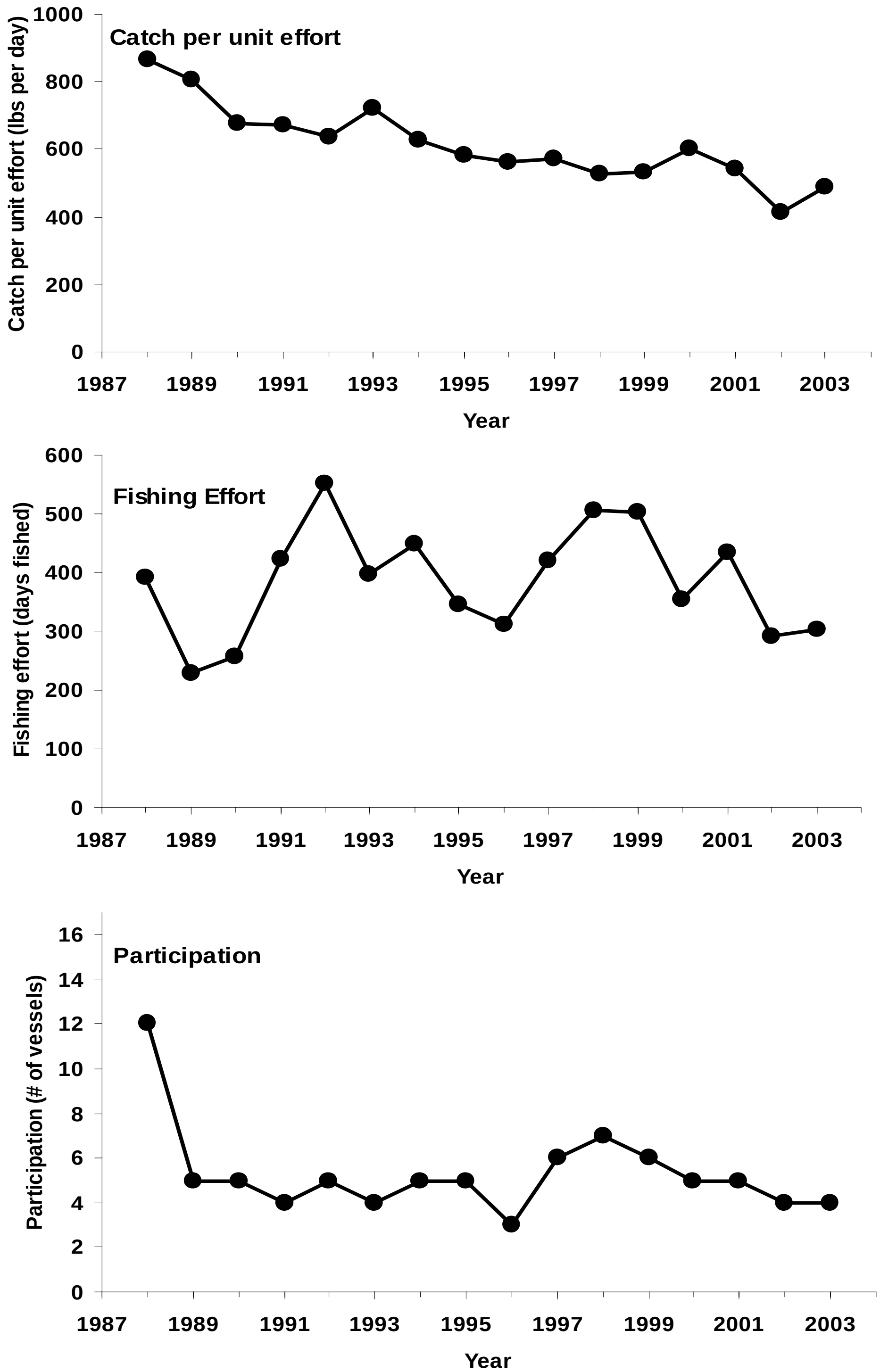


Figure 5. Hoʻomalu zone fishery time series [nominal data]

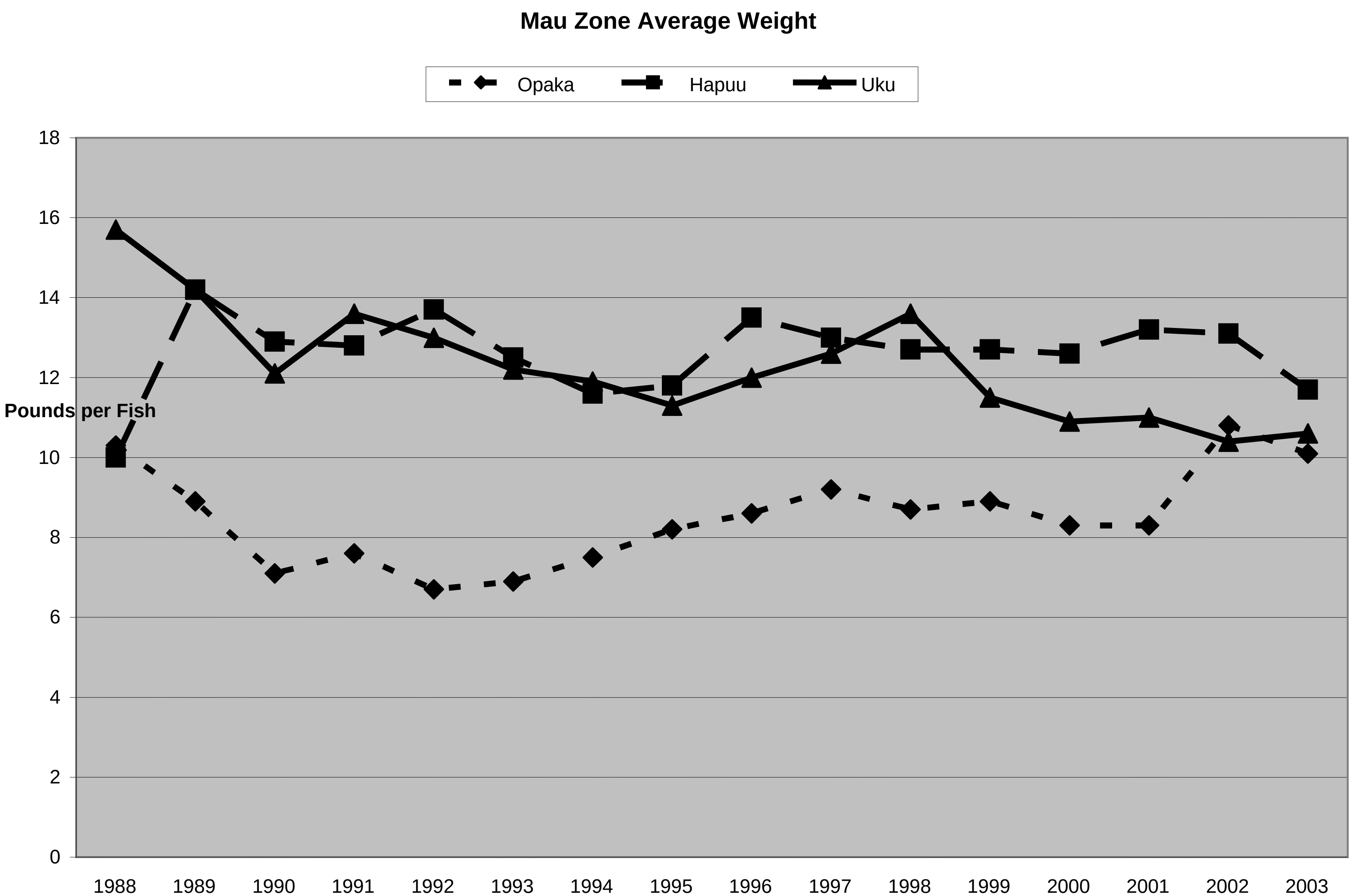


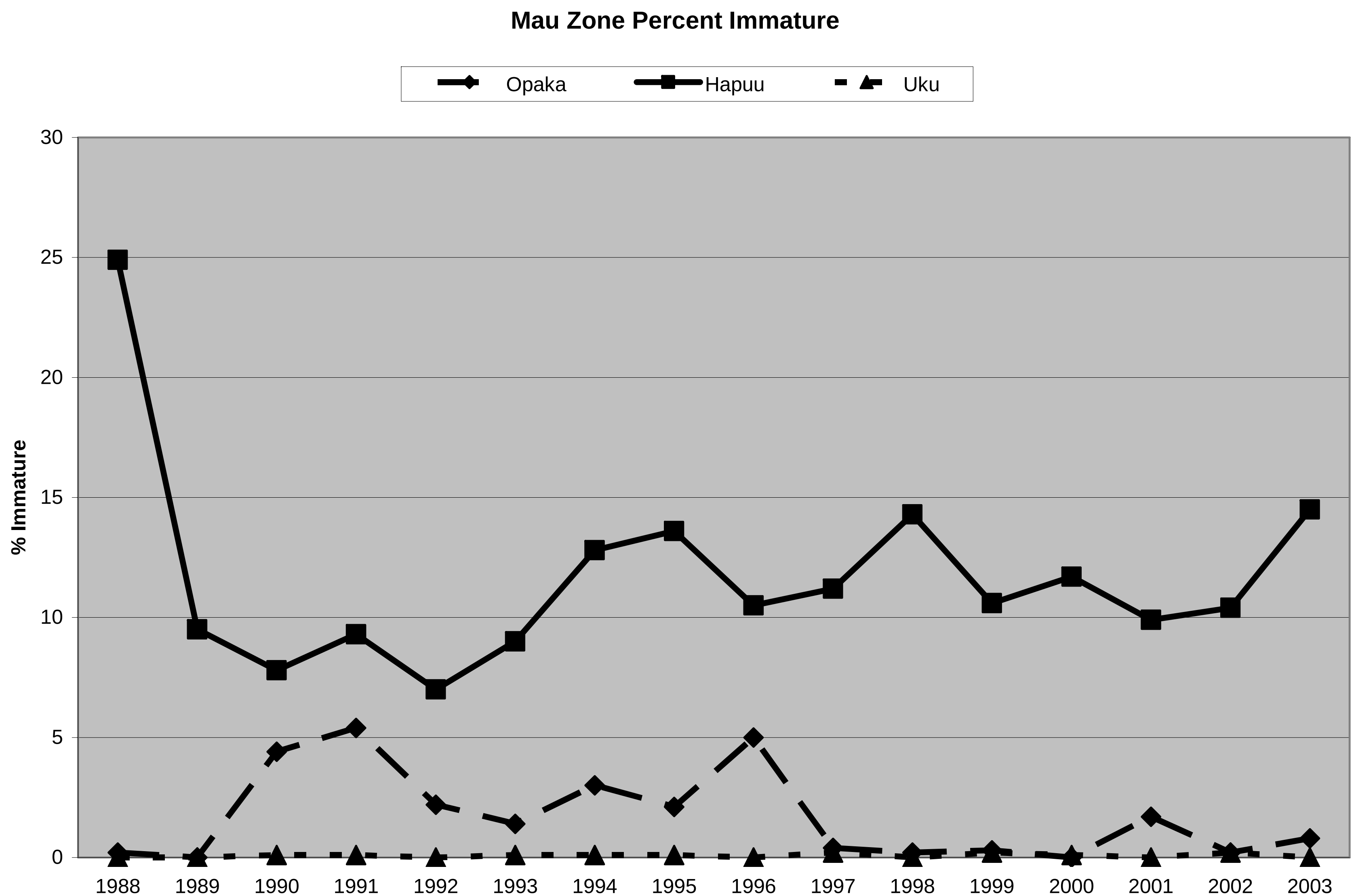
Appendix A: Hawaii Bottomfish and Seamount Groundfish Species

Scientific	English Common	Hawaii Common
Bottomfish:		
Aphareus rutilans	red snapper/silvermouth	lehi
Aprion virescens	gray snapper/jobfish	uku
Caranx ignobilis	giant trevally/jack	white ulua/pau'u
C. lugubris	black trevally/jack	black ulua
Epinephelus fasciatus	blacktip gouper	
E. quernus	sea bass	hapu'upuu
Etelis carbunculus	red snapper	ehu
E. coruscans	red snapper	onaga
Lethrinus amboinensis	ambon emperor	
L. rubrioperculatus	redgill emperor	
Lutjanus kasmira	blueline snapper	ta'ape
Pristipomoides auricilla	yellowtail snapper	yellowtail kalekale
P. filamentosus	pink snapper	opakapaka
P. flavipinnis	yelloweye snapper	yelloweye opakapaka
P. seiboldi	pink snapper	kalekale
P. zonatus	snapper	gindai
Pseudocaranx dentex	thicklip trevally	butaguchi/pig ulua
Seriola dumerili	amberjack	kahala
Variola louti	lunartail grouper	
Seamount Groundfish:		
Beryx splendens	alfonsin	kinmedai (Japanese)
Hyperoglyphe japonica	ratfish/butterfish	medai (Jap.)
Pseudopentaceros richardsoni	armorhead	kusakari tsubodai (Jap.)

Representative Summary Statistics from the NWHI Mau Zone

2 figures attached based on data from the WPFMC annual reports


Mau Zone Average Weight
Opaka
Hapuu
Uku
Pounds per Fish
0
2
4
6
8
10
12
14
16
18
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003


Mau Zone Percent Immature
Opaka
Hapuu
Uku
% Immature
30
25
20
15
10
5
0
1988
1989
1990
1991
1992
1993
1994
1995
1996
1997
1998
1999
2000
2001
2002
2003

APPENDIX 3: HDAR’S ESTIMATED REDUCTIONS IN EFFORT AND LANDINGS FROM THE PROPOSED BRFAS

Appendix 3
Estimated Reduction from Present Day Fishing
Effort and Catch in the Bottomfish Fishery with Alterative 2b.

Provided by the Division of Aquatic Resources, State of Hawaii

Background

In 1998, the Department of Land & Natural Resources', Division of Aquatic Resources (DLNR/DAR) implemented the State of Hawaii's Bottomfish Restricted Fishing Areas (BRFAs), which were designed to conserve marine resources and habitat. The DLNR/DAR has proposed changes in the BRFAs, which are based on an evaluation of landings data, interviews with fishers and completed surveys and mapping of bottomfish depth range and habitat throughout the Main Hawaiian Islands (MHI). As proposed by the state, Alternative 2b would create12 new BRFAs (Appendix Figures 3-1, 3-2, and 3-3). Additionally, current closed areas outside of the proposed 12 BRFAs would be reopened. The evaluation of these proposed BRFAs show that they should reduce the mortality on bottomfish in the MHI by at least 15 percent from 2004 levels.

Rationale

Bottomfish habitat depth range has been defined as the "Essential Fish Habitat" definition provided by NOAA Fisheries (Essential Fish Habitat is within 100 and 400 meters). Since catch (and effort) should be reduced from current levels, and reporting compliance is often delayed, the most complete recent calendar year's commercial data were used (2004). The measure of fishing effort used was the number of licensee-area-trips, based on license number; area fished, and trip end-date. Because multiple records exist for each fisher, area and species these values were computed and summed separately for each area and for the MHI as a whole.

Appendix Table 3-1 shows the resulting estimated total numbers of trips and lbs caught for the seven key species targeted in State and Federal Management Plans. The estimated reduction in fishing effort is 15.11% and there should be a 17.10% reduction in catch. The commercial values are shown, but it should be noted that an equivalent reduction in non-commercial catch is expected.

Appendix Table 3-1, column A shows the amount of catch and effort estimated to be restricted due to the proposed BRFAs (estimated by applying the percentage of EFH to 2004 catch and effort in corresponding commercial fish catch areas).

Appendix Table 3-1, column B shows the portion of current catch and effort estimated to open up, because some areas currently closed in BRFAs would open up (estimated catch/effort in portions of current BRFAs that fall outside proposed areas).

Appendix Table 3-1, column C shows the net change estimated from current levels, which is calculated by subtracting column B from column A.

Appendix Table 3-1: Estimated Change in Catch and Effort						
	A		B		C	
	Estimated Reduction in Catch/Effort due to Closure of Proposed BRFAs		Estimated Increase in Catch/Effort due to Opening of Non-overlapping Portions of Current BRFAs		Estimated Net Change in Catch/Effort from 2004 Levels	
	Trips	Lbs.	Trips	Lbs.	Trips	Lbs.
Closed Areas	697	58,939	286	17,304	411	41,634
% of Total	25.65%	24.21%	10.54%	7.11%	15.11%	17.10%
Other MHI	2,021	184,498			2,307	201,803
% of Total	74.35%	75.79%			84.89%	82.90%
Total MHI (100%)	2,718	243,437			2,718	243,437

There were several assumptions used in estimating the reduction from present day fishing effort in the bottomfish fishery with Alternative 2b.

Assumption 1 - Commercial Data Represents Non-Commercial Catch & Effort: Since only commercial fishers report their catch, complete non-commercial data are not available. Change in fishing effort for non-commercial fishers is assumed to be proportional to the amount of change estimated for commercial fishers.

Justification(s): Fish distribution is strongly tied to depth and habitat. Since the BRFAs restrict access to the fishing grounds equally to both groups, closed areas should apply equally to all fishers. Although there are slight differences in areas targeted by highline commercial fishers, highliners represent a small percentage of commercial fishers. The vast majority of commercial fishers are small-vessel “weekend warriors” who fish similarly to non-commercial fishers, so average commercial catch and effort should resemble non-commercial catch and effort for the most part.

Assumption 2 - Decreases in Fish Catch and Effort will be Proportional to the Change in Essential Fish Habitat Contained in Current vs Proposed BRFAs:

Justification(s): Because of the experience of fishers, and the link between fish distribution and habitat, bottomfishing in each commercial fishing area does not occur everywhere but is focused in the areas where appropriate depth ranges are found. Not all fishers have the experience to know the specific locations of pinnacles, cliffs, etc. identified by DLNR/DAR as Potentially Important Habitat Areas (PIHA, see DLNR/DAR website), but fishing by both commercial and non-commercial fishers can be expected to target the appropriate depth range.

Assumption 3 - Change will be Proportional to Changes in Essential Fish Habitat Enclosed by Current vs Proposed BRFAs, with adjustments for "good habitat" targeting and catch reporting idiosyncrasies

Justification(s): Appendix Figures 3-1, 3-2, and 3-3 shows the commercial fish catch reporting areas and their overlap with existing BRFAs versus recommended BRFAs. The figures also show the distribution of EFH. Based on this information, Appendix Table 3-2 shows the fish catch reporting areas that include all or part of each BRFA and their corresponding proportion (percent) of the EFH in that grid. These percentages were applied to the reported commercial catch and effort estimated to take place within each BRFA. EFH percentages were adjusted somewhat in some commercial fish catch areas, based on information obtained from interviews with fishers regarding the amount of time focused on particular regions (such as "the fingers" of Penguin Bank) and their tendency to "lump" catch from areas (such as Penguin Bank, Ka'ula Rock and some of the pinnacles) into a single commercial fish catch area (not split it with geographic specificity, relying on maps provided by DLNR's Division of Aquatic Resources).

Assumption 4 - Total MHI Trips Equal Sum of Area-Trips

Justification(s): These results are based on using total Area-Trips and reported pounds caught as the 100 percent value for both areas and the MHI during 2004. Area-specific catch and effort were computed for existing and proposed BRFAs and added for the whole MHI. While total catch is not in question, total trips may be somewhat overestimated to the extent there is same-trip overlap between nearby areas. This important of this difference was minimal (5 to 10 percent). It should be noted that including the overlap increases the total MHI effort estimate, which decreases the overall proportion of effort attributable to any given area. Thus, any differences between MHI trips and area-specific trips would tend to increase DLNR/DAR's estimate of overall effort reduction (a smaller total number of trips would apply), making the resulting effort reduction a conservative estimate.

Assumption 5 - Catch & Effort Added Back in Where Current and Proposed BRFAs Overlap in proportion to Enclosed EFH

Justification(s): The proportion of estimated catch and effort for existing BRFAs was added back in to the current effort estimate (as shown in Table 1). This increase was based on the percentage of the current BRFA and corresponding EFH that overlapped with the proposed new BRFAs.

Additional Considerations

Enforcement

In order for area closures to be effective, it is important to have effective enforcement. Problems with the current level of enforcement have been noted and were an incentive to place the proposed BRFAs closer to shore, to the extent possible, and design them with straight-line boundaries, making it easier for both fishers and enforcement officers to determine whether fishing takes place inside or outside the closed areas. An additional component of compliance that DAR can control directly is to develop an education effort (appropriate signage, brochures, publicity, etc.) to inform fishers of the revised BRFAs and how to report a violation.

In addition, DAR is committed to working closely with DLNR's Division of Conservation and Resources Enforcement (DOCARE) and appropriate federal enforcement agencies to: (1) encourage cooperation in monitoring compliance to improve the likelihood that violations will be detected; (2) to stated the rule in the most concise and unambiguous legal language possible so that detected violations can be prosecuted; (3) testify in legal proceedings to assist in prosecuting violators; and (4) if necessary, encourage a raise in the penalty schedule for violations to serve as an adequate deterrent to potential violators.

Monitoring

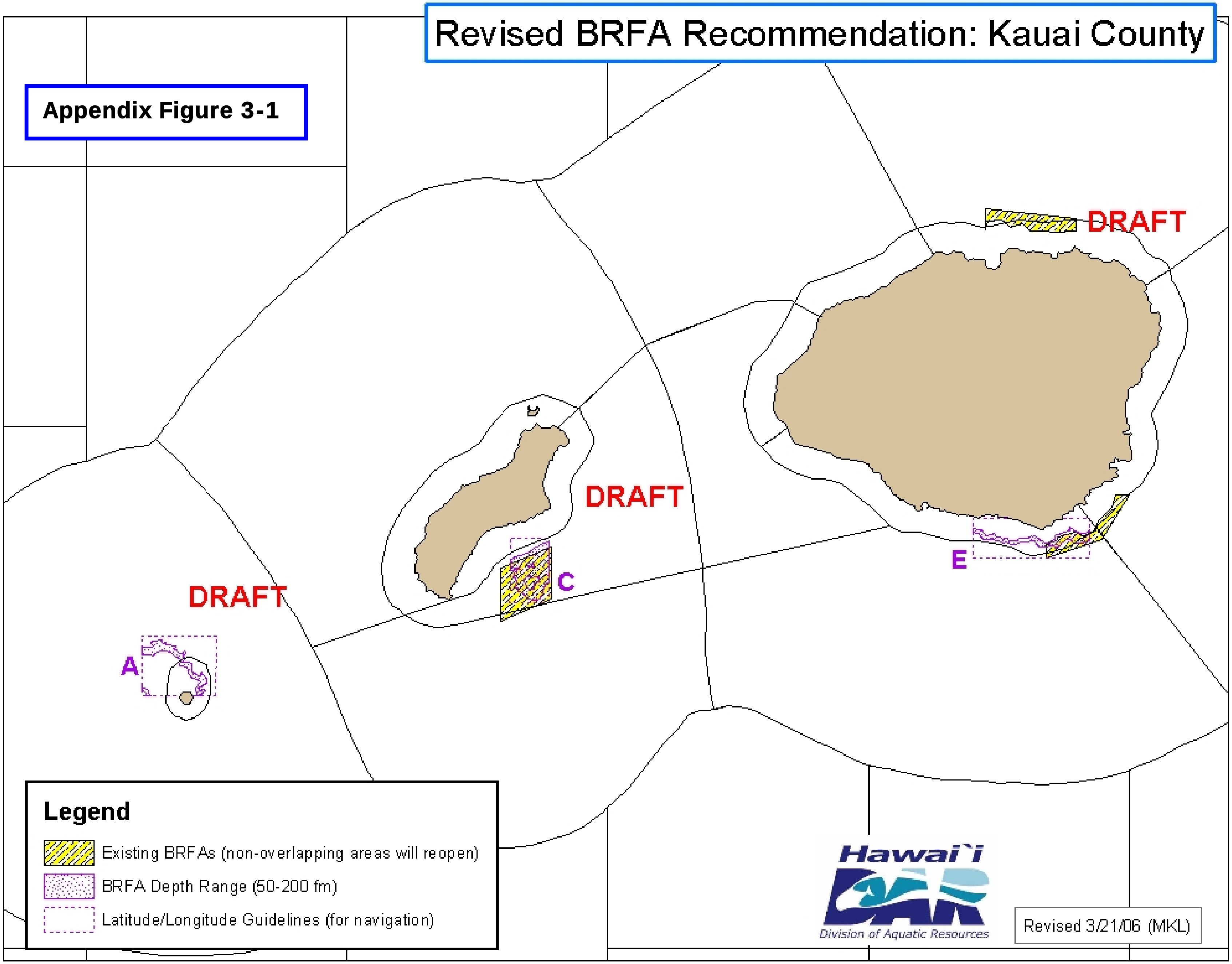
Although specific details of a monitoring program remain to be determined, DAR is committed to developing and implementing monitoring methodology that will allow us to determine how fishing mortality, biomass and size distribution are affected by the BRFAs. This monitoring will include both fishery-dependent and fishery-independent components.

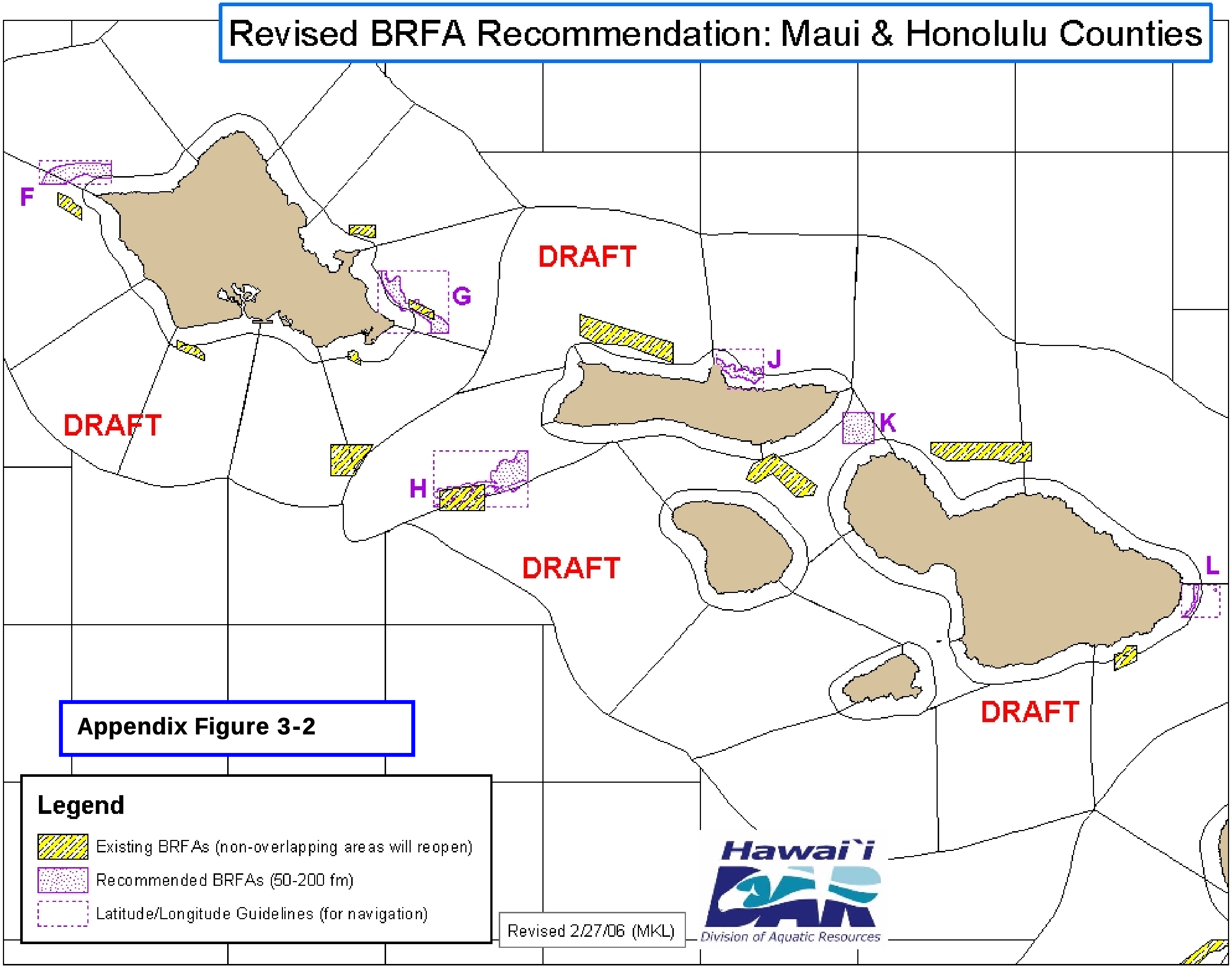
The main source of fishery data will be the existing commercial fish catch data, used to complete the evaluation included in this report. The Hawaii Marine Recreational Fishing Survey provides an additional means to monitor non-commercial catch and effort. This program has expanded to include regular fishing surveys on Oahu, Maui, Molokai, Hawaii and Kauai. An effort will also be made to sub-sample registered non-commercial bottomfish permit holders to evaluate their fishing activity, catch and effort. The intent of all this work will be to compile and monitor the range of catch and effort to ensure the bottomfish fishery can move away from the over-fishing condition.

Regarding fishery-independent monitoring, new technology allows DAR to monitor a grid of stations within appropriate habitats throughout the main Hawaiian Islands, using baited and unbaited video cameras to directly assess species and size-distribution at selected. DAR is committed to continue this work in collaboration with the University of Hawaii. Some catch sampling will be needed within closed areas. Consideration is being given to developing a monitoring effort that will incorporate cooperating fishers as component of a limited sampling program to check periodically changes in size distribution and CPUE within the BRFAs.

Appendix TABLE 3-2: Current/Recommended BRFAs, Commercial Fish Catch Areas & Estimated Percent of Reported Fish Catch/Effort								
BRFA	**Commercial Fish Catch Areas**				**Percentage (%) of Reported Catch/Effort**			
	1	**2**	**3**	**4**	**1**	**2**	**3**	**4**
1	505	525			50	100		
A	508	528			90	100		
C	505	525			50	50		
2	503	523			50	40		
3	500	504	520	524	33	25	0	0
E	500	520			45	100		
F	404	423	424		13	60	23	
4	423				30			
5	407	427			20	35		
6	428				25			
G	408	428			95	95		
7	409	429			25	10		
8	401	421			80	20		
9	420	429	331		15	10	10	
10	328	331			10	20		
H	331	328			60	40		
11	312	332			0	40		
J	313	333			45	20		
12	314	321			10	20		
K	301	314	321	322	10	10	20	10
13	322	323			33	10		
L	304	324			33	100		
14	304	324			15	10		
M	103	123			70	80		
16	122				25			
17	105	124	125		10	5	25	
N	106	126			50	100		
18	106	126			10	100		
O	108	128			33	100		
19	100	120			45	100		
20	101	121			50	0		

Appendix Table 3-3: Estimated Reduction in Bottomfish Catch and effort by County for Proposed BRFAs						
County or Bank	**BRFAs Included**		**Amount of Reduction**			
			CATCH		**EFFORT**	
	Current	**Proposed**	**Lbs.**	**%**	**Trips**	**%**
Kauai	1, 2, 3	A, C, E	7,937	3.26%	31	1.12 %
Honolulu	4, 5, 6, 7, 8	F, G	7,457	3.06	87	3.21
Penguin Bank	9, 10	H	18,522	7.61	177	6.49
Maui	11, 12, 13, 14	J, K, L	6,051	2.49	102	3.74
Hawaii	16, 17, 18, 19, 20	M, N, O	1,667	0.68%	15	0.55%
SUBTOTALS						
Closed Areas Lbs/Trips			**41,634**	**17.10%**	**411**	**15.11%**
Other MHI Lbs/Trips			**201,803**	**82.90%**	**2,307**	**84.89%**
TOTALS Lbs/Trips			**243,437**		**2,718**	
* Values for trips and landings represent the compiled “Estimated Net Change in Catch/Effort from 2004 Levels”, corresponding to column “C” from Table 2, for BRFAs listed within each county						


Revised BRFA Recommendation: Kauai County
Appendix Figure 3-1
DRAFT
DRAFT
DRAFT
A
C
E
Legend
Existing BRFAs (non-overlapping areas will reopen)
BRFA Depth Range (50-200 fm)
Latitude/Longitude Guidelines (for navigation)
Hawai`i
DAR
Division of Aquatic Resources
Revised 3/21/06 (MKL)


Revised BRFA Recommendation: Maui & Honolulu Counties
F
G
H
J
K
L
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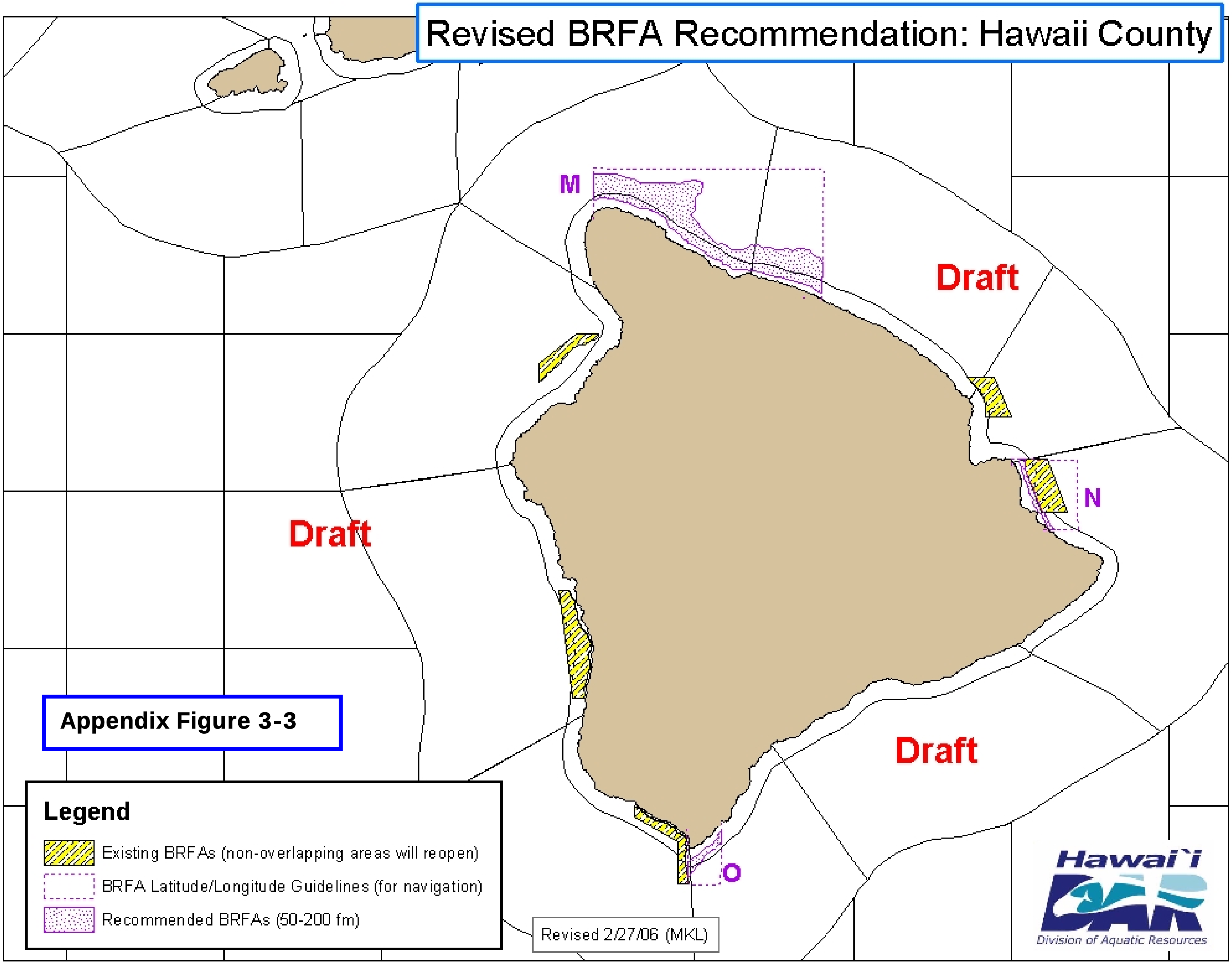
Appendix Figure 3-2
Legend
Existing BRFAs (non-overlapping areas will reopen)
Recommended BRFAs (50-200 fm)
Latitude/Longitude Guidelines (for navigation)
Revised 2/27/06 (MKL)
Hawai`i
Division of Aquatic Resources


Revised BRFA Recommendation: Hawaii County
M
N
O
Draft
Draft
Draft
Appendix Figure 3-3
Legend
Existing BRFAs (non-overlapping areas will reopen)
BRFA Latitude/Longitude Guidelines (for navigation)
Recommended BRFAs (50-200 fm)
Revised 2/27/06 (MKL)
Hawai`i
Division of Aquatic Resources