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March 18, 2008

MEMORANDUM FOR: Alvin Katekaru
Assistant Regional Administrator
Sustainable Fisheries Division

FROM: Chris Yates
Assistant Regional Administrator
Protected Resources Division

SUBJECT: Transmittal of final Biological Opinion under section 7 of the Endangered Species Act on the effects of implementation of new bottomfishing regulations in Federal waters of the Main Hawaiian Islands (Amendment 14) on listed marine species

Attached to this memorandcum is NMFS' final Biological Opinion (Opinion) under section 7 of the Endangered Species Act (ESA) on the effects of implementation of Amendment 14 to the Fishery Management Plan for the Bottomfish and Seamount Fisheries of the Western Pacific Region on ESA-listed marine species. The Opinion responds to your February 7th, 2008, request for consultation on the proposed action and accompanying Biological Assessment. Amendment 14 is a management response to end overfishing of deepwater bottomfish in the Main Hawaiian Islands (MHI). The proposed action covered by the Opinion is the Federal component of Amendment 14, thus the action area considered in the Opinion is limited to Federal waters of the MHI. Several measures are proposed in order to reduce deepwater bottomfish mortality in the MHI by 24 percent starting in 2008.

Listed species that may be found in the action area include blue (*Balaenoptera musculus*), fin (*Balaenoptera physalus)*, humpback (*Megaptera novaeangliae*), Northern right (*Eubalaena glacialis*), sei (*Balaenoptera borealis*), and sperm (*Physeter macrocephalus*) whales, as well as green (*Chelonia mydas*), loggerhead (*Caretta caretta*), olive ridley (*Lepidochelys olivacea*), hawksbill (*Eretmochelys imbricata*), and leatherback (*Dermocheyls coriacea*) sea turtles, and Hawaiian monk seals (*Monachus schauinslandi*). The Opinion concludes that the proposed action is not likely to jeopardize any of the ESA-listed marine species that may be found in the action area. Furthermore, the Opinion finds that 11 of the 12 listed species (all but the green sea turtle) found in the action area are not likely to be adversely affected by the proposed action.

The Hawaiian monk seal is not likely to be adversely affected by the proposed action because:

- None of the 44 hookings of monk seals observed and reported in the MHI in the past approximately 20 years have been confirmed as originating from the bottomfish fishery;
- During 6 years of the bottomfishing observer program (1990-93, 2003-2005) covering fishing trips in the Northwestern Hawaiian Islands (NWHI), no seal hookings were observed, despite the much greater abundance of seals in the NWHI than the MHI;
- The proposed action is limited to MHI Federal waters, and a tagging study of seals in the MHI showed that seals forage about three-fold more often in State than Federal waters;

- The proposed action will significantly reduce fishing effort in the bottomfish fishery;
- The likelihood of any seal hooking due to the proposed action is so low (1 hooking every 6.5 years, 1 hooking resulting in mortality or serious injury every 67 years) as to be considered discountable.
- Although seals feed on deepwater bottomfish, indirect competition with the proposed action is unlikely because seals feed on a great variety of fish and invertebrate species, and are thus able to readily switch from one prey species to another.

The green sea turtle is likely to be adversely affected, but not likely to be jeopardized, by the proposed action because:

- While the proposed action is limited to MHI Federal waters, and green sea turtles are primarily found in MHI State waters, the transit of bottomfishing vessels through State waters to and from Federal waters is an interrelated and interdependent action, the effects of which must be considered in the Opinion;
- The proposed action will result in thousands of commercial and non-commercial bottomfishing trips per year transiting State waters to and from Federal waters;
- Green sea turtles are frequently killed by vessel collisions around the MHI;
- The proposed action is estimated to be likely to kill two green sea turtles per year due to vessel collisions in State (vessels transiting to and from Federal waters) and Federal waters;
- The resulting mortality of green sea turtles is not likely to jeopardize the species because green sea turtles have rapidly increased in numbers in recent years while bottomfishing was occurring at a higher level of effort, and they are extremely unlikely to be hooked or entangled by bottomfishing gear.

An Incidental Take Statement (ITS) for green sea turtles is included in the Opinion. This concludes formal section 7 consultation on the effects of implementation of new bottomfishing regulations in MHI Federal waters (Amendment 14) on listed marine species. As stated in 50 CFR 402.16, the Sustainable Fisheries Division should reinitiate formal consultation if the amount or extent of take specified in the ITS is exceeded; if new information reveals effects of the action that may affect listed species in a manner or to an extent not previously considered; if the action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the Opinion; or if a new species is listed or critical habitat designated that may be affected by the proposed action.

If you have any questions, please feel free to contact me or Lance Smith of my staff.

Attachment: Biological Opinion

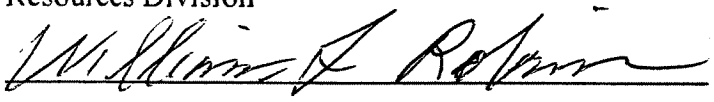
cc: F/PIR – Robinson
GC/PIR - DeRoma

F/PIR/2007/05762
I-PI-07-621-CY

If you need assistance with this document, please contact NOAA Fisheries at (808) 725-5000.

Endangered Species Act – Section 7 Consultation

Biological Opinion and Incidental Take Statement

Action Agency:	National Marine Fisheries Service, Pacific Islands Region, Sustainable Fisheries Division
Activity:	Implementation of Bottomfish Fishing Regulations within Federal Waters of the Main Hawaiian Islands
Consulting Agency:	National Marine Fisheries Service, Pacific Islands Region, Protected Resources Division
Approved By:	
	William L. Robinson Regional Administrator, Pacific Islands Region
Date Issued:	March 18, 2008

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Acronyms

BA	Biological Assessment
BFRA	Bottomfish Fishing Restricted Areas
BMUS	Bottomfish Management Unit Species
CFR	Code of Federal Regulations
CML	Commercial Marine License
DAR	Division of Aquatic Resources
DLNR	Department of Land and Natural Resources
DSEIS	Draft Supplement Environmental Impact Statement
ESA	Endangered Species Act
FEIS	Final Environmental Impact Statement
FFS	French Frigate Shoals
FMP	Fishery Management Plan
FR	Federal Register
FSEIS	Final Supplement Environmental Impact Statement
HMRFS	Hawaii Marine Recreational Fishing Survey
MHI	Main Hawaiian Islands
MMPA	Marine Mammals Protection Act
MSA	Magnuson Stevens Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NWHI	Northwestern Hawaiian Islands
PIFSC	Pacific Island Fishery Science Center
PIR	Pacific Island Region
PRD	Protected Species Division
SEIS	Supplemental Environmental Impact Statement
SFD	Sustainable Fisheries Division
TAC	Total Allowable Catch
USFWS	U.S. Fish and Wildlife Service
WPRFMC	Western Pacific Regional Fisheries Management Council

1 Introduction

Section 7(a)(2) of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1539(a)(2)) requires each Federal agency to ensure that any action they authorize, fund, or carry out is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of critical habitat of such species. When the action of a Federal agency "may affect" a protected species, that agency is required to consult with either the National Marine Fisheries Service (NMFS) or the United States Fish and Wildlife Service (USFWS), depending upon the protected species that may be affected. For the actions described in this document, the action agency is the Sustainable Fisheries Division (SFD) of NMFS, Pacific Islands Region (PIR). The consulting agency is the Protected Resources Division (PRD), also of NMFS PIR.

This document represents NMFS' biological opinion (opinion) of the effects of the phased implementation of Amendment 14 to the Bottomfish Fishery Management Plan (FMP) on marine species protected under the ESA. This opinion is based on our review of the February 7th, 2008, Biological Assessment (BA) prepared by SFD, recovery plans for the Hawaiian monk seal and U.S. Pacific populations of listed sea turtles and humpback whales, the most current marine mammal stock assessment reports, published and unpublished scientific information on the biology and ecology of threatened and endangered marine species in the action area, monitoring reports from prior fishing activity and research in the region, biological opinions on similar actions, and relevant scientific and gray literature.

2 Consultation History

A biological opinion was completed on the original implementation of the Bottomfish and Seamount Fishery Management Plan (Bottomfish FMP) for the Western Pacific Region in the 1980s. Another biological opinion was signed by NMFS on March 8, 2002, on the continued operation of the fisheries conducted under the Bottomfish FMP. The opinion found that the bottomfish fishery, as managed under the FMP, may incidentally hook monk seals, and identified seven instances of hookings that could have been attributable to direct interactions with the fishery. The opinion also estimated that one seal would be hooked every 2.9 years, and that one serious injury/mortality would result from a hooking every 6.7 years. NMFS concluded that few monk seals will be hooked or die as a result of interactions with the Northwestern Hawaiian Islands (NWHI) commercial bottomfish fishery, thus the opinion concluded with a 'no jeopardy' determination for Hawaiian monk seals. This opinion principally analyzed the NWHI bottomfish fishery.

Based on 2003 data analyzed by the NMFS Pacific Islands Fisheries Science Center (PIFSC), NMFS determined that overfishing of the bottomfish species complex is occurring within the Hawaiian Archipelago with the primary problem being excess fishing mortality in the main Hawaiian Islands (MHI). The NMFS Regional Administrator for the Pacific Islands Regional Office notified the Western Pacific Fishery Management Council (Council) of this overfishing determination on May 27, 2005. In response, the Council prepared Amendment 14 which

recommended closure of Federal waters[1] around Penguin and Middle Banks to fishing for bottomfish to end the overfishing. This action would have decreased bottomfish fishing effort by 15 percent, the amount indicated as necessary by the current stock assessment at the time.

Several events occurred that indicated a need to re-examine this action before finalizing Amendment 14. Most notably, an updated stock assessment completed by PIFSC concluded that the required reduction in fishing mortality based on 2004 data would be 24 percent, not 15 percent. In addition, a phase-out of the bottomfish fishery by 2011 in the NWHI was mandated through the Presidential Monument designation (71 FR 36443; June 26, 2006) and implementing regulations (71 FR 51134; August 29, 2006). The phase-out of the NWHI fishery may be significant because bottomfish are assessed as a stock complex combining the MHI and the NWHI (the Hawaiian Archipelago), and because larval transport may allow for one area to serve as a source of immigration to other areas such that management action in one may affect fish abundance in the other. After the phase-out, NWHI commercial bottomfish vessel operators may either begin fishing in the MHI or discontinue fishing for bottomfish.

A Final Environmental Impact Statement (FEIS) on the Bottomfish FMP was completed and made available to the public on June 17, 2005. On March 30, 2006, a Draft Supplemental Environmental Impact Statement (DSEIS) that focused on the Council's previous recommendations was made available with a 45-day comment period (ended on May 30, 2006). Before the Final SEIS was completed, the new stock assessment was produced. As a result, the FSEIS was not completed at that time, and a revised FSEIS was published on December 19, 2007, in conjunction with the revised Amendment 14.

The purpose of the proposed action is to end overfishing in the Hawaiian Archipelago bottomfish stock complex, specifically for: onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), hapu'upu'u (*Epinephelus quernus*), opakapaka (*Pristipomoides filamentosus*), and lehi (*Aphareus rutilans*), which collectively are referred to as the "Deep 7" species[2]. Based on the Council's recommendation, Amendment 14 would reduce fishing mortality in 2008 through the use of a seasonal closure in conjunction with limits on total allowable catch (TAC). As monitoring of the recreational fishery improves, overfishing would be prevented in 2009 and beyond, through implementation of TACs based on and applied to the commercial and the non-commercial (combined recreational and subsistence) sectors.

SFD requested initiation of formal Section 7 consultation on February 7th, 2008, for the phased implementation of Amendment 14 to the Bottomfish FMP in Federal waters of the MHI. SFD provided PRD with a BA of the effects of the proposed action on species listed under the ESA. The BA concluded that the proposed action may affect, but is not likely to adversely affect the following ten species: endangered blue whale (*Balaenoptera musculus*), endangered fin whale (*Balaenoptera physalus*), endangered humpback whale (*Megaptera novaeangliae*), endangered

[1] 'Federal waters' refers to the U.S. Exclusive Economic Zone (EEZ) generally between 3 and 200 nautical miles off of U.S. coastlines.

[2] The 'Deep 7' species are also designated as Bottomfish Management Unit Species (BMUS) in the Bottomfish FMP.

right whale (*Eubalaena glacialis*), endangered sei whale (*Balaenoptera borealis*), endangered sperm whale (*Physeter macrocephalus*), endangered hawksbill sea turtle (*Eretmochelys imbricata*), endangered leatherback sea turtle (*Dermochelys coriacea*), threatened loggerhead sea turtle (*Caretta caretta*), and endangered/threatened[3] olive ridley sea turtle (*Lepidochelys olivacea*). The BA concluded that the proposed action is likely to adversely affect the endangered Hawaiian monk seal (*Monachus schauinslandi*) as well as the endangered/ threatened[4] green sea turtle (*Chelonia mydas*), thus formal consultation is required. However, after analyzing the available information in the formulation of this biological opinion, NMFS concludes that the proposed action is not likely to adversely affect the Hawaiian monk seal, as described in section 6.2. Formal consultation is required because the proposed action is likely to adversely affect the endangered the endangered/threatened green sea turtle, as described in Section 8.

3 Description of the Action

The proposed action is to establish regulations for a new management regime for the MHI bottomfish fishery within Federal waters (3 – 200 nm from shore[1]), as summarized in Table 1. The purpose of the proposed action, in conjunction with State management within State waters (0 – 3 nm from shore), is to reduce overfishing on the Hawaiian Archipelago bottomfish stock complex by 24 percent in 2008, and to adjust allowable mortality or total allowable catch in the future based on the status of stocks.

This action focuses on the Federal bottomfish fishery (i.e., the component of the bottomfish fishery operating in Federal waters) around the MHI that target "Deep 7" species. The new regulations would establish an annual Total Allowable Catch (TAC) for both MHI commercial and non-commercial bottomfish fishermen, require permitting and reporting for all non-commercial vessel based fishermen that target Bottomfish Management Unit species (BMUS) in the MHI, establish non-commercial bag limits in MHI Federal waters and establish a summer seasonal closure in 2008. Thus, this opinion only analyzes bottomfishing in MHI Federal waters, not bottomfishing in the NWHI or elsewhere in the Pacific. Bottomfishing in the NWHI and elsewhere in the Pacific continues to be authorized under the March 8, 2002, opinion. The details of these proposed management measures are summarized below:

Total Allowable Catch Limit (TAC)

The proposed regulations would establish a "Deep 7" TAC of 178,000 lb for the 2007-2008 fishing year which would be a 24% reduction of 2004 commercial catch. Once the TAC is reached, the fishery will be closed to commercial and non-commercial Deep 7 fisheries. During the 2007-08 fishing year, only the commercial fishery would be monitored, and in subsequent years, data from both non-commercial and commercial catches would be used to calculate the

[3]The nesting populations of olive ridleys along the Pacific coast of Mexico are listed as endangered and all others are listed as threatened (50 FR 17.11).

[4]In 1978, under the ESA, the green turtle was listed and classified as threatened, except for the breeding populations in Florida and on the Pacific coast of Mexico, which were classified as endangered (50 FR 17.11).

TAC. Future TACs would be implemented by NMFS based on recommendations from the Council and the PIFSC.

Permitting and Reporting

Under the proposed regulations all vessel-based non-commercial fishermen who fish for BMUS in Federal waters of the MHI would be required to have Federal non-commercial fishing permits. Vessel operators are required to file reports of all fishing activity within 72 hours of each non-commercial fishing trip. Alternatively, fishermen would be allowed to fish for "Deep 7" species with a State of Hawaii (State) Commercial Marine License (CML) and would report to the State.

Non-commercial bag limits

Under the proposed regulations, a non-commercial bag limit of five of any combination "Deep 7" species per person per trip will apply in Federal waters.

2008 Closed season

The proposed regulations would establish a summer seasonal closure of Federal waters to bottomfish fishing for the "Deep 7" species from May 1-August 30, 2008, for both commercial and non-commercial fishermen.

State of Hawaii cooperation

Management of the MHI commercial bottomfish fishery has historically been the responsibility of the State of Hawaii Department of Land and Natural Resources (DLNR) Division of Aquatic Resources (DAR) and includes commercial permits and catch reporting. The State of Hawaii has also established Bottomfish Fishing Restricted Areas (BFRAs) in State waters which apply to both commercial and non-commercial fishermen.

To achieve the goals of the proposed Federal action, complimentary management actions may be taken by the State. For example, the State may consider the establishment of seasonal closures that parallel the Federal seasonal closures which would apply in State waters (0-3 nm). NMFS has no authority to regulate fishing activities in State waters. Therefore, the action upon which NMFS is required to consult under section 7 of the ESA covers only fishing activity conducted in Federal waters, and does not extend to fishing activity conducted in State waters.

Current Management Regime

In 2007, the Federal management regime for the MHI bottomfish fishery consisted of an interim emergency action establishing seasonal closure from May 15- September 30, 2007. The 2007 seasonal closure was implemented for Federal waters by NMFS pursuant to section 305(c) of the MSA (72 FR 27065; May 14, 2007) and by the Hawaii DLNR for State waters[5] and is not part of the action analyzed in this document.

[5] See http://www.hawaii.gov/dlnr/dar/bottomfishing.htm

Table 1: Current and Proposed Federal Management Regime		
	CURRENT FEDERAL MANAGEMENT REGIME	**PROPOSED FEDERAL MANAGEMENT REGIME**
	3-200 nm	3-200 nm
	Not required	Federal permits required for an estimated 800-5,000 vessel-based fishermen that fish for BMUS in Federal waters of the MHI.
Active commercial permits	300 (State issued CML)	300 (State issued CML) This action would not require new Federal permits for commercial bottomfish fishermen.
	Not required	Required for vessel operators of Federal non-commercial bottomfish trips.
	n/a	May 1-August 30, 2008
	None	178,000 lb (2007-08) In subsequent years, TAC will be implemented by NMFS as recommended by the Council and PIFSC.
	Five onaga and/or ehu per person per trip in State waters.	Five of any combination of "Deep 7" species per person per trip in Federal waters.
	No Federal area closures. State designated BFRA's would continue.	No Federal area closures. State designated BFRA's would continue.

4 Action Area

The proposed action is to establish regulations for a new management regime for the MHI bottomfish fishery within Federal waters (3 – 200 nm from shore), thus the action area is limited to MHI Federal waters. In the MHI, more than half (53%) of deepwater bottomfish habitat (30 – 200 m depth) occurs within Federal waters (Parke 2007; Fig. 1). Although the action area is limited to MHI Federal waters, the transit of bottomfishing vessels through State waters to fish in Federal waters is an interrelated and interdependent action (defined in Section 8), the effects of which must be considered in this opinion.

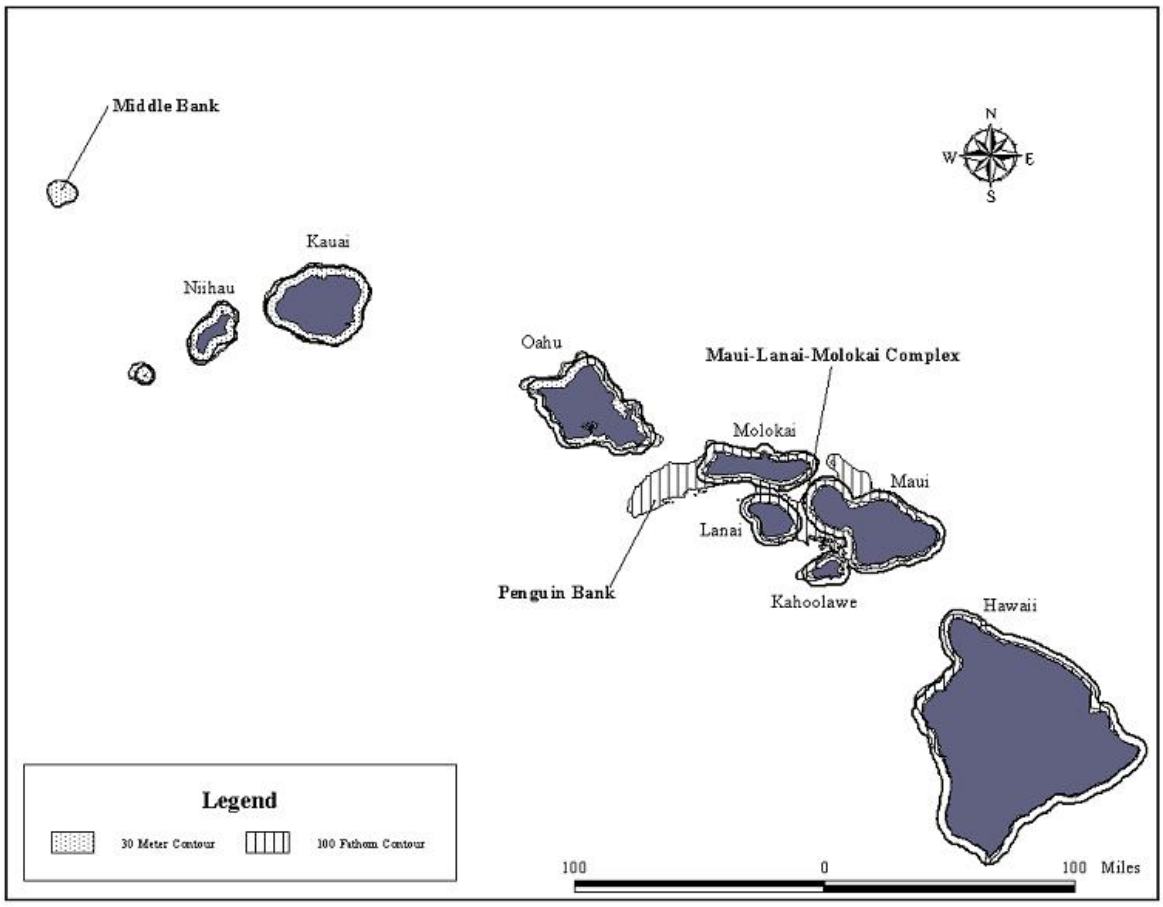


Figure 1. Map of the Main Hawaiian Islands (MHI), showing boundary between State and Federal waters (black line) and the 100 fathom (183 m) isobath.

5 Approach to the Assessment

NMFS approaches its Section 7 assessment with a series of four analyses. The first analysis identifies those aspects of proposed actions that are likely to have direct and indirect effects on the physical, chemical, and biotic environment of an action area (*effects analysis*). As part of this analysis, we identify the spatial extent of these direct and indirect effects, including changes in that spatial extent over time, thereby defining the action area for the consultation. The second analysis identifies the listed resources (i.e., individuals of a listed species, or components of its designated critical habitat) that are likely to co-occur with these effects in space and time and the nature of that co-occurrence (*exposure analysis*). In this analysis, we try to identify the number, life history stage, and other relevant information, of the individuals that are likely to be exposed to an Action's effects, as well as the populations or subpopulations those individuals represent. The third analysis requires consideration of the best available scientific and commercial data to determine whether and how those listed resources are likely to respond given their exposure (*response analysis*). The final analysis determines the risks those responses pose to listed resources (*risk analysis*, described in more detail below). The steps involved in each of these four analyses are described in the appendix to this opinion.

6 Species Status and Trends

6.1 Listed Species/Critical Habitat in the Action Area

NMFS has determined that the actions considered in this biological opinion may affect the following species provided protection under the ESA of 1973 (16 U.S.C. 1531 et seq.; ESA):

Blue whale	*Balaenoptera musculus*	Endangered
Fin whale	*Balaenoptera physalus*	Endangered
Humpback whale	*Megaptera novaeangliae*	Endangered
Sei whale	*Balaenoptera borealis*	Endangered
Sperm whale	*Physeter macrocephalus*	Endangered
Northern Right whale	*Eubalaena glacialis*	Endangered
Green sea turtle	*Chelonia mydas*	Threatened and Endangered
Hawksbill sea turtle	*Eretmochelys imbricata*	Endangered
Leatherback sea turtle	*Dermochelys coriacea*	Endangered
Loggerhead sea turtle	*Caretta caretta*	Threatened
Olive ridley sea turtle	*Lepidochelys olivacea*	Threatened and Endangered
Hawaiian monk seal	*Monachus schauinslandi*	Endangered

Although critical habitat has been designated for the Hawaiian monk seal, it is limited to the NWHI (53 FR 18990, May 26, 1988), thus the proposed action will have no effect on Hawaiian monk seal critical habitat. There is no proposed or designated critical habitat for any other ESA-listed marine species within the action area.

6.2 Species Not Likely to be Adversely Affected – Hawaiian Monk Seal

The effects, exposure, response, and risk analyses for the Hawaiian monk seal with regard to implementation of the proposed action are described below. The proposed action is the implementation of new bottomfishing regulations within Federal waters of the MHI (see Section 3 above). The following information was used to determine effects of the proposed action on Hawaiian monk seals: the BA, seal hooking and entanglement information, NWHI bottomfish observer results, the 2002 biological opinion on the Bottomfish FMP (NMFS 2002), the fatty acid – monk seal diet study (Iverson et al. 2006), a tagging study of seals in the MHI (Littnan et al. 2006), the recovery plan (NMFS 2007a), the most recent Hawaiian monk seal stock assessment report (NMFS 2007b), and the other literature cited in this opinion. According to this information, the following aspects of the bottomfish fishery have been identified to have potential effects on monk seals occurring in the action area (i.e., Federal waters of the MHI): Hookings, behavioral modification, and reduction of seal prey. The following analyses focus on these three effects. There is currently no evidence that vessel collisions associated with the proposed action pose potential adverse effects to Hawaiian monk seals, because bottomfishing boats are relatively slow-moving, and only two seals with possible vessel collision injuries have ever been found in the MHI (NMFS 2007a).

6.2.1 Effects Analysis

Hookings: Incidental hooking of monk seals may occur when seals take baited hooks or hooked fish. Such hookings from the bottomfish fishery within Federal waters around the MHI are possible because approximately half of bottomfish habitat in the MHI occurs in Federal waters (Fig. 1). In the MHI, nearshore fisheries have a direct impact on monk seals by incidental hooking and entanglement. In the MHI from 1989 – 2007, a total of 49 monk seals were observed either hooked or entangled. Other hookings and entanglements probably occurred but went unobserved or undocumented. A total of 18 hookings were confirmed as having originated from the *ulua* (large jacks, *Caranx* spp.) fishery, based on the gear that was either observed or recovered from the seals, and one of these seals was also entangled in a lay gillnet. Another 5 seals were entangled in gillnets. Of the remaining 26 hookings, 6 were from fisheries other than the bottomfish fishery (possibly from *papio* fishery, small jacks). The remaining 20 hookings (interactions # 1, 3, 7-10, 13, 26, 27, 29, 31, 32, 34, 38, 39, 41, 44, and 47-49, Table 2) could not be assigned to a particular fishery. Other hookings may not have been documented if hooks fell out or were overlooked. Hooks may cause serious injury or infection, leading to reduced feeding or other impairment. If not removed, the hook may lead to serious injury, infection, or death of the seal (NMFS 2002, 2007a, NMFS 2007b). None of the hookings documented in the MHI since 1989 could be confirmed as originating from the bottomfish fishery.

Table 2. MHI seal-fishery interactions documented by NMFS, 1989-2007.

#	Date and Location	Description	Outcome
1	1989 – Kauai	Juvenile female hooked	Hook removed and identified as type used in either the shore-based *ulua* fishery or the bottomfish fishery
2	1993 - Kauai (Kipu Kai Ranch)	Adult male reported with a hook in its lower jaw trailing about 3’ of line	Hook reported as a large "ulua" hook, trailing 100 lb. monofilament line, seal later seen without hook.
3	1994 – Kauai (Shipwreck Beach)	Seal reported with a large hook in mouth and trailing about 6’ of line	Hook type unknown, possibly longline related
4	1994 - Oahu (Makua)	Adult female entangled in gillnet	Entangled and drowned
5	1995 – Kauai (Hanamaulua Bay)	Juvenile male found dead, necropsy revealed hook in lower esophagus	Hook was identified as an *ulua* slide rig
6	1996 - Oahu (Ala Moana Beach)	Adult male hooked loosely in lower right mandible	Hook removed and identified as an *ulua* slide rig
7	1996 - Maui (Kaupo)	Adult seal hooked with ulua hook in mouth or jaw with trailing line	Seal reportedly hooked during a fishing tournament and cut loose
8	1996 – Oahu	Weaned male with hook in right cheek	Hook was removed by bystander, but hook type is unreported
9	1998 – Maui (Hana)	Juvenile female reported with a #7 or #9 *ulua* hook	Seal was later examined, no hook was found, but some minor trauma was observed in the mouth
10	2000 – Molokai	Juvenile male observed with 2 hooks and line embedded in chest	Seal was later examined, no hook or line present, but slight injury was documented.
11	2000 - Kauai (Haena Beach)	Adult female with hook in mouth	Hook removed and identified as an *ulua* slide rig
12	2001 - Kauai (Mahaulepu Beach)	Juvenile female with hook in lower lip and base of jaw	Hook removed and identified as type used in the recreational *ulua* fishery

#	Date and Location	Description	Outcome
13	2001 – Kahoolawe	Adult male reported with hook in abdomen or front flipper	Seal never resighted, hook type unknown
14	2001 - Hawaii (South Point)	Weaned male photographed with small hook in back, trailing line	Hook very small and line very light, Seal later observed without hook
15	2001 - Hawaii (South Point)	Weaned male hooked	Hook removed and identified as type used in the recreational *ulua* fishery
16	2002 - Oahu (Makua)	Immature seal entangled in nearshore gillnet	Reported released alive by local divers
17	2002 – Kauai	Adult female hooked through neck, trailing 10-15 ft of monofilament	Hook identified as type used in the recreational *ulua* fishery
18	2002 - Oahu (Ewa Beach)	Adult female hooked in lip, trailing steel leader	Hook removed and identified as an *ulua* slide rig
19	2003 - Kauai (Kapaa)	Adult female hooked in corner of mouth	Hook removed and identified as recreational sabiki rig, used by shorecasters
20	2003 - Kauai (Poipu)	Adult female observed hooked by *ulua* slide rig and trailing line	Later observed without hook
21	2003 - Molokai (Laau)	Adult male hooked in back of mouth, outside mandible	Hook removed and identified as an *ulua* slide rig
22	2003 - Kauai (Poipu)	Seal observed hooked by *ulua* slide rig and trailing line	Second-hand report that seal was hooked and fisherman cut line
23	2003 - Kauai (Ahukini Pier)	Adult seal observed hooked in mouth or lip	Multiple reports of hooking by *kawakawa* fisherman who retrieved all possible line before cutting it
24	2004 - Kauai (Kapaa)	Juvenile male hooked in lip, then entangled in gill net	Released alive from net; hook removed later that day and identified as an *ulua* slide rig
25	2004 - Kauai (Larsen's)	Adult male hooked by *ulua* slide rig	Hook surgically removed
26	2004 - Kauai (Poipu)	Subadult male observed with *ulua* hook in lip	Seal later observed without hook
27	2004 - Oahu (Mokuleia)	Seal observed with hook in lip	Unconfirmed but reliable report, hook type unknown
28	2004 - Kauai (Lydgate Park)	Juvenile male hooked in lower jaw muscle	Hook removed and identified as *ulua* slide rig
29	2005 - Kauai (Near Hanamaulu Beach Park)	Divers reported a seal with line trailing from its mouth	No subsequent resightings, hook type unknown
30	2005 - Oahu (Barbers Pt/Germaine's Luau)	Adult seal observed thrashing in water, apparently entangled in net	Responder found no seal, but net had large hole where the seal may have been entangled and freed itself
31	2005 - Oahu (near Makaha)	Adult seal observed with fishing line trailing from mouth	Bystanders reported hauled out seal with about 3' of bright green line trailing from mouth, hook was never sighted
32	2005 - Kauai (Pilaa Beach)	Juvenile Female hooked in corner of mouth, outside jaw	Hook was removed and identified as a circle hook, with no gear or line
33	2005 - Kauai (North Larsen's)	Weaned female hooked in corner of mouth with trailing line	Circle hook and heavy line typical of shorefishing targeting *ulua* but no slide rig was present. Hook removed
34	2005 - Kauai (Poipu)	Adult female hooked in corner of mouth with 8" of line trailing	Resighted without hook, but slight blood smear at left corner of mouth, hook type unidentified
35	2005 - Kauai (Ahukini)	Adult male with small hook in right cheek, outside of mouth, and 1' of trailing line	Photographed with small 'J' hook "damashi" rig characteristic of whipping for small fish, seal later resighted without hook

#	Date and Location	Description	Outcome
36	2005 - Kauai (Kukuiula Harbor)	Subadult seal hooked and trailing line with a bleach bottle	Diver reported approaching in boat and cutting line about 2' from seal, A dead subadult female with healing hook injury in the mouth was found in the vicinity a month later. Probably same animal
37	2006 - Kauai (North Larsen's)	Juvenile female hooked in right corner of mouth	Hook was removed and identified as an *ulua* slide rig
38	2006 - Oahu (Velzyland)	Adult seal reported hooked in chest and trailing a little line	Hook type identified only as 3", no follow up information
39	2006 - Kauai (Kapaa)	Juvenile male reported hooked in mouth	Fishermen reported cutting seal free, seal examined same day, no hook found but recent small wound in mouth hook type unidentified
40	2006 - Kauai (Kapaa)	Juvenile male hooked in corner of mouth	Hook removed, identified as an *ulua* slide rig
41	2006 - Kauai (Larsen's)	Juvenile male hooked in right side of mouth	Hook removed, and identified as a circle hook with about 8" nylon coated wire leader
42	2006 - Oahu (Waimanalo)	Weaned female entangled in gillnet	Diver reported finding dead seal in gill net off Makai Pier, carcass later recovered
43	2007 – Oahu (Hanauma Bay)	Subadult female hooked on rear flipper	Small 'J' hook "damashi" rig; seal seen 3 days later without hook
44	2007 - Oahu (Makua)	Adult male entangled in gillnet	Seal tightly wrapped in gillnet, dead
45	2007 – Kauai (Haena—Tunnels)	Adult female hooked by shorefisherman	Bystander saw shore (*ulua*) fisherman cut line to release hooked seal; bystander snorkeled out to confirm seal trailing line; seal seen 5 days later without hook
46	2007 – Hawaii (Lapakahi State Park)	Juvenile female hooked in cheek	Following day responders approached seal to remove hook and hook/slide rig came out by itself; hook was barbless.
47	2007 – Molokai (Kalaupapa)	Weaned male hooked in cheek	Hook removed by NPS personnel following day (hook lost)
48	2007 – Kauai (Poipu)	Subadult male with circle hook in cheek and trailing line	Large circle hook trailing line removed following day by Kauai coordinators
49	2007 – Molokai (Kalaupapa)	Subadult female hooked in right upper lip, trailing line.	Large circle hook trailing line removed by NMFS personnel 5 days later.

Behavioral Modification: While no seal hookings are known to have occurred from bottomfishing, interaction with the fishery could be occurring if monk seals are removing hooked fish or feeding on discarded bycatch. Although the MHI component of the bottomfish fishery has never had observers, results from the observer program in the NWHI component of the fishery in 1990-93 led NMFS to conclude that the fishery was resulting in substantial seal behavioral modification, such as following fishing vessels and feeding on hooked fish. In addition, monk seals may feed on discarded bycatch from the bottomfish fishery, including fish species associated with ciguatoxin. NMFS observers in 1990-1993 reported that fishery participants illegally fed discards to monk seals during hand line retrieval in order to distract the monk seals from stealing valuable catch (Nitta & Henderson 1993; NMFS 2002). Feeding of discards to monk seals is prohibited under both the ESA and the MMPA. However, even if discards are not intentionally fed to seals, the seals may still feed on any discarded bycatch they are able to find.

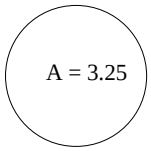
Prey Reduction: Although monk seals may consume over 150 fish species, a recent fatty acids study based on samples collected from approximately 200 monk seals (15 from MHI, the rest from NWHI) demonstrated that the average diet is dominated by five fish taxa (*Antigonia* spp. [boarfish], *Bembrops filifera* [duckbill], *Acanthurus*/*Ctenochaetus*/*Zebrasoma* spp. [tang/surgeonfish], *Etelis carbunculus* [ehu], and *Pristipomoides zonatus* [gindai]), including two deep-water snappers (ehu and gindai; Iverson et al. 2006). The importance of deep-water snappers in the average diet varied by life history stage, with the deep-water snappers being the most important prey species for juvenile monk seals. In the MHI, the same five taxa dominated the average diet although in different proportions: fewer boarfish, duckbill and ehu, but more gindai and tang/surgeonfish (there were not enough MHI samples to distinguish adult vs. juvenile diets). As described in Section 4 above, about half of deep-water snapper habitat in the MHI is in Federal waters, thus the proposed action has the potential to reduce monk seal prey.

6.2.2 Exposure and Response Analyses

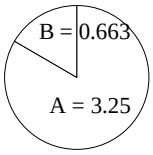
Limited information is available on the exposure and response of Hawaiian monk seals to the bottomfish fishery in the MHI, thus it is not possible to distinguish exposure from response. Exposure and response of seals to hookings, behavioral modifications, and prey reduction are therefore described together below.

Hookings: The likely exposure and response of Hawaiian monk seals to incidental hooking due to the proposed action was estimated using the six steps shown in Figure 2, and described in more detail below the figure:

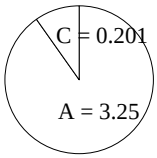
Step 1: Determine # recent (2003-07) seal hookings/yr in MHI potentially from bottomfish fishery (A from table below):



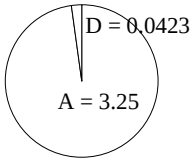
Step 2: Estimate proportion of A likely to be from bottomfish fishery (B from table below):



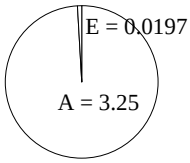
Step 3: Estimate proportion of B likely to be from bottomfishing in Federal waters (C from table below):



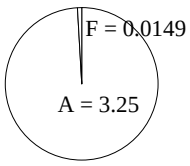
Step 4: Estimate proportion of C likely to result in mortality or serious injury without seal monitoring program (D from table below):



Step 5: Estimate proportion of D likely to result in mortality or serious injury with seal monitoring program (E from table below):



Step 6: Calculate predicted hookings due to the proposed action, which will reduce effort by 24% (F from table below):



	Variables (# seal hookings/yr) in MHI Bottomfish (BF) Fishery	Mean	Low	High
A	Hookings/yr potentially from BF in MHI, 2003-07	3.45	3.12	3.38
B	Hookings/yr likely from BF in MHI, 2003-07	0.663	0.312	1.014
C	Hookings/yr, BF, MHI Fed waters, 2003-07	0.201	0.047	0.355
D	Hookings/yr, BF, MHI Fed, mort./ser. inj, 2003-07	0.0423	0.0099	0.0746
E	Hookings/yr, BF, MHI Fed, mort/ser. inj, w/mt prgm., 2003-07	0.0197	0.0020	0.0373
F	Predicted hookings/yr causing mort/ser. inj, proposed action	0.0149	0.0015	0.0283

Figure 2. Steps for estimating annual seal hookings resulting in mortality or serious injury from the proposed action (bottomfishing in MHI Federal waters).

6-step Process for Seal Exposure and Response Analyses

Step 1: The seal population in the MHI has grown rapidly in the last decade (NMFS 2007a,b), thus using the hooking data before 2003 would likely underestimate hooking rates. For the 5-year period 2003-07, there were 13 unidentified hookings, giving an annual hooking rate of 2.6 seals/yr for all unidentified hookings (# 26, 27, 29, 31, 32, 34, 38, 39, 41, 44, and 47-49, Table 2), i.e., those that could potentially have been from the bottomfish fishery. Some hookings are likely to have occurred without being observed and/or recorded. This is especially true on

Niihau, where many seals are found (NMFS 2007a) but which has no seal monitoring program. Thus, NMFS estimates that 20 – 30 percent more unidentified hookings occurred in 2003-07 than noted in Table 2. Therefore, Variable A = (2.6 + [(2.6)(0.20)]) to (2.6 + [(2.6)(0.30)]) = 3.12 – 3.38 seal hookings/yr, thus mean for **Variable A = 3.25 seal hookings/yr**.

Step 2: Although all 13 unidentified hookings from 2003-07 in the MHI could potentially be from the bottomfish fishery, it is extremely unlikely that this is the case because of the prevalence of other fisheries using similar hooks, especially the shore-based *ulua* fishery. A 1996 survey estimated 32,000 non-commercial fishers spent 554,000 days *ulua* fishing that year in the MHI (Rick Gaffney & Associates, 2000), a much greater amount of effort than the commercial and non-commercial bottomfish fishery combined, even if *ulua* fishing effort has been stable since 1996 (it most likely has increased). For example, assuming that 380 commercial bottomfishing vessels make 60 trips per year, and 1,300 non-commercial vessels make 30 trips per year (estimates derived from information in the Proposed Rule for Bottomfish Management Measures in Main Hawaiian Islands, 73 FR 6101, February 1, 2008), there would be a total of 71,800 bottomfishing trips per year in the MHI, or 13 percent the number of the annual *ulua* fishing days in the MHI in the 1996 survey (Rick Gaffney & Associates, 2000). Some commercial bottomfishing trips would be for more than one day, thus bottomfishing effort in nearshore MHI waters may represent approximately 10 – 30 percent of the total fishing effort in the MHI with hooks similar to the unidentified hooks in Table 2. Thus, NMFS estimates that 10 – 30 percent of the unidentified hooks in 2003-07 could be from the bottomfish fishery, so Variable B = (0.10)(low for Variable A) to (0.30)(high for Variable A) = (0.10)(3.12) to (0.30)(3.38) = 0.312 – 1.014, thus mean for **Variable B = 0.663 seal hookings/yr.**

Step 3: Although the proposed action is limited to Federal waters of the MHI, Hawaiian monk seals do forage in bottomfish habitat within MHI Federal waters (Littnan et al. 2006). Seals are likely to be foraging in the daytime when fishing is occurring, thus seals will sometimes be exposed to bottomfishing gear. However, seals are more likely to occur in the nearshore (< 3 nm) State waters than in the offshore (> 3 nm) Federal waters: A recent study found that about 75 percent of marine habitat use by tagged seals in the MHI occurred in State waters, although there was considerable variation by geographic location and individual seal (Littnan et al. 2006). Thus 15 – 35 percent of MHI seal hookings from bottomfishing gear are likely to occur within Federal waters, so Variable C = (0.15)(low for Variable B) to (0.35)(high for Variable B) = (0.15)(0.312) to (0.35)(1.014) = 0.047 – 0.355, thus mean for **Variable C = 0.201 seal hookings/yr.**

Step 4: In its annual Stock Assessment Reports (SAR), NMFS determines mortality and serious injury to marine mammals from various sources. In the most recent Hawaiian monk seal SAR (NMFS 2007b), NMFS determined that six mortalities or serious injuries occurred in the MHI during the 5-year period 2002-2006 due to fisheries interactions (all were in the nearshore fisheries). During that 5-year period, there was a total of 27 fisheries interactions, including 24 hookings and three gillnet entanglements (Table 1). At least one of the entanglements resulted in mortality or serious injury, thus the maximum rate of mortality or serious injury due to hookings was 5/24, or 21 percent. Thus 21 percent of MHI seal hookings from bottomfishing gear in Federal waters are likely to result in mortality or serious injury, so Variable D = (0.21)(low for Variable C) to (0.21)(high for Variable C) = (0.21)(0.047) to (0.21)(0.355) = 0.0099 – 0.0746, thus mean for **Variable D = 0.0423 seal hookings/yr.**

Step 5: The above estimates of mortality and serious injury rates are based on the assumption that the hooks are not removed. However, seals in the MHI are closely monitored by a network of monk seal response programs on Kauai, Oahu, Maui and the Big Island, and many hooks are removed, most often resulting in healing of the wound and recovery of the seal. Because of this monitoring, and the monk seal's life history (frequent hauling out on beaches, moving around or between islands), we estimate that 50 – 80 percent of hookings are noticed and the hooks removed before serious infection or injury results. Thus, the likelihood of mortality or serious injury from hooking is reduced by 50 – 80 percent, so Variable E = (0.20)(low for Variable D) to (0.50)(high for Variable D) = (0.20)(0.0099) to (0.50)(0.0746) = 0.0020 – 0.0373, thus mean for **Variable E = 0.0197 seal hookings/yr.**

Step 6: The proposed action would reduce effort by 24 percent compared to recent years, thus Variable F = (0.76)(low for Variable E) to (0.76)(high for Variable E) = (0.76)(0.0020) to (0.76)(0.0373) = 0.0015 – 0.0283, thus mean for **Variable F = 0.0149 seal hookings/yr.**

Conclusion for Hooking: The six steps, and resulting hooking rate predictions for the proposed action are shown in Figure 2 and described above. The predicted rate of hookings from the proposed action resulting in mortality or serious injury to monk seals = 0.0149 seal hookings/yr, or one every 67 years. The predicted rate of all hookings (i.e., including those that do not result in mortality or serious injury, and those that are removed by the seal monitoring program) can be estimated by skipping Steps 4 and 5 above: In Step 6, plug in Variable C from Step 3, so (0.76)(low for Variable C) to (0.76)(high for Variable C) = (0.76)(0.047) to (0.76)(0.355) = 0.036 – 0.270, giving a mean of = 0.153 seal hookings/yr, or one every 6.5 years.

Behavioral Modification: When seals do encounter bottomfishing gear, some interactions may lead to behavioral modifications such as following vessels and removing hooked fish. While illegally providing discards as a means of distracting seals has been documented in the NWHI bottomfish fishery (Nitta & Henderson 1993), this practice is likely less prevalent in the MHI bottomfish fishery because of the much smaller seal population and the greater likelihood of encountering law enforcement. Whether discards are intentionally fed to seals or not, seals may find and consume discarded bycatch, especially in areas where both fishers and seals congregate. However, Hawaiian monk seals are not scavengers and do not typically forage on dead prey, as shown by the absence of seal interactions with baited shark fishing gear in an area with many seals (French Frigate Shoals; Lowe et al. 2003, Vatter 2003). Thus behavioral modification is likely to be limited to feeding on hooked target fish or living discards.

Some seals in the MHI have become particularly habituated to feeding off fishing gear. While these seals could interact with the MHI bottomfish fishery, they are more likely to target the numerous nearshore fisheries where seals spend more time. As described above for hooking, because the proposed action is restricted to MHI Federal waters, the MHI seal population is small, and seals occur more frequently in State than Federal waters, seals will not often be exposed to bottomfishing gear in MHI Federal waters. For these reasons, behavioral modification is likely to be minimal from the proposed action.

Prey Reduction: Fatty-acid studies of the monk seal diet suggest that ehu (*Etelis carbunculus*) and gindai (*Pristipomoides zonatus*) are two of the five most common fish taxa in the diet for MHI monk seals (Iverson et al. 2006). Ehu and gindai are two of the 'Deep 7' species, i.e., the six deepwater snappers and one grouper that make up the deep-water bottomfish fishery in Hawaii. None of the other five species were among the five most common fish taxa in the monk seal diet in this study. In 2004, the MHI commercial bottomfish fishery landed a total of 295,100 lbs of deep-water bottomfish, with ehu and gindai together making up 8.2 percent of the total (ehu = 7.5%, gindai < 1%; Moffitt et al. 2006). Thus, seals may be exposed to prey reduction in MHI Federal waters because of the proposed action. However, the data from the much larger sample taken from the NWHI (>200 seals vs. only 15 from MHI) demonstrates: (1) high diversity of fish species/taxa in the diet; and (2) high variability between the diets of individual seals (Iverson et al. 2006). These two findings suggest that while the bottomfish fishery is reducing one type of seal prey, seals can readily switch from one prey species to another. In addition, the robust physical condition of MHI seals (Baker and Johanos 2004) suggests that seals are finding adequate prey within the action area. Thus, there is no evidence that the bottomfish fishery has impacted monk seals through competition for prey, and the proposed action is intended to reduce fishing effort in this fishery by 24 percent in the MHI.

6.2.3 Risk Analysis

In order to concur that a proposed action is not likely to adversely affect listed species, NMFS must find that the effects of the proposed action are expected to be insignificant, discountable, or beneficial as defined in the joint U.S. Fish & Wildlife Service-NMFS Endangered Species Consultation Handbook (USFWS & NMFS 1998): (1) insignificant effects relate to the size of the impact and should never reach the scale where take occurs; (2) discountable effects are those that are extremely unlikely to occur; and (3) beneficial effects are positive effects without any adverse effects. This standard was applied in assessing the effects of hookings, behavioral modifications, and prey reduction from the proposed action on Hawaiian monk seals.

Hookings: The proposed action may result in an incidental hooking of a Hawaiian monk seal one time every 6.5 years (see *Conclusion for Hooking* under Section 6.2.2 above). This includes all hookings, even those that do not result in serious injury or any injury, and those that are removed by the seal monitoring program. Most hookings do not result in serious injury or mortality, and most hooks are removed by the seal monitoring program. Thus the estimated rate of hookings from the proposed action resulting in mortality or serious injury of monk seals is one every 67 years (Fig. 2). These hooking rates are based on conservative assumptions (see Section 6.2.2) and thus are likely to be overestimates. The hookings rates are so low that any hooking is considered extremely unlikely to occur, and therefore discountable.

Behavioral Modification: Because of the small numbers of monk seals in the MHI, the tendency of seals to concentrate in State rather than Federal waters, the reluctance of seals to scavenge dead bait, behavioral modification from the proposed action is considered insignificant (very unlikely to result in take) and discountable (extremely unlikely to occur).

Prey Reduction: The recent rapid increase of monk seal numbers in the MHI (NMFS 2007a) while the bottomfish fishery was operating at a higher level than the proposed action, and the apparent lack of food limitation for monk seals in the MHI (Baker and Johanos 2004), together

lead NMFS to conclude that prey reduction resulting from the proposed action is insignificant (very unlikely to result in take) and discountable (extremely unlikely to occur).

Based on the above effects-exposure-response-risk analyses for hookings, behavioral modification, and prey reduction potentially resulting from the proposed implementation of bottomfish regulations in MHI Federal waters, NMFS concludes that the proposed action is not likely to adversely affect Hawaiian monk seals.

6.3 Other Listed Species Not Likely to be Adversely Affected

Blue, fin, right, sei, and sperm whales, as well as leatherback, loggerhead, and olive ridley sea turtles, may be found within the action area and could interact with the MHI bottomfish fishery. However, there have been no reported or observed incidental takes of these species in the history of the bottomfish fishery. An observer program operated for two 3-year periods (1990-93, 2003-05) for the bottomfish fishery in the NWHI (Nitta & Henderson 1993, NMFS 2003, 2004a, 2005a), covering approximately 50 fishing trips. No ESA-listed species under NMFS jurisdiction (i.e., sea turtles or marine mammals) were observed to be hooked or entangled during any of the bottomfishing trips covered by the program. Also, the lack of sightings/observations of the eight species listed above (5 whales, 3 sea turtles) in the action area (i.e., MHI Federal waters) indicate that the probability of an encounter of these species with the bottomfish fishery is extremely low. Therefore, NMFS concludes that the proposed action is not likely to adversely affect blue, fin, right, sei, and sperm whales, or leatherback, loggerhead, and olive ridley sea turtles, and these species will not be considered further in this opinion.

After the green sea turtle, the hawksbill sea turtle is the most common turtle species found in the nearshore waters of the MHI. Of the 3,861 stranded sea turtles reported from the MHI for the 22-year period 1982-2003, there were 3,732 greens, 47 hawksbills, 31 olive ridleys, 5 leatherbacks, 1 loggerhead, and 45 unidentified. Most of the stranded greens with vessel strike injuries were found on Oahu, while hawksbills are more commonly found around the Big Island than around Oahu (Chaloupka et al., in press). Thus the likelihood of a hawksbill being killed by a bottomfishing boat as a result of the proposed action is extremely unlikely, because of the low abundance of this species in the MHI, and the spatial separation of bottomfishing boats (concentrated around Oahu) and hawksbills (concentrated around the Big Island). Therefore, NMFS concludes that the proposed action is not likely to adversely affect the hawksbill sea turtle, and this species will not be considered further in this opinion.

Of the six listed cetaceans, the humpback whale is by far the most common within the action area. Humpback whales occur off all eight of the MHI, and are commonly found in waters <200 of the MHI (NMFS 1991). Although humpback whales are found within the action area and could interact with the bottomfish fishery, no reported or observed entanglements of humpback whales by bottomfish fishing gear have occurred in the history of the fishery (BA, p.12). The number of confirmed reports of entangled whales in Hawaiian waters has increased in recent years (NMFS 2006, Table 4). However, entanglement typically occurs with gear from other fisheries (e.g., mooring lines, nets, etc.). In the unlikely event that a humpback whale contacts bottomfish fishing gear, the effects are expected to be insignificant because the small circle hooks that are used are unlikely to injure the whale. Also, the relatively light test line should break easily and is so light as to not burden a whale should it drag away any line. Thus, NMFS

concludes that the proposed action is not likely to adversely affect the humpback whale, and this species will not be considered further in this opinion.

6.4 Green Sea Turtle

Of the five listed sea turtles, the green sea turtle is by far the most common in the MHI. Although green sea turtle nesting in the Hawaiian Archipelago is mostly limited to French Frigate Shoals (FFS) in the NWHI, they are common around all eight of the MHI (NMFS & USFWS 2007). The action area for this consultation is limited to Federal waters of the MHI (3 – 200 nautical miles [nm] from shore), and green sea turtles are much more commonly found in State waters (i.e., within 3 nm of shore), especially shallow nearshore feeding grounds, than in Federal waters. No reported or observed hookings or entanglements of green sea turtles have been documented in the history of the bottomfish fishery (BA, p.11). However, the proposed action will authorize thousands of vessels to make tens of thousands bottomfish fishing trips within the action area, and each trip will result in vessels passing through the shallow nearshore waters where green sea turtles are concentrated. Vessel strikes of green sea turtles appear to be quite common; for example, 12 green sea turtles stranded on Oahu during the first nine months of 2007 had vessel strike injuries (Hawaii Sea Turtle Stranding Database, 2007). Although the nearshore areas where these vessel strikes are most likely to be occurring are outside of the action area, the passage of bottomfish fishing vessels through them would not occur but for the proposed action, and thus is an interrelated and interdependent action to the proposed action. Therefore, green sea turtles are likely to be adversely affected by the proposed action, and will be included in this opinion.

This section presents or cites the biological and other information relevant to formulating the biological opinion. Appropriate information on the green sea turtle's life history, its habitat and distribution, and other data on factors necessary to its survival, are included to provide background for analyses in later sections of this document.

6.3.1 Species Description, Distribution and Life History

The green sea turtle is distributed globally in tropical and sub-tropical oceans. The species was listed as threatened on July 28, 1978 (43 FR 32800), except for breeding populations found in Florida and the Pacific coast of Mexico, which were listed as endangered. The biology, habitat, and conservation status of the green sea turtle is described in a recent status review (NMFS & USFWS 2007). Critical habitat has been designated at one location in the Caribbean (Culebra Island, Puerto Rico; 63 FR 46693), but has not been proposed or designated in the Pacific. Nesting assemblages occur around the Pacific Rim as well as in Hawaii, and genetic evidence suggests two distinct clades: 1) western Pacific and South Pacific islands, and 2) eastern Pacific and Hawaii (Dutton 2003).

Green sea turtles occur around all of the Hawaiian Islands, and over 90 percent of green sea turtle nesting in Hawaii occurs at FFS in the NWHI. Adults migrate >1,000 km between foraging areas in the MHI and the FFS nesting area. After hatching, juveniles spend at least several years in pelagic areas where they feed primarily on small invertebrates, although juvenile life history is poorly understood. At about 10 years of age, a developmental migration occurs whereby juveniles recruit to coastal waters and switch to a herbivorous diet, and are then considered 'subadults'. The foraging and resting behavior of subadults and adults in shallow, nearshore

waters exposes them to collisions with the large numbers of vessels (Gulko & Eckert 2004; NMFS & USFWS 2007).

6.3.2 Foraging and Resting Behavior

Subadult and adult green sea turtles in Hawaii appear to have a nearly exclusive herbivorous diet, consisting primarily of sea grass and algae. Individuals are site-specific and consistently feed in the same areas on preferred substrates, which vary by location and between islands. Green sea turtles may congregate around benthic foraging pastures of algae or seagrass, especially in shallow water where algae is abundant. Turtles may also lay motionless on the substrate for long periods, possibly to rest or to avoid predators. They frequently rise to the surface to breathe, and may come ashore at some locations to bask. Green sea turtles are common in all coastal waters of the MHI (Gulko & Eckert 2004; NMFS & USFWS 1998).

6.3.3 Population Status and Trends

Since the initial nesting surveys at FFS in 1973, there has been a marked increase in annual green turtle nesting. During the first 5 years of monitoring (1973-1977), the mean annual nesting abundance was 83 nesting females, and during the most recent 5 years of monitoring (2002-2006), the mean annual nesting abundance was 400 females. The increase over the last 30+ years corresponds to an underlying near-linear increase of about 5.7 percent per year (Chaloupka & Balazs 2007, NMFS & USFWS 2007).

Information on in-water abundance is consistent with the increase in nesting. This linkage is to be expected since, based on genetics, satellite telemetry, and direct observation, green turtles from the nesting beaches at FFS remain resident at foraging areas throughout the Hawaiian archipelago. A significant increase in catch per unit effort of green sea turtles was seen from 1989-1999 during bull-pen fishing on Molokai. The number of subadults residing in foraging areas of the MHI has increased. In addition, there has been a dramatic increase in the number of basking turtles in the MHI and at Midway Atoll (NMFS & USFWS 2007).

7 Environmental Baseline for the Green Sea Turtle

The environmental baseline for this biological opinion includes the effects of past and ongoing human and natural factors leading to the current status of the green sea turtle, its habitats, and ecosystems within the action area. The environmental baseline is a “snapshot” of the species’ health at a specified point in time within the action area. It does not include the effects of the action under review in this consultation. The action area for this consultation is the Federal waters of the MHI (Fig. 1). Because green turtles are mobile and migrate extensively (Balazs 1994), they move back and forth between Federal and State waters, thus it is not possible to distinguish the status of these species within the action area (MHI Federal waters) from elsewhere in the MHI (State waters). Thus, this section describes the status of the species in the entire MHI.

Over 90 percent of green sea turtle nesting in Hawaii occurs on FFS, and the great majority of green sea turtles in the Hawaiian Archipelago are thought to originate from this nesting assemblage. Inter-annual variation in nesters is high, thus the running 5-year average is more informative than the annual count: During the most recent 5 years of monitoring (2002-2006), the mean annual nesting abundance was 400 females, a five-fold increase from the 1970s. During

this 30-year period, abundances of subadult and adult green sea turtles in the MHI has also increased several fold, suggesting a rapid population increase in the Hawaiian Archipelago (Chaloupka & Balazs 2007, NMFS & USFWS 2007).

This analysis describes factors affecting the environment of the species or habitat in the MHI, including state, local, and private actions already affecting the species or actions that occur contemporaneously with the consultation in progress. Unrelated Federal actions affecting (adverse or beneficial effects) the same species or critical habitat are also part of the environmental baseline considered in this section. This section summarizes information from the Recovery Plan (NMFS & USFWS 1998) and the most recent 5-year review (NMFS & USFWS 2007), which identifies the following primary threats to green sea turtles in the MHI: Degradation of foraging habitat, fibropapillomatosis, and fisheries bycatch (described further below). The recovery plan and 5-year review also identify ingestion of marine debris, climate change, and boat collisions as threats to green sea turtles in the MHI.

7.1 Degradation of Foraging Habitat

Increasing coastal development and tourism in the MHI is resulting in more pollution, runoff, and disturbance in many of the shallow nearshore areas that green sea turtles prefer for foraging. These effects are exacerbated by certain introduced alga species, which thrive in the disturbed foraging habitat, resulting in proliferation of introduced algae that overgrow and displace native algae species that green turtles generally prefer (although they do eat some introduced algae). Foraging habitat is also degraded by boat traffic, which not only poses a collision threat for turtles, but also may cause them to reduce usage of prime foraging habitat (NMFS & USFWS 1998, 2007).

7.2 Fibropapillomatosis

Fibropapillomatosis is a disease characterized by internal or external tumors (fibropapillomas) that may grow large enough to hamper swimming, vision, feeding, and predator avoidance. Fibropapillomas have been reported in all sea turtle species, but are much more common in green sea turtles than in other species. The incidence of fibropapilloma in green sea turtles exceeded 50 percent around some MHI islands in the 1990s, but has declined significantly since then. The disease is not well understood; suggested causes include human-related habitat degradation and ingestion of toxic algae, but evidence is inconclusive. The tumors are not always lethal, and may sometimes go into remission (NMFS & USFWS 1998, 2007).

7.3 Fisheries Bycatch

The extensive use of lay gillnets (AKA laynets) in the MHI sometimes results in entanglement and drowning of green sea turtles. Of the many kinds of nets used in Hawaii, gillnets are the most problematic for ESA-listed species such as monk seals and sea turtles, because they are left untended, and entangled animals usually drown. Revised State of Hawaii regulation governing laynets began in March 2007, but they can still be legally left untended, thus the likelihood of sea turtle entanglement and drowning is still considerable. Hook-and-line fishing from shore or boats, such as the *ulua-papio* fisheries, may also hook or entangle green sea turtles, although the chance of survival is higher than if caught in a laynet. The Hawaii-based pelagic longline fishery incidentally catches several species of sea turtles, but capture of green sea turtles is rare. This fishery is managed to minimize incidental capture of sea turtles through ESA Section 7

consultations (see NMFS 2004b for shallow-set component, NMFS 2005b for deep-set component), resulting in reduction of sea turtle bycatch by over 90 percent from previous levels (NMFS 2004b, 2005b).

8 Effects of the Action on the Green Sea Turtle

As described in Approach to the Assessment above and in the appendix in more detail, the effects of the proposed action (i.e., implementation of Amendment 14 to the Bottomfish FMP in Federal waters of the MHI) on the green sea turtle are determined with a series of four analyses (effects, exposure, response, risk): 1) The *effects analysis* identifies those aspects of proposed actions that are likely to have direct and indirect effects on the physical, chemical, and biotic environment of the action area; 2) the *exposure analysis* identifies individuals of a listed species, or components of its designated critical habitat, that are likely to co-occur with these effects in space and time and the nature of that co-occurrence; 3) the *response analysis* determines whether and how those listed resources are likely to respond given their exposure; and 4) the *risk analysis* determines the risks those responses pose to the listed species and its critical habitat. Since the green sea turtle does not have proposed or designated critical habitat in the Pacific, the proposed action will have no effect on critical habitat for this species.

The effects, exposure, response and risk analyses for the green sea turtle with regard to implementation of the proposed action are described below. The proposed action is the implementation of new bottomfishing regulations within Federal waters of the MHI (see Section 3 above). The following information was used to determine effects of the proposed action on green sea turtles: the BA, the recovery plan (NMFS & USFWS 1998), the most recent 5-year review (NMFS & USFWS 2007), the Proposed Rule for Bottomfish Management Measures in Main Hawaiian Islands (73 FR 6101, February 1, 2008), the Hawaii State Data Book, the Sea Turtle Stranding Database maintained by the Pacific Islands Fishery Science Center, Chaloupka et al. (in press), and other literature cited in this opinion.

8.1 Effects Analysis

While green sea turtles generally occur in State rather than Federal waters (the action area for this consultation is limited to Federal waters of the MHI), the transit of vessels through State waters is an interrelated and interdependent action: Under the ESA, interrelated actions are defined as those that have no independent utility apart from the proposed action, and interdependent actions are defined as those that depend on the larger action for its justification (ESA Implementing Regulations, 50 CFR 402.02). The transit of bottomfishing vessels through State waters to bottomfish in Federal waters meets both of these definitions, thus the effects of interrelated and interdependent actions must be considered in this biological opinion. The transit of bottomfishing vessels through State waters of the MHI may result in vessel strikes on green sea turtles, thus the following analyses focus on vessel strikes in both State and Federal waters associated with the proposed action.

Green sea turtles are distributed throughout the coastal waters of the MHI. They are most commonly associated with suitable foraging areas with abundant algae or seagrass beds, and complex coral reef or rocky outcrops with resting locations. Because of the prevalence of their habitat, and their increasing population in the MHI (Chaloupka & Balazs 2007, NMFS & USFWS 2007), green sea turtles are common throughout the waters of the MHI. During spring

and summer, some adults leave the MHI and migrate northwest to mate and nest at FFS in the NWHI. Since adult females do not nest every year, some adults remain in coastal waters around the MHI year-round. For these reasons, the great majority of vessel strikes on green sea turtles likely occur in State waters, because virtually all foraging habitat for this species occurs in nearshore areas <3 nm from shore.

Because green sea turtles forage in shallow areas, often remain just below the surface, and often surface to breathe, they are vulnerable to being struck by vessels (Chaloupka et al., in press). A study completed in Australia found the proportion of green turtles that fled to avoid an approaching vessel increased significantly as vessel speed decreased (Hazel et al. 2007). Sixty percent of observed turtles encountered during low speed trials (2.2 knots) fled the approaching vessel. Flight response dropped to 22 percent and 4 percent at moderate (5.9 knots) and fast (10.3 knots) vessel speeds, respectively. Those that fled at higher vessel speeds did so at significantly shorter distances. The results implied that sea turtles can not be expected to actively avoid a vessel traveling faster than 2.2 knots. The authors suggested that visual rather than auditory cues were more likely to provoke a flight response.

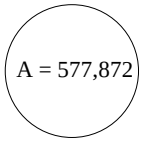
Green sea turtles are very unlikely to be hooked or entangled by bottomfishing gear. An observer program operated for two 3-year periods (1990-93, 2003-05) for the bottomfish fishery in the NWHI (Nitta & Henderson 1993, NMFS 2003, 2004a, 2005a), covering approximately 50 fishing trips. No green sea turtles, or any other ESA-listed species under NMFS jurisdiction (i.e., sea turtles or marine mammals), were ever observed to be hooked or entangled in this fishery. Although green turtles are very abundant around the MHI, they forage in shallow water (usually <30 m) and feed on algae. Thus green turtles are usually spatially separated from bottomfishing gear, which is typically fished between 30 and 200 m of depth. Furthermore, Hawaiian green turtles feed almost exclusively on algae, and are thus not likely to feed on the bait used in this fishery (Gulko & Eckert 2004). Another potential adverse effect of the proposed action on green turtles is being hooked by bottomfish vessels that switch to pelagic trolling, However, the troll, handline, and pole-and-line pelagic fisheries will be the subject of a separate consultation, thus their effects will be considered at that time. Therefore, the following exposure, response and risk analyses only cover vessel strikes associated with the proposed action.

8.2 Exposure and Response Analyses

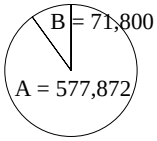
Limited information is available on the exposure and response of green sea turtles to vessel strikes from the proposed action, thus it is not possible to distinguish exposure from response. Exposure and response of turtles to vessel strikes are therefore described together below.

The likelihood of exposure and response of green sea turtles to lethal vessel strikes was estimated using the six-step process shown in Figure 3, and described in more detail after the figure:

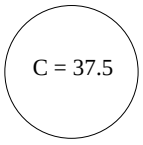
Step 1: Estimate total # vessel trips/yr (A from table below):



Step 2: Estimate total # bottomfish (BF) vessel trips/yr (B from table below):

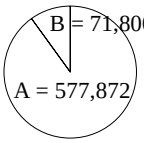


Step 3: Estimate annual turtle mortalities from vessel strikes during the 10-year periods 1998-2007 (C from table below):



Step 4: Calculate annual turtle mortalities from BF vessel strikes during the 10-year period 1998-2007 (D from table below; B/A is proportional to D/C because of assumption that each MHI vessel trip has equal probability of striking and killing a turtle – see Assumption #1 in text):

Since B/A = D/C, then:



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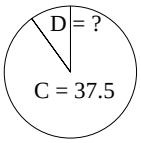

, or (B)(C)/A = D, so
(71,800)(37.5)/577,872 = D = <u>4.66 turtles/yr</u>

Step 5: Calculate annual turtle mortalities from BF vessel strikes during the 10-year period 1998-2007 due to operation of the fishery in Federal waters, i.e., 53% of the fishery (E from table below):

(D)(0.53), or (7.5)(0.53) = E = <u>2.47 turtles/yr</u>

Step 6: Calculate predicted annual turtle mortalities from BF vessel strikes due to the proposed action, which will reduce effort by 24% (F from table below):

(E)(0.76), or (4)(0.76) = F = <u>1.88 turtles/yr</u>

	Variables (#/yr) in MHI Bottomfish (BF) Fishery	Mean	Low	High
A	Total Vessel Trips/yr	577,872	270,112	885,632
B	Bottomfishing (BF) Vessel Trips/yr	71,800	23,200	120,400
C	Turtle Mortalities/yr, All Vessel Strikes, 1998-2007	37.5	25	50
D	Turtle Mortalities/yr from BF Vessel Strikes, 1998-2007	4.66	2.15	6.80
E	Turtle Mortalities/yr, BF Vessels, Fed Waters, 1998-2007	2.47	1.14	3.60
F	Predicted Mortalities/yr, BF Vessel Strikes, Prop. Action	1.88	0.87	2.74

Figure 3. Steps for estimating annual vessel strike mortalities in MHI from the bottomfish fishery.

6-step Process for Turtle Exposure and Response Analyses

<u>Assumptions</u>

1. All vessel trips in the MHI have an equal likelihood of striking a turtle.
2. Bottomfishing trips are equally distributed throughout MHI bottomfish habitat, 53 percent of which is in Federal waters (Parke 2007), thus 53 percent of MHI bottomfishing trips are in Federal waters.
3. The proposed action will reduce the number of bottomfishing trips in Federal waters by 24 percent.

Steps

Where possible, all numbers are an average taken over the last 10 years, or over all years within the last 10 years for which data were available. Ranges of values are given to reflect uncertainty:

Step 1: The total number of vessel trips in the MHI per year was estimated by first estimating the number of vessels in the following categories (1), then estimating the number of trips per vessel per year for each category (2), then adding the results together for a grand total (3):

1) Vessel numbers (Total registered vessels: 15,338, State Data Book, 2006, Table 18.48, av. 1997-2006):
   a) Commercial vessels:
   b) Commercial Use permits: 523 (Hawaii Dept of Boating and Ocean Recreation, 2005).
   c) Fishing vessels in State's commercial fisheries: ~2,300 (personal communication, R. Kokubun, Hawaii Division of Aquatic Resources).
      i) Non-commercial vessels: 15,338 – 2823 = 12,515
      ii) Total = 523 + 2,300 = 2,823.
2) Vessel trips:
   a) Commercial vessels (excluding cargo): This category includes commercial fishing boats (2,300), and all other 'commercial use vessels (523). Use 40 – 80 trips/yr as the range for all commercial fishing boats, based on the estimate of 60 trips/yr for commercial bottomfishing boats (from Proposed Rule for Bottomfish Management Measures in Main Hawaiian Islands, 73 FR 6101, February 1, 2008), and 80 - 120 trips/yr for all other 'commercial use' vessels:
      i) 2,300 commercial fishing boats x 40 - 80 trips/yr = 92,000 – 184,000 trips/year
      ii) 523 commercial use vessels x 80 – 120 trips/yr = 41,840 – 62,760 trips/year
      iii) Total commercial trips/yr = 133,840 – 246,760
   b) Non-commercial vessels: Use 10 - 50 trips/yr (73 FR 6101; this is the range of #/trips/yr of non-commercial bottomfishing boats in the Proposed Rule, so use for all non-commercial boats, as that is the best available information): 12,515 non-commercial boats x (10 - 50 trips/yr) = 125,150 – 625,750 trips/year.
   c) Cargo trips: Cargo vessel arrivals (State of Hawai'i Data Book, 2006, Table 18.50): 10,122/yr (average 2004-2005).
   d) Miscellaneous trips (Superferry, cruise ships, military vessels): 1,000 – 3,000
3) Total vessel trips in MHI per year: (Commercial, Non-Commercial, Cargo, Misc): (133,840 – 246,760) + (125,150 – 625,750) + 10,122 + (1,000 – 3,000) = A = 270,112 – 885,632 trips/yr, so mean for **Variable A = 577,872 trips/yr**.

Step 2: Number of bottomfishing trips in the MHI per year:

1) Bottomfishing Boats in State: (73 FR 6101):
   a) Commercial: 380 (the number of active permits in 2003, the most recent year for which data are available according to 73 FR 6101 – this number was used instead of the 300 vessels listed in the BA).
   b) Non-commercial: 800 to 1,800 (the number of non-commercial vessels estimated to be active in the fishery according to 73 FR 6101 – this number was used instead of the 800 to 5,000 vessels listed in the BA).

2) Bottomfishing Boat Trips:
   a) Commercial: 40 – 80 trips/yr (73 FR 6101), so (40 – 80) x 380 = 15,200 – 30,400 trips/yr.
   b) Non-commercial: (800 – 1,800 boats) x (10 – 50 trips/yr/boat) = 8,000 – 90,000 trips/yr (73 FR 6101).
3) Total bottomfishing trips in MHI per year: (15,200 + 8,000) – (30,400 + 90,000) trips, or B = 23,200 – 120,400 trips, so mean for **Variable B = 71,800 trips/yr**.

Step 3: The total number of green sea turtles killed each year in recent years (1998-2007) in the MHI by vessel strikes was estimated using the numbers of stranded turtles (i.e., dead turtles found on land) determined to have been killed by vessel strikes. Data on cause of mortality of stranded turtles in the MHI has been collected since the 1980s and compiled in the Hawaii Sea Turtle Stranding Database managed by the Pacific Island Fisheries Science Center (PIFSC). The literature was then used to estimate the proportion of fatally-struck green sea turtles in the MHI that are stranded, found and reported, allowing an estimate of the total number of green turtles that are struck and killed by vessels in the MHI each year.

1) Between 1998 and 2007, an average of 8 stranded green sea turtles per year in the MHI were determined to have died from vessel strikes (Hawaii Sea Turtle Stranding Database 2007). PIFSC classifies cause of death as vessel strike if a turtle has 'gross evidence of linear to parallel carapace fractures indicative of propeller, skeg or hull strikes' (Chaloupka et al., in press). The purpose of such guidelines is to ensure that no stranded turtles are falsely classified as having died from vessel strikes, meaning that 8 stranded turtles per year killed this way represents a minimum. Between 1982 and 2003, of the 3,732 stranded turtles that were examined in the MHI, 2.7% were determined to have died from vessel strikes, whereas 49% were classified as unknown cause of death (Chaloupka et al., in press). It is very likely that some of those that died of unknown causes actually died of vessel strikes. For example, turtles struck by flat-bottom boats like the common Boston Whaler might not show injuries that meet the above criteria. Flat-bottom boats are especially common in Kaneohe Bay, where stranded turtles with boat strike injuries are most commonly found in the MHI (Chaloupka et al., in press). Thus, to address this likely underestimate, NMFS estimates that an average of 10 green sea turtles per year were stranded from 1998 – 2007 in the MHI due to vessel strikes.
2) Stranded turtles found and reported in the MHI represent some proportion of the total number of turtles that die in MHI waters, because some dead or dying turtles do not strand, or are not found or reported after they strand. In the Atlantic, Murphy & Hopkins-Murphy (1989) and Epperly et al. (1996) report that sea turtles strandings represent 7-27% of at-sea mortality. In these studies, distance from shore of boat collisions with turtles was likely greater than in Hawaii because of turtle distribution. In addition, ocean currents in the Atlantic study areas were offshore, transporting dead turtles away from land. In Hawaii, most boat collisions occur on the windward side of Oahu (Chaloupka et al., in press), where tradewinds are likely to transport turtles towards land. Because of Hawaii's bathymetry (limited shallow water), adult green turtle foraging and resting habitats are confined to within a short distance from shore. Ocean currents likely often carry stranded turtles towards land, although some may be carried through the channels between the islands. Most MHI shorelines are heavily used by people year-round, so most carcasses are likely to be found, although not all will be reported. Thus, turtle strandings in Hawaii are likely to represent a somewhat higher proportion of at-

sea mortalities than reported above in the Atlantic (7-27%). For these reasons, NMFS estimates that reported, stranded turtles with vessel strike injuries in Hawaii represent 20 - 40% of at-sea mortalities due to vessel strikes.

3) Given the estimate of 10 stranded turtles/yr in the MHI killed by vessel strikes (Step 3, Point 1) above), and the estimate that these represent 20 – 40% of all green sea turtles killed in the MHI annually by vessel strikes (Point 2) above), we can calculate the total number of turtles killed per year in the MHI by vessel strikes: 10/0.4 – 10/0.2 = C = 25 – 50 turtles/yr, so mean for **Variable C = 37.5 turtles/yr.**

Step 4: The number of green sea turtles killed each year during recent years (1998-2007) in the MHI by bottomfishing vessel strikes was calculated using the above means for Variables A, B, and C. Because of Assumption #1 (all vessel trips in the MHI have an equal likelihood of striking a turtle), the ratio of bottomfish trips (B) to total trips (A) is proportional to the ratio of turtles killed by bottomfish vessel strikes (D) to total number of turtles killed by all vessel strikes (C). Thus, B/A = D/C, and (B)(C)/A = D. Plugging in the means for Variables A, B, and C: (71,800)(37.5)/577,872 = D = 4.66 turtles per year killed by bottomfish vessel strikes in MHI, so mean for **Variable D = 4.66 turtles/yr**. Low is calculated by plugging in the lows for Variables A, B, and C: (23,200)(25)/270,112 = 2.15 turtles/yr. High is calculated by plugging in the highs: (120,400)(50)/885,632 = 6.80 turtles/yr.

Step 5: The number of green sea turtles killed each year during recent years (1998-2007) in the MHI by bottomfishing vessel strikes due to the component of the fishery operating in Federal waters is calculated by multiplying Variable D by 0.53. This refers to turtles that are killed by vessel strikes by bottomfishing vessels transiting State waters to and from Federal waters, and by those vessels when they are in Federal waters. Because of the assumption that fishing trips are equally distributed throughout MHI bottomfish habitat (Assumption #2), and 53 percent of bottomfish habitat is in Federal waters (Parke 2007), (D)(0.53) = E, so E = (4.66)(0.53) = 2.47 turtles per year killed by bottomfish vessel strikes in MHI by component of fishery operating in Federal waters, so mean for **Variable E = 2.47 turtles/yr**. Low is calculated by plugging in the lows for Variable D: (2.15)(0.53) = 1.14 turtles/yr. High is calculated by plugging in the high: (6.80)(0.53) = 3.60 turtles/yr.

Step 6: The number of green sea turtles likely to be killed each year in the MHI by bottomfishing vessel strikes due to the component of the fishery operating in Federal waters when the fishery is reduced by 24 percent, i.e., the proposed action, is calculated by multiplying Variable E by 0.76: (E)(0.76) = F, so F = (2.47)(0.76) = 1.88 turtles per year killed by the proposed action, i.e., bottomfish vessel strikes in MHI by component of fishery operating in Federal waters after fishery is reduced by 24 percent, so mean for **Variable F = 1.88 turtles/yr**. Low is calculated by plugging in the lows for Variable E: (1.14)(0.76) = 0.87 turtles/yr. High is calculated by plugging in the high: (3.60)(0.76) = 2.74 turtles/yr.

8.3 Risk Analysis

The estimated rate of vessel strikes of green sea turtles resulting from the proposed action (new regulations for the bottomfish fishery in Federal waters of the MHI) is expected to be up to two fatal collisions per year (Fig. 3). The green sea turtle population in the MHI has increased in the past 30 years (Chaloupka & Balazs 2007, NMFS & USFWS 2007) while the bottomfish fishery

was operating at higher effort than the proposed action. The recent rapid increase of green sea turtle numbers in the MHI while the bottomfish fishery was operating at a higher level than the proposed action, and the low expected mortality rate of turtles from the proposed action, together lead NMFS to conclude that incidental collisions resulting from the proposed action are unlikely to reduce the numbers, reproduction, or distribution of the green sea turtle.

9 Cumulative Effects

Cumulative effects[6] include the effects of future State, Tribal, local, private, or other non-Federal actions that are reasonably certain to occur in the Action Area (50CFR402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The action area for this consultation is the Federal waters of the MHI (Fig. 1). Because green turtles are mobile and migrate extensively (Balazs 1994), they move back and forth between Federal and State waters, thus it is not possible to distinguish cumulative effects in Federal vs. State waters (similar to how the Environmental Baseline was described for State and Federal waters – see Section 7). Thus, this section describes cumulative effects in State and Federal waters in the entire MHI.

Future State, Tribal, local, private, or other non-Federal actions that may affect green turtles in MHI State waters include vessel traffic, coastal development, tourism, fishing, and other human activities. Subadult and adult green sea turtles in the MHI are found primarily within State waters because they forage and rest in shallow nearshore areas, putting them in harms way because of the transit of large numbers of vessels through these waters. A half million or more vessels pass through State waters every year (Section 8.2), the great majority of which are not part of any Federal action, causing many turtle injuries and mortalities because of collisions (Chaloupka et al., in press). Increasing tourism in the MHI is resulting in more people in the water disturbing turtles and potentially disrupting their feeding and resting behavior. The extensive use of lay gillnets (AKA laynets) in the MHI sometimes results in entanglement and drowning of green sea turtles. Of the many kinds of nets used in Hawaii, gillnets are the most problematic for turtles, because they are left untended, and entangled animals usually drown. Revised State of Hawaii regulation of laynets began in March 2007, but they can still be legally left untended, thus the likelihood of sea turtle entanglement and drowning is still considerable. Hook-and-line fishing from shore or boats, such as the *ulua-papio* fisheries, may also hook or entangle green sea turtles, although the chance of survival is higher than if caught in a laynet (Gulko & Eckert 2004; NMFS & USFWS 1998, 2007).

In Federal waters of the MHI, future State, Tribal, local, or private actions are very limited, because fishing in Federal waters is Federally regulated (and thus not part of the cumulative effects, because of coverage under separate ESA consultations). Shipping and other vessel traffic not related to fishing is probably the only type of activity that may result in cumulative effects on green sea turtles. However, green sea turtles are primarily found within State waters. NMFS is not aware of any proposed or anticipated changes in other human-related actions within MHI Federal waters (e.g., poaching, habitat degradation) or natural conditions (e.g., over-abundance

[6] "Cumulative effects", as defined for the purposes of the ESA, are limited to the effects of future, non-Federal actions in the Action Area.

of land or sea predators, changes in oceanic conditions, etc.) that would substantially change the impacts that each threat has on seals or turtles covered by this Opinion.

Climate change effects also contribute to cumulative effects. Impacts to green sea turtles from climate change may include skewed sex ratios of hatchlings, loss of nesting habitat, and other impacts. Increasing air temperatures may cause higher sand temperatures on nesting beaches, altering the thermal regime of incubating nests, which in turn alters the natural sex ratio within hatchling cohorts. Sea level rise is likely to affect low-lying beaches where sand depth is a limiting factor, as the sea may inundate nesting sites and decrease available nesting habitat. This loss of habitat could be exacerbated by a combination of environmental and oceanographic conditions linked to climate change, leading to increased frequency of storms and/or changed prevailing currents, both of which could lead to increased beach loss via erosion (NMFS & USFWS 2007).

10 Conclusion

As noted in Section 6.3, 11 of the 12 ESA-listed marine species are not likely to be adversely affected by the proposed action. Only the green sea turtle is likely to be adversely affected, thus the above effects analysis was conducted to determine if the proposed action is likely to jeopardize the continued existence of the green sea turtle. After reviewing the current status of the green sea turtle, the environmental baseline within the action area, the effects of the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action (new regulations for the bottomfish fishery in Federal waters of the MHI) as described is not likely to jeopardize the continued existence of the green sea turtle. The green sea turtle population in the MHI has increased in the past 30 years (Chaloupka & Balazs 2007, NMFS & USFWS 2007) while the bottomfish fishery was operating at higher effort than the proposed action. The recent rapid increase of green sea turtle numbers in the MHI while the bottomfish fishery was operating at a higher level than the proposed action, and the low expected mortality rate of green sea turtles from the proposed action, together support this conclusion. There is no proposed or designated critical habitat within the action area, thus the proposed action will not result in the destruction or adverse modification of any proposed or designated critical habitat.

11 Incidental Take Statement

Section 9 of the ESA and protective regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered to be prohibited taking under the ESA provided that such taking is in compliance with the reasonable and prudent measures and terms and conditions of the Incidental Take Statement.

NMFS believes that the incidental take of up to two green sea turtles per year (Table 3) may be expected to occur due to the proposed action (i.e., implementation of new bottomfishing regulations within Federal waters of the MHI), due to vessel strikes of turtles as bottomfishing vessels are transiting State waters en route to and from Federal waters, or within Federal waters.

If, during the course of the action, this level of incidental take is exceeded, reinitiation of consultation will be required (50 CFR 402.16).

Table 3. The number of green sea turtles expected to be killed per year as a result of the implementation of new bottomfishing regulations within Federal waters of the MHI.

	Number killed/yr
Green sea turtles	2

12 Conservation Recommendations

Section 7(a)(1) of the Act directs Federal agencies to utilize their authorities to further the purposes of the Act by carrying out conservation programs for the benefit of endangered and threatened species. Conservation recommendations are discretionary agency activities to minimize or avoid adverse effects of a proposed action on listed species or critical habitat, to help implement recovery plans, or develop information.

The following conservation recommendations are provided pursuant to section 7(a)(1) of the ESA for green sea turtles:

1. Vessel strikes or any other interactions of turtles with bottomfishing activity should be reported by calling (808) 983-5730 (Oahu) or the appropriate number (depending on location) as shown on the Sea Turtle Stranding Telephone and Pager Number webpage at http://www.pifsc.noaa.gov/psd/mtrp/turtle_contact.php
2. Bottomfishing vessel operators should reduce speed and be particularly vigilant for turtles when in nearshore waters where turtles are typically abundant.

The following conservation recommendations are provided pursuant to section 7(a)(1) of the ESA for Hawaiian monk seals:

1. Bottomfish fishers should remove fishing gear from the water if a seal/seals are in the vicinity.
2. Interactions of seals with bottomfishing should be reported by calling the Marine Mammal Stranding and Entanglement Hotline (1-888-256-9840), noting location, gear type, and amount of trailing gear (if any).

13 Reinitiation Notice

This concludes formal consultation on the implementation of new bottomfishing regulations within Federal waters of the MHI. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained (or is authorized by law) and if: (1) the amount or extent of the incidental take is exceeded; (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion; (3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat not considered in this opinion; or (4) a new species is listed or critical

habitat designated that may be affected by the action. If the amount or extent of incidental take identified in the incidental take statement that is enclosed in this biological opinion is exceeded, NMFS SFD should immediately request initiation of formal consultation.

14 Literature Cited

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