10.D.1.a.iii(1)-REV 1

151 CM
ACTION ITEM

WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

Specification of an Annual Catch Limit and Annual Catch Target for the Main Hawaiian Islands Deep 7 Bottomfish Complex for the 2011-12 Fishing Year

May 26, 2011

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

Table of Contents

TABLES

FIGURES

1.0 Background Information

Bottomfish fishing in federal waters around Hawaii is managed under the Fishery Ecosystem Plan for the Hawaii Archipelago (Hawaii FEP), developed by the Western Pacific Fishery Management Council (Council) and implemented by the National Marine Fisheries Service (NMFS) under the authority of the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act (MSA)). Until recently, the fisheries for Hawaiian archipelagic bottomfish stocks operated in two management subareas: (1) the inhabited main Hawaiian Islands (MHI) with their surrounding reefs and offshore banks; and (2) the Northwestern Hawaiian Islands (NWHI), a 1,200-nautical mile chain of largely uninhabited islets, reefs, and shoals. In 2009, the NWHI fishery was terminated to be in compliance with the Papahanaumokuakea Marine National Monument (Monument) which prohibits commercial fishing, although sustenance fishing for bottomfish is allowed to continue in accordance with Monument regulations (71 FR 51134, August 29, 2006). Therefore, bottomfish fishing managed under the Hawaii FEP only occurs in the MHI.

The MHI bottomfish fishery harvests an assemblage, or complex of 14 species that include nine snappers, four jack/trevally and a single species of grouper. However, the target species of a fishery, and the species of primary management concern are six deep-water snappers and the grouper. Termed the "Deep 7 bottomfish," they include: onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), opakapaka (*Pristipomoides filamentosus*), lehi (*Aphareus rutilans*) and hapuupuu (*Epinephelus quernes*). Federal requirements for the MHI bottomfish fishery include vessel identification, non-commercial fishing permits, non-commercial catch and effort logbooks, a non-commercial bag limit of five Deep 7 bottomfish per trip, and the specification of an annual catch limit (ACL) for the complex, including accountability measures (AMs) for adhering to the catch limit. For management purposes, the fishing year for the MHI Deep 7 bottomfish complex begins on September 1 and ends on August 31 the following year. For all other bottomfish stocks, the fishing year begins January 1 and ends on December 31.

For the past four fishing seasons (2007-2010), the MHI bottomfish fishery was managed through a total allowable catch (TAC) limit that was applied to the Deep 7 bottomfish complex only. The TAC system was created in response to a 2005 determination by NMFS that overfishing was occurring on the archipelagic-wide bottomfish multi-species complex (archipelagic bottomfish stocks) with the primary problem being excessive fishing mortality on the Deep 7 bottomfish species in the MHI (FR 73 18450, April 4, 2008). To end and prevent overfishing, the MHI Deep 7 bottomfish TAC was specified annually by NMFS, as recommended by the Council based upon the best available scientific, commercial, and other information. NMFS and the State of Hawaii monitored progress towards the TAC based on commercial bottomfish landing data submitted to the state by commercial marine license (CML) holders, and when the TAC was projected to be reached, NMFS closed the commercial and non-commercial MHI Deep 7 bottomfish sectors in federal waters until the end of the fishing year. Hawaii law allows the state to adopt a complementary closure for MHI Deep 7 bottomfish in state waters.

To keep fishermen and the public informed on progress towards the TAC and the projected in-season closure date, catch information is posted online throughout each fishing year at www.hawaiibottomfish.info, as well as on the NMFS Pacific Islands Region website.

1.1 Previous TAC Limits for MHI Deep 7 Bottomfish

2007-08 Fishing Year

Based on a 2006 stock assessment (Moffitt et al. 2006) prepared by NMFS Pacific Islands Fisheries Science Center (PIFSC), the MHI Deep 7 bottomfish TAC for the 2007-08 fishing year was set at 178,000 lb (73 FR 18450, April 4, 2008). This TAC represented a 24 percent reduction in fishing mortality based on 2004 data, and was necessary to end overfishing on the archipelagic bottomfish stocks. Monitoring of commercial landings toward the TAC began on October 1, 2007, and the MHI Deep 7 bottomfish fishery was closed on April 16, 2008 (73 FR 18717, April 7, 2008). However, due to a lag in commercial fishermen catch report submittals (which until October 2010, was allowed to be submitted by the 10^{th} day of the month following a fishing trip pursuant to state law), the final catch total for 2007-08 was 196,147 lb of Deep 7 bottomfish (18,147 lb, or 10 percent greater than the specified TAC) (HDAR 2010).

2008-09 Fishing Year

Based on an overfishing risk assessment completed by PIFSC in 2008 (Brodziak et al. 2008) and a draft 2008 bottomfish stock assessment update (Brodziak et al. 2009), the MHI Deep 7 bottomfish TAC for the 2008-09 fishing year was set at 241,000 lb (74 FR 6998, February 12, 2008). The TAC had a zero risk of overfishing the archipelagic bottomfish stocks and a 40 percent risk of localized depletion (i.e., risk of overfishing) of the MHI subarea bottomfish stocks. This stock assessment update also found that archipelagic bottomfish stocks were no longer subject to overfishing. Monitoring of commercial landings toward the 2008-09 TAC began on September 1, 2008, and the MHI bottomfish fishery was closed on July 6, 2009 (74 FR 27253, June 9, 2009). Due to the lag in commercial fishermen catch report submittals, the final catch total for 2008-09 was 259,194 lb of Deep 7 bottomfish (HDAR 2010). This catch was 18,194 lb, or 8 percent greater than the specified TAC.

2009-10 Fishing Year

For the 2009-10 MHI Deep 7 fishing year, the TAC was set at 254,050 lb (74 FR 48422, September 23, 2009). This TAC, developed by the Council's SSC, was based upon MHI Deep 7 bottomfish catch data from 1982-2007. The average catch for the MHI Deep 7 bottomfish for that time period was 339,698 lb, and the median catch was 308,526 lb, with the 25th percentile being 254,050 lb. Based on the overfishing risk analyses contained in the 2008 stock assessment from PIFSC (Brodziak et al. 2009), the 254,050 lb TAC was associated with zero risk of overfishing the archipelagic bottomfish stocks, and between 39 and 44 percent risk of localized depletion of the MHI subarea bottomfish stocks (74 FR 42641, August 24, 2009). Monitoring of commercial landings toward the 2009-10 TAC began on September 1, 2009, and the MHI bottomfish fishery was closed on April 20, 2010 (75 FR 170701 April 5, 2010). Due to a combination of adverse weather conditions and inadvertent duplication of accounting Deep 7 landings from manually submitted commercial catch reports and a newly implemented online reporting system, the final catch total for 2009-10 was 208,412 lb of Deep 7 bottomfish (-45,638 lb, or 18 percent short of the specified TAC) (HDAR 2010).

2010-11 Fishing Year

For the 2010-11 MHI Deep 7 fishing year, the TAC was set again at 254,050 lb (75 FR 53606, September 1, 2010) and was associated with zero risk of overfishing the archipelagic bottomfish stocks, and between 33 and 38 percent risk of localized depletion of the MHI subarea bottomfish stocks (75 FR 45086, August 2, 1010). Monitoring of commercial landings toward the 2010-11 TAC began on September 1, 2009, and the MHI bottomfish fishery was closed on March 12, 2011 (76 FR 10524, February 25, 2011). As of May 24, 2011, the actual catch for 2010-11 is 268,089 lb of Deep 7 bottomfish. This catch is 14,039 lb, or 5.5 percent, higher than the specified TAC. Table 1 summarizes the MHI Deep 7 bottomfish TAC limits, fishery closure dates and actual catches for the 2007-08 through the 2010-11 fishing years.

Table 1. MHI Deep 7 TAC Limits, Fishery Closure Dates and Actual Catch 2007-2010

Fishing Year	Specified TAC Limit	Date Fishery Closed	Actual Catch Total (lbs)	Overage (+) / Underage (-) (lbs)
2007-2008	178,000 lb	Apr. 16, 2008	196,147	+18,147 (10%)
2008-2009	241,000 lb	Jul. 6, 2009	259,194	+18,194 (8%)
2009-2010	254,050 lb	Apr. 20, 2010	208,412	-45,638 (-18%)
2010-2011	254,050 lb	Mar. 12, 2011	268,089	+14,039 (5.5%)

1.2 Recent Changes to State MHI Bottomfish Fishery Management Measures

In October 2010, the State of Hawaii Department of Land and Natural Resources (DLNR) revised the Hawaii Administrative Rules (HAR) pertaining to bottomfish management in state waters. The new rule established a requirement for CML holders to report all bottomfish catches within five days after the end of a trip (HAR 13-74-20; effective October 18, 2010). Prior to this rule change, catch reports were required to be submitted by the 10th day of the month following a fishing trip. This allowed for reports to be submitted up to 40 days after a fishing trip. The intent of the rule change was to improve the accuracy in monitoring of catch towards the catch limit by minimizing delay in catch report submittals. The rule also changed the State's non-commercial bag limit from five ehu or onaga or a combination of these two species per day, to a bag limit of any five Deep 7 bottomfish per day (HAR 13-94-7, effective October 18, 2010). The intent of the change is to make state law consistent with the federal bag limit for non-commercial Deep 7 bottomfish. The rule also changed the one-time bottomfish vessel registration requirement to an annual renewal requirement. This change was needed to update the state database of all registered commercial and non-commercial bottomfish vessels, and to help ensure that the list is kept current (HAR 13-94-9, effective October 18, 2010).

1.3 Annual Catch Limit and Accountability Measure Mechanism

In 2006, the MSA was reauthorized and required regional fishery management councils to amend their fishery management plans (FMP) to include a mechanism for specifying ACLs for all fisheries at a level such that overfishing does not occur, and to implement measures to ensure accountability (AM) for adhering to the catch limits. In response to the ACL requirement, the Council amended its five FEPs, including the Hawaii FEP to establish a mechanism for specifying ACLs and AMs in western Pacific fisheries (76 FR ___, DATE).

Pursuant to Amendment 3 to the Hawaii FEP (76 FR 14367, March 16, 2011), there are three required elements in the ACL mechanism. The first requires the Council's SSC to calculate an acceptable biological catch (ABC) that is set at or below the stock's overfishing limit (OFL). For stocks like the Hawaii bottomfish stocks that have estimates of maximum sustainable yield (MSY) and other MSY-based reference points derived from statistically-based stock assessment models (Tier 1-3 quality data), the ABC is calculated by the SSC based on an ABC control rule that accounts for scientific uncertainty in the estimate of the OFL, and the acceptable level of risk (as determined by the Council) that catch equal to the ABC would result in overfishing. In plain English, ABC is the maximum value for which the probability or risk of overfishing (P*) is equal to or less than 50 percent. By law, the probability of overfishing cannot exceed 50 percent and should be a lower value (74 FR 3178, January 9, 2011). Amendment 3 to the Hawaii FEP includes a qualitative process by which the P* value may be reduced below 50 percent based on consideration of four dimensions of information: assessment information, uncertainty characterization, stock status, and stock productivity and susceptibility.

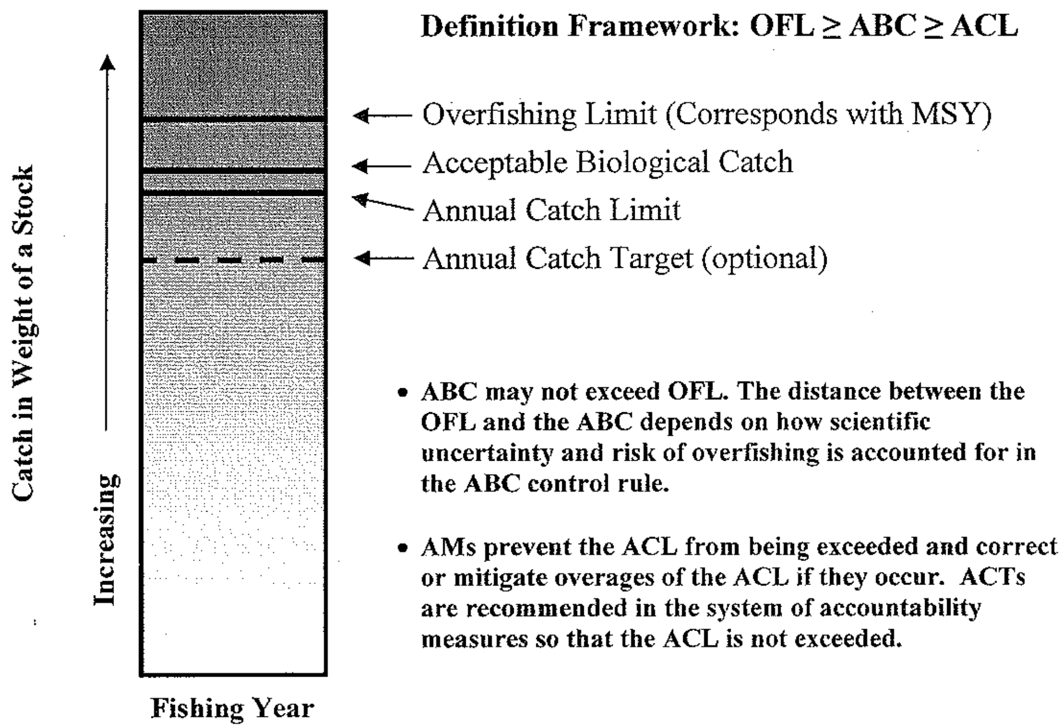
The second element requires the Council to determine an ACL that may not exceed the SSC-recommended ABC. Amendment 3 to the Hawaii FEP includes methods by which the ACL may be reduced from the ABC based on social, economic, ecological, and management uncertainty (SEEM) considerations. An ACL set below the ABC further reduces the probability that actual catch will exceed the OFL and result in overfishing; however, the ACL may be set equal to ABC if an annual catch target (ACT) is used.

The third and final element in the ACL mechanism is the inclusion of AMs. AMs prevent ACLs from being exceeded and correct or mitigate overages of ACLs if they occur. For example, AMs may include, but are not limited to, closing the fishery, closing specific areas, changing bag limits, or other methods to reduce catch. An ACT may also be used in the system of AMs so that an ACL is not exceeded. An ACT is the management target of the fishery and accounts for management uncertainty in controlling the actual catch at or below the ACL.

If the Council determines that an ACL has been exceeded, the Council may recommend as an AM that NMFS reduce the ACL in the subsequent fishing year by the amount of the overage. In determining whether an overage adjustment is necessary, the Council would consider the magnitude of the overage and its impact on the affected stock's status. Additionally, if an ACL is exceeded more than once in a four-year period, the Council is required to re-evaluate the mechanism of ACLs and AMs and adjust the system as necessary to improve its performance and effectiveness. Figure 1 illustrates the relationship between the terms used in this section.

For more details on the specific elements of the ACL mechanism, see Amendment 3 to the Hawaii FEP (76 FR 14367, March 16, 2011) and the final implementing regulations (76 FR ___, DATE). The ACL mechanism supersedes the TAC system for the MHI Deep 7 bottomfish fishery starting in the 2011-12 fishing year. ACLs will be required for all other bottomfish management unit species starting in the 2012 fishing year, which begins January 1, 2012.

Figure 1. Relationship between OFL, ABC, ACL, and ACT.



1.4 Purpose and Need

Provisions of the Hawaii FEP require NMFS to specify an ACL for the MHI Deep 7 bottomfish complex as recommended by the Council, as well as require AMs to be implemented to ensure the ACL is not exceeded and correct or mitigate overages of ACLs if they occur. The fishery management objective is to specify an ACL and AMs that will prevent overfishing from occurring, and ensure long-term sustainability of Hawaii's bottomfish stocks. Therefore, NMFS, as recommended by the Council, will specify an ACL for the MHI Deep 7 bottomfish stock complex for fishing year 2011-12, including AMs (e.g. ACT and fishery closure) to ensure the ACL is not exceeded.

2.0 Description of the Alternatives

The alternatives considered in this document are limited to ACL and AMs as they are the management measures to be applied to the fishery for the MHI Deep 7 bottomfish stock complex. Although the OFL and ABC are part of the ACL mechanism, the establishment of these reference points is not part of the proposed federal action, but is described for informational purposes.

2.1 Development of the Alternatives

Overview of the 2010 Stock Assessment

The 2010 stock assessment update for the MHI Deep 7 bottomfish stock complex was conducted by PIFSC through fishing year 2010 and included projections to determine catch limits and their associated probabilities of overfishing (Brodziak et al. *in prep*). The 2010 stock assessment uses similar commercial fishery data as in the 2008 assessment update (Brodziak et al. 2009), but includes a modified treatment of unreported catch and catch per unit effort (CPUE) standardization in response to recommendations from the Western Pacific Stock Assessment Review (WPSAR) of the 2008 update (Stokes 2009).

To address the unreported catch issue, the 2010 assessment includes four scenarios of unreported catch developed from available information which are described in detail in (Brodziak et al. *in prep*). The four scenarios are labeled in order of magnitude from the highest (Scenario 1) to the lowest (Scenario 4) estimates of unreported catch.

- Catch Scenario 1: **Unreported catch is 2 times commercial reported catch**
- Catch Scenario 2: **Unreported catch equals the commercial reported catch**
- Catch Scenario 3: **Unreported catch is one-fifth the commercial reported catch**
- Catch Scenario 4: **There is no unreported catch**

According to the 2010 assessment, the Catch Scenario 2 is the baseline because it uses the best available information on unreported to reported catch ratios estimated for individual Deep7 bottomfish species.

To address CPUE issue, the 2010 assessment includes three scenarios to represent changes in fishing power of the fleet that targets Deep 7 bottomfish for commercial catch.

- CPUE Scenario 1: **Negligible change in bottomfish fishing power through time.**
- CPUE Scenario 2: **Moderate change in bottomfish fishing power through time. Specifically, this scenario assumed that: (i) there was no change in fishing power during 1949-1970; (ii) fishing power increased at a rate of 0.25 percent per year during 1971-1980; fishing power increased at a rate of 0.5 percent per year during 1981-1990; (iii) fishing power increased at a rate of 0.25 percent per year during 1991-2000; and (iv) fishing power did not change during 2001-2010.**
- CPUE Scenario 3: **Substantial change bottomfish fishing power through time. Specifically, this scenario assumed that a substantial change in fishing power**

scenario had occurred since the 1950s with an average increase in fishing power of roughly 1.2% per year.

According the 2010 assessment, CPUE Scenario I was the baseline assessment because it best represented the scientific information about the efficiency of the Deep7 bottomfish fishing fleet through time and also because it did not include ad hoc assumptions about changes in fishing power for the deep handline fishery that has traditionally harvested the Deep7 bottomfish complex in the MHI.

Estimation of OFL

The stock assessment included projection results of a range of commercial catches of Deep 7 bottomfish that would produce probabilities of overfishing ranging from zero percent to 100 percent, and at five percent intervals in fishing year 2011-12 and in 2012-13 (Brodziak et al., *in prep.*). Under the Catch 2/CPUE 1 scenario combination, the long-term maximum sustainable yield (MSY) of the MHI Deep 7 bottomfish stock complex is estimated to be 417,000 lb. The assessment model also estimates that the catch limit associated with a 50% probability of overfishing the MHI Deep 7 bottomfish complex, or the overfishing limit (OFL), in the 2011-12 fishing year is 383,000 lb.

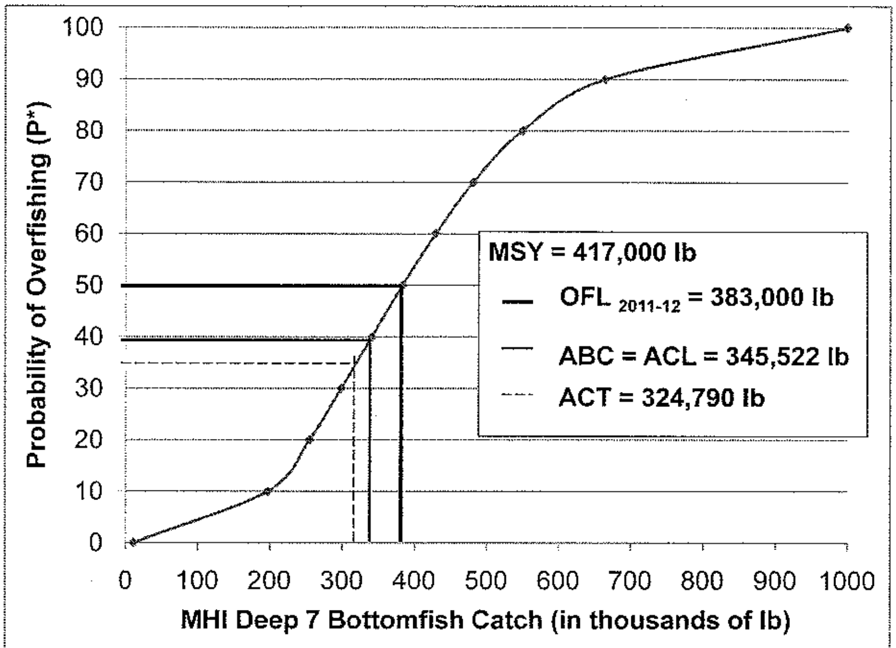
Calculation of ABC

In early 2010, the stock assessment update was reviewed by the Center for Independent Experts (CIE). The stock assessment update, including the findings of the CIE review were then presented at the 106th SSC meeting held February 22-24, 2010. At this meeting, the SSC determined that the 2010 assessment update and the probability of overfishing (P*) of 50%, with its corresponding catch of 383,000 lb, were adequate for the 2011-12 fishing year. Because the ACL should be implemented in 2011, at its 150th meeting held March 7-10, 2011, the Council recommended formation of a working group (P* Working Group (WG)) to assist it in determining the acceptable P* that the SSC must apply in the ABC control rule to calculate ABC so that an ACL could be determined. The P* WG concluded that a P* of 40.8% risk of overfishing is appropriate for the 2011-2012 MHI Deep 7 bottomfish fishing year.

Council ACL and AM Recommendations

At its 150th meeting, the Council also recommended formation of a second working group to assist it in reviewing social, economic, ecological, and management uncertainty (SEEM) information for specifying an ACL at or below the ABC. The outcomes of this working group were that the ACL be set equal to the ABC, and that an ACT be utilized at 6% less than the ACL. The ACT accounts for management uncertainty in controlling the actual catch and is an AM to prevent the ACL from being exceeded. When the ACT is projected to be reached, NMFS would close commercial and non-commercial fisheries for MHI Deep 7 bottomfish in federal waters through the end of the fishing year. Figure 2 illustrates the relationship and expected values of MSY, OFL, ABC, ACL and ACT for MHI Deep 7 bottomfish in fishing year 2011-12 under the Council's recommendation.

Figure 2. Potential values of OFL ABC, ACL and ACT for MHI Deep 7 bottomfish in 2011-12 should the Council recommend the results of the P* and SEEM Working Groups.



2.2 MHI Deep 7 Bottomfish ACL Alternatives

The Council is considering a range of MHI Deep 7 Bottomfish ACLs and their associated probabilities of overfishing (Table 2) that were developed by Council staff based upon the Catch 2/CPUE 1 scenario combination described in the 2010 MHI Deep 7 bottomfish stock assessment update (Brodziak et al. *in prep.*). The ACL specification may not exceed the SSC's recommended ABC. For each ACL alternative, a corresponding ACT may also be specified should the Council recommend the consensus of the SEEM WG. Alternatives below are structured utilizing an ACT based on the results of the SEEM WG, which is 6% below the ACL. Should the Council choose not to use an ACT or to use a different percentage, the pounds for the ACL or the ACT will change. When the ACT is projected to be reached, NMFS would close commercial and non-commercial fisheries for MHI Deep 7 bottomfish in federal waters through the end of the fishing year. Each alternative assumes continuation of complementary in-season closure in state waters upon attainment of the ACT. Regardless of which ACL and corresponding ACT is selected, other bottomfish management measures in the Hawaii FEP will remain in effect and commercial fishing in the NWHI will remain prohibited.

2.2.1 Alternative 1: Set ACL to 254,050 lb (Status Quo)

Under Alternative 1, the MHI Deep 7 bottomfish stock complex ACL would be the same as the 2010-11 fishing year TAC of 254,050 lb. Alternative 1 is the environmental baseline against which the other proposed ACLs for 2011-12 are compared. Based on the probabilities of overfishing contained in the 2010 bottomfish stock assessment update (Brodziak et al. *in prep.*), an ACL of 254,050 lb is associated with less than a 20 percent probability of overfishing the MHI Deep 7 bottomfish stock complex in fishing year 2011-12 and less than a 19 percent probability of overfishing if selected again for the 2012-13 fishing year. Under this alternative, the ACT would be set at 6 percent (15,250 lb) below the ACL, or 238,800 lb.

2.2.2 Alternative 2: Set ACL between 255,000 and 295,900 lb

Under Alternative 2, the MHI Deep 7 bottomfish stock complex ACL would be specified at a value between 255,000 and 295,900 lb. An ACL within this range would be associated with a 20-29 percent probability of overfishing the MHI Deep 7 bottomfish stock complex, decreasing to approximately a 19-28 probability of overfishing if selected again for the 2012-13 fishing year. Depending on the specific ACL selected, the ACT would be reduced by values between 15,300 and 17,748 lb, resulting in an ACT between 239,700 and 278,152 lb.

2.2.3 Alternative 3: Set ACL between 299,000 and 316,200 lb

Under Alternative 3, the MHI Deep 7 bottomfish stock complex ACL would be specified at a value between 299,000 and 316,200 lb. An ACL within this range would be associated with a 30-34 percent probability of overfishing the MHI Deep 7 bottomfish stock complex, decreasing to approximately a 29-33 probability of overfishing if selected again for the 2012-13 fishing year. Depending on the specific ACL selected, the ACT would be reduced by values between 17,940 and 19,000 lb, resulting in an ACT between 281,060 and 297,200 lb.

2.2.4 Alternative 4: Set ACL between 319,000 and 336,600 lb

Under Alternative 4, the MHI Deep 7 bottomfish stock complex ACL would be specified at a value between 319,000 and 337,270 lb. An ACL within this range would be associated with a 35-39 percent probability of overfishing the MHI Deep 7 bottomfish stock complex, decreasing to approximately a 34-38 probability of overfishing if selected again for the 2012-13 fishing year. Depending on the specific ACL selected, the ACT would be reduced by values between 19,140 and 20,230 lb, resulting in an ACT between 299,860 and 317,040 lb.

2.2.5 Alternative 5: Set ACL between 341,000 and 358,430 lbs

Under Alternative 5, the MHI Deep 7 bottomfish stock complex ACL would be specified at a value between 341,000 and 358,430 lb. An ACL within this range would be associated with a 40-44 percent probability of overfishing the MHI Deep 7 bottomfish stock complex, remaining roughly the same for the 2012-13 fishing year at approximately 39-44 probability of overfishing if selected again. Depending on the specific ACL selected, the ACT would be reduced by values between 20,460 and 21,510 lb, resulting in an ACT between 320,540 and 336,920 lb.

The range of Alternative 5 encompasses the results of the P* and SEEM WGs. The results of the P* WG conclude that the P* should be set at 40.8% risk of overfishing, which falls between a risk of overfishing of 40-44 and results in an ABC of 345,522. The SEEM WG concluded that the ACL for the MHI Deep 7 Bottomfish should be set equal to the ABC at 345,222, and utilize an ACT set 6% below the ACL at 324,790 lbs.

2.2.6 Alternative 6: Set ACL between 361,000 and 383,000 lbs

Under Alternative 6, the MHI Deep 7 bottomfish stock complex ACL would be specified at a value between 361,000 and 383,000 lb. An ACL within this range would be associated with a 45-50 percent probability of overfishing the MHI Deep 7 bottomfish stock complex, remaining the same for the 2012-13 fishing year if selected again. Depending on the specific ACL selected, the ACT would be reduced by values between 21,660 and 22,980 lb, resulting in an ACT between 339,340 and 360,020 lb.

Table 2. Summary of ACL alternatives for the 2011-12 fishing year, including associated probabilities of overfishing and corresponding ACTs.

Alternative	Proposed ACL for MHI Deep 7 Stock complex (lb)	Probability of overfishing MHI Deep 7 complex in fishing year (%)* 2011-2012	ACT (lb) *(-6% of ACL)*
Alternative 1 (Status Quo)	254,050 lb	<20	238,800
Alternative 2	255,000 - 295,900	20-29	239,700 to 278,152
Alternative 3	299,000	30	281,060
	303,400	31	285,200
	307,960	32	289,480
	311,850	33	293,140
	316,200	34	297,200
Alternative 4	319,000	35	299,860
	324,130	36	304,680
	330,140	37	310,330
	334,800	38	314,710
	337,270	39	317,040
Alternative 5	341,000	40	320,540
	346,100	41	325,340
	349,690	42	328,700
	354,570	43	333,300
	358,430	44	336,920
Alternative 6	361,000	45	339,340
	367,270	46	345,230
	372,930	47	350,560
	376,380	48	353,800
	379,630	49	356,850
	383,000	50	360,020

2.3 Alternatives Not Considered in Detail

Specification of a MHI Deep 7 TAC

Under this alternative, NMFS would specify a TAC for MHI Deep 7 bottomfish stock complex for fishing year 2011-12 instead of an ACL. However, specification of a TAC does not comply with the Magnuson-Stevens Act and the implementing regulations of the Hawaii FEP and is not discussed further.

Specification of separate State and Federal ACLs

Under this alternative, NMFS would specify a proportion of the overall ACL to be applied in federal waters, and when the federal-ACL was attained, NMFS would close the commercial and non-commercial fisheries for MHI Deep 7 bottomfish in federal waters only. However, to meet the fishery management objective of preventing overfishing, the State of Hawaii would need to specify an ACL that would apply in state waters. NMFS cannot compel the state to enact rules and regulations to specify a state ACL. Therefore, if only a federal ACL was specified, and NMFS closed federal waters upon attainment of the federal ACL, vessels could continue fishing unabated within state waters and NMFS would have no ability to prevent the overall ACL from being exceeded. For this reason, this alternative was not considered in detail.

ACLs based on Alternative Catch/CPUE Scenarios

Under this alternative, NMFS would specify an ACL based on an alternative Catch/CPUE scenario combination presented in Brodziak et al. *(in prep)*. The ACL alternatives and their associated probabilities of overfishing described in Section 2.2 are based on Catch 2/CPUE 1 scenario combination. Alternative Catch/CPUE scenario combinations presented in Brodziak et al. *(in prep)* include the following:

- Catch Scenario 1 and CPUE Scenario 1 or 2 or 3
- Catch Scenario 2 and CPUE Scenario 1 or 2 or 3
- Catch Scenario 3 and CPUE Scenario 1 or 2 or 3
- Catch Scenario 4 and CPUE Scenario 1 or 2 or 3

According to Brodziak et al. (in prep.) the probabilities of representing the true state of nature of the bottomfish fishery and Deep7 bottomfish population dynamics for the Catch/CPUE scenario combinations listed above range between 0.05 (Catch 4/CPUE 3) and 0.32 (Catch 2/CPUE 2). Since, the Catch 2 / CPUE Scenario 1 combination upon which the alternatives in Section 2.2 are based have the highest probability for representing the true state of nature (0.400), all other scenarios were not considered in developing alternative ACL specifications.

3.0 Affected Environment

3.1 Bottomfish Management Unit Species

The MHI bottomfish fishery harvests an assemblage, or complex of 14 species that include nine snappers, four jack/trevally and a single species of grouper. However, the target species of the fishery, and the species of primary management concern are six deep-water snappers and the grouper. Termed the "Deep 7 bottomfish," they include: onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), opakapaka (*Pristipomoides filamentosus*), lehi (*Aphareus rutilans*) and hapuupuu (*Epinephelus quernes*). The Deep 7 bottomfish complex is found along high-relief, deep slopes, and are fished with a vertical handline, while other species such as ulua, kahala and taape are caught at shallower depths. Uku can also be caught by vertical handline, but are frequently fished by drifting or slowly trolling over relatively flat bottom. Table 3 lists the Hawaii bottomfish management unit species (BMUS) of the Hawaii FEP.

Although taape (*Lutjanus kasmira*) is included in the Hawaii BMUS, it is an introduced species to Hawaii and is not a popular food fish, and catches and market value remains low (Parrish et al. 2000). Similarly, catches and marketability of the kahala (*Seriola dumerili*) also remains low as this species was the cause of a wide-spread breakout of ciguatera in Honolulu in 1979 (Ito and Uchida 1980) and continues to be associated with incidences of ciguatera fish poisoning (WPFMC 2007).

Table 3. Hawaii Archipelago Bottomfish Management Unit Species (BMUS)

Common Name	Local Name	Scientific Name
*Silver jaw jobfish	lehi	*Aphareus rutilans*
Grey jobfish	uku	*Aprion virescens*
Giant trevally	white ulua	*Caranx ignoblis*
Black jack	black ulua	*Caranx lugubris*
*Sea bass	hapuupuu	*Epinephelus quernus*
*Red snapper	ehu	*Etelis carbunculus*
*Longtail snapper	onaga, ulaula	*Etelis coruscans*
Blue stripe snapper	taape	*Lutjanus kasmira*
Yellowtail snapper	yellowtail, kalekale	*Pristipomoides auricilla*
*Pink snapper	opakapaka	*Pristipomoides filamentosus*
*Pink Snapper	kalekale	*Pristipomoides sieboldii*
*Snapper	gindai	*Pristipomoides zonatus*
Thick lipped trevally	pig ulua, butaguchi	*Pseudocaranx dentex*
Amberjack	kahala	*Seriola dumerili*

* Indicates a Deep 7 bottomfish

Please see the Final Supplemental Impact Statement prepared in association with Amendment 14 to the Fishery Management Plan to the Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region (Bottomfish FMP) for additional biological information on Hawaii BMUS (WPRFMC 2007).

3.2 Target Species

The Deep 7 bottomfish are the primary species targeted by MHI bottomfish fishery participants. Between 1949 and 2007 the average ratio of Deep 7 bottomfish catch to the total BMUS catch in the MHI by weight (excluding taape and kahala) was 0.72 with a range between 0.580 and 0.783 (Brodziak et al., 2009, Table A3). During the first three fishing years in which the MHI Deep 7 TAC was in place (Table 4), the average ratio of Deep 7 catch to total bottomfish catch was 0.67 (Brodziak et al. *in prep*).

Table 4. Ratio of Deep 7 bottomfish catch to total bottomfish catch in the MHI in TAC fishing years (2007, 2008 and 2009)

Fishing Year	Reported Catch of Deep 7 Bottomfish (1000 pounds)	Reported Catch of Other Bottomfish (1000 pounds)	Ratio of Deep 7 to Total Bottomfish
2007-2008	196.2	301.4	0.651
2008-2009	254.9	351.0	0.726
2009-2010	213.3	330.6	0.628
Average 2007 - 2009	**221.5**	**330.7**	**0.670**

Adapted from Table 5 and 6 in Brodizak et al. *in prep.*

There is limited quantitative information on the life history parameters of the Deep7 bottomfish, and in particular, the early life stages and juvenile characteristics are not yet well-described. Adults tend to inhabit deep waters of roughly 100-400 m depth in the MHI although some species (e.g., opakapaka) may shoal to mid-water depths to feed. The paragraphs below are drawn from WPFMC (2007) and briefly summarize information regarding the Deep 7 bottomfish species.

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

Ehu: Adult ehu will reach a length of at least 24 inches and a weight of up to about 12 pounds. They inhabit deeper offshore water beyond the reef, mainly occurring over rocky bottoms, usually between 80 and 218 fathoms. They feed on fishes and larger invertebrates such as squids, shrimps, and crabs, and reach sexual maturity at about 11.7 inches fork length, or one pound in weight, at approximately three years of age. Ehu, or ula ula, were determined to spawn in the NWHI from July – September in a study by Everson (1984). Ehu are distributed throughout the Indo-Pacific region.

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

Opakapaka: Large specimens will reach a length of at least three feet and weigh up to about 20 pounds. They inhabit deeper offshore water beyond the reef, occurring over rocky bottoms, usually between 40 and 120 fathoms. Fish apparently migrate into shallower depths near 40 fathoms at night. They feed on small fishes, squids, shrimps, crabs, pyrosomes, and zooplankton. Sexual maturity is reached at about 1.8 years and they generally spawn at about 2.2 years (1.5 pounds, 13 inches fork length). Their spawning season in the NWHI was determined in a 1980 study to be from June – December with peak spawning in August (Kikkawa 1980). Previous research on the age and growth of opakapaka estimated a maximum age of 18 years (Ralston and Miyamoto, 1983). However, recent ageing research based on bomb radiocarbon and lead radium decay dating of archival otolith samples indicate that this species has a life span on the order of 40 years. (A. Andrews, PIFSC, unpublished data, in Brodziak et al. *in prep*). This suggests that the adult natural mortality rate of opakapaka, the most abundant and key Deep 7 bottomfish species, is on the order of M=0.1 (Brodziak et al. *in prep*).

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

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

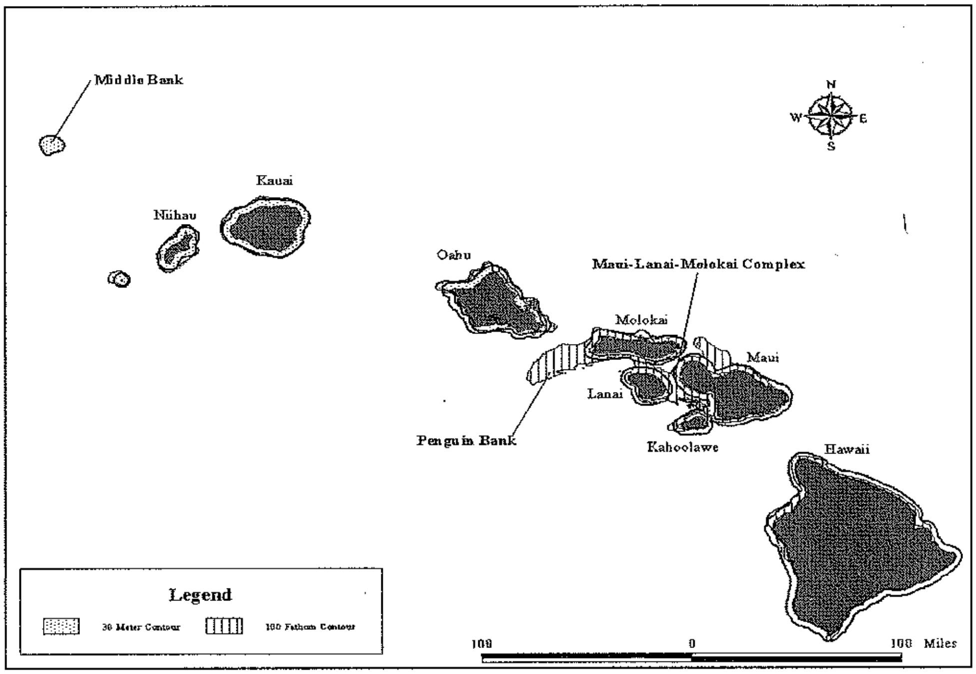
Hapuupuu: This grouper reaches lengths of up to four feet and weighs up to 60 pounds. They occur in waters 11 to 208 fathoms deep. They feed mainly on fish and crustaceans. The hāpuʻupuʻu is endemic to the Hawaiian Islands and Johnston Island.

3.3 MHI Bottomfish Habitat

Commercially important deepwater bottomfish are found along the deep slopes of island coasts and banks at depths of 100 to 400 meters (55 to 218 fathoms). Because of the volcanic nature of the islands within the Hawaiian Islands archipelago, most bottomfish habitat occurs in steepslope areas on the margins of the islands and banks. Recent mapping of bottomfish habitat in the MHI has shown that approximately 47 percent of the bottomfish habitat lies in State waters (Parke 2007). Bottomfish fishing grounds within federal waters (3 to 200 nm offshore) around the MHI include Middle Bank, most of Penguin Bank and approximately 45 nautical miles of 100-fathom bottomfish habitat in the Maui–Lanai–Molokai complex.

The Pacific Islands Regional Office conducted a review of bottomfish essential fish habitat and habitat areas of particular concern, which was subsequently reviewed through the Council WPSAR process. The SSC and Council will be considering the WPSAR report at the 107th SSC meeting and 151st Council meeting in June 2011.

Figure 3. General location of bottomfish habitat in the main Hawaiian Islands



Source: WPFMC 2005

3.4 Bycatch

As is the case for most fisheries, some of the MHI bottomfish fishery catches are lost or discarded. Fish may be stripped off the lines by sharks (i.e., lost) or they may be deliberately discarded due to shark damage or because of concerns regarding ciguatoxins.

Bycatch (i.e. discards) information from the MHI commercial bottomfish fishery has been compiled from catch and effort data submitted to HDAR by MHI commercial bottomfish fishery participants during 2003 and 2004. Overall, fishing for Deep 7 species is fairly target-specific, and the bycatch rate is relatively low, with 8.5 percent of the catch reported as not retained either because it was either lost or deliberately discarded (Kawamoto and Gonzales 2005). Pelagic management unit species comprise less than one percent (0.9 percent) of the total catch with less than one percent (0.3 percent of total catch) of this lost or discarded. The majority (88 percent) of this pelagic bycatch consists of sharks. It is believed that discarding sharks does not result in mortality because sharks do not suffer from barotraumas when brought up from depth (WPRFMC 2007).

Very little (3.3 percent) of the targeted Deep 7 species catch is reported as bycatch, and these are mostly snappers and groupers that have been damaged by sharks. If all fish in the BMUS complex (Deep 7 and other BMUS) are considered, the BMUS bycatch percentage rises to 7.5 percent. The majority of the BMUS bycatch is composed of kahala, butaguchi, and white ulua. All of these species are members of the jack family (Carangidae) and no jacks are included in the Deep 7 species complex. Ninety-three percent of all kahala (*Seriola dumerili* and *S. rivoliana*) were reported as bycatch. Release rates of kahala are high because these fish are known to be ciguatoxic and, as a result, have little market value in Hawaii (WPRFMC 2007). In 2009, the annual reported catch of kahala was 13,711 lb, of which less than four percent was sold.

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

Because non-commercial reporting requirements were only recently implemented, data on bycatch for the non-commercial sector of the MHI bottomfish fishery is not yet available. As compared to commercial fishery participants, non-commercial participants are believed to retain a greater variety of species for home consumption or distribution to relatives and friends, and thus their bycatch percentages are likely substantially lower than that of the commercial sector (Kawamoto, PIFSC, personal communication, reported in WPRFMC 2007).

The original Bottomfish FMP included five non-regulatory measures aimed at further reducing bycatch and bycatch mortality in the fishery and improving bycatch reporting: (1) outreach to fishermen and engagement of fishermen in management including research and monitoring in order to raise their awareness of bycatch issues and options to reduce bycatch and bycatch mortality, (2) research into fishing gear and method modifications to reduce bycatch and bycatch mortality, (3) research into the development of markets for discarded fish species (4) improvement of data collection and analysis systems to better measure bycatch and (5) training and outreach in methods to reduce the mortality of released fish due to barotrauma. These non-regulatory measures of the Bottomfish FMP were adopted into the Hawaii FEP and will continue in the fishery, regardless of the ACL that is specified.

3.5 Stock Status

Originally described in Amendment 6 to the Bottomfish FMP (68 FR 46112, August 5, 2003), status determination criteria (SDC) and other reference points for Hawaii bottomfish were incorporated into the Hawaii FEP (75 FR 2198, January 14, 2010) and is summarized here.

Under the Hawaii FEP, overfishing occurs when the fishing mortality rate (F) is greater than the fishing mortality rate which produces MSY (F_{MSY}) for one year or more. This threshold is termed the maximum fishing mortality threshold (MFMT) and is expressed as a ratio, $F/F_{MSY} = 1.0$. Thus, if the F/F_{MSY} ratio is greater than 1.0 for one year or more, overfishing is occurring. A stock is considered overfished when its biomass (B) has declined below the level necessary to produce MSY on a continuing basis (B_{MSY}). This threshold is termed the minimum stock size threshold (MSST) and is expressed as a ratio, $B/B_{MSY} = 0.7$. Thus, if the B/B_{MSY} ratio is less than 0.7, the stock complex is considered overfished. The SDCs of MFMT and MSST are applied to individual species within the multi-species stock complex when possible. When this is not possible, they are based on indicator species for the multi-species stock complex.

For management purposes, Hawaii bottomfish are managed as a single archipelagic-wide multi-species bottomfish stock complex. However, for assessment purposes, NMFS provides stock status evaluations for the archipelagic-wide multi-species bottomfish stock complex, as well as separate evaluations for the MHI subarea and NWHI subarea.

In the 2008 assessment update (Brodziak et al. 2009), Hawaii bottomfish was assessed as a single, archipelagic multi-species stock complex. The complex was not overfished (B_{2007}/B_{MSY}=1.13) and was not subject to overfishing (F_{2007}/F_{MSY}=0.62). However, due to the termination of the NWHI fishery with the creation of the Papahanaumokuakea Marine National Monument and the disproportionate fishing mortality on Deep 7 bottomfish species in the MHI, the Council recommended for the 2010 stock assessment update that NMFS conduct a status evaluation on just the Deep 7 bottomfish stock complex in the MHI. This 2010 stock assessment update indicated that the MHI Deep 7 bottomfish stock complex was not depleted (B_{2010}/B_{MSY}=0.92), and was currently not experiencing overfishing (F_{2010}/F_{MSY}=0.58) (Brodziak et al. *in prep*). While the 2010 stock assessment did not provide a stock status evaluation of the archipelagic-wide bottomfish stock multi-species stock complex that includes the NWHI, the F and B reference points are expected to be significantly better than the 2008 estimates given the termination of the NWHI fishery.

Based on the Catch 2/CPUE 1 scenario combination described in Section 2.1, the maximum sustainable yield (MSY) of the MHI Deep 7 bottomfish stock complex is estimated to be 417,000 lb. and the catch limit associated with a 50% probability of overfishing, the overfishing limit (OFL), is 383,000 lb of MHI Deep 7 bottomfish.

3.6 Protected Species

Protected species generally include sea turtles, marine mammals and seabirds. Please see the Final Supplemental Impact Statement prepared in association with Amendment 14 to the Bottomfish FMP for biological information on these species (WPRFMC 2007). Additional information is available in a 2008 Biological Opinion prepared by NMFS under section 7 of the ESA (NMFS 2008a).

Marine Mammals

Cetaceans listed as endangered under the ESA and that have been observed in the Western Pacific Region are the humpback whale (*Megaptera novaeangliae*), sperm whale (*Physeter macrocephalus*), blue whale (*Balaenoptera musculus*), fin whale (*B. physalus*), and sei whale (*B. borealis*). Although uncommon, the northern elephant seal (*Mirounga angustirostris*) has been occasionally observed in waters around the Hawaii Archipelago. The Hawaiian monk seal is the only endemic pinniped in Hawaii that is listed as endangered under the ESA. Research on monk seal diets suggests that some deepwater bottomfish caught in the fishery may be food resources for monk seals (unpublished report, NMFS PIFSC, Honolulu). However, under current levels of fishing pressure in the MHI, the monk seal population is growing, pupping is increasing, and the pups appear to be foraging successfully. Considering that monk seal foraging success appears to be high in the MHI than in the NWHI despite higher fishing pressure, competition for forage with the MHI bottomfish fishery does not appear to adversely impact monk seals in the MHI at this time. The 2008 Biological Opinion on the MHI Bottomfish fishery included an effects exposure response-risk analysis for monk seal hookings, behavioral modification, and prey reduction as a result of the MHI bottomfish fishery (NMFS 2008a). The Biological Opinion documented that the Hawaii's bottomfish fishery (in both the MHI and the NWHI management areas) may incidentally interact with monk seals. Although no hooking have been reported from the MHI bottomfish fishery, it is possible that hookings may have occurred without being observed and/or recorded. NMFS estimated that one seal would be hooked every 6.5 years, and that one serious injury/mortality would result from a hooking every 67 years. The Biological Opinion concluded that the Hawaii bottomfish fishery may affect, but is not likely to adversely affect the Hawaiian monk seal and that the fishery would not jeopardize the continued existence of the Hawaiian monk seal or destroy or adversely modify its critical habitat.

Other species of marine mammals that are not listed under the ESA that occur in the area where the MHI bottomfish fishery operates are:

<u>Whales</u>:
Blainsville beaked whale (*Mesoplodon densirostris*)
Bryde's whale (*Balaenoptera edeni*)
Cuvier's beaked whale (*Ziphius cavirostris*)
Dwarf sperm whale (*Kogia simus*)
False killer whale (*Pseudorca crassidens*)
Killer whale (*Orcinus orca*)
Longman's beaked whale (*Indopacetus pacificus*)
Melon-headed whale (*Peponocephala electra*)
Minke whale (*Balaenoptera acutorostrata*)
Pygmy killer whale (*Feresa attenuata*)
Pygmy sperm whale (*Kogia breviceps*)
Short-finned pilot whale (*Globicephala macrorhynchus*)

<u>Dolphins:</u>
Bottlenose dolphin (*Tursiops truncatus*)
Dall's porpoise (*Phocoenoides dalli*)
Fraser's dolphin (*Lagenodelphis hosei*)
Risso's dolphin (*Grampus griseus*)
Rough-toothed dolphin (*Steno bredanensis*)
Spinner dolphin (*Stenella longirostris*)
Spotted dolphin (*Stenella attenuata*)
Striped dolphin (*Stenella coeruleoalba*)

The MHI bottomfish fishery is listed as a Category III fishery under Section 118 of the MMPA (75 FR 68468, November 8, 2010). A Category III fishery is one with a low likelihood or no known incidental takings of marine mammals. NMFS has also concluded that the Hawaii Archipelago commercial bottomfish fisheries will not affect marine mammals in any manner not considered or authorized under the Marine Mammal Protection Act.

Sea Turtles
The breeding populations of Mexico's olive ridley sea turtles (*Lepidochelys olivacea*) are currently listed as endangered, while all other ridley populations are listed as threatened. Leatherback sea turtles (*Dermochelys coriacea*) and hawksbill turtles (*Eretmochelys imbricata*) are also classified as endangered. Loggerhead (*Caretta caretta*) and green sea turtles (*Chelonia mydas*) are listed as threatened (the green sea turtle is listed as threatened throughout its Pacific range, except for the endangered population nesting on the Pacific coast of Mexico). These five

species of sea turtles are highly migratory, or have a highly migratory phase in their life history (NMFS 2001). The green turtle is the only species regularly seen in EEZ waters around Hawaii. In its 2008 Biological Opinion on the MHI bottomfish fishery, NMFS determined that although sea turtles may be found within the MHI area and could interact with the fishery, there have been no reported or observed interactions with sea turtles in the history of the bottomfish fishery. Hawksbill, leatherback and olive ridley turtles are likely to be rare in the action area. NMFS concluded that the bottomfish fishery is not likely to adversely affect hawksbill, leatherback, loggerhead or olive ridley turtles. The opinion noted that green turtles are sometimes killed by collisions with vessels around the MHI and this is likely responsible for killing up to two green sea turtles per year. The resulting mortality is not likely to jeopardize the species because green sea turtles have been rapidly increasing in numbers in recent years when bottomfishing was occurring at a higher level of effort [than the current fishery], and they are extremely unlikely to be hooked or entangled by bottomfishing gear (NMFS 2008a).

Seabirds

Seabirds listed as threatened or endangered under the ESA are managed by the USFWS. The short-tailed albatross, which is listed as endangered under the ESA, is a migratory seabird that is known to be occasionally present in the NWHI. No interactions between seabirds and the MHI bottomfish fishery have been observed or reported. Other listed seabirds found in the region are the endangered Hawaiian petrel (*Pterodroma phaeopygia)* and the threatened Newell's shearwater (*Puffinus auricularis newelli*). Non-listed seabirds known to be present are the blackfooted albatrosses (*Phoebastria nigripes*); Laysan albatross (*P. immutabilis*); wedge-tailed (*Puffinus pacificus*), sooty (*P. griseus*) and fleshfooted (*P. carneipes*) shearwaters, as well as the masked booby (*Sula dactylatra*), brown booby (*Sula leucogaster*), and red-footed booby *(Sula sula*). Most of these seabirds forage far from the islands and are unlikely to interact with the bottomfish fishery. In addition, bottomfish fishing gear is deployed close to the vessel and does not afford much opportunity for seabirds to attack the bait. When bottomfish fishing a weighted mainline is dropped vertically over the side of the vessel and it sinks rapidly beyond the range of a diving seabird. It is retrieved rapidly using electric or hydraulic pullers. The time that bait is within the range of a diving seabird is quite limited and the proximity of the vessel hull is a significant deterrent.

Protected Species Interactions

Currently, there is no observer coverage in the MHI bottomfish fishery and therefore, there is very little information available on interactions between the MHI bottomfish fishery and protected species. As noted earlier, the MHI bottomfish fishery may interact indirectly with Hawaiian monk seals, though no mortality or serious injuries have been attributed to the fishery (Carettea et al. 2010). Nitta and Henderson (1993) reported that bottlenose dolphins remove bait and catch from handlines used to catch bottomfish off the island of Hawaii and Kaula Island, but no information is available that suggests any mortality or serious injuries have ever occurred. NMFS 2008 Biological Opinion on Hawaii's bottomfish fishery noted that green turtles are sometimes killed by collisions with vessels around the MHI and this is likely responsible for killing up to two green sea turtles per year. Although there is a possibility of accidental hooking of seabirds, the circle hooks used in the bottomfish fishery do not lend easily to incidental hooking of seabirds; no interactions between seabirds and the MHI bottomfish fishery have been observed or reported.

3.7 Essential Fish Habitat and Habitat Areas of Particular Concern

Essential fish habitat (EFH) is defined as those waters and substrate as necessary to fish for spawning, breeding, feeding, and growth to maturity. This includes the marine areas and their chemical and biological properties that are utilized by the organism. Substrate includes sediment, hard bottom, and other structural relief underlying the water column along with their associated biological communities. In 1999, the Council developed and NMFS approved EFH definitions for management unit species (MUS) of the Bottomfish and Seamount Groundfish FMP (Amendment 6), Crustacean FMP (Amendment 10), Pelagic FMP (Amendment 8), and Precious Corals FMP (Amendment 4) (74 FR 19067, April 19, 1999). Additional EFH definitions for coral reef ecosystem species were approved by NMFS in 2004 as part of the implementation of the Coral Reef Ecosystem FMP 2004 (69 FR8336, February 24, 2004). EFH definitions were also approved for deepwater shrimp through an amendment to the Crustaceans FMP in 2008 (73 FR 70603, November 21, 2008). Ten years later in 2009, the Council developed and NMFS approved five new archipelagic-based fishery ecosystem plans (FEP), including the Hawaii Archipelago FEP. The FEP incorporated and reorganized elements of the Councils' species-based FMPs into a spatially-oriented management plan (75 FR 2198, January 14, 2010). As a result, EFH definitions and related provisions for all FMP fishery resources are subsequently carried forward into the respective FEPs.

In addition to and as a subset of EFH, the Council described habitat areas of particular concern (HAPC) based on the following criteria: ecological function of the habitat is important, habitat is sensitive to anthropogenic degradation, development activities are or will stress the habitat, and/or the habitat type is rare. In considering the potential impacts of a proposed fishery management action on EFH, all designated EFH must be considered. The designated areas of EFH and HAPC for all Hawaii FEP MUS by life stage are summarized in Table 3. The Council is currently reviewing habitat information relevant to Hawaii bottomfish and seamount groundfish and may refine these EFH/HAPC designations if warranted (76 FR 13604, March 14, 2011).

Table 5. EFH and HAPC for Hawaii FEP MUS

	Species Complex	**EFH**	**HAPC**
Bottomfish MUS	**Shallow-water species (0–50 fm):** uku (*Aprion virescens*), thicklip trevally (*Pseudocaranx dentex*), giant trevally (*Caranx ignoblis*), black trevally (*Caranx lugubris*), amberjack (*Seriola dumerili*), taape (*Lutjanus kasmira*)	**Eggs and larvae:** the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 400 m (200 fm). **Juvenile/adults:** the water column and all bottom habitat extending from the shoreline to a depth of 400 m (200 fm)	All slopes and escarpments between 40–280 m (20 and 140 fm) Three known areas of juvenile opakapaka habitat: two off Oahu and one off Molokai

	Species Complex	EFH	HAPC
Bottomfish MUS	**Deep-water species (50–200 fm):** ehu (*Etelis carbunculus*), onaga (*Etelis coruscans*), opakapaka (*Pristipomoides filamentosus*), yellowtail kalekale (*P. auricilla*), kalekale (*P. sieboldii*), gindai (*P. zonatus*), hapuupuu (*Epinephelus quernus*), lehi (*Aphareus rutilans*)	**Eggs and larvae:** the water column extending from the shoreline to the outer limit of the EEZ down to a depth of 400 m (200 fathoms) **Juvenile/adults:** the water column and all bottom habitat extending from the shoreline to a depth of 400 meters (200 fm)	All slopes and escarpments between 40–280 m (20 and 140 fm) Three known areas of juvenile opakapaka habitat: two off Oahu and one off Molokai
Seamount Groundfish MUS	**Seamount groundfish species (50–200 fm):** armorhead (*Pseudopentaceros wheeleri*), raftfish/butterfish (*Hyperoglyphe japonica*), alfonsin (*Beryx splendens*)	**Eggs and larvae:** the (epipelagic zone) water column down to a depth of 200 m (100 fm) of all EEZ waters bounded by latitude 29°–35° **Juvenile/adults:** all EEZ waters and bottom habitat bounded by latitude 29°–35° N and longitude 171° E–179° W between 200 and 600 m (100 and 300 fm)	No HAPC designated for seamount groundfish
Crustaceans MUS	**Spiny and slipper lobster complex:** Hawaiian spiny lobster (*Panulirus marginatus*), spiny lobster (*P. penicillatus, P.* spp.), ridgeback slipper lobster (*Scyllarides haanii*), Chinese slipper lobster (*Parribacus antarcticus*) **Kona crab :** Kona crab (*Ranina ranina*)	**Eggs and larvae:** the water column from the shoreline to the outer limit of the EEZ down to a depth of 150 m (75 fm) **Juvenile/adults:** all of the bottom habitat from the shoreline to a depth of 100 m (50 fm)	All banks in the NWHI with summits less than or equal to 30 m (15 fathoms) from the surface
	Deepwater shrimp: (*Heterocarpus* spp.)	**Eggs and larvae:** the water column and associated outer reef slopes between 550 and 700 m **Juvenile/adults:** the outer reef slopes at depths between 300-700 m	No HAPC designated for deepwater shrimp.

	Species Complex	EFH	HAPC
Precious Corals MUS	**Shallow-water precious corals (10-50 fm):** black coral (*Antipathes dichotoma*), black coral (*Antipathis grandis*), black coral (*Antipathes ulex*) **Deep-water precious corals (150–750 fm):** Pink coral (*Corallium secundum*), red coral (*C. regale*), pink coral (*C. laauense*), midway deepsea coral (*C.* sp nov.), gold coral (*Gerardia* spp.), gold coral (*Callogorgia gilberti*), gold coral (*Narella* spp.), gold coral (*Calyptrophora* spp.), bamboo coral (*Lepidisis olapa*), bamboo coral (*Acanella* spp.)	EFH for Precious Corals is confined to six known precious coral beds located off Keahole Point, Makapuu, Kaena Point, Wespac bed, Brooks Bank, and 180 Fathom Bank EFH has also been designated for three beds known for black corals in the Main Hawaiian Islands between Milolii and South Point on the Big Island, the Auau Channel, and the southern border of Kauai	Includes the Makapuu bed, Wespac bed, Brooks Banks bed For Black Corals, the Auau Channel has been identified as a HAPC
Coral Reef Ecosystem MUS	**All Coral Reef Ecosystem MUS**	EFH for the Coral Reef Ecosystem MUS includes the water column and all benthic substrate to a depth of 50 fm from the shoreline to the outer limit of the EEZ	Includes all no-take MPAs identified in the CRE-FMP, all Pacific remote islands, as well as numerous existing MPAs, research sites, and coral reef habitats throughout the western Pacific

Weighted lines or baited hooks may rest on the bottom substrate during bottomfish fishing operations, and may impact substrate EFH and HAPC. Lost bottomfish fishing gear, including anchors and anchors lines, have the potential to impact the substrate. Research conducted in NWHI bottomfish fishing sites found low counts of this type of fishing debris (Raita and St. Rogatien Banks) (Kelley and Moffitt 2004).

No adverse effects to water column EFH and HAPC have been attributed to bottomfish fishing in Hawaii (G. Davis, PIRO, personal communication). Some have theorized that sending a weighted handline with baited hooks and a small chum bag to bottom depths, generally to 50 fathoms and below, may introduce parasites or disease into the water column, but to date no such problems have been reported or documented in Hawaii's bottomfish fisheries (Kelley and Moffitt 2004).

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

3.8 Economic, Social and Cultural Setting

3.8.1 The Economic Setting

Hawaii's economy is dominated by the visitor industry (tourism) and defense (military), with tourism being the leading industry in terms of employment and expenditures. The two represent over one quarter of the state's 2008 Gross Domestic Product (GDP, formerly, Gross State Product) without consideration of ancillary services, and also comprise the largest shares of "export" earnings (Table 6 and Table 7). However, including retirement and disability payments, grants, contracts, other payments, and wages and salaries, total federal expenditures in Hawaii were $15 billion in 2008 (DBEDT 2010), about 24 percent of the state's GDP.

Table 6. Hawaii's Gross Domestic Product

Year	Gross Domestic Product *(million $)*	Per Capita GDP	Residential Population
2009	NA	NA	1,295,178
2008	$63,874	$49,563	1,288,198
2007	$62,019	$48,553	1,277,356

Source: DBEDT 2010 (Table 13.02)

Table 7. Hawaii's Direct Income from Major Export Industries

Year	Sugar *(million $)*	Pineapple *(million $)*	Defense *(million $)*	Visitor *(million $)*
2009	NA	NA	NA	9,993.2
2008	71.4	NA	6,1072.2	11,398.5
2007	76.3	NA	5,466.7	12,811.1
2006	79.7	NA	5,379.2	12,491.6
2005[1]	92.5	113.4	5,015.3	11,904.0

[1] 2005 is the most recent year in which complete industry statistics are available.
Source: DBEDT 2010 (Table 13.01)

Natural resource production, which includes agriculture, forestry, fishing and hunting remains important in Hawaii, although its relative contribution to the economy has been greatly reduced compared to the period of sugar and pineapple plantations throughout the first 60 or 70 years of the 20th century. In 2008, natural resource production accounted for $332 million dollars of the state's GDP, and less than one percent of the state's civilian labor force (Table 8). By comparison, 30 percent of those employed in 2008 were in management, professional, and related industries, followed by 26 percent in sales jobs, and 24 percent in the service (hospitality) industry with the remainder in construction, transportation and other industries (DBEDT 2010).

In 2008, Hawaii's civilian labor force was estimated at 646,000 individuals with approximately 4 percent unemployment rate, growing to 6.8 percent in 2009.

Table 8. Hawaii Employment Statistics

Year	Civilian Labor Force	Employed	Unemployment Rate	Personal Income
2009	637,000	594,500	6.8	$54,409

2008	646,000	620,000	4.0	$54,175
2007	640,150	623,150	2.7	$52,253

In 2008, there were 6.7 million visitors to in Hawaii, up 4.4% compared to 2009 (6.4 million) but down 10% compared to the peak of 7.5 million in 2007. Approximately 73% of visitors to Hawaii are domestic, while 27% are from international origin (DBEDT 2011). Please see the Final Supplemental Impact Statement prepared in association with Amendment 14 to the Bottomfish FMP for additional information on Hawaii's economy (WPRFMC 2007).

3.8.2 Overview of Hawaii Fishing-Related Economic Activities

In 2008, there were 4,263 licensed commercial fishermen in Hawaii (Hamm et al. 2010), although for many of these fishing is not the primary source of income. Many recreational and subsistence fishers hold commercial licenses in order to be able to sell the occasional fish to cover trip expenses. In 2008 Hawaii fishermen landed over 30 million pounds of seafood (83 percent of which was comprised of pelagic tunas and billfish) with a total ex-vessel value of over $85 million (Hamm et. al. 2010). This amounts to a very small percentage of the state's $63.8 billion GDP. On the other hand, the seafood industry is an important component of the local and tourism consumption, and the recreational and subsistence proportion involves a substantial portion of the local population estimated by USFWS (1996) to be 132,000 participants. Total fishing expenditures by these participants was estimated at $130 million.

3.8.3 Overview of the MHI Bottomfish Fishery

Participation and Effort
In fishing year 2010-11 (September 1, 2010- March 12, 2011), 475 vessels were actively engaged in the commercial harvest of MHI Deep 7 bottomfish, a 5% increase compared to the 2009-10 fishing year (September 1, 2009- April 20, 2010). During the 2009-2010 fishing year, there were 451 active vessels, a 25% increase compared to the 2008-09 fishing year (September 1, 2008 – July 6, 2009) where there were 380 active vessels.

Since the State of Hawaii does not have complementary non-commercial permit system for state waters, participation in the MHI Deep 7 bottomfish fishery by non-commercial vessels is largely unknown. Currently, only 17 individuals possess federal non-commercial MHI Deep 7 bottomfish permits, although the size of the non-commercial sector has been estimated to be up to 750 active vessels (WPFMC 2007).

When the federal non-commercial permit was initially implemented in 2008, NMFS issued nearly 100 permits. Since non-commercial fishers are subject to a five fish per trip bag limit, the subsequent decrease in federal non-commercial permits is likely attributed to fishers choosing a state CML, which exempts them from the bag limit and is comparable in cost to the federal permit. This development may explain the dramatic rise in commercial vessel participation in recent years.

In 2010, NOAA's PIFSC conducted the Hawaii Bottomfish Survey to estimate important economic contributions bottomfish fishing activities provide to the State of Hawaii. Surveys were mailed to all federal non-commercial bottomfish permit holders and all Hawaii CML holders who report catching bottomfish since November 2008. Of the 519 total survey respondents, approximately 83% reported catching less than 500 lb of Deep 7 bottomfish in the past 12 months while 17% caught more. Of those that caught less than 500 lb, 35 percent reporting selling a portion of the catch compared to 79% of those who report catching more than 500 lb (Hospital 2010). Survey respondents also reported making an average of 14 trips in the past 12 months, with Maui County residents making the most (20), followed by Hawaii County (15) and Kauai and Oahu counties with the least (12).

Fishing Location

Specific bottomfish fishing locales favored by fishermen vary seasonally according to sea conditions and the availability and price of target species. Analysis of reported commercial catches of MHI Deep 7 bottom for fishing years 1949-2009 indicate that the island group of Maui, Molokai (including Penguin bank) and Lanai account for 59% of the catch, followed by Hawaii Island (21%), Oahu (8%) and Kauai (11%) (Brodziak et al. *in prep.*). During the first three fishing years in which the MHI Deep 7 TAC was in place (2007-2009), distribution of catch was similarly distributed with the Maui-Molokai-Lanai island group accounting for 56% of the total reported commercial catch, followed by Hawaii Island (29%), Oahu (7%) and Kauai (7%) (Table 9).

Table 9. Reported Commercial Catches (thousands of pounds) of Deep 7 bottomfish by Hawaiian Island Group and fishing year (2007, 2008, and 2009)

Fishing Year	Hawaii Island	Maui-Molokai-Lanai	Oahu	Kauai	Total MHI Catch
2007-08	55.7	103.0	23.1	14.4	196.2
2008-09	85.5	138.8	15.7	14.9	254.9
2009-10	48.3	133.1	14.3	17.6	213.3
2007-2009 Total	189.5	374.9	53.1	46.9	664.4

Source: Adapted from Table 7.1 in Brodziak et al *in prep.*

Landings

Since the 2007-08 fishing year, the MHI Deep 7 bottomfish fishery has been managed under a fleet-wide TAC specified each fishing year by NMFS as recommended by the Council. Table 10 summarizes the MHI Deep 7 bottomfish TAC limits, fishery closure dates and actual catches for the 2007-08 through the 2010-11 fishing years.

Table 10. MHI Deep 7 TAC Limits, Fishery Closure Dates and Actual Catch 2007-2010

Fishing Year	Specified TAC Limit (lbs)	Date Fishery Closed	Actual Catch Total (lbs)	Overage (+)/ Underage (-) (lbs)
2007-2008	178,000	Apr. 16, 2008	196,147	+18,147 (10%)
2008-2009	241,000	Jul. 6, 2009	259,194	+18,194 (8%)
2009-2010	254,050	Apr. 20, 2010	208,412	-45,638 (-18%)
2010-2011	254,050	Mar. 12, 2011	268,089	+14,039 (5.5%)

Ex-Vessel Value and Revenue
The average monthly price of MHI Deep 7 bottomfish preliminarily estimated in 2010 dollars is $5.93 (Hospital, PIFSC, May 25, 2011, *pers. comm.*). Based on 2010-11 total reported landings of 268,089 lb, the total wide ex-vessel value of MHI Deep 7 bottomfish the fleet in 2010 was approximately $1.59 million.

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

3.8.4 Environmental Justice Communities

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations, signed in 1994, requires Federal agencies to consider the impacts of proposed actions on members of minority and low-income communities to ensure that disproportionately high and adverse human health or environmental effects on these communities are identified and addressed. Minority and low-income populations are defined as follows:

Minority Populations. People of Hispanic origin, Blacks, American Indians and Alaska Natives, Asians, Native Hawaiian and Other Pacific Islanders, as well as those individuals who categorized themselves as "two or more races" or "some other race" on the Census 2000 questionnaire.

Low-Income Populations. People living below the poverty level.

The MHI bottomfish fishery includes participants that are in both the minority population and low-income population groups. Therefore, this environmental assessment will consider whether there would be disproportionately high and adverse impacts on the environment or on the health of these members of the MHI Deep 7 bottomfish fishery as a result of specifying an ACL for the 2011-12 fishing year.

3.8.5 Fishing Communities

The MSA defines a "fishing community" as "...a community that is substantially dependent upon or substantially engaged in the harvest or processing of fishery resources to meet social and economic needs, and includes fishing vessel owners, operators, and crew, and fish processors that are based in such communities" (16 U.S.C. § 1802(16)). NMFS further specifies in the National Standard guidelines that a fishing community is "...a social or economic group whose members reside in a specific location and share a common dependency on commercial, recreational, or subsistence fishing or on directly related fisheries dependent services and industries (for example, boatyards, ice suppliers, tackle shops)".

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

In 2002, the Council identified each of the islands of Kauai, Niihau, Oahu, Maui, Molokai, Lanai and Hawaii as a fishing community for the purposes of assessing the effects of fishery conservation and management measures on fishing communities, providing for the sustained participation of such communities, minimizing adverse economic impacts on such communities, and for other purposes under the MSA. These definitions were subsequently approved by NMFS. (68 FR 46112, August 5, 2003).

4.0 Anticipated Impacts of the Alternatives

4.1 Impact to Target Species

Alternative 1: No Action
Under the No Action alternative, the ACL would be set at the 2009-2010 level of 254,050 lbs, which results in a less than 20% risk of overfishing the MHI Deep 7 complex in fishing years 2011-2012 (Brodziak et al. *in prep.*). The ACT would be reduced from the ACL. Assuming the Council agrees with the SEEM analysis results, the reduction from ACL would be 6%, resulting in an ACT of 238,800.

Alternative 2: Set ACL between 255,000 and 295,900 lb
Under Alternative 2, the ACL would be set between 255,000 and 295,000 lbs, which corresponds to a 20-29% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012 (Brodziak et al. *in prep.*). The ACT would be reduced from the ACL. Assuming the Council agrees with the SEEM analysis results, the reduction from ACL would be 6%, resulting in an ACT between 239,700 and 278,152, which corresponds to about a 18-25% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012.

Alternative 3: Set ACL between 299,000 and 316,200 lb
Under Alternative 3, the ACL would be set between 299,000 and 316,000 lbs, which corresponds to a 30-34% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012 (Brodziak et al. *in prep.*). The ACT would be reduced from the ACL. Assuming the Council agrees with the SEEM analysis results, the reduction from ACL would be 6%, resulting in an ACT between 281,060 and 297,200 lbs, which corresponds to about a 27-30% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012.

Alternative 4: Set ACL between 319,000 and 336,600 lb
Under Alternative 4, the ACL would be set between 319,000 and 336,600 lbs, which corresponds to a 35-39% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012 (Brodziak et al. *in prep.*). The ACT would be reduced from the ACL. Assuming the Council agrees with the SEEM analysis results, the reduction from ACL would be 6%, resulting in an ACT between 299,860 and 317,040 lbs, which corresponds to about a 30-34%% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012.

Alternative 5: Set ACL between 341,000 and 358,430 lbs
Under Alternative 5, the ACL would be set between 341,000 and 358,430 lbs, which corresponds to a 40-44% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012 (Brodziak et al. *in prep.*). The ACT would be reduced from the ACL. Assuming the Council agrees with the SEEM analysis results, the reduction from ACL would be 6%, resulting in an ACT between 320,540 and 336,920 lbs, which corresponds to about a 35-38.5% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012.

Alternative 6: Set ACL between 361,000 and 383,000 lbs
Under Alternative 4, the ACL would be set between 361,000 and 383,000 lbs, which corresponds to a 45-50% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012 (Brodziak et al. *in prep.*). The ACT would be reduced from the ACL. Assuming the

Council agrees with the SEEM analysis results, the reduction from ACL would be 6%, resulting in an ACT between 339,340 and 360,020 lbs, which corresponds to about a 39.5-45% risk of overfishing the MHI Deep 7 bottomfish complex during the fishing year 2011-2012.

Under all of the action alternatives, highgrading within the Deep 7 species could result in additional mortality to target species if fishermen discard small fish in favor of larger fish or discard low-value species in favor of higher-value species. Deep-slope bottomfish generally have a high mortality rate resulting from barotrauma (physical damage to the fish as air in the swim bladder expands during ascent) after they are brought to the surface. If, and to what extent, high-grading occurs, additional bottomfish mortality may occur due to barotrauma. However, there are ways to mitigate barotrauma and increase the survivability of the deep-water fish with gas bladders. The simplest is by venting the air bladder with a needle. Once the bladder has been vented, the fish can swim back down to depth and force gases back into the body fluids increasing the chances of survival. This technique has been used with Deep 7 species very successfully in mark/recapture studies. Recent education and outreach activities have been conducted by the WPRFMC, NMFS, and the State of Hawaii that include pamphlets and demonstrations on various techniques to reduce barotrauma on deep-water bottomfish. If high-grading were to occur, species most likely to be discarded include lehi, gindai, and kalekale, which receive the lowest prices at market of the Deep 7 species. Based on available information, these stocks are in relatively better condition than the higher priced ehu or onaga that would certainly not be discarded. It would not be necessary to discard any non-Deep 7 species caught, as they would not count against the TAC. At higher TACs there may be little incentive to highgrade (or even to harvest the entire TAC) as annual Deep 7 harvests when the fishery was open access ranged between 227,00-301,000 lb., demonstrating that the demand for MHI commercial Deep 7 bottomfish fishing may be lower than some of the higher TACs considered here.

The PIFSC has elevated the priority of research on bottomfish stocks (PIFSC 2007). In the future, as knowledge is gained regarding growth and fecundity, recruitment, population dynamics, and other basic biological parameters as well as post-release survival and high-grading in the fishery, there will be more and better information available to improve management of the stock.

4.2 Impact to Non-Target and Bycatch Species

Alternative 1-6: No Action (254,000 lbs) – 383,000

Fishing for Deep 7 species is fairly target-specific, and the bycatch rate for non-target species is relatively low (approximately 8 percent) in this fishery. A relatively low TAC could lead to increased discards of less desirable commercial species on small vessels with limited storage space. To minimize mortalities associated with discards, the Council and NMFS have implemented an educational program to teach fishermen how to release unwanted fishes and avoid excess mortality due to barotrauma. The current effort that goes into treating barotrauma fish by fishermen is not known.

At higher TACs, there may be less incentive to highgrade – when the fishery was open access, annual Deep 7 harvests ranged between 227,00-301,000 lb., demonstrating that the demand for

MHI commercial Deep 7 bottomfish fishing may be lower than some of the higher TACs considered here.

Non-commercial fishermen in general are expected to have less targeting skill than commercial fishermen, and therefore may have higher non-target catches. They should, however, be less influenced by market value and therefore may be expected to retain more non-target species than commercial fishermen. In all cases bycatch by MHI bottomfish fishermen is not anticipated to lead to significant adverse impacts on bycatch species stocks. Bycatch stocks are considered healthy and the increased impacts on bycatch species that would result from the TACs considered here are not expected to significantly affect bycatch stocks or their prey, competitors and predators. The fact that all fish that are caught and discarded must be reported on Federal logbooks will help fishery managers to monitor bycatch and highgrading and address these topics in the future, as needed, to ensure that the fishery is not having a significant adverse impact on bycatch stocks.

Impacts to Pelagic Species
Under Alternatives 1-6, the closure of the MHI bottomfish fishery upon reaching the TAC could cause some fishery participants to move into the pelagic non-longline troll and handline fisheries. This potential displacement has not been specifically studied or quantified. A comparison of the commercial bottomfish and the commercial troll fishery finds that the 2009 MHI commercial bottomfish fishery had approximately 451 active commercial vessels and the Hawaii commercial troll fishery had 2,210 licensed fishermen who fished primarily for pelagic species. However Hawaii's pelagic troll fishery (for yellowfin tuna) and the hook-and-line mackerel (akule and opelu) fishery are normally at their peak during the summer, and many of the fishermen who fish for bottomfish already shift to pelagic fisheries during the summer, so the increase in pelagic fishing due to the MHI bottomfish TAC may be minor.

4.3 Impacts on Protected Resources

Alternative 1-6: No Action (254,000 lbs) – 383,000
The impacts of the MHI bottomfish fishery on ESA listed species were considered in a Biological Opinion (BiOp) prepared by NMFS dated March 18, 2008, pursuant to section 7 of the Endangered Species Act. The BiOp determined that fishing activities conducted under the Hawaii FEP and its implementing regulations are not likely to jeopardize the continued existence of any endangered or threatened species under the jurisdiction of NMFS, or result in the destruction or adverse modification of critical habitat. None of the alternatives considered would modify operations of the bottomfish fishery in any way that would be expected to affect endangered or threatened species or critical habitat in any manner not previously considered in that consultation.

4.4 Impacts to EFH and HAPC

Alternative 1-6: No Action (254,000 lbs) – 383,000
Due to prohibitions on destructive fishing gear and the operations of the gear used, no adverse effects to water column EFH and HAPC (virtually all EEZ waters) have been attributed to bottomfish fishing in Hawaii (NMFS 2009). Because none of the alternatives considered here would allow destructive fishing gear or change the way fishing gear is currently deployed, they

are not expected to lead to substantial physical, chemical, or biological alterations to the habitat, or result in loss of, or injury to managed species or their prey.

4.5 Effects on Fishery Participants and Fishing Communities

Alternative 1: No Action – 254,050 lb

Based on the preliminary economic findings (Hospital, PIFSC, May 25, 2011, *pers. comm.*), the 2010 average price per pound for the MHI Deep 7 bottomfish species was $5.93 and assuming that all catches were sold, the ex-vessel value for the MHI commercial Deep 7 fishery under Alternative 1 is $1,506,516. Dividing these fleet totals equally among all 475 commercial vessels active during 2010 would yield potential per vessel gross revenue of $3,171. Fishing communities are expected to be impacted because they will make less revenue under Alternative 1 from provisioning fishing vessels with bait, tackle, ice, and fuel as well as from the sales of harvested fish through wholesalers, retailers and restaurants, and the jobs created by these activities. The range of impacts to fishing communities under Alternative 1 has not been quantified.

Alternative 2: Set ACL between 255,000 and 295,900 lb

Based on the preliminary economic findings (Hospital, PIFSC, May 25, 2011, *pers. comm.*), the 2010 average price per pound for the MHI Deep 7 bottomfish species was $5.93 and assuming that all catches were sold, the ex-vessel value for the MHI commercial Deep 7 fishery under Alternative 2 ranges from $1,512,150 to $1,754,687. Dividing these fleet totals equally among all 475 commercial vessels active during 2010 would yield potential per vessel gross revenue between $3,732 and $3,947. Fishing communities are expected to be impacted because they will make less revenue under Alternative 2 than the other alternatives from provisioning fishing vessels with bait, tackle, ice, and fuel as well as from the sales of harvested fish through wholesalers, retailers and restaurants, and the jobs created by these activities. The range of impacts to fishing communities under Alternative 2 has not been quantified.

Alternative 3: Set ACL between 299,000 and 316,200 lb

Based on the preliminary economic findings (Hospital, PIFSC, May 25, 2011, *pers. comm.*), the 2010 average price per pound for the MHI Deep 7 bottomfish species was $5.93 and assuming that all catches were sold, the ex-vessel value for the MHI commercial Deep 7 fishery under Alternative 3 ranges from $1,773,070 to $1,875,066. Dividing these fleet totals equally among all 475 commercial vessels active during 2010 would yield potential per vessel gross revenue ranging from $3,732 to $3,947. Fishing communities are expected to be a little impacted because they benefit from provisioning fishing vessels with bait, tackle, ice, and fuel as well as from the sales of harvested fish through wholesalers, retailers and restaurants, and the jobs created by these activities. The range of impacts to fishing communities under Alternative 3 has not been quantified.

Alternative 4: Set ACL between 319,000 and 336,600 lb

Based on the preliminary economic findings (Hospital, PIFSC, May 25, 2011, *pers. comm.*), the 2010 average price per pound for the MHI Deep 7 bottomfish species was $5.93 and assuming that all catches were sold, the ex-vessel value for the MHI commercial Deep 7 fishery under Alternative 4 ranges from $1,891,670 to $1,996,038. Dividing these fleet totals equally among all 475 commercial vessels active during 2010 would yield potential per vessel gross revenue ranging from $3,982 to $4,202. Fishing communities are expected to be slightly positively impacted because they benefit from provisioning fishing vessels with bait, tackle, ice, and fuel as well as from the sales of harvested fish through wholesalers, retailers and restaurants, and the jobs created by these activities. The range of impacts to fishing communities under Alternative 4 has not been quantified.

Alternative 5: Set ACL between 341,000 and 358,430 lbs
Based on the preliminary economic findings (Hospital, PIFSC, May 25, 2011, *pers. comm.*), the 2010 average price per pound for the MHI Deep 7 bottomfish species was $5.93 and assuming that all catches were sold, the ex-vessel value for the MHI commercial Deep 7 fishery under Alternative 5 ranges from $2,022,130 to $2,125,489. Dividing these fleet totals equally among all 475 commercial vessels active during 2010 would yield potential per vessel gross revenue ranging from $4,257 to $4,474. Fishing communities are expected to be more positively impacted because they benefit from provisioning fishing vessels with bait, tackle, ice, and fuel as well as from the sales of harvested fish through wholesalers, retailers and restaurants, and the jobs created by these activities. The range of impacts to fishing communities under Alternative 5 has not been quantified.

Alternative 6: Set ACL between 361,000 and 383,000 lbs
Based on the preliminary economic findings (Hospital, PIFSC, May 25, 2011, *pers. comm.*), the 2010 average price per pound for the MHI Deep 7 bottomfish species was $5.93 and assuming that all catches were sold, the ex-vessel value for the MHI commercial Deep 7 fishery under Alternative 6 ranges from $2,140,730 to $2,271,190. Dividing these fleet totals equally among all 475 commercial vessels active during 2010 would yield potential per vessel gross revenue of $4,506 to $4,781. Fishing communities are expected to be positively impacted because they benefit from provisioning fishing vessels with bait, tackle, ice, and fuel as well as from the sales of harvested fish through wholesalers, retailers and restaurants, and the jobs created by these activities. The range of impacts to fishing communities under Alternative 6 has not been quantified.

4.6 Environmental Justice Impacts

Alternative 1-6: No Action (254,000 lbs) – 383,000
None of the alternatives are expected to adversely impact any particular segment of the population because the ACL is not allocated based on race or income level. All ACL alternatives considered are higher than the status quo, which may benefit all participants including those that may be a minority or have low income.

4.7 Cumulative Impacts

Alternative 1-6: No Action (254,000 lbs) – 383,000
The specification of an ACL is designed to maintain the viability of the fish stocks and support sustainable fishing. The individually insignificant impacts of specifying an ACL would not become significant when considered along with other actions or conditions that are affecting the MHI bottomfish fishery. The ACL is part of a suite of management measures that were designed to ensure the resources are sustainably managed in accordance with the Hawaii FEP and Amendment 3 to the Hawaii FEP. Other actions that affect the MHI bottomfish fishery are

primarily related to the State's management of bottomfish in State waters. The State of Hawaii has established Bottomfish Restricted Fishing Areas and is currently working to implement regulations that authorize it to establish complementary regulations for fishery closures in State waters when the commercial ACL or ACT (whichever is chosen as the lowest limit by the Council) is achieved. The specification of the 2011-2012 MHI Deep 7 bottomfish ACL is intended to continue to allow fishermen to fish sustainably and achieve optimum yields from bottomfish in the Main Hawaiian Islands. The ACLs considered here are not inconsistent with the State of Hawaii's management of the bottomfish resources in the MHI. The ACLs considered here are not expected to result in cumulatively significant adverse impacts when considered in conjunction with past, present, or anticipated future actions by NMFS or other entities. Please see the Final Supplemental Impact Statement prepared in association with Amendment 14 to the Bottomfish FMP (WPRFMC 2007) for more information.

4.8 Climate Change

There are no specific studies about the impacts of ocean circulation pattern changes on bottomfish stocks. In general, it has been shown that large scale climate cycles can impact winds, currents, ocean mixing, temperature regimes, nutrient recharge, and affect the productivity of all trophic levels in the North Pacific Ocean (Polovina et al. 1994). These impacts can result in variability in fish stock size, recruitment, growth rates, or other factors. There is no available research specific to the impacts of climate change on Hawaiian bottomfish. However, because the current fishery management action is managing fishing harvest, impacts from climate change are not likely to affect the success of managing the fishery. Bottomfish stocks, as well as non-target fishes and protected species that interact with the fishery are currently affected by these large-scale climate fluctuations and will continue to be affected in the same way regardless of which TAC alternative is selected for implementation. Condition of the stock, fishery yield, species interactions and other fishery outcomes are monitored through logbooks and sales reports. Therefore, any impacts to the fish stocks or other resources that are due to climate change or other ecosystem factors would be indirectly reflected in harvest reports and could be considered by scientists in the overall management of the fishery.

5.0 References Cited

Brodziak, J. 2008. An Assessment of the Risk of Archipelagic Overfishing for Alternative Total Allowable Catches of Deep-7 Bottomfish in the Main Hawaiian Islands Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-08-03, 31 p.

Brodziak, J., R. Moffitt, and G. DiNardo. 2009. Hawaiian bottomfish assessment update for 2008. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-09- 02, 93 p.

Brodziak, J., D. Courtney, L. Wagatsuma, J. O'Malley, H. Lee, W. Walsh, A. Andrews, R. Humphreys, and G. DiNardo. *(in prep)*. Stock Assessment of the Main Hawaiian Islands Deep 7 Bottomfish Complex Through 2010. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent.

Carretta, J., K. Forney, E. Oleson, K. Martien, M. Muto, M. Lowry, J. Barlow, J. Baker , B. Hanson, D. Lynch, L. Carswell, R. Brownell Jr., J. Robbins, D. Mattila, K. Ralls, and M. Hill. 2010. Draft U.S. Pacific Marine Mammal Stock Assessment: 2010. NOAA-TM-NMFS-SWFSC-XXX. U.S. Department of Commerce. National Oceanic and Atmospheric Administration. National Marine Fisheries Service. Southwest Fisheries Science Center.

Department of Business, Economic Development and Tourism (DBEDT). 2010. The State of Hawaii Data Book, 2009. Honolulu, HI.

Department of Business, Economic Development and Tourism (DBEDT). 2011. Historical Visitor Statistics (Table 4: Visitors Staying Overnight or Longer: 1927-2009). Accessed at http://hawaii.gov/dbedt/info/visitor-stats on April 8, 2011.

Hamm, D.C., M.M.C. Quach, K.R. Brousseau, and C.J. Graham. 2010. Fishery Statistics of the Western Pacific, Volume 25. Pacific Islands Fish. Sci. Cent., Natl. Mar. Fish. Serv., NOAA, Honolulu, HI 96822-2396. Pacific Islands Fish. Sci. Cent. Admin. Rep. H-10-03, Section D: State of Hawaii 2008 Fishery Statistics.

HDAR (Hawaii Division of Aquatic Resources). 2010. Bottomfish News. Volume 8. June 2010.

Hospital, J. 2010. Hawaii Bottomfish Survey: 2010 Preliminary Results. National Marine Fisheries Service, Pacific Islands Fisheries Science Center. November 2010 [Brochure] 8 pp.

Ito, B and R. Uchida. 1980. Results of ciguatera analysis of fishes in the Northwestern Hawaiian Islands. In: Grigg RW and Pfund RT (eds.). Proceedings of the Symposium on Status of Resource Investigations in the Northwestern Hawaiian Islands, April 24-25, 1980, University of Hawaii, Honolulu, Hawaii. Sea Grant Misc. Rep. UNIHI-SEAGRANT-MR-80-04, p. 81-89.

Kawamoto, K., and D. Gonzales. 2005. Summary of Main Hawaiian Island Catch Disposition in the Bottomfish Fishery, 2003-2004. Pacific Islands Fisheries Science Center Internal Report IR-05-023, 9 pp.

Kelley, C. and Moffitt, R. 2004. The impacts of bottomfishing on Raita and West St. Rogatien Reserve Preservation Areas in the Northwestern Hawaiian Islands Coral Reef Ecosystem Reserve. Final Report submitted to the National Marine Sanctuaries Program. HawaiiUndersea Research Laboratory and NOAA NMFS Pacific Islands Fisheries Science Center.

Moffitt, R.B., D.R. Kobayashi, and G.T. DiNardo. 2006. Status of the Hawaiian Bottomfish Stocks, 2004. Pacific Islands Fisheries Science Center, National Marine Fisheries Service, NOAA, Honolulu, HI. PIFSC Admin. Rept. H-06-01. 45 pp.

NMFS 2008. Endangered Species Act – Section 7 Consultation. Biological Opinion and Incidental Take Statement for Amendment 14 to the Bottomfish Fishery Management Plan. Implementation of Bottomfish Fishing Regulations within Federal Waters of the Main Hawaiian Islands. National Marine Fisheries Service, Pacific Islands Region, Protected Resources Division.

Parke, M. 2007. Linking fishermen reported system commercial bottomfish catch data to habitat and proposed restricted fishing areas using GIS and spatial analysis. U.S. Dept. of Commerce. NOAA Tech. Mem., NOAA-TM-NMFS-PIFSC-11. Pacific Islands Fisheries Science Center. Honolulu, HI.

Parrish, J., G. Aeby, E. Conklin, G. Ivey and B. Schumacher. 2000. Interations of Non-Indigenous Blueline Snapper (Taape) with Native Fishery Species. Final Report Submitted to the State of Hawaii Department of Land and Natural Resources. August 31, 2000.

Stokes, K. 2009. Report on the Western Pacific stock assessment review 1 Hawaii deep slope bottomfish. Center for Independent Experts, stokes.net.nz Ltd., Wellington 6035, New Zealand, 27 p.

U.S. Department of the Interior, Fish and Wildlife Service (USFWS), and U.S. Department of Commerce, Bureau of the Census. 1996 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation.

WPFMC (Western Pacific Fishery Management Council) 2005.

WPFMC (Western Pacific Fishery Management Council) 2007. Amendment 14 to the Fishery Management Plan for Bottomfish and Seamount Groundfish Fisheries of the Western Pacific Region including a Final Supplemental Environmental Statement. Western Pacific Fishery Management Council, Honolulu, HI.