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ACTION ITEM

WESTERN
PACIFIC
REGIONAL
FISHERY
MANAGEMENT
COUNCIL

Acceptable Biological Catches, Annual Catch Limits, and Accountability Measures for Miscellaneous Bottomfish Species

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Acronyms

ABC – Acceptable Biological Catch
ACL – Annual Catch Limit
AM – Accountability Measure
CNMI – Commonwealth of the Northern Mariana Islands
DAR – Department of Aquatic Resources (Hawaii)
DAWR – Division of Aquatic and Wildlife Resources (Guam)
DFW – Division of Fish and Wildlife (CNMI)
DMWR – Department of Marine and Wildlife Resources (American Samoa)
EEZ – Exclusive Economic Zone
FEP – Fishery Ecosystem Plan
MHI – Main Hawaiian Islands
Magnuson-Stevens Act or MSA – Magnuson-Stevens Fishery Conservation and Management Act
MSY – Maximum Sustainable Yield
NMFS – National Marine Fisheries Service
RFMC – Regional Fishery Management Council
SSC – Scientific and Statistical Committee
TAC – Total Allowable Catch

1 Background Information

In 2006, Congress reauthorized the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act or MSA) and included additional requirements to prevent and end overfishing, and rebuild overfished stocks. Under the MSA, Regional Fishery Management Councils (RFMC) are to amend their fishery management plans to include a mechanism for specifying annual catch limits (ACLs) for all fisheries at a level such that overfishing does not occur and to implement measures to ensure accountability (AM) for adhering to these limits. The MSA further directs that, unless otherwise provided for under an international agreement to which the U.S. participates, this mechanism must be established by 2010 for fisheries subject to overfishing, and by 2011 for all other fisheries. On January 16, 2009, the National Marine Fisheries Service (NMFS) published advisory guidelines under 50 CFR §600.310 (74 FR 3178) to assist RFMCs in implementing ACL and AM requirements.

To comply with the ACL and AM requirements, the Western Pacific Fishery Management Council (Council), in coordination with NMFS, prepared an omnibus amendment to the fishery ecosystem plans (FEP) for American Samoa, Hawaii, the Mariana Archipelago (Guam and the Commonwealth of the Northern Mariana Islands (CNMI)), Pacific Remote Island Areas (PRIA), and Pacific Pelagic fisheries. The amendment was approved and became effective July 27, 2011 and describes the mechanism and process the Council will use to specify ACLs and AMs for all stocks and stock complexes managed under the FEPs (76 FR 37285).

Overview of the ACL Specification Process

There are three required elements in the ACL specification mechanism contained in the Council's ACL specification process (WPRFMC 2011). The first requires the Council's Scientific and Statistical Committee (SSC) to calculate an acceptable biological catch (ABC) that is set at or below the stock or stock complex's overfishing limit (OFL). The OFL is an estimate of the catch level above which overfishing is occurring. ABC is the level of catch that accounts for the scientific uncertainty in the estimate of OFL and other scientific uncertainty. To determine the appropriate ABC, the ACL mechanism described in the FEPs includes a five-tiered system of control rules that allows for different levels of scientific information to be considered. Tiers 1-2 involve data rich to data moderate situations and include levels of scientific uncertainty derived from model-based stock assessments. Tiers 3-5 involve data poor situations and include levels of scientific uncertainty derived from ad-hoc procedures including simulations models or expert opinion. When calculating and ABC for a stock or stock complex, the SSC must first evaluate the information available for the stock and assign the stock or stock complex into one of the five tiers. The SSC must then apply the control rule assigned to that tier to determine ABC. The SSC may recommend an ABC that differs from the results of the ABC control rule calculation based on factors such as data uncertainty, recruitment variability, declining trends in population variables, and other factors determined relevant by the SSC. However, the SSC must explain its rationale.

The second element requires the Council to determine an ACL that may not exceed the SSC recommended ABC. The process includes methods by which the ACL may be reduced from the

ABC based on social, economic, and ecological considerations, or management uncertainty[1] (SEEM). An ACL set below the ABC further reduces the probability that actual catch will exceed the OFL and result in overfishing.

The third and final element in the ACL process is the inclusion of AMs. There are two categories of AMs, in-season AMs and AMs for when the ACL is exceeded. In-season AMs prevent an ACL from being exceeded and 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 an ACL is 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 ACL process, and adjust the system, as necessary, to improve its performance and effectiveness. Figure 1Figure 1illustrates the relationship between the terms used in this section.

For more details on the specific elements of the ACL specification mechanism and process, see Amendment 1 to the PRIA FEP, Amendment 2 to the American Samoa Archipelago FEP, Amendment 2 to the Mariana FEP and Amendment 3 to the Hawaii Archipelago FEP, and the final implementing regulations at 50 CFR §665.4 (76 FR 37286, June 27, 2011).

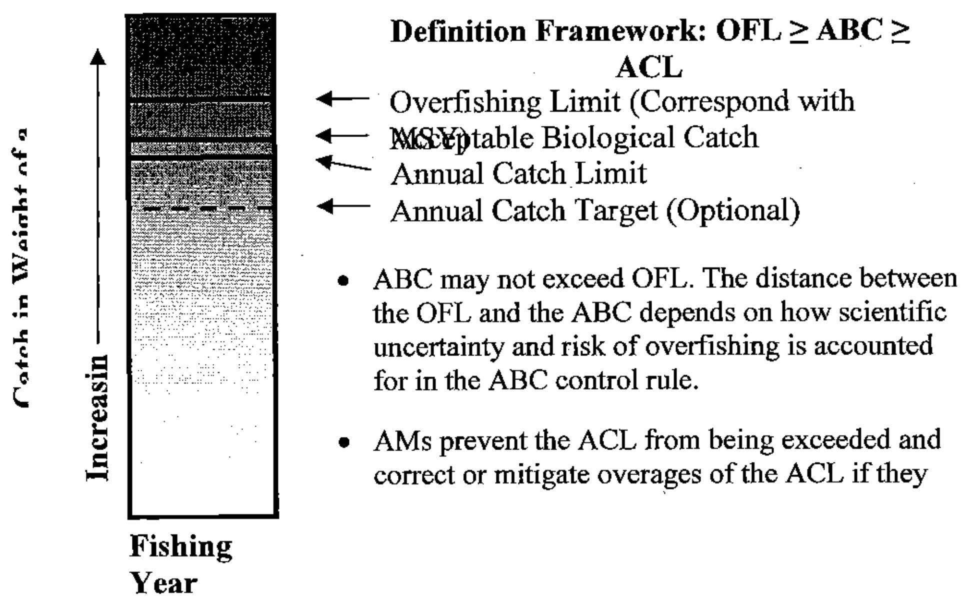

Figure 1. Relationship between OFL, ABC, ACL and ACT

[1] Management uncertainty occurs because of the lack of sufficient information about catch (e.g., late reporting, under reporting, and misreporting of landings.

1.1 Purpose and Need

ACLs are needed in order to comply with the Magnuson-Stevens Act and provisions of the FEPs for American Samoa, the Mariana Archipelago, and Hawaii which require NMFS to specify an ACL for each stock and stock complex in western Pacific bottomfish fisheries. The fishery management objective of this action is to specify an ACL for all western Pacific bottomfish management unit species (BMUS) that will prevent overfishing from occurring, and ensure long-term sustainability of the resource while allowing fishery participants to continue to benefit from its utilization. AMs also are needed to correct or mitigate overages of the ACL should they occur. In American Samoa, CNMI and Guam, BMUS managed as a single multi-species stock complex. In Hawaii, BMUS are managed as two separate stock complexes, the main Hawaiian Islands (MHI) Deep 7 stock complex[2] and the MHI non-deep 7 stock complex[3]. Consistent with the FEPs, ACLs are specified at the stock complex level.

ACLs will not be specified for bottofish MUS in the PRIA because commercial fishing is prohibited out to 50 nautical miles by Presidential Proclamation 8336 which established the Pacific Remote Island Marine National Monument (74 FR 1565, January 12, 2009), and there are no bottomfish habitats beyond the monument boundaries. ACLs for non-commercial coral reef ecosystem fisheries within the boundaries of the PRIA monument may be developed in the future through a separate action in accordance with Proclamation 8336, if the Secretary of Commerce determines non-commercial fishing can be allowed, and managed as a sustainable activity.

1.2 Proposed Action

NMFS proposes to specify an ACL for BMUS in American Samoa, CNMI and Guam. Additionally, NMFS proposes to specify an ACL for the non-deep 7 BMUS in the main Hawaii Hawaiian Islands (MHI). The proposed ACL specifications are based on the recommendations of the Council which were developed in accordance with the approved ACL mechanism described in the FEPs and implementing federal regulations at 50 CFR §665.4, and considering the best available scientific, commercial, and other information.

The ACL for each stock complex would be specified for the 2012 and the 2013 fishing years which begins on January 1 and ends on December 31 annually. In each island area, catches to be counted towards the ACL for each bottomfish stock complex would be calculated starting on January 1 through December 31 based on catch data collected by local resource management agencies through their respective fishery monitoring programs, and by NMFS through federal logbook reporting. If an ACL for any stock complex is exceeded and results in biological consequences to a stock or stock complex, NMFS would take action to correct the operational issue that caused the ACL overage, as recommended by the Council which could include a downward adjustment to the ACL for that stock complex in the following fishing year.

[2] MHI Deep 7 bottomfish include onaga (*Etelis coruscans*), ehu (*Etelis carbunculus*), gindai (*Pristipomoides zonatus*), kalekale (*Pristipomoides sieboldii*), opakapaka (*Pristipomoides filamentosus*), lehi (*Aphareus rutilans*), and hapuupuu (*Epinephelus quernus*).

[3] MHI non-deep 7 bottomfish include uku *(Aprion virescens)*, white ulua *(Caranx ignoblis)*, black ulua *(Caranx lugubris)*, taape *(Lutjanus kasmira)*, yellowtail kalekale *(Pristipomoides auricilla)*, butaguchi *(Pseudocaranx dentex)* and kahala *(Seriola dumerili)*.

1.3 Related Agency Actions

ACL and AM specifications for other western Pacific fisheries

On September 2, 2011, NMFS published a final rule specifying quota of 325,000 lb of Deep 7 bottomfish in MHI for the 2011-12 fishing year, based on an annual catch limit (ACL) of 346,000 lb recommended by the Council (76 FR 54715). When the quota is projected to be reached, NMFS will close the fisheries for Deep 7 bottomfish in the MHI for the remainder of the fishing year. The specifications were based on the recommendations of the Council and considering the best available scientific, commercial and other information.

In addition, the Council and its SSC are currently developing ACL and AM recommendations for all other western Pacific fisheries for the 2012 and 2013 fishing years. These include crustacean fisheries (lobsters, kona crab and deepwater shrimps), deepwater precious coral fisheries (black, pink and bamboo corals) and bottomfish. NMFS anticipates developing environmental analysis documents on the proposed specifications for these fisheries concurrently with this action.

1.4 Decision to be Made

At its 108th meeting in October 2011, the SSC must recommend an ABC for the multi-species bottomfish stock complexes in American Samoa, CNMI, Guam and the non Deep-7 bottomfish stock complex in the MHI.

At its 152nd meeting in October 2011, the Council must specify ACLs for each stock complex that may not exceed the ABC recommendation of the SSC.

1.5 Public Involvement

[To be developed]

2 Description of the Alternatives Considered

The ACL specifications for the multi-species bottomfish stock complexes in American Samoa, Guam and CNMI are based on the most recent bottomfish stock assessment (Moffitt et al., 2007) completed by NMFS Pacific Islands Fisheries Science Center (PIFSC) which uses data though 2005. This document has not been subject to the Council/NMFS Western Pacific Stock Assessment Review Process (WPSAR). However, to comply with requirements of the Magnuson-Stevens Act and the FEPs to specify ACLs in fishing year 2012, the results of Moffitt et al (2007) is considered the best available scientific information and will be used by the SSC and the Council to calculate ABC and specifying ACL, respectively. The Council expects a new bottomfish stock assessment to be completed by NMFS PIFSC in 2012 which will be subject to the WPSAR review process and the results of which will be used to establish future ABCs and ACLs for BMUS in American Samoa, Guam and CNMI.

Table 1 provides a summary of the estimates of maximum sustainable yield (MSY) by Moffitt et al (2007) and recent average catch and catch as a percent of MSY for bottomfish in American Samoa, Guam and CNMI

Table 1. Estimates of MSY, recent average catch and catch as a percent of MSY (2006-2009) for bottomfish in American Samoa, Guam and the CNMI

Archipelago	BMUS MSY (lbs)	95% CL	Mean BMUS catch 2006-2009[1]	Mean BMUS catch as % of MSY
American Samoa	109,000	±29,700	19,326	17.7
Guam	53,000	±9,500	35,081	66.2
CNMI	200,500	±40,500	17,419	8.7
Mariana Archipelago	253,500[2]	NA	52,500[2]	20.7

[1] Source: http://www.pifsc.noaa.gov/wpacfin/

[2] Values were derived by combining data points for CNMI and Guam.

In terms of the Council process for establishing ABCs, the Moffitt et al (2007) report conforms more to a Tier 2 (Quasi-probabilistic approach to estimating ABCs), than the Tier 1 assessment in which P*, or the risk of overfishing a given stock in the fishing year based on an assessment, is given. Nonetheless, the Moffitt et al (2007) assessment provides probabilities based on the assessments about whether a catch results in current biomass below BMSY and a harvest rate higher than that generating MSY (HMSY).

One of the main distinguishing features between the bottomfish fishery in Hawaii and those of American Samoa, Guam and CNMI is the inclusion of two species of emperors (*Lethrinus spp.*) and a species of grouper (*Variola lauti*) which are not found in Hawaii. A list of the deep and shallow BMUS species of American Samoa, Guam and CNMI are provided in Table 2, while the recent bottomfish catches in the three island area are given in Table 3.

Table 2. BMUS of American Samoa, Guam and CNMI

Species name	Common name	Deep or shallow component
Aphareus rutilans	Lehi	Deep
Aprion virescens	Uku	Shallow
Caranx ignobilis	Giant trevally	Shallow
Caranx lugubris	Black trevally	Deep
Epinephelus fasciatus	Blacktip grouper	Shallow
Etelis carbunculus	Ehu	Deep
Etelis coruscans	Onaga	Deep
Lethrinus amboinensis	Ambon emperor	Shallow
Lethrinus rubrioperculatus	Redgill emperor	Shallow
Lutjanus kasmira	Blueline snapper	Shallow
Pristipomoides auricilla	Yellowtail snapper	Deep
Pristipomoides filamentosus	Opakapaka	Deep
Pristipomoides flavipinnis	Yelloweye opakapaka	Deep
Pristipomoides seiboldi	Kalekale	Deep
Pristipomoides zonatus	Gindai	Deep
Seriola dumerili	Amberjack	Shallow
Variola louti	Lunartail	Deep

Source: Moffitt et al., 2007

Table 3. Annual Estimated Landings of BMUS in American Samoa, CNMI and Guam (2005-09)

	American Samoa[1]	Guam[2]	CNMI[1]
2000	13,319	65,871	14,968
2001	21,439	51,035	25,303
2002	16,603	23,881	18,816
2003	4,645	42,650	18,063
2004	11,469	36,920	12,973
2005	5,649	36,471	16,538
2006	5,252	37,850	12,262
2007	13,092	26,508	18,606
2008	24,585	36,933	18,389
2009	34,375	39,033	20,418
Ave. 2006-2009 only	**19,326**	**35,081**	**17,419**

Source: http://www.pifsc.noaa.gov/wpacfin

[1] Based on estimated commercial landings data

[2] Based on total estimated boat-based landings

2.1 American Samoa Bottomfish Fishery

NMFS/Council Estimation of OFL

The following text is adapted from the 2005 stock assessment for bottomfish complexes in Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands by Moffitt et al., (2007). These authors assessed the status of bottomfish complexes in the three US territories using a surplus production model.

A Bayesian statistical framework was applied to estimate parameters of a Schaefer model fit to a time series of annual CPUE statistics. This approach provided direct estimates of parameter uncertainty for status determination. The surplus production model includes both process error in biomass production dynamics and observation error in the catch-per-unit effort data. Alternative models with differing prior assumptions about carrying capacity and the ratio of initial stock biomass (at the beginning of the assessment time period) to carrying capacity were evaluated using the Akaike Information Criterion. The sensitivity of status determination results to prior distributions and model assumptions was also evaluated. Stock status determinations based on the models with the closest fits to the CPUE data appear relatively robust.

Carrying capacity (K) estimates from the set of credible models indicated that K ranged from 432 to 906 thousand pounds. The posterior means for intrinsic growth rate suggested that estimates of r were between 0.45 and 0.48. Estimates of initial ratio of biomass to carrying capacity were between 0.64 and 0.80 over the set of credible models. The posterior mean of MSY was MSY = 109.0 ± 29.7. The biomass status of the American Samoa bottomfish complex in 2005 was healthy, with a probability of $p>0.99$ that biomass was above BMSY based on the best-fitting model. Similarly, the probability that the harvest rate in 2005 exceeded the overfishing threshold was $p<0.01$. Estimates of American Samoa bottomfish biomass have fluctuated around 800 thousand pounds since 1988 (Figure 2).

Lacking a specific OFL for fishing year 2012, the long-term MSY of 109,000 lb may be considered as a proxy OFL for American Samoa bottomfish in fishing year 2012.

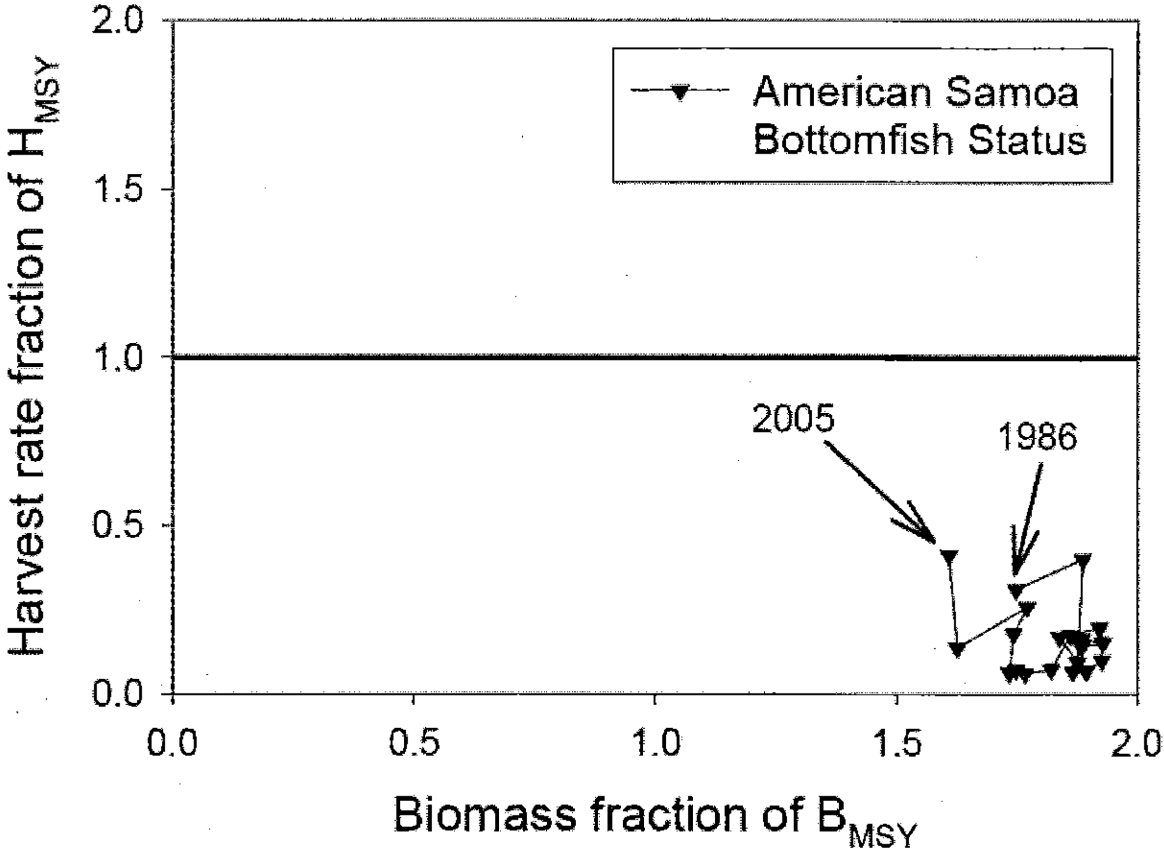

Figure 2. Estimates of relative biomass and relative exploitation rate from the best fitting production model for American Samoa, 1986-2005 (Source Moffitt et al 2007)

Biomass increased moderately in the in the 1990s and has been relatively stable since then. Estimates of exploitation rate decreased to less than 5% in the late-1980s and remained low until 2004 when they increased to about 8%. Estimates of relative biomass indicate that the biomass of the American Samoa bottomfish complex has been above BMSY during 1986-2005. Similarly, estimates of relative exploitation rate indicate that the annual harvest rate has been below HMSY since 1986. Lower bounds of the 80% confidence intervals for relative biomass show that the annual probability of biomass being at or above BMSY was 90% or greater throughout the time period (Figure 2). Similarly, upper bounds of the 80% confidence intervals for relative exploitation rate indicate that the annual probability of harvest rate being at or below HMSY was 90% or greater. Overall, the production model results suggest that the American Samoa bottomfish complex has was not overfished and did not experience overfishing between the period 1986-2005. Recent (2006-2009) average catch in the American Samoa bottomfish fishery 19,326 lb or about 18% of MSY.

SSC's Calculation of ABC

The SSC must consider what it will establish as the ABC for American Samoa bottomfish based on the level of scientific uncertainty in the estimate of OFL. Potential approaches are:

Approach 1: No Action
The SSC could decide not to establish an ABC for American Samoa BMUS, but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

Approach 2. Set the ABC equal to the MSY
The SSC could set the ABC equal to the point estimate of **MSY (109,000 lb)** for American Samoa BMUS as estimated by Moffitt et al (2007). If the point estimate of MSY is considered the proxy OFL in fishing year 2012, setting **ABC = 109,000 lb** would mean that there would be no buffer between the ABC and the proxy OFL. As noted in Table 1, recent (2006-2009) average bottomfish catch in American Samoa is 19,326 lb or about 18% of MSY. Based on recent current levels of fishing, catch is unlikely to increase significantly in 2012.

Approach 3. Set the ABC at the lower 95% confidence limit of the MSY
The SSC could take a more conservative approach than Approach 2 and set the ABC as the lower bound of the MSY estimated by Moffitt et al (2007). Setting **ABC = 79,300 lbs** would provide a 29,700 lb buffer between ABC the point estimate of MSY (proxy OFL). As noted in Table 1, recent (2006-2009) average bottomfish catch in American Samoa is 19,326 lb is still significantly lower than the ABC specified under this approach.

Approach 4: Set ABC based on probability of exceeding MSY
Under Alterantive 3, the ABC would be set at a level where there was only a 5% probability of exceeding the MSY. However, the SSC could assume that the variability about the MSY is equally distributed (Central Limit Theorem) and set the ABC at some alternative probability value of exceeding the MSY. This approach is not the comparable to the P* approach used with the Deep7 stock assessment, since exceeding the MSY in this instance may not necessarily be overfishing the stock. However, it does provide an alternative to simply applying the 95% confidence interval as a buffer between the catch and MSY. The catches associated with probability values ranging from 2% to 98% of exceeding MSY for the American Samoa bottomfish fishery are shown in Table 3.

Table 4. Probabilities of exceeding MSY in the American Samoa bottomfish fishery

Probability of exceeding MSY	Catch (lb)
0.02	79,894
0.05	84,646
0.10	89,992
0.15	93,705
0.20	96,526
0.25	99,051
0.30	101,278
0.35	103,357
0.40	105,288
0.45	107,218

Probability of exceeding MSY	Catch (lb)
0.5 (point estimate of MSY)	109,000
0.55	110,782
0.60	112,713
0.65	114,643
0.70	116,722
0.75	118,950
0.80	121,474
0.85	124,296
0.90	128,008
0.95	133,354
0.98	138,106

Council ACL and AM Recommendations
In establishing the ACL for American Samoa bottomfish, the American Samoa FEP requires the Council to consider the ABC as well as social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM). The ACL may not exceed the SSC recommended ABC.

Currently, in-season AMs (e.g., fishery closures) are not possible under the current fishery monitoring system because near-real time processing of catch information cannot be achieved. In American Samoa, NMFS relies primarily on the fishery data collection programs administered by American Samoa Department of Marine and Wildlife Resources (DMWR). However, DMWR does not have the personnel or resources to process catch data in near-real time, and so fishery statistics are generally not available until at least six months after the data has been collected. Significant resources will also be required to support the establishment of in-season monitoring capabilities in American Samoa. Therefore, until resources are made available by NMFS, only AMs for when the ACL is exceeded are possible at this time. Under this approach, the Council must determine as soon as possible after the fishing year if an ACL for any stock or stock complex was exceeded. If an ACL is exceeded, the Council in consultation with its advisory bodies would determine the reason for the overage as well as any biological consequences to the stock resulting from the overage. If warranted, the Council would recommend NMFS take action to correct the operational issue that caused the ACL overage which could include a downward adjustment to the ACL in the following fishing year.

2.1.1 Alternative 1: No Action, Status Quo

The Council could decide not to establish an ACL for American Samoa BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

2.1.2 Alternative 2: Set ACL equal to the ABC

Should the SSC recommend Approach 2 and set ABC = 109,000 lb, i.e. the point estimate of MSY (proxy OFL), **ACL would also be set at 109,000 lb** and there would be no buffer between the OFL, ABC and ACL. However as noted in Table 1, recent average catches of bottomfish in American Samoa (2006-2009) is 19,326 lb or about 18% of MSY and is smaller than the confidence interval or margin of error in the estimate of MSY which is ±29,700 lb. Based on current levels of fishing, catch in 2012 would need to increase five fold in order to attain an ACL of 109,000 lb which is highly unlikely. Additionally, in 2009 American Samoa was struck by a tsunami causing large scale damage and impacts to the territory's bottomfish fishing fleet resulting in the territorial government requesting disaster assistance under Sections 312 and 315 of the Magnuson-Stevens Act. For these reasons the potential for overfishing is extremely low and the Council may choose not to reduce ACL below the ABC based on SEEM considerations.

Should the SSC recommend Approach 3 and set ABC = 79,300 lb (lower bound of the MSY), **ACL would also be set at 79,300 lb.** There would be a 29,700 lb buffer between OFL and ABC, but no buffer between ABC and ACL. Based on current fishing activity (Table 1), catch would need to increase four fold in order to attain an ACL of 79,300 lb which is also highly unlikely. For the reasons stated above, Council may choose not to reduce ACL below the ABC based on SEEM considerations.

Should the SSC recommend Approach 4 and set ABC = X % probability of exceeding MSY in 2012, **ACL would be set at ______ lb.** [Need to include analysis of effects relative to recent catch].

2.1.3 Alternative 3: Set ACL lower than ABC based on SEEM considerations

The Council may set ABC lower than ABC based on an informal consideration of social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM) as required by the American Samoa FEP.

2.2 Guam Bottomfish Fishery

NMFS/Council Estimation of OFL

For Guam bottomfish, the posterior means for carrying capacity from the set of credible models indicated that estimates of K ranged from 347 to 591 thousand pounds. The posterior means for intrinsic growth rate suggested that estimates of r were between 0.47 and 0.58 while estimates of the initial ratio of biomass to carrying capacity were between 0.64 and 0.76. The posterior mean of MSY was MSY = 53.0 ± 9.5 thousand pounds. Based on the best-fitting model, the biomass status of the Guam bottomfish complex in 2005 was positive with a 16 probability of $p>0.99$ that biomass was above BMSY. Similarly, the probability that the harvest rate in 2005 exceeded the overfishing threshold was $p<0.01$. Estimates of Guam bottomfish biomass have fluctuated between 250-300 thousand pounds since 1982 (Figure 3).

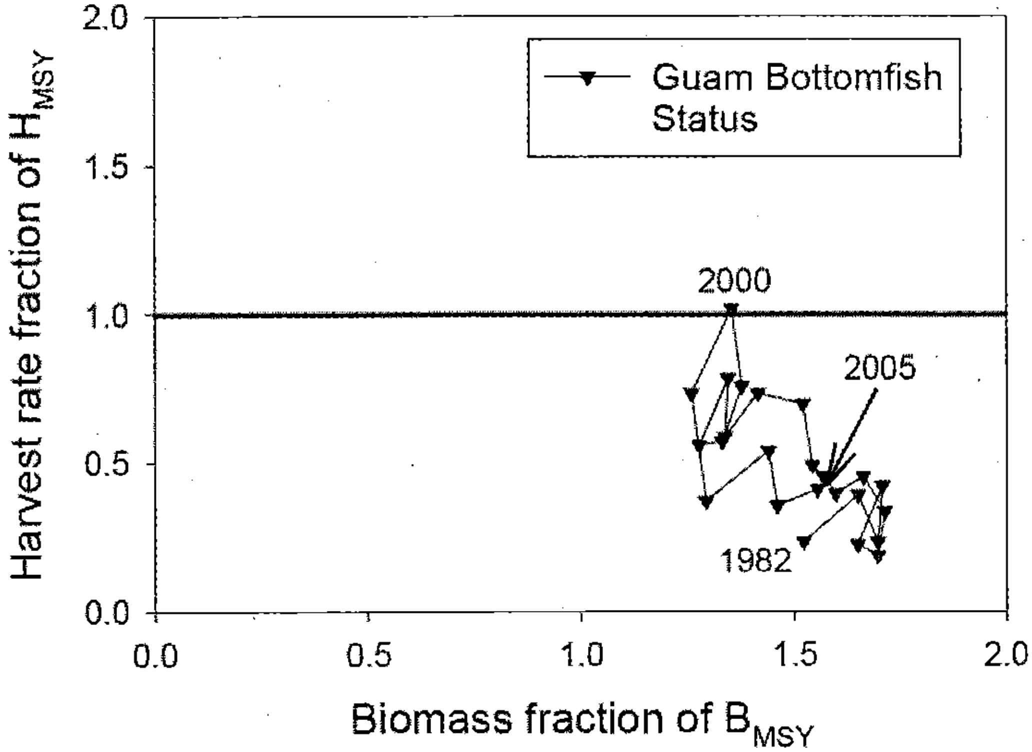

Figure 3. Estimates of relative biomass and relative exploitation rate from the bestfitting production model for Guam, 1982-2005 (Source Moffitt et al 2007)

Biomass declined in the late-1980s to 2000 and has increased since then. Estimates of exploitation rate increased from less than 10% in the early-1980s to a peak of 27% in 2000. Since 2000, exploitation rates have decreased to about 10% in 2005. Estimates of relative biomass (Byear/BMSY) indicate that biomass of the Guam bottomfish complex was above BMSY during 1982-2005. Lower bounds of the 80% confidence intervals for relative biomass show that the annual probability that biomass exceeded BMSY was 90% or greater throughout the time period (Figure 3). Similarly, the estimates of relative exploitation rate (Hyear/HMSY) indicate that the annual harvest rate has been below HMSY since 1982, with the exception of 2000. Upper bounds of the 80% confidence intervals for relative exploitation rate show that the annual probability that harvest rate was below HMSY was 90% or greater, with the exception of the year 2000 when there was roughly a 50% chance that exploitation rate was at or above HMSY. Overall, the production model results suggest that the Guam bottomfish complex has not been overfished since 1982 and has not experienced overfishing, except perhaps in 2000 (Figure 2).

Lacking a specific OFL for fishing year 2012, the long-term MSY of 53,000 lb may be considered as a proxy OFL for Guam bottomfish in fishing year 2012.

Recent (2006-2009) average catch in the Guam bottomfish fishery which operates around the coast of Guam and on the southern offshore banks is 35,081 lb or approximately 66% of MSY (Table 1). However the political division between Guam and the CNMI is an anthropogenic construct and it is probably better to assess the status of bottomfish in the Mariana Archipelago as opposed to separately for the two island groups. On an archipelagic basis recent catches have amounted to about 20% of the MSY (Table 1).

SSC's Calculation of ABC

The SSC must consider what it will establish as the ABC for Guam bottomfish based on the level of scientific uncertainty in the estimate of OFL. The likely potential approaches are:

Approach 1. No Action

The SSC could decide not to establish an ABC for Guam BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

Approach 2. Set the ABC equal to the MSY

The SSC could set the ABC equal to the point estimate **MSY (53,000 lb)** for Guam BMUS as estimated by Moffitt et al (2007). If the point estimate of MSY is considered the proxy OFL in fishing year 2012, setting **ABC = 53,000 lbs** would mean that there would be no buffer between the ABC and the proxy OFL. However as noted in Table 1, recent (2006-2009) average bottomfish catch in Guam is 35,081 lb or approximately 66% of MSY, with the highest catch in the period occurring in 2009 at 39,000 lb or 74% of MSY. Based on current levels of fishing, catch is unlikely to increase significantly in 2012.

Approach 3. Set the ABC at the lower 95% confidence limit of the MSY

The SSC could take a more conservative approach than Approach 2 and set the ABC as the lower bound of the MSY estimated by Moffitt et al (2007). Setting **ABC = 43,500 lbs** would provide a 9,500 lb buffer between ABC and the point estimate of MSY (proxy OFL).
Based on current levels of fishing, catch in 2012 is likely to remain lower than the ABC specified under this approach. In addition, if the Guam and CNMI catches together are compared with the Mariana Archipelago MSY (MSY for Guam and CNMI BMUS combined), recent average catches have been just over 20% of the MSY (Table 1).

Approach 4: Set ABC based on probability of exceeding MSY

Under Alternative 3, the ABC would be set at a level where there was only a 5% probability of exceeding the MSY. However, the SSC could assume that the variability about the MSY is equally distributed (Central Limit Theorem) and set the ABC at some alternative probability value of exceeding the MSY. This approach is not the comparable to the P* approach used with the Deep7 stock assessment, since exceeding the MSY in this instance may not necessarily be overfishing the stock. However, it does provide an alternative to simply applying the 95% confidence interval as a buffer between the catch and MSY. The catches associated with probability values ranging from 10% to 100% of exceeding MSY for the Guam bottomfish fishery are shown in Table 4.

Table 5. Probabilities of exceeding MSY in the Guam bottomfish fishery

Probability of exceeding MSY	Catch (lb)

0.02	43,690
0.05	45,210
0.10	46,920
0.15	48,108
0.20	49,010
0.25	49,818
0.30	50,530
0.35	51,195
0.40	51,813
0.45	52,430
0.5 (point estimate of MSY)	53,000
0.55	53,570
0.60	54,188
0.65	54,805
0.70	55,470
0.75	56,183
0.80	56,990
0.85	57,893
0.90	59,080
0.95	60,790
0.98	62,310

Council ACL and AM Recommendations
In establishing the ACL for Guam bottomfish, the Mariana Archipelago FEP requires the Council to consider the ABC as well as social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM). The ACL may not exceed the SSC recommended ABC.

Currently, in-season AMs (e.g., fishery closures) are not possible under the current fishery monitoring system because near-real time processing of catch information cannot be achieved. In Guam, NMFS relies primarily on the fishery data collection programs administered by Guam Division of Aquatic and Wildlife Resources (DAWR). However, DAWR does not have the personnel or resources to process catch data in near-real time, and so fisheries statistics are generally not available until at least six months after the data has been collected. Significant resources will also be required to support the establishment of in-season monitoring capabilities in Guam. Therefore, until resources are made available by NMFS, only AMs for when the ACL is exceeded are possible at this time. Under this approach, the Council must determine as soon as possible after the fishing year if an ACL for any stock or stock complex was exceeded. If an ACL is exceeded, the Council in consultation with its advisory bodies would determine the reason for the overage as well as any biological consequences to the stock resulting from the overage. If warranted, the Council would recommend NMFS take action to correct the operational issue that caused the ACL overage which could include a downward adjustment to the ACL in the following fishing year.

2.2.1 Alternative 1: No Action, Status Quo

The Council could decide not to establish an ACL for Guam BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

2.2.2 Alternative 2: Set the ACL equal to the ABC

Should the SSC recommend setting ABC = 53,000 lbs, i.e. the point estimate of MSY (proxy OFL), **ACL would also be set at 53,000 lbs** and there would be no buffer between the OFL, ABC and ACL. However as noted in Table 1, recent average catches of bottomfish in Guam (2006-2009) is 35,081 lb or about 66% of MSY, with the highest catch in the period 2006-2009 of 39,000 lbs or 74% of MSY. Based on current levels of fishing, catch in 2012 is not expected to increase significantly and is likely to remain lower than the ACL specified under this approach. Moreover, if the Guam and CNMI catches are compared with the Mariana Archipelago MSY (Table 1), recent average catches have been just over 20% of the combined MSY.

Should the SSC recommend setting ABC = 43,500 lb (lower bound of the MSY), **ACL would be set at 43,500 lb.** There would be a 9,500 lb buffer between OFL and ABC, but no buffer between ABC and ACL. Based on current levels of fishing, catch in 2012 is not expected to increase significantly, and is likely to remain lower than the ACL specified under this approach.

Should the SSC recommend Approach 4 and set ABC = X % probability of exceeding MSY in 2012, **ACL would be set at ______ lb.** [Need to include analysis of effects relative to recent catch].

2.2.3 Alternative 3: Set ACL lower than ABC based on SEEM considerations

The Council may set ABC lower than ABC based on social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM) as required by the Mariana FEP.

2.3 CNMI Bottomfish Fishery

NMFS/Council Estimation of OFL

Carrying capacity estimates from the set of credible models indicated that K ranged from 1027 to 1713 thousand pounds (Table 3.2). Estimates of intrinsic growth rate suggested that r was roughly 0.57. Estimates of the initial ratio of biomass to carrying capacity were 0.45 over the set of credible models, indicating that the model had no information to change the prior assumption for this parameter. The posterior mean of MSY was MSY = 200.5 ± 40.5 thousand pounds. The biomass status of the CNMI bottomfish complex in 2005 appeared to be healthy with a probability of $p>0.99$ that biomass was above BMSY over the set of credible models. Similarly, the probability that the harvest rate in 2005 exceeded the overfishing threshold was $p<0.06$. Estimates of CNMI bottomfish biomass have fluctuated around 1300 thousand pounds since 1988 (Figure 4).

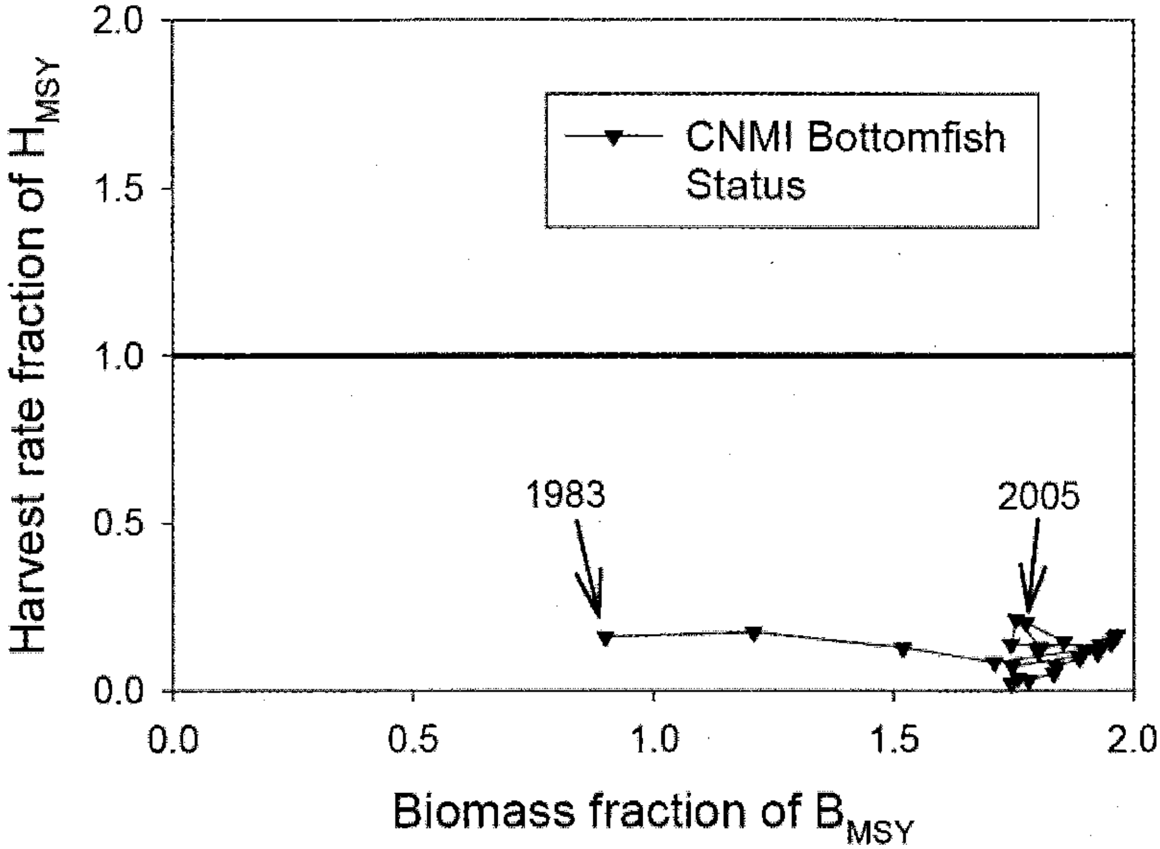

Figure 4. Estimates of relative biomass and relative exploitation rate from the bestfitting production model for the CNMI, 1983-2005(Source Moffitt et al 2007)

Biomass increased in the mid-1990s and has been relatively stable since then. Estimates of exploitation rate decreased from about 5% in the early 1980s to less than 5% in the early 1990s. Since then exploitation rates have increased to around 5%. Estimates of relative biomass indicate that biomass of the CNMI bottomfish complex has been above BMSY since 1984 (Figure 3). Similarly, the estimates of relative exploitation rate indicate that the annual harvest rate was below HMSY during 1983- 2005. Lower bounds of the 80% confidence intervals for relative biomass show that the annual probability that biomass exceeded BMSY was 90% or greater throughout most of the time period (Figure 4). Similarly, upper bounds of the 80% confidence intervals for relative exploitation rate indicate that the annual probability of harvest rate being at or below HMSY was 90% or greater. Overall, the production model results suggest that the CNMI bottomfish complex was not overfished and did not experience overfishing during 1986-2005 (Figure 4).

Lacking a specific OFL for fishing year 2012, the long-term MSY of 200,500 lb may be considered a proxy OFL for CNMI bottomfish in fishing year 2012.

Recent (2006-2009) average catch in the CNMI bottomfish fishery which operates primarily around the southern islands of Rota, Tinian and Saipan and offshore banks is 17,419 lb or about

9% of the MSY. As noted above, the political division between the CNMI and Guam and is an anthropogenic construct and it is probably better to as the status of bottomfish in the Mariana Archipelago as opposed to separately for the two island groups. On an archipelagic basis recent bottomfish catches have amounted to about 20% of the combined Guam/CNMI MSY (Table 1).

SSC's Calculation of ABC

The SSC must consider what it will establish as the ABC for CNMI bottomfish based on the level of scientific uncertainty in the estimate of OFL. The likely potential approaches are:

Approach 1. No Action

The SSC could decide not to establish an ABC for CNMI BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

Approach 2. Set the ABC equal to the MSY

The SSC could set the ABC equal to the point estimate MSY (200,500 lb) for CNMI BMUS as estimated by Moffitt et al (2007). If the point estimate of MSY is considered the proxy OFL in fishing year 2012, setting **ABC = 200,500 lb** would mean that there would be no buffer between the ABC and the proxy OFL. As noted in Table 1, recent (2006-2009) average catch is 17,419 lb or about 9% of the MSY and is unlikely to increase significantly in 2012. Further, in the unlikely event that catches actually rise to the level of the MSY point estimate, catch is not expected to exceed the upper bound of the confidence limit which is 241,000 lb.

Approach 3. Set the ABC at the lower bound of the MSY

The SSC could take a more conservative approach than Approach 2 and set the ABC as the lower bound of the MSY estimated by Moffitt et al (2007). Setting **ABC = 160,000 lbs** would provide a 40,500 lb buffer between ABC and the point estimate of MSY (proxy OFL). As noted in Table 1, recent (2006-2009) average bottomfish catch in CNMI is 17,419 lb and would be significantly lower than the ABC specified under this approach.

Approach 4: Set ABC based on probability of exceeding MSY

Under Alternative 3, the ABC would be set at a level where there was only a 5% probability of exceeding the MSY. However, the SSC could assume that the variability about the MSY is equally distributed (Central Limit Theorem) and set the ABC at some alternative probability value of exceeding the MSY. This approach is not the comparable to the P* approach used with the Deep7 stock assessment, since exceeding the MSY in this instance may not necessarily be overfishing the stock. However, it does provide an alternative to simply applying the 95% confidence interval as a buffer between the catch and MSY. The catches associated with probability values ranging from 2% to 98% of exceeding MSY for the CNMI bottomfish fishery are shown in Table 4.

Table 6. Catches and associated probabilities of exceeding MSY in the CNMI bottomfish fishery

Probability of exceeding MSY	Catch (lb)

0.02	160,810
0.05	167,290
0.10	174,580
0.15	179,643
0.20	183,490
0.25	186,933
0.30	189,970
0.35	192,805
0.40	195,438
0.45	198,070
0.5 (point estimate of MSY)	200,500
0.55	202,930
0.60	205,563
0.65	208,195
0.70	211,030
0.75	214,068
0.80	217,510
0.85	221,358
0.90	226,420
0.95	233,710
0.98	240,190

Council ACL and AM Recommendations

In establishing the ACL for CNMI bottomfish, the Mariana Archipelago FEP requires the Council to consider the ABC as well as social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM). The ACL may not exceed the SSC recommended ABC.

Currently, in-season AMs (e.g., fishery closures) are not possible under the current fishery monitoring system because near-real time processing of catch information cannot be achieved. In the CNMI, NMFS relies primarily on the fishery data collection programs administered by CNMI Division of Fish and Wildlife (DFW). However, DFW does not have the personnel or resources to process catch data in near-real time, and so fisheries statistics are generally not available until at least six months after the data has been collected. Significant resources will also be required to support the establishment of in-season monitoring capabilities in the CNMI. Therefore, until resources are made available by NMFS, only AMs for when the ACL is exceeded are possible at this time. Under this approach, the Council must determine as soon as possible after the fishing year if an ACL for any stock or stock complex was exceeded. If an ACL is exceeded, the Council in consultation with its advisory bodies would determine the reason for the overage as well as any biological consequences to the stock resulting from the overage. If warranted, the Council would recommend NMFS take action to correct the operational issue that caused the ACL overage which could include a downward adjustment to the ACL in the following fishing year.

2.3.1 Alternative 1: No Action, Status Quo

The Council could decide not to establish an ABC for CNMI BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

2.3.2 Alternative 2: Set the ACL equal to the ABC

Should the SSC recommend setting ABC = 200,500 lb, i.e. the point estimate of MSY (OFL proxy), **ACL would also be set at 200,500 lb** and there would be no buffer between OFL, ABC and ACL. However as noted in Table 1, recent (2006-2009) average catch is 17,419 lb or about 9% of the MSY and is smaller than the confidence interval or margin of error in the estimate of MSY which is ±40,500 lb. Based on current levels of fishing, catch in 2012 would need to increase eleven fold in order to attain an ACL of 200,000 lb which is highly unlikely. For these reasons, the potential for overfishing is extremely low and the Council may choose to not reduce ACL below the ABC based on SEEM considerations.

Should the SSC recommend setting ABC = 160,000 lb (lower bound of the MSY), **ACL would also be set at 160,000 lb.** There would be a 40,500 lb buffer between OFL and ABC, but no buffer between ABC and ACL. Based on current levels of fishing catch in 2011 would need to increase over nine-fold in order to attain an ACL of 160,000 lb which is highly unlikely. For these reasons, the potential for overfishing is extremely low and the Council may choose to not reduce ACL below the ABC based on SEEM considerations.

Should the SSC recommend Approach 4 and set ABC = X % probability of exceeding MSY in 2012, **ACL would be set at ______ lb.** [Need to include analysis of effects relative to recent catch].

2.3.3 Alternative 3: Set ACL lower than ABC based on SEEM considerations

The Council may set ABC lower than ABC based on social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM) as required by the Mariana FEP.

2.4 Hawaii non-Deep 7 Bottomfish Fishery

NMFS/Council Estimation of OFL

In 2011, NMFS Pacific Islands Fisheries Science Center completed a stock assessment for the Deep 7 bottomfish stock complex which 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 press, Table 17.1 and shown in Appendix 1). The 2010 stock assessment uses similar commercial fishery data as in the previous 2008 stock assessment (Brodziak et al. 2009), but includes a modified treatment of unreported catch and catch per unit of effort (CPUE) standardization, as well as new research information on the likely life history characteristics of bottomfish (A. Andrews, PIFSC, unpublished 2010 research).

According to the 2010 stock assessment update, the Catch 2/CPUE 1 scenario combination represents the best approximation (with a 0.400 probability) of the true state of nature of the bottomfish fishery and Deep 7 bottomfish population dynamics. 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 percent probability of overfishing the MHI Deep 7 bottomfish complex in fishing year 2011-12 and again in fishing year 2012-13 is 383,000 lb. Therefore, while the long-term MSY for the Deep 7 bottomfish fishery is 417,000 lb, the overfishing limit (OFL) for the 2011-12 and 2012-13 fishing years is estimated to be 383,000 lb. These estimates are based on the bottomfish catch and effort information from the time period 1949-2010.

The 2010 MHI Deep 7 bottomfish stock assessment does not include an evaluation of stock status or the risk of overfishing for any of the remaining BMUS in the MHI (hereinafter, the MHI non-deep 7 bottomfish)[4]. Therefore, biological reference points including estimates of MSY and OFL for the MHI non-deep 7 bottomfish is unknown. However, the stock assessment projection results described in Table 17.1 of the 2010 assessment could by analogy, be used to develop an OFL proxy for the MHI non-deep 7 bottomfish stock complex, and a range of commercial non-Deep 7 bottomfish catches that would produce probabilities of overfishing ranging from zero percent to 100 percent in fishing year 2012 although, this approach requires assumptions that population dynamics, catchability and other parameters of the non-deep7 bottomfish are similar in relative scale to the Deep 7 bottomfish (Brodziak, pers. com. March 31, 2011).

In general, MHI non-deep 7 bottomfish are coral reef associated species and are more productive and have a greater availability of habitat area compared to MHI Deep 7 bottomfish. However, non-deep 7 are also harvested by a greater range of gear methods which results in levels and rates of exploitation that have not been assesses quantitatively or qualitatively in any previous stock assessment.

While a separate stock assessment for MHI non-deep 7 bottomfish is the preferred approach, until one is produced, establishing a proxy for OFL and probabilities of overfishing for this stock complex based on projection results of the Catch 2/CPUE 1 scenario combination for MHI Deep 7 bottomfish may be an appropriate approach given that reported commercial catches of MHI Deep 7 bottomfish in proportion to the total reported commercial catches of all MHI bottomfish (Deep 7 + non-deep 7) are relatively stable over time as indicated in Tables 5 (Estimates of total Deep 7 catches) and Table 6 (Estimates of total bottomfish catches) contained in Brodziak et al. (in press). Inversely, reported commercial catches of MHI non-deep 7 bottomfish in proportion to total reported commercial catches of all MHI bottomfish are also stable overtime.

Table 7 below summarizes the proportion of the average reported commercial catches (C) of MHI Deep 7 bottomfish relative to the average total reported commercial catches of all MHI bottomfish for three time periods: (1) 1949-2010; (2) 2000-2009; and 2008-2009 as presented in

[4] MHI non-deep 7 bottomfish include uku *(Aprion virescens)*, white ulua *(Caranx ignoblis)*, black ulua *(Caranx lugubris)*, taape *(Lutjanus kasmira)*, yellowtail kalekale *(Pristipomoides auricilla)*, butaguchi (*Pseudocaranx dentex)* and kahala (*Seriola dumerili)*.

Tables 5 and 6 in Brodziak et al. (in press). The proportion of MHI Deep 7 catch (P_{DEEP7}) to the total MHI bottomfish catch is also provided and is calculated using the following equation:

$$P_{DEEP7(t)} = C_{DEEP7(t)} / C_{\text{Total BMUS}(t)}$$

Table 7. Proportion of reported commercial catches of MHI Deep 7 and total reported commercial MHI bottomfish catch over time under Catch 2/CPUE 1 scenario

	t = 1949-2010	t =2000-2009	t =2008-2010
Ave. Catch of Deep 7 bottomfish[1]	281.3	234.3	221.5
Ave. Catch of Total BMUS[2]	422.1	325.3	330.7
Proportion of Deep 7 (P_{DEEP7})	0.666	0.720	0.700

[1] Source: Table 5 in Brodziak et al., (in press)

[2] Source: Table 6 in Brodziak et al., (in press)

To estimate an OFL proxy for the MHI non-deep 7 bottomfish stock complex, and a range of commercial non-Deep 7 bottomfish catches that would produce probabilities of overfishing ranging from zero percent to 100 percent in fishing year 2012, the commercial catch values for MHI Deep 7 bottomfish associated with Catch 2/ CPUE Scenario 1 as presented in Table 17.1 of Brodziak et al., (in press) can be divided by the P_{DEEP7} value in Table 3 above.

The results of this calculation will derive the total commercial catch equivalent of all MHI bottomfish (Deep 7 + non-deep 7) and the corresponding probabilities of overfishing all MHI bottomfish in 2012. To derive the level of catch that would produce the corresponding probability of overfishing for MHI non-deep 7 bottomfish, the level of catch for MHI Deep 7 bottomfish is simply subtracted from the level of catch for all MHI bottomfish.

Tables 4, 5 and 6 describes the results of this calculation for the time periods 1949-2010, 2000-2009 and 2008-2009, respectively. In all tables, projections for total commercial catch of MHI Deep 7 bottomfish are based on the catch and effort information from the time period 1949-2010.

Table 8. Commercial catch (1000 pounds) of MHI Deep 7 BMUS, MHI non-Deep 7 BMUS and all MHI BMUS combined that would produce probabilities of overfishing in 2012 from 0 through 50% based on 1949-2010 catch data. (P_{DEEP7} = 0.666)

Probability of Overfishing[1]	Catch of MHI Deep 7 BMUS[1]	Catch of All MHI BMUS *(Deep 7 + non-Deep 7)*	Catch of MHI non-Deep 7 BMUS
0	11	17	6
5	147	221	74
10	197	296	99
15	229	344	115
20	255	386	131
25	277	415	138
30	299	449	150
35	319	479	160
40	341	512	171

Probability of Overfishing[1]	Catch of MHI Deep 7 BMUS[1]	Catch of All MHI BMUS *(Deep 7 + non-Deep 7)*	Catch of MHI non-Deep 7 BMUS
45	361	542	181
50	383	575	192
55	407	611	204
60	429	644	215
65	455	683	228
70	481	722	241
75	513	779	266
80	549	824	275
85	597	896	299
90	665	998	333
95	783	1176	393
99	1001	1503	502

[1] Source: Table 17.1 in Brodziak et al., (in press)

Table 9. Commercial catch (1000 pounds) of MHI Deep 7 BMUS, MHI non-Deep 7 BMUS and all MHI BMUS combined that would produce probabilities of overfishing in 2012 from 0 through 50% based on 2000-2010 catch data (PDEEP7 = 0.72)

Probability of Overfishing[1]	Catch of MHI Deep 7 BMUS[1]	Catch of All MHI BMUS *(Deep 7 + non-Deep 7)*	Catch of MHI non-Deep 7 BMUS
0	11	15	4
5	147	204	57
10	197	274	77
15	229	318	89
20	255	354	99
25	277	385	108
30	299	415	116
35	319	443	124
40	341	474	133
45	361	501	140
50	383	532	149
55	407	565	158
60	429	596	167
65	455	632	177
70	481	668	187
75	513	713	200
80	549	763	214
85	597	829	232
90	665	924	259
95	783	1088	305
99	1001	1390	389

[1] Source: Table 17.1 in Brodziak et al., (in press)

Table 10. Commercial catch (1000 pounds) of MHI Deep 7 BMUS, MHI non-Deep 7 BMUS and all MHI BMUS combined that would produce probabilities of overfishing in 2012 from 0 through 50% based on 2008-2010 catch data (PDEEP7 = 0.700)

Probability of Overfishing[1]	Catch of MHI Deep 7 BMUS[1]	Catch of All MHI BMUS *(Deep 7 + non-Deep 7)*	Catch of MHI non-Deep 7 BMUS
0	11	16	5
5	147	210	63
10	197	281	84
15	229	327	98
20	255	364	109
25	277	396	119
30	299	427	128
35	319	456	137
40	341	487	146
45	361	515	154
50	383	547	164
55	407	581	174
60	429	613	184
65	455	650	195
70	481	687	206
75	513	733	220
80	549	784	235
85	597	853	256
90	665	950	285
95	783	1119	336
99	1001	1430	429

[1] Source: Table 17.1 in Brodziak et al., (in press)

In accordance with the Hawaii FEP, ABC is the maximum value for which the probability or risk of overfishing (P*) is 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, including assessment information, uncertainty characterization, stock status, and stock productivity and susceptibility.

SSC's Calculation of ABC

The SSC must consider what it will establish as the ABC for MHI non-deep 7 bottomfish based on the level of scientific uncertainty in the estimate of OFL. The likely potential approaches are:

Approach 1. No Action

The SSC could decide not to establish an ABC for Hawaii non-deep 7 BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

Approach 2. Set the ABC less than or equal to the level of catch associated with a P* of 50%
The SSC could set the ABC equal to the level of catch associated with a 50% probability of overfishing non-deep 7 bottomfish in the MHI in fishing year 2012. Under this approach, the SSC must first decide which of the three time periods (1949-2010, 2000-2009 or 2008-2009) best represent catches of non-deep 7 bottomfish fishery. Then, the SSC must set the ABC at a level supported by the best available information and in consideration of scientific uncertainty in the estimate of OFL and other scientific uncertainty including assessment information, uncertainty characterization, stock status, and stock productivity and susceptibility and other information. Although the Council should advise the SSC on the level of risk to apply in calculating ABC, the Council has not done so.

Approach 3. Set the ABC according to the Tier 5 ABC control rule
Under this approach, the SSC would determine that Approach 2 is inappropriate and that MHI non-deep 7 stocks are data poor stocks and therefore, ABC should be calculated in accordance with the Tier 5 control rule for data poor stocks.

For data poor stocks where only catch data is available and OFL is unknown, ABC is calculated by the SSC based on the tier 5 ABC control rule (Tier 5: Data poor, Ad hoc Approach to Setting ABCs) which directs the SSC to multiply the average catch from a time period where there is no quantitative or qualitative evidence of declining abundance ("Recent Catch") by a factor based on a qualitative estimate of relative stock size or biomass (B) in the year of management. When it is not possible to analytically determine B relative to the biomass necessary to produce the maximum sustainable yield (MSY) from the fishery (B_{MSY}), the process allows for an approach based on informed judgment, including expert opinion and consensus-building methods provides a summary of the Council's default ABC control rule for data poor stocks.

Table 11. Tier 5 ABC Control Rule (Data poor, Ad hoc Approach to Setting ABCs)

Assessment of biomass	ABC multiplier
If estimate of B is above B_{MSY}	ABC = 1.00 x Recent Catch
If estimate of B is above minimum stock size threshold (MSST), but below B_{MSY}	ABC = 0.67 x Recent Catch
If estimate of B is below MSST (i.e. overfished)	ABC = 0.33 x Recent Catch

The long term time series for the non-deep 7stocks is given in Table 10 and in Figures X-Y. The SSC may use these time series or parts thereof to set the 'Recent Catch'. Selection of the portion of the time series would be contingent that the trend in the data was stable, ie as flat trajectory or an increasing trend, since it would be assumed that such trajectories were empirical evidence that biomass was above MSY. Clearly, with an increasing catch trend some informed judgment would have to be made that the increase in catch is not leading to depletion of the biomass either to B_{MSY} or below B_{MSY}.

If the SSC is unable to establish a 'Recent Catch' based on this approach due to extreme variability in the data, it may choose another option, which was applied to coral reef fish, where the 75th percentile of the time series of catches is selected. The 75th percentile values for the non-deep7 bottomfish catches are given in Table 11. The percentiles were calculated over the time series for which catch date were available., i.e. 1966 to 2010 for uku and total catch, 1982-2010 for butaguchi, 1984- 2010 for black ulua, 1981-2010 for white ulua and 2001-2010 for yellowtail kali.

Table 12. Time series (1966-2010) of non-deep 7 catch in the Main Hawaii Islands bottomfish fishery

Species Name	Uku	Butaguchi	Black ulua	White ulua	Yellowtail kali	Total
1966	57,833	0	0	0	0	57,833
1967	58,540	0	0	0	0	58,540
1968	49,664	0	0	0	0	49,664
1969	57,526	0	0	0	0	57,526
1970	47,405	0	0	0	0	47,405
1971	48,697	0	0	0	0	48,697
1972	48,064	0	0	0	0	48,064
1973	66,857	0	0	0	0	66,857
1974	77,918	0	0	0	0	77,918
1975	61,722	0	0	0	0	61,722
1976	62,115	0	0	0	0	62,115
1977	67,951	0	0	0	0	67,951
1978	83,702	0	0	0	0	83,702
1979	87,031	0	0	0	0	87,031
1980	74,651	0	0	0	0	74,651
1981	84,859	0	0	481	0	85,340
1982	100,860	2,175	0	5,694	0	108,730
1983	131,631	1,255	0	13,673	0	146,559
1984	138,276	2,921	117	20,553	0	161,867
1985	49,251	4,034	902	9,868	0	64,055
1986	104,019	19,414	363	14,774	0	138,570
1987	56,725	1,698	61	7,458	0	65,942
1988	343,177	6,026	354	22,643	0	372,201
1989	207,734	10,454	503	19,744	0	238,434
1990	97,235	6,840	62	13,375	0	117,512
1991	90,266	7,895	24	6,806	0	104,991
1992	88,389	2,229	93	7,075	0	97,786
1993	69,948	3,760	68	2,891	0	76,667
1994	71,802	4,678	169	2,691	0	79,340
1995	62,456	6,264	186	3,214	0	72,121
1996	53,237	3,260	52	6,210	0	62,759
1997	67,957	5,923	192	2,203	0	76,276
1998	61,088	1,943	315	3,715	0	67,061

Species Name	Uku	Butaguchi	Black ulua	White ulua	Yellowtail kali	Total
1999	90,968	1,946	12	2,976	0	95,901
2000	83,318	2,947	73	4,044	0	90,382
2001	58,436	1,814	122	4,199	5	64,576
2002	57,155	1,659	421	4,183	1	63,420
2003	45,704	1,635	1,180	12,873	0	61,391
2004	76,815	1,394	1,034	14,112	43	93,399
2005	63,505	1,493	453	11,213	25	76,688
2006	59,569	298	267	9,076	32	69,241
2007	68,953	880	773	26,722	0	97,328
2008	92,872	1,193	405	15,856	6	110,331
2009	87,175	1,083	549	13,794	35	102,636
2010	123,250	772	3,348	17,986	27	145,383

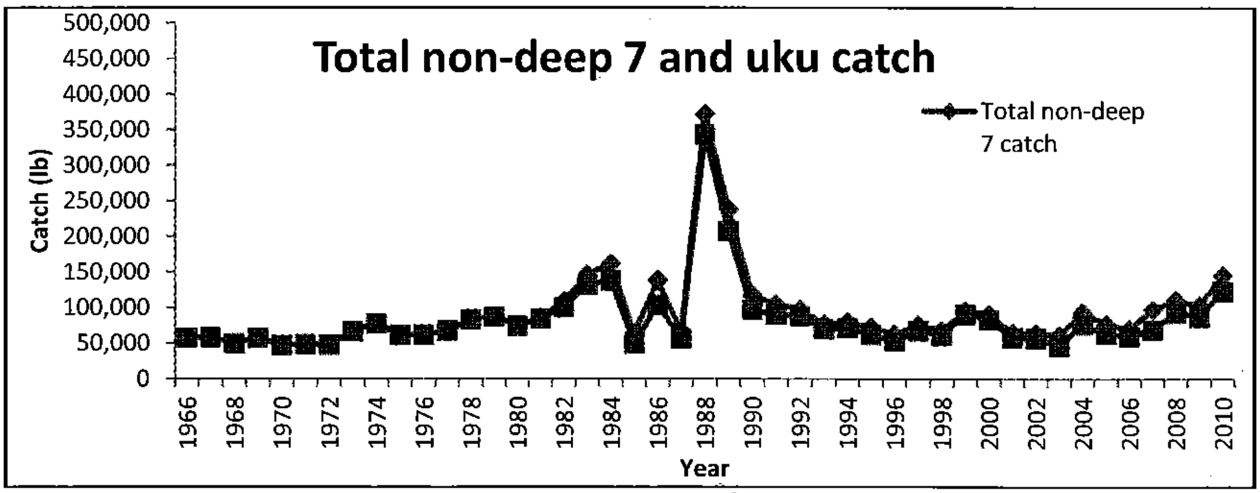

Figure 5. Main Hawaiian Islands catches of all non-deep7 bottomfish and uku between 1966-2010

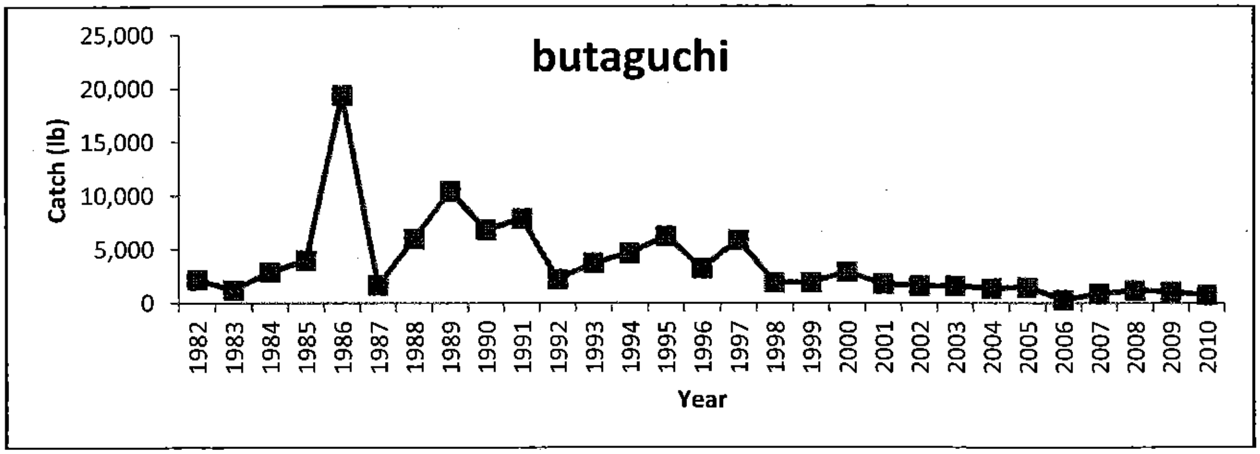

Figure 6. Main Hawaiian Islands catches of butaguchi between 1982-2010

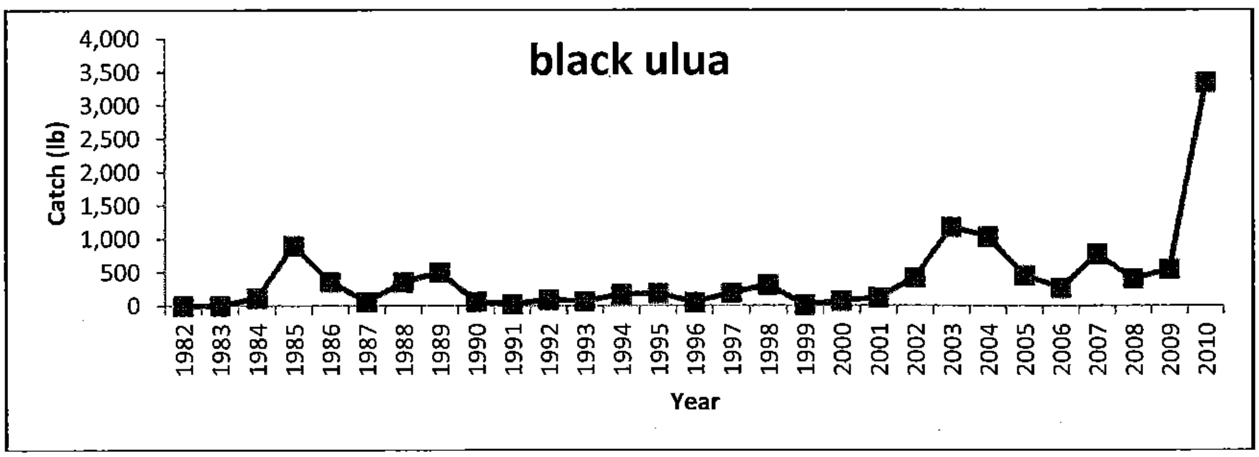

Figure 7. Main Hawaiian Islands catches of black ulua between 1982-2010

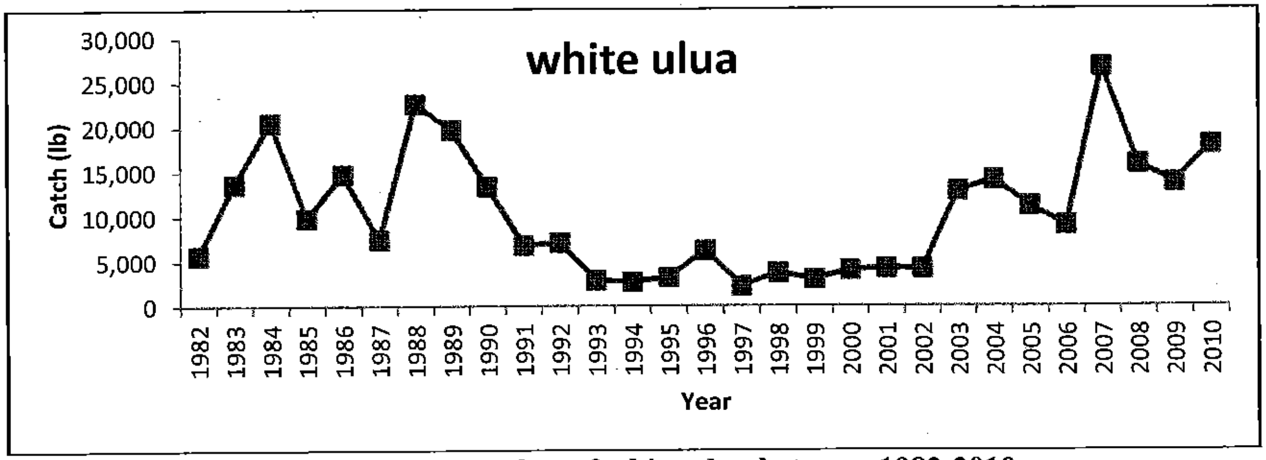

Figure 8. Main Hawaiian Islands catches of white ulua between 1982-2010

Table 13. 75th Percentiles for the non-deep7 bottomfish catch from 1966 to 2010. Note for Yellowtail Kali, the 75th percentile was estimated for the catch between 2001-2010

Species	75th Percentile catch (lb)
Uku	88,389
Butaguchi	4,677
Black ulua	477
White ulua	14,032
Yellowtail Kali	30
Total non-deep 7 catch	107,608

Council ACL and AM Recommendations

In establishing the ACL for Hawaii bottomfish, the Hawaii Archipelago FEP requires the Council to consider the ABC as well as social and economic factors, pertinent ecological considerations, and management uncertainty (SEEM). The ACL may not exceed the SSC recommended ABC. For the purpose of Hawaii BMUS ACL specifications, taape *(Lutjanus kasmira)* and kahala (*Seriola dumerili)* will not be included as these species were specifically excluded from NMFS stock assessment parameters. Instead, ACLs for these species are being considered under the ACL specification for Coral Reef Ecosystem MUS currently in development. Specifically, catches of taape will be included in the ACL specification for the family Lutjanidae (snappers) while catches of kahala will be included in the ACL specification for the family Carangidae (jacks).

Currently, in-season AMs (e.g., fishery closures) are not possible under the current fishery monitoring system because near-real time processing of catch information cannot be achieved. In the Hawaii, NMFS relies primarily on the fishery data collection programs administered by Hawaii Division of Aquatic Resources (HDAR). However, HDAR does not have the personnel or resources to process catch data in near-real time, and so fisheries statistics are generally not available until at least six months after the data has been collected. Significant resources will also be required to support the establishment of in-season monitoring capabilities in the Hawaii. Therefore, until resources are made available by NMFS, only AMs for when the ACL is exceeded are possible at this time. Under this approach, the Council must determine as soon as possible after the fishing year if an ACL for any stock or stock complex was exceeded. If an ACL is exceeded, the Council in consultation with its advisory bodies would determine the reason for the overage as well as any biological consequences to the stock resulting from the overage. If warranted, the Council would recommend NMFS take action to correct the operational issue that caused the ACL overage which could include a downward adjustment to the ACL in the following fishing year.

2.4.1 Alternative 1: No Action, Status Quo

The Council could decide not to establish an ABC for CNMI BMUS but this would be inconsistent with the MSA and with the amendment to all the Council's FEPs where a process has been established for the designation of ABCs by the SSC and subsequent designation of ACLs by the Council.

2.4.2 Alternative 2: Set ACL equal to ABC

ACL will depend if SSC chooses to Approach 2 (Set the ABC less than or equal to the level of catch associated with a P* of 50%) or Approach 3 (Set the ABC according to the Tier 5 ABC control rule).

2.4.3 Alternative 3: Set ACL at or below ABC based on SEEM considerations

The Council may set ABC lower than ABC based on an informal consideration of social and economic factors, pertinent ecological, and management uncertainty (SEEM) as required by the Hawaii FEP.

3 References

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WPRFC. 2011. Omnibus Amendment for the Western Pacific Region to Establish a Process for Specifying Annual Catch Limits and Accountability Measures Including an Environmental Assessment. Amendment 1 to the Fishery Ecosystem Plan for the Pacific Remote Island Areas; Amendment 2 to the Fishery Ecosystem Plan for the American Samoa Archipelago; Amendment 2 to the Fishery Ecosystem Plan for the Mariana Archipelago; Amendment 3 to the Fishery Ecosystem Plan for the Hawaii Archipelago; Amendment 4 to the Fishery Ecosystem Plan for Pacific Pelagic Fisheries of the Western Pacific Region. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii, 122 p.