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Options for Specifying Acceptable Biological Catch for the Main Hawaiian Island Deep 7 Bottomfish Fishery for Fishing Year 2015-16, 2016-17, and 2017-18

Summary: The SSC must recommend multi-year acceptable biological catch for the main Hawaiian island deep 7 bottomfish for fishing year 2015-16, 2016-17, and 2017-18. The best scientific information available is the 2011 stock assessment model with updated data to 2013 (Boggs memo for the record dated March 03, 2015). Based on this updated information, the Maximum Sustainable Yield was estimated to be at 404,000 lbs and the overfishing limit at 352,000 lbs (catch level associated with a 50% probability of overfishing). The retrospective pattern in the model and data caused the reduction which is expected since the model is correcting the estimate of biomass as the assessment is updated with additional data. The P* working group and SSC subcommittee evaluated the scientific uncertainty and recommended a risk level for the full SSC and Council to consider.

The SSC and Council needs to evaluate the following options:
1) No Action - no ACLs will be specified for fishing year 2015-16, 2016-17, and 2017-18

2) Status Quo - Specify the same ABC based on the old stock assessment without updating the time series and set at P* of 41% which is 346,000 lb

3) Specify ABC/ACLs based on the updated 2011 assessment model with three years of data and the new P* of 38 percent, which is 302,000 lb The ACL would not be reduced from ABC for SEEM factors because….

4) Specify ABC based on the updated 2011 assessment model with three years of data and apply a phase-in P* approach over the three year period. For 2015-16, P* =44% (326,000 lb), for 2016-17, P* =41% (314,000 lb) for 2017-18, P*=38% (302,000 lb).

5) Specify ABC based on the updated 2011 assessment model with three years of data and set P* at 30%, which is 270,000 lb

ABC Alternatives for Deep 7 Bottomfish Fisheries in the MHI

This section describes a range of ABC alternatives for MHI Deep 7 bottomfish fisheries in fishing years 2015-16, 2016-17, 2017-18 and expected fishery outcomes. Table 2 summarizes the alternatives considered, including their associated probability of overfishing percentiles (P*) based on risk projections from the 2011 stock assessment with updated data to 2013 (Table 2 in Boggs memo for record dated March 3, 2015, and shown in Appendix A). In accordance with

National Standard 1 guidelines of the Magnuson-Stevens Act, the probability of overfishing cannot exceed 50 percent and should be a lower value (74 FR 3178, January 9, 2011).

Table 1. Summary of ABC alternatives and associated probability of overfishing (P*) percentile for MHI Deep 7 bottomfish, including MSY-based reference points.

MHI Deep 7 Bottomfish						
MSY = 404,000 lb						
OFL = 352,000 lb (P*=50%)						
$ABC_{14\text{-}15}$ = 346,000 lb (P*=41%) – Based on Brodziak et al. 2011						
$ABC_{15\text{-}16}$ To be determined. Will be based on Brodizak et al. 2011 as updated						
	FY 2015-2016		***FY 2016-2017***		***FY 2017-2018***	
	ABC (lb)	***P****	***ABC (lb)***	***P****	***ABC (lb)***	***P****
Alternative 1 (No Action)	No ABC	NA	No ABC	NA	No ABC	NA
Alternative 2 (Status Quo applied to 3 years)	346,000	48-49	346,000	48-49	346,000	48-49
Alternative 3 (P* level using updated data and apply quota to 3 years)	302,000	38	302,000	38	302,000	38
Alternative 4 (P* level using updated data and apply phase in approach to preferred P* level)	326,000	44	314,000	41	302,000	38
Alternative 5 (P* level using updated data and lower than preferred P* level)	270,000	30	270,000	30	270,000	30

Source: updated numbers are based of the Boggs memo (2015)

Alternative 1: No ABC (No Action)

Under Alternative 1, the SSC would not specify an ABC for the MHI Deep 7 bottomfish fishery for the 2015-18 fishing year. However, this alternative would not comply with the Magnuson-Stevens Act or the provisions of the Hawaii FEP, which require NMFS to specify an ACL and AMs for all stocks and stock complexes.

Expected Fishery Outcome

Under this alternative, the lack of an ABC is not expected to result in large adverse effects on the conduct of the fishery, including gear types used, areas fished, level of catch or effort, target and non-target stocks, or protected species. This is because based upon the best available commercial and scientific information, the MHI Deep 7 bottomfish fishery historically harvests less than the stock complex's maximum sustainable year, even without an ABC. As shown in Table 2 commercial catches of MHI Deep 7 bottomfish have consistently remained below the estimated OFL of 352,000 lb and long-term MSY of 404,000 lb. In the 2013-14 fishing year, the fishery reported a total of 309,485 lb of MHI Deep 7 bottomfish. This is the highest level of catch since NMFS implemented a catch limit system in the 2007-08 fishing year. During fishing year 2013-

14, the fishery remained open year round. In fishing years 2015-16, 2016-17, and 2017-18 total reported catch is expected to be similar to 2013-14 catch, and is not expected to result in overfishing. As of May 15, 2015, the fishery has a reported total landing of 265,619 lbs for fishing year 2014-2015. Therefore, the expected fishery outcome under Alternative 1 is expected to be identical to the expected fishery outcome described under Alternative 2 below.

Alternative 2: Specify an ABC of 346,000 lb based on the 2011 Stock Assessment with no updated data (Status Quo/NEPA Baseline)

Under Alternative 2, the SSC would specify an ABC of 346,000 lb for the 2015-16, 2016-17, 2017-18 fishing years as previously recommended by the Council. Based on probability of overfishing projections contained in the 2011 stock assessment (Table 19.1 in Brodziak et al. 2011 and shown in Appendix B), an ABC of 346,000 lb is associated with a 41 percent probability of overfishing the MHI Deep 7 bottomfish stock complex should the entire ACL be caught. This ABC is identical the ABC NMFS specified for the fishery in fishing year 2012-13 (77 FR 56791, September 9, 2012, and 2013-14 (78 FR 59626, September 27, 2013).

Expected Fishery Outcome

Under Alternative 2, the specification of an ABC of 346,000 lb is not expected to result in changes in the conduct of the fishery, including gear types used, areas fished, level of catch or effort. This is because total reported catch in 2015-16, 2016-17, and 2017-18 is expected to be similar to 2013-14 catch (i.e., 309,485 lb), and remain below the ABC of 346,000 lb. As of May 15, 2015, the fishery has a reported total landing of 265,619 lbs for fishing year 2014-2015 and is not expected to reach the 2014-15 ACL of 346,000 lb.

Alternative 3: Specify an ACL of 302,000 lb based on the 2011 Stock Assessment with updated data to 2013 and no phase-in

Under Alternative 3, the SSC would specify an ABC of 302,000 lb of MHI Deep 7 bottomfish for the 2015-16, 2016-17, and 2017-18 fishing year. Based on the probability of overfishing projections contained in the update of 2011 benchmark stock assessment of Deep 7 bottomfish in the Main Hawaiian Islands using data through 2013 (Boggs memo for the record dated March 3, 2015 and the supplemental table dated May 19, 2015), an ACL of 302,000 lb is associated with a 38 percent probability of overfishing should the entire ACL be caught. The P* working group re-evaluated the scientific uncertainty around the 2011 assessment as a result of the recent CIE review that highlighted uncertainties in the model, assumption and data that went into the assessment. The P* working group met on May 6, 2015 and June 4, 2015 and recommended a risk of overfishing level of 38% for the MHI deep 7 bottomfish fishery (see appendix C).

Based on the 2011 stock assessment model with three years of additional catch data, the 2015 stock assessment update re-estimates MSY to be 404,000 lb, which is less than the previous MSY estimate of 417,000 lb reported in the 2011 stock assessment (Boggs memo for the record dated March 3, 2015). Based on a maximum potential harvest of 346,000 lb of MHI Deep 7 bottomfish in the ongoing 2014-15 fishing year, the 2015 stock assessment update estimated an OFL of 352,000 lb, which is less than the OFL estimate in the 2011 stock assessment at 383,000 lbs.

Expected Fishery Outcome

Under Alternative 3, the fishery is not likely to reach the ABC of 302,000 lb if the fishery performance is average relative to the fishery performance over the past 3 years (Table 4). If the fishery performs closely to the 2013-14 fishing year, the fishery can potentially close around early to mid-August (Table 2). If the fishery performance peaks and trends maximum landing each month, this level of catch would result in a five month potential fishery closure starting early April to August.

Alternative 4: Specify an ABC of 326,000 lb, 314,000 lb, and 302,000 lb for fishing year 2015-16, 2016-17, and 2017-18 using a Slow-Up Fast-Down phase-in approach

Under Alternative 4, the SSC would specify an ABC of 326,000 lb, 314,000 lb, and 302,000 lb of MHI Deep 7 bottomfish for the 2015-16, 2016-17, and 2017-18 fishing year, respectively. Based on the probability of overfishing projections contained in the update of 2011 benchmark stock assessment of Deep 7 bottomfish In the Main Hawaiian Islands using data through 2013 (Boggs memo for the record dated March 3, 2015 and the supplemental table dated May 19, 2015), an ACL of 326,000 lb, 314,000 lb, and 302,000 lb are associated with a 44, 41, and 38 percent probability of overfishing, respectively.

The proposed revision to the National Standard 1 guidelines allows for the use of a phase-in approach in the ABC control rules that would phase in changes to the ABC over a period of time not to exceed 3 years, so long as overfishing is prevented. This has been used by the International Pacific Halibut Commission (IPHC) (Hare and Clark 2008). The Council recommends a Slow-up Fast-down phase in approach. This adjustment limits abrupt fishery ABC changes from one year to the next in the following manner. If a fishery ABC is greater than the previous year's catch limit, only 33.3% of the increase is allowed. If a fishery CEY is lower than the previous year's catch limit, only 50% of the decrease is allowed. The ability to make ACL adjustments that provide more stability to fishing participants, yet do not jeopardize the capacity of the stock or stock complex to produce MSY on a continuing basis.

Figure 1 shows the phase in approach where the limits are reduced incrementally over a three year period using a Slow up-Fast down approach. This would maintain the fishery below the OFL and at the same time maximize the catch as it transition to the new risk level on the third year.

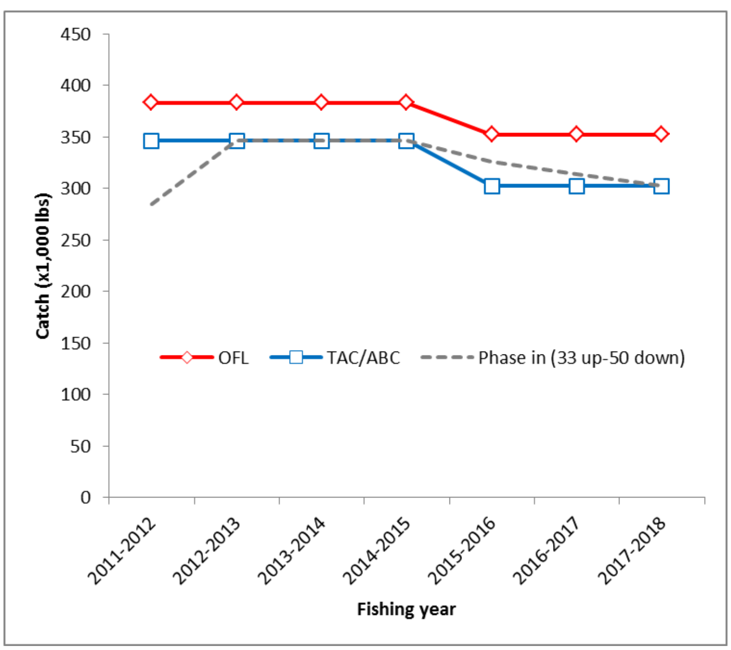

Figure 1. Phase-in approach to specifying ABCs over a three year period using SUFD.

SUFD phase-in approach was shown to be sensitive if there is a strong retrospective pattern and bias (Hare and Clark 2008). However based on the retrospective analysis from Brodziak et al. 2011, the key model outputs did not exhibit a retrospective pattern and a chosen risk of overfishing would also not be expected to exhibit retrospective bias (Figure 2 and 3). This may indicate that the phase-in approach for the MHI deep 7 bottomfish is feasible.

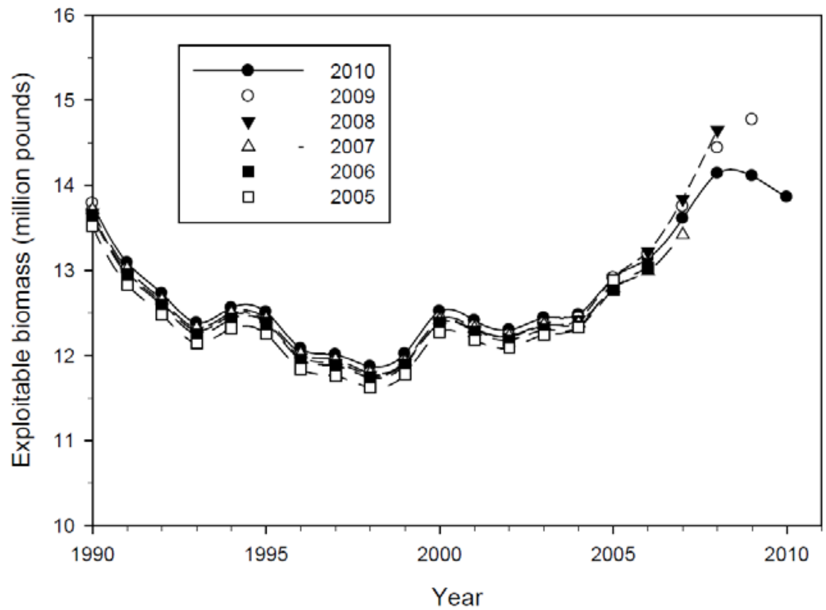

Figure 2. Retrospective analysis for mean exploitable biomass
SOURCE: Brodziak et al. 2011

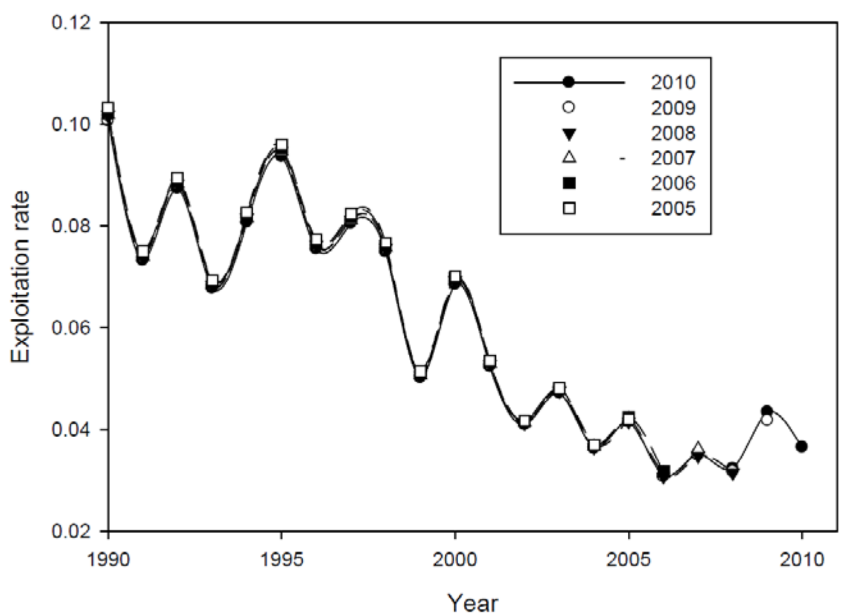

Figure 3. Retrospective analysis for mean exploitation rate
SOURCE: Brodziak et al. 2011

Expected Fishery Outcome
Under Alternative 4, for fishing year 2015-16 and 2016-17, the specification of an ABC of 326,000 lb and 314,000 lb and the associated AMs are not expected to result in changes in the conduct of the fishery, including gear types used, areas fished, level of catch or effort. This is because total reported catch in 2014-15 and 2015-16 is expected to be similar to 2013-14 catch (i.e., 309,485 lb), and remain below the said ACLs.

For fishing year 2017-18, the fishery is not likely to reach the ABC of 302,000 lb if the fishery performance is average relative to the fishery performance over the past 3 years (Table 4). If the fishery performs closely to the 2013-14 fishing year, the fishery can potentially close around early to mid-August (Table 2). If the fishery performance peaks and trends maximum landing each month, this level of catch would result in a five month potential fishery closure starting early April to August.

Alternative 5: Specify an ABC of 270,000 lb based on the 2011 Stock Assessment with updated data to 2013 and no phase-in

Under Alternative 5, The SSC would specify an ABC of 270,000 lb of MHI Deep 7 bottomfish for the 2015-16, 2016-17, and 2017-18 fishing year. Based on the probability of overfishing projections contained in the update of 2011 benchmark stock assessment of Deep 7 bottomfish In the Main Hawaiian Islands using data through 2013 (Boggs memo for the record dated March 3, 2015 and the supplemental table dated May 19, 2015), an ACL of 270,000 lb is associated with a 30 percent probability of overfishing.

Expected Fishery Outcome
Under Alternative 5, the fishery is expected to reach the ABC of 270,000 lb by the end of April to early May if the fishery performance is based on the monthly MHI Deep 7 bottomfish catches in the 2013-14 fishing year that attained 283,293 lb of MHI Deep 7 bottomfish in May 2014, the 9th month of the fishing year (Table xx, HDAR unpublished data). If the fishery performance is compared to an average of the last 4 fishing years (2011-12, 2012-13, 2013-14, 2014-May 2015), an ACL of 270,000 will not result in any closure (Table 4). However, if the fishery performance is compared to the maximum landing of every month, an ACL of 270,000 lb would result in a 6 month fishery closure closing at around February to March where it landed around 265,558 lb to 301,332 lbs.

Table 2. MHI Deep 7 bottomfish - monthly and cumulative lb caught (Sept. 2005-May 2015)

Monthly Lb Caught Sept. 2005-May 2015										
Month	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**
Sep	6,841	12,986	29	0	20,718	46,872	40,628	14,043	20,115	38,869
Oct	8,937	31,295	26,059	0	39,943	34,757	23,169	28,200	37,173	29,353
Nov	26,341	28,536	32,003	28,672	8,416	35,424	15,789	20,510	34,012	26,935
Dec	58,210	29,777	23,331	58,764	66,854	67,325	25,859	40,657	55,813	52,967
Jan	15,592	24,195	32,880	49,570	33,273	37,336	44,361	28,064	46,114	55,289
Feb	24,671	18,815	49,362	18,045	26,829	41,675	22,040	5,065	42,643	26,852
Mar	13,709	31,797	28,511	24,449	8,255	4,650	10,429	35,774	20,793	24,631
Apr*	3,817	22,417	3,999.4	28,959	4,754	0	20,144	22,834	8,001	9,604
May*	9,840	5,030	0	35,616	0	0	10,095	12,847	18,575	988
Jun*	8,141	0	0	10,840	0	0	4,891	2,651	7,721	
Jul*	7,128	0	2.5	4,283	0	0	5,367	4,929	5,670	
Aug*	9,769	0	0	0	0	0	5,617	12,990	12,815	
Total	**193,003**	**204,852**	**196,178**	**259,201**	**209,043**	**268,041**	**228,389**	**238,565**	**309,485**	
Cumulative Lb Caught Sept. 2005-May 2015										
Month	**2005-06**	**2006-07**	**2007-08**	**2008-09**	**2009-10**	**2010-11**	**2011-12**	**2012-13**	**2013-14**	**2014-15**
Sep	6,841	12,986	29	0	20,718	46,872	40,628	14,043	20,115	38,869
Oct	15,778	44,281	26,088	0	60,661	81,629	63,797	42,243	57,288	68,222
Nov	42,120	72,818	58,091	28,672	69,077	117,053	79,586	62,753	91,300	95,157
Dec	100,331	102,596	81,422	87,436	135,931	184,378	105,445	103,410	147,113	148,124
Jan	115,924	126,791	114,302	137,007	169,204	221,715	149,806	131,474	193,227	203,413
Feb	140,595	145,606	163,664	155,052	196,033	263,390	171,846	136,539	235,870	230,265
Mar	154,305	177,404	192,176	179,502	204,289	268,041	182,275	172,313	256,663	254,896
Apr*	158,122	199,821	196,176	208,461	209,043	0	202,419	195,147	264,664	264,500
May*	167,962	204,852	196,176	244,077	0	0	212,514	207,994	283,239	265,488
Jun*	176,104	0	196,176	254,917	0	0	217,405	210,645	290,960	
Jul*	183,233	0	196,178	259,201	0	0	222,772	215,574	296,630	
Aug*	193,003	0	0	259,203	0	0	228,389	228,564	309,445	

Source: Hawaii Division of Aquatic Resources, Data available through 5/15/2015

* Denotes months with closed season

Table 3. MHI Deep 7 Bottomfish - monthly mean and max lb caught (Sept. 2005-March 2011)

Hawaii Deep 7 Bottomfish - Monthly Pounds (lb) Caught Sep 2011-May 2015		
Month	*Mean lb Caught **	*Max lb Caught*
Sep	28,414	40,628 (2011-12)
Oct	29,474	37,173 (2013-14)
Nov	24,312	34,012 (2013-14)
Dec	43,824	55,813 (2013-14)
Jan	43,457	55,289 (2014-15)
Feb	24,150	42,643 (2013-14)
Mar	22,907	35,774 (2012-13)
Apr	15,146	22,834 (2012-13)
May	10,626	18,575 (2013-14)
Jun	5,088	7,721 (2013-14)
Jul	5,322	5,670 (2013-14)
Aug	10,474	12,990 (2012-13)

** Months with zero catch not included in the mean*

Table 4. Projected cumulative catch of MHI Deep 7 bottomfish based on reported monthly mean and maximum catches

Month	**Based on Monthly Mean***	**Based on Monthly Max**
Sep	28,414	40,628
Oct	57,888	77,801
Nov	82,199	111,813
Dec	126,023	167,626
Jan	169,480	222,915
Feb	193,630	265,558
Mar	216,537	301,332
Apr	231,683	324,166
May	242,309	342,741
Jun	239,670	350,462
Jul	244,992	356,132
Aug	255,466	369,122

** Months with zero catch not included in the mean*

Appendix A

U.S. DEPARTMENT OF COMMERCE
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March 03, 2015

MEMORANDUM FOR: The Record

FROM: Christofer H. Boggs

ABOUT: Advice regarding what Deep-7 bottomfish assessment to use in 2015

Our assessment scientists did a good job on the 2014 assessment, which initiated an improvement in the approach for standardizing CPUE data. The Science Center now has additional insights to why the fisheries data used in the 2014 assessments produced results that CIE peer review advised were not ready for management application. These insights result from the intense scrutiny the assessment has received and our consideration of the peer review's conclusions. Although the 2014 assessment used a superior new approach to standardizing CPUE compared to the 2011 assessment, there are some good reasons why the fisheries data could be better used in such an approach. The 2011 assessment relied on the only data continuously available throughout the time series: catch per day fished. The new 2014 CPUE standardization approach split the time series into old (1949-1993) and new stanzas (1994-2013). It did so to account for differences among fishermen that could only be linked through time in the recent stanza. The fisheries data could be better used for this new split-stanza context in two important ways:

1) Although catch per day fished is the best available CPUE that is available continuously over the whole time series, it may not be the best available over the most recent time series. If the time series is to be split with CPUE issues addressed differently before and after the split, one could also analyze and include detailed effort data that has been collected only for the last dozen years. This data could strongly influence recent trends. This was not seen by the Center as the work for a simple update in 2014, as it is a complex undertaking.

   The use of CPUE defined as catch per day fished is subject to great criticism, and one way to address this is use of details on hours and numbers of lines and hooks used by fishermen over the last dozen years. Only inexplicit, undescribed differences among fishermen linked through time were applied to the recent stanza in the 2014 CPUE standardization. Using the recent effort detail would still allow differences between individual fishermen to be standardized, and also allow changes in effort details through time, to be addressed. Both were factors of great concern to the reviewers. (Differences among areas and seasons and other such factors that can be applied throughout the whole time series have remained part of the CPUE standardization in both 2011 and 2014).

2) Further efforts could be made to apply the CPUE standardization for differences between fishermen to more data using various exploratory methods and other data sets. The 2014 assessment overlooked a compilation of confidential non-electronic records held by the State of Hawaii that may help to link fisher's identities back through an earlier stanza of time.

Since the CIE peer review advised that the 2014 assessment was not ready for application to management, and we cannot improve the assessment in the ways described above in short order, the Science Center believes that a much more simple update of the 2011 assessment using data from the 3 most recent years available provides the best scientific information available for management. Although catch per day fished may not be the best available CPUE data that can be used in the superior split-stanza CPUE standardization, it is the best available CPUE data that is available over the entire time series, and thus appropriate for use in the 2011 assessment approach, which does not utilize a split-stanza CPUE standardization approach.

Attachment:

Update of 2011 benchmark stock assessment of Deep 7 bottomfish in the Main Hawaiian Islands using data through 2013

Update of 2011 benchmark stock assessment of Deep 7 bottomfish in the Main Hawaiian Islands using data through 2013

This document summarizes the results of a strict update of the 2011 benchmark assessment of Deep 7 bottomfish in the Main Hawaiian Islands (Brodziak et al. 2011) using three additional years of data from 2011-2013. Both catch data and standardized CPUE from 2011-2013 are included; CPUE is standardized using the same methods as previously applied in the 2011 assessment. All other assumptions and methods are the same as those used in the 2011 stock assessment.

Table 1. Estimated parameters, reference points, and stock status values. Values indicating biomass (e.g. B, B_{MSY}, MSY) are in units of million pounds.

Parameter/Reference point/ Stock status	Mean	SD
r	0.106	0.025
K	27.36	9.378
M	1.76	1.28
P_1	0.58	0.1
Q	13	4.3
τ^2	0.05	0.01
σ^2	0.022	0.008
H_{MSY}	6.00%	2.10%
B_{MSY}	14.51	4.267
MSY for Total Catch	0.839	0.324
MSY for Reported Catch	0.404	0.156
P_{MSY}	0.54	0.08
H_{2013}	3.80%	1.40%
H_{2013}/H_{MSY}	0.627	N/A
Prob ($H_{2013} > H_{MSY}$)	14.7%	N/A
B_{2013}	13.34	5.397
B_{2013}/B_{MSY}	0.930	0.258
Prob ($B_{2013} < 0.70*B_{MSY}$)	25.1%	N/A

Table 2. Estimated acceptable biological catches (ABCs) (pounds) for commercial fishing in fishing years 2015 and 2016, corresponding 2015 probabilities of overfishing from 0% to 50% in 5% increments, as well as mean projected harvest rates, exploitable biomasses, and probable stock status conditions. Overfished is defined as $B<0.70*B_{MSY}$, and overfishing is defined as $H>H_{MSY}$. These projections assume that annual commercial catch in 2014 was 276,000 pounds, or 80% of the 2014 annual catch limit of 346,000 pounds.

Probability of Overfishing Deep7 Bottomfish in the Main Hawaiian Islands in Fishing Year 2015	Acceptable Biological Commercial Catch (pounds) in Fishing Years 2015 and 2016	Probability of Overfishing in 2016	Expected Harvest Rate in 2015	Expected Harvest Rate in 2016	Mean Exploitable Biomass (1000,000 pounds) in 2016	Probability of being overfished in 2016
0.00	14,000	0.00	0.2%	0.2%	14.80	0.15
0.05	130,000	0.05	2.3%	2.2%	14.56	0.17
0.10	174,000	0.10	3.1%	3.0%	14.47	0.18
0.15	202,000	0.14	3.6%	3.5%	14.41	0.18
0.20	228,000	0.19	4.0%	4.0%	14.35	0.18
0.25	250,000	0.24	4.4%	4.4%	14.31	0.19
0.30	270,000	0.29	4.8%	4.7%	14.27	0.19
0.35	290,000	0.34	5.1%	5.1%	14.23	0.19
0.40	310,000	0.39	5.5%	5.5%	14.18	0.20
0.41	314,000	0.40	5.6%	5.6%	14.18	0.20
0.45	330,000	0.44	5.8%	5.9%	14.14	0.20
0.50	352,000	0.50	6.2%	6.3%	14.10	0.21

References:

Brodziak, J., D. Courtney, L. Wagatsuma, J. O'Malley, H. Lee, W. Walsh, A. Andrews, R. Humphreys, and G. DiNardo. 2011. Stock assessment of the Main Hawaiian Islands Deep7 bottomfish complex through 2010. U.S. Dep. Commer., NOAA Tech. Memo., NOAA-TMNMFS-PIFSC-29, 176 p. + Appendix.

Risk table from projections of an update of the 2011 benchmark stock assessment of Deep 7 bottomfish in the Main Hawaiian Islands using data through 2013

May 26, 2015

This document provides additional detail of the projections from a strict update of the 2011 benchmark assessment of Deep 7 bottomfish in the Main Hawaiian Islands (Brodziak et al. 2011) using three additional years of data from 2011-2013. Both catch data and standardized CPUE from 2011-2013 are included as additional data; CPUE is standardized using the same methods as previously applied in the 2011 assessment. All other assumptions and methods are the same as those used in the 2011 stock assessment.

Table. Estimated acceptable biological catches (ABCs) in pounds for commercial fishing in fishing years 2015 and 2016, and corresponding 2015 and 2016 probabilities of overfishing. Overfishing is defined as H>HMSY. These projections assume that annual commercial catch in 2014 was 276,000 pounds, or 80% of the 2014 annual catch limit of 346,000 pounds.

Probability of Overfishing Deep7 Bottomfish in the Main Hawaiian Islands in Fishing Year 2015	Acceptable Biological Commercial Catch (pounds) in Fishing Years 2015 and 2016	Probability of Overfishing Deep7 Bottomfish in the Main Hawaiian Islands in Fishing Year 2016
0.01	36,000	0.01
0.05	130,000	0.05
0.10	174,000	0.10
0.15	202,000	0.14
0.20	228,000	0.19
0.25	250,000	0.24
0.26	254,000	0.25
0.27	258,000	0.26
0.28	262,000	0.27
0.29	266,000	0.28
0.30	270,000	0.29
0.31	274,000	0.30
0.32	278,000	0.31
0.33	282,000	0.32
0.34	286,000	0.33
0.35	290,000	0.34
0.36	294,000	0.35
0.37	298,000	0.36
0.38	302,000	0.37
0.39	306,000	0.38
0.40	310,000	0.39
0.41	314,000	0.40
0.42	318,000	0.41
0.43	322,000	0.42
0.44	326,000	0.43
0.45	330,000	0.44
0.46	334,000	0.45
0.47	340,000	0.47
0.48	344,000	0.48
0.49	348,000	0.49
0.50	352,000	0.50

Appendix B

Table 19.1.--Projection results showing the total allowable commercial catches (1000 pounds) of Deep7 bottomfish in fishing years 2012 and 2013 that would produce probabilities of overfishing in 2012 of 0%, 5%, 10%, …, 50% and greater under Baseline Catch Scenario II and Baseline CPUE Scenario I.

Catch Scenario II and CPUE Scenario I				
Probability of Overfishing Deep7 Bottomfish in the Main Hawaiian Islands in Fishing Year 2012	Total Allowable Commercial Catch (1000 pounds) of Deep7 Bottomfish in Fishing Years 2012 and 2013	Probability of Overfishing Deep7 Bottomfish in the Main Hawaiian Islands in Fishing Year 2013	Median Ratio of Deep7 Bottomfish Exploitable Biomass in 2013 to BMSY	Probability That Deep7 Bottomfish Biomass in 2013 Is Greater Than the Minimum Stock Size Threshold (0.7*BMSY)
0	11	0	1.05	0.92
0.05	147	0.02	1.03	0.91
0.10	197	0.09	1.02	0.90
0.15	229	0.14	1.02	0.90
0.20	255	0.19	1.01	0.89
0.25	277	0.24	1.01	0.89
0.30	299	0.29	1.01	0.89
0.35	319	0.34	1.00	0.88
0.40	341	0.39	1.00	0.88
0.45	361	0.45	1.00	0.88
0.50	383	0.50	0.99	0.88
0.55	407	0.56	0.99	0.87
0.60	429	0.60	0.99	0.87
0.65	455	0.66	0.98	0.87
0.70	481	0.71	0.98	0.86
0.75	513	0.76	0.97	0.86
0.80	549	0.81	0.97	0.85
0.85	597	0.86	0.96	0.84
0.90	665	0.91	0.95	0.83
0.95	783	0.96	0.93	0.81
0.99	1001	0.99	0.90	0.77

Appendix C

WESTERN PACIFIC REGIONAL FISHERY MANAGEMENT COUNCIL

P* Working Group Meeting
May 6, 2015
10:00 am to 4:00 pm
Main Conference Room
Council Office

Working group participants: Bob Skillman (SSC member), David Itano (SSC member), Annie Yau (NMFS PIFSC-Presenter), Christofer Boggs (NMFS PIFSC), Gary Beals (HI AP Chair), Layne Nakagawa (Fisherman, AP member), Roy Morioka (Fisherman, H-FACT), Ariel Jacobs (NMFS PIRO)
Council staff: Marlowe Sabater and Mark Mitsuyasu (WPRFMC)
Public: Ed Ebisui III (Fisherman-Oahu), Ed Watamura (Fisherman, AP member)
Invited but absent: Ed Ebisui (Council member), Matt Dunlap (NMFS PIRO)

DRAFT REPORT

1. **Introductions**
   The meeting started at 10:05 am. Council staff provided an overview of the meeting and the agenda. Clarifications were made on the membership of the working group. Chris Boggs replaced Bob Humphreys (in a Life History Workshop), Annie Yau is a presenter and resource person, David Itano was invited to be a working group member since he was part of the original P* working group. Ed Ebisui III and Ed Watamura are members of the public that provided additional insights regarding the fishery. Fishermen were included as working group members to incorporate their expertise and knowledge on the various uncertainties related to the fishery and how that affects the data that goes into the assessment. This also enhances the transparency of the P* process.

2. **Recommendations from previous Council meetings**
   Council staff presented on the recommendations from the 162nd Council Meeting. The first recommendation was the delivery of the updated results of the 2011 assessment adding 3 years of data in order to facilitate the P* process. Recent developments from generation of the 2014 draft stock assessment and the succeeding reviews highlighted the uncertainties related to the scientific information which affects the P* hence the need to revisit the P* analysis for this fishery. This working group meeting addresses that Council recommendation.

   The second recommendation was to organize a Data Workshop for the MHI deep 7 bottomfish fishery that would support the development of the benchmark assessment due on 2017. This will be a series of workshops to finalize the datasets that would go into the benchmark assessment. Fishermen will be invited to participate in these workshops in order to ground-truth the data and put it to proper perspective.

3. **Overview of the P* process**

Council staff provided an overview of the P* process. The P* analysis is a semi-quantitative process to determine the risk of overfishing associated with the scientific uncertainty in the data and the assessment. This determines the buffer between the overfishing limit (OFL) and the acceptable biological catch (ABC). The four dimensions were described (assessment information, uncertainty characterization, stock status, productivity and susceptibility) and the criteria associated with each. The previous P* scoring process was reviewed

The deep 7 complex is assessed as a complex but can also use an indicator species within the complex. Changing the management unit species complex would require an amendment. Management is done on the complex and the overfishing determination is linked to the complex. There were concerns about exploitation of the vulnerable species when managing on a complex. However, the D7 assessment takes into consideration of the life history of the most dominant species in the catch and the vulnerable species just make up a small percent of the fishery landing. There was some discussion on whether to break apart the complex first and do the assessment to determine real status of the vulnerable species or conduct the assessment of the vulnerable species first prior to breaking the complex and manage species individually. Nonetheless, once it was determined that a species is being overfished and experiencing overfishing, the Council would need to take action.

4. State of the Science for the Main Hawaiian Island Deep 7 Bottomfish

a. Report on assessment update using 2011 model with 3 years of data

Dr. Annie Yau presented on the background of the 2011 stock assessment and the results of the assessment update with three additional years of data (catch and CPUE from 2011-2013). Dr. Yau enumerated various sources of uncertainties built into the assessment: unreported catch (± 20%), standard deviation in the standardized CPUE, observation error (assumes there are errors in the data), and process error (uncertainties due to weather, climatic, productivity change over time). The latter sets of errors are estimated via the input data (model has flexibility is fitting – inability to measure things, allows the model to accept noise and fluctuate) and assumed to have an average value over time.

The discussion focused on the following points:

- The model works because it was able to detect the effects of the fishery in the CPUE and the CPUE is linked to the abundance of the fish.

- Fishing skill is important to take into consideration but is currently challenging to model. Change in gear efficiency can be masked by fishing skill and change in fishery participants over time.

- CPUE may have been affected during the TAC years because people are racing to the fish. However, during the period that the fishery is closed is associated with the low CPUE. That should have been accounted for in the quarter.

b. ***Summary of comments from the CIE reviewers affecting uncertainties***

Dr. Annie Yau summarized the various sources of uncertainties brought up by the various reviewers of the 2011 and 2014 stock assessments. First was related to life history. The reviewers felt that the M used in both assessments is too high (0.30 and 0.25 for 2011 and 2014, respectively). The reviewers recommended that M=0.10 to 0.15 would be more appropriate.

DAR trip reports – data quality of catch and effort was suspect prior to 1994 – improved data collection especially tracking individual CML; the forms changed over time; the requirements for reporting also changed

Unreported catch – pre 1990 estimates of unreported catch should be explored since the study used focused on Oahu. More analysis needs to be done on unreported catch. Directional biases over time, the 20% uncertainty may not be capturing this. The unreported catch uncertainty in earlier years may not be consistent over time. More thought on the +- 20%.

Bayesian priors may be too informative – might influence the results; changes in technology and fishing efficiency should be accounted for.

Production model is not capturing the size and age structure; Individual dynamics might not be captured since its in a complex; Magnitude the process error is assumed constant over time but this might not be true

The discussion brought up the following points:

- Fishermen brought up the suggestion to use size based estimates into the assessment. This is one alternative data set that can be explored in the data workshop. However, a size structured model may require additional parameters in order to work and still have to be tested if the size data will not conflict with other data sets and have the model converge.

- It was also brought up that total weight is heavily biased to opakapaka. Paka are dense fish while others including the onaga are lighter in weight for a given length. So when plotting weight over time, the weight composition of the complex may change. Number of fish may be one more data to consider. Length data is also harder to collect due to size selectivity of the fishery. Different bottomfishers have different size composition of their catch. Hi-liners tend to target the bigger fish due to the commercial nature of their operation while part-timers and those new to the fishery would take all sizes of fish. One idea brought up was to standardize the CPUE for species.

- The number of fishermen reporting catching bottomfish seemed to be overinflated and the catches are skewed toward~~s~~ a few highliners.

- In the big island palu ahi fishery, the bottomfish is considered bycatch. This may require the filtering of bycatch from the data. The trip is for tuna but a lot of bottomfish is caught and becomes part of the record because the report does not filter bycatch. [Need to verify by reviewing Kona palu ahi reports.]

5. Review of the P* Dimensions and Criteria

a. Assessment information

i. Reliable catch history – The previous score was 0. There is now recognition that the data is not perfect hence cannot score it 0. In contract, cannot throw away the catch history otherwise it cannot be used thus cannot score it a 1. The uncertainty measure was incorporated but is this uncertainty able to compensate with the deficiency. The reliability of the earlier years is questionable. It's the data that the assessment scientist can work with. The uncertainty focuses or more concern is the unreported catch. The catch data is catching some signal on the history of the fishery. The unreported catch is questionable due to the point estimates given vary in their estimates. The most recent estimates may be more reliable. A score of 0.2 is appropriate.

ii. Standardized CPUE – The previous score was 0. It is not a perfect CPUE standardization. Although, the reviewers agreed that adding the gear efficiency and fisherman skill as a significant improvement, the standardization did not account for other sources of available data. The patterns seen in the CPUE makes analytical sense and the signal of changes in the fishery is captured in the standardization. Other factors will be controlled in the next benchmark. The group felt the assessment is halfway in terms of acceptable CPUE standardization hence a score of 0.5 was applied.

iii. Species specific data – the model is saying that everything is opakapaka; not species specific in anyway. A score of 1 still applies.

iv. All sources of mortality accounted for – The biggest source of mortality that is unknown is the unreported catch. Other sources of mortality are discards and bycatch that are known to occur in the fishery but are deemed insignificant compared to the unreported catch. There were also uncertainties associated with the true estimate of natural mortality. A score of 0.5 still applies.

v. Fishery independent survey – Although fishery independent surveys has been conducted in the Maui nui area, these has not gone operational and not incorporated in the assessment. A score of 1 still applies

vi. Tagging data – There is an existing tagging program for bottomfish that yields some results. This data has not been analyzed and applied in the assessment. The score of 1 still applies.

vii. Spatial analysis – Although reporting areas has been used as a standardization factor in the assessment, the assessment is still considered as a basic surplus production model with no specific spatial analysis. It was noted that spatial analysis might not even be a good assessment aspect at this stage because the available data cannot produce enough information for a full blown spatially explicit stock assessment. It is more appropriate to use size/length frequency as an assessment aspect because that is the next level of assessment that can be made available. The score of 1 still applies.

Assessment Aspects (AAs)	Score
Reliable catch history	0.2
Standardized CPUE	0.5
Species-specific data	1
All sources of mortality accounted for	0.5
Fishery independent survey	1
Tagging data	1
Spatial analysis	1
SUM	5.2 scaled equivalent = -1.6

b. Uncertainty characterization

The initial score for this dimension was 0. CIE highlighted several uncertainties - +-20% might not be an accurate error; proscriptive prior; issue of uncertainty about power and skill. However, the assessment did incorporate several uncertainties as described in the above section. The group elevated the reduction score from 0 to 2.0.

Description	Score
Complete. Key determinant – uncertainty in both assessment inputs and environmental conditions included	-0.0 -2.0
High. Key determinant – reflects more than just uncertainty in future recruitment	-2.5
Medium. Uncertainties are addressed via statistical techniques and sensitivities, but full uncertainty is not carried forward in projections	-5.0
Low. Distributions of F_{MSY} and MSY are lacking	-7.5
None. Only single point estimates; no sensitivities or uncertainty evaluations	-10

c. Stock status

The initial score for this dimension is 3. This was elevated from 2 to 3 due to the multi-species nature of this fishery. Some species may be hit harder than others and it goes undetected. This rationale is duplicative of the first dimension (species specific data). The P* working group revised the rationale behind the score. Given the CIE review comment on the natural mortality being overestimated, changing the M from 0.3 or 0.25 to 0.1 will move the MSST closer to the current point estimate of biomass. This necessitates the score to be elevated from 2 to 4. There was much discussion among the working group members on these criteria but given the inability to revise the characteristics of the four key determinants for this P* analysis, a score of 4.0 was selected. Members felt that another descriptor with a Score of -3.0 would have been more appropriate

Description	Biomass (B) and Fishing (F) Levels	Score
Neither overfished nor overfishing	B > MSST and BMSY, F < MFMT	-0.0
Neither overfished nor overfishing	B > MSST, F < MFMT	-2.0
Neither Overfished nor overfishing	B ≥ MSST, F ≤ MFMT	-4.0
Stock is not overfished, overfishing is occurring	B > MSST, F > MFMT	-6.0
Stock is overfished, overfishing is not occurring	B < MSST, F ≤ MFMT	-8.0
Stock is overfished, overfishing is occurring	B < MSST, F >MFMT	-10.0

d. Productivity and susceptibility

The initial score is 4.9. The life history team was not present in the meeting. Working group members recommended to hold-off on changing the scores on this dimension until they are available for no-one had any expertise on this dimension. Chris Boggs will consult with Bob Humphreys and Bob Moffitt on the scores and rationale behind the scores. In an email from Boggs dated May 7, 2015 1:51 pm, he confirmed that the susceptibility parameter is related to the vulnerability to capture in the fishery and not related to life history. The fishermen can provide the appropriate scores for this parameter.

It is suggested that the working group survey those MHI BF fishermen who have been engaged in the SA process to evaluate this determinant and provide their consensus score.

Description	Score
Low risk. High productivity, susceptibility low.	-0.0
Low/medium risk. Moderate productivity, low susceptibility	-2.5
Medium risk. Moderate productivity, and susceptibility	-5.0 -4.9
Medium/High risk. Moderate productivity, high susceptibility	-7.5
High risk. Low productivity, high susceptibility	-10

6. Summary of scores and P* recommendations

Dimension	Score
1. Assessment Information: Quantitative assessment provides estimates of exploitation and B; includes MSY-derived benchmarks, but species specific data, fishery independent data, tagging data, spatial analysis and all sources of mortality not captured in the assessments	-1.6
2. Uncertainty characterization: Complete. Key determinant – uncertainty in both assessment inputs and environmental conditions included	-2
3. Stock status: Neither overfished nor overfishing, but status based on stock complex as opposed to individual stocks.	-4
4. PSA: Medium risk: Moderate productivity, and susceptibility	-4.9
Final Score	-12.5
P* = total score (-9.2) from ABC_{Max} of 50	**P* = 37.5 ≈ 38**

The preliminary P* score is 38%. This may change once the PSA dimension has been revisited. Another meeting will be scheduled to finalize the scores. This will be scheduled on the latter part of May and working group members will be invited to finalize the scores.

The meeting ended at 5:05 pm