Specifying Acceptable Biological Catch and Annual Catch Limits for the Bottomfish Management Unit Species in American Samoa, Guam, and Commonwealth of Northern Mariana Islands

Introduction

The Council's 2011 omnibus amendment to all its FEPs[1] specifies a process whereby Acceptable Biological Catches (ABC) may be established based on quality of fishery data and whether a stock assessment was conducted. NMFS Guidelines for the establishment of an ABC dictate that the level of catch cannot exceed to 50% probability (P*) of overfishing the stock within one year.

The SSC established the current Acceptable Biological Catches (ABCs) for the bottomfish fishery in American Samoa, Guam and Commonwealth of Northern Mariana Island based on the 2007 stock assessment (Moffitt et al. 2007[2]). As this report did not undergo the Western Pacific Stock Assessment Review (WPSAR) process, the SSC decided that the Moffitt et al (2007) assessment could not be regarded as Tier 2

Therefore the SCC applied the Tier 4 Control Rule ABC control rule where ABC = 0.91 x MSY.

The resulting ABCs are as follows:

American Samoa = 99,200 lbs
Guam = 48,200 lbs
CNMI = 182,500

An updated stock assessment was released by the Pacific Island Fisheries Science Center in June 2012 (Brodziak et al. 2012[3]). This stock assessment update provided a two consecutive year estimate on the probability of overfishing and a corresponding level of catch. This assessment allows for the use of Tier 1 to 3 control rule when specifying ABCs. This control rule would require a P* analysis. An SSC Working Group was established prior to the 110th SSC Meeting to provide adequate review of the Brodziak et al (2012) stock assessment update.

Based on the Working Group report and the deliberations at its 110th meeting in June 2012, the SSC concluded that "the assessment is adequate to set management reference points in the short term". Applicable scientific comments and suggestions on the previous model were incorporated in the updated stock assessment model.

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[1] WPRFMC. 2011. Omnibus Amendment for the Western Pacific Region to Establish a Process for Specifying Annual Catch Limits and Accountability Measures Including an Environmental Assessment. Western Pacific Regional Fishery Management Council, Honolulu, Hawaii.

[2] Moffitt, R. B., J. Brodziak and T. Flores. 2007. Status of the Bottomfish Resources of American Samoa, Guam, and Commonwealth of the Northern Mariana Islands, 2005. National Marine Fisheries Service Pacific islands Fisheries Science Center Administrative Report H-07-04, Honolulu, 52 p.

[3] Brodziak J, O'Malley J, Richards B, DiNardo G. 2012. Stock assessment update of the Status of the Bottomfish Resources of American Samoa, the Commonwealth of Northern Mariana Islands, and Guam, 2012. National Marine Fisheries Service Pacific Island Fisheries Science Center Internal Report IR-12-022, Honolulu. 126p.

At it's 111st meeting the SSC recommended the following P* values resulting in an ABC level of:

American Samoa = 101,000 lbs @ P^*_{2013} = 30%; P^*_{2014} = 41%
Guam = 66,800 lbs @ P^*_{2013} = 28%; P^*_{2014} = 40%
CNMI = 228,000 lbs @ P^*_{2013} = 28%; P^*_{2014} = 39%

The annual catch limits were set equal to ABC since the catches are well below the ACLs. In 2013, the catches relative to the ACLs are as follows:

Jurisdiction	**ACL (lbs)**	**2013 BMUS catch (lbs)**	**% of catch limit**
American Samoa	101,000	5,355	5.3%
Guam	66,800	31,026	46.4%
CNMI	228,000	18,045	7.9%

The SSC's Task
The 2012 Territory bottomfish stock assessment is still the best scientific information available pending the completion of the assessment update scheduled for the first quarter of 2015 (Di Nardo pers.comm.). The previous specification covers fishing year 2013-2014. The SSC needs to recommend a P* and specify an ABC for fishing year 2015.

Given that there is no new stock assessment (new assessment scheduled in 2015) and no significant change in the fishery, the P* analysis is still current American Samoa is currently at P* = 39%; Guam at P* = 40%; and CNMI at P* = 39%.

In specifying the ABCs for the territory bottomfish, the SSC have the following options:

- ***Option 1: Maintain status quo and roll-over the existing ABCs***
- ***Option 2: Specify a different ABC***

Option 1 will maintain the ABCs at the current level of P* Since the catches in the past 2 consecutive years were below the ABC levels, the actual risks of overfishing are below than the projected risks based on the 2012 assessment. Option 1 provides no additional analysis since the 2012 assessment is still considered as the best scientific information available. The low catches in recent years also provide additional weight to this option.

Option 2 would require additional analysis particularly in the P*. There were no observable change in the fishery no any new science that exist to warrant changing the P* level.

The Council's Task
In specifying the ACLs for the territory bottomfish, the Council have the following options:

- **Option 1: Maintain status quo and roll-over the existing ACL set at ACL=ABC**
- **Option 2: Specify a different ACL**

Option 1 will maintain the ACL at the current level of P*. Since the catches in the past 2 consecutive years were below the ACL levels, the actual risks of overfishing are below than the projected risks based on the 2012 assessment. Option 1 provides no additional analysis since the 2012 assessment is still considered as the best scientific information available. The low catches in recent years also provide additional weight to this option. In addition, the low catches relative to the ACL provide significant buffer for the ACLs not to be reached given the under developed state of the fishery. This continues to justify setting the management uncertainty at 0 at this time. The accountability measures would remain as overage adjustment since in-season monitoring is not possible at this time.

Option 2 would require additional analysis particularly in the P*. There were no observable change in the fishery no any new science that exist to warrant changing the P* level.

	American Samoa Bottomfish			Guam Bottomfish			CNMI Bottomfish		
MSY Estimate	***76,200 ± 14,300 lb***			***55,000 lb ± 7,900 lb***			***172,900 ± 32,200 lb***		
Catch $_{2013}$	**5,355**			**31,026**			**18,045**		
Ave$_{catch11-13}$	**7,731**			**56,258**			**19,375**		
	Catch (lb)	*Probability of Overfishing in 2013 (%)*	*Probability of Overfishing in 2014 (%)*	***Catch (lb)***	*Probability of Overfishing in 2013 (%)*	*Probability of Overfishing in 2014 (%)*	***Catch (lb)***	*Probability of Overfishing in 2013 (%)*	*Probability of Overfishing in 2014 (%)*
Alternative 1 *(Status Quo)*	**99,200**	28-29	36-38	**48,200**	5-10	5-11	**182,500**	10-15	11-17
Alternative 2 (<30%)	**33,000**	0	0	**22,000**	0	0	**4,000**	0	0
	60,000	5	5	**44,000**	5	5	**130,000**	5	5
	73,000	10	12	**51,000**	10	11	**162,000**	10	11
	81,000	15	18	**56,000**	15	17	**183,000**	15	17
	89,000	20	26	**61,000**	20	26	**203,000**	20	26
	90,200	21	27	**61,800**	21	28	**206,200**	21	28
	91,400	22	29				**209,400**	22	29
Alternative 3 (30-39%)	**92,600**	23	30	**62,600**	22	30	**212,600**	23	31
	93,800	24	32	**63,400**	23	31	**215,800**	24	32
	95,000	25	33	**64,200**	24	33	**219,000**	25	34
	96,200	26	35	**65,000**	25	35	**222,000**	26	36
	97,400	27	36	**65,600**	26	37	**225,000**	27	38
	98,600	28	38	**66,200**	27	38	**228,000**	28	39
	99,800	29	39						
Alternative 4 (40-45%)	**101,000**	30	41	**66,800**	28	40	**231,000**	29	41
	102,200	31	43	**67,400**	29	41	**234,000**	30	43
	103,400	32	44	**68,000**	30	43	**237,000**	31	45
				68,500	31	45			
Alternative 5 (46-50%)	**104,600**	33	46	**69,200**	32	46	**240,000**	32	47
	105,800	34	47	**69,800**	33	48	**243,000**	33	48
	107,000	35	49	**70,400**	34	49	**246,000**	34	50
	108,000	36	50	**71,000**	35	51			

Source: Values interpolated from Table 15-17 in Brodziak et al., 2012

BACKGROUND INFORMATION FROM BRODZIAK ET AL 2012

In May 2012, NMFS PIFSC completed a bottomfish stock assessment (Brodziak et al, 2012) for American Samoa, Guam and the CNMI. The 2012 stock assessment applies the same production modeling as the previous 2007 assessment (Moffitt et al., 2007) and uses data though 2010. A Bayesian statistical framework is applied to estimate parameters of a production model fit to a time series of annual CPUE statistics. This approach provides 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 are evaluated using the Deviance information criterion. The sensitivity of status determination results to catch data and model assumptions is also evaluated. For each island area, the PIFSC 2012 stock assessment also includes stock projection results for a range of bottomfish catches that would produce probabilities of overfishing in fishing year 2013 and 2014 ranging from 0 percent to 100 percent and at five percent intervals (Brodziak et al, 2012, Tables 15-17. A brief summary of the key model outputs are provided below.

1.1.1 American Samoa Bottomfish MUS

Estimation of OFL

According to the PIFSC 2012 bottomfish stock assessment (Brodziak et al., 2012), the posterior mean of MSY for American Samoa bottomfish is estimated to be 76,200 ± 14,300 lb, which is lower than the previous MSY estimate of 109,000 ± 29,700 lb reported in the 2007 assessment by Moffitt et al. (2007). Stock projection results, which assume that a bottomfish catch limit would be harvested in its entirety in 2013 and again in 2014 and indicates that an ACL set at approximately 108,000 lb would result in a 36 percent probability of overfishing in 2013, rising to 50 percent probability of overfishing in 2014 (Table 1), the maximum risk allowable under Federal law (74 FR 3178, January 9, 2011). Therefore, 108,000 lb is considered to be the OFL proxy for the two year period. This suggests catch in 2013 and 2014 would need to exceed MSY by nearly 32,000 lb each year for overfishing to occur. As a reference, estimated average annual total catch during the period 2008-2010 was 30,593 lb with 9,509 lb landed in 2010, the most recent year data is available (Table 2).

Table 1. American Samoa probability of overfishing in 2013 and 2014 at different levels of catch

ACL (lb)	% Probability of Overfishing (2013)	% Probability of Overfishing (2014)
33,000	0	0
60,000	5	5
73,000	10	12
81,000	15	18
89,000	20	26
90,200	21	27

ACL (lb)	% Probability of Overfishing (2013)	% Probability of Overfishing (2014)
91,400	22	29
92,600	23	30
93,800	24	32
95,000	25	33
96,200	26	35
97,400	27	36
98,600	28	38
99,800	29	39
101,000	30	41
102,200	31	43
103,400	32	44
104,600	33	46
105,800	34	47
107,000	35	49
108,000	36	50

Source: Values interpolated from Table 15 in Brodziak et al., 2012

Stock Status

Under all the western Pacific FEPs, overfishing of bottomfish occurs when the fishing mortality rate (F) is greater than the fishing mortality rate that produces MSY (FMSY) for one year or more. This threshold is termed the maximum fishing mortality threshold (MFMT) and is expressed as a ratio, F/FMSY = 1.0. Thus, if the F/FMSY ratio is greater than 1.0 for one year or more, overfishing is occurring. A stock is considered overfished when its biomass (B) has declined below the level necessary to produce MSY on a continuing basis (BMSY). This threshold is termed the minimum stock size threshold (MSST) and is expressed as a ratio, B/BMSY = 0.7[4]. Thus, if the B/BMSY ratio is less than 0.7, the stock complex is considered overfished. Whenever possible, status determination criteria (SDC) of MFMT and MSST are applied to individual species within the multi-species stock complex. When that is not possible, SDCs are applied to indicator species for the multi-species stock complex. With current data, neither approach is possible; therefore, SDCs were applied to the entire bottomfish multi-species complex as a whole.

In 2010, the most recent year for which stock status information was available, F_{2010}/F MSY = 0.09 while B_{210}/B MSY = 1.59 (Table 12 in Brodziak et al., 2012). The production model results indicate that the American Samoa bottomfish complex was not overfished and did not experience overfishing at any point between the periods 1986 and 2010 (Figure 1). Based on stock projections, an annual catch of 108,000 lb in 2013 and again in 2014 would be necessary to produce an F/FMSY ratio of 1.0 (i.e., overfishing).

[4] . Based on an estimated natural mortality rate (M) of 0.3 and that MMST = 1 - M

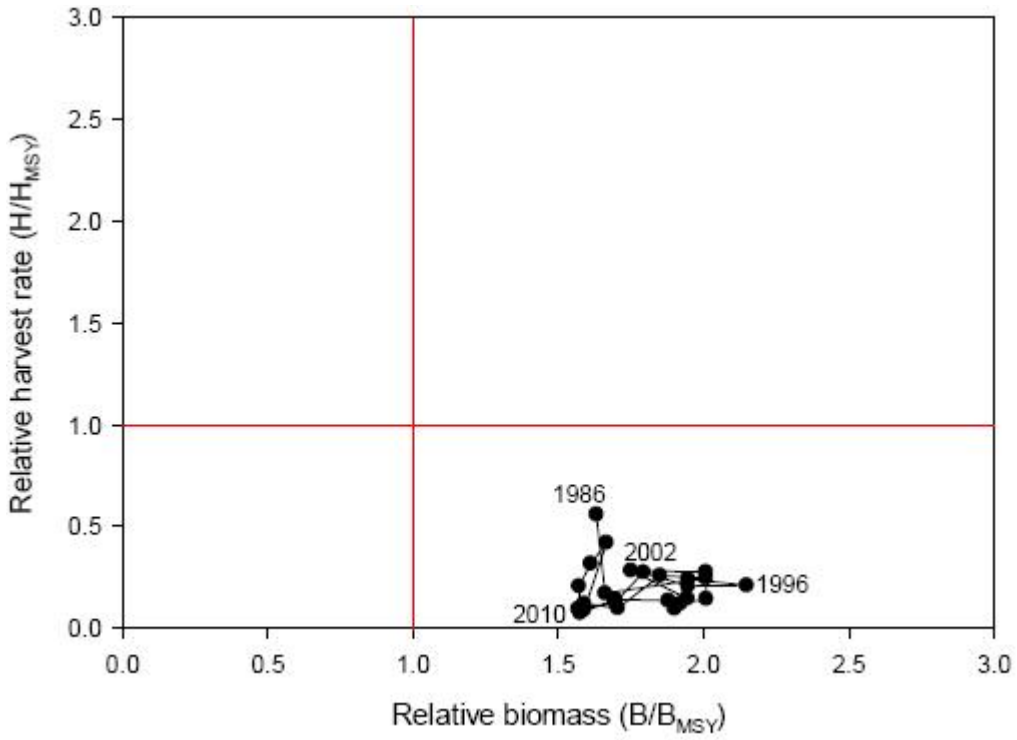

Figure 1. Kobe plot of relative biomass and relative exploitation rate from the best fitting production model for American Samoa, 1986-2010 (Source: Brodziak et al., 2012, Figure 25)

Table 2. Annual estimated catch of BMUS in American Samoa (2000-2013)

Year	Estimated Total Catch (lb)[1]	Estimated Commercial Catch (lb)[2]
2000	19,816	13,320
2001	37,847	21,439
2002	34,149	16,604
2003	19,199	4,646
2004	17,206	11,470
2005	16,329	5,650
2006	7,913	5,253
2007	21,874	13,093
2008	34,812	24,585
2009	47,458	34,360
2010	9,509	8,667
2011	15,234	14,838
2012	2,606	2,604
2013	5,355	5,322
Ave. Catch 2011-2013	**7,731**	**7,588**

[1]Source: Table 2 in Brodziak et al., (2012). Updated (2011-2013) using data from WPFMC annual report (unpublished)

[2] Source: NMFS WPacFIN website http://www.pifsc.noaa.gov/wpacfin (accessed 9/14/2012)

1.1.2 Guam Bottomfish MUS

Estimation of OFL

According to the PIFSC 2012 bottomfish stock assessment (Brodziak et al., 2012), the posterior mean of MSY for Guam bottomfish is estimated to be 55,000 lb ± 7,900 lb, which is slightly higher than the previous MSY estimate of 53,000 ± 9,500 lb reported in the 2007 assessment by Moffitt et al. (2007). Stock projection results, which assume that an annual bottomfish catch limit would be harvested in its entirety in 2013 and again in 2014, indicates that an ACL set at approximately 70,400 lb would result in a 34 percent probability of overfishing in 2013, rising to approximately 50 percent probability of overfishing in 2014 (Table 3), the maximum risk allowable under Federal law (74 FR 3178, January 9, 2011). Therefore, 70,400 lb is considered to be the OFL proxy for the two year period. This suggests catch in 2013 and 2014 would need to exceed MSY by over 15,000 lb each year for overfishing to occur. As a reference, estimated average annual total catch during the period 2008-2010 was 35,499 lb with 28,958 lb landed in 2010, the most recent year data is available (Table 4).

Table 3. Guam probabilities of overfishing in 2013 and 2014 at different levels of catch

ACL (lb)	% Probability of Overfishing (2013)	% Probability of Overfishing (2014)
22,000	0	0
44,000	5	5
51,000	10	11
56,000	15	17
61,000	20	26
61,800	21	28
62,600	22	30
63,400	23	31
64,200	24	33
65,000	25	35
65,600	26	37
66,200	27	38
66,800	28	40
67,400	29	41
68,000	30	43
68,500	31	45
69,200	32	46
69,800	33	48
70,400	34	49
71,000	35	51

Source: Values interpolated from Table 17 in Brodziak et al., (2012)

Stock Status

In 2010, the most recent year for which stock status information was available, F_{2010}/F MSY = 0.47 while B_{210}/B MSY = 1.594 (Table 14 in Brodziak et al., 2012). The production model results indicate that during the period 1982 through 2010, the Guam bottomfish complex has not been overfished and has not experienced overfishing, except perhaps in 2000 (Figure 2). Based on stock projections, an annual catch of 70,400 lb in 2013 and again in would be necessary to produce an F/FMSY ratio of 1.0 (i.e., overfishing).

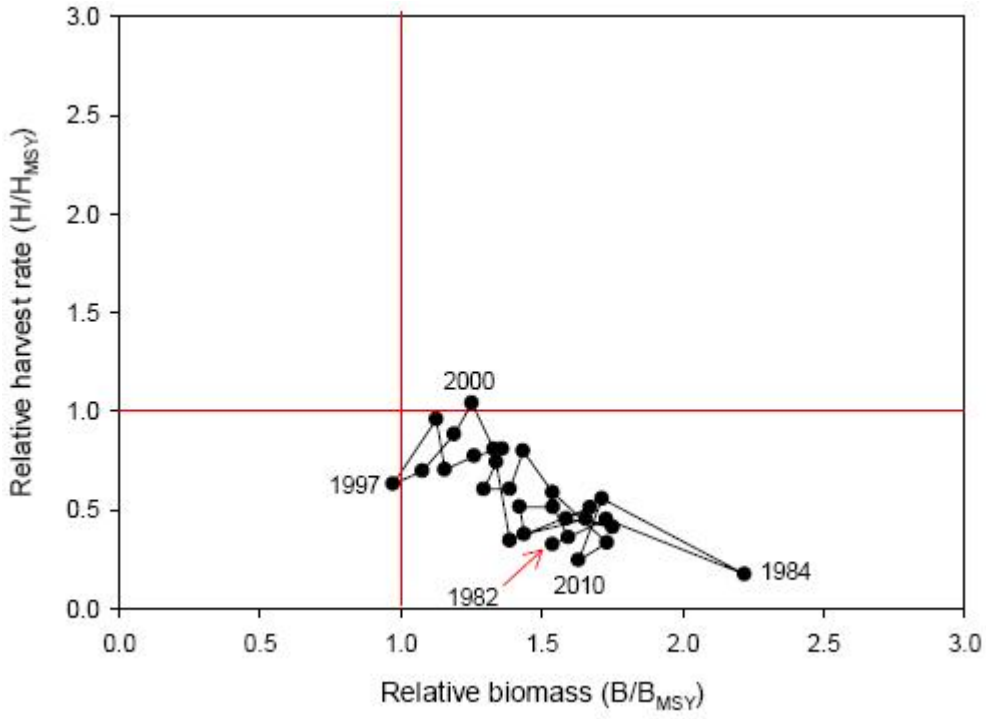

Figure 2. Kobe plot of relative biomass and relative exploitation rate from the best fitting production model for Guam, 1982-2010 (Source: Brodziak et al., 2012, Figure 39)

Table 4. Annual estimated catch of BMUS in Guam (2011-2013)

Year	Estimated Total Catch (lb)[1]	Estimated Commercial Catch (lb)[2]
2000	66,000	20,372
2001	54,352	23,690
2002	24,044	17,562
2003	43,253	10,842
2004	36,915	24,947
2005	36,529	23,002
2006	38,054	17,101
2007	27,459	16,074
2008	37,316	11,484
2009	40,222	15,868
2010	28,958	13,811
2011	58,627	15,985

Year	Estimated Total Catch (lb)[1]	Estimated Commercial Catch (lb)[2]
2012	25,232	10,000
2013	31,026	
Ave. Catch 2011-2013	**56,258**	

[1]Source: Table 2 in Brodziak et al., (2012). Updated (2011-2013) using data from WPFMC annual report (unpublished)
[2] Source: NMFS WPacFIN website http://www.pifsc.noaa.gov/wpacfin (accessed 9/14/2012)

1.1.3 CNMI Bottomfish MUS

Estimation of OFL
According to the PIFSC 2012 bottomfish stock assessment (Brodziak et al., 2012), the posterior mean of MSY for CNMI bottomfish is estimated to be 172,900 ± 32,200 lb, which is lower than the previous MSY estimate of 200,500 ± 40,500 lb reported in the 2007 assessment by Moffitt et al. (2007). Stock projection results, which assume that an annual bottomfish catch limit would be harvested in its entirety in 2013 and again in 2014, indicates that an ACL set at approximately 246,000 lb would result in a 34 percent probability of overfishing in 2013, rising to approximately 50 percent probability of overfishing in 2014 (Table 5), the maximum risk allowable under Federal law (74 FR 3178, January 9, 2011). Therefore, 246,000 lb is considered to be the OFL proxy for the two year period. This suggests catch in 2013 and 2014 would need to exceed MSY by over 73,000 lb each year for overfishing to occur. As a reference, estimated average annual total catch during the period 2008-2010 was 35,314 lb with 22,395 lb landed in 2010, the most recent year data is available (Table 6).

Table 5. CNMI probabilities of overfishing in 2013 and 2014 at different levels of catch

ACL (lb)	% Probability of Overfishing (2013)	% Probability of Overfishing (2014)
4,000	0	0
130,000	5	5
162,000	10	11
183,000	15	17
203,000	20	26
206,200	21	28
209,400	22	29
212,600	23	31
215,800	24	32
219,000	25	34
222,000	26	36
225,000	27	38
228,000	28	39
231,000	29	41
234,000	30	43
237,000	31	45
240,000	32	47

ACL (lb)	% Probability of Overfishing (2013)	% Probability of Overfishing (2014)
243,000	33	48
246,000	34	50

Source: Values interpolated from Table 17 in Brodziak et al., (2012)

Stock Status

In 2010, the most recent year for which stock status information was available, F_{2010}/F MSY = 0.09 while B_{2010}/B MSY = 1.78 (Table 13 in Brodziak et al., 2012). The production model results indicate that the CNMI bottomfish complex was not overfished and did not experience overfishing at any point between the periods 1986 and 2010. Based on stock projections, an annual catch of 246,000 lb in 2013 and again in 2014 would be necessary to produce an F/FMSY ratio of 1.0 (i.e., overfishing).

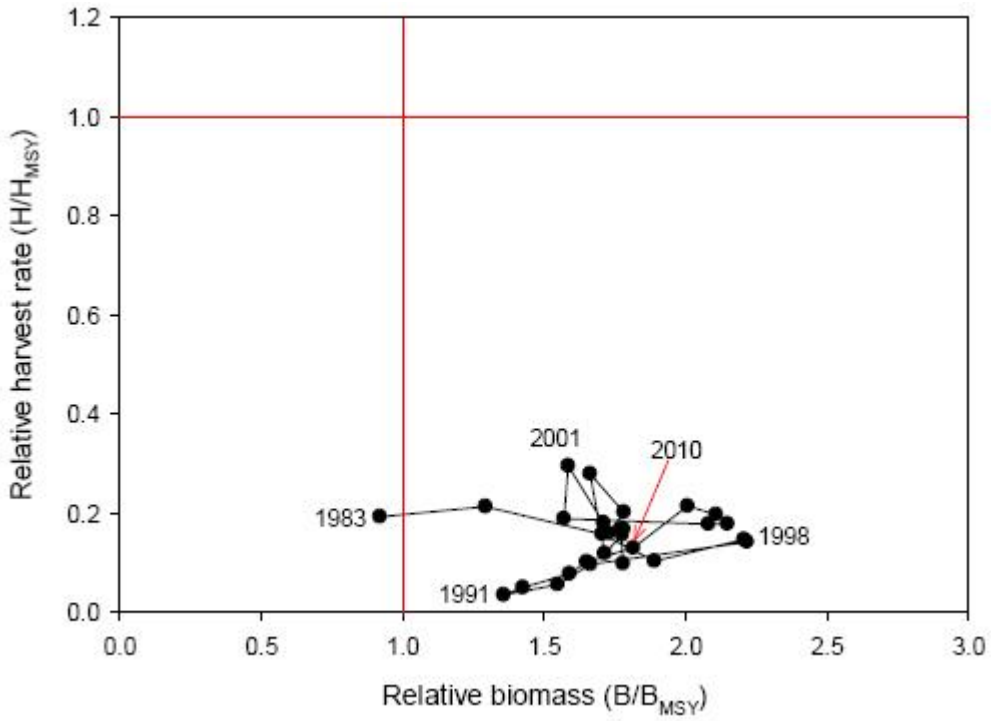

Figure 3. Kobe plot of relative biomass and relative exploitation rate from the best fitting production model for CNMI, 1983-2010 (Source: Brodziak et al., 2012, Figure 32)

Table 6. Annual estimated catch of BMUS in CNMI (2011-2013)

Year	Estimated Total Catch (lb)[1]	Estimated Commercial Catch (lb)[2]
2000	45,258	14,970
2001	71,256	25,300
2002	46,765	18,820
2003	41,903	18,060
2004	54,475	12,970
2005	70,404	16,540

Year	Estimated Total Catch (lb)[1]	Estimated Commercial Catch (lb)[2]
2006	29,340	12,260
2007	39,476	18,610
2008	42,070	18,390
2009	41,176	20,420
2010	22,395	14,730
2011	24,850	16,271
2012	15,231	11,072
2013	18,045	14,328
Ave. Catch 2011-2013	**19,375**	**13,890**

[1]Source: Table 2 in Brodziak et al., (2012). Updated (2011-2013) using data from WPFMC annual report (unpublished)

[2] Source: NMFS WPacFIN website http://www.pifsc.noaa.gov/wpacfin (accessed 9/14/2012)