New England Fishery Management Council
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MEMORANDUM

DATE: January 16, 2013

TO: Scientific and Statistical Committee (SSC)
Groundfish Oversight Committee

FROM: Groundfish Plan Development Team (PDT)

SUBJECT: **FY 2013 - 2015 ABCs**

1. This memo provides information to support FY 2013 - 2015 ABCs recommendations for GB cod, GOM cod, and SNE/MA winter flounder. The Terms of Reference request OFLs/ABCs for FY 2013-2015.

2. The recommendations are based on benchmark GOM and GB cod assessments completed in December, 2012, and the SNE/MA winter flounder benchmark assessment completed in June 2011. The assessment reports are provided as separate documents and the data in the assessments are not repeated here.

3. The terminal year of the cod assessments is 2011; the terminal year for the SNE/MA winter flounder assessment is 2010. Catch assumptions for the years between the terminal year and 2013 are described in Table 2.

4. ABCs are based on the current default ABC control rule that was proposed by the SSC and adopted in Amendment 16:

"Action: The MSY control rules adopted by Amendment 13 are replaced by the ABC control rules listed below. These ABC control rules will be used in the absence of better information that may allow a more explicit determination of scientific uncertainty for a stock or stocks. If such information is available – that is, if scientific uncertainty can be characterized in a more accurate fashion -- it can be used by the SSC to determine ABCs. These ABC control rules can be modified in a future Council action (an amendment, framework, or specification package):

a. ABC should be determined as the catch associated with 75% of FMSY.
b. If fishing at 75% of FMSY does not achieve the mandated rebuilding requirements for overfished stocks, ABC should be determined as the catch associated with the fishing mortality that meets rebuilding requirements (Frebuild).

c. For stocks that cannot rebuild to BMSY in the specified rebuilding period, even with no fishing, the ABC should be based on incidental bycatch, including a reduction in bycatch rate (i.e., the proportion of the stock caught as bycatch).
d. Interim ABCs should be determined for stocks with unknown status according to case-by case recommendations from the SSC."

Performance of Projections

5. Over the last few years evidence has increased that the projections used to set future catches and plan rebuilding strategies do not perform well – that is, the projected catch does not result in the desired fishing mortality, and stock growth does not occur as expected. *This has been documented in several PDT reports to the SSC, as well as at the 2012 Groundfish Assessment Updates meeting. The recent GB cod benchmark assessment concluded that projections should not be used to calculate Frebuild. An alternative to using the projections for catch advice has not been developed. The observed performance of the projections should be taken into account when determining ABCs.*

6. In the past, groundfish rebuilding strategies adopted by the Council have generally used an Frebuild calculated to achieve the target by a defined year with a desired probability of success. Typically the projections predict steadily increasing stock sizes catches. On the whole, these approaches have not been successful even though catches were often less that the ACLs because the projections (generally) appear to over-estimate future rebuilding. As result, several of the PDT recommendations that follow do not increase catches based on projected future stock sizes until there is scientific evidence that the stock has increased. This is the underlying rationale for suggesting a constant catch for FY 2013 – 2015 for GOM and GB cod and SNE/MA winter flounder.

Other Issues

7. The FMP allows sectors to carry-over up to 10 percent of an unused initial Annual Catch Entitlement from one fishing year to the next. This carry-over is not explicitly considered in the projections shown below. When allocations decline dramatically – as will likely be the case for GB cod and GOM cod from FY 2012 to FY 2013 – the carry-over can be a relatively large percentage of the ABC. For example, 10 percent of the sector allocation of GB cod for FY 2012 would be 460 mt, roughly 23 percent of the U.S. ABC under the proposal in this memo.

8. OFLs were calculated for specific ABC series because the ABC in year *t* affects the OFL in year *t+1*. If the ABCs are revised from those shown, the OFLs will need to be recalculated.

Table 1 – PDT recommended OFLs and ABCs for FY 2012 – FY 2015. FY 2012 values provided for context. Grayed out values previously adopted and do not need to be revisited.

(1) For US/CA stocks, total ABC is shown. After allowing for Canadian share, US ABC will be lower.

	2012		2013		2014		2015		Remarks
Stock	**OFL**	**ABC**	**OFL**	**ABC**	**OFL**	**ABC**	**OFL**	**ABC**	
GB cod[(1)]	7,311	5,616	3,279	2,506	3,570	2,506	4,191	2,506	2012 benchmark assessment
GOM cod		6,700	1,635	1,249	1,966	1,249	2,705	1,249	2012 benchmark assessment
GB haddock[(1)]	51,150	39,846	46,185	35,783	46,268	35,699	56,293	43,606,	2012 assessment update
GOM haddock	1,296	1,013	371	290	440	341	561	435	2012 assessment update
GB yellowtail flounder[(1)]	1,691	1,303	Unknown	1,150					Rebuild by 2023
SNE/MA yellowtail flounder	3,166	1,003	1,021	700	1,021	700	1,021	700	
CC/GOM yellowtail flounder	1,508	1,159	713	548	936	548	1,194	548	2012 assessment update
Plaice	4,727	3,632	2,035	1,557	1,981	1,515	2,021	1,544	2012 assessment update
Witch flounder	2,141	1,639	1,196	783	1,512	783	1,846	783	2012 assessment update
GB winter flounder	4,839	3,753	4,819	3,750	4,626	3,598			75% of FMSY
GOM winter flounder	1,458	1,078	1,458	1,078	1,458	1,078			75% of FMSY ; 60% survey efficiency
SNE/MA winter flounder	*2,336*	*626*	2,732	1,676	3,372	1,676	4,439	1,676	2011 benchmark assessment
Redfish	12,036	9,224	15,468	10,995	16,130	11,465	16,845	11,974	2012 assessment update
White hake	5,306	3,638	TBD	TBD	TBD	TBD			
Pollock	19,887	15,400	20,060	15,600	20,554	16,000			75% of FMSY
N windowpane	230	173	202	151	202	151	202	151	75% of FMSY
S windowpane	515	386	730	548	730	548	730	548	75% of FMSY
Ocean pout	342	256	313	235	313	235	313	235	75% of FMSY
Atlantic halibut	143	85	164	99	180	109	198	119	2012 assessment update
Atlantic wolffish	92	83	94	70	94	70	94	70	2012 assessment update

Catch Assumption for Stock Projections

The terminal year for the SNE/MA winter flounder assessment was 2010. NERO APSD provided and estimates for 2011 and 2012.

The terminal year for the benchmark GOM and GB cod assessments is 2011. ABCs are being set for 2013 -2015. In order to perform the projections, an input of catch or fishing mortality is needed for 2012. For 2012, NERO APSD provided an estimate of total catches. This was adjusted to account for changes in the way discard mortality was calculated in the 2012 benchmark assessments, and to add expected Canadian catches.

Catch assumptions are provided in Table 2.

Table 2 – CY 2011 and CY 2012 catch assumption used in projections

Stock	Year	
	2011	2012
GB cod	N/A	2,910
GOM cod	N/A	3,767
SNE Winter Flounder	363	345

Northeast Multispecies
Acceptable Biological Catch

FY 2013 -2015

Contents

Gulf of Maine Cod

I. Stock status

Last assessment/terminal year: 2012/20110 (SARC 55 benchmark)
Assessment Model: ASAP
Status Determination Criteria: SSB_{MSY} 54,743 mt or 80,200 mt/F40%=0.18
Assessment Results: 18% or 13% of SSB_{MSY}/ 5 times F_{MSY}
Overfished/overfishing status: Overfished/overfishing occurring
Rebuilding plan: TBD (update planned for FY 2014)

II. OFLs/ABCs

	PDT Recommendation						
	Constant Catch 1,249 mt			Constant Catch 1,550 mt			
	OFL Base	OFL Mramp	ABC(1)	OFL Base	OFL Mramp	ABC(2)	Catch
2010	11,089	NA	8,530	11,089	NA		7,700
2011	11,715	NA	9,012	11,715	NA		6,800
2012		NA	6,700		NA		3,767*
2013	1,635	1,078	1,249	1,635	1,078	1,550	
2014	1,966	1,194	1,249	1,917	1,133	1,550	
2015	2,705	1,662	1,249	1,639	1,566	1,550	

* Calendar year catch estimate

Basis: Two constant catch scenarios presented as alternatives. See text for description.

Probability of overfishing/overfished: See Table 3

III. Comments/Special Considerations

1. The SARC review panel approved two different assessment models and suggested four approaches for performing projections. One assessment model (base case) assumes M=0.2; the second (Mramp) reflects an increase to M=0.4 over time. The projection alternatives differ in their treatment of future M. Two projection approaches assume M=0.2. One additional projection approach used with the Mramp model assumes that M declines to 0.2 at some undefined time in the future. The other projection approach used with the Mramp model assumes that there has been a regime shift and M=0.4 indefinitely. These multiple assessment models and multiple projection approaches complicate using the assessment results for catch advice. The projection approaches that are based on M=0.4 are the most problematic. In one instance, there is a wide range of possible years that could be considered for the when the decline in M to 0.2 occurs. In the case where M=0.4 indefinitely, this leads to an inconsistency between the projection and the

reference points (all reference points are based on M=0.2). The SARC did not accept the F_{MSY} proxy developed by the SAW Working Group for this latter scenario. The SARC simplified these problems, however, by recommending that in the short-term the Mramp model should assume that M=0.4. For this reason, results are only presented for the base case M=0.2 and Mramp M=0.4 models/projections.

2. The PDT's approach to using the multiple models was to calculate the catch at 75 pct of F_{MSY} in the two projections (base case and Mramp 0.4). The resulting catches were input into each of the other projections to create a consequence table (Table 3). The Mramp 0.4 catches are considerably lower than the base case in each year. The catches from the base case model would result in an F > 0.18 if the Mramp 0.4 represents the true state of nature. This would be overfishing when compared to an F_{MSY} proxy that is based on F40% and M=0.2

3. The PDT examined Table 3 and developed an approach for considering all of the information in the table. The most precautionary approach (in a biological sense) to setting ABCs for 2013 – 2015 would be to use the catch from the Mramp 0.4 model/projections, but this effectively ignores the base case model. Under the two scenarios catches increase in 2014 and 2015 as a result of projected stock size increases.

4. Experience has repeatedly demonstrated that projected stock size increases are often not realized; usually stock growth is slower than projected (GB haddock and redfish are notable exceptions). For this reason, the PDT explored constant catches for the FY 2013 - 2015 time period. This would end overfishing in FY 2013 under the base case and in FY 2015 under the Mramp projection and would accelerate rebuilding if stock growth is accurately predicted by the projections. If stock growth is slower than expected – as has usually been the case – the constant catch would have less impact than a catch that is based on an assumed increase in stock size.

5. The PDT explored two versions of the constant catch scenario.

- The first would hold ABC constant at 1,249 mt for FY 2013 –FY 2015. This is the ABC at 75 pct of F_{MSY} using the base case projection. Under the Mramp 0.4 model, this would would achieve 75 pct of F_{MSY} in 2015.
- The second version of a constant ABC would set the ABC at 1,550 mt for FY 2013 – 2015. This is the 2015 ABC at F_{MSY} in the Mramp=0.4 model. Under that model, fishing mortality would be about 0.27 in 2013 but would decline to F_{MSY} in FY 2015. Under the base case model, the ABC would be less than the catch at F_{MSY} in FY 2013 but would be higher than 75 pct of F_{MSY} until FY 2015.

6. The ABCs that are being considered represent large declines from recent catches. Revenue impacts of the FY 2013 quotas (for all stocks) can be estimated using the Quota Change Model (QCM) reviewed by the SSC last year. The differences in revenue between a 1,250 mt catch and a 1,550 mt catch in FY 2013 are expected to be relatively small, but not unimportant (analysis to be provided).

7. Other considerations: As noted by the SARC review panel, if natural mortality has permanently changed to M=0.4 the current reference points will need to be revised in the future. The terminal year of the assessment was 2011; reviewers noted that the 2012 spring survey index reflected a continued decline, but was not included in the assessment.

8. Of the two constant catch scenarios that the PDT discussed, the 1,249 mt ABC is more consistent with the default control rule of 75 pct FMSY, results in lower fishing mortality should the Mramp 0.4, model represent the state of nature, is less reliant on the accuracy of the projections, but results in reduced economic benefits to the industry and the community when compared to the 1,550 mt constant catch ABC. The latter ABC provides increased economic benefits, would be expected to result in a dramatic reduction from current estimates of fishing mortality, results in similar projected stock increases, but is a departure from the default ABC control rule and leads to higher risks of overfishing. On balance, the PDT believes the 1,249 mt ABC is more appropriate given the status of this stock.

Table 3 – Consequence table for GOM cod ABCs based on 75 pct of F_{MSY}. ABCs are the same across rows and are based on the Model/Projection approach shown. Impacts on SSB and F are shown for different assessment models in the columns. (Row: basis for catch advice; column: state of nature)

75% of Fmsy:	0.135		Model					
F_{MSY}:	0.18		Base Case			Mramp 0.4		
Model/Projection Approach	**Year**	**Catch**	**SSB('000 mt)**	**F**	**Rebuild Date**	**SSB('000 mt)**	**F**	**Rebuild Date**
Base Case M=0.2	2013	1,249	9.40	0.135	2022	6.834	0.211	never to 0.2 BRPS
	2014	1,503	12.14	0.135		8.431	0.236	
	2015	2,030	16.87	0.135		11.402	0.231	
Mramp 0.4	2013	822	9.49	0.087	2020	6.929	0.135	never to 0.2 BRPS
	2014	935	12.65	0.079		8.873	0.135	
	2015	1,313	17.97	0.080		12.263	0.135	

Table 4 – Consequence table for GOM cod constant catch scenarios

75% of Fmsy:	0.135		Model							
F_{MSY}:	0.18		Base Case				Mramp 0.4			
Model/Projection Approach	**Year**	**Catch**	**SSB('000 mt)**	**F**	**Prob $F>F_{MSY}$**	**Prob SSB< ½ SSBMSY**	**SSB('000 mt)**	**F**	**Prob $F>F_{MSY}$**	**Prob SSB< ½ SSBMSY**
Constant Catch 1,249 mt	2013	1,249	9.40	0.135	0.197	1	6.84	0.211	0.68	1
	2014	1,249	12.19	0.111	0.082	1	8.50	0.193	0.583	1
	2015	1,249	17.26	0.08	0.004	0.977	11.75	0.135	0.094	1
Constant Catch 1,550 mt	2013	1,550	9.34	0.17	0.42	100	6.77	0.267	0.891	1
	2014	1,550	11.86	0.143	0.232	100	8.21	0.252	0.867	1
	2015	1,550	16.63	0.104	0.035	0.982	11.26	0.178	0.48	1

Georges Bank Cod

I. Stock status

Last assessment/terminal year:	2012/2011 (SARC 55 benchmark)
Assessment Model:	ASAP
Status Determination Criteria:	SSB_{MSY} 186,535 mt /F40%=0.18
Assessment Results:	7% of SSB_{MSY}/2.4 times F_{MSY} (retro adjusted)
Overfished/overfishing status:	Overfished/overfishing
Rebuilding plan:	2026

II. PDT recommended OFL/ABC

	OFL	ABC	US ABC	US Catch	Total Catch
2010	6,272	4,812	3,800	3,000	3,900
2011	7,311	5,616	4,766	3,500	4,500
2012	7,311	5,616	5,103	2,410	2,910*
2013	3,279	2,506	2,002		
2014	3,570	2,506			
2015	4,191	2,506			

* Calendar year catch estimate

Basis: Projection from SARC 55 benchmark assessment based on 75 percent of F_{MSY}

Probability of overfishing/overfished: See Table 5

III. Comments

1. This stock is in rebuilding program with an end date of 2026. The SARC recommended against using the projections to estimate Frebuild. The catch advice is based on 75 pct of $F_{MSY.}$

2. The SARC indicated that rebuilding projections were considered unreliable and should not be used to determine an Frebuild that would be used as the basis for management advice. The PDT believes that this recommendation is based partly on the nature of the recruitment model used in the projection, which shows a dramatic increase in recruitment when SSB exceeds 50,000 mt. This can create some unusual rebuilding scenarios: for example, reducing catches to low levels to climb out of the low biomass regime, and then projecting rapidly increasing stock size and catches as the larger recruitments immediately influence the projection.

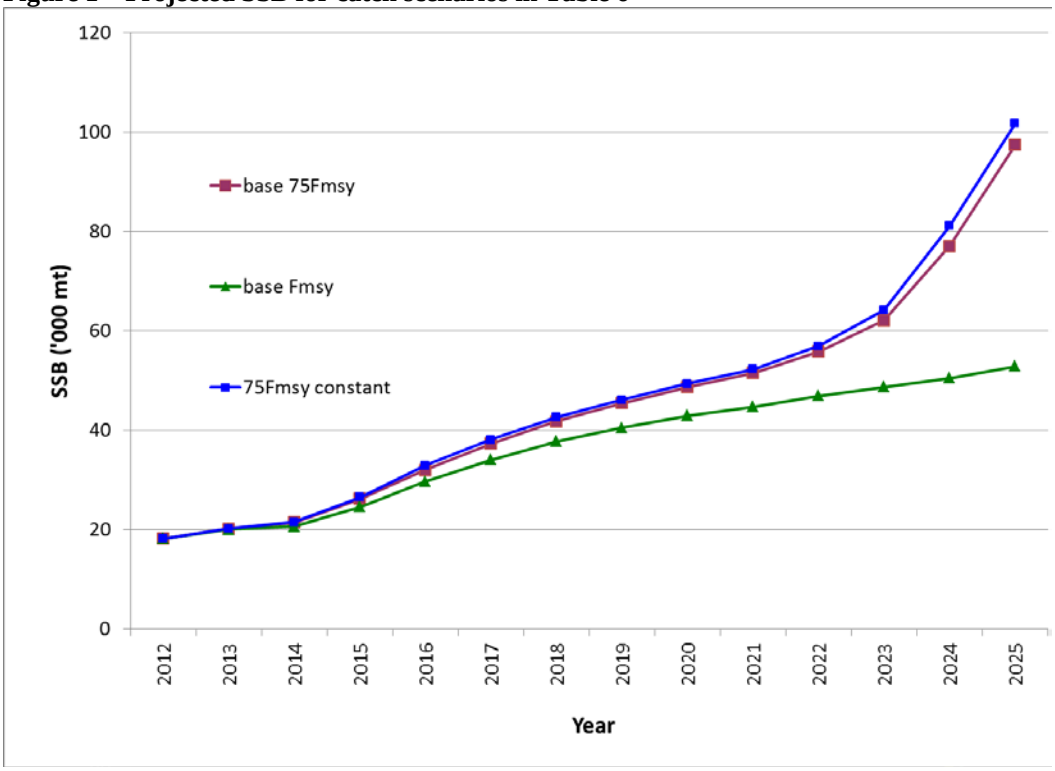
3. While an Frebuild cannot be calculated the projection at 75 pct of F_{MSY} shows relatively modest SSB increases from 2012 to 2014 (see Figure 1). Over the long-term, it appears doubtful

that catches based on75 pct of F_{MSY} would achieve the rebuilding target by 2026. There has been little progress in rebuilding this stock since 1994. Much like the case for GOM cod, the PDT recommends a constant catch approach for the next three years, with the catch at 2,506 mt. This is the catch at 75 pct of F_{MSY} in 2013. Again, if the projections are accurate, the stock will increase more rapidly under the constant catch scenario than would be the case under a constant F scenario. If the projections over-estimate rebuilding potential, then the constant catch scenario should reduce the impact to the stock size. The results are shown in Table Table 5.

Table 5 – GB cod ABC alternatives

75% of Fmsy:	0.135		**Model**			
F_{MSY}:	0.18					
	Year	Catch ('000 mt)	SSB	F	Prob F> FMSY	Prob SSB< ½ SSB_{MSY}
75 pct FMSY	2013	2,506	20.19	0.135	0.167	1.000
	2014	2,732	21.50	0.135	0.190	1.000
	2015	3,172	26.18	0.135	0.177	1.000
PDT Recommended Constant 2,506	2013	2,506	20.19	0.135	0.167	1.000
	2014	2,506	21.55	0.123	0.123	1.000
	2015	2,506	26.53	0.104	0.039	1.000

Figure 1 – Projected SSB for catch scenarios in Table 6



SNE/MA Winter Flounder

I. Stock status

Last assessment/terminal year:	2011/2010 (SARC 52 benchmark assessment)
Assessment Model:	ASAP/SCAA
Status Determination Criteria:	SSB_{MSY} 43,661mt/F_{MSY} =0.29
Assessment Results:	16% of SSB_{MSY}/18% of F_{MSY}
Overfished/overfishing status:	Overfished/Overfishing not occurring
Rebuilding plan:	Rebuild by 2014/TBD

II. PDT recommended OFL/ABC

A. Rebuilding strategy: rebuild by 2023 with median probability of success

	OFL	ABC	CY Catch
2010	1,568	644	400
2011	2,117	897	363
2012	2,336	626	345
2013	2,732	1,676	
2014	3,372	1,676	
2015	4,439	1,676	

* Calendar year catch based on NERO in-season ACL monitoring

Basis: Projection from SARC benchmark assessment. Constant catch scenario based on recent observed recruitment.

Probability of overfishing/overfished:

III. Comments

1. A revised ABC is being considered for this stock because the Council is considering a change to the management measures. The Council will consider revising the rebuilding strategy for this stock and may remove the prohibition on landing this stock.

2. The Council has not yet identified the revised rebuilding strategies that will be considered for this stock. The PDT will suggest the following alternative to the Groundfish Committee:

- Calculate the Frebuild necessary to rebuild by 2023 with at least a 50 percent probability of success. This is the maximum rebuilding period possible.

4. This stock has seen a decline in SSB and recruitment since 1981 (see Figure 2); this suggests that projected stock increases should be viewed with some skepticism. For example, Figure 3

adds the projected median SSB and recruitment for 2013 – 2015 to the assessment time series (2013 -2015 catches of 2000 mt, followed by F=0.175). The projected increases are rapid and seem optimistic when compared to recently observed conditions for this stock. The increase from 2010 to 2011 is due to the estimated size of the 2008 year class and the recent low F. But there is little sign in the recent NMFS trawl surveys that indicate the projected increase from 2010 to 2011 was realized (Figure 4). The fall 2012 survey does indicate an increase in mean numbers and weight per tow and numbers at length and, but this apparent increase in larger fish was not reflected in the spring 2012 survey (Figure 5). Several states also survey this stock. The PDT examined only one of these surveys. The Massachusetts Fall 2012 survey does not reflect the same increase as the NFMS fall survey.

5. SARC 52 adopted a Beverton-Holt stock recruit relationship for this stock. The B-H relationship predicts relatively rapid increases in recruitment and rapid stock growth. Figure 6 (observed ratio of recruits per spawner compared to predicted ratio of recruits to spawner) indicates a significant trend in residuals over time with the BH predicting higher recruitment for the past 13 years and under predicting recruitment in the early years under higher biomass. In recent years, the stock appears to be producing only 2/3 of the BH predicted ratio of recruits per spawner. The predictive value of BH may be even worse if retrospective pattern in recruits (biased high) and SSB (biased low) are taken into account.

6. One way to illustrate the effects of the long-term decline in recruitment on stock productivity is to develop a series of empirical cumulative distribution functions with successively shorter time periods. For example, the first CDF is based on all the years in the time series, the last CDF is based on the most recent two yeasr. These successive CDFs were then used as projection inputs for long-term projections to determine the yield that would result at the 75 pct F_{MSY} proxy. The results are shown in Figure 7. The theoretical yield shows a steady decline, even though there were periods where SSB fluctuated in the mid-90s and mid-2000's. The slope in the declining trend does appear to lessen in recent years.

7. The catches that would result from an Frebuild/2023 strategy are shown in Table 6. On the one hand, the standard projections appear to indicate the stock can support a fairly large increase in catch and still rebuild by 2023. But our experience with projections, coupled with time series of SSB and recruitment, suggest caution should be considered prior to targeting paper fish.

8. In order to evaluate the effect of lower recruitment on short-term catch advice, the PDT performed sensitivity analyses that replaced the B-H stock-recruit assumption in the projections with an empirical CDF based on the observed Age-1 numbers from 1999 to 2010. It is important to note this is not the recruitment model approved by the SARC, which adopted the BH model, and these runs are intended as sensitivity analyses only; they are not offered as a replacement for the SARC inputs. These results are compared to the standard projections in Table 6. They show that unless recruitment improves from the recently observed values for this stock, the Frebuild/2023 catches will lead to stock declines.

9. For these reasons the PDT explored two constant ABC scenarios from 2013 to 2015. Using either of these two scenarios would be a departure from using the catch that results from fishing at Frebuild, which has typically how catches have been set in the past. But the SSC has already used this approach for several groundfish stocks (plaice, witch flounder, CC/GOM yellowtail flounder). The PDT believes that this approach may help buffer the tendency of the projections to over-estimate stock rebuilding.

10. The PDT developed two constant catch ABCs: 2,000 mt and 1,676 mt. The rationale for each is slightly different.

- With a constant catch of 2,000 mt for FY 2013- 2015, the Frebuild from 2016 to 2023 is nearly identical to the Frebuild from 2013 to 2023 (0.178 vs. 0.175). The 2013 F would be expected to be less than 75 pct of F_{MSY} . This amount of catch, however, would result in a 12 percent decline in SSB from FY 2013 to FY 2015 should near-term recruitment be similar to that experienced from 1999 – 2010 rather than the recruitment predicted by the BH stock recruit curve adopted by the assessment.
- If long-term recruitment is closer to the recent 1999 – 2010 experience rather than the BH stock-recruit prediction, then long-term yield would be about 1,676 mt. This constant catch quota would result in a smaller reduction in SSB from 2013 to 2015 (7 percent) under the low-recruitment scenario. Rebuilding would occur more rapidly under the BH recruit assumption than would be the case at 2,000 mt.

11. Given the recent history of this stock, the PDT recommends the constant ABC of 1,676 mt. This is about double the current 2013 ABC, and is more than the catch in any year since 2007. This catch should also be sustainable if recruitment in the future does not decline from what was observed during the last 12 years of the assessment (1999 – 2010).

Figure 2 - – SNE/MA winter flounder SSB vs. Age – 1, 1981 - 2010

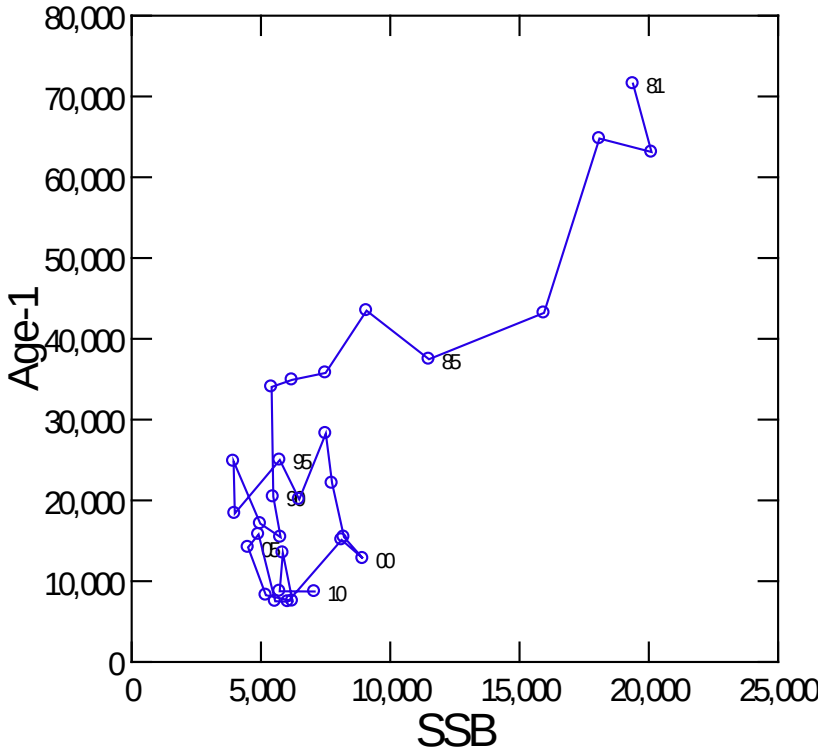


Figure 3 - SNE/MA winter flounder SSB vs. Age-1, 1981 – 2015 (2011-2015 based on projection)

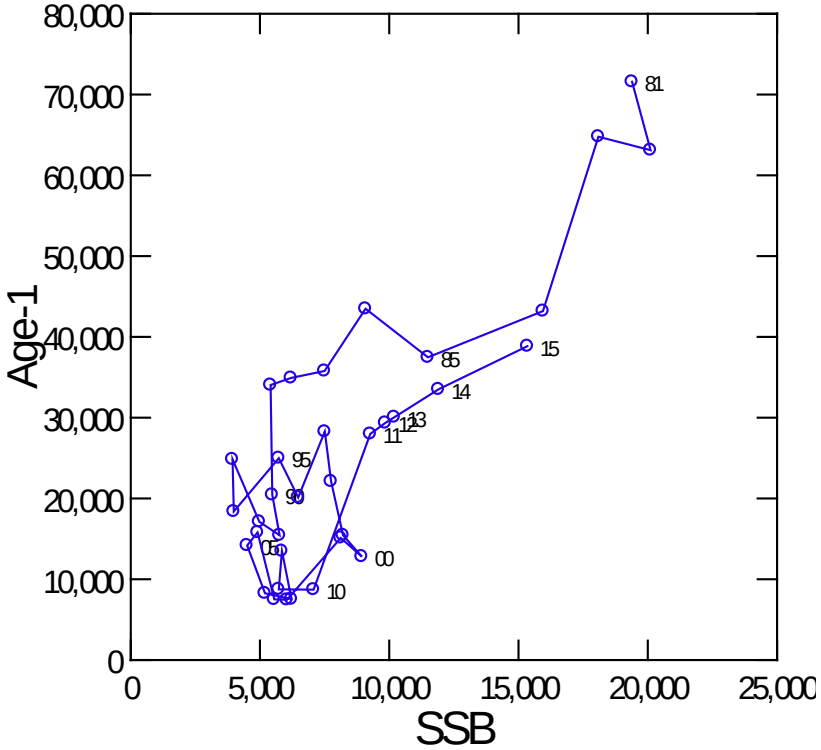
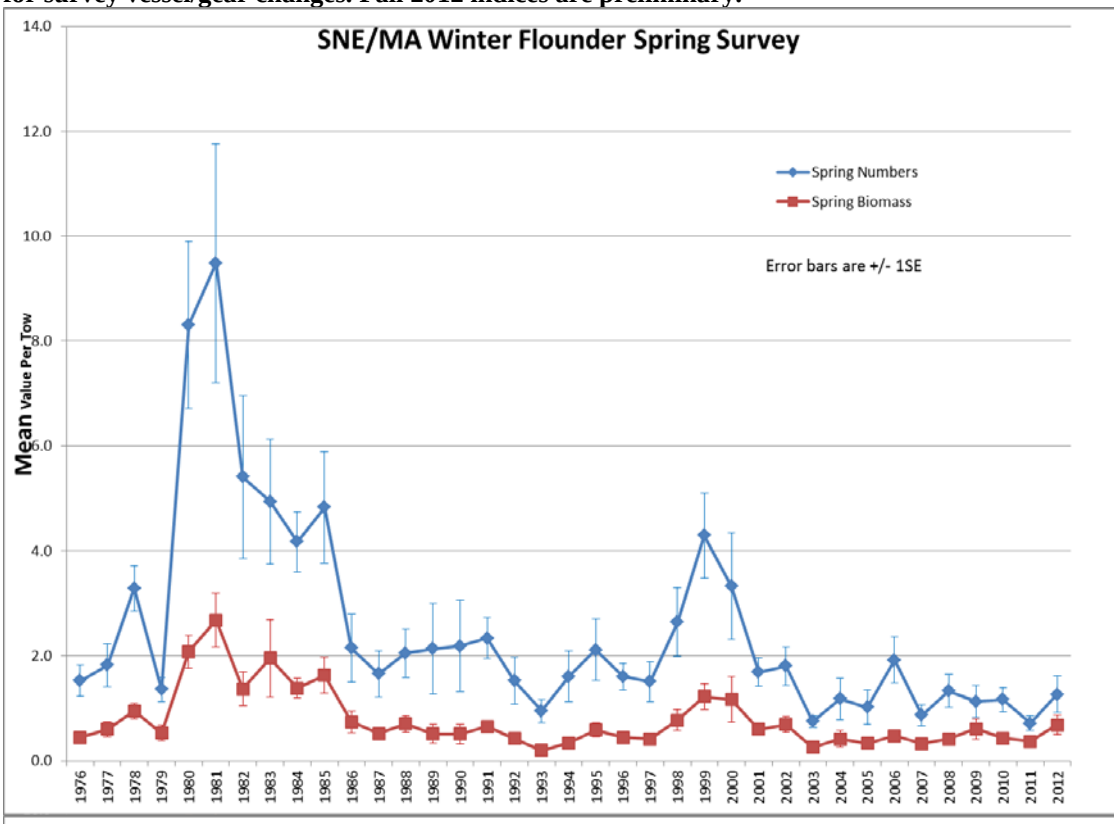


Figure 4 – Spring/Fall NMFS bottom trawl survey indices for SNE/MA winter flounder. All indices calibrated for survey vessel/gear changes. Fall 2012 indices are preliminary.



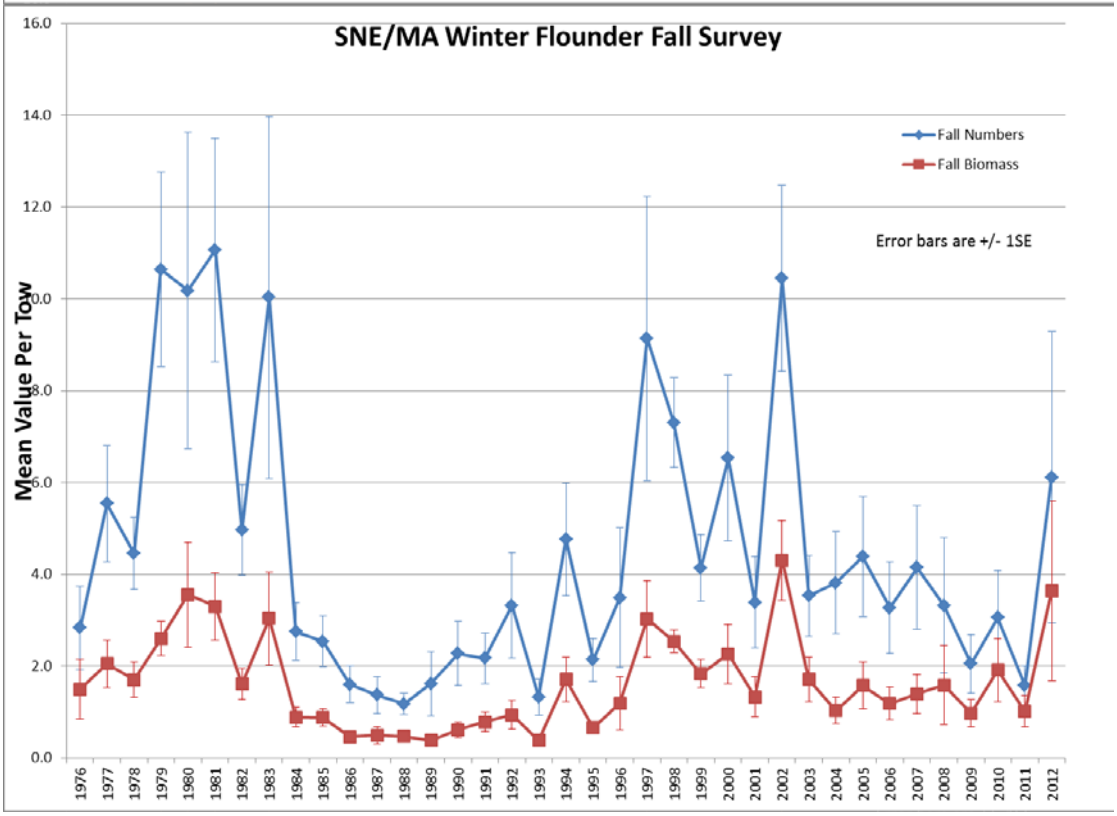


Figure 5 – Stratified NMFS bottom trawl survey mean number at length, SNE/MA winter flounder. Fall 2012 values are preliminary.

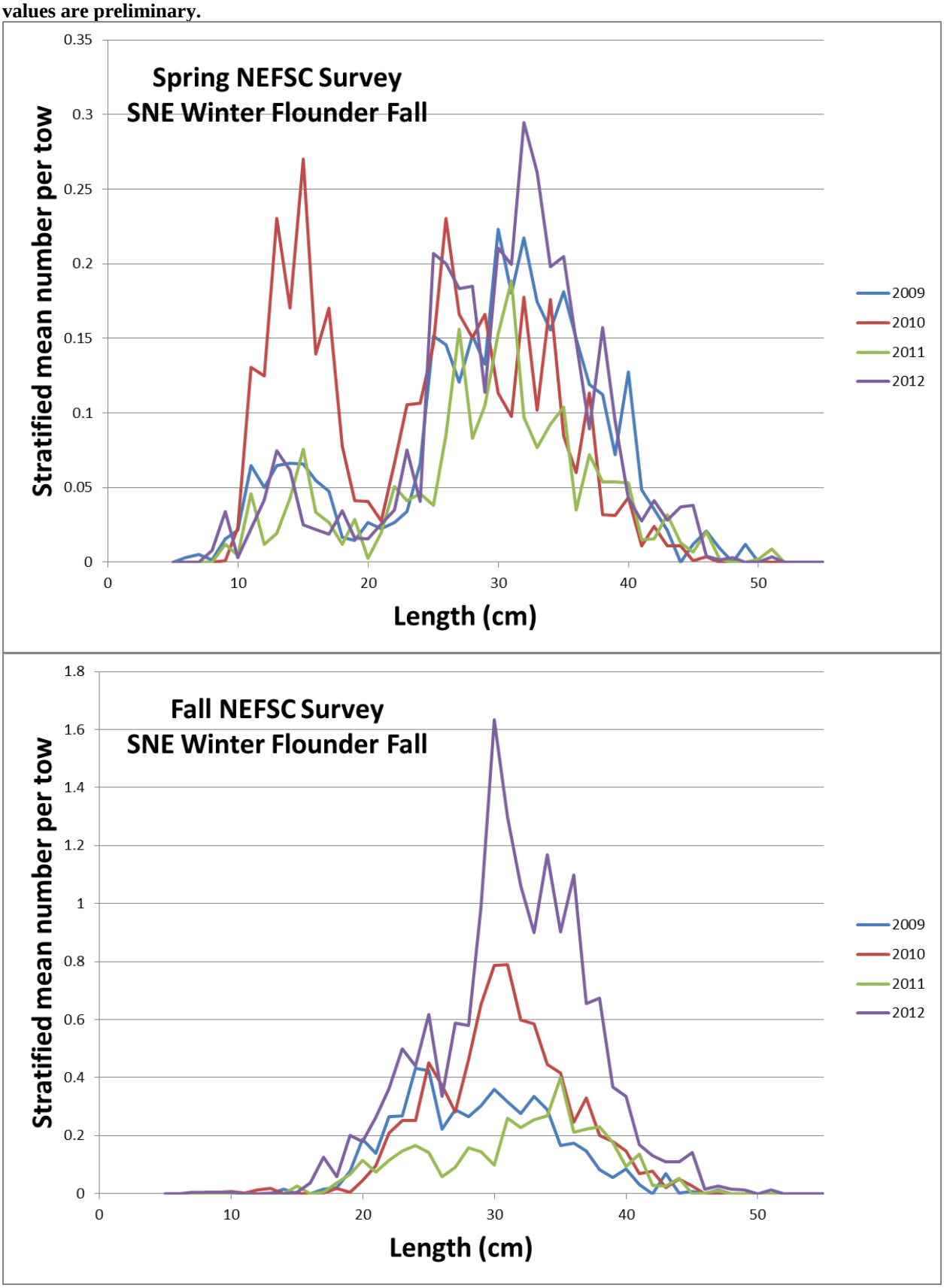


Figure 6 - Time series trend in Recruits per Spawner (R/S) for SNE/MA winter flounder; most recent years are on the right side of the plot.

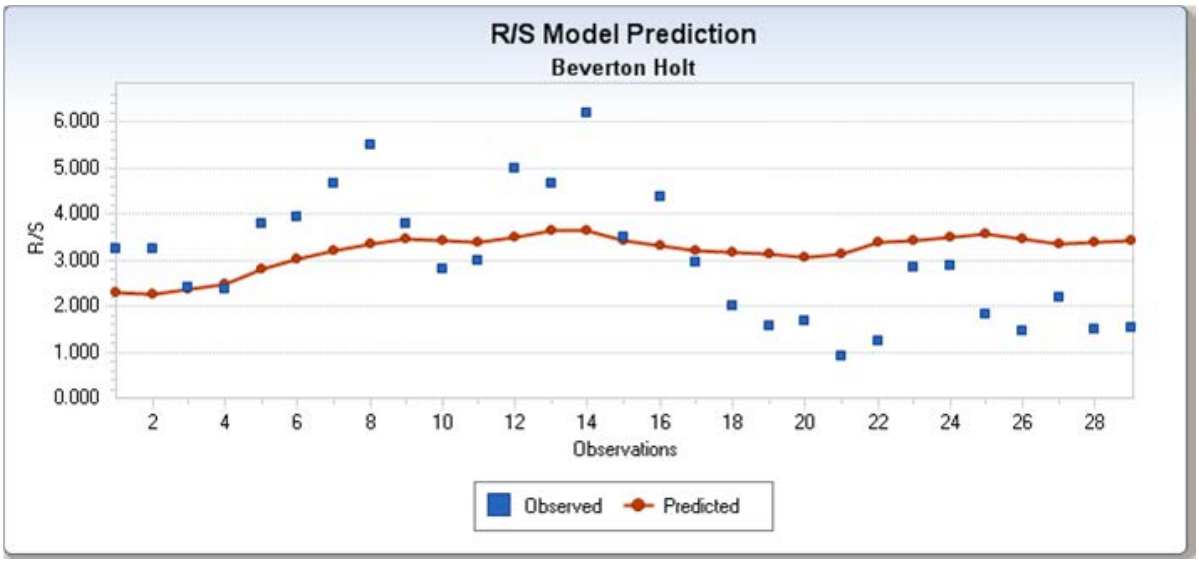


Figure 7 - Exploration of recruitment CDF series impacts on long-term yield

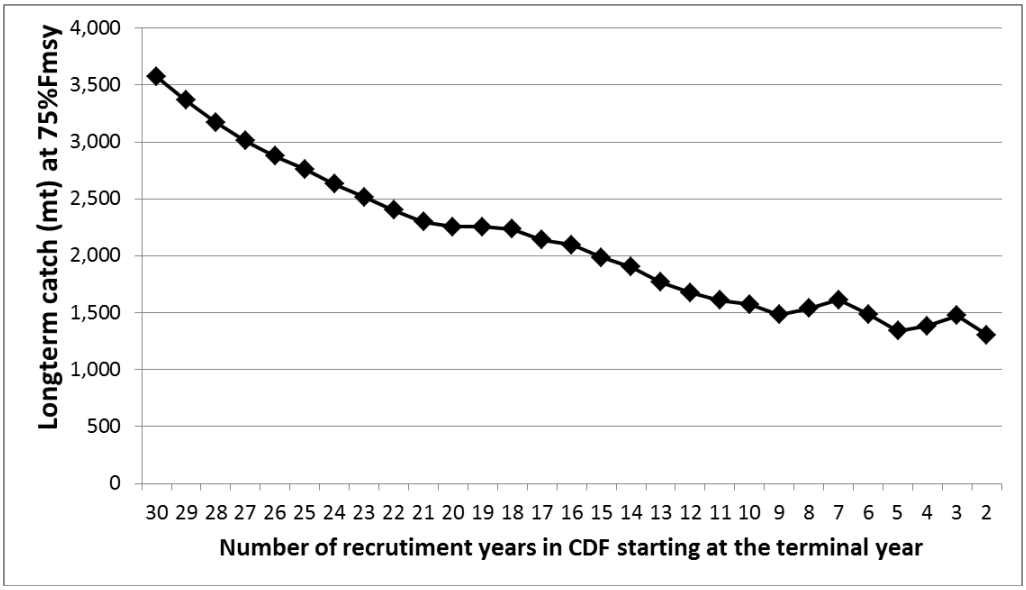


Table 6 - Consequence table for catches based on different rebuilding strategies. Catches are the same across rows and are based on the Model/Projection approach shown. Impacts on SSB and F are shown for different assessment models in the columns. (Row: basis for catch advice; column: state of nature)

75% of Fmsy:	0.218		Model						
F_{MSY}:	**0.29**		**BH Recruitment**				**Alternate Recruitment (1999 – 2010 CDF)**		
Model/Projection Approach	**Year**	**ABC**	**SSB('000 mt)**	**F**	**Rebuild Year**		**SSB('000 mt)**	**F**	**Rebuild Year**
Frebuild 2023	2013	1,716	10.503	0.175	2023		10.197	0.193	Never (N/A)
	2014	2,108	12.371	0.175			9.752	0.254	
	2015	2,729	15.569	0.175			8.876	0.362	

Table 7 – Consequence table for constant catch scenarios for SNE/MA winter flounder

			Model							
			BH Recruitment				**Alternate recruitment**			
	Year	**ABC**	**SSB**('000 mt)	**F**	**Prob SSB< ½ SSBMSY**	**Prob F> FMSY**	**SSB**('000 mt)	**F**	**Prob SSB< ½ SSBMSY**	**Prob F> FMSY**
Constant Catch 2,000 mt	2013	2,000	10.450	0.206	1.000	0.000	10.139	0.227	1.000	0.002
	2014	2,000	12.150	0.168	0.994	0.001	9.522	0.246	1.000	0.065
	2015	2,000	15.567	0.127	0.897	0.000	8.898	0.259	1.000	0.212
Constant Catch 1,676 mt	2013	1,676	10.503	0.175	1.000	0.000	10.205	0.188	1.000	0.000
	2014	1,676	12.442	0.141	0.994	0.000	9.875	0.197	1.000	0.000
	2015	1,676	16.087	0.105	0.879	0.000	9.504	0.202	1.000	0.001