New England Fishery Management Council
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To: Tom Nies, Executive Director
From: Scientific and Statistical Committee
Date: November 4, 2014

Subject: Overfishing levels (OFLs) and acceptable biological catch (ABC) recommendations for pollock, Georges Bank (GB) winter flounder, Gulf of Maine (GOM) winter flounder, and GOM cod.

The SSC met on October 20, 2014 in Danvers, Massachusetts, to address the following terms of reference (TORs):

Pollock, GB winter flounder, and GOM winter flounder

- Review the 2014 operational assessments for pollock, GB winter flounder, and GOM winter flounder and the work of the Groundfish Plan Development Team (PDT) and provide the OFL and ABC for each year for fishing years 2015-2017 that will prevent overfishing, provide for rebuilding and is consistent with the default control rule. (See list of documents for the assessment summary and PDT report under Information below).

GOM cod

- Review information provided through the PDT that estimates the amount of incidental catch of GOM cod that may be caught if the stock is not targeted. Determine whether the estimates provide information that can help inform ABC recommendations.
- Provide advice on appropriate spawning stock biomass reference points (i.e, SSBMSY), Frebuild and projections of catches and SSBs, that is consistent with the 2014 stock assessment update for the Mramp model with M=0.4 continuing indefinitely.
- Review the 2014 update assessment of GOM cod, previous SSC recommendation, and additional information provided for this meeting. Determine whether the SSC's provisional ABC of 200 mt for FY 2015-2017 should be revised in light of the additional information considered. If so, provide a revised ABC for each year for fishing years 2015-2017 that will prevent overfishing, provide for rebuilding and is consistent with the default control rule. (See list of documents for the assessment summary and PDT report under Information below).

To meet these TORs, the SSC considered the following documents:

1. Memo from Groundfish PDT to SSC re Pollock, Georges Bank winter flounder, and Gulf of Maine winter flounder ABCs, dated October 14, 2014
2. 2014 Operational Assessments and Peer Review Reports for Georges Bank winter flounder, Gulf of Maine Winter Flounder, and Pollock, prepublication draft dated October 2014.

3. Documents from the last benchmark assessments for pollock (SAW/SARC 50) and GB winter flounder and GOM winter flounder (SAW/SARC 52) are located here: http://www.nefsc.noaa.gov/saw/reports.html
4. Memo from Groundfish PDT to SSC re Gulf of Maine cod ABCs, dated September 11, 2014
5. Gulf of Maine Atlantic Cod 2014 Assessment Update, Draft Working Paper, (NEFSC) – dated September 3, 2014
6. Gulf of Maine Cod 2014 Assessment Update Peer Review Report, August 28-29, 2014 (NEFSC) – dated September 5, 2014
7. Documents from the most recent benchmark assessments for GOM cod (SAW/SARC 55 and SAW/SARC 53) are located here: http://www.nefsc.noaa.gov/saw/reports.html
8. Memo from Groundfish PDT to SSC re FY 2013-2015 ABCs, dated January 13, 2013
9. SSC Memo to Executive Director Paul Howard re Georges Bank cod, Gulf of Maine cod and Southern New England/Mid-Atlantic winter flounder ABCs for FY2013-2015, dated January 29, 2013
10. Presentation: Gulf of Maine Atlantic Cod 2014 Assessment Update – Mike Palmer (NEFSC) – dated September 15, 2014
11. Presentation: Groundfish Plan Development Team Report: Gulf of Maine Cod ABCs and OFLs for FY 2015- FY 2017– Jamie Cournane (NEFMC) and Paul Nitschke (NEFSC) – dated September 15, 2014
12. Memo from Groundfish PDT to SSC re Gulf of Maine cod bycatch, dated October 16, 2014
13. Presentation: Groundfish Plan Development Team Report: Gulf of Maine Cod bycatch– Jamie Cournane (NEFMC) – dated October 20, 2014
14. Memo from Groundfish PDT to the Groundfish Committee on GOM cod status determination criteria, dated April 7, 2013
15. SSC Memo to Executive Director Tom Nies re OFLs and ABC recommendations for Gulf of Maine cod, dated September 24, 2014
16. Presentation on the operational update of pollock – Brian Linton (NEFSC) – dated October 20, 2014
17. Presentation on the operational updates of Georges Bank and Gulf of Maine winter flounder – Paul Nitschke (NEFSC) – dated October 20, 2014
18. Presentation on the PDT report on pollock and winter flounder ABC and OFL alternatives – Jamie Cournane (NEFMC) and Paul Nitschke (NEFSC), dated October 20, 2014
19. Presentation on the quota change model – Chad Demarest (NEFSC) – dated October 20, 2014

Pollock

The operational assessment for pollock concluded that the biomass is above B_{MSY}, and therefore is not overfished, and that overfishing is not occurring. In this situation, the default control rule dictates that ABC be based on fishing at $75\%F_{MSY}$, although the control rule also dictates that ABC can be adjusted based upon additional scientific information.

The PDT proposed candidate ABCs for 2015-2017 based upon $75\%F_{MSY}$ applied to projected exploitable biomass. However, for many groundfish stocks in recent years, projections have proven in hindsight to be overly optimistic, which increases the probability of overfishing. Therefore, in response to this concern for several stocks with projected increases in biomass and catch, the SSC has recommended setting the ABC based upon $75\%F_{MSY}$ applied to projected biomass for the first year, and then holding this ABC constant for the second and third years. Because OFL is intended to be a risk-neutral limit, it is allowed to change with projected biomass. Maintaining the ABC

constant when the OFL is projected to increase implies an increasing uncertainty buffer into the future as confidence in projections decreases, and is the approach we recommend for pollock.

The ABC resulting from applying 75%F_{MSY} to biomass projected for 2015 is 16,600mt. The SSC recommends that 16,600mt be the ABC for 2015, 2016 and 2017. Corresponding OFLs increase from 21,538mt in 2015, to 21,864mt in 2016, to 24,598mt in 2017. In offering this advice, the SSC notes that an operational assessment for pollock is planned in 2015, and the 2016 and 2017 ABCs and OFLs may be adjusted based upon updated information.

The SSC recognizes that the SAW50 assessment method is a substantial improvement over the previous index-based assessment method, but considerable uncertainties remain in the updated analytical assessment. Therefore, the SSC recommends that the uncertainties evaluated through sensitivity analyses (e.g., assumed form of selectivity, data weighting) and the potential causes of the retrospective pattern be investigated in future assessments.

Georges Bank winter flounder

The operational assessment concluded that biomass is above 50%B_{MSY} but still below B_{MSY}. Therefore, the stock is not overfished, but continued rebuilding toward the biomass target is required. The rebuilding objective is 75% probability of being rebuilt by 2017. Overfishing is not occurring. In this situation, the default control rule dictates that ABCs be based on $F_{rebuild}$. The SSC sees no reason to deviate from the default control rule, and therefore recommends that ABCs increase from 2,124mt in 2015, to 2,221mt in 2016, to 2,294mt in 2017. Corresponding OFLs increase from 3,242mt in 2015, to 3,383mt in 2016, to 3,511mt in 2017. In offering this advice, the SSC notes that an operational assessment for GB winter flounder is planned in 2015, and the 2016 and 2017 ABCs and OFLs may be adjusted based upon updated information.

Gulf of Maine winter flounder

The operational assessment concluded that overfishing is not occurring. However, as with previous assessments, biomass-based reference points could not be estimated, and it is therefore unknown whether the stock is overfished. The default control rule dictates setting ABC as 75%F_{MSY} applied to the most recent estimate of exploitable biomass. Projections are not possible for index-based stocks, and ABC therefore remains constant until new survey indices are available. Therefore, the SSC recommends that ABC be set at 510mt for 2015, 2016 and 2017, with a corresponding OFL of 688mt. In offering this advice, the SSC notes that an operational assessment for GOM winter flounder is planned in 2015, and the 2016 and 2017 ABCs and OFLs may be adjusted based upon updated information.

Given that the majority of catch of both GOM cod and GOM winter flounder come from the same statistical area, in setting catch advice the SSC recognizes that catches of GOM winter flounder may be particularly affected by Council decisions for GOM cod. These issues are more likely to affect management uncertainty rather than scientific uncertainty.

Gulf of Maine cod

Utility of incidental catch information

The SSC expresses gratitude to the PDT and the groundfish sector representatives for addressing the request for additional information on incidental, non-target catch, especially given the very limited time to do so. In response to the first TOR for GOM cod, the SSC reviewed the information provided and determined that it could be used to inform catch advice, as described below.

The PDT was unable to produce a single estimate of incidental, non-target catch with confidence given the information and time available. Information provided by three commercial fishing industry groups representing all but two groundfish sectors that have relatively little cod allocation, along with recreational discard estimates provided by the PDT, suggest an approximation of incidental catch on the order of 500-600mt, close to or slightly greater than the 2015-2017 OFL of 514mt. There are additional sources of fishing mortality not included within this estimate, notably bycatch from other fisheries, as well as other uncertainties, and the actual incidental catch is likely to be higher. However, the information provided helps scale the likely non-target catch.

Alternative reference points

In response to the second TOR for GOM cod, the SSC reviewed information provided by NEFSC on reference points, catch and biomass projections, and other estimates associated with a scenario in which natural mortality ramps up to 0.4 and then remains at this rate indefinitely. The SSC did not focus its discussion on the numerical outcomes associated with a scenario in which M ramps up to 0.4 and remains at the level, however. Instead, SSC discussion focused more generally on the plausibility of the scenario and its implications.

With respect to the plausibility of a persistent change in M, some SSC members deferred to the SARC55 conclusion that, if M has increased in recent years, it is unlikely to be a permanent change, and therefore will return to a level that is more consistent with the life history of a species like cod (e.g., M=0.2). On the other hand, some members felt that there have been multiple changes within the ecosystem that have likely increased mortality of cod, and that a sudden return to a lower mortality rate coincident the end of the assessment time series is unlikely. Other SSC members noted that SARC55 also concluded that no change in M from the assumed value of 0.2 was a comparably plausible scenario, and some felt that to be more likely.

The plausibility and persistence of a change in M notwithstanding, there was also disagreement within the SSC about the implications for reference points and catch advice if such a change is assumed to have occurred. Some members felt that expectations for rebuilding need to be consistent with the current productivity of the stock as determined, in part, by the current natural mortality rate. That would mean lowering the estimated B_{MSY} due to fewer fish reaching larger size classes, and increasing the estimated F_{MSY}, consistent with yield-per-recruit theory. Other members argued that theories of sustainable fishing assumed a certain set of co-evolved life history traits, and that a recent increase in M represents a substantial deviation and a highly stressed population. In such a situation, increasing F would be imprudent as it would further stress the stock as it adapts to its changed environment. The challenge of determining appropriate overfishing limits and rebuilding targets for the increasing M scenario is exacerbated because these reference points for cod are currently based on MSY proxies rather than direct estimates of MSY reference points. Revised estimates of $F_{40\%SPR}$ that assume M=0.4 and the associated rebuilding target may not represent F_{MSY} and B_{MSY} as intended, and a different SPR might be warranted.

Ultimately, the SSC was not able to reach consensus on the issues addressed, and reiterates previous recommendations that a dedicated scientific process is needed to develop a formal consensus about the nature of regime shifts or other more persistent ecological changes that might fundamentally alter expectations about stock productivity. Because this was an operational update, it is not appropriate for the SSC to deviate significantly from the view of this stock represented by the previous benchmark assessment (i.e., reference points based on M=0.2) in developing catch advice.

Finally, despite the lively debate on these issues among its members, the SSC did reach consensus that the GOM cod stock is in poor shape under any of the scenarios considered, and that substantial reductions in catch are needed to allow for rebuilding.

ABC advice

The SSC recommends an ABC for 2015-2017 that is 75% of the OFL of 514mt, or 386mt. The SSC recommends this approach for the following reasons:

- ABC advice is still well below the OFL to account for uncertainty in the OFL.
- ABC advice is substantially reduced from the status quo ABC (1,550mt) as required given the poor state of the stock. Specifically, the SSC is recommending a 75% reduction in the ABC.
- ABC advice is below the average of the three alternatives based upon 75%F_{MSY} provided by the PDT (405mt for 2015), but above the values based on $F_{rebuild}$ (180 mt and 207 mt for 2015) from the two projections which suggest rebuilding in ten years is possible.
- The control rule includes a provision for the ABC to be set based on an estimate of incidental non-target bycatch, with a reduction, when projections suggest that rebuilding is not possible within 10 years. Given the information at hand and the need to balance this provision with other components of the control rule associated with alternative scenarios put forward by the assessment, this recommendation is the best option the SSC can offer to achieve this policy objective.
- Based on the assessment and the PDT's analysis, it is clear that the prospects for rebuilding Gulf of Maine cod in a 10 year time frame are limited at best. Projections assuming M=0.4 (but using M=0.2 reference points) suggest that rebuilding is impossible. Under M=0.2, rebuilding may be possible, but as the PDT's analysis highlights, this would require favorable environmental conditions and sustained growth of 37-40% per year. Furthermore, the low population size raises the possibility of depensatory processes that may cause projections to be overly optimistic. Based on this analysis, the SSC concluded that rebuilding this stock in 10 years is unlikely under current conditions.
- There remains disagreement within the SSC about the implications for reference points and catch advice when M is assumed to have increased within an assessment.
- SSB would still be projected to increase, so an ABC of 386m would not compromise the ability of the stock to rebuild. However, catch projections to provide for rebuilding by 2024 would need to be re-estimated.
- The ABC and OFL values are held constant for years 2015-2017 in recognition of the difficulties making projections at low population sizes and the update assessment scheduled for 2015.

Summary of recommendations

1. **ABCs and OFLs are as follows (all values are in metric tons, mt):**

Stock	2015		2016[1]		2017[1]	
	ABC	OFL	ABC	OFL	ABC	OFL
Pollock	16,600	21,538	16,600	21,864	16,600	24,598
GB winter flounder	2,124	3,242	2,221	3,383	2,294	3,511
GOM winter flounder	510	688	510	688	510	688
GOM cod	386	514	386	514	386	514

[1]ABCs and OFLs for 2016 and 2017 are expected to be adjusted following the operational assessment planned in 2015.

2. **Uncertainties in the pollock stock assessment evaluated by sensitivity analyses (e.g., assumed form of selectivity, data weighting) and the retrospective pattern should be considered in future assessments.**

3. **A scientific process is needed to develop a formal consensus on the impact of recent ecosystem changes, including the possibility that we have experienced an abrupt and possibly persistent regime shift, especially as those affect natural mortality and other key drivers of productivity of GOM cod and other stocks.**