



New England Fishery Management Council

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**To:** Paul J. Howard, Executive Director  
**From:** Scientific and Statistical Committee  
**Date:** January 29, 2013

**Subject: Georges Bank cod, Gulf of Maine cod and Southern New England/Mid-Atlantic winter flounder ABCs for FY2013-2015**

The SSC met on January 23, 2013 to address the following terms of reference (TOR):

1. The SSC is asked to develop Overfishing Limit (OFL) and Acceptable Biological Catch (ABC) recommendations for Northeast Multispecies stocks as specified below.
2. ABC recommendations are to be based on the fishing mortality strategies approved by the Council in Amendments 13 and 16 and related management actions. Status determination criteria should be used that are specified in Amendment 16 or subsequent actions, or that will be implemented through FW 48 consistent with the recommendations of recent SARCs. The general control rule for groundfish stocks that has been adopted is:
3. "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."
4. GOM cod: Provide an OFL and ABC for 2013-2015 that will prevent overfishing and that is consistent with the default ABC control rule. This stock is currently subject to a formal rebuilding program and the ABC should be based the default ABC control rule. Should SARC 55 determine that this stock is overfished and cannot rebuild by 2014, a revised rebuilding plan will be implemented at the beginning of FY 2014.

5. GB cod: Provide an OFL and ABC for 2013-2015 that will prevent overfishing and that is consistent with the default ABC control rule. This stock is currently subject to a formal rebuilding program and the ABC should be based on the default ABC control rule.
6. SNE/MA winter flounder: Provide an OFL and ABC for 2013-2015 that will prevent overfishing and that is consistent with alternative management strategies that will be considered by the Council.
7. The following documents are provided for the SSC's review:
  - a. Groundfish Plan Development Team memo to the SSC dated January 16, 2013
  - b. 55th Northeast Regional SAW Assessment Summary Report  
<http://www.nefsc.noaa.gov/publications/crd/crd1301/>
  - c. 55th Northeast Regional SAW and Reviewer Reports from Cadigan, Casey and Holmes (4 reports total) <http://www.nefsc.noaa.gov/saw/saw55/>
  - d. 55th Northeast Regional SAW Assessment Reports for GOM Cod and GB Cod  
<http://www.nefsc.noaa.gov/SAW-Public/>
  - e. 52nd Northeast Regional Stock Assessment Workshop Assessment Summary Report  
<http://www.nefsc.noaa.gov/publications/crd/crd1111/index.html> (includes SNE/MA Winter Flounder)
  - f. 52nd Northeast Regional Stock Assessment Workshop Report  
<http://www.nefsc.noaa.gov/saw/saw52/crd1117.pdf> (includes SNE/MA Winter Flounder)

#### Georges Bank cod

The PDT presented two ABC alternatives to the SSC. The first method applies 75% of the  $F_{MSY}$  proxy to the projected biomass, resulting in values of 2,506mt for 2013, 2,732mt for 2014, and 3,172mt for 2015. The second method applies 75% of the  $F_{MSY}$  proxy to the projected biomass in 2013 and then retains that value for 2014 and 2015. **The SSC favors the second option: ABC should not exceed 2,506mt for 2013-2015.** This recommendation was based on several factors.

Repeated experiences in recent years demonstrate poor performance of stock projections. Projections often deviate substantially from updated perceptions of stock dynamics revealed by later assessments, and this problem increases further into the future from the starting year of the projection. Therefore, while there is some confidence in estimated biomass in the first year of the projection, 2013, rapid deviations mean that confidence is much lower for 2014 and especially 2015. In fact, the SSC's preference is to only provide ABCs for 2013 and 2014. While the SSC recognizes the rationale for setting a 2015 ABC at this stage as a placeholder in case circumstances do not allow it to be set later, the SSC cautions against basing fisheries management on data that is several years old (i.e., basing the ABC in 2015 on data no more recent than 2011).

Deviations between projections and stock performance have recently tended toward over-optimistic expectations of stock growth. Despite ACLs set with uncertainty buffers and catch below those ACLs, later assessments often reveal continued overfishing. Instead of adjusting ABC based on optimistic projections of future stock growth, holding catch constant provides an additional buffer against that outcome.

In addition to significant concerns about the performance of stock and catch projections, other issues raised include:

- During public comment at the SSC meeting, several industry members highlighted that fish have been hard to find, especially over the past year, despite ample ACE being available and high prices for cod.
- Age structure of GB cod has been severely truncated since the mid-1990s. Older and larger cod spawn more frequently, produce disproportionately more eggs per spawn, and have higher egg quality and juvenile survival. These attributes are not captured by the assessment, and could cause underestimation of the effects of a loss of the older age groups.
- Distribution of cod through time has seen a consistent shift north and eastward, which might be changing availability of fish to the fleet.
- Spawning stock biomass is very low and close to the origin of the stock-recruitment relationship, where predator traps and other ecological phenomena can reduce per-capita reproductive rates.

Industry members also commented that the federal government has issued a disaster declaration for the groundfish fishery, which specifies that poor stock status persists despite adherence to catch limits. This suggests that other factors are inhibiting recovery, and that these factors need to be better understood and, where possible, mitigated. Therefore, the SSC urges greater attention to conditions and processes that affect stock dynamics beyond those typically captured by the assessment and ABC-setting process. See below for further discussion of this issue.

#### Gulf of Maine cod

The PDT presented two ABC alternatives to the SSC. Both adopt a constant catch approach. The first is based on 75% of the  $F_{MSY}$  proxy applied to the 2013 biomass projected from the base model in the assessment, resulting in a value of 1,249mt for 2013-2015. The second is based on the M-ramp model and sets the value of 1,550mt as the ABC for 2013-2015 based on F declining from 0.27 in 2013 to the  $F_{MSY}$  proxy in 2015 due to projected increase in the stock. This second constant catch ABC has F less than the  $F_{MSY}$  proxy under the  $M=0.2$  model for all three years. **The SSC agreed with the PDT that the preferred ABC for 2013-2015 should not exceed 1,249mt, but also includes the second alternative of ABC not to exceed 1,550mt for 2013-2015 in our recommendation for reasons outlined below.**

The PDT preferred the first approach given the overfished state of the stock and the comparatively small economic differences predicted between the two options. However, the PDT noted that economic impacts looming for the groundfish fishery due to a series of ACL cuts in 2013 and beyond might mean that even small differences in economic outcomes will be significant. The SSC agreed with the PDT's evaluation of the two options, and noted that both alternatives appropriately use the assessment outcomes and account for scientific uncertainty. An ABC of 1,550mt is the maximum the SSC endorses based on the PDT analysis, but urges the Council to consider the 1,249mt alternative in order to conserve the stock and enhance the likelihood of rebuilding. Furthermore, although the SSC has serious concerns about the status of the stock which motivate the preference for  $ABC=1,249mt$ , we also recognize that either value represents a substantial reduction in recent harvest, and is expected to promote rebuilding more than recent level of catch have allowed.

The GOM cod assessment took an important step that was welcomed by the SSC in presenting two models to help understand stock dynamics. The potential value of considering multiple models with

comparable performance and plausibility has been discussed by the SSC in the past, and reviewing both models in the course of this decision provided additional insights and understanding of the nature and extent of uncertainty. However, presenting two models also introduced new difficulties into the deliberations and development of ABC advice. Two models converged to common estimates of SSB, F and recruitment in the terminal year so projections began from a common starting point, but the implications of ABC alternatives differed between subsequent projections from the two models.

Consideration of the M-ramp model also raised important and unresolved questions. It is unclear whether the increase in M to 0.4 assumed for the M-ramp model will be persistent or ephemeral, i.e., whether or not M will return to the longer term estimate of 0.2, and the base model assumed no change at all. The SARC panel determined that, if M has increased, an eventual return to 0.2 is likely given that it is more consistent with inherent life history traits of cod (growth, longevity, maturity) and that the mechanism for the increase is not clear. Therefore, fishing mortality targets used in the projections from either model were based on reference points that assumed  $M=0.2$ .

In addition to the approaches adopted during the assessment and PDT analysis, the SSC discussed two other aspects of the potential shift in the mortality regime, one related to policy and the other related to science. The policy discussion focused on the implications of the National Standards guidance for the methods used. Again, based on SARC recommendations, the increased natural mortality was not carried through to the overfishing definition or the rebuilding target. The SARC recommendation might not be consistent with NS1 guidelines that, “*MSY is the largest long-term average catch or yield that can be taken from a stock or stock complex under prevailing ecological, environmental conditions...*” However, elsewhere it is stated that, “*Some short-term environmental changes can alter the current size of a stock or stock complex without affecting the long-term productive capacity of the stock or stock complex.*” Therefore, depending upon the interpretation of the terms “prevailing” and “short-term”, it may or may not be necessary to apply different F values to biomass projected from the two models in determining catch advice.

There was disagreement within the SSC about whether the M-ramp model’s increase in the natural mortality rate should lead to an increase or a decrease in the target fishing mortality rate. The SSC was unable to resolve this difference in directional change of target fishing mortality rate during the meeting. The discussion raised larger scientific questions about the nature and implications of regime shifts, similar to those raised in the discussion about both GB cod and SNEMA winter flounder, questions that require urgent attention and resolution (see below).

#### Southern New England/Mid-Atlantic winter flounder

The PDT presented two ABC alternatives to the SSC. Both adopt a constant catch approach. The first adopts an ABC of 2,000mt for 2013-2015, which keeps F within 75% of  $F_{MSY}$  in 2013 and within  $F_{rebuild}$  thereafter. The second adopts an ABC of 1,676mt, which is the long-term yield expected if 75% of  $F_{MSY}$  is maintained indefinitely and recruitment follows more recent trends rather than the longer term trend used in the assessment. The PDT recommended the latter alternative, and **the SSC agreed that ABC for 2013-2015 should not exceed 1,676mt.**

The primary impetus for this decision is a clear pattern in the stock-recruitment residuals, wherein actual recruitment for 1999-2010 has been consistently below recruitment predicted by the Beverton-Holt model used in the assessment. Residuals should be distributed more or less evenly on either side of the predicted relationship if the relationship still holds. A persistent bias in one direction

suggests that something in the environment has changed or that the model fit is too poor to use for predictions.

#### Other recommendations

As noted above, the SSC had some discomfort with setting ABCs for 2015 given poor performance of some recent assessments, low confidence in projections, rapid and incompletely understood changes in the ecosystem, and socio-economic impacts of our catch advice. We felt compelled to meet the terms of reference provided by the Council, but also to caveat our advice appropriately. However, we strongly urge the Council, NOAA, NRCC and other institutions in the science and management system to do everything possible to provide updated information in the form of new update or benchmark assessments, survey data, catch information, and other research results within 2014 so that the 2015 ABCs can be revisited and possibly adjusted if appropriate.

This information will not, however, resolve overarching questions about changes in the ecosystem, and especially whether there has been a persistent regime shift, questions that were a component of SSC discussions of all of these stocks. In fact, similar questions have been raised in other SSC deliberations. For example, our initial ABC advice for silver hake included unanswered questions about whether there has been a fundamental change in productivity, which resulted in the substantial increase in the ABC relative to historical catch trends. Also, our review of the GOM cod analyses provided by Drs. Butterworth and Rademeyer in March 2012 raised question about how far back in time an assessment should go if a regime shift has taken place, since the earliest years will be most dissimilar from the new regime. A series of scientific publications over the past decade provide evidence for a possible regime shift, and the extreme temperatures and resultant changes in species' distributions and behavior provides more immediate and tangible evidence that the system might be behaving in a fundamentally different way than in the past.

Therefore, we recommend that processes be initiated at the regional or, preferably, national level to accomplish three primary objectives. First, identify the key metrics and threshold values of those metrics that define when a regime shift has taken place. Second, evaluate data against those thresholds to determine if a regime shift has taken place in the Gulf of Maine/Georges Bank/Southern New England region, or if one is underway. Third, determine appropriate management responses for when a regime shift is determined to have taken place.

The SSC recognizes that progress was made on the proposed work plan to address cod management units. However, the SSC reiterates its previous recommendation that "There should be a comprehensive evaluation of scientific information on cod population structure and its management implications, including the possibility of revising management units. This evaluation should occur in time to be taken into account in the next management cycle, beginning with the 2014 fishing year."

#### Summary of recommendations

1. **The ABC for Georges Bank cod for 2013, 2014 and 2015 should not exceed 2,506mt. The associated OFLs are 3,279 mt, 3,570 mt, and 4,191 mt for FY 2013-2015, respectively.**
2. **The preferred ABC for Gulf of Maine cod for 2103, 2014 and 2015 should not exceed 1,249mt, but the Council might also consider alternative values not to exceed 1,550mt depending upon its risk tolerance. The OFLs associated with the 1,249 mt constant catch ABC are 1,635 mt, 1,966 mt, and 2,705 mt for FY 2013-2015, respectively, while the OFLs associated with the 1,550 mt constant catch ABC are 1,635 mt, 1,917 mt, and**

**2,639 mt for FY 2013-2015, respectively. Both sets of OFLs are based on the M=0.2 model.**

- 3. The ABC for Southern New England/Mid-Atlantic winter flounder for 2013, 2014 and 2015 should not exceed 1,676mt. The associated OFLs are 2,732 mt, 3,372 mt, and 4,439 mt for FY 2013-2015, respectively.**
- 4. Updated information to re-evaluate 2015 ABCs should be produced within 2014.**
- 5. A regional or national process to better define regime shifts, develop metrics for when they occur, and determine management strategies as a result is urgently needed.**

Summary of 2013-2015 OFLs and ABCs for Georges Bank cod, Gulf of Maine cod, and Southern New England/Mid-Atlantic winter flounder (all values in metric tons, mt).

	2013		2014		2015	
	OFL	ABC	OFL	ABC	OFL	ABC
Georges Bank cod	3,279	2,506	3,570	2,506	4,191	2,506
Gulf of Maine cod – preferred	1,635	1,249	1,966	1,249	2,705	1,249
Gulf of Maine cod – alternative	1,635	1,550	1,917	1,550	2,639	1,550
SNEMA winter flounder	2,732	1,676	3,372	1,676	4,439	1,676