Mid-Atlantic Fishery Management Council
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Richard B. Robins, Jr., Chairman | Lee G. Anderson, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

DATE: 1 June 2016

TO: Richard B. Robins, Jr., MAFMC Chairman

FROM: John Boreman, Ph.D., Chair, MAFMC Scientific and Statistical Committee

SUBJECT: Report of the May 2016 SSC Meeting

The SSC met in Baltimore, MD, on 25-26 May 2016 for the main purpose of developing multi-year ABC recommendations for Surfclams and Ocean Quahogs, and reviewing data updates to determine if the SSC's ABC recommendations for the squids, mackerel, and butterfish should be changed. The SSC also continued discussion of criteria for assigning coefficients of variation for OFLs, and providing input during the Council's re-examination of its risk policy for setting ABCs. The final meeting agenda is attached (Attachment 1).

A total of 12 SSC members were in attendance on May 25th and 10 on May 26th, which constituted a quorum for both days (Attachment 2). Also in attendance were scientists from the NEFSC (NMFS Northeast Fisheries Science Center) by phone, staff from the Council, and representatives from the fishing industry and the general public. Documents cited in this report can be accessed via the MAFMC SSC website (http://www.mafmc.org/ssc-meetings/2016/may-25-26).

Surfclams

Jessica Coakley (MAFMC staff) reviewed the most recent survey and catch data provided by the NEFSC and the fishery performance report prepared by the Advisory Panel, with assistance from Dan Hennen (NEFSC staff). The current ABC specifications for Surfclams expire at the end of the 2016 fishing year, so the SSC is being requested to develop new specifications for the 2017 and 2018 fishing years. A new benchmark assessment is expected later this year.

The SSC's responses to the Council's terms of reference (ToRs, *in italics*) for Surfclams are as follows:

For Surfclam, the SSC will provide a written report that identifies the following for fishing years 2017-2018:

1) The level of uncertainty that the SSC deems most appropriate for the information content of the most recent stock assessment, based on criteria listed in the Omnibus Amendment.

The SSC considered this stock to be characterized by an "SSC-modified OFL probability distribution" in line with its designation in 2013 (old Level 3).

2) If possible, the level of catch (in weight) and the probability of overfishing associated with the overfishing limit (OFL) based on the maximum fishing mortality rate threshold or, if appropriate, an OFL proxy.

Owing to the lack of a new stock assessment, the SSC used the same method that was used in 2013 to estimate the catch in weight for the 2017 and 2018 fishing years. The relevant levels are:

2017	**69,925 mt**	P(overfishing) = 50%
2018	**70,102 mt**	P(overfishing) = 50%

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock.

The SSC determined the ABC by using the Council's risk policy:

2017	**44,469 mt**	P(overfishing) = 29%
2018	**45,524 mt**	P(overfishing) = 30%

The SSC noted that it is continuing to use an OFL CV = 100% for its projections based on estimates derived from an assessment that employed data only up to and including 2011. Some additional caution that may be necessary because of this extended projection period. However, this is offset by survey evidence of average or above average recruitment in the southern regions, the fact that the quota has not been fully harvested in each year, and generally low exploitation rates.

4) The most significant sources of scientific uncertainty associated with determination of OFL and/or ABC.

The data for the most recent assessment included data up to and including 2011; therefore, the lack of an assessment that uses the most recent data is an important source of uncertainty. The SSC notes that a new assessment is expected to undergo peer review in July 2016 and, if accepted, should provide the basis for specifications when the SSC next reviews this species in May 2017. Additionally, the principal sources of uncertainty from the 2013 determination still apply:

a. The F = M foundation for establishing OFL;
b. Estimates of M used in the assessment;
c. The scales at which regional replenishment occurs and the potential impact of localized depletion;
d. Absolute biomass is not known, and biomasses are currently scaled to presumed abundance in 1999 to develop reference points (because the 1999 biomass is assumed to serve as a proxy for carrying capacity (K) of the stock); and
e. Uncertainty in the fishing mortality rates (F), as identified by the SARC external review panel (Houde, et al. 2013). In particular, the comparison of catch to the scaled abundance (see point c above) introduces unquantified uncertainty in estimates of F. Also, incidental mortality estimates, which are used, in part, to generate fishing mortality rates are poorly described and are not current.

5) Ecosystem considerations accounted for in the stock assessment, and any additional ecosystem

considerations that the SSC took into account in selecting the ABC, including the basis for those additional considerations.

No specific, additional ecosystem considerations were provided to the SSC to include in developing the recommended ABC. The SSC notes that increasing regional temperatures are likely to impact the distribution and abundance of this species. The SSC also notes that ecosystem considerations are included in the terms of reference for the new benchmark assessment: ToR 3 addresses changes in Surfclam habitat quality related to climate change and other factors, and ToR 4 addresses a possible change in depth of Surfclams over time and its impact on vital rates.

6) Prioritized research or monitoring recommendations that would reduce the scientific uncertainty in the ABC recommendation and/or improve the assessment level.

The SSC notes that the ToRs for the upcoming benchmark assessment encapsulate the committee's concerns relative to research and monitoring recommendations.

7) The materials considered in reaching its recommendations.

- 2016 Surfclam and Ocean Quahog AP Fishery Performance Report
- A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf by Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016)
- MAFMC Staff Memo from Jessica Coakley to Chris Moore, dated 6 May 2016
- 2016 Surfclam AP Information Document
- 2016 Surfclam Data Update
- Estimated Proportion of Undersized Surfclam Landings for 2015
- SAW 56 Summary Report
- SAW 56 Assessment Report
- SAW 56 Panelist Report

These documents can be accessed via the SSC's website (http://www.mafmc.org/ssc-meetings/2016/may-25-26).

8) A certification that the recommendations provided by the SSC represent the best scientific information available.

To the best of the SSC's knowledge, these recommendations are based on the best available scientific information.

Ocean Quahogs

As with Surfclams, Jessica Coakley (MAFMC staff) reviewed the most recent survey and catch data provided by the NEFSC and the fishery performance report prepared by the Advisory Panel, with assistance from Dan Hennen (NEFSC staff). The current ABC specifications for Ocean Quahog also expire at the end of the 2016 fishing year, so the SSC is being requested to develop new specifications for the 2017 and 2018 fishing years. A new benchmark assessment is expected in 2017.

The SSC's responses to the Council's terms of reference (ToRs, *in italics*) for Ocean Quahogs are as follows:

For Ocean Quahog, the SSC will provide a written report that identifies the following for fishing years

2017-2018:

1) The level of uncertainty that the SSC deems most appropriate for the information content of the most recent stock assessment, based on criteria listed in the Omnibus Amendment.

Owing to the lack of a more recent assessment, the SSC followed precedent and confirmed its previous evaluation of this stock as one for which "OFL cannot be specified with current state of knowledge."

2) If possible, the level of catch (in weight) and the probability of overfishing associated with the overfishing limit (OFL) based on the maximum fishing mortality rate threshold or, if appropriate, an OFL proxy.

The SSC deemed that it lacked credible information on which to calculate an OFL.

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock.

The SSC recommends setting an ABC for the 2017 and 2018 fishing years that maintains *status quo*. The recommended ABC in each year is **26,100 mt** – a direct extension of the level of ABC that has been in operation since 2014.

The SSC notes its expectations expressed in 2013 – that catches would remain relatively constant. The SSC also notes that a new assessment is expected in February 2017, the results of which, if accepted, should be available for SSC's May 2017 meeting at which it can reconsider specification of ABC for the 2018 fishing year.

4) The most significant sources of scientific uncertainty associated with determination of OFL and/or ABC.

The SSC reiterates its concerns noted in its 2013 report. The SSC also encourages that information from the SCeMFiS program on levels of recruitment be brought forward for consideration by the SAW/SARC working group and SSC.

Principal concerns in 2013 were:

- The fishing mortality rate reference point was deemed non-credible because species to which Ocean Quahog was compared were not appropriate;
- 40-year forecasts were provided in the previous assessment report and should be continued;
- Mechanisms for low recent recruitments are not known – could be either a result of underlying stock productivity or a consequence of life history of a long lived-species; and
- The nature of historical recruitments is poorly known.

5) Ecosystem considerations accounted for in the stock assessment, and any additional ecosystem considerations that the SSC took into account in selecting the ABC, including the basis for those additional considerations.

No specific, additional considerations are included in the SSC's recommended ABC. The SSC recommends that the upcoming assessment should follow the ecosystem considerations included in the Surfclam assessment and other habitat-related factors that may be relevant.

6) Prioritized research or monitoring recommendations that would reduce the scientific uncertainty in the ABC recommendation and/or improve the assessment level.

The SSC noted these areas in its 2013 report – and they are reiterated here with added notes in brackets:

- Development of credible management reference points remains a high priority. [The recent publication of a management strategy evaluation by Hennen (NAJFM – 2015) is step in this direction.]
- Reliability of estimates of stock biomass should be evaluated.
- Progress on developing age-length keys would be helpful for the assessment and for understanding recruitment patterns. [The SSC notes that the results from the SCeMFiS program may help in this regard.]
- Improved understanding of age-specific reproductive values would be of help in understanding the stock's resilience. For example, are the older and much larger females as important contributors to the spawning potential as they are for some long-lived fishes?
- Quantification of habitat-specific productivity would be important – both in terms providing robust vital rate estimates and also ensuring sustainable patterns of exploitation.
- Impacts of climate variability on long-term productivity and spatial distribution of the stock and of the fishery.

7) The materials considered in reaching its recommendations.

- 2016 Surfclam and Ocean Quahog AP Fishery Performance Report
- A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf by Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016)
- MAFMC Staff Memo from Jessica Coakley to Chris Moore, dated 9 May 2016
- 2016 Ocean Quahog AP Information Document
- 2016 Ocean Quahog Data Update
- Stock Assessment Update for Ocean Quahogs through 2011

These documents can be accessed via the SSC's website (http://www.mafmc.org/ssc-meetings/2016/may-25-26). The SSC also referenced the following journal article:

Hennen, D. R. 2015. How should we harvest an animal that can live for centuries? North American Journal of Fisheries Management 35:512–527, 2015

8) A certification that the recommendations provided by the SSC represent the best scientific information available.

To the best of the SSC knowledge, these recommendations are based on the best available scientific information.

Mackerel, Squids, and Butterfish

For Atlantic Mackerel, Longfin Squid, *Illex* squid, and Butterfish, the SSC was asked to review their ABC recommendations for the 2017 fishing year to determine if they needed to be changed based on new evidence. Atlantic Mackerel are in year three of three-year specifications, and the squids and Butterfish are in year two of three-year specs. Jason Didden (MAFMC staff) and staff from the Northeast Fisheries Science Center (Kiersten Curti for Atlantic Mackerel, Lisa Hendrickson for the squids, and Chuck Adams for Butterfish) walked the SSC through the latest survey and catch data, as

well as the fishery performance reports developed by the MSB Advisory Panel. Documents considered during the SSC deliberations are accessible via the SSC website (http://www.mafmc.org/ssc-meetings/2016/may-25-26) and include the MAFMC staff memo containing ABC recommendations, MAFMC staff's fishery information updates, catch and survey updates from the NEFSC, the combined fishery performance report, the most recent Canadian assessment and TRAC assessments for Atlantic Mackerel, and other informational materials. **For all four species, the SSC determined that the available information did not support changing the ABC recommendations for fishing year 2017.** However, the SSC did note some concerns about the status of Atlantic Mackerel and the squids.

For Atlantic Mackerel, the SSC continues to be concerned about the absence of large fish in the survey area of US and Canadian waters. The SSC appreciated inclusion of the catch-by-area charts in the information provided by the NEFSC, and encouraged development of analogous charts for all species managed by the MAFMC. Since the implementation of annual catch limits in 2011, total catch of Atlantic Mackerel has been less than 40% of the annual ABCs, with the exception of 2015 where catch was approximately 51% of the ABC. Indices-at-age derived from the most recent (spring 2015) bottom trawl survey are predominately fish aged 1 to 3, similar to the age distribution observed in 2009 and 2011; no fish aged six or older were captured in the survey. In the past, these pulses of recruitment did not result in capture of older fish in later years. The SSC was informed that the Canadians are planning to do an assessment of mackerel in the coming year; the SSC encouraged development of a combined US/Canada joint assessment for Atlantic mackerel as part of the TRAC (Trans-Boundary Assessment Committee) process. However, Kiersten Curti informed the committee that recent talks with Canada indicated reluctance by the Canadians to conduct a joint TRAC-type assessment.

The SSC noted that the mean body weight of both squid species captured in the NEFSC bottom trawl survey is still declining. This continues to be a cause for concern that has been attributed to environmental factors, primarily water temperature.[1] The SSC asked if the smaller size of the squids was a limiting factor in the squid fishery; Jeff Kaelin will check and respond.

CV Subgroup Report

Sarah Gaichas walked the SSC through her summary notes of her discussions with NEFSC stock assessment scientists regarding approaches to estimating the coefficient of variation (CV) for the overfishing limit (OFL), a key step in the development of ABC recommendations that invokes the Council's risk policy. The SSC then had a broader discussion of how to proceed regarding OFL CV estimation for both the short term and in the longer term.

The SSC made three general recommendations:

1. Historical forecast error is worth exploring as a short-term solution to establish an OFL CV based on assessments. This information could be requested within the assessment process, and would be available ideally whenever SSC is making recommendations.
    a. The most useful OFL CVs would be developed from separate distributions for forecasts one, two, and three or more years out.

[1] Dawe, E. G., L. C. Hendrickson, E. B. Colburne, K. F. Drinkwater, and M. A. Showell. 2007. Ocean climate effects on the relative abundance of short-finned (*Illex illecebrosus*) and long-finned (*Loligo pealeii*) squid in the Northwest Atlantic Ocean. Fish. Oceanogr. 16 (4): 303–316.

    b. Estimation would be done by looking across previous actual assessment documents, and not just using retrospective patterns within the current assessment. The number of assessments included would generally require going back as far as possible without getting to models and/or data sets that differ radically from the current situation.
    c. Discussion of basic protocols within the subcommittee and with assessment scientists will be necessary; e.g., when are assessments too different to include in the analyses?
2. Move ahead with more formal dialogue with the NEFSC to address the larger issue of estimating uncertainty in the OFL: how to develop criteria for "bins" of OFL CV by life history, data quality, assessment characteristics, and what an assessment able to estimate a satisfactory OFL CV directly actually looks like.
    a. This dialogue could take the form of a 1-2 day workshop, possibly associated with an SSC winter meeting, and possibly convened in Woods Hole.
    b. The Subgroup needs to develop clear objectives and a work plan before scheduling any workshop.
3. Investigate coordination with the NEFMC SSC on risk policy, and how to ensure that requests made of NEFSC assessment scientists were efficiently coordinated between Councils.

The SSC had a related discussion of the MAFMC Risk Policy. The OFL CV Subgroup (Sarah Gaichas, Olaf Jensen, Tom Miller, Brian Rothschild, and Mike Wilberg, with the addition of Paul Rago and David Tomberlin) will assist the Council with analyses of the current risk policy and potential alternative components. Performance of the current risk policy (including selected OFL CV levels) could be addressed alongside alternative configurations of the risk policy that might include changes to P* (probability of overfishing) values, species-specific control rules, or other measures to control interannual variability of ABCs. A management strategy evaluation could address this, but it would be a long-term project and best coordinated with the longer-term collaborative approach to address OFL CV (see point 2 above).

A broader approach to risk policy looking beyond single species approaches to stewardship and management was suggested. This may need the SSC and Monitoring Committee working together, and addressing it would require adding economic and social sciences expertise to the OFL CV Subgroup. Questions to investigate could include:

- When setting ABC for one species, what are ecological and economic outcomes for other species?
- What have been the consequences of our decisions, beyond impacts on the stock? Evaluating this requires better performance measures for economic and social objectives.
- What is being given up throughout the fishery? What other choices will be available given a specific ABC for one species? What are impacts to other fisheries?
- What is the consequence overall of choosing an ABC?
- How might new National Standard 1 and 2 Guidelines influence with the risk policy?

Council's ACL/AM Omnibus Framework

Rich Seagraves updated the SSC on an action recently taken by the Council to initiate a review of its risk policy and ABC control rule framework, which were implemented as a result of the 2007 MSA Reauthorization. MAFMC staff is currently developing a set of alternatives to the risk policy for consideration by the Council, including different control rules based on different life histories or species groups, a potential increase to a maximum P* of 45%, and the shape of the risk tolerance response

curve. The Council is also considering building in inertia to ABC recommendations to minimize inter-annual variability in catch (i.e., restrict inter-annual changes in to ABC to some percentage). In addition, the Council would like to see a more formalized treatment for species with assessments in the data poor category; staff recommends working with the SSC's CV Subgroup and the Council's Executive Committee to accomplish this task. The Council is also considering convening an external panel to provide an independent peer review of the current system. Finally, the Council is interested in determining how the risk policy has performed over the past five years (which could be determined via a management strategy evaluation) and is seeking ways to improve that performance.

During the ensuing discussion, the SSC noted that recent reductions in ABCs were not the result of decisions made about the CV of OFL by the SSC (i.e., they were not due to the selection of CVs input into ABC control rule framework). For example, recent changes in the ABC for summer flounder were the result of changes in stock biomass from the recent assessment update. [The MAFMC SSC is one of the few SSCs actually facing the probability question instead of using *ad hoc* methods.] This is a difficult scientific question and it is probably impossible to get a direct analytical estimate from stock assessments. While the Council welcomed the reduction in the OFL CV from 100% to 60% for some of the species, their concerns relate to the lack of objective criteria to establish the CV about OFL for a given stock assessment. The SSC shares these concerns, which is the basis for establishment of the CV Subgroup.

In terms of maintaining stability of annual catch limits, there is a tension between maximizing yield and maintaining stable catch streams. The Council's desire to place limits on the maximum change in ABC from year to year is largely driven by social and economic considerations. Establishing boundary conditions for acceptable volatility in catch vs risk to populations is not a scientific matter but rather a policy one driven by social and economic considerations. The main objective should be to reduce the volatility in ABCs and avoid chasing assessment noise, while following the rules during standard assessment updates.

In terms of outcomes, the Council and SSC need to consider the consequences of decisions based on the current risk policy and ABC control rule framework. This evaluation should extend beyond the biological impacts on the stock and should include critically important social and economic performance measures as well. On a related issue, the SSC noted that there is an artificial separation between ABC and ACL/TAC considerations - the SSC has never looked at the latter part. The Council should consider ways to address this separation and re-evaluate the SSC's role relative to the role of the Monitoring Committees.

The SSC also noted that the CV Subgroup is currently establishing criteria to bin the CVs for MAFMC stock assessments. The uncertainty associated with the different sources of data that drive the overall OFL CV needs to be more fully explored (see the preceding section of this report). The current risk policy implies a different temporal trajectory of the population in response to the control rule, which does not vary by species. It is critical that an empirical basis is established for specification of the CV for each Mid-Atlantic stock assessment (the stock's life history could be a basis).

Staff will report back to the Council on this discussion and proceed with the plan to engage the SSC through the CV Subgroup in an evaluation of the current system, and consider modifications to the risk policy and ABC framework (with external peer review of any proposed changes).

cc: SSC Members, Lee Anderson, Chris Moore, Rich Seagraves, José Montañez, Jason Didden, Jessica Coakley, Dan Hennen, Kiersten Curti, Lisa Hendrickson, Chuck Adams

Attachment 1

Mid-Atlantic Fishery Management Council
Scientific and Statistical Committee Meeting
25-26 May 2016

Final Agenda

Wednesday May 25, 2016

1:00 pm	Recommend surfclam and ocean quahog ABC specifications (2017-2018)
3:30 pm	CV Subgroup Report
5:00 pm	Adjourn

Thursday May 26, 2016

8:30 am	Review 2017 Atlantic mackerel, long-finned squid, Illex, and butterfish ABC specifications
10:00 am	Other business - Council's ACL/AM Omnibus Framework
11:00 am	Adjourn

Attachment 2

MAFMC Scientific and Statistical Committee
25-26 May 2016 Meeting
Baltimore, MD

Name	Affiliation
SSC Members in Attendance:	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chair, 5/25 only)	University of Maryland - CBL
David Tomberlin	NMFS Office of Science and Technology
Doug Lipton	NMFS
Mark Holliday	NMFS (Retired)
Mike Frisk (5/25 only)	Stony Brook University
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Ed Houde	University of Maryland – CBL
Wendy Gabriel	NMFS Northeast Fisheries Science Center
Olaf Jensen	Rutgers University
Paul Rago	NMFS (retired)
Rob Latour	VIMS
Others in attendance:	
Rich Seagraves	MAFMC staff
Jessica Coakley (5/25 only)	MAFMC staff
José Montañez (5/25 only)	MAFMC staff
Jason Didden (5/26 only)	MAFMC staff
Dan Hennen (by phone, 5/25 only)	NMFS Northeast Fisheries Science Center
Lisa Hendrickson (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Chuck Adams (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Kiersten Curti (by phone, 5/26 only)	NMFS Northeast Fisheries Science Center
Dave Wallace (5/25 only)	Wallace and Associates
Jeff Kaelin	Lund's Seafood and MAFMC member
Tom Alspach	SCOQ Advisory Panel member
Purcie Bennett-Nickerson (5/26 only)	Pew Charitable Trust
Greg DiDomenico (5/26 only)	GSSA