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M E M O R A N D U M

DATE: 25 May 2017

TO: Michael Luisi, MAFMC Chairman

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

SUBJECT: Report of the May 2017 SSC Meeting

The SSC met in Baltimore on the 17th and 18th of May 2017. The main objectives of the meeting were to develop new ABC recommendations for Butterfish, *Illex* squid, Longfin Squid, Atlantic Surfclam, and Ocean Quahog, and review its ABC previous recommendation for Atlantic Mackerel in Fishing Year 2018 in light of updated information. The SSC also briefly discussed other topics, which included progress by the OFL CV Working Group, the status of the upcoming National SSC Workshop and the NRCC Assessment Priorities Working Group, and a proposed re-design of the NEFSC Clam Survey (Attachment 1).

A total of 11 SSC members were in attendance on May 17th and 12 members attended on May 18th, which constituted a quorum for both days (Attachment 2). Also in attendance were an MAFMC member, MAFMC staff, staff from NMFS Northeast Fisheries Science Center and GARFO, and representatives from the fishing industry. For each ABC deliberation, the following order of business was used: (1) presentation by the lead NEFSC assessment scientist; (2) presentation by the lead MAFMC staff member; (3) comments by the SSC member who served as SARC chair (Mike Wilberg for Atlantic Surfclam and Ed Houde for Ocean Quahog); (4) comments by the lead SSC members for species biology and socioeconomics, respectively; (5) public comments; and (6) ABC deliberations by the SSC. All documents referenced in the report can be accessed via the SSC's meeting website (http://www.mafmc.org/ssc-meetings/2017/may-17-18).

The SSC requests that future wording of the MAFMC's generic Term of Reference #2, asking for the level of catch (in weight) and the probability of overfishing associated with the overfishing limit (OFL), be clarified. By definition, the OFL is catch and, when correctly calculated, the probability of overfishing when harvesting at OFL is equal to 0.5.

Butterfish

The SSC was requested by the MAFMC to develop ABC recommendations for fishing years 2018-2020. Chuck Adams (NEFSC staff) reviewed the results of the updated assessment, followed by Jason Didden (MAFMC staff) who updated the SSC on fishery regulations and fishery performance, and presented MAFMC staff's ABC recommendations. Based on the results of the stock assessment update, the Butterfish resource is not overfished and overfishing is not occurring in the assessment terminal year (2016). The current fishing mortality rate (F_{2016} = 0.05) is 94% below the overfishing reference point F_{MSY} proxy of 0.81. The current spawning stock biomass (SSB) is 41% above the accepted biomass reference point SSB_{MSY} proxy of 45,616 mt.

Responses by the SSC to the Terms of Reference (in *italics*) provided by the MAFMC are as follows:

For Butterfish, the SSC will provide a written report that identifies the following for fishing years 2018-2020:

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 determined that the OFL for Butterfish should be considered "an OFL CV augmented by the SSC." The assessment produced an estimate of the OFL, but the SSC considered the estimate of uncertainty in the OFL from the assessment unrealistic for use in ABC determination.

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 F_{MSY} proxy used in the assessment was based on 2/3M. The estimate of M in the 2014 assessment was M = 1.22, implying the OFL = F_{MSY} = 0.81. Assuming that subsequent ABCs are fully harvested, the equivalent OFLs for the three years are:

Year	OFL
2018	**28,628 mt**
2019	**37,637 mt**
2020	**39,592 mt**

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

The SSC was presented with an update from the benchmark assessment. Accordingly, the SSC maintained the approach of basing the ABC on an OFL with a CV = 100%. Based on the projections the equivalent ABCs are:

Year	ABC
2018	**17,801 mt**
2019	**27,108 mt**
2020	**32,063 mt**

The expected probability of overfishing in these projections is very low (average P* = 0.08), and thus the projections are very conservative.

As an interim measure, the SSC will evaluate survey CPUEs (NEAMAP and NEFSC Fall survey) as indices of annual recruitment for possible action. Currently, the projections assume that future recruitments are a random sampling from the historic distribution of recruitments. The SSC notes there is a declining trend in recent recruitments that is not considered in this assumption.

The SSC chose not to accept the MAFMC staff recommendation of a constant ABC because the SSC believed the constant ABC strategy implied an evaluation of economic trade-offs, for which the SSC did not have clear guidance.

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

- The foundation for the OFL was *ad hoc* rather than being derived internally in the model.
- The application of an assumed q-value to estimate M, while novel and well thought out, contributes to uncertainty.
- The assessment was limited to a period of low stock productivity, well after a period of higher exploitation, which reduces the data contrast available to the model.
- Conflicting trends among seasonal surveys were not incorporated in the model.
- Model-based estimates of F are imprecise and particularly influenced by three years of low catch.
- There are residual trends in the survey data that might be explained by environmental or biotic (predation) factors that were not incorporated in the model.
- There appears to be a declining trend in annual recruitment, suggesting projections may be uncertain.
- Additional uncertainty arises because the reference points are calculated from the previous assessment and are not internally consistent with the estimate of M from the update.

5) Review the performance of the Butterfish discard cap and its effectiveness in limiting discards in the Longfin Squid fishery.

The Butterfish discard cap appears to be working as intended. The SSC notes that the impact of the discards on the overall dynamics of the Butterfish stock is likely small, and a re-evaluation of the magnitude of the cap may be warranted.

6) 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.

There were no specific ecosystem considerations in the population dynamics model. However, the OFL was based on a proxy that incorporated consideration of the role of Butterfish as a forage species. Additionally, the calculation of availability of the fish to the survey did incorporate considerations of temperature as a factor influencing fish distributions.

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

- Conduct simulation studies to evaluate the uncertainty in the *ad hoc* F_{msy} proxy;
- Develop reference points that are internal to the model;
- Develop a parallel catchability estimate for Spring surveys so that both Spring and Fall surveys could be included in the model;
- Evaluate approaches to include additional surveys, e.g., from States, in the assessment model;
- Analyze additional estimation of consumptive demand of predators to identify critical periods of overlap of predators and prey;
- Reconsider stock structure and degree of exchange with the South Atlantic stock component; and
- Evaluate the potential role of variation in "available thermal habitat area" in the NEAMAP survey as an explanation of inter-annual variability in NEAMAP CPUE.

8) The materials considered in reaching its recommendations.

- Year-end Butterfish Catch and Mortality Cap Report for the 2016 Fishing Year
- Butterfish 2017 Stock Assessment Update
- Butterfish Projections 2018-2020
- Butterfish Indices
- Fishery performance report
- Staff memo
- SAW/SARC 58 Butterfish Assessment Materials

These documents can be accessed via the SSC meeting website (http://www.mafmc.org/ssc-meetings/2017/may-17-18).

9) 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.

Illex Squid

Lisa Hendrickson (NEFSC) gave an overview of the recent data update for *Illex* squid, followed by Jason Didden (MAFMC staff), who presented an overview of fishery regulations and fishery performance, and MAFMC staff's ABC recommendations. The data update shows that landings from the southern stock component declined after 2011 and were below the 1987-2015 average (12,095 mt) during 2012-2016. Landings during 2016 totaled 6,684 mt. Data from the Northeast Commercial Fisheries Database indicated that fishing effort also declined after 2011. After reaching a peak in 2006, fall relative abundance declined and was below the 1967-2015 median (8.0 squid per tow) during 2011-2013 (4.7 squid per tow) then increased and was near the median during 2014-2016. Despite the fact that landings from the entire stock were low during most years since 1999, the mean body weights of squid caught in the NEFSC fall surveys has gradually declined.

Responses by the SSC to the Terms of Reference (in *italics*) provided by the MAFMC are as follows:

For Illex squid, the SSC will provide a written report that identifies the following for fishing years 2018-2020:

1) The level 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 latest assessment did not specify an OFL. This is unchanged from the previous SSC determination.

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.

Because an OFL cannot be specified given the current state of knowledge it is not possible to specify the probability of overfishing.

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

The SSC recommends a 2018-2020 multi-year ABC specification of **24,000 mt** (the same as has been set since 2012 by the SSC). This is based on the observation that landings of 24,000 - 26,000 mt do not appear to have caused harm to the *Illex* stock, based on indices and landings in years following when landings were in the range of 24,000 mt - 26,000

mt. Landings are highly variable within a wide range, but have been below the average since 2013. Indices are also variable, but have not been consistently below the average value.

There has been a long-term decline in average size. Causes for the decline in average size remain unknown, but could include changes in environmental variables, a possible change in the timing of the survey, and/or an increase in an unspecified size-selective source of mortality, such as fishing or natural mortality.

The method used by the SSC for setting the ABC assumes that the stock has been lightly exploited.

The SSC recommends that a benchmark assessment or a research track assessment examining the effects of environmental variables on survey trends in *Illex* be undertaken by 2020, which would be 14 years since the last benchmark assessment was conducted.

The SSC will consider the following data sources to evaluate whether to depart from the three-year ABC specification:

1. Total landings – in particular deviation from average;
2. Spatial distribution of landings – in particular evidence for broad-scale latitudinal shifts in catches;
3. Fishery dependent effort (landings per tow);
4. Biological characteristics of the catch; and
5. Spatial distribution of survey catches.

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

- Unavailable estimates of biological reference points (F & B), and no estimates of recent biomass and/or fishing mortality;
- Surveys that cover only a portion of the entire range (leading to variable availability);
- Poor precision of U.S. discard estimates (but of low magnitude);
- Use of a bottom trawl survey gear for a semi-pelagic species may induce variation in the indices of abundance and obscure the true signal;
- LPUE values that are sensitive to availability;
- Highly variable natural mortality; and
- An extremely short life-span (less than 1 year), and unknown, but likely high, impact of environmental factors on recruitment and growth.

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 additional ecosystem considerations were taken into account by the SSC in setting the ABCs.

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

High priority

- Expand investigations into system productivity and oceanographic correlates with trends in *Illex* availability, recruitment, growth, and abundance. This could include development of a habitat-based availability index to standardize surveys.
- Collect demographic information on growth, maturation, mortality, and reproduction by sex, season, and cohort to estimate and evaluate the level and changes in stock productivity.
- Evaluate a length-based assessment with a sub-annual time step, undertaking cooperative research with the fishing industry.
- Refine the between-vessel survey calibration estimate for *Illex*, and consider a size-based calibration.
- Evaluate the potential to collect real time spatial and temporal data on catch and biological characteristics of the catch to support in season management.

Lower priority

- Explore the reasons for the decline in average size of *Illex* caught in the survey since 1985.
- Compare predator consumption estimates to total catch.
- Investigate range and range dynamics at depths >185 m.

7) The materials considered in reaching its recommendations.

- *Illex* Data Update
- Advisory Panel (AP) MSB Fishery Information Document
- AP MSB Fishery Performance Report
- MSB Staff ABC Recommendations

These documents can be accessed via the SSC meeting website (http://www.mafmc.org/ssc-meetings/2017/may-17-18).

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.

Longfin Squid

Lisa Hendrickson (NEFSC) gave an overview of the recent assessment update for Longfin Squid, followed by Jason Didden (MAFMC staff), who presented an overview of fishery regulations and fishery performance, and MAFMC staff's ABC recommendations. According to the update, in 2016 the Longfin Squid stock was not overfished because the average of catchability-adjusted, swept-area biomass estimates derived from the NEFSC spring and NEFSC plus NEAMAP fall surveys during 2015-2016 were much greater than the threshold B_{MSY} proxy of 21,203 mt. The overfishing status could not be determined because there are no fishing mortality reference points for the stock.

Responses by the SSC to the Terms of Reference (in *italics*) provided by the MAFMC are as follows:

For Longfin Squid, the SSC will provide a written report that identifies the following for fishing years 2018-2020:

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 latest assessment did not specify an OFL. This is unchanged from the previous SSC determination.

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.

> Because an OFL cannot be specified given the current state of knowledge it is not possible to specify the probability of overfishing.

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

> The SSC recommends an ABC for a three-year period (2018-2020) equal to the catch in the year of the highest exploitation ratio (1993). Thus, the recommended ABC is **23,400 mt**, the same as has been set since 2012 by the SSC, which occurred during a period of apparent relatively light exploitation (1976-2009) according to the 2010 Longfin Squid assessment.
>
> The SSC will consider the following data sources to evaluate whether to depart from the three-year ABC specification:
>
> 1. Total landings – in particular deviation from average;

2. Spatial distribution of landings – in particular evidence for broad-scale latitudinal shifts in catches;
3. Fishery dependent effort (landings per tow);
4. Biological characteristics of the catch; and
5. Spatial distribution of survey catches.

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

- Surveys cover unknown portion of entire range (variable availability) – the range may extend beyond survey coverage;
- Using a bottom trawl survey gear for a semi-pelagic species may induce variation in the indices of abundance and obscure the true signal;
- Highly variable survey trends;
- Extremely short life-span (less than 1 year), and unknown, but likely high, impact of environmental factors on recruitment;
- Because of its short life span, its high and variable rate of natural mortality, and the delay in collating survey and catch information, there is an inherent lag in information pertaining to the current state of the stock and the ability to estimate reference points; and
- Inability to distinguish between inter-seasonal differences in productivity and inter-seasonal differences in catchability.

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 additional ecosystem considerations were used in the 2017 assessment update, nor used in the SSC's ABC determination.

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

1. Expand investigations into system productivity and oceanographic correlates with trends in Longfin Squid availability, recruitment, growth, and abundance. This could include:
    a. Development of a habitat-based availability index to standardize surveys.
    b. Exploration of alternative weightings of semi-annual surveys other than simple averaging.
    c. Understanding the spatial coverage and availability to the surveys.
    d. Evaluation of methods of incorporating ecological relationships, predation, and oceanic events that influence abundance and availability.
    e. Refining understanding of catchability in surveys (especially NEAMAP).
2. Continue to monitor the performance of the squid fisheries and related fisheries in relation to the full breadth of regulatory measures with a view towards improving the economics of the fisheries.

3. Evaluate approaches to real time management including expanding age and growth studies to better estimate average growth patterns and to discern seasonal productivity/catchability patterns.
4. Until real-time assessment is feasible, expand cohort analysis to understand dynamics of Longfin Squid to support stock assessments and the incorporation of seasonal indices.
5. Explore alternative approaches to assessment of this species to provide an OFL
6. Refine understanding of stock range and structure.

7) The materials considered in reaching its recommendations.

- Advisory Panel (AP) MSB Fishery Information Document
- AP MSB Fishery Performance Report
- MSB Staff ABC Recommendations
- Longfin Squid Assessment Update

These documents can be accessed via the SSC meeting website (http://www.mafmc.org/ssc-meetings/2017/may-17-18).

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.

Atlantic Mackerel

Jason Didden (MAFMC staff) and Kiersten Curti (NEFSC) gave an overview of the most recent data update for Atlantic Mackerel, followed by Jason Didden's overview of fishery regulations and fishery performance, and MAFMC staff's ABC recommendation. Estimated 2016 relative abundance was lower than the time series median and 2016 relative biomass was equivalent to the time series median. During the most recent time interval (2006-2015), mackerel size composition range was the smallest of the time series. Average length in the surveys exhibited substantial interannual variability, but generally increased over the beginning of the time series, reaching a peak in 1979, and then declined over the latter part of the time series. Since 2011, total catch has been less than the annual ABCs; however, the proportion of the ABC caught has increased as the ABC has decreased, with total catch representing approximately 52% and 71% of the ABC in 2015 and 2016, respectively.

As noted in the data update report from the Northeast Fisheries Science Center, the U.S. is currently beginning a benchmark assessment with the SARC review occurring on 28-30 November 2017. The scope of the assessment will be NAFO subareas 3-6 and the working group comprises both U.S. and Canadian scientists.

Based on the information presented, and in anticipation of a new benchmark assessment in the coming year, the SSC decided not to change its 2018 ABC recommendation for Atlantic Mackerel (**19,898 mt**).

Atlantic Surfclam

Dan Hennen (NEFSC) provided the SSC with a summary of the most recent benchmark assessment and a data update for Atlantic Surfclam, followed by Jessica Coakley's (MAFMC staff) presentation of the regulatory history, fishery performance, and MAFMC staff presentation. Mike Wilberg (SSC member) chaired the SARC panel that reviewed the benchmark assessment for Atlantic Surfclam and gave a brief summary of the panel's findings. The new reference points, approved by the SARC panel for use in management, are ratios rather than absolute values. This approach allows for conclusions about the status of the stock despite substantial uncertainty in the stock's actual biomass. Conclusions of the assessment are that overfishing did not occur in 2015, and the probability of the stock being overfished is very low (<0.01).

The SSC acknowledges the substantial and cooperative effort that went into the preparation of the benchmark assessments for Atlantic Surfclam and Ocean Quahog.

Responses by the SSC to the Terms of Reference (in *italics*) provided by the MAFMC are as follows:

For Atlantic Surfclam, the SSC will provide a written report that identifies the following for fishing years 2018-2020:

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.

> A reported OFL estimate was considered to be highly uncertain, and deemed in the assessment report to be unreliable. No absolute estimates of fishing mortality rate or current stock size were endorsed by the review panel or the assessment report. Therefore, the OFL could not be estimated.

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.

> Because an OFL cannot be specified reliably, the probability of overfishing associated with the OFL cannot be specified.

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC

specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

The recommended ABC is **29,363 mt**, based on a commercial quota of 26,218 mt and 12% incidental mortality. This has been sustained by the stock historically and shown to show no harm. This ABC is recommended for three years. Survey data, including survey indices and swept area estimates of biomass (when available), catch records, and spatial distribution of the fishery should be examined as interim metrics.

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

- Absolute estimates of spawning stock biomass (SSB), recruitment (R), and fishing mortality (F) are scale uncertain.
- Uncertainty from combining absolute SSB, F, and R estimates, and projected trends for the northern and southern areas into a "whole stock."
- Ecosystem analyses suggest surfclam habitat is changing – decreasing in Delmarva and increasing in NJ and Long Island. The net effects on total habitat area and carrying capacity are unknown.
- Model assumption of a 12% incidental mortality, which also may have changed.
- Dredge efficiency is a major factor for setting the scale of the model.
- Catchability was estimated differently for the old and new surveys.
- The assumed dome-shaped selectivity patterns for the survey were based on gear selectivity experiments and are not identical to the way selectivity is defined in the model.
- The distribution of size-at-age in the assessment has largest individuals at intermediate ages (probably because the CVs on size at age for the older ages are too small). This may cause a bias in estimates of F.
- There were conflicts between prior distributions of parameters and some other data sets for both models, but especially for the Southern Area. This is a common problem in integrated stock assessments, but may be indicative of structural problems that could be explored (e.g., un-modelled heterogeneity in growth, recruitment, or mortality)

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 additional ecosystem considerations were taken into account in selecting the ABC.

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

- Carefully consider any changes to the survey design (should maintain same vessel and gear).
- Dredge efficiency is a major factor for setting the scale of the model – more work may be needed.
- Re-examine whether the structural decisions in the assessment model are leading to conflicts in the data.
- Consider methods to estimate natural mortality (M) from the assessments by using data from shells and recently dead individuals.
- Continue to develop the institutional capacity and support for age-length integrated models.
- Examine spatial scales of variability in survey and commercial catch data as they may be useful in improving the design of the survey or in developing regions for assessment or management.
- Model-based estimators should be used to "fill gaps" in survey strata.
- Consider the new observer discard data.
- Consider whether a federal-state assessment would be more appropriate.
- Include Nantucket Shoals in the surveyed area for Atlantic Surfclam.
- Re-stratify the Northern Area to make the survey more efficient and effective.
- Use "gap filling" (using data from adjacent years or areas) to calculate survey indices.

7) The materials considered in reaching its recommendations.

- Surfclam Summary Report (CRD 16-13), November 2016
- Surfclam Assessment Report (CRD 17-05)
- Surfclam Assessment Update
- Surfclam SARC 61 Panel Summary Report
- Surfclam SARC 61 Bell Report
- Surfclam SARC 61 Cryer Report
- Surfclam SARC 61 Needle Report
- 2017 Surfclam AP Fishery Information Document
- Surfclam staff recommendations memo
- Surfclam and Ocean Quahog Fishery Performance Report

These documents can be accessed via the SSC meeting website (http://www.mafmc.org/ssc-meetings/2017/may-17-18).

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 Quahog

Dan Hennen (NEFSC) provided the SSC with a summary of the most recent benchmark assessment, followed by Jessica Coakley's (MAFMC staff) presentation of the regulatory history, fishery performance, and MAFMC staff presentation. Ed Houde (SSC member) chaired the SARC panel that reviewed the benchmark assessment for Ocean Quahog and gave a brief summary of the panel's findings. The new reference points, approved by the SARC panel for use in management, are ratios rather than absolute values. This approach allows for conclusions about the status of the surfclam stock despite substantial uncertainty in the actual biomass of the stock. Conclusions of the assessment are that overfishing did not occur in 2015, and the probability of the stock being overfished is very low (<0.01).

As already noted, but worth repeating, the SSC acknowledges the substantial and cooperative effort that went into the preparation of the benchmark assessments for Atlantic Surfclam and Ocean Quahog.

For Ocean Quahog, the SSC will provide a written report that identifies the following for fishing years 2018-2020:

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 reported OFL estimate, though associated with substantial uncertainty, was deemed credible, and could form the basis of developing management advice. The SSC deemed that Ocean Quahog should be considered a stock with an SSC-modified OFL probability distribution.

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 levels in catch associated with the accepted OFL (F = 0.019) for the relevant fishing years are:

Year	OFL
2018	**61,600 mt**
2019	**63,600 mt**
2020	**63,100 mt**

3) The level of catch (in weight) and the probability of overfishing associated with the acceptable biological catch (ABC) for the stock, the number of fishing years for which the ABC specification applies and, if possible, interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration.

The SSC considered the Ocean Quahog to be a species with an atypical life history, and applied an SSC modified OFL distribution with a CV=100% for a stock with an SSB biomass > SSB target. The calculated ABC values, with associated probabilities of overfishing are:

Year	ABC	P(overfishing)
2018	**44,695 mt**	0.35
2019	**46,146 mt**	0.35
2020	**45,783 mt**	0.35

The SSC determined Ocean Quahog to have an atypical life history because of the atypical ratio of age at maturity to maximum life expectancy, together with fundamental questions over what explains productivity in this stock.

The SSC will evaluate the following interim metrics in considering whether to abandon or modify the proposed three-year ABC schedule:

1) The value of the relative abundance metric; and
2) The spatial and temporal distribution of catch and effort.

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

- Absolute estimates of spawning stock biomass (SSB), recruitment (R), and fishing mortality (F) are scale uncertain. Almost all the information on biomass scale was from the priors on survey catchability and at least one model-based depletion estimate of catchability (q) was unlikely given the prior applied in the model.
- Recruitment is difficult to estimate in the Ocean Quahog assessment because age composition data is not fit in the model and growth is highly variable.
- The assessment considers the stock at large spatial scales and there is a need to improve the understanding of demographic processes (including recruitment and settlement) at smaller spatial scales that are not now captured in the model.

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 additional ecosystem considerations were taken into account in selecting the ABC. However, there was consideration by the assessment team and review panel of the potential effects of environmental effects on Ocean Quahog which, to date, are difficult to detect.

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

High Priority

- Priority for outstanding research recommendations should be accorded to biological parameters and further understanding of survey dredge efficiency in relation to Ocean Quahog density and bottom type.
    - Survey performance, age and growth, spatial processes, and recruitment processes are areas that need attention.
    - Estimated relationships between size and number of eggs produced.
    - Additional age and growth studies to determine if extreme longevity (e.g., 400 years) is typical or unusual and to refine estimates of M (see page 47 of the assessment report).
    - Additional age and growth studies over proper geographic scales to investigate spatial and temporal recruitment patterns.
    - Better information about maturity at length.
    - The validated age data on five individuals show that variable growth was likely. Considerably more exploration of growth and growth variability is warranted (i.e., N>>5). Variable growth also could indicate differences in productivity between regions. This possibility needs to be explored in future assessments, as the ageing method develops.

Lower priority

- Better and more diagnostics for model performance, including implementation of Markov Chain - Monte Carlo (MCMC) methods for Ocean Quahog to be included in future reports.
- Development of assessment methods for stocks such as Ocean Quahog that are believed to experience low F.
- Development of a method to improve imputation of survey data. Survey data possibly can be modelled purely as an abundance index, standardized for the key factors of region, depth, speed, tow duration, dredge characteristics, etc., without the size-frequency data or a composite metric of area swept based on speed and duration.
- Development of a length- and possibly age-structured assessment.

7) The materials considered in reaching its recommendations.

- Quahog Summary Report (CRD 16-13), March 2017
- Quahog Assessment Report
- Quahog SARC 63 Panel Report
- Quahog SARC 63 Hart Report
- Quahog SARC 63 Bell Report
- Quahog SARC 63 Cryer Report
- 2017 Ocean Quahog AP Fishery Information Document
- Quahog Staff Recommendations Memo
- Hennen (2105). NAJFM Quahog MSE

- Pace et al. (2017). JSR Quahog Age Frequency
- Surfclam and Ocean Quahog Fishery Performance Report
- Quahog Summary of Work from SCeMFiS

These documents can be accessed via the SSC meeting website (http://www.mafmc.org/ssc-meetings/2017/may-17-18).

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.

Other Topics

In addition to setting new ABCs for five stocks and reaffirming the ABC for Atlantic mackerel, the SSC also received updates on the status of the work being undertaken by OFL CV Working Group and the NRCC Assessment Working Group, and the latest plans for the upcoming National SSC Workshop. The OFL CV Working Group plans to conduct 1-2 webinars with the intent of having a report ready for SSC review this coming fall; the Working Group chair (Paul Rago) will work with MAFMC staff to develop terms of reference and a list of expected outcomes in preparation for the webinars.

The NRCC Assessment Working Group was established to developed a list of criteria that could be used to help the NRCC schedule upcoming benchmark assessments. Recently, the group was expanded to include representatives from the SSCs. The intent is to have a report to the NRCC at its upcoming meeting in June.

The steering committee for the upcoming National SSC Workshop, to be held next January in San Diego, has developed an agenda and list of potential guest speakers that was delivered to the Council Coordinating Committee (CCC) at its meeting that was being held concurrently with the SSC's meeting. The overall theme of the workshop is "Management Strategy Evaluations (MSEs) as Tools to Provide Management Advice in the Face of Uncertainty and Environmental Change" with the following subthemes: (1) use of MSEs in evaluating and modifying harvest control rules; (2) estimating and accommodating uncertainty; and (3) harvest control rules in a changing environment. The proposed agenda will be distributed to the SSC when it is approved by the CCC.

At the end of the SSC's meeting a small group of SSC members and MAFMC staff had a productive dialogue with NEFSC assessment staff about the proposed re-design of the NEFSC's clam survey.

c: SSC Members, Warren Elliott, Chris Moore, Rich Seagraves, Jason Didden, Jessica Coakley, Chuck Adams, Lisa Hendrickson, Kiersten Curti, Dan Hennen, Larry Jacobson, Jan Saunders

Attachment 1

Mid-Atlantic Fishery Management Council
Scientific and Statistical Committee Meeting
17-18 May 2017

Final Agenda (Times Approximate)

Wednesday, May 17, 2017

9:00 Butterfish ABC Specifications (Adams/Didden)

10:30 *Illex* squid ABC Specifications (Hendrickson/Didden)

12:30 Lunch

1:30 Longfin Squid ABC Specifications (Hendrickson/Didden)

3:00 Atlantic Mackerel data and fishery update (Didden)

4:30 Potential other topic discussion – OFL uncertainty group, National SSC meeting discussion, NRCC working group discussion

5:30 Adjourn

Thursday, May 18, 2017

8:30 Atlantic Surfclam 61 SAW/SARC Assessment (Hennen)

9:30 Atlantic Surfclam ABC Specifications (Coakley)

12:30 Lunch

1:00 Ocean Quahog 63 SAW/SARC Assessment (Hennen)

2:00 Ocean Quahog ABC Specifications (Coakley)

3:30 NEFSC clam dredge survey redesign (Jacobson)

4:30 Adjourn

Attachment 2

MAFMC Scientific and Statistical Committee
17-18 May 2017 Meeting Attendance

Name	Affiliation
SSC Members in Attendance:	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chair)	University of Maryland - CBL
Mark Holliday	NMFS (Retired)
Wendy Gabriel	NMFS Northeast Fisheries Science Center
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Ed Houde	University of Maryland – CBL
Brian Rothschild	UMass Dartmouth (Retired)
Rob Latour	VIMS
Dave Secor (18th only)	University of Maryland - CBL
Paul Rago	NMFS (retired)
Mike Frisk	Stony Brook University
Michael Wilberg	University of Maryland - CBL
Others in attendance:	
Rich Seagraves	MAFMC staff
Brandon Muffley	MAFMC staff
Jessica Coakley (18th only)	MAFMC staff
Jason Didden (17th only)	MAFMC staff
Chuck Adams (17th only)	NMFS Northeast Fisheries Science Center
Lisa Hendrickson (17th only)	NMFS Northeast Fisheries Science Center
Dan Hennen (18th only)	NMFS Northeast Fisheries Science Center
Larry Jacobson (18th only)	NMFS Northeast Fisheries Science Center
Kiersten Curti (17th only, by phone)	NMFS Northeast Fisheries Science Center
Peter Himchak	Omega Protein (17th); LaMonica Fine Foods (18th)
Doug Christel (17th only, by phone)	NMFS GARFO
Doug Potts (18th only, by phone)	NMFS GARFO
Jeff Kaelin (17th only)	Lunds Fisheries
Greg DiDomenico (17th only)	Garden State Seafood Association
Dave Wallace (18th only)	Wallace and Associates
Tom Alspach (18th only)	Sea Watch International
Tom Hoff (18th only)	Wallace and Associates
Howard King (18th only)	MAFMC member