Mid-Atlantic Fishery Management Council
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Michael P. Luisi, Chairman | G. Warren Elliott, Vice Chairman
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M E M O R A N D U M

Date: 17 September 2018

To: Michael P. Luisi, Chairman, MAFMC

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

Subject: Report of the September 2018 SSC Meeting

The SSC met in Baltimore on the 11th of September 2018. The main objectives of the meeting were to develop new ABC specifications for Spiny Dogfish and, at the request of the Council, revisit the SSC's ABC recommendations for *Illex* squid for the 2019 and 2020 fishing years (Attachment 1). The agenda also included a discussion of progress being made by the NRCC in developing an assessment scheduling protocol for the GARFO region; however, there was not enough time to address this topic due to the extended amount of discussion (and debate) on Spiny Dogfish and *Illex*.

A total of 14 SSC members were in attendance (Attachment 2), which constituted a quorum. Also attending, in addition to yourself, were MAFMC staff and Council members, NEFSC staff (via webinar), ASMFC staff, and representatives from the fishing industry. Documents referenced in the report can be accessed via the SSC's meeting website (http://www.mafmc.org/council-events/2018/september-2018-ssc-meeting).

Spiny Dogfish

Jason Didden (MAFMC staff) briefed the SSC on the updated assessment prepared by the Northeast Fisheries Science Center (NEFSC) and the latest fishery performance report. Since SSC member Paul Rago is listed as a co-author of the updated assessment, he recused himself from any discussion related to the SSC's OFL and ABC recommendations other than answering questions and helping to identify sources of scientific uncertainty and research needs. Yan Jiao, as the SSC lead for Spiny Dogfish, led the SSC's discussion and development of OFL and ABC recommendations.

The SSC spent a considerable amount of time debating two issues raised in the updated assessment: (1) whether the Kalman filter method should still be applied to the time series of stock biomass estimates or return to the pre-2014 approved method of using a three-year running average; and (2) whether or not to include the low 2017 biomass estimate in the time series.

These issues were eventually resolved by the SSC as noted in the following responses to the Council's terms of reference (in *italics*).

For Spiny Dogfish, the SSC will provide a written report that identifies the following for the 2019 - 2021 fishing years:

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 level of uncertainty of OFL in the assessment update requires an SSC-specified coefficient of variation (CV).

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

   Development of the OFL for Spiny Dogfish is based on an index-based estimate of biomass multiplied by an estimate of F_{msy} from a stochastic model. Thus, the indices of biomass and how they are calculated are important to the OFL values calculated.

   Data from the NEFSC spring survey in 2014 are not used because of missing survey coverage. This necessitated an approach in 2015 to estimate the biomass index value for 2014.

   In 2015, the SSC was asked to provide a three-year ABC specification. The SSC accepted application of the Kalman filter to the dogfish time series to overcome a data gap in the time series for 2014. The Kalman filter was chosen as the approach to filling the gap because it had improved performance over other approaches (the Council *ad hoc* approach and a three-year average) since it uses observation error from the survey data, and that it does not allow the estimates to increase rapidly, although they may decline rapidly.

   The SSC discussed extensively the justification for returning to the approved SAW/SARC 43 method (pre-2014) or maintaining the Kalman filter. The SSC determined that the extent to which the observation error uncertainty from the NEFSC spring survey provides a reliable indicator of biomass or an index of availability of dogfish is unknown. Thus, the SSC determined that, because the initial reason for adopting the Kalman filter approach is no longer needed and there was insufficient time to fully evaluate alternative approaches, it was appropriate to return to the three-year average approach.

   Data from the NEFSC spring survey in 2017 indicates a low biomass of large females in that year. After extensive discussion, the SSC determined that there is no reason not to use the 2017 survey value in calculations. The SSC heard that concerns remain over the reliability of this index value from stakeholders.

   Accordingly, the F_{msy} proxy for Spiny Dogfish is 0.2439, which is calculated from a projection model for which the finite rate of population increase is equal to 1.0. The updated NEFSC assessment recommends an OFL of **21,549 mt (47.5 million pounds)** for 2019,

which is also recommended by Council staff. Future OFLs assume that ABC-level catches are achieved.

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 made the determination of the CV of the OFL by considering the nine factors identified in the recently proposed OFL CV framework. The SSCs evaluation of each criterion was as follows:

1. Data quality (moderate uncertainty): For Spiny Dogfish the NEFSC spring survey is a low accuracy synoptic survey; however, catch and discard data are of high quality and have been thoroughly evaluated.
2. Model identification process (moderate – high uncertainty): The assessment uses a single model within which many parameter sensitivities have been explored. The application of the three-year smoothing and the Kalman filter produced divergent results.
3. Retrospective adjustment (high uncertainty): No retrospective analysis was applied.
4. Comparison with empirical scale (NA): The OFL is based on an empirical estimate of population biomass and a stochastic estimate of F_{msy}; a full model-based estimate is lacking.
5. Ecosystem factors accounted (high uncertainty): No formal accounting was made in the assessment for environmental factors; however, there are possible environmental effects on availability of dogfish to the survey that were discussed extensively, but cannot be included in the current assessment approach.
6. Trend in recruitment (moderate uncertainty): The consequence of the female size structure was included in the stochastic resampling of empirical data in the projection model, and the consequences of this were included in the model output.
7. Prediction error (high uncertainty): No estimate of prediction error was available.
8. Assessment accuracy under different fishing pressures (moderate uncertainty): There has been historical variation in fishing pressure that provides moderate contrast in survey indices.
9. MSE Simulations (NA): No MSE simulations have been performed for Spiny Dogfish.

Collectively, the attributes of the Spiny Dogfish assessment update suggest a moderate degree of uncertainty in the results. The SSC notes ongoing concern over the timing and completeness of the survey and potential issues for variable and possibly temporally correlated patterns in availability of dogfish to the survey. This has important consequences for our understanding of stock biomass and therefore management reference points.

Based on these criteria, the SSC calculated the ABCs based on a lognormally-distributed OFL with a CV of 100%. The SSC applied the Council's risk policy for a typical life history

and an estimated B_{201x}/B_{msy} ratio < 1 for all three years. Using these parameters, the P* values and the associated ABCs are as follows:

Year	P*	ABC (mt)
2019	0.269	12,914
2020	0.274	14,126
2021	0.296	16,043

The SSC will examine Spiny Dogfish discard rates, survey abundance trends (size composition, sex ratio, and pup size), average size and sex in commercial landings, agreement between observed and predicted catch and survey forecasts, changes in Canadian landings, and the spatial distributions of catch and survey abundances each year of the specification to determine if the multiyear ABC recommendations should be maintained.

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

The SSC concurs with the list of sources of scientific uncertainty provided in the 2018 Spiny Dogfish Assessment Update, which are:

- Large changes in interannual abundance are most likely driven by poorly understood changes in availability rather than true changes in abundance or the short-term effects of fishing activity. Even small changes in resource availability in the small offshore strata could have large implications for abundance estimates. Further studies on the effects of environmental factors are recommended.
- The long-term dynamics of Spiny Dogfish are an important guide for structuring harvest scenarios given their life history; current size structure has important implications for informing harvest strategies.
- The size- and sex-specific selectivity of the fishery landings and discards may change with market conditions and availability. Changes in selectivity have important implications for the definition of exploitable biomass, the estimation of fishing mortality rates, and biological reference points for fishing mortality.
- Uncertainty in the estimated survival of discarded dogfish is not currently incorporated in the assessment.
- Uncertainty in the biomass and pup abundance estimates may alter the biomass reference points derived from the Ricker stock recruitment curve.

In addition, the SSC notes:

- The disagreement for recent year estimates among different analysis methods is unresolved. This is a substantial source of uncertainty as it affects the status of the stock with respect to management reference points.
- The current assessment method does not include other surveys (e.g., NEAMAP) in the region.

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

No specific, additional ecosystem information was provided to the SSC for consideration in forming its ABC recommendations. However, there are possible environmental effects on availability of dogfish to the survey that were discussed extensively, but cannot be included in the current assessment approach.

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

1. Revise the assessment model to investigate the effects of stock structure, distribution, sex ratio, and size of pups on birth rate and first year survival of pups.
2. Explore model-based methods to derive survey indices for Spiny Dogfish.
3. Consider development of a state-space assessment model.
4. Continue large scale (international) tagging programs, including conventional external tags, data storage tags, and satellite pop-up tags, to help clarify movement patterns and migration rates.
5. Investigate the distribution of Spiny Dogfish beyond the depth range of current NEFSC trawl surveys, possibly by using experimental research or supplemental surveys.
6. Continue aging studies for Spiny Dogfish age structures (e.g., fins, spines) obtained from all sampling programs (include additional age validation and age structure exchanges), and conduct an aging workshop for Spiny Dogfish, encouraging participation by NEFSC, Canada DFO, other interested state agencies, academia, and other international investigators with an interest in dogfish aging (US and Canada Pacific Coast, ICES).
7. Evaluate ecosystem effects on Spiny Dogfish acting through changes in dogfish vital rates.

7) *The materials considered in reaching its recommendations.*

- Staff Memo: 2019-2021 Spiny Dogfish ABCs
- Spiny Dogfish AP Fishery Performance Report
- AP Fishery Information Document
- 2018 Spiny Dogfish Stock Assessment Update
- Report of the 2015 SSC meeting
- NEAMAP survey indices

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.

Illex Squid

In May 2017, the SSC specified a three-year (2018 – 2020) ABC for *Illex* of 24,000 MT. This specification was adopted by the Council at its June 2017 meeting in Norfolk, VA. In May 2018, the SSC evaluated the most recent catch data and the NEFSC spring survey data and concluded there was no reason to change its three-year ABC adopted in 2017. At its 13-16 August 2018 meeting in Virginia Beach, VA, the Council unanimously approved the following motion:

> *Based on new catch and survey information, move to remand the Illex ABC back to the SSC to consider an increase in ABC for 2019 and 2020.*

The SSC considered the Council's remand during its 11 September 2018 meeting. In considering the Council's remand, the SSC carefully evaluated the remand against the Council's approved standard operating procedures (last revised June 8, 2017 – weblink: https://static1.squarespace.com/static/511cdc7fe4b00307a2628ac6/t/5a4d12fd9140b791bb3fc30e/1515000575610/2017-06-08_MAFMC-SOPP-final.pdf). The Council's policies afford it four criteria under which to remand an ABC decision back to SSC. These criteria are:

1) Failure of the Committee to follow the terms of reference provided to it by the Council;
2) An error, in fact or omission, in the materials provided to the Committee;
3) An error in fact in the calculations, if any, undertaken by the Committee in developing its ABC recommendation; and
4) Failure of the Committee to follow its standard operating procedures.

There was no evidence the SSC did not follow its terms or reference, there was no evidence of an error in fact or in omission in the material presented to the Committee, there was no evidence of a calculation error, and the SSC did follow its standard operating procedures. There is no basis for remand based on new information. Based on this evaluation the SSC respectfully disagrees with the basis of the Council's remand. The SSC had previously rejected a remand for Black Sea Bass at a special meeting in January 2013 for similar reasons.

It is important that a process to overturn an ABC that has been specified in error, such as the Council's policy, should exist. The SSC notes that the remand policy is narrowly constrained deliberately to ensure that, once established, ABCs remain a reliable foundation for management to provide predictability for the industry. There is concern that if such a deliberate policy is not maintained there will be strong pressure to revise ABCs upward based on preliminary and piecemeal information that have not been fully integrated with existing information. This tendency may be particularly true for more contentious species under Council management. The SSC believes that a similar desire to adjust ABCs downward in response to preliminary information is unlikely. This has the potential to create a ratchet effect that could see ABCs driven higher than a full, integrated, and rigorous analysis would indicate.

Despite rejecting the basis of the Council's remand, the SSC did discuss the basis of its ABC specification based on Council Chair Mike Luisi's explanation of the Council's intent in drafting the motion. The SSC considered whether there were any changes in our knowledge of the biology of *Illex* squid, the information on the recent catches, and information presented to it on

catches of *Illex* squid in the NEAMAP survey. The SSC took a similar approach in considering Black Sea Bass in 2013.

Illex squid occur throughout the western Atlantic from Florida to Newfoundland, Canada. *Illex* squid is a seasonal species that moves onto the shelf from deeper waters in the late spring of each year. Evidence from detailed analysis of length frequencies and from statolith-based ageing indicate that *Illex* pass through several generations during the summer – autumn period before leaving the shelf in late autumn.[1] Fisheries for *Illex* squid occur from Cape Hatteras, NC, to Newfoundland. A commercial offshore trawl fishery in the mid-Atlantic Bight has existed for *Illex* squid. Information from commercial fishers presented to the SSC at the 11 September 2018 meeting suggest that most of this harvest occurs a tightly restricted range of depths along a narrow band from Cape Hatteras to the Hudson Canyon (Figure 1). The last stock assessment for this species was in 2006.[2] The SSC notes that this12-year interval since the last assessment is the longest for any species under MAFMC management, and given that *Illex* pass through many generations each year, may be equivalent biologically to a 30+ year gap for other species under MAFMC management with longer life spans.

The SSC considered whether the new information presented to it – the rapid attainment of the commercial quota in 2018 based on the quota monitoring system (Figure 2) and a time series of *Illex* catches in the NEAMAP survey (Figure 3), represent new information of sufficient weight for the SSC to overturn its ABC specification. The SSC did not feel these pieces of information would have materially changed its existing specification. Based on discussions among members at the meeting, the SSC stands by its statement establishing the current ABC in our May 2015 SSC report that "based on the observation that landings of 24,000 - 26,000 mt do not appear to have caused harm to the *Illex* stock." This statement formed the basis of our three-year ABC specification in May 2017. Our standing recommendation of 24,000 mt is based on the judgement of the SSC that *Illex* has been lightly exploited historically because of the relatively small portion of its range within which the commercial fishery operates. Given this categorization of a relatively light fishing history, setting an ABC near the maximum historical catch is reasonable (Wiedenmann et al. 2013[3]). However, the SSC believes that raising the ABC to 26,000 mt in 2019, and perhaps 2020 as well, will likely <u>not</u> result in a greater than a 40% chance of causing overfishing. Currently, estimates are not available to evaluate the degree to which a 26,000 mt ABC achieves the Council's risk policy.

Several stakeholders in the fishery presented information to the SSC and argued passionately for an increase in quota, based on their observations of the distribution and abundance of *Illex* squid. Stakeholders also expressed their desire to see in-season management of *Illex* squid. In the face of the lack of a recent stock assessment or a method to estimate an overfishing limit (OFL) for this stock, there was a strong sense among both SSC members and stakeholders that a

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[1] Hendrickson, L. C. 2004. Population biology of northern shortfin squid (*Illex illecebrosus*) in the Northwest Atlantic Ocean and initial documentation of a spawning area. ICES Journal of Marine Science. 61:252-266.

[2] Northeast Fisheries Science Center. 2006. 42nd Northeast Regional Stock Assessment Workshop (42nd SAW) stock assessment report, part A: silver hake, Atlantic mackerel, and northern shortfin squid. U.S. Department of Commerce, Northeast Fisheries Science Center Reference Document 06-09a; 284 p.

[3] Wiedenmann, J., M.J. Wilberg, and T.J. Miller. An Evaluation of Harvest Control Rules for Data-Poor Fisheries. North American Journal of Fisheries Management 33:845–860.

collaborative approach to collecting and analyzing existing and new data may provide a way for the SSC to work with industry partners to find a way forward. Such an approach might include establishing a working group of SSC members (and potentially non-SSC scientists) to address questions such as:

- If an OFL can be estimated given current information;
- What alternative squid management might look like;
- Identifying a feasible approach for in-season management;
- Data that are needed to support a stock assessment that estimates an OFL or in-season management;
- Who does the work;
- Costs, requirements;
- What has been done in the past here, and in other regions; and
- Signals that the SSC should be looking for to adjust ABC.

The SSC encourages the Council to find mechanisms to support such analyses. Potential programs include Council support, stock assessment improvement funds, the NOAA Saltonstall-Kennedy grant program, and exploration of a cooperative industry survey program based on its commercial operations.

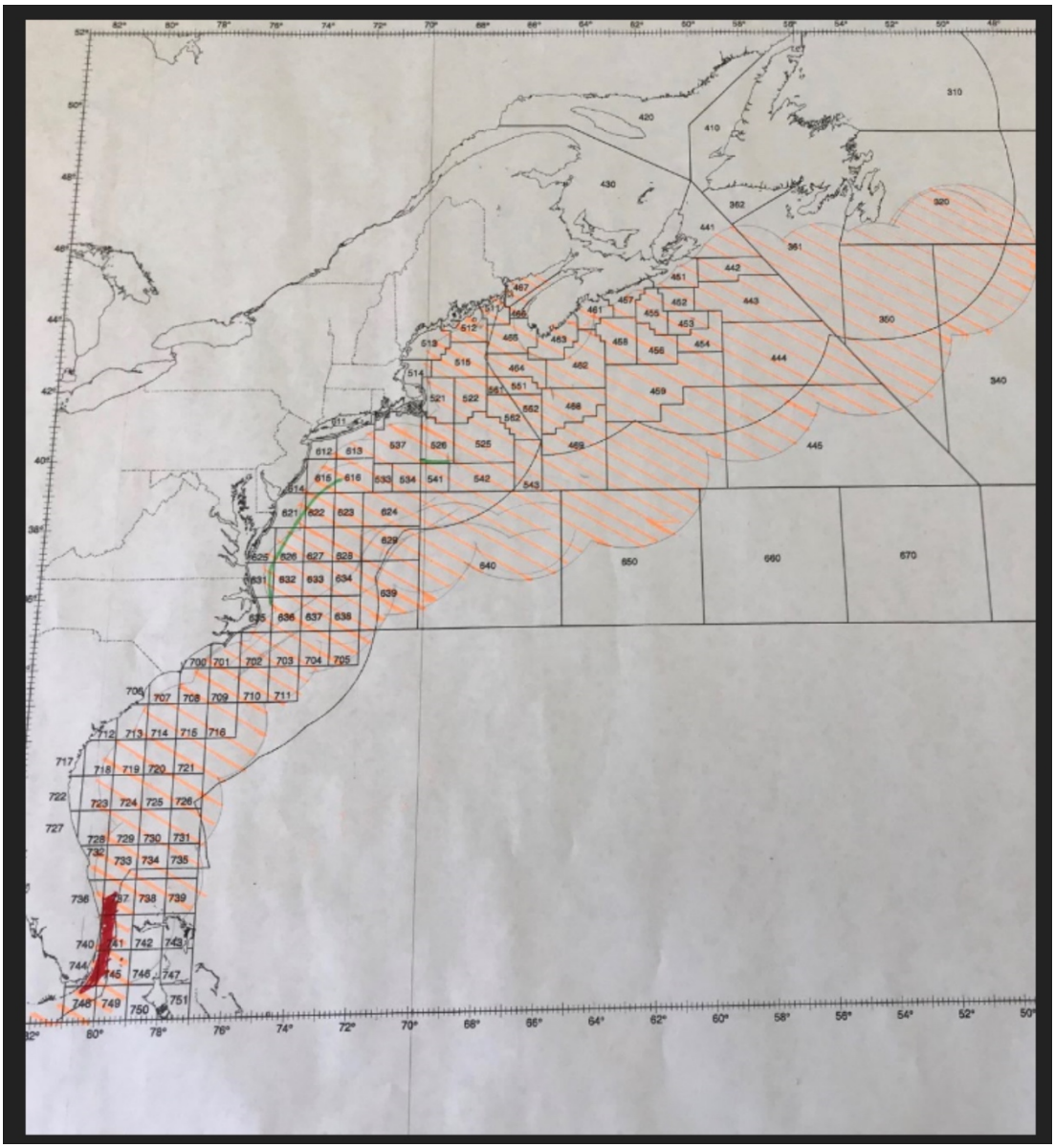

Figure 1. North-American Atlantic coast from Newfoundland, Canada, to Florida, USA, showing the general area of *Illex* squid occurrence (shaded orange) and the focus of the commercial harvest in the mid-Atlantic (green line stretching from Cape Hatteras, NC, to the Hudson Canyon). Also shown in the figure is the focus of the *Illex* fishery in Florida (red). Information provided by Captain Kyle Goodwin.

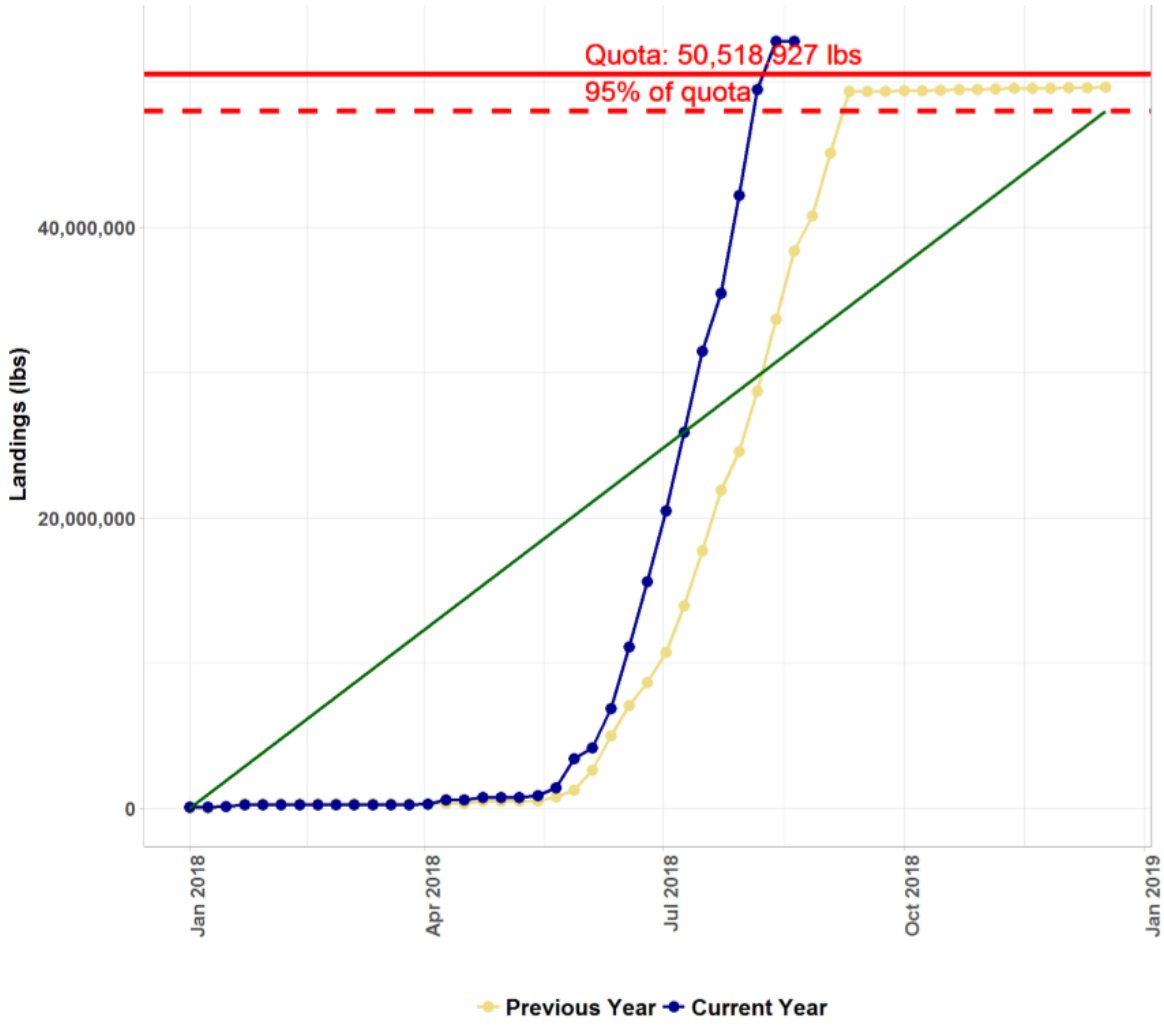

Figure 2. Information on weekly harvest reports for *Illex* squid from 2018 (blue) and 2017 (yellow) from the quota monitoring system. Figure provided by Council staff.

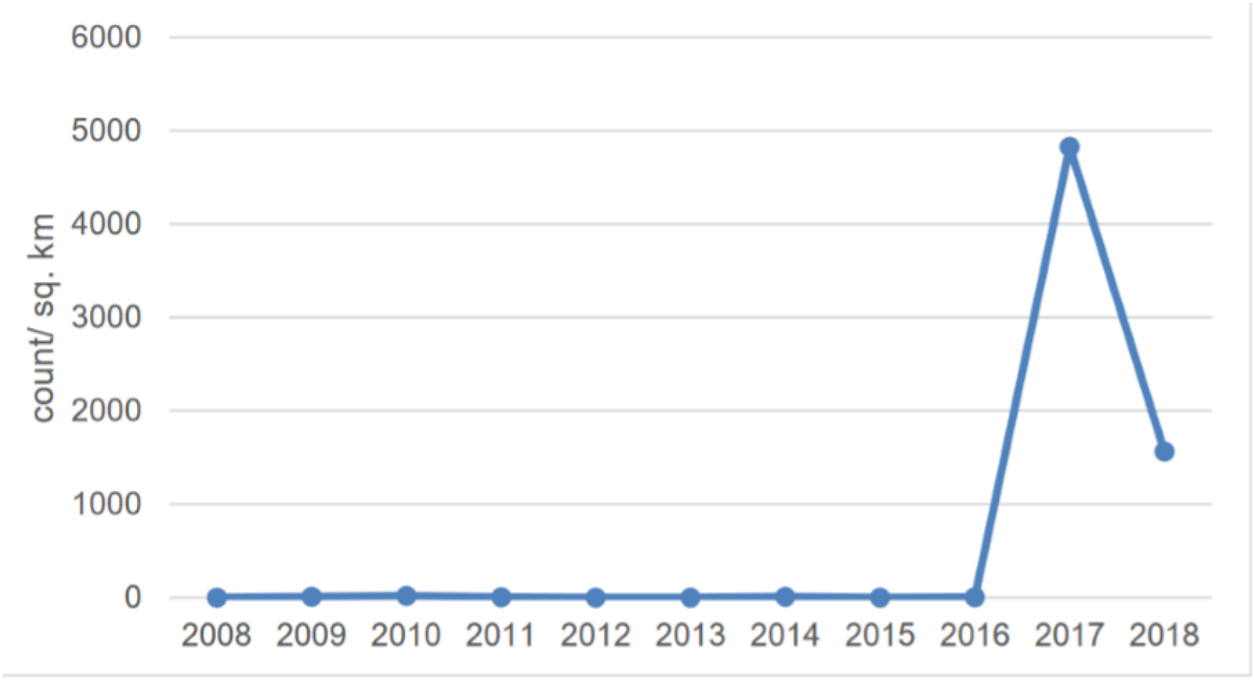

Figure 3. Estimates of swept area abundance of *Illex* squid in the spring NEAMAP survey. Figure from Council staff. NEAMAP staff indicate that the figure includes all survey regions in which *Illex* have ever been caught on a NEAMAP spring cruise (Rhode Island Sound down to the mouth of the Delaware Bay), so no positive tows for *Illex* were thrown out. The index is a CPUE, where catch is in count, and effort is area swept (in square km) for each tow, so the CPUE is count/sq km. The CVs are very high (all greater than 250%). The 2008-2016 count numbers are all less than 17/sq km.

NRCC Assessment Schedule and Review Process Update

Due to lack of time, this topic was postponed to a future SSC meeting or webinar.

c: SSC Members, Warren Elliott, Chris Moore, Brandon Muffley, Jason Didden, Lisa Hendrickson, Kirby Rootes-Murdy, Jan Saunders

Attachment 1

Mid-Atlantic Fishery Management Council
Scientific and Statistical Committee Meeting

September 11, 2018

Royal Sonesta Harbor Court Baltimore

550 Light Street Baltimore, MD, 21202

AGENDA

Tuesday, September 11, 2018

9:00 Spiny Dogfish ABC specifications for the 2019-2021 fishing years (J. Didden)

12:00 Lunch

1:00 *Illex* squid ABC recommendation for 2019 and 2020 – remand from August 2018 Council meeting (J. Didden)

2:30 NRCC assessment schedule and review process update (J. Boreman/B. Muffley) [POSTPONED]

3:30 Other business, if needed

4:00 Adjourn

Attachment 2

MAFMC Scientific and Statistical Committee
11 September 2018
Baltimore, Maryland

Meeting Attendance

Name	Affiliation
SSC Members in Attendance:	
John Boreman (SSC Chairman)	NC State University
Tom Miller (SSC Vice-Chairman)	University of Maryland – CBL
Sarah Gaichas	NMFS Northeast Fisheries Science Center
Ed Houde	University of Maryland – CBL (retired)
Mike Wilberg	University of Maryland - CBL
Mike Frisk	Stony Brook University
Dave Secor	University of Maryland – CBL
Paul Rago	NMFS Fisheries (retired)
Yan Jiao	Virginia Tech
Doug Lipton	NMFS
Wendy Gabriel	NMFS Northeast Fisheries Science Center
Lee Anderson	University of Delaware (emeritus)
Mark Holliday	NMFS (retired)
Brian Rothschild	UMass Dartmouth (emeritus)
Others in attendance:	
Jason Didden	MAFMC staff
Brandon Muffley	MAFMC staff
Mike Luisi	MAFMC Chair
Warren Elliott	MAFMC Vice-Chair
Lisa Hendrickson (via webinar)	NMFS Northeast Fisheries Science Center
Kirby Rootes-Murdy	ASMFC
Jeff Kaelin	Lund's Fisheries
Jim Ruhle	Commercial fisherman
Meghan Lapp	SeaFreeze, Ltd.
Tony DiLernia	MAFMC member
Kyle Goodwin	Commercial fisherman
Greg DiDomenico	Garden State Seafood Association