Mid-Atlantic Fishery Management Council
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P. Weston Townsend, Chairman | Michael P. Luisi, Vice Chairman
Christopher M. Moore, Ph.D., Executive Director

MEMORANDUM

Date: November 17, 2023

To: Wes Townsend , Chairman, MAFMC

From: Paul J. Rago, Ph.D., Chair, MAFMC Scientific and Statistical Committee (SSC)

Subject: Report of the October 30, 2023 SSC Meeting

Executive Summary

The SSC met via webinar on October 30, 2023 to review Atlantic Mackerel Acceptable Biological Catch (ABC) recommendations for 2024-2025, and provide Spiny Dogfish ABC recommendations for 2024-2026.

Atlantic Mackerel ABC Recommendations for 2024-2025

The SSC considered four different scenarios to estimate ABCs for 2024 and 2025. The scenario selected adjusts the initial stock size by setting the 2022 recruitment to the median of the time series. This adjustment is considered appropriate in view of the overestimation of rebuilding in recent years and the low precision of the estimate of year class strength in the terminal year of the assessment.

Based on this scenario, the SSC recommended the following ABCs:

Projection	2024	2025
Year-specific (mt)	2,726	3,900
Averaged (mt)	3,200	3,200

These year-specific ABCs are based on an $F_{rebuild}$ of 0.07 with an expected probability of rebuilding of 60.5%. An average quota of 3,200 mt per year also is projected to result in a 60.5% chance of rebuilding if F=0.07 is applied to the population in the 2026-2032 rebuild period.

Spiny Dogfish ABC Recommendations for 2024-2026

After thorough consideration of the attributes of the data and assessment model, the SSC recommended an OFL CV of 100%.

The updated 2023 Spiny Dogfish Management Track Assessment estimated an OFL of 7,818 mt for the 2024 fishing year, 7,970 mt for 2025, and 8,112 mt for 2026.

The ABCs were calculated based on a lognormally-distributed OFL with the recommended CV of 100%. The SSC applied the Council's risk policy and an estimated $SSB_{2024-2026}/SSB_{msy}$ ratio > 1 for all three years. Using these parameters, the P* values and the associated ABCs are as follows:

Year	P*	ABC (mt)
2024	0.456	7,135
2025	0.459	7,312
2026	0.460	7,473

Summary Report

Background

The SSC met via webinar on October 30, 2023. The agenda for the meeting and the participants are provided in Attachments 1 and 2, respectively. Topics discussed included: Atlantic Mackerel ABCs for 2024-25 and Spiny Dogfish ABCs for 2024-2026.

Meetings of the SSC reflect the combined planning efforts of management and scientific staff. Also acknowledged are Kiersten Curti and Dvora Hart from the NEFSC, and Jason Didden from the Council for their presentations and working papers. Brandon Muffley is thanked for his exemplary efforts to coordinate the meeting and ensure that all supporting documents were available. We benefited from timely and insightful comments by members of the public. SSC members are thanked for their engagement and insightful comments. Mike Wilberg led the discussion of TOR for Atlantic Mackerel; Yan Jiao led the discussions for Spiny Dogfish. Meeting rapporteurs included Tom Miller, Geret DePiper, and Sarah Gaichas. Finally, we thank Sarah Gaichas and Brandon Muffley for sharing their meeting notes.

All documents referenced in this report can be accessed via the SSC's meeting website https://www.mafmc.org/ssc-meetings/2023/oct 30. The OFL CV framework table that provides the general evaluation metrics associated with the nine decision criteria for each OFL CV bin is provided as Attachment 3. Attachment 4 is a comprehensive guide to the acronyms in this and earlier reports.

Atlantic Mackerel ABC Recommendations for 2024-2025

The SSC previously reviewed a Level 1 Management Track Assessment (MTA) for Atlantic Mackerel at its July 2023 meeting. Level 1 MTAs are not reviewed externally prior to delivery to the SSC. At that time, the updated information revealed that overfishing was not occurring. Since this represented a change in stock status, current Northeast Regional Coordinating Council (NRCC) guidelines for MTA require that the assessment be reviewed by a peer-review panel (i.e., a Level 2 MTA). Such a review had not occurred by the time of the SSC meeting in July. Nonetheless, the SSC developed preliminary recommendations at its July meeting that were delivered to the Council in August, pending confirmation of abundance estimates and stock status at a MTA peer review. In September 2023, the SSC reviewed and approved a revised set of seven alternative projection scenarios to address several concerns about overly optimistic projections and incorporate Council feedback on their interest in constant catch recommendations. Finally, at this meeting, the results of the Level 2 MTA peer review that was conducted 18-20 September, were delivered to the SSC along with the MTA Review Panel recommendations. Previous findings of the Level 1 MTA were confirmed. Following presentations by Kiersten Curti, NEFSC, and Jason Didden, MAFMC, the SSC discussed the projection scenarios. Discussions focused on the rationale underlying the alternatives.

Before beginning a discussion of rebuilding scenarios, the SSC addressed an SSC member's concern about the causes for the depleted biomass of the stock. Atlantic Mackerel's currently overfished or depleted status is generally attributed to excessive fishing mortality (F) over the assessment period. While most acknowledge excessive harvesting in the 1990s, the high estimates of mortality since then may also be influenced by an increase in natural mortality (M). The SSC discussed an alternative hypothesis proposed by David Secor in which recent decreases in abundance are driven by predation and that current commercial fleet capacity may have been insufficient to cause historic peaks in F from 2008-2011.

The relative balance between fishing and natural mortality is poorly known and has been the subject of multiple investigations including collaborative studies between the US and Canada and an ICES Working Group. Recent attempts to incorporate time-varying natural mortality into stock assessments have not been successful in either the US or Canada. The SSC acknowledged that if undetected increases in M have occurred, then reductions in catches will be less effective for rebuilding than predicted. Changes in M also change biological reference points so the implications for rebuilding are neither straightforward or linear. However, several factors complicate our understanding of interpretations of stock history. First, there have been changes in the estimates of harvests by Canadian fleets. Moreover, there also seem to be shifts in the relative productivity of the two spatial components in the stock. The SSC accepted the MTA Review Panel conclusion of an unexplained process error affecting the performance of the model, one explanation for which could be changing natural mortality. Further, the SSC acknowledges the high likelihood that stock rebuilding will be slower than expected and advocates for a more nuanced characterization of stock status, and applauds ongoing efforts to refine such estimates. But, the SSC fell short of altering the staff conclusion that "the current situation is the result of about 50 years of overfishing." It was also noted that the veracity of this statement does not have direct implications for the selection of alternative harvest scenarios for rebuilding.

Four distinct rebuilding scenarios were considered for Atlantic Mackerel. All of them achieved a probability of rebuilding of 61% or greater, but they differed with respect to how recent estimates of recruitment were treated and whether or not an adjustment for the stock assessment retrospective pattern was applied. The first scenario used the final estimates of stock size-at-age from the MTA, and applied no adjustments. Scenarios 2 to 4 modified the terminal year estimates in various ways. To address the Council's request for constant catch levels in 2024 and 2025, projections for Scenarios 2 to 4 were also computed (Scenarios 2a, 3a, and 4a) to find a constant catch that met the rebuilding target probability in 2032.

Comparisons of recent projections with updated stock assessments revealed a strong dependency between the recruitment estimate and rebuilding status. Terminal year abundance estimates of age 1 fish are highly imprecise because their relative size has not been confirmed in the fishery landings. Scenario 2 and 2a addressed this dependency by assigning the median recruitment to the terminal estimate for 2022, thereby limiting expression of high recruitments. Scenario 2a estimated the constant average catch for 2024-2025. This approach is not without precedent in the MAFMC and NEFMC and has been used for projections for Golden Tilefish and various New England groundfish species.

Scenario 3 and 3a adjusted the terminal year abundance estimates for 2022 by applying the retrospective adjustment factor to each age class. Simulation studies for some species (but not Atlantic Mackerel), have shown better projection performance when the retrospective adjustment factor is applied irrespective of its magnitude or statistical significance.

Scenario 4 and 4a incorporate the assignment of median recruitment to the 2022 estimate and retrospective adjustment to other age groups. It was noted that the combination of median recruitment and retrospective adjustment has not been applied to other stocks in the Northeast.

The SSC did not support Scenario 1 because it did not address known performance concerns in recent projections and the SSC concluded this approach was both too optimistic and unreliable. Scenarios 4 and 4a were rejected because of the ad hoc mixing of adjustment factors and because its simulation performance was unknown. Scenario 2 and 2a were ultimately endorsed by the SSC but the endorsement was tempered by technical concerns about the scenario formulation. Some SSC members felt the adjustment of all age classes for retrospective pattern, as in Scenario 3 and 3a, was more scientifically justified. Ultimately the SSC agreed that Scenario 2 and 2a were most consistent with recent overestimation of rebuilding trajectories and adjustments used in other assessments when age 1 abundance estimates are highly imprecise.

Following this presentation and initial discussion, the SSC addressed the Terms of Reference (*italics*) for Atlantic Mackerel. Responses by the SSC (standard font) to the Terms of Reference provided by the MAFMC are as follows:

Terms of Reference

For Atlantic Mackerel, the SSC will provide a written report that identifies the following for the 2024-2025 fishing years:

1) *The level of total catch (in weight) for each requested fishing year that is consistent with the updated $F_{rebuild}$ mortality rate associated with achieving a 61% rebuilding probability for Atlantic Mackerel by 2032. The SSC shall provide both varying and constant ABC's for projection option selected;*

The lead analyst provided a number of alternative projections that differed in assumptions related to future recruitments and how retrospective bias evident in the assessment were incorporated. The SSC appreciated the careful work in creating the range of projections it considered.

The SSC considered the overestimation of recent year classes to be a significant factor in selecting the projection used to provide its ABC. As a result, the SSC rejected using the direct estimates from the assessment model as the basis for its recommendations. The SSC noted the presence of substantial retrospective bias (both within a model and between models) in SSB and F. However, the size of the bias was not of sufficient magnitude, based on the standard used by NEFSC, to require adjustment in reference points. Moreover, simulation testing of the combined effects of both dampening of recruitment and retrospective adjustment in projections remains to be evaluated for Atlantic Mackerel. Consequently, the SSC based its ABC recommendation on projections that dampened future recruitments only.

The SSC provides the following ABCs:

Projection	2024	2025
Year-specific (mt)	2,726	3,900
Averaged (mt)	3,200	3,200

2) *Interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration*;

i. SSB estimates from US and Canadian egg surveys, as available.
ii. Survey indices, as available, particularly if relevant to estimates of year class strength.
iii. Age-structure in surveys, as available.
iv. Removal estimates.

3) *The most significant sources of scientific uncertainty associated with determination of the ABC recommendation*;

- Projections have not been reliable in the recent recovery period.
    - Retrospective bias (overestimation) of SSB.
    - Uncertainty in the terminal year recruitment is an important source of uncertainty influencing projections.
    - Above-average recruitments have not been expressed in older age classes, suggesting recruitment estimates are likely optimistic.
    - Recovery of SSB projected in previous assessments has not materialized.
- The management track assessment review identified concerns over model fit, potentially suggesting unaccounted process error in the current model whose cause could include unaccounted sources of mortality, including predation mortality. Literature (Smith et al. 2015; Guillemette et al. 2018) and ongoing modeling work by DFO and ICES WGNAM indicate substantial predation mortality on adult Atlantic Mackerel. This leads to uncertainty in the constant M assumption.
- Diverging expectations for stock productivity in projections which introduces uncertainty over the appropriate distribution for recruitment to be used in projections.
- Effects of updates in Canadian catch estimates.
    - Bait and recreational fishery in Canada was not historically monitored.
    - The time series of Canadian landings has been revised.
- The Atlantic Mackerel assessment uses an index of SSB derived from egg surveys. The DFO egg survey is designed and timed specifically to target Mackerel spawning. The US index is based on a broader ecosystem survey that does not sample preferentially during peak Mackerel spawning. US-specific estimates of fecundity and phenology are lacking.

- Trawl survey representation of abundance and age structure.

4) *The materials considered by the SSC in reaching its recommendations;*

- SSC Terms of Reference for Atlantic Mackerel
- Staff Memo: 2024-2025 Atlantic Mackerel 2024-2025 ABC Specifications Overview and Recommendations
- Updated 2024-2025 ABC Projection Scenarios
- 2023 Atlantic Mackerel Management Track Assessment Report
    - Management Track Assessment Model Diagnostics
- Fall 2023 Management Track Assessment Peer Review Panel Summary Report
- 2023 Atlantic Mackerel Advisory Panel Fishery Performance Report
- 2023 Atlantic Mackerel Fishery Information Document
- Memo from Dave Secor regarding comments in staff memo
- Consumption by marine mammals on the Northeast U.S. continental shelf (Smith et. Al. 2015)

5) *A conclusion that the recommendations provided by the SSC are based on scientific information the SSC believes meets the applicable National Standard guidelines for best scientific information available.*

The SSC believes that the recommendations provided are based on scientific information that meets the applicable National Standard guidelines for best scientific information available.

Public Comment – Several fishermen noted that the location of mackerel has changed in recent years. Historically, herring arrived first in April, followed by mackerel in April and May. Atlantic Mackerel then typically moved northward. Now, fish stay up to nine months. Smaller fish tend to remain inshore while larger fish move offshore towards Stellwagen Bank. As a result of increased local abundance, the public often has trouble understanding the need for catch reductions.

Another fisherman noted high abundance of Atlantic Mackerel on northern Jeffrey's Ledge. The contemporary pattern is much different than prior years and suggestive of a regime change. Kiersten Curti responded that the assessment shows similar patterns and offered to discuss further with fishermen.

Commercial fishermen have been participating in a cooperative project and have sent many samples of pre- and post-pawning fish to NEFSC from April to August. They noted that the likely extended period of spawning may limit the utility of scientific egg and larval surveys that are typically restricted to much shorter intervals. Fishermen have also observed that many Atlantic Mackerel stomachs are filled with eggs; however, the eggs have not been identified to species. Reports of Atlantic Mackerel eating sand eels are common. (This observation was also reported by haddock fishermen in Canada at the TRAC in 2023).

Spiny Dogfish ABC Recommendations for 2024-2026

Dvora Hart, NEFSC, provided an overview of the MTA results for the SSC. The MTA was based on the recently completed Research Track Assessment (RTA), but also included some notable updates; namely, a change in the maximum size for female dogfish and full implementation of the assessment in Stock Synthesis 3. The model implementation allowed for characterization of changing selectivity patterns over time, incorporation of multiple fishing fleets, and changes in growth parameters over time. The F_{msy} proxy increased to 60% of B_0 and catch data back to 1924 were used to derive the initial stock size for estimation. The SSC noted the concerns expressed by the MTA Review Panel regarding the SS3 model's assumption regarding initial equilibrium conditions. This drives the need to estimate catches back to 1924. Yet, these estimates are uncertain. Additional technical details include the use of an increased weighting of the survey index component of the log likelihood function and the use of a stock recruitment function estimated externally from the model. Analysis of median length of mature females indicates a downward trend over time. In the 1990s this decline was related to intense size-selective fishing, but causes for the decline in more recent years have not been identified. The combined effects of these changes support the perception of lower productivity than previously assumed. Stock size is above B_{msy} and F is below the $F_{60\%msp}$ proxy.

The SSC noted that earlier research had documented both time and season changes in distribution. Recent work has suggested a greater fraction of the population in Canadian waters in the summer and fall. One of the effects of starting the model in 1924 rather than 1989 is that the SSB_{msy} drops by more than 50%. The MT attributed this change to the change in pup production from the SR curve.

Public Comment – Several representatives from industry summarized the consequences of lower quotas. The reduction in 2023 resulted in the closure of a processor in Virginia. They noted that the market is "fragile" due to foreign demand and prices. Reduced supply can disrupt current supply chains that rely on access to markets. Once closed, these markets can be difficult to restart. One processor who uses Spiny Dogfish for organic fertilizer noted the dependency of agriculture on current quotas. Lower landings can also reduce the competitiveness of fishermen for valuable dock space at ports.

Public commenters noted the importance of adequate conservation measures and acknowledged earlier periods of high exploitation and rapid change in the population structure of Spiny Dogfish. Additional biological sampling of current landings was advocated. Several suggestions were made about stock structure with apparent differences between southern and northern fish.

Following the presentations and discussion, and input from the public, the SSC began discussion of the Terms of Reference and derivation of the OFL CV table for Spiny Dogfish. Responses by the SSC (standard font) to the Terms of Reference (*italics*) provided by the MAFMC are as follows:

Terms of Reference

For Spiny Dogfish, the SSC will provide a written report that identifies the following for the 2024-2026 fishing years:

1) *Based on the criteria identified in the acceptable biological catch (ABC) control rule, assign the stock to one of four types of control rules (analytically derived, modified by the assessment team, modified by the SSC, or OFL cannot be specified) the SSC deems most appropriate for the information content of the most recent stock assessment;*

   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, determine the level of catch (in weight) associated with the overfishing limit (OFL) for each requested fishing year based on the maximum fishing mortality rate threshold or, if appropriate, an OFL proxy, and the associated coefficient of variation recommended by the SSC and its basis;*

   A sex-specific stock synthesis (SS3) model is used to estimate OFL. According to this SS3 model, the F_{msy} proxy for Spiny Dogfish is 0.0246, which is calculated based on *60%SPR*.

   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 SSC's evaluations of each criterion were as follows:

   1. Data quality (moderate uncertainty): The NEFSC spring survey covers a wide range of the Spiny Dogfish distribution and is considered reasonably representative of Spiny Dogfish population changes; however, discard mortality, age, and growth data are of high uncertainty with ageing data not used in the assessment.

   2. Model identification process (moderate uncertainty): The assessment uses a single model within which many parameter sensitivities have been explored. The assessment model used fixed parameters in the Stock-Recruitment (SR) relationship and is sensitive to data weighting to abundance indices.

   3. Retrospective adjustment (low uncertainty): The assessment model resulted in low retrospective errors in F and SSB output.

   4. Comparison with empirical measures or simpler analyses (100): The management track model using data back to 1924 resulted in similar SSB output, F, and R, as these are from the research track model using data starting from 1989. There is moderate agreement between the SS3 models and the Stochastic Estimator approach.

   5. Ecosystem factors accounted (high uncertainty): No formal accounting was made in the assessment for ecosystem factors. Maturity and growth are found to have significant changes and have been included in the assessment, but no factors ("drivers") are identified to interpret the maturity and growth changes.

6. Trend in recruitment (moderate uncertainty): The estimated recruitment over time did show patterns with years of high or low recruitment. However, recruitment in the recent four years (2019-2022) was not lower than the long-term average, and projections are not likely to need additional consideration of changes in recruitment.
7. Prediction error (high uncertainty): No estimate of prediction error was available.
8. Assessment accuracy under different fishing pressures (low uncertainty): The data should be informative about fishing mortality rates and biomass because fishing mortality has been relatively high from 1960-2000.
9. MSE Simulations (N/A): No MSE simulations have been performed for Spiny Dogfish.

Based on these criteria, the SSC recommended an OFL CV of 100%.

The updated 2023 Spiny Dogfish management track assessment estimated an OFL of 7,818 mt for 2024 fishing year, 7,970 mt for 2025, and 8,112 mt for 2026.

3) *The level of catch (in weight) and the probability of overfishing (P*) associated with the ABC for each requested fishing year based on the traditional approach of varying ABCs in each year. If appropriate, specify interim metrics that can be examined to determine if multi-year specifications need reconsideration prior to their expiration;*

The ABCs were calculated based on a lognormally-distributed OFL with the recommended CV of 100%. The SSC applied the Council's risk policy and an estimated $SSB_{2024\text{-}2026}/SSB_{msy}$ ratio > 1 for all three years. Using these parameters, the P* values and the associated ABCs are as follows:

Year	P*	ABC (mt)
2024	0.456	7,135
2025	0.459	7,312
2026	0.460	7,473

Subject to availability, the SSC will examine the following interim metrics: 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 reconsidered prior to their expiration.

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

- While the model-based assessment is less reliant on individual survey abundance estimates, further studies on the effects of environmental factors on the availability of dogfish to the survey 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.
- Application of a fixed stock-recruitment relationship is a source of uncertainty for both reference point estimation and subsequent projections.
- The current model uses only the NEFSC Spring bottom trawl survey and does not include other surveys (e.g., NEAMAP) in the region. This places heavy reliance on the NEFSC trawl survey, for which concerns over patterns of availability of spiny dogfish have been expressed.
- The SSC noted changes in the size distribution of mature female dogfish might reflect changes in growth and reductions in stock productivity. There were efforts to include the potential effect of changes in stock productivity in the assessment model, but these efforts remain incomplete.
- The choice of the likelihood weighting factor, lambda, affected the status determination. The SSC recognizes that the approach taken to select the value of lambda followed reasonable practices, and is supported by the congruence of survey data. However, this does remain a source of uncertainty.
- The incorporation of early landings and discard data (1924-1961) is required to meet the equilibrium assumptions of the SS3 platform. The uncertainty of these data is not quantifiable but likely substantial.

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

- No ecosystem factors were included in the assessment. No specific, additional ecosystem information was provided to the SSC for consideration in forming its ABC recommendations.
- No significant changes in spatial shift over time are detected through a VAST analysis.
- Maturity and growth changed after the 2010s and have been included in the assessment. No factors ("drivers") are identified that might have caused the maturity and growth changes.
- Classified as "low climate vulnerability" by Hare et al. (2016).

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

Aging

- Consistently collect, process, and age spines of Spiny Dogfish to understand growth and growth changes over time, and support future age-based assessments. This should include additional age validation and age structure exchanges.
- An aging workshop for Spiny Dogfish, including 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) would be useful. The SSC supports the availability of new, short-term funding to support the aging.

Survey Abundances and Distribution

- Continue exploration into the spatial distribution of Spiny Dogfish (e.g., off-shelf abundance).
    - Investigate the distribution of Spiny Dogfish beyond the depth range of current NEFSC trawl surveys, possibly by using experimental research or supplemental surveys.
    - Continue exploring VAST models and other spatial approaches.
- 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. These studies could also provide estimates of growth and mortality, independent of age-based work. Tagging estimates could also be integrated into SS3 models if sufficient data are available.
- Explore the use of other survey abundance indices and fishery catch rate that may inform either YOY or larger Spiny Dogfish estimates in the assessment model.

Catch and Discard

- Conduct directed studies that estimate discard mortality rates for Spiny Dogfish by commercial and recreational harvesting gear type.
- Explore the adequacy of current estimates of size and sex composition of commercial catches. This may require expansion of current port sampling efforts.

Modeling

- Further explore the sensitivity of the SS3 model parameterization and configuration.
    - We encourage more thought about using non-equilibrium starting points in the SS3 modeling framework when historical catch data are uncertain.
- Develop state-space models that can incorporate process error.

Ecosystem Effects

- Investigate the role of ecosystem drivers to explain the decline in maturity and other life history parameters over time.
- Investigate datasets enumerating the abundance or diet of known Spiny Dogfish predators for insight into natural mortality rates.

7) *The materials considered by the SSC in reaching its recommendations;*

- SSC Terms of Reference for Spiny Dogfish
- Staff Memo: 2024-2026 Spiny Dogfish ABC Recommendations
- 2024-2026 OFL/ABC Stock Projections
- Draft Spiny Dogfish OFL CV Decision Criteria Summary Table
- 2023 Spiny Dogfish Management Track Assessment Report
- Stock Synthesis for Spiny Dogfish Report
- Fall 2023 Management Track Assessment Peer Review Panel Summary Report
- 2022 Spiny Dogfish Research Track Assessment Report
- 2023 Spiny Dogfish Advisory Panel Fishery Performance Report
- 2023 Spiny Dogfish Fishery Information Document
- Hare JA, Morrison WE, Nelson MW, Stachura MM, Teeters EJ, Griffis RB, et al. (2016) A Vulnerability Assessment of Fish and Invertebrates to Climate Change on the Northeast U.S. Continental Shelf. PloS ONE 11(2): e0146756. https://doi.org/10.1371/journal.pone.0146756

8) *A conclusion that the recommendations provided by the SSC are based on scientific information the SSC believes meets the applicable National Standard guidelines for best scientific information available.*

The SSC believes that the recommendations provided are based on scientific information that meets the applicable National Standard guidelines for best scientific information available.

Attachment 1:

Mid-Atlantic Fishery Management Council

Scientific and Statistical Committee Meeting

October 30, 2023 via Webinar

Webinar Information

Link: **Click here to join the October 30, 2023 SSC meeting**

Call-in Number: 1-415-655-0001

Access Code: 2338 120 4231; Password: n3ZtYUc7nz3

AGENDA

10:00 Welcome/Overview of meeting agenda (P. Rago)

10:05 Review of Atlantic Mackerel ABC recommendations for the 2024-2025 fishing years
- Overview of the 2023 management track assessment results and updated stock projections (K. Curti, NEFSC)
- Review staff memo and recommendations (J. Didden)
- 2024-2025 SSC ABC recommendations

12:30 Lunch

1:30 Spiny Dogfish ABC specifications for the 2024-2026 fishing years
- Overview of 2023 management track assessment results (D. Hart, NEFSC)
- Review staff memo and 2024-2026 ABC recommendations (J. Didden)
- 2024-2026 SSC ABC recommendations (Y. Jiao)

3:00 Break

3:15 Continue Spiny Dogfish 2024-2026 ABC recommendations

4:30 Adjourn

Note: agenda topic times are approximate and subject to change

Attachment 2:

MAFMC Scientific and Statistical Committee

October 30, 2023

Meeting Attendance

Name	Affiliation
Paul Rago (SSC Chairman)	NOAA Fisheries (retired)
Tom Miller	University of Maryland – CBL
Ed Houde	University of Maryland – CBL (emeritus)
John Boreman	NOAA Fisheries (retired)
Jorge Holzer	University of Maryland
Yan Jiao	Virginia Tech University
Sarah Gaichas	NOAA Fisheries NEFSC
Wendy Gabriel	NOAA Fisheries (retired)
Cynthia Jones	Old Dominion University
Geret DePiper	NOAA Fisheries NEFSC
Andrew Scheld	Virginia Institute of Marine Sciences
Mark Holliday	NOAA Fisheries (retired)
Olaf Jensen	U. of Wisconsin-Madison
Gavin Fay	U. Massachusetts-Dartmouth
Michael Frisk	Stony Brook University
Brian Rothschild	U. Massachusetts-Dartmouth
Michael Wilberg (SSC Vice Chairman)	University of Maryland – CBL
Alexei Sharov	Maryland Dept. of Natural Resources

Others in attendance (only includes presenters and members of public who spoke):

Jason Didden	MAFMC staff
Brandon Muffley	MAFMC staff
Kiersten Curti	NEFSC
Dvora Hart	NEFSC
John Whiteside	Sustainable Fisheries Association
Han Chang	NEFSC
Jeff Young	Advanced New Technologies
Jared Auerbach	Red's Best
Pierre Julliard	Seatrade Inc.
Michael Pierdinock	Stellwagen Bank Charter Boat Assoc.
Jack Patrican	
Dennis Saluty	Quality Custom Packing

Attachment 3:

OFL CV Decision Table Criteria (updated June 2020)

Decision Criteria	Default OFL CV=60%	Default OFL CV=100%	Default OFL CV=150%
Data quality	One or more synoptic surveys over stock area for multiple years. High quality monitoring of landings size and age composition. Long term, precise monitoring of discards. Landings estimates highly accurate.	Low precision synoptic surveys or one or more regional surveys which lack coherency in trend. Age and/or length data available with uncertain quality. Lacking or imprecise discard estimates. Moderate accuracy of landings estimates.	No reliable abundance indices. Catch estimates are unreliable. No age and/or length data available or highly uncertain. Natural mortality rates are unknown or suspected to be highly variable. Incomplete or highly uncertain landings estimates.
Model appropriateness and identification process	Multiple differently structured models agree on outputs; many sensitivities explored. Model appropriately captures/considers species life history and spatial/stock structure.	Single model structure with many parameter sensitivities explored. Moderate agreement among different model runs indicating low sensitivities of model results to specific parameterization.	Highly divergent outputs from multiple models or no exploration of alternative model structures or sensitivities.
Retrospective analysis	Minor retrospective patterns.	Moderate retrospective patterns.	No retrospective analysis or severe retrospective patterns.
Comparison with empirical measures or simpler analyses	Assessment biomass and/or fishing mortality estimates compare favorably with empirical estimates.	Moderate agreement between assessment estimates and empirical estimates or simpler analyses.	Estimates of scale are difficult to reconcile and/or no empirical estimates.
Ecosystem factors accounted	Assessment considered habitat and ecosystem effects on stock productivity, distribution, mortality and quantitatively included appropriate factors reducing uncertainty in short term predictions. Evidence outside the assessment suggests that ecosystem productivity and habitat quality are stable. Comparable species in the region have synchronous production characteristics and stable short-term predictions. Climate vulnerability analysis suggests low risk of change in productivity due to changing climate.	Assessment considered habitat/ecosystem factors but did not demonstrate either reduced or inflated short-term prediction uncertainty based on these factors. Evidence outside the assessment suggests that ecosystem productivity and habitat quality are variable, with mixed productivity and uncertainty signals among comparable species in the region. Climate vulnerability analysis suggests moderate risk of change in productivity from changing climate.	Assessment either demonstrated that including appropriate ecosystem/habitat factors increases short-term prediction uncertainty, or did not consider habitat and ecosystem factors. Evidence outside the assessment suggests that ecosystem productivity and habitat quality are variable and 16egradeng. Comparable species in the region have high uncertainty in short term predictions. Climate vulnerability analysis suggests high risk of changing productivity from changing climate.
Trend in recruitment	Consistent recruitment pattern with no trend.	Moderate levels of recruitment variability or modest consistency in pattern or trends. OFL estimates adjusted for recent trends in recruitment. OFL estimate appropriately accounted for recent trends in recruitment.	Recruitment pattern highly inconsistent and variable. Recruitment trend not considered or no recruitment estimate.

Prediction error	Low estimate of recent prediction error.	Moderate estimate of recent prediction error.	High or no estimate of recent prediction error.
Assessment accuracy under different fishing pressures	High degree of contrast in landings and surveys with apparent response in indices to changes in removals. Fishing mortality at levels expected to influence population dynamics in recent years.	Moderate agreement in the surveys to changes in catches. Observed moderate fishing mortality in fishery (i.e., lack of high fishing mortality in recent years).	Relatively little change in surveys or catches over time. Low precision of estimates. Low fishing mortality in recent years. "One-way" trips for production models.
Simulation analysis/MSE	Can be used to evaluate different combinations of uncertainties and indicate the most appropriate OFL CV for a particular stock assessment.		

Attachment 4: Glossary (cumulative from previous SSC reports)

AA—Area Allocation Approach
ABC—Acceptable Biological Catch
ACCSP—Atlantic Coastal Cooperative Statistics Program
AGEPRO—Age Projection Software
APAIS—Access Point Angler Intercept Survey
ASMFC—Atlantic States Marine Fisheries Commission
B_{msy}—Biomass at Maximum Sustainable Yield
B_0— Biomass at Zero Fishing
CAMS—Catch Accounting and Monitoring System
CCC—Council Coordination Committee
CIE—Center for Independent Experts
CPUE—Catch Per Unit Effort (Catch=Landings+ Discards)
CV—Coefficient of Variation
DFO—Department of Fisheries and Oceans, Canada
EAFM—Ecosystem Approaches to Fisheries Management
ESP—Ecosystem and Socio-economic Profiles
F_{msy}—Fishing Mortality at Maximum Sustainable Yield
$F_{rebuild}$—Fishing Mortality associated with Stock Rebuilding Plan
FSV—Fishery Survey Vessel
FMAT—Fishery Management Action Team
GARFO—Greater Atlantic Region Fisheries Office
HCR—Harvest Control Rule
GRA—Gear Restricted Area
LPUE—Landings per Unit Effort
M—Instantaneous Rate of Natural Mortality
MRIP—Marine Recreational Information Program
MTA—Management Track Assessment
MSE—Management Strategy Evaluation
NEFSC—Northeast Fisheries Science Center
NRHA—Northeast Regional Habitat Assessment
OFL—Overfishing Limit
P*—Probability of Overfishing
PSE—Proportional Standard Error
RDM—Recreational Demand Model
RHL—Recreational Harvest Limit
RMSP—Recreational Measures Setting Process
RTA—Research Track Assessment
R/V—Research Vessel
SCS—Scientific Coordination Subcommittee
SEDAR—Southeast Data, Assessment, and Review
SPR—Spawner Per Recruit
SS3—Stock Synthesis 3

SSB_{msy}—Spawning Stock Biomass at Maximum Sustainable Yield
SSC—Scientific and Statistical Committee
TAILWINDSTeam for Assessing Impacts to Living Resources from Offshore WIND turbineS
UTID—Universal Trip Identifier
VAST—Vector Autoregressive Spatio-Temporal
WHAM—Woods Hole Assessment Model

Attachment 5:

OFL CV Decision Criteria Table for Spiny Dogfish – Oct. 2023

Decision Criteria	Summary of Decision Criteria Considerations	Assigned OFL CV Bin (60/100/150)
Data quality	**Surveys** ● Three fishery-independent surveys are available and used: NEFSC spring bottom trawl offshore Yankee 36 (1968-1972), Yankee 41 (1973-1981), and NEFSC spring bottom trawl (inshore + offshore survey, Albatross -Biglow 1982-2022) data are available for all years (except 2014 and 2020 Bigelow) in the assessment. ● NEFSC fall bottom trawl (inshore + offshore survey, Albatross -Biglow 1982-2022) and regional surveys such as NEAMAP, MSDMF, and ME-NH trawl surveys are not used in Management Track model tuning. There were sensitivity runs in the Research Track but not comparable with the base run because the data weighting was not comparable. No update on these sensitivity runs was provided in the management track assessment report. **Landings and discards** ● Age data are of high uncertainty and not used in the model ● Discard uncertainty is high, such as extrapolating pre-1989 and low trip coverages in the 1990s. ● Discarding estimation in recent years have been more precise ● Discard mortalities from recreational and commercial (otter trawl, sink gillnet, scallop dredge, and longline) fisheries are based on assumptions in NEFSC 2006 (43rd SAW), which was not based on direct studies on spiny dogfish. **Life history data** ● Growth data is treated as uncertain and not used; Nammack (1985) growth parameters were used 1924-2011, whereas L_∞ was estimated from model for 2012-2022.	100
Model appropriateness and identification process	● A sex-specific age-structured model fitting to length frequency data implemented in Stock Synthesis version 3.30.21 (SS3). ● Catch is modelled as 2 fleets: sink gillnet+recreational+others, longline+ottertrawl+foreign. ● Discards are modelled as 3 fleets: sink gillnet+scallop dredge, large mesh otter trawl+longline+recreational, small mesh otter trawl ● Life history time blocks (2) used to address the changes in growth and maturity. ● Selectivity blocks used in all the catch and discard fleets. ● Spawner stock-recruitment (SR) relationship was based on a survivorship configuration with Z_{frac}, β and σ_R estimated outside of the model. ● Biological reference points were updated in the 2023 management track assessment. SSB biological reference points are sensitive to SR parameter assumptions, though a major driver for the drop in SSB is	100

	due to a correction to the estimation procedure, which currently occurs within SS3 but was estimated externally, and incorrectly using a higher productivity, within the Research Track assessment. ● Model results are sensitive to data weighting of the survey indices, which are upweighted with respect to other model components. The weighting is selected to bridge the catchability across Albatross and Bigelow survey stanzas, and effectively downweights the length frequency data. ● Extension of management track time series back to 1924 necessitates the use of more variable catch estimates but more closely aligns the model with theoretical underpinnings of an equilibrium starting state. Ultimately, the consistency across the Research Track and Management Track results indicates some robustness to this extension.	
Retrospective analysis	● Persistent retrospective patterns were identified in the most recent model but minor, with low retrospective errors in F and SSB output.	60
Comparison with empirical measures or simpler analyses	● The research track assessment included a comparison with the Stochastic Estimator (swept area) biomass. The descriptions of historical population dynamics from the two approaches are different with respect to both magnitude and variability. The survey weighting ultimately utilized brought results between the two more closely in line. ● A few other simpler analyses were provided in the research track review, including DCAC, DB-SRA, and Ismooth. They either don't show stock status or show different stock status. ● The management track assessment extended the data back to 1924 (compared to 1989 in the research track assessment). The results are consistent in SSB and F trends but not in SSB_{msy} ($SSB_{60\%\ SPR}$) output. SSB biological reference points are sensitive to SR parameter assumptions, though a major driver for the drop in SSB is due to a correction to the estimation procedure, which currently occurs within SS3 but was estimated externally, and incorrectly using a higher productivity, within the Research Track assessment.	100
Ecosystem factors accounted	● No ecosystem factors were included in the assessment. ● No significant changes in spatial shift over time are detected through a VAST analysis. Maturity and growth are found to have changed after the 2010s and have been included in the assessment. No factors ("driver") are identified to cause the maturity and growth changes. ● Classified as "low climate vulnerability" by Hare et al. (2016).	150
Trend in recruitment	● There are no SR relationship changes modeled or detected. The survivorship SR relationship, including the variance of recruitment, is fixed in the SS3 model. ● The estimated recruitment over time did show patterns with years of high or low recruitment. However, recruitment in the recent 4 years (2019-2022) was not lower than long term average, and projections are not likely to need additional consideration of changes in recruitment.	100
Prediction error	● No forecast error plots provided.	150

	• This is the first structured stochastic dynamic model. It may take some years to be validated. • The model results are sensitive to SR assumption and survey data weighting.	
Assessment accuracy under different fishing pressures	• Fishing mortality has been relatively high from 1960-2000, so the data should be informative about fishing mortality rates and biomass.	60
Simulation analysis/MSE	• No MSE-type analyses were conducted.	n/a

MEMORANDUM

DATE: November 13, 2023

TO: Cate O'Keefe, NEFMC Executive Director

Chris Moore, MAFMC Executive Director

FROM: NEFMC and MAFMC Scientific and Statistical Committee Subpanel

SUBJECT: Essential Fish Habitat and Habitat Areas of Particular Concern Designation Methods

Terms of Reference:
A subpanel composed of NEFMC and MAFMC Scientific and Statistical Committee (SSC) members met on September 29, 2023, via webinar to address the following terms of reference (TORs):

1. Principles applied to improving EFH and HAPC designations:
    a. Are the Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) designation principles clear and complete?
    b. Is there an expectation that applying these principles (with available information) will lead to improvement (over the last iteration) for the EFH/HAPC designations that are developed to support the NOAA/Council EFH consultation process? Improvement should be evaluated in terms of clarity and usability for EFH consultations, as well as modernization to utilize more recent data and methods to better estimate "true" underlying patterns of habitat use (to the extent they are understood).
2. Methods for developing EFH text and map descriptions including application of model-based approaches (Are we working with limited information in a reasonable way?)
    a. Habitat Models Fitted to Federal Survey Data (offshore areas): Are overall modeling approaches, and the translation of model predictions to offshore EFH maps based on reasonable assumptions and/or choices with respect to:
        i. Spatial and temporal domain, resolution, gridding, and aggregation schemes?
        ii. Suite of environmental predictors and data sources?
        iii. Measures of performance and uncertainty, and minimum acceptable criteria?
        iv. Methods/thresholds for delineation of essential habitat bounds?
    b. Consideration of Additional Data Elements Including State and Regional Surveys (inshore areas): For inshore areas where model-based predictions are not available (or extrapolations may not be reliable), are the approaches for employing

additional quantitative survey data to inform EFH maps reasonable? (e.g., methods for aggregating disparate regional or state-level surveys, choice of quantiles for mapping, etc.)?
    c. Has a reasonable approach been taken to create a single map that integrates inshore, offshore, and other supplementary information sources? Other information sources could include primary literature, reports, commercial or recreational catches, etc.
    d. Are the text descriptions clear, informative, and inclusive of information on all life stages, species movement, and connectivity between life stages (using data and literature sources)?
3. Are the approaches to identifying HAPC, based on Species and Habitat Climate Vulnerability or Core Habitat Areas, reasonable given the information available?
4. Recommend future enhancements for EFH and HAPC designations noting whether each is an immediate need or a longer-term project.

Purpose: The subpanel was charged with evaluating the current results and summary products of the Northeast Regional Fish Habitat Assessment (NRHA). The NRHA project team consists of members of the NEFMC, MAFMC, NOAA Fisheries, and other organizations. Since the last SSC subpanel review of NRHA products (June 2022), the project team has worked to apply the models, analyses, and other assessment products developed in the previous iteration to theoretical EFH and HAPC designations. The subpanel was tasked to provide expert review of the proposed methods, including draft EFH/HAPC designations for a pilot suite of species, before the methods are applied by the project team to a broader range of species.

SSC subpanel members in attendance: John Boreman, Jeremy Collie, Ed Houde, Yan Jiao, Conor McManus (Chair), and Sam Truesdell.

Documents: To address these TORs, the subpanel considered the following information:
1. Presentation: EFH and HAPC designation methods
2. Modeling paper (Hui et al. 2023 - https://doi.org/10.1111/2041-210X.14184)
3. EFH principles and decision points, including modeling and mapping methods
4. Revised text and map designations for red hake, bluefish, shortfin squid, and summer flounder
5. Joint SSC subpanel NRHA review report – June 1, 2022
6. NRHA summary report NRHA
Data Explorer: https://nrha.shinyapps.io/dataexplorer/#!/

The subpanel were provided with presentations from the project team outlining background on the NRHA efforts, EFH and HAPC definitions, technical and modeling work conducted, application of that work to species, and areas where future work and research can or should be continued. Overall, the subpanel believed the project team made substantial improvements since the previous review. However, the subpanel did not feel there was adequate time to thoroughly address each of the TORs. Future iterations of review may consider greater time allotments for the peer-review. Comments specific to TORs are provided below.

Responses to TORs:

1. *Principles applied to improving EFH and HAPC designations:*
   a. *Are the Essential Fish Habitat (EFH) and Habitat Areas of Particular Concern (HAPC) designation principles clear and complete?*
   b. *Is there an expectation that applying these principles (with available information) will lead to improvement (over the last iteration) for the EFH/HAPC designations that are developed to support the NOAA/Council EFH consultation process? Improvement should be evaluated in terms of clarity and usability for EFH consultations, as well as modernization to utilize more recent data and methods to better estimate "true" underlying patterns of habitat use (to the extent they are understood).*

The subpanel noted a significant need to better define EFH and HAPC. Specifically, within the definitions, there must be stronger specification (e.g., how one defines 'rarity' or 'sensitivity'). The subpanel also questioned how elements such as uncertainty (e.g., CVs) are incorporated into these definitions, and cautioned using probability of occurrence as it potentially can provide biased insight. With designations moving from place-based HAPC toward core areas of the species, the subpanel suggested using quantiles of probability of occurrence to fine-tune the HAPC definitions. The subpanel agreed that the project team's information has been substantially improved, but the principles could benefit from further clarification.

2. *Methods for developing EFH text and map descriptions including application of model-based approaches (Are we working with limited information in a reasonable way?)*
   a. *Habitat Models Fitted to Federal Survey Data (offshore areas): Are overall modeling approaches, and the translation of model predictions to offshore EFH maps based on reasonable assumptions and/or choices with respect to:*
      i. *Spatial and temporal domain, resolution, gridding, and aggregation schemes?*
      ii. *Suite of environmental predictors and data sources?*
      iii. *Measures of performance and uncertainty, and minimum acceptable criteria?*
      iv. *Methods/thresholds for delineation of essential habitat bounds?*
   b. *Consideration of Additional Data Elements Including State and Regional Surveys (inshore areas): For inshore areas where model-based predictions are not available (or extrapolations may not be reliable), are the approaches for employing additional quantitative survey data to inform EFH maps reasonable? (e.g., methods for aggregating disparate regional or state-level surveys, choice of quantiles for mapping, etc.)?*
   c. *Has a reasonable approach been taken to create a single map that integrates inshore, offshore, and other supplementary information sources? Other information sources could include primary literature, reports, commercial or recreational catches, etc.*

d. *Are the text descriptions clear, informative, and inclusive of information on all life stages, species movement, and connectivity between life stages (using data and literature sources)?*

The subpanel queried the project team with respect to the spatial resolution for informing the modeling, and the degree to which increasing spatial resolution from 10-minute squares to 1-km grids in fact improves the utility of this tool for action or consultation. The project team indicated that the finer grid now supports addressing finer-scale features that are necessary to account for unique ecosystem attributes, and meets the needs of spatial management discussions currently taking place. The subpanel noted that finer spatial scale will likely lead to greater uncertainty in predictions; the project team indicated that loss of finer scale comes with greater uncertainty more in the temporal scale than spatial scale. The subpanel indicated it would be desirable to use an equal-area grid as opposed to 0.01 degree resolution, which varies by latitude, which can be accomplished with the analytical tools currently being used by the project team.

The subpanel also asked about the degree to which important habitat variables are not currently accounted for in the models (e.g., predators, benthic habitat data, climate oscillations). The project team indicated that final selection of variables was attributed to several factors: (i) whether the data of interest for inclusion exist consistently over space and time, (ii) are already incorporated indirectly via other covariates (i.e., through other independent variables or the co-varying of species), (iii) risk of over-parameterizing the models. The subpanel suggested an analysis that looks at total area occupied or core area at several probability-of-occurrence thresholds to understand sensitivities of model output in defining core habitat areas. The subpanel noted that the project team's current framework does not allow for other survey data types to be incorporated, which may inhibit including other species or life stages in the modeling component of the assessment. The subpanel noted that nearshore trawl survey data resulting from programs like NEAMAP and state surveys would be important for inclusion in these modeling endeavors, if the team were able to include such surveys. While other trawl survey information could perhaps be incorporated, other classes of survey data (e.g., fixed gear surveys) could be more problematic. The subpanel also highlighted the large volume of larval-stage data from various monitoring efforts that could be integrated in the non-modeling framework (including power plant and the NOAA Ecosystem Monitoring Survey data). The project team recognized the potential for these data to identify spawning and rearing habitats but did not believe it was presently feasible to include such early-life-stage data in their work. The subpanel also noted the absence of fisheries-dependent data, which can be insightful for species distribution modeling as well. Spatial and temporal biases in sampling can also be problematic; areas not sampled or time periods missed might suggest that those areas or periods lack importance for species, when in reality the results can simply be an artifact of the survey design. The project team posed some ways to consider this question, particularly with respect to how connectivity between life stages and movement patterns can be better represented.

3. *Are the approaches to identifying HAPC, based on Species and Habitat Climate Vulnerability or Core Habitat Areas, reasonable given the information available?*

The subpanel reiterated the need to reduce ambiguity regarding the definitions and differences between HAPC and EFH, and that it would be useful to include an element that addresses HAPC explicitly. It is critical that the definitions of location-based and habitat-based EFH and HAPC are consistent among councils; further national guidance from NOAA may be beneficial in meeting this need. The project team noted the different examples of inconsistencies in definitions that exist in the New England and Mid-Atlantic regions. The subpanel recommended having core habitat be represented by distinct metrics (e.g., maximum probability).

4. *Recommend future enhancements for EFH and HAPC designations noting whether each is an immediate need or a longer-term project.*

The subpanel discussed the utility of the modeling efforts to identify how species distributions will shift or change, particularly at the leading edges of current species footprints. The subpanel also discussed the fact that the project team's models are based on hind-cast information, with the predictions being used to then guide future EFH or HAPC designations. Accordingly, the subpanel discussed how model outputs could be used to best indicate future habitat requirements. A suggestion was made to use forecasted environmental data to inform future habitat guidance; however, the project team cautioned against that approach based on multiple reasons, including availability of forecast data at relevant spatiotemporal scales and the uncertainty in those projections for application in a legally binding framework. An alternative approach discussed was to assign higher weight to more recent years' model outputs when averaging the hindcast years' modeled data to provide more contemporary predictions. To support contemporary predictions of habitat use, the subpanel affirms the importance of continuing and strengthening spatial sampling and survey programs. The subpanel also discussed the importance of addressing data-poor or infrequently observed species for modeling, but did not provide immediate guidance or criteria for defining a data-poor taxa. The subpanel stressed the importance of communication with other fishery management councils that are pursuing similar work (e.g., NPFMC).