



**Mid-Atlantic Fishery Management Council**

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Michael P. Luisi, Chairman | P. Weston Townsend, Vice Chairman

Christopher M. Moore, Ph.D., Executive Director

## **M E M O R A N D U M**

**Date:** November 30, 2021

**To:** Council

**From:** Brandon Muffley, Council staff

**Subject:** Biennial Review of 5-Year Research Priorities Document – Meeting Materials

On Wednesday, December 15, 2021, the Council will review and consider approval of modifications to the 2020-2024 Comprehensive Research Priorities document. The suggested modifications were developed as part of the first ever biennial review process, including recommendations from the Research Steering Committee. Materials listed below are provided for Council consideration of this agenda item.

*The following materials are enclosed:*

1. November 16, 2021 Research Steering Committee meeting summary (available [here](#) or behind Tab 17)
2. Staff memo: Biennial review of research priorities document
3. Draft mark-up of comprehensive research priorities list

Research Steering  
Committee Summary –  
available [here](#) or behind  
Tab 17



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# MEMORANDUM

**Date:** November 9, 2021  
**To:** Research Steering Committee  
**From:** Brandon Muffley, Council staff  
**Subject:** Biennial Review of 5-Year Research Priorities Document

## Background:

In December 2019, the Mid-Atlantic Fishery Management Council (Council) approved the Five-Year (2020-2024) Research Priorities document that aligns science needs with the management objectives and resources identified in the Council's 2020-2024 Strategic Plan and Five-Year Cooperative Agreement. Required by the reauthorization of Magnuson-Stevens Act in 2006, this document provides a comprehensive review and identification of the Council's science and data needs across all its fishery management plans (FMPs). The 2020-2024 document was re-organized and prioritized to develop a more useful, tactical, and strategic document to effectively advance scientific and management information by the Council and NOAA Northeast Fisheries Science Center (NEFSC).

Included for the first time, the 2020-2024 Research Priorities document identified a process to review, update, and monitor progress to improve the document and help ensure its successful implementation. In 2020<sup>1</sup>, the document was updated to include additional information on the species-specific priorities and indicate which of the seven broad research priority theme(s) is being addressed by each individual priority, thereby ensuring the identified research addresses the Council's larger priority themes and needs. In addition, a review of 2019-2020 Council-supported science and management projects was conducted in order to evaluate the utility of the document to inform priorities for funding by the Council. The review found that all 14 Council-supported projects addressed at least one broad priority theme and half of the projects addressed 10 species-specific priorities, nearly 10% of all priorities identified in the current research priorities document.

In 2021, the Council is conducting its first biennial review of all species-specific research priorities identified in the 2020-2024 priorities document. The goal is to provide for a broad and comprehensive review to ensure the document is reflective of the Council's current science and management needs. This memo describes the process to review the priorities list, identifies recommended modifications to species-specific priorities, and provides any relevant

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<sup>1</sup>To review the updated 5-Year (2020-2024) Research Priorities document and staff memo detailing the 2020 review, please see <https://www.mafmc.org/research-priorities>.

justification or rationale for any potential modifications.

At the November 16, 2021 meeting, the Research Steering Committee (Committee) will review the recommended research priority changes. The Committee will provide any feedback regarding the biennial review process, identify any additional changes to the individual priorities, and make any recommendations for Council consideration. The revised document and any Committee recommendations will then be presented to the Council for review and approval at the December meeting.

### **Review of Five-Year (2020-2024) Research Priorities:**

Input on current, and potentially new, research priorities for each Council-managed species was provided throughout 2021. First, all species-specific Advisory Panels reviewed the current research priorities as part of their development of the annual Fishery Performance Reports and suggested any edits or new research considerations. The Scientific and Statistical Committee (SSC) then provided input on science needs when they reviewed previously set catch specifications and they developed specific research recommendations when setting new catch specifications following a management track assessment. Then, during their review of catch and management recommendations, the Monitoring Committees provided input on the respective current research priorities and the new priorities developed by the SSC. In addition, any new or updated research recommendations identified in the 2020 and 2021 management track stock assessment and peer review reports were also considered during the review (note: no Mid-Atlantic research track stock assessments were completed in 2020-2021). Finally, staff then worked with the Council staff lead and the NEFSC assessment leads to review all input received and identify any potential modifications to the existing research priorities list.

For this review, a variety of possible research priority modifications are recommended for consideration by the Committee and Council. These research priority modifications include: removal, editing the existing language, change in priority order, or adding a new priority. Additional context as to why and when a particular modification to a research need is recommended is provided below.

- **Removal** – an existing research priority could be removed because the priority was addressed (through research, assessment, or management advancements) or because it was no longer considered a priority
- **Editing existing language** – language edits for a particular priority are recommended to help add clarity or specificity, provide additional detail because there is new information available to inform the priority, or updated to reflect the current status of addressing the priority
- **Change in priority order** – the priority order of an existing research need(s) could move up or down within the groupings (i.e., short-term/small scale or long-term/large scale) due to changing/updated information and upcoming needs
- **New priority** – a new proposed research priority need could be added to the list depending upon updated recommendations from the SSC, AP, stock assessment, or peer review. The newly recommended priority was not given a priority number but has been placed in priority order (numbering will be updated once the Council approves the revised document).

## *Draft Edits and Modifications to Research Priorities*

Included as background material is a draft comprehensive list of Council research priority needs that is marked-up with recommended modifications for cross-species and species-specific priorities (Attachment 1). There are a total of 34 proposed modifications, or approximately a third (33%) of all existing priorities. The majority (44%) of the recommended modifications are edits and changes to the existing language for a particular research need. As noted above, language edits may be recommended for a number of reasons but are intended to ensure the priority appropriately captures the research needs and accurately reflects the current status of addressing a priority. For example, a number of language edits (priority # 55, 57, and 59) are suggested under Golden Tilefish to indicate some progress has been made to address these priorities, due to the completion of the 2020 longline survey, but more work is needed to completely address the priority need. Adding a new priority comprised 26% of the recommended modifications, followed by a change to the priority ranking (18%). Removing a current priority because a priority was addressed/completed comprised the smallest modifications – additional discussion as to why is provided below. Table 1 provides a summary of all recommended modifications by species and includes information on the type of modification and a justification or rationale for the recommendation.

While the current priorities document was just approved in 2019 and many Council priorities remain relevant, this review highlights that the Council's science needs continue to evolve as new research is conducted or our understanding of a specific priority may change with additional information. This is reflected in the modest number of recommended modifications to the existing priorities list, which includes the removal of 4 priorities and the addition of 9 priorities. This review also highlights that the Council's research priority list is being used by a variety of groups and several priorities have been completed or work is currently underway. There are at least 42 current research priorities (41% of all priorities) that have been completed, are currently being reviewed, or are in the process of being addressed. This number is likely an underestimate as staff is likely unaware of some applicable research or there are projects with a different focus but may provide insight for a particular priority.

Given the modest number of recommended modifications, it's also worth noting this review occurred during a time period when there were no research track assessments for Council-managed stocks. However, there are currently five research track stock assessments that are expected to be completed, and peer reviewed in 2022 including: *Illex* Squid, Butterfish, Spiny Dogfish, Bluefish, and Black Sea Bass. The five different research track working groups are reviewing the various research priorities to identify which priorities can be considered and evaluated during the assessment process. For example, the Bluefish working group reviewed all Council priorities and plan to evaluate six different priorities (priority # 30, 31, 32, 35, and 37). There has been a similar response to review and evaluate Council priorities from the other working groups as well. During the development of a research track assessment and following the completion of the peer review, a number of new research needs and priorities are typically identified for future stock assessment advances. In addition, there are other significant Council projects that will be completed prior to the 2023 biennial review that will likely address other priority needs. For example, the Northeast Regional Fish Habitat Assessment (NRHA) is expected to be completed in mid-2022 and will provide a suite of habitat science products that will help address some of the habitat, EAFM, and climate and distribution shift research priorities. Therefore, it is anticipated the next biennial review will likely include a significant number of recommended changes, both removing completed priorities and adding new ones.

## Next Steps and RSC Meeting Expectations:

As mentioned previously, the next biennial research priority review will occur in late 2023. That review will update the comprehensive research priorities list and will also include another review of Council-supported science and management projects from 2021-2023 to continue to track the Council's progress in addressing research priorities. Council staff also continues to keep an eye on one of the long-term goals identified in the 2020-2024 priorities document – to conduct a more holistic priorities review with greater consideration of research priorities from across the region. A sub-group of Northeast Regional Coordinating Council (NRCC) staff members are currently developing an approach to improve coordination, planning, and prioritization of research needs throughout the region as they relate to stock assessment improvements through the research track assessment process. If the process is supported by the NRCC, there could be certain components of that approach that could be used to evaluate and consider non-stock assessment research priorities for the region.

At the November 16<sup>th</sup> meeting, the Committee will review all recommended modifications to the comprehensive research priorities list. The Committee will then make any changes to the proposed modifications (e.g., accept, reject, or change) and identify any additional modifications to the priority list. In addition, staff is looking for feedback from the Committee regarding the value of the review to ensure this process is providing a document and information that is helpful to the Council. Some questions for the Committee to consider are:

- Does the Committee believe these reviews are helpful and make the document more useful for the Council?
- Is there information or components of the review that are missing or could make the review more informative?
- Is it appropriate to make changes to the priorities since this is a 5-year document? Is there a limit to the amount of change? Should the review just entail an evaluation of completion and progress of priorities (i.e., no changes)?
- Should we minimize the number of reviews?

The Committee should provide any input regarding potential improvements and the value of the review process completed in 2020 and 2021. A Committee recommendation regarding the review and any modifications should be approved for Council consideration at the December meeting.

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**Table 1.** Summary of all recommended modifications to the comprehensive list of priority needs in the Mid-Atlantic Council’s 2020-2024 Research Priorities document.

Priority #	Species	Proposed Change	Rationale/Justification
5	Cross-Species	Language modification	Intended to provide some additional clarity and specificity regarding the potential impacts from offshore wind energy development
**	Cross-Species	New	Have existing wind energy priorities related to biological and socioeconomic impacts. Including the potential science impacts was noted by AP members as missing and needed
8	Cross-Species	Language modification	Considering habitat changes is also a critical component to understand potential implications to stock productivity
15	Atlantic Mackerel	Language modification	New research on microchemistry and genetics is now/soon to be available that may necessitate a review of stock/contingent assumptions
16	Atlantic Mackerel	Priority ranking #	Collection and analysis of egg data is the most critical data need for the stock assessment
21	Atlantic Mackerel	Priority ranking #	Given the new microchemistry and genetic research and information available, this priority could be moved into the short-term/smaller scale grouping and considered sooner
**	Atlantic Mackerel	New	Given the continued poor stock condition, even under continued low catches, the SSC recommended an evaluation of natural and predation mortality for the stock
**	Atlantic Mackerel	New	The revised MRIP estimates indicate that recreational catch is equivalent to nearly 50% of the commercial catch and nearly 40% of the total mackerel catch. The SSC recommended an evaluation of the recreational information, its uncertainties, and implications for the stock assessment
**	Black Sea Bass	New	New recreational models may help provide some additional insight into a greater understanding and predicting the factors that drive recreational harvest and discard
23	Black Sea Bass	Language modification	Updating this discard priority to reflect input from the SSC and to apply to both the recreational and commercial fisheries
24	Black Sea Bass	Remove	Starting to account for anticipated overages in projections and implications of any ABC overages can be evaluated within the management track assessment updates every two years
25	Black Sea Bass	Remove	May not be as relevant given recent actions to update the commercial state allocations and considering an update to the commercial/recreational allocations
29	Black Sea Bass	Remove	The 2016 benchmark assessment evaluation of trawl survey data concluded the gear was the effective and appropriate for use as an abundance index in the assessment. Not sure if a new survey, at this time, is needed
39	Blueline Tilefish	Language modification	Update language to reflect that mandatory reporting now in place and move focus to reviewing and improving reporting in future
41 and 42	Blueline Tilefish	Priority ranking #	Switch priorities to focus on assessment modeling needs given assessment on 2024 SEDAR schedule

**	Butterfish	New	During the development of the current research track assessment, the working group noted that additional exploration of scale uncertainty (i.e., scale of population size) is needed
**	Chub Mackerel	New	More robust estimates of discards and catch are needed to properly monitor and manage the fishery
50	Chub Mackerel	Language modification	Expanding the types of biological information that should be collected from fishery independent and dependent sources
55	Golden Tilefish	Language modification	2020 longline survey provided information to help inform/advance this priority, but additional survey data is needed to complete
56	Golden Tilefish	Priority ranking #	Other priorities focusing on biological sampling and validation more critical
57	Golden Tilefish	Language modification	2020 longline survey did collect additional biological samples but more is needed. Also highlighting an SSC priority to continue to develop year specific age-length keys
59	Golden Tilefish	Language modification	Some ageing work (samples from 2017 and 2020 surveys) has been done, but need to continue efforts
**	<i>Illex</i> Squid	New	Recommendation from assessment lead as a critical need to help evaluate <i>Illex</i> catch in the NEFSC trawl survey
68	Longfin Squid	Language modification	Adding some additional clarity as to the timing and type of evaluation needed between NEAMAP and NEFSC trawl survey
71	Longfin Squid	Priority ranking #	Moved to long-term/larger scale grouping
**	Longfin Squid	New	Consistent with new <i>Illex</i> recommendation regarding need to help evaluate Longfin Squid catch in the NEFSC trawl survey
77	Ocean Quahog	Language modification	New technologies continue to be developed that could prove valuable to increase the sampling (e.g., measure everything versus a sub-sample), including length frequency data, during research surveys
82	Scup	Priority ranking #	Increased interest from the Monitoring Committee in understanding these dynamics; markets may change with possible MSC certification
83	Scup	Language modification	Some clarifying language added to indicate some/on-going analysis on some components of this priority are being conducted
85	Scup	Remove	This priority was addressed during the 2021 Management Track assessment (new 2013+ selectivity block added)
**	Summer Flounder	New	This was a new research priority identified by the SSC given new methods and research has been conducted on this topic
100	Surfclam	Language modification	Making consistent with priority #76 under Ocean Quahog
101	Surfclam	Language modification	Similar changes as proposed for #77 under Ocean Quahog to include emerging technologies for data collection efforts
103	Surfclam	Language modification	Expand priority to address an SSC recommendation to consider stock area connectivity and recruitment processes



## Appendix 1

### Draft comprehensive list of research needs for Mid-Atlantic Council managed species with recommended modifications

#### Modification Key

Purple text – new priority suggested for addition

Red strikethrough – existing priority suggested for deletion

Green text – suggested language modification to existing priority

Highlighted number ↑↓ – suggested change in priority order with direction arrow

## – work being done or in process to address priority

Highlighted priority – Research Steering Committee recommendation and edits

GENERAL OR CROSS-SPECIES	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
1. Investigate stock structure utilizing otolith microchemistry and other genetic analyses for different Mid-Atlantic stocks (e.g., golden and blue line tilefish, black sea bass, Atlantic mackerel, and surfclam). ##	A, F, G
2. Understand the objectives and performance measures for the fishery from a biological and socioeconomic perspective, to evaluate the balance of costs and benefits of ABC specifications (e.g., variable vs. average ABC).	B, C
3. Explore the utilization of local ecological knowledge to help characterize and understand fisheries habitat change over time to help identify areas of greatest need of protection.	C, F, G
4. Create a framework to improve social science information regarding crew employment, remuneration and job satisfaction for all Mid-Atlantic fisheries.	C
5. Evaluate the potential impacts of offshore wind development, including the impacts from electromagnetic fields and noise, on habitats, <del>and</del> productivity, larval distribution, and changing community structure of Council-managed stocks.	A, F, G
** Evaluate the impacts of offshore wind energy development on fisheries-independent surveys (e.g., implications for data collection efforts, survey design, and uncertainty) ##	A, F, G
6. Evaluate the relationship between changes in landings limits and the rates and magnitude of discarding in the commercial and recreational fisheries.	B, C, D, E
7. Evaluate the use of samples collected by the industry study fleet for all Mid-Atlantic stocks.	A, B, F, G
<b>LONG-TERM/LARGER SCALE</b>	
8. Monitor changes in distribution and habitat use for all Mid-Atlantic species and evaluate implications for stock productivity. ##	A, B, D, F, G
9. Collect accurate size and age composition of commercial and recreational catch (including the discarded component of the catch) to develop or improve catch at age matrices for all managed stocks.	A, B, E
10. Incorporate ecosystem level data (predator/prey interactions, trophic dynamics, etc.) into single and multi-species assessment and management models. ##	A, F, G
11. Investigate potential sector and regional allocation changes and adaptive management strategies to respond to changing environmental conditions.	C, D, F, G

12. Develop tools to collect representative economic information on fixed and variable trip costs to understand fleet profitability for all Mid-Atlantic fisheries.	C, E, F
13. Evaluate potential socioeconomic impacts of offshore wind energy development on Council-managed fisheries, including changes in fishing behavior, changes in the distribution of fishing effort, changes in revenues, and differential impacts on commercial and recreational fisheries. ##	C, E, F
14. Implement novel supplemental surveys to derive fishery independent indices of abundance (black sea bass, blueline and golden tilefish, Atlantic mackerel). ##	A

ATLANTIC MACKEREL	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
15. Investigate Revisit stock structure and spawning components through based on additional recent otolith microchemistry and/or genetic projects data. ##	A, F, G
16↑. Continue to collect and evaluate mackerel egg data (ECOMON survey). ##	A
<b>LONG-TERM/LARGER SCALE</b>	
** . Evaluation of time and age-variant natural mortality and predation mortality for this stock	A, F, G
** . Evaluate data quality and assessment sensitivities for U.S. recreational data, and unmonitored Canadian data.	A
17. Develop methods for using acoustics to determine Atlantic mackerel abundance and/or catchability.	A
18. Initiate a reproductive study in the U.S. to obtain fecundity estimates and spawning seasonality. Update Canadian fecundity estimates (which are currently based on a 1986 publication) and compare estimates between countries.	A
19. Obtain biological samples from all components of the fishery and covering both spawning contingents.	A
20. Investigate possible growth and maturity differences between spawning contingents.	A
21↑. Continue to pursue modeling approaches that explicitly account for the spatial structure of the stock (i.e. two spawning contingents). ##	A
22. Explore potential changes in environmental conditions (habitat changes, larval diets, cannibalism, etc.) that impact larval survival and recruitment.	A, F, G

BLACK SEA BASS	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
** . Evaluate the biological, management, and socioeconomic drivers of recreational harvest and discards. ##	B, C, E
23. Increase sea sampling in both stated and federal waters to verify information from commercial logbooks to provide better estimates of discards ( Improve the precision of recreational and commercial discard estimates and estimate the uncertainty of recreational and commercial discards with emphasis on commercial pot trap and hook and line gear. ##	A, B
24. Evaluate the implications of continued ABC overages on stock projections.	A
25. Utilize a management strategy evaluation to consider alternative allocation schemes.	C, D
26. Continued evaluation of the appropriateness of the current model structure with two spatial sub-units. ##	A
<b>LONG-TERM/LARGER SCALE</b>	
27. Investigate movement rates and cues within the population, and spatial patterns in growth, recruitment, and mortality.	A, G

28. Investigate the impact of a changing environment due to climate change on the life history and spatial dynamics of the stock and fisheries.	A, F, G
<del>29. Develop a reliable fishery independent index for black sea bass for habitats not effectively sampled with existing methodologies.</del>	A
29. Consider or investigate new or alternative methods that effectively sample in black sea bass habitats.	

BLUEFISH	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
30. Enhance the data collection of recreational discard lengths and weights to develop a more reliable recreational discard estimate in weight. ##	A, B, E
31. Evaluate species associations with recreational angler trips targeting bluefish to potentially modify the bluefish recreational CPUE index used in the assessment. ##	A
32. Evaluate methods for integrating disparate indices produced at multiple spatial and temporal scales into a stock-wide assessment model. ##	A
33. Evaluate changes in selectivity of age-0 bluefish in fishery independent surveys due to shifting environmental conditions. Investigate trends in recruitment.	A, G
34. Conduct a post-release mortality study to determine if the recreational discard mortality rate has changed over time.	A, B, E
35. Investigate the assumption of zero discards in the commercial fishery. ##	A, B
<b>LONG-TERM/LARGER SCALE</b>	
36. Develop a fishery independent index and/or fishery dependent sampling program of offshore populations of bluefish to capture larger, older fish.	A, G
37. Investigate how environmental variability may affect timing of migration patterns of juvenile bluefish and the distribution of adults, which in turn, may affect availability. ##	A, G

BLUELINE TILEFISH	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
38. Identify data sources and sampling methods to improve the biological length samples of commercial and recreational landings to better characterize the size distribution of removals.	A, E
39. Incorporate Review and consider enhancements to improve mandatory logbook reporting for all recreational anglers and collect fishery-dependent information such as effort, total catch and length information on harvested and discarded fish. ##	A, B, E
40. Collect additional biological samples to enhance understanding of life history dynamics and biological characteristics of the stock (e.g., age and size of maturity, maximum age, fecundity, spawning periods).	A
<b>LONG-TERM/LARGER SCALE</b>	
41↓ (to #42). Research the reliability of aging methods and determination of growth parameters (e.g., intensive tagging survey). Collect additional age information from the commercial and recreational sectors.	A
42↑ (to #41). Investigate new stock assessment approaches, including non-equilibrium methods, should be explored.	A
43. Conduct habitat studies of deep-water sites in the mid-Atlantic (Norfolk Canyon, Baltimore Canyon, and Hudson Canyon).	A, G

BUTTERFISH	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
44. Examine the efficiency (including day vs. night) of survey gear and potential changes in butterfly catchability including a parallel catchability estimate for NEFSC Spring surveys so that both Spring and Fall surveys can be included in the model. ##	A
45. Evaluate approaches to include additional surveys (e.g., states) in the assessment model. ##	A
46. Evaluate the uncertainty in the ad hoc $F_{MSY}$ proxy and effects on catch advice. ##	A
47. Consider development of reference points that are internal to the stock assessment model. ##	A
<b>LONG-TERM/LARGER SCALE</b>	
** Further investigate methods to inform population scaling within assessments.	A
48. Further investigate the role of butterfly in the ecosystem and refine predation estimates. ##	A, F
49. Reconsider stock structure and degree of exchange with south Atlantic stock component (i.e., stock ID).	A, G

CHUB MACKEREL	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
** Develop expanded discard estimates for the region and better quantify South Atlantic catch.	A
50. Collect length, age, growth, maturity information from fishery independent and dependent data sources throughout U.S. Atlantic water. ##	A
51. Evaluate catch per unit effort including the influence of environmental and socioeconomic factors.	A, C, G
52. Investigate existing egg and larval surveys throughout the U.S. Atlantic coast to better understand chub mackerel recruitment dynamics. ##	A
<b>LONG-TERM/LARGER SCALE</b>	
53. Investigate stock mixing throughout Atlantic waters, as applicable.	A
54. Investigate habitat use at different life stages.	A, F

GOLDEN TILEFISH	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
55. Continue to utilize fishery-independent information to assess whether the dome-shaped selectivity curve used in the assessment reflects fishery selectivity or availability, or both. ##	A
56↓ (to #59). Evaluate data collection methods to increase information on gear conflicts, species interactions (i.e., spiny dogfish), and bait type to understand their effects on the commercial CPUE index.	A, B, F
57. Continue to collect and analyze biological samples to create year specific age-length keys and to improve life history, maturity and distribution information. ##	A
58. Develop sampling programs to increase information of recreational landings at size and age.	A, E
59. Continue to assess the accuracy and reliability of aging techniques. ##	A
<b>LONG-TERM/LARGER SCALE</b>	
60. Evaluate the role of the golden tilefish gear restricted areas on the stock and its fisheries.	A, F
61. Evaluate the effects of climate and environmental indices on stock dynamics.	A, F, G

ILLEX SQUID	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
62. Collect demographic information on growth, mortality, reproduction by sex, season, and cohort. ##	A
63. Investigate feasibility of real-time management, including undertaking cooperative research with the fishing industry. ##	A, C
64. Analyze the change in availability of <i>Illex</i> to the survey and fishery, resulting from long-term changes in climate or other oceanographic factors.	A, F
65. Expand investigations into oceanographic correlates with trends in recruitment and abundance.	A, F
<b>LONG-TERM/LARGER SCALE</b>	
** Quantify escapement over the headrope and wings of the NEFSC survey trawl.	A
66. Investigate beyond-shelf availability.	A

LONGFIN SQUID	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
67. Further develop practicable ways to reduce bycatch.	B
68. Refine understanding of availability and catchability in surveys (e.g., especially fall NEAMAP-Bigelow comparisons and conversion factors).	A
69. Collect more age, sex and maturity data for each seasonal cohort.	A
70. Evaluate effectiveness of current mesh regulations.	B
71. Determine what portion of stock is outside current research trawl surveys.	A
<b>LONG-TERM/LARGER SCALE</b>	
** Quantify escapement over the headrope and wings of the NEFSC survey trawl.	A
72. Until real-time assessment is feasible, expand cohort analysis to refine stock assessments and their incorporation of seasonal indices (currently spring and fall are just averaged).	A
73. 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.	A
74. Evaluate methods of incorporating ecological relationships, predation, and oceanic events that influence abundance and availability.	A, F
75. Refine understanding of stock range and structure. ##	A, G

OCEAN QUAHOG	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
76. Conduct research to better understand life history for an extremely long-lived species at appropriate temporal and spatial scales (growth, size-at-age, recruitment, natural mortality, maturity-at-length, and fecundity – in order of priority).	A
77. Evaluate the cost and benefit of different technological methods (e.g., HABCAM, EM, AI, and optical surveys) for measuring ocean quahog abundance, length frequency, and habitat. ##	A, F
<b>LONG-TERM/LARGER SCALE</b>	
78. Conduct work to support spatially explicit stock assessments that account for source and sink differences in productivity (i.e., are some areas more important to productivity than others).	A

79. Development of techniques to age ocean quahogs in a cost-effective manner.	A
<b>SCUP</b>	
<b>SHORT-TERM/SMALLER SCALE</b>	
80. Evaluate the spatial and temporal overlap of scup and squid to better understand and characterize scup discard patterns.	A, B, F
81. Characterize the pattern of selectivity for older ages of scup in both surveys and fisheries.	A
82 ↑ (to #80). Explore the relationship between scup market trends, regulatory changes, and commercial landings and discards.	B, C, F
<b>LONG-TERM/LARGER SCALE</b>	
83. Continue to evaluate the role and relative importance of implemented management strategies (i.e., gear restricted areas, increased minimum mesh size, and minimizing scup and squid fishery interactions) versus and expand analysis to consider the long-term climate variability to the increases in stock abundance and high recruitment events since 2000. ##	A, B, D, F, G
84. Characterize the current scup market and explore the development of new markets.	C
<del>85. Explore the applicability of the pattern of fishery selectivity in the model to the most recent catch data to determine whether a new selectivity block in the model is warranted.</del>	A
<b>SPINY DOGFISH</b>	
<b>SHORT-TERM/SMALLER SCALE</b>	
86. Integrate recent information on the efficiency of the NEFSC survey gear as it relates to: distribution of spiny dogfish beyond the current NEFSC trawl survey geographic footprint (including inter annual differences); gear efficiency; depth utilization within the footprint; distribution within the survey footprint under different environmental conditions. ##	A, G
87. Explore model-based methods to derive survey indices for spiny dogfish. ##	A
88. Investigate alternative stock assessment modeling frameworks that evaluate: the effects of stock structure; distribution; updated biological information such as sex ratio and spiny dogfish productivity; state-space models; and sex-specific models. ##	A
89. Evaluate the utility of the study fleet information as it relates to issues identified under priority #86 above. ##	A
<b>LONG-TERM/LARGER SCALE</b>	
90. Research opportunities to increase domestic and/or international market demand.	C
91. Expand information on the efficiency of the NEFSC survey gear as it relates to: distribution of spiny dogfish beyond the current NEFSC trawl survey geographic footprint (including inter annual differences); gear efficiency; depth utilization within the footprint; distribution within the survey footprint under different environmental conditions.	A, G
92. 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).	A
93. Evaluate ecosystem effects on spiny dogfish acting through changes in dogfish vital rates.	A, F, G

SUMMER FLOUNDER	Corresponding Theme(s)
<b>SHORT-TERM/SMALLER SCALE</b>	
94. Collect length, weight, and age data by sex to fully evaluate the sex and size distributions of landed and discarded fish in the summer flounder fisheries.	A, B, E
95. Evaluate summer flounder discard survival under different environmental variables and gear configurations with survey design considerations that account for feeding and predation.	A, B, E
<b>LONG-TERM/LARGER SCALE</b>	
96. Continue to evaluate the causes for decreased recruitment, changes in recruitment distribution, and changes in the recruit-per-spawner relationship in recent years. Develop studies, sampling programs, or analyses to better understand how and why these changes are occurring, and the implications to stock productivity.	A, F, G
97. Evaluate range expansion and/or changes in distribution and their implications for stock assessment and management.	A, F, G
98. Explore the potential mechanisms for recent slower growth that is observed in both sexes.	A, F, G
99. Incorporate sex-specific differences in size-at-age into the stock assessment through model structures as well as data streams.	A
** <a href="#">. Reconsider stock structure based on modern approaches.</a>	A, F, G
<b>SURFCLAM</b>	Corresponding Theme(s)
<b>SHORT-TERM/SHORTER SCALE</b>	
100. Conduct research to better understand life history at appropriate temporal and spatial scales ( <a href="#">fecundity, maturity at-length, age and growth, recruitment, and natural mortality information</a> <a href="#">growth, size-at-age, recruitment, natural mortality, maturity-at-length, and fecundity</a> – in order of priority).	A
101. Evaluate the cost and benefits of <a href="#">different technological methods</a> (e.g., HABCAM, EM, AI, or optical surveys) for measuring surfclam abundance and habitat, including <a href="#">patch-size-clam density</a> . <a href="#">##</a>	A, F
<b>LONG-TERM/LARGER SCALE</b>	
102. Examine the effects of climate change on the spatial distribution of clams, on the operation of the fishery, and patterns of discarding/incidental mortality, and on the overall productivity of the stock.	A, B, F, G
103. Evaluate small-scale surfclam patch density <a href="#">and the connectivity of the two stock areas</a> (Mid-Atlantic and Georges Bank) and the implications on stock dynamics, particularly reproductive success <a href="#">and recruitment exchange</a> .	A