New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
Eric Reid, Chair | Thomas A. Nies, *Executive Director*

MEMORANDUM

DATE: May 27, 2022

TO: Groundfish Committee

FROM: Groundfish Plan Development Team

SUBJECT: **2022-2026 Council Research Priorities Related to Groundfish**

On May 18, 2022, the Groundfish Plan Development Team (PDT) reviewed groundfish-related Council research priorities. The PDT forwards its recommendations to the Groundfish Committee for consideration. The Council plans to decide on its 2022-2026 research priorities at its June 2022 meeting.

The 2021-2025 Council Research Priorities included several related to groundfish, habitat, and multiple plans (Attachment 1). The PDT notes additions in green and deletions in ~~red strike through~~.

Enclosed, please find a letter from the Council to the Northeast Fisheries Science Center in March 2021 requesting that white hake and redfish be aged and the response from the Center. The Committee may wish to consider an addition to the list of research priorities.

DRAFT NEFMC Research Priorities and Data Needs, 2022-2026
Groundfish

DRAFT May 27, 2022

No.	Title	Description, rationale, potential use	Rating	Status	FMP	Species	Broad categories	Cross-listing	Notes
4	~~Develop a conversion factor between the survey results for the *R/V Albatross* and *R/V Bigelow* for wolffish.~~	Would improve wolffish stock assessment.	Important (near term)	Unknown	Northeast multispecies	Atlantic wolffish	Fish surveys	Unknown	This factor becomes less important as more years of *R/V Bigelow* data are used in assessments. NEFSC is using the ocean pout conversion for wolffish until the Albatross and Bigelow data can be split into separate series. PDT suggests removing and adding wolffish under #7 & #31.
7	Supplement existing surveys with fixed gear and/or advanced sampling techniques to facilitate sampling in inaccessible areas.	e.g., use of longline or pot/trap gear to sample within complex habitat areas.	Important (near term)	Underway	Multiple	Multiple	Fish surveys	Unknown	NEFSC/CRB funding a GOM longline survey. Consider Atlantic cod, Atlantic halibut and wolffish.
16	Further investigations into stock definition, stock movements, mixing, and migration through tagging studies, DNA markers, morphological characteristics and other means for groundfish (Atlantic cod, Atlantic halibut).	To improve the understanding of stock structure of Atlantic cod and Atlantic halibut, possibly make changes in the future to the stock boundaries.	Important (near term)	Underway	Northeast multispecies	Cod, Halibut	Population dynamics	Unknown	Multiple completed and ongoing projects. Cod: SMAST, MA DMF, Cornell, UNH; TNC& GMRI (3 S-K projects); completed report of Atlantic Cod Stock Structure Working Group. Being considered in the Atlantic cod Research Track. Halibut: TNC.
24	Investigate fine-scale spawning dynamics and the appropriate size and timing of spawning area closures.	Potential to adjust time-area closures for groundfish species or impact small-mesh multispecies exemption areas.	Important (near term)	Underway	Multiple	Multiple	Population dynamics	Unknown	Two S-K projects and Council-funded projects on cod and winter flounder spawning. NEFSC has supported a GMRI study.
28	Continue to explore uncertainties in groundfish stock assessments, including retrospective patterns; identify adjustments (e.g., data or modeling revisions) to resolve those patterns.	Would improve groundfish stock assessments.	Urgent (essential)	Underway	Northeast multispecies	Groundfish	Stock assessment, Ecosystems	Unknown	Council contracted J. Wiedenmann & O. Jensen at Rutgers work; NEFSC working on this issue (WKFORBIAS workshop, report in prep). Work from Index-Based Methods Working Group.
30	Develop guidance for rejecting stock assessments and next steps, including how to set new biological reference points if an assessment/model is rejected.	Would improve the stock assessment process.	Urgent (essential)	Underway	Multiple	Multiple	Stock assessment	Unknown	Badly needed. NRCC has started efforts on BSIA. SMS stock assessments have been previously rejected & this issue could arise again in future assessments.
31	Explore use of survey results from the *R/V Bigelow* as a separate index of abundance as the survey time series lengthens.	Would improve stock assessments. May be important for SMS stocks, although calibration studies were deemed sufficient for silver & red hakes.	Important (near term)	Underway	Multiple	Multiple	Stock assessment	Unknown	This is part of the benchmark assessment process already. The 2018 A. herring benchmark assess. was the first to do so for a NE species/stock. Could also consider for wolffish.
35	Incorporate other surveys into stock assessments as appropriate.	Would improve stock assessments. Including industry-based surveys, state surveys, NEAMAP, collaborative surveys with industry and scientists.	Important (near term)	Underway	Multiple	Multiple	Stock assessment	Unknown	Used recently for GOM cod, witch flounder, and GB yellowtail flounder assessments. NEFSC plans to evaluate in management track process. Probably needed for small-mesh multispecies stocks.
36	~~How should the inshore and offshore components of the groundfish fishery be identified?~~	Investigate the modern groundfish fishery.	Important (near term)	Unknown	Northeast multispecies	Groundfish	Fisheries management, Human dimensions	Unknown	No NEFSC work. The PDT suggests removing if this is no longer of interest.
37	~~Examine whether the current definition of the directed groundfish fishery (landing >1 lb. groundfish per year) is still appropriate.~~	Investigate the modern groundfish fishery and explore other definitions to identify whether the economic analyses for groundfish actions accurately capture the fishery.	Important (near term)	Unknown	Northeast multispecies	Groundfish	Fisheries management, Human dimensions	Unknown	No NEFSC work. Topic came up in the 2019 interviews of Council members (Williams et al 2020). The PDT suggests removing if this is no longer of interest.

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38	Evaluate the effectiveness of the groundfish ABC control rule for setting groundfish catch advice.	Use of groundfish ABC control rule has been difficult recently. Investigate: 1) the potential for using F-ramp procedures in control rules, & 2) when to use "Option C" & how to estimate ABC with it (for stocks that cannot rebuild to BMSY in the specified rebuilding period, even with no fishing, the ABC should be based on incidental bycatch, incl. lowering bycatch rate).	Strategic (future needs)	~~Unknown, Underway, Underway, Unknown~~	Northeast multispecies	Groundfish	Fisheries management	Unknown	This was a Nov. 2016 SSC recommendation resulting from discussion of the Wiedenmann and Jenson work. The SSC felt that control rules for all FMPs should be investigated starting with groundfish. A MSE-like study may help. GMRI completed MSE-like study for Council. Changes being considered under FW65, Council priority for 2021-2022. Change status to "underway"
39	Catch efficiencies by mesh size, when new minimum fish size regulations are implemented.	Investigate potential means to improve access to healthy stocks while minimizing impacts to stocks needing conservation.	Strategic (future needs)	~~Unknown~~	Northeast multispecies	Groundfish	Fisheries management	Unknown	Mesh size, possession limits, and small-mesh access areas should also be considered. No NEFSC work. Small mesh for haddock was an item not approved in A16. Relevant to the redfish exemption area in FW61 and maximized retention in A23. Change status to "underway"
40	~~Options to broaden the definition of the sector system & increase flexibility in groundfish fishery operations (e.g., expanding the range of participants allowed to join sectors and the suite of permits and their associated allocations that can be used under sectors).~~	Investigate potential means to improve access to healthy stocks while minimizing impacts to stocks needing conservation.	strategic (future needs)	Unknown	Northeast multispecies	Groundfish	Fisheries management	Unknown	No NEFSC work. The PDT suggests removing if this is no longer of interest.
41	Research on organizational theory, collaboration and trust and its implications for the use of science in decision making and acceptance of management outcomes.	Could improve NEFMC and NMFS processes.	Urgent (essential)	Underway	Multiple	Multiple	Fisheries management, Human dimensions	HI-EBFM	Priority added in 2020. See Ebbin (2004).
43	Research and/or policy analysis study to move towards recommendations for how the Council addresses environmental justice, including the nexus with data collection and repeatability, and process recommendations for engagement.	Would improve ability to address public engagement requirements in various statutes and compliance with the EO 12898 on Environmental Justice.	Urgent (essential)	Underway	Multiple	Multiple	Fisheries management, Human dimensions	HI-EBFM	Priority added in 2020. Was a recommendation of the 2018 NEFMC program review. NEFSC has ongoing work on this topic. Ongoing EJ work includes community snapshot profiles and repackaged social indicators into EEJ search tool in development.
45	Investigate the economic impacts of GB yellowtail flounder quotas on the scallop fishery, particularly how allocations of other fisheries impact rotational management.	Would improve the economic impact assemments of groundfish and scallop actions.	Urgent (essential)	Underway	Northeast multispecies, Sea scallop	Scallops, Groundfish	Fisheries management, Human dimensions	Unknown	Priority added in 2020. The PDT plans to check with Scallop PDT on if this work is "underway" as indicated in the status collumn.
53	~~Investigate the feasibility of permit splitting across and within all FMPs.~~	Increase flexibility & reduce the barriers for new entrants to NEFMC fisheries, to achieve goals of FMPs. Explore why the decision was made to bind certain permits together and revisit to see whether it is still appropriate. Could involve MAFMC permits.	Important (near term)	Unknown	Multiple	Multiple	Fisheries management, Human dimensions	Unknown	This priority might be relevant for vessels in the small-mesh multispecies fishery, although effects of permit changes could have implications for the open access fishery. No NEFSC work. The PDT suggests removing if this is no longer of interest.
56	Improve sampling for commercial groundfish catch at age data, e.g., cooperative NMFS-industry programs to supplement port agent activities, with emphasis on bycatch (incl. incidental catch).	Improve data for stock assessments	Strategic (future needs)	Underway	Northeast multispecies	Groundfish	Fishery performance & monitoring	Unknown	Work underway by the NEFSC Cooperative Research Biosampling Program. The PDT would like clarrification if this is in repsonse to recent reductions in the federal port sampling program.

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57	~~Evaluate spatially explicit changes in groundfish fleet behavior in response to restricted fishing in closed areas.~~	Impacts analysis of management actions.	Strategic (future needs)	Unknown	Northeast multispecies	Groundfish	Fishery performance & monitoring	Unknown	It is important to understand the effects of a key management tool, i.e. closed areas. No NEFSC work but Gini indices are calculated in some assessments. The PDT suggests removing if this is no longer of interest or redefining the purpose of the study. There has been a decreased emphasis on closed areas for the management of groundfish, if targeted at closed area access programs there seems to be little purpose for this.
58	Investigate groundfish discard mortality rate estimates across gear types (e.g., GB cod for the recreational fishery).	There are currently different mortality rates used for GB and GOM cod for the recreational fishery; the explanation for this difference is unclear.	Important (near term)	Underway	Northeast multispecies	Groundfish	Fishery performance & monitoring	Unknown	Recent Council-funded project and literature review by PDT changed discard mortality rates for wolffish, Atlantic halibut, and GOM haddock. Outside of NEFSC expertise.
59	Research the extent and composition bycatch, discards and discard survival in the large-mesh groundfish fishery (e.g., silver hake).	Could be used to design selective gear or area/season management and improve catch reporting.	Important (near term)	Underway	Northeast multispecies, Small-mesh multispecies	Groundfish, Silver hake	Fishery performance & monitoring, Bycatch	Unknown	Silver hake catches have been a fraction of the ACL, but we have reduced the southern whiting specifications by 38% due to declining biomass. Outside NEFSC expertise.
60	Continue to improve reporting accuracy, including accurate reporting of species and area fished.	Would improve catch reporting, including proper identification of key species, which are often misreported by fishermen (e.g. red/white hake; silver/offshore hake).	Important (near term)	Underway	Multiple, Small-mesh multispecies, Northeast multispecies	Multiple, Offshore hake, Red hake, White hake	Fishery performance & monitoring	Unknown	Work to support Amendment 23/Groundfish Monitoring for the commercial Fishery. A23 is now approved.
64	Identify gears and/or methods that would reduce bycatch and/or improve discard survival of unwanted catch, that may change the ratio of component catch species or improve size and species selectivity of gear for groundfish, monkfish, herring and skates.	Minimize bycatch	Urgent (essential)	Underway	Northeast multispecies, Monkfish, Atlantic herring, Skates	Groundfish, Monkfish, Atlantic herring, Skates	Bycatch, Gear	RSA	Many projects, e.g., BREP 2018 award creating bycatch avoidance model for rec fishery; small-mesh belly panel to reduce flatfish. Four S-K projects on lobster trap bycatch & haddock trawls. 2013 S-K project on reducing sturgeon bycatch in monkfish gillnet. Outside of NEFSC expertise.
73	Develop gear modifications or fishing techniques that may reduce or eliminate the threat of sea turtle interactions without unacceptable reductions in target retention in all fisheries.		Strategic (future needs)	Underway	Multiple	Multiple	Protected species, Bycatch	Unknown	A 2022-2023 RSA priority. MADMF (2016) studied leatherback behavior off Cape Cod to help reduce entanglements. CFF (2017) studies turtle bycatch reduction. NEFSC comparative TED study in longfin squid fisher; report passed NEFSC review. Ongoing contract for work in gillnet fishery and with larger vessels in squid fishery.
75	Policy evaluation of bycatch management, incl. possible implementation of a 100% retention policy to minimize discarding and ecosystem effects.		Important (near term)	Unknown	Multiple	Multiple	Bycatch	Unknown	This issue is important for all species with a significant amount of discards, including silver and red hakes. No NEFSC work. The PDT notes Maximized Retention/Electronic Monitoring could be a case study for 100% retention for groundfish. PDT would still mark as "unknown" status.
76	Data collection efforts for improved social and economic impact analyses, as well as cost-benefit analysis, for all fisheries, but particularly groundfish and Atlantic herring.	Some of this is done; fixed cost data is a particular need. The data is needed in user-friendly formats.	Urgent (essential)	Underway	Northeast multispecies, Atlantic herring, Multiple	Groundfish, Atlantic herring, Multiple	Human dimensions	HI-EBFM	2013 and 2017 S-K projects on groundfish communities. For herring, some work was done for the IFM amendment. NEFSC SSB data collection continues (e.g., crew survey, income survey). Topic came up in the 2019 interviews of Council members (Williams et al 2020). NEFSC cost-survey expected in 2023.

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78	All fisheries: (1) the vessels, firms, organizations, and communities involved; (2) capacity use and fixed costs; (3) stakeholders besides directed fishery participants; (4) dealers and processors (e.g., dependence on fishery, location, costs, earnings, employment); and (5) market dynamics (e.g., relationships between fishermen, buyers, and processors; and end users).	For use in Council actions: describing the potentially impacted human communities and potential impacts.	Urgent (essential)	Underway	Multiple	Multiple	Human dimensions	HI-EBFM	Priority added in 2019. See also the needs identified in the Groundfish Catch Share Program Review (Swasey et al., 2020). Topic came up in the 2019 interviews of Council members (Williams et al 2020). Some work underway by NEFSC.
79	Improve quantification of economic impacts from restricted fishing in closed areas and small-mesh exemption areas (lack of access to other areas).	Could develop a spatially-explicit fleet behavior model. A MSE-like study may be appropriate.	Important (near term)	Unknown	Multiple	Multiple	Human dimensions	Unknown	
80	Evaluate other human dimensions data sources to supplement NEFSC crew/industry survey data.	Work to address challenges of sample size, repeatability, reliability, etc. in economic, sociological, an other human dimensions research.	Urgent (essential)	Unknown	Multiple	Multiple	Human dimensions	HI-EBFM	Priority added in 2020. NEFSC cost-survey expected in 2023.
81	Advance efforts to incorporate new data and concepts into the development, review, and update of social science indicators.	Opportunity to further connect work underway across the NEFSC SSB with other work at NEFSC and with other related indicators work (i.e. NOAA-BEA ocean economy report, NOAA E-NOW, Stimpson Center CORVI, etc.).	Urgent (essential)	~~Unknown~~	Multiple	Multiple	Human dimensions	HI-EBFM	Priority added in 2020. NEFSC has ongoing work, update status with "underway"
82	Investigate the value (existence, use, option) of deep-sea corals. Estimate coral recovery rates, and how they relate to intermporal tradeoffs around fishing and coral protection.	Would support consideration of new or modified coral protection zone designations. Typically existence value is assessed with willingness to pay surveys.	Important (near term)	Unknown	Multiple	Multiple	Human dimensions, Habitat	Unknown	DSCRTP funding-could help (planning 2022 or 2023, funding fo three years afterward). European literature on existence value of *Lophelia;* see also O'Connor et al 2020, Ankamah et al 2020. Continued NEFSC analyses of past surveys; characterizing habitats & contributing to DSCRTP national coral database. Intermittent funding for cruises from outside NEFSC in the meantime.
83	Within a variety of habitat types, quantify the degree of seabed contact for fishing gears and their component parts, particularly groundfish trawls (e.g., chain vs. roller sweeps, modified ground cables (e.g. shortened, raised), semi-pelagic doors). Better quantify gear dimensions (width) estimate swept area more accurately.	Would support refinements to the Fishing Effects (SASI) model, specifically the discrimination of impacts between different types of trawls, and facilitate the design of gear-restriction vs. closure area management approaches.	Strategic (future needs)	Unknown	Northeast multispecies	Groundfish	Habitat	Unknown	Fishing Effects (SASI) model was updated in 2018-2019 but did not tackle this issue. Outside of NEFSC expertise.
84	Characterize and evaluate current and potential HMAs and HAPCs.	Identify nursery and over-wintering habitats of species vulnerable to habitat alteration by fishing gear (e.g., scallop dredge).	Important (near term)	Underway	Multiple	Multiple	Habitat	Unknown	Scallop RSA funded Scott Gallagher at WHOI to compete 3 years of BACI work in the EGB HAPC. Final report completed; additional analyses provided to Habitat PDT April 2021. Habitat PDT working on Northern Edge white paper. Clam dredge-mounted video work in GSC HMA; HABCAM and SMAST drop camera data could be applied. Importance of inside/outside comparisons of fish condition (e.g., Sherwood & Grabowski 2015).

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85	Evaluate habitat recovery following impact by fishing gear (scallop dredges trawls, clam dredge, fixed gears), and long-term or chronic effects of fishing on marine resource productivity.	Would help develop or revise spatial management for habitat protection. This includes examining gear impacts on seabed habitats in Northeast US waters that account for effort, season, sedimentary character and biological community.	Strategic (future needs)	Underway	Multiple	Multiple	Habitat	Unknown	Linking the state of impacts and recovery to managed species could begin by reviewing seafloor images. Re corals, potential to document trawling impacts using existing database of images and/or use these to document baseline conditions in new DSC closures. Estimating effects on resource productivity is more difficult. RSA-funded project Northern Edge Georges Bank (Gallager et al). Also Cau et al. (2020), Steves et al. (2020), Sciberras et al. (2018), Sullivan et al. (2006), Sullivan et al. (2000).
87	Understand relationships between managed species & their geological, biological, & physical habitats; assess spatial & seasonal variation in habitat use & fisheries productivity. Specifically: (1) Concurrent spatial data on recruitment, growth & reproduction of managed fish & shellfish across habitats & environments. (2) Links between habitat characteristics & primary prey species, through a concurrent assessment of habitat characteristics & prey species occurrence. (3) links between habitat types (e.g., space/time variation of shelter & prey) & the productivity of managed species.	Research to help analyze and evaluate the benefits of spatial management alternatives for habitat. This work could help refine EFH designations. Ideally, these results will contain spatially-explicit data incl. species abundance at different life-history stages, measures of species condition (or survivorship, growth rate, or similar metric linked to variation in productivity across the landscape) and the characteristics of concurrently sampled habitat features, substrates and associated prey.	Urgent (essential)	Underway	Multiple	Multiple	Habitat	Unknown	This is the cornerstone of habitat management and important for habitat management in an ecosystem plan. The work should explicitly explain data limitations defining essential fish habitat, given the original sampling design and spatial and temporal scales of sampling. Planned NHRA habitat suitability and species distribution modeling work will support this priority; suggest using NHRA results to generate field-testable hypotheses. Some NEFSC work underway. Pickens et al. (2021).
88	Studies that would inform assessments of the effects of fixed gears on seabed habitat components.	Extent of fixed gear movement along the seabed during setting, soaking, and hauling is unknown. Would support refinements to SASI/Fishing Effects model. Important for deep-sea corals.	Strategic (future needs)	Underway	Multiple	Multiple	Habitat	Unknown	Schweitzer & Stevens paper on trap gears. Consider impacts to coral & sponge habitats specifically, possibly using Jordan Basin as study site. No NEFSC work underway.
89	Targeted studies following the 2013-2019 Northeast region deep-sea coral research in the Gulf of Maine and in the offshore canyons and seamounts that focus on defining areas/habitat conditions that support coral and sponge “garden” habitats. Studies of growth, reproduction, population connectivity and particularly their functional role as fish habitat are needed. Develop more sophisticated, higher-resolution models that predict coral presence/absence or relative abundance, not just likelihood of occurrence or habitat suitability.	Would facilitate future revisions (boundary changes, or additions of new areas) to deep-sea coral management zones in the Gulf of Maine and canyons/slope.	Strategic (future needs)	Unknown	Multiple	Multiple	Habitat	Unknown	Need more general DSC surveys, to groundtruth & improve the habitat suitability model & lessen the need for it. Would give a handle on DSC biodiversity, biogeography, & genetics (or population connectivity). During discussion of the Jordan Basin coral DHRA, NEFMC wanted study on effects of mobile trawl gear. Potentially a separate topic. Additional funding through the DSCRTP coming for the northeast region in 2023 or 2024 for three years. June 2019 Northern Neighbors cruise. Continued updates to DSCRTP database. Continued data analyses & specimen studies from previous surveys; characterizing habitats & contributing to DSCRTP national coral database. Intermittent funding for cruises coming from outside NEFSC in the meantime. Future modeling work requires NOS expertise.

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90	Refine estimates of benthic boundary shear stress at the seabed/water column interface and ground truth critical shear stress thresholds across seasons and depths (i.e., are seabed sediments stable/unstable at various levels of flow, as predicted by models, what are effects of variation in biological attributes that influence disturbance via shear stress).	Would support refinements to SASI/Fishing Effects model. When possible, use data from sensors deployed on the seabed to ground truth modeled estimates.	Strategic (future needs)	Unknown	Multiple	Multiple	Habitat	Unknown	Possible to look at this issue using existing seabed imagery? Two hypotheses - high stress results in unstable communities, and hgh stress leads to animals adapted to those conditions. Understanding this (i.e., sheer stress) might also be important for deep-sea coral habitat suitability modeling and perhaps other biological components of the benthos. Outside NEFSC expertise.
91	Geological and biological sampling using acoustic, video, and grab sampling in the Gulf of Maine and Southern New England region to improve spatial resolution of habitat distributions and characterize temporal (e.g., interannual, seasonal) variability. Include targeted sampling of benthic community structure (infauna and epifauna) in representative substrate types (e.g., mud, sand, gravel, cobble, and boulder in high and low energy environments) across multiple environmental settings.	This is an important priority for habitat management in an ecosystem plan. Would improve support for spatial management intended to target specific habitat types for protection. Some areas of the GOM are very sparsely sampled for benthic habitat characteristics. SNE includes habitat management areas of particular interest (i.e., Great South Channel HMA) as well as offshore wind development sites. Could also help with aquaculture citing.	Urgent (essential)	Underway	Multiple	Multiple	Habitat, Wind energy, Aquaculture	Unknown	Habitat mapping is a foundation for many other studies. Acoustic mapping is underway in GOM for deep-sea corals (US/CAN collaboration using ROPOS platform). Such mapping also being discussed in Great South Channel/Nantucket Shoals region. Data related to this priority exist in SNE region related to offshore wind projects but note that the spatial resolution of benthic data to support wind development is too coarse to resolve habitat features at sub-meter scales (important to use these data appropriately). Note NOAA/Ørsted MOA on data sharing. See substrate mapping report for NY Bight (BOEM funded NCCOS project). INSPIRE Environmental study at BIWF. Updated NMFS habitat mapping recommendations were given to BOEM March 2021. BOEM habitat characterization studies; HabCam images could be analyzed. RODEO environmental studies program (Carey et al., 2020).
93	Quantify predator/prey relationships that are important to the development of management strategy evaluations.	Information is needed to develop ecosystem management tools and approaches.	Important (near term)	Underway	Multiple	Multiple	Ecosystems	Unknown	NEFSC Food Habits Program and evacuation rate studies.
96	Icthyoplankton monitoring	Data is needed to assess changes in predation and effects on productivity	Important (near term)	Underway	Multiple	Multiple	Ecosystems, Population dynamics	Unknown	Priority added in 2020. Failures to obtain full spatial coverage during recent EcoMon plankton surveys contribute to uncertainty about recent shifts in spawning activity.
97	Evaluate whether stock status of some species is increasing the rebuilding timeline of groundfish stocks.	Information is needed to develop ecosystem management tools and approaches.	Urgent (essential)	Underway	Northeast multispecies	Groundfish	Ecosystems	Unknown	Bell et al. (2017) on winter flounder rebuilding. The PDT discussed this may be considered in FW65 - SNE/MA winter flounder reference points and rebuilding plan.
98	Investigate effectiveness of seasonal and year-round spatial management (e.g., sms exemption areas and seasons) to achieve goals such as: improved yield, mortality reduction, spawning protection, bycatch avoidance/reduction, and ecosystem protection and improvement.	Investigate potential means to improve access to healthy stocks while minimizing impacts to stocks needing conservation. Information is needed to develop ecosystem management tools and approaches. A MSE-like study may be appropriate.	Important (near term)	Underway	Multiple, Northeast multispecies, Small-mesh multispecies	Multiple, Groundfish, Small-mesh multispecies	Ecosystems, Fisheries management	Unknown	SMAST finished EFP on this, SMS PDT has not seen results yet. It is related to the MADMF study in SMA 1, presented to NEFMC RSC, in which there was no evidence of reduced discard rates by opening the season early. Bycatch was >5% threshold, mainly from high haddock catch. This was analyzed by the PDT last year. Spatial management is an important tool for managing target & non-target effects of targeting sms (e.g., bycatch, environment).
99	Monitor trends in non-target, ecosystem components.	Information is needed to develop ecosystem management tools and approaches.	Strategic (future needs)	Underway	Multiple	Multiple	Ecosystems	Unknown	See NEFSC Ecosystem Status Reports.

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100	Develop and enhance industry-based oceanographic data collection (e.g., physical, primary productivity, habitat metrics, including seasonal variation in these metrics).	Information is needed to develop ecosystem management tools and approaches.	Strategic (future needs)	Underway	Multiple	Multiple	Ecosystems	NEFSC	Possible application for industry data trust (RODA project). Study Fleet and eMOLT programs collecting some data.
101	Better understand species responses to climate change (e.g. distribution, productivity, recruitment) and how these changes may affect fisheries (e.g., South Atlantic stocks moving north, scallop distribution, silver and red hake stocks).	Information is needed to build resiliency into FMPs and surveys (strata based on historic distribution), and to account for possible new interactions between fisheries and fish species. It could potentially explain why some species are not rebuilding (e.g., thorny skate). Consider changes at the species level, and accounting for interactions between species. This could avoid forcing the industry to rebuild stocks to unachievable levels.	Urgent (essential)	Underway	Multiple	Multiple	Ecosystems, Habitat, Climate change, Human dimensions	HI-EBFM	Priority added in 2019. Northeast Fish and Shellfish Climate Vulnerability Assessment (Hare et al. 2016). Rutgers modeling work (e.g., Morely et al. 2016). NHRA habitat suitability models (results in 2022) will incorporate climate forecasts. NEFSC work in Northeast groundfish and Climate Program Office programs. NEFSC habitat modeling work underway for thorny skate. Kleisner et al (2016, 2017) included skate species. Research by Chang et al (NMFS FATE project), Lehnert et al. (2019), Friedland et al (2020; 2021a,c).
102	Research ecosystem operational advice: synthesize existing data, modelling, and meta-data analysis, incl. environmental variability and climate change; relationship between habitat and fishery resource productivity (incl. impact of fishing on functional value of habitat); trophic interactions and their implications; managing mixed species fisheries; function and effectiveness of closed area management.	Information is needed to develop ecosystem management tools and approaches.	Important (near term)	Underway	Multiple	Multiple	Ecosystems, Climate change, Habitat	Unknown	This integrates other habitat research priorities, including the importance and role of quality habitat on recruitment and juvenile productivity & survival. A 2017 S-K project on "choke" species in a changing climate. Data on the trophic interaction of skates with other benthic species would be helpful. Several NEFSC projects underway. Topic came up in the 2019 interviews of Council members (Williams et al 2020).
103	Evaluate potential resilience of managed species to climate change and ecosystem change by preservation of forage diversity.	Information is needed to develop ecosystem management tools and approaches. Relevant to silver hake, which serves as a key part of the ecosystem as forage.	Important (near term)	Underway	Multiple, Small-mesh multispecies	Multiple, Small-mesh multispecies	Ecosystems, Climate change	Unknown	Work underway with Northeast groundfish (Saba FY19 funds to incorporate Cobalt into Atlantis ecosystem model) could address some of these issues.
104	Evaluate the fishability of offshore windfarms (fixed or floating) and aquaculture sites, including related fishing displacement and how this affects spatial management of fisheries.	Information is needed to allow the Council to accurately articulate concerns about these projects.	Urgent (essential)	Underway	Habitat	Multiple	Wind energy, Fishery performance & monitoring, Aquaculture	Unknown	Priority added in 2019. Ongoing work: Rutgers/USM/ODU/ VIMS study on surfclam/ocean quahog fishery, RODA Fisheries Knowledge Trust, ASMFC Electronic Tracking Pilot Program (recent update: http://www.asmfc.org/files/Meetings/79AnnualMeeting/AmericanLobsterBoard.pdf), ongoing Rutgers (D. Munroe) project on wind development impacts on scallop fishery (2020 RSA). State of Maine floating OSW research wind farm (lease application in development) has this issue as part of their research agenda.

No.	Title	Description, rationale, potential use	Rating	Status	FMP	Species	Broad categories	Cross-listing	Notes
105	Develop habitat suitability modeling capability for purpose of exploring climate effects on fisheries stock distribution and abundance.	Habitat suitability modeling is and has already been used to predict deep-sea coral distributions in the NE. Can adapt models to support other habitat research such as predicting habitat effects related to aquaculture expansion and potential offshore wind energy areas. Monthly modeling could predict when and where seasonal migrations (versus summer residence) may be affected by climate change and when and where interaction with offshore wind construction activities and permanent habitat alterations may occur so as to better facilitate mitigation plans. Work can support the Northeast Regional Habitat Assessment including the nearshore and offshore tasks. The higher resolution of these models is well suited for better delineation of EFH.	Important (near term)	Underway	Multiple	Multiple	Ecosystems, Habitat, Wind energy, Climate change, Aquaculture	Unknown	Priority added in 2019. The climatology database is being updated & integrated with the latest high-resolution global climate model of NOAA's Geophysical Fluid Dynamics Lab. The new models are being used for current & historic habitat suitability predictions instead of previous climate models to produce improved species response curves. UMaine modeling sea scallop & lobster distributions. NHRA linkage. Priority particularly relevant for silver & red hake stocks. 2021 ICES workshop and related report - WKPHM.
106	Evaluate impact of offshore wind development and aquaculture on behavior, reproductive success, and survivorship of managed fish and shellfish species (e.g., scallops).	Information is needed to assess impacts of offshore development on marine fishery resources. Could include: impacts on scallop larval settlement, growth, reproduction, fishing opportunities, etc.	Urgent (essential)	Underway	Habitat, Sea scallop	Multiple, Scallops	Wind energy, Habitat, Population dynamics, Fisheries management, Aquaculture	Unknown	Priority added in 2019. Was 2019 Scallop RSA priority. Very active area of research. Complex issue, beyond first order effects. What information is needed at baseline? Consider short term mitigation options during construction. What about resource changes (e.g., increases in BSB habitat, loss of sand habitats)? BOEM-funded: Acoustics: Behavioral effects of sound sources from offshore renewable energy construction on the black sea bass (*Centropristis striata*) & longfin inshore squid (*Doryteuthis pealeii;* NSL #AT-17-02; NEFSC & WHOI, 2021). MIT/WHOI study on longfin inshore squid (Jones et al. 2020). SMAST-WHOI 2019 RSA project: Assessing Potential Impacts of Offshore Wind Facilities on Regional Sea Scallop Larva & Early Juvenile Transport;-BOEM-funded DHI study 'Hydrodynamic Modeling and Particle Tracking in the U.S. Mid-Atlantic Bight.' Friedland et al. (2021b).
107	Assess how changes in fisheries-independent surveys that cannot access areas in fixed or floating wind farms and aquaculture sites for sampling will affect stock assessments and the impact of additional uncertainty in management advice. Also consider effects on fishery-dependent data collection.	Information is needed to plan for necessary changes in survey efforts (potentially including novel survey methods) so that adequate assessment of fishery resources can be maintained post-development.	Urgent (essential)	Underway	Multiple	Multiple	Wind energy, Fish surveys, Stock assessment, Aquaculture	Unknown	Priority added in 2019. NEFSC working group funded by BOEM for project: Development of a Strategy to Evaluate NEFSC Fishery Resource Surveys Affected by Offshore Wind Development. Also a scallop survey working group TOR. Opportunity for ROSA. Consider GOM region too; focus on effective sampling for overfished stocks. This is a likely issue for assessing silver & red hake biomass indices, which are currently used to determine status.

No.	Title	Description, rationale, potential use	Rating	Status	FMP	Species	Broad categories	Cross-listing	Notes
108	Will specific changes to FMPs be able to mitigate impacts of wind farm and aquaculture placement on either fishermen or on resource areas (e.g., Demarcation Line adjustments, management and/or habitat boundary adjustments)?	Need to understand how fisheries management approaches and offshore wind development intersect, and how fisheries management could be adapted to react to offshore wind development. A MSE-like study may be appropriate.	Important (near term)	Unknown	Multiple	Multiple	Wind energy, Fisheries management, Ecosystems, Habitat, Human dimensions	HI-EBFM	Priority added in 2019.
110	Study whether dynamic reference points should be used given a changing climate.	Static reference points may not be appropriate as species shift due to climate change.	Strategic (future needs)	~~Unknown~~	Multiple	Multiple	Fisheries management, Climate change	Unknown	Priority added in 2021. The PDT discussed this may be considered in the Atlantic cod Research Track. Change status to "underway"

New England Fishery Management Council
50 WATER STREET | NEWBURYPORT, MASSACHUSETTS 01950 | PHONE 978 465 0492 | FAX 978 465 3116
John F. Quinn, J.D., Ph.D., Chairman | Thomas A. Nies, *Executive Director*

March 4, 2021

Dr. Jon Hare
Science and Research Director
Northeast Fisheries Science Center
NOAA Fisheries
166 Water Street
Woods Hole, MA 02543-1026

Dear Jon:

On December 2, 2020, the Council discussed recent stock assessment results for white hake (2019) and redfish (2020). These targeted stocks are vital for commercial and recreational groundfish fisheries. I request that your staff prioritize the processing of age samples for these two stocks so the data can be used in the next assessments.

The Council recently adopted measures for these two stocks in Framework 61 to the Northeast Multispecies FMP. The Council is concerned about the data used in their assessments and considered the following motion on December 2, 2020:

> *that for groundfish stocks where the assessment has identified catch at age information as an important source of uncertainty (e.g. white hake and redfish), the Council requests the Science Center prioritize the processing of age samples prior to the next update/assessment.*
>
> *Motion carried 16/0/1.*

The record is clear that for both of these stocks, the lack of ageing data increases the uncertainty of the assessment results. These shortfalls are well-documented. For example, the 2019 management track assessment report made the following recommendations for white hake, which is overfished and in a rebuilding plan:

> *Age structures collected by the observer program are available and should be aged to augment the survey keys. They are also available from the ASMFC shrimp survey and would allow another survey to be added to the model. Otoliths are currently being collected from the market category for heads and these should also be aged.*

This point was emphasized in the peer review report, which suggested the following improvements:

Complete ageing of the survey (fall 2003). Complete ageing of the observer samples from 2001 on. Complete ageing of the other surveys (shrimp, MENH) and attempt to use as recruitment indices.

The Council's Scientific and Statistical Committee (SSC) also recognized the importance of additional ageing data when they said in their 2019 report:

> *On the data side, improving commercial sampling would help characterize catch better, and processing the existing age structures to augment age and length info would benefit the next assessment.*

While redfish is rebuilt (not overfishing or experiencing overfishing), at the 2020 Management Track Assessment, the Peer Review Panel observed that stock size indices were declining more steeply than the estimated biomass in the assessment. This is troubling. Accurate assessment results are critical as the Council expects more sector vessels will target redfish through an exemption included in FW 61. Only one year of ageing data used in the assessment is more recent than 1985. The assessment report identified a lack of age data as the largest source of uncertainty:

> *The largest source of uncertainty in the Acadian redfish assessment is the lack of age data, particularly from the commercial fishery. Age measurements from landings halted after 1985, due to relatively low landings. Current landings have increased to levels seen in the mid-1980s. If landings continue to increase, then age data from the fishery will become increasingly important.*

This recommendation was seconded by the Peer Review Panel:

> *The Peer Review Panel strongly recommends that the ageing material collected be processed and be made available to be used in the next assessment. Exploration of data weightings should be continued, implying an enhanced review for the next assessment.*

Similarly, the Council's Scientific and Statistical Committee (SSC) indicated in their 2020 report:

> *Therefore, the SSC accepted the base model for current catch advice but recommends exploring survey fitting and the incorporation of more age data as these become available in future assessments.*

It is clear that there is a need for better data to support the assessments for these two stocks. Fishery dependent data is critical to analytic assessments, and we should do our best to make sure it is collected, and used, in a timely manner. I look forward to hearing your plans for addressing the Council's request. Please contact me if you have questions.

Sincerely,

Thomas A. Nies

Tom Nies
Executive Director

cc: Michael Pentony, GARFO

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Fisheries Science Center
166 Water Street
Woods Hole, MA 02543-1026

March 11, 2021

Mr. Thomas Nies
Executive Director
New England Fishery Management Council
50 Water Street
Newburyport, MA 01950

Dear Tom:

Thank you for your letter of March 4, 2021, emphasizing the importance of ageing biological samples for White Hake and Acadian Redfish as a strategy for improving the stock assessments of these two important groundfish stocks. Both Acadian Redfish and large White Hake are technically challenging to age, requiring considerable expertise and time resources to generate accurate ages relative to other species. In addition, we are limited in the total available resources that we can devote to ageing to support the broad profile of managed stocks in the Northeast, so we strive to optimally allocate these resources to provide the greatest overall benefit for multistock fisheries management. It is important to note that it has been the Center's long-term strategy to collect significantly more age samples than we have the capacity to process, as this gives us options to prioritize and adjust processing to address current and future management priorities.

In response to your request to process White Hake age samples to support future assessments, we are currently emphasizing ageing of biological samples collected on the NEFSC Bottom Longline Survey, a relatively new survey that samples significant numbers of commercial-size White Hake. In addition, we are making progress in ageing historical samples from the Northern Shrimp Bottom Trawl Survey. Although White Hake are a bycatch species in the shrimp survey, our strategy here is to provide another potential time series to improve the stock assessment. However, it will take time and additional resources that we do not currently have to analyze all of the historical age samples, so we are unlikely to have all years of the shrimp survey complete by the next assessment.

In response to your request to process Acadian Redfish age samples to support future stock assessments, our priority continues to be maintenance of the ageing time series of the NEFSC Autumn Bottom Trawl Survey, which is the only complete time series of age data for this stock. In addition, we are focused and making progress on ageing samples collected from the commercial fishery. Again, we opportunistically sampled the commercial fishery continuously

during a time when Acadian Redfish did not support an active fishery, providing an opportunity to use available resources to process these samples. We expect to complete some, but certainly not all years in the several decades gap in commercial age data, 1986-2016, by the next assessment.

We hope that our response is helpful in understanding how we are allocating our limited resources relative to the broad portfolio of managed fish and invertebrate species that have ageing needs. If you have any questions, please don't hesitate to give me a call.

Sincerely,

Jonathan A. Hare, Ph.D.
Science and Research Director

cc: M. Pentony