New England Fishery Management Council

MID-ATLANTIC FISHERY MANAGEMENT COUNCIL

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).