Report from the National Essential Fish Habitat Summit

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Executive Summary

In recognition of the twentieth anniversary of the inclusion of essential fish habitat (EFH) provisions into the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the National Marine Fisheries Service (NOAA Fisheries), regional fishery management councils (councils), and their partners convened the National EFH Summit in May 2016. Held in Annapolis, Maryland, this three-day participatory working meeting was facilitated by the Fisheries Leadership and Sustainability Forum, and organized by council and NOAA Fisheries staff and leadership across regions. The goal of this Summit was to bring together council and NOAA Fisheries habitat experts to assess and identify opportunities, challenges, and successful approaches for effective implementation of the MSA-EFH authorities across regions, and in a changing environment.

Through targeted presentations, roundtable sessions, and breakout group discussions, Summit participants shared ideas and experiences across roles, regions, and responsibilities. Council staff and NOAA Fisheries scientists and managers reported on current progress in understanding EFH and in applying its authorities. Participants also discussed regional approaches toward identifying, describing, and reviewing EFH and habitat areas of particular concern (HAPCs), specific regional data needs, and the tools and methods used by regions to continue successfully designating, refining, and conserving EFH, even when challenged by the limitations of the available data. Continued conversations focused on how best to minimize adverse fishing effects on EFH in effective yet practicable ways, how best to measure progress, and regional differences in these perspectives, including in their application and evaluation.

Additional presentations and discussions included an overview of EFH consultations and their successes, how best to improve habitat-focused communication between and within councils and federal agencies, and examples of successful collaborations between NOAA and federal partners in habitat-based scientific and conservation efforts. Roundtable conversations also included how regions are addressing emerging threats to EFH from non-fishing activities such as natural gas and wind energy development, aquaculture, climate change, offshore mining, sediment diversions, and invasive species, activities that produce underwater sound, including the cumulative effects of these stressors. Additionally, advances in habitat science to support the effective implementation and use of EFH designations, applications to address EFH in a changing environment, and the need for improved coordination among scientists and managers were also discussed. Finally, as fisheries managers strive for a more holistic, system-wide perspective, summit attendees discussed how EFH can serve as an important component of ecosystem-based fisheries management (EBFM) and how best to integrate it into the fishery management process in each region.

The following themes emerged over the course of the three-day Summit:

- Defining “essential” as it applies to EFH will remain a key challenge.
- Establishing clearly defined goals and objectives in the use of EFH authorities is necessary for practicable and effective conservation.
- Habitat conservation is paramount in maintaining ecosystem and fishery productivity, and is a useful tool for implementing EBFM.

- Providing a “voice” for fisheries, and building relationships and collaborations among NOAA Fisheries, the councils, federal action agencies, and the fishing community is vital for successful habitat conservation.
- NOAA Fisheries and partners, including the fishing community, must continue to address habitat science gaps.
- Implementing shared mandates requires flexibility and acknowledgement of the differing regional contexts, innovations, and approaches for identifying, reviewing, revising, and conserving EFH.
- All EFH practitioners, including scientists, managers, and consultation staff, should strive to build a community of practice, maintain communications, and develop effective working relationships within and across regions.

At the cross-regional level, participants confirmed the value of communication among members of the habitat and EFH community, especially among EFH scientists, council staff, and managers regarding their EFH approaches, interests, and advances. Specific topics of interest for ongoing information exchange include climate change, ecosystem-based management, cumulative impacts, and funding high priority science needs. Continued opportunities to foster information exchanges among councils, regional offices, and science centers within and across regions are imperative to ensuring successful fisheries management and habitat conservation.

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Introduction

In 1996, Congress recognized that the continuing loss of habitats is one of the greatest long-term threats to our nation's commercial and recreational fisheries. At that time they added a new tool, essential fish habitat (EFH) conservation, to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), giving the National Oceanic Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) and the regional fishery management councils (councils) a stronger voice in decisions that affect the habitats that are vital to our nation's fisheries.

EFH is defined in MSA as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity".[1] Essential habitats are those necessary to a sustainable fishery and the managed species' contribution to a healthy ecosystem. Impacts from certain fishing practices and coastal and marine development may alter, damage, or destroy habitats essential for productive fish stocks. NOAA Fisheries, the regional fishery management councils, and other federal agencies work together to minimize these threats on fish habitats.

The MSA §305(b) requires the eight councils and the NOAA Fisheries Atlantic Highly Migratory Species Division to identify and describe EFH for federally managed species under their jurisdictions. Based on the best available scientific information, the councils and NOAA Fisheries describe EFH for each life stage, provide maps of EFH, designate subsets of EFH as habitat areas of particular concern (HAPCs), and must minimize adverse effects of fishing on EFH to the extent practicable. All of this information is provided within the federal fishery management plans. Additionally, federal agencies are required to contact NOAA Fisheries and consult on all actions or proposed actions authorized, funded, or undertaken that may adversely affect EFH. Through this consultation process, NOAA Fisheries provides advice and recommendations to avoid, reduce, or compensate for adverse effects to EFH.

Throughout 2016, NOAA Fisheries, the councils, and their partners celebrated twenty years of EFH conservation. To recognize this milestone, NOAA Fisheries and council leadership, through the Council Coordination Committee (CCC), agreed to support a National EFH Summit.

EFH Summit Objectives and Terms of Reference

The National EFH Summit[2] was held May 17-19, 2016, in Annapolis, Maryland. The EFH Summit was a collaborative meeting developed with input from the Council Coordination Committee (CCC), the CCC Habitat Workgroup, and planning bodies including council and agency staff from around the country. The Fisheries Leadership & Sustainability Forum (Fisheries Forum) coordinated the planning process and facilitated meeting sessions. The goal of the EFH Summit was to convene council and NOAA Fisheries habitat experts to assess and

[1] Magnuson-Stevens Fishery Conservation and Management Reauthorization Act. 2006. U.S. Public Law 109-479, 120 Statute 3575, §3 (10).

[2] Fisheries Leadership and Sustainability Forum: National Essential Fish Habitat Summit http://www.fisheriesforum.org/our-work/special-projects/efh-summit/

identify opportunities, challenges, and successful approaches for the effective implementation of the MSA-EFH authorities. The EFH Summit was a participatory working meeting, with an emphasis on conversation across roles and regions. Short presentations and regional examples were included as a starting point for facilitated breakouts and large group discussions. Detailed information on the meeting agenda, Summit organizers and participants, and a summary of post-Summit activities may be found in Appendices A-D of this report.

The EFH Summit Terms of Reference (TOR) include a set of broad topics that support the EFH Summit objective. Each TOR was addressed through targeted discussions and examples that maximize the opportunity to share ideas and experiences across roles, regions, and responsibilities.

1. Share perspectives on successful approaches to EFH designation and review.
2. Consider approaches for evaluating the effectiveness of actions taken to minimize adverse effects of fishing on EFH.
3. Identify opportunities to ensure effective communication between NOAA Fisheries and councils on the implementation and use of EFH authorities, including the EFH consultation process.
4. Identify opportunities to integrate habitat information into the fishery management process and ecosystem-based fisheries management.
5. Consider how advances in habitat science can support the effective implementation and use of EFH authorities, and identify opportunities and challenges to aligning habitat science with management needs.

EFH and Habitat Areas of Particular Concern Identification and Review

The MSA requires councils and NOAA Fisheries to designate EFH for species managed under federal fishery management plans (FMPs). Each federal FMP must describe and identify EFH, minimize to the extent practicable the adverse effects of fishing on EFH, and identify other actions to encourage the conservation and enhancement of EFH. FMPs also designate subsets of EFH as HAPCs to highlight priority areas or habitat types for conservation and management. HAPCs are designated based on ecological importance, susceptibility to human-induced environmental degradation, susceptibility to stress from development, and/or rarity of the habitat type. NOAA Fisheries and the councils have described EFH for multiple life stages of nearly 1,000 federally managed species and designated more than 100 HAPCs.

Councils and NOAA Fisheries must also periodically review EFH information within FMPs. The objective of the review, commonly referred to as the “EFH five-year review,” is to evaluate and synthesize new information on habitat and determine whether changes to the FMPs are warranted. The EFH five-year review will evaluate published scientific literature, unpublished scientific reports, information solicited from interested parties, and previously unavailable or inaccessible data. If the Council or NOAA Fisheries finds that an update is warranted, FMP amendments will be initiated, along with the appropriate analytical documents.

Regional/Council Similarities and Differences

The EFH Summit took a two-part approach to share similarities and differences between regional uses of EFH authorities. Prior to the EFH Summit, the Fisheries Leadership and Sustainability Forum worked with every council and region, and the NOAA Fisheries Atlantic Highly Migratory Species Management Division, to develop short (2-4 page) profiles describing:

- Each region's approach to identifying, describing, and reviewing EFH and designating HAPCs.
- A chronology of council actions on EFH, tools and mapping approaches.
- EFH consultation involvement, among other relevant and insightful information.

These documents were provided to participants prior to the Summit and offered additional detail and a common frame of reference for discussions. All Regional EFH Profiles can be found at http://www.fisheriesforum.org/our-work/special-projects/efh-summit. A related report, Regional Use of the HAPC Designation, and a supplemental document, Current and Proposed Habitat Areas of Particular Concern, are available under the Essential Fish Habitat subheading at http://www.mafmc.org/habitat/.

Council and agency staff participated in a regional roundtable session and discussion to highlight similarities, differences, and regional adaptations to the use of EFH authorities. Topics included the timing and scope of EFH reviews, information inputs, roles and responsibilities, the use of tools and modeling approaches, and successes and challenges. Speakers shared the ideas and questions raised through their EFH processes including defining and refining the meaning of "essential," organizing EFH information (e.g., identifying overlays and "hotspots" of habitat use), capturing variability and change, engaging councils, the public, and other partners effectively, and identifying and using goals and objectives to guide conservation work. Out of these presentations and discussions, councils particularly highlighted their challenges and unique approaches to incorporating data into their EFH five-year reviews.

EFH Designations and Data Challenges

All councils and regions struggle with limitations on the availability of detailed fish habitat data, which in turn can limit the specificity of EFH designations. As data evolves and becomes available, the regions and councils will begin to see a more refined definition of EFH. In the meantime, councils and NOAA Fisheries regions have taken unique approaches to incorporating data into their five-year reviews. However, challenges to incorporating those data and confusion or misunderstanding on why we designate EFH and HAPCs remain. Seven key topics were addressed during EFH Summit discussion:

EFH Designations

EFH designations inform many conservation processes, including informing EFH consultations, habitat research priorities, fishery management actions, and applying ecosystem-based fisheries management (EBFM)[3], among others. NOAA Fisheries biologists use EFH identifications and

[3] NOAA Fisheries Ecosystem-Based Fisheries Management Policy and Roadmap. https://www.st.nmfs.noaa.gov/ecosystems/ebfm/creating-an-ebfm-management-policy

descriptions to provide recommendations to federal action agencies to minimize the adverse effects of federally proposed, authorized, funded, or undertaken activities. In the process of designating EFH, councils should use the best available information to thoroughly describe and identify the components of EFH to facilitate habitat protection. Councils and NOAA Fisheries (for Atlantic highly migratory species (HMS)) should consider the intention of these EFH designations when crafting designations to meet those needs. For example, in order to facilitate protection of fishery species that use inshore and nearshore habitats during key early life stages, councils should emphasize detailed inshore/nearshore habitat needs and data (e.g., examine relative abundance by using state surveys).

HAPC Designations

Councils and NOAA Fisheries recognized the need to highlight priority habitat areas in FMPs as early as the 1980s. For example, the Gulf of Mexico Fishery Management Council (GMFMC) highlighted priority coral habitat areas in its 1982 FMP for Coral and Coral Reefs. This set the stage for HAPC designation. HAPCs are easily mistaken for other management measures, such as marine protected areas, because HAPC designations are often accompanied with implementing regulations that restrict activities. However, HAPCs have no implied management measures - councils must take further action to implement fishery management measures within HAPCs. Additionally, HAPCs do not automatically confer any restrictions on non-fishing activities, such as constraints on energy development or access for boating or diving. Regardless of the presence of restrictions, HAPCs are still important tools for EFH consulting biologists, who assess the effects of proposed activities on aquatic habitats. If a project is located within or near a HAPC, EFH consulting biologists may recommend additional or more rigorous EFH conservation measures. Looking forward, councils want to use the HAPC authority more effectively to draw attention to the most productive habitats and fishing grounds. They are searching for new tools and information in order to better define HAPCs.

Forward Looking Data

Some councils and NOAA Fisheries use long time series of data to determine EFH designations for their managed species. Relying on historical data can serve to identify habitats that have been used by species in the past and present, but does not account for recent changes in species distributions and habitat use. Given current climate trends, the output from forward looking projections models may help to predict fluctuations in species distributions, and clarify the effects of climate change on species' habitat use dynamics. Data could also be used to anticipate which habitats may become more vulnerable, or are at risk due to climate change. NOAA Fisheries and councils may also look to incorporate other types of information, such as professional judgment, if a dataset does not represent the current location of species or if modeling is not feasible. NOAA Fisheries and council members want EFH designations that effectively support the design and evaluation of fishery management measures that often remain in place for many years. EFH designations that are based on or include information on climate vulnerability could ultimately inform the Regional Offices as they consider the long-term effects of federal activities on EFH.

The Need for Dynamic Data

EFH, among other distribution data on wildlife and marine species, is usually illustrated through static maps. However, marine species do not live in a static environment, and static mapping

does not accurately represent the dynamic nature of the marine environment.[4] Many marine species are known to migrate based upon temporal and seasonal variability, availability of prey, habitat type, and life stage, and strong seasonal components may drive the migratory patterns and habitat use by fishes. Additionally, many federally managed species are pelagic, highly mobile, and align along dynamic current boundaries, instead of bottom features or stationary habitats. Because static maps do not capture these patterns, it is important to account for the dynamic, seasonal and climate-driven fishery habitat use and changing distribution within EFH text descriptions. Councils and NOAA Fisheries are searching for ways to incorporate such dynamic data into EFH text descriptions, maps, and management decisions.

Data Scale

When we attempt to quantify species-habitat interactions, data are usually collected and compiled over large spatial and temporal scales.[5] Specific areas that species select as suitable habitats are difficult to identify and habitat use is difficult to quantify. For example, Golden Tilefish prefer clay habitat and dig burrows in the sediment to form "pueblos." They also prefer stable bottom temperatures and are found along a narrow band on the shelf. To display their preferred thermal range the Mid-Atlantic Fishery Management Council (MAFMC) used the depth range where these bottom temperatures prevail during the year (100-300 m) to determine their habitat distribution. However, this approach does not account for microscale variations in habitat conditions (e.g., sediment type). Some councils aggregate survey data and map EFH using ten-minute squares of latitude and longitude, but we know fish use habitats at finer spatial scales. Determining species-habitat interactions at finer spatial scales would improve our understanding of the interaction between species and their habitats, and provide consulting biologists with more specific needed information for the protection of those habitats.

Integrating Multiple Data Sources

Fisheries data come from multiple sources, and vary in terms of the type of information provided and spatial scale. Sources include satellite and acoustic tags, surveys, fishery dependent observer data, or small-scale research projects. Staff must combine multiple types of information collected under varying sampling regimens that they do not have control over, making it difficult to integrate multiple data sources into a cohesive set. For example, the New England and Mid-Atlantic fishery management councils have used fifty years of federal trawl survey data in their Omnibus Habitat Amendment 2, but combining distinct surveys and additional inshore trawl survey data into a single EFH product proved challenging. This effort was particularly complicated by the diverse types of data that were collected by a number of different states over different timespans, seasons, and with nets of different types and mesh sizes. For analysis, all datasets had to be combined together and mapped at a ten-minute designation based on the same criteria, but thresholds for identifying "EFH" versus "not EFH" varied for the different data sets. We need better methods for integrating diverse datasets, especially for those that are derived from different data sources and are processed differently.

[4] Žydelis R. et al. Dynamic habitat models: using telemetry data to project fisheries bycatch. Proc. R. Soc. B 278, 3191–3200 (2011).

[5] Ibid.

Lack of Data
Most managed species are data poor, having only presence/absence or distribution information (EFH designation as Level 0 or 1).[6] EFH can be designated for multiple life stages if data are unavailable for each individual life stage. For instance, the NOAA Fisheries Atlantic HMS Management Division uses this approach for species such as the Whale Shark and Porbeagle Shark. Sometimes EFH determinations cannot be made because basic life history information or data are lacking altogether. HMS species are often ubiquitously distributed across multiple types of habitats, and so it is difficult to determine their proclivity for one habitat over another. Lastly, additional information is needed for better understanding of the impacts of fishing and non-fishing activities on habitats.

Technology and Partnerships for Better EFH Designations
Councils and NOAA Fisheries also presented on actions that they are taking to advance and refine EFH by using tools and models (data portals, climate impact assessments, ecosystem modeling, etc.), and highlighted collaborations with partners that can allow for the development and use of these types of tools in improving EFH designations and impact analyses.

EFH Data Catalogue and Atlas
The South Atlantic Fishery Management Council (SAFMC) has been collaborating with the Fish and Wildlife Research Institute (FWRI) since 2003 to create, compile, and host spatial and non-spatial data relevant to habitats, management zones, and fisheries in the South Atlantic ecosystem through the SAFMC Digital Dashboard (http://ocean.floridamarine.org/safmc_dashboard/). This Dashboard includes a Data Catalogue where one can view and download select spatial layers, regional partner and project links, and ArcGIS Online products. This Dashboard was created with the goal of linking everything from upland/mountains to the EEZ on a landscape-scale. Additionally, SAFMC worked closely with FWRI to create the SAFMC Habitat and Ecosystem Atlas (http://safmc.net/habitat-and-ecosystems/safmc-habitat-and-ecosystem-atlas/). The new Atlas will allow users to view a variety of map services supporting fishery management issues in a single portal, including EFH and HAPC designations and habitat information.

Identifying EFH Hotspots
The GMFMC completed its most recent EFH five-year review in December 2016. As part of the review, the GMFMC considered whether it is more important to reduce or refine spatial depictions of EFH. In the Gulf of Mexico region, most of the EEZ is described as EFH for at least one species. For example, reef fish EFH is currently all waters out to the 100-fathom mark (200 m). The GMFMC refined EFH to the species and life stage level, overlaid EFH map layers for certain life stages within FMPs, identified EFH hotspots for multiple species, and created heat maps of those hotspots. These heat maps attribute specific depths and habitat types to the life stages of each species. This approach better depicts and leverages available science for better management decisions regarding these species and their habitats.

The Caribbean Fishery Management Council (CFMC) has identified hot spots for managed species, such as fish spawning aggregation sites, by using information from local fishers.

[6] 50 C.F.R. § 600.815 (a)(1)(iii)(1-4)

Consultants from the University of Puerto Rico and University of the Virgin Islands collected data on fish species size and population density per 1000 square meters. Currently, designations exist for 151 species of fish and shellfish, and over 80 species of coral, resulting in over 21 EFH classifications. In recent projects, at least two more habitat designations from mesophotic reefs have been completed. At this stage, the CFMC is trying to assess which EFH areas are most essential and where they should focus future scientific and conservation efforts.

Species Profiles
The GMFMC is currently creating species profiles, which contain a snapshot of EFH information for each species. These profiles summarize the scientific literature, with a focus on studies that inform current knowledge of habitat utilization by the species. The profiles also include and a description of the managed species habitat use by life stage, and the history of the fishery. The GMFMC is planning to add searchable bibliographies of literature used, with links to open source resources and abstracts of other resources. Long documents are generally not user friendly, so the overall goal of these efforts is to make information more accessible and easily available online. All of this new information will be hosted in the Gulf Council Data Portal.

The SAFMC is actively building an online system that gives species life history information, annual catch limits, and habitat information. The system is intended to be a resource for people working on EFH.

Collaboration on Bathymetry Data
Most EFH data currently collected in the Caribbean are from waters less than 30 meters deep, as deeper data collection requires technical diving skills. Therefore, most habitats have been described only in state waters and not in the EEZ. In order to gather additional EFH data from deeper and/or federal waters, the CFMC is collaborating with state agencies, local anglers, NOAA, and other partners to collect high-resolution bathymetry data. High-resolution bathymetry and habitat maps are then used to help plan dives to assess specific habitats and the use of those habitats by different species.

<u>Regional Approaches to EFH 5-year Reviews</u>
Lastly, councils and NOAA Fisheries presented on regional approaches and processes for identifying and reviewing EFH.

Fishery Ecosystem/Island Based Plans
As of the Summit, The Western Pacific Fishery Management Council (WPFMC) was in the process of amending the Hawaiian Archipelago Fishery Ecosystem Plan bottomfish and seamount groundfish EFH designations. This is a multispecies FEP with individual EFH designations for each species by depth range, and water column descriptors. EFH is based on analysis of these data types or model results. For bottomfish, 95% of distribution data (Level 1) observations only account for the post-settlement and adult life stages, while egg and larval life stages have little to no data. Although models predict that eggs will hatch within 50 miles of islands, larval dispersal likely extends beyond the EEZ boundaries. Therefore, the EFH designation for the egg life stage is limited to within 50 miles from shore. The council uses FEPs, which meet the requirements for FMPs, and requires a plan team to complete the EFH review through an annual report process. The process was operationalized in 2016 due to

restructuring, and new staff in the council, the NOAA Fisheries Regional Office, and NOAA Fisheries Science Center are working on updating precious corals species descriptions.

The CFMC is also transitioning to location-based FMPs, which are structured by island or island group rather than by species, to allow managers to consider the differences in culture, markets, gears, and seafood preferences among the U.S. Caribbean islands. In March 2013, the CFMC developed an Environmental Assessment, which analyzed the shift in fisheries management in the U.S. Caribbean from species-based to island-based. The CFMC is currently developing island-based FMPs for Puerto Rico, St. Croix, and St. Thomas/St. John and, when finalized, these will replace the current species-based FMPs. The switch will help the CFMC identify essential habitat for each managed species for each island.

Omnibus EFH Review Approach

The NEFMC recently finished Omnibus EFH Amendment 2 (OHA2). Instead of reviewing individual FMPs, the NEFMC reviewed and updated EFH for all NEFMC-managed species in a single omnibus amendment. The council initiated OHA2 in 2004 and approved EFH designations for 18 of the species managed by the council and several new HAPCs in 2007. Final action on OHA2 was taken in 2015 when the council approved some new area closures to minimize the adverse impacts of mobile, bottom-tending fishing gear on EFH and retained other area closures that were established in 2004 in separate management actions. OHA2 is currently awaiting NOAA Fisheries approval, but once implemented will update EFH designations for all species managed by the council (now 28). The MAFMC is taking a similar omnibus approach in its upcoming EFH five-year review for the 13 species currently managed by the MAFMC. Designations and fishery impact evaluations were updated for some of the species managed by this council during the late 1990s and early 2000s, but not for all.

Two Approaches from One Council

The Pacific Fishery Management Council (PFMC) Groundfish and Salmon FMPs contain EFH descriptions for multiple species, which are updated during five-year reviews. The most recent EFH five-year review of the Pacific Coast Salmon FMP, completed in 2011, led to EFH descriptions in freshwater habitat, marine and estuarine waters, and habitats out to the EEZ north of Point Conception, as stated in Amendment 18 to the Pacific Coast Salmon FMP (Final Rule, 2014). Although the review identified some adverse effects on salmon EFH from fishing, those effects are in state waters. Therefore, it did not result in any management measures to address those effects.

Amendment 19 to the Pacific Groundfish FMP (2006) designated EFH for 90+ species, and when taken across all species and life stages, encompasses all estuarine and marine waters and substrate in depths less than or equal to 3,500 m shoreward to mean higher high water or the upriver extent of saltwater intrusion (where salinity <0.5 parts per thousand). Amendment 19 also closed 72% of all groundfish EFH to certain types of bottom contact fishing gear to minimize the effects of fishing on EFH. The PFMC's 2010 review of groundfish EFH (completed in 2013) determined that changes to the designation of EFH were not warranted, but did find that changes to the EFH Conservation Areas that prohibit bottom trawling were warranted. However, the PFMC is currently considering fishery management actions in Amendment 28 to the FMP that revise the EFH Conservation Areas where bottom trawling is

prohibited, which eliminate the prohibition of bottom trawling between 100fm and 150 fm. This prohibition was put in place to control bycatch of overfished species, but also provides EFH protections and takes a precautionary approach in closing waters 3,500 fathoms and deeper from bottom contact gear under the MSA discretionary authorities.

In its salmon and groundfish EFH reviews, the PFMC used two different administrative processes. The salmon FMP was examined by a very small committee that reviewed the best available science, while the groundfish review committee also included academics, coastal treaty tribes, non-governmental organizations, and fishing industry representatives. The salmon review committee made specific recommendations on changes to EFH, while the groundfish review committee used a more complex process that included a request for proposals from the public that resulted in eight proposals. The groundfish review committee evaluated the public proposals and made high-level recommendations on changes to the EFH provisions.

In summary, changes to salmon EFH were based primarily on the review committee's recommendations, and no management measures were made. Changes to EFH for groundfish were based on the proposals, including areas closed to bottom trawling gear. Following these two processes, the PFMC recognized the need to establish clear goals or objectives prior to an EFH review, and carefully consider the makeup of such review bodies. This is especially important when considering management actions to minimize adverse effects.

Additional Issues

Continued group discussion regarding EFH and HAPC identification and review focused on additional challenges, including:

- Examining the opportunity cost from “underdefined” EFH, and striking the balance between tight refinement and simple regulation.
- Determining when “enough” conservation has been achieved and evaluating the outcome of measures intended to minimize fishery impacts.
- Identifying inland boundaries of EFH designations.
- Considering the impacts of climate change on EFH.
- Determining if EFH designations could, and do play a role in stock status.
- Identifying the role of the NOAA Fisheries science centers and other conservation agencies in defining and protecting EFH.
- Assessing the need for sufficient funding to identify priorities to fulfill the mandates for EFH.

Conclusions

- Councils and NOAA Fisheries should craft EFH descriptions in a way to maximize their utility to fishery and habitat conservation managers.
- HAPC designations can help EFH practitioners pinpoint the most important habitats and fishing grounds to protect during consultations.
- Forward looking and finer-scale data are needed on species and their interactions with habitats to improve EFH designations.
- More information on the dynamic nature of pelagic habitats (e.g., seasonal changes that affect fine-scale species distributions) would make EFH text descriptions more useful for short-term impact assessments.

- Habitat assessment, mapping, data dissemination tools and technology, and collaborations with key partners can enhance the EFH designation process.
- Councils and NOAA Fisheries use a variety of methods and approaches to review and update EFH information, and this regional flexibility is important to maintain.

Practicability and Effectiveness

MSA and the EFH regulatory guidelines require that fishery management plans prevent, mitigate, or minimize any adverse effects from fishing, to the extent practicable, if there is evidence that a fishing activity adversely affects EFH in a manner that is more than minimal and not temporary in nature. The regulatory guidelines also state that FMPs should identify a range of potential new actions that could be taken to address adverse effects on EFH, include an analysis of the practicability of potential new actions, and adopt any new measures that are necessary and practicable. In determining whether it is practicable to minimize an adverse effect from fishing, councils should consider the nature and extent of the adverse effect on EFH and the long and short-term costs and benefits of potential management measures to EFH, associated fisheries, and the nation. However, a formal cost/benefit analysis is not required.

These requirements have led the councils and NOAA Fisheries to question whether fishery management measures have been effective in minimizing the adverse effects of fishing on EFH, and what further actions are practicable. Practicability and effectiveness are related concepts, but have been difficult to define.

The EFH Summit took an in-depth look at these challenging EFH requirements, focusing on the mandate to minimize to the extent practicable adverse effects from fishing. The group also considered approaches for evaluating the effectiveness of actions to conserve EFH and minimize adverse effects from fishing. Speakers from the New England, Alaska, and Pacific regions shared their experience with these topics in the context of their regions' fisheries, ecosystems, and information sources, focusing on the handoff from habitat science to fishery management decisions. Participants explored practicability and effectiveness in depth through facilitated breakout discussions that considered the information, tools, goals, objectives, metrics, and other inputs that could contribute to evaluating effectiveness.

<u>Key Themes of Discussion</u>
Determining what is "practicable" and what is "effective" is not easy. Both are "squishy" concepts that are difficult to pin down. Participants agreed that additional clarity or structure in addressing these terms could be valuable to guide further discussions of each concept. However, these concepts, like EFH itself, are context-dependent and regionally interpreted. The challenges of addressing both simultaneously adds another layer of complexity to fundamental EFH challenges (defining essential, refining EFH, etc.).

Effectiveness and practicability both circle back to fundamental EFH questions
In discussing these concepts, EFH Summit participants frequently highlighted that determining both practicability and effectiveness depends on setting clear goals and objectives. By having a clearly defined understanding of what a council or NOAA Fisheries is trying to achieve, scientists, managers, and the public can better understand whether habitat conservation actions

have been effective and whether newly proposed management measures are practicable. Additionally, some participants commented that determining effectiveness and practicability requires a strong understanding of "essential." For example, is a council or NOAA Fisheries identifying and conserving habitat that is most in need of protection? What are the qualities that make it essential – e.g., abundance, density, species richness? Others thought that "essential" could mean the full range of fishery habitat needs, not simply what is most sensitive, compelling, well-known, vulnerable, etc. Finally, the "right amount" of habitat conservation (i.e., what is both effective and practicable) ideally depends on linking habitat conservation measures with fishery resource productivity, which remains challenging. In practice, however, there is seldom enough quantitative information available to link the two, and the more feasible approach of "minimizing adverse impacts on EFH to the extent practicable" as defined in the EFH Final Rule is used instead.

Each region approaches practicability and effectiveness from a different perspective
Each regional council approaches the practicability and effectiveness concepts differently depending on a variety of factors, including the type of habitat protection required (e.g., gear restrictions, area closures, or protections from non-fishing impacts), fishing gear types restricted (particularly bottom trawls, dredges. and other mobile bottom-tending gears), and the level of focus on minimizing adverse impacts. These concepts have been a prominent discussion topic within the North Pacific Fishery Management Council (NPFMC), PFMC, and NEFMC as they reviewed their EFH information in fishery management plans and considered whether new fishing impact minimization measures are necessary to conserve EFH. The concepts have been less prominent in other regions - e.g., the Western Pacific and the Southeastern U.S. - where bottom-contact gear is less prevalent. However, the effectiveness of conservation recommendations to minimize non-fishing related impacts to EFH is a focus across all regions.

The relationship between practicability and effectiveness is complicated
Effectiveness is seemingly a more common discussion point across all regions as they struggle to determine whether EFH identifications and conservation measures are working to rebuild and maintain sustainable fisheries and healthy fishery ecosystems. Practicability, on the other hand, is more often discussed in the context of deciding how to minimize adverse effects of fishing on habitats while at the same time avoiding unacceptable economic impacts. These concepts are sometimes viewed as opposing each other. For example, a larger gear closure may be more likely to be effective to conserve habitat, but a smaller closure area may be more practicable.

Effectiveness is difficult to demonstrate and measure
EFH Summit participants found that demonstrating effectiveness is necessary for achieving buy-in and in showing that habitat conservation actions have translated into measurable benefits for fisheries, including increased productivity and fishing access. However, there are currently no commonly used quantitative mechanisms to measure the effectiveness of any singular habitat conservation action or to quantify benefits of a broader suite of habitat conservation strategies. We lack the capacity for long term monitoring of conservation outcomes, and are challenged by the lack of quantitative information to link habitat conservation with productivity or stock status. Additionally, we are still determining the connections between inshore habitats and offshore fisheries. Similarly, we do not have the capacity or infrastructure to evaluate the effectiveness of EFH conservation recommendations provided through the consultation process. Multiple factors

influence the effectiveness of such conservation approaches, including action agency implementation and follow through. Often, and especially in the case of EFH consultations, effectiveness is viewed in terms of adverse outcomes avoided.

The discussion around the topic of effectiveness did not lead to a common agreement on an approach for its determination or on whether its measurement is even necessary.

Practicability is context dependent, and largely implicit
Consideration of practicability is implicit but constant - councils are assessing practicability with every decision, whether formally or informally – evaluating values, costs, benefits, and risk tolerance. The EFH regulatory guidelines provide a definition of practicability, and the considerations and inputs that contribute to determining practicability are similar across regions: e.g., information availability, cost or displacement of industry, type of restrictions, technology, etc. However, EFH Summit participants found that the councils and NOAA Fisheries have different perspectives on what level of impact from these considerations is deemed practicable. There were varying opinions on the need to further clarify a national definition of practicability and provide guidance for determining it. Many agreed that a more robust definition and guidance could make it easier for council or NOAA Fisheries use during the EFH review and amendment process. However, it may be hard to find common solutions that would satisfy the needs of each council or region. What is practicable for one council or NOAA Fisheries might not be practicable for another, and most agreed that regional flexibility is important to maintain. Ultimately, councils and NOAA Fisheries are responsible for providing their rationale and regional context in determining practicability. Absent national guidance, individual councils and NOAA Fisheries should work with NOAA regional offices on a case-by-case basis to define practicability more clearly beyond what is articulated in the EFH Final Rule, and clarify how they are achieving it.

Practicability is a "negative standard"
A common theme of discussion was that it is much easier to demonstrate that a proposed fishery management or habitat conservation measure is <u>not</u> practicable than to show that it <u>is</u> practicable. Given the difficulty in quantifying the benefits of habitat conservation activities, discussions on practicability tend to focus more on economic feasibility. A more comprehensive and effective way to measure conservation benefits is needed for more balanced practicability evaluations.

<u>Conclusions</u>

- Determining both practicability and effectiveness depends on setting clear goals and objectives.
- In any given situation, determining what is effective and practicable requires a strong understanding of what "essential" means.
- Ideally, the "right amount" of habitat conservation is the amount that enhances resource productivity, but in practice this is very challenging to determine.
- It is important to maintain regional flexibility when making practicability determinations.

EFH Consultations, Effective Council-Agency Communication, and Opportunities for Collaboration

Representatives from the NOAA Fisheries Office of Sustainable Fisheries, several councils, and NOAA Fisheries regional offices offered their perspectives on EFH consultations and strategies to enhance council-agency communication. Presentations and conversations among panelists along these themes helped to frame discussions for better understanding of EFH consultations, areas for their development, and methods for bridging communication gaps among federal agencies and councils.

Introduction to the EFH Consultation Process

An introductory overview was presented on EFH consultations. These MSA mandated consultations between NOAA Fisheries and other federal agencies are required for any federal actions or proposed federal actions undertaken in a given location that may adversely affect EFH. While state agencies are not required to consult on similar state actions, NOAA Fisheries can provide recommendations on how best to carry out state projects in ways that are the most ecologically favorable. In addition, the Councils are able to comment on such actions, make recommendations to state and federal agencies, and comment on activities that are likely to affect habitat substantially, including the EFH of diadromous fishes. These consultations are also required when actions occurring outside of EFH (e.g. upland activities) may adversely affect EFH and when EFH is designated in areas that were historically, but not currently, occupied (e.g., above certain impassible dams. Each year, NOAA Fisheries biologists and staff receive approximately 6,000 requests for consultations nationally.

Adverse effects are defined as any impacts that reduce the quality or quantity of EFH, and they account for those impacts that are direct, indirect, individually cumulative, or synergistic. These effects are examined for their magnitude, range of impacts, and whether they require conservation recommendations or appropriate measures to avoid, minimize, or offset them. EFH consultations are most commonly abbreviated consultations, and are completed in a short timeframe, generally 30 days. Expanded consultations for more complex, large scale or high-impact activities also occur, and require coordination that is more robust over a longer timeframe, and may include extensive literature and data reviews. Programmatic consultations may also be used to streamline the consultation process for an entire program, parts of a program, or a number of similar individual actions occurring within a given geographic area, e.g., transportation projects or those that require nationwide permits.

When issuing EFH conservation recommendations as part of the consultation process, NOAA Fisheries focuses on how projects would affect habitats and sensitive life stages of living marine resources. The MSA, and the implementing regulations on EFH, requires a detailed response to EFH Conservation Recommendations from the Federal action agency within 30 days of their receipt. The response must include a description of the measures proposed by the agency for avoiding, mitigating, or offsetting the impact of the activity on EFH. If the response is inconsistent with NOAA Fisheries EFH Conservation Recommendations, the agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects. If an agreement cannot be met between NOAA

Fisheries and the action agency at the staff level, further review can be requested by the NOAA Fisheries Assistant Administrator, although these are rarely needed.

Most EFH consultations occur for projects undertaken by the Army Corps of Engineers, though NOAA Fisheries also consults on hundreds of activities each year performed by the U.S. Department of Defense, the U.S. Department of Transportation's Federal Highway Administration (FHWA), the U.S. Department of Energy's Federal Energy Regulatory Commission (FERC), and other agencies. Activities that are commonly the subject of consultation include, dredge and fill operations, shoreline stabilization efforts, beach nourishment and dock construction work, and transportation projects. Each consultation has a differing level of effort, dependent on the level of early coordination, the degree to which the agency is willing to coordinate and accept EFH conservation recommendations, project size, potential impact to EFH, and the quality of the EFH assessment. For example, consultation between NOAA Fisheries and the U.S. Army Corps of Engineers for deepening New York Harbor has been ongoing for 20 years. This consultation represents a collaborative effort to protect EFH and other fishery resources while efficiently deepening and maintenance dredging over 30 nautical miles of Federal Navigation Channels within New York Harbor for many years to come.

Due to the high number of EFH consultation requests received by NOAA Fisheries each year, they are often prioritized to focus on larger, high ecological value projects with greatest potential for long-term effects, and on those projects that may be controversial. Consultations may also be combined to address cumulative effects, or to consider impacts to aquatic resources of concern to NOAA, but fall under other authorities such as the Fish and Wildlife Coordination Act or the Endangered Species Act.

Following the presentation, discussion was focused on clarifying requirements for states to engage in EFH consultation processes, and elaborating on the ongoing New York Harbor consultations:

States are not required to consult with NOAA Fisheries, but NOAA can issue recommendations on state-level projects if their effects are discovered, or during public comment periods and coordination efforts. However, unlike Federal agencies, states are not required to respond to these recommendations.

Although emphasized by many as an example of the strength of the EFH consultation program, the ongoing New York Harbor coordination is atypical and has been very dependent on the cooperation of the Army Corps of Engineers and Port Authority of New York and New Jersey. In general, willing partners are needed to continue consultations, collect data, and invest resources toward these efforts, and such circumstances may not generally be the case as they were in this example. Relationships must be developed with certain jurisdictions, and the benefits of such consultations should be communicated to local partners and other entities such as fishery management councils.

Strengthening Council-Agency Communication

Representatives from either a NOAA Fisheries Regional Office or council in the southeast, mid-Atlantic, and Alaska regions presented strategies and commentary on how best to strengthen communication between federal agencies and corresponding regional councils.

A collaborative presentation from the NOAA Fisheries Southeast Regional Office (SERO) and the SAFMC summarized communication strategies from programmatic to project-specific levels between the SERO Habitat Conservation Division (HCD) and SAFMC staff. Representatives from both groups are members of the SAFMC Habitat Advisory and Coral Advisory Panels, playing a significant role in these seats, which serves a cornerstone of their council-agency programmatic level communication. In these capacities, the HCD provides input to develop SAFMC habitat policies, update EFH designations, and modify fishing gear restrictions. The HCD also communicates SAFMC fishery habitat priorities to other federal agencies, e.g., to BOEM on offshore wind energy development activities. Additional synergies include collaborative work on the South Atlantic Landscape Conservation Cooperative (SALCC) nationwide effort to identify high conservation potential areas for focusing SALCC oceanic priorities, which allows state and federal agencies to concentrate restoration actions in these locations. Additionally, HCD staff are assisting the SAFMC in writing its Fishery Ecosystem Plan, in briefing councils on special and individual EFH projects, and assisting in writing comment letters on these projects to other federal agencies.

Representatives from the MAFMC work with support from the NOAA Fisheries Greater Atlantic Regional Fisheries Office (GARFO) HCD in improving council approaches to habitat issues. The MAFMC works closely with NOAA Fisheries to strengthen the use of existing EFH authorities and tools, to communicate habitat concerns and positions through policy documents, to develop more habitat objective-based approaches for the council, and to help in leveraging council priorities. During the 1980s, there was strong communication between the MAFMC and NOAA Fisheries, but the connection became more marginalized during the 2000s when a shift from habitat issues toward allocation and stock rebuilding concerns occurred. Efforts to resume this connection for habitat are ongoing, especially in setting up processes to discover regional habitat projects of interest to the MAFMC, NOAA, and other agencies, and in drafting fishing and non-fishing policies with ecosystem and ocean planning advisors and stakeholders. The MAFMC receives periodic updates from GARFO HCD on habitat projects of concern, such as the impacts of inshore dam removals, dredging, and restoration efforts, and offshore habitat impacts of energy exploration, cables, and mining. Additionally, the MAFMC has participated in meetings regarding SAFMC council-agency collaborative process, and is working to incorporate some of the SAFMC's strategies.

Similar to the Habitat Advisory Panel for the southeast region, the NPFMC's Ecosystem Committee has established procedures to provide input on non-fishing impacts to EFH in Alaska, and has expressed interest in marine mining and energy projects that could affect fisheries or adversely affect EFH. The NPFMC has identified specific non-fishing related priorities based on the extent to which an activity would interact with a given fishery. Given the size of Alaska's coastline, there are many projects to be considered that interact with its fisheries and potentially affect EFH, including marine mining, oil and gas development, seafloor cables, and naval

exercises. Improved council-agency collaboration is emerging as a stronger priority for addressing tradeoffs and multiple impacts to EFH in Alaska's ecosystems.

Following presentations, discussions among presenters and audience participants focused on the South Atlantic region's efforts to improve mapping and tracking, and how to make this concentration a stronger priority for other regions. The SAFMC staff is deeply interested in advanced technology with programs to examine how mapping technologies can enhance council activities.

Additionally, council staff and NOAA Fisheries regional staffs are engaging the NOAA Fisheries science centers to form action teams during EFH reviews for input and increased capacity to complete reviews. While the science centers are not directly involved in the consultation process, more interaction between them and the councils would help to better integrate habitat science with council priorities and improve communication. The NOAA Fisheries Alaska Regional Office has successfully worked with the Alaska Fisheries Science Center (AFSC) on projects related to oil and gas, toxicology, and hydrology, but has lacked resources to examine other subjects at larger scales such as entire embayments or ports. Setting up a formal process to do so would be helpful. SERO has a good relationship with the Southeast Fisheries Science Center (SEFSC), but it is an ad-hoc arrangement, and providing consistency and funding would help strengthen the relationship. SERO also works closely with the National Centers for Coastal Ocean Science (NCCOS) and relies on their habitat data, in addition to information from other sources. While focused on larger projects, the southeast is also interested in moving its focus toward examining the cumulative impacts of smaller projects for which fewer resources have existed.

These concerns were echoed by MAFMC staff participants, who recommended creating policies and more opportunities to advocate these interests across groups.
In northern Alaska, a cumulative impacts vulnerability assessment was funded for Norton Sound where Red King Crabs (*Paralithodes camtschaticus*) are found. The area is also subject to non-point source discharge, offshore mining, storm water, and other activities. Effects across space and time are being considered both spatially and temporally. Funding limitations have prevented a desired expansion of these efforts into the Gulf of Alaska.

Finally, conversations also touched on how council engagement for developing policies and relationships can enhance the EFH consultation process. Anytime the council weighs in on an issue it adds weight to the federal government recommendations, which can help to advance and focus federal actions on habitat issues.

<u>Habitat Networks and Collaborations</u>
Building partnerships among NOAA Fisheries, the councils, and other federal agencies to address mutual habitat concerns is needed for leveraging and coordinating resources. Examples of NOAA Fisheries' interagency work under the Fish and Wildlife Coordination Act, and collaborations with the U.S. Navy and the Department of the Interior, were presented and discussed with workshop participants to illustrate collaborative efforts for advancing habitat data collection and management.

Since the 1970s, NOAA Fisheries has participated with the U.S. Fish and Wildlife Service, the Environmental Protection Agency, and other federal and state agencies under the guidelines of the Fish and Wildlife Coordination Act to protect and increase the supply of wildlife and wildlife resources. NOAA Fisheries assists in efforts to avoid, minimize, and mitigate environmental consequences from planned projects and events that may alter or affect EFH, and in developing mitigation tools in coordination with other agencies. Additionally, these networks have been used to leverage funds for habitat and living marine resource surveys to obtain needed EFH data. As these frameworks continue, ownership and data sharing details are being developed, while templates are also being created to allow for continued interagency funding and information gathering opportunities.

NOAA Fisheries SERO HCD and the SAFMC have worked together with the U.S. Navy, especially regarding their overlapping interests at the Stetson-Miami Terrace Deepwater Coral HAPC in the South Atlantic. Naval training and underwater war games occur near this HAPC, and consultations are required as to how these activities may potentially affect deepwater coral habitat. To explore potential consequences of these actions, the Navy agreed to survey this habitat (435 square miles) and to allow NOAA Fisheries to use the data collected for any application and mitigation efforts.

Ongoing communication and information exchange between NOAA Fisheries and the Navy has resulted in the development of joint survey cruises, mapping products, and habitat conservation plans, which were used by the SAFMC to expand the HAPC to address fishing gear impacts. Information gathered by the Navy has also been used to amend the North Florida Marine Protected Area (MPA). However, the above efforts have all been undertaken informally, as the only written records between NOAA Fisheries and the Navy are EFH consultation letters. To avoid the need for formal EFH Conservation Recommendations, the Navy has been very cooperative from the beginning, and will now consult one year in advance of any activities. Any drafted letter with potential recommendations is then subject to negotiations that are addressed before a final letter is written. As a result, the consultation process on this project has become more efficient per each five-year period NEPA document renewal, and the Navy has been more proactively willing to increase their habitat mapping efforts.

Continuing on the subject of building relationships for effective EFH consultations, participants discussed the value of the non-binding EFH consultation process. Action agencies have the discretion to either accept or not accept the advice given by NOAA Fisheries, and the likelihood of acceptance depends on the quality of the relationship and trust built between action agency and NOAA Fisheries staff. Additionally, conversations that consider the goals and objectives of both action and consulting agencies, and that allow for dialogue about consultation advice throughout the entire process before an actual letter with recommendations is sent, are key to building good relationships. Efforts to elevate projects of interest can also be influenced by the quality of the relationship with an action agency, but are more likely to be related to NOAA Fisheries priorities toward the level of impact it is willing to accept when balancing other demands.

Joint EFH conservation efforts between the Northeast Fisheries Science Center (NEFSC) and the Bureau of Ocean Energy Management (BOEM)’s wind energy development, and survey work

with the U.S. Geological Survey (USGS) in Hudson Canyons, were also discussed. In addition to examining habitat suitability in these regions, the goals of these projects were mutually agreed upon by all agencies, and funds were identified for interagency collaboration. In mapping regional wind energy areas, BOEM was interested in habitat information at the scale of the project regions of interest, but the NEFSC was able to expand these efforts to the entire continental shelf and work together with the University of Massachusetts for visual ground-truthing. Proposed wind energy locations were mapped and divided by topography, and several were found to be lower quality fishing areas, which suggested minimal impact to fishery species. Additional data from USGS seabed classifications, NEFSC bottom trawl surveys, and benthic data were overlain together with oceanographic information in a Geographic Information System (GIS). Using BOEM's habitat suitability models, these efforts determined 85 distinct species distributions that could be aggregated with fish assemblage information, and helped address fish movement patterns over time throughout the shelf. Many north-south fish migrations were documented throughout the region, and this information may be of great utility in the context of climate change.

Additionally, before collaborations began with BOEM, the NEFSC and USGS worked together on long-term mapping of Hudson Canyon using Autonomous Underwater Vehicles (AUVs) and high-resolution sonar (including data on bathymetry, slope, and backscatter information). These data were assembled together by joint NOAA and USGS team members to create a Hudson Canyon habitat map with species distribution information. Key to these efforts was coordinated use of ships for mapping efforts.

Overall, coordinated relationships with federal action agencies are happening nationwide, especially given the wide range of action agencies that work closely with NOAA Fisheries on advisory and scientific teams. Because NOAA Fisheries is spread over a large area, it must rely on other entities to assist in the work required for a given need, negotiate with the priorities of those entities, and move forward together in addressing mutual interests. Common visions and mutual reliance on specific expertise along a variety of subjects help facilitate the development of these partnerships among agencies and allow them to build over time.

Emerging Issues

The EFH consultations and effective council-agency communication session culminated in a roundtable discussion on emerging issues in each region. This roundtable discussion allowed each region to describe emerging issues that are happening or have happened in their region and how a given region successfully dealt with these issues. The roundtable discussion allowed each region to learn how other regions mitigate new threats to EFH. Throughout discussions, it was clear that each region has been experiencing different emerging issues pertaining to EFH, but all regions recognize that tackling such emerging issues requires collaboration and cooperation between regions, between scientists and managers, between NOAA Fisheries and the councils, and with Federal agencies during EFH consultations.

Emerging issues in the Pacific Islands Region include offshore wind energy development and open cage aquaculture. In the past, the Pacific Islands Region focused most of their EFH designation and consultation on the nearshore, and mostly dealt with non-fishing impacts (since no bottom trawling occurs in their region). Human activities are increasing offshore in the U.S.

Pacific Islands, especially with the development of wind energy sites and creation of open ocean aquaculture. These new offshore projects planned in federal waters present new challenges for the Pacific Islands, warranting increased collaboration with the councils on assessing the potential impacts to EFH, especially since resources are lacking for EFH consultations. This increased collaboration between managers and council members will help tackle the new challenges that emerge as offshore wind energy and open cage aquaculture continue to expand in the Pacific Islands.

Hurricane Sandy made residents in the Greater Atlantic Region more acutely aware of the impacts of climate change and extreme weather on their region, which has shifted focus towards coastal resiliency. Many EFH consultations were undertaken for clean-up projects after Hurricane Sandy, but they tended to be quick and informal since they focused on life, health, and safety. To look at long-term coastal resiliency issues, the U.S. Army Corps of Engineers also examined community vulnerability to future flood events as part of its North Atlantic Coastal Comprehensive Study, which helped identify those communities that would benefit most from new infrastructure projects. NOAA Fisheries is also a member of the Sandy Regional Infrastructure Resilience Coordination group led by Department of Housing and Urban Development to improve coordination among Federal and State agencies and to streamline the review, permitting and construction of coastal infrastructure projects. With the need for new ways to increase community resilience, the federal agencies in the Greater Atlantic Region have to think about EFH differently by increasing coordination and communication to find the appropriate balance between community and environmental resilience.

The Alaska Region provided many examples of how they minimized impacts to EFH when new projects or marine interests in their region emerged. For example, increasing industrialization in the marine mining industry in Norton Sound required new research to determine potential impacts to the region's Red King Crab fishery. This research not only determined the impact of increased mining to Red King Crab, but also increased understanding of the Red King Crab stock characteristics, which is beneficial to the stock assessment of this species. Other projects, like the laying of a fiber optic cable on the seafloor and the moratorium on oil and gas in Bristol Bay, were successful thanks to coordination and support from the NPFMC. Lastly, coordinated discussions took place between the NPFMC, and the AFSC National Marine Mammal Laboratory to avoid any adverse effects to EFH and HAPCs from the intentional sinking of planes and vessels. These examples all show that coordination and collaboration between agencies can reduce impacts to EFH and HAPCs.

In the West Coast Region, one main emerging issue discussed was the impact of anthropogenic underwater sound, which is also becoming a greater concern in other regions. A number of pile-driving projects in the early 2000s resulted in fish kills, including a large one in San Francisco Bay, from the high intensity sound waves it produced. To assess the risk of future pile driving, the Fisheries Hydroacoustic Working Group (FHWG), consisting of staff from state and federal agencies and experts on the effects of underwater sound, was created. This working group aims to establish thresholds for underwater sounds generated by pile driving, find a way to assess the risks to fishes posed by those sounds, produce methods to minimize adverse effects, and to develop a standardized monitoring and reporting for projects that may produce harmful levels of underwater sound. The lessons from the fish kills in the early 2000s increased awareness of the

impacts of underwater sound and have allowed researchers to develop ways to reduce its adverse effects, not only in the Pacific, but also in other regions. Although the FHWG was initially focused on the sounds produced by pile driving, it recognizes there are other harmful anthropogenic sound sources and may address those in the future.

The Southeast Region discussed three emerging issues it is currently working to resolve: liquid natural gas (LNG) facilities, sediment diversion projects, and invasive species. In many Gulf of Mexico LNG facilities, seawater is used to reheat liquid natural gas and is then discharged back into the ocean at about 20°C cooler than the ambient temperature. There was a time lag between the development of LNG facilities and the assessment of the potential effects of the discharge of cooled waters on fish stocks, but studies now show that about five billion fish eggs and larvae are killed per facility due to this cooled discharged water. The Southeast Region is also dealing with land subsidence and sea level rise. Currently, an estimated 1,800 square miles of land has been lost in Louisiana in the past 100 years, and sediment diversion projects began in 2000 in an attempt to reverse this loss. Hurricane Katrina changed the landscape in the state of Louisiana, making the identification of diversion projects a high priority. However, there were adverse impacts to EFH with these projects (water quality degradation, alterations to salinity, etc.). Recognizing the need for these diversion projects, a cross cutting regional interdisciplinary team was formed, and SERO developed a strategic plan to deal with mitigating adverse effects from the sediment diversion projects. These examples helped the Southeast region develop an effective way to deal with emerging issues: identify the issue, raise a concern, and get more attention to the issue even if it is not directly habitat-related. The Southeast is also beginning to consider the effects of invasive aquatic species, specifically the impacts of the invasive Orange Cup Coral (*Tubastraea coccinea*) and the invasive seagrass, *Halophila stipulacea*. The Southeast will use their experience with past emerging issues to deal with the threat of new aquatic invasive species.

Many of these emerging issues may have cumulative impacts. There was one clear takeaway across all regions: projects need coordination and cooperation between all parties involved for a successful EFH consultation.

<u>Conclusions</u>

- EFH consultations have been useful for strengthening relationships among federal partners, and in advancing agency-specific scientific and habitat conservation interests.
- Collaborations among federal agencies, councils, and NOAA Fisheries have allowed for effective leveraging of efforts for scientific investigations, management actions, and the incorporation of advanced sampling technologies toward EFH characterizations. Additionally, collaborations between the regions and action agencies are imperative to these efforts.
- NOAA Fisheries and the councils are addressing emerging threats and non-fishing impacts to EFH such as from natural gas and wind energy development, aquaculture, climate change, offshore mining, sediment diversions, invasive species, underwater sound, and their cumulative effects.
- As new threats continue to emerge, EFH practitioners should seek opportunities to share information and conservation approaches across regions.

EFH Authorities in a Changing Environment

As changes in global environmental conditions continue, scientists and managers are focusing their efforts on accounting for evolving pressures that affect EFH. Foundational scientific studies that examine the effects of climate and human-related stressors on habitats and their dependent species, and that document needed information on species-habitat relationships, are crucial for ensuring the highest efficacy of adaptive management practices for EFH.

However, few comprehensive habitat maps are available, and much work remains to be done to both systematically characterize habitats (including substrate and water column) and integrate this information with information on the ecology and productivity of managed species throughout their life cycles. Without baseline habitat data, numerous challenges persist in how to evaluate habitat and species dynamics in response to changing environmental conditions and apply EFH management mandates under these emerging scenarios. Research that informs scientifically sound habitat conservation practices and aids development of strategies to mitigate impacts to EFH and dependent species must continue be a top priority.

Conversations and presentations for this session at the EFH Summit focused on how best to use EFH authorities in a changing environment while examining science and management needs and innovations for their practicality. Efforts to continue identifying and describing EFH are ongoing, but large data gaps remain for addressing emerging threats, mapping habitats, and understanding habitat attributes, species interactions, and the role of habitat at the ecosystem level. All of these factors come into play in refining and describing EFH at greater resolutions, improving higher-level characterizations, examining and responding to how climate change may alter habitat quality, distribution, and use over time, and in improving the effectiveness of EFH consultations in accounting for emerging threats. Presentations reviewed habitat science advances, ecosystem modeling approaches, species-habitat predictions that include water column properties, habitat prioritizations across species life histories, and improved monitoring and mapping efforts for EFH. Additional topics of discussion focused on the key research questions that underlie the implementation and use of EFH authorities, the feasibility of addressing these questions, how habitat science advances are enabling scientists and managers to address these questions more effectively, and research limitations.

<u>Advances in Habitat Science to Support EFH</u>

Since the incorporation of EFH provisions into MSA, scientific efforts have focused on identifying, characterizing, and understanding the habitat requirements of managed fishery species throughout their life histories. In 2010, NOAA Fisheries created the *Habitat Assessment Improvement Plan* (HAIP), which set the agency's strategy for pursuing habitat science, developing more robust assessments for scientifically sound management of marine fisheries and their associated habitats, and guiding program priorities. The HAIP defines a habitat assessment as the process and the products associated with consolidating, analyzing, and reporting the best available information on habitat characteristics relative to the population dynamics of fishery species and other living marine resources.

The HAIP set out two major goals: 1) reduce habitat-related uncertainty in stock assessments; and 2) create a scientific framework for improving the identification of EFH. To use agency resources effectively, regional habitat assessment prioritizations recommended in the HAIP are

focusing scientific investigations on species whose assessments and EFH designations would most benefit from additional habitat information. However, as management priorities broaden to ecosystem scales, linking habitat efforts to EBFM also requires complementarily prioritizing taxa and habitats that are most vulnerable to human and natural pressures and systematically investigating relationships across stocks and habitats, as detailed in the EBFM Road Map. Increased use and application of advanced sampling technologies toward these efforts is also needed for further foundational habitat characterizations.

To build on addressing these needs and provide input for their advancement, habitat assessments have been developed for several species since the 2010 release of the HAIP. NOAA Fisheries has supported studies that incorporate habitat information into stock assessments and may be applied to refining EFH. A well-publicized example is work by John Manderson and colleagues at the NEFSC that examined temperature-dependent fluctuations in Butterfish habitat to account for shifts in their catch in fishery-independent surveys. Catch data were recalibrated to account for this effect on habitat and distribution, and applied toward refining the stock assessment that had previously underestimated their numbers. Ultimately, the Butterfish quota was increased seven-fold, from 3.2 million pounds in 2014 to 22.5 million pounds in 2015, and the stock was no longer declared as overfished (Adams et al. 2015).[7] Other examples include studies that have improved catchability estimates of Alaska Snow Crab populations (resulting in an increase in their overfishing limits by 64%), provided habitat-specific growth and productivity rates of juvenile penaeid shrimps in the Gulf of Mexico, as well as habitat assessments for a suite of species including Summer Flounder and Winter Flounder, sardines, west coast groundfishes, and southeast reef fishes – all of which advance ecosystem modeling potential and can improve EFH designations.

Additionally, two National Habitat Assessment Workshops (NHAWs) were convened in 2010 and 2012 to strengthen the community of habitat science and management practitioners, and identify priorities. One key takeaway of the second NHAW was realizing the important connection between inshore and offshore habitats, as many anthropogenic impacts and EFH consultations occur in estuaries and near the coast (where many nursery habitats occur), while the stocks managed by NOAA Fisheries are primarily harvested offshore. To resolve the high priority knowledge gap of quantitatively linking inshore habitats to offshore fisheries production, NOAA Fisheries supported three regional pilot projects to examine these connections for North Atlantic diadromous fishes and for Southern Flounder, and to inventory and assess West Coast nursery estuarine habitats. To continue investigations of this inshore-offshore relationship, budget initiatives have been developed for the agency, and successfully incorporated into the President's Budget for FYs 2016 ($5M) and 2017 ($5.9M). Although these initiatives were not ultimately approved by Congress, their inclusions emphasize the importance of this work to the agency in meeting its EFH mandates.

Complementary efforts to make stock assessments more ecologically robust and to quantify inshore-offshore productivity, NOAA's habitat science have also focused on improving EFH

[7] Adams C. F., T. J. Miller, J. P. Manderson, D. E. Richardson, and B. E. Smith. 2015. Butterfish 2014 stock assessment. US Department of Commerce, Northeast Fisheries Science Center Reference Document 15-06. Available: http://www.nefsc.noaa.gov/publications. (March 2017).

level information. As most species information is Level 1 (presence/absence data), and Levels 2-4 information (2 - density; 3 - vital rates including growth, reproduction, and survival; and 4 - productivity data) is only available for a handful of species, NOAA Fisheries has supported studies to enhance EFH information. Examples include survey work by Rooper et al. in Gulf of Alaska benthic substrates where they quantified fish habitats. Their findings were incorporated into models to refine Alaska EFH, which moved their information to Level 2 species density descriptions.

Applied understanding of the ecological role of habitat in marine ecosystems through habitat research and assessments can strengthen EBFM implementation. Because habitats are a relevant unit of analysis for EBFM, a more systematic approach to habitat characterization is warranted to better delineate EFH across multiple species. However, many data gaps remain in foundational habitat science. More robust habitat characterization efforts that incorporate ecological relationships and interactions of multiple managed species within identified habitats, and account for habitat connections (including inshore-offshore), will greatly enhance EFH designations, ecosystem modeling efforts, and the potential for EBFM to produce useful outcomes. Additional priorities include consideration of these factors under changing environmental scenarios and valuation of the ecosystem services that habitats provide, especially in light of increased human and climate-related stressors.

Applying habitat science toward enhancing stock assessments, EBFM, and EFH designations for multiple species effectively requires efforts to prioritize resources, systematically examine remaining data gaps, apply new technologies to characterize unexamined areas, and gain continued support through budget initiatives and external partnerships are ongoing. Since the publication of the HAIP, NOAA Fisheries has supported research to improve habitat science and habitat assessments by funding short-term, small-scale projects. Building on these efforts, the agency is working to enhance support for habitat science through habitat-centric efforts, including NOAA's Habitat Blueprint[8], and by increasing habitat information that is available to ecosystem science efforts, such as NOAA's Integrated Ecosystem Assessment (IEA) program. Despite limited resources and budgetary challenges, advances in habitat science, and in the promotion of habitat conservation continue, and are being applied toward refining and characterizing EFH. Continued focus upon the habitat-dependent aspects of ecosystem processes and their dependent species will facilitate a more complete implementation of an ecosystem approach to management, and allow for the most scientifically sound conservation of our managed species, the habitats that support them, and the sustainability of our fisheries.

Ecosystem Modeling for Habitat Management

Habitat data support accurate EFH designations and are used directly by models that examine tactical management questions. Although habitats and fish stocks are inextricably linked, there has remained a certain disconnect between habitat science and other aspects of fisheries management. In stock assessments, habitat-mediated factors including catchability and species distribution could strongly influence population dynamics and the efficacy of fisheries management decisions, but habitat is not explicitly accounted for in most assessment models.

[8] NOAA (National Oceanic and Atmospheric Administration). NOAA Habitat Blueprint. Available: https://www.habitatblueprint.noaa.gov

Ultimately, stock assessment science and management can inform habitat science and management (and vice-versa), and doing so requires making habitat information more quantitative and scalable while making fisheries information more spatial and integrative. Both disciplines support ecosystem modeling, which in turn can address many of the pertinent questions for effective fisheries and habitat management.

Fisheries resource management is focused on particular questions, such as whether a stock is subject to overfishing or is overfished, and depends on heuristic models to determine appropriate fishing levels. Moving beyond a typical single-species focus also requires knowledge of ecosystem function and processes to advance scientific theory, and for strategically assessing tradeoffs. Strategic modeling can examine scenarios over longer timeframes, and is useful for linking stock assessments with habitat science and management. It allows for a spectrum of solutions, such as calculating values for data-limited variables, to examining biomass dynamics, or up to full system level modeling. Recent advances using Atlantis models allow biogeochemistry, climate, oceanography, and biogenic habitat information to be fed into multi-fisheries models and to investigate the best fisheries management strategies for a particular ecosystem. Some of this work has been applied to Chesapeake Bay Summer Flounder populations and other coexisting species to measure their responses to tidal marsh habitat quality in a changing climate. Over time, biomass decreases for multiple species were observed in preliminary model outputs, and provided more environmental information regarding the importance of marsh habitat to the ecosystem. Atlantis models in Guam are used as a coastal model to examine the impacts of land-use on fisheries and coral reefs. All of this information can be used to inform decision making for habitat conservation at multiple scales and identify further information needs as environmental pressures change.

Fisheries scientists have been applying ecosystem models to consider the consequences of coastal and offshore development on fishery species and the ecosystem-level effects of habitat restoration projects, including how marsh rebuilding efforts may enhance fisheries. These efforts can bring multiple groups together and work as good starting points for addressing EFH-related habitat and fisheries questions in a changing environment.

<u>Nowcasting Seascape Dynamics to Better Estimate Past and Future Species-Habitat Distributions</u>
Marine habitats cannot be examined solely based on ocean bottom structures and must consider the water column as well. Historically, habitats were defined using G.E. Hutchinson's species niche concept (1957)[9] to include the conditions that affect population growth. A niche is multi-dimensional, encompassing multiple factors including temperature, oxygen, food availability, solute concentrations, etc., all of which can be displayed in time and space to define the habitat used by a particular species and lifestage. Niches should be defined based on vital rates of a given species, within the context of the environment of interest. While Hutchinson's original focus was on population dynamics, habitat scientists are also examining individual vital rates such as survival, development, growth, reproductive power, and migration, and all of these factors feed into population growth.

[9] Hutchinson G. E. 1957. Concluding remarks. Cold Spring Harbor Symposia on Quantitative Biology 22:415–427

Underlying these population-level estimates is a link to species metabolism for which species-dependent requirements of water, oxygen, pH, food, solute concentrations, temperature, and hydrostatic pressure are needed for optimal metabolic rates. To meet these requirements, an organism may either select an external environment (habitat) that most closely matches these needs, or internally regulate them physiologically through energy expenditure. By examining the physical properties of the oceanic water column, one may determine the degree to which marine organisms can use habitat selection to optimize their metabolic performances. Because life in liquid exists in a significantly more concentrated environment than air, differences in solutes, oxygen, density, and viscosity greatly influence a species' habitat. Thus, hydrodynamics, including circulation and mixing, contribute fundamentally to marine habitats and seascape hydrology.

Oceanic properties are being observed in real time with buoys and regional Integrated Ocean Observing Systems (IOOS) to complement satellite observations of optical properties, radar-based measurements of currents, and the use of underwater gliders to measure temperature. All of this information allows for accurate simulations of spatiotemporal ocean patterns at multiple scales, including at a 1-kilometer resolution. As regional stock surveys are designed for assessing populations and not habitat, this restricts their focus to larger scales, and can limit their integration with oceanic parameters to only coarse-scale temperature and salinity information. However, laboratory and field experiments can quantify species and organismal vital rates that can be used in biophysical models, and advanced sampling technologies including gliders, tags, and sensors can measure needed information telemetrically, and at smaller scales. Additionally, collaborative research with the fishing industry and community can gather needed data at the scales of species and habitat interactions, which can be examined with complementary environmental information. Advances have been made to tie data collected by squid, mackerel, and herring fleets with species population dynamics and seascape and global economic variables. Working together with the fishing industry to collect empirical data can directly inform seascape models, advance more efficient fishing practices, and build needed trust among scientists, managers, and fishers. Ultimately, complementing fishery-dependent information with IOOS data can advance ecosystem-based assessments, refine habitat information, and improve ecological forecasting efforts in light of rapidly changing conditions.

Prioritizing Habitat Conservation Across Ontogeny and Species

Habitat requirements of living marine resources vary by species and ontogenetic life stage. As efforts to examine habitat use patterns across combinations of species and life stages evolve, prioritization of consistently important habitat types and locations for conservation must occur at tractable scales. Patterns of habitat use can be analyzed using software such as MARXAN to characterize marine areas using a matrix of specific cross-shelf habitat types and geomorphic zones. With this information, priority habitat/location combinations can be identified for a given species and ontogenetic life stage, and changes in these combinations can be examined throughout species life histories and as they vary across species. As applied to Caribbean reef fishes, juvenile Doctorfish (*Acanthurus chirurgus*) use different habitat/location combinations than mature individuals, while several species of parrotfish inhabit outer shelf areas more regularly than other species. By overlaying habitat use for all species on the matrix, this method can identify the highest priority combinations. Iterative runs of the software can provide a

frequency of selection for cells that show up as important, and identify areas that are centers for productivity.

If all habitats are essential to at least one species, then prioritization of locations for conservation can be based on functional habitat diversity, which in turn can serve as a surrogate for species distribution patterns and increase focus on habitat connectivity issues. Connectivity is needed for species to move and acquire resources, and both habitat diversity and productivity can enhance connectivity. For Caribbean reef fishes, functional habitats include particular reefs, uncolonized hard bottoms, and vegetated habitats, including seagrasses and mangroves. Connections between these habitat types at the scale of feeding or ontogenetic migrations should be factored into the prioritization process. Larger scale evaluations that include all habitats in a single area must also consider limitations of larval dispersal.

Monitoring, Modeling, and Mapping Demersal Communities in Untrawlable Habitats

One challenge for defining EFH has been in classifying habitats for deep-water demersal species that occur in complex, high relief substrates. Over 100 species of US west coast rockfish are managed in the bottomfish complex, and are found at depths greater than 50 meters. As most groundfish data come from trawl surveys, which generally occur in low relief habitats, little information has been collected about deep-water bottomfish. Advances in characterizing deep water rockfishes, demersal communities, and deep sea coral habitats have included increased use of visual count surveys with manned submersibles and Remotely Operated Vehicles (ROVs) to collect information on fish abundance and size; coral identification, size, and condition; habitat and bottom type; marine relief; marine debris; and environmental data (including temperature, salinity, etc.). All information can be georeferenced and examined with spatial analyses. As individual species have specific habitat preferences, they form guilds associated with particular habitats, and these guilds generally extend throughout the west coast.

Community structure of these deep-water demersal species can be assessed by using environmental gradients to find explanatory variables, with work by Yoklavich and colleagues at the SWFSC showing that 75% of the variability influencing bottomfish distribution was explained by depth and percent rocky substrate. Visual survey data have been used to locate and monitor MPAs in deep waters for Federal and State governments, and to protect vulnerable habitats to create a first phase network of west coast marine reserves that build on 124 created MPAs. Additionally, these visual surveys have been used to identify and inform placement of Pacific Coast Groundfish EFH Conservation Areas (EFHCAs). As these sites cannot be regularly monitored, visual data have been coupled with mapped seafloor information to predict abundance and distribution of rockfishes and to examine Pacific Coast MPA and EFHCA effectiveness. Point observations of species density and biomass were overlain with gridded seafloor habitat data that was derived from 5-meter resolution digital elevation model. These data were used to create a generalized additive model (GAM) to inform stock assessments and EFH consultations, quantify habitat capacity, prioritize habitats for conservation, and evaluate potential risks to stocks.

The visual surveys provide a more complete understanding of an ecosystem for which traditional survey methods are poorly suited, and this non-extractive, non-destructive method can be used to assess fish species and structure forming organisms. However, as these ecosystems have already

been altered by humans and natural stressors, there are certain challenges in assessing their habitats, while submersible and ROV technologies additionally can affect fish behaviors. Rocky areas are dominated by small weedy species, which are devoid of large fishes, while ongoing removal of and damage to large corals has reduced coral habitat quality. There are almost no baseline data on pre-fishery assemblages, and limited amounts of patchy rocky habitats exist to support these species. Spatially specific habitat data are often limited, with California bathymetric data being essential to characterization and protection efforts. As there is no ongoing monitoring plan, more funding is needed to initiate regular coastwide visual surveys to sample habitats that are beyond the capability of standard trawling gears and to support high resolution mapping with multibeam technologies in untrawlable (and other) habitats. Continuation of these efforts would work to increase their conservation effectiveness and advance refinement of EFH for deep-water species.

Discussion

Presenters summarized their research in terms of how it can support effective EFH implementation. NOAA Fisheries supports science that provides better information to define and manage EFH, and studies that address habitat-related uncertainty in stock assessments. For councils and other managers, looking at habitat use across species and life stages helps to identify centers of production and spawning grounds, which can be linked to stock assessments and increase resolution of EFH designations. There is also a need for broader modeling efforts that expand beyond coasts to address how terrestrial factors and upstream human development impact EFH. Additionally, the surveys that are being undertaken by scientists are helping to identify and describe EFH, which cannot be protected if its spatial extent is unknown. Predictive models can help to fill in information gaps.

Audience participants were interested in how best to incorporate spatial habitat modeling into stock assessments. Panelists answered that several approaches to do so include making stock assessments more spatial, improving habitat monitoring frequencies, examining habitat productivity, and reducing observation and process error by appropriately scaling habitat variables (i.e., mortality as related to habitat type) into stock assessment vectors. Reasons for resistance to incorporating these factors into stock assessments were also discussed, such as the pressures on assessment scientists that require conservative, accurate, less complex assessments, much foundational habitat work that remains to be done, data poor models, and potential unfamiliarity in how to add more parameters. Additional considerations include time constraints in completing assessments, and conservative approaches toward managing fisheries and in dealing with stakeholders. These issues are also compounded by irregular contemplation of changes to assessments (usually coinciding with benchmarks), and challenges in implementing wholesale changes to approaches.

Questions about deep-sea coral habitat vulnerability to fishing gears, aquaculture, and alternative energy were also addressed, as were recommendations to improve model input through better engagement of biologists and stakeholders familiar with particular systems.

Presenters also remarked on their future research interests including:

- Improved incorporation of socio-economic information into models.

- Advancing deep-water visual surveys to address data collection and analysis biases and stock assessment needs.
- Using telemetric methods for gathering needed bathymetric and habitat data, and applying the information toward protecting key locations that are important to stocks during their life histories.
- Applying habitat science toward protected species and critical habitat designations.
- More ground-truthing of oceanic habitat models through collaborative research with the fishing industry.

EFH in a Changing Climate Breakout Sessions

Three breakout sessions were convened to discuss EFH in a changing climate. Each group consisted of scientists from fisheries science centers, members of regional fishery management councils, and managers from regional offices involved with research, EFH designation, or EFH consultations. One main issue was agreed upon by all groups – climate change effects on EFH are complex and more resources are needed to advance our understanding. In each of the three groups, similar issues were apparent: climate change is affecting each region differently, current EFH designations are based on historical data, and broad EFH descriptions that lack key seasonal habitat use information are of little value to understand potential long-term impacts of certain actions on fisheries.

Climate change is affecting each region of the United States differently, causing scientists, managers, and council members to apply their EFH authorities in different ways. For example, managers in the Southeast Region are just starting to discuss climate change, while managers and council members in the Mid-Atlantic and Northeast are already dealing with its effects, such as shifts in species distributions that necessitate changes in the management of the affected fisheries. Anticipating these effects creates difficulties when EFH is being designated, and during EFH consultations. One particular concern brought up by scientists is the potential disparity in the pace at which the effects of climate change may occur as compared to the timeframe in which certain species may be managed, and that gaps still exist in the baseline data that could be used to assess climate-related changes in habitat use and availability. This point then led to the next issue – EFH is based on historical data.

EFH is reviewed and updated, if necessary, every five years, but updates often take longer. This creates difficulty during EFH consultations, because managers may be forced to rely on older data that may be less relevant to current conditions. For instance, a species may have recently vacated a particular habitat, but the EFH designation may not reflect these recent changes. Managers agree that EFH needs to be updated to account for climate change effects, especially since EFH consultations try to anticipate future impacts and habitat use. Climate-related factors are likely to affect the future of many projects that are being completed, but accurately projecting the magnitude of their effects throughout the lifetime of the project can be challenging. Currently, scientists and councils are working together during reviews to get the most recent data for updated designations, but this can take a long time and data gaps still exist in many cases. During this discussion, the next issue arose – the definition of EFH is very broad.
Many EFH designations are based only on Level 1 (presence/absence) or Level 2 (density) data, with Level 3-4 data (growth, reproduction, survival; production rate) available for a much smaller number of species in certain regions. Having habitat-specific vital rates for each species

will help narrow EFH designations. This information will also assist in predicting climate change effects on EFH, which will help in future designations and consultations. Council members and managers recognize the benefits of prioritizing habitat and moving towards Level 4 data in EFH designations. A federal action agency representative mentioned they would be better able to gauge the impacts of their projects if, instead of just having information on the presence of a species, they knew that the habitat they were affecting was responsible for increasing the growth, survival, or productivity of a population. Even though more advanced understanding is preferred, limited resources inhibit moving from Level 1 to Level 4 data for most species. In light of these limitations, scientists, managers, and council staff are working towards identifying habitats that are essential for multiple species. This will assist in prioritizing EFH locations, which will benefit designations and consultations while efforts to improve knowledge of habitat-specific vital rates and productivity are ongoing.

In all three breakout discussions, participants agreed that climate change effects on EFH are complex and data gaps are hindering the understanding of future effects. However, coordination among scientists and managers on this issue will help each group reach the shared goal of understanding and mitigating the effects of climate change on fisheries and EFH.

Conclusions

- Advances in EFH science and habitat assessments for fisheries species have increased since the 2010 publication of the NOAA Fisheries Habitat Assessment Improvement Plan (HAIP), and scientific efforts are now being incorporated into an ecosystem and EBFM context.
- Large data gaps remain for addressing emerging threats, characterizing habitats, and understanding habitat attributes, species interactions, and the role of habitat at the ecosystem level.
- Information from ecosystem models can be used to inform decision making at multiple scales, examine emerging scenarios, and bring multiple groups together to address habitat and fisheries questions in a changing environment.
- Marine habitats consist of both ocean bottom structure and the water column, and information gathered from cooperative research with the fishing community and from using oceanographic data, including from *in-situ* Integrated Ocean Observing Systems, can improve our understanding of EFH and seascape ecological forecasting.
- EFH and habitat connectivity can be examined using a multi-species matrix lens throughout species' life histories to identify high-priority areas for protection and productivity.
- Using visual surveys and advanced sampling technologies to characterize deepwater and/or untrawlable habitats has led to the development of predictive models to inform species' habitat use patterns, and the establishment of several EFH conservation areas.
- Climate change effects on EFH are complex and differ by region. More data, resources, and improved coordination among scientists, and managers is necessary for advancing our understanding of these effects, and for maintaining habitat integrity and sustainable fisheries.

EFH and EBFM

Day three of the EFH summit began with a presentation from NOAA Fisheries Office of Sustainable Fisheries on the relationship between EFH and EBFM, and on how each supports the other. Currently, many regional fishery management councils are working to implement EBFM, with most developing a Fishery Ecosystem Plan for their region. Examples were provided on how EFH can serve as a tool for EBFM, such as when considering EFH for forage fish, or the ecosystem effects from potential species biomass increases in conservation actions that are based on EFH designations.

Following this introduction, examples of how habitat science can support EBFM were presented. One presentation highlighted how habitat indicators (quality, quantity, and pressure) are being used for the California Current Integrated Ecosystem Assessment (CCIEA).[10] Recognizing that species rely on different habitats, four macrohabitats were identified, and habitat indicators were mapped for each of the macrohabitats in four ecoregions of the CCIEA. The habitat indicators were developed in this study by establishing a relationship between the indicator and attribute of interest. These indicators were applied by creating a decision rule based on the relationship, monitoring changes in the indicator to determine effectiveness with respect to management action, then reassessing periodically. Habitat indicators have the potential to be used in EBFM by creating habitat based reference points for fisheries management, assessing cumulative effects in each area, and by examining climate change metrics for each habitat. For future success, it would be beneficial to move from identifying single species EFH to determining habitats that are essential to multiple species. Finding these habitat guilds will make EFH more useful in an EBFM framework by prioritizing habitat that is essential for multiple species complexes. This presentation suggested ways to use EFH to advance EBFM by defining aspects of EFH that are temporally dynamic or responsive to management, developing habitat indicators to track, targeting habitat science to determine species guilds that respond to habitat variation, and addressing habitat management in a multi-stock context.

After the presentations, breakout groups discussed how EFH and EBFM intersect in each region. All groups discussed the lack of fundamental habitat data, since all regions are still dealing with Level 1 (presence/absence) data for EFH instead of more advanced data, which could hinder the ability to prioritize habitats for EFH designation. Participants from all regions agreed on the implicit links between EFH and EBFM, since protecting habitat can benefit ecosystem productivity and work to conserve multiple managed stocks. The current EFH authorities make it possible to identify ecologically important areas, and help prioritize research that will feed into EBFM. Regions discussed two examples of management approaches being used in different regions: space-based and forage-based. Both of these management approaches link EFH and EBFM, especially since forage-based management considers incorporating forage fish as habitat. Some regions, like the Northeast and Southeast, are working on progressing from single-species stock assessments to EAFM, EBFM, and eventually EBM. Even though some data gaps exist, all regions agreed having a stronger focus on EBFM would advance thinking on EFH.

[10] The California Current Integrated Ecosystem Assessment. https://www.integratedecosystemassessment.noaa.gov/regions/california-current-region/index.html

A broad-ranging full group discussion on the relationship between EFH and EBFM took place after the breakout group discussions. Throughout there was a consistent focus on strengthening the connection between EFH and EBFM. Management strategies may already acknowledge and make the connection between EFH and EBFM, and participants noted that it is important to communicate that this connection is already intact. For example, some spatial management exists to protect EFH (e.g., closures for spawning aggregations), which is also a form of EBM. These connections are also apparent when recognizing that ecosystem processes influence the amount and location of EFH.

One problem that was realized is that current spatial management has mainly been used in offshore habitats, and more management of inshore habitats is needed. There was agreement that information on the link between inshore and offshore production is missing, and increased understanding of this connection is important for both EFH and EBFM.

Ultimately, approaches using both EFH and EBFM support fisheries management, which is dependent upon advancements in habitat and ecosystem science. When communicating the benefits of EFH designations and EBFM to the fishing industry and other groups, it should be emphasized that ecosystem approaches may actually lead to more and better quality fish, not reductions in catch limits. Even though more must be done to move towards EBFM, and to integrate it more strongly with EFH, this discussion raised clear examples of successes in doing so. For example, with the implementation of the National Ocean Policy, Regional Ocean Planning Bodies have been working towards EBM by delineating important areas of the ocean based on the spatial distribution of resources and resource users. These efforts will benefit future protection of HAPCs and other important habitats. Through increased communication and coordination between different habitat professionals, solidifying the link between EFH and EBFM is possible.

<u>Conclusions</u>

- EFH can serve as a tool for EBFM just as EBFM can serve as a tool for identifying and designating EFH, and there have been successful examples of habitat information informing the EBFM process.
- Current spatial management has mainly been used in offshore habitats, and more understanding on the link between inshore and offshore production is needed to improve the scientific basis for EFH designations, EBFM, and habitat protection.
- Improving basic understanding of the connections between habitat, ecosystem processes, and the fisheries that they support will improve ecosystem management.

Summary and Conclusions

The following themes and findings emerged during multiple discussions and sessions. Some of these topics (e.g., goals and objectives) are not addressed by the Terms of Reference or in a particular session, but came up repeatedly at the Summit. Other topics (e.g., EBFM) did support a focused session and came up frequently in the context of other discussions. Further exploring these themes and findings will help EFH practitioners improve the effectiveness of the national EFH program and result in more focused habitat conservation and fishery management.

Defining "essential" will remain a key challenge: The community of EFH practitioners has articulated what they view as fundamental questions and considerations underlying the effective use of EFH authorities and determining what habitats are truly "essential" to maintaining productive fisheries. Discussion often circled around whether EFH should be more or less inclusive, what it means to refine EFH, whether EFH designations should reflect the past or anticipate the future, how EFH information should be organized, whether EFH should be static or dynamic, among others. Some of these points are tractable; others may not have answers but are important for framing discussion and decision-making.

Establishing goals and objectives is a crucial first step to EFH conservation: The "effective" use of EFH authorities, and what constitutes "essential," "successful," "practicable," etc., depends on having a clearly defined intent, purpose, or endpoint. It would be valuable for NOAA Fisheries, councils, and the fishing community to clearly define such goals and objectives before initiating scientific and management actions related to EFH.

Maintaining fishery productivity is an important end goal that should guide EFH identification and conservation activities: Habitat protection is critical to maintaining ecosystem and fishery productivity. It is important to more clearly recognize this intersection, and to use EFH authorities as a tool to implement EBFM.

Providing a "voice" for fisheries, building relationships, and collaboration are critical to effective conservation: The EFH consultation authority connects the fisheries management community with a much larger network of agencies, stakeholders, and potential partners and collaborators, and provides the opportunity for fishery managers to communicate priorities and needs. Such networks are critical to ensure that fish habitat receives appropriate consideration during federal decision-making. Effective habitat conservation is heavily reliant on strong relationships between scientists and managers, between NOAA Fisheries and federal action agencies, and among the fishing community, the councils, and NOAA Fisheries.

NOAA Fisheries, councils, and the fishing community must work together to address habitat science and data gaps: The availability of habitat science and data, and the challenges of funding habitat research, were common threads throughout all topics discussed at the EFH Summit. The mixed audience of managers, support staff, and scientists identified habitat science needs and questions that resonate with the EFH community, as well as with the broader fisheries management community. It is clear that NOAA Fisheries, councils, and the fishing community benefit from seeking opportunities to collaborate with other agencies and non-traditional organizations to fill habitat science and data gaps to identify and describe EFH.

Implementing national mandates requires regional flexibility: The regional implementation of EFH mandates reflects regional contexts and relationships, and leads to regional diversity, innovations, and adaptations. Regional differences in approaches exist for identifying, describing, reviewing, and conserving EFH, and such flexibility is important to maintain.

All EFH practitioners should strive to build a community of practice, maintain communication, and develop effective working relationships: The fisheries management community benefits from the opportunity for EFH practitioners to learn from one another and share regional

experiences, as well as to maintain effective communication between councils and the agency. Sharing tools and technology can further advance each region's EFH designations and provide insight into alternatives for EFH conservation recommendations. At the Summit, the final report out and group discussion following the regional breakouts reinforced the value of ongoing learning and information exchange across regions.

Appendix A – Agenda

National Essential Fish Habitat Summit

May 17-19, 2016 • Annapolis, MD • Westin Annapolis

FINAL AGENDA

Workshop Partners

NOAA Fisheries Office of Habitat Conservation • NOAA Fisheries Office of Science & Technology

Council Coordination Committee • Fisheries Leadership & Sustainability Forum

EFH Summit Objective

The purpose of the EFH Summit is to assess and identify opportunities, challenges, and successful approaches for the effective implementation of the Magnuson-Stevens Act EFH authorities.

Terms of Reference:

1. Share perspectives on successful approaches to EFH designation and review.
2. Consider approaches for evaluating the effectiveness of actions taken to minimize adverse effects of fishing on EFH.
3. Identify opportunities to ensure effective communication between NOAA Fisheries and councils on the implementation and use of EFH authorities, including the EFH consultation process.
4. Identify opportunities to integrate habitat information into the fishery management process and ecosystem-based fisheries management.
5. Consider how advances in habitat science can support the effective implementation and use of EFH authorities, and identify opportunities and challenges to aligning habitat science with management needs.

Registration will begin at 7:30 am outside the main meeting room, Capitol D.

Tuesday, May 17th • Where are we now?

8:30 – 9:15 am **Opening remarks and discussion**

- *Carrie Selberg, NOAA Fisheries Office of Habitat Conservation*
- *Bill Tweit, North Pacific Fishery Management Council and Council Coordination Committee*
- *Katie Latanich, Fisheries Forum*
- *John Boreman, North Carolina State University; MAFMC SSC*
- *Group discussion*

> ➔ What opportunities exist to build professional networks among scientists, managers, and staff with EFH responsibilities?
> ➔ What do you hope to gain from your participation in the EFH Summit? How can the EFH Summit support your work?

9:15 – 10:30 am **Regional roundtable: Identifying and reviewing EFH and HAPCs**

- New England – *Michelle Bachman, NEFMC*
- Mid-Atlantic – *Jessica Coakley, MAFMC*
- Atlantic HMS – *Jennifer Cudney, NMFS/OSF*
- South Atlantic – *Roger Pugliese, SAFMC*
- Gulf of Mexico – *Claire Roberts, GMFMC*
- Caribbean – *Graciela Garcia-Moliner, CFMC*
- North Pacific – *Steve MacLean, NPFMC*
- Western Pacific – *Rebecca Walker, WPRFMC*
- Pacific – *John Stadler, NMFS/WCRO*

10:30 – 10:45 am **Break**

10:45 – 12:00 pm **Regional roundtable (continued)**

- Regional approaches (continued)
- Group discussion

> ➔ What factors contribute to different regional approaches to EFH and HAPC identification and review?
> ➔ What works well for your region, and why? What have you learned from your region's experience?

12:00 – 1:15 pm **Lunch (on your own)**

1:15 – 2:45 pm **Translating habitat science into fishery management decisions**

- The science and process behind habitat management areas in New England – *Michelle Bachman, NEFMC and David Stevenson, NMFS/GARFO*
- Habitat science in Alaska: It starts with a plan. – *Matt Eagleton, NMFS/AKRO, John Olson, NMFS/AKRO, and Chris Rooper, NMFS/AKFSC*
- A comprehensive strategy to identify and conserve Pacific Coast Groundfish EFH: Has it succeeded? – *Waldo Wakefield, NMFS/NWFSC and John Stadler, NMFS/WCRO*
- Group discussion

2:45 – 3:00 pm **Break**

3:00 – 4:15 pm **Facilitated breakout discussions: Practicability and effectiveness**

Participants will be divided into three breakout groups including a mix of roles/regions. Fisheries Forum facilitators.

- ➔ What objectives, tradeoffs, and considerations are shaping your region's implementation of EFH authorities?
- ➔ How is practicability discussed and determined in your region?
- ➔ What are the opportunities and challenges to evaluating the effectiveness of EFH-related decisions?

4:15 – 5:00 pm **Full group discussion**

Fisheries forum facilitators

- ➔ From your perspective, what constitutes "successful" or "effective" implementation and use of EFH authorities?
- ➔ Is the identification of EFH a gradual process of refinement? A process of innovation and reinvention? Why?

The Fisheries Forum will host a networking reception, 5:30 – 7:30 pm at Level, 69 West Street. All participants are invited to attend!

Wednesday, May 18th • EFH authorities in a changing environment

8:30 – 8:45 am **Introduction and Day 1 review**

Fisheries Forum facilitators

8:45 – 10:30 am **Advances in habitat science to support EFH**

- Habitat science orientation – *Steve Brown, NMFS/OST*
- Ecosystem modeling for habitat management - *Howard Townsend, NMFS/OHC*
- Nowcasting seascape dynamics to better estimate past and future species-habitat distributions - *John Manderson, NMFS/NEFSC*
- Prioritizing habitat across ontogeny and species – *Richard Appeldoorn, University of Puerto Rico; CFMC SSC*
- Monitoring, modeling, and mapping demersal communities in untrawlable habitats - *Mary Yoklavich, NMFS/SWFSC*

➔ What are the key research questions underlying the implementation and use of EFH authorities?
➔ Which questions are possible and feasible to address? How are advances in habitat science enabling us to address these questions more effectively?
➔ What are the limitations? Are any questions impossible to answer?

10:30 – 10:45 am **Break**

10:45 – 12:00 pm **Facilitated breakout discussions: EFH authorities in a changing environment**

Participants will be divided into three breakout groups including a mix of roles/regions. Fisheries Forum facilitators.

➔ How might climate change impact the effectiveness of actions to identify and conserve EFH, including through the EFH consultation process? Why—and how—might the use of EFH authorities need to adapt?
➔ How could EFH authorities be used to support climate resilience?
➔ What are the key questions, concerns, and uncertainties to consider?

12:00 – 1:15 pm **Lunch (on your own)**

1:15 – 3:30 pm **EFH consultations and effective council-agency communication**

- Introduction to the EFH consultation process – *Karen Greene, NMFS/GARFO*
- Council-agency communication and EFH consultations
  - *Pace Wilber, NMFS/SERO*
  - *Jessica Coakley, MAFMC*
  - *Matt Eagleton, NMFS/AKRO*

- Regional EFH Coordinators - Emerging issues roundtable
  - *Danielle Jayewardene, NMFS/PIRO*
  - *Karen Greene, NMFS/GARFO*
  - *Matt Eagleton, NMFS/AKRO*
  - *John Stadler, NMFS/WCRO*
  - *David Dale, NMFS/SERO*
- Group discussion

➔ What pathways exist for council-agency communication related to EFH consultations?
➔ What level of council engagement and awareness of EFH consultations is beneficial, and why? What are the opportunities and challenges to effective council engagement?
➔ How might emerging issues and development activities influence the need for communication among regions and management partners?

3:30 – 3:45 pm **Break**

3:45 – 5:00 pm **Habitat networks and opportunities for collaboration**

- *Gerry Davis, NMFS/PIRO*
- *Pace Wilber, NMFS/SERO*
- *Lou Chiarella, NMFS/GARFO*
- *Vince Guida, NMFS/NEFSC*
- Group discussion

➔ What collaborations and partnerships does your council, region, or science center participate in? What is the purpose? (E.g. information sharing, coordination, communicating research priorities, etc.)
➔ How are collaborations and partnerships initiated and maintained? What makes them successful?

Thursday May 19th • Looking ahead

8:30 – 8:45 am **Introduction and Day 2 review**

Fisheries Forum facilitators

8:45 – 10:30 am **EFH authorities and ecosystem-based fisheries management (EBFM)**

- A national perspective on EFH as a tool for EBFM – *Karen Abrams, NMFS/OSF*
- Habitat indicators for the California Current Integrated Ecosystem Assessment – *Correigh Greene, NMFS/NWFSC*
- Group discussion

> ➔ How can habitat conservation be used as a strategy to implement EBFM?
> ➔ How can EFH authorities be leveraged to support regional EBFM approaches?
> ➔ In the context of your region, how could EFH information be organized to support EBFM most effectively?

10:30 – 10:45 am **Break**

10:45 – 12:00 am **Facilitated breakout discussions: Regional discussions**

Participants will break out into groups by region. NOAA Fisheries facilitators.

> ➔ What challenges, emerging issues, and new opportunities do you think will influence your region's use of EFH authorities in the future?
> ➔ What discussions at the EFH Summit were most informative to your work? What new ideas and information will you take back to your region?

12:00 – 1:15 pm **Lunch (on your own)**

1:15 – 2:30 pm **Full group report back and discussion: Looking ahead**

Each regional group will present highlights of their region's discussion.

2:30 – 3:00 pm **Wrap up and closing remarks**

Adjourn

Appendix B – Planning Groups

The following individuals provided significant insight and input to the EFH Summit planning process:

Fisheries Leadership and Sustainability Forum:
Kim Gordon, Caitlin Hamer, Katie Latanich**.**

EFH Summit Steering Committee:
Michelle Bachman, Jessica Coakley, David Dale, John Froeschke, Correigh Greene, Kirsten Larsen, Lauren Latchford, Terra Lederhouse, Steve MacLean, Becky Walker.

EFH Summit Advisory Group:
John Boreman, Lou Chiarella, Michelle Duval, Carlos Farchette, Kara Meckley, Tom Nies, Tom Noji, Bill Tweit.

CCC Habitat Workgroup:
Michelle Bachman, Jessica Coakley, David Dale, Matt Eagleton, John Froeschke, Graciela Garcia-Moliner, Karen Greene, Morgan Kilgour, Kirsten Larsen, Lauren Latchford, Terra Lederhouse, Steve MacLean, Tony Marshak, John Olson, Roger Pugliese, Claire Roberts, Bob Schroeder, John Stadler, Becky Walker.

Appendix C – Participants

Name	Affiliation
Abrams, Karen	NMFS/OSF
Anderson, Lee	MAFMC Vice Chairman
Appeldoorn, Richard	CFMC SSC Chairman
Atkinson, Alex	NMFS/OHC
Bachman, Michelle	NEFMC staff
Bankey, Laura	National Aquarium
Beard, Kristy	NMFS/GARFO
Bigford, Tom	American Fisheries Society
Boreman, John	MAFMC SSC Chairman
Brady, Bonnie	Long Island Commercial Fishing Association
Brock, Robert	NOS/ONMS
Brown, Steve	NMFS/OST
Chesney, Bryant	NMFS/WCRO
Chiarella, Lou	NMFS/GARFO
Coakley, Jessica	MAFMC staff
Colden, Allison	Restore America's Estuaries
Cooper, Peter	NMFS/OSF/HMS
Cruz Lizama, Becky	NOAA/OLIA
Cudney, Jen	NMFS/OSF/HMS
Culbertson, Jennifer	Bureau of Ocean Energy Management
Dale, David	NMFS/SERO
Davis, Gerry	NMFS/PIRO
DeAngelis, Bryan	The Nature Conservancy
Deem, Jeff	Virginia Marine Resources Commission, Finfish Mgmt Advisory Committee
DeMello, Josh	WPRFMC staff
Diaz, Dale	GMFMC member
Duval, Michelle	SAFMC Chairman
Eagleton, Matt	NMFS/AKRO
Fay, Virginia	NMFS/SERO
Ford, Kathryn	NEFMC Habitat PDT member
Garcia-Moliner, Graciela	CFMC staff
Gauvin, John	Alaska Seafood Cooperative
Gerke, Brandee	NMFS/AKRO
Gittings, Steve	NOS/ONMS
Greene, Karen	NMFS/GARFO
Greene, Correigh	NMFS/NWFSC
Guida, Vince	NMFS/NEFSC
Harris, Janine	NMFS/OHC
Hawkins, Annie	Kelley Drye & Warren LLP
Haymans, Doug	SAFMC member

Hoellen, Kris	National Aquarium
Hooker, Brian	Bureau of Ocean Energy Management
Ihde, Tom	NMFS/HC/NCBO
Ito, Daniel	NMFS/AFSC
Jayewardene, Danielle	NMFS/PIRO
Kellison, Todd	NMFS/SEFSC
Kellogg, Chris	NEFMC staff
Kelly, Moira	NMFS/GARFO
Kilgour, Morgan	GMFMC staff
Larsen, Kirsten	NMFS/OST
Latchford, Lauren	NMFS/OHC
Lederhouse, Terra	NMFS/OHC
Lockhart, Frank	NMFS/WCRO
Luisi, Mike	MAFMC Vice Chairman
MacLean, Steve	NPFMC staff
Magliocca, Michelle	NMFS/GARFO
Manderson, John	NMFS/NEFSC
Marshak, Tony	NMFS/OST
Masterton, Molly	Natural Resources Defense Council
Matthews, Kathryn	Oceana
Meaney, Chris	NMFS/OHC
Meckley, Kara	NMFS/OHC
Minkiewicz, Drew	Kelley Drye & Warren LLP
Moore, Meredith	The Pew Charitable Trusts
Moore, Peter	MAFMC AP member
Moustahfid, Hassan	NOS/IOOS
Olson, John	NMFS/AKRO
Odell, Jay	The Nature Conservancy
Packer, Dave	NMFS/NEFSC
Parke, Michael	NMFS/PIFSC
Pessutti, Jeff	NMFS/NEFSC
Pool, Taylor	American Fisheries Society
Pugliese, Roger	SAFMC staff
Quinn, John	NEFMC Vice Chairman
Recht, Fran	Pacific States Marine Fisheries Commission
Roberts, Claire	GMFMC staff
Rogers, Stan	NMFS/OHC
Rooper, Chris	NMFS/AFSC
Seagraves, Rich	MAFMC staff
Selberg, Carrie	NMFS/OHC
Smith, Tyler	CFMC SSC member
Stadler, John	NMFS/WCRO
Stedman, Susan-Marie	NMFS/OHC
Stein, Sarah	NMFS/OST
Stevenson, David	NMFS/GARFO
Swafford, Russell	NMFS/SERO

Swasey, Jill	MRAG Americas, Inc.
Tate, TJ	National Aquarium
Townsend, Howard	NMFS/OHC
Tweit, Bill	NPFMC Vice Chairman
Waine, Michael	NMFS/OSF
Wakefield, Waldo	NMFS/NWFSC
Walker, Rebecca	WPRFMC staff
Wenzel, Lauren	NOS/ONMS
Wilber, Pace	NMFS/SERO
Witherell, Dave	NPFMC staff
Woolcott, Craig	NOAA/OLIA
Yoklavich, Mary	NMFS/SWFSC

Appendix D – Post-Summit Activities

NOAA Fisheries and the Fisheries Leadership and Sustainability Forum shared additional, more abbreviated meeting summaries with participants and the public immediately following the EFH Summit.

Council Coordination Committee (CCC) discussion: Representatives from NOAA Fisheries Office of Habitat Conservation, the Fisheries Leadership and Sustainability Forum, and the North Pacific Fishery Management Council (on behalf of the EFH Summit Advisory Group and the CCC) provided key highlights from the EFH Summit discussions to the CCC at its May 25-26, 2016 meeting in St. Thomas, U.S. Virgin Islands. Several CCC members that attended the EFH Summit praised NOAA Fisheries and the Fisheries Leadership and Sustainability Forum their planning and execution of the Summit and stressed the value of the information exchange across regions from a variety of participants. There was special praise for the obvious passion from many of the EFH scientists and managers that presented information at the Summit. The CCC unanimously agreed to continue the cross-council CCC Habitat Workgroup to discuss several key issues raised at the Summit, including coordination and communication on new and emerging coastal and marine development activities, and asked for the working group to report back on progress at one of the 2017 CCC meetings, which did occur at the spring 2017 meeting in Gloucester, MA.

Summary document: The Fisheries Leadership and Sustainability Forum also developed a brief summary report, available at http://www.habitat.noaa.gov/efh20/pdf/EFH_summit_summary.pdf.