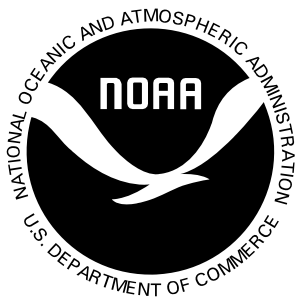


Habitat Assessment Prioritization

A Report by the Habitat Assessment Prioritization Working Group

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Executive Summary

Habitat science is critical to the National Marine Fisheries Service (NMFS) to fulfill regulatory mandates under the Magnuson-Stevens Fishery Conservation and Management Act (MSA). Two areas of emphasis identified in the Habitat Assessment Improvement Plan (HAIP) are: (1) reducing habitat-related uncertainty in stock assessments; and (2) improving the information upon which designations of essential fish habitat (EFH) and habitat areas of particular concern (HAPC) are based. To accomplish these goals, NMFS conducts habitat assessments, which are the process and the products associated with consolidating, analyzing, and reporting the best available information on the influence of habitat characteristics on the population dynamics of fishery species and other living marine resources. Enhanced habitat understanding will advance NMFS' ability to meet MSA mandates and will move the agency toward more sophisticated integrated ecosystem assessments and more comprehensive ecosystem-based management (EBM).

The HAIP recommends that NMFS develop criteria to prioritize stocks that would benefit from habitat assessments. The HAIP also recommends that NMFS identify and prioritize data inadequacies for stocks and their respective habitats. These recommendations were supported at the National Habitat Assessment Workshop, which concluded that regional entities should work together to support the HAIP, including greater communication and coordination between Fisheries Science Centers, Regional Offices, Restoration Centers, and NMFS Headquarters.

In order to implement the goals of the HAIP, the Habitat Assessment Prioritization Work Group (HAPWG) was formed. Specifically, the HAPWG was tasked to: (1) determine the approach, terms, and specific criteria most appropriate for prioritizing habitat assessments and (2) make recommendations about how to best apply prioritization criteria to develop lists of regional habitat priorities. This document recommends a prioritization process to be carried out by Regional Habitat Assessment Prioritization Work Groups, consisting of staff from NMFS Regional Offices and Fisheries Science Centers.

These regional habitat assessment priorities will collectively represent a national set of habitat science priorities. Habitat Science Supporting Stock Assessment Priorities represent the extent to which a habitat assessment should provide efficient and meaningful results to improve stock assessments for valuable and important stocks. EFH Science Priorities represent the extent to which a habitat assessment should provide efficient and meaningful results to inform designations of HAPC and EFH for valuable and important stocks. The priorities will be used to build new habitat science funding initiatives and inform strategic planning for habitat assessments as outlined in the NOAA Habitat Blueprint

Introduction

This document is a significant milestone in NOAA's National Marine Fisheries Service's (NMFS) work to build a comprehensive habitat science program that can meet the scientific and management challenges of the 21st century. The working group members assert that habitat and other ecological considerations are a crucial component of fisheries management and that all decisions involving the environment and its natural resources should take them into consideration. Progress toward this goal requires that habitat information be recognized and accepted not only as the best available data, but also as the definitive information being used by NMFS scientists and managers. Building habitat science to this level requires rigorous habitat assessments (see text box below). Although NMFS has a long and distinguished history in fisheries science, gaps remain in the agency's capacity to conduct habitat science. These gaps affect the agency's ability to provide the habitat information needed to fully address the mandates of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) and conduct ecosystem-based management.

Recognizing the need to improve the agency's habitat science capacity, the NMFS Science Board commissioned a habitat science plan in 2008, and appointed the Habitat Assessment Improvement Plan team. The resulting *Marine Fisheries Habitat Assessment Improvement Plan* (HAIP; NMFS 2010) includes an analysis of the agency's habitat science needs, and provides nine major recommendations for meeting these needs. Three tiers of excellence in habitat assessment are defined in the HAIP, along with estimates of the human and financial resources needed to advance from tier to tier.

Habitat is the place where species live, and can be characterized and described by the physical, chemical, biological, and geological components of the ocean environment.

A habitat assessment is 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. Indicators of the value and condition (or status) of habitat can be developed through a habitat assessment by understanding the relationships between habitat characteristics, the productivity of fishery species, and the type and magnitude of various impacts.

HAIP, p. 1.

The goals of the HAIP are to: (1) assist NOAA in developing habitat science; (2) improve NMFS' ability to identify essential fish habitat and habitat areas of particular concern; (3) provide information needed to assess impacts to essential fish habitat; (4) reduce habitat-related uncertainty in stock assessments; (5) facilitate a greater number of stock assessments that explicitly incorporate ecosystem considerations and spatial analyses; (6) contribute to assessments of ecosystem services; and (7) contribute to

ecosystem-based management (EBM), integrated ecosystem assessments (IEAs), and coastal and marine spatial planning (CMSP).

The scope of the HAIP was restricted to federally managed stocks or stock complexes that are included in fishery management plans (FMP), with a particular focus on the 230 stocks that comprise the Fish Stock Sustainability Index (FSSI). FSSI stocks represent over 90% of commercial and recreational landings in the United States. Similarly, this process prioritizes FSSI stocks but allows exceptions for regional Fishery Management Council (FMC) priority stocks with FMPs. While the focus is on FSSI stocks, improved habitat science and assessments will also benefit other living marine resources.

Two of the recommendations in the HAIP have led to the development of this prioritization document: (1) NMFS should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments; and (2) NMFS should identify and prioritize data inadequacies for stocks and their respective habitats, as relevant to information gaps identified in the HAIP. This prioritization document addresses the first of these two recommendations, and will presents a method to achieve the second. While this document does not explicitly prioritize geographic locations, the geographic context is provided by the habitats used by each stock.

Shortly after the publication of the HAIP, NMFS sponsored the first National Habitat Assessment Workshop (NHAW). This workshop was designed to kick off implementation of the HAIP, and included a joint session with the agency's 11th National Stock Assessment Workshop (NSAW; Blackhart 2010). A key finding from this workshop was the need to improve communication and coordination among Fisheries Science Centers, Regional Offices, Restoration Centers, and NMFS Headquarters in order for them to work effectively as regional teams to supporting the implementation of the HAIP.

Following these recommendations, a 19-member Habitat Assessment Prioritization Work Group (HAPWG ; Appendix 1) was formed that broadly represents those components of the agency with responsibilities involving fish habitat. The goal of this team was to develop a standardized set of criteria to prioritize stocks that would benefit from improved habitat assessments, and to provide guidelines for applying them. The resulting prioritization process will identify FSSI and select stocks with FMPs that are likely to derive the greatest benefit from habitat assessments. Prioritization will be conducted by regional teams, resulting in region-specific lists of priority stocks to focus NMFS' habitat research.

While this effort was being undertaken, NMFS leadership called for an increased focus on habitat science and conservation across all agency activities, and the Habitat Blueprint was developed. The Habitat Blueprint provides a forward looking framework for NOAA to think and act strategically across programs and with partner organizations to address the growing challenge of coastal and marine habitat loss and degradation. A geographic priority area will be selected in each region to implement innovative place-based habitat solutions to address coastal and marine resource challenges. The stocks identified by this prioritization process will be used to establish these areas as well as prioritize our science efforts as outlined in the Blueprint.

More focused research through the resulting Habitat Science Priorities would provide substantial benefits to NMFS. It could result in a more efficient use of existing resources and information and provide justification for increased funding for habitat science. Habitat assessments for these high-priority stocks could improve stock assessment model design, improve model inputs, incorporate the relationships between habitat and population processes in models, and provide the information to refine or improve the understanding of EFH. Such science is the next step toward the long-term goal of attaining Tier 3 habitat assessments for every federally managed stock as NMFS implements the HAIP and the NOAA Habitat Blueprint.

Prioritization Process

This document outlines a procedure to prioritize stocks whose management would benefit from improved habitat science. The HAPWG strongly believes that habitat science priorities should be determined regionally, because fishery management and science decisions are made and implemented largely on that basis. The HAPWG therefore recommends that each NMFS region convene a Regional Habitat Assessment Prioritization Work Group (RHAWPG) to prioritize stocks for habitat assessments. Each RHAWPG should implement the process outlined in this document to generate regional habitat assessment priorities, which collectively will represent a national set of habitat science priorities.

Habitat science is used by NMFS Regional Offices to manage essential fish habitat (EFH), and by Fisheries Science Centers for a variety of purposes, including improved stock assessment and improved understanding of habitat dependencies affecting the distribution and abundance of managed species. To reflect the diversity of uses for habitat science and ensure a meaningful prioritization process, each Regional Habitat Assessment Prioritization Work Group (RHAPWG) should include representative NMFS scientists and managers who use and contribute to habitat science. Each RHAPWG should be comprised of staff from Fishery Science Centers, Regional Offices, and other experts as appropriate. Each NMFS Fisheries Science Center Director should appoint representatives from the Science Center with the necessary expertise in habitat, stock assessment, and ecosystem science to evaluate stocks by the criteria listed in this document. Each NMFS Regional Administrator should appoint Regional Office staff to evaluate stocks from a management perspective. Each RHAPWG should prioritize the stocks for which it has primary stock-assessment and/or EFH responsibilities. If a stock is jointly managed by two NMFS regions, the stock may be represented in the prioritization process in either one or both of those regions at the discretion of regional leadership (Science Center Directors and Regional Administrators). Experts from adjoining regions should be included in the scoring for these stocks.

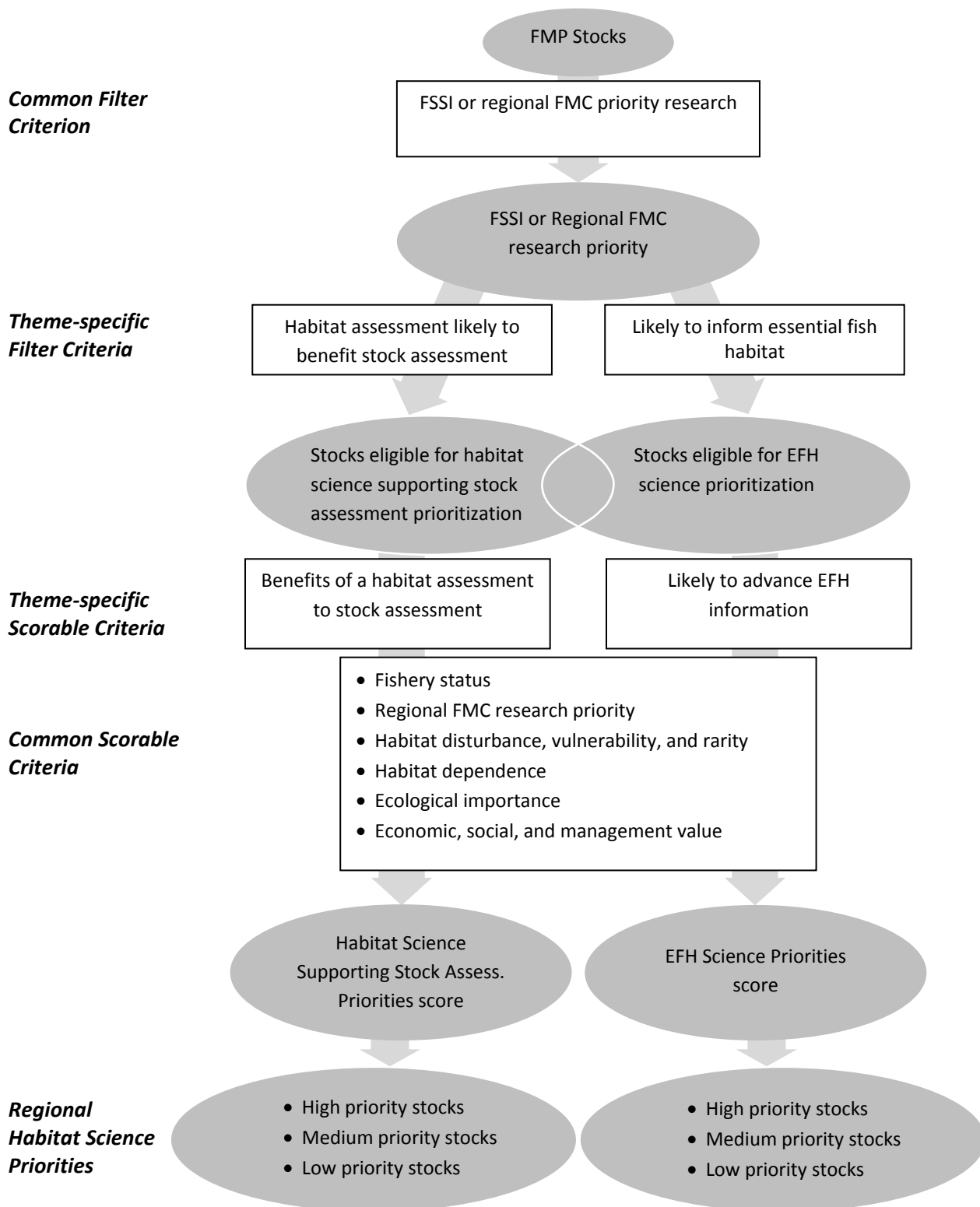
The HAIP identifies two major research demands for habitat science and assessments: (1) reduce habitat-related uncertainty in stock assessments, and (2) improve the information upon which designations of essential fish habitat (EFH) and habitat areas of particular concern (HAPC) are based. The HAPWG supports these two objectives through two parallel prioritization processes: the Habitat Science Supporting Stock Assessment prioritization and the Essential Fish Habitat Science prioritization (Figure 1). These prioritization processes consider unique habitat science applications, but take advantage of common evaluation criteria (Table 1).

This process supports a prioritization of those stocks managed by NMFS through FMPs. Stocks represent the fundamental management level in the MSA. As such, stocks are commonly used units in strategic planning throughout NMFS. The HAPWG recognizes the importance of EBM, and the relationship between species and their habitats is a fundamental component of EBM. While the priorities that result from this process are organized at the stock level, the habitat assessments they identify will provide information for a suite of stocks and other factors, not just the focus stock.

Table 1. Applicable criteria for each habitat assessment prioritization process. Some criteria apply to both prioritization processes (common), while some apply to only one of the two prioritization processes (theme-specific). A stock must be eligible using filter criteria before being evaluated against scorable criteria and assigned a score.

	Habitat Science Supporting Stock Assessment Prioritization	Essential Fish Habitat Science Prioritization
Common Filter Criteria	FMP stock listed in the FSSI or classified as regional Fishery Management Council research priority	FMP stock listed in the FSSI or classified as regional Fishery Management Council research priority
Theme-specific Filter Criteria	Habitat assessment likely to benefit stock assessment	Habitat assessment likely to inform essential fish habitat science
Theme-specific Scorable Criteria	Benefits of a habitat assessment to a stock assessment	Habitat assessment likely to advance EFH information
Common Scorable Criteria	Fishery status	Fishery status
	Regional Fishery Management Council research priority	Regional Fishery Management Council research priority
	Habitat disturbance, vulnerability, and rarity	Habitat disturbance, vulnerability, and rarity
	Habitat dependence	Habitat dependence
	Ecological importance	Ecological importance
	Economic, social, and management value	Economic, social, and management value

Figure 1. The prioritization process to be followed by each RHAPWG.



There are two types of criteria to be used when considering each stock: filter criteria and scorable criteria. A stock must meet the filter criteria to be further considered in the prioritization process. If a stock does not meet a filter criterion, it should be removed from consideration for the prioritization process(es) to which that criterion applies. The common filter criterion, “FMP stock listed in the FSSI or classified as regional Fishery Management Council research priority,” applies to both the habitat science supporting stock assessment and EFH prioritization processes. This filter should be considered first, and any stocks that do not qualify should be removed from consideration. Next, the RHAPWG should consider the remaining stocks separately against the two theme-specific filter criteria (Table 1). Those stocks that pass the “Habitat assessment likely to benefit stock assessment” filter should be further considered for the Habitat Science Supporting Stock Assessment prioritization. Those stocks that pass the “Likely to inform essential fish habitat science” filter should be further considered for the EFH prioritization.

In the second round of criteria, scorable criteria, the RHAPWG will assign a score independently to each stock based on its qualifications against a rubric. The scores will be used later in the process to create the priorities for each region. Stocks eligible for the habitat science supporting stock assessment prioritization (i.e., those that met the “FMP or FMC research priority” and “Habitat assessment likely to benefit stock assessment” filters) should be evaluated against the “Benefits of a habitat assessment to stock assessment” criterion. Stocks eligible for the EFH prioritization (i.e., those that met the “FMP or regional FMC research priority” and “Likely to inform EFH” filters) should be evaluated against the “Likely to advance EFH information” criterion. The remaining scorable criteria are common to both prioritization processes. Therefore, the RHAPWG should score all stocks that are eligible for the stock assessment *or* the EFH prioritization processes using the common scorable criteria (Table 1). These scores should then be applied to the stock only for the prioritization process(es) for which it is eligible.

Appendices 2 and 3 provide scores for a set of example stocks, illustrating the differences and commonalities between the prioritization processes. For example, stock 1 did not pass the “FSSI or regional FMC priority research” criterion; therefore, it was not assessed any further against the other criteria. Stock 2 passed the “FSSI or regional FMC priority research” filter; therefore it was considered against the “Habitat assessment likely to benefit stock assessment” and “Likely to inform EFH” filters. Since stock 2 only passed the “Likely to inform EFH” filter, it was only scored for criteria that apply to the Essential Fish Habitat Science prioritization process. Conversely, stock 7 only passed the “FSSI or regional FMC priority research” and subsequent “Habitat assessment likely to benefit stock assessment” filters, so it was only scored against criteria that apply to the Habitat Science Supporting Stock Assessment prioritization. Stock 4 passed all filter criteria, and was evaluated against all scorable criteria. Since many of the scorable criteria apply to both prioritization processes the same values were used for both processes.

Once all eligible stocks for each prioritization process have been scored, their priority scores should be summed separately for each prioritization process to create a final score. The HAPWG does not recommend that any weights be applied to the scores when creating a final score. If a weighting scheme

is applied by the RHAPWG, the decision should be made before the prioritization is begun, and the rationale should be documented.

Once all eligible stocks have been given a final score for their prioritization process(es), these scores must be translated into Habitat Science Priority categories. There are two sets of Habitat Science Priority categories corresponding to the major theme areas for habitat science: Essential Fish Habitat Science Priority categories and Habitat Science Supporting Stock Assessment Priority categories. The final score from each process should be used to sort eligible stocks to their respective scored lists (i.e., one list for Habitat Science Supporting Stock Assessment Priorities and one list for Essential Fish Habitat Science Priorities). This score should then be used to identify stocks as high, medium, or low priorities for each theme area.

The HAPWG does not recommend a set number or percentage breakdown when assigning stocks to either the Essential Fish Habitat Science Priority categories or the Habitat Science Supporting Stock Assessment Priority categories. While general guidelines for cutoffs (e.g., 90th percentile and 70th percentile or top five scoring stocks and the next ten highest scoring stocks) could be specified, it is better to allow RHAPWGs to tailor this part of the prioritization to their particular science needs or resources. Additionally, there may be situations where many similar stocks are grouped together in a particular category due to similar life-histories or habitat requirements. Although stocks with similar habitats could be addressed with a single or limited number of habitat assessments, this emphasis could unduly exclude other significant stocks from consideration. For example, high-scoring salmon stocks in the Pacific Northwest could exclude all other stocks from the high-priority category. In such a case, the RHAPWG might choose a lower threshold to include a greater diversity of stocks in that category. Another consideration to be addressed is whether a small difference (e.g., 1 point) in the final score is a meaningful difference in practice. The RHAPWG may choose to identify natural or otherwise meaningful breaks in the final scores to assign Habitat Science Priority categories. The example cutoffs listed above should be treated as general guidelines, which the RHAPWG may choose to alter. If the RHAPWG chooses to do so, it should document the rationale for the decision.

The RHAPWG should present its results in a report that provides a summarized list of stocks in each Habitat Science Priority category. The report should also include an appendix containing a table of raw scores from each criterion for each stock or stock complex considered (see examples in Appendices 2 and 3). The report should also contain an appendix with additional text for each stock as needed to explain or justify scores, to identify knowledge gaps and suggest research, and to provide other useful information.

The HAPWG conducted a pilot prioritization to test the process and criteria to ensure the process: (1) is comprehensive, practical and flexible, (2) can be implemented by a panel of experts, and (3) is adequate for discriminating high-priority stocks. A set of 17 validation stocks and stock complexes managed by NMFS across all six regions were selected to represent the diversity of stocks to be prioritized. Stocks representing various habitats (e.g., pelagic, anadromous, demersal, coral reef, etc.), economic or cultural values, levels of knowledge, regional FMC research priorities, and stock statuses were selected

to test the criteria across the range of possible outcomes. The HAPWG found the process to be both manageable and efficient. While the HAPWG relied mainly on expert opinions within the group (i.e., no previous data synthesis was conducted, as would be the case for the RPHAWG process), the HAPWG was able to complete the prioritization in approximately 3 hours. Consensus was reached in the diverse group of stock assessment scientists, habitat scientists, and habitat managers on each score after a short discussion. The HAPWG found that both consistency and efficiency were improved by scoring all stocks for a single criterion before moving on to the next criterion, as opposed to scoring a stock against each of the criteria before moving on to evaluate the next stock. Therefore, the HAPWG recommends that RHAPWGs score all stocks at once for a given criterion. Criteria that were difficult to interpret or score were clarified by the HAPWG during this pilot prioritization. While the unofficial scores were not intended for use in the actual prioritization processes and therefore will not be released, the data in Appendices 2 and 3 roughly represent the distribution and outcomes of this pilot prioritization. The outcomes of the pilot prioritization generally matched HAPWG members' interpretation of habitat research priorities in their regions.

General Criteria Guidance

This section provides general guidance for using the evaluation criteria that comprise the two prioritization processes. Each of these criteria also has a set of specific guidelines, which are described in detail below, after the rubric for that criterion. The guidelines include definitions (also found in the Glossary) and specific interpretations. This guidance provided in this section applies to all criteria unless specifically defined otherwise in the guidance of that criterion.

When evaluating a stock against the criteria, each life-history stage should be considered, and the score from the maximum-scoring life history stage should be assigned to that stock. Similarly, if stock complexes are considered, the score from the maximum-scoring stock should be assigned to that complex. If the stock fails to meet any of the specified criteria, zero points should be assigned.

The RHAPWG should use the definition of *habitat* provided by the HAIP: “The place where species live, characterized by the physical, chemical, biological, and geological components of the ocean environment.” Habitat includes the entire water column as well as the seafloor, and should be considered in the context of oceanographic conditions that affect connectivity among habitats. Habitat should be considered at multiple temporal and spatial scales. For example, the impacts of large-scale anthropogenic factors (such as climate change) should be considered as well as localized factors (such as site-specific dredging).

The RHAPWG likely will identify data gaps while evaluating stocks using each criterion. For example, when determining whether a habitat assessment for a stock is likely to result in an SAIP Level 5 assessment, the RHAPWG might discover that benthic mapping is the major data gap inhibiting such an advance. This information, generated through discussions of diverse habitat science practitioners, is valuable and rarely documented.

The RHAPWG should compile and determine the appropriateness of information sources before meeting. Information should be compiled at the discretion of the RHAPWG. Where possible and appropriate, the working group should seek input from experts on stocks and habitats to aid in the decision process and gather the best available information. Examples of other potential information sources include regional research plans compiled by Sea Grant, Marine Fisheries Commissions, and regional ocean partnerships. If adequate information exists, a score should be assigned for each criterion according to the rubric. If adequate information does not exist, it may be inferred from similar stocks, similar habitats, and/or professional opinion or judgment. If no information is available, can be inferred through similar stocks or habitats, or determined through professional judgment, the regional prioritization group should assign a moderate value (i.e., 2) to the stock for the rubric in question. This ensures that the lack of information does not significantly impact the stock’s overall score either positively or negatively.

Recommendations for Using the Prioritized Lists

Once the Habitat Science Priorities have been assigned, they can be used to inform habitat research, strategic planning, and support funding initiatives. These priorities are an important piece of information to be considered when determining the habitat assessments to be performed. The Habitat Science Priorities should be used to focus and improve habitat science as NMFS implements the HAIP and *NOAA Habitat Blueprint*.

The Habitat Science Priorities produced by this process represent the extent to which a stock satisfies the suite of criteria used to identify stocks that are most likely to provide efficient and meaningful results from a habitat assessment. High-priority stocks meet many of these criteria, while medium-priority do so to a lesser extent. Low-priority stocks meet the basic criteria to qualify for a productive habitat assessment, but received moderate to low scores in the prioritization process.

Habitat science represents an important component of EBM. As NMFS implements EBM, it will be important to address relationships between stocks and their habitats as mediated by other ecosystem components. As the Habitat Science Priorities are implemented, they should be considered in the context of EBM and existing NMFS research programs. Research should strive to address a portfolio of diverse habitats, stocks, communities, and ecosystems to maximize the results of habitat assessments. In practice, numerous considerations must be taken into account when determining which habitat assessments to conduct during Fisheries Science Center–level implementation or when judging the merit of proposals. Examples of such considerations include opportunistic research, available resources, partnerships and cost-sharing, efficiency, building and maintaining long-term research, and the best use of existing information.

The priorities generated through this process are not intended to be static. To the contrary, the priorities should be regularly updated to meet the HAIP's goals of reducing habitat-related uncertainty and improving knowledge supporting EFH and HAPC. The HAPWG recommends revising the priorities approximately every five years. A five-year timeframe for revision would allow research priorities to be modified as habitat assessments are implemented and research goals are achieved, and mirrors the time frame for EFH updates. This timeframe would also provide stability over the medium term for strategic planning of habitat assessments and minimize the resources required to conduct more frequent prioritization activities. A five-year timeframe would also allow the tracking of research gains through performance measures connected to the Habitat Science Priorities. Any revisions to the process should be adaptive, allowing for flexibility to remove or revise ineffective criteria, add new criteria, or modify the process to improve its efficiency or results.

Filter Criteria Guidance

Common filter criterion: FMP stock listed in the FSSI or is a regional Fishery Management Council research priority

Application

This criterion should be applied as a filter for both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

NMFS implements Fishery Management Plans that have currently been developed by regional FMCs for 533 managed stocks (FMP stocks). Due to the large number of FMP stocks and the information requirements of the prioritization process, it is necessary to filter out lower-priority stocks. The Fish Stock Sustainability Index (FSSI) identifies many of the most commercially and recreationally important stocks and stock complexes. Criteria for selection of FSSI stocks include whether they are primary target species (landings greater than 200,000 pounds), are overfished or subject to overfishing, have assessments scheduled, have previously been identified as important to management, or other factors as appropriate. The FSSI stocks represent about 90% of all commercial and recreational landings in the United States.

The regional FMCs provide research priorities to the Fisheries Science Center Directors. While each region and regional FMC use different protocols to provide these science priorities, the information may be useful in supplementing the list of FSSI stocks to ensure that important stocks are considered.

Scoring Rubric

To pass this filter for further consideration, a stock must be included in the management unit of a federal FMP. The stock must also be included as one of the 230 stocks on the FSSI list *or* be listed as a regional Fishery Management Council research priority.

Guidelines

When determining whether a stock is a regional FMC priority for this criterion, the most recent regional FMC research priority document should be used. A stock may be listed as a general research priority; it does not need to be listed as a habitat-specific research priority. This clarification maintains the intent of the criterion, which is that stocks identified as important to the regional FMC are considered for the prioritization process. The list of FSSI stocks is available online at <http://www.nmfs.noaa.gov/sfa/statusoffisheries/SOSmain.htm>, and the list of stocks with an FMP is at http://www.nmfs.noaa.gov/sfa/domes_fish/FisheryMgmtPlans.htm.

Theme-specific filter criterion: Habitat assessment likely to benefit stock assessment

Application

This criterion should be applied as a filter for the Habitat Science Supporting Stock Assessment Prioritization process.

Introduction

A major goal for habitat assessments is to improve the accuracy, precision, and/or efficiency of stock assessments. Such improvements would provide clear and direct socioeconomic benefits. For example, decreased uncertainty in stock assessments could potentially decrease the management buffer applied to annual catch limits (ACL), leading to increased catches while not increasing the risk of overfishing. While the benefits of habitat assessments to some stock assessments are potentially great, some stocks lack the data, strong relationships to habitat, or other factors that would lead to these benefits. This criterion is intended to select only those stocks whose stock assessments would likely benefit from a habitat assessment.

Scoring Rubric

To pass this filter for further consideration, a stock must be likely to be assessed in the next 5 years, or be in the top quartile of stocks in the Stock Assessment Prioritization. Additionally, the stock's assessment must be likely to benefit from a habitat assessment as described below.

Guidelines

When determining whether a stock assessment would likely benefit from a habitat assessment, the stock may qualify through one of the following conditions. The habitat assessment would need to likely (1) improve model design (e.g., define spatial structure or provide an additional population dynamics process); (2) improve stock assessment model inputs (e.g., improve survey design or reduce sampling variability); or (3) Create new opportunities to develop modeling or survey techniques that incorporate the relationships between habitat and population processes or data variability.

The intent of this criterion is to ensure that information from the habitat assessment could be incorporated into a stock assessment. A minimum-level stock assessment involves some sort of quantitative data analysis and provides the information necessary to estimate the current abundance and exploitation rates of a stock relative to predefined goals; simple data reports (such as catch reports, abundance indices from a fishery-independent survey, etc.) do not qualify as stock assessments. However, updates to trend analyses or dynamic models by inclusion of new catch and abundance data to provide updated status determinations, quotas, and other information do qualify as an assessment. The Stock Assessment Prioritization is a separate process conducted to prioritize stock assessments, while the process described in this document prioritizes stocks for habitat assessments.

Theme-specific filter criterion: Habitat assessment likely to inform essential fish habitat science

Application

This criterion should be applied as a filter for the Essential Fish Habitat Science Prioritization process.

Introduction

The MSA requires that NMFS delineate and manage essential fish habitat (EFH). EFH is categorized by levels of knowledge (Appendix 4), which describe the amount and type of data associating stocks and habitats. This four-level approach provides a logical method to gather and organize data for the identification of EFH. By collecting and using information from progressively higher levels, FMCs and NMFS can maximize their habitat conservation efforts to ensure that the most ecologically important or productive habitats receive the greatest attention. The process for gathering information should begin at Level 1 to define the range of the managed species and should progress stepwise through the levels to assess habitat utilization. FMCs should strive to obtain data sufficient to describe habitat at the highest level of detail (Level 4) and provide the regulated community (i.e., fishermen and other individuals or groups proposing or conducting activities that may adversely affect EFH) with an increasingly detailed description and identification of EFH. This approach provides a natural framework for identifying information gaps that indicate needs for collecting additional information or performing research to improve our understanding of EFH.

Statutes require that EFH must be reviewed and potentially refined at least every five years, a process that requires new habitat science. Habitat assessments synthesize and provide such knowledge, and the intent of this criterion is to identify stocks for which a habitat assessment could provide the information to refine or improve the understanding of EFH.

Scoring Rubric

To pass this filter for further consideration, a habitat assessment for the stock must be likely to be conducted within a region's EFH Five-Year Review schedule. In addition, the habitat assessment for this stock must be likely to define EFH, refine EFH, or improve the understanding of adverse effects of fishing or non-fishing activities on EFH.

Guidelines

To pass this filter, an EFH review must be expected to be completed in the next five years for a stock, species, and/or species complex as well as one of the three potential qualifications listed above. In particular, "Define EFH" means to identify new EFH for a stock, such as to provide information at EFH Level 1. "Refine the EFH level of knowledge" means an increase between or within the EFH levels of knowledge. In some cases, the level of knowledge may be at the highest obtainable score, but a habitat assessment may improve the understanding of adverse effects of fishing or non-fishing activities on EFH. Such information also qualifies a stock to pass this filter.

Scorable Criteria Guidance

Theme-specific scorable criterion: Benefits of a habitat assessment to a stock assessment

Application

This scorable criterion should be applied to the Habitat Science Supporting Stock Assessment Prioritization process.

Introduction

NMFS' fish stock assessments collect, analyze, and report demographic information to determine the effects of fishing on populations. A minimum-level stock assessment involves some sort of quantitative data analysis and provides the information necessary to estimate the current abundance and exploitation rates of a stock relative to predefined goals; simple data reports (such as catch reports, abundance indices from a fishery-independent survey, etc.) do not qualify as stock assessments. However, updates to trend analyses or dynamic models by inclusion of new catch and abundance data to provide updated status determinations, quotas, and other information do qualify as an assessment.

Stock assessments use data from a variety of sources, and the quality of stock assessment products are directly tied to the quality of input data. In addition to basic data on catch, abundance, and life history, advanced stock assessments may incorporate ecosystem considerations such as habitat, multispecies effects, climate, or other environmental variables. Linking stock assessments to ecosystem factors is key to advancing NMFS' stock assessments to the "next generation" and achieving the highest level of stock assessment, as defined in the *Marine Fisheries Stock Assessment Improvement Plan* (NMFS 2001). This objective is also described in the *Marine Fisheries Habitat Assessment Improvement Plan* (NMFS 2010), which classifies Tier 3 habitat assessments as those that determine habitat-specific vital rates by life stage to quantify relationships between habitat and fishery production.

Scoring Rubric

Score	Rubric
5	A habitat assessment for this stock is likely to result in an SAIP Level 5 stock assessment, an HAIP Tier 3 habitat assessment, or improve performance within an existing SAIP Level 5 or HAIP Tier 3 assessment.
4	A habitat assessment for this stock is likely to improve survey efficiency or efficacy, reduce sampling variability, or improve the analysis of fishery catch per unit of effort (CPUE) data that are likely to be used in a stock assessment.
1	A habitat assessment would provide new opportunities to develop stock assessment modeling or survey techniques that incorporate the relationships between habitat and population processes or data variability.

Guidelines

Each stock should be considered against the rubric above, and assigned the score corresponding to the highest applicable rubric category for which it qualifies.

Stock assessment teams within each region should be consulted on the feasibility and likelihood of applying habitat assessment results to the stock assessment process for each stock considered. For a stock to receive points for this criterion, the regional prioritization group must consider whether the habitat assessment will likely provide new data sources or substantially improve existing data sources to be used in the stock assessment process. Points should only be awarded in cases where new or substantially improved data sources are likely to be produced by a habitat assessment.

HAIP Tier 3 and SAIP Level 5 definitions are provided in the Glossary. Stocks qualifying for HAIP Tier 3 (e.g., through explicit incorporation of habitat data into the stock assessment model), should be awarded 5 points. Points should be awarded if a habitat assessment is likely to improve the performance of an existing SAIP Level 5 stock assessment or significantly improve an existing HAIP Tier 3 habitat assessment.

There are many situations in which habitat assessments may potentially provide the information necessary to develop or apply new stock assessment modeling or survey techniques. To qualify, these must incorporate the relationship between habitat and population processes or data variability. For example, if a stock is currently assessed as part of a stock complex, but a habitat assessment might provide sufficient information for a separate assessment, it would qualify for 1 point.

Theme-specific scorable criterion: Habitat assessment likely to advance EFH information

Application

This scorable criterion should be applied to the Essential Fish Habitat Science Prioritization process.

Introduction

This criterion evaluates the extent to which a habitat assessment for a stock will result in an increase in the EFH level of knowledge for any life stage of that stock or increase understanding of the effects of fishing or non-fishing activities on EFH. This will assist NMFS and the regional FMCs as they fulfill MSA requirements to “minimize to the extent practicable adverse effects on such habitat caused by fishing” and consult with federal agencies “with respect to any action authorized, funded, or undertaken by [a federal agency] that may adversely affect” EFH.

The EFH regulations describe four levels of information for defining EFH. This four-level approach provides a logical method to gather and organize data for the identification of EFH. By collecting and using information from progressively higher levels, regional FMCs and NMFS can maximize their habitat conservation efforts to ensure that the most ecologically important or productive habitats receive the greatest attention. The process for gathering information should begin at Level 1 to define the range of the managed species and should progress stepwise through the levels to assess habitat utilization. regional FMCs should strive to obtain data sufficient to describe habitat at the highest level of detail (Level 4) and provide the regulated community (i.e., fishermen and other individuals or groups proposing or conducting activities that may adversely affect EFH) with an increasingly detailed interpretation of the description and identification of EFH. This approach provides a natural framework for identifying information gaps that indicate needs for collecting additional information or performing research to improve our understanding of EFH.

Scoring Rubric

Points	Rubric
5	A habitat assessment would likely provide an initial definition of EFH or an increase in understanding of adverse effects of fishing or non-fishing activities on EFH.
4	A habitat assessment would likely provide an increase in information sufficient to increase between EFH levels of knowledge.
1	A habitat assessment would likely provide an increase in information within the existing EFH level of knowledge.

Guidelines

Each stock should be considered against the rubric above, and assigned the score corresponding to the highest applicable rubric category for which it qualifies.

An initial definition of EFH, as described in the rubric, refers to a situation in which a stock with EFH status unknown is assigned a higher level (e.g., Level 1).

To qualify for 4 points, a habitat assessment must be likely to result in an increase in information between EFH levels of knowledge. A likely increase in information of one, two, or three EFH levels would qualify for this rubric category. For example, a habitat assessment might provide information to increase from Level 2 (habitat-related densities) to Level 3 (growth, reproduction, or survival rates within habitats). In this context, all improvements between EFH levels of knowledge are equal, such that moving from Level 1 to 2 is the same as moving from Level 3 to 4.

To qualify for 1 point, a habitat assessment must be likely to result in an increase in information within the current EFH level of knowledge. For example, a habitat assessment might provide improved information within a Level 1 stock that is important to EFH delineation and interpretation, but not sufficient to merit an increase to Level 2.

Common scorable criterion: Fishery status

Application

This scorable criterion should be applied to both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

The goal for this criterion is to prioritize habitat assessments for stocks at risk of population decline due to overexploitation or other factors. The score is determined by comparing the stock's abundance to reference levels of abundance (e.g., below 80% of B_{MSY}). Knowledge about the habitat requirements of such stocks may help in the development of management measures to increase stock abundance or production.

Scoring Rubric

Score	Rubric
5	Stock is overfished, approaching an overfished condition, experiencing overfishing, or is in a rebuilding or recovery plan.
3	Stock is below 80% of B_{MSY} .
2	Stock is fully exploited (i.e., $F_{MSY} \geq F_C \geq 0.75 F_{MSY}$, or $ABC \geq \text{Total Catch} \geq 0.75 ABC$ if no F_{MSY} available).
1	Stock status is unknown, but credible information exists to suggest that the stock is at risk or vulnerable to overexploitation.

Guidelines

Each stock should be considered against the rubric above, and assigned the score corresponding to the highest applicable rubric category for which it qualifies.

To score the maximum points for this criterion, a stock must be officially deemed “overfished,” “approaching an overfished condition,” experiencing “overfishing,” or in a rebuilding or recovery plan. Overfishing occurs when the fishing mortality rate, F_C , is greater than or equal to the fishing mortality that produces maximum sustainable yield (F_{MSY}). For some stocks B_{MSY} and F_{MSY} are not known, but proxies such as $B_{35\%}$ and $F_{35\%}$ may be used to determine whether a stock is overfished or experiencing overfishing.

To score 3 points, a stock's biomass, B , must be below 80% of the biomass necessary to produce maximum sustainable yield (B_{MSY}). This metric is reported as part of the calculation for FSSI scores.

To score 2 points, a stock must be fully exploited. A stock is fully exploited when F_C is greater than or equal to 75% of F_{MSY} , but below F_{MSY} . If—and only if— F_{MSY} is not available, a stock may qualify for 2 points when total catch is greater than or equal to 75% of Allowable Biological Catch (ABC).

In some cases, a stock may not have sufficient data to calculate B_{MSY} , ABC, F_{MSY} , or F_C . In this case, a stock should be awarded 1 point if credible information exists to suggest that the stock is at risk or vulnerable to overexploitation (e.g., Patrick et al. 2009). This determination should be made by the RHPWG in consultation with relevant fishery experts and in consideration of fishery status uncertainty.

Common scorable criterion: Regional Fishery Management Council research priority

Application

This scorable criterion should be applied to both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

The goal of this criterion is to focus habitat science on stocks that are high research priorities for the regional FMCs. These priorities are prepared by FMCs for stocks with input from NMFS, stakeholder groups, and the informed public. Research needed to increase the knowledge of fish and their habitat is prioritized to address immediate concerns and ongoing needs. Importantly, these priorities help scientists and managers address pressing issues and act to leverage funding sources.

Scoring Rubric

Score	Rubric
5	Research is identified for a stock by the regional FMC to address a pressing issue and satisfy the federal requirements of the MSA.
3	Research is identified for a stock by the regional FMC to address ongoing needs to maintain existing fishery management
1	Research is identified for a stock by the regional FMC; however, it is not of immediate concern or necessary to manage a federal fishery.

Guidelines

Each stock should be considered against the rubric above, and assigned the score corresponding to the highest applicable rubric category for which it qualifies.

When determining whether a stock is a regional FMC priority for this criterion, the most recent regional FMC research priorities should be used. A stock may be listed as a general research priority; it does not need to be listed as a habitat-specific research priority. This prioritizes stocks that are important to the regional FMC.

To qualify for 5 points, research must be identified for a stock that addresses a pressing issue that must be addressed to satisfy the federal requirements of the MSA. Examples of such research include

ecosystem and climate change, fishing effects on EFH, other anthropogenic impacts, identifying unknowns, investigating sensitive life history stages, and identifying rare habitats.

To qualify for 3 points, research must be identified for a stock to address ongoing needs to maintain existing fishery management. Examples of such research include improved stock assessment modeling efforts.

Regional FMCs may identify research for some stocks without specific, pressing issues or ongoing needs that must be addressed. All stocks that are represented as FMC priorities but do not qualify for the 5- or 3-point categories should be assigned 1 point.

Common scorable criterion: Habitat disturbance, vulnerability, and rarity

Application

This scorable criterion should be applied to both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

Habitat disturbance, vulnerability, and rarity are a suite of related characteristics that together describe the susceptibility of a fish stock to the impacts of habitat loss or alteration. The intent of this rubric is to identify stocks that have disturbed, vulnerable, or rare habitats as habitat assessment priorities. While disturbance, vulnerability, and rarity are different concepts, they can be combined into a meaningful scoring scheme through the additive point system below.

Scoring Rubric

Additive Points	Rubric	Category
+1	A large portion of the habitat of a fish stock is disturbed due to fishing activities or other direct anthropogenic events.	1
+1	A large portion of the habitat of a fish stock is disturbed as a result of natural disasters and indirect anthropogenic impacts.	2
+1	The habitat of a fish stock is vulnerable to disturbance based on a location that is accessible or heavily used, resulting in impacts to habitat.	3
+1	The habitat of a fish stock is vulnerable or slow to recover from disturbance.	4
+1	The habitat of a fish stock is demonstrably rare.	5

Guidelines

Each stock should be considered against each rubric category above, and assigned 1 point in every category for which it meets the standards. A maximum of 5 points is possible. If information is not available, cannot be inferred through similar stocks or habitats, or cannot be determined through best professional judgment, no points should be awarded.

Habitat disturbance and vulnerability should include not only direct physical and biological effects, but also resource population effects or ecosystem-level effects caused by the removal of targeted species.

Reduction of habitat complexity by fishing has been shown in multiple studies to have significant negative effects on survival of juveniles. In scoring habitat disturbance and vulnerability, a broad range of characteristics associated with habitat structure and function, which vary by species and life stage, must be considered. Evaluations should include all aspects of habitat (e.g., benthic characterization, water column and oceanographic conditions, and connectivity). Since there is often a lack of the biological, chemical, and physical habitat information needed to prove direct links between habitat and fishery productivity, RHAPWGs should use their best judgment to determine whether important habitats to the stock are disturbed or vulnerable. While few habitats are truly pristine, disturbance in this criterion should refer to meaningful disruptions to the ecological function of a habitat.

When evaluating the first category on this rubric, only direct habitat disturbances due to fishing activities or other direct anthropogenic events should be considered. Direct anthropogenic impacts are impacts to habitat clearly caused by humans in close proximity to the impact site (e.g., trawling, dredging, major ports, mining, fill, point-source pollution, or habitat removal).

When evaluating the second category, only disturbances that result from natural disasters and indirect anthropogenic impacts should be assigned a point. Indirect anthropogenic impacts are impacts to habitat that may be caused by humans and are mediated by a series of other physical, chemical, or biological processes (e.g., loss of freshwater input due to upstream water diversion, a dead zone due to nutrient enrichment, climate change impacts, or non-point source pollution).

The third category addresses habitat disturbance as related to geography and exposure to human disturbance based on location or intensity of use. Habitats in proximity to human population centers or within productive fishing areas are often subjected to disturbance. Examples include hydrologically connected wetlands, estuaries, and marine areas near metropolitan areas and fishing areas routinely fished or close to a fishing port.

The fourth rubric category addresses vulnerable habitats that are easily disturbed by human-induced activity or are slow to recover from disturbance. Careful consideration should be given, because recovery times of living and non-living habitats vary from months to centuries. Habitats that are slow to recover should be considered in the context of recovery time and disturbance frequency. Stocks associated with habitats that are not resilient should be awarded a point for this rubric category.

The fifth rubric category addresses rare habitats. Rare habitats occur in small or spatially limited areas; they are not broadly distributed. Rare habitats may also be those that have experienced substantial habitat loss. Many living habitats are thought to be rare, such as eelgrasses, kelps, and corals. In most regions, the overall extent of rare habitats versus other habitats is not known. However, there is likely some scientific understanding that a habitat is considered rare, either spatially or ecologically.

Common scorable criterion: Habitat dependence

Application

This scorable criterion should be applied to both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

Because all stocks exist in the context of habitat, changes in habitat quality and quantity may have impacts at the individual level (e.g., condition factor) or at the species level (e.g., production). However, some stocks rely more directly on particular habitats, and some habitats are more important during particular life history stages. The strength of the relationship between habitats and an individual fish or a fish stock describes its dependence on that habitat. Habitat assessments on highly habitat-dependent stocks are likely to provide useful information to fisheries managers. The purpose of this criterion is to prioritize habitat assessments for highly habitat-dependent stocks that will benefit stock assessment and EFH management.

Scoring Rubric

Score	Rubric
5	There is quantitative evidence that vital rates and productivity of a stock are dependent on habitat.
3	There is a measurable difference, attributable to habitat quality and/or quantity, in a stock's density, population size, and/or an individual's condition factor.
1	While uncertainty exists due to poor or conflicting data, there is a reasonable expectation for a measurable difference, attributable to habitat quality and/or quantity, in a stock's density, population size, and/or an individual's condition factor.

Guidelines

Each stock should be considered against the rubric above, and assigned the score corresponding to the highest applicable rubric category for which it qualifies.

When determining whether a stock qualifies for the 3- or 1-point categories, a measurable difference is one that has been shown to be statistically significant.

Common scorable criterion: Ecological importance

Application

This scorable criterion should be applied to both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

The purpose of this criterion is to place a higher priority on stocks that have relatively high ecological importance. Ecological importance can arise from a disproportionate influence on other species due to predation (as predator or prey), competition, mutualism, or parasitism. Dominant predator and prey species can drive trophic cascades or bottom-up processes, and importance can be elucidated via diet studies. Competitive influence can be difficult to estimate, but high-biomass species are likely to have greater competitive influence (and have a greater effect on ecological processes in general) than relatively rare stocks. Stocks can also have important mutualistic (e.g., mixed stock schooling benefits) or parasitic (e.g., disease vectors) influences. Given the lack of data, these types of interactions will likely be hard to quantify and may warrant further research. However, one relevant type of mutualistic interaction that is more easily identified is the capacity to modify habitat. Ecosystem engineers are species that create, modify, or maintain habitat in an ecosystem (Jones et al. 1994).

Scoring Rubric

Additive Points	Rubric	Category
+1	The stock is an important predator. Based on current data from the region, the stock consumes a high number of species (top quartile) compared to other predators at that life stage.	1
+1	The stock is important prey. Based on current data from the region, the stock occurs in diets of a high number of species (top quartile) compared to other prey at that life stage.	2
+1	The stock has a high biomass. The stock currently has a high (top quartile) biomass in the best available metric, within the region of interest, and at a particular life stage.	3
+1	The stock is a habitat-altering species. It is known to create, modify, or maintain habitat functions.	4
+1	Evidence exists that in the region of interest the stock was historically abundant, or an important predator, prey, or ecosystem engineer.	5

Guidelines

Each stock should be considered against each rubric category above, and assigned 1 point in every category for which it meets the standards. A maximum of 5 points is possible. Each life-history stage should be considered, and the score from the maximum-scoring life history stage should be assigned to that stock. Ecological importance will likely vary over time. The RHAPWG should use the best available data over the longest time period possible to evaluate stocks against the criteria.

Diet information required to score the first and second categories varies by region. Several marine ecosystems now have extensive diet matrices through which importance of a given species can be quantified in better ways (e.g., analyses of nodal importance) than the simple approach described here. If such metrics are available, the RHAPWG may choose to use them as a substitute for the number of species. In the event that diet information does not exist for the fishery, the first and second rubric categories may not be readily scorable. In this case, the RHAWPG should consider selecting the top 25% of stocks for that category based on professional judgment. For example, if 100 stocks were eligible to be scored (e.g., passed the filter criteria for the Essential Fish Habitat Science Prioritization), then the 25 predators with the most species-rich diets would be selected. If sufficient diet data do not exist, credit 1 point total for both categories.

For the third category, species biomass should ideally be estimated using fishery-independent survey data but, in their absence, landing statistics could be used.

For the fourth and fifth rubric categories, points should only be awarded if there is clear scientific support. A stock is considered an ecosystem engineer if its individuals directly or indirectly modulate the availability of resources to other species by causing substantial physical state changes in biotic or abiotic materials. In so doing, they modify, maintain, or create habitats (after Jones et al. 1994).

For the fifth category, evidence similar to the preceding categories should ideally be used to judge historical abundance, importance as a prey or predator, or whether a stock is an ecosystem engineer. However, if such data are not available, the data standard described in the criteria guidance still applies (i.e., best available information, information inferred through similar stocks or habitats, or information determined through best professional judgment are also acceptable). If none of these sources are available, the stock should be scored as a zero.

Common scorable criterion: Economic, social, and management value

Application

This scorable criterion should be applied to both the Habitat Science Supporting Stock Assessment Prioritization and the Essential Fish Habitat Science Prioritization processes.

Introduction

Habitat research should be prioritized to best support important stocks. The importance of a stock can be measured in economic, social, and management terms. In some cases, species with high economic importance will be prioritized. In other cases, a stock may be prioritized because of significant social or cultural importance, despite relatively low overall economic importance. Special recognition related to resource management issues should also be considered. For example, some “choke stocks” trigger management actions in other fisheries based on bycatch or a significant take of protected species. The most appropriate metrics for these factors may vary according to regional considerations and concerns, and the availability of data.

Scoring Rubric

Score	Rubric	Category
+1	The economic impacts of the commercial industry for this stock are in the top quartile (25%) of FMP stocks in the region.	1
+1	The economic impacts of recreational fishing for this stock are in the top quartile (25%) of FMP stocks in the region.	2
+1	The commercial fishery for the stock has high resource-management importance.	3
+1	The recreational fishery for the stock has high resource-management importance.	4
+1	The stock has high social value such as cultural importance or strong localized effects on community viability, or is necessary for subsistence.	5

Guidelines

Each stock should be considered against each rubric category above, and assigned 1 point in every category for which it meets the standards. A maximum of 5 points is possible. If information is not

available, cannot be inferred through similar stocks or habitats, or cannot be determined through best professional judgment, no points should be awarded.

When considering the economic impacts of the commercial industry in the first rubric category, detailed information about the employment, sales, and income impacts for the commercial harvesters, primary dealers and processors, secondary seafood wholesalers and distributors, grocers, and restaurants should be used to assign economic importance whenever possible (see, for example, Kirkley 2009). Otherwise, the RHAPWG should determine an appropriate metric such as aggregate dockside value of the landings or the first wholesale value. Regardless of the metric used to estimate commercial economic value, stocks should be ranked by the metric and a point given to stocks in the top quartile (25%).

When considering the economic impacts of recreational fishing in the second rubric category, economic importance should be based on total economic impacts (e.g., including total sales from angler expenditures, value added, income, and any other financial impacts) when these data are readily available for a particular stock (see, for example, Gentner and Steinback 2008). It is recognized, however, that it is not possible to generate economic impacts for a number of recreationally caught stocks/species. The RHAWPG should use its discretion to consider the best available data to meet this category of the rubric. Stocks should be ranked by the recreational fishing economic impact metric and a point given to stocks in the top quartile (25%).

A commercial fishery for a stock may be considered of high importance to resource management. The stock should be awarded a point if it meets at least one of the following three conditions: (1) it functions as a "choke stock" with bycatch limits that can cause premature closure of another fishery (2) its commercial fishery is responsible for protective spatial-management measures that substantially limit fishing effort or methods in the region; or (3) it is directly responsible for significant take of protected species.

A recreational fishery for a stock may be considered high value to resource management. The stock should be awarded a point if it meets at least one of the following three conditions: (1) it functions as a "choke stock" with bycatch limits that can cause premature closure of another fishery; (2) its recreational fishery is responsible for protective spatial-management measures that substantially limit fishing effort or methods in the region; or (3) it is directly responsible for significant take of protected species.

When considering the social value of the stock in the fifth rubric category, a number of potential metrics could be used by the RHAWPG. Social value should be determined at the discretion of the experts with knowledge of the region. If there is no obvious break point to clearly distinguish a group of socially valuable stocks, the region should identify the top quartile (25%). Social value includes cultural importance such as traditional use, historical ties to fishing communities, or indigenous rights. Social value also includes the concentration of benefits among communities. In some cases, priority could be given to stocks that affect multiple communities as measured by the number of vessels participating in the fishery, the number of ports with landings, or other pertinent information.

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Glossary

For a full glossary of terms used by NMFS, see the source document for this glossary, the NOAA Fisheries Glossary (NOAA 2006).

Allowable Biological Catch (ABC): A term that refers to the range of estimated allowable catch for a species or species group. It is set each year by a scientific group. The ABC estimates are used to set the annual total allowable catch.

Approaching an Overfished Condition: The basis for determining whether a stock is approaching an overfished condition is a comparison of the current stock biomass and trends in fishing effort to determine whether the stock is likely to become overfished within 2 years.

Biomass (B): Or standing stock. The total weight of a group (or stock) of living organisms (e.g., fish, plankton) or of some defined fraction of it (e.g., spawners) in an area, at a particular time; 2. Measure of the quantity, usually by weight in pounds or metric tons (2,205 pounds or 1 metric ton), of a stock at a given time.

B_{MSY}: 1. Long-term average biomass that would be achieved if fishing at a constant fishing mortality rate equal to F_{MSY} ; 2. The weight (biomass) of a group of fish necessary to produce maximum sustainable yield.

Commercial Fishery: A term related to the whole process of catching and marketing fish and shellfish for sale. It refers to and includes fisheries resources, fishermen, and related businesses.

Ecosystem-Based Management (EBM, EBFM): An approach that takes major ecosystem components and services—both structural and functional—into account in managing fisheries. It values habitat, embraces a multispecies perspective, and is committed to understanding ecosystem processes. Its goal is to rebuild and sustain populations, species, biological communities, and marine ecosystems at high levels of productivity and biological diversity so as not to jeopardize a wide range of goods and services from marine ecosystems while providing food, revenue, and recreation for humans.

Ecosystem engineer: An organism that directly or indirectly modulates the availability of resources to other species, by causing physical state changes in biotic or abiotic materials. In so doing, they modify, maintain, or create habitats (Jones et al. 1994).

Essential Fish Habitat (EFH): Congress defined EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. 1802(10)). The EFH guidelines under 50 CFR 600.10 further interpret the EFH definition as follows: Waters include aquatic areas and their associated physical, chemical, and biological properties that are used by fish and may include aquatic areas historically used by fish where appropriate; substrate includes sediment, hard bottom, structures underlying the waters, and associated biological communities; necessary means the habitat required to

support a sustainable fishery and the managed species' contribution to a healthy ecosystem; and "spawning, breeding, feeding, or growth to maturity" covers a species' full life cycle.

Essential Fish Habitat Consultation: An EFH consultation refers to the process of satisfying the Federal agency consultation and response requirements of section 305(b)(2) and 305(b)(4)(B) of the Magnuson-Stevens Act, and the EFH conservation recommendation requirement of section 305(b)(4)(A) of that Act. When completed, an EFH consultation generally consists of: 1) notification to the National Marine Fisheries Service (NMFS) of a Federal action that may adversely affect EFH; 2) an EFH assessment provided to NMFS; 3) EFH conservation recommendations provided by NMFS to the Federal action agency; and 4) the Federal agency's response to NMFS EFH conservation recommendations.

F_C: The most recent fishing mortality rate.

Fishery Independent: Characteristic of information (e.g. stock abundance index) or an activity (e.g. research vessel survey) obtained or undertaken independently of the activity of the fishing sector. Intended to avoid the biases inherent to fishery-related data

Fishery Management Council (FMC): A regional fisheries management body established by the Magnuson-Stevens Act to manage fishery resources in eight designated regions of the United States.

Fishery Management Plan (FMP): 1. A document prepared under supervision of the appropriate fishery management council (FMC) for management of stocks of fish judged to be in need of management. The plan must generally be formally approved. An FMP includes data, analyses, and management measures; 2. A plan containing conservation and management measures for fishery resources, and other provisions required by the Magnuson-Stevens Act, developed by fishery management councils or the Secretary of Commerce.

Fishing Mortality (F): 1. F stands for the fishing mortality rate in a particular stock. It is roughly the proportion of the fishable stock that is caught in a year; 2. A measurement of the rate of removal from a population by fishing. Fishing mortality can be reported as either annual or instantaneous. Annual mortality is the percentage of fish dying in one year. Instantaneous mortality is that percentage of fish dying at any one time.

F_{MSY}: The fishing mortality rate that, if applied constantly, would result in maximum sustainable yield (MSY). Used as a biological reference point, F_{MSY} is the implicit fishing mortality target of many regional and national fishery management authorities and organizations. F_{MSY} can be estimated in two ways: a) from simple biomass aggregated production models; b) from age-structured models that include a stock-recruitment relationship.

Habitat Area(s) of Particular Concern (HAPC): Subsets of essential fish habitat that serve an important ecological function, are particularly sensitive to human induced environmental degradation, are particularly stressed by human development activities, or comprise a rare habitat type.

Habitat Assessment: 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. Indicators of the value and condition (or status) of habitat can be developed through a habitat assessment by understanding the relationships between habitat characteristics, the productivity of fishery species, and the type and magnitude of various impacts (NMFS 2010).

HAIP Tier 1 Habitat Assessment: The Marine Fisheries Habitat Assessment Improvement Plan (HAIP) defines three Tiers of Excellence for habitat assessments. Tier 1 habitat assessments provide habitat-specific presence/absence species distribution data, similar to EFH Level 1 data (NMFS 2010).

HAIP Tier 2 Habitat Assessment: The Marine Fisheries Habitat Assessment Improvement Plan (HAIP) defines three Tiers of Excellence for habitat assessments. Tier 2 habitat assessments provide habitat-specific densities of species and life stages, similar to EFH Level 2 data (NMFS 2010).

HAIP Tier 3 Habitat Assessment: The Marine Fisheries Habitat Assessment Improvement Plan (HAIP) defines three Tiers of Excellence for habitat assessments. Tier 3 habitat assessments will incorporate habitat-specific vital rates (e.g., growth, reproduction, survival, and production) of FMP/FSSI stocks by life stage, which is equivalent to EFH Levels 3 and 4 data (NMFS 2010).

High Essential Fish Habitat Science Priority: Essential Fish Habitat Science Priorities represent the extent to which stocks are likely to provide efficient and meaningful results from a habitat assessment to inform EFH and HAPC for valuable and important stocks. High priority stocks are generally the most likely to provide efficient and meaningful results from a habitat assessment and represent important management, economic, or cultural value.

High Habitat Science Supporting Stock Assessment Priority: Habitat Science Supporting Stock Assessment Priorities represent the extent to which stocks should provide efficient and meaningful results from a habitat assessment to improve stock assessments for valuable and important stocks. High priority stocks are generally the most likely to provide efficient and meaningful results from a habitat assessment and represent important management, economic, or cultural value.

Low Essential Fish Habitat Science Priority: Essential Fish Habitat Science Priorities represent the extent to which stocks are likely to provide efficient and meaningful results from a habitat assessment to inform EFH and HAPC for valuable and important stocks. Low Priority stocks are the remaining eligible stocks in the prioritization process. These stocks meet the basic criteria for a productive habitat assessment, but received moderate to low scores.

Low Habitat Science Supporting Stock Assessment Priority: Habitat Science Supporting Stock Assessment Priorities represent the extent to which stocks should provide efficient and meaningful results from a habitat assessment to improve stock assessments for valuable and important stocks. Low

Priority stocks are the remaining eligible stocks in the prioritization process. These stocks meet the basic criteria for a productive habitat assessment, but received moderate to low scores.

Magnuson-Stevens Fishery Conservation and Management Act (MSA): Federal legislation responsible for establishing the Fishery Management Councils (FMCs) and the mandatory and discretionary guidelines for Federal Fishery Management Plans (FMPs). This legislation was originally enacted in 1976 as the Fishery Management and Conservation Act; its name was changed to the Magnuson Fishery Conservation and Management Act in 1980, and in 1996 it was renamed the Magnuson-Stevens Fishery Conservation and Management Act.

Maximum Sustainable Yield (MSY): The largest average catch or yield that can continuously be taken from a stock under existing environmental conditions. For species with fluctuating recruitment, the maximum might be obtained by taking fewer fish in some years than in others. Also called: maximum equilibrium catch; maximum sustained yield; sustainable catch.

Medium Essential Fish Habitat Science Priority: Essential Fish Habitat Science Priorities represent the extent to which stocks are likely to provide efficient and meaningful results from a habitat assessment to inform EFH and HAPC for valuable and important stocks. Medium priority stocks have the next highest prioritization scores (below High Priority scores) and share many of the same characteristics as High Priority stocks, albeit to a lesser extent. They are likely to provide efficient and meaningful results from a habitat assessment and represent important management, economic, or cultural value.

Medium Habitat Science Supporting Stock Assessment Priority: Habitat Science Supporting Stock Assessment Priorities represent the extent to which stocks should provide efficient and meaningful results from a habitat assessment to improve stock assessments for valuable and important stocks. Medium priority stocks have the next highest prioritization scores (below High Priority scores) and share many of the same characteristics as High Priority stocks, albeit to a lesser extent. They are likely to provide efficient and meaningful results from a habitat assessment and represent important management, economic, or cultural value.

Mutualism: An interaction between two species that benefits the fitness of both (Odum 1971).

Next Generation Stock Assessment: Advancing NOAA Fisheries' stock assessment program to the "next generation" will provide the more timely, accurate, and complete information needed to support 21st century management measures implemented under the Magnuson-Stevens Reauthorization Act (including annual catch limits). Next generation stock assessments include four important components: 1) prioritized - assessment goals are clearly defined and activities are prioritized to meet goals; 2) timely and efficient - key steps include streamlined data systems, standardized modeling approaches, efficient and focused review processes, and better communication tools; 3) ecosystem linked - assessments are linked to ecosystem factors such as climate, habitat, multispecies effects and other environmental variables; and 4) utilize advanced technology - maximize data collection to support assessments through

increased use of advanced sampling technologies and support continued development of such technologies.

NOAA Habitat Blueprint: The Habitat Blueprint provides a framework to think and act strategically across programs and with partner organizations to address the growing challenge of habitat loss and degradation. The four main objectives are to: 1) Implement regional habitat initiatives; 2) Establish geographic priorities; 3) Implement a systemic and strategic approach to habitat science; and 4) Strengthen policy and legislation.

Overfished: 1. An overfished stock or stock complex “whose size is sufficiently small that a change in management practices is required to achieve an appropriate level and rate of rebuilding.” A stock or stock complex is considered overfished when its population size falls below the minimum stock size threshold (MSST). A rebuilding plan is required for stocks that are deemed overfished; 2. A stock is considered “overfished” when exploited beyond an explicit limit beyond which its abundance is considered ‘too low’ to ensure safe reproduction. In many fisheries for the term is used when biomass has been estimated to be below a limit biological reference point that is used as the signpost defining an “overfished condition.” This signpost is often taken as being F_{MSY} , but the usage of the term may not always be consistent.

Overfishing: 1. According to the National Standard Guidelines, “overfishing occurs whenever a stock or stock complex is subjected to a rate or level of fishing mortality that jeopardizes the capacity of a stock or stock complex to produce maximum sustainable yield (MSY) on a continuing basis.” Overfishing is occurring if the maximum fishing mortality threshold (MFMT) is exceeded for 1 year or more; 2. In general, the action of exerting fishing pressure (fishing intensity) beyond the agreed optimum level. A reduction of fishing pressure would, in the medium term, lead to an increase in the total catch.

Recreational Fishery: Harvesting fish for personal use, sport, and challenge (e.g., as opposed to profit or research). Recreational fishing does not include sale, barter, or trade of all or part of the catch.

Region: One of six NOAA Fisheries regions with management responsibilities addressed by a Regional Office and science responsibilities provided by a Fisheries Science Center.

SAIP Level 5 Stock Assessment: The Marine Fisheries Stock Assessment Improvement Plan (SAIP; NMFS 2001) defines six levels of stock assessment (0 to 5) based on increasing levels of complexity in the assessment methods used for a given stock. The assessment level also generally reflects the availability of data (and the value or importance of the fishery). Level 5 assessments use complex and sophisticated methods, incorporating ecosystem considerations and spatial and seasonal analyses into the assessment model. Ecosystem considerations include one or more of the following: a) time-varying parameters, including environmental variables; b) multispecies effects; or c) living components of the ecosystem.

Stock Assessment Prioritization: The results of the work group on Prioritizing Fish Stock Assessments, identifying priority stocks and stock complexes for stock assessment. These priorities are expected to be released, but have not been at the time of writing.

Total Catch: All sources of fishing mortality, including retained catch (both target and incidental) and bycatch (dead discards, catch released alive, and unobserved mortality).

Appendix 1: Habitat Assessment Prioritization Working Group Terms of Reference

A habitat assessment is both the process and 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. Habitat assessments are critical for providing information on the effect of habitat on fisheries production for use by habitat managers, stock assessment scientists, and other users of habitat science information. The Marine Fisheries Habitat Assessment Improvement Plan (HAIP) lists a number of recommendations to improve the quality of NMFS' habitat assessments and develop a comprehensive habitat science program in support of resource management, including recommendations focusing on the development of priorities for habitat assessments. Specifically, the HAIP recommends that 1) NMFS should develop criteria to prioritize stocks and geographic locations that would benefit from habitat assessments, and 2) NMFS should identify and prioritize data inadequacies for stocks and their respective habitats, as relevant to information gaps identified in the HAIP.

The benefits of improved habitat assessments include a range of scientific and management applications, including: improved understanding of the role of habitat in fish/fishery production, community interactions, and other critical ecosystem processes; improved capability to identify and protect vital habitats (including essential fish habitat and habitat areas of particular concern); more effective habitat restoration efforts; improved design and management of marine protected areas; improved fishery-independent population surveys; and improved stock assessments. Specific prioritization decisions will depend on regional perspectives of the greatest needs and most important habitat assessment-related benefits.

As part of the national program to implement the HAIP and improve habitat assessments, NMFS is convening a Habitat Assessment Prioritization Working Group (HAPWG). The HAPWG will consist of 16 members from across NMFS regions with backgrounds in:

Habitat science: Michael Parke [PIFSC], Bob McConnaughey [AFSC], Correigh Greene [NWFSC], and Mary Yoklavich [SWFSC], Dave Packer [NEFSC]

Stock assessment science (including assessment modelers and statisticians): Jon Heifetz [AFSC], Ian Taylor [NWFSC], and Michael Schirripa [SEFSC]

Ecology (including food web modeling and environmental modeling): Hongguang Ma [PIFSC], John Manderson [NEFSC], and John Quinlan [SEFSC]

Habitat management: Garry Mayer [OHC], Matt Eagleton [AKRO], David Dale [SERO], and Korie Schaeffer [SWRO]

NMFS Office of Science and Technology: Stephen K. Brown, Joe Nohner, Kirsten Larsen, and Kristan Blackhart

This broad cross-section of backgrounds and geographic regions will ensure that the diversity of NMFS' interests is represented in the development of prioritization criteria. Members of the working group will be responsible for representing their colleagues and should take the initiative to communicate with them on habitat science prioritization issues outside of HAPWG discussions.

The overall goal for this working group will be to develop a nationally-standardized set of *criteria* for prioritizing stocks and/or geographic areas that would most benefit from habitat assessments. Once developed, these criteria will be used to guide development of priority lists for habitat assessment during future regional-level workshops. Criteria will also be used to update priority lists over time as priorities change or new information becomes available. As stated above, specific prioritization decisions will depend on regional perspectives of the greatest needs and most important habitat assessment-related benefits. Priorities developed by regions will be addressed to the extent possible using existing resources, and will serve as a powerful tool for seeking increased funding for habitat science through the NOAA budget process. Regional prioritization exercises may also identify opportunities to: 1) improve use of existing information; 2) expand collection of habitat information during existing surveys; and 3) streamline efforts or strengthen collaborations.

The working group will convene primarily through conference calls, web/video conferencing as necessary, and potentially a face-to-face meeting (contingent on the availability of funding). Scheduling of meetings will be set by the group in order to achieve the objectives described below. Organizational and logistical support (including compilation and editing of major documents) will be provided by staff from the Office of Habitat Conservation (Dave Packer) and the Office of Science and Technology (Kristan Blackhart, Steve Brown, Kirsten Larsen, and Joe Nohner). The draft and final criteria produced by the group will be vetted by senior NMFS management (e.g., the NMFS Science Board and/or the Leadership Council).

The proposed Terms of Reference for the Habitat Assessment Prioritization Working Group include:

1. Determine the approach, terms, and specific criteria most appropriate for prioritizing habitat assessments. This may include one or more of the criteria listed below. These approaches should be considered together rather than individually so that a single, unified prioritization list results. Criteria should focus on singling out those priorities that would benefit most from improved habitat information (i.e., not necessarily the easiest to accomplish but the most efficient and effective).
 - a. Criteria based on species, stocks, or life stages that would most benefit from habitat assessment.
 - b. Criteria based on geographic areas or habitat types that would most benefit from habitat assessment.
2. Make recommendations about how to best apply prioritization criteria at the regional level to develop lists of regional habitat priorities.
 - a. Provide guidance about ways to align priorities with funding decisions.
 - b. Provide guidance about applying priority lists to national performance measures related to habitat assessment.
 - c. Provide guidance about a schedule for providing updates to prioritization lists.
3. Prepare a document addressing the prioritization criteria that will guide regional prioritization activities with a tentative delivery deadline of October 2011.

Appendix 2: Example Habitat Science Supporting Stock Assessment Prioritization

Hypothetical Stock ID	Criteria Outcomes by Stock																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
FSSI or regional FMC priority research	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Habitat assessment likely to benefit stock assessment	-	N	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Benefit of a habitat assessment to stock assessment	-	-	-	1	1	4	4	4	4	4	4	4	5	4	4	4	1	5	5	5
Fisheries status	-	-	-	0	0	2	2	0	0	2	5	0	0	2	2	5	5	5	5	5
Regional FMC research priority	-	-	-	3	3	1	1	3	3	3	3	1	3	3	3	3	5	5	5	3
Habitat disturbance, vulnerability, and rarity	-	-	-	0	0	0	0	0	0	0	0	3	0	2	2	3	3	3	3	3
Habitat dependence	-	-	-	1	1	3	3	3	3	3	3	5	5	3	5	3	3	3	3	5
Ecological importance	-	-	-	1	1	1	1	3	3	3	1	2	3	3	3	2	3	1	2	3
Value - economic, social, management	-	-	-	0	0	1	1	2	2	1	1	3	2	2	2	2	4	3	3	3
Final Score	-	-	-	6	6	12	12	15	15	16	17	18	18	19	21	22	24	25	26	27
Percentile Score	-	-	-	0	0	13	13	25	25	38	44	50	50	63	69	75	81	88	94	100
Habitat and Stock Assessment Priority	-	-	-	L	L	L	L	L	L	L	L	L	L	L	L	M	M	M	H	H

This table illustrates the information that Regional Habitat Assessment Prioritization Work Groups (RHAPWGs) must evaluate and present as part of the prioritization process. Stocks should be assigned a score if they pass a filter (Y) but not if they fail it (N). High (H), medium (M), and low (L) Habitat Science Supporting Stock Assessment Priority assignments are determined by the RHAPWG in the context of the Final Score and the Percentile Score (the percentage of stocks with a final score equal to or less than the stock).

Appendix 3: Example Essential Fish Habitat Science Prioritization

Hypothetical Stock ID	Criteria Outcomes by Stock																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
FSSI or regional FMC priority research	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Likely to inform essential fish habitat science	-	Y	Y	Y	Y	Y	N	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Likely to advance EFH information	-	1	4	1	4	1	-	4	4	4	4	4	1	4	1	4	1	5	5	5
Fisheries status	-	0	2	0	0	2	-	0	0	2	5	0	0	2	2	5	5	5	5	5
Regional FMC research priority	-	3	1	3	3	1	-	3	3	3	3	1	3	3	3	3	5	5	5	3
Habitat disturbance, vulnerability, and rarity	-	0	0	0	0	0	-	0	0	0	0	3	0	2	2	3	3	3	3	3
Habitat dependence	-	1	3	1	1	3	-	3	3	3	3	5	5	3	5	3	3	3	3	5
Ecological importance	-	1	1	1	1	1	-	3	3	3	1	2	3	3	3	2	3	1	2	3
Value - economic, social, management	-	0	1	0	0	1	-	2	2	1	1	3	2	2	2	2	4	3	3	3
Final Score	-	6	12	6	9	9	-	15	15	16	17	18	14	19	18	22	24	25	26	27
Percentile Score	-	0	24	0	12	12	-	35	35	47	53	59	29	71	59	76	82	88	94	100
Habitat and Stock Assessment Priority	-	L	L	L	L	L	-	L	L	L	L	L	L	M	L	M	M	M	H	H

This table illustrates the information that Regional Habitat Assessment Prioritization Work Groups (RHAPWGs) must evaluate and present as part of the prioritization process. Stocks should be assigned a score if they pass a filter (Y) but not if they fail it (N). High (H), medium (M), and low (L) Essential Fish Habitat Science Priority assignments are determined by the RHAPWG in the context of the Final Score and Percentile Score (the percentage of stocks with a final score equal to or less than the stock)

Appendix 4: Essential Fish Habitat Regulatory Text

The following text from the MSA describes the classification of essential fish habitat information into four levels of knowledge, and sets goals for regional FMCs and the NMFS to describe habitat at the highest level of detail.

§ 600.815 (a) (2) (i) (C) The following approach should be used to gather and organize the data necessary for identifying EFH. Information from all levels should be used to identify EFH. The goal of this procedure is to include as many levels of analysis as possible within the constraints of the available data. Councils should strive to obtain data sufficient to describe habitat at the highest level of detail (i.e., Level 4).

§ 600.815 (a) (2) (i) (C) (1) Level 1: Presence/absence distribution data are available for some or all portions of the geographic range of the species. At this level, only presence/absence data are available to describe the distribution of a species (or life history stage) in relation to potential habitats. Care should be taken to ensure that all potential habitats have been sampled adequately. In the event that distribution data are available for only portions of the geographic area occupied by a particular life history stage of a species, EFH can be inferred on the basis of distributions among habitats where the species has been found and on information about its habitat requirements and behavior.

§ 600.815 (a) (2) (i) (C) (2) Level 2: Habitat-related densities of the species are available. At this level, quantitative data (i.e., density or relative abundance) are available for the habitats occupied by a species or life history stage. Because the efficiency of sampling methods is often affected by habitat characteristics, strict quality assurance criteria should be used to ensure that density estimates are comparable among methods and habitats. Density data should reflect habitat utilization, and the degree that a habitat is utilized is assumed to be indicative of habitat value. When assessing habitat value on the basis of fish densities in this manner, temporal changes in habitat availability and utilization should be considered.

§ 600.815 (a) (2) (i) (C) (3) Level 3: Growth, reproduction, or survival rates within habitats are available. At this level, data are available on habitat-related growth, reproduction, and/or survival by life history stage. The habitats contributing the most to productivity should be those that support the highest growth, reproduction, and survival of the species (or life history stage).

§ 600.815 (a) (2) (i) (C) (4) Level 4: Production rates by habitat are available. At this level, data are available that directly relate the production rates of a species or life history stage to habitat type, quantity, quality, and location. Essential habitats are those necessary to maintain fish production consistent with a sustainable fishery and the managed species' contribution to a healthy ecosystem.