NORTHEAST OCEAN PLAN

Summary of the review process, feedback received, and remaining questions for draft data products and methods relevant to the components of ecological importance (from the Important Ecological Areas Framework in the Northeast Ocean Plan)

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This document describes the review process for draft data products and methods compiled for each of the components of ecological importance[1]. The narrative of the review process describes the number of individuals and which sectors/groups provided feedback, and it describes by what methods that feedback was obtained. In the subsequent section, the feedback received is generally summarized. Then, key questions remaining after the review of each component are broadly outlined. Finally, additional detail on the feedback and remaining questions for each component is provided.

Review process

Between July 2016 and February 2017, the Northeast Regional Planning Body (RPB), Marine-life Data and Analysis Team (MDAT), and ocean planning staff assembled available (published, peer-reviewed) datasets and methods relevant to each of five components of ecological importance (productivity, biodiversity, abundance, vulnerability, rarity). More than 100 individual datasets were assembled, many of which are already included on the Northeast Ocean Data Portal, but each of which needed to be reviewed for their appropriateness in this context.

In February 2017, the RPB initiated review of the draft data and methods with regional scientists and staff from RPB entities. Between February and May, ocean planning staff held webinars and calls, facilitated data access and review via SeaSketch (a web-based mapping application)[2], and collected and documented feedback that was provided during these sessions. Over 110 individuals were provided access to the data via SeaSketch and approximately 30 individuals provided feedback during webinars and calls during this time.

In May 2017, component data and methods available on SeaSketch were made accessible to interested members of the public, with the purpose of providing the opportunity to as many individuals as possible to understand the draft data and to provide input on methods and potential uses of the data. Also in May 2017, the Mid-Atlantic RPB provided access to SeaSketch for its entities' staff and ocean planning stakeholders. Between May and September 2017, over 130 additional users from both regions were added to SeaSketch, around 50 of whom were

[1] See Northeast Ocean Plan, pp. 53-55 and 196-199; and subsequent documents at: http://neoceanplanning.org/library/

[2] SeaSketch (www.seasketch.org) is a mapping tool that enables discussion and collaboration on spatial datasets and maps by multiple users. It was used for this review process as a tool to allow controlled access to draft datasets, and does not replace the public datasets and information on the Northeast Ocean Data Portal.

members of academia, industry, and non-governmental organizations. During this time, ocean planning staff coordinated and held in-person meetings, webinars, and phone calls, and facilitated access to SeaSketch to discuss the draft data, potential methods, and key questions. Over 80 individuals engaged in discussions with ocean planning staff one-on-one or as part of a group. In addition, as of September 2017, 16 individuals also provided detailed input on the draft data and methods relevant to one or more components via a SeaSketch data evaluation tool.

In total, over 240 individuals were provided access to the draft data and methods. 111 individuals provided feedback verbally though in-person meetings, phone calls, and webinars. 16 individuals went on to also provide detailed feedback on one or more components through the SeaSketch data evaluation tool.

Feedback received

Overall, feedback was generally positive about the usefulness of the assembled datasets and the published methods that were chosen to develop them. Many individuals also noted key data gaps for each component that represent important considerations when using the data or when identifying regional science and research priorities.

An important consideration throughout the data development and review process has been related to how many data layers are appropriate for illustrating each component. In general, individuals requested more detail (i.e., more data layers) per component. For example, individuals were interested in seeing monthly and seasonal map products and animations versus annual averages, and many individuals discussed the greater potential value of ecological group-level products (e.g., “demersal fish”) versus taxa-level products (e.g., “all fish species”) in order to show patterns that are useful for making decisions. The feedback received throughout the review process, however, is much more complex. For example, for some components, the feedback may lead to an overall reduction in the number of data layers due to selecting one method over another, or due to the recognition that some methods may require more time and research in order to be useful. It should also be noted that some individuals preferred a smaller set of averaged, summarized, or synthesized map products per component, and that some individuals preferred that he RPB discontinue the exercise altogether due to concerns about data gaps, the robustness of methods, and potentially unclear uses of the final data products.

There was also support for advancing a strategy to present and visualize these data via the Northeast Ocean Data Portal. There was broad recognition that some datasets and concepts require additional explanation and documentation to inform how datasets can be used. Many individuals also suggested that additional attention on presentation would enhance the usability of the datasets and advance an understanding of important ecological patterns. Presentation options were discussed, including new tools with the ability to overlay information or to visualize temporal variability within a single view (e.g., animations).

Key remaining questions

Following the review and discussion of data layers and methods under each component, some broader, thematic questions, as well as some technical questions, remained. The questions below relate to the representation of each component as a whole, and indicate important topics to be discussed at the November workshop. Additional scientific and technical questions are captured in the "Detailed feedback" section below.

Component 1: Which/how many temporal windows are important to include for productivity metrics (e.g., long-term averages, annual averages, seasonal averages, monthly averages?)

Component 2: Which, if any, diversity metrics (species richness, Gini-Simpson index, Shannon index) are redundant, and how could they be used?

Component 3: Which of the three abundance metrics (total abundance/biomass, core abundance/biomass area richness, ranked relative abundance) best represent abundance patterns? Do any of these metrics adequately address the dynamic nature of abundance and also areas of long-term aggregation?

Component 4: Should the RPB continue building data products for specific stressors while also developing products that represent inherent vulnerability?

Component 5: How can the RPB better spatially characterize rare species and habitats? What other sources of non-spatial information could be used to fill data gaps for rare species and habitats?

Relevant to all components: How can these data layers be made accessible for a diversity of potential uses and applications? What additional Portal tools could be developed to facilitate data access and understanding?

Detailed feedback on each component

The detailed feedback received for each component has been synthesized by ocean planning staff and is summarized below. This feedback reflects the results of the SeaSketch data evaluation tool, but even more so, the many conversations and discussions held on this topic via webinar, phone, and in-person since February 2017. The table below provides context for material that was reviewed ("What was reviewed?"), describes discussion topics for each type of data, and lists key remaining questions and potential next steps as context for discussion at upcoming meetings. For additional information about the datasets that were reviewed, see the full IEA Data Guide.

Where possible, ocean planning staff and the technical team estimated when specific feedback can be addressed and potentially incorporated into the next phase of product development: by the end of 2017; in the near-term (1-2 years), or longer-term science and research priorities (2+ years).

Component 1: Productivity + habitat and oceanographic drivers

Data layers to support Component 1 are predominately derived from NOAA Northeast Fisheries Science Center (NEFSC) products and research. Due to issues with data availability, the technical team reproduced some data layers for this component (and included them in SeaSketch) using NEFSC methodologies but with different source data. However, in the future, any publicly available data products under this component should be representative of NEFSC's final and publicly available, peer-reviewed, data products.

What was reviewed?	Feedback received	Key remaining questions	Potential next steps
Regional scale primary productivity, using NEFSC methods	Good; NEFSC data are authoritative. "Bloom start day" is somewhat different in that it could capture temporal change or phenological patterns.	What and how many temporal windows are most useful (monthly, seasonal, annual)?	Coordinate with NEFSC (near-term)
Fine-scale primary productivity, using different methods	Promising; needs to be peer-reviewed and published.		
Regional scale secondary productivity (NEFSC)	Good; NEFSC are authoritative. Continuous coverage maps of zooplankton biovolume are preferred.	What and how many temporal windows are most useful (monthly, seasonal, annual)?	Coordinate with NEFSC (near-term)
Habitat and oceanographic drivers Spatially static: canyons and seamounts; Temporally dynamic: sea surface temperature fronts, eddy probabilities	Relevant to more than one component. Should be separate and used as context for other component data.	For static features: what's missing? For dynamic features: what temporal windows are most useful?	Add surface and bottom current data (by end of 2017). Develop animations and/or dynamic data products (near-term)

Component 2: Biodiversity

Component 2 relies on data products produced by the Marine-life Data and Analysis Team (MDAT). Accordingly, this component is limited to representations of biodiversity of sampled/observed cetacean, avian, and fish species and therefore has significant data gaps (e.g. highly migratory finfish, benthic fauna).

What was reviewed?	Feedback received	Key remaining questions	Potential next steps
Taxonomic metrics of diversity for cetaceans, birds, and fish	Data are limited to observed cetaceans, birds, fish; there are significant data gaps. The three metrics are good; want to know more about similarities and differences among Species Richness, Shannon Index, Gini-Simpson Index.	Are any of the metrics redundant? How could they be used?	Compare results of the 3 metrics, and explain scenarios for when one might be used vs. another (near-term)
Experimental layer representing functional diversity – richness of avian foraging guilds	Functional diversity refers to the variety of biological processes, functions or characteristics of a particular ecosystem. This is an important category of biodiversity but there are limitations that affect data interpretation and potential use, e.g., layer does not represent the relative abundance of birds exhibiting their particular feeding behavior (it represents all observations of the species that tend to feed in a particular way, including non-feeding behavior).	How can functional diversity be mapped?	Develop data products for (one or all three) biodiversity metrics for cetacean, bird, and fish ecological groups as one way to characterize biodiversity patterns across different functional groups (by end of 2017) Develop approaches to map functional diversity (long-term)

Component 3: Abundance

Like the Biodiversity component, Component 3 relies primarily on MDAT data products. There is one additional data product representing areas of above average abundance of benthic megafaunal species produced by the University of Massachusetts Dartmouth School of Marine Science and Technology.

What was reviewed?	Feedback received	Key remaining questions	Potential next steps
Three abundance metrics for cetaceans, birds, fish	Good; want to know more about similarities and differences among Total Abundance/Biomass, Core Abundance/Biomass Area Richness, Ranked Relative Abundance. A strength of the experimental Ranked Relative Abundance (RRA) products is the monthly (cetacean) or seasonal (avian) layers. Annual averages tend to smooth spatial/temporal patterns in abundance. Abundance products with the highest temporal resolution possible are useful for decision-making. Abundance patterns are dynamic – try animating layers to show how abundance patterns change throughout the year. Consider the value of the Northeast/Mid-A scale core abundance area richness maps, and/or provide additional guidance for their use.	Are any of the abundance metrics redundant? Do any of these metrics adequately address the dynamic nature of abundance and also areas of long-term aggregation? What's the best way to display/visualize temporal variability in abundance?	Tool(s) to compare Total Abundance/Biomass, Core Abundance/Biomass Area Richness, Ranked Relative Abundance (near-term) Tool(s) such as time-sliders or animations to visualize dynamic patterns in one or all abundance metrics (near-term)
Life history products (areas of spawning, breeding, feeding, migratory routes)	Good; but some are not related to high abundance (e.g., sometimes migratory routes = dispersed); all layers are repeated in Component 4	Do all of these layers relate to areas of high abundance?	Consider how these products do or do not fit in Component 3 (near-term)

Component 4: Vulnerability

There was general support for the approach of assembling data relevant to both specific stressors and to inherent sensitivity/fragility. However, a limitation within the stressor-by-stressor category is that it would be difficult to compile a comprehensive and representative set of data products. A limitation within the inherent sensitivity category is that many of the layers are limited to species of regulatory concern, and to compile a suite of data products using life history traits to assess inherent sensitivity of a broader list of species would be a large long-term project.

What was reviewed?	Feedback received	Key remaining questions	Potential next steps
Stressor-based sensitivity data products, including: Offshore energy infrastructure (birds) Sound (cetaceans) Pelagic and benthic fishing gear (habitat)	There are so many ways to be vulnerable that it is hard to pick out locations of high overall vulnerability. Difficult to be comprehensive and representative; need to include climate change (e.g., temperature, sea level, acidification), marine debris, entanglement as stressors.	Should the RPB continue building data products for ***specific stressors*** and for representing ***inherent*** vulnerability? What other stressors are important to include?	Add fish climate vulnerability groups based on NEFSC work (Hare et al. 2016) (by end of 2017). Track literature and add vulnerability groups for climate change (cetaceans), marine debris, and entanglement when available (near-term, long-term)
Inherent sensitivity (i.e., life history products for species of regulatory concern) data products	Good; however, would be a long-term project to expand the life history concept to all species. Biologically Important Areas (BIAs)[3] could fit here.	What methods and data sources can be used to map sensitivity based on life history characteristics?	Add Mid-Atlantic eelgrass, wetlands, shellfish data (by end of 2017, near-term) Develop approaches to map sensitivity/vulnerability based on species' life history characteristics (long-term)

[3] The Biologically Important Areas (BIAs) component of the NOAA CetMap effort supplements the quantitative information on cetacean density, distribution, and occurrence by: 1) identifying areas where cetacean species or populations are known to concentrate for specific behaviors, or be range-limited, but for which there is not sufficient data for their importance to be reflected in the quantitative mapping effort; and 2) providing additional context within which to examine potential interactions between cetaceans and human activities. http://cetsound.noaa.gov/important

Component 5: Rarity

This component is likely to always have significant data gaps. Spatial data products are dependent on robust observations and therefore rare species and habitats are underrepresented in these products. Despite of and due to the lack of quantitative distribution data for many rare species and habitats, agencies have developed and use spatial data products such as species ranges, critical habitats, biologically important areas that are relevant to rare species and habitats. By the end of 2017, these existing data products can be added to this component.

What was reviewed?	Feedback received	Key remaining questions	Potential next steps
Regionally rare (state-listed species and regional conservation concern) Globally rare (ESA-listed)	There will always be data gaps; quantitative data is limited. Rare species that are not formally protected by states or federal authorities, or are not listed as of conservation concern, are not represented. Spatially rare habitats are missing. Agencies already use data to address these gaps such as species ranges[4], critical habitats[5], and Biologically Important Areas[6]. Does not currently address the underlying reason that a species or habitat is rare – e.g., does the species/habitat have naturally low occurrence, or is its occurrence presently low due to historic and current stressors/disturbances? This type of information is important for decision-making. There is an important coastal connection to several rare fish species (Atlantic sturgeon, river herring, Atlantic salmon) and many bird species (see Northeast state-listed species).	How can the RPB better spatially characterize rare species and habitats? What other sources of non-spatial information could be used to fill data gaps for rare species and habitats?	Add species ranges, critical habitats, Biologically Important Areas (by end of 2017). Add data table of Mid-Atlantic state-listed species (by end of 2017). Include data and information at the individual species-level for species that are endangered or rare, including cetaceans, birds, corals, and sea turtles (by end of 2017). Mathematically calculate spatially rare habitats (long-term). Consider developing a more complete articulation of "rarity" (near-term).

[4]The range of a species is defined as the general geographical area within which that species can be found, including those areas used throughout all or part of the species' life cycle. See Atlantic sturgeon example: https://www.greateratlantic.fisheries.noaa.gov/protected/section7/guidance/maps/atlanticsturgeon.pdf.pdf

[5]Critical habitat is defined as specific areas: within the geographical area occupied by the species at the time of listing, if they contain physical or biological features essential to conservation, and those features may require special management considerations or protection; and outside the geographical area occupied by the species if the agency determines that the area itself is essential for conservation. http://www.nmfs.noaa.gov/pr/species/criticalhabitat.htm

[6]See footnote on previous page; http://cetsound.noaa.gov/important