Northeast Regional Planning Body
Natural Resources Workshop

June 25, 2014
The Charles Hotel, Cambridge, Massachusetts

MEETING SUMMARY

Introduction and Workshop Objectives

The Northeast Regional Planning Body (RPB) hosted this one-day public workshop on natural resources prior to their (fourth) RPB meeting on June 26, 2014. Approximately 125 participants from tribes, federal and state agencies, industry groups, academic institutions, nonprofit organizations, and interested citizens attended the workshop. Participants provided input on natural resource assessments that will inform future ocean planning work under the RPB's Healthy Ocean and Coastal Ecosystems goal.[1] See Appendix A for a full list of participants. The objectives of this workshop were to:

- Inform options for characterizing marine mammal, sea turtle, bird, and fish distribution and abundance for use in ocean planning.
- Discuss a review of existing regional efforts to identify areas of ecological importance or measure the health of the marine system and consider the applicability of such assessments for ocean planning.

Staff from the Consensus Building Institute (CBI) and the Meridian Institute facilitated the workshop, and CBI staff drafted this workshop summary.[2] Presentation slides and other materials from the workshop are available at the following URL:

http://neoceanplanning.org/events/natural-resources-workshop/

Betsy Nicholson, the National Oceanic and Atmospheric Administration's (NOAA) Northeast Lead for the Coastal Services Center, welcomed participants and provided background on the National Ocean Policy. She noted the following. Established by executive order in 2010, the National Ocean Policy mandated the development of an ecosystem-based framework for regional coastal and marine spatial planning to address conservation, economic activity, user conflict, and the sustainable use of ocean, coastal,

[1] See Actions 1-1 and 1-2 in the Framework for Ocean Planning in the Northeast United States (Framework).
[2] Consensus Building Institute staff: Ona Ferguson, Patrick Field, and Eric Roberts. Meridian Institute staff: Ingrid Irigoyen.

and Great Lakes resources. The Policy designated the creation of Regional Planning Bodies (RPBs) in nine regions of the US and tasked them with developing products and regional plans that meet the needs of each region.

Ocean Planning Timeline and Ongoing Natural Resources Characterization

Nick Napoli, Ocean Planning Project Manager at the Northeast Regional Ocean Council (NROC), briefed participants on the work completed to date on the RPB draft goals and on the timeline for ocean planning. He also introduced the ongoing work to characterize natural resources. His comments are summarized below.[3]

Although natural resource characterization work will influence the outcomes of each of the RPB's three draft goals,[4] the effective decision making goal also informs the natural resource characterization. Recognizing this link, NROC staff have been talking in an additional effort with regulatory agencies, industry, environmental groups and others to identify potential methods to enhance inter-agency coordination on existing permitting processes and to determine what regional data could be helpful in existing decision-making processes. The initial focus of the resource characterization and the related conversations about inter-agency coordination and data needs are focused on permitting and review of potential energy/infrastructure, aquaculture, and sand and gravel projects.

As described in the RPB's Framework, the three primary objectives of the Healthy Oceans and Coastal Ecosystems goal are to:

- Characterize the ecosystem, economy, and cultural resources,
- Support existing restoration and conservation programs, and
- Develop a regional ocean science plan.

This workshop was designed to provide input on the approach the RPB will be taking to achieve the first objective, characterization. Action 1-1 of that objective is to characterize the abundance and distribution of marine mammals, sea turtles, bird, and fish. Prior to the workshop, NROC and its support contractors began to inventory existing data sets, products, and their applications and developed a set of options and key decisions to be made about how to develop distribution and abundance products. NROC also contracted with a team composed of Duke University's Marine Geospatial Ecology Lab, the Biogeography Branch of the NOAA National Centers for Coastal Ocean Science, and the Ecosystem Assessment Program of the NOAA Northeast Fisheries Science Center - collectively called the Marine Life Data and Analysis Team (MDAT) - to begin characterizing the abundance and distribution of natural resources based on their data

[3] A copy of the presentation is available at: http://neoceanplanning.org/wp-content/uploads/2014/08/NRW_Introduction_Napoli_6-25-14.pdf

[4] The Northeast RPB's three goals are effective decision making; healthy ocean and coastal ecosystems; and, compatibility among past, current, and future ocean uses.

holdings and the inventory created by NROC. A separate NROC subcommittee is looking at habitat classification methodologies and coordination between regional habitat classification efforts. In addition, the online NROC Data Portal will be updated with new information on different natural and cultural resources and human activities as it is collected.

The timeline for Action 1-1 is as follows. This summer and early fall, NROC will convene expert working groups to gather input on product development, and will hold webinars to provide other opportunities for interested parties to be informed and stay engaged. NROC will also continue to engage agencies, environmental, and industry groups throughout summer 2014 to better understand data needs for regulatory and permitting processes. Public meetings will be held in the fall, and the RPB will meet in November to decide how to proceed with the characterization of natural resources.

Action 1-2 of the objective to characterize the ecosystem, economy, and cultural resources is to review existing ecological assessments from the region and, from those assessments, to determine what the RPB could and should do to develop useful ocean planning products. The NROC inventory of existing data sets, products, and their applications and the set of options and key decisions to be made about how to develop distribution and abundance products (that is, Action 1-1) lays the foundation for Action 1-2.

Participants had the following questions and comments:

- In regards to membership of the working groups that will inform product development, a participant suggested taking precautions to not overload those individuals (who are likely also being called on for technical help by others).
- Researchers should also be inventorying the benthic and water column communities that affect the distribution of marine mammals, fish, turtles, and birds.
- We should be discussing changing system characteristics. Mr. Napoli responded that the MDAT team will be looking at trends and that the MDAT team approaches allow for some review of changes in habitat characteristics such as water temperature.

Distribution and Abundance Data, Methods, and Options (Action 1-1)

Emily Shumchenia, NROC contractor, presented background research she conducted for Action 1-1 to inventory existing regional data sets and the options and decisions that need to be made in order to develop distribution and abundance products (such as maps). Findings from her research are available in the *Draft summary of marine life data*

sources and approaches to define ecologically important areas and measure ocean health.[5] Her presentation is summarized in the following paragraphs.[6]

The inventory of existing marine life data sources describes, for each data set, what marine life components were included, the data collection and analysis methodology, and final outputs, including cartographic representation. Once thus described, the data sets were then sorted by cross-cutting issues including data type, temporal span, treatment, final products, and uses. Different aspects of each data set pose specific questions to consider when developing abundance and distribution products.

The presenter noted that she had grouped products into two general kinds of products. Tier 1 spatial products would show maps of species observation data and the like. These are simplest, in that they only use observational data, and therefore, end products do not cover the entire region. Tier 2 spatial products, in addition to Tier 1, would use habitat data and other environmental covariates that influence distribution to predict species distribution and abundance. These are more complex, in that they provide full geographic coverage by linking observational data to habitat information, but may be challenging in that it is not always clear which environmental covariate is driving the model influencing the final output. To determine which data to include in the final products that will be developed, Ms. Shumchenia highlighted the need to consider what the desired end products will look like and how they will be used. Below are some of the questions that must be answered for technical work to advance in the coming months.

Data:

- What data sources should be included?
- What should be the geographic extent of the data set?
- How could data from different survey methods be integrated?
- How could expert/traditional knowledge be integrated?

Time Scale:

- How many decades should be included?
- Should data be represented monthly, seasonally, or by annual summaries?

Treatment:

- Should data be summarized by species, guild, or functional group?
- How would migration routes be incorporated?
- Which environmental covariates should be incorporated?

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[5] http://neoceanplanning.org/wp-content/uploads/2014/06/Marine-Life-Assessment-Inventory_draft-for-workshop.pdf

[6] A copy of the presentation is available at: http://neoceanplanning.org/wp-content/uploads/2014/08/Shumchenia_June25th_presentation1.pdf

Uses:

- How will new spatial data products be used?

Potential uses were identified to elucidate the links between the previous four categories and the management and regulatory uses of the data to guide creation of usable final products. Different uses could be as supporting information, for environmental impact assessment or permitting decisions, or for assessing compatibility with other uses.

In addition to consideration of the above issues, different species classes may require consideration of options unique to a specific species. For marine birds, for example, decisions will need to be made about how to incorporate sea bird habitat, habitat characteristics, and prey species distribution. For fish, decisions will need to be made about whether and how to integrate near shore and offshore data from state and federal agencies. For marine mammals and turtles, decisions will need to be made about how to characterize migration routes. Later in the afternoon of the workshop, participants tackled some of these questions during small group discussions of marine mammals and turtles, fish and birds. Summaries of those discussions are included further below.

In small table groups, participants reflected on Ms. Shumchenia's presentation and identified concerns, issues, or questions raised by her presentation. Highlights of these small discussions were shared with the full group, as follows, grouped by theme:

1) Suggested Assessments / Data - Several participants suggested specific assessments or data sets to include in the inventory or to use as examples when creating final products. A participant suggested including both systematic and non-systematic data sets, the latter of which might include data from acoustic monitoring, satellite telemetry, or opportunistic whale or dolphin observations. One commenter suggested creating a clearinghouse/repository where communities or researchers can directly deposit potentially useful data into the data portal. Ms. Shumchenia said the inventory is in draft form and requested that participants send additional data sets to her for inclusion in the inventory and review of final product design (see also the specific data sets listed under the Traditional/Expert Knowledge subcategory). Participants identified the following potential data sets:

- The Atlantic States Marine Fisheries stock assessment on lobster
- Massachusetts lobster trap survey data, which are completed annually and which will be completed by the industry in 2015. Expand this data collection effort into federal waters to support ocean planning.
- The NOAA CetMap project could serve as a template, since the cartographers developed five tiers of data organization when navigating a similar set of questions for a different project.
- Flora data sets
- Marine bat data sets currently being gathered

- Provincetown Center for Coastal Studies observation data of bowhead and right whales in Cape Cod Bay

2) Geographic Scope of Data - Several participants suggested including both regional and local data sets. Regarding migratory fish and the health of the fish population, a participant noted that the final products should elucidate the connection between important inshore fisheries or watersheds and the Gulf of Maine. Another participant suggested that the regional distribution and abundance data available for bird species is useful and this same scale would also be useful for other major species groups. Mr. Napoli stated that the goal is to incorporate local data sets into the models; but the outstanding question is which data sets and whether they can be integrated.

3) Traditional and Expert Knowledge - Several commenters suggested that traditional and expert data and knowledge both be included. One person suggested including the data Ted Ames collected via interviews with elder fishermen to map historical inshore cod spawning areas. Another participant suggested that similar interview methodology could be used to collect information about the historical locations of eelgrass or to characterize the ocean health earlier than 1968. Similarly, a participant said that substantial and detailed information exists within the fishing community at large; but it has not yet been amassed. Another participant suggested that informal study groups, such as one he is involved with that focuses on the historical ecology of the watershed and inshore fisheries in the Gulf of Maine with special interest in river herring, would like to share their expertise with those doing ocean planning.[7] In regard to the comments about collecting data through interview methodologies, Mr. Napoli said the focus will be on existing data sets given the 2016 deadline; but that participants should continue suggesting ideas about how to collect information to fill data gaps, since these could be added to the long-term science plan.

4) Temporal Scale of Data - Several participants commented on the importance of integrating as much historic data as possible into the final products to help characterize the long-term changes in ocean and species health and to establish a solid baselines. One participant suggested at least seven years of historic data would be necessary to draw useful conclusions for lobster populations. Regarding migratory fish species such as smelt, salmon and cod, a commenter suggested that data be included to illustrate the location of fish, both in and out of spawning season and in the past and present.

5) The Importance of Application and Uses – Some participants commented that the ultimate use of the products will depend on which data sets are included. For example, more detailed and higher resolution local level data sets would be required to establish boundaries between ocean activities or to do project planning, while regionally

[7] The group he described includes members from the University of New Hampshire, Boston University, University of Massachusetts, and Princeton University.

comprehensive data might be sufficient to guide general planning discussions. Additionally, a participant referred to the mapping efforts of Massachusetts and Rhode Island and suggested that it might be more useful to create maps that answer specific planning questions than to create general maps to answer unspecified questions.

A participant commented also that it is essential to remember that many available data sets were created for specific management purposes, so the underlying data sets must be connected to the management decisions for which they were intended (e.g. for National Fisheries Management Council). Otherwise, if they are disconnected, the underlying political/purpose aspect of some data sets will be lost.

A participant suggested the need to focus on the application that is being used to turn the data into useful information because the application process will influence the type of data that is used and the outputs received. The participant asked if thought had been given to the data application process. John Weber, NROC Ocean Planning Director, said this comment is exactly why NROC is doing this work—to identify the types of data outputs that regulators need to possess when conversing with specific user groups about management decisions.

6) Other - A participant noted that data and decision making efforts have historically been siloed, and thus there is a need for a tool that will merge all the data to enhance decision making across groups. The participant expressed concern that NROC may not achieve this ideal tool from the current contract with MDAT and asked when an output assessing the full ecological community might be produced. Mr. Napoli stated that it is accurate (the MDAT contract will not produce full ecological community outputs). Today is the beginning of the conversation about how to create this type of desired output over time.

Introduction of the Marine-Life Data Analysis Team

Corrie Curtice, Research Analyst in the Marine Geospatial Ecology Lab at Duke University's Nicholas School of the Environment, introduced the Marine-Life Data Analysis Team (MDAT), a group of researchers tasked with compiling data and developing information products that will help the RPB and others assess ecological function, vulnerability and risk, and scientific uncertainty when making ocean planning decisions.[8] MDAT is comprised of data analysts and model developers from Duke University, NOAA National Center for Coastal Ocean Science (NCCOS), NOAA National Marine Fisheries Service (NMFS)/Northeast Fisheries Science Center Ecosystem Assessment Team (NEFSC EcoAP), and Loyola University. The following is a summary of Ms. Curtice's comments.[9]

[8] The Marine-Life Data Team can be reached at northeast_marinelife_data@duke.edu

[9] A copy of the presentation is available at: http://neoceanplanning.org/wp-content/uploads/2014/08/NRW_MDATOverview_Curtice_6-25-14.pdf

MDAT members maintain many relevant data sets from projects in the Northeast and have extensive experience working with data products and models to analyze and interpret the results. They manage or have direct access to the Ocean Biogeographic Information System Spatial Ecological Analysis of Megavertebrate Populations (OBIS-SEAMAP) database, OBIS-USA, iOBIS Strategic Environmental Research and Development Program (SERDP), Cetmap, USGS/BOEM Avian Compendium database, NorthEast Area Monitoring and Assessment Program (NEAMAP), and over 240 additional surveys spanning more than half a century.

MDAT will begin its work by reviewing current data holdings and identifying additional local and regional data sets with stakeholders from the region, with the intent of creating products (maps, for instance) for the Northeast region by summer 2015. These products, which will focus on seabirds, marine mammals and turtles, and fish species, could include survey and observation density maps, site per unit effort (SPUE) maps, and hotspot maps organized by taxa, seasons, year(s), or focal species. Since each product type has different pros and cons associated with it, MDAT will seek stakeholder input from expert working groups to determine which products would be the most useful in the Northeast. MDAT also expects to hold public webinars to provide updates on progress and to disseminate the final products.

Participants had the following questions and comments about the MDAT work plan. Responses from MDAT are *italicized*.

- In the southern zone of the Northeast area, we are already seeing shifts in the ecosystems; for example, fish stocks are moving east and north. To what degree will the system created by MDAT capture the shifts and potential shifts in the ecosystems over time? *We have some animated maps that show these shifts already for fish. The NEFSC is working on a separate project with The Nature Conservancy to investigate the influence of climate to change ecosystems by matching the concept of climate velocity with magnitudes of change in individual species. We should be able to use the outcomes of that project as inputs into RPB products.*
- Are the distribution density models driven by first principals like primary production or are they mostly based on physical parameters? *An ongoing investigation on distribution patterns with respect to prey items and primary productivity as a proxy for other food dynamics in the system could be pulled into this discussion; but it is not included in this work plan. We first want to identify the known distribution based on actual data and some environmental co-variates and then make the types of more complex connections you identified.*
- What tools will MDAT use to analyze the compatibility between different human uses and the taxonomic groups? *MDAT's focus is aggregating data and producing products for marine mammal, sea turtle, bird, and fish distribution and abundance.*

Potential uses of these products, such as in compatibility analyses, will be considered during development.

Breakout Group Summaries

In the afternoon of the workshop, the participants self-selected into one of three breakout groups by taxonomic organism (marine mammals and turtles; seabirds; and fish). In each group, participants discussed potential data sources, geographic areas, and species to include in the final distribution and abundance products. Summarized below are each of the breakout group discussions. Participants were given the option to turn in their thoughts in writing in addition to contributing verbally. This synthesis includes both verbal and written input from those breakout sessions.

A. Marine Mammals and Turtles Breakout Group

There were approximately 30 participants in the group that discussed marine mammals and turtles. Their input is summarized by the four questions asked.

A.1. Species Prioritization: Which marine mammal species are of highest priority regarding marine spatial planning?

The group discussed how species should be prioritized and which species should be prioritized when creating abundance and distribution models and maps, given limited time and budget. They generally discussed one of four approaches: prioritization based on biologically important species, prioritization-based listing as threatened or endangered on the Endangered Species Act (ESA), prioritization based on the type of ocean activity, or equal prioritization for all species. Participants noted that the migratory nature of some species and the localized nature of other species make it difficult to broadly select priority species.

- Species prioritization based on ocean activity - Prioritization could be based on the anticipated ocean activity (including the different phases of the activity such as site surveying, construction, and operation), since different activities have specific impacts on specific species at specific times (i.e., seasons). For example, pinnipeds are priority species if considering aquaculture development. An alternative view, which was seen as unfavorable by some participants, is that prioritization based on specific projects or activities would default ocean planning to the stove-piped, status quo approach of prioritization based on ESA species and other protected mammals and commercially valuable fish. They said this would be putting management ahead of science, when they would prefer the opposite. Participants also noted that, at least for some species, cumulative impacts that occur across the entire species range could potentially cause a greater impact to a species than any single project.

- Species prioritization based ESA listing – Many participants suggested the highest priority species to gather data about should be those listed under the Endangered

Species Act; others specifically suggested not taking this approach. A participant noted that a statutory obligation exists for all marine mammals under the Marine Mammal Protection Act (MMPA), so no individual species should be prioritized above another.

- Prioritization based on biological importance - One alternative to the ESA prioritization would be to prioritize species based on biological importance (e.g., keystone species or a species like sand lance) or select a species that could represent larger subgroups of mammals (e.g., mammals which all prey on the same fish). Another suggestion was to base prioritization on the species' status as a sentinel species (which may differ based on planning purpose or development use).

- No prioritization - Other participants suggested not prioritizing species. Instead, they suggested that an overall baseline assessment using the best available data for all species should be completed.

Participants also offered the following suggestions and comments.

- Species to prioritize:
  - Species that are experiencing or have recently experienced periods of unusually high mortality (e.g. tusiops and harbor seals)
  - All species impacted by human activities like bycatch and ship strikes (including all seals, harbor porpoises, white sided dolphins, common dolphins, pilot whales, and Risso's dolphins)
  - Specifically listed species: fin, sei, minke, humpback whales, North Atlantic right whales, and beaked whales
  - All turtle species, including all hard shell and leatherback. Model/map all turtles together since a lot of turtle data exists but may not identify specific turtle species. Participants seemed to agree that all turtles should be mapped. One participant indicated these turtles: Green, Kemp's Ridley, Leatherback, Loggerhead, Hawksbill.
  - Prioritize those for which data are not available, to fill data gaps.
  - Prioritize those for which data are available, then address data gaps next.
  - Prioritize by feeding areas, giving consideration to prey species of significance over individual predator species.
- Criteria for prioritization could also include rarity (relative to potential abundance), vulnerability (to activity), and data availability (ability to produce model for data poor species that meet vulnerability and ecological importance criteria).
- Someone suggested that species that spend the majority of their time outside of or on the cusp of the study area may not warrant prioritization.
- Positive impacts resulting from ocean activities should be mapped too.
- Integrate acoustics data and observation data, if possible.

A.2. Resolution, Scale and Boundaries: What spatial resolution over what geographic extent would be most useful for marine spatial planning? How far in-shore (state waters, large bays/sounds, etc.)?

Although the boundary between the Mid-Atlantic and the Northeast Atlantic region is still being delineated, the area of the Northeast region extends from the Long Island Sound in the south through the Gulf of Maine in the north, and east to the Economic Exclusive Zone (EEZ). For the purposes of characterizing marine life, the range of the species as it relates to this general planning boundary will be considered.

For spatial resolution, the group discussed the potential applications of the data recognizing that a cell size of 250 meters by 250 meters is ideal for site-specific decisions or planning of smaller areas (such as the MA Ocean Plan) while larger cells might be appropriate for larger geographic areas. The group also recognized that spatial resolution and grain size may depend on the species and on the data available. One member suggested considering a hierarchical approach and use of a GIS technique called scene model to scale the cells to the mechanism that planners want to observe. A participant suggested a variable cell size driven by data distribution (voronoi tessellation); however another participant advised against this approach.

The group offered the following suggestions for the spatial resolution and geographic extent that would be most useful for ocean planning:

- Map the entire range of the species or to the greatest extent of the data set – Mapping the entire range of a species along the eastern seaboard would maximize efficiencies between the Mid-Atlantic and the Northeast region, and would enable the identification of hotspots for specific activities such as feeding or breeding, migratory patterns, and critical habitat. If using data from an extended range, use the distribution in the New England area to determine the breaks in the color ramps.
- Include the range where species existed but may no longer populate due to die-off or due to recent unusually high mortality rates.
- Map areas of high likelihood for species/human interaction to occur.
- Map trends and changes over time and across different maps or data sets to the extent possible.
- Map distribution and abundance by depth.
- Map distribution and abundance in bays and sounds.

The group also suggested a variety of timescales that would be most useful for marine spatial planning. Some people suggested a minimum of three months of data be displayed because anything less would not provide a sound assessment. Others suggested displaying data at the monthly scale and only combining the data, when and if necessary, at a maximum increment of three months. Still others suggested displaying the data at the smallest times scale possible.

Other comments:

- The more the characterization of distribution and abundance is expressed in terms of depth and time, the more useful the maps will be; however, this will also increase uncertainty.
- Seek opportunities to develop a formal partnership with the Mid-Atlantic region to save money and increase scientific robustness.

A.3. Anticipated data uses: What are the currently anticipated uses of marine mammal data for marine spatial planning?

The group discussed and listed the following anticipated uses of marine mammal and turtle data for marine spatial planning:

- Siting decisions on aquaculture, mobile gear fisheries, fixed gear fisheries, designating shipping lanes, oil and gas pipelines, wind energy, sand and gravel mining, tidal energy, scientific testing of buoys or other devices, and designation of essential habitat.
- Ecosystem service models.
- Co-occurrence models to identify where marine mammal and human models overlap, and adjusted to include the impact area, which is broader than where the human activity is occurring.
- Data could be used to identify and predict vulnerabilities associated with various ocean activities and then determine which activities may be more compatible in a particular region given the use of the area by marine mammals. This could include impacts from noise, displacement, ship strikes, entanglement, etc.
- The data could be used to inform project decisions and encourage pro-active ocean planning by identifying ecologically important areas.
- The data could also be used to refine environmental impact assessment site surveys and help to answer site-specific questions.
- End users may wish to overlap disparate data sets on top of the model output. For example, overlay stranding data or observation on top of the model outputs to make decisions about areas where no data exists in the model.
- Data could help with monitoring and evaluating changes to species over time and effectiveness of plans to achieve stated goals.

Other comments:

- The models and outputs will need to be flexible in order to serve many needs.
- Sufficient thought must go into deciding how the MDAT team will summarize and display their work, and explain what was selected and why.
- Cartographers should provide guidance and caveats describing how each map should and should not be used.
- Clearly distinguish between no data and no sightings on the maps.
- Include summary maps that show all endangered species on one map.

- The MDAT team will not have to make every map if they design their portal interface to support user-driver queries.

A.4. Data Sources and Partnerships: What are possible data sources and partnerships that can supplement the existing marine mammal data from large-scale survey efforts?

The group discussed possible partnerships that could supplement the existing marine mammal data from large-scale survey efforts. A participant suggested that a strong partnership be developed between the Mid-Atlantic team and the Northeast Atlantic team to share data and leverage resources. This could be particularly important in regards to the marine mammal migration path through the Mid-Atlantic.

Participants suggested seeking data from the following groups or organizations or including the listed data sets:

- Expert workshops – in the case of the migration path between the Mid-Atlantic and the Northeast Atlantic, it may be useful to gather leading experts to discuss and delineate the bounds of the key migration pathways
- Mass Audubon's data on turtle stranding and observations
- Data from the Sea Turtle Stranding and Salvage Network
- Clean Energy Center's aerial turtle observation data
- Pinniped and humpback whale data from the Provincetown Center for Coastal Studies
- Whale Center of New England, which is curated by the Provincetown Center for Coastal Studies
- Whale and Dolphin Conservation
- Blue Ocean Society
- Virginia Aquarium and Marine Science Center
- College of the Atlantic, and the associated Allied Whale
- Battelle Ocean Sciences
- All regional stranding networks
- Satellite tagging data from NOAA NMFS, New England Aquarium
- Gulf of Maine Research Institute by-catch avoidance mapping
- Data from whale watch and eco-tour boats
- Opportunistic data for humpback whales – This data would be useful because more humpback whales are being seen year round in the Mid-Atlantic but the broad scale surveys do not capture their presence.
- Entanglement and beaching data for right whales and other species – This data also informs distribution and abundance even when observation data in the same location may be lacking.
- Kara Dodge's work on leatherback turtle locations
- Brooke Wikgren's paper on co-kriging to merge on-effort and off-effort survey data collection efforts.

- Right Whale Consortium (A caution was noted that they get their data from many other sources, so take care to avoid integrating duplicate data sets).

B. Avian Breakout Group

There were approximately thirty participants in the group that discussed avian distribution and abundance. Their input is summarized by the four questions asked.

B.1. Species Prioritization: Which marine bird species are of highest priority regarding marine spatial planning?

The group discussed how species should be prioritized and which species should be prioritized when creating future spatial data products. The group recognized that it was difficult to determine which species to include since they did not have collectively defined management goals or clearly defined uses of the data to serve as guidance. In the future, some participants recommended first defining the needs and goals for use of the data before considering what to prioritize. The primary options that emerged for prioritization included:

- Do not exclude any species: Some participants suggested the prioritization should focus on maintaining today's species at healthy numbers and avoiding future species loss. This focus meant that some participants recommended not excluding any species and aiming for as comprehensive of a list as possible. Participants also felt that it was important to have data available for a wide variety of uses, ranging from conservation purposes to wind energy facility siting to the positive value bird species can provide.

- Use existing laws and lists as guidance: Many participants stressed that there are already existing legal mandates and major ornithology initiatives that have prioritized species. These include The Migratory Bird Treaty Act, the Endangered Species Act, the International Union for the Conservation of Nature, the Water Bird Council in North America, Bureau of Energy and Ocean Management, and the Fish and Wildlife Service Species of Greatest Conservation Need. They advised using these lists to prioritize rather than creating new ones without a clear rationale or purpose.

- Focus on species dependent on a specific area: Multiple people supported the idea of focusing on species from a defined area, such as the area around Massachusetts. A past effort in Massachusetts led to focusing on bird species dependent on the Massachusetts area for the health of their species, such as the long-tailed duck and the roseate tern. A participant suggested that existing lists could be narrowed down to focus just on species that are heavily dependent on the geographic area of concern for the initiative.

- Prioritize by Sector: Some participants recommended prioritizing the species based on the sector interested in the information and their goals and needs. Examples included wind energy, recreational users, defense and security, and conservation. Using this lens could help to prioritize information needs.

Other comments and suggestions:

- Data availability, especially for rare species, is the main constraint on what can be mapped. Do not focus only on species with abundant data or the most rare birds in the region may be overlooked.
- If data gaps are identified, the RPB could convene subject-matter experts to collect new data.
- If new lists are drafted, RPB should ask subject-matter experts to review and revise them.
- Capturing nesting island, sea habitats and foraging area data in addition to population data is important.
- Prioritization should also try to capture human activity (e.g. bycatch) that affects some marine bird populations.
- Another lens for prioritization could be uncertainty and building data products that help RPB deal with uncertainties in future decision-making.
- Participants also expressed interest in predictive modeling for how well birds can do in the region.
- Include bat data for species that migrate over oceans.

B.2. Spatial Resolution, Geographic Extent, and Timescale: What spatial resolution over what geographic extent would be most useful for marine spatial planning? How far in-shore (state waters, large bays/sounds, etc.)?

In terms of spatial resolution, the group expressed that having data available at multiple resolutions and grid sizes would aid different uses of and needs for the data. No consensus emerged in terms of geographic extent of spatial resolution, but the following points and recommendations were made:

Geographic extent:

- Normalized data from 3 nautical miles (nm) to 50 nm and the area covering 0 to 3 nm from shore and inshore data, if available, would be useful from an environmental permitting perspective.
- Include Long Island Sound.
- The geographic extent should be considered in the context of what the RPB needs and defines as a geographic boundary of interest.
- Include birds on the coastline, salt marsh species and intertidal habitat in the geographic extent covered.
- Include near-shore waters for marine birds, many of which are good sentinel species for changing patterns in foraging areas.

- Make available raster or ESRI data files that can be manipulated using GIS programs.

Spatial Resolution:

- If possible, create outputs with finer and courser resolution, though this is limited by the scale of the data/predictive variables available. Courser data can allow for precautionary protection of larger areas and can be more ideal to minimize error in models.
- Marine mammal data is often used in one square kilometer cells. That resolution also puts you in topography relatable to the dynamics of the sea bottom.
- For larger areas, like the Gulf of Maine, a 4 square kilometer scale might be ideal.
- Consider using the Outer Continental Shelf lease block area of one square mile.
- Consider the trade-off between resolution and prediction accuracy. Better in some places than in others.
- Scientists prefer the finest spatial scale while managers want to reduce uncertainty, which can come with an expanded scale.
- Spatial resolution and geographic extent should include migratory corridors in addition to hotspots. There are also land birds that will migrate over oceans.
- Also important to consider a bird's aerial point of view and how they would view feeding areas from above/shelf edge.
- Another spatial consideration is the air space above water, since birds fly. NOAA collects altitude data. These data could be used to develop distribution and abundance estimates for various elevations.

The group's discussion of temporal resolution was briefer than earlier topics. The consensus that emerged was that data captured on monthly scale was more ideal than seasonal data. This is because to interpret seasonal data, the months flanking key events like spring and fall blooms also need to be included. Monthly data also allows for capture of variations between individual birds' movements. The group acknowledged, however, that this timescale requires more frequent data sampling, and resources to do that sampling could be a challenge. At a minimum, the breakout group noted that seasonal data is necessary.

B.3. Anticipated data uses: What are the currently anticipated uses of marine bird data for marine spatial planning?

Participants said that data would be used for different categories, making a "sort by" function a helpful tool to create and use for organizing the data for different management uses. Potential sorting criteria discussed during the meeting could include Endangered Species Act (ESA) compliance, hunting, Bureau of Ocean Energy Management (BOEM) permitting requirements, recreational uses, energy siting, defense and security, available data, conservation goals, habitat and foraging, vulnerability data,

and rare species. Predictive models were also mentioned as useful. One participant said that this data would be useful for anticipating climate change impacts on bird species.

B.4. Possible data sources and partnerships: What other data exist besides the Compendium [and other data the NCCOS/Loyola team has in hand]?

The group recommended many potential data sources and other types of data that could be included. Data sources noted included the following.

- BOEM/USGS Compendium
- Bird Life International's Sea Bird Tracking Database
- The Fish and Wildlife Service's Avian Knowledge Network
- NOAA Seabird Stewards Monitoring Program and a Sheer-water Tagging Program
- National Wildlife Refuge System
- Northeastern Regional Association of Coastal and Ocean Observing Systems (NERACOOS)
- Regional Association for Research on the Gulf of Maine (RARGOM)
- Stantec has acoustic and radar studies on bats for the Department of Energy.
- Request visual, aerial, and radar survey data from wind/offshore developers who have conducted studies in the region. This may require specific requests with detailed information, and MOUs of how you will use the data.
- Existing risk assessment models, such as Beth Gardner's "Mapping the Distribution, Abundance and Risk Assessment of Marine Birds in the Northwest Atlantic."
- Latest update of "Seabird Research and Conservation Activities in the Northwestern Atlantic Marine Bird Conservation Cooperative" from the Atlantic Coast Joint Venture.

Other types of data:

- Telemetry and satellite data to show migration corridors and distribution when not at hotspots.
- Acoustic data, if available (similar to VHF tag data that can capture acoustic data for whales).
- Next Generation Radar (NexRad) data, which is publicly available and extends offshore.
- Another idea is to catalyze spatial analysis working groups focusing on the oceans so we can understand processes rather than make static maps. Integrate across taxonomy and methodologies to have a common database for decision making (for example, there are projects now to tag fish utilizing hot spots).

C. Fisheries Breakout Group

There were approximately sixty participants in the fisheries breakout group. Their input is summarized by the four questions asked.

C.1. Species Prioritization: Which fish species are of highest priority regarding marine spatial planning?

The group discussed how to prioritize fish species for mapping and modeling. Participants suggested that species could be prioritized using some combination of the following criteria: commercial value, ecological importance or indicator species (e.g. keystone species such as noncommercial prey species like sand lance), rare species which may or may not be on the endangered or threatened species list, species that are important to other species including mammals and birds, representative species for each trophic level, vulnerability of a species to threats (such as climate change) or impacts (from specific ocean uses), and the frequency at which species have been studied with emphasis on the lesser studied species (those not likely captured by BOEM, Fishery Council, or other routine investigations). Several participants stressed the importance of prioritizing a small number of ecologically important fish species that could serve as indicators for overall ecosystem health.

Some participants suggested prioritizing the following species: scallops (and the distribution of larval scallop propagation), lobsters, horseshoe crabs, oysters, kelp, conch, whelk, seabass, scup, Atlantic herring, blueback herring, alewife herring, fluke, dogfish, and sand lance.

Participants also made the following comments or suggestions:

- Identify onshore-offshore connections, if possible.
- Identify data gaps if insufficient data is available to map distribution and abundance (e.g. horseshoe crabs).
- Consider that climate change could change habitat requirements and cause shifts in the species that are considered the most commercially valuable.
- It may be useful to identify critical issues that currently fall outside of current regulatory frameworks and focus on these issues and the species they impact rather than try and reinvent the wheel of fisheries data already extensively managed by existing regulatory efforts.
- Identify those data sets or efforts that are not merely descriptive, but seek to be predictive about species distribution and abundance.

C.2. Spatial Resolution, Geographic Extent, and Timescale: What spatial resolution over what geographic extent would be most useful for marine spatial planning? How far in-shore (state waters, large bays/sounds, etc.)?

The group discussed the spatial resolution and scale that should be used when mapping the data, emphasizing the need to track shifting boundaries of fish populations given the dynamic nature of fish populations and the impact of climate change on habitat. Generally, group members suggested mapping distribution and abundance from the headwaters of rivers to the economic exclusive zone (EEZ), and possibly beyond the EEZ. Some members suggested initially focusing on coastal areas/state waters where most user conflicts and key ecosystems are located before moving into deeper waters, while others suggested focusing on offshore areas where current or soon-to-be proposed projects may likely cause user conflict (offshore wind facilities, shipping lanes, etc.).

Discussion also included the following topics:

- Land to sea geographic extent – Several group members commented on the importance of mapping the links between the headwaters of rivers, to shore zones, and the open ocean since this has been a long-term challenge to complete. Participants suggested this link is vital to understanding ocean health. In particular, this information could illuminate the onshore conditions that lead to offshore ecological impacts like ocean dead zones (i.e., from chronic excessive nutrients).

- Best available or most appropriate/meaningful extent and resolution – Several commenters suggested that the scale and resolution of the data will depend on data availability and the scale of a proposed ocean use. Participants noted that finer resolution maps could be created for areas with greater quantities of data, or that grid size could be based on data density. Other members commented that the most appropriate geographic extent and spatial resolution should be selected based on the management question to be answered. Resolutions may be different depending on the planning process, whether its research planning, community planning, conservation planning, business planning, etc.

- Data issues and challenges – Group members described issues or challenges that may be inherent in the data. In particular, members noted that some data might not be spatially accurate. For example, the state lobster landing data may also include lobster from federal waters. People also noted the tendency to create rectilinear grids that do not necessarily reflect the complexity of the ocean ecology (bottom types, currents, etc.). One participant suggested the basis of the maps should be recent bathymetric charts, which would lead to a non-rectilinear grid approach.

Other comments:

- Focus on where the current fishery management system cannot reach and where fish populations are vulnerable to non-fishing threats, such as inshore traffic.
- Maps should illustrate both where data is and where data is not available.

- Since generalized maps will incorporate many flaws and can only provide general guidance, it will be necessary to require local assessments for any planned ocean use.

C.3. Anticipated data uses: What are the currently anticipated uses of fish data for marine spatial planning?

Participants discussed how the fish data might be used in marine spatial planning processes. The comments broadly fell into the categories of ecosystem based management, user conflict management, predictive capacity, and agency coordination and decision improvement.

- Ecosystem Based Management for ocean health – Many participants said the data should be used to establish a baseline for ecosystem health. Additionally, the data could be used to plan for ecosystem restoration and long-term sustainability. For example, some data could be used to help determine where and how to rebuild oyster reefs. The data could also serve to identify trends and changes in overall ocean health and/or in specific project locations and identify the migration of economically viable species into areas where they were not located historically. Participants asked what metrics or indicators might be used to determine a healthier ecosystem.

- Ocean use mapping and conflict management – Group members said that data identifying who is using and how they are using the fisheries could be key to reducing conflict between users, while also providing a context to introduce new users without adverse effect.

- Predictive Capacity – Participants suggested using the data to link habitat data to fish distributions, then compare differences in predictions with other factors such as warmer water temperatures or other abiotic or biotic factors to improve the capacity to predict movements and locations of resources and ocean users interested in those resources.

- Coordinated and improved agency decision making – Participants said the data should serve as a baseline data set from which all agencies can coordinate their decision making. The noted the importance of collecting and sharing new data and the usefulness of the shared data set to serve as a baseline for monitoring impacts from approved projects.

Other Comments:

- The data should not recreate fishery management.
- The process must recognize data gaps early and allow for the integration of new data as it is collected.

- Use this data for determining siting and potential impact of wind, gas/pipelines, cables, creation of alternate shipping lanes, and recommendations for agencies and developers when considering uses for specific spaces.

C.4. Possible data sources and partnerships: What other possible data sources should we consider besides trawls from states, NEFSC and NEAMAP?

Participants discussed data sources and potential partnerships that could be formed to acquire more data. Participants acknowledged that trawl data represents most of the currently available data and pointed out several limitations if only trawl data is used.

- *Issues with trawl data* – Participants indicated that trawl data is a useful starting point, but would not be sufficient alone. They noted that lobster and scallops are not well represented in trawl surveys. Some participants said that trawl tows in the Gulf of Maine collected anomalous data that is unrepresentative of actual conditions. Others suggested that large data gaps exist in locations where trawl surveys cannot be completed.

- *VMS data* – Participants discussed the use of VMS data. They noted that VMS data in the UK provided a lot of useful data; but that VMS data would provide only vessel positional data, not information on what was caught where.

Possible data or data sources – Participants noted the following data or data sources:

- State of Maine data from lobster suction surveys, sea urchin surveys, and lobster ventless traps surveys
- Soft-shell clam and river herring data from towns
- State area statistical reporting data
- Fish larvae data
- Prey data
- Acoustic surveys
- Sea sampling
- Video surveys
- Traditional/local knowledge of where fishing happens and where fish were historically
- Scallop dredge
- Observer data
- Sea viewing Wide Field-of-view Sensor (SeaWiFS)
- National Park data
- National Estuarine Research Reserve (NERRS) data
- Nutrient data
- Create a voluntary survey for fishermen to report effort in areas

Other Comments (either made in person or received in writing):

- How do we link scales of local data sets versus broader scales? What about historic data versus predictive models?
- Account for dissonance between where fishermen report their hauls and where they actually fish
- Focus on how to use the data recognizing the limitations on what the data can tell us to move forward
- Use whatever data is on hand: finer scale of detail in some areas and less refined grids where we are lacking data

Overview of regional efforts to identify ecological areas or measure ecosystem health (Action 1-2)

After people reported back from the breakout groups, Emily Shumchenia, NROC contractor, presented an overview of research completed for Action 1-2, creation of an inventory of regional efforts and assessments to identify ecological areas or measure ecosystem health. This data will serve as the basis for the RPB to decide which research should be completed in addition to the characterization of the abundance and distribution of marine natural resources. Her presentation is summarized below.[10]

The inventory of potential investigations the RPB could complete is divided into three sections: identification of areas of ecological importance; measuring ocean health; and consideration of tradeoffs. Areas of ecological importance include assessments to identify species, biodiversity and habitat "hot" spots, and ecologically important areas. Tools for measuring ocean health include assessments and models such as single species impact models, cumulative impact models, and ocean and ecological health indices. Tradeoffs, which were added because of the numerous tradeoff assessments completed in the region, include assessments of ecosystem services and other similar comparisons. Ms. Shumchenia reviewed each assessment by their complexity, the requirements to run or be assembled or interpreted, data availability in the region, NROC capacity to complete the work, and management application of the assessments.

Ms. Shumchenia noted that stakeholder input on how to represent the data on the maps produced by MDAT and on the answers to the questions associated with the cross-cutting issues would help the RPB prepare to complete the assessments in the inventory created under Action 1-2. She urged participants to review the inventory and provide feedback on the different types of assessments the RPB could undertake.

[10] A copy of the presentation is available at: http://neoceanplanning.org/wp-content/uploads/2014/08/Shumchenia_June25th_presentation2.pdf

Group Discussion about Action 1-2

Prior to opening this large group session for participant discussion, five individuals from scientific, government, and academic backgrounds provided their perspectives on identifying ecological areas and measuring ecological health.

Leila Hatch, Marine Ecologist at NOAA's Stellwagen Bank National Marine Sanctuary, said the responsibilities of the National Marine Sanctuary team are to assess the compatibility of sanctuary uses with sustaining full ecological processes in the sanctuary and addressing actions that injure sanctuary resources. She noted that she and her colleagues tackle many of the same questions raised during the workshop as they manage the sanctuary. Stellwagen could provide a strong case study for regional ocean planning. Ultimately, the Sanctuary uses two tools to achieve their management goals: high-resolution tools for project-specific risk assessment of transient projects that could impact resources in the sanctuary and long-term assessments of ecological health and processes, both natural and human, that sustain the sanctuary. For example, in coordination with several key partners, they have reviewed whale population density data and shipping route data in co-occurrence risk assessment models.

Bruce Carlisle, Director of the Massachusetts Office of Coastal Zone Management, described his experience developing the Massachusetts Oceans Plan and the challenges at the state level. The discussions held during the workshop mirrored those held when Massachusetts began to develop its Ocean Plan. He commented that during plan development, they attempted to determine areas of ecological importance by developing an ecological valuation index. However, the state decided the approach did not provide results at a fine enough scale or with enough certainty to use it for decision making. Although they learned a lot, set new science priorities, and have made significant progress mapping important marine resources, more complex analyses proved to be very problematic. He emphasized the importance of clearly defining priorities early and setting realistic work goals.

Les Kaufman, Professor of Biology at Boston University, described what might be possible for the RPB to complete from a technical perspective. He currently leads a team that developed a tradeoff analysis based on biophysical and socioeconomic data. This analytical approach was tested in the Massachusetts Ocean Management Plan area as well as at numerous other coastal locations around the world. The result of the analysis is a dynamic map that illustrates the flow of value over space and time under varying management scenarios in the simulated system. The analysis does not predict what will happen; but it does help managers analyze the implications and costs associated with particular management decisions. Ultimately, Professor Kaufman suggested the ocean planning process start by first identifying which decisions need to be made, then developing a tradeoff model to help answer to the pertinent questions, rather than gathering and organizing data and then seeking to make use of it.

Andy Rosenberg, Director of the Center for Science and Democracy at the Union of Concerned Scientists and former, active participant in the Massachusetts Ocean Plan development, commented that it is a significant challenge to put different types of assessments in an inventory into a reasonable order. He noted that although it is useful to identify which management decision is to be made with a given tool, this is not always how the processes unfolds in real life. Therefore, categorization of status and trends, options for management, and identification of success markers are crucial. He stressed that management decisions are being made now, with or without full or complete data sets, rather than being placed on hold while this work is being completed. He asked if the fundamental question is really how to improve the availability and use of data in the current management process, regardless of the ultimate decision to be made.

Grover Fugate, Executive Director of the Rhode Island Coastal Resources Management Council, provided a regulator's perspective in which decisions are made in a complex, dynamic environment. He commented that regulators are risk-averse when making decisions, especially when there is a lack of data; and that trying to understand the ecological interactions between projects—each of which might impact different species—complicates individual decisions. He also said that while regulators are making decisions based on species considered important today, changing system dynamics complicate these decisions because the important species of today might not be the important species in a few years. This would mean that decisions today should be made with focus on the species of tomorrow. Mr. Fugate stressed the importance of remembering the ultimate goal when developing the tool: making decisions for various activities in a better framework than is currently used.

The discussion was then opened to the full group, and was guided by the following questions:

1) How might these assessments be used in Northeast ocean planning? Do they meet the goals of the RPB? How/why/why not?
2) What are the technical, methodological, data, and policy challenges?
3) What else does the RPB need to know in order to make a decision in November?

Participant comments spanned a range of topics but generally fell into the categories of integrated agency decision making, involvement of interested parties, and value prioritization and trade off analysis tools. Broadly, the group discussion indicated that the tools are not the end point, but rather they are the methods for helping the agencies and the interested parties engage in more effective ocean management decision making processes. More detailed comments are summarized below.

1) *Integrated agency decision making* – Participants said the RPB should enable more effective decision-making by enhancing collaboration and coordination between the numerous state and federal agencies. Enhanced coordination and the tools produced by the RPB could better elucidate the context in which decisions are to be made and help managers understand the areas of overlap between ocean uses, which could aid in planning for multiple uses.

2) *Involvement of interested parties* – Related to institutional coordination and collaboration, participants discussed engagement of other non-governmental parties in ocean planning and decision making efforts. The RPB could investigate methods to ensure engagement between government agencies and interested parties occurs early and often throughout decision making processes instead of only at the end of a planning process after final decisions are made.

3) *Value prioritization and tradeoff analysis tools* – Participants discussed prioritizing values and potentially conducting a tradeoff analysis. In summary, participants noted that these more complex trade-off models and tools are fraught with complexity and potential controversy. One commenter suggested the next step after mapping natural resources would be to identify and agree upon ecologically valuable areas and areas of important ocean uses, as was done in some state ocean planning efforts. Another participant suggested that the immediate next step should be to start integrated planning of all ocean uses to prioritize values and identify and maximize benefits of tradeoffs between the ocean uses most important to society. A participant strongly disagreed with this suggestion, saying that tradeoff analysis would not achieve the ultimate goal of restoring ocean health, since tradeoff analysis only seeks profit maximization. A few participants noted that though dollars are often used as a unit of measure in tradeoff analysis, other units such as those for biophysical or ecological outputs contained in the Ocean Health Index could and/or should be used too, and such tools do not have to reduce decisions to economic values only. A participant added that the tools that are developed should be compatible with the values inherent in the goals and objectives established by the RPB. Similarly, a commenter said the RPB must wisely choose how to represent the values and potential management decisions in data outputs like maps, because the outputs will narrow the amount of information most directly relevant in a specific management context. Finally, a participant noted that communities across New England are likely to value resources differently and a commitment by the RPB to respect those values could inform the approach taken for product creation. A participant recommended that NROC or the RPB more thoroughly explain tradeoff analysis tools in large group forums to help people understand them better, how they relate to the baseline assessment, what values they can or cannot incorporate, and how they can be used and should not be used.

4) *Other* – Participants also made the following comments and suggestions:

- A trusted source of data and information that has been independently verified at state and regional levels is very useful and hopefully something the RPB can produce.
- Incorporate non-systematic data such as marine mammal stranding data into the tools.
- In addition to maps, the data and tools could be used to identify management actions that may be required to ensure continued ecosystem function or enhance existing functioning.
- Account for uneven data collection efforts that may skew the data and create significant margins of error that may not be captured on the map.
- Regarding challenges, remember that specific activities may impact specific species, so maps illustrating specific ocean uses and/or specific species distributions will be useful in addition to maps illustrating overarching ocean uses.
- Be transparent with the tools, methodologies, and data by providing data codes or direct links to data sources, assumptions, limitations, etc.
- As stewards of the public trust being watched by interested parties throughout the region and the country, remember that this process is legacy building for each of the RPB members. Since the RPB will be responsible for anything that is different in 2016, rise to your best to overcome the challenges and do not succumb to the lowest common denominator at this critical point in the history of ocean management.

Closing Comments and Next Steps

Nick Napoli provided brief comments to close the meeting. He stated that the discussion during the workshop marks the beginning of the conversation about which opportunities the RPB could pursue. Teams will evaluate the opportunities and challenges of the options over the next five months and present a focused set of options for the RBP to choose from in November. He thanked everyone for their participation and closed the workshop.

Appendix A: Workshop Participants

Category	First Name	Last Name	Organization
Public Participant	Jennifer	Anderson	National Oceanic and Atmospheric Administration
Public Participant	Peter	Auster	University of Connecticut, Sea Research
Public Participant	Deerin	Babb-Brott	SeaPlan
Public Participant	Nick	Battista	Island Institute
Public Participant	Sarah	Bennett	Oceana
Public Participant	Mary	Boatman	BOEM
Public Participant	Bob	Boeri	State of Massachusetts
Public Participant	Priscilla	Brooks	Conservation Law Foundation
Public Participant	Todd	Callaghan	State of Massachusetts
Public Participant	Alison	Chase	Natural Resources Defense Council
Public Participant	Giancarlo	Cicchetti	U.S. Environmental Protection Agency
Public Participant	Rebecca	Clark Uchenna	Island Institute
Public Participant	Gwynn	Crichton	The Nature Conservancy
Public Participant	Mike	Crowe	Fishermen's Voice
Public Participant	Corrie	Curtice	Duke University
Public Participant	Joan	Curtice	Human Resources Consultant
Public Participant	Stuart	Dalzell	MassPort
Public Participant	Heather	Deese	Island Institute
Public Participant	Richard	Delaney	Center for Coastal Studies
Public Participant	Chris	Elphick	University of Connecticut
Public Participant	Susan	Farady	Roger Williams University
Public Participant	Jennifer	Felt	Conservation Law Foundation
Public Participant	Leah	Fine	Conservation Law Foundation
Public	Mike	Fogarty	NOAA/NMFS

Participant			
Public Participant	Nathan	Frohling	The Nature Conservancy
Public Participant	Chloey	Fross	
Public Participant	Melissa	Gates	Surfrider Foundation
Public Participant	Andrew	Gilbert	Biodiversity Research Institute
Public Participant	Jon	Grabowski	Northeastern University
Public Participant	Brent	Greenfield	National Ocean Policy Coalition
Public Participant	Scott	Geis	NOAA/NEFSC
Public Participant	Robert	Griffin	Natural Capital Project
Public Participant	Carla	Guenther	Penobscot East Resource Center
Public Participant	Sarah	Gurtman	National Oceanic and Atmospheric Administration
Public Participant	Kelly	Heber	Massachusetts Institute of Technology
Public Participant	Jenny	Helmick	ERG
Public Participant	Loal	Herrera	Consultant
Public Participant	Amber	Hewett	National Wildlife Federation
Public Participant	Keely	Hite	Bureau of Ocean Energy Management
Public Participant	Porter	Hoagland	Woods Hole Oceanographic Institution
Public Participant	Emily	Huntley	State of Massachusetts
Public Participant	Regen	Jamieson	New England Aquarium
Public Participant	Di	Jin	Woods Hole Oceanographic Institution
Public Participant	Laurie	Jodziewitz	American Wind Energy Association
Public Participant	Beth	Josephson	National Oceanic and Atmospheric Administration
Public Participant	Les	Kaufman	Boston University
Public Participant	Supriya	Khadke	SeaPlan
Public Participant	Steve	Kirk	University of Rhode Island, Marine Affairs
Public Participant	Kevin	Kotelly	US Army Corps of Engineers
Public Participant	George	LaPointe	George LaPointe Consulting

Public Participant	Andrew	Lipsky	SeaPlan
Public Participant	Kate	Longley	Sea Plan
Public Participant	Margo	Mansfield	National Oceanic and Atmospheric Administration
Public Participant	Jennifer	McCann	University of Rhode Island
Public Participant	Sally	McGee	The Nature Conservancy
Public Participant	Alyson	McKnight	University of Maine
Public Participant	Anne	Merwin	Ocean Conservancy
Public Participant	John	Miller	Ocean River Institute
Public Participant	Andrew	Milliken	USFW North America
Public Participant	Ivy	Mlsna	U.S. Environmental Protection Agency
Public Participant	Steve	Moir	
Public Participant	Stephanie	Moura	SeaPlan
Public Participant	Pete	Murdoch	U.S. Geological Survey
Public Participant	Richard	Nelson	Lobster Fisheries
Public Participant	Valerie	Nelson	Water Alliance, Gloucester Maritime Innovation Collaborative
Public Participant	Jay	Odell	The Nature Conservancy
Public Participant	Erik	Olsen	Institute for Marine Research
Public Participant	Kevin	Ouelette	MSC Software Corporation
Public Participant	Debra	Palka	National Oceanic and Atmospheric Administration
Public Participant	Jason	Roberts	Duke University
Public Participant	Lauren	Rogers	Natural Capital Project
Public Participant	Andrew	Rosenberg	Union of Concerned Scientists
Public Participant	Sally	Sherman	State of Maine
Public Participant	Emily	Shumchenia	Northeast Region Ocean Council
Public Participant	Douglas	Sigourney	National Oceanic and Atmospheric Administration
Public Participant	Sarah	Smith	EDF
Public Participant	Rachel	Strader	Gordon and Betty Moore Foundation

Public Participant	Molly	Sullivan	SeaPlan
Public Participant	Erin	Summers	Maine Department Marine Resources
Public Participant	Aaron	Svedlow	Tetra Tech
Public Participant	Mindy	Sweeney	Normandeau Associates Inc.
Public Participant	Peter	Taylor	Waterview Consulting
Public Participant	Prassede	Vella Foote	Massachusetts Office of Energy and Environmental Affairs
Public Participant	Grace	Weatherall	Consensus Building Institute
Public Participant	Brooke	Wikgren	New England Aquarium
Public Participant	John	Williamson	Sea Keeper Fishery Consulting
Public Participant	Paul	Williamson	Maine Ocean & Wind Industry Initiative
Public Participant	Arliss	Winship	National Oceanic and Atmospheric Administration
Public Participant	Sarah	Winter Whelan	American Littoral Society
Public Participant	Katherine	Wyatt	Natural Capital Project
Public Participant	Sharon	Young	Human Society of the USA
RPB-Fed	Joe	Atangan	U.S. Navy
RPB-Fed	Christine	Clarke	U.S. Department of Agriculture
RPB-Fed	Mel	Coté	U.S. Environmental Protection Agency
RPB-Fed	Dan	Hubbard	U.S. Coast Guard
RPB-Fed	Bob	LaBelle	U.S. Department of the Interior
RPB-Fed	Christopher	Tompsett	U.S. Navy
RPB-Staff	David	Blatt (alternate for Brian Thompson)	State of Connecticut
RPB-Staff	Christopher	Boelke	National Oceanic and Atmospheric Administration
RPB-Staff	Ashley	Chappell	National Oceanic and Atmospheric Administration
RPB-Staff	Michele	DesAutels	U.S. Coast Guard
RPB-Staff	Leila	Hatch	National Oceanic and Atmospheric Administration
RPB-Staff	Taura	Huxley-Nelson	U.S. Navy
RPB-Staff	Mary	Krueger	National Park Service
RPB-Staff	Regina	Lyons	U.S. Environmental Protection Agency
RPB-Staff	Daniel	Martin	National Oceanic and Atmospheric Administration
RPB-Staff	Meghan	Massaua (alternate for Pat Gilman)	U.S. Department of Energy
RPB-Staff	Meredith	Mendelson (alternate for Pat Keliher)	State of Maine

RPB-Staff	Matthew	Nixon (alternate for Kathleen Leyden)	State of Maine
RPB-Staff	Emily	Norton	State of Maine
RPB-Staff	Lorraine	Wakeman (alternate for Jeff Flumigan)	U.S. Department of Transportation
RPB-Staff	Christian	Williams	State of New Hampshire
RPB-State	Bruce	Carlisle	State of Massachusetts
RPB-State	Kathryn	Ford	State of Massachusetts
RPB-State	Grover	Fugate	State of Rhode Island
RPB-State	Susan	Whalen	State of Connecticut
RPB-Tribal	Richard	Getchell	All Nations Consulting
RPB-Tribal	Elizabeth	James-Perry	Wampanoag Tribe of Gay Head (Aquinnah)
RPB-Tribal	Sharri	Venno	Houlton Band of Maliseet Indians
Support Staff	Laura	Cantral	Meridian Institute
Support Staff	Julie	Curti	Consensus Building Institute
Support Staff	Ona	Ferguson	Consensus Building Institute
Support Staff	Patrick	Field	Consensus Building Institute
Support Staff	Shelly	Foston	Meridian Institute
Support Staff	Julie	Herlihy	Consensus Building Institute
Support Staff	Ingrid	Irigoyen	Meridian Institute
Support Staff	Katie	Lund	Northeast Ocean Council
Support Staff	Nick	Napoli	Northeast Regional Ocean Council
Support Staff	Eric	Roberts	Consensus Building Institute
Support Staff	Griffin	Smith	Consensus Building Institute
Support Staff	John	Weber	Northeast Regional Ocean Council