# Interim Guide to Draft Data Products and Potential Methods for the Ecologically Rich Area Framework

*DRAFT*

July 11, 2017

The Mid-Atlantic Regional Planning Body (RPB) has been working with the Marine Life Data and Analysis Team (MDAT) to organize existing data and develop new draft products that could apply to each of the five components from the Ecologically Rich Area Framework (ERAs). This interim guide provides an overview of those draft data products and the methods for developing them, including references for each. Each of the data products, the methods used to develop those products, and the organization of these products within the ERA Framework are draft. Therefore, everything in this interim guide should be construed as a work-in-progress.

For each draft data layer (first column of the tables), the interim guide notes the unit of measure and the spatial resolution (second and third columns). Additional information about each draft data layer, such as the temporal resolution, or the analytical method used to derive the layer—if not provided in the data layer name—is provided in the "Reference(s)" column (last column in the tables).

In addition, the RPB and MDAT provide the following notes about the over 100 datasets described in this guide:

- These data reflect *observed and/or sampled* marine life and habitats; therefore, characterizations of productivity, diversity, richness, abundance, and rarity (and likely other characterizations) should not be interpreted to summarize or represent these metrics for the *total ecosystem*, but may provide meaningful estimates based on current scientific understanding.
- There are clear differences in scale and observational effort among taxa, habitats, and geographies (i.e., nearshore, offshore, off the shelf) which need to be considered in the context of the "representativeness" of each dataset.
- To provide structure and context for the data, it was often helpful to organize datasets into categories within each component (e.g., data layers relevant to high abundance and data layers relevant to important life history stages for Component 3). These categories are shown in rows within each Component table in blue text.
- Some of the data layers reflect different ways to represent a single concept (for example, species richness and Gini-Simpson index are two ways to represent biodiversity).
- There are several ecosystem features for which there are currently limited or no data, including benthic productivity, large-bodied/pelagic fishes, benthic invertebrate communities, and sea turtles.
- Some of the draft datasets in this guide are already available on the Mid-Atlantic Ocean Data Portal, but each of these data layers needs to be reviewed for its appropriateness in illustrating each component.

## Component 1: Areas of high productivity

The NOAA Northeast Fisheries Science Center (NEFSC – which covers the area from Maine through Virginia) will be the primary data provider for the data in this component. The RPB continues to work with NEFSC staff to determine which available datasets best characterize productivity for the US Northeast Shelf Large Marine Ecosystem. The RPB expects to receive data representing: spring bloom frequency, magnitude and start day (1998-2015) from Friedland et al. 2015; primary productivity season means (1997-2015); and total zooplankton "biovolume" interpolations from NEFSC data.

♦ =currently available on the Mid-Atlantic Ocean Data Portal

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| Primary productivity | | | |
| Chlorophyll-a seasonal medians (2002 – 2015) | mg/m$^3$ | 1.3km x 1.3km | NASA MODIS-Aqua level-2 layers (http://oceancolor.gsfc.nasa.gov) from the 2014 reprocessing.<br>Hu, C., Lee Z., and Franz, B.A. 2012. Chlorophyll-a algorithms for oligotrophic oceans: A novel approach based on three-band reflectance difference, J. Geophys. Res., 117, C01011 |
| Bloom frequency (2002 – 2015)<br>- Spring bloom frequency<br>- Summer bloom frequency<br>- Fall bloom frequency<br>- Winter bloom frequency | % | 1.3km x 1.3km | Source data: MERIS<br>Method: similar to Friedland KD, Leaf RT, Kane J, Tommasi D, Asch RG, Rebuck N, Ji R, Large SI, Stock C, Saba VS. 2015. Spring bloom dynamics and zooplankton biomass response on the US Northeast Continental Shelf. Continental Shelf Research 102: 47-61.<br>***Potential to be replaced with layers from NEFSC covering 1998-2015; 0.5° grid*** |
| Bloom magnitude (2002 - 2015)<br>- Spring bloom strength (median)<br>- Fall bloom strength (median) | mg/m$^3$ | 1.3km x 1.3 km | Source data: MERIS<br>Methods: Vargas, M., C. W. Brown, and M. R. P. Sapiano. 2009. Phenology of marine phytoplankton from satellite ocean color measurements. Geophysical Research Letters 36.<br>Sapiano, M. R. P., C. W. Brown, S. Schollaert Uz, and M. Vargas. 2012. Establishing a global climatology of marine phytoplankton phenological characteristics. Journal of Geophysical Research 117:C08026.<br>***Potential to be replaced with layers from NEFSC covering 1998-2015; 0.5° grid*** |
| Bloom start day (2002 - 2015)<br>- Spring day of peak bloom (median)<br>- Fall day of peak bloom (median) | julian day | 1.3km x 1.3 km | Source data: MERIS<br>Method: Siegel, D. A., S. C. Doney, and J. A. Yoder. 2002. The North Atlantic spring phytoplankton bloom and Sverdrup's critical depth hypothesis. Science 296:730–733.<br>***Potential to be replaced with layers from NEFSC covering 1998-2015; 0.5°*** |

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| | | | ***grid*** |
| Frequency of chlorophyll-a anomalies (2002 - 2015)<br>- Spring anomalies frequency<br>- Summer anomalies frequency<br>- Fall anomalies frequency<br>- Winter anomalies frequency | % | 1.3km x 1.3 km | Method: Suryan, R. M., J. A. Santora, and W. J. Sydeman. 2012. New approach for using remotely sensed chlorophyll a to identify seabird hotspots. Marine Ecology - Progress Series 451:213–225. |
| Long-term annual mean chlorophyll-a fronts | | | Pending further information from NOAA NEFSC |
| Primary productivity season means (1997 – 2015) | | | Pending further information from NOAA NEFSC |
| Eelgrass | | Polygon | Eelgrass metadata on Northeast Ocean Data Portal; Eelgrass to be added to the Mid-Atlantic Ocean Data Portal shortly |
| Coastal Wetlands | | Polygon | Coastal wetlands metadata on Northeast Ocean Data Portal; Wetlands to be added to the Mid-Atlantic Ocean Data Portal shortly |
| Secondary productivity | | | |
| Species/season summaries<br>– Calanus finmarchicus average abundance – spring, fall<br>– Euphausiids average abundance – spring, fall<br>– Gammarid amphipods average abundance – spring, fall<br>– Mysid shrimp average abundance – spring, fall | log(abundance /m$^3$) | 2.6km x 2.6km | Calanus finmarchicus metadata on Northeast Ocean Data Portal<br>Euphausiids metadata on Northeast Ocean Data Portal<br>Gammarid amphipods metadata on Northeast Ocean Data Portal<br>Mysid shrimp metadata on Northeast Ocean Data Portal |
| Zooplankton biovolume (10km grid summary)<br>– Biovolume fall, 1995-2004<br>– Biovolume fall, 2005-2014<br>– Biovolume spring, 1995-2004<br>– Biovolume spring, 2005-2014 | | 10km x 10km | Raw data from NOAA NEFSC: https://www.nefsc.noaa.gov/ecosys/ecosystem-ecology/zooplankton.html. Grid summaries by Northeast Ocean Data Portal Working Group<br>Kane J. 2007. Zooplankton abundance trends on Georges Bank, 1977-2004. ICES Journal of Marine Science 64(5):909-91.<br>Kane J. 2011. Inter-decadal variability of zooplankton abundance in the Middle Atlantic Bight. Journal of Northwest Atlantic Fishery Science 43: 81-92<br>***Potential to be replaced with layers from NEFSC*** |
| Proxies for high productivity | | | |
| Geophysical features | | | |
| Canyons - Harris et al. 2014 | | Polygon | Harris, P. T., M. Macmillan-Lawler, J. Rupp, and E. K. Baker. 2014. "Geomorphology of the Oceans." *Marine Geology*, 50th Anniversary |

| **Data layer** | **Units** | **Resolution** | **Reference(s)** |
|---|---|---|---|
| | | | Special Issue, 352 (June): 4–24. |
| Canyons - derived from bathymetric position index | | 100m | Derived using the Bathymetric Position Index (BPI) on ~100m resolution regional bathymetry data by Northeast Ocean Data Portal Working Group |
| Seamounts - Yesson et al. 2011 | | Point data | Yesson, Chris, Malcolm R. Clark, Michelle L. Taylor, and Alex D. Rogers. 2011. "The Global Distribution of Seamounts Based on 30 Arc Seconds Bathymetry Data." *Deep Sea Research Part I: Oceanographic Research Papers*, February. doi:10.1016/j.dsr.2011.02.004. |
| Seamounts - derived from bathymetric position index | | 100m | Derived using the Bathymetric Position Index (BPI) on ~100m resolution regional bathymetry data by Northeast Ocean Data Portal Working Group |
| Frontal boundaries<br>− SST front probability (winter)<br>− SST front probability (spring)<br>− SST front probability (summer)<br>− SST front probability (fall) | % | 2km x 2km | Monthly 'climatologies' from Peter Miller (Plymouth Marine Laboratory) derived from monthly front presence/absence in turn derived from daily NASA MUR 1- km SST data (2002-2013) and used in the MDAT avian models:<br>Kinlan, B.P., A.J. Winship, T.P. White, and J. Christensen. 2016. Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Phase I Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2016-039. xvii+113 p. Available online: https://www.data.boem.gov/PI/PDFImages/ESPIS/5/5512.pdf |
| Eddy probability<br>− Anticyclonic eddy probability - winter<br>− Anticyclonic eddy probability - spring<br>− Anticyclonic eddy probability - summer<br>− Anticyclonic eddy probability - fall<br>− Cyclonic eddy probability - winter<br>− Cyclonic eddy probability - spring<br>− Cyclonic eddy probability - summer<br>− Cyclonic eddy probability - fall | % | native resolution: ⅓ degree (approx. 37 km) regridded to 2km | Derived from sea surface height; Kinlan, B.P., A.J. Winship, T.P. White, and J. Christensen. 2016. Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning: Phase I Report. U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs, Sterling, VA. OCS Study BOEM 2016-039. xvii+113 p. Available online: https://www.data.boem.gov/PI/PDFImages/ESPIS/5/5512.pdf |

## Component 2: Areas of high biodiversity

Biodiversity products were produced as part of the Marine life Data and Analysis Team (MDAT) mapping effort and include sampled/observed marine mammal, bird, and fish species. The intention for this component is to first display taxonomic metrics of biodiversity because 1) they are complete, and 2) they may adequately characterize patterns in biodiversity. Longer-term, there is a potential option to develop maps of functional diversity that include metrics of trophic richness (provided now as a proof of concept) but could also include metrics of mobility type, habitat preference, size, body form, and life span. There is a large body of functional trait research that could be used to choose metrics and assign taxa/species to trait categories (for example see http://www.marinespecies.org/traits/).

♦=currently available on the Mid-Atlantic Ocean Data Portal

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| Taxonomic metrics and indices of diversity | | | |
| – ♦All Cetacean Species Richness<br>– ♦All Bird Species Richness<br>– ♦All Fish Species Richness – NEFSC Fall surveys<br>– All Fish Species Richness – NEAMAP surveys<br>– All Fish Species – Gini-Simpson Index (NEFSC fall surveys)<br>– All Cetacean Species – Gini-Simpson Index | # species (richness); probability that all individuals belong to different species (Gini-Simpson – more sensitive to species dominance) | 10km x 10km (cetaceans and fish)<br>2km x 2km (bird) | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at:http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf<br>Simpson, E.H. 1949. Measurement of Diversity. *Nature* 163: 688. |
| Functional metrics of diversity | | | |
| Richness of bird foraging guilds | # (out of 4) foraging guilds represented with at least 2 species | 2km x 2km | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at:http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf |
| Proxies for high biodiversity | | | |
| Coral habitats | habitat suitability (high and very high) | ~350m | NOAA NCCOS Deep Sea Corals modeling: https://coastalscience.noaa.gov/projects/detail?key=35 |
| Canyons - Harris et al. 2014 | | Polygon | Harris, P. T., M. Macmillan-Lawler, J. Rupp, and E. K. Baker. 2014. “Geomorphology of the |

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| | | | Oceans." *Marine Geology*, 50th Anniversary Special Issue, 352 (June): 4–24. doi:10.1016/j.margeo.2014.01.011. |
| Canyons - derived from bathymetric position index | | Polygon | Derived using the Bathymetric Position Index (BPI) on ~100m resolution regional bathymetry data by the Northeast Ocean Data Portal Working Group |
| Seamounts - Yesson et al. 2011 | | Point data | Yesson, Chris, Malcolm R. Clark, Michelle L. Taylor, and Alex D. Rogers. 2011. "The Global Distribution of Seamounts Based on 30 Arc Seconds Bathymetry Data." *Deep Sea Research Part I: Oceanographic Research Papers*, February. doi:10.1016/j.dsr.2011.02.004. |
| Canyons - derived from bathymetric position index | | Polygon | Derived using the Bathymetric Position Index (BPI) on ~100m resolution regional bathymetry data by the Northeast Ocean Data Portal Working Group |
| Other areas of complex seafloor<br>– Bathymetric position index, 83m<br>– Bathymetric position index, 251m | Non-dimensional benthic position index | 83m and 251m | Wright, D.J., Pendleton, M., Boulware, J., Walbridge, S., Gerlt, B., Eslinger, D., Sampson, D., and Huntley, E. 2012. ArcGIS Benthic Terrain Modeler (BTM), v. 3.0, Environmental Systems Research Institute, NOAA Coastal Services Center, Massachusetts Office of Coastal Zone Management. Available online: http://esriurl.com/5754. |

## Component 3: Areas of high abundance

Abundance products for marine mammals, birds, and fish are readily available from the MDAT mapping effort, and they were produced with two different methods: simple total abundance maps per taxa and core abundance/biomass area richness per taxa. The core abundance/biomass area richness methodology and products were reviewed in February 2016 and will be submitted for peer-review in a scientific journal in 2017. A ranked relative abundance approach is another method tested by MDAT that has promise because relative abundances can be readily compared among taxa. Currently, ranked relative abundances are included for individual taxa separately. Abundance products for benthic invertebrates are summarized on the grid used for the New England Fishery Management Council (NEFMC) Swept-Area-Seabed-Impact (SASI) analysis grid (10km x 10km), as made available by the data provider (University of Massachusetts School for Marine Science and Technology (SMAST)).

♦ =currently available on the Mid-Atlantic Ocean Data Portal

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| **Marine life total abundance/biomass** | | | |
| – ♦All cetaceans total abundance<br>– ♦All avian species total relative abundance<br>– ♦All fish species total biomass (NEFSC fall surveys<br>– All fish species total biomass (NEAMAP surveys) | # of individuals | 10km x 10km (cetaceans and fish)<br>2km x 2km (avian) | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at: http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf |
| **Marine life core abundance/biomass area richness** | | | |
| – Cetacean core abundance area richness: Atlantic, Mid-Atlantic, Northeast scales<br>– Avian core abundance area richness: Atlantic, Mid-Atlantic, Northeast scales<br>– Fish (NEFSC fall) core biomass area richness: Atlantic, Mid-Atlantic, Northeast scales<br>– Fish (NEAMAP) core biomass area richness: Atlantic, Mid-Atlantic, Northeast scales | # of species core abundance /biomass areas | 10km x 10km (cetaceans and fish)<br>2km x 2km (avian) | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at: http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf |
| **Ranked relative species abundance** | | | |
| – Mammals – January, top 15%<br>– Mammals – August, top 15%<br>– Avian – Winter, top 15%<br>– Avian – Summer, top 15%<br>– Fish – NEFSC fall, top 15% | Ranking of areas by their proportion of total species abundance across | 10km x 10km (cetaceans and fish)<br>2km x 2km (avian) | Lehtomäki, J. & Moilanen, A. 2013. Methods and workflow for spatial conservation prioritization using Zonation. Environmental Modelling & Software 47, 128–137.<br>Moilanen, A. 2007. Landscape Zonation, benefit functions and target-based planning: Unifying |

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| | species | | reserve selection strategies. Biological Conservation 134, 571–579. |
| Number of benthic megafaunal groups with above average (2003-2012) abundance | # groups | 10km x 10km | Stokesbury K.D.E, Adams E.K., Asci S.C., Bethoney N.D., Inglis S., Jaffarian T., Keiley E., Rosellon-Druker J.M., Malloy R. Jr., O'Keefe C. 2015. SMAST Sea scallop (Placopecten magellanicus) drop camera survey from 1999 to 2014. Report to the NEFMC Review of Scallop Survey Methodologies. Available: http://www.nefsc.noaa.gov/SAW-Public/scallop-survey-meth-review-Mar-2015/3-DropCamera_SMAST/New/SMAST%20drop%20cam%20survey%201999- 2014%20(Stokesbury).pdf |
| Life history products | | | |
| Cetacean Biologically Important Areas | | Polygon | NOAA CetMap; Van Parijs, S. M., Curtice, C., & Ferguson, M. C. (Eds.). 2015. Biologically Important Areas for cetaceans within U.S. waters. Aquatic Mammals (Special Issue), 41(1). 128 pp. |
| ♦Fish and Shellfish EFH overlay | # species | 10' x 10' | Fish and shellfish EFH overlay metadata on the Mid-Atlantic Ocean Data Portal |
| ♦Highly Migratory Species EFH overlay | # species | Polygon | Highly Migratory Species EFH overlay metadata on the Northeast Ocean Data Portal |
| Critical Habitat Designations | | Polygon | Critical Habitat Designations metadata on the Marine Cadastre |
| Habitat Areas of Particular Concern (HAPC) | | Polygon | Habitat Areas of Particular Concern metadata from NOAA National Coastal Data Development Center |
| ASMFC Herring Spawning Areas | | Polygon | ASMFC Herring Spawning Areas metadata on the Northeast Ocean Data Portal |
| Scallop Habitat Closure Areas | | Polygon | Scallop Habitat Closure Areas metadata from NOAA GARFO |
| Bird Nest Sites | | Point data | Bird Nest Sites metadata on the Northeast Ocean Data Portal |

## Component 4: Areas of vulnerable marine resources

Data relevant to vulnerable marine resources come from many sources. Several sources were related to a management or regulatory framework designed to protect the resource; e.g., Critical Habitats defined under the Endangered Species Act. Layers were also derived from studies or efforts to quantify species' sensitivity to a particular stressor; e.g., the maps of avian species with higher collision sensitivity due to offshore renewable energy. Therefore, the available observational data and the chosen mapping approach may be skewed toward a particular concern/impact and less representative of more general inherent vulnerability. As a result, the layers in this category range in their ability to characterize species' fragility, inherent sensitivity, and sensitivity to specific stressors/disturbances.

For this Component, to date, the RPB has relied heavily on existing data on the Mid-Atlantic and Northeast Ocean Data Portals, and also obtained new data from the New England Fishery Management Council's SASI analyses and deep sea corals work, as well as the Mid-Atlantic Fishery Management Council's deep sea corals work.

♦ =currently available on the Mid-Atlantic Ocean Data Portal

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| Sensitivity to specific stressors | | | |
| – ♦ Relative abundance of avian species with higher collision sensitivity<br>– ♦ Relative abundance of avian species with higher displacement sensitivity | # individuals | 2km x 2km | MDAT; Robinson Willmott, J. C., G. Forcey, and A. Kent. 2013. The Relative Vulnerability of Migratory Bird Species to Offshore Wind Energy Projects on the Atlantic Outer Continental Shelf: An Assessment Method and Database. Final Report to the U.S. Department of the Interior, Bureau of Ocean Energy Management, Office of Renewable Energy Programs. OCS Study BOEM 2013-207. 275 pp. http://www.data.boem.gov/PI/PDFImages/ESPIS/5/5319.pdf |
| – ♦ Abundance of cetaceans sensitive to high-frequency sound<br>– ♦ Abundance of cetaceans sensitive to mid-frequency sound<br>– ♦ Abundance of cetaceans sensitive to low-frequency sound | # individuals | 10km x 10km | MDAT; Southall, B. L., Bowles, A. E., Ellison, W. T., Finneran, J. J., Gentry, R. L., Greene Jr, C. R., … others. 2008. Marine mammal noise-exposure criteria: initial scientific recommendations. Bioacoustics, 17(1-3), 273–275. |
| Habitat sensitivity to bottom trawling (chosen with NEFMC technical staff to be representative of bottom effects) | area swept in a cell conditioned by the susceptibility and recovery parameters assigned to the habitat features inferred to the | 10km x 10km | NEFMC. 2011. *The Swept Area Seabed Impact (SASI) model: A tool for analyzing the effects of fishing on essential fish habitat*. *Essential Fish Habitat (EFH) Omnibus Amendment*. New England Fishery Management Council, Newburyport, MA.<br><br>Grabowski, J. H., Bachman, M., Demarest, C., Eayrs, S., Harris, B. P., Malkoski, V., … |

| **Data layer** | **Units** | **Resolution** | **Reference(s)** |
| --- | --- | --- | --- |
| | substrates known to exist in that cell (km$^2$) | | Stevenson, D. 2014. Assessing the vulnerability of marine benthos to fishing gear impacts. *Reviews in Fisheries Science & Aquaculture*, *22*(2), 142–155. http://doi.org/10.1080/10641262.2013.846292 |
| Habitat sensitivity to longline fishing (chosen with NEFMC technical staff to be representative of pelagic effects) | area swept in a cell conditioned by the susceptibility and recovery parameters assigned to the habitat features inferred to the substrates known to exist in that cell (km$^2$) | 10km x 10km | NEFMC. 2011. *The Swept Area Seabed Impact (SASI) model: A tool for analyzing the effects of fishing on essential fish habitat*. *Essential Fish Habitat (EFH) Omnibus Amendment*. New England Fishery Management Council Newburyport, MA. Grabowski, J. H., Bachman, M., Demarest, C., Eayrs, S., Harris, B. P., Malkoski, V., … Stevenson, D. (2014). Assessing the vulnerability of marine benthos to fishing gear impacts. *Reviews in Fisheries Science & Aquaculture*, *22*(2), 142–155. http://doi.org/10.1080/10641262.2013.846292 |
| Fragile and inherently sensitive species/habitats | | | |
| MAFMC discrete deep sea coral zones | | Polygon | MAFMC discrete deep sea coral zones metadata from NOAA GARFO |
| Draft coral amendment – Discrete Zones (for NEFMC deliberation) | | Polygon | Draft coral amendment discrete zones metadata on Northeast Ocean Data Portal |
| Eelgrass beds | | Polygon | Eelgrass metadata on Northeast Ocean Data Portal; Eelgrass to be added to the Mid-Atlantic Ocean Data Portal shortly |
| Shellfish habitat | | Polygon | Shellfish habitat metadata on Northeast Ocean Data Portal |
| Coastal wetlands | | Polygon | Coastal wetlands data on Northeast Ocean Data Portal; Wetlands to be added to the Mid-Atlantic Ocean Data Portal shortly |
| Sponges | Average % of samples present | 10km x 10km | Offshore video survey and oceanographic analysis: Georges Bank to the Chesapeake (SMAST) |
| ♦Fish and Shellfish EFH overlay | # species | 10’ x 10’ | Fish and shellfish EFH overlay metadata on the Mid-Atlantic Ocean Data Portal |
| ♦Highly Migratory Species EFH overlay | # species | Polygon | Highly migratory species EFH overlay on the Northeast Ocean Data Portal |

| Data layer | Units | Resolution | Reference(s) |
|---|---|---|---|
| ♦Total relative abundance of BCR30 highest, high, and moderate priority avian species | Relative # individuals | 2km x 2km | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at:http://seamap.env.duke.edu /models/MDAT/MDAT-Technical-Report-v1_1.pdf |
| Habitat Areas of Particular Concern (HAPC) | | Polygon | Habitat Areas of Particular Concern metadata from NOAA National Coastal Data Development Center |
| Scallop habitat closure areas | | Polygon | Scallop Habitat Closure Areas metadata from NOAA GARFO |
| ASMFC Herring Spawning Areas | | Polygon | ASMFC Herring Spawning Areas metadata on the Northeast Ocean Data Portal |
| Critical Habitat Designations | | Polygon | Critical Habitat Designations metadata on the Marine Cadastre |
| Bird Habitat | | Polygon | Bird habitat derived from the NOAA Environmental Sensitivity Index; metadata on Northeast Ocean Data Portal |

## Component 5: Areas of rare marine resources

For this component, rarity is parsed into the rarity of species at regional and global scales. To date and due to data availability, the RPB has relied primarily on Endangered Species Act status to determine the species that are relevant to this component. Layers representing individual species/group abundance are derived from the MDAT mapping effort. At this point, this component includes data for species that are relevant to the Northeast region – some of which are also relevant to the Mid-Atlantic region. Work is currently underway to ensure regionally and globally rare species that are relevant to the Mid-Atlantic region are included.

♦ =currently available on the Mid-Atlantic Ocean Data Portal

| **Data layer** | **Units** | **Resolution** | **Reference(s)** |
|---|---|---|---|
| Regionally rare | | | |
| – Total relative abundance of BCR30 priority avian species<br>– Total relative abundance of state-listed avian species | Relative # individuals | 2km x 2km | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at:http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf |
| Globally rare | | | |
| ♦Abundance of all ESA-listed cetaceans | # individuals | 10km x 10km | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at:http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf |
| Roseate tern annual relative abundance | Relative # individuals | 2km x 2km | Curtice, C., Cleary J., Shumchenia E., Halpin P.N. 2016. Marine-life Data Analysis Team (MDAT) technical report on the methods and development of marine-life data to support regional ocean planning and management. Prepared on behalf of the Marine-life Data Analysis Team (MDAT). Accessed at:http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf |