Mid-Atlantic Ocean Data Development for Wind Energy Planning

Final Project Report

NOAA Grant # NA19NOS4190163

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SUMMARY

The main objective of this project was to further develop datasets important to the Mid-Atlantic region so they could be included in The Nature Conservancy's wind energy planning tool (now known as the Marine Mapping Tool). This tool is publicly available at this URL:

https://maps.tnc.org/marinemap

Users of this tool can quantitatively assess a location by visualizing data on marine life and habitats currently available on the Northeast (https://www.northeastoceandata.org/) and Mid-Atlantic (https://portal.midatlanticocean.org/) Regional Ocean Data portals. The tool is intended to encourage and promote the use of data layers on the portals by focusing the information on the sites and places that people care about. It also provides users with regional and temporal context so they can determine the importance of each piece of information. This tool is intended to support environmental impact assessments related to wind energy development offshore. It is also designed to be the first stop in any user's data exploration about a site and directs users to the regional data portals to further research each location. All data developed for this project are viewable within the tool.

Upon entering the tool, users first encounter a splash screen (Figure 1) containing background information and instructions for use. It also provides links to track updates on the tool and its datasets.

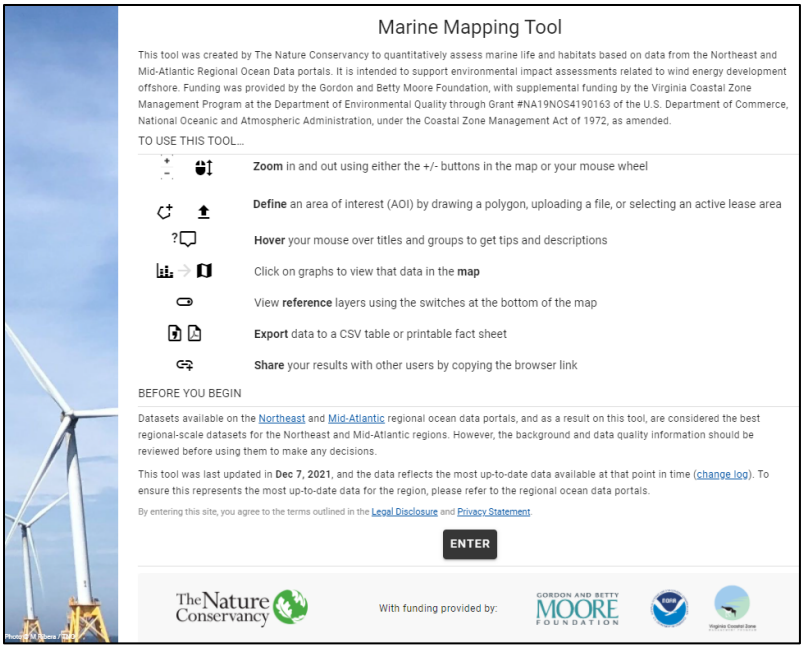

Figure 1 – Splash screen for Marine Mapping Tool

Users can then select, upload, or draw an area of interest (AOI). The tool allows users to select from a list of active and proposed energy projects. This list comes directly from the regional data portals, so it gets updated as new projects are being reviewed.

After selecting the AOI, users get immediate feedback on significant marine features within this location The Marine Mapping Tool is organized so it visualizes the information from "big picture" metrics about species groups to species by species information to temporal information, so users can dig deeper into the topics they are interested in. The first screen shows "Marine Life and Habitat flags", which are intended to draw attention to significant marine features and species in the AOI that may need monitoring or mitigation (see Figure 2).

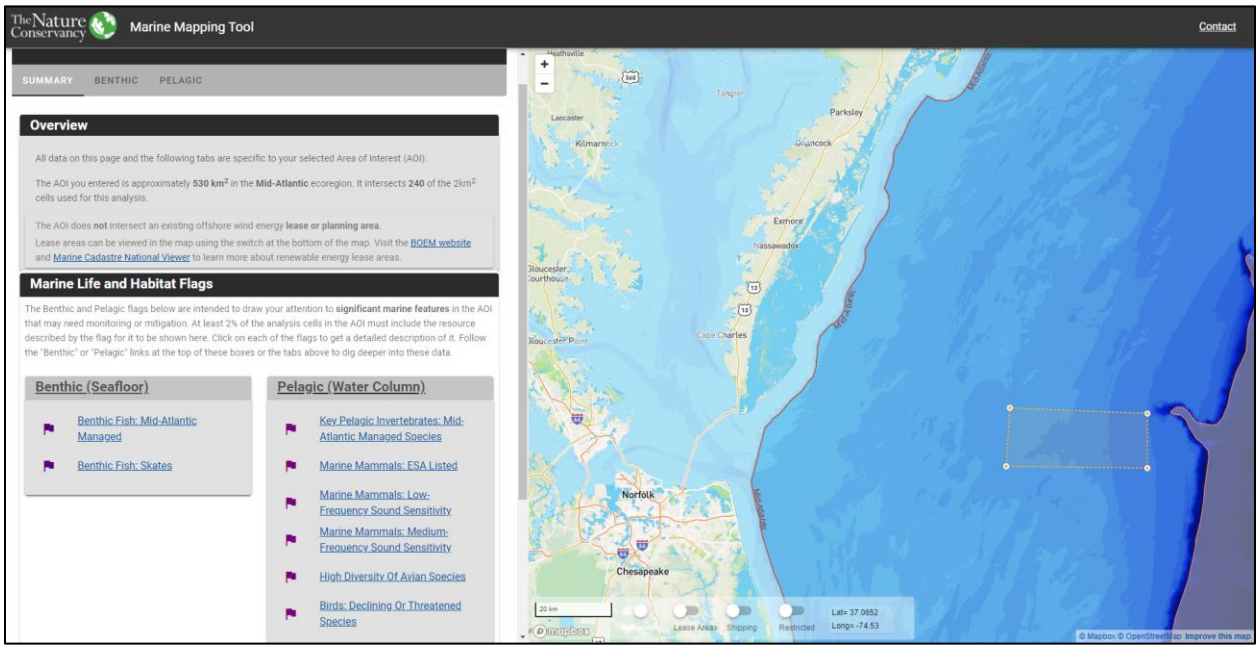

Figure 2 – Summary screen with overview of Area of Interest (top-left) and Marine Life and Habitat Flags (bottom-left)

For each area, users can visualize features and species tied to both the seafloor (benthic) and the water column (pelagic). An example of selecting the Virginia Electric and Power Company wind planning area as an area of interest can be found in this link.

Discussion of work products

<u>Product #1</u>: Update marine mammal data for the Mid-Atlantic region using newest survey data

Marine mammal data for the tool were developed in coordination with the Marine Geospatial Ecology Lab (MGEL) at Duke University. High abundance areas for each species and month were determined based on modeled data and this was combined with NOAA's biological important areas data. In addition, the most recent available data on marine mammal sightings from OBIS-SEAMAP were incorporated so areas with confirmed sightings were combined with modeled abundance data. Survey effort data were also included to distinguish between areas that have no sightings versus where there was no survey effort.

Multiple views of these data are available within the tool: summaries of species and species groups with very high estimated abundance, maps of individual species estimated abundance, and information on survey density and seasonal abundance. Selected examples from the tool are shown below.

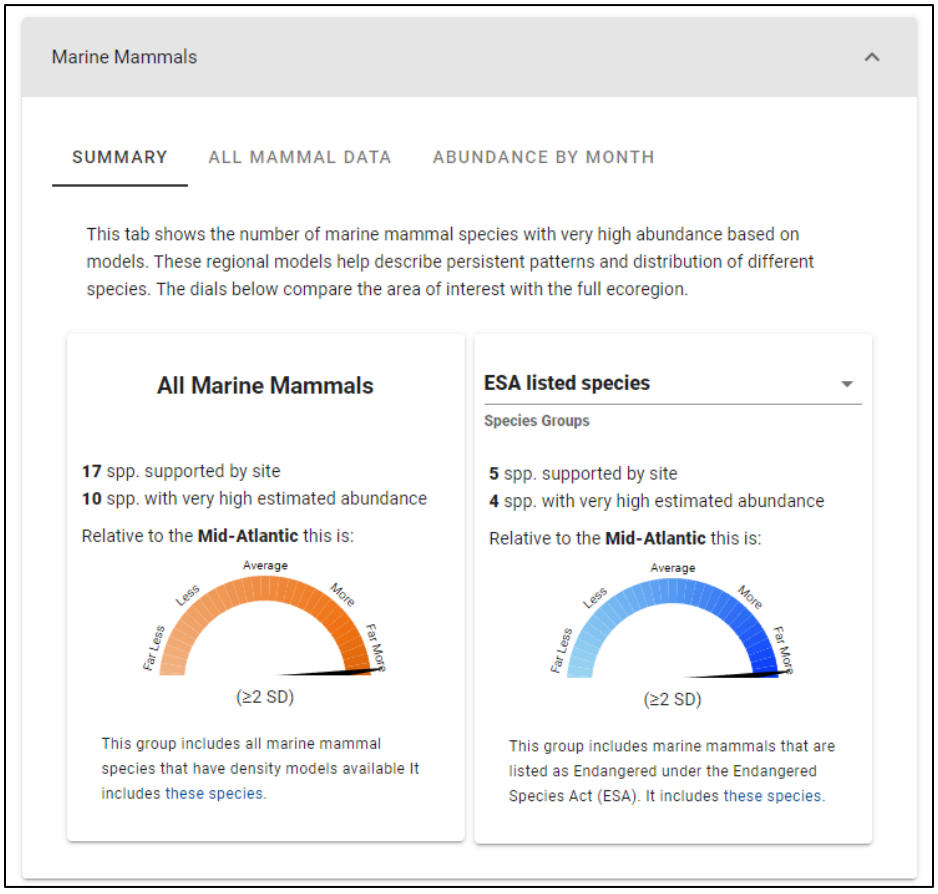

Figure 3 – Overview screen found on Marine Mammal tab, comparing diversity of AOI to the average for the ecoregion.

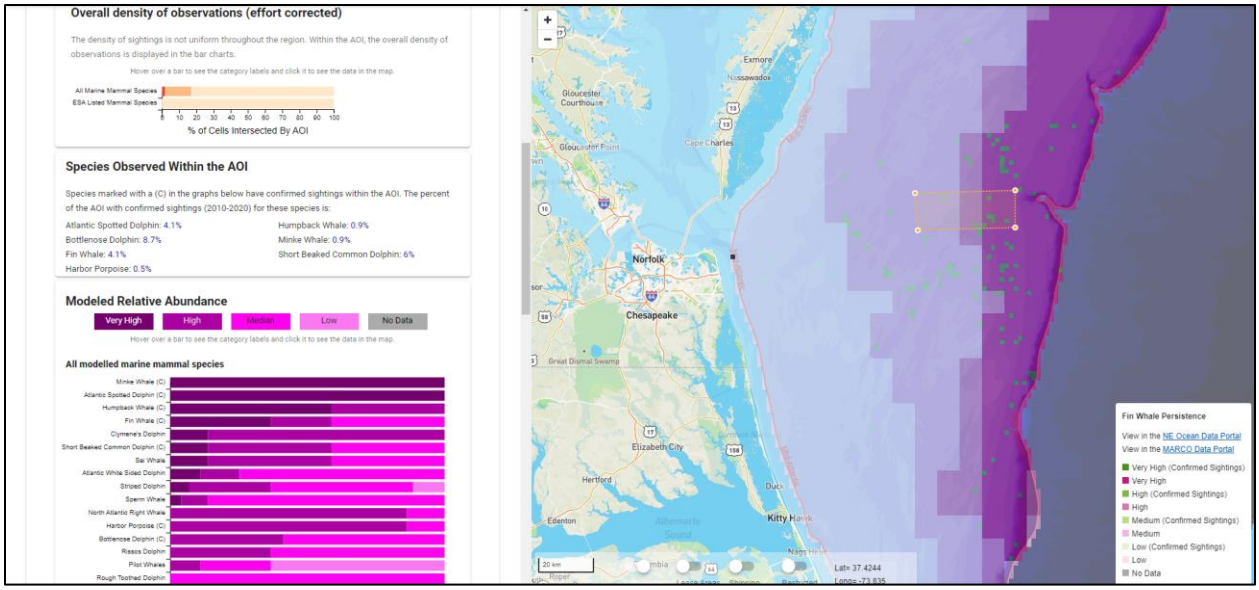

Figure 4 – Marine Mammal tab on the tool, showing estimated abundances for selected species in the AOI, together with sightings for those species in the past 10 years.

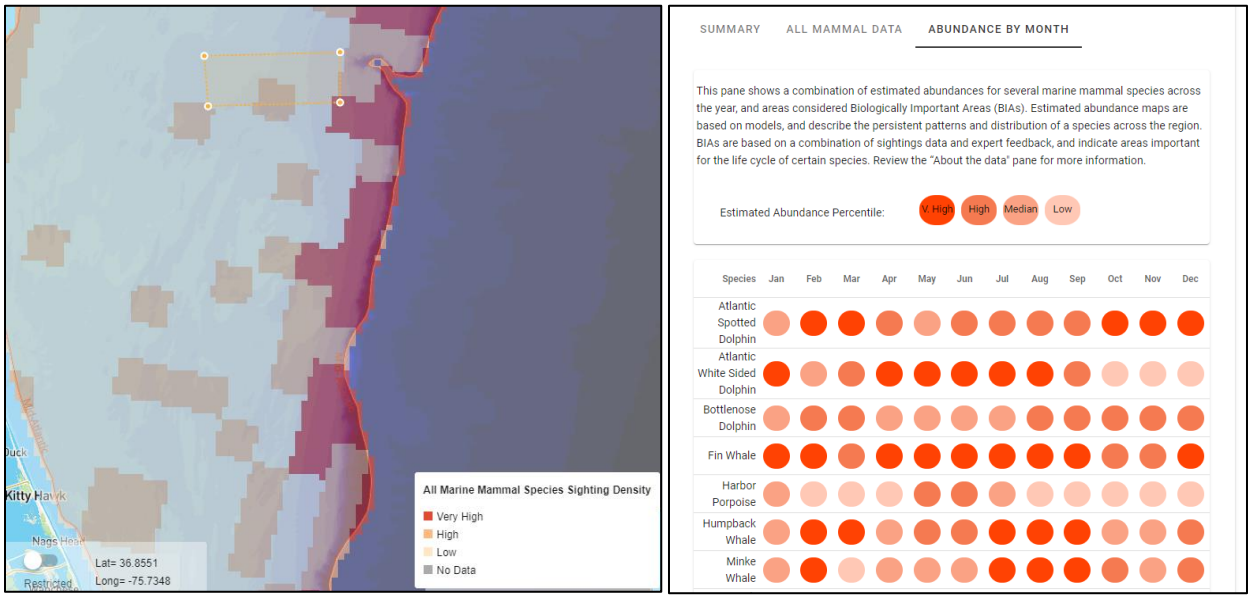

Figure 5 - Detail of estimated abundances for a species of whale within the AOI (left) and the monthly estimates (right)

<u>Product #2</u>: Update benthic data layers for the Mid-Atlantic region

Updated datasets on bathymetry, seabed forms, and sediments are available for visualization and analysis in the Marine Mapping Tool and have also been updated on the Mid-Atlantic Ocean Data Portal (https://portal.midatlanticocean.org/visualize). Older versions of these benthic datasets existed on the

portal prior to this project and these were updated and geographic coverage was extended further south as part of this project. Direct links to these data in the portal are found below:

- Seabed forms: Map viewer | Data Catalog | Metadata
- Sediments: Map viewer | Data Catalog | Metadata
- Bathymetry (see the Regional Bathymetry layer): Map viewer | Data Catalog | Metadata

Examples of using these data in the Marine Mapping Tool are below:

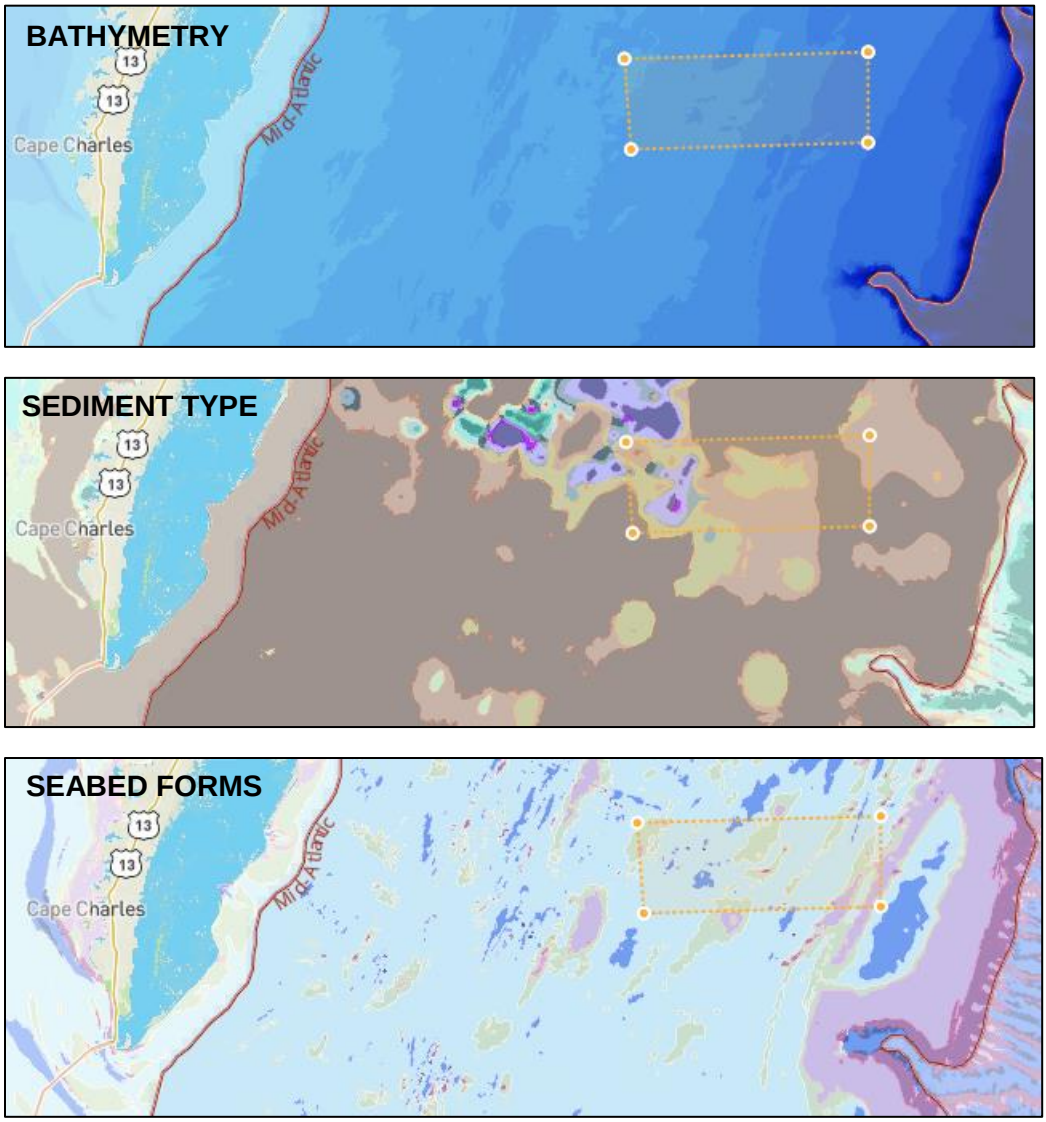

Figure 6 – Zoomed-in views of maps created in the Marine Mapping Tool: Bathymetry (top), Sediment type (middle), Seabed Forms (bottom)

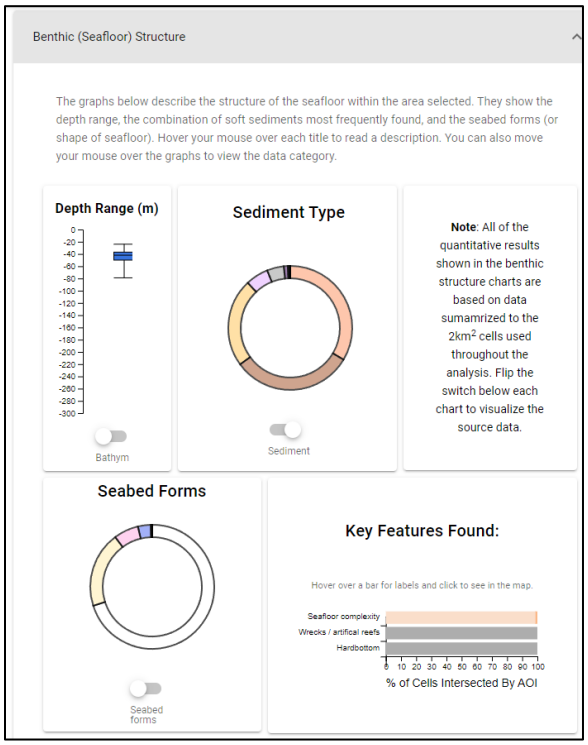

Figure 7 – Overview screen for seafloor structure

<u>Product #3</u>: Coordinate with Rutgers to improve on pelagic habitat maps by adding MARACOOS data

The objective of the Marine Mapping tool was always to connect to Regional Data Portal datasets to facilitate management decisions. So the first step in tool development was to do a full review of the currently available oceanographic data layers in both regional data portals. Feedback was also sought from experts in the region, including those at Rutgers, to incorporate their feedback in this exploratory process. This led to the realization that for oceanographic data to be useful for decision making, they must describe persistent features that drive species aggregations in the region. Unless the data connect to the species and resources that people care about in the region, these layers won't have much meaning for decision making.

As a result, a more ambitious plan than the one initially proposed for this project was developed. See Figure 8 for an initial mock-up. This would allow users to compare oceanographic characteristics to similar areas across the ecoregion. It will also allow users to see persistence of a set of features that can be located by combining different sources of information.

One important source of information is the modeled bottom temperature data developed by Rutgers University for MARACOOS (example from the Mid-Atlantic portal shown in Figure 9). As part of this project, workflows were developed for processing these data and updating these layers so in the near future they can be part of the pelagic section of the tool.

Since this new approach goes beyond the time and resources that were allocated for this project, a search was undertaken for a currently available dataset that could introduce users to pelagic features. Ultimately,

the “Pelagic Seascapes” data from NOAA were incorporated into the tool, which describe dynamic, changing ocean habitats. Seasonal data for the most recent decade were used and a persistence score was also calculated and can be visualized in the tool (Figure 10).

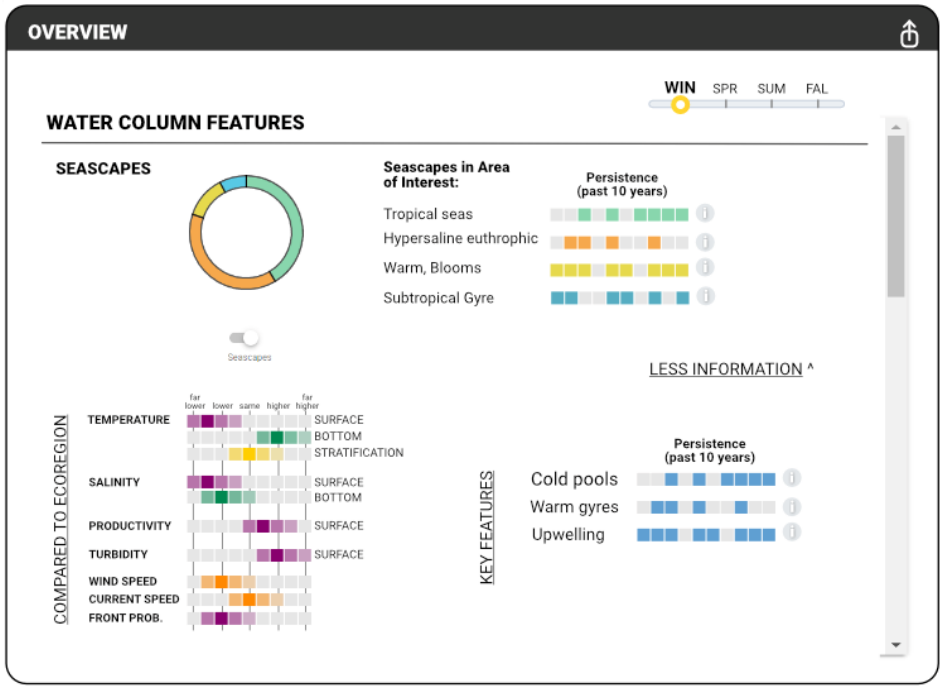

Figure 8 – Tentative mock-up of future oceanographic tab for the Marine Mapping Tool

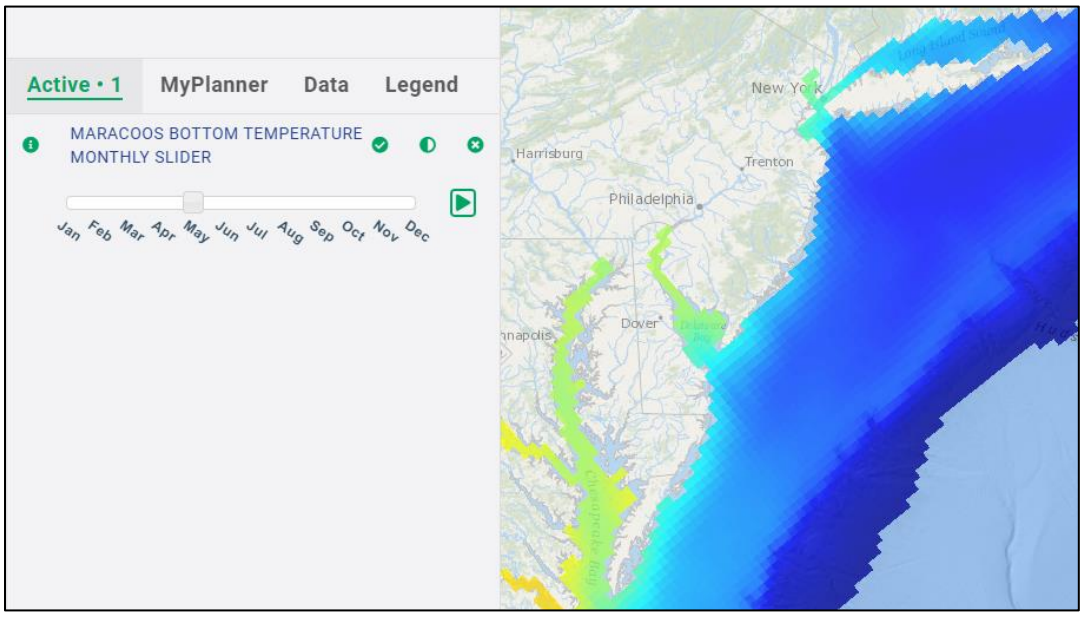

Figure 9 – Screen shot of Mid-Atlantic Portal showing MARACOOS monthly bottom temperature product.

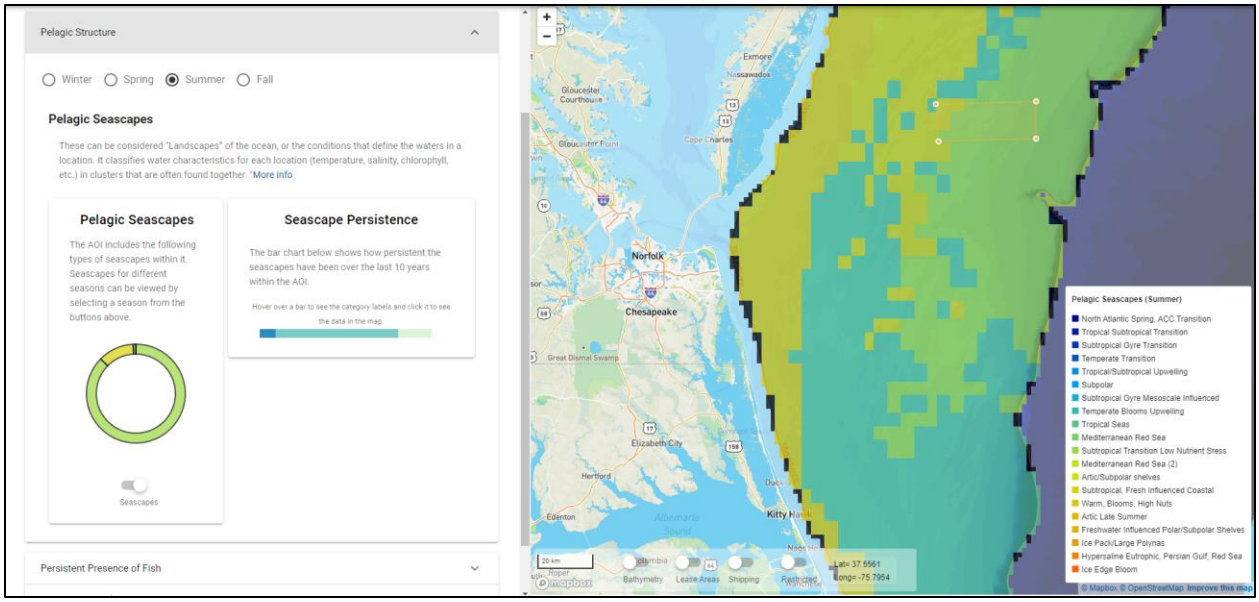

Figure 10 – Pelagic Features Tab in Marine Mapping tool, showing NOAA's pelagic seascapes dataset.

While this is not the vision initially proposed, lessons learned here have been leveraged as part of a new grant to expand the tool into the Southeast region of the US. SECOORA is funding the expansion, which will be focused on two data gaps for the region: Fish data and oceanographic processes. These more ambitious products that will be developed as part of this grant will have a greater impact in facilitating the use of oceanographic data for decision-making.

<u>Product #4:</u> Update Wind Energy Planning Decision Support Tool to ensure this tool is best connected to the Mid-Atlantic Ocean Data Portal

One of the objectives with the Marine Mapping Tool is to be a gateway to the Regional Portals, so users can be quickly directed to the right datasets within the portals to meet their needs. For this reason, in addition to providing links to the portals in the introduction and in the sources sections of the tool, links are also provided within the map legend for every species of fish, marine mammal, bird, and invertebrate available to map within the tool. This was accomplished with an extensive Google spreadsheet containing hundreds of links that is read by the tool behind the scenes and is transparent to users. Examples are shown below.

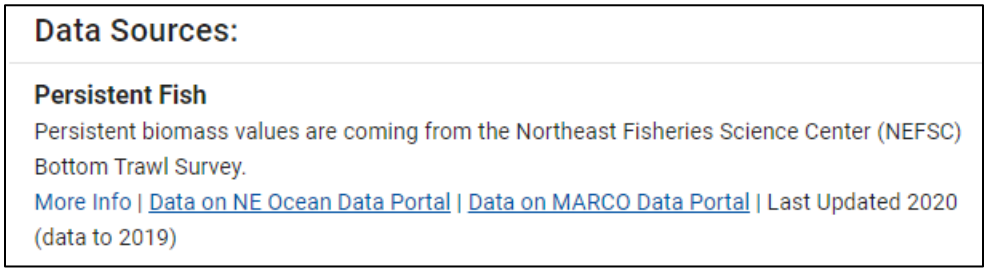

Figure 11- Example of Portal links within the "About the data…" tab

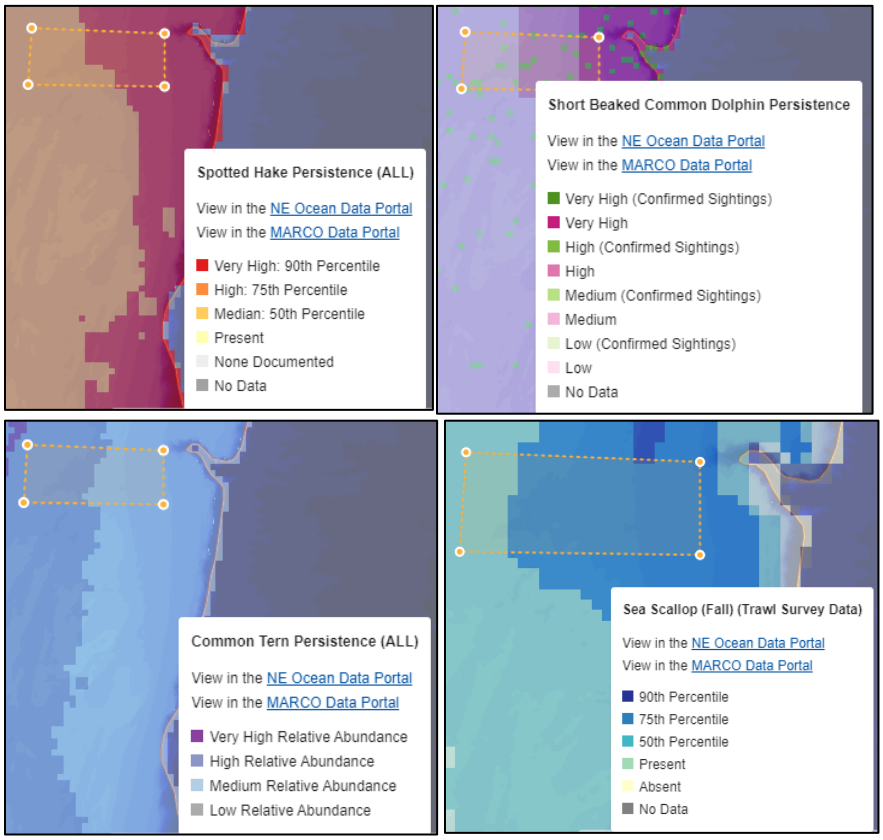

Figure 12 – Examples of links to the Portals embedded in the legends for each layer

Additional work

Reporting functionality

Extensive documentation on data sources and methods is included in the Marine Mapping Tool and funding from this grant was crucial to expanding the reporting functionality. For any area of interest, users can export a formatted HTML file containing a summary of attributes for that site, and may also export a CSV file containing every single attribute reported on in the tool (e.g., every species, habitat, etc.).

	A	B	C	D	E	F	G
1	Marine Mapping Tool report generated on 09-Feb-2022 02:16PM						
2	Visit the Marine Mapping Tool for this AOI at						
3	https://maps.tnc.org/marinemap/?c=-75.1157%252C37.1791%252C-75.1102%252C37.0521%252C-74.7641%252C37.0652%252C-74.7641%252C37.1704%252C-75.1157%252C37.1791						
4	to visualize the data graphically and learn more about data sources and analysis methods.						
5							
6	Class	Metric Type	Group	Species	Season	Metric	Value
7407	Pelagic Fish	Trends Over Time	MAFMC FMPs (Pelagic)	Butterfish	Fall	Current (max within AOI)	Median Persistence (50th Percentile)
7408	Pelagic Fish	Trends Over Time	MAFMC FMPs (Pelagic)	Butterfish	Spring	1970s (max within AOI)	High Persistence (75th Percentile)
7409	Pelagic Fish	Trends Over Time	MAFMC FMPs (Pelagic)	Butterfish	Spring	1980s (max within AOI)	High Persistence (75th Percentile)
7410	Pelagic Fish	Trends Over Time	MAFMC FMPs (Pelagic)	Butterfish	Spring	1990s (max within AOI)	High Persistence (75th Percentile)
7411	Pelagic Fish	Trends Over Time	MAFMC FMPs (Pelagic)	Butterfish	Spring	2000s (max within AOI)	High Persistence (75th Percentile)
7412	Pelagic Fish	Trends Over Time	MAFMC FMPs (Pelagic)	Butterfish	Spring	Current (max within AOI)	Median Persistence (50th Percentile)
7413	Marine Mammals	Group Summary	All modelled marine mammal species	--	All	# of Spp	29
7414	Marine Mammals	Group Summary	All modelled marine mammal species	--	All	# of Spp w/ Persistently Very High Biomass	11
7415	Marine Mammals	Group Summary	All modelled marine mammal species	--	All	Z-Score: # of Spp w/ Persistently Very High Biomass relative to the Mid-Atlantic ecoregion	3.1 (Far More)
7416	Marine Mammals	Group Summary	Baleen Whales	--	All	# of Spp	7
7417	Marine Mammals	Group Summary	Baleen Whales	--	All	# of Spp w/ Persistently Very High Biomass	5
7418	Marine Mammals	Group Summary	Baleen Whales	--	All	Z-Score: # of Spp w/ Persistently Very High Biomass relative to the Mid-Atlantic ecoregion	3.0 (Far More)
7419	Marine Mammals	Group Summary	ESA listed species	--	All	# of Spp	6
7420	Marine Mammals	Group Summary	ESA listed species	--	All	# of Spp w/ Persistently Very High Biomass	5

Figure 13 – Example of CSV table with attributes from an AOI

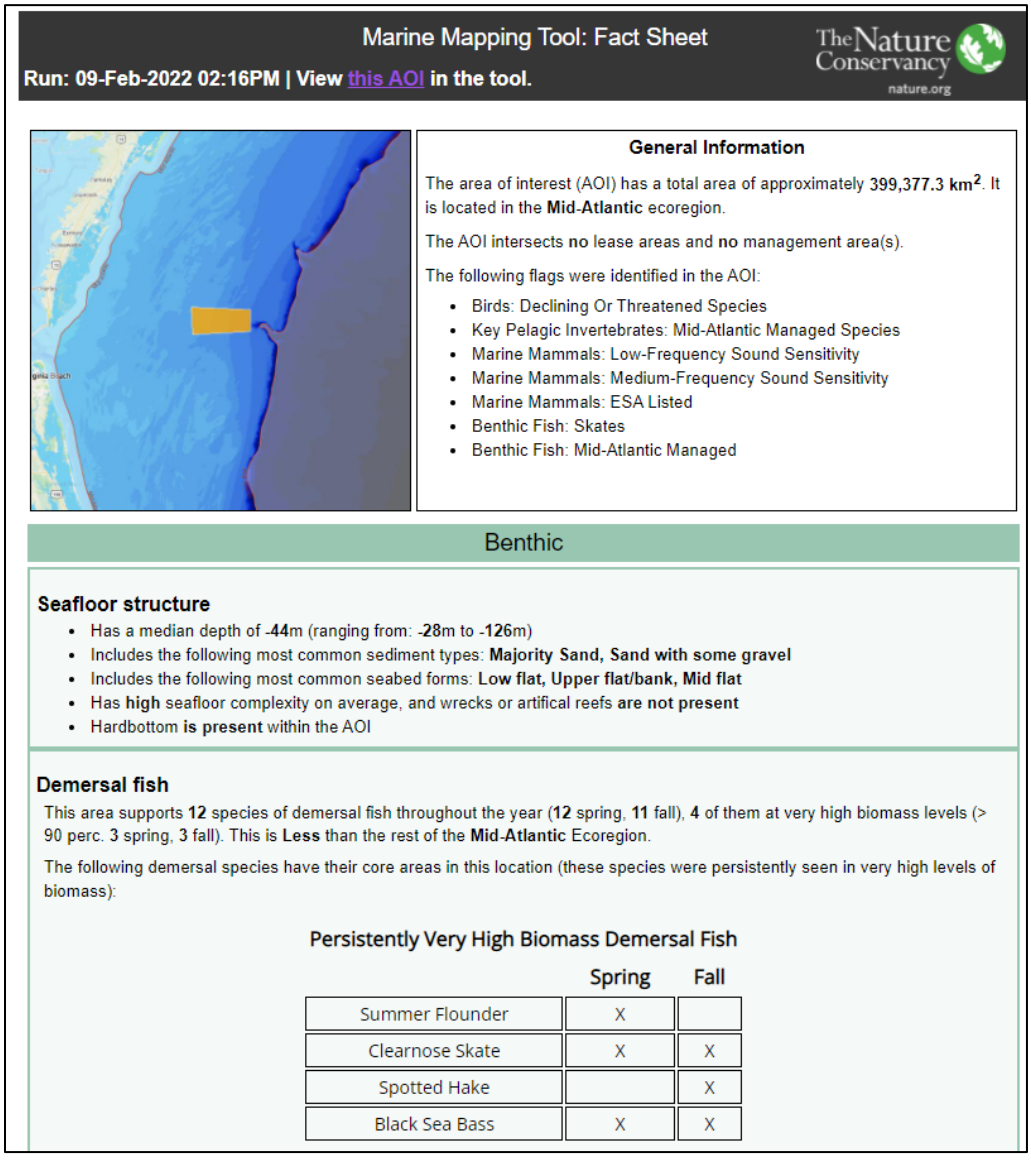

Figure 14 – Excerpt of Report with summarized attributes from the AOI.

Marine mammal strandings

Funding from this grant also supported development of spatial data showing marine mammal strandings in the Mid-Atlantic over the last 20 years. These data will be available on the Mid-Atlantic portal and have also been sent to NOAA, the source for the tabular data from which the spatial data were derived. An example visualization of these data on the portal staging site is shown below.

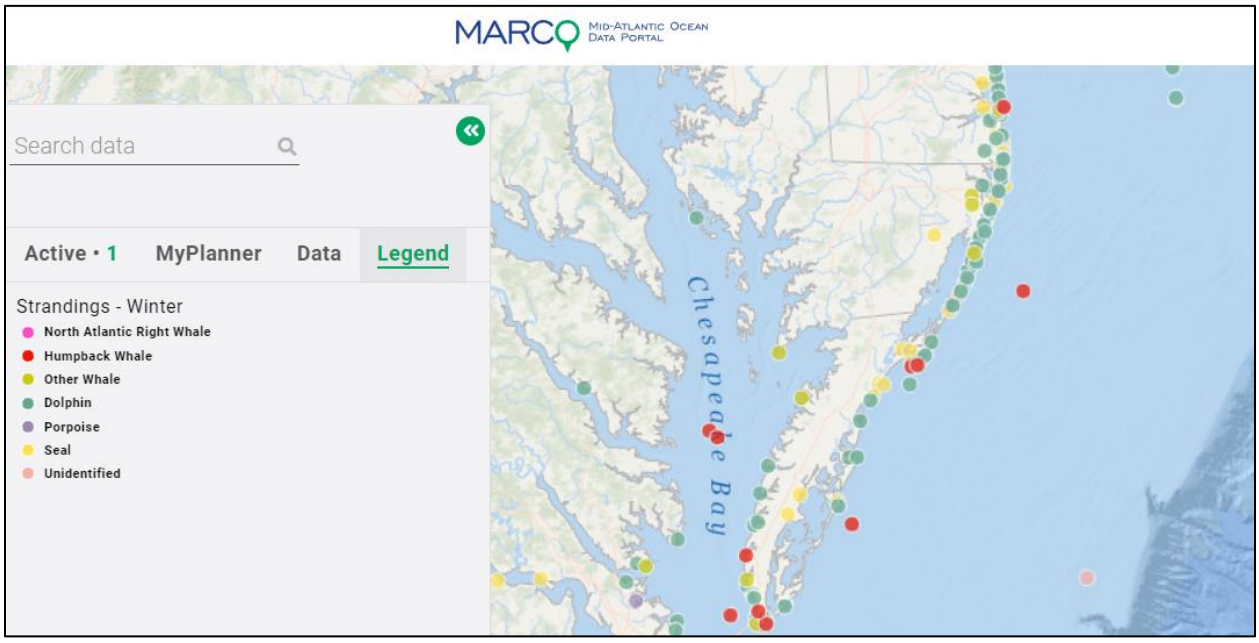

Figure 14 – Screenshot of Mid-Atlantic Ocean Data Portal, showing whale strandings dataset.