

# Mid-Atlantic Healthy Ocean Ecosystem Action 1: ERAs

Mid-Atlantic Regional Planning Body Meeting  
update June 20, 2017

MID-ATLANTIC REGIONAL

**OCEAN  
ACTION  
PLAN**



# Identify and Increase Understanding of Ecologically Rich Areas



Identify ecologically rich areas of the ocean in the Mid-Atlantic region and increase understanding of those areas to foster more informed decision making.



## Presentation Overview

- Finalization of framework for identifying ERAs
- Update on marine life data synthesis products
- Report from ERA Workshop- May 19, 2017
- ERA Work Group recommendation for next steps

# Framework for Identifying ERAs



- Draft Framework included in Draft Mid-Atlantic Regional Ocean Action Plan - Summer 2016
- Five ERA components:
  1. Productivity
  2. Biodiversity
  3. Species abundance
  4. Rarity
  5. Vulnerability

# Framework for Identifying ERAs (cont'd)



- Additions to Draft Framework:
  - Data sets to be cross- checked with known species of Indigenous cultural importance
  - Four types of ERAs
    - Fixed
    - Clustered
    - Ephemeral
    - Ambulatory
- RPB approved March 21, 2017
- Presented for finalization today June 20, 2017

# Marine-life Data Synthesis Products



Mid-Atlantic Regional Planning Body Update  
June 20, 2017

Jesse Cleary

Marine Geospatial Ecology Lab, Duke University, Marine Life Data & Analysis Team (MDAT)

Pat Halpin (PI), Earvin Balderama (Co-I), Mike Fogarty (Co-I)

Jason Roberts, Arliss Winship, Corrie Curtice, Jesse Cleary, Emily Shumchenia, Charles Perretti





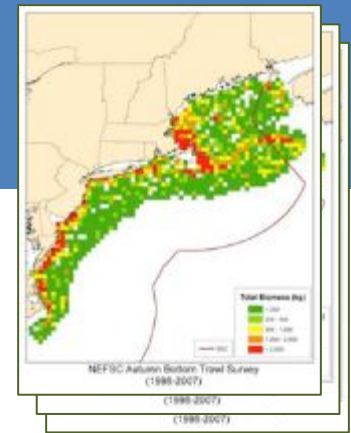
## Overview

- MDAT Data Review and Update
- May 2017 ERA Workshop: Data Discussions

# MDAT Data Review – Species Data

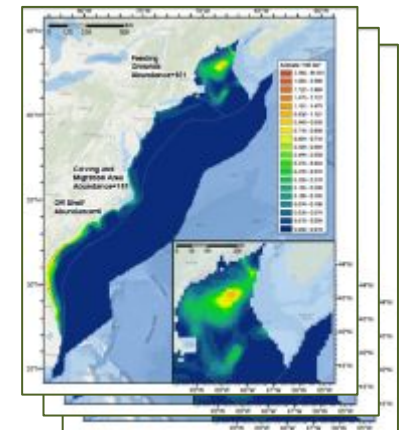
## Fish

- 82 species
- Biomass
- 1979-2014; 2005-2014



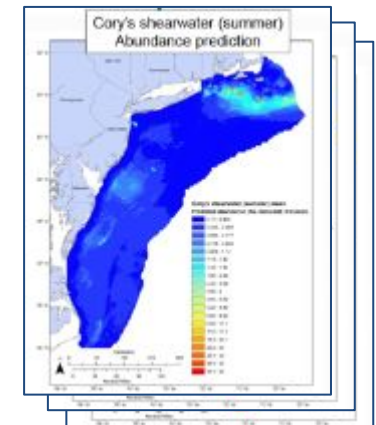
## Mammals

- 29 species / guilds
- Predicted density
- Monthly, Annual



## Avian

- 40 Species
- Predicted relative density and occurrence
- Seasonal, Annual

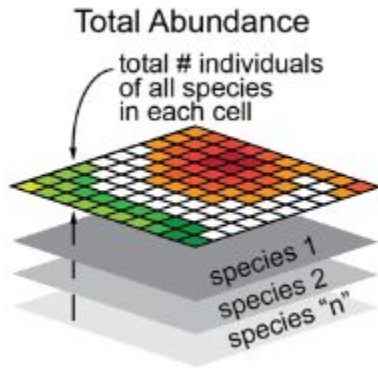




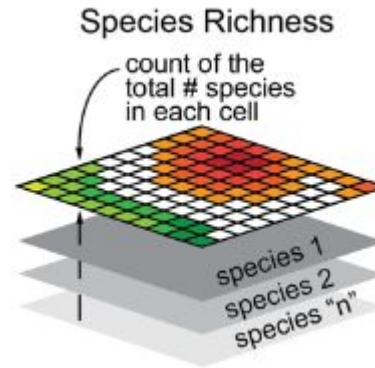
# MDAT Data Review - Summary Products

For species groups:

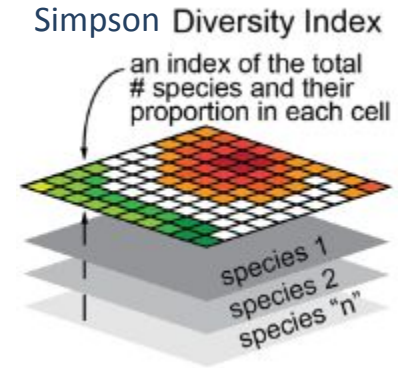
## 1. Group Abundance / Biomass



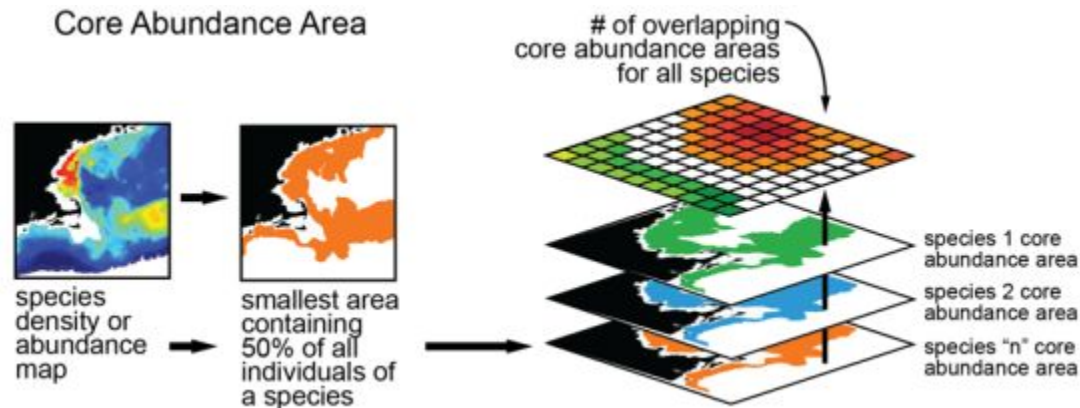
## 2. Species Richness



## 3. Biodiversity Index



## 4. Core Abundance / Biomass Area Richness



# SCIENTIFIC REPORTS

OPEN

## Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico

Received: 28 November 2015  
Accepted: 17 February 2016  
Published: 05 March 2016

Jason J. Roberts<sup>1</sup>, Benjamin D. Best<sup>1,2</sup>, Laura Mannocci<sup>1</sup>, El Fajjoka<sup>1</sup>, Patrick N. Halpin<sup>3</sup>, Debra L. Polke<sup>4</sup>, Lance P. Garrison<sup>5</sup>, Keith D. Mullin<sup>6</sup>, Timothy V. N. Cole<sup>7</sup>, Christin B. Khan<sup>8</sup>, William A. McLellan<sup>9</sup>, D. Ann Pabst<sup>10</sup> & Gwen G. Lockhart<sup>1</sup>

Cetaceans are protected worldwide but vulnerable to incidental harm from an expanding array of human activities at sea. Managing potential hazards to these highly-mobile populations increasingly requires a detailed understanding of their seasonal distributions and habitats. Pursuant to the urgent need for this knowledge for the U.S. Atlantic and Gulf of Mexico, we integrated 23 years of aerial and shipboard cetacean surveys, linked them to environmental covariates obtained from remote sensing and ocean models, and built habitat-based density models for 26 species and 3 multi-species guilds using distance sampling methodology. In the Atlantic, for 13 well-known species, model predictions resembled seasonal movement patterns previously suggested in the literature. For these we produced monthly mean density maps. For lesser-known taxa, and in the Gulf of Mexico, where seasonal movements were less well described, we produced year-round mean density maps. The results revealed high regional differences in small delphinoid densities, confirmed the importance of the continental slope to large delphinoids and of canyons and seamounts to beaked and sperm whales, and quantified seasonal shifts in the densities of migratory baleen whales. The density maps, freely available online, are the first for these regions to be published in the peer-reviewed literature.

The International Whaling Commission global moratorium on commercial whaling in 1986 curbed the biggest direct anthropogenic threat to many cetacean populations. But other threats have persisted, such as bycatch in fisheries<sup>1</sup>, ship strikes<sup>2</sup>, oil spills<sup>3,4</sup>, and other pollutants<sup>5</sup>. New threats have been recognized, including naval active sonar<sup>6,7</sup>, other anthropogenic sources of noise<sup>8,9</sup>, and climate change<sup>10</sup>. In the United States, national laws protect cetaceans. The Marine Mammal Protection Act (MMPA) prohibits intentional or incidental killing, injuring, or harassment of cetaceans and specifies the circumstances and rules under which permits may be issued for such activities. The Endangered Species Act (ESA) prohibits harm to species threatened with extinction, including 16 cetacean species, and requires conservation of their habitat. The National Environmental Policy Act (NEPA) specifies the process by which U.S. national government agencies must evaluate the potential environmental effects of their actions, consider alternatives, and conduct public reviews. Agency actions that involve activities that require permits under the MMPA or ESA are usually subject to this process.

To evaluate the potential effects of proposed activities on cetacean populations, interested parties require a detailed understanding of the spatiotemporal distributions of these populations. Recent developments have created an urgent need for this information in U.S. waters of the Atlantic and Gulf of Mexico, when the U.S. Bureau of Ocean Energy Management (BOEM) proposed to open a large portion of the Atlantic continental shelf to oil and natural gas development and to expand oil and gas leasing in the Gulf of Mexico. Concurrently, the U.S. Navy began development of a new Environmental Impact Statement assessing the effects of training activities proposed for a large portion of the western North Atlantic, while the National Marine Fisheries Service (NMFS) proposed

<sup>1</sup>Marine Geospatial Ecology Laboratory, Nicholas School of the Environment, Duke University, Durham, NC, USA. <sup>2</sup>Brew School of Environmental Sciences and Management, University of California, Santa Barbara, CA, USA. <sup>3</sup>Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA, USA. <sup>4</sup>Southeast Fisheries Science Center, National Marine Fisheries Service, Miami, FL, USA. <sup>5</sup>Southeast Fisheries Science Center, National Marine Fisheries Service, Pascagoula, MS, USA. <sup>6</sup>Biology and Marine Biology, University of North Carolina Wilmington, NC, USA. <sup>7</sup>Virginia Aquarium & Marine Science Center, Virginia Beach, VA, USA. Correspondence and requests for materials should be addressed to J.J.R. (email: jason.roberts@duke.edu)

OCS Study  
BOEM 2016-039

## Modeling At-Sea Occurrence and Abundance of Marine Birds to Support Atlantic Marine Renewable Energy Planning

### Phase I Report

Authors

Brian P. Kinlan  
Arliss J. Winship  
Timothy P. White  
John Christensen

Prepared under NCCOS IAA MOA-2013-046-8696, BOEM OCS Study 2016-039, and NCCOS BOEM IAA M13PG00005

by  
U.S. Department of Commerce  
National Oceanic and Atmospheric Administration  
National Ocean Service  
National Centers for Coastal Ocean Science  
Center for Coastal Monitoring and Assessment  
Biogeography Branch  
1305 East-West Hwy, SSMC-4, N/SCI-1  
Silver Spring, MD 20910



Published by  
U.S. Department of the Interior  
Bureau of Ocean Energy Management  
Office of Renewable Energy Programs  
May 2016



# MDAT Data – Current Use

## Individual Species Models / Data

- NOAA - Marine Mammal Protection Act, Endangered Species Act
- Navy - Navy Acoustic Effects Model (NAEMO)
- BOEM – Wind energy planning
- NOAA NMFS – Stock assessment

# MDAT Data – Engagement

## NE and Mid-Atlantic Stakeholder & RPB engagement

- 2014-2015
  - 9 Expert Working Group meetings
  - 14 workshops, public webinars, and RPB meetings
- 2016
  - 10 workshops, work group meetings, webinars, and RPB meetings
- 2017
  - 7 workshops, work group calls, and conference presentations completed; ~7 tentatively scheduled

# MDAT Data and Model Updates

- Update to Duke marine mammal models
- Update to NOAA NCCOS avian models
- NEW - Loyola avian models
- Update to MDAT summary products



## Overview

- MDAT Data Review and Update
- May 2017 ERA Workshop: Data Discussions

# May 2017 ERA Workshop: Data Discussions

- Continue to improve data communication
  - Individual Species Models / Data
  - Summary Products
- Continue linking data to ERA components
  - Rolling incorporation of survey results

# Data Communication

*Stakeholder feedback:*

***The need to better understand the individual species data and models***

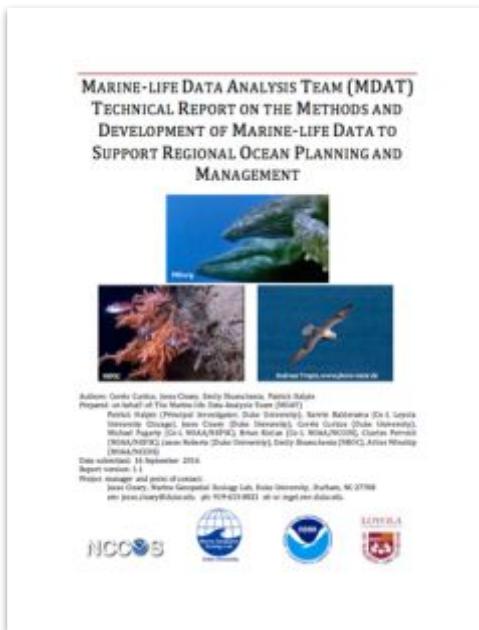
*Stakeholders asked questions about input observations, modeling process, peer review, understanding uncertainty...*



# Data Communication - Existing

## MDAT website

- MDAT Technical Report
- Data and model metadata PDFs
- Data download packages



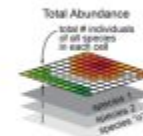
<b>Data Collection</b>	RE Sea Occurrence and Abundance of Marine Birds developed by the NOAA National Centers for Coastal Ocean Science (NCCOS), prepared by the Marine-Life Data and Analysis Team (MDAT)
<b>Data Collection Title</b>	SEAT_ML_BIRDS_NMFS_16A_01_2016_01_20
<b>Data Collection URL</b>	http://seamap.env.duke.edu/mdl/molat/
<b>Data Set</b>	SEAT_ML_BIRDS_NMFS_16A_01_2016_01_20
<b>Data Set Title</b>	SEAT_ML_BIRDS_NMFS_16A_01_2016_01_20
<b>Principal Investigator</b>	NOAA Fisheries, Brian Kistler, Brian Kistler, Timothy Wain '08, DUC, NOAA, NCCOS, National Center for Coastal Ocean Science (NCCOS)
<b>MDAT Partners</b>	NOAA Fisheries PATRICK W. RABALA (PI) - MARINE GEOSPATIAL ECOLOGY LAB AT DUKE UNIVERSITY JESSE CLOERN (D-1) - LOYOLA UNIVERSITY CHICAGO CORDE CORBIN (D-1) - NOAA/NMFS MICHAEL FOGARTY (D-1) - NOAA/NMFS BRIAN GILMAN (D-1) - NOAA/NMFS CHARLES PARSONS (D-1) - NOAA/NMFS JASON ROBERTS (D-1) - NOAA/NMFS EMILY SHUSTEROVA (D-1) - ALFRED UNIVERSITY
<b>Primary Points of Contact</b>	NOAA Fisheries, Jesse Cloern, jesse.cloern@duke.edu - Website: <a href="http://www.marinegeospatialecology.org">www.marinegeospatialecology.org</a> Website: <a href="http://www.marinegeospatialecology.org">www.marinegeospatialecology.org</a>
<b>Collaborators</b>	NOAA Fisheries, NOAA, NCCOS, National Center for Coastal Ocean Science (NCCOS) TIM JONES SUELLI JOHNSON KAPONE JOHNSON RYAN JOHNSON NEALIE STOCKAMP MARK WOOD ALISON O'CONNELL ALLISON SUTHERLAND ELLEN ELSNER ROB BARBER CATHY CALHOUN DAVID SLOTT RILEY SHAWNEE JAMES WOOD And many additional data providers - listed in Appendix A of Kistler et al., 2016
<b>MDAT SUPPORTERS</b>	DAVID BALCHONEM (D-1), LOYOLA UNIVERSITY CHICAGO JAMES ELIERY (Duke University) GEORGE GUSTINE (Duke University) MICHAEL FOGARTY (D-1, NOAA/NMFS) PATRICK W. RABALA (PI), DUKE UNIVERSITY BRIAN KISTLER (D-1), NOAA/NMFS CHARLES PARSONS (NOAA/NMFS) JESSE CLOERN (Duke University) EMILY SHUSTEROVA (MIOC)
<b>Author(s)</b>	NOAA Fisheries, NOAA, NCCOS Brian Kistler, Brian Kistler, Timothy Wain '08



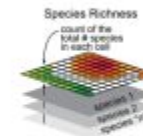
## Summary Products

For each species group, and for all species in a taxon:

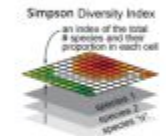
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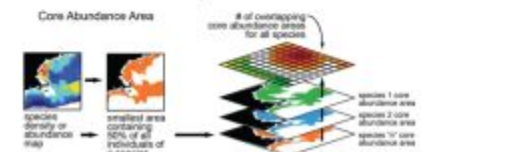
### 2. Species Richness



### 3. Biodiversity Index



### 4. Core Abundance / Biomass Area Richness



<http://seamap.env.duke.edu/models/mdat/>

## SCIENTIFIC REPORTS

### OPEN Habitat-based cetacean density models for the U.S. Atlantic and Gulf of Mexico

Received: 18 November 2023  
Accepted: 17 February 2024  
Published: 03 March 2024

Jason J. Roberts<sup>1</sup>, Benjamin D. Best<sup>2,3</sup>, Laura Mannocci<sup>2</sup>, Ei Fujioka<sup>1</sup>, Patrick N. Halpin<sup>1</sup>, Debra L. Palka<sup>3</sup>, Lance P. Garrison<sup>4</sup>, Keith D. Mullin<sup>5</sup>, Timothy V. N. Cole<sup>1</sup>, Christin B. Khan<sup>1</sup>, William A. McLellan<sup>6</sup>, D. Ann Pabst<sup>6</sup> & Gwen G. Lockhart<sup>7</sup>

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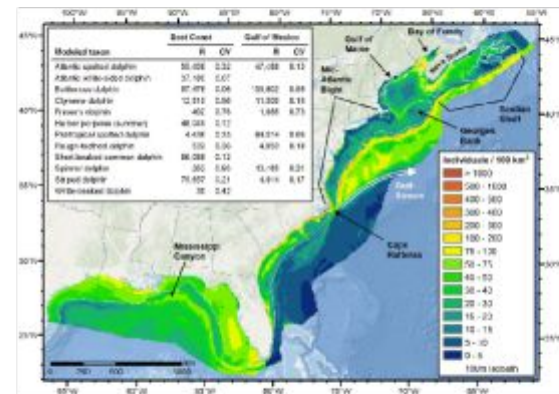
The International Whaling Commission placed a moratorium on commercial whaling in 1986, curtailing the biggest direct anthropogenic threat to many cetacean populations. But other threats have persisted, such as bycatch in fisheries<sup>1</sup>, ship strikes<sup>2,3</sup>, oil spills<sup>4,5</sup>, and other pollutants<sup>6</sup>. New threats have been recognized, including naval active sonar<sup>7,8</sup>, other anthropogenic sources of noise<sup>9,10</sup>, and climate change<sup>11</sup>. In the United States, national laws protect cetaceans. The Marine Mammal Protection Act (MMPA) prohibits intentional or incidental killing, injuring, or harassment of cetaceans and specifies the circumstances and rules under which permits may be issued for such activities. The Endangered Species Act (ESA) prohibits harm to species threatened with extinction, including 16 cetacean species, and requires conservation of their habitat. The National Environmental Policy Act (NEPA) specifies the process by which U.S. national government agencies must evaluate the potential environmental effects of their actions, consider alternatives, and conduct public reviews. Agency actions that involve decisions to issue permits under the MMPA or ESA are usually subject to this process.

To evaluate the potential effects of proposed activities on cetacean populations, interested parties require a detailed understanding of the spatiotemporal distributions of these populations. Recent developments have created an urgent need for this information in U.S. waters of the Atlantic and Gulf of Mexico, when the U.S. Bureau of Ocean Energy Management (BOEM) proposed to open a large portion of the Atlantic continental shelf to oil and natural gas development and to expand oil and gas leasing in the Gulf of Mexico. Concurrently, the U.S. Navy began development of a new Environmental Impact Statement assessing the effects of training activities proposed for a large portion of the western North Atlantic, while the National Marine Fisheries Service (NMFS) proposed

<sup>1</sup>Marine Geospatial Ecology Laboratory, Nicholas School of the Environment, Duke University, Durham, NC, USA. <sup>2</sup>Bran School of Environmental Sciences and Management, University of California, Santa Barbara, CA, USA. <sup>3</sup>Northeast Fisheries Science Center, National Marine Fisheries Service, Woods Hole, MA, USA. <sup>4</sup>Southeast Fisheries Science Center, National Marine Fisheries Service, Miami, FL, USA. <sup>5</sup>Southeast Fisheries Science Center, National Marine Fisheries Service, Pascagoula, MS, USA. <sup>6</sup>Biology and Marine Biology, University of North Carolina Wilmington, NC, USA. <sup>7</sup>Virginia Aquarium & Marine Science Center, Virginia Beach, VA, USA. Correspondence and requests for materials should be addressed to J.J.R. (email: jason.roberts@duke.edu)

Region	Taxonomic group	Sightings retained for analysis		Taxa modeled with	
		Fully resolved	Ambiguous	DMs	Stratified models
EC	Small delphinoids	1074	544	6	6
	Large delphinoids	817	575	5	2
	Beaked and sperm whales	363	191	2	2
GOM	Small delphinoids	780	340	5	2
	Large delphinoids	160	171	7	1
	Beaked and sperm whales	118	15	2	2
Total	Beaked whales	482	208	5	1
	Baleen whales	15	8	1	1

**Table 2.** Sightings reported and taxa modeled. Fully-resolved sightings had a complete taxonomic identification. Ambiguous sightings that were retained for analysis were classified into one of the 29 modeled taxa (see Methods). Taxa modeled with stratified models were sighted so infrequently that a DM model could not be fitted; instead, we produced traditional mean density estimates for the geographic areas they were likely to inhabit.

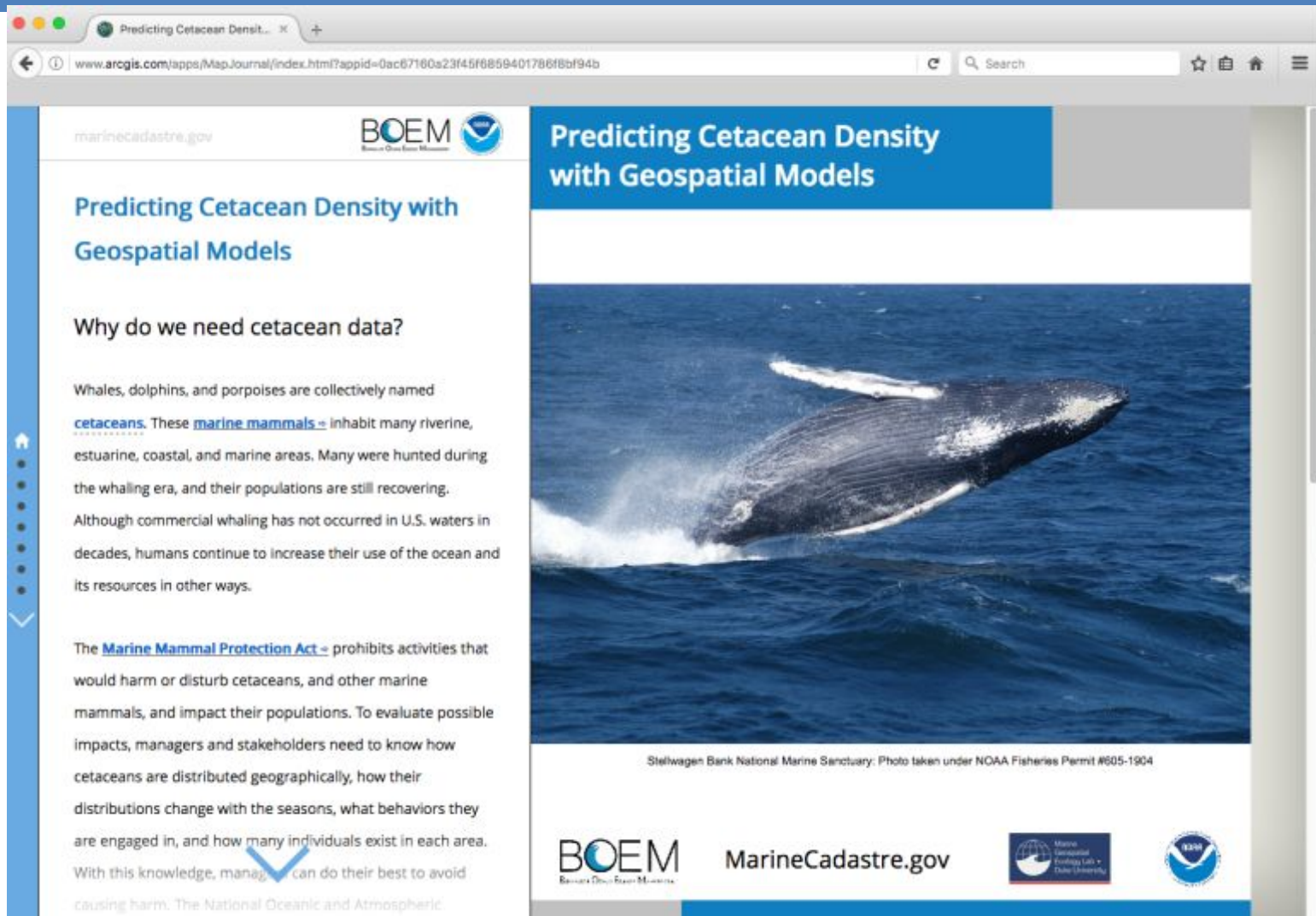


**Figure 2.** Predicted mean density of small delphinoids. The inset table lists the estimated mean abundance (number of individuals, N) and associated coefficient of variation (CV) for each taxon. The estimates are year-round (as an input for harbor porpoise). Harbor porpoise was modeled with two seasonal models instead of a year-round model; the estimates listed are for the summer model. Damaged as <https://www.nature.com/scientificreports/>. Figure produced with ArcGIS 10.2.2 (<http://www.esri.com/>); bathymetry map credit: ERI, DGL, and GEDCO, NOAA NODC, and other contributors.

occur throughout oceanic waters, to highest density along the continental slope, consistent with prior reports<sup>12,13</sup>. Pilot whales were especially concentrated off Cape Hatteras, just north of where the Gulf Stream separates from the shelf. Both were also predicted in lower density over the shelf in northern, cold, productive waters. We modeled the remaining four species with stratified models. Killer and false killer whales were sighted and assumed to occur both on and off the shelf, while melon-headed and northern bottlenose whales were sighted and assumed to occur only in oceanic waters.

**Beaked and sperm whales.** For beaked and sperm whales, deep-diving toothwhales, our models predicted patchy distributions concentrated in deep waters over high relief bathymetry, in keeping with evidence of high prey density in these areas<sup>14</sup>. In the GOM, models predicted concentrations near off-shelf submarine canyons at the mouth of the Mississippi River and the central northern Gulf<sup>15</sup>, and along the continental slope (Fig. 4). In the EC, the models predicted highest densities along the continental slope, in and around submarine canyons, and

# Data Communication – Existing model story map



The screenshot shows a web browser window with the URL [www.arcgis.com/apps/MapJournal/index.html?appid=0ac67180s23f45f6869401786f8bf94b](http://www.arcgis.com/apps/MapJournal/index.html?appid=0ac67180s23f45f6869401786f8bf94b). The page is titled "Predicting Cetacean Density with Geospatial Models" and is part of a story map from BOEM (Bureau of Ocean Energy Management) and MarineCadastre.gov. The main content area features a large image of a whale breaching the ocean surface. Below the image, there is a caption: "Stellwagen Bank National Marine Sanctuary: Photo taken under NOAA Fisheries Permit #605-1904". The page also includes a sidebar with a navigation menu and a footer with logos for BOEM, MarineCadastre.gov, and NOAA.

marinecadastre.gov

BOEM  
BUREAU OF OCEAN ENERGY MANAGEMENT

## Predicting Cetacean Density with Geospatial Models

### Why do we need cetacean data?

Whales, dolphins, and porpoises are collectively named **cetaceans**. These **marine mammals** inhabit many riverine, estuarine, coastal, and marine areas. Many were hunted during the whaling era, and their populations are still recovering. Although commercial whaling has not occurred in U.S. waters in decades, humans continue to increase their use of the ocean and its resources in other ways.

The **Marine Mammal Protection Act** prohibits activities that would harm or disturb cetaceans, and other marine mammals, and impact their populations. To evaluate possible impacts, managers and stakeholders need to know how cetaceans are distributed geographically, how their distributions change with the seasons, what behaviors they are engaged in, and how many individuals exist in each area. With this knowledge, managers can do their best to avoid causing harm. The National Oceanic and Atmospheric

Stellwagen Bank National Marine Sanctuary: Photo taken under NOAA Fisheries Permit #605-1904

BOEM  
BUREAU OF OCEAN ENERGY MANAGEMENT

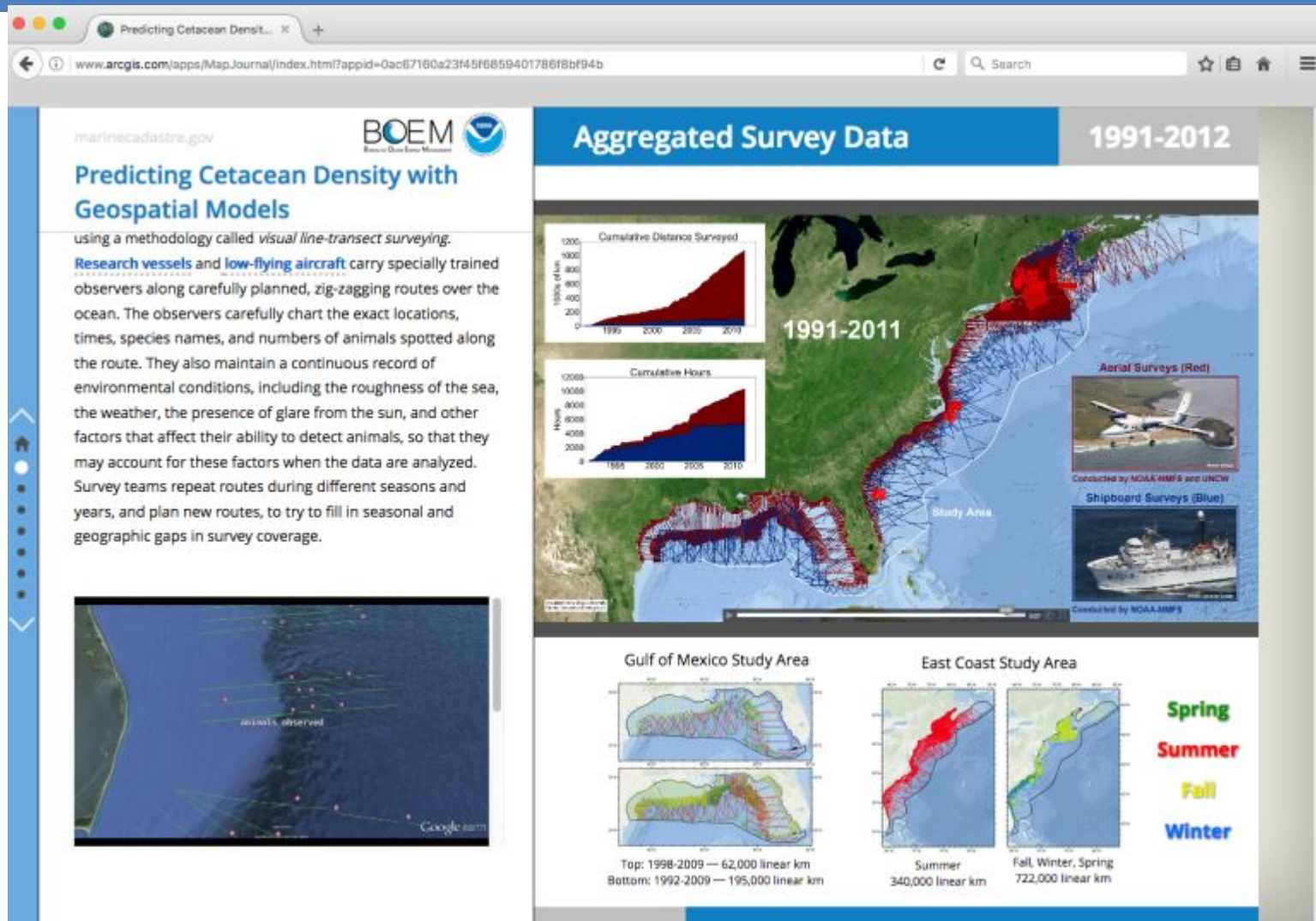
MarineCadastre.gov

Marine Mammal Protection Act  
U.S. DEPARTMENT OF COMMERCE

NOAA

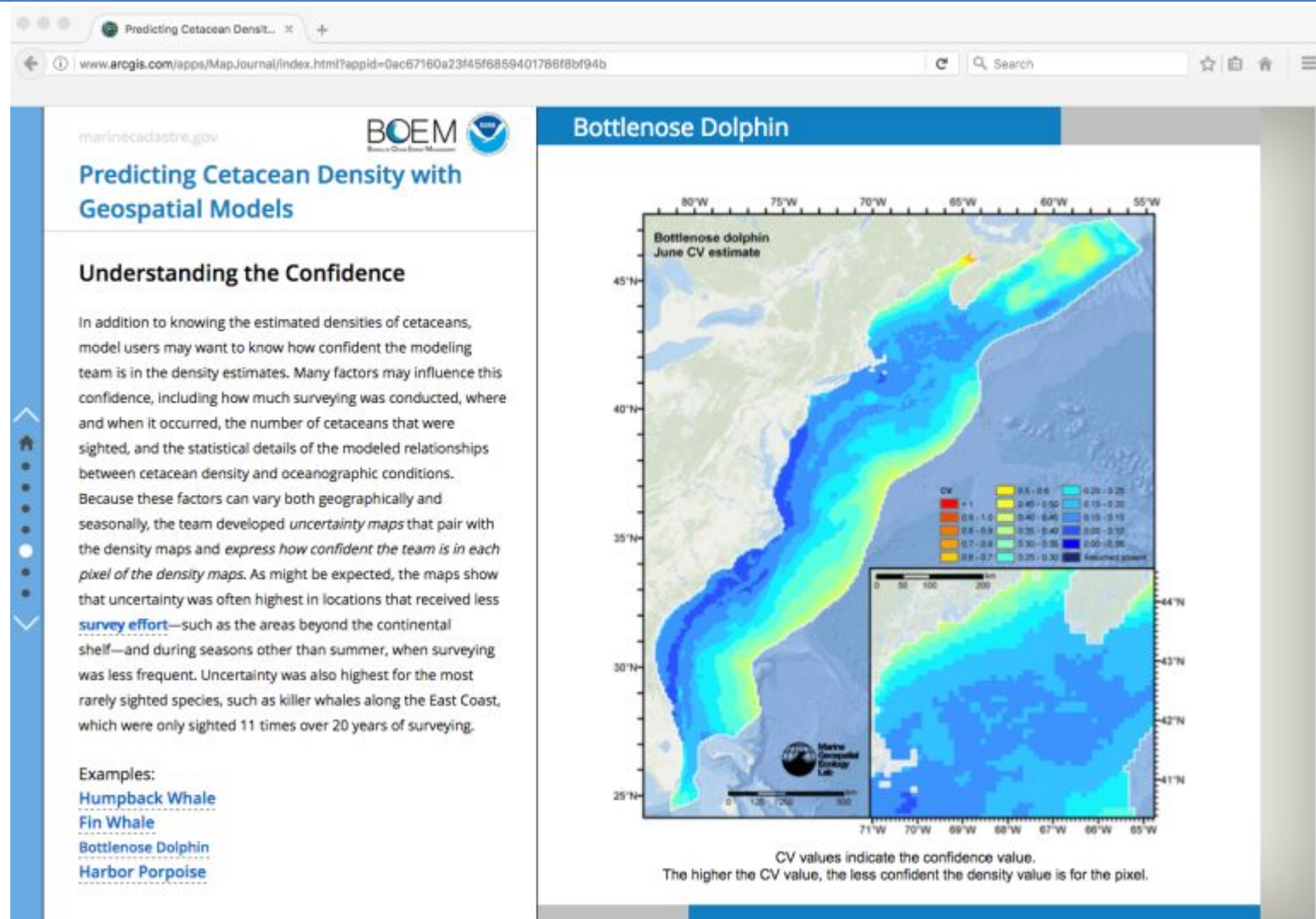
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# Data Communication – Existing model story map



<https://goo.gl/yTM9fH>

# Data Communication – Existing model story map



<https://goo.gl/yTM9fH>

# Data Communication – Confidence/Uncertainty

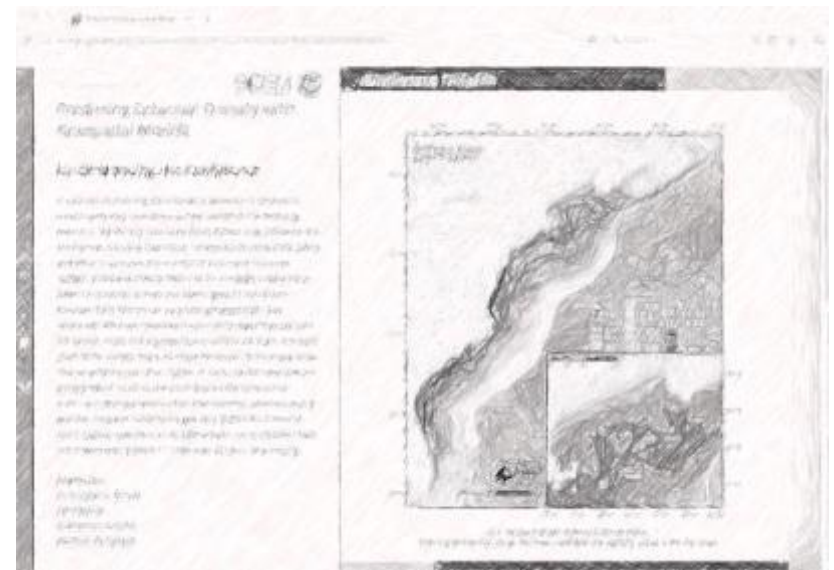
Improve explanation and use guidance of existing confidence and uncertainty products

- Coefficient of Variation
- Standard Error
- 5% confidence level
- 50% confidence level
- 95% confidence level



5% CL

“No fewer animals than this”



# Data Communication

*Stakeholder feedback:*

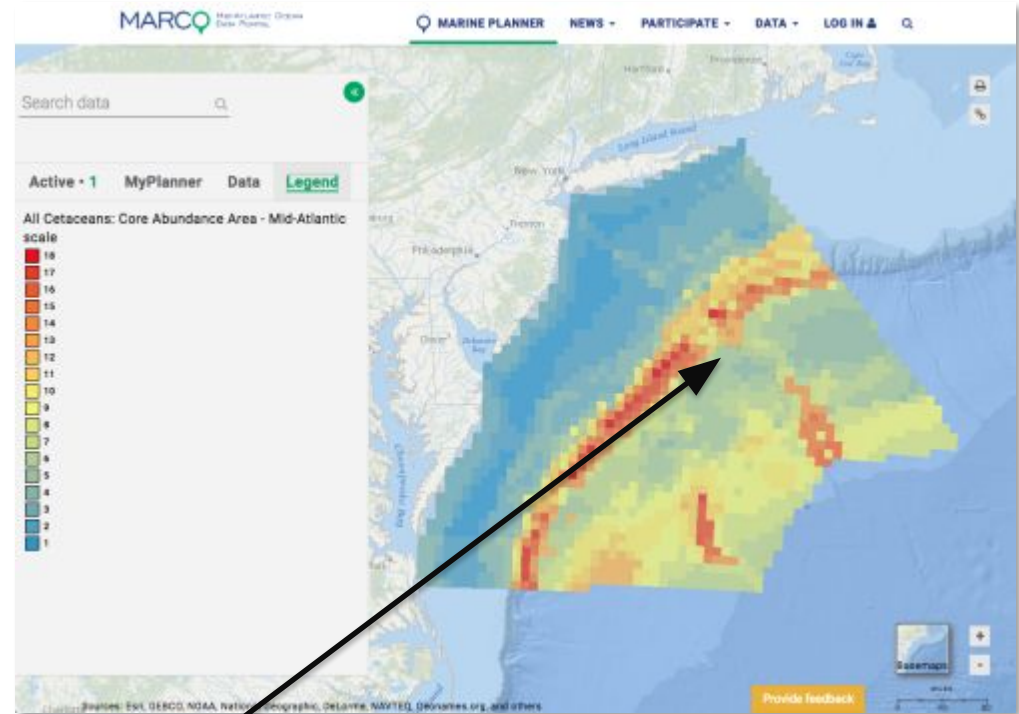
***The need to better understand the composition of summary products***

*Stakeholders asked to be able to click on a map of species abundance or richness and see what species contributed to the value...*

# Data Communication – Summary Product Composition

Species making up the index values for each cell

- Abundance
- Species Richness
- Core Abundance/Biomass Areas



Portal updates will follow

Core Abundance Area Richness	Species List
7	Dwarf sperm whale, Pygmy sperm whale, Risso's dolphin, Rough-toothed dolphin, Short-finned pilot whale, Spinner dolphin, White-beaked dolphin



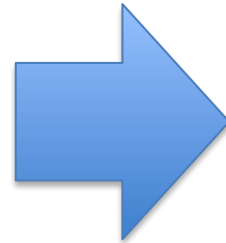
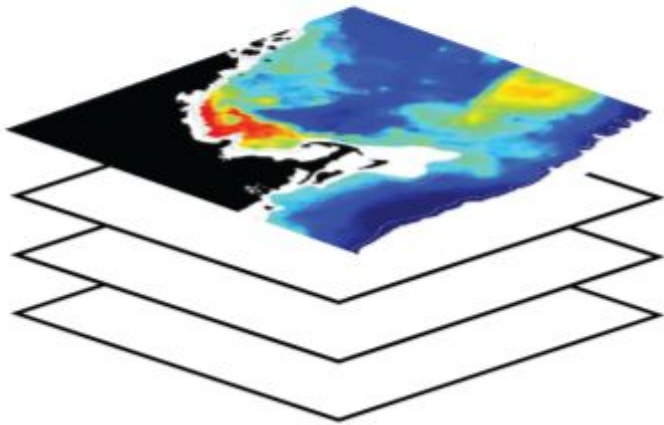
# May 2017 ERA Workshop: Data Discussions

- Continue to improve data communication
  - Individual Species Models / Data
  - Summary Products
- Continue linking data to ERA components
  - ERA workshop guidance
  - Rolling incorporation of evaluation results

# Linking data to ERA Components

What data best illustrate the components of ERAs?

Marine life and habitat  
individual species data



1. Productivity
2. Biodiversity
3. Abundance
4. Vulnerability
5. Rarity

# IEA/ERA Data Review Process

July 2016

First presentation of draft data to support Components 1 and 2 to Northeast Ecosystem Based Management Work Group and public

Aug 2016

Initial draft data to support 5 Components presented at Mid-A public ERA workshop



Need to be able to explore the data and better understand underlying methods

Developed **IEA/ERA Data Guide** (now publicly available) and **Data Evaluation** tool using SeaSketch (a web-based mapping app)

# SeaSketch Data Evaluation

1. Evaluate existing data applicability to components
2. New data review and applicability to components

Northeast Ocean Planning

admin

seasketch

English | About Us | Help | Jesse Cleary

Data Layers | My Plans | **Participate**

Surveys / Component 1 Evaluation

**Jesse Cleary**  
You are filling out this survey as Jesse Cleary. If this is not you please logout.  
[Admin option - Complete for another user](#)

**Key Documents**

**Tutorial video**  
[How to complete this survey](#)

**Reference Material**  
[IEA/ERA Data Guide](#)  
[The Northeast Ocean Plan](#)  
[The Mid-Atlantic Regional Ocean Action Plan](#)

**Overview**

This evaluation contains 3 main questions, including opportunities to annotate the map to highlight data gaps, artifacts, or other features of interest. At the bottom of the form you have the option to save your responses as draft (and return later) or to submit your responses as final.

**1. Areas of High Productivity**

The NOAA Northeast Fisheries Science Center will be the primary data provider for the data in this component. We continue to work with NEFSC staff to determine which available datasets best characterize productivity for the US Northeast Shelf LME. We expect to receive data representing: spring bloom frequency, magnitude and start day (1999-2015) from Friedland et al. 2015; primary productivity season means (1997-2015); and total zooplankton biovolume interpolations. We currently provide examples and approximations of the expected NEFSC layers using similar data sources and methods.

Below we first present data and questions for primary productivity (1a), then for secondary productivity (1b), and finally for proxies of high productivity (1c).

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# ERA Component Data Guide

IEA/ERA Data Guide				6
Data layer	Units	Resolution	Reference(s)	
- Cyclonic eddy probability - fall				
<p><b>Component 2: Areas of high biodiversity</b></p> <p>Biodiversity products were produced as part of the 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, we present the 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 <a href="http://www.marinespecies.org/traits/">http://www.marinespecies.org/traits/</a>).</p> <p>◆ = presented on the Northeast Ocean Data Portal and in the Northeast Ocean Plan</p>				
Data layer	Units	Resolution	Reference(s)	
<u>Taxonomic metrics and indices of diversity</u>				
<ul style="list-style-type: none"> <li>- ◆ All Cetacean Species Richness</li> <li>- ◆ All Bird Species Richness</li> <li>- ◆ All Fish Species Richness – NEFSC Fall surveys</li> <li>- All Fish Species Richness – NEAMAP surveys</li> <li>- All Fish Species – Gini-Simpson Index (NEFSC fall surveys)</li> <li>- All Cetacean Species – Gini-Simpson Index</li> </ul>	# species (richness); probability that all individuals belong to different species (Gini-Simpson)	10km x 10km (cetaceans and fish) 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: <a href="http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf">http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf</a>  Simpson, E.H. 1949. "Measurement of Diversity." <i>Nature</i> 163: 688. doi:10.1038/163688a0.	
<u>Functional metrics of diversity</u>				
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: <a href="http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf">http://seamap.env.duke.edu/models/MDAT/MDAT-Technical-Report-v1_1.pdf</a>	
<u>Proxies for high biodiversity</u>				
Coral gardens	habitat	~350m	NOAA NCCOS Deep Sea Corals modeling: <a href="https://coastalscience.noaa.gov/projects/detail?key=35">https://coastalscience.noaa.gov/projects/detail?key=35</a>	

# IEA/ERA Data Review Process

Feb 2017

Northeast scientists begin examining data on SeaSketch and responding via Data Evaluation

- Targeted outreach to explain/discuss data, methods, process
- Access requested and granted to ~100 individuals in Northeast

May 2017

Mid-Atlantic scientists begin examining data on SeaSketch and responding via Data Evaluation

- Targeted outreach to explain/discuss data, methods, process IN PROGRESS (Emily)
- Access requested and granted to ~100 individuals in Mid-Atlantic

# IEA/ERA Data Review Process

Summer 2017

**Continued review and evaluation** of potential data and methods to support each of the 5 Components

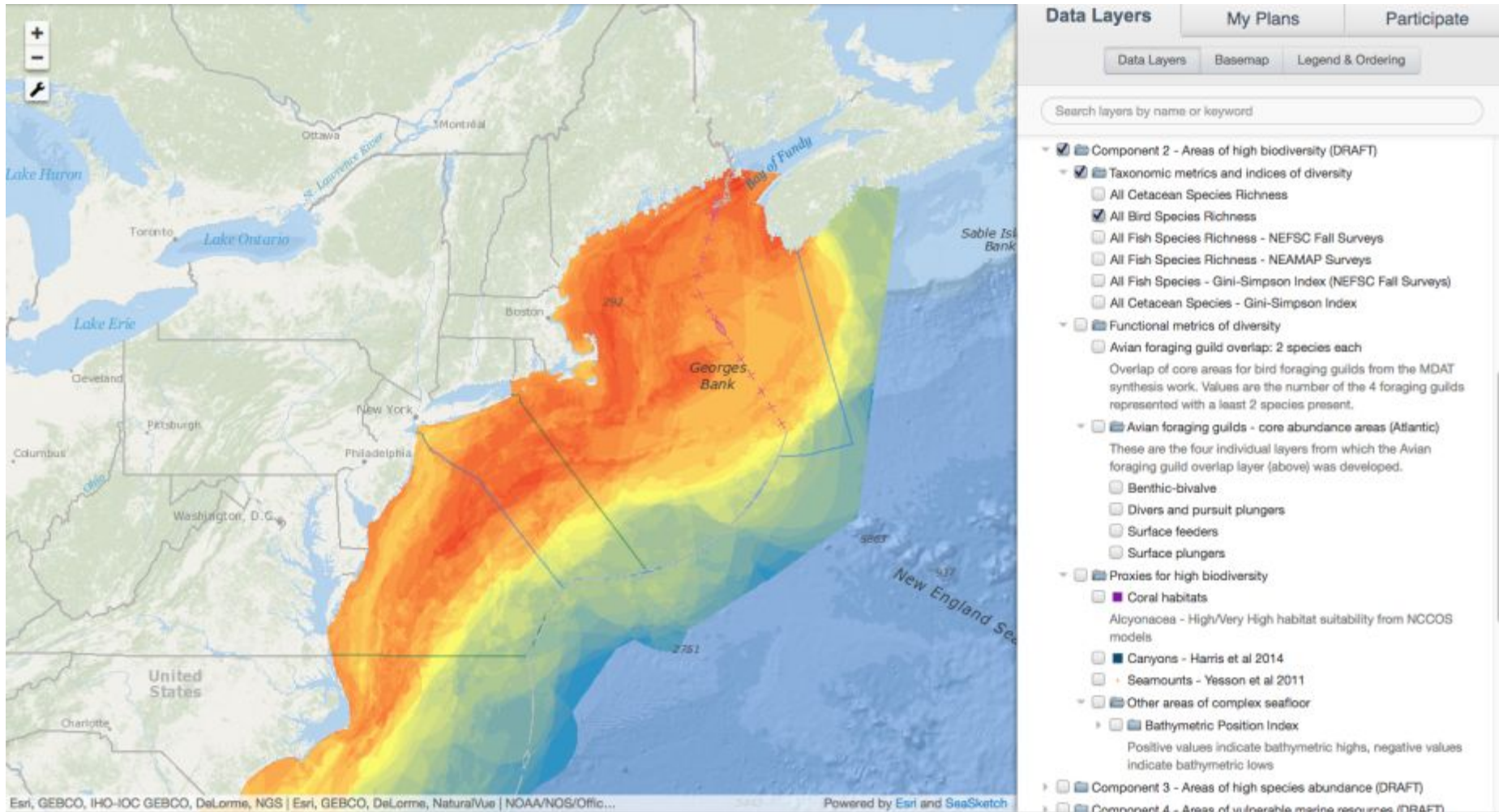
- Includes additional one-on-one **outreach and discussions** as needed
- Continued consideration of feedback/input as MDAT products are updated and new species groups are developed

Fall 2017

Summarize key methodological questions that arise, and potentially hold discussions via workshop(s) as RPBs deem appropriate

# ERA Component Data and SeaSketch

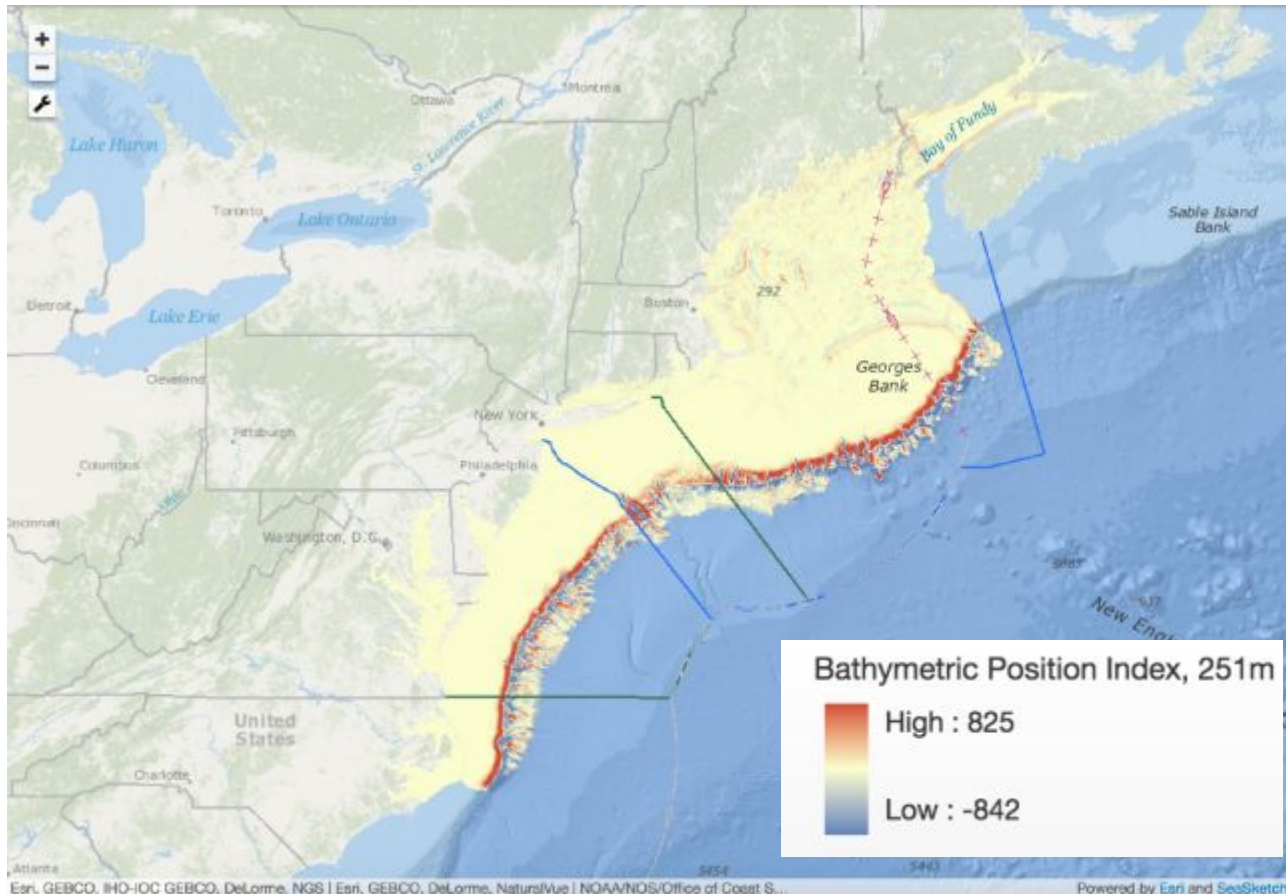
## Component 2: Areas of high biodiversity





# ERA Component Data and SeaSketch

## Component 2: Areas of high biodiversity



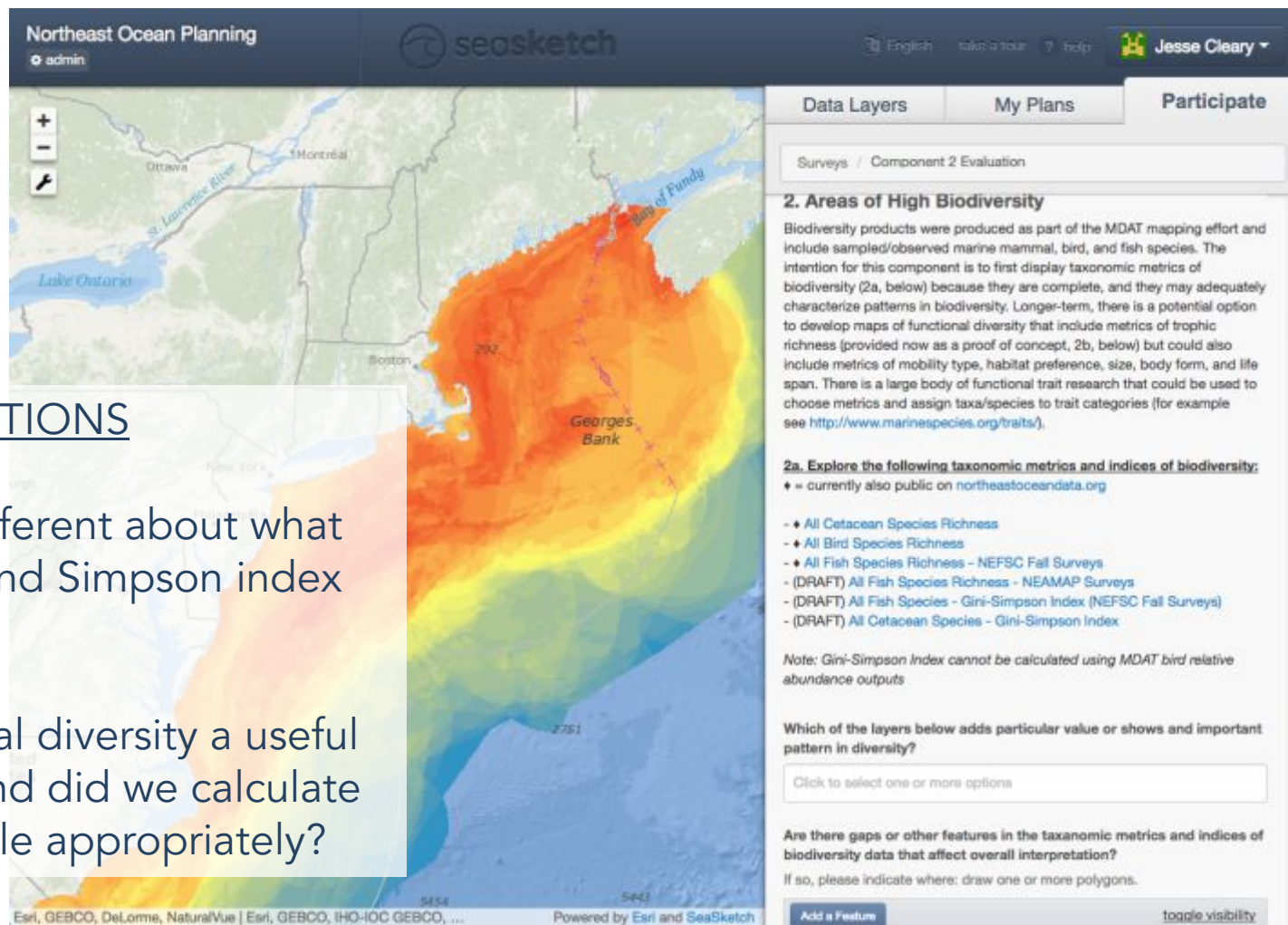
Data Layers My Plans Participate

Data Layers Basemap Legend & Ordering

Search layers by name or keyword

- Component 1 - Areas of high productivity (DRAFT)
- Component 2 - Areas of high biodiversity (DRAFT)
  - Taxonomic metrics and indices of diversity
    - All Cetacean Species Richness
    - All Bird Species Richness
    - All Fish Species Richness - NEFSC Fall Surveys
    - All Fish Species Richness - NEAMAP Surveys
    - All Fish Species - Gini-Simpson Index (NEFSC Fall Surveys)
    - All Cetacean Species - Gini-Simpson Index
  - Functional metrics of diversity
    - Avian foraging guild overlap: 2 species each  
Overlap of core areas for bird foraging guilds from the MDAT synthesis work. Values are the number of the 4 foraging guilds represented with a least 2 species present.
  - Avian foraging guilds - core abundance areas (Atlantic)  
These are the four individual layers from which the Avian foraging guild overlap layer (above) was developed.
  - Proxies for High biodiversity
    - Coral habitats
      - Alcyonacea - High/Very High habitat suitability from NCCOS models
    - Canyons - Harris et al 2014
    - Seamounts - Yesson et al 2011
  - Other areas of complex seafloor
    - Bathymetric Position Index  
Positive values indicate bathymetric highs, negative values indicate bathymetric lows
      - Bathymetric Position Index, 83m
      - Bathymetric Position Index, 251m
- Component 3 - Areas of high species abundance (DRAFT)

# ERA Component Data and SeaSketch



## KEY QUESTIONS

What is different about what Richness and Simpson index tell us?

Is functional diversity a useful concept and did we calculate the example appropriately?

# May 2017 ERA Workshop: Data Discussions

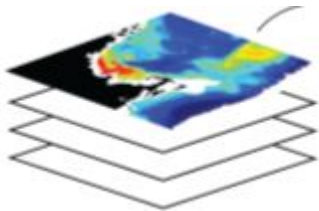
- Continue to improve data communication
  - Individual Species Models / Data
  - Summary Products
- Continue linking data to ERA components
  - ERA workshop guidance
  - Rolling incorporation of evaluation results

# May 2017 ERA Workshop: Data Discussions

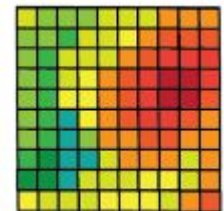
## ERA work group discussion:

- May 2017 ERA Workshop
- MDAT biogeographic data exploration
- SeaSketch data evaluation

What level of component synthesis is useful?

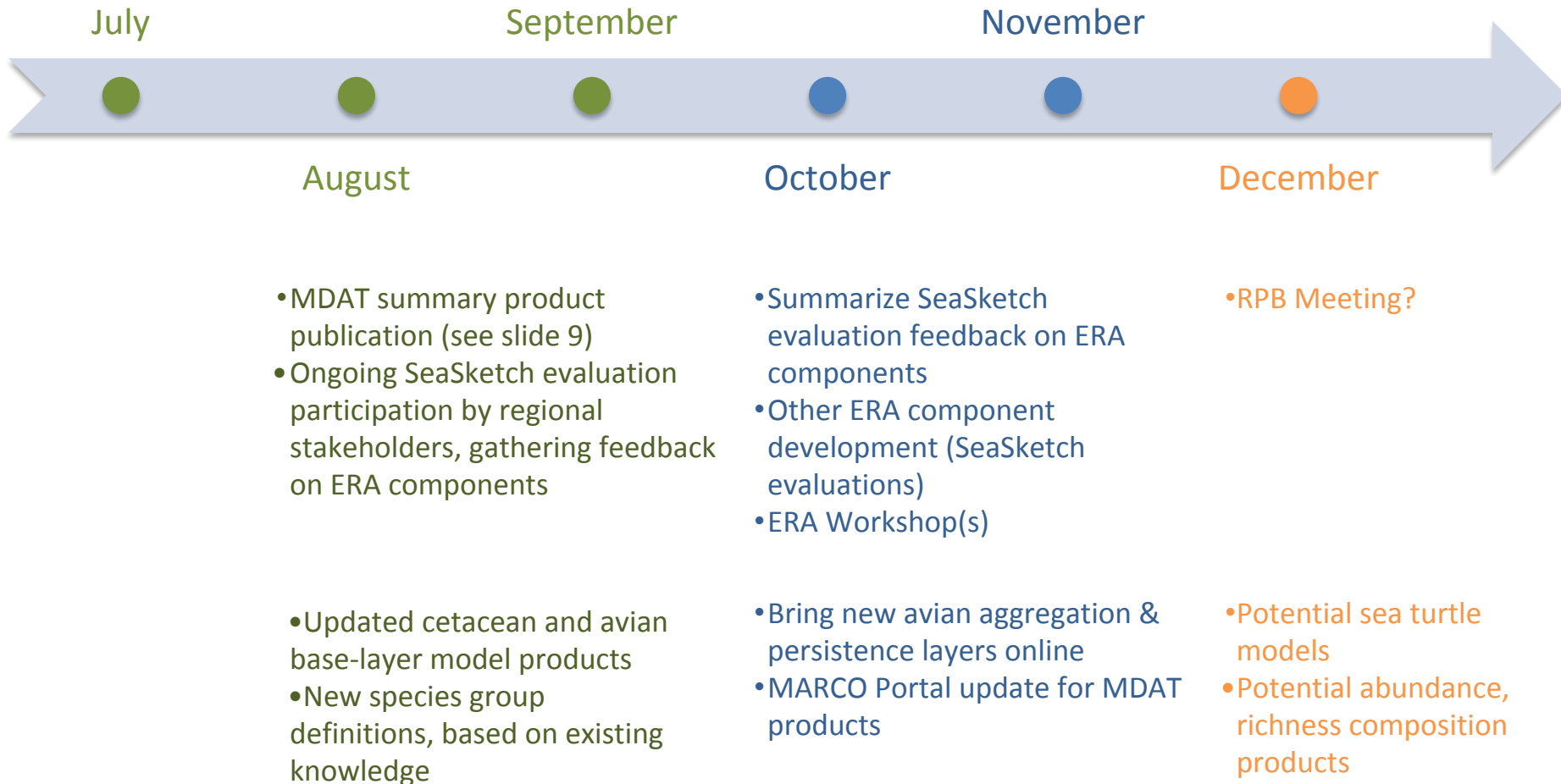


Component 1



Component 1

# MDAT Summer and Fall Timeline





## MDAT Summary

- MDAT data updates this summer and fall
- Continue to improve data communication
- Continue to work on ERA components

# ERA Workshop- May 19, 2017

- 49 participants (incl. 10 RPB entities) at St. Jones NERR- Delaware
- Objectives:
  - Enhance **understanding of data product development** to characterize the components and types of ERAs
  - Obtain stakeholder input on **opportunities and challenges** in **identifying** ERAs and **criteria for selecting a pilot** ERA
  - **Review efforts to collect expert input via “SeaSketch”** to help guide ERA data development
  - Solicit ideas for obtaining additional stakeholder input



# ERA Workshop Results

## Communications Needs:

- Immediate need for FAQ Fact Sheet
- More intuitive ways to understand data sets and metadata for non-technical users
- More widespread availability of SeaSketch as a visualization tool and its companion Data Guide
- Call for more workshops, webinars and online tutorials

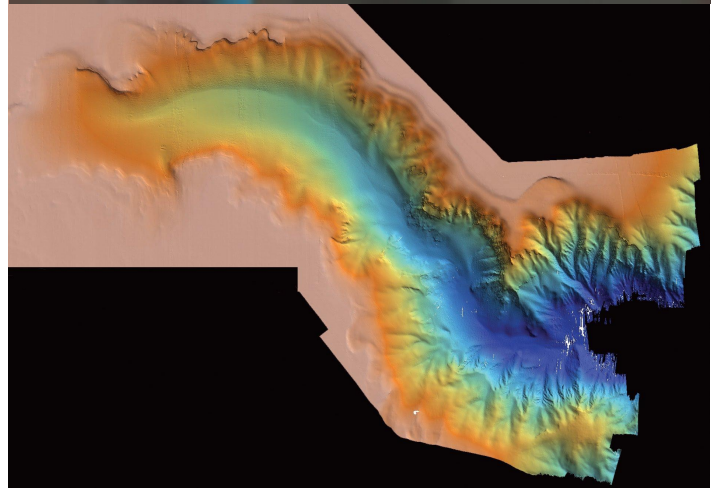
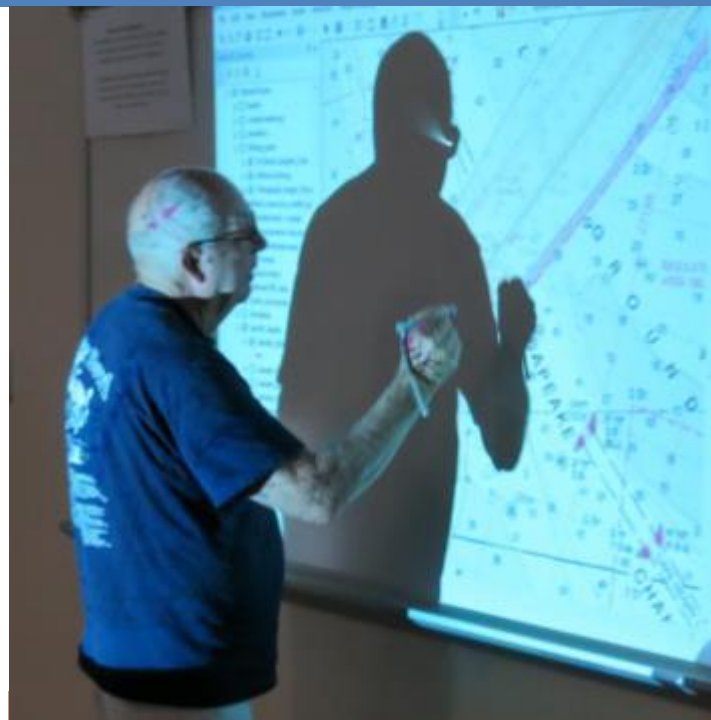




# ERA Workshop Results

## Data-related Questions:

- Are there still gaps in the core data and is the uncertainty level too high? Can we include opportunistic data?
- How will data be applied to each of the five ERA components?
- Can MDAT and ERA data development work be connected to Mid-Atlantic Fishery Management Council Essential Fish Habitat process?
- What level of synthesis is useful or not beyond the 5 components?



# ERA Workshop Results

## Process-related Needs/Questions:

- Clarity on peer review process for individual species models and data synthesis products
  - formal scientific peer review
  - stakeholder/public review
- Will all five ERA components be mapped for whole Mid-A before selection of a pilot?
- Does an ERA need to have at just one or all five of the components?
- Suggestion that pilot area should focus on complex area- with overlapping uses, resources, authorities
- When will human use information be considered?
- Clarity on content and intent of pilot area report

# ERA Work Group Recommendation for Next Steps

Follow the HOE Action #1 steps in the order stated in the Mid-A Regional Ocean Action Plan, but ***extend the timeline through March 2018***:

- July 2017
  - Develop ***ERA fact sheet*** with FAQs
  - Develop ***outline for sample ERA Report***
  - Schedule ***additional stakeholder engagement*** opportunities for August (e.g., MAFMC meeting?) through October to review:
    - draft component maps
    - sample outline for ERA reports
    - fact sheet with FAQs
- July - October 2017
  - Continue monthly ERA Work Group calls to:
    - discuss to what extent ***further synthesis of map layers*** is useful to decision-making
    - discuss ***criteria for selecting first area*** for a sample ERA report

# ERA Work Group Recommendation

- October 2017
  - Create ***draft maps illustrating the 5 components of ERAs***
- November 2017
  - Hold ***workshop*** to gather stakeholder input on data critical to characterizing components of and types of ERAs
- December 2017
  - Finalize and ***post ERA component maps*** on Ocean Data Portal
  - Finalize criteria for selecting first ERA on which to prepare a report
- March 2018
  - Select first ERA for report



# Discussion

