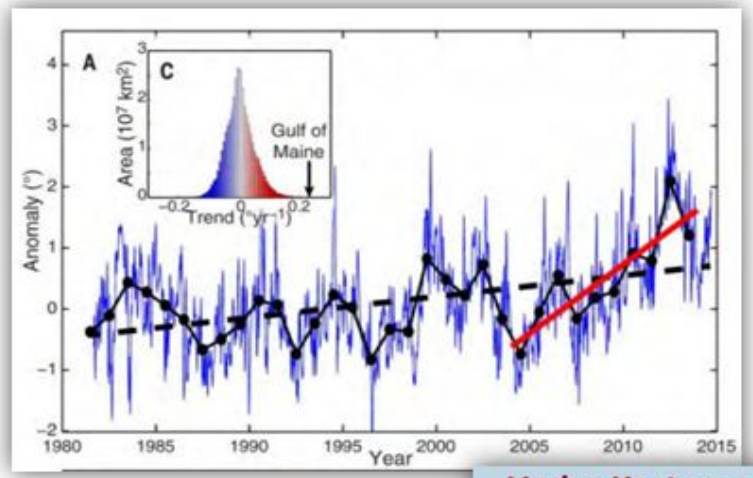
The Distribution Mapping and Analysis Portal (DisMAP)

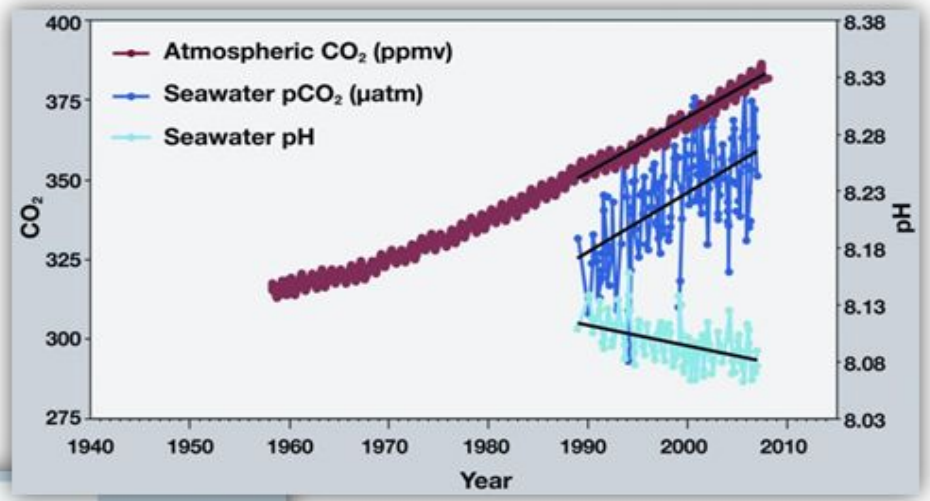
Melissa Karp
ECS tech, *in support of*, NMFS Office of Science & Technology
melissa.karp@noaa.gov

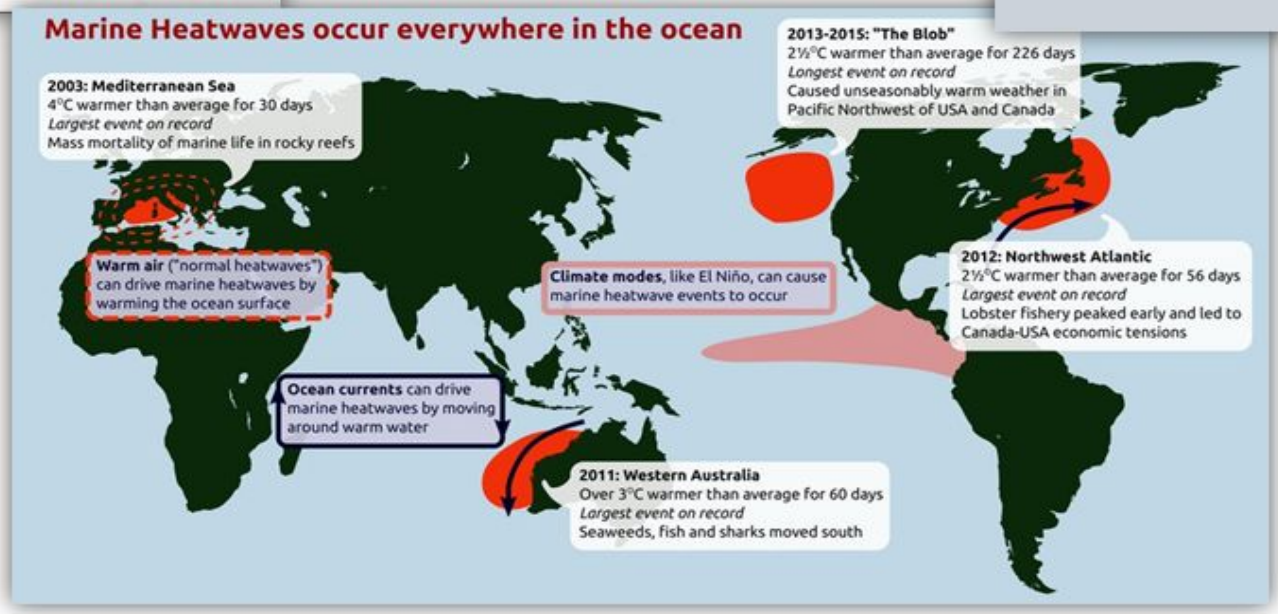
Outline

- Background and Motivation
- What is DisMAP?
- Key components
- Future directions
- Acknowledgements: The Team

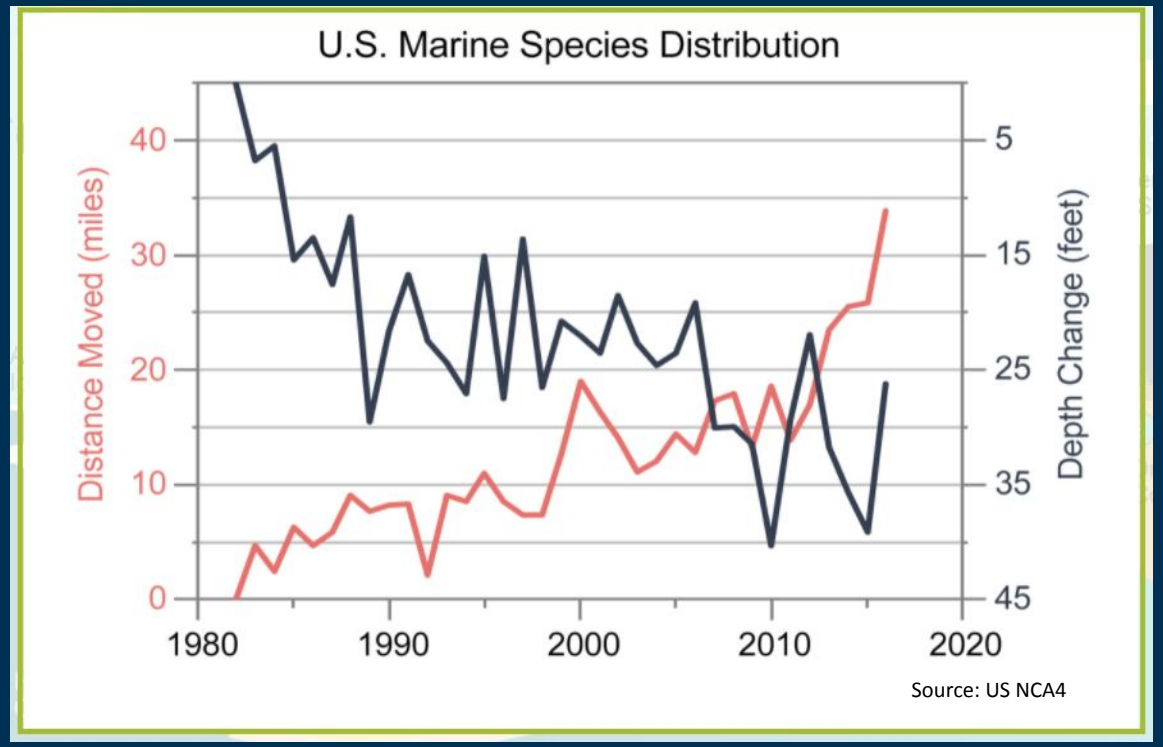
The Motivation For DisMAP

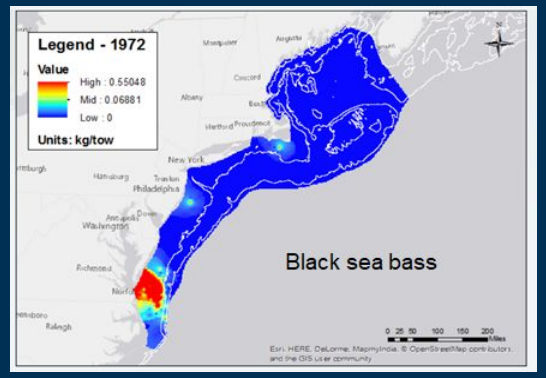


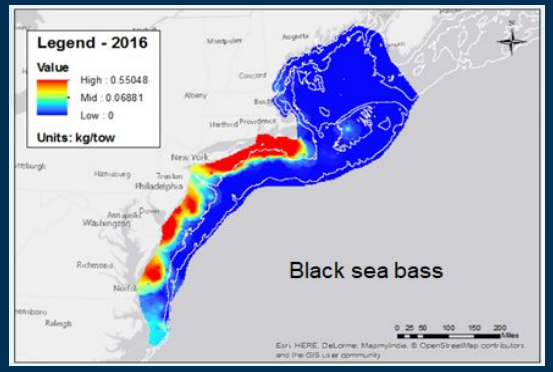




The Motivation For DisMAP







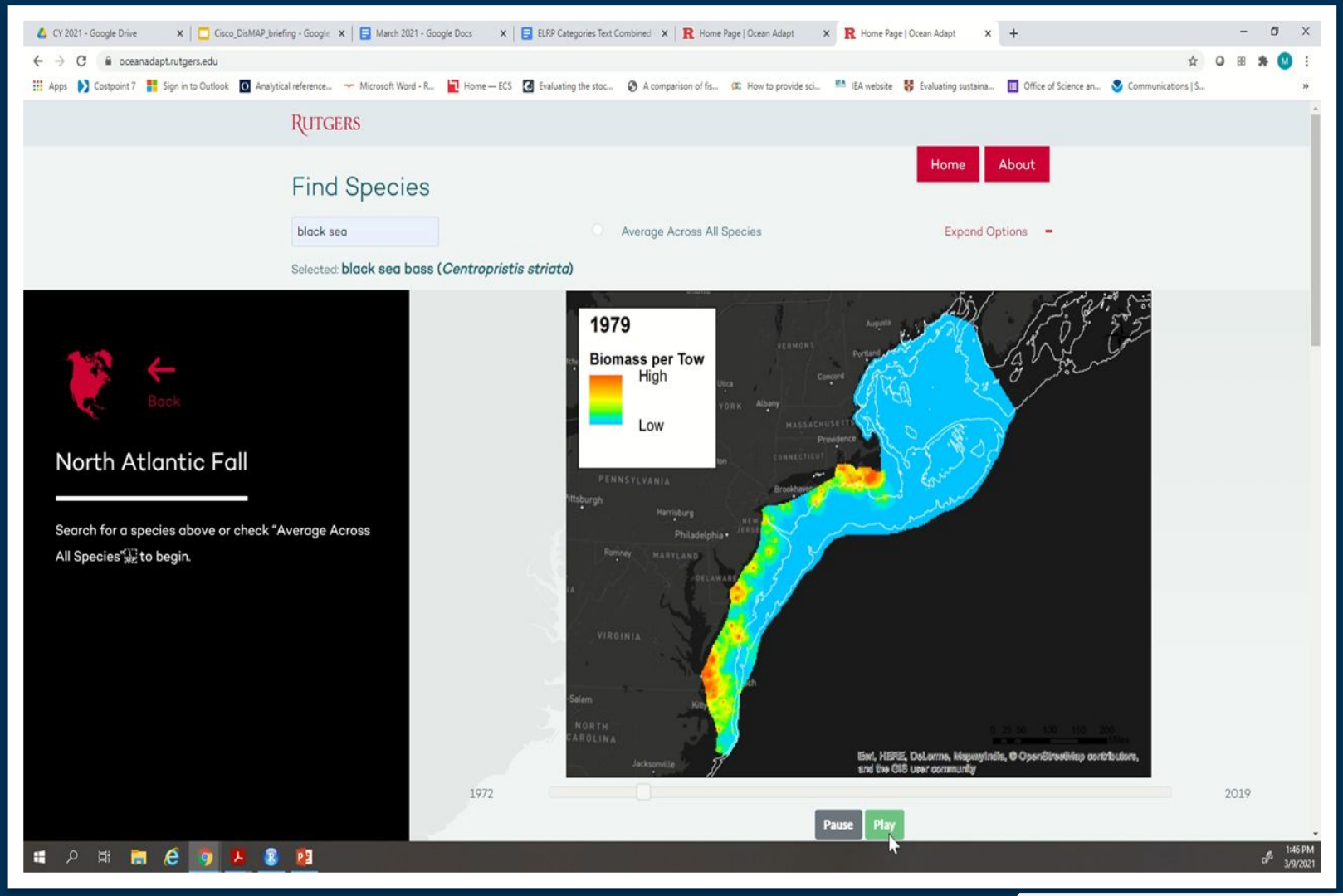
Source: OceanAdapt (https://oceanadapt.rutgers.edu/)

- Interest and need to understand species responses to changing environment
- One of the main goal of the study of ecology
- Management implications of changing distributions
- Collect extensive information on species distribution through surveys, but access and deliver is inconsistent across the regions

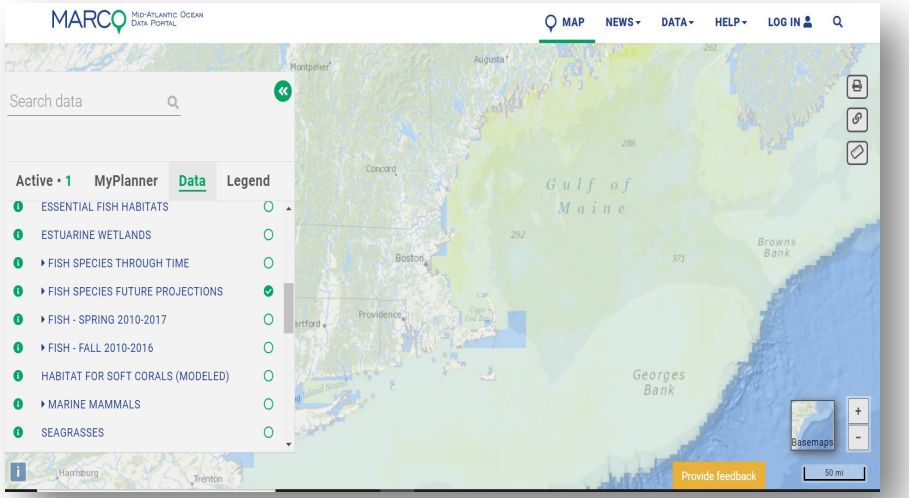
NOAA FISHERIES

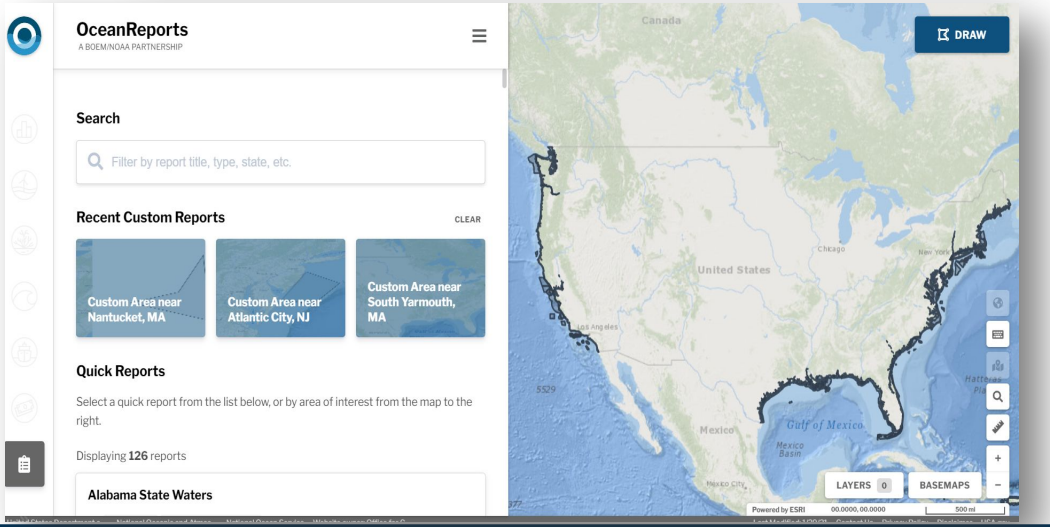
Successful Pilot: Ocean Adapt

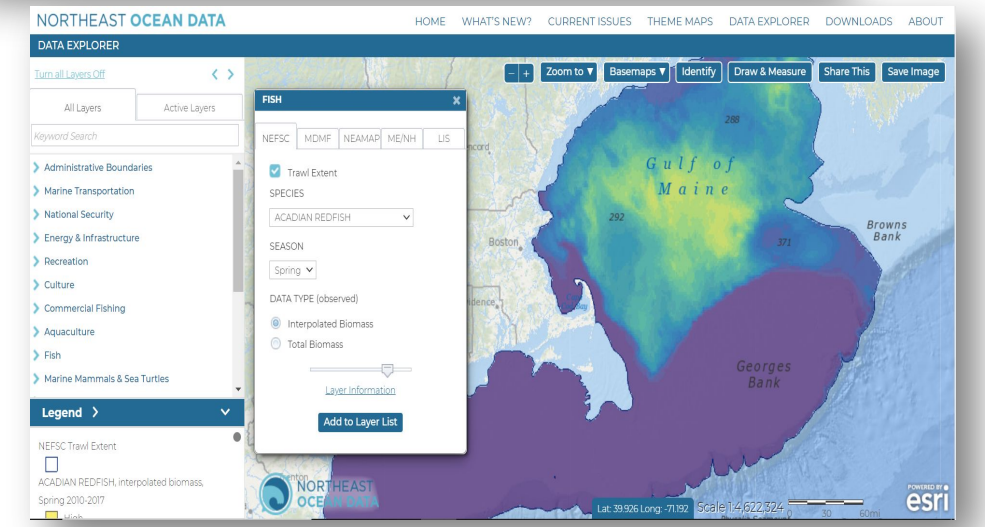
- Successful collaboration between NMFS and Rutgers since 2015.
- Provides information on historic and projected distributions for 300+ species
- Updated annually from NMFS and DFO trawl surveys.
- NMFS Assessment:
  - Limited platform
  - Growing demands
  - Recommendation to develop next generation portal



DisMAP Relative to Other Ocean Data Portals



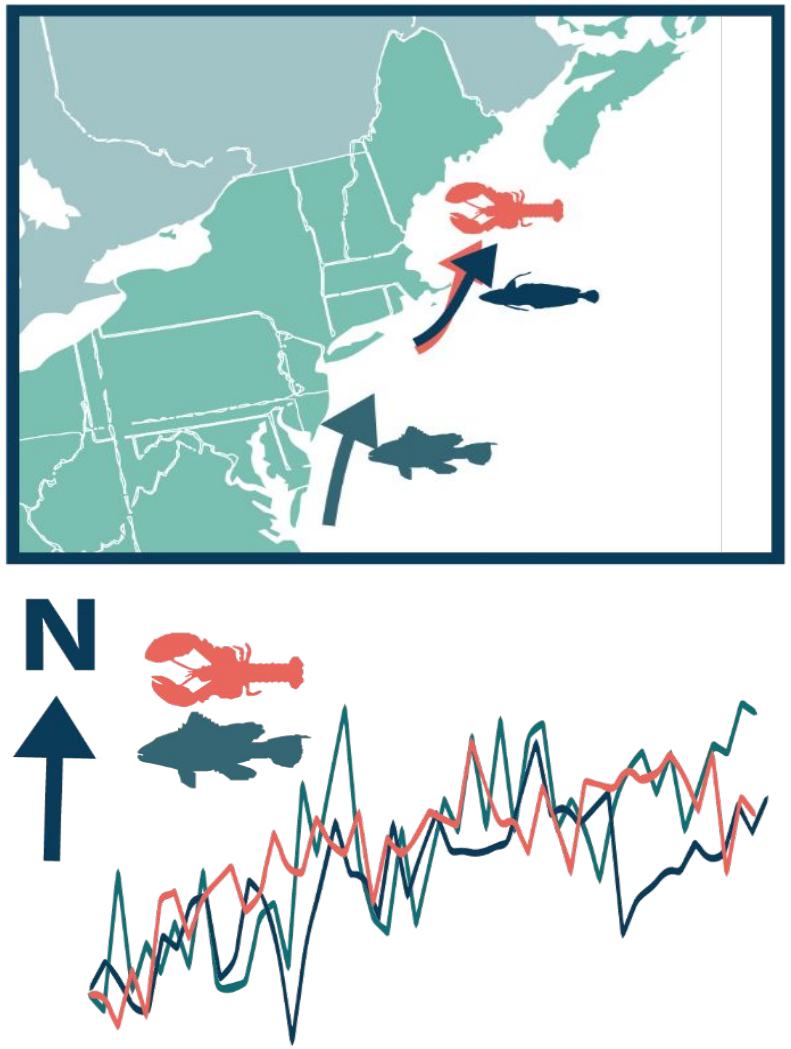




NOAA FISHERIES

The NMFS Distribution Mapping and Analysis Portal (DisMAP)

DisMAP is: A national online portal providing visualization and analysis tools to allow users to view, download, and dynamically interact with data to track and understand past and projected future distributions of marine species



Objectives:

- Make information on marine species distributions more accessible, usable, and useful to stakeholders
- Provide species distribution information across biogeographic and jurisdictional boundaries
- Provide consistent nationwide tracking and analysis of species distributions.
- Support and track development and advances in the field of species distribution modeling.
- Leverage and amplify investments and efforts.

The NMFS Distribution Mapping and Analysis Portal (DisMAP)

DisMAP will have five modules where users can interact with and explore the distribution data in different ways:

Single Species Distributions
Explore visual and numerical representation of several key metrics that define a species range and distribution and how they have or are projected to change over time.

Multispecies Overlap & Interactions
Explore species interactions, such as area or range overlap, within an area of interest and evaluate how those interactions have or may change over time.

Species Shifts & Human Interactions
Examine how availability of different fish species has or is projected to change under future conditions for different ports

Regional Summary
Explore how communities have changed at the regional level (e.g. species richness and diversity), and quickly view changes in key distribution metrics across all species in a region at one time.

Data Download
Search for species or regions (surveys) of interest to download the cleaned, standardized data to use outside the portal

Back-end: Data Compilation & Processing

Download Raw bottom trawl survey data from regional databases

Data processed in R using Ocean Adapt code

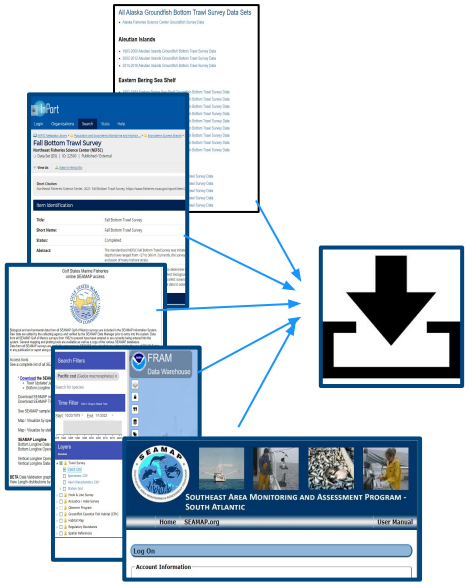
Biomass (wtcpue) for each station, year, season, species

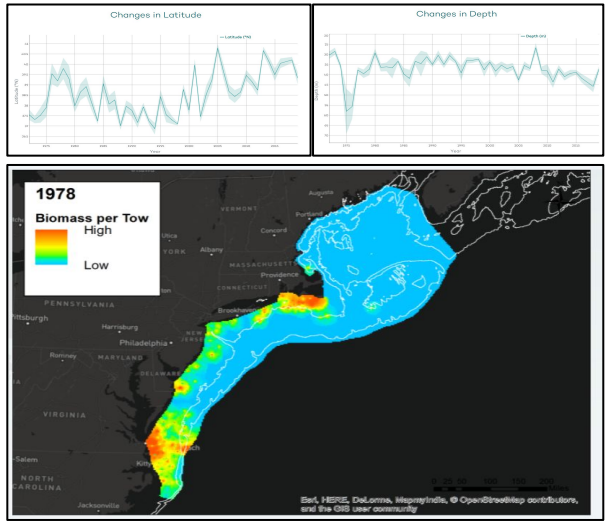
IDW interpolation method in Python

Interpolated biomass (by year and season) for each species (raster)

Calculate distribution metrics (e.g., COG, average depth, effective area occupied)

Upload to NOAA Geoplatform (ArcGIS online)





NOAA FISHERIES

NOAA FISHERIES

Find a Species | Fishing & Seafood | Protecting Marine Life | Environment | Regions | Resources | Services | About Us

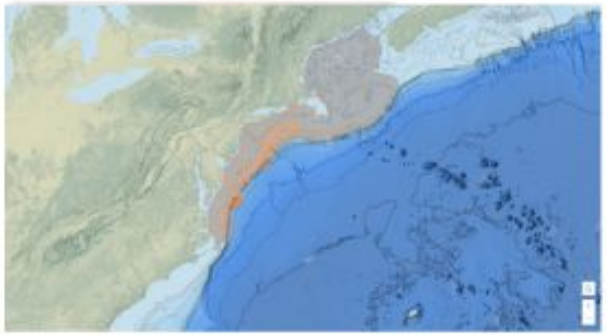
Distribution Mapping and Analysis Portal

Launch Portal

Marine species are shifting their distributions in response to climate change, and in the U.S, there is high and growing demand for species distribution information for use in fishery science and management and other ocean use decision-making (e.g., energy, transportation). Climate driven shifts in species distribution have implications for both management and science decisions. In order for managers and scientists to make informed decisions about how to adjust appropriately to changing distributions and species ranges, they require quick, easy, and reliable access to the most up to date information on current and future projected species distributions.

DisMAP

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Aliquam egestas, velit at condimentum placerat, sem sapien laoreet mauris, dictum porttitor lacus est nec enim. Vivamus feugiat elit lorem, eu porttitor ante ultrices id. Phasellus suscipit tellus ante, nec dignissim elit imperdiet nec. Nullam fringilla feugiat nisl. Ut pretium, metus venenatis dictum viverra, dui metus finibus enim, ac rhoncus sem lorem vitae mauris. Suspendisse ut venenatis libero. Suspendisse lorem felis, pretium in maximus id, tempor non ipsum Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat. Aliquam egestas, velit at condimentum placerat, sem sapien laoreet mauris, dictum porttitor lacus est nec enim. Vivamus feugiat elit loren, eu porttitor ante ultrices id. Phasellus suscipit tellus ante, nec dignissim elit imperdiet nec. Nullam fringilla feugiat nisl. Ut pretium, metus venenatis dictum viverra, dui metus finibus enim, ac rhoncus sem lorem vitae mauris. Suspendisse ut venenatis libero. Suspendisse lorem felis, pretium in maximus id, tempor non ipsum Lorem ipsum dolor sit amet,



Single Species

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat

Multi-Species Analysis

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat

Port Availability

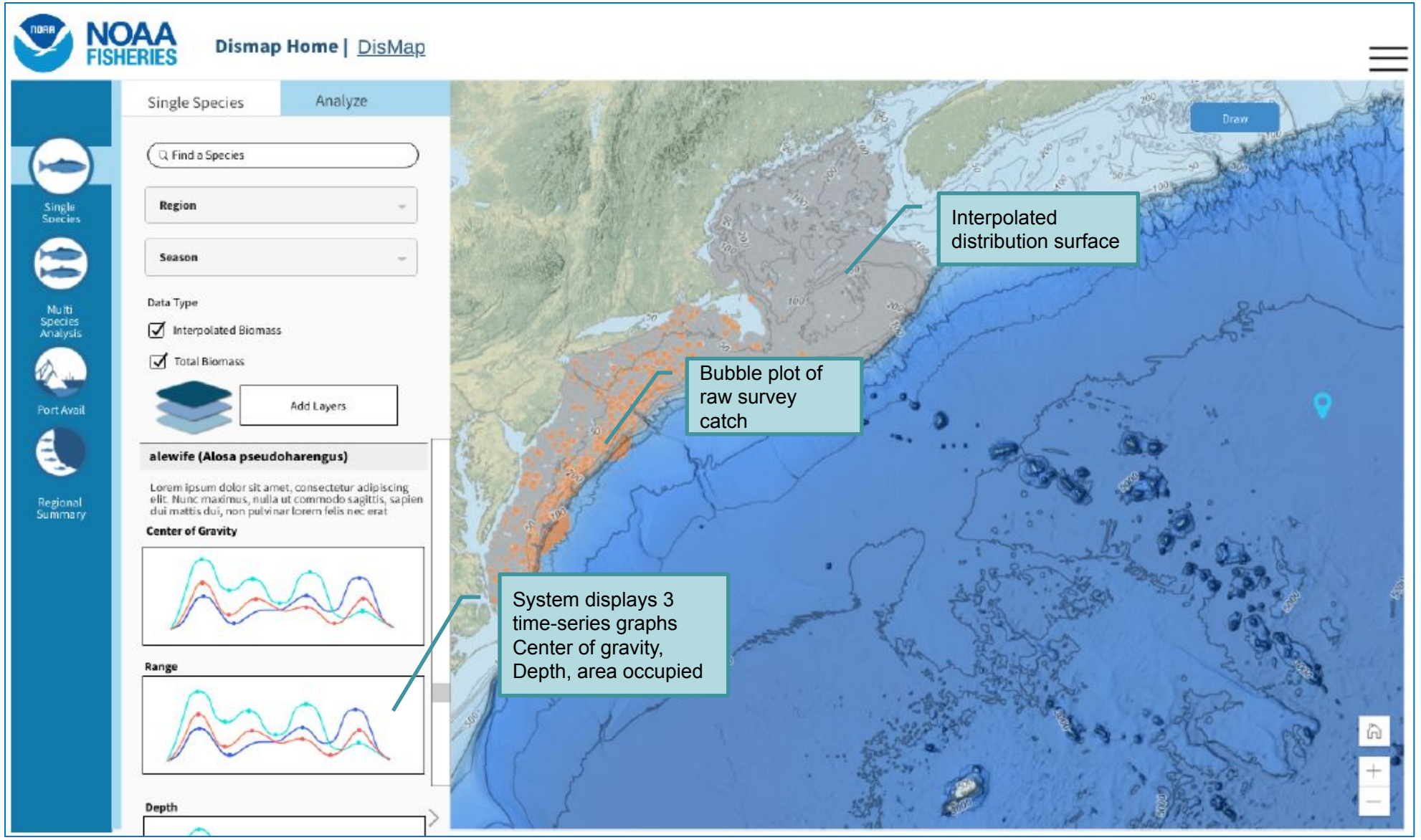
Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat

Regional Summary

Lorem ipsum dolor sit amet, consectetur adipiscing elit. Nunc maximus, nulla ut commodo sagittis, sapien dui mattis dui, non pulvinar lorem felis nec erat

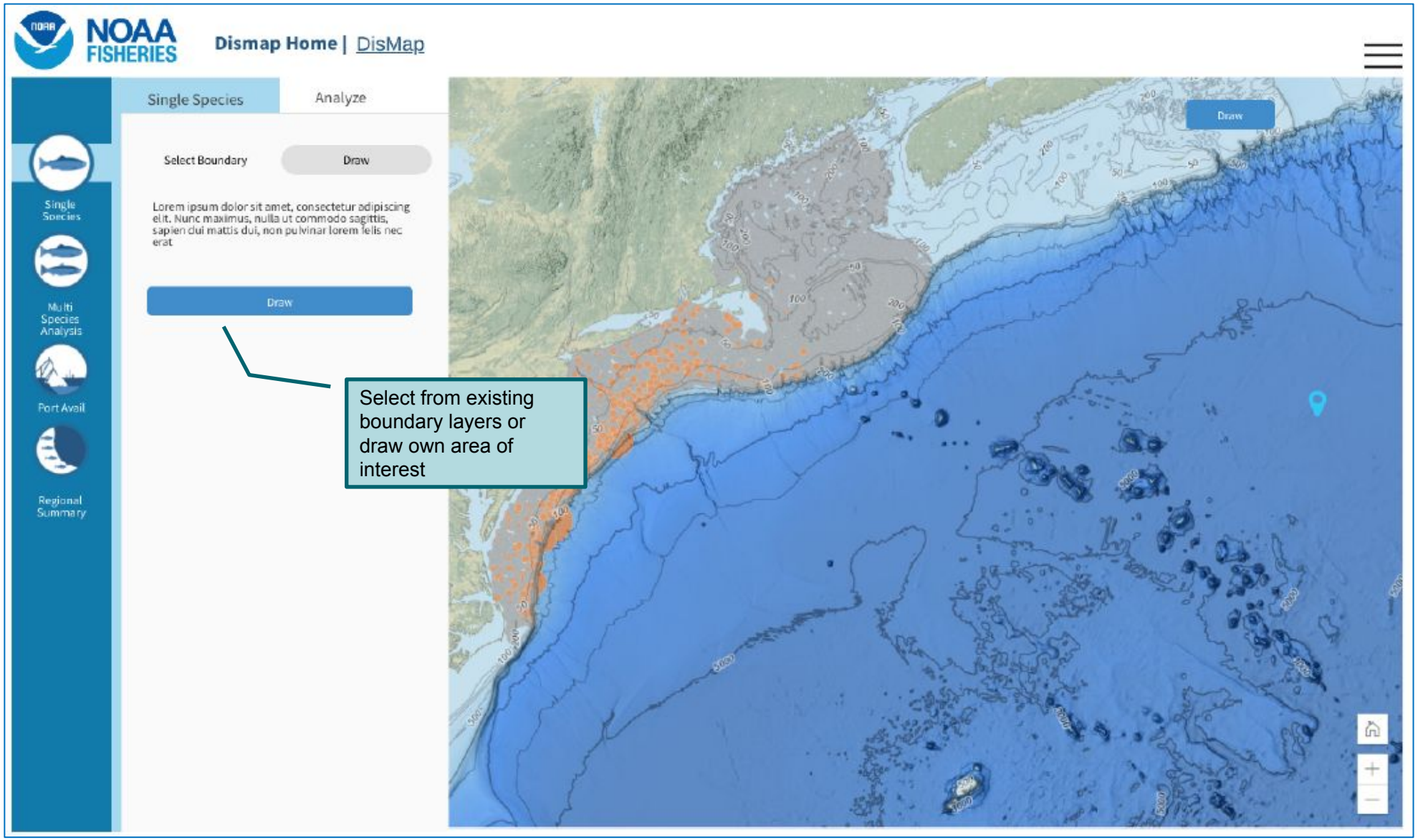
Key Features of DisMAP *beta*

Single Species Distribution Shifts



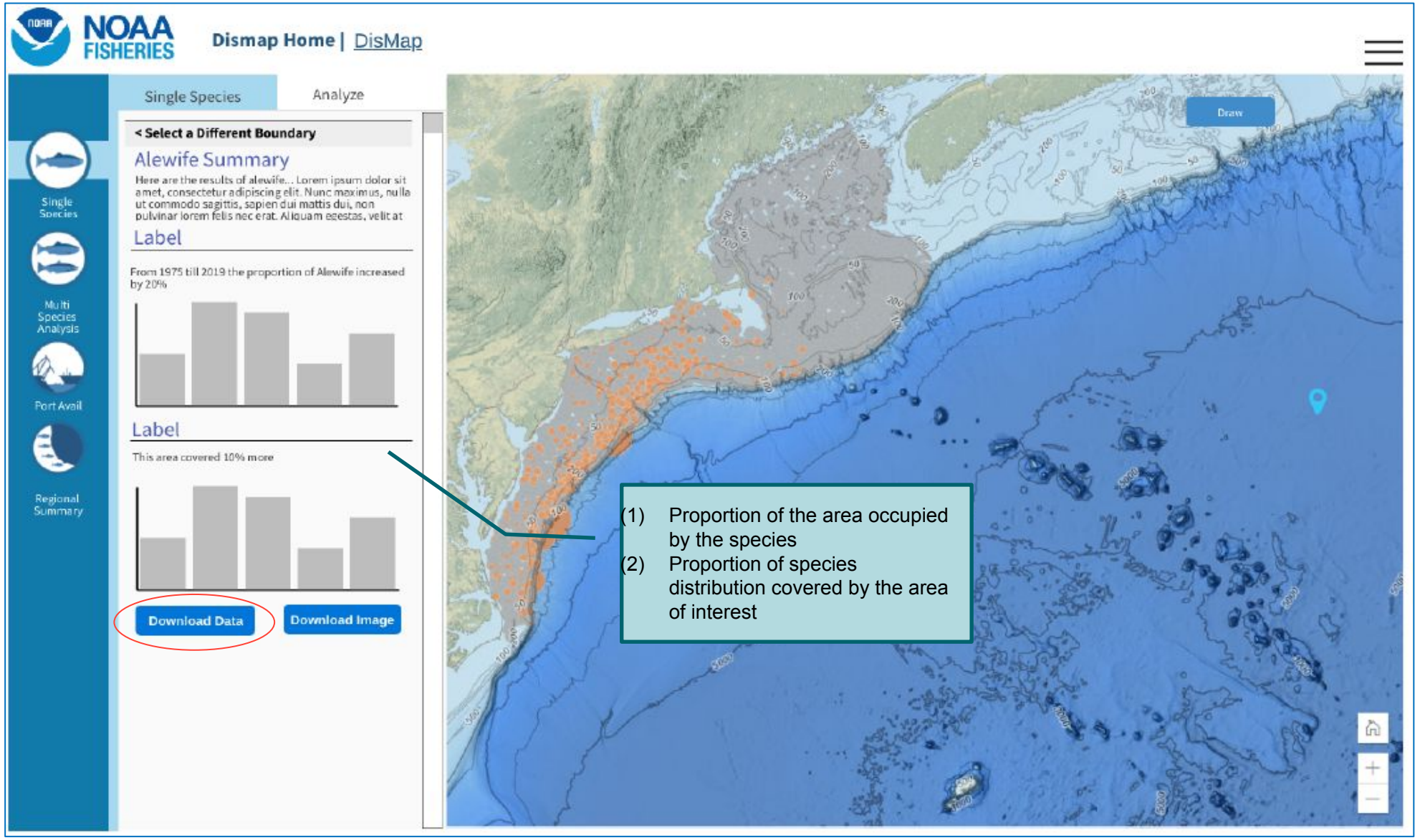
Key Features of DisMAP *beta*

Single Species Distribution Shifts



Key Features of DisMAP *beta*

Single Species Distribution Shifts

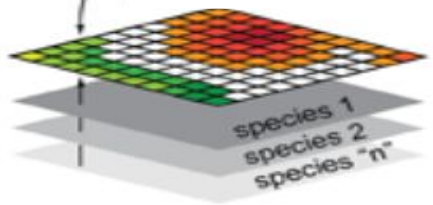


Key Features of DisMAP *beta*

Regional Summary Module

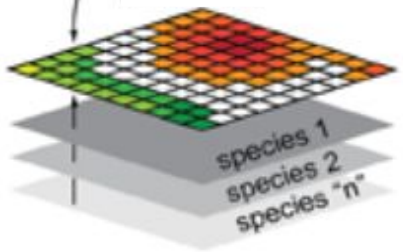
Species Richness

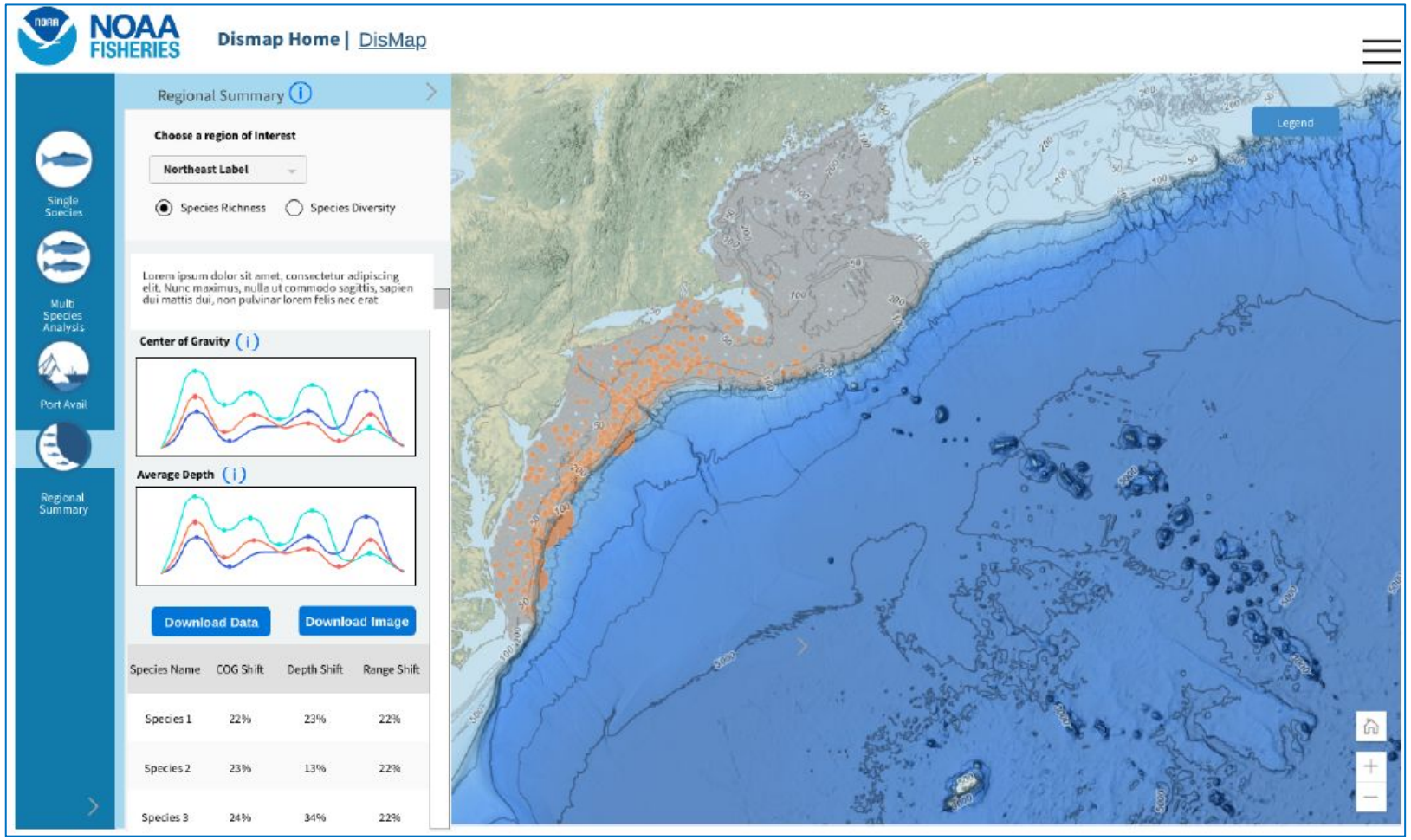
total # of species found (interpolated wtcpue >0) in each cell



Species Diversity

Index of the total # of species and their relative proportion in each grid cell





images modified from Northeast Ocean Data Portal

WHO WILL USE THE PORTAL AND HOW?

NON-TECHNICAL USERS

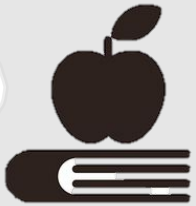
FISHING INDUSTRY

- Prepare for changing fishing conditions and opportunities

GENERAL PUBLIC

- View and interact with maps and graphs
- General interest, knowledge, awareness

EDUCATION, COMMUNICATION, OUTREACH



- Communicate and educate on the impacts of climate change on fisheries

TECHNICAL USERS

ACADEMIC RESEARCHERS

- Hypothesis testing and data exploration to inform future research efforts

FISHERIES SCIENTIST (SCIENCE AGENCIES)

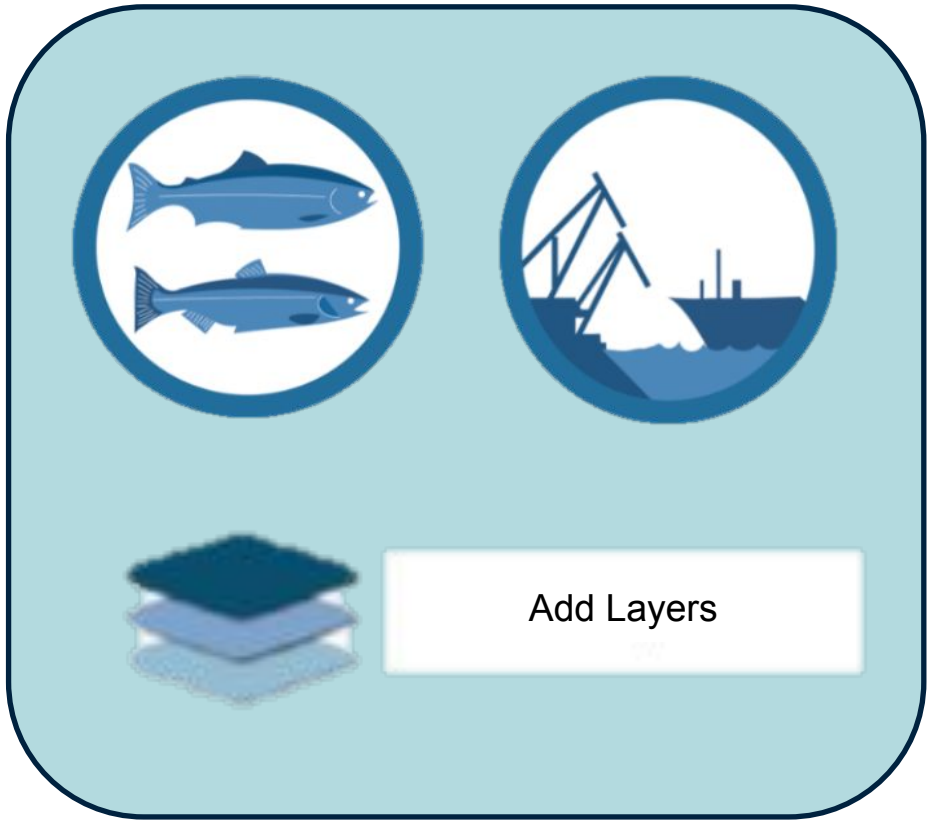
- Evaluate/inform survey designs
- Identify and understand changes in stock boundaries
- Download data to explore outside of portal

FISHERIES MANAGERS

- Inform/evaluate spatiotemporal closures
- EFH designations
- Jurisdictional allocations
- Fishing community vulnerability

Planned for Future Releases

- Interpolated maps and distribution metrics updated annual
- Multispecies Overlap & Interactions and Species Shifts & Human Interactions
- Developing plan to review and pull in statistical SDM output developed by Science Center Staff and Partners
- Other survey data sources
- Additional layers to include on map (e.g. environmental conditions (sst, salinity, Ocean acidification?), protected areas, Others?)



Steering Committee

Melissa Karp
NMFS OST - ST4
Project Manager

Roger Griffis
NMFS OST - ST7

Jay Peterson
NMFS OST - ST7

Patrick Lynch
NMFS OST - ST4

Corrine Bassin
NMFS OST - ST4

Mike Lewis
NMFS OST - ST1

Wendy Morrison
NMFS OSF

Hassan Moustahfid
IOOS

Jim Thorson
AFSC

Kevin Craig
SEFSC

Scott Large
NEFSC

Elliott Hazen
SWFSC

Isaac Kaplan
NWFSC

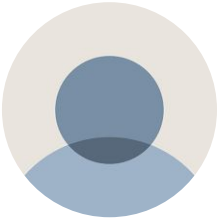
Don Kobayashi
PIFSC

Phoebe Woodworth-Jeffcoats
PIFSC

Development Team

Melissa Karp
NMFS OST - ST4
Project Manager

Kristan Blackhart
NMFS OST - ST4



Scott Sauri
NMFS OST - ST6

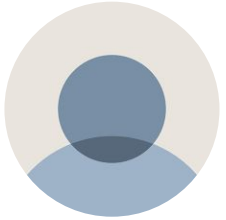
Tim Haverland
NMFS OST - ST6

John Kennedy
NMFS OST - ST6

Roger Griffis
NMFS OST - ST7

Patrick Lynch
NMFS OST - ST4

Elizabeth Chilton
NMFS OST - ST4



Dan Forrest
Rutgers – Ocean Adapt

QUESTIONS

NOAA FISHERIES

Front-end: Data Management

The NOAA GeoPlatform (ArcGIS Online) will be used to store and access processed DisMAP data, including:

- Imagery layers to provide access to gridded data: interpolated species biomass, species richness, and species diversity
- Hosted feature layers to provide access to survey observation points, with one service per data series.
- Area layers, to be used for general orientation and focused analysis (e.g. area overlap analysis)
  - Jurisdictional Authority & Allocation Areas
  - Fishery Management Areas
  - Ecological Production Units (EPUs)
  - Marine Protected Areas
- Oceanographic & Habitat Conditions layers
  - Sea Surface Temperature
  - Ocean Acidification layers??
- Tabular data that supports the application:
  - Indicators - year-based indicators calculated for each species within a data series. The indicator tables will provide data for graphs in the application.
    - Center of Gravity (COG)
    - Area Occupied
    - Depth