## The Northeast Regional Habitat Assessment: A collaborative, multi-disciplinary project to develop decision support products for marine fish habitat management

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# NRHA Goal: To describe and characterize estuarine, coastal, and offshore fish habitat distribution, abundance, and quality in the Northeast.

Four actions were identified as necessary to meet this goal:

1) Inshore fish habitat assessment

- a) Fish distribution and abundance
- b) Habitat distribution, status, and trends
- 2) Habitat vulnerability including response to changes in climate,
- 3) Spatial descriptions of species habitat use in the offshore area, and,
- 4) Habitat data visualization and decision support tools.

## **Acknowledgments**

#### **The Steering Committee:**

Mid-Atlantic Fishery Management Council - Christopher Moore New England Fishery Management Council - Thomas Nies Atlantic Coast Fish Habitat Partnership - Lisa Havel Atlantic States Marine Fisheries Commission - Bob Beal (designee Patrick Campfield)

Duke University, Marine Spatial Ecology - Patrick Halpin Monmouth University, Urban Coast Institute - Tony McDonald National Fish Habitat Partnership, Science and Data Committee -Gary Whelan

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NOAA NCCOS Marine Spatial Ecology Division - Mark Monaco NOAA Fisheries Office of Science and Technology - Peg Brady, Tony Marshak

NOAA Northeast Fisheries Science Center - Thomas Noji (retired), Dan Wieczorak

The Nature Conservancy - Kate Wilke

#### **Action Teams:**

Gulf of Maine Research Institute - Kathy Mills Maryland DNR - Marek Topolski Massachusetts DMF - Mark Rousseau NOAA Fisheries GARFO - David Stevenson, Alison Verkade, NOAA Fisheries NEFSC - Kevin Friedland, Donna Johnson, Ryan Morse, Dave Packer, Vince Saba, Harvey Walsh NOAA NCCOS - Andrew Leight The Nature Conservancy - Bryan DeAngelis, Rich Bell, Marta Ribera The PEW Charitable Trusts - Zack Greenberg Rhode Island DEM - Eric Schneider US Fish and Wildlife Service -Julie Devers US Geologic Service - Stephen Faulkner Virginia Institute of Marine Sciences - Robert Latour

NRHA/FSCVA/HCVA Crosswalk: UMass/SMAST Gavin Fay and Madeleine Guyant, and Project CoPIs, Mike Johnson, Tauna Rankin, Wendy Morrison (NOAA Fisheries)

**Other Collaborators:** David (Moe) Nelson (NOAA NOS), Aaron Kornbluth (PEW), Lisa Havel and Pat Campfield (ASMFC/ACFHP), Karl Vilacoba, Emily Shumchenia, and Nick Napoli (MARCO/NROC), Sarah Gaichas and Kim Hyde (NOAA Fisheries NEFSC), and Emily Farr.

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# Focus Species (65+, important to managers)

- **Mid-Atlantic Council:** Atlantic and chub mackerel, butterfish, longfin and shortfin squid, surfclam, ocean quahog, summer flounder, scup, black sea bass, bluefish, golden and blueline tilefish, spiny dogfish
- New England Council: Cod, cusk, haddock, pollock, Acadian redfish, plaice, halibut, winter flounder, witch flounder, yellowtail flounder, wolffish, windowpane, ocean pout, offshore, red, and white hake, monkfish, Atlantic herring, salmon, skates (seven species), red crab, sea scallop
- Additional Atlantic States Marine Fisheries Commission (ASMFC): Eel, lobster, croaker, menhaden, striped bass, Atlantic sturgeon, black drum, cobia, horseshoe crab, Jonah crab, northern shrimp, red drum, shad and river herring, Spanish mackerel, spot, spotted seatrout, tautog, weakfish, coastal sharks
- Highly migratory with Habitat Areas of Particular Concern (HAPC) designations: Sandbar shark, dusky shark

## **Assessment Products at a Glance**

#### Data inventory

- Catch data from state and federal fisheries-independent surveys; including comparison table
- Environmental datasets (used as model covariates)
- Gathered habitat data sets (oysters, SAV, etc.) but not displayed
- One page metadata document for each survey or data set

#### Habitat use

- Species profiles: Summarize life history and habitat use for each focus species
- Stage-based, single species and joint species distribution models (SDMs)
- Inshore Habitat Report

### **Climate vulnerability - Species-Habitat Crosswalk**

- Species-habitat matrix and climate vulnerability narratives

### Fish Habitat data visualization and decision support tools

- NRHA Data Explorer: R-Shiny application used to show trends in species distribution and abundance at state and regional scales, and to share other products and documentation
- Working with partners at Mid-Atlantic Ocean Data Portal, Northeast Ocean Data Portal, and possibly NOAA DisMAP to share selected products

## Scientific publications/reports

Community-level Basis Function Modeling methods paper, R package; Optical paper in development

#### **Data inventory**

A	В	С	D	E	
Name	Region	Inshore/Offshore	Source	Туре	Data
Simple Ocean Data Assimilation (SODA3.3.1)	Entire Atlantic Co	Offshore	NOAA, University of	Point	botton
Northwest Atlantic Regional Climatology		Offshore	NOAA		surfac
NOAA OI SST V2 High Resolution Dataset	Global	Offshore	NOAA	gridded	Surfac
HYCOM + NCODA Global 1/12° Reanalysis	Global	Offshore	COAPS	gridded	3D Hi
Ocean Acidification tool for the Chesapeake Bay	Chesapeake Bay	Inshore/Offshore	VIMS/NOAA	gridded	surfac
NARR Model based (assimlated, reanalysis)		Offshore	NOAA		High-r
eMOLT		Offshore	NOAA		Botton
Estuarine salinity zones in US	US	Inshore	NOAA	shapefile	Salinit
NASA Ocean Color	Global		NASA		ocean
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NOAA NMFS Water Column Properties Data	NC to Maine	Offshore	NOAA	spredshe	e sufrace realtim
USGS Water Data for the Nation	US		USGS		
Chesapeake Bay Program Water Quality	Chesapeake Bay	Inshore	Chesapeake Bay P points		physic
Seafloor Salinity (pss)	Global	Inshore/Offshore	Marine Conservation	shapefile	botton
Salinity Zones for the Gulf of Maine	Gulf of Maine	Inshore	Fish and Wildlife Se	gridded	Salinit
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#### **Model-based Approaches**

Predicted probability

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Model comp

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vellowtail flounder

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YEAR

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Model Distribution Variance explained Species correlation matrix

Left pane is true catch and right pane is predicted catch

#### **Inshore Fish Data**



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#### Metadata (1-pagers)

usSEABED								
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In addition to quantified lab-derived data, the datasets of usSEABED also include estimated numeric values for those typical seabed characteristics—nofed above—based on the extensive accumulation of word-based data in U.S. waters. These data are rich in information but were previously difficult to guartify, map pluot, or use in bese descriptive data-from short sentences, small essays, or

Intellet descriptive calasimitation software tenentics, simal testagi, or single phrases —are treated as a mathematical equation that is considered as a whole. Filters based on fuzzy set theory assign relative weight to each word in the description, and estimate the values of testaual and other parameters. In addition, the testaual implications of one-testaual terms—such as "broken shell" or

The resulting numeric data, now useable in a GIS or model, should

be considered "fuzzy": that is, they give an approximation-not a

rigorous measurement-of the assessed values.

kiloigical data. seaments including core ways, sensitiv descriptions, photos, and videos, as well as the more standard numeric data from a laboratory were classifie using Foik and Shepard systems. Statistical comparisons are made between lab-based and word-based outputs as a ground truth to improve trassification. The goal is accurate classification within

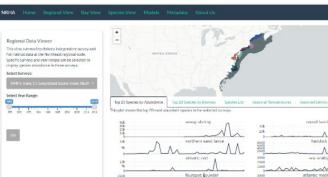
#### Data Caveate

Series want actistions have been made but overall ustEABED has not been updated since 2002. Absences cannot be assumed because data is based on observation records. Additionally, much of the database is based on descriptive data is calcisationalizations are estimates and not exact measurements of grain size. Lastly, due to limitations in sample gare unSEABED does a poor job representing larger selement such as obdetes, boulders and bedickd, outcypts. Data Access

usSEABED data is available for download and is broken into three regions, Pacific Coast, Gulf of Mexico and Caribbean and Labechezu olasi a available en operatoria ano la torixen nino timor regiona, planto Coals, Qui ol intexico ano Cantoo Affanto Coals, Digital data castargi https://toostatama.manine.ugg.govitata/orailosabed/data.htm The sediment data sources included in usISABED: https://www.ugg.govitata-noilos/ussebed/data.htm Contact: Brain Bucchowski Woods Neio Coastal and Marine Science Center DeucinowskiQitugg.pvr 508-457-2381

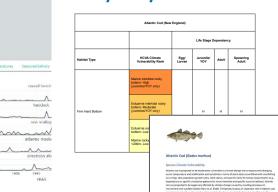
Citation Buckhowski, B.J., Reidi, J.A., Schweitzer, P.N., Cross, V.A., and Jenkins, C.J., 2000, vs5EABED—Othione surficial-sedment database for sample within the United Bases Exclusive Economic Zone. U.S. Geological Europy data release, https://doi.org/10.0006/PHVLC/MM.

#### **Data Explorer**



## **NRHA/CVA/HCVA Crosswalk**

southern extent of the range due to projected increased temperature (Drinkwater 2005; Fogarty et al. 2008; Pershing et al. 2015; Planque and Fredeu 19996.



#### Lots of Reports...

#### Species Profile - Black Sea Bass (Centropristis stripto)

#### Species range and distribution

Black was have range from southern Nova Sentia and the Bay of Fandy (Senti 1988) is southern Florida (Boven and Avise 1999) and into the Gulf of Mexico.

Habitat characteristics and habitat use by life stage

East and largue. Loss and largue are pelasic, and more more abundant in more durits of 10-40 m and Light an instance Light into interest in periods, interest and instance and interest and interes Back and have egge also extra infragately in large bays such a Bazzach Bay, XA (Stone et al. 1994), but are not in Long Mand Sourd (Oberlinan and Stat 1952, Wheedand 1959, Exclude 1959), and about in Namputent Hay RI (Hourse and Grouni 1989) and Delaware Bay (Wang and Karselan 1979).

While black was have use collected close to share on the continental shaff, they mady secon within outpurso. After et al. (1993) openitized that most large satile in new shore contractiol shaft habras and they move into columne mayorice where post-satilement stage junctiles can be abundant.

Young of the Year Joveniks: Larvae hands from eggs at 1.5.2.1 mm TL and settle to the bottom as early promotion at 30-16 mm TL (Kandall 1977; Falsey 1987; Alsis et al. 1999) primarily in numerious shall array in dells (og surfdarss) and samly substrate, then more into estantize numery atous on shallow (530 m, mody (20m) dellifsk, spong, impliped labitit, also szanas bels, söbit hásitas, mi mas-mak sinarrez. They as medy found on new-registed ondy interdid fats and baches and in depar, mailly batam liveffalses areas, recently setled fait even in accumulations of dell on and subtrata, complex micro toocgraphies on research day, on rocky reefs, and on weeks (Able et al. 1995).

Investion annexes to be most abandent in acceptic statem and achibating springs of mass extension has on secur at salirities as low as 8 ppt (Drohen et al. 2005). Joseniles can be reliatively common in estartic south of Cape Cod, and are found in estuaries such as Narragament Bay, Long Island Sound, the Hadson-Raitas emary, Gear Bay (NI), Delevare Bay, Chesaptale Bay and Hilstaries, as well as many ostarios father scale feer references cited in Dolan et al. 2005).

Within entracies, young fish use shallow the life haryster and emerally sponge (including Microclone prolyters; ampleped (dependent addars), surgerso helds (dependity Rappia op.), and cabile labitant an well as marmedic observers such as whereas, pillings, wereks, neeks, each and conch pos (see reference ofted in Donhan et al. 2005). Each jurnalies are rare on an equitated sandy interdied fats and buckles (Allen et al. 1978) as well as deeper, modely bottoms (Richards 1963b). According to Able and Fahar

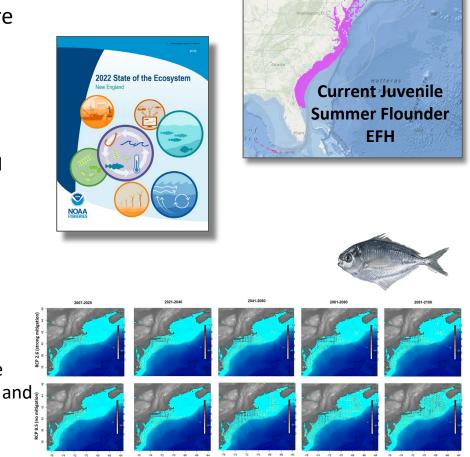
	+	
Regional Data Viewer	-	
This view summarizes fishery independent survey and fish habitat data at the Northeast regional scale. Specific surveys and year ranges can be selected to dipley specifies admittene in those surveys.		UNITED STA

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# Selected applications for NRHA products

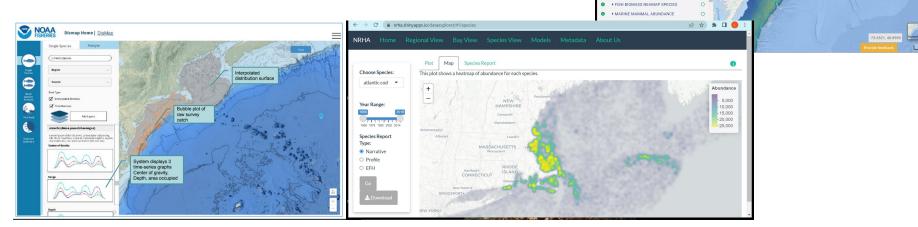
## **Applications for NRHA Products**

- Essential Fish Habitat: NRHA provides more specificity on which environmental factors influence species distribution
  - o EFH text descriptions and maps
  - Habitat area of particular concern (HAPC) designations
  - Potential for shifts due to climate change and adaptive approach with automated updates
- State of the Ecosystem Reports: NRHA provides habitat and climate change information on managed species
- Single Species Assessments: Addresses Ecosystem TORs (e.g. butterfish 2022)
  - NRHA provides historic distributions and projected distributions due to climate change
  - Links between environmental drivers stock health and recruitment



## **Publicly Available Data Portals**

- Intent is to make NRHA products as widely available as possible
- Northeast Ocean Data Portal
- Mid-Atlantic Ocean Data Portal (MARCO)
- NMFS Distribution Mapping and Analysis Portal (DisMAP)
- NRHA Data Explorer (R-Shiny)



Active Lavers (2)

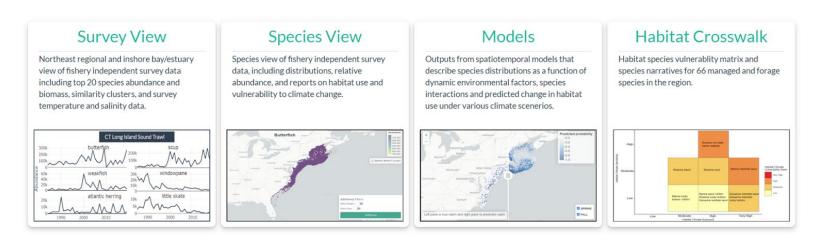
MARCO

O MAP NEWS-

## **NRHA Data Explorer Demonstration**

## Available here: <a href="https://nrha.shinyapps.io/dataexplorer">https://nrha.shinyapps.io/dataexplorer</a>

Welcome to the Northeast Regional Habitat Assessment Data Explorer



This application shares products from the Northeast Regional Marine Fish Habitat Assessment (NRHA) and provides tools to explore fish habitat data\*, with an emphasis on habitat use at different regional scales and by diverse fish and shellfish species in the Northeast. For more info about our history and team see About Us.

\*Dataset displayed on this site in summary format have associated caveats related to the collection of these data and their use. Please refer to the **Reports page** for additional details on each dataset, including contact information to obtain the source data. NRHA did not create the data and cannot guarantee its accuracy, or its suitability for use for other applications. NRHA encourages proper use and attribution of any datasets summarized on this site. Interested parties should directly contact the data providers noted in the metadata inventory for additional details on these data and their proper use.