

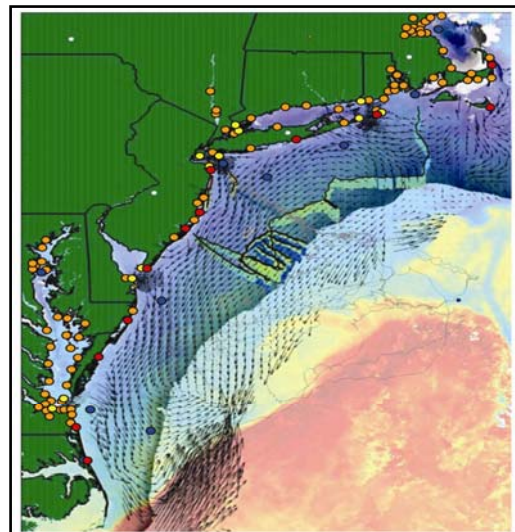
## Developing Ecological Indicators for Spatial Fisheries Management using Ocean Observatory Defined Habitat Characteristics in the Mid-Atlantic Bight

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Defining habitat indicators for fishery resources is challenging due to the complex interactions between marine ecosystems and physical forcing. Ocean observatories now sample at the broad spatial and fine temporal scales required to describe the dynamics effects of physically forced habitat features on fish distributions in coastal marine ecosystems. This project, funded by the NOAA Fisheries and the Environment (FATE) program, will develop spatially and temporally explicit habitat indicators useful for fisheries management from analyses merging North East Fisheries Science Center (NEFSC) bottom trawl fisheries survey data with Mid-Atlantic Regional Coastal Ocean Observing System (MARCOOS; <http://marine.rutgers.edu/cool/>). Specifically, we will use community and single species statistical models to relate fisheries resources to pelagic and benthic habitat variables measured between 2003-present. The habitat indicators derived from this analysis could become a standard statistical tool used with ocean observatories for the prediction of spatial changes in fish community structure and abundance in near real-time.

### Approach

We propose to merge NEFSC bottom trawl stock assessment surveys (MAB) with coastal ocean data collected by the Mid Atlantic Regional Ocean Observing System (MARCOOS), a component of the Integrated Ocean Observing System (IOOS). The NEFSC data includes coastwide fishery independent surveys of demersal fish and invertebrates and hydrography during the fall, winter and spring. MARCOOS ocean data includes fine scale characterization phytoplankton production, water mass, current velocity, and subsurface features derived from U.S. and foreign satellites in space, a network of high-frequency radars deployed along the shore, and a fleet of robotic gliders flying beneath the ocean surface. These data will be combined with topographic characteristics of the bottom derived from sonar bathymetry. We will determine the combination of pelagic and benthic characteristics associated with changes in fish community structure using multivariate statistical techniques that focus on the entire fish community. We will then use these results to guide the construction of spatially and temporally explicit habitat models for select federally managed species.



IOOS pelagic habitat data in the study area from subsurface gliders (ribbon), CODAR surface current radar (arrows). Satellite temperature and ocean color

The primary goals of this proposed effort include:

1) Merging ocean NOAA bottom trawl survey and sonar data with observatory pelagic habitat characteristics derived from IOOS satellites, high frequency radar and gliders from 2003-present.

2) Multivariate analyses of the datasets to identify pelagic and benthic habitat characteristics most strongly associated with spatial and temporal fish community variation. The relative importance of ocean data provided by IOOS and traditional habitat variables in explaining fish distributions will be quantified.

3) Train and test a set of single species habitat models of including long-finned squid (*Loligo pealei*), spiny dogfish (*Squalus acanthias*) and summer Flounder (*Paralichthys dentatus*) using significant habitat gradients identified with the multispecies approach in goal 2.

## **Benefits**

- 1) Assessment of the value of environmental monitoring, provided by IOOS, for fisheries management and critical first step toward the construction of spatially and temporally explicit community and single species statistical habitat models. These models could be linked to physical ocean nowcasts and forecasts to produce statistical predictions of fish community distributions, single species distributions, and spatial ecosystem structure.
- 2) Quantify the importance of different environmental data products in explaining variability in the abundance of marine resource species in the Mid Atlantic Bight ecosystem and thus identify specific parameters useful as habitat indicators.
- 3) Provide single species statistical models that can be linked with environmental data to construct dynamic habitat maps useful for marine fisheries resource managers.
- 4) Provide background information necessary for the future development of mechanistic, operational, and spatially explicit fisheries resource forecast models linked with physical ocean forecasts.