

ANNUAL REPORT FY14

Habitat Assessment Funded Research

Project Title:

Predictive modeling of habitat distribution to support expansion of fishery-independent survey efforts: laying the groundwork to reduce uncertainty in stock assessments

Principal Investigator(s):

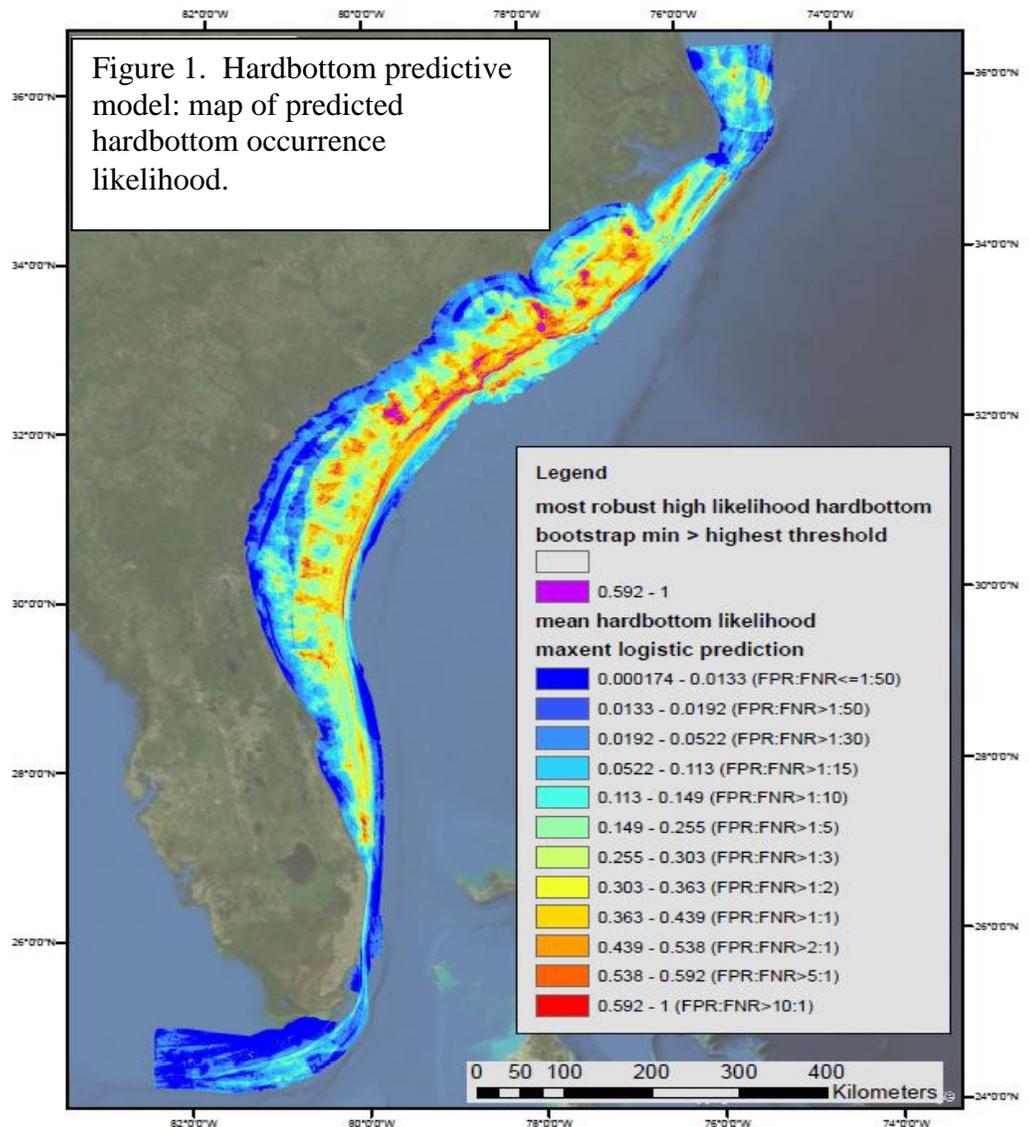
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Goals:

The overall objective of the project is to predict and groundtruth the occurrence and distribution of hardbottom habitat in the South Atlantic (southeast US Atlantic Ocean waters), particularly in areas where limited to no fishery-independent sampling currently occurs due to lack of knowledge of hardbottom habitat in those areas.

Approach:

We are using statistical models to integrate information on the location of known hardbottom habitats, along with broader environmental and seafloor characteristics to predict and map the



location of likely hardbottom habitats. We are then validating these models by comparison with information collected by video, diver surveys, and sonar surveys conducted aboard NOAA ships. The study area for this project includes state and federal waters (from the coast out to 300 meters depth), from North Carolina to northeast Florida. The first prong of our approach involves development of a region-wide predictive model of hardbottom habitat distribution for a large portion of the South Atlantic survey area (i.e., continental shelf and shelf-edge waters off of NC and SC out to 300m depth). The second prong of our approach involves initial validation of the model by collecting and classifying multibeam sonar and split-beam fisheries acoustic data from areas containing predicted hardbottom habitat.

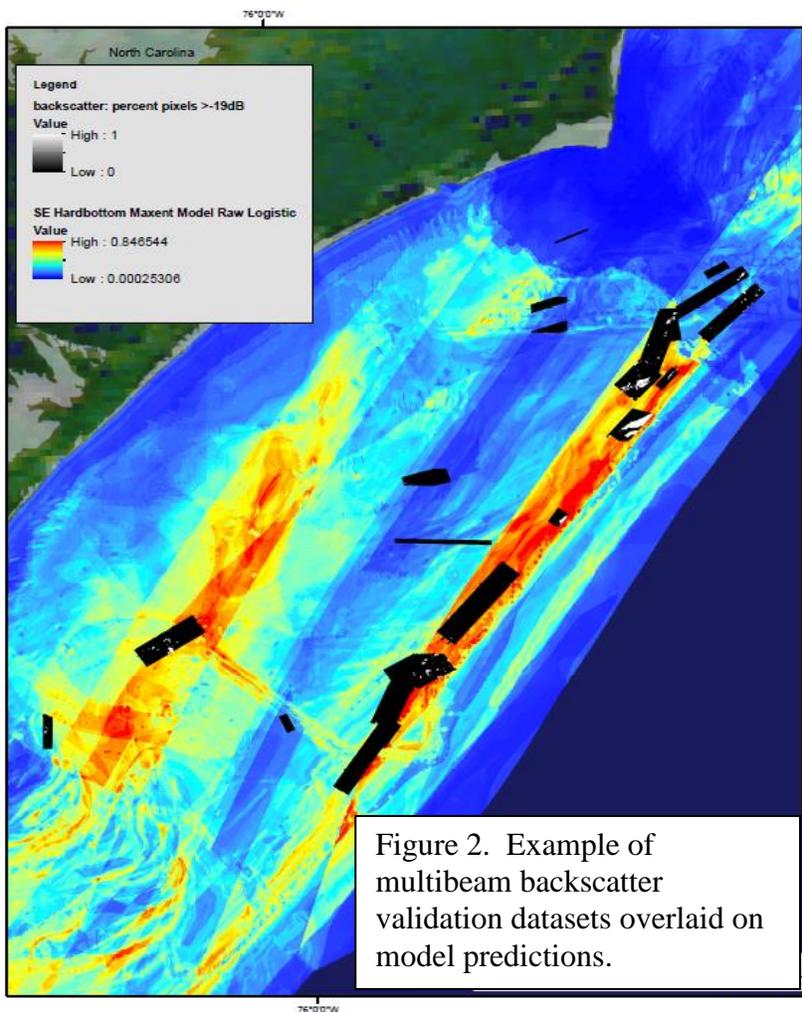
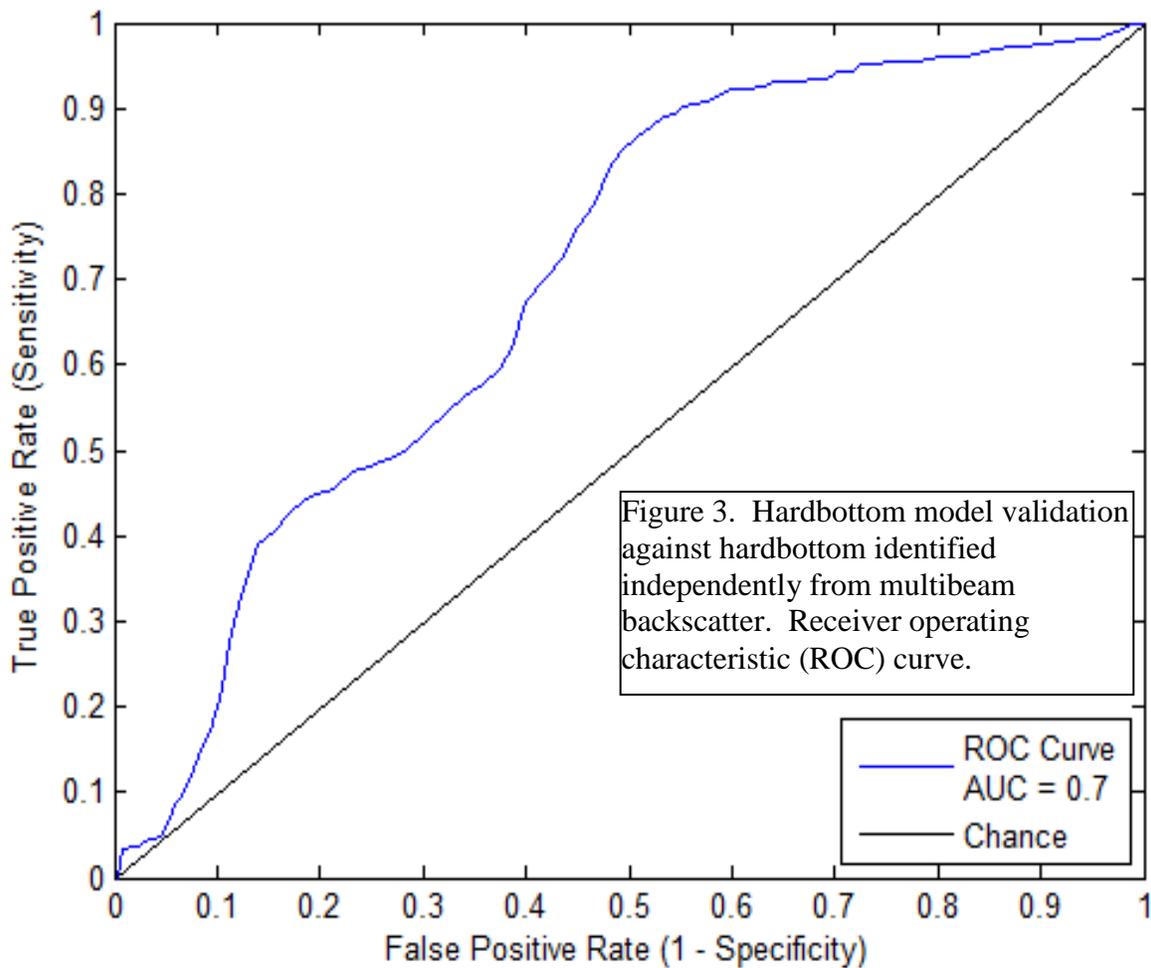


Figure 2. Example of multibeam backscatter validation datasets overlaid on model predictions.

Work Completed:

The predictive model has been completed by the NOS/NCCOS/CCMA/Biogeography Branch co-PIs. A map of the predicted hardbottom occurrence likelihood is presented in Figure 1. This model was developed using a database of known hardbottom locations provided by NMFS PIs and a large suite of multi-scale metrics of bottom topography and surficial sediment characteristics developed by the Biogeography Branch from NOAA Coastal Relief Model bathymetry and the USGS usSeaBed database. A Maximum Entropy modeling approach with bootstrapping was used to assess model uncertainty and identify the most robust predicted areas of hardbottom (purple in Fig. 1).

Backscatter and bathymetric data (Figure 2), acquired in 2012 on the NOAA ship Pisces with the SIMRAD ME70 multibeam-fisheries sonar system were used to develop a habitat classification scheme. These maps of classified habitats are also being used as a comparative dataset for validating the regional model outputs and show good correspondence of hardbottom habitats identified from high-resolution ME70 surveys with regional model predictions (Figure 3). The



ROC curve analysis shown in Figure 3 shows, for example, that the regional hardbottom model can correctly identify 90% of grid cells that would be classified as hardbottom in a multibeam survey, with a false positive rate of only 50%. This means that, on average, only 2 model grid cells predicted to have hardbottom need to be searched before encountering hardbottom, a significant improvement over a random search. The Area Under Curve statistic (AUC) is 0.7, indicating that the model has good predictive ability. Given the promising nature of these results, we will propose continued validation and refinement of the model in a follow-on proposal.

The final classification scheme for high-resolution multibeam surveys delineates three classes of potential bottom type (unconsolidated, transitional, low relief hard-bottom), as well as regions of low-moderate relief structure (Figure 4), and will be useful for selection and stratification of fishery-independent survey sites at a finer scale.

Applications:

The work completed here is improving our knowledge of South Atlantic hardbottom habitat distribution and supporting development of an expanded survey universe for fishery-independent sampling, an accomplishment deemed critical by panelists in a recent review of South Atlantic fishery-independent sampling programs (Massey 2012). The expansion of the fishery-

independent survey universe into currently undersampled areas will lead to more accurate and representative fishery-independent size and age distributions and indices of abundance for use in stock assessments, leading to increased accuracy and reduced uncertainty in those assessments, which are increasingly dependent on fishery-independent data. The creation of a regional map of hardbottom habitat for the first time opens up the possibility of stratification of sampling by habitat, as well as improved information on EFH.

Publications/Presentations/Webpages:

- NCCOS project webpage: <http://www.coastalscience.noaa.gov/projects/detail?key=226>

