Predictive habitat modeling of a submarine ridge off of the West Florida Escarpment

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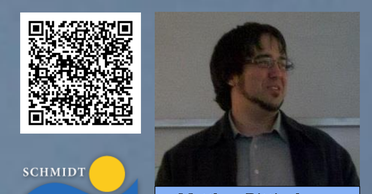

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Primary author

ABSTRACT

Habitat modeling offers a useful tool for deep-sea exploration planning and a cost-effective approach to deep-sea ecosystem management. Challenges to these techniques include the appropriate scale of analysis, availability of data, definition of predictor variables, and potential for model verification. In August 2012, the R/V *Falkor* collected high resolution bathymetry data along the West Florida Escarpment, using Kongsberg EM710 and EM302 multibeam echosounders. A ridge feature near the shelf break (400-650 m depth) had been previously mapped by the NOAA Ship *Okeanos Explorer* in April 2012.Video transects conducted by the Global Explorer MK3 ROV revealed a diverse assemblage of deep-sea corals and associated organisms. Habitat forming corals, such as *Lophelia pertusa*, *Leiopathes sp.*, *Plumarella sp.*, and *Stylaster sp.*, were observed.

The goal of this work is to use CARIS HIPS 7.1, BASE Editor 4.0, and ArcGIS 10.1 to generate a mesoscale predictive habitat model based on observed species distributions, substrate character, and bathymetry. This predictive model will be used to assess the areas with greatest potential for conservation and future research.

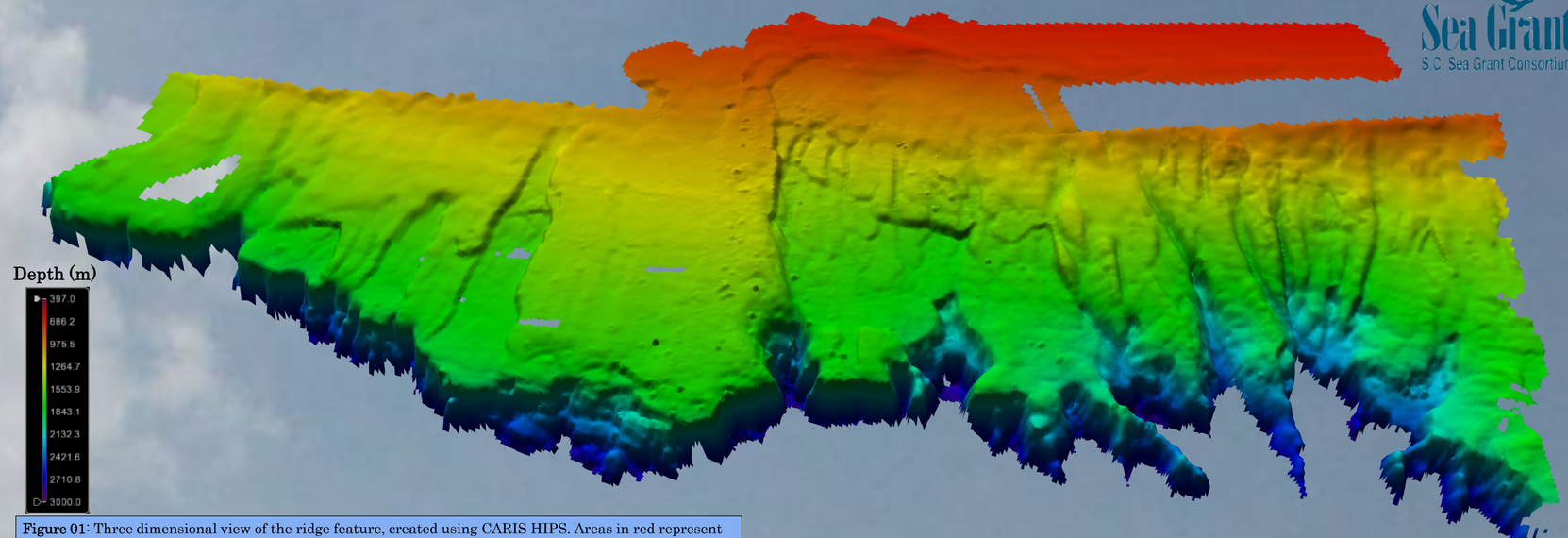


Figure 01: Three dimensional view of the ridge feature, created using CARIS HIPS. Areas in red represent more shallow pings, and areas represented in blue/purple represent deeper pings. VE=3.5

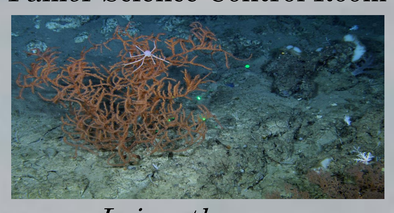
NOAA Ship *Okeanos Explorer*

SOI R/V *Falkor*

Global Explorer MK 3 ROV

Falkor Science Control Room

Lophelia pertusa and squat lobsters



Leiopathes sp.

METHODS:

- Multibeam echosounder (MBES) data were collected from the NOAA Ship *Okeanos Explorer* (Kongsberg EM302) and the Schmidt Ocean Institute R/V *Falkor* (Kongsberg EM302 and EM710) on the West Florida Shelf escarpment.
- A Remotely Operated Vehicle (ROV) was deployed in the study area to conduct limited area visual surveys (video transects).
- Video transect data were analyzed for coral taxa of interest.
- MBES data were analyzed (CARIS HIPS and SIPS 7.1) to create a Swath BASE bathymetry surface at a 10 m resolution.
- Backscatter data were analyzed in CARIS HIPS and SIPS 7.1, GeoCoder, ArcGIS 10.1, and CARIS BASE Editor 4.0.
- Substrate character was analyzed by using known coral locations to generate a known intensity range for hard bottom to create a predictive habitat model.

RESULTS AND DISCUSSION:

- **2,729.33 sq. km.** area of multibeam echosounder data processed and mapped.
- **31** groundtruthed coral observations across **12** taxa observed in ROV video.
- Greater bathymetric rugosity and more higher sounding return intensity suggest that the southern portion of the West Florida Escarpment contains more potential coral habitat than the comparatively flat northern regions. The largest area of predicted hard ground habitat is shown to be along the ridge features.
- Gaps in data collection and backscatter distortion caused by nadir lines represent flaws in the data that may be corrected with planned, additional future post-processing.
- Taxa observed occur in varying depth ranges, and the current model is not valid in predicting the habitat of individual taxa, but generalizes to taxonomic orders such as Gorgonians, Antipatharians, and Scleractinians.

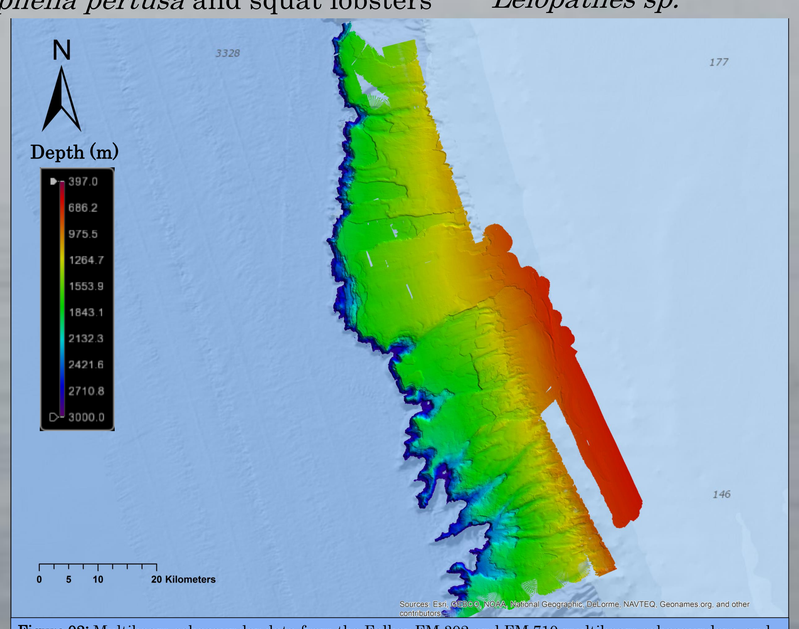


Figure 02: Multibeam echosounder data from the Falkor EM 302 and EM 710 multibeam echosounders, and the Okeanos EM 302 multibeam echosounder, created using cleaned SWATH surfaces in CARIS HIPS.

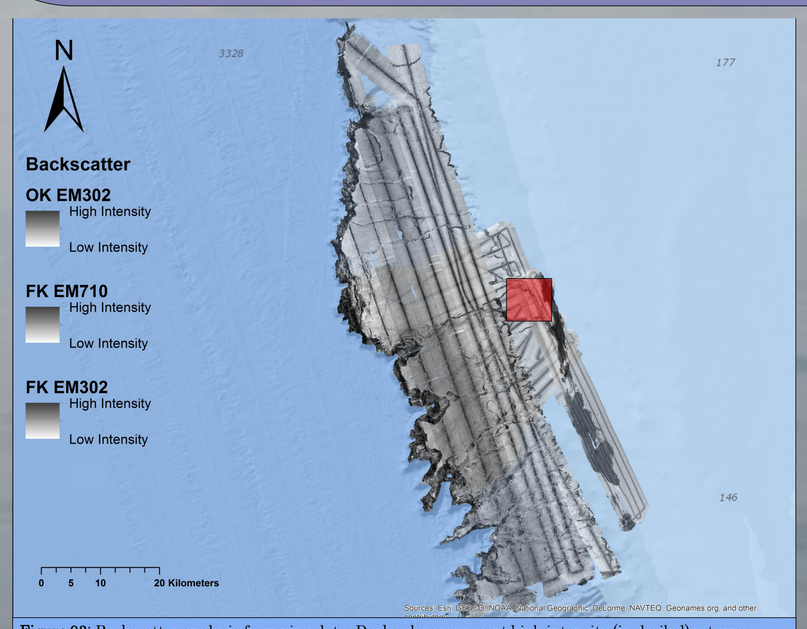


Figure 03: Backscatter analysis from ping data. Dark colors represent high intensity (in decibel) returns, corresponding to hard bottom. Dark straight lines indicate a problem with nadir lines in the backscatter data. The red square shows the area where ROV transects were conducted, shown below in Figure 06.

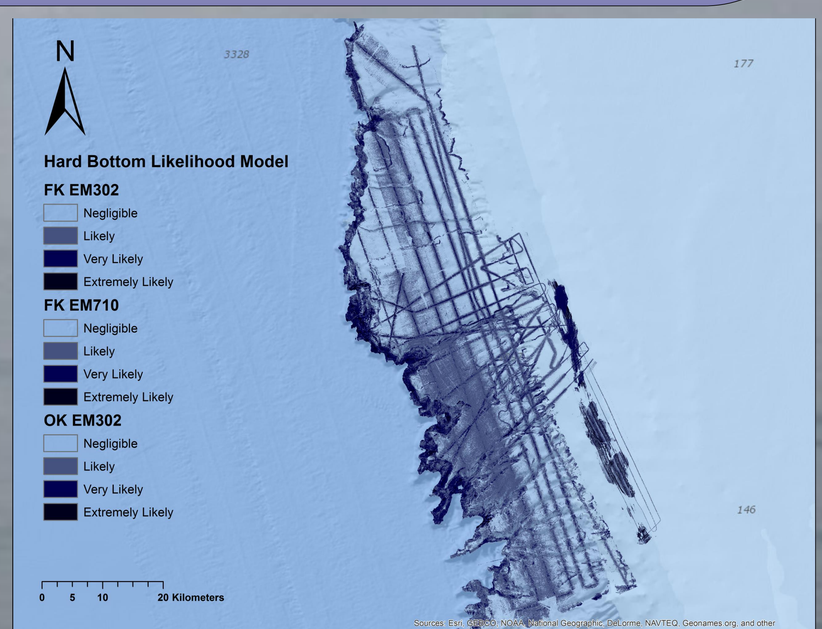
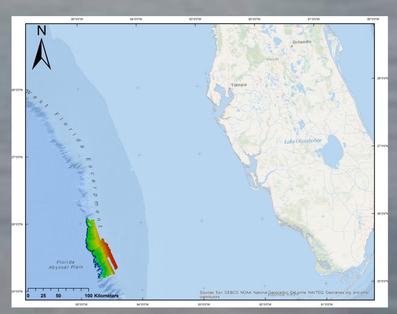
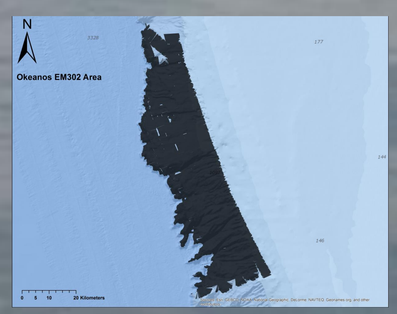


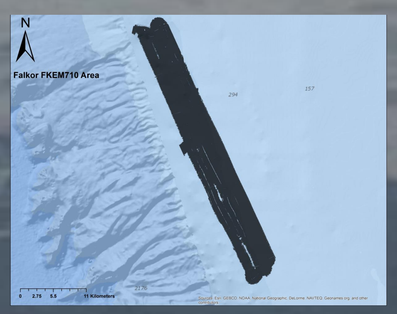
Figure 04: Predictive habitat model created by filtering backscatter return intensity using known coral habitat bottom densities (ground truthed by ROV) to display all potential hard bottom coral habitat.



West Florida Escarpment



Okeanos EM302 Study Area



Falkor EM710 Study Area

Falkor EM302 Study Area

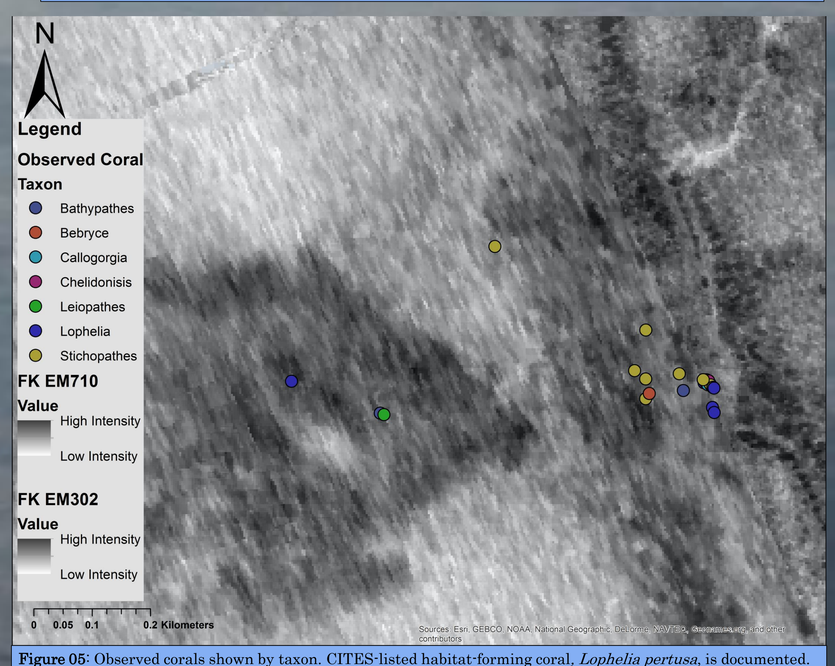


Figure 05: Observed corals shown by taxon. CITES-listed habitat-forming coral, *Lophelia pertusa*, is documented. Gorgonians, such as *Callogorgia sp.*, and black corals such as long-lived *Leiopathes sp.* are also observed. Observed corals are found on primarily dark gray areas corresponding to hard bottom habitat.

Figure 06: ROV video footage of groundtruthed hard bottom habitat. Bathypathes sp. is shown in foreground.

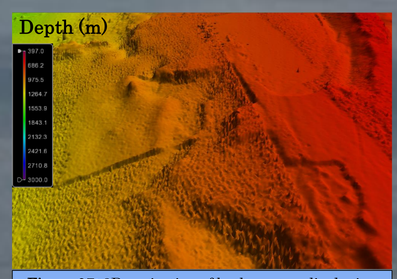


Figure 07: 3D projection of bathymetry, displaying the same area as in Figure 06.

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ACKNOWLEDGEMENTS:

Thanks go to the **SeaGrant program**, the **College of Charleston Department of Geology and Environmental Geosciences**, and the **Department of Environmental Studies** for their generous contributions to this research. Thanks to **Dr. Norm Levine** for his mentorship in ArcGIS. Thanks to **Josh Mode** of **CARIS**, whose invaluable teaching and advice with the CARIS software suite accelerated the data processing. Thanks to the members of the **BEAM Team** and the **NOAA Deep Sea Coral Ecology** lab, whose edits and suggestions significantly improved this product. Thanks to the crew of the **R/V *Falkor* FK004e** and **Okeanos Explorer EX1105** cruises.