Bathymetric Analysis of Continental Shelf-Edge Marine Habitat off the Coast of Charleston, SC

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Abstract

A bathymetric feature was identified in the continental shelf-edge, 85 km southeast of Charleston, SC, and named the Geneva Delta. This feature may have been an active source of detritus and large-scale wave-generated sediment transport during past sea levels. Bathymetric data were collected for College of Charleston BEAMS Program vessels during a research cruise in May 2012 aboard the NOAA Ship Nancy Foster. High-resolution multibeam sonar and Video Ray twin camera systems, as well as camera systems for capturing larger angle views of the shelf edge, were used to capture data. The shelf edge extends across a depth range of 43 to 79 m on the southeastern side of the shelf. The western or landward side of the delta area (Fig. 5b) is characterized by a series of rocky outcrops, known as Doc’s Rocks North and South (Harris et al., 2013), which provide hard-bottom habitat for a variety of commercially important marine organisms. The study site is of particular interest to the commercial fishing industry. These data are crucial to understanding the bathymetric and biological potential for studying this area, both the rocky shelf edge and the Geneva Delta, in order to determine potential locations for establishing Marine Protected Areas.

Introduction

This study was conducted to further explore the shelf-edge of South Carolina with regard to hard-bottom fish habitats. The study area, recently named the Geneva Delta (Harris et al., 2013), is located at the outer continental shelf of the Southeastern United States since the last interglacial, with approximately suitable outcrops in the study area, which justify considering the shelf edge and edge of South Carolina. This area, both the rocky shelf edge and the Geneva Delta, is of particular interest to the commercial fishing industry and conservation efforts such as Marine Protected Areas (MPAs). Studies have shown an increase of the lionfish, Pterois volitans, along with other commercial species, as well as species with unknown characteristics (Schroder et al., 2009). The shelf edge is an important, yet underutilized habitat for marine species, in order to prevent their further encroachment. To date, no measures have been taken to control the lionfish population in shelf edge waters, despite their abundances found off the entire eastern seaboard as far north as New England (Florida FWC, 2013).

Results and Discussion

- Depth Range: 45-70 m
- High-reflective features support identification of fore-reef shelf-edge depositology along the Geneva Delta region (Harris et al., 2013)
- Features of rocky shelf edges exhibit relief of 2 to 6 m at the intersection of the outcrops
- Habitat at these locations is of particular ecological and socioeconomic interest
- Benthic marine organisms burrow and adhere to these morphologically complex outcrops, creating unique habitats for commercial and noncommercial fisheries, as can be seen in ROV footage (O’Day et al., 2013)
- A channel with relief of approximately 2.5 m is located within Doc’s Rocks South. It was likely a major intake of water, having a lower density at sea level and significantly contributed to the development of the Geneva Delta (Fig. 5b)
- The Geneva Delta includes the presence of the rocky outcrops in the form of town marks and pockets of heavy weathering, which trend as a N-SW direction (Fig. 6a)
- Doc’s Rocks, the defined ridges located North (Fig. 5a) and South (Fig. 6b) on the delta, are important for allowing the BEAMS Program to utilize the data collected on this cruise. The data were collected aboard the NOAA Ship Nancy Foster during cruise 45. Methods

- Data collected aboard the NOAA Ship Nancy Foster during cruise 45
- Crew from May 9-14, 2012 led by Co-Cruise Scientists Dr. Leslie Sautter and Dr. Scott Harris
- Multibeam data collected using an OsciTech 700-1200 kHz multibeam system
- Video footage was obtained using a Phantom 500 ROV by Deep Ocean Engineering
- CUBE surface created in CARIS HIPS 7.1 using software with 5 m resolution

Acknowledgements

Dr. Scott Harris and Kyle W. Ford and for allowing the BEAMS Program to utilize the data collected on this cruise. The data were collected aboard the NOAA Ship Nancy Foster during cruise 45. The lamprey research program, led by Dr. Leslie Sautter and Dr. Scott Harris, in the Carolina Department of Natural Resources - Habitat Characterization, Spatial Variation, and Reproductive

References

- Foster, R. J., 2006. Ebb Delta Lobe
- Finley, R. J., 2006. Ebb Delta Lobe
- Doc’s Rocks North Profile (A’
- Profile A shows the step dikathety of the shelf edge and the surrounding water with the surrounding continental shelf

Figure 1: Location of the study area off the coast of South Carolina

Figure 2: CUBE BASE Surface of Doc’s Rocks and the Geneva Delta (U.S. Map and Depths; 100 m

Figure 3: Doc’s Rocks North exhibits rocky ledges, which attract a plethora of marine organisms

Figure 4: Trajectory to the northeast can be observed, showing the locations of Doc’s Rocks South rocky outcrops

Figure 5: Examples of delta lobe from southeastern orientation; with approximate profile locations

Figure 6: Doc’s Rocks South shows a stream of water as known as the shelf edge and profile location

Figure 7: The southeastern ledges exhibit the linear structure of the shelf edge

Figure 8: The southeastern ledges exhibit the linear structure of the shelf edge

Figure 9: Transect of the southeastern ledges exhibit the linear structure of the shelf edge

Figure 10: Transect of the southeastern ledges exhibit the linear structure of the shelf edge