

**Abstract**

Bathymetric survey data were collected by NOAA Center for Coastal Fisheries and Habitat Research scientists (Beaufort, NC) along the shelf edge of Onslow Bay aboard the NOAA Ship NANCY FOSTER in April 2008 and June 2009. Two sites, "Big Fish" and "OS\_05" (water depths ranging 39.75 to 133.72 m) were investigated using a Simrad EM1002 multibeam sonar system, and processed using CARIS HIPS 7.0 software. Mapping the bathymetry of this rocky seafloor area aids in assessing the benthic habitat of the non-indigenous Lionfish (*Pterois volitans*), which has been seen to propagate in the waters of the Atlantic as far north as North Carolina since the early 1990's. The venomous Lionfish – native to the Indo-Pacific coral reefs – thrives in warm waters up to depths of 200 m. The continental shelf of the southeastern coast of the U.S. mimics the terrain and water temperature of the Lionfish's native waters. This species is a danger to the commercial grouper fishing industry off the southeastern U.S. coast since it feeds on small fish, crustaceans, banded coral shrimp, and crabs, and has no known predators. Habitat mapping provides useful information for eradicating this invasive species.

# Bathymetric Analysis of Lionfish Habitats Along the Continental Shelf Edge Off Onslow Bay, NC

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Figure 1: Onslow Bay, NC and locations of Big Fish and OS\_05 survey sites (Google Earth).

**Methods**

- Data were collected by the NOAA Ship NANCY FOSTER in April 2008 and June 2009 using the Kongsberg Simrad EM1002 High-Resolution Multibeam Mapping System.
- Raw data were processed using CARIS HIPS and SIPS 7.0

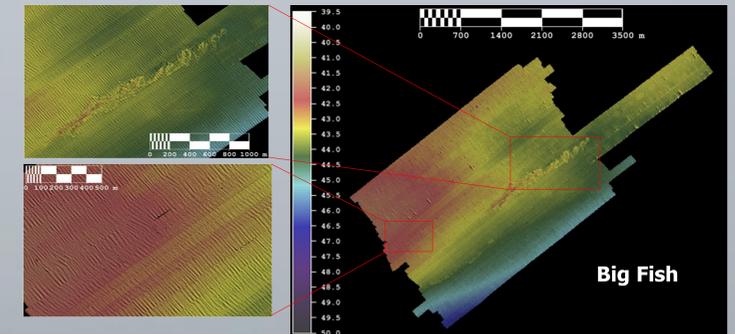


Figure 5: 2D close-ups of the Big Fish survey Area. All depth measurements are in meters.



**Background**

- Onslow Bay is studied for the use of habitat mapping of the northern and offshore limits of the lionfish (*Pterois volitans/miles*) (photos at right) population off the continental shelf of the southeastern United States.
- Lionfish are native to the Indo-Pacific coral reef systems, and live in waters between 10-20° C.
- Areas mapped include OS\_05 (April 2008) and Big Fish (June 2009) using a multibeam sonar.
- Dr. Paula Whitfield (NOAA CCFHR Beaufort Lab) and colleagues have researched the lionfish population and habitat using multibeam sonar and underwater diving census.

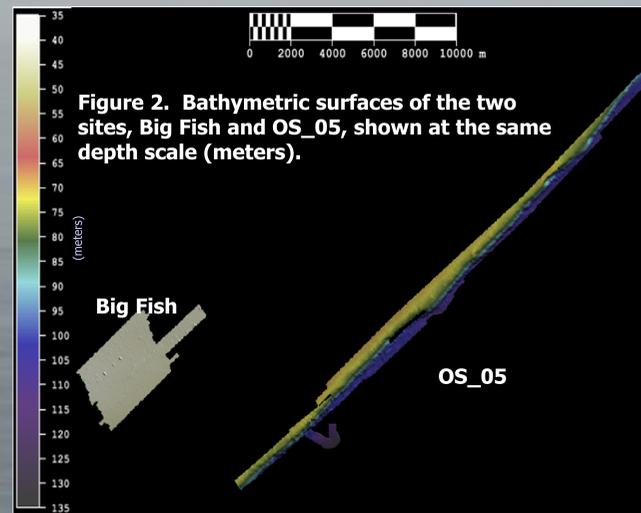


Figure 2. Bathymetric surfaces of the two sites, Big Fish and OS\_05, shown at the same depth scale (meters).

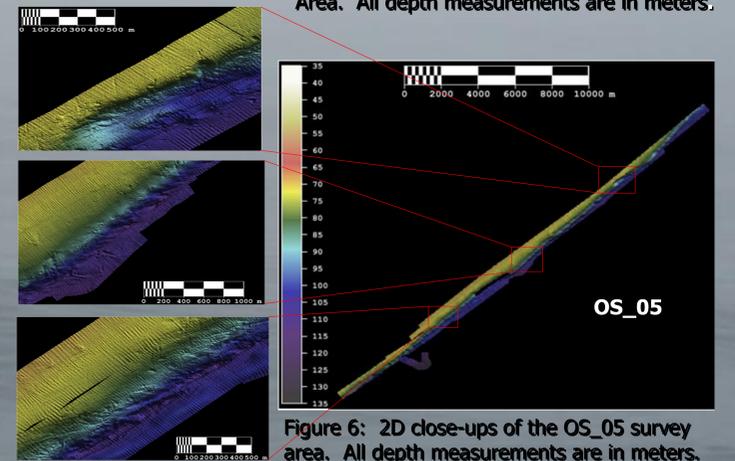


Figure 6: 2D close-ups of the OS\_05 survey area. All depth measurements are in meters.

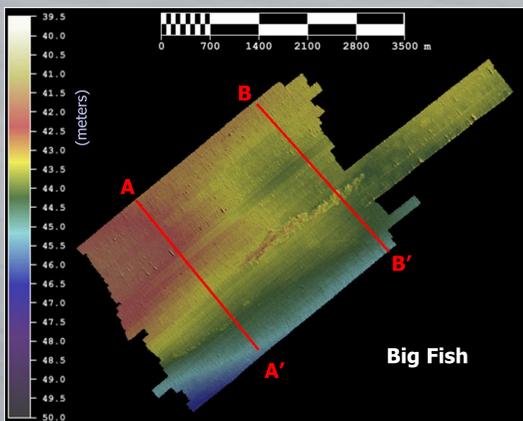


Figure 3: Big Fish with cross-sectional profiles, A-A' and B-B'.

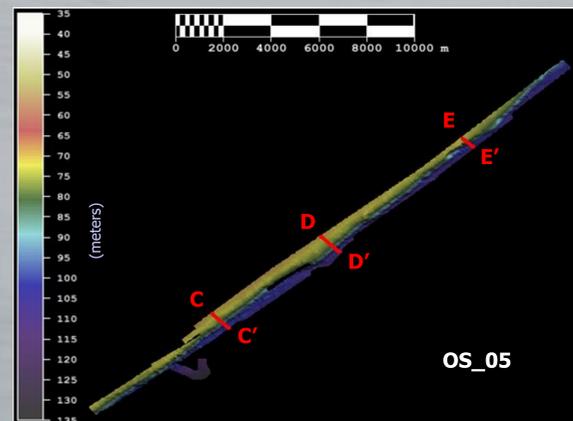
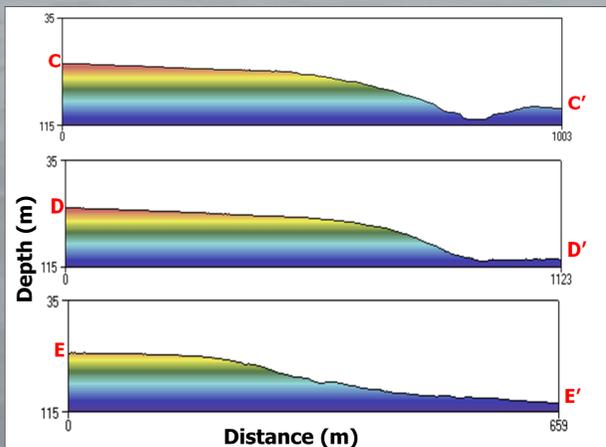
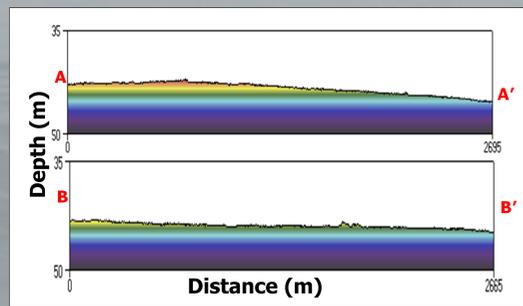


Figure 4: OS\_05 with cross-sectional profiles C-C', D-D', and E-E'.



**Results**

- Bathymetric analysis of the Big Fish survey area shows very little relief- 42.9 to 44.2m, a 1.4 m relief. (Fig. 3).
- A single sedimentary rocky outcrop exists in the Big Fish survey area (Figs. 5 and 7).
- The bathymetric analysis of the OS\_05 survey area shows the edge of the continental shelf (Fig. 4). All formations are likely to be sedimentary.
- Apparent ripple marks in the close up 2D (Fig. 5 and 6) are not seafloor features, but they are artifacts of the ship's motion that cannot be corrected.
- The OS\_05 area shows scarps and scour depressions along the continental margin from the water flow and currents in the ocean (Figs. 6 and 7).



**Discussion**

- The combination of rocky and high relief terrain of OS\_05 consisting of several steep scarps and scour depressions create an ideal habitat for predatory fish such as the Lionfish.
- Warm waters brought in by the Gulf Stream also aid in the establishment of an idyllic environment for a fish indigenous to the waters of the Indo-Pacific coral reefs.
- The Lionfish, which is native to coral reef systems, likely finds the rocky terrain of the continental shelf to mimic its natural habitat.
- Having no known predators in the Southeastern United States continental shelf waters coupled with an ideal habitat lends to the recent population explosion.

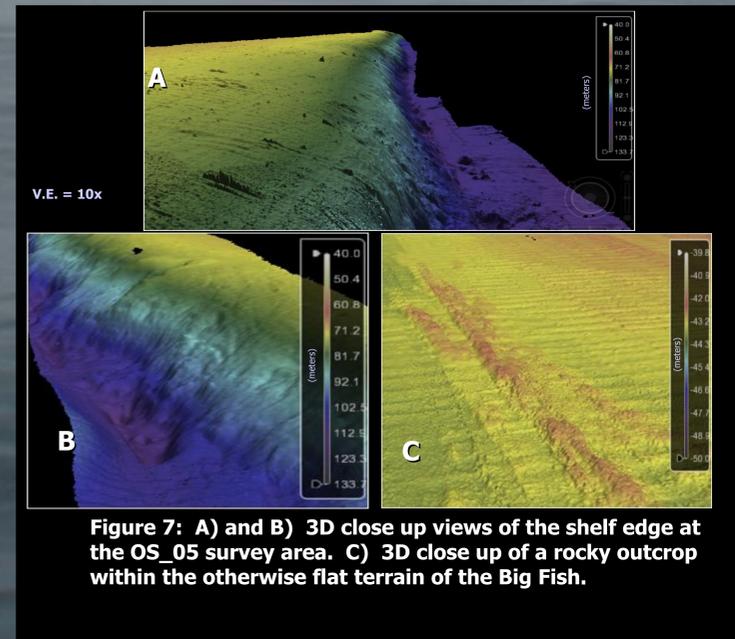


Figure 7: A) and B) 3D close up views of the shelf edge at the OS\_05 survey area. C) 3D close up of a rocky outcrop within the otherwise flat terrain of the Big Fish.

**References**

- Whitfield, Paula, et. Al. "Biological invasion of the Indo-Pacific lionfish *Pterois volitans* along the Atlantic coast of North America." Marine Ecology Progress Series vol. 235 (2002) 289–297.
- Albins, Mark, Hixon, Mark."Invasive Indo-Pacific lionfish *Pterois volitans* reduce recruitment of Atlantic coral-reef fishes." Marine Ecology Progress Series vol. 367 (2008) 233-238.
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