**ABSTRACT**

In September 2009, multibeam sonar data were collected aboard the NOAA Ship NANCY FOSTER (Figure 6) from September 22–30, 2009. Raw data were acquired using Simrad EM1002 multibeam sonar system. CTD recorder employed to collect data off of NOAA’s National Marine Sanctuary, and overall resource distribution, to assist with NOAA’s Marine Spatial Planning initiative. CARIS HIPS 7.0 software was used to process bathymetric data that were collected using a SIMRAD EM1002 multibeam sonar data acquisition system. Water depths range between 12 and 120 m with reef habitats located in waters shallower than 30 m at the Dry Tortugas site. Numerous scientific dives were conducted to assess fish populations and reef biodiversity. Ongoing explorations are necessary west of Dry Tortugas to monitor the effect of preservation on reef habitats.

**BACKGROUND**

The Tortugas Ecological Reserve (TER), effective since July 1, 2001, is a comprehensive plan developed by the National Park Service and NOAA as part of the Florida Keys National Marine Sanctuary, designed to protect the biodiversity of the region. The TER covers 99 square nautical miles and is designated as a “no-take” area to protect grouper and snapper populations that are sensitive to overfishing. The 2009 Dry Tortugas expedition aboard the NOAA Ship NANCY FOSTER was led by scientists from NOAA’s Center for Coastal Fisheries and Habitat Research from September 22–30 in three areas in southern Florida (Figure 1): west of Dry Tortugas (Figure 2), south of Key West (Figure 3), and southeast of Vaca Key (Figure 4). The cruise consisted of multibeam sonar analysis used to record the bathymetry of the TER, as some areas had not been mapped previously (Figure 5). Additionally, over 30 scientific dives were employed for the purpose of characterizing reef ecosystems and monitoring fish populations. The goliath grouper (Epinephelus itajara) and mutton snapper (Lutjanus analis) can be used to indicate the health of the ecosystem, as these fish were rarely spotted in this area before the enactment of the TER due to overfishing (NOAA). These grouper and snapper populations flourish in reef and hard bottom habitats in shallow waters (Florida Museum of Natural History, Smithsonian Marine Station).

**METHODS**

- Cruise conducted aboard NOAA Ship NANCY FOSTER (Figure 6) from September 22–30, 2009.
- Raw data were acquired using Simrad EM1002 multibeam sonar system.
- CTD recorder employed to collect data about the water profile survey.
- Raw data were converted and edited using CARIS HIPS 7.0 software.
- Background research was conducted on grouper and snapper populations to provide an accurate assessment of fish habitats in coral ecosystems.

**RESULTS**

- Key West (Figure 3) and Vaca Key (Figure 4) are gently sloping areas with no carbonate structures present.
- Dry Tortugas (Figure 2) has a variety of bathymetric features between 12 and 26 m. Figure 5A and Figure 7 profile 1 depict coral pinnacles across a gently sloping area. Figure 7B and Figure 7 profile 2 illustrate carbonate mounds that are present throughout a large portion of the region surveyed. A deep depression is also noted in Figure 7 profile 2. Figure 7C and Figure 7 profile 3 illustrate the variety of features found in the area, depicting more carbonate mounds and depressions. Figure 7C is located atop a large platform that likely extends southward beyond the study area.
- The bathymetric features present west of Dry Tortugas are ideal habitats for adult grouper and snapper populations (Florida Museum of Natural History, Smithsonian Marine Station).
- The NOAA crew reported an increase in goliath grouper (Figure 8A) and mutton snapper sightings since the early 2000’s before enactment of the TER. In 2006, NOAA Ault et al. report an increase in grouper and snapper populations. This may eventually lead to an expansion of the TER.

**CONCLUSIONS**

- The region surveyed within the TER is a prime location for grouper and snapper habitats, as the fish dwell in shallow reef ecosystems with hard, rocky bottoms (Florida Museum of Natural History, Smithsonian Marine Station).
- Enactment of the TER has been beneficial, as NOAA and Ault et al. (2006) both report an increase of grouper and snapper populations that are endangered by overfishing (Figure 8).
- Further mapping of the region should be conducted, as NOAA reports that the bathymetric data have not yet been collected for the entire TER (Figure 5).
- A complete map of the bathymetric features of the TER is necessary to further characterize the probable fish habitats for scientific divers. Additional dive areas will lead to a more accurate idea of fish populations.
- Areas outside the TER adjacent to the “no-take” zones should also be monitored over time to assess the effects of increased fishing activity. Additional data over can provide coastal managers with a causal relationship between “no-take” zoning and increased fish populations. This may eventually lead to an expansion of the TER.