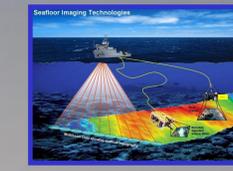


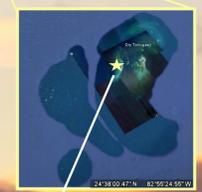
# Multibeam Sonar Analysis of Dry Tortugas National Park

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Dry Tortugas National Park was established in 1992 in order to maintain its unique and pristine marine habitat. Located ~112 km west of Key West, Florida, Dry Tortugas spans over 64,700 acres, with 99 % of its area under water. Unique coral communities with pinnacles, staghorn, and elkhorn corals are attracted to this tropical shallow water substrate. Multibeam sonar data were collected on the NOAA Ship Nancy Foster in September 2009 by investigators from the NOAA Florida Keys National Marine Sanctuary Coral Disease and Condition project. Bathymetric data were then processed using CARIS HIPS 7.0. The detailed seafloor maps and 3-D images created highlight some of the prominent features in the park, including various reef structures and east-west trending sand bodies. The reef platform is mainly composed of oolitic and coral sand deposits, with some carbonate muds and large sand bodies. The stratigraphy of Dry Tortugas ranges from sand and anthropogenic debris in the upper 1 to 15m of Holocene limestone. The most prominent layer is the Pleistocene Key Largo Limestone, which underlies Holocene deposits and is composed of fossilized patches of reef complexes and oolitic limestone. The living coral reefs are currently under threat of degradation due to vessel groundings and overuse. Multibeam analysis of Dry Tortugas provides a baseline and starting point for future efforts to preserve this National Park.



**METHODS**

- ❖ Raw multibeam sonar data were acquired using Simrad EM1002 aboard the NOAA Ship *Nancy Foster*.
- ❖ Data were cleaned and processed using mapping software CARIS HIPS 7.0
- ❖ Background Research was conducted to gain an understanding of the marine habitats characterizing the Dry Tortugas Area

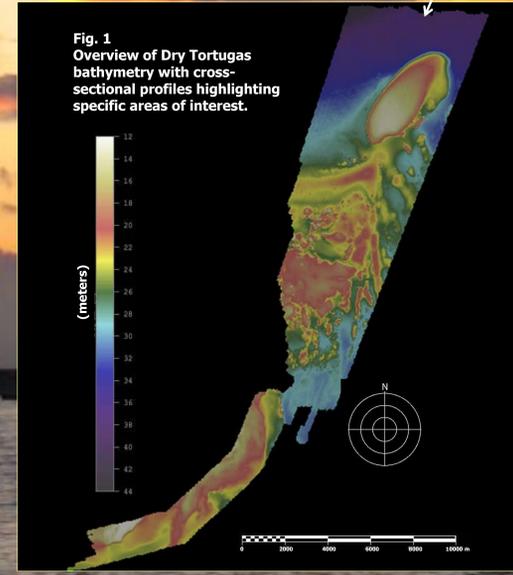


Figure  
These images were taken on the *Nancy Foster* in 2009 during mapping of the Dry Tortugas National Park

**REFERENCES**

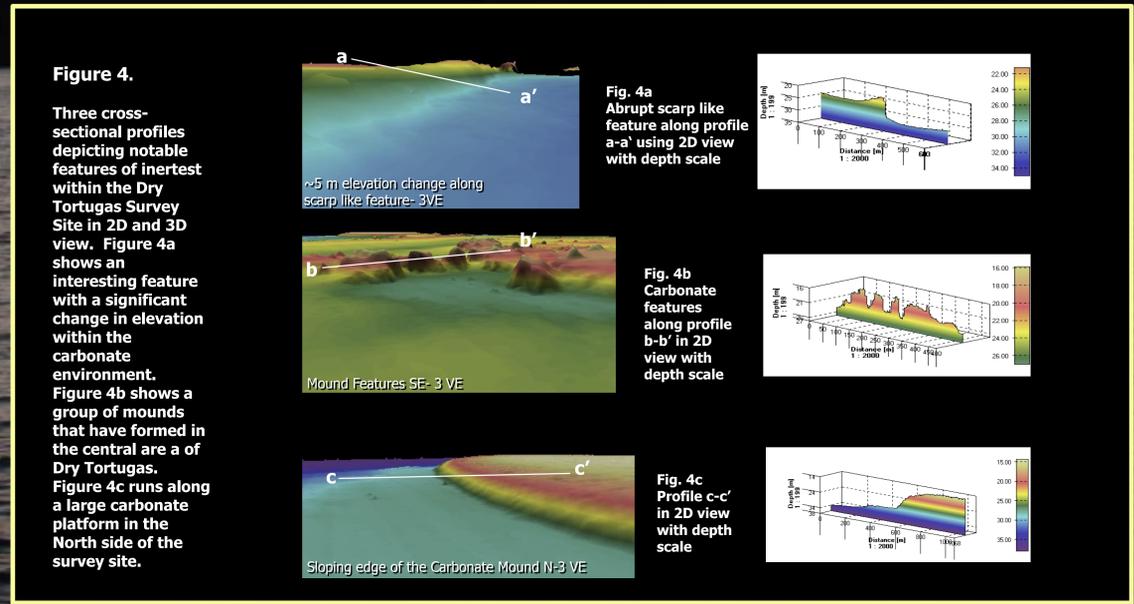
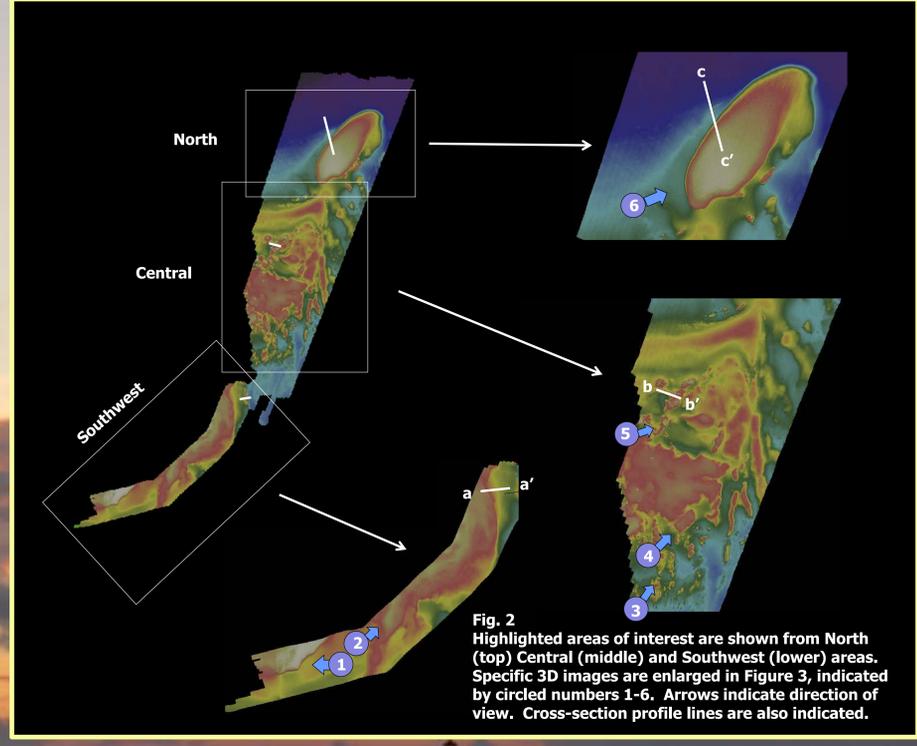
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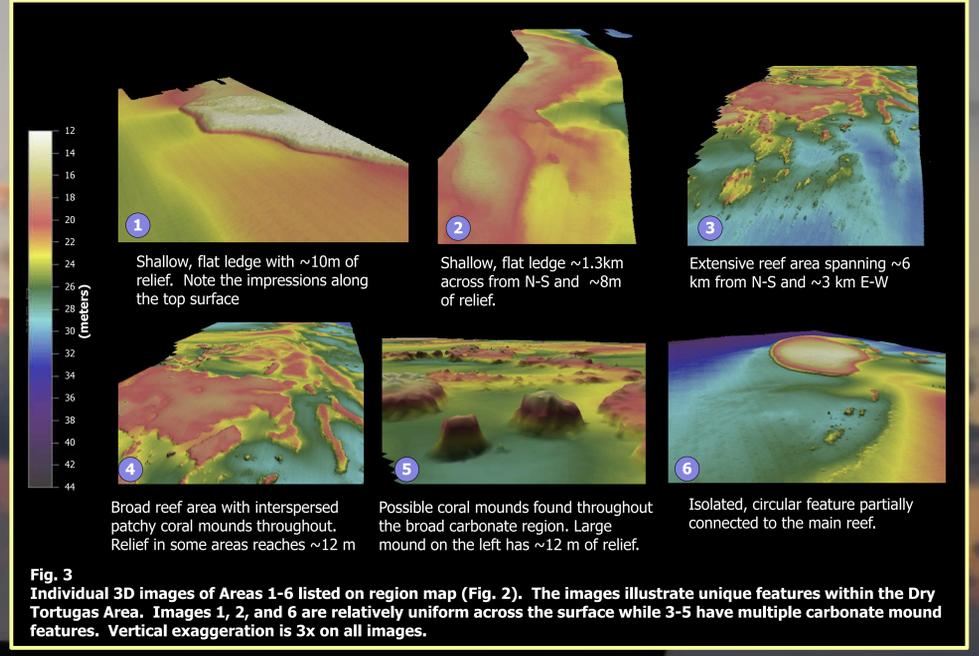
**BACKGROUND**

- ❖ The Dry Tortugas area is comprised of a group of islands located near the SW corner of the Florida Platform approximately 112 km west of Key West, Florida (Walter et. al 2002).
- ❖ The site is well protected from north and northwest seasonal storm activity by the shallow carbonate platform that underlies the subaerially exposed keys to the west and north (Walter et. al. 2002). This results in areas of thick accumulations of sediments of varying compositions, such as silt, sand, and shells (Walter et. al. 2002).
- ❖ The reefs of Dry Tortugas are thick in some locations, with accumulations of sediments up to 17 m, forming an elevated atoll-like rim (Thornberry 2005).
- ❖ Geologic activity in the Holocene consists of accumulation of coral reefs, carbonate muds, and sand deposits, which is controlled by geologic factors such as topography and climatic factors such as timing and rate of sea level rise, oceanic currents, and sediment facies (Thornberry 2005)
- ❖ Due to this unique location, Dry Tortugas protects unique coral communities including, pinnacles, staghorn and elkhorn corals (Thornberry 2005).



**DISCUSSION**

- ❖ Multibeam data, surveyed ~112 km off the coast of Key West, revealing distinct carbonate features throughout the entire survey site.
- ❖ The unique carbonate environment provides a nutrient rich habitat for benthic organisms, comprising more than 99% of Dry Tortugas National Park (Thornberry 2005). Degradation is a constant threat for sea grass beds due to vessel groundings and overuse in the area as well as the slow steady rise in sea level (Thornberry 2005). It is important to understand these geologic features so that this pristine ecosystem can be preserved.
- ❖ Multibeam sonar analysis provides a good baseline for initiating preservation management of these special areas (NOAA).
- ❖ According to the data provided by NOAA in 2009, this survey site is rich with carbonate reef environments and atolls, providing multiple opportunities for rich marine ecosystems.
- ❖ Sites highlighted in this study indicate possible areas for further research where sediment samples and marine life survey could be useful for future protection of these distinctive environments.



**RESULTS:**

- ❖ Multibeam sonar mapping of the survey area was performed during the 2009 research cruise onboard the NOAA Ship *Nancy Foster*, which revealed several submarine carbonate features:
  1. On the north end of the survey site a Large platform that is ~1-1.5 km wide with ~10 m of relief was observed.
  2. A series of isolated coral mounds that range from between 5 m tall to 10 m in average height was found within the central area of the survey site.
  3. A massive platform is observed in the central survey site that is about 5-10 m in height and spans at least 1 km across.
  4. Various patchy 'reef like' mounds was seen throughout the survey site.
  5. One scarp like feature ~10 m deep towards the lower portion of the survey site was measured along profile a-a' (figure).