Mapping Pulley Ridge: One of America's Deepest Known Hermatypic Coral Habitats

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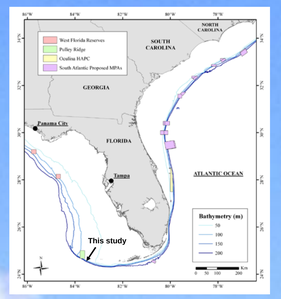
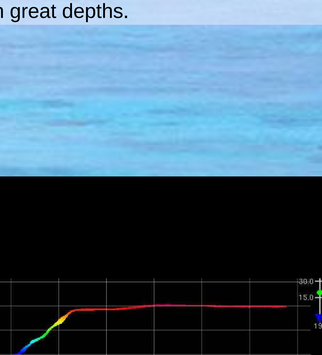


Figure 1. Southwestern coast of Florida showing location of the Pulley Ridge. The arrow shows the location of the region mapped for this study.

Pulley Ridge, located fifty miles west of the Florida Keys extends over 200 km and parallels a series of N-S oriented drowned barrier islands. The depth of this ridge ranges from 60 m to more than 80 m and was last exposed ~14,000 years ago when sea level was significantly lower. The purpose of the project was to map hermatypic coral sites in search of their deepest known habitat. This study will allow further planning of manned submersible dives in an attempt to retrieve coral samples so that we might better understand how these corals continue to survive at 100+m of water depth.



R/V *Suncoaster* (USF College of Marine Sciences)

Methods:

- Multibeam surveying using SIMRAD 1002 aboard the R/V *Suncoaster*
- The depth range of this area lies just inside the depth limits for the SIMRAD EM1002.
- Processing and characterizing using CARIS HIPS 6.1

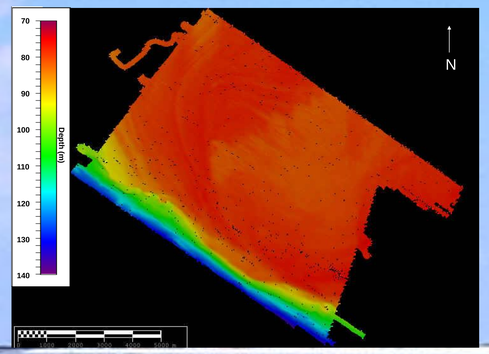


Figure 2. Pulley Ridge area of survey. The black dotted areas are gaps in the data, the result of both the high vessel speed and the depth limitations of the Simrad 1002 system.

Results: A possible drowned barrier island has been identified from this study area (Fig. 4, outlined in black). Figure 5 shows examples of the different gradients along the ridge face. A-A' and B-B' represent sinuous ridges while neighboring parts of the ridge exemplify a series of terrace-like features. A-A' and B-B' both have gradients of approximately .04.

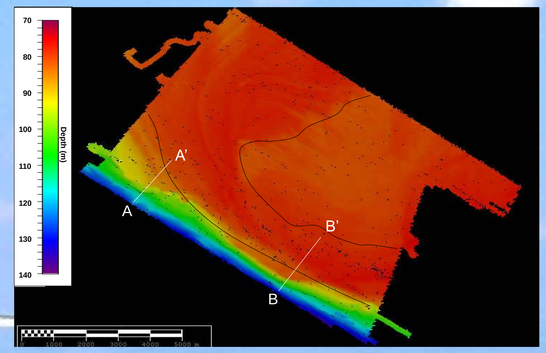


Figure 4. Paleo-barrier island represented by the possible re-curved spit (outlined in black), that parallels Pulley Ridge. Profiles A-A' and B-B' are also marked on the map in white.

Importance of study

Hermatypic corals are corals that share a symbiotic relationship with algae. This relationship centers around the corals feeding the algae and the algae feeding the corals. But the corals also take advantage of the increased levels of carbon and use it to increase calcification rates, while the algae call the coral home. Hermatypic corals have been sampled at Pulley Ridge at 83m of water depth. In recognition of this unique habitat, the government has named Pulley Ridge a Habitat Area of Particular Concern (HAPC). Plans for future sampling studies are underway so that we may learn more about these unique habitats and how these corals survive at such great depths.

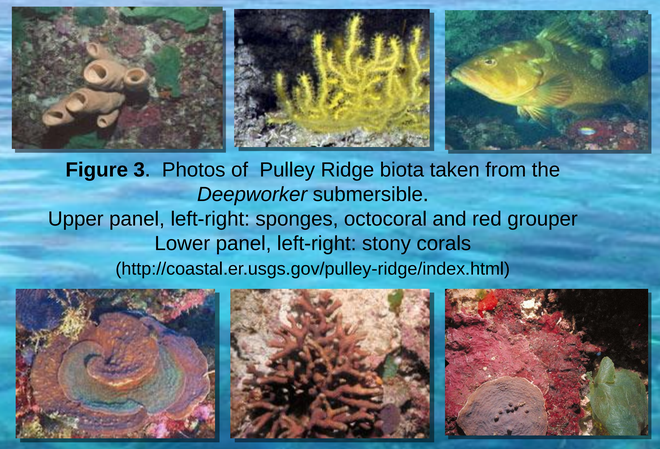


Figure 3. Photos of Pulley Ridge biota taken from the *Deepworker* submersible.
Upper panel, left-right: sponges, octocoral and red grouper
Lower panel, left-right: stony corals
(http://coastal.er.usgs.gov/pulley-ridge/index.html)

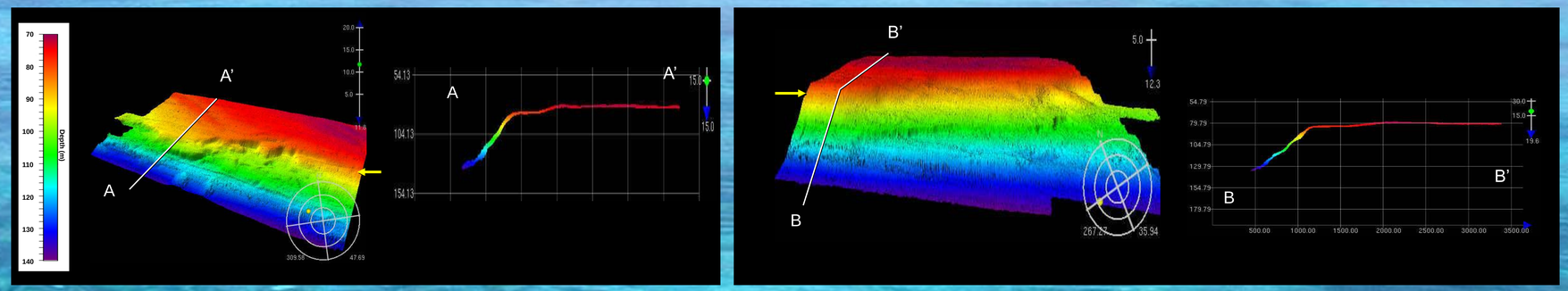


Figure 5. Ridge close-ups with corresponding profiles A-A' and B-B', with approximately 12.4 vertical exaggeration. These profiles show areas with the steepest gradient of the ridge. Other areas are more terraced (see the area to the right of B-B'). The yellow arrows represent the deepest point at which hermatypic corals have been collected.

Discussion: The Pulley Ridge survey area covers over 313 km² and seems to have provided several promising locations for probable hermatypic coral habitats. The 3D images show areas of high gradient slopes on the ridge face and other areas with very low slope, both of which can support coral growth. The majority of the ridge lies below 80m, providing many potential coral habitat areas in which to choose future sampling locations. ROV and side scan sonar data should be collected to determine hard ground from soft substrates in order to increase the chance of recovering a hermatypic coral specimen from below 83m of depth. The different types of bathymetry offer several areas for possible sampling (steep or terraced slopes). More research should be completed prior to sending a manned submersible to recover coral specimens.

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References: USGS Coastal & Marine Geology Program