Pulley Ridge Habitat and Community Structure

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Purpose

Quantify benthic habitat and benthic community at Pulley Ridge and the Dry Tortugas deep shelf (outside the reserve boundaries)
• 9 zones defined
• 91 ROV dives
• PR: 68 1-km² blocks
• TER: 23 1-km² blocks
• Each random block was surveyed with five 100-m ROV transects, taking downward still pictures every ~30 sec
• 17,888 digital photos
• 16,071 photos for quantitative analysis of % cover of habitat and benthic biota
• 237 hours of video for analysis of fish densities
Benthic macrobiota (usually >1 cm) identified to the lowest taxa level possible
A Short Video
Pulley Ridge: Overall Benthic Biota

- Algae (46.7%)
- Coral (1.5%)
- Gorgonacea (0.1%)
- Antipatharia (0.1%)
- Porifera (1.2%)
- Bare Bottom (43%)
Pulley Ridge: Algal Community

- Previous list of known taxa – 27 species (Hine et al. 2008)
- Examination of all previous samples and photosamples reveals at least 95 species:
  - Rhodophyta – 60
  - Chlorophyta – 25
  - Ochrophyta – 10
- The average benthic macroalgae cover = 47%
  - 35% of this is red algae
- Red algae dominated by crustose coralline algae (29% average cover)
- Green algae more common on Main Ridge, the shallowest region, than the other areas
  - *Anadyomene menziesii*, unique to Pulley Ridge, was the most common green alga (average 8%)
Hard Corals – 16 species

• The average hard coral cover is 1.5%
  o Agariciidae plate corals (*Agaricia* spp. and *H. cucullata*) – 0.9%
  o *Madracis* spp. – 0.5%
  o *Montastrea cavernosa* – 0.01%

• Coral cover on the Main Ridge within the HAPC averaged 0.9%

• Coral cover was highest in the Central Basin outside of the HAPC (average = 2.5%)
Other Invertebrates

Gorgonian octocorals – 15 species

Sponges – 102 species
Fish Community (86 species)

- Most abundant species:
  - Grunts (Haemulidae)
  - Striped Grunt (*Haemulon striatum*)
  - School Bass (*Schultzea beta*)
  - Cardinal Fish (*Apogon* spp.)
  - Purple Reeffish (*Chromis scotti*)

![Striped Grunt (*Haemulon striatum*)]

![School Bass (*Schultzea beta*)]

![Cardinalfish (*Apogon* sp.)]

![Purple Reeffish (*Chromis scotti*)]
Red Grouper & Lionfish

*Epinephelus morio* (Red Grouper)

*Pterois* (Lionfish)
Multibeam Sonar Map Showing Red Grouper Burrows (10-m diameter) at Pulley Ridge HAPC

Estimated Number of Grouper Burrows = 155,490
Pulley Ridge – What We Know Now

HAPC Coral ↓ 92% in past 10 years

[Bar chart showing coral cover from 2003 to 2015 for North, Middle, and South regions.]

Overall Cover

- 2003 data from USGS surveys

Legend:
- Agaricia sp. and H. cucullata
- Montastraea cavernosa
- Other Hard Coral
But there is good news in the Central Basin!

In 2014 and 2015, we discovered vast fields of plate coral – outside of the Pulley Ridge protected area!
*Agaricia* plate corals extended tens of meters in diameter outside of the HAPC. Coral densities averaged 17 colonies/m$^2$ (ranging from 3-77 colonies/m$^2$)
Surveyed 23 1-km² random blocks adjacent to Tortugas Ecological Reserves (TER) using ROV.

The Pulley Ridge sites were primarily at deep mesophotic depths (59-94 m), whereas the patch reefs and fringing reef sites at the Tortugas were comparatively shallow (23-55 m).
Dry Tortugas: Hard Corals – 19 species

- The average hard coral cover (all sites) was 1.3%
- Hard coral cover was highest on the fringing reefs (4%)
- Assemblage of typical Florida Keys species
- Most abundant coral is *Montastrea cavernosa*

![Montastrea cavernosa](image1)

![Dichocoenia stokesii](image2)

![Pseudodiploria strigosa](image3)
Dry Tortugas: Other Invertebrates

Gorgonian octocorals – 16 species

Sponges – 57 species

Aiolochroia crassa

Ircinia campana

Callyspongia spp.
Fish Community (96 Species)

- Most abundant
  - Yellowtail Reeffish (*Chromis enchrysurus*)
  - Bicolor Damselfish (*Stegastes partitus*)
  - Purple Reeffish (*Chromis scotti*)

Lionfish are much less abundant in the Tortugas:

- 1,814 were observed at Pulley Ridge vs. 71 at Dry Tortugas

- 17 managed species; most abundant:
  - Yellowtail Snapper (*Ocyurus chrysurus*)
  - Dog Snapper (*Lutjanus jocu*)
  - White Grunt (*Haemulon plumieri*)
**Pulley Ridge vs. Dry Tortugas – Percent Cover**

**Pulley Ridge**
- Algae (46.7%)
- Gorgonacea (0.1%)
- Porifera (1.2%)
- Coral (1.5%)
- Bare Bottom (43%)

**Tortugas**
- Algae (26.0%)
- Gorgonacea (1.7%)
- Porifera (1.2%)
- Coral (0.1%)
- Antipatharia (0%)
- Bare Bottom (64.5%)
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