Meiofauna Biomass and Population Density of Reef and Subtidal Ecosystems

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Abstract

The Alligator Harbor Aquatic Preserve (AHAP) is an estuarine bay in the northeast region of the Gulf of Mexico along the northwest coast of Florida. AHAP is administered by the Florida Department of Environmental Protection's (FDEP) Florida Coastal Office (FCO) and was created in 1969. This project examines meiofauna, a group of organisms with over 20 phyla that make Alligator Harbor rich with biodiversity. AHAP provides valuable resources for a variety of species; for example, the stable saline conditions allow clam and oyster aquaculture to thrive. Meiofauna are microscopic organisms which live between the grains of aquatic sediments and are responsible for much of the nutrient cycling that occurs in benthic ecosystems. In this study, sediment samples were collected and meiofauna, specifically nematodes and copepods, were extracted from the sediments to be analyzed. The data collected includes population density, length and width, and biomass of the collected meiofauna. This information can be used to gauge the productivity and overall health of AHAP and in relation with oyster reefs, as there is a strong relationship between meiofauna counts, biomass, and environmental health status. The information collected in this study can be used to inform management and guide current and future activities in the area.

Location

Figure 1: Location of Alligator Harbor Aquatic Preserve in relation to the Gulf of Mexico. Image taken from Florida Department of Environmental Protection (11).

Figure 2: Reef: (29.906995, -84.364464). Image: Kevin Engelbert

Methods

Sample Collection:

1. Use a large syringe to collect six reef samples and six subtidal mud samples for a total of twelve samples

Sample Processing and Analysis

1. Filter sediment using stacked 500 and 63 µm sieves and rinse with water
2. Extract meiofauna with a centrifuge by applying density separation principles
2. Up to 120 nematodes and 50 copepods were randomly picked out from each of the twelve samples and set aside to be analyzed
3. Remaining nematodes and copepods are counted
4. Picked organisms are mounted onto glass slides for further analysis

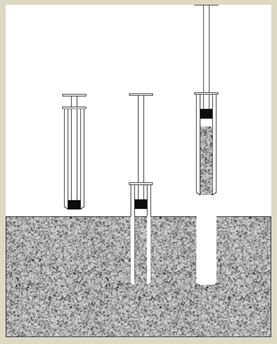

Figure 3: Syringe sampling. Image: Jeroen Ingels

Figure 4: Example of glass slide with glycerol. Image: Allison Scheel

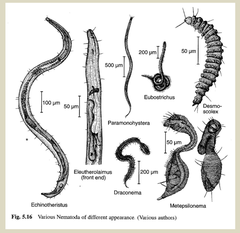

Fig. 5.16 Various Nematoda of different appearance (Various authors)

Figure 5: Examples of nematodes. Image taken from Giere (140).

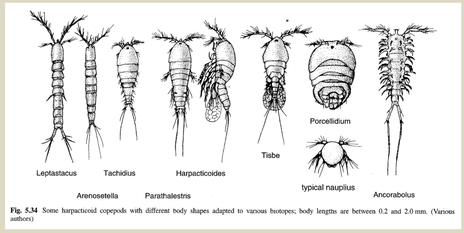

Fig. 5.34 Some harpacticoid copepods with different body shapes adapted to various biotopes; body lengths are between 0.2 and 2.0 mm. (Various authors)

Figure 6: Examples of copepods. Image taken from Giere (183).

Next Steps and Projections

In the upcoming weeks, the collected specimens will be mounted onto glass slides. Once mounted, the organisms can be measured using a computer software that allows the user to trace the organism to determine the length. Using the length found by the software, the biomass, or weight, of the organism can be calculated by using the following formula:

$$\log W \text{ (dwt)} - 2.47 \log L - 7.97 \text{ (Giere 2009)}$$

where (dwt) is body mass and L is length. The calculated biomass can give us insights in the amount of carbon that is being produced and consumed in oyster reef and sedimentary habitats by meiofauna in Alligator Harbor, as well as information on the functional role of meiofauna.

Limitations

A few limitations discovered whilst completing this study that may cause slight errors in the results include:

- Organisms may get stuck on sieves, removing them from the sample pool
- Differences in sediment collection method by site
- Organisms may be compacted into sediment during centrifugation, removing them from the sample pool

Future Directions

This information will provide a glimpse into the miniature life, ecology and functional roles of coastal oyster reef habitats in the Alligator Bay Aquatic Preserve ecosystem. Biomass and abundance are acknowledged as excellent proxies for assessing the ecological status of benthic ecosystems and this study may provide information on how the presence of oyster reefs influence ecology of nearby sedimentary systems.

References

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Schratzberger, M. and J. Ingels. "*Meiofauna matters: The Roles of meiofauna in benthic ecosystems*. Journal of experimental Marine Biology and Ecology 502: 12-25, 2018.
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A Special Thank You to Josh Breithaupt, Kevin Engelbert, Shelbe Chenoah DuBree, and Havalend Steinmuller