THE EFFECTS OF THE BURROWING ANEMONE, *CERIANTHEOPSIS AMERICANUS*, ON INVERTEBRATE DIVERSITY AND ABUNDANCE AT LEO-15, STATION 30

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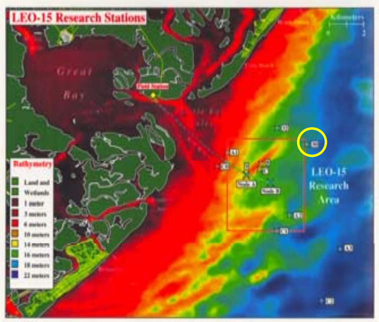


Abstract

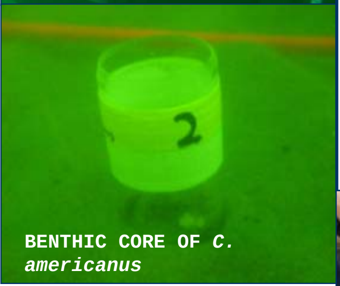
On June 22, 2006 five paired benthic sample cores were taken by divers at LEO-15, Station 30, with comparative treatments of *Ceriantheopsis americanus* anemone tubes and bare sand. Three pairs of cores were sorted, identified, and counted for invertebrates living associated with the tubes and sand. Using nonparametric Mann-Whitney U tests, it was found that the cores that contained anemone tubes were more diverse than the sand cores (P<0.043, df=2). The tests also show that there is no difference between the abundance of invertebrates in the tube cores and the sand cores (P<0.275, df=2). When looking at the seven most abundant taxa found in both treatments, it was found that the abundance of two polychaete worms, *Parougia caeca* and Syllidae spp., where significantly higher in the tube cores than the sand cores (P<0.046, df=2 / P<0.05, df=2). Sediment syringes cores were also taken by divers. There is no significant difference in the sediment composition or percent organic matter between the tube cores and the sand cores.

Introduction

The Order Ceriantharia, contains exclusively tube-dwelling, infaunal anemones. Their tubes are composed of a type of cnida, mucus, and sediment, and can extend more than 30cm into the sediment.[1] The felt-like material can provide structure and habitat in an otherwise sandy bottom, as well as create a collection area for detritus. The tubes themselves may house a great number of bacteria, which may be a food source for other animals.[2] There are documented examples of other invertebrates living commensally within the anemones tubes (Phoronids).[3]

It is known that *C. americanus* prey on settling larvae and copepods, but what else do they effect?[4] If the tubes of Ceriantheopsis enhance bottom habitats, thereby increasing diversity and abundance of invertebrates, it could mean that they indirectly effect survival of large animals, like economically important fishes, that prey on species that could potentially benefit from *C. americanus* tubes and the habitat they create.


Ceriantheopsis americanus


BENTHIC CORE OF *C. americanus*

Methods

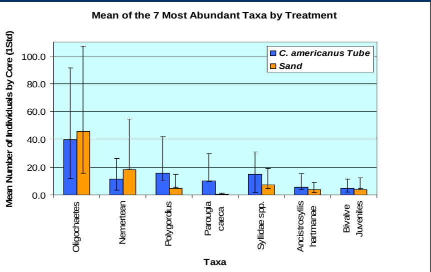
Core samples were obtained by two divers on SCUBA at approximately 60 ft depth. Following a reel tape measure, they searched the bottom for an extended anemone. Once found, a .25 m^2 quadrat was placed over the tube to count epifauna around the tube (data not used). A 60cc sediment syringe was taken at base of the tube, and then the core was taken with the anemone in the middle. The depth cored was approximately 12 cm into the sand. No anemones were actually collected as their tubes extended deeper into the sand. A comparison core was taken at least 30 cm away from the tube core on bare sand. A sediment syringe was also taken alongside the sand core. The samples were preserved with a 10% formalin and Rose Bengal solution (Rose Bengal stains all protein pink, which makes the animals easier to see when sorting). After sitting for at least five hrs, the samples where washed with water and the liquid was replaced with a 95% ethanol solution. Samples were then sorted under a dissecting microscope and identified down to the most specific level possible. The tubes were measured, sectioned and cut in half to ensure that any interstitial animals were not overlooked. After identifying and counting, Mann-Whitney U tests were used to establish significant differences. The sediments were oven dried, weighed, and sieved at >1000 *um*, 500-100 *um*, 250-500 *um*, 63-250 *um*, and <63 *um* for sediment grain size composition. Part of the dried sample was set aside to be super-heated at 500º C to calculate percent organic material lost during heating.

Results & Discussion

The statistics tests indicate that while invertebrate taxa richness is enhanced by the presence of the anemone tubes, abundance shows no difference when the tubes are present. The plots of the means of both taxa richness and abundance show that the average for tubes are higher; it could be that the small sample size has produced large standard deviations in the abundance test, and that it would otherwise come back as significant if these relationships were examined more extensively (i.e. more samples). The increase in diversity means that the production of the area can be higher compared to areas around it, as different types of animals can prey on the animals there.

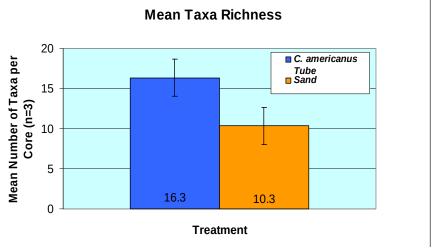
Seven of the most common taxa were analyzed separately: Oligochaetes, Nemerteans, four polychaete worms (Polygordius, *Parougia caeca*, Syllidae spp., *Ancistrosyllis hartmanae*,) and Bivalve juveniles. Two of the polychaete worms, *Parougia caeca*, Syllidae spp., were found in consistently greater abundance in the cores with anemone tubes than in sand cores. *Parougia caeca* is a type of Dorvilleid worm that is poorly known. They can be either predatory or opportunistic and occur in organically enriched areas.[5] While the organic matter tests showed no overall significant difference, tube sediment sample #4 showed at least twice as much organic matter as any other sample, while sand percent organic matter stayed consistent with tubes percent organic matter or lower. If organic matter is indeed higher around the tubes, it may explain the increase in this particular species. Syllidae are usually associated with specific hosts, such as sponges, cnidarians, decapods, and echinoderms. It seems they also have commensal association with these anemones. They are also predatory, using an armored pharynx to pierce prey and suck out the contents.[5] The increased diversity could offer more prey opportunities for these worms.

Although not considered in the statistical tests because of their designation as meiofauna, calanoid and particularly harpacticoid copepods were found in high numbers, especially associated with the tubes. Both are small copepods, usually found living between sand grains. Surprisingly, in two out of five tubes examined large numbers (100+) were found living in between the layers of the anemone tube. This is particularly interesting because *C. americanus* preys on these copepods. Some of these copepods had ovisacs, meaning they were adults and perhaps brooding. The tube tissue seemed to be littered with these ovisacs, and they were found in all five of the tubes. (Since harpacticoids are believed to carry their ovisacs until they hatch, the discarded sacs in the tube tissue may also be mucus casing harpacticoids create to live in.) Harpacticoid copepods are known to cluster around structures in sandy bottoms for both protection from predators and for the organic matter that settles around the structures. It seems to be an association that bears further investigation. Also, many of the animals were difficult to identify because they were juveniles. Perhaps these anemone tubes serve as a larval nursery as well.

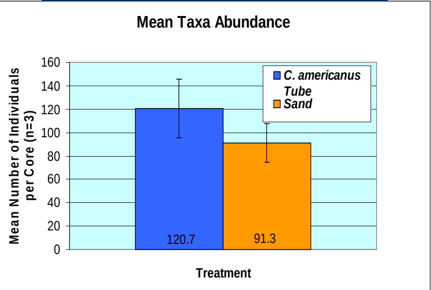


Significant Mann-Whitney U Statistics

Taxa	Mann-Whitney Value	P-Value
Parougia caeca	0.00	0.046
Syllidae spp.	0.00	0.050



Mean Number of Taxa per 31.137 cm2
(Mann-Whitney U Test: P<0.043, df=2, ***)



Mean Number of Individuals per 31.17 cm2
(Mann-Whitney U Test: P<0.275, df=2, NS)

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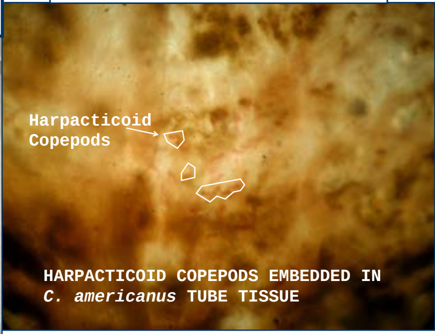
Thanks to David Thistle, who Judy recommended I talk to about my copepod observation.


C. americanus TUBE BEFORE PRESERVATION



HARPACTICOID COPEPODS EMBEDDED IN *C. americanus* TUBE TISSUE

References Available Upon Request