Benthic Habitats and Ecological Characterization

University of Connecticut

CHANGES IN SEAFLOOR HABITAT over time. From 1991-2010, *Haliclona oculata*, *Astrangia poculata*, *Mytilus edulis*, and branching bryozoa were reef dominants. In 2012-2013, *Haliclona* (the long, finger-like organisms) is absent from reef fauna.

Mapping seafloor habitats and ecological processes requires combining and visualizing the geologic and biologic elements of the seafloor environment. Another challenge is to incorporate their dynamics over time, since, as we know, things change over time. If maps are to be more than a simple snapshot in time, we need to capture the changes that occur over time in a way that will be useful to stakeholders and managers who are the target audience for these maps. The LIS Seafloor Mapping Program involves a close collaboration of oceanographers, geologists and ecologists each using a diversity of approaches for data collection, processing, and interpretation. The pilot area features Stratford Shoal, a feature that based on previous experience has a diversity of habitats including boulder reefs along the spine of the shoal, sand waves with gravel troughs in shallower areas, and mud-clay in the basins to the east and west. Multiple sampling tools were used to sample and quantify the geological and ecological variability, and the process of testing different approaches to map this variation in both space and time is underway. Maps of sediment type and texture, species distributions, biological diversity, community type, community dynamics-stability, and more are being developed.

Sampling Tools

Grab samples of the seafloor sediment are useful for grain size analysis and quantifying the animals that live beneath the sediment surface, while video and still photography allow us to rapidly survey those animals that live on the sediment surface, especially in areas of coarse sand and gravel. A grab sampler with video and digital still camera capability named SEABed Observation and Sampling System (SEABOSS) and operated by the US Geological Survey (USGS), is the backbone of our sampling program. This technology allows us to both see and sample the seafloor from the deck of the ship. UConn operates the Instrumented Seafloor Imaging System (ISIS) camera platform, similar to SEABOSS but without the grab. Both vehicles are essentially flown over the seafloor, with the winch operator controlling altitude and the ship controlling speed and direction. While these systems can operate from multiple research vessels, the *Research Vessel (RV) Connecticut* has dynamic positioning, a computer system that allows the ship to hold position and make small controlled changes in its position using GPS without anchoring. The *Kraken2* Remotely Operated Vehicle (ROV), also operated by UConn, allows us to fly over complex seafloor terrain to collect video and still images from multiple angles. Our strategy has been to focus efforts at 31 sampling sites, chosen using the initial multibeam sonar maps developed by NOAA to represent unique areas based on sediment, texture, and depth or in areas of unique transitions.

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Preliminary Results

We already have some interesting results during the pilot period. Previous studies along the boulder reef on the southern spine of the Shoal showed a coral-dominated community that was relatively stable for over 20 years. Our first survey in this area using SEABOSS showed that the "dead man's finger" sponges (i.e., *Haliclona oculata*) were gone at a couple of our stations. A subsequent survey with ISIS, focused solely on the reef, revealed these sponges were gone from a large area. What happened? Predation, disease, disturbance from storms, climate change, or freshwater runoff? The answer remains unclear. Quantitative analysis of image samples is ongoing, assessing abundance of habitat forming species like the sponge and other species and seafloor features. Grab sampling approaches also have produced some new and interesting results. One might expect that samples of organisms living in similar types of sediment, like mud, would be very similar across the study area. However, results to date indicate a high degree of variation in community composition across small spatial scales. Noting that sample sorting and species identification is ongoing, interim results indicate that, even in areas with similar sediments the biological community comprises less than 50 percent similarity between sample sites. Further, when compared to sampling conducted in the same area in 1996, the samples in 2012 had significantly greater diversity.

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