What does a Sponge Eat? Examining Variability in Sponge Nutrition in the Florida Keys

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Abstract

As filter-feeding organisms, sponges are intimately tied to their environment. Any variability in the environment should therefore be reflected in the tissue of the sponge. However, some sponges are known to host large microbial communities, and the influence of these microbes on the nutrition of their host is largely unknown. To examine the influences on variability in sponge nutrition, we collected tissue samples from eleven sponge species at thirteen ocean and bayside sites near Key Largo, Florida. We also collected sediment samples, suspended particulate organic matter, and seagrass samples where possible. All of these samples were then analyzed to determine the stable carbon and nitrogen isotope ratios, which are used as a tracer of nutrient flows between organisms. These data revealed significant inter- and intraspecific differences, such as low $\delta^{15}N$ values that suggest N_2 fixation occurs within some species, and spatially variable $\delta^{13}C$ values that suggest variations in organic matter inputs between nearshore and offshore sites. To explore the potential connections between low $\delta^{15}N$ values and the N_2-fixing potential of sponge-associated microbes, and spatial correlations between $\delta^{13}C$ values and variable sponge microbial communities, we performed molecular analyses on sponge tissue and water column samples to characterize the microbial communities of these samples. We also used fluorescein dye to trace the flow of water through the sponges, and were then able to collect excurrent water, which will also be analyzed to

characterize the microbial community. These analyses indicate a correlation between variability in the stable isotopes and variability in the microbial communities. These data, therefore, suggest inherent differences in types and sources of nutrients available to sponge species that contain diverse and massive bacterial communities versus those with few bacteria. Future work includes a mission in Aquarius, the underwater habitat, to perform tracer experiments with sponges to determine rates of nitrogen fixation.