Effects of freshwater springs on epiphyte load and herbivory in *Thalassia testudinum*

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Abstract: The seagrass, *Thalassia testudinum,* is abundant in the West Back Reef of Discovery Bay, and is a major food source for sea urchins and parrotfish. Freshwater springs are also common in the area, though few studies have examined their impact on marine organisms. We predicted that the lower salinity and temperature around freshwater springs would adversely affect both the epiphytes growing on *T. testudinum* and the herbivores that prey on them. However, we found no difference in epiphyte loads or amount of herbivory between freshwater and marine sites in the reef, indicating that there is little effect of freshwater springs on these parameters of the seagrass community.

Key Words: seagrass, salinity

INTRODUCTION

Thalassia testudinum is a common seagrass in the West Back Reef of Discovery Bay, Jamaica. It is a primary food source for parrotfish and sea urchins (Ogden 1980). The amount of nutritious epiphytes growing on seagrass blades is of particular importance to the herbivores; fish and urchins have been shown to preferentially feed upon grass blades with heavy epiphyte loads (Lumbardo 1980).

Freshwater springs are abundant in the West Back Reef. These areas have lower salinity and temperature than the rest of the marine environment, conditions which we hypothesized would affect the epifauna and herbivore communities associated with the seagrass, *T. testudinum.* Since marine organisms should be adapted to salt water, we predicted that seagrass epiphyte loads would be lower in freshwater spring areas than in full salinity seawater. We also expected to find less herbivory near freshwater springs, as fish and urchins may avoid these areas, or may feed less on grasses in freshwater if epiphyte loads there are lower.

METHODS

We selected sixteen sites in the West Back Reef of Discovery Bay, Jamaica. Eight sites were selected as outlets of freshwater springs based on their lower temperature and the blurry water column where fresh and salt water mix. The other eight sites were selected as typical marine areas, and were of comparable depth and substrate complexity as the freshwater areas. Although we tried to select areas that were exclusively marine or freshwater, it is unlikely that our sites were completely isolated areas of fresh and seawater.

At each of the sixteen sites, we selected five intact blades of *T. testudinum.* We then ranked epiphyte load for the top 8 cm of each blade on a scale of 0 – 10, which was based on the percent coverage and thickness of epiphytes. Zero indicated no epiphytes present on the blade; 10 indicated the entire blade was covered with a thick layer of epiphytes.

For herbivory samples, we collected 160 intact blades of *T. testudinum* that had moderate levels of epiphyte cover (≈ 5 on our scale) from one seagrass patch in a marine area of the West Back Reef. We cut each grass blade to 8 cm, and then fastened bunches of five blades with clothespins. We then attached pairs of clothespins (10 *T. testudinum* blades) to bolts to anchor them to the substratum. We also attached marker buoys to each bolt. The seagrass samples were placed at the sixteen sites for 18 hours and percent leaf loss was estimated for each blade. We did not record whether leaf loss was due to urchin or fish herbivory.

RESULTS

There was no difference in epiphyte load between the freshwater and marine sites (Kruskal-Wallis: $X^2 = 0.00$, df = 1, P = 0.96). The mean epiphyte ranks (± 1 SE) were 3.95 ± 0.43 and 3.96 ± 0.37 for freshwater and marine

sites, respectively. There was also no difference in levels of herbivory between freshwater spring areas and marine areas (Kruskal-Wallis: $X^2 = 0.01$, df = 1, P = 0.92; Fig. 1). Although the mean herbivory levels appear different, this was due to one marine sample which was completely eaten.

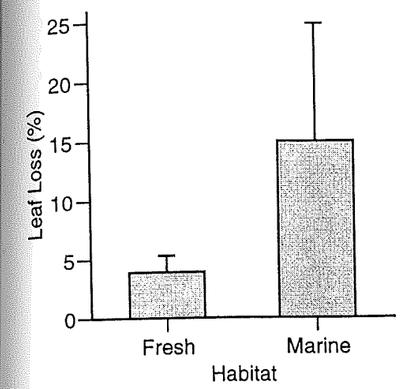

Fig. 1. Percent herbivory (mean ± 1 SE) on grass blades placed in marine and freshwater spring areas of Discovery Bay, Jamaica (P =0.92).

DISCUSSION

Epiphyte loads on *T. testudinum* in freshwater spring and seawater sites were very similar, suggesting that salinity differences do not affect colonization by epiphytes. Also, freshwater inputs do not appear to affect the foraging behavior of sea urchins and fish, since we found no differences in herbivory on the *T. testudinum* implanted in areas within, and outside of, freshwater springs.

Our data are interesting since much of the West Back Reef of Discovery Bay seems to be affected by freshwater inputs. It may be that freshwater effects are not local and that most organisms present in this back reef can tolerate lower salinity and temperature. Organisms in bays without freshwater inputs may be less tolerant to lower salinity.

We experienced some difficulty defining distinct areas of fresh and salt water in the reef, because we did not directly measure temperature and salinity. Thus, we could not determine the actual effects these springs are having on the abiotic environment. It would be interesting to look at the distribution of *T. testudinum* throughout the bay to see if it is more common in true marine areas, since it is usually only found in areas of salinity greater than 25 0/00 (Dawes 1974). Also, future studies could investigate differences in epiphytic species composition and diversity between freshwater and marine areas, to determine if certain species can tolerate lower salinity and temperature better than others.

Freshwater inputs do not seem to affect the colonization of *T. testudinum* by epiphytic organisms or the feeding habits of herbivorous fishes and urchins. This suggests that the freshwater springs are either not appreciably changing the salinity and temperature of the water drastically enough for marine organisms to be affected, or that these marine organisms have successfully adapted to tolerate these changes.

LITERATURE CITED

Dawes, C. J. 1974. Marine algae of the west coast of Florida. University of Miami Press: Gables, Florida.

Lumbardo, J. 1980. Grazing pressure on epiphytic community of *Thalassia testudinum.* Dartmouth FSP.

Ogden, J. C. 1980. Faunal relationships in Caribbean seagrass beds. Pp. 172-192 *in* Phillips R. C. and P. C. McRay eds. 1980. Handbook of Seagrass Biology. Garland Press: New York.