SELECTIVE HERBIVORY BY PARROTFISH ON EPIPHYTE COVERED TURTLEGRASS BLADES

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Abstract. Thalassia testudinum grass blades were divided longitudinally with half the blades covered by epiphytic algae and the other half scraped clean of algae. Divided this way, the age of grass blade parts is removed as a factor in determining if parrotfish prefer turtlegrass blades with encrusting algae on them. We found that parrotfish took significantly more bites from the algae-covered portion of the blade. No significant difference was found for the number of bites per unit blade area between the half-covered blade and a control of a whole blade covered with algae, nor was there a difference between the clean half-blade and a whole algae-free blade control. The control comparison was used to determine if the parrotfish viewed a half-covered blade as though it was completely encrusted. (JVK)

INTRODUCTION (SLS)

Seagrass beds are a common feature in the shallow waters of the world's oceans and are highly productive systems (Ogden 1980). The blades of the seagrass provide nutrition and protection for both plants and animals, including encrusting algae, sponges, hydrozoan polyps, and tunicates (Kaplan 1982).

In Discovery Bay, Jamaica, the leaves of the turtlegrass, *Thalassia testudinum*, provide a large surface area for colonization by encrusting algae such as Teptoporalithon and Tenaria which may also obtain nutrients that are reached from the blades (Ogden 1980). Turtlegrass and their associated algae are eaten by a variety of herbivorous organisms (Kaplan 1982).

It has been suggested that parrotfish (Scaridae) selectively graze on the turtlegrass blades with high concentrations of epiphytes (Jambrirdo 1980). A more recent study (Dols, et al. 1989) found that these fish are able to select the section of the blade with higher epiphyll cover on which to graze. However, since the older parts of the leaf usually support higher epiphyll load, their experimental design did not separate the effects of age of blade sections from their epiphyll load. We proposed that parrotfish would selectively feed on blades with high epiphyll cover independent of the age of the leaf.

METHODS (JJS)

To test our hypothesis, we prepared *Thalassia* leaves in three ways, with two controls and a treatment. The first control was a bundle of six leaves which were collected with no encrusting algae, and the second control was a similar bundle with all leaves fully encrusted with algae. The treated bundle consisted of six leaves divided longitudinally, with half of each leaf scraped clean of algae, and the other half fully encrusted (Figure 1). Each blade was 12cm long and a replicate consisted of one of each type of bundle tied together and weighted to the bottom. All of the ten replicates were placed in turtle grass beds of similar densities and left for six hours. Parrotfish grazing was quantified by counting number of bites present on each individual blade. This design will allow us to discern if age of the leaf rather than algal encrustation is the causal factor in parrotfish herbivory, because if age is the most important factor, both sides of the treated leaf will be grazed equally.

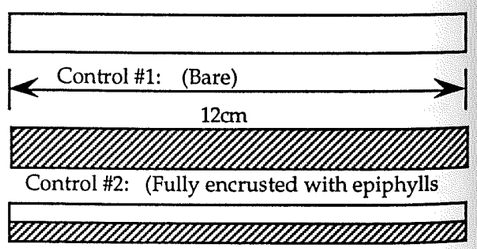

Figure 1. Experimental design

Table 1. Grazing rates for all treatments. (All values are number of bites per unit leaf area).

	TREATMENTS			
Replicate#	Control #1	Control #2	Half with algae	Half w/o algae
1	0	0.0	0	0
2	0	0.167	0	0
3	0	0.5	0	0
4	0	1.667	1.333	0
5	0	6.0	5.0	0.333
6	0	0.0	0	0
7	0	0.8	0.333	0
8	0	0.4	0.667	0
9	0	0.167	1.667	0.333
10	0	1.017	0.90	0.067

RESULTS (JJS)

Since each treatment leaf was divided in two sections for data collection, the area for each part of the treatment was half that of either control. To standardize for this difference in total leaf area between treatment and controls grazing intensity was calculated as the number of bites per 12cm x 2cm blade. The number of bites were pooled for each bunch of six leaves, and the average number of bites per unit area for the entire bunch was recorded (Table 1). The encrusted control (1.02 bites/area) showed more intense herbivory than the scraped side of the treatment (0.07 bites/area, $U=83$, $p<0.01$). Similarly, the encrusted side of the treatment leaves (0.90 bites/area) was eaten more than the scraped side of the treatment ($U=73$, $p<.05$, Wilcoxon two sample test). There was no difference in herbivory between the encrusted control and encrusted side of the treatment ($U=58$, $p>0.1$). There was no herbivory on the unencrusted control leaves, and this was not significantly different from the scraped side of the treatment ($U=63$, $p>0.1$, Wilcoxon two sample test).

DISCUSSION (JMH)

We determined that, of the several animals known to prey on *Thalassia*, the parrotfish was the most likely herbivore in our trials. We observed a parrotfish grazing on one of the sample leaves, and the herbivory on our samples consisted of small, clean-edged bites which are characteristic of this fish. Two leaves were missing from our samples at the end of the trial, which may be a result of wave action or grazing by sea urchins.

Our results show that parrotfish graze preferentially on algae-encrusted areas of *Thalassia* leaves, regardless of the age of the leaf area. We conclude that the fish are able to sense, visually or olfactorily, the presence of epiphytic cover on these leaves. It would be in-

teresting to discover how sensitive the fish are to intermediate levels of epiphyte cover.

By finding a difference in herbivory on laterally adjacent scraped and unscraped portions of leaf segments, we have controlled for the effect of leaf age and have compared only epiphyte cover. In so doing, we have produced results which support and further explain previous findings that parrotfish graze preferentially on algae-encrusted areas of *Thalassia* leaves (Dols, et al. 1989).

Studies of the effects of grazing on *Thalassia* populations would be interesting. Detrimental effects of parrotfish grazing may be minimized, since the fish eat old, epiphyte-covered leaves that may be less profitable to the plant than new leaves. Green turtle and sea urchin herbivory may also have an effect on *Thalassia* populations, which should be addressed in other studies.

Literature Cited

Dols, A., E. Connolly, S. Gangadharan, and T. Richardson. 1989. The effect of height and position of algae on grazing by parrotfish on *Thalassia*. Dartmouth FSP (1989).

Kaplan, E.H. 1982. A field guide to coral reefs of the Caribbean and Florida. Boston: Houghton Mifflin Co., pg. 13-14.

Lamburdo, J. 1980. Grazing pressure on epiphytic community of *Thalassia testudinum*. Dartmouth FSP (1980).

Ogden, J.C. 1980. Faunal relationships in Caribbean seagrass beds. In *Handbook of Seagrass Biology: An Ecosystem Perspective*, R.C. Phillips and C.P. McRay, eds. New York: Garland STP Press, pg. 173-198.