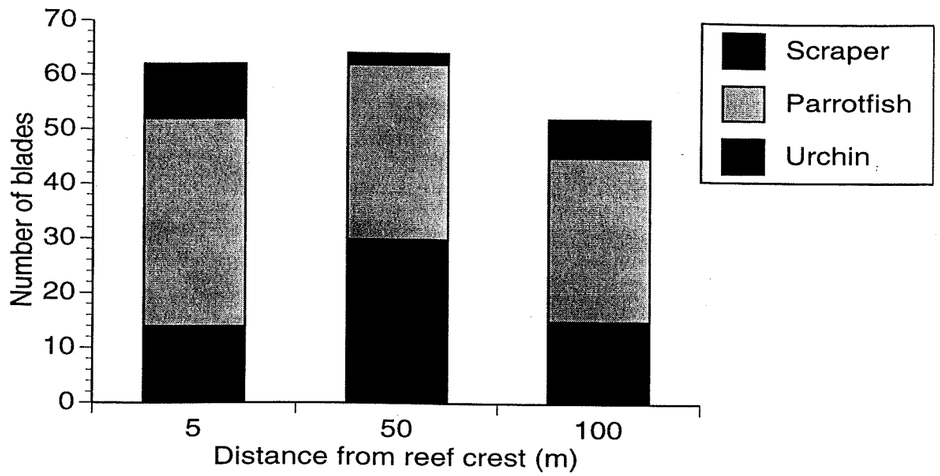


FIG. 4. Type of herbivory on turtle grass blades at various distances from the reef crest (N=60 blades at 5m and 50m, N=50 blades at 100m.) Note: total number of blades may exceed 60 at 5m and 50m and 50 at 100m since individual blades may have suffered more then one type of herbivory.





# *THALASSIA TESTUDINUM* HERBIVORE PREFERENCE MEDIATED BY ALGAL EPIBIONT LOAD

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*Abstract.* Herbivores have been shown to prefer turtle grass with algal epibionts, specifically filamentous algae, over turtle grass with no epibionts. In addition, turtle grass blades differ in the type of algal epibionts they carry. Our objective was to study preferences of two herbivores, sea urchins and parrot fish, on different algal epibionts on turtle grass. After 20 hrs exposure in the field we found no herbivory on control plants with no epibionts and the greatest percent area removed of turtle grass with only calcareous algae. The majority of this removal was by sea urchins which are known to feed at night. Turtle grass blades with long foliose and calcareous algae were grazed less, with the majority of leaf area removed by fish. The least grazed treatment was turtle grass with short filamentous and calcareous epibionts. The lower levels of grazing on the foliose algae may have been due to chemical defenses in the foliose algae, which could have deterred herbivory by fish and urchins.

*Key words: calcareous algae, filamentous algae, urchins, parrotfish*

## INTRODUCTION

In many coral reef systems, turtle grass (*Thalassia testudinum*) is a dominant food source for herbivores, such as parrotfish and sea urchins. Past studies have shown that herbivores, such as parrotfish, prefer turtlegrass blades with epibionts to those without epibionts (Hall et al. 1992, Dudycha et al. 1992, Berry et al. 1994), due to the fact that epibionts provide the bulk of their nutritional intake (Harlin 1980). There is a diverse collection of epiphytic algal species known to grow on turtle grass blades, some of which have been shown to invest in chemical defenses against herbivory (Harlin, 1980). Our objective was to determine if the type of epibiont load has an effect on herbivore preference.

Preliminary field observations demonstrated three types of algae dominating the epibiont load on *T. testudinum* blades: calcareous algae, long brown foliose, and microscopic red filamentous algae. By manipulating the presence of the algal epibionts, we compared the amounts of herbivory among four experimental treatments to determine if herbivores have a preference for turtlegrass with a certain type of epibiont load. We hypothesized that 1) turtle grass with long brown foliose (and calcareous) algae would be most preferred by herbivores since long brown foliose algae is known to be more palatable than calcareous algae (Hay and Fenical 1988); 2) turtle grass with microscopic red filamentous (and calcareous) algae would be the next preferred type; and 3) turtle grass with only calcareous algae would be preferred only over turtle grass with no epibiont load which would be preferred the least. In addition, we tried to determine if there was a preference of certain herbivores (urchins or parrotfish) for turtle grass with certain types of epiphyte loads.

## METHODS

Research was conducted at the Discovery Bay Marine Biology Laboratory in Discovery Bay, Jamaica. On 23 February 1997 we removed epibiont covered turtle grass plants from the west back reef near the marine laboratory. To examine differences in amount of herbivory among specific epibiont covers, we created four different treatments: 1) no epibionts, 2) calcareous algae epibionts only, 3) microscopic filamentous algae and calcareous algae, and 4) long foliose, microscopic filamentous, and calcareous algae. We did this by using a dissecting scope and razor blades to remove all long (visible to the naked eye) foliose algae (leaving leaves with both microscopic filamentous and calcareous algae) or all of the algae present (controls).

We created 30 leaves of each treatment type in which each leaf was 15 cm long and had no visible signs of herbivory apparent on the prepared leaf. The area of each blade was measured, and each individual leaf was marked to differentiate between specific leaves and their respective areas. For each of the four treatments, we divided the 30 leaves into six bundles of five leaves, which were bound with a clothespin and attached to metal bolts. At 18:00, 24 bundles were placed one meter apart from each other in random order at the edge of an existing turtle grass stand.

On 24 February 1997 we collected the plants at 14:00, and individually measured the area removed from each leaf. The area removed on each leaf was divided by the known original area to determine percent herbivory. The type of herbivore damage was determined by the final bite marks left on the grass blade. Fish herbivory was defined as circular cuts, while urchin herbivory was defined as straight or jagged cuts.

## Results

We found no herbivory on our control treatment of turtle grass that lacked epibionts. However, there were significantly different amounts of leaves eaten across the epibiont treatments (contingency test, r^2=0.18, df=89, P=0.0035, Table 1).

Of those plants with algal epibionts, turtle grass with only calcareous epibionts were grazed most, turtle grass with long foliose and calcareous epibiont algae had intermediate levels of grazing and turtle grass with short red filamentous and calcareous epibiont algae were grazed least (Fig. 1). This suggests that short filamentous algae are deterring feeding but the presence of long filamentous algae may enhance preference over the short filamentous and calcareous algae only treatment.

The type of herbivory, by either urchins or fish, was significantly different according to type of epibionts (chi-squared, r2=.027, df=20, P=0.03, Table 2, Fig. 2).

## Discussion

Both fish and urchins prefer turtle grass with epibiont growth as indicated by the lack of herbivory on the control treatment. The other three treatments all experienced some form of herbivory, although in varying degrees. Contrary to the hypothesis that the brown foliose algae would have the most herbivory since it is both fleshy and very apparent, we found instead that turtle grass with red calcareous epibionts had the highest percentage of area removed from its leaves. It is possible that long brown foliose algae and the red filamentous algae types have more plant defenses against herbivory than the red calcareous algae. We found turtle grass with long foliose algae had the second most percentage area removed from its leaves, possibly because urchins, which consumed more biomass than the fish, ate more of the foliose algae than the other types of algae. Urchins may have eaten a high percentage of the brown foliose algae because they are less susceptible to brown algae defenses than fish (Hay, 1988).

Brown foliose algae may be more defended from fish than the red (filamentous and calcareous) algae, and therefore, eaten less by fish that may prefer the more palatable red algae. In addition to possible chemical differences, the morphological differences between the treatments may account for differences in herbivory as the calcareous algae may be easier for the herbivores to manipulate than the more loosely associated filamentous and foliose algae.

**Table 1: The number of turtle grass leaves with and without herbivory on all treatments of turtle grass with different algal epibionts.**

| Turtle Grass leaves with: | No Epibionts | Calcareous | Long Fol and Cal | Short Fil and Cal |
|---|---|---|---|---|
| No Herbivory | 24 | 15 | 20 | 13 |
| Herbivory | 0 | 10 | 4 | 7 |

**Table 2: The number of turtle grass blades that had area removed by either urchins or fish according to epibiont type.**

| Herbivore | No epibionts | Calcareous | Long Fol and Cal | Short Fil and Cal |
|---|---|---|---|---|
| Urchin | 0 | 7 | 2 | 1 |
| Fish | 0 | 2 | 2 | 6 |





Future studies could investigate the defenses of these different forms of epiphytes (brown foliose and red filamentous algae) and determine if indeed some types of algae are more chemically defended against certain predators than others. If certain algae are more defended against predators, the presence of well defended epiphytes could have consequences for the fitness of the host plant.

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