

THE EFFECT OF *STEGASTES DORSOPUNICANS* TERRITORIALITY ON HERBIVORY OF *THALASSIA TESTUDINUM* BY FISH AND SEA URCHINS

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Abstract. We examined the effect of territorial behavior of dusky damselfish (*Stegastes dorsopunicans*) on herbivory on turtle grass (*Thalassia testudinum*) by fish and sea urchins. We evaluated the effect of territoriality by measuring herbivore damage on *Thalassia* blades inside and outside of damselfish territories. We found that most of the grazing on *Thalassia* blades was done by fish rather than by urchins, leading us to believe that dusky damselfish are inefficient at excluding schools of herbivorous fish. (JPF)

INTRODUCTION (MS)

Previous research has shown that levels of herbivory can be reduced by the territorial behavior of *Stegastes dorsopunicans*, the dusky damselfish (Mahoney 1981). A more recent study has demonstrated, however, that the degree of grazing by sea urchins and fishes on algae is unaffected by the dusky damselfish (Foster 1987). In light of such conflicting findings, we looked at the effect of territorial behavior of the dusky damselfish on herbivory of *Thalassia testudinum* by grazing fishes and sea urchins.

Examination of herbivory damage on *Thalassia* provides a means of assessing the effects of damselfish territoriality, as first, *Thalassia* frequently occurs in the same areas of the backreef as dusky damselfish, and second, *Thalassia* is known to be an important food resource for both sea urchins (*Diadema antillarum* and *Tripneustes ventricosus*) and fish (*Scarus* spp). We hypothesized that dusky damselfish would exclude both sea urchins and herbivorous fish from its territories and predicted that total herbivory on *Thalassia* blades placed in damselfish territories would be less than on those blades placed in undefended areas.

METHODS (SPC)

We selected three dusky damselfish territories in the backreef just short of the rear zone of the reef crest in Discovery Bay, Jamaica, WI. Each damselfish was observed for 10-15min. to determine the dimensions of its territory. Furthermore, to ensure that urchin grazing was a viable possibility, we selected only territories with at least one *Diadema* within a 1m radius. We placed four weighted clothespins randomly in a 900cm² area of each territory. Each clothespin held five blades of *Thalassia*, with blade length of \approx 20cm. For controls, we positioned four clothespins of *Thalassia* as close as possible to the border of the dusky territories, making sure that the blades were outside the territories.

We left the *Thalassia* in place for seven hours during the day (1130 to 1830), including dusk. After retrieving the *Thalassia*, we examined the blades individually to determine whether sea urchin or fishes were responsible for the grazing damage. We assumed that a clean bite indicated grazing by fish, while an area with an irregular jagged edge indicated grazing by sea urchins.

Table 1. Number of *Thalassia testudinum* blades grazed by sea urchins and fishes inside and outside of dusky damselfish territories. *

Herbivore	Number of blades grazed	
	IN	OUT
Sea urchin	18	9
Fishes	24	40

*Individual blades grazed by both sea urchins and fishes were counted toward both of the totals respectively

RESULTS (JPF)

Territorial defense by the dusky damselfish did not seem to influence ratios of herbivory by fish and urchins on *Thalassia*. We found no significant difference in total herbivory within damselfish territories vs. outside ($\chi^2=0.19$, $p>0.05$), although we did find more blades grazed by fish outside the damselfish territories (40) than inside (24). *Thalassia* blades suffered significantly more herbivory by fish than by urchins ($\chi^2=21.1$, $p<.005$; Figure 1). Among blades grazed exclusively by one type of herbivore, we observed more fish herbivory than urchin herbivory both inside and outside territories (inside: 38% vs. 28%, outside: 56% vs. 0%). In contrast to the pattern of fish herbivory, we found a greater number of blades grazed by urchins inside damselfish territories (15) than outside (9; Table 1).

DISCUSSION (MS)

Contrary to our expectations, dusky damselfish do not appear to influence herbivory rates on experimental additions of *Thalassia* inside territories. Both our own observations and a previous study (Foster 1987) suggest that dusky damselfish are not effective at excluding schools of herbivorous fish. This may explain the high incidence of

grazed *Thalassia* blades inside damselfish territories.

Thalassia face a greater threat from grazing fish than from sea urchins both inside and outside territories. One factor contributing to this result may be the decreased activity level of *Diadema* during daylight hours (when our study was conducted), a strategy that enables the urchin to remain cryptic.

We cannot support our hypothesis that dusky damselfish exclude urchins. Indeed, an individual *Tripneustes ventricosus* was observed grazing on one of the experimental clumps of *Thalassia*. However, we suggest that a quantification of the relative impacts of different urchin species would more accurately describe this system. Since twice as much herbivory by urchins was observed inside than outside territories, urchins may have a distinct advantage by feeding in such areas. Dusky damselfish often choose rocky, heterogeneous plots to establish territories, areas that would similarly provide refuge for sea urchins. A more extensive application for our methods, with more replicates and including manipulation of damselfish would more accurately assess the extent to which damselfish influence herbivory rates on *Thalassia*.

LITERATURE CITED

- Foster, S.A. 1987. Territoriality of the dusky damselfish: influence on algal biomass and on the relative impacts of grazing by fishes and *Diadema*. *Oikos* 50: 153-160.
- Mahoney, B.M. 1981. An examination of interspecific territory in the dusky damselfish. *Bulletin of Marine Science* 31(1): 141-146.