Epiphytic Algae on *Thalassia testudinum* as main food source for gastropod *Astraea americana*

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Introduction

Seagrass beds are a particularly productive, nutrient-rich environment that requires the steady grazing to maintain optimal productivity. A crucial positive interaction takes place between seagrass and the small grazers that inhabit the seagrass beds. Seagrass beds that are consistently grazed provides a nutrient transfer from the nutrient-rich grasses to the grazers while creating an opportunity for new growth of the seagrass. Epiphytic grazers are particularly important in controlling epiphytic algae cover to prevent eutrophication. *Thalassia testudinum*, commonly known as Turtle Grass has the ability to grow in very dense environments, resulting in increased surface area for phytoplankton and epiphytes. The density of phytoplankton and epiphytes is controlled, by epiphytic grazers such as the gastropod *Astraea americana*. If the relationship of seagrasses and epiphytic grazers is removed, a negative cascade of effects on larger herbivores and foragers that are dependent on the success of *T. testudinum* in seagrass beds will suffer (Holomquist 1997). The relationship between *T. testudinum* and *A. americana* in Florida Bay seagrass beds gives an idea optimal conditions in which small epiphytic grazers have the most success in controlling epiphytic algae control.

Research Questions

- What factors, such as *T. testudinum* and macroalgae percent cover, relate to the density of *A. americana*?
- How does the percent cover of epiphitic algae affect *A. americana* blade selection?

Methods

Five 30 meter transects will be laid out across areas that have variable *T. testudinum* cover. Beginning at meter #1, and every other following meter, a 1x1 meter quadrat will be placed on the right-hand side of the transect. Therefore, 75 quadrats of data were collected. At each quadrat, three sets of data was recorded. First, both the percent cover of *T. testudinum* and the percent cover of macroalgae in the quadrat was estimated to the nearest 5%. Next, the number of *Astraea americana* was recorded. *A. americana* were found diving down to the quadrat and searching it thoroughly by hand. When an *A. americana* was found the *T. testudinum* or macroalgae, the *A. americana* was removed and the blade or algae was placed in a jar specifically labeled for that transect and quadrat. The jars with the *T. testudinum* blades or macroalgae were brought back to the lab, and the percent cover of epiphytic algae was estimated to the nearest 5%. In the fifth transect, five blades of *T. testudinum* without *A. americana* were collected and percent cover of epiphytic algae was recorded to compare with the collected samples.

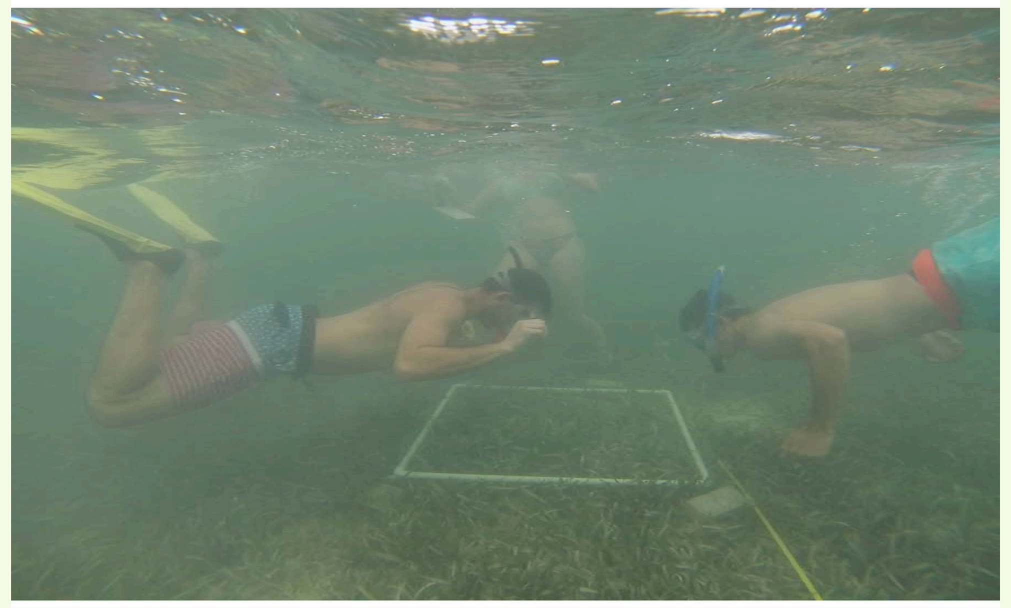

Figure 1: Looking into the benthic environment to find *Astraea americana*.

Results

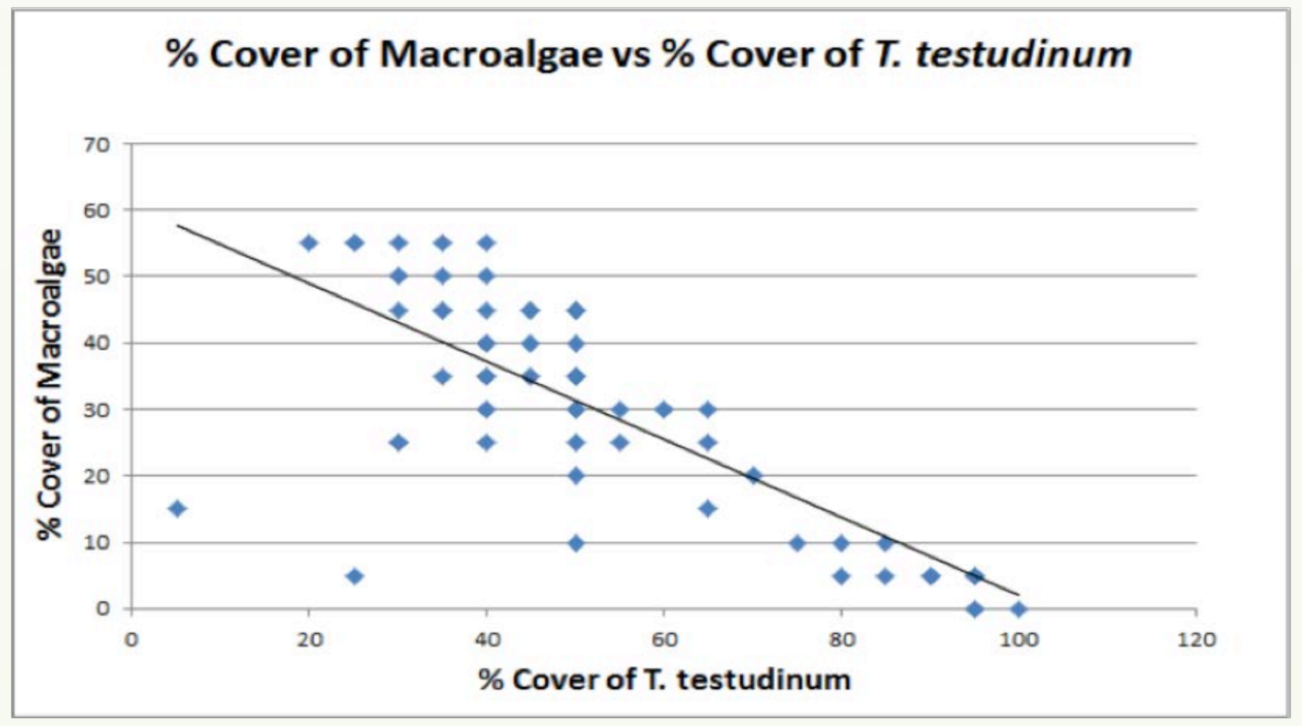

Figure 2: Correlation between % cover of macroalgae and % cover of T. testudinum. R-squared = .612 and p < .0001.

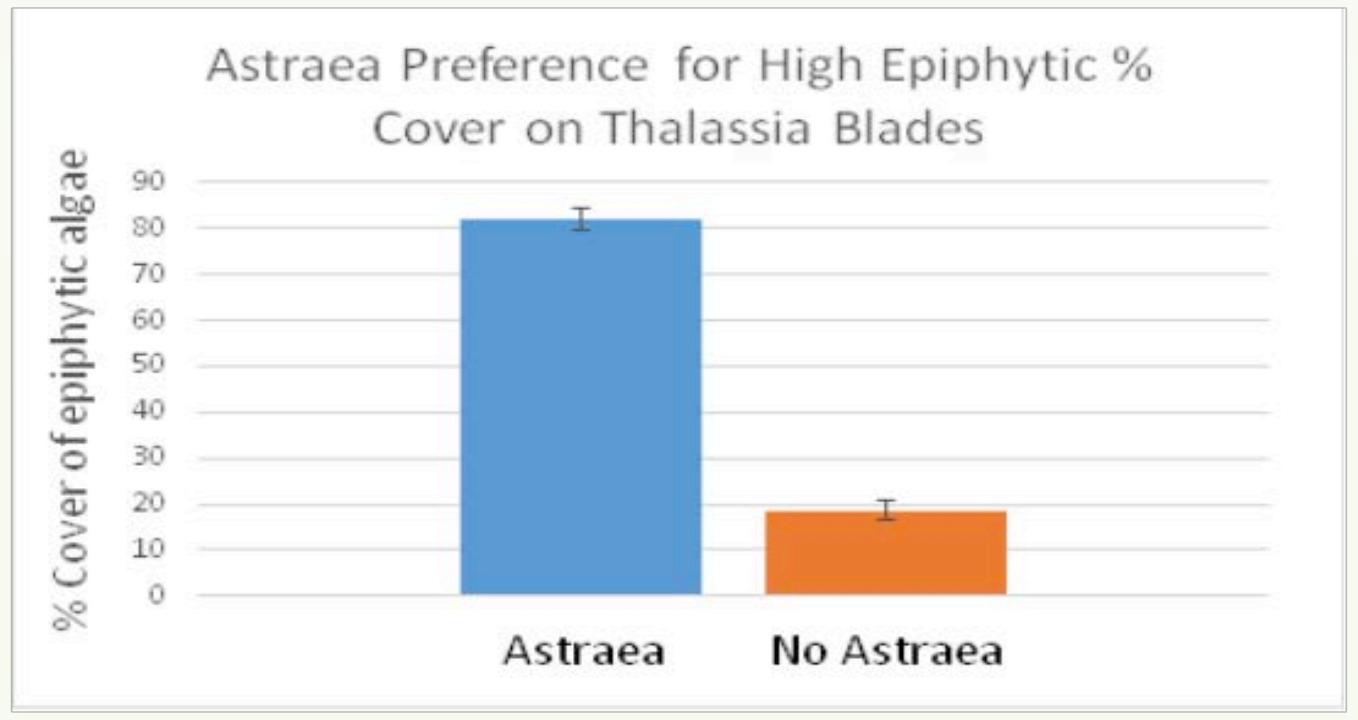

Figure 5: Comparison of % cover of epiphytic algae on blades with A. americana and blades without. $F(1,25) = 446.97$, $p < .0001$.

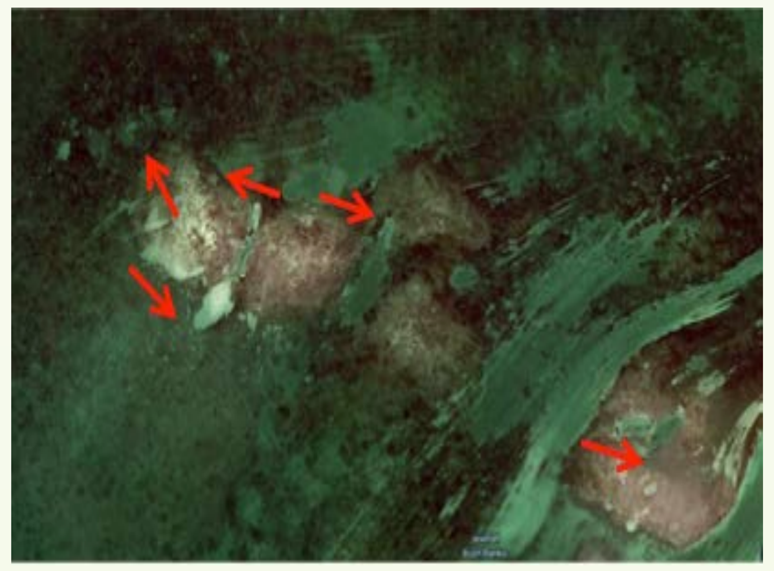

Figure 3: Triton Flats, a series of shallow water mud Flats near Layton, Florida and where our transects were placed

Figure 6: The *Astraea Americana* were mostly found on Thalassia blades covered in epiphitic algae.

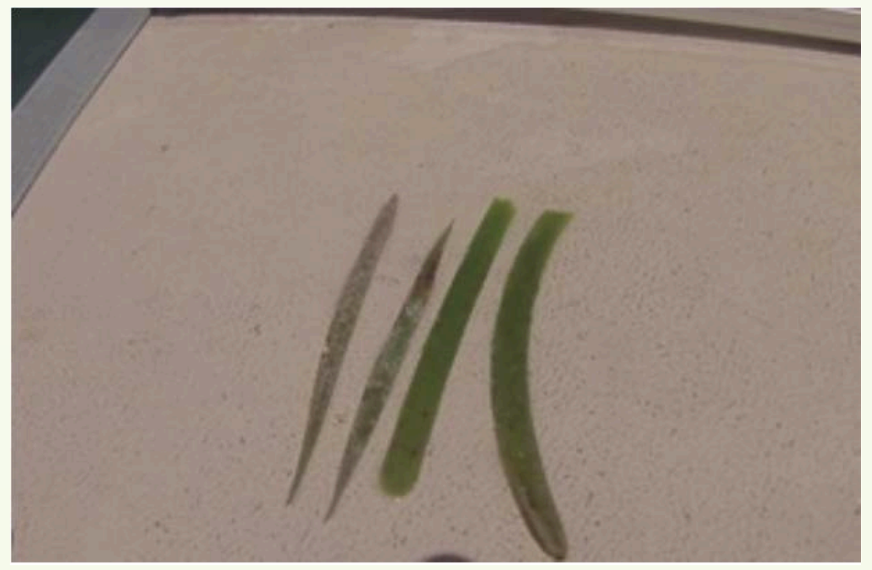

Figure 7. Two blades on left have high epiphytic algae cover. Two blades on the right lack epiphytic algae

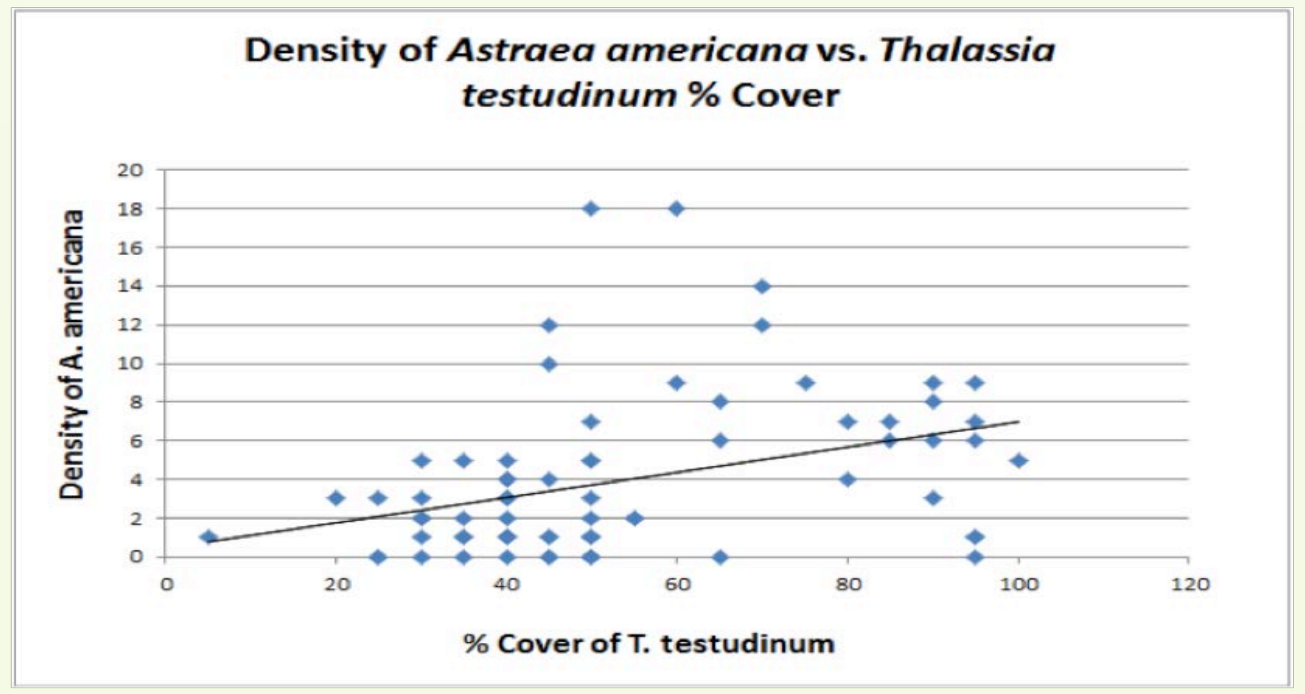

Figure 4: Correlation between density of Astraea americana and % cover of T. testudinum. $F(1,74) = 7.96$, $p = .007$

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
% cover of algae	1	1	9.94	3.95	0.05
% cover of Thalassia	1	1	20.06	7.96	0.007
% cover of algae*% cover of Thalassia	1	1	11.61	4.61	0.04
Epiphytic average on blades with astraea	1	1	0.01	0.004	0.95
Transect	4	4	48.14	4.78	0.002

Table 2: Factors that effect *A. americana* density

Discussion

There was a strong correlation between macroalgae and *T. testudinum* percent cover, meaning that they are competing for the same space and resources. Knowing the percent cover of one of them explains about 60% of the variation in the data. In other words, one of the big factors that affected *T. testudinum* percent cover is macroalgae percent cover and vise versa. However, as the model shows, the correlation is not a perfect negative correlation which means that there are other factors that likely have an effect on T. *testudinum* cover. These other factors are probably site dependent, for example the depth and turbidity of the water, the presence of grazers such as sea urchins, etc.

Both macroalgae and *T. testudinum* percent cover had significant individual effects, as well as a significant interaction, on the density of *A. americana*. While we had predicted correctly that the percent cover of *T. testudinum* would have the most significant effect on *A. americana* density, we were surprised that macroalgae had an effect also. Our data seems to show that *A. americana* densities were not actually highest in areas with lots of *T. testudinum* cover, but in areas that had about 50-70% cover of *T. testudinum* and some macroalgae cover (Figure 4). This suggests that small doses of macroalgae can have a positive effect on A. americana densities. There are a couple factors to further consider when interpreting the results of our study, for example, the accuracy of our data. It is also possible that most macroalgae are more structurally complex than *T. testudinum*, so they provide some protection and cover to *A. americana* when they are not grazing on the epiphytic algae-covered *T. testudinum* blades.

Lastly, our results in Figure 5 suggest that *A. americana* preferentially graze on blades that have a lot of their main food source, epiphytic algae. *A. americana* prefer to be in areas with medium to high percent cover of *T. testudinum*, and within that area, they will feed on the blades that have a lot of epiphytic algae. This knowledge is important because it brings to attention the importance of epiphytic algae in the food web. *T. testudinum,* itself, is not a food source to these small gastropods that are eaten by many other organisms, but *T. testudinum* provides the medium for epiphytic algae to grow on which then supports the gastropod population.

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