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It's not easy being a reef: Impacts of competition and corallivory in the Florida Keys

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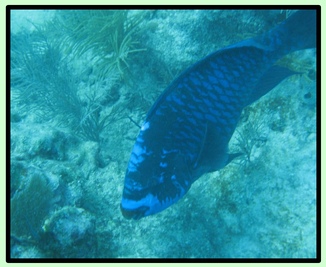

It's not easy being a reef:
The impacts of corallivory and competition on coral cover in the Florida Keys

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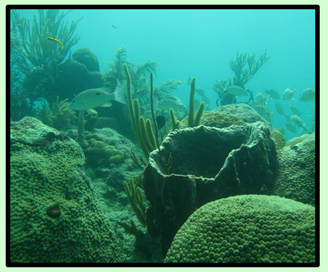
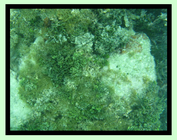
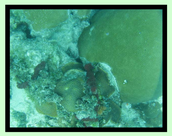


Introduction

As coral cover in the Florida Keys continues to decline, understanding the factors driving this trend has become a priority for researchers. Previous studies suggest that parrotfish may play an important role by reducing the negative impact of macroalgae on corals (Mumby and Steneck 2008). Along the northern Florida Keys reef tract, coral colonies are often in direct competition for space and nutrients with macroalgae (Lirman 2001). Parrotfish are quite abundant in the Florida Keys, but their density is not strongly associated with either macroalgae or coral cover estimates (Kramer and Heck 2007). Furthermore, corals may actually be grazed by parrotfishes making their net impact on coral reef health difficult to predict (Burkpile 2012). To estimate the direct and indirect impact of parrotfish on corals, we measured coral, turf and macroalgae cover, along with parrotfish density on 14 reefs over three census periods.

Hypotheses





- H_1: Corals are negatively related to macroalgae due to competition
- H_2: Macroalgae are negatively related to parrotfish due to herbivory
- H_3: Corals are negatively related to parrotfish due to corallivory or positively related to parrotfish due to indirect effects of herbivory on macroalgae

Methods and Materials

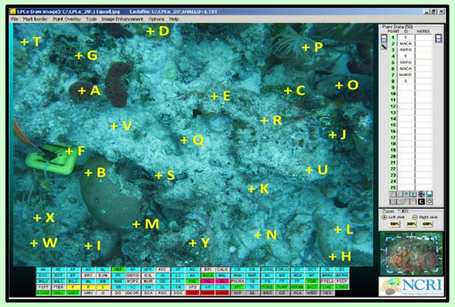
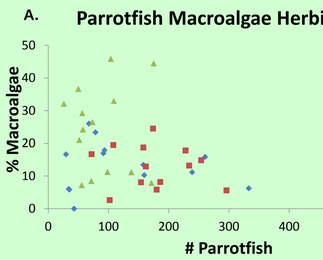


Figure 1. Substrate composition estimated from twenty-four 0.5 m X 0.5 m quadrants on each reef. Twenty-five random point substrate estimation was accomplished using Coral Point Count for Excel (CPCe).

- Selected n = 14 patch reefs > 50 m
- Divers counted parrotfish species
- Photographed substrate every 10 m
- Took video footage of transect
- Calculated percent cover using CPCe
  - Live coral
  - Macroalgae
  - Turf algae
  - Sponge
  - Octocorals

Figure 2. Locations of the 14 research sites in the Florida Keys National Marine Sanctuary.

Results



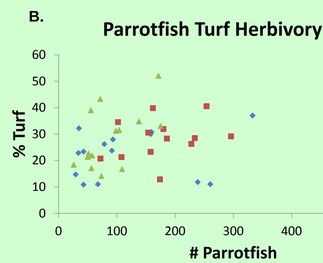
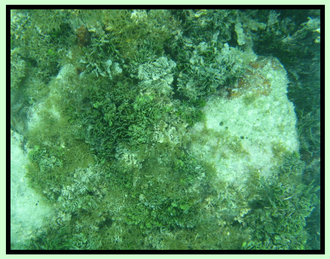
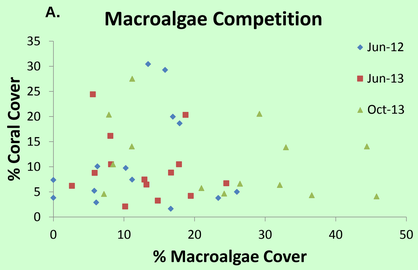


Figure 3 – Total parrotfish density compared to (A) the percentage of macroalgae and (B) the percentage of turf algae present at each site for three sampling periods.





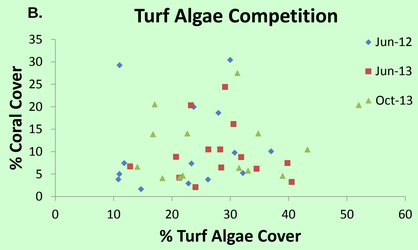
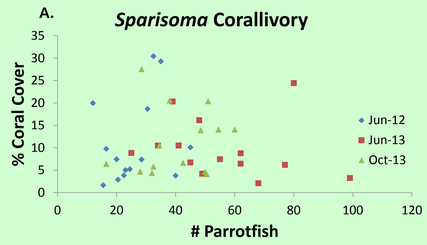


Figure 4 – Percent cover of live coral compared to the (A) percent macroalgae cover and (B) percent turf algae cover at each site for three sampling periods.



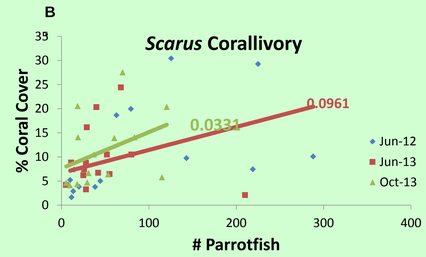
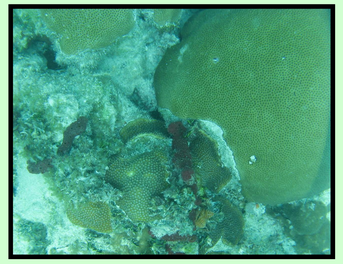


Figure 5 – Percent cover of live coral compared to the total number of (A) *Sparisoma* parrotfish and (B) *Scarus* parrotfish present at each site for three sampling periods. Significant positive relationships were found by linear regression for June 2012 and October 2013 censuses.



Conclusions

- No significant relationship was found between total parrotfish population and macroalgae or turf algae
  No significant relationship was found between live coral cover and macrolgae or turf algae
  No significant relationship was found between live coral cover and *Sparisoma* parrotfish density
- A significant positive relationship was found between live coral cover and *Scarus* parrotfish density in June 2012 ($p = 0.0961$) and October 2013 ($p = 0.0331$)
- These results suggest that parrotfish have a net positive effect on corals in the Florida Keys
- This positive relationship between parrotfish density and coral cover may be due to other factors such as reef complexity, water quality or reef history

References

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Acknowledgements

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