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Just keep grazing: Parrotfish grazing and dietary selectivity in the Florida Keys

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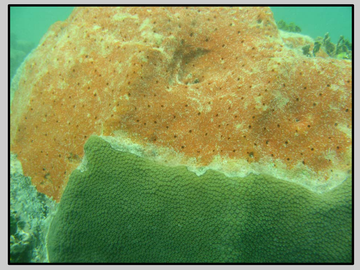
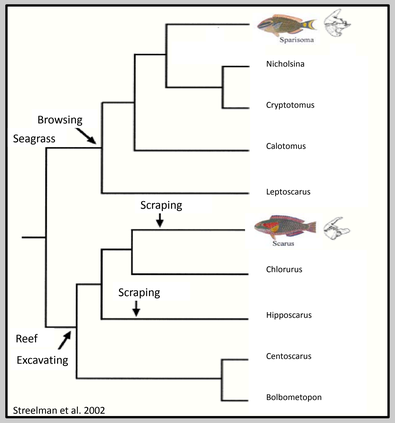


Introduction

The reefs of the Florida Keys contain a variety of coral species that provide a foundation for a healthy ecosystem. Coral health and diversity can be influenced by many community factors including macroalgae cover and parrotfish abundance. Parrotfish are common grazers on reefs and there is conflicting data on their effects on corals. Many scientists say the overgrazing of corals by parrotfish has damaged the corals so severely that they are unable to survive, allowing macroalgae to dominate ecosystems and outcompete corals (Rotjan and Lewis 2008). Fleshy macroalgae species are fast growing and can easily out compete coral species for essential nutrients (Mumby et al. 2007). Therefore, by having parrotfish to graze on the macroalgae they may have an indirect positive effect on coral cover (Mumby 2009). In the Florida Keys parrotfish have been observed to feed directly on corals (Burkepile 2012). The two most abundant genera of parrotfish in the Keys are



Scarus and *Sparisoma*. These two species exhibit different feeding preferences based upon their jaw morphologies (Streelman et al. 2002). The feeding strategies are excavating and browsing. Excavators (*Scarus*) remove substrate when they feed indicating they could harm corals. Browsers (*Sparisoma*) tend to just remove the algae they are eating, leaving the substratum intact (Streelman et al. 2002). In this experiment we used observational data on the feeding behavior of 10 species of parrotfishes to determine their dietary preferences using the Strauss' Selectivity Indices. Substrate composition for 14 reefs in the FKNMS were evaluated through visual surveys, video transects, and digital photographs. This was compared to the foraging behaviors of 30 parrotfishes per reef from both the *Scarus* and *Sparisoma* genera. Average selectivity indices for each species were compared for five substrate types coral, macroalgae, turf, sponge and other. We also compared whether excavating (*Scarus*) and browsing (*Sparisoma)* genera had predictable differences in their selectivity indices.

Hypotheses

H_1: Parrotfishes exhibit dietary selectivity

H_2: *Scarus* spp. will prefer hard substrates / turf algae

H_3: *Sparisoma* spp. will prefer fleshy macroalgae

Methods

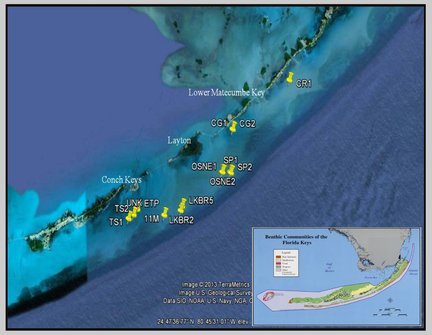


Figure 1. Locations of the 14 research sites in the Florida Keys National Marine Sanctuary.

- Selected n=14 patch reefs > 50 m
- Divers counted parrotfish species
- Divers recorded individual parrotfish bite counts
- Photograph substrate every 10 m
- Calculated percent cover using CPCe software
- Calculated parrotfish selectivity indices using Strauss' Selectivity Index equation: $L = \%\ bites_i - \%\ substrate_i$

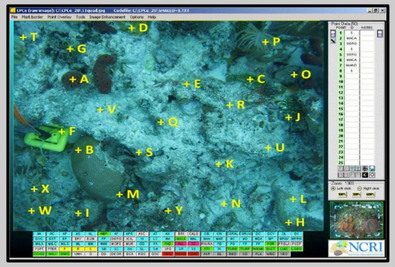


Figure 2. Substrate composition estimated from twenty-four 0.5 m X 0.5 m quadrants on each reef. Twenty-five random point substrate estimation was accomplished using Coral Point Count for Excel (CPCe) software.

Results

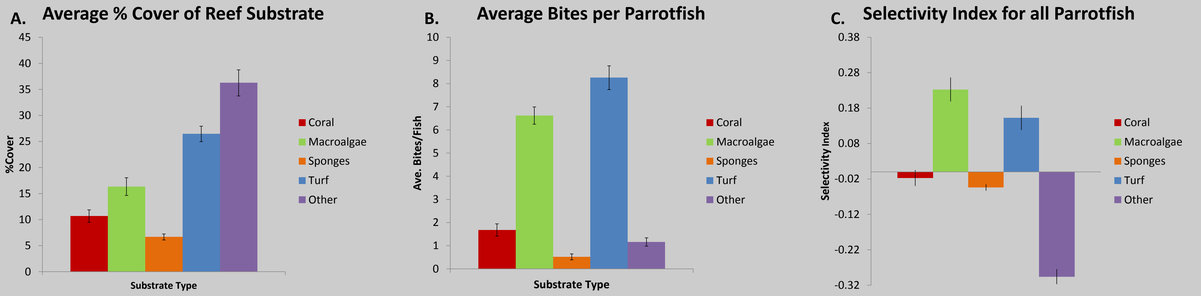
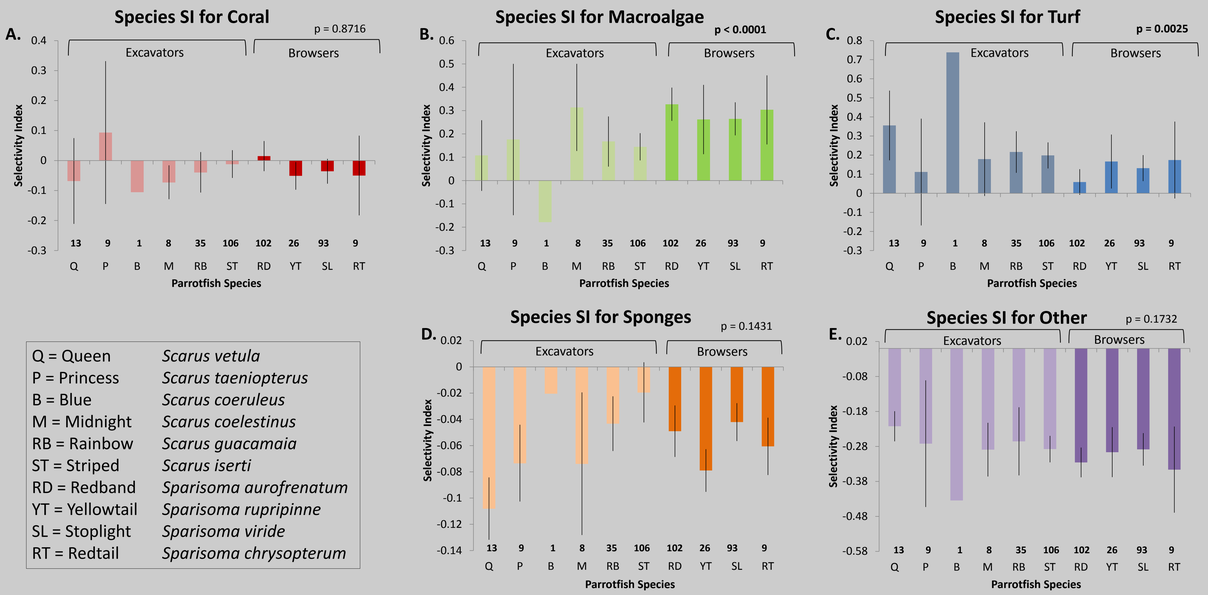


Figure 3. (A) The average percent cover of coral, macroalgae, sponges, turf and other on 14 patch reefs. (B) The average bites per parrotfish on coral, macroalgae, sponges, turf and other. (C) The Strauss' Selectivity Index for all species of parrotfish for coal, macroalgae, sponges, turf and other.



Q = Queen	*Scarus vetula*
P = Princess	*Scarus taeniopterus*
B = Blue	*Scarus coeruleus*
M = Midnight	*Scarus coelestinus*
RB = Rainbow	*Scarus guacamaia*
ST = Striped	*Scarus iserti*
RD = Redband	*Sparisoma aurofrenatum*
YT = Yellowtail	*Sparisoma rupripinne*
SL = Stoplight	*Sparisoma viride*
RT = Redtail	*Sparisoma chrysopterum*

Figure 4. Selectivity indices of 10 parrotfish species (see legend) for (A) coral, (B) macroalgae, (C) turf, (D) sponges, and (E) other. Brackets indicate which species belong to the same genus. Lighter shaded bars are excavator species in the *Scarus* genus and the darker bars are browser species in the *Sparisoma* genus. Numbers on the x-axis indicate species sample size. Average selectivity by genera tested by student t-test.

Conclusions

- Parrotfish show a diet preference towards macroalgae and turf.
- Parrotfish show a diet avoidance of sponges and other substrate.
- There were no significant differences between species.
- ***Sparisoma***
  - Show a significant preference for macroalgae compared to *Scarus* ($p < 0.0001$)
- ***Scarus***
  - Show a significant preference for turf compared to *Sparisoma* ($p = 0.0025$)
- Parrotfish do not prefer nor avoid live coral, instead they show a preference for macroalgae and turf depending on genus.

Acknowledgements

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