Introduction
Coral reefs have long been known as locations of refuge for reef fishes. Hixon et al. (1993) displayed that reef fish are more abundant when there are holes in reef structure to avoid predators (b). These patterns of refuge around reefs can also be observed aerially at Heron Island, Australia. In this shallow lagoon, distinct grazing halos surround patch reefs. Madin et al. (2011) found evidence supporting the hypothesis that grazing by herbivorous fish caused the halo patterns and that this foraging behavior was driven by predator-mediate effects (c). The results of this study suggest that as distance from the reef edge increases, so does the risk of predation.

Based on this past research at Heron Island, I predicted that as distance from patch reef increased, fish abundance, diversity, and grazing behavior would decrease in response to higher predation risk.

Methods

Experiment design
This study was conducted at Heron Island, Australia. The study site was within swimming distance of the island and consisted of a cluster of patch reefs. We laid three transects radiating out from reef structures and set three GoPro cameras at 0, 10, and 20 meters from the reef edge. Approximately 2 hours of footage were taken by each camera. We collected data over three consecutive days (May 29, May 30, and June 1, 2017) beginning at high tide.

Video analysis
To collect data from the videos, I identified and counted fish to the lowest taxonomic level of my ability. I also calculated the proportion of fish observed foraging and average bite rate.

Data analysis
I conducted three types of analyses on the video data. To investigate the effect of distance from the reef edge on overall fish abundance, Shannon’s diversity index of fish, proportion of fish biting, and bite rate I used linear mixed effects models. The random effects in these models were reef ID and date.

To analyze the effect of distance on community structure, I conducted a multi-dimensional scaling analysis (MDS). This is a complex statistical analysis which uses the abundance of each taxa at each distance to quantify if there is difference in community structure between the distances. The further the centroid of each distance is from the other distances, the more unique the fish communities.

Results

Contrary to my prediction, fish abundance increased with increased distance from patch reef edge.

Fish species diversity was not influenced by distances from patch reef edge.

There was no significant difference in foraging behavior with distance from the reef edge.

Community structure differed with distance and differences were driven primarily by Gerres oyena (common silver biddy).

Gerres oyena abundance increased with increased distance from the reef edge.

Overall, I found that the fish community differed with increased distance from the reef, but fish foraging behavior was not affected.

References:

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CONTACT
Audree Van Valkenburg
audreejoy.van@aggimail.usu.edu