

# Can Parrotfish Populations be Used as an Indicator of Coral Reef Diversity?

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## Background

- Corals rely on a mutualistic relationship with algae: corals provide a protective environment and compounds for photosynthesis to the algae in return for oxygen from the algae. Although, if too many algae are present in reefs, it creates competition for the corals to survive (Mumby, 2009).
- Parrotfish help regulate competition by eating the algae in the reef, benefitting the corals (Taylor, 2019).



Figure 1. Parrotfish are an indicator species of a coral reef health. Parrotfish graze the reef for algae, which promotes coral growth. Higher populations of parrotfish indicate a healthy coral reef.

Parrotfish in Coral Reef [Digital image]. (2019). Retrieved 2020, from <https://fisharoma.com/parrotfish/>

## Motivation

- Coastal communities rely heavily on the health of the ecosystem by way of tourism, fishing, and mitigation of potentially damaging natural weather occurrences such as waves, storms, and floods.
- Coral reefs provide ecosystem services such as providing habitat for fish, food, protecting coastlines from storms, and are spawning grounds for economically important fish (Jackson, 2013).
- We propose to evaluate how parrotfish benefit coral health through population control and how their role can help lead to coral reef rehabilitation.

## Hypothesis

- We hypothesize that there is a relationship between parrotfish abundance and coral diversity.

Predicted Coral Reef Diversity Response to Parrotfish Abundance

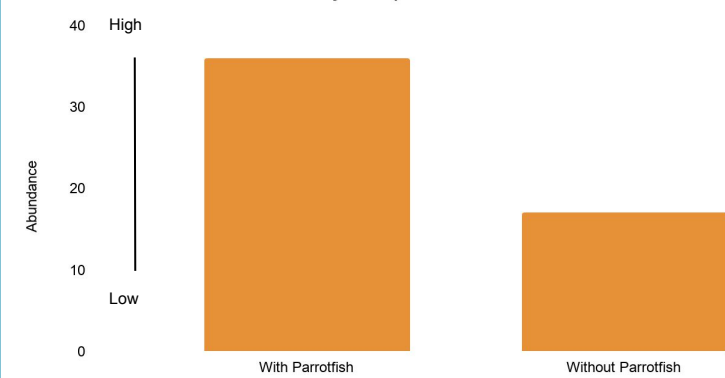


Figure 2. Our predictions about the presence of parrotfish will influence coral reef abundance. Parrotfish presence will be determined if there are bite scars on the coral and coral abundance will be measured through diversity.

## Predictions

- We predict that coral reef diversity, as measured by number of corals, will be highest in areas with the presence of parrotfish (Figure 2).

## Study Design

- We would conduct a field experiment based in the Great Barrier Reef and use quadrats in areas with the appeared presence of parrotfish (identified by parrotfish bite scars on the corals) and closed off sections of reef that does not allow for parrotfish to enter. The strategy we would use to gather data would include sectioning off 1 meter by 1 meter areas (some open to fish grazing and others enclosed) and count the number of parrotfish bite scars that appear on the corals (within open quadrats) and the changes of coral reef diversity (within all quadrats) every 3 days for 6 months and record changes.

## Study Design

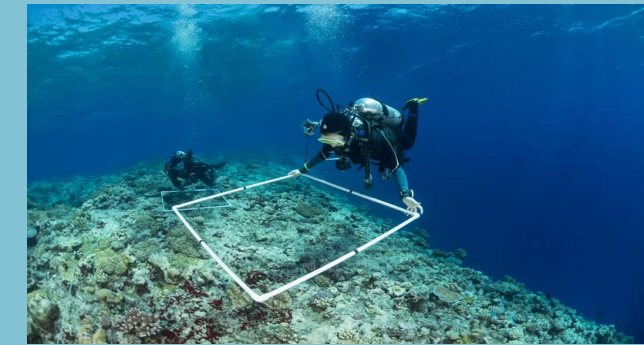


Figure 3. Quadrats are 1-meter by 1-meter areas of the reef (one open, the other closed off to fish) that we will revisit every 3 days for 6 months in to monitor the same areas in the reef and see the change over time.

Coral Reef Quadrat [Digital image]. (2012, May). Retrieved November, 2020, from <https://www.oceanmatters.org/morgan-and-shreya-drilling-holes-for-their-groups-quadrat/>

## Intended Analysis

- Given that our response variable (number of corals) is continuous, and our independent variable (parrotfish and lack of parrotfish) is categorical with two groups we will analyze the data collected using a T-test.
- The output from the T-test will help us identify if parrotfish have an influence on the abundance of corals in an area. Because our study design is small and ocean temperatures are continuing to rise, altering coral reef ecosystems, our inferences may change with time. The rising temperatures also limit possible future study sites due to mass bleaching effects occurring in coral reefs.

## Expected Benefits

- Our study will inform and potentially lead to more studies about the relationship between the coral reefs and parrotfish, as well as to why their relationship is so fundamental. Parrotfish are necessary for the survival of reefs across the world's oceans (Russ, 2015), therefore they need to be present in reefs now and in the future through human regulation and population monitoring. The conclusions of this study and others may result in increased protection of this species within reefs by federal, state, or local policies to ensure healthy ecosystems and a lasting reef.

## References

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