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Major: Marine Biology
Fish Community Structure Following Disturbance on Patch Reefs in San Salvador, Bahamas
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The assessment of coral reefs is critical due to their worldwide decline associated with ongoing global temperature rise, fishing pressure, and coral diseases (Peckol et al., 2003). Coral reef systems are also experiencing a phase shift that involves a decline in coral dominance concurrently with an increase in macroalgal dominance (Bruno et al. 2009). Such changes could potentially impact reef fish community structure, and reef ecosystems more generally. The primary focus of this research was to determine if there was a change in fish species diversity, abundance, and overall community structure following an experimental disturbance event on a patch reef. Data were collected four months apart on a series of shallow patch reefs located at Dump Reef on San Salvador Island, Bahamas. Five pairs of 1 m² control and experimental plots were established in January 2019. Macroalgae was removed from the experimental plots to the extent possible (~50-60%) and adjacent undisturbed plots acted as controls. GoPro cameras were deployed in January and May of 2019 and were run for up to ~1 hr to collect videos of each replicate plots. The videos collected were then assessed using BORIS (Behavioral Observation Research Interactive Software) to quantify fish community composition. Each video was broken up into ten-minute video segments and each segment was considered as a within-plot replicate. Statistical analyses were conducted using NCSS and PRIMER software. In May, video was collected at only 4 pairs of control and experimental plots, due to uncertainty in the specific location of one of the set of plots.

Results indicated that there was a distinct seasonal change with respect to community structure but there was no difference among control and experimental plots (Figure 1). May control plots exhibited more uniformity in community structure compared to experimental plots, which had significantly more variability. January control and experimental plots were characterized by a large abundance of initial phase bluehead wrasse (*Thalassoma bifasciatum)* and juvenile phase slippery dick wrasse (*Halichoeres bivittatus*). A 2-way ANOVA test indicated significant differences with respect to date for species abundance (p=0.000000) and species richness (p=0.000125). Mean species abundance and richness decreased from January to May, reflecting the seasonal fluctuations on Dump Reef in fish community structure. The two most abundant species overall were initial phase bluehead wrasse and juvenile phase striped parrotfish (*Scarus iseri*). In both January and May, bluehead wrasse were observed more frequently in experimental plots while the striped parrotfish were observed more frequently in control plots. However, mean number of fish for both species decreased from January to May. Overall, it appears that seasonality affected fish community structure much more than disturbance/algal removal in this experiment. More research should be conducted to examine what specific factors may be causing seasonal fluctuations, and if longer-term removal experiments, with more frequent data collected -would yield a clearer relationship with respect to fish community structure and macroalgal communities in Bahamian patch reefs.

References

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Peckol, P. M., A. Curran, B. J. Greenstein, E. Y. Floyd, and M. L. Robbart. 2003. Assessment of coral reefs off San Salvador Island, Bahamas (stony corals, algae and fish populations). Atoll Research Bulletin 496:124-145.
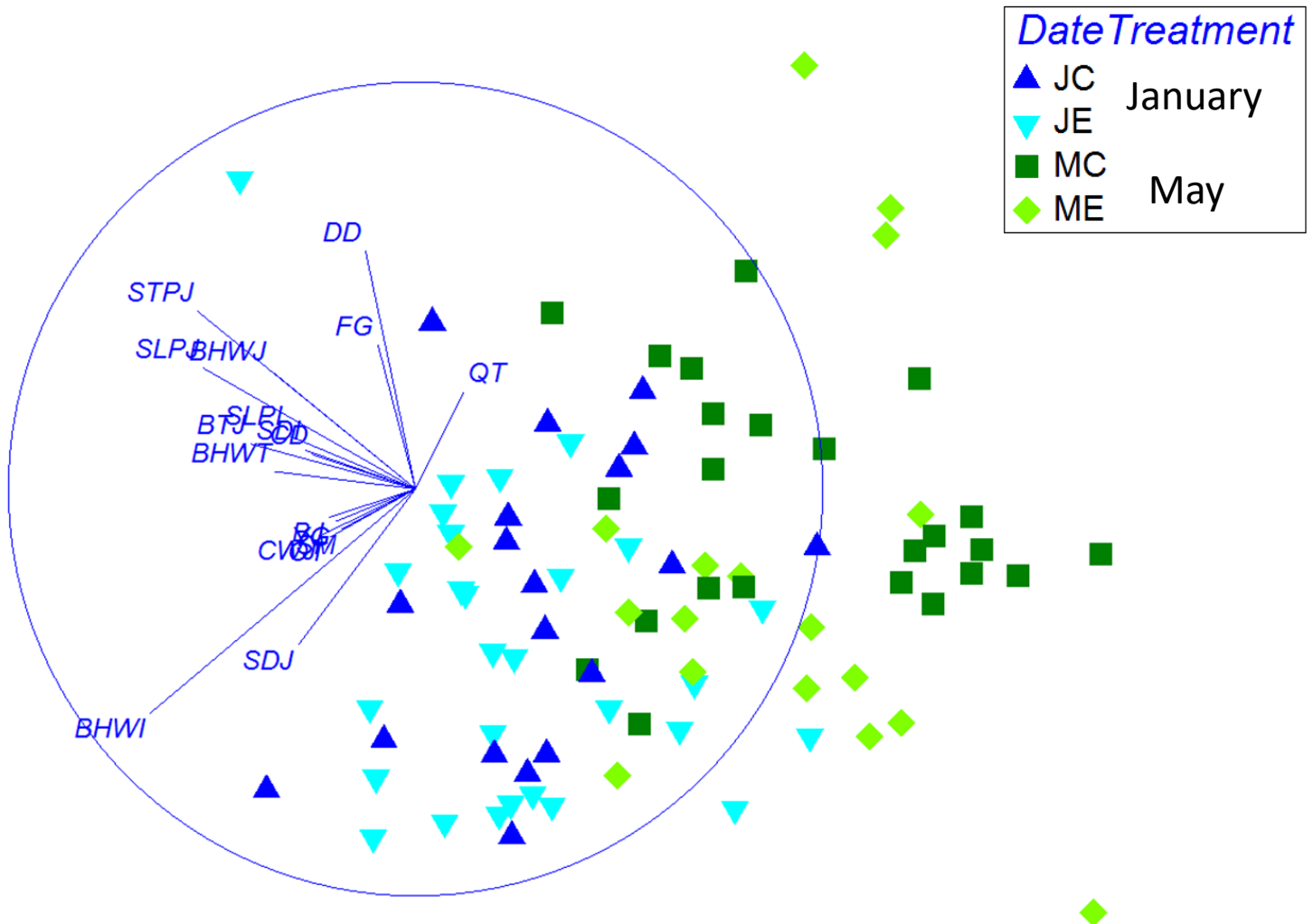
Figure 1. Results of a non-metric multidimensional scaling analysis showing variation in fish community structure among treatments. The Bray Curtis similarity index was used on untransformed data.