Plan Overview

A Data Management Plan created using DMPTool

Title: RAPID: A comparison of acute heat stress and fish abundance influencing coral survival.

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Affiliation: Clemson University (clemson.edu)

Funder: National Science Foundation (nsf.gov)

Template: BCO-DMO NSF OCE: Biological and Chemical Oceanography

Project abstract:

Overview

Rising global temperatures continues to place coral reefs in severe peril. The symbiotic relationship between corals their algal symbionts (zooxanthellae) break down under extreme temperatures leading to increased coral bleaching, the expulsion of their protective algal symbionts. Without zooxanthellae, the transparent “bleached” corals are vulnerable to elevated UV exposure which can be lethal. Yet some corals seem to show higher resilience and recovery during these periods of extreme heat. One potential reason for increased resilience may be positive interactions with reef fishes that associate with corals. Many reef fish graze directly on coral polyps or on harmful fleshy algae that compete with corals for space and nutrients. As these reef fish establish territories on and around coral, they have the potential to benefit corals through disruption of boundary layers, fecal deposition of nutrients and zooxanthellae, and in some cases even shading from direct sunlight. Understanding how these community interactions influence coral survival and recovery from bleaching is essential to our efforts to restore reef communities.

Intellectual Merit

In this study, we examine how reef fish abundance and behaviors associated with massive corals that have bleached influence the degree and the rate of recovery of impacted corals. By leveraging a long-term dataset on reef community structure and local heat load in the middle Florida Keys, we seek to tease apart the environmental factors and potential benefits/costs of reef fish associations on the recovery of individual bleached corals and the influence of severe bleaching on reef community structure. Observational data collected over a nine month recovery period from October through June will allow us to analyze the factors most associated with individual coral recovery and estimate how bleaching severity in turn influences coral reef community structure. The analyses proposed will help distinguish if coral resilience is strictly determined by local abiotic conditions or are moderated by the abundance and behaviors of associated reef fishes during the

period of recovery. Such a study will help inform resource managers as to the role that community structure and dynamics play in ecological resilience of fragile corals under increasing heat stress.

Broader Impacts

The need for public understanding of connections between climate change, ocean health, and coral reef ecosystem services is of paramount if we hope to galvanize support for a sustainable future. This project addresses this need through the professional development of graduate and undergraduate student researchers that are also mentors to elementary school children. Our Something Very Fishy Marine Science STEAM program is a musical theatre approach to the teaching of NOAA's Ocean Literacy Principles. What makes our program unique is the direct connection of the research we conduct on fish behaviors and coral reef health translated into imaginary field trips to the Florida Keys which highlight the diversity of careers that contribute to solving our ocean crisis. Children involved in our Something Very Fishy program get to learn about marine science from undergraduate docents that have been diving and conducting research in the Keys. This connection between seeing individuals that look like them doing marine science is a fantastic way to build interests in STEM disciplines while raising awareness of the links between how we live our lives and the health of the ocean. Children in the Something Very Fishy program show an increased awareness of the ocean literacy principles and an increased interest in marine science related STEM careers. Helping children to better understand what is happening to the oceans and how it impacts everyone's lives is a powerful broader impact addressing the world's most challenging problem.

Start date: 10-15-2023

End date: 10-14-2024

Last modified: 09-17-2023

Copyright information:

RAPID: A comparison of acute heat stress and fish abundance influencing coral survival.

As project administrator, I will comply with the dissemination policies and data management requirements described in the NSF Award and Administration Guide (AAG, Chapter VI.D.4) and the NSF Division of Ocean Sciences Sample and Data Policy.

1. Daily float plans will be shared with the FWC law enforcement. 2. The only sampling equipment will be YSI multiprobes, video cameras, and thermal loggers. 3. The actual sampling events will be recorded on paper logs (scanned into PDF documents) and/or in a digital event log using the R2R event logger application (if available). 4. A cruise report will not be required for this project.

Observational Data Sets

1. Individual coral survival. This dataset will include metadata on each individual coral censused (n = 240) including photos (5 views X 4 sampling dates), and fish association videos (.mp4 file type X 4 sampling dates). Percent cover status, fish presence, and fish behaviors will be included in the analysis of these photos and videos. Data preserved as a flat ASCII file will be uploaded to the BCO-DMO (Biological and Chemical Oceanography - Data Management Office)

2. Reef community census. This dataset will be taken at each location sampled for each sampling period (30 locations X 4 sampling dates - n = 120). In addition, previous summer reef census data from the previous six years 2018-2023 will be contributed from archival data from the Clemson Marine Research program (mchildr@clemson.edu). Substrate photos (12 per location X 30 locations X 4 sampling periods - 1440 substrate photos will be uploaded into CoralNet and will be made available to the public. From these photos the dataset will estimate substrate % cover including hard corals, soft corals, sponges, fleshy algae, calcareous algae, and turf algae. Video transects from along each 50 m transect will also be made available and will be censused for reef fish families present or absent on each sampling date. Water quality data from YSI sampling and from HOBO temperature loggers will also be included in this dataset. Sampling period is from 10/15/2023 through 10/14/2024.

All datafiles will be made publicly available at https://childress.weebly.com and in the BCO-DMO repository.

1. Substrate census, fish abundance, and daily temperature data will be stored in flat ASCII files, which can be read easily by different software packages. 2. Field data will include date, time, latitude, longitude, and depth, as appropriate. 3. Metadata will be prepared in accordance with BCO-DMO conventions (i.e. using the BCO-DMO metadata forms) and will include detailed descriptions of collection and analysis procedures. 4. A code list of abbreviations will be included in the metadata file. 5. Quality flags will be assigned according to the ODS IODE Quality Flag scheme (IOC Manuals and Guides, 54, volume 3; http://www.iode.org/mg54_3.

The investigators will store project data (including spreadsheets, ASCII files, images, and PDFs of scanned logs) on laboratory computers that are backed up by the Clemson University CCIT One Drive. The Principal Investigator (PI) has also has RAD external drive for data storage. Personal computers in all laboratories are backed up instantaneously to the University One Drive Cloud storage system.

Data will make publicly available within 12 months of the end of the grant. It will be posed both on the publicly accessible Childress lab website and also in the BCO-DMO repository. There is no sensitive data being collected on this project.

All data collected with this project will be uploaded to the BCO-DMO repository and will be archived with the other Clemson Marine Research databases stored on the One Drive Cloud storage system at Clemson University with emergency backup on the Synology RAD array external drive housed in 105 Jordan Hall, Clemson University, Clemson, SC 29634.

The person primarily responsible for the data collection, data entry, data storage, data archiving and data dissemination will be the grant PI Michael Childress. Signatories to the Clemson Marine Research Memorandum of Understanding for Field Data will continue to have equal access and co-ownership of the data. The Lead PI, Michael Childress, will coordinate the overall data management and sharing process and will submit the project data, including metadata, to the Biological and Chemical Oceanography Data Management Office (BCO-DMO).
