Benthic community data from surveys of reefs in southwestern Puerto Rico during 2018 and 2020

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Project
» RAPID: MICROBIOME AND POPULATION DYNAMICS IN SCLERACTINIAN CORAL TISSUE LOSS DISEASE INFECTED CORALS IN PUERTO RICO (RAPID-SCTLD-PR)

Contributors	Affiliation	Role
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Abstract
This data set consists of benthic community surveys from reefs in southwestern Puerto Rico. The surveys occurred during 2018 and 2020 at various shallow depths (3-, 4-, 10-, 15-meters) in the reefs Turrumote 2, Romero, Guilligan Is, Guanica Bay, Cayo Coral, and Punta Guanica. The methodology used in the field was the line transect method. To understand the community changes caused by Stony Coral Tissue Loss Disease (SCTLD), a baseline is needed before the advent of the disease. These benthic coverage data composed of different coral species, algae, and other substrata will serve as the baseline information and were collected by Dr. Ernesto Weil of the Department of Marine Sciences, University of Puerto Rico at Mayaguez.

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Coverage

Location: Caribbean Sea, Southwest Puerto Rico
Spatial Extent: **N**:17.96783 **E**:-66.75667 **S**:17.92155 **W**:-67.97467
Temporal Extent: 2018-01-18 - 2020-10-11

Methods & Sampling

The surveys were conducted at various shallow depths (3-, 4-, 10-, 15-meters (m)) in the reefs Turrumote 2, Romero, Guilligan Is, Guanica Bay, Cayo Coral, and Punta Guanica. These reefs are located in southwestern Puerto Rico (approx. lat. 17.8849, long. -67.01546, depth 3-15 m).

The methodology used in the field was the line transect method. The length of each line was 10 m.

Five haphazardly placed, 10-m long permanent, linear/band transects were set up in each of at least three

depth intervals (0-5, 7-12, and > 15 m) in several localities prior to the arrival of the disease. They were surveyed before the epizootic event started, to estimate initial live coral cover, during the peak of the event to estimate disease prevalence and species impacted, and again after the disease arrested to estimate impact at the population and community levels.

The linear distance (in centimeters (cm)) of each different substrate (live coral colonies, sponges, zoanthids, crustose coralline algae, etc.) under the tape was measured along each ten-meter-long transect. Relative cover (as a percent (%)) for each substrate in each transect was calculated and added up for each transect. The overall and average percent cover for each biological group and substrate was then estimated for each depth and each locality. Variability in live coral cover across depth intervals in each reef and locality, and among localities will be compared before, during, and after the SCTLD epizootic event.

All coral colonies were checked for health status (healthy, SCTLD infected, other diseases, and bleaching) along a band transect (10 x 2 m (20 sqm) marked by the linear tape. Proportions of colonies in each health category will be calculated for each depth, locality, and over time. Variability in the temporal dynamics of SCTLD prevalence for each foundational, susceptible species impacted will be assessed across depth intervals within each locality, across localities, and over time.

Instrumentation:
Besides the individual diving equipment and an underwater camera, no special instruments were needed to collect the live coral cover. A fiberglass graduated 30-m long tape, a PVC pipe (1-m long), a slate, underwater paper, and pencils were the materials used. Additionally, we had HOBO temp loggers (ONSET Corp.) in several localities, which will provide seasonal/annual variability and the number of days/weeks with higher-than-normal water temperatures.

Data Processing Description

Identification of benthic species was done by the diver *in situ*. Most of the survey data has been entered into Excel spreadsheets and edited for errors. We still have to finish a couple of localities to then run the analyses with parametric and multivariate analyses to assess significant variability and changes in live coral cover, disease prevalence, biodiversity, and the impact of the disease at the population and community levels.

BCO-DMO Processing Description

- Converted the species code list to CSV format and imported the file into the BCO-DMO system.
- Imported original file "RAW-DATA-GUANICA-REEFS-2018-2020-EW-REV-jan25.xlsx" into the BCO-DMO system.
- Removed rows 75 and 76 of the original Excel file (as instructed by the submitter to correct for duplicate rows of data).
- Converted dates to YYYY-MM-DD format.
- Converted latitude and longitude values from degrees and decimal minutes to decimal degrees; rounded values to 5 decimal places.
- Renamed fields to comply with BCO-DMO naming conventions.
- Made the following changes for consistent formatting/use of codes:
-- Replaced "Turf" with "TUR" in the "Group" column.
-- Replaced "OCT" and "Oct" with "Octocoral" in the "Genera" column.
-- Replaced "SPO" and "Spo" with "Sponge" in the "Genera" column.
-- Replaced "Turf+Sand" with "Turf and sand" in the "Genera" column.
-- Replaced "OCT" and "oct" with "Oct" in the "Species" column.
-- Replaced "Romero2" with "Romero 2" in the "Locality" column.
- For rows where "Genera" = "Palythoa", and "Species" = "Pame", changed "Pame" to "Pcar".
- Corrected the species code list so "Pcar" = "Palythoa caribaeorum".
- Joined the species code list to the primary data file, creating a new column "Species_name".
- Renamed the original "Species" column to "Species_code".
- Saved the final file as "958181_v1_reef_surveys_2018_2020.csv".

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Data Files

File
958181_v1_reef_surveys_2018_2020.csv (Comma Separated Values (.csv), 630.94 KB) MD5:99453a586dbee94b465daee1f664a4b5 Primary data file for dataset ID 958181, version 1

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Related Publications

Loya, Y. (1972). Community structure and species diversity of hermatypic corals at Eilat, Red Sea. Marine Biology, 13(2), 100–123. doi:10.1007/bf00366561 https://doi.org/10.1007/BF00366561
Methods

Lucas, M. Q., Collazo Roman, D. L., Mercado, M. A., Fain, E. J., Toledo-Rodríguez, D. A., & Weil, E. (2024). Stony coral tissue loss disease (SCTLD) induced mass mortality at Arecibo, Puerto Rico. Marine Biodiversity, 54(1). https://doi.org/10.1007/s12526-023-01393-6
Results

Weil, E., & Cróquer, A. (2009). Spatial variability in distribution and prevalence of Caribbean scleractinian coral and octocoral diseases. I. Community-level analysis. Diseases of Aquatic Organisms, 83, 195–208. https://doi.org/10.3354/dao02011
Methods

Weil, E., Hernández-Delgado, E.A., Gonzalez, M., Williams, S., Suleimán-Ramos, S., Figuerola, M., & Metz-Estrella, T. (2019). Spread of the New Coral Disease "SCTLD" into the Caribbean: Implications for Puerto Rico. Reef Encounters. Vol. 34 (1):38-43. https://coralreefs.org/wp-content/uploads/2019/01/Reef-Encounter-34-May-2007.pdf
Results

Weil. E., Croquer, A., Urreiztieta, I. (2009) Temporal variability and impact of coral diseases and bleaching in La Parguera, Puerto Rico from 2003–2007. Caribbean Journal of Science 45(2–3), 221-246 https://doi.org/10.18475/cjos.v45i2.a10
Methods

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Parameters

Parameter	Description	Units
Year	Year of the transect work	unitless
Date	Date of the transect work	unitless
Locality	Name of the reef location of the transect work	unitless
Latitude	Latitude of the transect work	decimal degrees
Longitude	Longitude of the transect work	decimal degrees

Reef_Number	Numerical coding of the reef	unitless
Transect	Replicate number of transect	unitless
Depth	Depth of the transect	meters (m)
Depth_code	Depth code: SHA = shallow, INT = intermediate, DEEP = Deep.	unitless
Group	Code used to indicate the group: ACT = ACTINARIA, ALG = Algae, CYA = CYANOBACTERIA, HYD = Hydrozoan, OCT = Octocoral, PSE = PEYSSONNELIA, RUB = RUBBLE, SPO =Sponge, SCL = Scleractinian, SAN = Sand, T+S = TURF + SAND, ZOA = ZOANTHID.	unitless
Genera	Genera of organisms encountered in the transect	unitless
Species_code	Species (code) of organisms encountered in the transect	unitless
Species_name	Species (name) of organisms encountered in the transect	unitless
Raw_data	Distance from the beginning of the line transect	centimeters (cm)
linear_cover	Distance from the beginning of each 20 cm interval of the transect	centimeters (cm)
percent_cover	Percent cover of the transect by each organism	percentage (%)

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Instruments

Dataset-specific Instrument Name	30-m long tape
Generic Instrument Name	Measuring Tape
Dataset-specific Description	A fiberglass graduated 30-m long tape, a PVC pipe (1-m long), a slate, underwater paper and pencils were the materials used.
Generic Instrument Description	A tape measure or measuring tape is a flexible ruler. It consists of a ribbon of cloth, plastic, fibre glass, or metal strip with linear-measurement markings. It is a common tool for measuring distance or length.

Dataset-specific Instrument Name	underwater camera
Generic Instrument Name	Underwater Camera
Generic Instrument Description	All types of photographic equipment that may be deployed underwater including stills, video, film and digital systems.

Dataset-specific Instrument Name	underwater paper and pencils
Generic Instrument Name	Underwater Writing Slate
Dataset-specific Description	A fiberglass graduated 30-m long tape, a PVC pipe (1-m long), a slate, underwater paper and pencils were the materials used.
Generic Instrument Description	Underwater writing slates and pencils are used to transport pre-dive plans underwater, to record facts whilst underwater and to aid communication with other divers.

Dataset-specific Instrument Name	HOBO temp loggers (ONSET Corp.)
Generic Instrument Name	Water Temperature Sensor
Dataset-specific Description	We had HOBO temp loggers (ONSET Corp.) in several localities, which will provide seasonal/annual variability and the number of days/weeks with higher-than-normal water temperatures.
Generic Instrument Description	General term for an instrument that measures the temperature of the water with which it is in contact (thermometer).

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Project Information

RAPID: MICROBIOME AND POPULATION DYNAMICS IN SCLERACTINIAN CORAL TISSUE LOSS DISEASE INFECTED CORALS IN PUERTO RICO (RAPID-SCTLD-PR)

Coverage: Southwest Puerto Rico, Caribbean Sea

Location: The study will be carried out in reefs off La Parguera Natural Reserve, on the south-west coast of Puerto Rico. Facilities are located within the Reserve, so we have quick and easy access to the reefs for collections and surveys. Caribbean Sea, Southwest Puerto Rico, Lat. 17.8849 Long. -67.01546

NSF Award Abstract:
Modern coral reefs are the result of thousands of years of growth and development, but their demise is occurring at alarming rates around the World. In the Caribbean alone, over 60% of live coral cover has been lost in many reefs in just 30-40 years. Consequently, their ecological and economic benefits to coastal communities are also declining. Disease outbreaks and more intense and frequent bleaching (loss of the microalgae in coral tissues) events associated with increasing water temperatures are some of the main factors for coral reef mass mortalities. The highly infectious and deadly Scleractinian Coral Tissue Loss Disease (SCTLD), first identified in 2014 in Florida, is quickly moving through the Caribbean causing extensive mortalities across important reef-building corals. Current research is focused in after-infection events to identify the pathogen and characterize the signs, patterns and consequences of SCTLD transmission. This study investigates coral tissues and the coral-associated bacteria communities before, during and after the infection has occurred in reefs in Puerto Rico. The societal broader impact of the project relates to the significant ecosystem services provided by coral reefs, which are threatened by SCTLD. The project will also support training of a graduate student.

Questions about etiological variability and the temporal dynamics of the microbiome in SCTLD-affected coral species remain unanswered. Specifically, this proposal addresses the following questions: (1) What are the changes in the microbiome composition and abundances of the susceptible coral species when infected with SCTLD? (2) What is the variability in virulence, prevalence and mortality within and amongst species in different phases of the infection and in different habitats? The research site is in La Parguera Natural Reserve, southwest Puerto Rico, where the research team has characterized and monitored several reefs and environmental conditions from the shore to the shelf edge since 2003. This project includes surveys of permanent transects and molecular characterization of tissue/mucus samples, and microbial communities within those, collected from healthy colonies of two to three of the most susceptible coral species (i.e., Meandrina meandrites, M. jacksoni and Orbicella faveolata) and colonies of two resistant species (i.e., Montastraea cavernosa, Porites astreoides) at the long-term monitoring site. The expected arrival of SCTLD to Puerto Rico in Fall 2019, offers the team of researchers a unique window of opportunity to capture reef biological conditions before, during and after infection to complement other research efforts to better understand the ecological dynamics, prevalence and consequences of this new deadly coral disease.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2000863

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