Sponge volume at Virgin Islands Territorial Coral Reef Monitoring Program's (TCRMP) permanent monitoring sites, 2015-2017

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Project
» RAPID: Collaborative Research: Sponge resilience in the face of multiple stressors (Sponge resilience)

Contributors	Affiliation	Role
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Abstract
Sponge volume at Virgin Islands Territorial Coral Reef Monitoring Program's (TCRMP) permanent monitoring sites, 2015-2017.

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Coverage

Spatial Extent: **N**:18.3743 **E**:-64.8602 **S**:18.2786 **W**:-65.0823
Temporal Extent: 2015-08-01 - 2017-12-31

Dataset Description

This dataset includes total sponge volume in quadrats at six sites in Virgin Islands Territorial Coral Reef Monitoring Program, pre- and post-hurricane, 2015-2017.

These data were published in Gochfeld et al (2020).

Methods & Sampling

Prior to the 2017 hurricanes, six shallow (8-15 m depth) reef sites had been selected from the Virgin Islands Territorial Coral Reef Monitoring Program's (TCRMP) permanent monitoring sites to study variation in sponge communities in St. Thomas. These sites included Black Point (N18° 20.665', W64° 59.107'), Coculus Rock

(N18° 18.734', W64° 51.613'), and Magens Bay (N18° 22.459', W64° 56.077'), which are in embayments with heavily developed watersheds. Buck Island (N18° 16.717', W64° 53.925') and Savana Island (N18° 20.437', W65° 04.939') are located near undeveloped offshore cays. Botany Bay (N18° 21.433', W65° 02.071') is a nearshore site in a bay with a low level of watershed development. For this study, we used three randomly selected transects out of the six permanently established 10 m TCRMP transects at each site. The same three transects at each site were re-surveyed repeatedly in August 2015, August 2016 (pre-hurricanes) and December 2017 (10 weeks post-hurricanes).

At each site, sponge volume was calculated within permanent 1 m^2 quadrats centered on the transect line within the initial and/or final meter of the transect. Sponge volume was calculated for 3-5 quadrats per site. As there were over 80 species of sponges within our survey areas, representing a wide diversity of morphologies, we chose to use a standardized measurement approach for all sponges, rather than calculating the true volumetric measurement for each sponge based on its actual morphology. Thus, sponges were essentially treated as cuboids. We used a flexible sewing tape to measure the longest dimension of the sponge, then one to several width measurements perpendicular to the initial length measurement, and one to several height measurements, as needed to represent the shape and dimensions of each sponge. Multiple measurements for each dimension were averaged and length x width x height was calculated. For large tubes, of which there were relatively few, we subtracted the dimensions of the interior cavity from the exterior dimensions of the sponge. Generated data were in cm3 of sponge/m2 (Gochfeld et al. 2020).

Data Processing Description

To test for hurricane effects on various metrics of the sponge community, repeated measures analyses of variance (ANOVA) were performed on sponge volume, with site as a random factor, using the lmer function in the lme4 package in R (Bates et al. 2015). Square-root transformations were performed to meet the assumptions of parametric analysis. For significant effects, post-hoc comparisons were performed using the lumens function with the Tukey correction specified in R. To characterize hurricane effects on sponges with differing morphologies, a repeated measures ANOVA was also performed on arcsine transformed proportions to test for the main effect of year, using site as a random factor, followed by least square means post-hoc tests where warranted (Gochfeld et al. 2020).

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI names, version date
- modified parameter names to conform with BCO-DMO naming conventions
- added site_name, site_description, lat and lon columns (converted lat and lon to decimal degrees)

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Data Files

File
sponge_volume.csv (Comma Separated Values (.csv), 4.70 KB) MD5:74ead2ec6032fac3aa28af89326bc4b7 Primary data file for dataset ID 814490

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Parameters

Parameter	Description	Units
year	sampling year	unitless
site	sampling site identifier	unitless
site_name	name of sampling site	unitless
site_description	description of relative human development of site	unitless
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
quadrat	quadrat identifier	unitless
sponge_volume	estimated volume of all sponges In quadrat	centimeters^3 of sponge/meter^2 (cm3/m2)

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Project Information

RAPID: Collaborative Research: Sponge resilience in the face of multiple stressors (Sponge resilience)

Coverage: St. Thomas, U.S. Virgin Islands

NSF Award Abstract:
Over the past several decades, coral reefs worldwide have undergone a transition from being dominated by the corals themselves to being dominated by sponges or algae. The causes of these changes are complex, but they include both natural stressors, such as diseases and hurricanes, and impacts from human activities, such as coastal development and climate change. There are over 600 species of sponges on Caribbean coral reefs, and they serve many important ecological roles, including nutrient cycling, providing food and shelter for other reef animals, and producing a tremendous diversity of chemical compounds that are important for controlling species interactions on the reef, and may serve as potential new drugs. In spite of their importance on coral reefs, there are many aspects of sponge biology that remain unknown, including how they respond to different types of stressors. Coral reefs in St. Thomas, in the U.S. Virgin Islands, are exposed to different levels of man-made stressors, depending upon their proximity to coastal development, and the sponge assemblages on these reefs also vary with levels of human impacts. In September 2017, St. Thomas was devastated by two Category 5 hurricanes in a row. Since, unlike corals, virtually nothing is known about what happens to sponge communities in the aftermath of hurricanes, the research team will use a combination of field ecology and population genetics approaches to determine how sponge communities respond and recover from these devastating storms and whether prior exposure to land-based stressors affects their recovery. Researchers at the Universities of Mississippi, Alabama and the Virgin Islands will participate in this RAPID project, and will provide training opportunities for students and postdoctoral researchers, especially from underrepresented groups. Information will be provided to resource managers in the Virgin Islands, along with outreach programs to community groups in St. Thomas.

The goal of this project is to assess the impacts of single (e.g., hurricanes) versus multiple (e.g., hurricanes and land-based sources of pollution) stressors on the resilience, recovery, and recruitment of sponge communities in St. Thomas, U.S.V.I. Given the growing dominance of sponges on coral reefs worldwide, understanding the responses of sponges to natural and anthropogenic stressors is increasingly important. The investigators will leverage multiple years of data on sponge assemblages from several sites around the island of St. Thomas that varied in their levels of exposure to local land-based stressors prior to Hurricanes Irma and Maria, and evaluate changes to these diverse assemblages over time, beginning within 3 months of these devastating storms. Using a combination of natural and experimentally cleared plots, the investigators will assess the progress of sponge succession and whether the presence of algae interferes with sponge recruitment and recovery. Subsamples of recruits and nearby conspecifics will be collected to evaluate population genetic diversity and potential sources of new individuals. The data resulting from this project will provide critical insights into sponge resilience in response to hurricanes at sites previously exposed to land-based stressors, the initiation of succession within sponge communities, potential predictors of successional

trajectory, and genetic diversity within sponge populations following a storm event. This information will help identify factors that inhibit coral recovery and potential approaches to enhance resilience of coral reefs.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1807807

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