Benthic invertebrate abundances associated with octocoral forests in St. John, US Virgin Islands from July 2019 to Jan 2020

Website: https://www.bco-dmo.org/dataset/892248
Data Type: Other Field Results
Version: 1
Version Date: 2023-03-21

Project
» Collaborative Research: Pattern and process in the abundance and recruitment of Caribbean octocorals (Octocoral Community Dynamics)
» RUI: Pattern and process in five decades of change on Caribbean reefs (St John Coral Reefs)

Contributors	Affiliation	Role
Edmunds, Peter J.	California State University Northridge (CSUN)	Principal Investigator
Girard, John	California State University Northridge (CSUN)	Student
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
These data represent the benthic invertebrates counted in association with various octocoral canopies as well as the composition of individual octocorals and the physical parameters (mean height, mean closure, and density) of octocoral canopies. These data were used to test for the association of benthic invertebrate communities across a gradient of octocoral forest formation. Arborescent octocorals were excluded from invertebrate counts used to test for community association. Benthic surveys of invertebrates and octocoral forests were conducted on SCUBA during July – August of 2019 and in January of 2020 using the same quadrats (1 m2) placed at ≤ 13-m depth. These data were collected as part of an NSF Coral Reef Time Series, Virgin Islands: Long-term coral reef community dynamics in the Virgin Islands National Park and were published in Girard and Edmunds (2023).

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Coverage

Spatial Extent: **N**:18.3154 **E**:-64.7186 **S**:18.307 **W**:-64.7313
Temporal Extent: 2019-07-26 - 2020-01-27

Methods & Sampling

This research was conducted from the University of the Virgin Islands Marine Station in Lameshur Bay St. John, U.S. Virgin Islands at depth ≤ 13 m during July – August 2019 and January 2020.

Methods & Sampling:

Benthic surveys of invertebrates and octocoral forests were conducted using the same quadrats (1 m2) on SCUBA during July – August of 2019 and in January of 2020 placed at ≤ 13-m depth. Quadrats were randomly placed along 20 m, non-overlapping transects that were positioned haphazardly along fringing reefs.Unitary organisms were recorded as individuals, and encrusting modular organisms were counted by the number of autonomous patches of biomass, with both expressed as organisms quadrat-1. Organisms were identified in situ or with reference photos (18.2 megapixels) using field guides (Humann et al., 2013), expert opinion (mostly for sponges), and an electronic reference catalog (Zea et al., 2014). Surveys were conducted at the Cabritte Horn, Tektite, and White Point study sites. Arborescent octocorals with their holdfasts present in the quadrat were measured and contributed to mean height, and density of octocoral canopy measurements. Octocoral height was quantified by measuring the distance from hold fast to to the most distal branch perpendicular to the benthos.

Canopy closure was quantified using a modified method from (Jennings et. al. 1999) whereby a GoPro Hero 3+ camera with a 130° field of view (manufacturer's specification, Go-Pro., Inc. San Mateo, CA) was used to record still images in the center, and at each of the four corners, of quadrats, with all five images quadrat-1 recorded within < 5 minutes. To avoid biases in estimating canopy closure caused by adjacent non-living substrata (e.g., boulders and rock walls), images were excluded when they included these features. Images were analyzed using ImageJ software (v1.52a, Schneider et al., 2012), in which 300 randomly located dots (~ 0.5 pixel in diameter) were superimposed on each image. The number of dots on the octocoral canopy were counted and expressed as a percentage of the dot population. This metric was used to quantify canopy closure, and the results from the five images quadrat-1 were averaged to characterize each quadrat.

Instruments:

PVC Quadrats (1 m2)
Transect tapes
Measuring ribbons with mm graduations
GoPro Hero 3+ camera
Sony Cybershot DSC-WX300/B

Data Processing Description

To calculate canopy closure images were analyzed using ImageJ software (v1.52a, Schneider et al., 2012), in which 300 randomly located dots (~ 0.5 pixel in diameter) were superimposed on each image. The number of dots on the octocoral canopy were counted and expressed as a percentage of the dot population. To aid in the quantification of dots a grid of twenty squares was superimposed on the image. Each "box" was scored for the number of points in it that fell on the octocoral canopy. All twenty boxes for each image were summed for the total points out of 300 falling on the octocoral canopy.

BCO-DMO Data Manager Processing Notes:
* Source file "St.John_BenthicInvertebrates_Octocoral Forests.csv" imported into the BCO-DMO data system
* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]
* Column names with taxonomic names matched to known names in the World Register of marine species (WoRMS) using the taxa match tool on 2023-01-13. A supplemental table was added including the names used in column names of this dataset, and the matched AphiaID, LSID and accepted name.
* lat and lon added to the data from a site list
* Date format converted to ISO 8601 format
* Mean closure rounded to 4 decimal places and mean octocoral height rounded to two decimal places.

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Data Files

File
Benthic Invertebrate Abundance filename: benthic_invert_abund.csv (Comma Separated Values (.csv), 23.81 KB) MD5:a38e78a55aabeee8d0650f222cb5105b This is the primary data table for dataset 892248 see "Parameters" section for full column information. See supplemental file "Taxonomic Identifiers" for more information about taxonimic names in each column. The corresponding photos for each site, transect number and quadrat number are provided as supplemental files (see "Photo Inventory" and Girard_and_Edmunds_2023_supporting_photos.zip).

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Supplemental Files

File
Photo inventory filename: photo_inventory.csv (Comma Separated Values (.csv), 148.68 KB) MD5:2bdcfdff1945b4e75048f03870524b7b Photo inventory table for files within Girard_and_Edmunds_2023_supporting_photos.zip This table has columns: filename, file name relative_filepath, relative path inside the zip file filesize_bytes, filesize in bytes md5sum, checksum of image file Site, site name Quadrat_Num, quadrat number Transect_Num, transect number Year, year (YYYY) lat, site latitude in decimal degrees lon, site longitude in decimal degrees Category, description of survey type (Closure, Community, etc). The site, transect number and quadrat number correspond to the values in the main data table "Benthic Invertebrate Abundance."
Site List filename: site_list.csv (Comma Separated Values (.csv), 192 bytes) MD5:4415feb2d663fc251a671a2a7c5cac04 Site list for all dataset related to the results publication Girard and Edmunds (2023). Parameters (column names, descriptions, and units): Site, Site name used in dataset related to Girard and Edmunds (2023),unitless lat, Site latitude,decimal degrees lon,Site longitude,decimal degrees Alternate_name, Alternate name for the site,unitless
Supporting Photos for Girard and Edmunds (2023) filename: Girard_and_Edmunds_2023_supporting_photos.zip (ZIP Archive (ZIP), 3.77 GB) MD5:55008bec5933c4c2eefb45f7a7824d39 See "photo_inventory.csv" for a full file listing within this photo zip file. Photo inventory also includes site and quadrat information.
Taxonomic Identifers filename: taxon_identifiers.csv (Comma Separated Values (.csv), 9.42 KB) MD5:86e7a0edf7cc84cdfc5d74844eabb2a3 Taxon identifiers (AphiaID and LSID) used in this dataset. Generated using the World Register of Species taxa match tool performed 2023-01-13.

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Related Publications

Girard, J. F., & Edmunds, P. J. (2023). Effects of arborescent octocoral assemblages on the understory benthic communities of shallow Caribbean reefs. Journal of Experimental Marine Biology and Ecology, 561, 151870. https://doi.org/10.1016/j.jembe.2023.151870
Results

GoPro (2013). Hero 3 silver edition: user manual. 1–62. https://gopro.com/content/dam/help/hero3-silver-

edition/manuals/HERO3_Silver_UM_ENG_RevC_web.pdf. Accessed: 21/Dec/2022
Methods

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Related Datasets

IsRelatedTo

Girard, J., Edmunds, P. J. (2023) **Canopy closure values from photographs taken within octocoral forests in Lameshur Bay St. John, U.S. Virgin Islands from July 2019 to Jan 2020.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892258.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Canopy closure values from photographs taken within octocoral forestsalong the south shore of St. John, U.S. Virgin Islands in March of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892323.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Light intensity (lux) of downwelling light upon the benthos along differing conditions of octocoral canopy formation in East Cabritte, in Grootpan Bay, St. John U.S. Virgin Islands in March of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892300.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Light intensity (lux) of downwelling light upon the benthos along differing conditions of octocoral canopy formation in Lameshur Bay St. John, U.S. Virgin Islands in March of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892272.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Octocoral canopy metrics (mean height, density, and closure) in St. John, US Virgin Islands in March of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892293.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Octocoral height, density, and genera from in situ observations within octocoral forests in Lameshur Bay St. John, U.S. Virgin Islands from July 2019 to Jan 2020.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892265.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Pulse Amplitude Modulation (PAM) fluorometer measurements from Porites astreoides colonies in St. John, US Virgin Islands from July to August of 2019.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892279.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Simultaneous light intensity measurements from a HOBO light intensity logger and a cosine-corrected PAR sensor in Lameshur Bay, St. John, U.S. Virgin Islands in January of 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892308.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

Girard, J., Edmunds, P. J. (2023) **Steady state photosynthesis (photosynthetic induction time) from**

Porites astreoides colonies in St. John, US Virgin Islands from July to August of 2019. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-21 doi:10.26008/1912/bco-dmo.892286.1 [view at BCO-DMO]
Relationship Description: Octocoral measurements and invertebrate counts were done in the same quadrats. Therefore, the quadrat IDs correspond to each other across community & canopy data sets.

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Parameters

Parameter	Description	Units
Date	Date sample was taken in ISO 8601 format.	unitless
Site	Site name	unitless
lat	Site latitude	decimal degrees
lon	Site longitude	decimal degrees
Transect_Num	Transect number at site	unitless
Quadrat_Num	Quadrat number on transect	unitless
Quadrat_Depth	Depth below the water's surface where the quadrat was placed	meters (m)
Quadrat_ID	Code to quickly identify quadrats. Letter is the first letter of the site and the number reflects the quadrat number at that site	unitless
Mean_height_Octocorals_gt_50mm	Mean height of octocoral greater than 50mm Tall	mm
Densty_Octocorals_gt_50mm	Density of Octocorals greater than 50 mm Tall	individuals per meter squared (#/m2)
Mean_Closure	Proportion of sky abscured by octocoral branched in quadrats. Averaged from 5 closure photos within the quadrat	unitless
Num_of_Benthic_Invertebrates	Total count of benthic invertebrates	per individual
Num_of_Taxa	Total number of different taxonomic units	per taxon

Acropora_cervicornis	Count of Acropora cervicornis individuals within the quadrat	per individual
Acropora_palmata	Count of Acropora palmata individuals within the quadrat	per individual
Agaricia_agaricites	Count of Agaricia agaricites individuals within the quadrat	per individual
Agaricia_lamarcki	Count of Agaricia lamarcki individuals within the quadrat	per individual
Agaricia_humilis	Count of Agaricia humilis individuals within the quadrat	per individual
Agaricia_fragilis	Count of Agaricia fragilis individuals within the quadrat	per individual
Dichocoenia_stokesi	Count of Dichocoenia stokesi individuals within the quadrat	per individual
Colpophyllia_natans	Count of Colpophyllia natans individuals within the quadrat	per individual
Dendrogyra_cylindrus	Count of Dendrogyra cylindrus individuals within the quadrat	per individual
Diploria_labyrinthiformis	Count of Diploria labyrinthiformis individuals within the quadrat	per individual
Pseudodiploria_strigosa	Count of Pseudodiploria strigosa individuals within the quadrat	per individual
Eusmilia_fastigiata	Count of Eusmilia fastigiata individuals within the quadrat	per individual
Favia_fragum	Count of Favia fragum individuals within the quadrat	per individual
Leptoseris_helioseris_cucullata	Count of Leptoseris (helioseris) cucullata individuals within the quadrat	per individual

Isophyllia_sinuosa	Count of Isophyllia sinuosa individuals within the quadrat	per individual
Manicina_areolata	Count of Manicina areolata individuals within the quadrat	per individual
Madracis_decactis	Count of Madracis decactis individuals within the quadrat	per individual
Madracis_mirabilis_auretenra	Count of Madracis mirabilis (auretenra) individuals within the quadrat	per individual
Montastrea_cavernosa	Count of Montastrea cavernosa individuals within the quadrat	per individual
Meandrina_meandrites	Count of Meandrina meandrites individuals within the quadrat	per individual
Mussa_angulosa	Count of Mussa angulosa individuals within the quadrat	per individual
Mycetophyllia_aliciae	Count of Mycetophyllia aliciae individuals within the quadrat	per individual
Mycetophyllia_lamarckiana	Count of Mycetophyllia lamarckiana individuals within the quadrat	per individual
Orbicella_annularis	Count of Orbicella annularis individuals within the quadrat	per individual
Orbicella_faveolata	Count of Orbicella faveolata individuals within the quadrat	per individual
Orbicella_franksi	Count of Orbicella franksi individuals within the quadrat	per individual
Porites_astreoides	Count of Porites astreoides individuals within the quadrat	per individual
Porites_divaricata	Count of Porites divaricata individuals within the quadrat	per individual
Porites_furcata	Count of Porites furcata individuals within the quadrat	per individual

Porites_porites	Count of Porites porites individuals within the quadrat	per individual
Porites_colonensis	Count of Porites colonensis individuals within the quadrat	per individual
Scolymia_cubensis	Count of Scolymia cubensis individuals within the quadrat	per individual
Scolymia_lacera	Count of Scolymia lacera individuals within the quadrat	per individual
Siderastrea_radians	Count of Siderastrea radians individuals within the quadrat	per individual
Solenastrea_hyades	Count of Solenastrea hyades individuals within the quadrat	per individual
Siderastrea_siderea	Count of Siderastrea siderea individuals within the quadrat	per individual
Stephanocoenia_intersepta	Count of Stephanocoenia intersepta individuals within the quadrat	per individual
Millepora_alcicornis	Count of Millepora alcicornis individuals within the quadrat	per individual
Stenopus_hispidus	Count of Stenopus hispidus individuals within the quadrat	per individual
Ancylomenes_pedersoni	Count of Ancylomenes pedersoni individuals within the quadrat	per individual
Stenorhynchus_seticornis	Count of Stenorhynchus seticornis individuals within the quadrat	per individual
Periclimenes_yucatanicus	Count of Periclimenes yucatanicus individuals within the quadrat	per individual
Ophiuroidea	Count of Ophiuroidea individuals within the quadrat	per individual

Diadema_antillarum	Count of Diadema antillarum individuals within the quadrat	per individual
Echinometra_viridis	Count of Echinometra viridis individuals within the quadrat	per individual
Arbacia_punctulata	Count of Arbacia punctulata individuals within the quadrat	per individual
Eucidaris_tribuloides	Count of Eucidaris tribuloides individuals within the quadrat	per individual
Echinometra_lucunter	Count of Echinometra lucunter individuals within the quadrat	per individual
Exaiptasia_diaphana	Count of Exaiptasia diaphana individuals within the quadrat	per individual
Bartholomea_annulata	Count of Bartholomea annulata individuals within the quadrat	per individual
Spirobranchus_giganteus	Count of Spirobranchus giganteus individuals within the quadrat	per individual
Pomatostegus_stellatus	Count of Pomatostegus stellatus individuals within the quadrat	per individual
Notaulax_occidentalis	Count of Notaulax occidentalis individuals within the quadrat	per individual
Anamobaea_orstedii	Count of Anamobaea orstedii individuals within the quadrat	per individual
Sabellidae_Unknown_1	Count of Sabellidae - Unknown 1 individuals within the quadrat	per individual
Sabellidae_Unknown_2	Count of Sabellidae - Unknown 2 individuals within the quadrat	per individual

Branchiomma_nigromaculatum	Count of Branchiomma nigromaculatum individuals within the quadrat	per individual
Serpulidae_Unknown_1	Count of Serpulidae - Unknown 1 individuals within the quadrat	per individual
Sabellastarte_magnifica	Count of Sabellastarte magnifica individuals within the quadrat	per individual
Filogranella_sp	Count of Filogranella sp. individuals within the quadrat	per individual
Serpulidae_Unknown_2	Count of Serpulidae - Unknown 2 individuals within the quadrat	per individual
Bispira_melanostigma	Count of Bispira melanostigma individuals within the quadrat	per individual
Hermodice_carunculata	Count of Hermodice carunculata individuals within the quadrat	per individual
Cerithium_litteratum	Count of Cerithium litteratum individuals within the quadrat	per individual
Unknown_Gastropod	Count of Unknown Gastropod individuals within the quadrat	per individual
Cyphoma_gibbosum	Count of Cyphoma gibbosum individuals within the quadrat	per individual
Clavelina_picta	Count of Clavelina picta individuals within the quadrat	per individual
Rhopalaea_abdominalis	Count of Rhopalaea abdominalis individuals within the quadrat	per individual
Polycarpa_spongiabilis	Count of Polycarpa spongiabilis individuals within the quadrat	per individual
Palythoa_caribaeorum	Count of Palythoa caribaeorum individuals within the quadrat	per individual
Amphimedon_compressa	Count of Amphimedon compressa individuals within the quadrat	per individual

Unknown_13	Count of Unknown 13 individuals within the quadrat	per individual
Unknown_15	Count of Unknown 15 individuals within the quadrat	per individual
Unknown_14	Count of Unknown 14 individuals within the quadrat	per individual
Didemnidae	Count of Didemnidae individuals within the quadrat	per individual
Spirastrella_coccinea	Count of Spirastrella coccinea individuals within the quadrat	per individual
Unknown_16	Count of Unknown 16 individuals within the quadrat	per individual
Unknown_17	Count of Unknown 17 individuals within the quadrat	per individual
Smenospongia_aurea	Count of Smenospongia aurea individuals within the quadrat	per individual
Aplysinidae_tubes_Verongula_spp_Aiolochroia_spp	Count of Aplysinidae tubes Verongula spp & Aiolochroia spp individuals within the quadrat	per individual
Aplysina_fulva	Count of Aplysina fulva individuals within the quadrat	per individual
Unknown_5	Count of Unknown 5 individuals within the quadrat	per individual
Monanchora_arbuscula	Count of Monanchora arbuscula individuals within the quadrat	per individual
Unknown_27	Count of Unknown 27 individuals within the quadrat	per individual

Cliona_delitrix	Count of Cliona delitrix individuals within the quadrat	per individual
Niphates_digitalis	Count of Niphates digitalis individuals within the quadrat	per individual
Unknown_12	Count of Unknown 12 individuals within the quadrat	per individual
Unknown_11	Count of Unknown 11 individuals within the quadrat	per individual
Ectyoplasia_ferox	Count of Ectyoplasia ferox individuals within the quadrat	per individual
Diplosoma_glandulosum	Count of Diplosoma glandulosum individuals within the quadrat	per individual
Unknown_1	Count of Unknown 1 individuals within the quadrat	per individual
Ircinia_strobilina	Count of Ircinia strobilina individuals within the quadrat	per individual
Eudistoma_obscuratum	Count of Eudistoma obscuratum individuals within the quadrat	per individual
Unknown_2	Count of Unknown 2 individuals within the quadrat	per individual
Unknown_26	Count of Unknown 26 individuals within the quadrat	per individual
Ircinia_felix	Count of Ircinia felix individuals within the quadrat	per individual
Aplysina_cauliformis	Count of Aplysina cauliformis individuals within the quadrat	per individual
Erythropodium_caribaeorum	Count of Erythropodium caribaeorum individuals within the quadrat	per individual
Ircinia_campana	Count of Ircinia campana individuals within the quadrat	per individual

Scopalina_ruetzleri	Count of Scopalina ruetzleri individuals within the quadrat	per individual
Unknown_18	Count of Unknown 18 individuals within the quadrat	per individual
Callyspongia_fallax	Count of Callyspongia fallax individuals within the quadrat	per individual
Siphonodictyon_coralliphagum	Count of Siphonodictyon coralliphagum individuals within the quadrat	per individual
Unknown_25	Count of Unknown 25 individuals within the quadrat	per individual
Cinachyrella_kuekenthali	Count of Cinachyrella kuekenthali individuals within the quadrat	per individual
Mycale_laevis	Count of Mycale laevis individuals within the quadrat	per individual
Unknown_19	Count of Unknown 19 individuals within the quadrat	per individual
Unknown_23	Count of Unknown 23 individuals within the quadrat	per individual
Unknown_8	Count of Unknown 8 individuals within the quadrat	per individual
Unknown_24	Count of Unknown 24 individuals within the quadrat	per individual
Unknown_22	Count of Unknown 22 individuals within the quadrat	per individual
Ascidia_sydneiensis	Count of Ascidia sydneiensis individuals within the quadrat	per individual
Desmapsamma_anchorata	Count of Desmapsamma anchorata individuals within the quadrat	per individual

Callyspongia_plicifera	Count of Callyspongia plicifera individuals within the quadrat	per individual
Clathria_Microciona_bulbotoxa	Count of Clathria (Microciona) bulbotoxa individuals within the quadrat	per individual
Unknown_6	Count of Unknown 6 individuals within the quadrat	per individual
Unknown_4	Count of Unknown 4 individuals within the quadrat	per individual
Unknown_10	Count of Unknown 10 individuals within the quadrat	per individual
Unknown_7	Count of Unknown 7 individuals within the quadrat	per individual
Spirastrella_hartmani	Count of Spirastrella hartmani individuals within the quadrat	per individual
Clathria_Micronciona_spinosa	Count of Clathria (Micronciona) spinosa individuals within the quadrat	per individual
Unknown_21	Count of Unknown 21 individuals within the quadrat	per individual
Aiolochroia_crassa	Count of Aiolochroia crassa individuals within the quadrat	per individual
Unknown_20	Count of Unknown 20 individuals within the quadrat	per individual
Unknown_3	Count of Unknown 3 individuals within the quadrat	per individual
Unknown_9	Count of Unknown 9 individuals within the quadrat	per individual

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Instruments

Dataset-specific Instrument Name	Sony Cybershot DSC-WX300/B
Generic Instrument Name	Camera
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

Dataset-specific Instrument Name	GoPro Hero 3+ 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.

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Project Information

Collaborative Research: Pattern and process in the abundance and recruitment of Caribbean octocorals (Octocoral Community Dynamics)

Coverage: St. John, US Virgin Islands

NSF Award Abstract:
Coral reefs are exposed to a diversity of natural and anthropogenic disturbances, and the consequences for ecosystem degradation have been widely publicized. However, the reported changes have been biased towards fishes and stony corals, and for Caribbean reefs, the most notable example of this bias are octocorals ("soft corals"). Although they are abundant and dominate many Caribbean reefs, they are rarely included in studies due to the difficulty of both identifying them and in quantifying their abundances. In some places there is compelling evidence that soft corals have increased in abundance, even while stony corals have become less common. This suggests that soft corals are more resilient than stony corals to the wide diversity of disturbances that have been impacting coral corals. The best coral reefs on which to study these changes are those that have been studied for decades and can provide a decadal context to more recent events, and in this regard the reefs of St. John, US Virgin Islands are unique. Stony corals on the reefs have been studied since 1987, and the soft corals from 2014. This provides unrivalled platform to evaluate patterns of octocoral abundance and recruitment; identify the patterns of change that are occurring on these reefs, and identify the processes responsible for the resilience of octocoral populations. The project will extend soft coral monitoring from 4 years to 8 years, and within this framework will examine the roles of baby corals, and their response to seafloor roughness, seawater flow, and seaweed, in determining the success of soft corals. The work will also assess whether the destructive effects of Hurricanes Irma and Maria have modified the pattern of change. In concert with these efforts the project will be closely integrated with local high schools at which the investigators will host marine biology clubs and provide independent study opportunities for their students and teachers. Unique training opportunities will be provided to undergraduate and graduate students, as well as a postdoctoral researcher, all of whom will study and work in St. John, and the investigators will train coral reef researchers to identify the species of soft corals through a hands-on workshop to be conducted in the Florida Keys.

Understanding how changing environmental conditions will affect the community structure of major biomes is the ecological objective defining the 21st century. The holistic effects of these conditions on coral reefs will be studied on shallow reefs within the Virgin Islands National Park in St. John, US Virgin Islands, which is the site of one of the longest-running, long-term studies of coral reef community dynamics in the region. With NSF-LTREB support, the investigators have been studying long-term changes in stony coral communities in this location since 1987, and in 2014 NSF-OCE support was used to build an octocoral "overlay" to this decadal perspective. The present project extends from this unique history, which has been punctuated by the effects of Hurricanes Irma and Maria, to place octocoral synecology in a decadal context, and the investigators exploit a rich suite of

legacy data to better understand the present and immediate future of Caribbean coral reefs. This four-year project will advance on two concurrent fronts: first, to extend time-series analyses of octocoral communities from four to eight years to characterize the pattern and pace of change in community structure, and second, to conduct a program of hypothesis-driven experiments focused on octocoral settlement that will uncover the mechanisms allowing octocorals to more effectively colonize substrata than scleractinian corals on present day reefs. Specifically, the investigators will conduct mensurative and manipulative experiments addressing four hypotheses focusing on the roles of: (1) habitat complexity in distinguishing between octocoral and scleractinian recruitment niches, (2) the recruitment niche in mediating post-settlement success, (3) competition in algal turf and macroalgae in determining the success of octocoral and scleractian recruits, and (4) role of octocoral canopies in modulating the flux of particles and larvae to the seafloor beneath. The results of this study will be integrated to evaluate the factors driving higher ecological resilience of octocorals versus scleractinians on present-day Caribbean reefs.

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.

RUI: Pattern and process in five decades of change on Caribbean reefs (St John Coral Reefs)

Website: http://coralreefs.csun.edu/

Coverage: United States Virgin Islands, St. John: 18.318, -64.7253

This project has been supported by continuing grants:
OCE-2019992 "RUI: Pattern and process in four decades of change on Caribbean reefs" (2020-2026)
OCE-2546549 "RUI Pattern and process in five decades of change on Caribbean reefs" (2026-2029)

NSF award OCE-2546549 project summary:

Overview

This proposal focuses on American coral reefs in the United States Virgin Islands, most of which are trending towards persistent low coral colony abundances. This is a conspicuous aspect of the coral reef crisis, and while much is known of the disturbances causing corals to die, little is known about the ecological implications of low coral abundance. This project leverages four decades of research in St. John by using multiple sites to test five hypotheses addressing mechanisms preventing depleted coral populations from increasing in size, and they are developed in a hierarchical framework to advance basic ecology, and enhance understanding of coral reefs and the ecological processes structuring marine communities in the Anthropocene. The project is mensurative because it is conducted in an MPA, but its scope is broadened through: (a) analyses of algal symbionts (Symbiodiniaceae) with co PI, Cunning (Shedd Aquarium), (b) by extending the coral reef time-series from 40 to 43 yrs, and (c) applying wavelet analyses to the time-series. Three years of funding will support 1 mo/y of fieldwork, 11 mo/y of analysis, QA/QC, graduate training, a one year postdoc, outreach, and manuscript preparation. This RUI proposal is targeting the OCE call NSF PD 23-1650.

Intellectual merit

The intellectual merits lie in the *hypotheses* focused on the mechanisms leading to persistent low abundance coral communities. This project is designed around a conceptual model that preserves the integrity of a 43 yr time series and tests 5 integrated hypotheses addressing four science needs: (1) advancing basic ecology, (2) leveraging of existing data to realize emergent properties, (3) serving data to end users, and (4) outreach benefitting American stake holders. Over three years, fieldwork and analyses will address: H_1 Coral reef community structure is converging to a stable low coral abundance state; $\mathbf{H_2}$. The impact of disturbances is mediated by the spatial structuring of community dynamics, and the expression of portfolio effects**;** $\mathbf{H_3}$ Intensification of the coral recruitment 'bottleneck' and its gradual transition to settlement failure; $\mathbf{H_4}$ Declining populations sizes of echinoids limit the formation of grazing halos in which corals settle; $\mathbf{H_5}$ Persistence of low abundance coral communities is favored by changes in the symbiodiniacaea complement.

Broader impacts

This project will advance discoverability of time-series data in the public domain, student mentoring and

experiential fieldwork, research on the causes of changes affecting marine communities, and in-person outreach at schools in California an Illinois, the University of the Virgin Islands, and the Friends of the VI National Park. Open access to high resolution data quantifying coral reefs over five decades is a critical community need to which this project will respond by placing in > 14,000 photoquadrats in the public domain (1987-present). Up to five graduate (MS) students will be mentored in marine science through fieldwork and lab analysis, and one REU students will be supported in a graduate mentoring framework. At middle schools, an “aquarium library” program will place marine animals in classrooms for 2–3 weeks in collaboration with the non-profit organization, ‘Underwater Zoo’. At high schools, ‘marine biology clubs’ will address project themes, provide research opportunities, and entrain teachers in field trips. In the field, teachers will conduct research leading to publications and will lead outreach activities with children in the junior ranger program administered by the Friends of the VI National Park. The efficacy of outreach tasks will be assessed through pre/post surveys and questionnaires administered using Google forms by teachers at partner schools. The results of assessment will be used to tune project deliverable to better meet the needs of the outreach audience.

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.

Related Projects:

- Affiliated with MCR-LTER - https://www.bco-dmo.org/project/2222
- Serves as a new project that builds on NSF DEB-1350146 - RUI-LTREB Renewal: Three decades of coral reef community dynamics in St. John, USVI: 2014-2019 - https://www.bco-dmo.org/project/734983
- Overlaps with OCE 17-56678 (which focuses on soft corals with H. Lasker) - Collaborative Research: Pattern and process in the abundance and recruitment of Caribbean octocorals - https://www.bco-dmo.org/project/752508
- LTREB Long-term coral reef community dynamics in St. John, USVI: 1987-2019 - https://www.bco-dmo.org/project/2272
- RUI: Pattern and process in four decades of change on Caribbean reefs - https://www.bco-dmo.org/project/835192
- RAPID: Hurricane Irma: Effects of repeated severe storms on shallow Caribbean reefs and their changing ecological resilience - https://www.bco-dmo.org/project/722163

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1756678
NSF Division of Ocean Sciences (NSF OCE)	OCE-2019992

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