Abundance and percent cover of macroalgae at Cabritte Horn (St.John, US Virgin Islands) from 1992-2020

Website: https://www.bco-dmo.org/dataset/875543
Data Type: Other Field Results
Version: 1
Version Date: 2022-06-10

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

Contributors	Affiliation	Role
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Abstract
These data describe the abundance of macroalgae in quadrats at Cabritte Horn in St. John from 1992-2020. The percent cover for macroalgae is used to test for an association with Millepora abundance.

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Coverage

Spatial Extent: **Lat**:18.3075 **Lon**:-64.7219
Temporal Extent: 1992-05-30 - 2020-08-06

Methods & Sampling

Abundance of macroalgae was examined by measuring percent cover at Cabritte Horn on the south shore of St. John, US Virgin Islands across three decades. Photographic sampling of quadrats was performed annually from 1992 to 2020 using cameras mounted on a framer at a fixed height above the reef. Color slide film was used from 1992–2000 (and digitized at 4000 dpi), with digital photography implemented in 2001. Photoquadrats were recorded at random positions along the transect, which was 20 meters long from 1992–1999 and 40 meters long from 2000 onward when the sample size was increased to ~40 photoquadrats per year.

For details on association with *Millepora spp.*, see Related Datasets section below. To access images, see Related Publications section below for link to Coral Image Downloads and Viewer (Cabritte Horn images under "Random Sites")

Data Processing Description

The photoquadrats were used to determine the percentage cover of benthic space holders using CoralNet

software (Williams et al, 2019; Chen et al, 2021) with 200 random points on each image that were manually annotated. All aspects of the benthic community were quantified, but here only the cover of macroalgae is reported.

Statistical analyses
Macroalgal cover (arcsine transformed), the morphology of Millepora sp. (log transformed), and temperature were compared among years using one way ANOVAs with Bonferonni post hoc analyses to compare between years (using Systat 13 software).

BCO-DMO processing
- added columns for latitude and longitude
- converted Date to YMD format
- added columns for location and camera type
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions

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Data Files

File
macroalgal_cover.csv (Comma Separated Values (.csv), 100.69 KB) MD5:0ad6f40588bc6d570a81db41b1146a6f Primary data file for dataset ID 875543

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Related Publications

Chen, Q., Beijbom, O., Chan, S., Bouwmeester, J., & Kriegman, D. (2021). A New Deep Learning Engine for CoralNet. In Proceedings of the IEEE/CVF International Conference on Computer Vision (pp. 3693-3702).
Software

Edmunds P. J. (2022). Persistence of a sessile benthic organism promoted by a morphological strategy combining sheets and trees. Proceedings. Biological sciences, 289(1978), 20220952. https://doi.org/10.1098/rspb.2022.0952
Results

Systat Software, Inc. (n.d.). SYSTAT - Powerful Statistical Analysis and Graphics Software Available from https://systatsoftware.com/products/systat/.
Software

Williams, I. D., Couch, C. S., Beijbom, O., Oliver, T. A., Vargas-Angel, B., Schumacher, B. D., & Brainard, R. E. (2019). Leveraging Automated Image Analysis Tools to Transform Our Capacity to Assess Status and Trends of Coral Reefs. Frontiers in Marine Science, 6. https://doi.org/10.3389/fmars.2019.00222
Software

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Related Datasets

IsRelatedTo

Edmunds, P. J. (2022) **Abundance and percent cover of Millepora species at Cabritte Horn (St.John, US Virgin Islands) from 1992-2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-06-09 doi:10.26008/1912/bco-dmo.875524.1 [view at BCO-DMO]

Edmunds, P. J. (2022) **Morphology and features of Millepora colonies at Cabritte Horn (St.John, US**

Virgin Islands) from 1992-2021. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-06-13 doi:10.26008/1912/bco-dmo.875553.1 [view at BCO-DMO]
Relationship Description: Data on percent cover of macroalgae was used in GAMs to determine effects on Millepora morphology

IsSupplementedBy

NSF Coral Reef Time Series, Virgin Islands. (2022). Raw Coral Image Downloads and Viewer. Retrieved March 25, 2022, from https://coralreefs.csun.edu/data/coral-image-viewer/

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Parameters

Parameter	Description	Units
Latitude	Latitude	decimal degrees
Longitude	Longitude	decimal degrees
Sampling_Date	Date of photographic quadrat sampling	unitless
Quadrat_number	Quadrat number	unitless
Percent_cover_macroalgae	Percentage cover of macroalgae	percent (%)
Location	Geographical location	unitless
Camera	Type of camera and lens used for photographic quadrat sampling	unitless

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Instruments

Dataset-specific Instrument Name	Nikonos V film camera
Generic Instrument Name	Camera
Dataset-specific Description	A Nikonos V film camera with 28 mm lens was used in the years 1992-2000
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

Dataset-specific Instrument Name	Nikon Coolpix 990
Generic Instrument Name	Camera
Dataset-specific Description	A Nikon Coolpix 990 digital camera with 8-24 mm lens was used in the years 2001-2005
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

Dataset-specific Instrument Name	Nikon DSLR digital camera
Generic Instrument Name	Camera
Dataset-specific Description	A Nikon DSLR D70/DX digital camera with 18-70 mm lens was used in the years 2006-2010 A Nikon DSLR D90/DX digital camera with 18-70 mm lens was used in the year 2011 A Nikon DSLR D7000/DX digital camera with 18-70 mm lens was used in the years 2012-2015 A Nikon DSLR D810/FX digital camera with 18-35 mm lens was used in the years 2016-2021
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

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Project Information

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-2019992

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