

Abundance and percent cover of *Millepora* species at Cabritte Horn (St. John, US Virgin Islands) from 1992-2021

Website: <https://www.bco-dmo.org/dataset/875524>

Data Type: Other Field Results

Version: 1

Version Date: 2022-06-09

Project

» [RUI: Pattern and process in four decades of change on Caribbean reefs](#) (St John Coral Reefs)

Contributors	Affiliation	Role
Edmunds, Peter J.	California State University Northridge (CSUN)	Principal Investigator
Gerlach, Dana Stuart	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

These data describe the abundance of *Millepora* species (as percent cover) at Cabritte Horn, St. John, US Virgin Islands from 1992-2021. They are used to evaluate how the abundance of this coral (% cover) has changed over three decades.

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Coverage

Spatial Extent: Lat:18.3075 Lon:-64.7219

Temporal Extent: 1992-05-30 - 2021-07-23

Methods & Sampling

Abundance of *Millepora* species was examined by measuring percent cover at Cabritte Horn in St. John, US Virgin Islands across three decades. Photographic sampling of quadrats (0.5m x 0.5 m) was performed from 1992 to 2021 using cameras mounted on a framer about 80 centimeters 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 2000-2021.

The abundance of *Millepora* sp. chaotically changed from 1992 to 2021 in concert with hurricanes, bleaching, and macroalgal crowding. To access images showing these patterns, see Related Publications section below for Coral Image Downloads and Viewer link (Cabritte Horn images can be found under "Random Sites"). For details on percent cover of macroalgae, see dataset <https://www.bco-dmo.org/dataset/875543> (see Related Datasets section below).

Data Processing Description

Photoquadrats were used to quantify *Millepora* abundance using ImageJ software (Abràmoff et al., 2004). Areas of encrusting *Millepora sp.* were located in each photoquadrat, outlined, and their areas measured with all pieces of sheet forms quantified separately. Because *Millepora* species' sheet forms meander across the substratum and are prone to fission, it was not always clear where colonies began and ended within photoquadrats. Colonies therefore were defined as areas of autonomous tissue, so portions of colonies that were partially within the photoquadrats (uncommon) were scored as separate colonies. The area of sheets were summed by quadrat and used to calculate the percentage cover of *Millepora sp.*

Statistical analyses

The morphology of *Millepora sp.* (log transformed), macroalgal cover (arcsine transformed), and temperature were compared among years using one way ANOVAs with Bonferonni post hoc analyses to compare between years (using Systat 13 software). The capacity of *Millepora sp.* to exploit a sheet-tree morphology was quantified (see 'Millepora features' dataset: <https://www.bco-dmo.org/dataset/875553>)

BCO-DMO processing

- converted Date to YMD format
- added columns for latitude and longitude
- 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
millepora_cover.csv (Comma Separated Values (.csv), 105.35 KB) MD5:4b3f95fbfede1f11e4b107839fa036a9
Primary data file for dataset ID 875524

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Related Publications

Abràmoff, M.D, Magalhães, P.J., Ram, S.J. 2004. Image processing with ImageJ. *Biophotonics International* 11(7): 36–42

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

Edmunds, P. (2013). Decadal-scale changes in the community structure of coral reefs of St. John, US Virgin Islands. *Marine Ecology Progress Series*, 489, 107–123. doi:[10.3354/meps10424](https://doi.org/10.3354/meps10424)

Related Research

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

Software

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Related Datasets

IsRelatedTo

Edmunds, P. J. (2022) **Abundance and percent cover of macroalgae at Cabritte Horn (St.John, US Virgin Islands) from 1992-2020**. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-06-10 doi:10.26008/1912/bco-dmo.875543.1 [[view at BCO-DMO](#)]
Relationship Description: Part of same study on benthic percent cover

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](#)]

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_Millepora	Percentage cover of Millepora species	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 four 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

NSF Award Abstract:

The coral reef crisis refers to the high rates of death affecting tropical reef-building corals throughout the world, and the strong likelihood that coral reefs will become functionally extinct within the current century. Knowledge of these trends comes from the monitoring of coral reefs to evaluate their health over time, with the most informative projects providing high-resolution information extending over decades. Such projects describe both how reefs are changing, and answer questions addressing the causes of the changes and the form in which reefs will persist in the future. This project focuses on coral reefs in United States waters, specifically around St. John in the US Virgin Islands. These reefs are protected within the Virgin Islands National Park, and have been studied more consistently and in greater detail than most reefs anywhere in the world. Building from 33 years of research, this project extends monitoring of these habitats by another five years, and uses the emerging base of knowledge, and the biological laboratory created by the reefs of St. John, to address the causes and consequences of the bottleneck preventing baby corals from repopulating the reefs. The work is accomplished with annual expeditions, staffed by faculty, graduate students, undergraduates, and teachers, coupled with analyses of samples at California State University, Northridge, and Florida State University, Tallahassee. The students and teachers assist with the research goals at the center of this project, but also engage in independent study and integrate with the rich and diverse societal context and natural history of the Caribbean. The scope of the science agenda extends to schools in California, where students are introduced to the roles played by marine animals in ecosystem health, concepts of long-term change in the biological world, and the role of science engagement in promoting positive environmental outcomes. In addition to generating a wide spectrum of project deliverables focusing on scientific discovery, the project promotes STEM careers and train globally aware scientists and educators capable of supporting the science agenda of the United States in the 21st Century.

This project leverages one of the longest time-series analyses of Caribbean coral reefs to extend the time-series from 33 to 38 years, and it tests hypotheses addressing the causes and consequences of changing coral reef community structure. The project focuses on reefs within the Virgin Islands National Park (VINP) and along the shore of St. John, US Virgin Islands, and is integrated with stakeholders working in conservation (VINP) and local academia (University of the Virgin Islands). Beginning in 1987, the project has addressed detail-oriented analyses within a small spatial area that complements the large-scale analyses conducted by the VINP. The results of these efforts create an unrivaled context within which ecologically relevant hypotheses can be tested to elucidate mechanisms driving ecological change. Building from image- and survey- based analyses, 33 years of data reveal the extent to which these reefs have transitioned to a low-abundance coral state, and the importance of the bottleneck preventing coral recruits from contributing to adult size classes. The intellectual merits of this project leverage these discoveries to address eight hypotheses: (H1) long-term changes are defining a cryptic regime change, with the low coral abundance reinforced by, (H2) enhanced community resilience, (H3) low post-settlement success, (H4) negative effects of peyssonnelid algal crusts (PAC) on juvenile corals, (H5) inability of juvenile corals to match their phenotypes to future conditions, (H6) impaired population growth caused by reduced genetic diversity, (H7) the premium placed on PAC-free halos around *Diadema* sea urchins for coral recruitment, and (H8) biotic homogenization occurring on a landscape-scale.

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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