The frequency of distances to the nearest Milleopora for coral species found on long-term sampling sites in St. John, USVI.

Website: https://www.bco-dmo.org/dataset/745605
Data Type: Other Field Results
Version: 1
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Project
» LTREB Long-term coral reef community dynamics in St. John, USVI: 1987-2019 (St. John LTREB)
» Collaborative research: Ecology and functional biology of octocoral communities (VI Octocorals)
» RUI-LTREB Renewal: Three decades of coral reef community dynamics in St. John, USVI: 2014-2019 (RUI-LTREB)

Contributors	Affiliation	Role
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Abstract
The frequency of distances to the nearest Milleopora for coral species found on long-term sampling sites in St. John, USVI.

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Coverage

Spatial Extent: **Lat**:18.32 **Lon**:-64.723
Temporal Extent: 2014 - 2015

Dataset Description

Data published in Invertebrate Biology paper entitled "*Overgrowth of Caribbean octocorals by milleporid hydrocorals*".

Methods & Sampling

Methodology from Wegener et al., 2017

Reefs were censused between Cabritte Horn (18°18.4560 N, 63°43.6620 W) and White Point (18°18. 8610 N, 64°43.9090 W) on the south shore of St. John, and surveys were completed at multiple sites that were haphazardly selected as the field schedule permitted. The same vicinities were censused in 2 years, but replicate areas of reef were not relocated. Fringing reefs along the south shore of St. John are richly populated by octocorals and scleractinians that have been studied since 1987 (Rogers & Miller 2006; Edmunds 2013; Edmunds & Lasker 2016), and in this study, they were evaluated for interactions between colonies of Millepora

spp. and octocorals. Surveys were completed in two summers (July and August of 2014 and 2016) at 9–14 m depth, and they focused on arborescent octocorals at sites close to those that have been surveyed for decades (Edmunds 2013).

Objective 1: Abundance of octocoral encrustation

To calculate the percentage of arborescent octocorals encrusted by colonies of Millepora spp., reefs were censused using band transects (2014, 10 9 2 m) and quadrats (2015, 1 9 1 m), that were randomly placed along a constant isobath at each site, but with depths varying among sites. Arborescent octocorals were counted by genus when their holdfasts were vis- ible within the band transects and quadrats, and colonies were inspected for encrustations of Millepora spp. Colonies of octocorals were scored as encrusted if any portion of their surface was covered by colonies of Millepora spp., and octocorals were identified to genus where this was possible; fully encrusted colonies often were impossible to identify and were scored as “unknown” octocorals. For all octocorals (i.e., pooled among taxa) and for each genus (where possible), densities of encrusted and Millepora-free colonies were calculated using data pooled among sites. The abundance of encrusted octocorals was expressed as a percentage of all colo- nies censused each year.

Objective 2: Initiation of octocoral encrustations

The likelihood that octocorals became encrusted through pursuit by Millepora spp. was evaluated from evidence that Millepora spp. colonies were orienting their growth toward nearby octocorals (sensu Wahle 1980). This possibility was determined by searching for examples of this growth orientation and, further, by measuring the distance from octocorals encrusted by Millepora spp. to other Millepora spp. colonies (called originating colonies), from which pursuit leading to encrustation could have been staged. The reef adjacent to encrusted octocorals was searched for originating colonies, and in 2014, these surveys were completed up to 1.5 m from the holdfasts of encrusted octocorals. In 2015, this distance was increased to 2.0 m to provide a more exhaustive census for possible originating colonies.

Our methods to evaluate the origins of colonies of Millepora spp. on octocorals were limited by the inability to census colonies over time in order to observe the progression of pursuit (by Millepora) or its outcome (overgrowth of octocorals). As an alternative to repeated censuses, we focused our 2015 measurements of distances between hydrocoral and octocoral colonies to include only those octocoral colonies encrusted by just a few centimeters of hydrocoral growth. Because these encrustations were at least as common in St. John as they were in Jamaica in the 1970s, when pursuit by Millepora was first observed (Wahle 1980) (described below), it was reasonable to expect that among large numbers of encrusted octocorals, we would observe interactions of varying ages including pursuit in its earliest stages. These encrustations likely had a recent origin and, therefore, signs of initiation by pursuit were more likely to be evident. Partially encrusted colonies were identified to genus where this was possible, and the distance to the nearest colony of Millepora spp. within 2 m of the holdfast was recorded.

Data Processing Description

BCO-DMO Data Processing Notes:

-Reformatted column names to comply with BCO-DMO standards
-Replaced blank cells with nd
-Added year columns

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Data Files

File
distance.csv (Comma Separated Values (.csv), 6.49 KB) MD5:a88143311e4a68880e88cfb60baa1c1d Primary data file for dataset ID 745605

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Related Publications

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
Methods

Edmunds, P., & Lasker, H. (2016). Cryptic regime shift in benthic community structure on shallow reefs in St. John, US Virgin Islands. Marine Ecology Progress Series, 559, 1–12. doi:10.3354/meps11900
Methods

Rogers, C., & Miller, J. (2006). Permanent phase shifts or reversible declines in coral cover? Lack of recovery of two coral reefs inSt. John, US Virgin Islands. Marine Ecology Progress Series, 306, 103–114. doi:10.3354/meps306103
Methods

WAHLE, C. M. (1980). Detection, Pursuit, and Overgrowth of Tropical Gorgonians by Milleporid Hydrocorals: Perseus and Medusa Revisited. Science, 209(4457), 689–691. doi:10.1126/science.209.4457.689
Methods

Wegener, C., Martin, B., Didden, C., & Edmunds, P. J. (2017). Overgrowth of Caribbean octocorals by milleporid hydrocorals. Invertebrate Biology, 137(1), 29–37. doi:10.1111/ivb.12201
Results

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Methods

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Parameters

Parameter	Description	Units
Year	Year	unitless
Site	Site	unitless
Genus	Genus sampled	unitless
Nearest_Millepora	Distance of nearest Millepora	centimeters
Position_of_infection	Position of infection on octocoral	unitless

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Project Information

LTREB Long-term coral reef community dynamics in St. John, USVI: 1987-2019 (St. John LTREB)

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

Coverage: St. John, U.S. Virgin Islands; California State University Northridge

Long Term Research in Environmental Biology (LTREB) in US Virgin Islands:

From the NSF award abstract:

In an era of growing human pressures on natural resources, there is a critical need to understand how major ecosystems will respond, the extent to which resource management can lessen the implications of these responses, and the likely state of these ecosystems in the future. Time-series analyses of community structure provide a vital tool in meeting these needs and promise a profound understanding of community change. This study focuses on coral reef ecosystems; an existing time-series analysis of the coral community structure on the reefs of St. John, US Virgin Islands, will be expanded to 27 years of continuous data in annual increments. Expansion of the core time-series data will be used to address five questions: (1) To what extent is the ecology at a small spatial scale (1-2 km) representative of regional scale events (10's of km)? (2) What are the effects of declining coral cover in modifying the genetic population structure of the coral host and its algal symbionts? (3) What are the roles of pre- versus post-settlement events in determining the population dynamics of small corals? (4) What role do physical forcing agents (other than temperature) play in driving the population dynamics of juvenile corals? and (5) How are populations of other, non-coral invertebrates responding to decadal-scale declines in coral cover? Ecological methods identical to those used over the last two decades will be supplemented by molecular genetic tools to understand the extent to which declining coral cover is affecting the genetic diversity of the corals remaining. An information management program will be implemented to create broad access by the scientific community to the entire data set.

The importance of this study lies in the extreme longevity of the data describing coral reefs in a unique ecological context, and the immense potential that these data possess for understanding both the patterns of comprehensive community change (i.e., involving corals, other invertebrates, and genetic diversity), and the processes driving them. Importantly, as this project is closely integrated with resource management within the VI National Park, as well as larger efforts to study coral reefs in the US through the NSF Moorea Coral Reef LTER, it has a strong potential to have scientific and management implications that extend further than the location of the study.

Collaborative research: Ecology and functional biology of octocoral communities (VI Octocorals)

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

Coverage: St. John, US Virgin Islands: 18.3185, 64.7242

The recent past has not been good for coral reefs, and journals have been filled with examples of declining coral cover, crashing fish populations, rising cover of macroalgae, and a future potentially filled with slime. However, reefs are more than the corals and fishes for which they are known best, and their biodiversity is affected strongly by other groups of organisms. The non-coral fauna of reefs is being neglected in the rush to evaluate the loss of corals and fishes, and this project will add on to an on-going long term ecological study by studying soft corals. This project will be focused on the ecology of soft corals on reefs in St. John, USVI to understand the Past, Present and the Future community structure of soft corals in a changing world. For the Past, the principal investigators will complete a retrospective analysis of octocoral abundance in St. John between 1992 and the present, as well as Caribbean-wide since the 1960's. For the Present, they will: (i) evaluate spatio-temporal changes between soft corals and corals, (ii) test for the role of competition with macroalgae and between soft corals and corals as processes driving the rising abundance of soft corals, and (iii) explore the role of soft corals as "animal forests" in modifying physical conditions beneath their canopy, thereby modulating recruitment dynamics. For the Future the project will conduct demographic analyses on key soft corals to evaluate annual variation in population processes and project populations into a future impacted by global climate change.

This project was funded to provide and independent "overlay" to the ongoing LTREB award (DEB-1350146, co-funded by OCE, PI Edmunds) focused on the long-term dynamics of coral reefs in St. John.

Note: This project is closely associated with the project "RAPID: Resilience of Caribbean octocorals following Hurricanes Irma and Maria". See: https://www.bco-dmo.org/project/749653.

The following publications and data resulted from this project:
2017 Tsounis, G., and P. J. Edmunds. Three decades of coral reef community dynamics in St. John, USVI: a contrast of scleractinians and octocorals. Ecosphere 8(1):e01646. DOI: 10.1002/ecs2.1646
Rainfall and temperature data
Coral and macroalgae abundance and distribution
Descriptions of hurricanes affecting St. John

2016 Gambrel, B. and Lasker, H.R. Marine Ecology Progress Series 546: 85–95, DOI: 10.3354/meps11670
Colony to colony interactions
Eunicea flexuosa interactions
Gorgonia ventalina asymmetry
Nearest neighbor surveys

2015 Lenz EA, Bramanti L, Lasker HR, Edmunds PJ. Long-term variation of octocoral populations in St. John, US Virgin Islands. Coral Reefs DOI 10.1007/s00338-015-1315-x
octocoral survey - densities
octocoral counts - photoquadrats vs. insitu survey
octocoral literature review
Download complete data for this publication (Excel file)

2015 Privitera-Johnson, K., et al., Density-associated recruitment in octocoral communities in St. John, US Virgin Islands, J.Exp. Mar. Biol. Ecol. DOI: 10.1016/j.jembe.2015.08.006
octocoral density dependence
Download complete data for this publication (Excel file)

Other datasets related to this project:
octocoral transects - adult colony height

RUI-LTREB Renewal: Three decades of coral reef community dynamics in St. John, USVI: 2014-2019 (RUI-LTREB)

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

Coverage: USVI

Describing how ecosystems like coral reefs are changing is at the forefront of efforts to evaluate the biological consequences of global climate change and ocean acidification. Coral reefs have become the poster child of these efforts. Amid concern that they could become ecologically extinct within a century, describing what has been lost, what is left, and what is at risk, is of paramount importance. This project exploits an unrivalled legacy of information beginning in 1987 to evaluate the form in which reefs will persist, and the extent to which they will be able to resist further onslaughts of environmental challenges. This long-term project continues a 27-year study of Caribbean coral reefs. The diverse data collected will allow the investigators to determine the roles of local and global disturbances in reef degradation. The data will also reveal the structure and function of reefs in a future with more human disturbances, when corals may no longer dominate tropical reefs.

The broad societal impacts of this project include advancing understanding of an ecosystem that has long been held emblematic of the beauty, diversity, and delicacy of the biological world. Proposed research will expose new generations of undergraduate and graduate students to natural history and the quantitative assessment of the ways in which our planet is changing. This training will lead to a more profound understanding of contemporary ecology at the same time that it promotes excellence in STEM careers and supports technology infrastructure in the United States. Partnerships will be established between universities and high schools to bring university faculty and students in contact with k-12 educators and their students, allow teachers to carry out research in inspiring coral reef locations, and motivate children to pursue STEM careers. Open access to decades of legacy data will stimulate further research and teaching.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1332915
NSF Division of Environmental Biology (NSF DEB)	DEB-1350146

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