

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

Website: <https://www.bco-dmo.org/dataset/892308>

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 four decades of change on Caribbean reefs](#) (St John Coral Reefs)

Contributors	Affiliation	Role
Edmunds, Peter J.	California State University Northridge (CSUN)	Principal Investigator
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Abstract

These data represent simultaneous measurements taken by a HOBO light intensity logger (model UA-0002-64) measuring in lux and a cosine-corrected PAR sensor (LI-192, Li-Cor Biosciences) fitted by the manufacturer into a logger (miniPAR, Precision Measurement Engineering) measuring PAR in $\mu\text{mol photon m}^{-2} \text{s}^{-1}$. This was done at the Tektite site at 9 m depth in Lameshur Bay, St. John, U.S. Virgin Islands during January of 2021. This was done to cross-calibrate illuminance data (lux) from the HOBO logger to PAR ($\mu\text{mol photon m}^{-2} \text{s}^{-1}$) (after Long et al. 2012) for assistance in the ecological interpretation of illuminance data. 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).

Table of Contents

- [Coverage](#)
- [Dataset Description](#)
 - [Methods & Sampling](#)
 - [Data Processing Description](#)
- [Data Files](#)
- [Supplemental Files](#)
- [Related Publications](#)
- [Related Datasets](#)
- [Parameters](#)
- [Instruments](#)
- [Project Information](#)
- [Funding](#)

Coverage

Spatial Extent: Lat:18.3113 Lon:-64.7226

Temporal Extent: 2021-01-25 - 2021-01-27

Methods & Sampling

Location

Tektite site in Lameshur Bay, St. John, U.S. Virgin Islands at 9-m depth

Research conducted from the University of the Virgin Islands Marine Station in Lameshur Bay in Jan 2019.

Methods & Sampling:

The HOBO and PAR logger were synchronized, deployed next to one another at 9-m depth with their light sensors at the same depth and perpendicular to the surface. Loggers were deployed at the Tektite site, and set to take a light measurement once every minute. Loggers started sampling at 14:05:00 (Local Time, Atlantic Standard Time, GMT -4) on January 25th 2021 and stopped sampling at 16:45:00 on January 27th 2021. Sampling days were characterized as clear, and sunny with few passing clouds and a calm sea state.

Instruments:

HOBO Light and Temperature Logger, Model UA-0002-64
Cosine-corrected PAR sensor (LI-192, Li-Cor Biosciences) fitted by the manufacturer into a logger (miniPAR, Precision Measurement Engineering)

Data Processing Description

BCO-DMO Data Manager Processing Notes:

- * File "St.John_Light Lux to PAR Correlation Data_Jan2021.csv" imported as the primary table for this dataset.
- * lat lon values added into the table by joining with the site list.
- * site name added to data table
- * DateTime in UTC ISO 8601 format added to data table from UTC-4 timestamp
- * 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]

[[table of contents](#) | [back to top](#)]

Data Files

File
light_lux_and_PAR.csv (Comma Separated Values (.csv), 236.40 KB) MD5:fd93b952268a30f5cbe8c6008d7d07c2
Primary data table for dataset 892308.

[[table of contents](#) | [back to top](#)]

Supplemental Files

File
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

[[table of contents](#) | [back to top](#)]

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

Related Datasets

IsRelatedTo

Girard, J., Edmunds, P. J. (2023) **Benthic invertebrate abundances associated with octocoral forests in St. John, US 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.892248.1 [[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 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 forests along 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) **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.

[[table of contents](#) | [back to top](#)]

Parameters

Parameter	Description	Units
Site	Site name	unitless
lat	Site latitude	decimal degrees
lon	Site longitude	decimal degrees
DateTime_GMTminus04	Date and time of sample (time zone GMT-4)	unitless
ISO_DateTime_UTC	Date and time of sample (time zone UTC) in ISO 8601 format	unitless
HOBO_Light_Intensity	Light intensity in lux from the HOBO logger	lux (lx)
PME_PAR	Light intensity corresponding to PAR wavelengths from the PME PAR logger	micromoles of photons per meter squared per second (umol photon m ⁻² s ⁻¹)

[[table of contents](#) | [back to top](#)]

Instruments

Dataset-specific Instrument Name	HOBO Light and Temperature Logger, Model UA-0002-64
Generic Instrument Name	Onset HOBO Pendant Temperature/Light Data Logger
Generic Instrument Description	The Onset HOBO (model numbers UA-002-64 or UA-001-64) is an in-situ instrument for wet or underwater applications. It supports light intensity, soil temperature, temperature, and water temperature. A two-channel logger with 10-bit resolution can record up to approximately 28,000 combined temperature and light measurements with 64K bytes memory. It has a polypropylene housing case. Uses an optical USB to transmit data. A solar radiation shield is used for measurement in sunlight. Temperature measurement range: -20 deg C to 70 deg C (temperature). Light measurement range: 0 to 320,000 lux. Temperature accuracy: +/- 0.53 deg C from 0 deg C to 50 deg C. Light accuracy: Designed for measurement of relative light levels. Water depth rating: 30 m.

Dataset-specific Instrument Name	LI-192, miniPAR
Generic Instrument Name	PME miniPAR logger
Dataset-specific Description	Cosine-corrected PAR sensor (LI-192, Li-Cor Biosciences) fitted by the manufacturer into a logger (miniPAR, Precision Measurement Engineering)
Generic Instrument Description	A submersible instrument that logs PAR (Photosynthetically Active Radiation), temperature and tilt measurements. Data are recorded on an internal SD card. The sensor is a LI-192 Underwater Quantum Sensor, manufactured by LI-COR. The sensor uses a silicon photodiode and glass optical filters to create a uniform sensitivity to light wavelengths in the 400-700nm range. It measures PAR from all angles in one hemisphere. An anti-fouling wiper is available. The instrument can be configured to record at intervals between 1 and 60 minutes. It is submersible up to 100 metres. PAR measurement accuracy is dependent upon the stability of the sensor pointed towards the water surface.

[[table of contents](#) | [back to top](#)]

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 reefs. 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 scleractinian 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 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>

[[table of contents](#) | [back to top](#)]

Funding

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

[[table of contents](#) | [back to top](#)]