Water quality metrics collected from 25 meter reefs from around the U.S. Virgin Islands during May 2023 (Multi-scale multi-host disease spread project)

Website: https://www.bco-dmo.org/dataset/986272
Data Type: Other Field Results
Version: 2
Version Date: 2025-11-24

Project
» A multi-scale approach to predicting infectious multi-host disease spread in marine benthic communities (Multi-scale multi-host disease spread)

Contributors	Affiliation	Role
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Abstract
Reef seawater was collected to quantify microbial cell abundances. Water samples were collected by SCUBA divers approximately 2 meters above the reef surface. Physical parameters, including temperature, salinity, dissolved oxygen, pH, and turbidity, were measured from the boat using an EXO2 multiparameter sonde. Sample processing will follow previously published methods (Becker et al., 2020; Weber et al., 2020). Collections were replicated across four sampling days.

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Coverage

Location: St. Thomas, U.S. Virgin Islands
Spatial Extent: **Lat**:18.28845 **Lon**:65.10175

Temporal Extent: 2023-05-03 - 2023-05-07

Methods & Sampling

Reef seawater was collected to measure microbial cell abundances. Water samples were collected via SCUBA 2 meters above the reef. Sample processing will be conducted using previously published methods (Becker et al., 2020; Weber et al., 2020). From the boat, we used an EXO2 multiparameter sonde to measure temperature, salinity, dissolved oxygen, pH, and turbidity. Collections were replicated on four sampling days.

BCO-DMO Processing Description

Version 1

* Removed blank spaces from parameter names and replaced them with underscores ("_").
* The format of the time column was changed from %H:%M:%S %p to %H:%M:%S. The time values have also been converted from Atlantic Standard time (UTC-4) to UTC+0.
* Removed special characters and units from parameter names. DO_mg/L was changed to DO_Concentration to differentiate it from the DO_Percent values.
* Converted the date field from %m-%d-%y to %Y-%m-%d.
* Added a new field called ISO_DateTime_UTC by combining the date and Time_of_sonde fields; if a row does not contain both a date and Time_of_sonde value, there is no corresponding value in ISO_DateTime_UTC.
* NA data values were removed from the data file and replaced with blank values.

Version 2
* N and W were removed from the latitude and longitude values, respectively, and the values within these columns were converted from strings to floats.

Problem Description

Cell abundances were not collected on May 7, 2023. As a result, the following measurements are not available on this date: Lab_ID_for_cell_abundances, pro, syn, peak, hbact.

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Data Files

File	
986272_v2_25m_virgin_islands_reef_water_quality_metrics.csv	(Comma Separated Values (.csv), 966 bytes) MD5:bc060321511660cb40666cd039761d3c
Primary data file for dataset ID 986272, version 2	

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Related Publications

Becker, C., Weber, L., Suca, J., Llopiz, J., Mooney, T., & Apprill, A. (2020). Microbial and nutrient dynamics in mangrove, reef, and seagrass waters over tidal and diurnal time scales. Aquatic Microbial Ecology, 85, 101–119. https://doi.org/10.3354/ame01944
Methods

Weber, L., González-Díaz, P., Armenteros, M., Ferrer, V. M., Bretos, F., Bartels, E., Santoro, A. E., & Apprill, A. (2019). Microbial signatures of protected and impacted Northern Caribbean reefs: changes from Cuba to the Florida Keys. Environmental Microbiology, 22(1), 499–519. Portico. https://doi.org/10.1111/1462-2920.14870 https://doi.org/doi:10.1111/1462-2920.14870
Methods

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Parameters

Parameter	Description	Units
Mission	Name of the project when these data were collected.	unitless
Site	Name of the reef site in the U.S. Virgin Islands where these data were collected.	unitless
Latitude	Latitude of the reef site.	decimal degrees
Longitude	Longitude of the reef site.	decimal degrees
ISO_DateTime_UTC	Date and time of the Sonde deployment.	unitless
Date	Date of data collection.	unitless
Sampling_depth	Depth of sampling for non-Sonde samples.	meters (m)
Time_of_sonde	Time of sonde measurements in UTC collected with multiparameter water quality sonde from the UVI Environmental Analysis Lab.	unitless
Temp_C	Temperature in celcius collected with multiparameter water quality sonde from the UVI Environmental Analysis Lab.	degrees Celcius
mmHg	Millimeters of mercury collected with multiparameter water quality sonde from the UVI Environmental Analysis Lab.	millimeters
DO_Percent	Dissolved oxygen as percent collected with multiparameter water quality sonde from the UVI Environmental Analysis Lab.	unitless
DO_Concentration	Dissolved oxygen as concentration collected with multiparameter water quality sonde from the UVI Environmental Analysis Lab.	miligrams per liter (mg/L)
SPC	Specific conductance measures with an in an in situ multiparameter water quality sonde from the UVI Environmental Analysis Lab.	microSiemens per centimeter (uS/cm)
C	Conductivity measured with an in situ multiparameter water quality sonde from the UVI Environmental Analysis Lab.	microSiemens per centimeter (uS/cm)

SAL	Salinity as measured with an in situ multiparameter water quality sonde from the UVI Environmental Analysis Lab.	parts per thousand (ppt)
pH	pH measured with an in situ multiparameter water quality sonde from the UVI Environmental Analysis Lab.	unitless
NTU	Turbidity measured with an in situ multiparameter water quality sonde from the UVI Environmental Analysis Lab.	Nephelometric Turbidity Units (NTU)
TSS	Total suspended solids measured with an in situ multiparameter water quality sonde from the UVI Environmental Analysis Lab.	miligrams per liter (mg/L)
DEP_m	Depth of of the deployed multiparameter water quality sonde from the UVI Environmental Analysis Lab.	meters (m)
Lab_ID_for_cell_abundances	Internal lab identity given to cell abundance samples.	unitless
pro	Prochlorococcus concentration measured with flow cytometry from 1 mL samples collected 2 meters above the reef.	cells per milliliter (cells/mL)
syn	Synechococcus concentration measured with flow cytometry from 1 mL samples collected 2 meters above the reef.	cells per milliliter (cells/mL)
peuk	Picoeukaryote concentraiton measured with flow cytometry from 1 mL samples collected 2 meters above the reef.	cells per milliliter (cells/mL)
hbact	Heterotrophic bacteria and Archaea concentrations measured with flow cytometry from 1 mL samples collected 2 meters above the reef.	cells per milliliter (cells/mL)

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Instruments

Dataset-specific Instrument Name	YSI EXO Sonde (YSI Inc./Xylem Inc.)
Generic Instrument Name	YSI EXO multiparameter water quality sondes
Dataset-specific Description	At each sampling location, we collected reef seawater for water quality metrics: the microbial community of the surrounding environment, inorganic nutrient concentrations, the total organic carbon and total nitrogen, and cell abundances. Sample processing will be conducted using previously published methods (Becker et al., 2020; Weber et al., 2020). Water was collected via SCUBA 2 meters above the reef. From the boat, we used an Exo2 multiparameter sonde to measure temperature, salinity, dissolved oxygen, pH, and turbidity. Each experimental site had replicate sampling events on two different days.
Generic Instrument Description	Comprehensive multi-parameter, water-quality monitoring sondes designed for long-term monitoring, profiling and spot sampling. The EXO sondes are split into several categories: EXO1 Sonde, EXO2 Sonde, EXO3 Sonde. Each category has a slightly different design purpose with the EXO2 and EXO3 containing more sensor ports than the EXO1. Data are collected using up to four user-replaceable sensors and an integral pressure transducer. Users communicate with the sonde via a field cable to an EXO Handheld, via Bluetooth wireless connection to a PC, or a USB connection to a PC. Typical parameter specifications for relevant sensors include dissolved oxygen with ranges of 0-50 mg/l, with a resolution of +/- 0.1 mg/l, an accuracy of 1 percent of reading for values between 0-20 mg/l and an accuracy of +/- 5 percent of reading for values 20-50 mg/l. Temp ranges are from-5 to +50 degC, with an accuracy of +/- 0.001 degC. Conductivity has a range of 0-200 mS/cm, with an accuracy of +/-0.5 percent of reading + 0.001 mS/cm and a resolution of 0.0001 - 0.01 mS/cm.

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Project Information

A multi-scale approach to predicting infectious multi-host disease spread in marine benthic communities (Multi-scale multi-host disease spread)

Coverage: United States Virgin Islands

NSF Award Abstract:
Marine diseases have devastating impacts on ocean ecosystems and this work will directly examine the framework for understanding disease transmission in the ocean. A team of ecologists, ocean connectivity and disease modelers, microbiologists, and coral immunologists (from the University of Virgin Islands (UVI), Louisiana State University (LSU), Rice University, University of Texas-Arlington and the Woods Hole Oceanographic Institution) will develop a model that predicts transmission of a devastating Caribbean coral disease that has the potential to impact the economic value of coral reefs, including those located in the U.S. This project will support multidisciplinary field and laboratory research experiences of graduate students at multiple minority-serving institutions, and will provide undergraduate students with hands-on training in modeling, ecological and molecular analysis techniques. UVI and LSU are in EPSCoR jurisdictions and have diverse student bodies, including numerous under-represented minority (URM) students. The research team will collaboratively provide URM students with research experiences in STEM fields. Project findings will be broadly communicated through virtual public programming, and through the Virgin Islands Coral Disease Advisory Committee with updates on the vicoraldisease.org website. A coral disease response workshop for the U.S. Virgin Islands will also be held, in which project results will be presented and used to support disease response planning.

Over the last four decades, marine diseases have decimated ecosystem engineers in marine coastal ecosystems, including the rocky intertidal, seagrasses and coral reefs. The pathogens driving these diseases have frequently been challenging to isolate, characterize and confirm, in part because they affect multiple host species and can spread by ocean currents, as well as through individual contact. Here, we propose a multi-

scale epidemic model for studying marine disease that addresses both within-host and within-patch disease dynamics, and explicitly acknowledges the dispersal of pathogens between populations. Our interdisciplinary research team of ecologists, connectivity and disease modelers, microbiologists, and coral immunologists will integrate the largest set of predictors of marine disease spread to date: individual host species traits that allow for disease resistance or susceptibility, local transmission within communities that may have unique community structure, and hydrodynamic connectivity among susceptible communities. Modeling will be supported with rich data sets of within- and among-patch population characteristics and disease dynamics as well as molecular data on species-level disease responses. This project will advance knowledge of infectious diseases by integrating multidimensional scales and differential host susceptibilities into existing epidemiological models. This model will particularly advance the framework for studying marine diseases and has the potential to elucidate the transmission properties of a devastating Caribbean coral disease (stony coral tissue loss disease) that fits the most confounding and notorious hallmarks of marine diseases: infection of multiple hosts by an elusive pathogen.

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.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2109622

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