Sea urchin (Diadema mexicanum) counts from video transects of reefs off Pacific Panama collected between 2016 and 2018

Website: https://www.bco-dmo.org/dataset/883841
Data Type: Other Field Results
Version: 1
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Project
» Collaborative Research: Climate Change, Mesoscale Oceanography, and the Dynamics of Eastern Pacific Coral Reefs (Coral Climate ETP)

Contributors	Affiliation	Role
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Abstract
These data include counts of the sea urchin Diadema mexicanum for reefs off Pacific Panamá that were collected between 2016 and 2018. D. mexicanum individuals were counted for video transects that encompassed an area of 25 x 1 m. These data provide insight into the status of the sea urchin population and the amount of bioerosion pressure that these reefs are experiencing. The video transects were collected by students from Northeastern University's Three Seas Program and processed by Victor Rodriguez-Ruano.

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Coverage

Spatial Extent: **N**:8.63174 **E**:-79.0284 **S**:7.40309 **W**:-81.7588
Temporal Extent: 2016 - 2018

Methods & Sampling

Six 25 x 1 m video belt-transects were haphazardly captured at each site for each sampling period by SCUBA divers with a GoPro camera, which was pointed down and positioned 1 m from the reef surface as they travelled along the transect at a constant speed. The abundance of sea urchins, which were predominantly Diadema mexicanum, were then used to estimate sea urchin density (ind. m-2).

Organism scientific name and Lifesciences Identifier (LSID):
Diadema mexicanum (urn:lsid:marinespecies.org:taxname:513223)

Data Processing Description

BCO-DMO Data Manager Processing Notes:
* Sheet name "Sheet2" of source file "Diadema_VideoT_Master_BCO.xlsx" was imported into the BCO-DMO data system as the main data table for this dataset.
* Geospatial bounds were calculated from latitudes and longitudes within the data table.
* "Date" column containing Spring|Fall and year broken into separate "Season" and "Year" columns.
* lat/lon values rounded to 5 decimal places.

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Related Publications

Rodriguez-Ruano, V., Toth, L. T., & Aronson, R. B. (2022). Assigning causality to events in the Holocene record of coral reefs. Geological Society, London, Special Publications, 529(1). https://doi.org/10.1144/sp529-2022-47
https://doi.org/10.1144/SP529-2022-47
Results

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Parameters

Parameter	Description	Units
Season	Time of the year when the data were collected (Spring or Fall)	unitless
Year	Year the data were collected	unitless
Gulf	Specifies whether the data were collected in the Gulf of Panama or Chiriqui	unitless
Site	Experimental site	unitless
Longitude	Longitude	decimal degrees
Latitude	Latitude	decimal degrees
Transect	Transect number	unitless
Diadema	Abundance of Diadema spp. sea urchins	number of individuals
Area	Area covered by the video transect	square meters (m2)
Density	Population density of Diadema spp. for each transect	individuals per square meter (ind/m2)

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Instruments

Dataset-specific Instrument Name	GoPro Hero 4
Generic Instrument Name	Camera
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

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Project Information

Collaborative Research: Climate Change, Mesoscale Oceanography, and the Dynamics of Eastern Pacific Coral Reefs (Coral Climate ETP)

Website: https://research.fit.edu/marine-paleolab/research-projects/eastern-tropical-pacific/

Coverage: Pacific Panamá

Coral reefs are under threat around the world, and climate change is the main reason they are declining. Knowing how local conditions on a reef exaggerate or mask the impacts of climate change make it possible to predict which reefs are most likely to survive longer and, therefore, which reefs deserve the greatest effort and funding for conservation. Reefs off the Pacific coast of Panama are vulnerable to the impacts of global climate change but are also strongly influenced by small-scale currents and other local conditions. The goal of this study is to see how those local differences affect coral growth and the ability of the corals to build reefs. Climate change appears poised to shut down reef growth off Pacific Panama within the next century. Considering that sea-level rise is accelerating at the same time, if coral reefs shut down they will not be able to protect populated shorelines from storm damage and erosion. In addition to its scientific insights, this project will provide undergraduate and graduate training, provide research training for underrepresented groups, advance women in scientific careers, and contribute important information for management and policy. The results will be incorporated into innovative curricular materials for K through 12 classes in Title-I schools in Florida aligned with Next Generation (Common Core) standards, and standards for Climate and Ocean Literacy. An annual film festival will be organized for K through 12 students to explore themes in marine science through videography.

Global climate change is now the leading cause of coral-reef degradation, but the extent to which mesoscale oceanography overprints climatic forcing is poorly understood. Previous studies in Pacific Panama showed that reef ecosystems collapsed from 4100 to 1600 years ago. The 2500-yr hiatus in reef-building occurred at locations throughout the Pacific, and the primary cause was increased variability of the El Nino-Southern Oscillation. This study will determine the influence of contemporary variability in mesoscale oceanography in the eastern tropical Pacific (ETP) on variability in the condition of local coral populations. Insights from the living populations will be combined with paleoecological and geochemical studies of reef frameworks to infer past conditions that were inimical or beneficial to coral growth and reef accretion. Three primary hypotheses will be tested in Pacific Panama:
H1. Mesoscale oceanography is manifested in gradients of reef condition, coral growth, and coral physiological condition. Physiographic protection from upwelling currents and thermocline shoaling confers positive effects on coral growth rate and physiology.
H2. The impacts of mesoscale oceanographic regimes on the growth and condition of reef-corals were felt at least as far back as the mid- to late Holocene.
H3. Physiographic protection from upwelling currents and thermocline shoaling conferred positive effects on vertical reef accretion in the past and shortened the late-Holocene hiatus.
Specific research approaches to test these hypotheses will include collecting high-resolution, oceanographic time series to characterize contemporary environments along gradients of physical conditions; collecting ecological and geochemical data on the condition of living coral populations; and extracting cores from the reef frameworks and analyzing the coral assemblages taxonomically, taphonomically, and geochemically to assess patterns of biotic and paleoenvironmental variability. Strong spatial and temporal variability in the physical drivers of reef development make the ETP an excellent model system in which to examine the response of coral reefs to climate change over a range of physical regimes. This research will provide a unique opportunity

to tease apart the controls on reef development across multiple spatial and temporal scales. The climatology underlying the late-Holocene hiatus was similar to probable scenarios for the next century, implying that climate change could be driving reef ecosystems of the ETP (and elsewhere) toward another collapse. Understanding how the hiatus unfolded along oceanographic gradients will increase our power to predict the future responses of reefs to a rapidly changing climate.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1535007

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