Coral disease data at 4 locations in the Caribbean in 2012: Mahahual, Mexico; Tuxpan, Mexico; Bocas del Toro, Panama; St. John, United States Virgin Islands

Website: https://www.bco-dmo.org/dataset/562569
Version:

Project
» Are coral diseases contagious? (Contagious coral diseases?)

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Dataset Description

We studied four locations: (1) Mahahual, Mexico (latitude 18"42'N, longitude 87"42'W) and (2) Tuxpan, Mexico (latitude 21"01'N, longitude 97"11'W), (3) Bocas del Toro, Panama (latitude 9"12'N, longitude 82"09'W) and (4) St. John, United States Virgin Islands (USVI) (latitude 18"18'N, longitude 64"45'W). Each site is identified geographically with latitude and longitude in the original Excel Spreadsheet.

Each coral colony with a disease sign was identified in situ and the species and disease signs were recorded. Four disease signs were identified: (1) white sign was defined as a bright, white band or patch of recent mortality adjacent to healthy-appearing tissue (i.e., the tissue bordered a well-defined edge of exposed skeleton not yet colonized by algae or other biofouling organisms), (2) dark spot was defined as tissue with purple, brown or black lesions, forming spots of irregular shapes, (3) black band was defined as a black band over the coral tissue exposing white skeleton with different stages of biofouling, and (4) yellow sign was defined as a yellow discoloration of tissue forming a band or blotches. White signs and black bands were associated with recent tissue loss; yellow signs and dark spots were usually, but not always, associated with recent tissue loss. Notably, very few yellow bands were observed that followed the classical description. Instead, most coral colonies presented a patchy, non-uniform yellowing of the tissue; therefore the condition was termed 'yellow sign.' Additionally, any area of recently exposed white skeleton, which was not clearly caused by predation or a competitive interaction, was recorded as a white sign, including white plagues, white bands and white pox. The white-sign diseases were not differentiated because of similar- or identical-appearing signs, unknown etiologies for several diseases, and the possibility that the diseases were caused by the same pathogens. Coral colonies were occasionally recorded with two or more signs of disease, when those signs appeared to be spatially independent.

The data will be freely accessible, but are restrictting all access until our final manuscript has been through the peer review process and has been published. Therefore, we are restricting access until 1st June 2017, one year after the final dataset will be submitted (May 30, 2016). Currently, only the site locations and positions are available in the dataset.

References:

Randall, C.J., A. Jordan-Garza, E. Muller, R. van Woesik (2014) Relationships between the history of thermal stress and the relative risk of Caribbean coral diseases. Ecology 95(7): 1981-1994

Methods & Sampling

To assess the prevalence of coral diseases at each location, a survey area (~ 1-10 square km depending on the region's geographic features) of hard-bottom habitat was visually defined using Google Earth (http://earth.google.com/). The survey area was divided into 100 by 100 meter cells (using Google Earth Path 1.4.4). Within each location, twenty-five 100 by 100 meter cells were randomly selected as sites. These sites were defined as the primary sampling units. A single 10 by 10 meter quadrat was haphazardly placed within each site, for field-data collection. To maintain consistency across locations and to minimize potential effects of coral-assemblage differences, three criteria had to be met for a site to be surveyed: (1) the depth averaged between 5 and 10 meters, (2) the substrate was hard bottom, and (3) corals were present. If any one of these criteria was not met at a given site, it was rejected and the next randomly generated site was selected. In total, twenty-five, 10 by 10 meter quadrats were sampled at each location, for a total of 50 quadrats across two frequent-anomaly locations and 50 quadrats across two reference locations, for a total survey area of 10,000 square meters. All four locations were surveyed between 2 July and 1 September 2012. At each site, divers surveyed each 100 square meter quadrat by systematically laying ten contiguous 1 x 10 m belt transects onto the reef substrate.

At each site, still photographs were taken of the benthic community using a Sony Cybershot camera (14 megapixels), supported on a polyvinyl carbon frame fixed approximately 1.5 meters from the substrate. Each photograph will capture approximately 1 squere meter of the substrate. There are approximately 120 photos taken per 10 m x10 m quadrat, which incorporates some overlap. The still images will be stitched together using Canon Photostich®, to create a mosaic of each 10 x 10 m quadrat. When coral diseases are present in a quadrat, then every individual colony of the coral species with the disease will be outlined using Coral Point Count (CPCe) software. After completing the mosaic and outlining the necessary corals, a grid will be placed over the photo-mosaic quadrat, and the location of each colony within the quadrat will be mapped.

Data Processing Description

The data were not further processed. (See Methods & Sampling)

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Data Files

File
coral_diseases_thermal_history.csv (Comma Separated Values (.csv), 190 bytes) MD5:08f245d35d928faeb4d9f3d39d096720 Primary data file for dataset ID 562569

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Parameters

Parameter	Description	Units
lat	Latitude decimal degrees. Negative values means south latitudes.	Decimal degrees
lon	Longitude decimal degrees. Negative is west longitude values.	Decimal degrees
location	Textual description of the site location	n/a

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Deployments

vanWoesik_2012

Website	https://www.bco-dmo.org/deployment/562802
Platform	Caribbean_nearshore
Start Date	2012-06-01
End Date	2016-05-31
Description	First, we will use a hierarchical sampling design to test whether coral diseases follow a contagious-disease model over two spatial scales in the Caribbean. We will also undertake this study in locations with and without a recent history of frequent thermal stress to test the alternate hypothesis that coral diseases are not infectious and contagious but are instead the result of compromised coral hosts that have undergone thermal stress. Second, we will undertake transmission experiments to examine whether coral diseases are indeed transmissible. Study Locations: (1) Mahahual, Mexico (latitude 18"42'N, longitude 87"42'W) and (2) Tuxpan, Mexico (latitude 21"01'N, longitude 97"11'W), (3) Robet van (latitude 9"12'N, longitude 82"09'W), (4) St. John, United States Virgin Islands (USVI) (latitude 18"18'N, longitude 64"45'W), and (5) Wonderland Reef, Florida (latitude 24.56028 N, longitude 81.50127 W).

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Project Information

Are coral diseases contagious? (Contagious coral diseases?)

Coverage: Caribbean

Diseases are one of the greatest threats to corals in the Caribbean. Yet, very little is known about marine diseases in general and coral diseases in particular. Although some pathogens have been acknowledged, identifying coral pathogens has proven difficult and evasive. Presently, coral diseases are assumed to be both infectious and contagious, suggesting that infection is caused by pathogens being passed from colony to colony through a vector. However, few studies have tested this assumption. Spatial epidemiology, or disease mapping, can provide insight into whether diseases cluster and follow a contagious-disease model. In this study we will take a two tiered approach. First, we will use a hierarchical sampling design to test whether coral diseases follow a contagious-disease model over two spatial scales in the Caribbean. We will also undertake this study in locations with and without a recent history of frequent thermal stress to test the alternate hypothesis that coral diseases are not infectious and contagious but are instead the result of compromised coral hosts that have undergone thermal stress. Second, we will undertake transmission experiments to examine whether coral diseases are indeed transmissible.

The research will take place in the Caribbean, at four locations: (1) Mahahual, Mexico (latitude 18"42'N, longitude 87"42'W) and (2) Tuxpan, Mexico (latitude 21"01'N, longitude 97"11'W), (3) Bocas del Toro, Panama (latitude 9"12'N, longitude 82"09'W) and (4) St. John, United States Virgin Islands (USVI) (latitude 18"18'N, longitude 64"45'W).

Intellectual merit

There is a certain urgency to identify coral diseases, predict their prevalence, and determine whether they are infectious and contagious or non-communicable. By understanding the etiology of coral diseases, we can determine whether human intervention will help reduce their prevalence. Without understanding these processes, we will merely continue to measure disease, continue to look for pathogens that may not exist, and watch coral populations continue to deteriorate. Although microbes play a role in disease infection, many coral diseases might not be transmissible. Therefore, we may need to incorporate environmental threshold parameters, which may be more likely the underlying mechanisms driving coral-disease dynamics. The results will have important implications for modeling diseases and predicting contemporary and future coral disease outbreaks.

Broader Impact

The underlying assumption of most disease models is contagion, which is the transmission of pathogens from infected to susceptible hosts. This study will examine this basic assumption. If it turns out that coral diseases are a consequence of a two-step process, and the corals that are tolerant to temperature stress are also resistant to diseases, then making predictions based on temperature trends will be transformational, especially in rapidly warming, yet heterogeneous, oceans. The study will train students in the field of spatial epidemiology of coral diseases.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1219804

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