Metadata used for developing model for transmission of the sponge disease Aplysina Red Band Syndrome from reef surveys conducted in the Exuma Cays, Bahamas, and Carrie Bow Cay, Belize from 2009-2014

Website: https://www.bco-dmo.org/dataset/565305
Data Type: Other Field Results
Version: 01 Sept 2015
Version Date: 2015-09-01

Project
» Developing a model for transmission of an infectious disease of marine sponges (Sponge Disease Model)

Contributors	Affiliation	Role
Gochfeld, Deborah J.	University of Mississippi (UM-NCNPR)	Principal Investigator, Contact
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Coverage

Spatial Extent: **N**:23.79663 **E**:-76.1353 **S**:16.80436 **W**:-88.089316
Temporal Extent: 2009-05 - 2014-07

Dataset Description

See related publication: Easson et al. (2013)

Methods & Sampling

Collection of data:
Data were generated from repeated 100 m^2 quadrats on two patch reefs in the Exuma Cays, Bahamas (Big Point, Rainbow Gardens) and two reefs near Carrie Bow Cay, Belize (Patch reef 1, Patch reef 2). Reefs are all in 5 m water depth. In Bahamas, the Big Point quadrat was surveyed 8 times (May 2009, May 2010, May/July/September 2011, June 2012, August 2013, July 2014) and the Rainbow Gardens quadrat was

surveyed 6 times (May 2010, July/September 2011, June 2012, August 2013, July 2014). This sampling schedule spans the interval during which Hurricane Irene (Category 3) impacted these reefs in the Bahamas on 27 August 2011 (Easson et al. 2013). In Belize, quadrats on both reefs were surveyed twice (May 2012, June 2013).

During each survey, the entire quadrat was photographed in 1 m^2, and every individual *Aplysina cauliformis* sponge was marked on an underwater map and total length was measured to the nearest cm. Whether the sponge was healthy or infected by *Aplysina* Red Band Syndrome was also recorded.

Data Processing Description

Data analysis:
Each sponge was georeferenced onto a map generated from the quadrat images in ArcGIS to create a shapefile in which each sponge's location, size, number of branches and health status were recorded. For each quadrat at each point in time, the numbers of contacts between healthy-healthy, healthy-diseased and diseased-diseased sponges were calculated based on sponge location, total length and number of branches (based on methods in Easson et al. 2013). Percent of disease transmission was calculated as the percent of all sponge contacts that were between two diseased sponges.

Download the shapefiles here (225 kb zip file)

BCO-DMO Processing Notes:
- Modified parameter names to conform with BCO-DMO naming conventions;
- Added lat and lon values from the metadata form;
- Replaced spaces with underscores in the site column;
- Replaced commas with semi-colons in the notes column;
- 14-Nov-2018: removed embargo on dataset.

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Data Files

File
Quadrat_metadata.csv (Comma Separated Values (.csv), 2.00 KB) MD5:c9c40f2cc88dd35c5afb04d3ad15a691 Primary data file for dataset ID 565305

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Related Publications

Easson, C. G., Slattery, M., Momm, H. G., Olson, J. B., Thacker, R. W., & Gochfeld, D. J. (2013). Exploring Individual- to Population-Level Impacts of Disease on Coral Reef Sponges: Using Spatial Analysis to Assess the Fate, Dynamics, and Transmission of Aplysina Red Band Syndrome (ARBS). PLoS ONE, 8(11), e79976. doi:10.1371/journal.pone.0079976
Results

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Parameters

Parameter	Description	Units
location	Site location (Belize or Bahamas).	dimensionless
site	Site name.	dimensionless
lat	Latitude of site.	decimal degrees
lon	Longitude of site.	decimal degrees
date	Month and year of sampling.	dimensionless
month	2-digit month of sampling.	mm (01 to 12)
year	4-digit year of sampling	YYYY
healthy	Number of healthy sponges.	dimensionless
diseased	Number of diseased sponges.	dimensionless
total	Total number of sponges (healthy + diseased).	dimensionless
disease_prevalence	Disease prevalence = (number diseased/total) x 100	percentage (%)
healthy_healthy_contacts	Healthy-healthy sponge contacts.	dimensionless
healthy_diseased_contacts	Healthy-diseased sponge contacts.	dimensionless
diseased_diseased_contacts	Diseased-diseased sponge contacts.	dimensionless
total_contacts_w_diseased	Total contacts with diseased sponges (sum of healthy_diseased_contacts and diseased_diseased_contacts)	dimensionless
proportion_transmission	Proportion of Disease contacts that resulted in transmission.	Alpha value (D:D/total)
pcnt_transmission	Percent transmission = proportion_transmission x 100.	percent (%)
notes	Notes.	dimensionless

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Instruments

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

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Deployments

Bahamas_Gochfeld

Website	https://www.bco-dmo.org/deployment/640645
Platform	Gochfeld_lab
Start Date	2009-05-01
End Date	2014-07-01
Description	In Bahamas, the Big Point quadrat was surveyed 8 times (May 2009, May 2010, May/July/September 2011, June 2012, August 2013, July 2014) and the Rainbow Gardens quadrat was surveyed 6 times (May 2010, July/September 2011, June 2012, August 2013, July 2014). Experiments conducted at North Norman's reef in the Exuma Cays, Bahamas involved the marking of healthy and ARBS-affected sponges (n = 21-24 of each) in situ to examine the temporal changes in biochemical, physiological and microbiological associations in the Aplysina cauliformis holobiont over the course of transmission of Aplysina Red Band Disease (ARBS).

Belize_Gochfeld

Website	https://www.bco-dmo.org/deployment/640649
Platform	Gochfeld_lab
Start Date	2012-05-01
End Date	2013-06-01
Description	In Belize, quadrats on both reefs were surveyed twice (May 2012, June 2013).

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Project Information

Developing a model for transmission of an infectious disease of marine sponges (Sponge Disease Model)

Coverage: Exuma, Bahamas; Carrie Bow Cay, Belize; St. Thomas, USVI

Description from NSF award abstract:
Diseases of marine invertebrates have been shown to be primary causes of the accelerating destruction of Caribbean coral reef systems. Diseases affecting natural populations threaten biodiversity, resilience and the ecological balance of communities, as well as the ecosystem services they provide. To date, most studies of diseases on reefs have focused on corals, however, reports of sponge diseases have also increased across

the globe. On Caribbean reefs, sponges are often a dominant component of the reef biomass,and thus play an important role in the ecology of these ecosystems. The most well described disease affecting Caribbean sponges is Aplysina Red Band Syndrome (ARBS), which affects sponges of the genus Aplysina, resulting in reduced growth, tissue necrosis and breakage at the site of the lesion, particularly during storm events. Understanding how diseases emerge and are transmitted within marine ecosystems is critical for maintaining a healthy level of biodiversity, particularly if we are to gain any predictive power in a rapidly-changing environment. Testing models of disease transmission using extensive field observations and laboratory analyses will contribute to a better understanding of disease processes and developing a transmission model for ARBS requires detailed knowledge about the pathogen-host interaction and pathogen reservoirs in the environment. While a large body of information regarding the ecology and physiology of ARBS-infected sponges is available it is recognized that modeling the transmission dynamics requires a more focused and collaborative approach. This project will develop and test a model of marine disease processes that includes the role of polymicrobial infections, sources and sinks of the pathogen(s), and the ontogeny of this disease within a model host sponge species (*Aplysina cauliformis*).

This novel approach is a high-risk venture (i.e., a timely idea lacking requisite results) with high pay-off potential (i.e., the results will fundamentally enhance our understanding of disease transmission within marine sponges). In this respect, the proposal is appropriate for EAGER funding. The principal investigators will use modern techniques such as high throughput sequencing and incorporate these approaches as a new tools in their laboratories as well as in their undergraduate and graduate courses. Graduate and undergraduate students will also be provided with multidisciplinary hands-on research experiences and will participate in sponge disease surveys to test the newly developed transmission model. Public seminars will be presented to discuss the implications of marine diseases coral reefs and to highlight the potential utility of disease models for the effective management of marine resources. Results from the proposed research will further our knowledge of disease transmission dynamics and enhance our understanding of the role of diseases in the ecology of coral reef ecosystems.

Selected publications related to this research:

Olson JB, Thacker RW, Gochfeld DJ (2014) Molecular community profiling reveals impacts of time, space, and disease status on the bacterial community associated with the Caribbean sponge *Aplysina cauliformis*. FEMS Microbiology Ecology 87:268-279. doi:10.1111/1574-6941.12222

Easson CG, Slattery M, Momm HG, Olson JB, Thacker RW, Gochfeld DJ (2013) Exploring individual- to population-level impacts of disease on coral reef sponges: using spatial analysis to assess the fate, dynamics, and transmission of *Aplysina* Red Band Syndrome (ARBS). PLoS One 8(11): e79976. doi:10.1371/journal.pone.0079976

Gochfeld DJ, Easson CG, Freeman CJ, Thacker RW, Olson JB (2012) Disease and nutrient enrichment as potential stressors on the Caribbean sponge *Aplysina cauliformis* and its bacterial symbionts. Marine Ecology Progress Series 456:101-111. doi:10.3354/meps09716

Gochfeld DJ, Kamel HN, Olson JB, Thacker RW (2012) Trade-offs in defensive metabolite production but not ecological function in healthy and diseased sponges. Journal of Chemical Ecology 38:451-462. doi:10.1007/s10886-012-0099-5

Gochfeld DJ, Schlöder C, Thacker RW (2007) Sponge Community Structure and Disease Prevalence on coral reefs in Bocas del Toro, Panama. In: Custódio MR, Lõbo-Hajdu G, Hajdu E, Muricy G (eds) *Porifera Research: Biodiversity, Innovation, and Sustainability*. Série Livros 28. Museu Nacional, Rio de Janeiro. Pp 335-343. URL: http://hdl.handle.net/10088/12017

Olson J, Gochfeld D, Slattery M (2006) *Aplysina* red band syndrome: a new threat to Caribbean sponges. Diseases of Aquatic Organisms 71:163-168. doi:10.3354/dao071163

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1214303

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