Sediment removal rates during experiment in which sedimentation was applied to treatment corals in Moorea, French Polynesia from June to August 2012 (Vermetids_Corals project)

Website: https://www.bco-dmo.org/dataset/726232
Data Type: experimental
Version: 2017-10-05

Project
» Spatial patterns of coral-vermetid interactions: short-term effects and long-term consequences (Vermetids_Corals)

Contributors	Affiliation	Role
Zill, Julie	University of Hawai'i (UH)	Principal Investigator
Gil, Michael A.	University of California-Davis (UC Davis)	Co-Principal Investigator
Osenberg, Craig	University of Georgia (UGA)	Co-Principal Investigator, Contact
Biddle, Mathew	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Table of Contents

Coverage

Spatial Extent: **N**:-17.47279 **E**:-149.78277 **S**:-17.48365 **W**:-149.84698
Temporal Extent: 2012-06 - 2012-08

Dataset Description

A manipulative experiment to determine the growth rate of corals in the presence and absence of sediment and vermetids.

Related Datasets:

- Zill et al 2017 Coral Growth: https://www.bco-dmo.org/dataset/726215
- Zill et al 2017 Sediment Removal Rate: https://www.bco-dmo.org/dataset/726232 (Current page)

Methods & Sampling

In June-August 2012, we conducted a 54-day field experiment on the north shore of Moorea, French Polynesia.

We manipulated the presence of the vermetid *Ceraesignum maximum* (formerly *Dendropoma maximum*) and high sedimentation, yielding four fully-crossed treatments. In response to which, we measured the growth of the reef-building coral massive Porites (a species complex mostly composed of P. lobata and P. lutea, see Veron 1995).

This study was performed in a shallow lagoonal backreef area, where vermetid densities can be quite high (up to >100 per m2: Smalley 1984; Shima et al. 2010). We selected 36 large (approximately 1 meter in diameter), mostly-dead colonies of massive Porites to serve as deployment sites for our experimental corals. These colonies occurred at a similar depth along a 150-m transect that was roughly parallel to the reef crest and perpendicular to prevailing water currents. Because differences in water flow could affect vermetid net casting efficacy and sediment removal rates, we quantified relative flow variation among sites using calibrated clod cards (Jokiel & Morrissey 1993). The flat top of each site was home to an average of 5 ± 1 (SD) vermetids in a 400 cm2 area, ensuring that mucus nets would consistently cover the experimental corals receiving the "+vermetid" treatments. We randomly assigned the four experimental treatments to our sites, from half of which we removed all vermetids to create the "–vermetid" treatments. Our experimental corals were 36 juvenile massive *Porites* colonies that we collected from a nearby location. Each coral was attached to a small plastic base using marine epoxy, and buoyantly weighed (following Davies 1989). They were then assigned to nine blocks of four corals based on similarity in morphology, and outplanted to each deployment site using u-nails.

For the +sedimentation treatments, approximately 11 grams (dry weight) of sediment of visibly similar grain size was scooped from the nearby seafloor and gently sprinkled 2 cm above the coral every 1-2 days. This yielded 47 sediment applications over 54 days at an average rate of 54.2 ± 21.2 (SD) mg cm2 day-1, which is well within locally observed reef sedimentation rates (see LTER sedimentation rates). During each visit to the site, experimental corals were examined for vermetid net presence or absence. Twenty-eight corals were videotaped in blocks to quantify relative sediment removal rate, determined as: [(Cinitial-Cfinal)/Cinitial] where Cinitial and Cfinal are the coral surface areas that were covered by sediment at the start vs. end of the trial. We used ImageJ software to quantify Cinitial and Cfinal.

Data Processing Description

We used ImageJ software to quantify Cinitial and Cfinal.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- added the year of the observation to the Date column and reformatted from mm/dd/yyyy to yyyymmdd.

[table of contents | back to top]

Data Files

File	
Zilletal_2017_SedRemovalRate.csv	(Comma Separated Values (.csv), 1.19 KB) MD5:09230153baeea0d71c03df57059f775a
Primary data file for dataset ID 726232	

[table of contents | back to top]

Related Publications

Jokiel, P., & Morrissey, J. (1993). Water motion on coral reefs: evaluation of the "clod card" technique . Marine Ecology Progress Series, 93, 175–181. doi:10.3354/meps093175
Methods

Shima, J. S., Osenberg, C. W., & Stier, A. C. (2010). The vermetid gastropod Dendropoma maximum reduces coral growth and survival. Biology Letters, 6(6), 815–818. doi:10.1098/rsbl.2010.0291
Methods

Smally, T. L. (1984). Possible effects of intraspecific competition on the population structure of a solitary vermetid mollusc. Marine ecology progress series. Oldendorf, 14(2), 139-144.
Methods

Zill, J. A., Gil, M. A., & Osenberg, C. W. (2017). When environmental factors become stressors: interactive effects of vermetid gastropods and sedimentation on corals. Biology Letters, 13(3), 20160957. doi:10.1098/rsbl.2016.0957
General

[table of contents | back to top]

Parameters

Parameter	Description	Units
Unit	the name of individual coral; the letter corresponds to the treatment received (P=Control; Y=vermetids only; O=sediment only; R= both vermetids and sediment)	unitless
Block	the block number that the experimental coral belonged to which was based on morphology	unitless
Ttt	the treatment that the experimental coral received (P = control; Y = vermetids only; O = sediment only; R = both vermetids and sediment)	unitless
Vermetids	presence [1] or absence [0] of vermetids in the vicinity of the coral	unitless
Sediment	whether the high sediment treatment was applied [1] or not applied [0]	unitless
Date	the date (year = 2012) that the block of corals was filmed (all were filmed but only the ones with the sediment treatment applied were analyzed)	unitless
PropSedRemoved	Proportion of initial tissue covered by sediment was uncovered. PropSedRemoval = [(Ci-Cf)/Ci] Out of total amount of initially covered tissue, how much more of THAT tissue has been uncovered after 6 hrs, rather than in terms of tissue of entire colony C	unitless
Morphology	general notes on corals' morphology	unitless
Notes	Miscellaneous notes	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	videotaped
Generic Instrument Name	Camera
Dataset-specific Description	Twenty-eight corals were videotaped in blocks to quantify relative sediment removal rate.
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

[table of contents | back to top]

Deployments

Osenberg_et_al_Moorea

Website	https://www.bco-dmo.org/deployment/644752
Platform	Osenberg et al Moorea
Start Date	2003-05-19
End Date	2015-07-12

[table of contents | back to top]

Project Information

Spatial patterns of coral-vermetid interactions: short-term effects and long-term consequences (Vermetids_Corals)

Coverage: Moorea, French Polynesia (-17.48 degrees S, -149.82 degrees W)

Description from NSF abstract:
Ecological surprises are most likely to be manifest in diverse communities where many interactions remain uninvestigated. Coral reefs harbor much of the world's biodiversity, and recent studies by the investigators suggest that one overlooked, but potentially important, biological interaction involves vermetid gastropods. Vermetid gastropods are nonmobile, tube-building snails that feed via an extensive mucus net. Vermetids reduce coral growth by up to 80%, and coral survival by as much as 60%. Because effects vary among coral taxa, vermetids may substantially alter the structure of coral communities as well as the community of fishes and invertebrates that inhabit the coral reef.

The investigators will conduct a suite of experimental and observational studies that: 1) quantify the effects of four species of vermetids across coral species to assess if species effects and responses are concordant or idiosyncratic; 2) use meta-analysis to compare effects of vermetids relative to other coral stressors and determine the factors that influence variation in coral responses; 3) determine the role of coral commensals that inhabit the branching coral, Pocillopora, and evaluate how the development of the commensal assemblage modifies the deleterious effects of vermetids; 4) determine how vermetid mucus nets affect the local environment of corals and evaluate several hypotheses about proposed mechanisms; and 5) assess the long-term implications of vermetids on coral communities and the fishes and invertebrates that depend on the coral.

Note: The Principal Investigator, Dr. Craig W. Osenberg, was at the University of Florida at the time the NSF award was granted. Dr. Osenberg moved to the University of Georgia during the summer of 2014 (current contact information).

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1130359

[table of contents | back to top]