Benthic data collected in and out of MPA borders in Viti Levu, Fiji from 2010-2012

Website: https://www.bco-dmo.org/dataset/706063
Data Type: Other Field Results
Version: 1
Version Date: 2016-06-23

Project
» Killer Seaweeds: Allelopathy against Fijian Corals (Killer Seaweeds)

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Abstract
Benthic data collected in and out of MPA borders in Viti Levu, Fiji from 2010-2012

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Coverage

Spatial Extent: **Lat**:-18.21765 **Lon**:177.7163167

Dataset Description

Benthic data collected inside/outside each MPA border.

Methods & Sampling

Surveys of benthic community composition were conducted to assess habitat differences inside and outside of each MPA border and the relationship between coral cover and Acanthaster displacement at each border. Surveys used 40 m point intercept transects (n = 20 transects border-1 MPA-1, points at 0.5 m intervals, 1,600 points border -1) that were non-overlapping (mean distance between transects = ~12 m) and oriented parallel to the coastline, with the midpoint (20 m) of each transect positioned on the MPA border (20 m within the MPA and 20 m within the fished area).

Data Processing Description

These include raw benthic cover data as counts and percentages.

BCO-DMO Data Processing Notes:

- reformatted the column names to comply with BCO-DMO standards
- replaced spaces with underscores
- replaced "N/A" with "nd"

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Data Files

File
benthic_cover_2200.csv (Comma Separated Values (.csv), 13.35 KB) MD5:711b06982d7a400e676079c0b4c1fc8a Primary data file for dataset ID 706063

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Related Publications

Clements, C. S., & Hay, M. E. (2017). Size matters: Predator outbreaks threaten foundation species in small Marine Protected Areas. PLOS ONE, 12(2), e0171569. doi:10.1371/journal.pone.0171569
General

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Parameters

Parameter	Description	Units
village	The village site where the data were collected on the Coral Coast of Viti Levu, Fiji	unitless
border	The MPA border where surveys benthic cover survey was conducted	unitless
area	The reef area at each village site where the data were collected	unitless
transect	The individual transect on each village's MPA border where benthic cover data were collected	unitless
coral_count	Coral cover data (counts) from each point-intercept-transect (40 points per transect)	count
dead_coral_count	Dead coral cover data (counts) from each point-intercept-transect (40 points per transect)	count
macroalgae_count	Macrolagae cover data (counts) from each point-intercept-transect (40 points per transect)	count

rock_count	Rock cover data (counts) from each point-intercept-transect (40 points per transect)	count
rubble_sand_count	Rubble/sand cover data (counts) from each point-intercept-transect (40 points per transect)	count
other_count	Other cover data (counts) from each point-intercept-transect (40 points per transect)	count
coral_percent_cover	Coral cover data (percent) from each point-intercept-transect	percent
dead_coral_percent_cover	Dead coral cover data (percent) from each point-intercept-transect	percent
macroalgae_percent_cover	Macrolagae cover data (percent) from each point-intercept-transect	percent
rock_percent_cover	Rock cover data (percent) from each point-intercept-transect	percent
rubble_sand_percent_cover	Rubble/sand cover data (percent) from each point-intercept-transect	percent
other_percent_cover	Other cover data (percent) from each point-intercept-transect	percent

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Deployments

Fiji_2011

Website	https://www.bco-dmo.org/deployment/480730
Platform	Hay_GaTech
Start Date	2010-11-01
End Date	2012-01-01
Description	Studies for this deployment were conducted: November 2010 through February 2011 and between November 2011 and January 2012 on shallow (~1 m below the surface at low tide, equal or shallower than 2 m at high tide), intertidal fringing reefs platforms in Villages of Votua, Vatu-o-lalai and Namada, Coral Coast Viti Levu, Fiji. May–December 2011 on an approximately1.5-2.5 m deep reef flat within a no-take marine reserve at Votua Village, Viti Levu, Fiji.

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Project Information

Killer Seaweeds: Allelopathy against Fijian Corals (Killer Seaweeds)

Coverage: Viti Levu, Fiji (18º13.049’S, 177º42.968’E)

Extracted from the NSF award abstract:

Coral reefs are in dramatic global decline, with reefs commonly converting from species-rich and topographically-complex communities dominated by corals to species- poor and topographically-simplified communities dominated by seaweeds. These phase-shifts result in fundamental loss of ecosystem function. Despite debate about whether coral-to-algal transitions are commonly a primary cause, or simply a consequence, of coral mortality, rigorous field investigation of seaweed-coral competition has received limited attention. There is limited information on how the outcome of seaweed-coral competition varies among species or the relative importance of different competitive mechanisms in facilitating seaweed dominance. In an effort to address this topic, the PI will conduct field experiments in the tropical South Pacific (Fiji) to determine the effects of seaweeds on corals when in direct contact, which seaweeds are most damaging to corals, the role allelopathic lipids that are transferred via contact in producing these effects, the identity and surface concentrations of these metabolites, and the dynamic nature of seaweed metabolite production and coral response following contact. The herbivorous fishes most responsible for controlling allelopathic seaweeds will be identified, the roles of seaweed metabolites in allelopathy vs herbivore deterrence will be studied, and the potential for better managing and conserving critical reef herbivores so as to slow or reverse conversion of coral reef to seaweed meadows will be examined.

Preliminary results indicate that seaweeds may commonly damage corals via lipid- soluble allelochemicals. Such chemically-mediated interactions could kill or damage adult corals and produce the suppression of coral fecundity and recruitment noted by previous investigators and could precipitate positive feedback mechanisms making reef recovery increasingly unlikely as seaweed abundance increases. Chemically-mediated seaweed-coral competition may play a critical role in the degradation of present-day coral reefs. Increasing information on which seaweeds are most aggressive to corals and which herbivores best limit these seaweeds may prove useful in better managing reefs to facilitate resilience and possible recovery despite threats of global-scale stresses. Fiji is well positioned to rapidly use findings from this project for better management of reef resources because it has already erected >260 MPAs, Fijian villagers have already bought-in to the value of MPAs, and the Fiji Locally-Managed Marine Area (FLMMA) Network is well organized to get information to villagers in a culturally sensitive and useful manner.

The broader impacts of this project are far reaching. The project provides training opportunities for 2-2.5 Ph.D students and 1 undergraduate student each year in the interdisciplinary areas of marine ecology, marine conservation, and marine chemical ecology. Findings from this project will be immediately integrated into classes at Ga Tech and made available throughout Fiji via a foundation and web site that have already set-up to support marine conservation efforts in Fiji and marine education efforts both within Fiji and internationally. Business and community leaders from Atlanta (via Rotary International Service efforts) have been recruited to help organize and fund community service and outreach projects in Fiji -- several of which are likely to involve marine conservation and education based in part on these efforts there. Media outlets (National Geographic, NPR, Animal Planet, Audubon Magazine, etc.) and local Rotary clubs will be used to better disseminate these discoveries to the public.

PUBLICATIONS PRODUCED AS A RESULT OF THIS RESEARCH

Rasher DB, Stout EP, Engel S, Kubanek J, and ME Hay. "Macroalgal terpenes function as allelopathic agents against reef corals", Proceedings of the National Academy of Sciences, v. 108, 2011, p. 17726.

Beattie AJ, ME Hay, B Magnusson, R de Nys, J Smeathers, JFV Vincent. "Ecology and bioprospecting," Austral Ecology, v.36, 2011, p. 341.

Rasher DB and ME Hay. "Seaweed allelopathy degrades the resilience and function of coral reefs," Communicative and Integrative Biology, v.3, 2010.

Hay ME, Rasher DB. "Corals in crisis," The Scientist, v.24, 2010, p. 42.

Hay ME and DB Rasher. "Coral reefs in crisis: reversing the biotic death spiral," Faculty 1000 Biology Reports 2010, v.2, 2010.

Rasher DB and ME Hay. "Chemically rich seaweeds poison corals when not controlled by herbivores", Proceedings of the National Academy of Sciences, v.107, 2010, p. 9683.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0929119
National Institutes of Health (NIH)	U01-TW007401

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