Macroalgal cover at month 4 in experimental plots on a fringing reef in Fiji.

Website: https://www.bco-dmo.org/dataset/756776
Data Type: Other Field Results
Version: 1
Version Date: 2019-02-25

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

Contributors	Affiliation	Role
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Coverage

Spatial Extent: **Lat**:-18.2057 **Lon**:177.67

Dataset Description

To assess plot colonization by benthic macroalgae at 4 months, photographs of each plot were analysed for the percentage cover of macroalgae using ImageJ (version 1.8.0_121).

These data are depicted in Figure 2c of Clements and Hay (2019).

These data was also funded through:
National Institutes of Health (2 U19 TW007401-10)
Teasley Endowment to the Georgia Institute of Technology

Methods & Sampling

Macroalgal colonization of polycultures and monocultures of each species at 4 months were compared with ANOVA and Tukey's post-hoc tests using a permutation approach (5,000 permutations) in the R (version 3.3.2) package lmPerm (version 2.1.0).

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- appended the latitude and longitude coordinates to the data as supplied in the accompanying metadata

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Data Files

File
cover.csv (Comma Separated Values (.csv), 2.61 KB) MD5:8d7ae6530f4e252c049501bbc8be1a57

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Related Publications

Clements, C. S., & Hay, M. E. (2019). Biodiversity enhances coral growth, tissue survivorship and suppression of macroalgae. Nature Ecology & Evolution, 3(2), 178–182. doi:10.1038/s41559-018-0752-7
Results

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Parameters

Parameter	Description	Units
Plot	The unique ID number of the plot	unitless
Treatment	The experimental treatment of the plot	unitless
Species	The species present within the plot. Polyculture plots contain all three species (Porites cylindrica; Pocillopora damicornis; Acropora millepora)	unitless
Cover	The percent macroalgal cover within the plot	percent
lat	latitude with North values positive; negative denotes South	decimal degrees
lon	longitude with East values positive; negative denotes West	decimal degrees

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Instruments

Dataset-specific Instrument Name	Canon Powershot D30
Generic Instrument Name	Camera
Dataset-specific Description	To assess plot colonization by benthic macroalgae at 4 months, photographs of each plot were analysed for the percentage cover of macroalgae using ImageJ (version 1.8.0_121).
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

Dataset-specific Instrument Name	snorkel
Generic Instrument Name	Diving Mask and Snorkel
Dataset-specific Description	These data were collected near shore via snorkel.
Generic Instrument Description	A diving mask (also half mask, dive mask or scuba mask) is an item of diving equipment that allows underwater divers, including, scuba divers, free-divers, and snorkelers to see clearly underwater. Snorkel: A breathing apparatus for swimmers and surface divers that allows swimming or continuous use of a face mask without lifting the head to breathe, consisting of a tube that curves out of the mouth and extends above the surface of the water.

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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

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