

Behavioral observation data of tagged and untagged *Acanthaster* in Viti Levu, Fiji from 2010-2012

Website: <https://www.bco-dmo.org/dataset/706051>

Data Type: Other Field Results

Version: 1

Version Date: 2017-06-23

Project

» [Killer Seaweeds: Allelopathy against Fijian Corals](#) (Killer Seaweeds)

Contributors	Affiliation	Role
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Abstract

Behavioral observation data of tagged and untagged *Acanthaster* in Viti Levu, Fiji from 2010-2012

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Coverage

Spatial Extent: Lat:-18.21765 Lon:177.7163167

Temporal Extent: 2013-07-23 - 2013-07-26

Dataset Description

Behavioral observation data of tagged and untagged *Acanthaster*.

Methods & Sampling

To evaluate how tagging might affect *Acanthaster* behavior, we conducted experiments comparing righting ability and feeding behavior of tagged and untagged *Acanthaster* (n = 10 individuals treatment-1) that were caged on the reef flat of Votua's MPA. Ten individuals were each tagged by inserting five plastic tag fasteners at the base of individual arms near the oral disk, and all individuals were held in individual cages on the reef flat for the 7-day duration of this experiment. Two days were allowed for tag acclimation among the treatment group before experiments were conducted. Righting ability was assessed on days 3 and 7 post-tagging by flipping individuals onto their aboral surface and measuring the time required to right themselves onto their oral surface. This was repeated three times for each individual with a 1-minute rest interval between trials. Individuals were also offered two small fragments of the coral *Montipora hispida* (~8-10 cm length) on days three and five post-tagging to assess the effects of tagging on feeding behavior. To evaluate how tagging might affect *Acanthaster* behavior, we conducted experiments comparing righting ability and feeding behavior of

tagged and untagged *Acanthaster* ($n = 10$ individuals treatment⁻¹) that were caged on the reef flat of Votua's MPA. Ten individuals were each tagged by inserting five plastic tag fasteners at the base of individual arms near the oral disk, and all individuals were held in individual cages on the reef flat for the 7-day duration of this experiment. Two days were allowed for tag acclimation among the treatment group before experiments were conducted. Righting ability was assessed on days 3 and 7 post-tagging by flipping individuals onto their aboral surface and measuring the time required to right themselves onto their oral surface. This was repeated three times for each individual with a 1-minute rest interval between trials. Individuals were also offered two small fragments of the coral *Montipora hispida* (~8-10 cm length) on days three and five post-tagging to assess the effects of tagging on feeding behavior.

Data Processing Description

These are the raw data.

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
acanthaster_tagging_trials.csv (Comma Separated Values (.csv), 2.83 KB) MD5:77f1a6385c7c2c84c8766e75fcb3a3bf
Primary data file for dataset ID 706051

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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](https://doi.org/10.1371/journal.pone.0171569)
General

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Parameters

Parameter	Description	Units
acanthaster_ID	The identification number for each individual sea star	unitless
tagging_status	Whether the individual was tagged or untagged	unitless
righting_time_trial1	The amount of time that it took an individual to right itself on to its oral surfave after being flipped on its aboral surface.	seconds
righting_time_trial2	The amount of time that it took an individual to right itself on to its oral surfave after being flipped on its aboral surface.	seconds
righting_time_trial3	The amount of time that it took an individual to right itself on to its oral surfave after being flipped on its aboral surface.	seconds
mean_righting_time	The mean amount of time that it took an individual to right itself on to its oral surfave after being flipped on its aboral surface.	seconds
righting_trial_date	The date when righting trials were conducted.	unitless
date_coral_offered	The date that two pieces of coral were offered to an individual	unitless
coral_eaten	Whether an individual consumed the corals offered to it in the feeding trials	unitless
date_coral_eaten	The date by which corals were eaten.	unitless

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Instruments

Dataset-specific Instrument Name	Garmin GPS 76CSX
Generic Instrument Name	GPS receiver
Dataset-specific Description	Used to monitor individuals' movements
Generic Instrument Description	Acquires satellite signals and tracks your location. This term has been deprecated. Use instead: https://www.bco-dmo.org/instrument/560

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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 approximately 1.5-2.5 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 (18°13.049'S, 177°42.968'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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