Palatability of Galaxaura extract on Amphiroa to herbivores in the Viti Levu, Fiji from 2011 (Killer Seaweeds project)

Website: https://www.bco-dmo.org/dataset/488830
Version: 2014-01-22

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

Contributors	Affiliation	Role
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Methods & Sampling

To test extract deterrence against other herbivores, we resuspended the same Galaxaura extracts in ether, coated each at a natural volumetric concentration on three branches (a 0.74+ 0.02 ml volumetric equivalent) of blotted dry and pre-weighed Amphiroa crassa (a heavily calcified seaweed avoided by Naso spp. but consumed by the parrotfish Chlorurus sordidus [30], hereafter 'Amphiroa'), allowed the ether to evaporate, inserted each set of branches 5 cm apart on their own 60 cm section of 3-stranded rope (n = 12 ropes extract-1), and deployed paired treatment and control ropes in the field (as described earlier). We also coated Amphiroa only with ether and deployed them as caged controls within 1 m of each pair to control for changes in seaweed mass unrelated to herbivory. Grazing on Amphiroa was low (only five pairs received detectable grazing) and assays lasted 3-5 days. We calculated the mass of Amphiroa consumed among the five pairs with detectable grazing using the formula described earlier.

Relevant References:

* Rasher DB and ME Hay. "Competition induces allelopathy but suppresses growth and anti-herbivore defense in a chemically rich seaweed". Proceedings of the Royal Society: B-Biological Sciences. vol. 281 no. 1777 20132615, 2014 (http://dx.doi.org/10.1098/rspb.2013.2615).

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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Data Files

File
extract_pal_Amphiroa.csv (Comma Separated Values (.csv), 1.17 KB) MD5:fe504734975a606c9a6bf4b9c53d151e Primary data file for dataset ID 488830

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Parameters

Parameter	Description	Units
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
date_begin	date deployed	mm/dd/yyyy
date_end	date retrieved	mm/dd/yyyy
sample	pair identification number	unitless
Galaxaura_extract	treatment = extract of treatment Galaxaura on Amphiroa; control = extract of control Galaxaura on Amphiroa	unitless
mass_initial_Amphiroa_herb	initial mass of Amphiroa exposed to herbivores	grams
mass_final_Amphiroa_herb	final mass of Amphiroa exposed to herbivores	grams
mass_initial_Amphiroa_cage	initial mass of caged Amphiroa	grams
mass_final_Amphiroa_cage	final mass of caged Amphiroa	grams
mass_initial_Amphiroa_herb_corr	initial mass of Amphiroa exposed to herbivores; corrected for change in caged seaweed	grams
amt_consumed_g	amount of Amphiroa consumed; wet weight	grams
amt_consumed_pcent	percent Amphiroa consumed	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.

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Funding

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