Dominant microbe taxa from Florida Keys National Marine Sanctuary, 2009-2012 (HERBVRE project)

Website: https://www.bco-dmo.org/dataset/674407
Data Type: experimental
Version: 1
Version Date: 2017-01-10

Project
» Cascading interactions of herbivore loss and nutrient enrichment on coral reef macroalgae, corals, and microbial dynamics (HERBVRE)

Contributors	Affiliation	Role
Burkepile, Deron	Florida International University (FIU)	Principal Investigator
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Abstract
This dataset contains microbial orders that rose to dominate at least one sample. Values quantify the number of samples in which each order was the most abundant, as well as average metadata values for the samples in which that order became most abundant. Metadata values calculated are temperature, overall community evenness, the cover of all upright algae, tall turf algae, or cyanobacteria, and the average abundance of the dominant taxon. Published in Nature Communications (2016) doi:10.1038/ncomms11833, Supplementary Data 3f.

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Coverage

Spatial Extent: **Lat**:24.9943 **Lon**:-80.4065

Dataset Description

This dataset contains microbial orders that rose to dominate at least one sample. Values quantify the number of samples in which each order was the most abundant, as well as average metadata values for the samples in which that order became most abundant. Metadata values calculated are temperature, overall community evenness, the cover of all upright algae, tall turf algae, or cyanobacteria, and the average abundance of the dominant taxon.

Natural history of the study site:
This experiment was conducted in the area of Pickles Reef (24.99430, -80.40650), located east of Key Largo, Florida in the United States. The Florida Keys reef tract consists of a large bank reef system located approximately 8 km offshore of the Florida Keys, USA, and paralleling the island chain. Our study reef is a 5-6 m deep spur and groove reef system within this reef tract. The reefs of the Florida Keys have robust herbivorous fish populations and are relatively oligotrophic. Coral cover on most reefs in the Florida Keys, including our site, is 5-10%, while macroalgal cover averages ~15%, but ranges from 0-70% depending on location and season. Parrotfishes (*Scaridae*) and surgeonfishes (*Acanthuridae*) are the dominant herbivores on

these reefs as fishing for them was banned in 1981. The other important herbivore on Caribbean reefs, the urchin *Diadema antillarum*, remains at low densities across the Florida Keys following the mass mortality event in 1982-3.

Published in Nature Communications (2016) doi:10.1038/ncomms11833, Supplementary Data 3f.

Related Reference:
Zaneveld, J.R., D.E. Burkepile, A.A. Shantz, C. Pritchard, R. McMinds, J. Payet, R. Welsh, A.M.S. Correa, N.P. Lemoine, S. Rosales, C.E. Fuchs, and R. Vega Thurber (2016) Overfishing, nutrient pollution, and temperature interact to disrupt coral reefs down to microbial scales. Nature Communications 7:11833 doi:10.1038/ncomms11833 Supplementary Information

Data Processing Description

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date, reference information;
- renamed parameters to comply with BCO-DMO naming conventions;
- reduced decimal places from 9 to 2;
- changed N/A to nd (no data).

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Data Files

File
S3f_domin_microbes.csv (Comma Separated Values (.csv), 4.40 KB) MD5:36df2010f01d9b902b81d97da8904660 Primary data file for dataset ID 674407

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Related Publications

Zaneveld, J. R., Burkepile, D. E., Shantz, A. A., Pritchard, C. E., McMinds, R., Payet, J. P., ... Thurber, R. V. (2016). Overfishing and nutrient pollution interact with temperature to disrupt coral reefs down to microbial scales. Nature Communications, 7(1). doi:10.1038/ncomms11833
Results

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Parameters

Parameter	Description	Units
display_name	microbe taxonomic name	unitless
num_samples_dominated	number of samples in which this taxon dominated	samples
temp	temperature	degrees Celsius
temp_stdev	temperature standard deviation	degrees Celsius

temp_sem	temperature standard error	degrees Celsius
total_upright_algal_cover	total upright algal cover (% cover)	unitless (percent)
total_upright_algal_cover_stdev	total upright algal cover standard deviation	unitless (percent)
total_upright_algal_cove_sem	total upright algal cover standard error	unitless (percent)
tall_turf_cover	tall turf cover (% cover)	unitless (percent)
tall_turf_cover_stdev	tall turf cover standard deviation	unitless (percent)
tall_turf_cover_sem	tall turf cover standard error	unitless (percent)
benthic_Cyanobacteria	benthic cyanobacteria cover (% cover)	unitless (percent)
benthic_Cyanobacteria_stdev	benthic cyanobacteria cover standard deviation	unitless (percent)
benthic_Cyanobacteria_sem	benthic cyanobacteria cover standard error	unitless (percent)
evenness	evenness (equitability)	dimensionless
evenness_stdev	evenness standard deviation	dimensionless
evenness_sem	evenness standard error	dimensionless
abund_dom_taxon	abundance of dominant taxon	per meter^2
abund_dom_taxon_stdev	abundance of dominant taxon standard deviation	per meter^2
abund_dom_taxon_sem	abundance of dominant taxon standard error	per meter^2
taxonomy	taxonomy from QIIME Greengenes 13_8	unitless

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Deployments

Burkepile_FL_Keys

Website	https://www.bco-dmo.org/deployment/639486
Platform	Florida Keys National Marine Sanctuary
Start Date	2009-06-01
End Date	2012-08-31
Description	Herbivore effects on reef algae

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Project Information

Cascading interactions of herbivore loss and nutrient enrichment on coral reef macroalgae, corals, and microbial dynamics (HERBVRE)

Coverage: Key Largo, Florida Keys, USA; N 24.99430, W 080.40650

Description from NSF award abstract:
Coral reefs in the Caribbean Sea are undergoing unprecedented declines in coral cover due in large part to climate change, pollution, and reductions in fish biodiversity and abundance. Macroalgae have become abundant on reefs, probably due to decreases in herbivory (e.g., through overfishing) and increases in anthropogenic inputs of nutrients. The spread of macroalgae has negative feedbacks on reef recovery because algae are often superior competitors and suppress growth of both adult and juvenile corals. A majority of reef studies to date have focused on how stressors affect macroorganisms, while relatively few have investigated how these stressors and the resultant algal-dominated states affect microorganisms. Yet, coral reef-associated microbes play significant roles in coral reef ecosystems through biogeochemical cycling and disease. Since microbes are important mutualists of corals as well as potential pathogens, it is important to understand the mechanisms that control their taxonomic and functional diversity.

The goal of this proposal is to quantify how alterations of top-down (removal of herbivorous fish) and bottom-up (inorganic nutrient addition) forces alter macrobial as well as microbial dynamics on coral reefs in order to understand the mechanisms that reinforce coral-depauperate reef systems. This work asks two main questions:

Q1. How do nutrient enrichment and herbivore removal interact to affect benthic algal abundance, coral-algal interactions, and coral survivorship and growth?

Q2. How do nutrient enrichment and herbivore removal affect bacterial abundance, taxonomic diversity, and functional diversity on and within corals?

The proposed research will directly and empirically address many of the current hypotheses about how bottom-up and top-down forces alter reef dynamics. The PIs will investigate: (1) the impact of multiple stressors over several years; (2) impacts on multiple levels of biological organization (from fishes to algae to microbes); and (3) the mechanisms underlying changes in algal-coral microbe interactions. Significantly, the approach will provide the statistical power necessary to distinguish between seasonal- and stress-induced changes in macro- and microbial diversity.

Resulting Publication:
Zaneveld, J.R., D.E. Burkepile, A.A. Shantz, C. Pritchard, R. McMinds, J. Payet, R. Welsh, A.M.S. Correa, N.P. Lemoine, S. Rosales, C.E. Fuchs, and R. Vega Thurber (2016) Overfishing, nutrient pollution, and temperature interact to disrupt coral reefs down to microbial scales. Nature Communications 7:11833 doi:10.1038/ncomms11833.
Access to data via Supplementary Information.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1130786

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