Benthic community composition at Pickles Reef, Florida Keys National Marine Sanctuary from 2009-2013

Website: https://www.bco-dmo.org/dataset/674368
Data Type: experimental
Version: 2
Version Date: 2021-08-06

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
Vega Thurber, Rebecca	Florida International University (FIU)	Co-Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
This dataset contains benthic community composition data for the study plots at Pickles Reef, Florida Keys National Marine Sanctuary from 2009-2013. Published in Nature Communications (2016) doi:10.1038/ncomms11833, Supplementary Data 2c.

Table of Contents

Coverage

Spatial Extent: **Lat**:24.9943 **Lon**:-80.4065
Temporal Extent: 2009-06-22 - 2013-08-17

Dataset Description

This dataset contains benthic community composition data for the study plots at Pickles Reef, Florida Keys National Marine Sanctuary from 2009-2013. Published in Nature Communications (2016) doi:10.1038/ncomms11833, Supplementary Data 2c.

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.

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

Methods & Sampling

Quantification of benthic cover:
At least once every season (for example, spring, summer, fall, winter at 12–14 week intervals), we visually quantified benthic cover within four, 50 × 50 cm quadrats in each of the 1 m2 treatment areas. These quadrats were divided into 49 points, and benthic organisms under each point were identified to species or genus. Algae that are challenging to identify taxonomically under field conditions (for example, crustose coralline algae and filamentous algae) were classified into algal functional groups. Filamentous algae were classified into short algal turf (<0.5 cm in height) or algal turf (>0.5 cm in height) given that taller, thicker algal turf can often be deleterious to coral health and growth10.

Benthic cover was quantified in June 2009 1 week before treatments were initiated to provide a baseline from which to assess changes in algal abundance and community structure. No significant differences among treatments in algal abundance could be detected at the beginning of the experiment (see initial time points in Fig. 1a,b), as expected given random assignment of subplots to treatment conditions. Further, during the summer of each year (2009–2012) when algal cover was often at its highest, we also surveyed open areas of reef (areas that did not have three-sided exclosure controls) within the 9-m2 plots to assess whether the exclosure controls had any effect on algal abundance or community composition. We did not detect any differences in algal abundance or community composition between the open unmanipulated areas and exclosure controls (Supplementary Data 1).

Data Processing Description

BCO-DMO Processing:
- extracted the benthic community columns from the full table, plus the sample id, site, latitude, and longitude columns;
- added conventional header with dataset name, PI name, version date, reference information;
- renamed parameters to comply with BCO-DMO naming conventions;
- replaced 'unknown' with 'nd' ('no data').

[table of contents | back to top]

Data Files

File	
S2c_benthic_community.csv	(Comma Separated Values (.csv), 188.47 KB) MD5:890268cfb5c6f697219c9c9bf43b6acf
Primary data file for dataset ID 674368	

[table of contents | back to top]

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

[table of contents | back to top]

Related Datasets

IsRelatedTo

Burkepile, D., Vega Thurber, R. (2021) **Microbial sample metadata, sequencing and treatment details, temperature and salinity at Pickles Reef, Florida Keys National Marine Sanctuary from 2009-2012.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-08-06 doi:10.26008/1912/bco-dmo.674321.2 [view at BCO-DMO]

Burkepile, D., Vega Thurber, R. (2021) **Parrotfish bite annotations from Florida Keys National Marine Sanctuary, 2009-2013.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-08-06 doi:10.26008/1912/bco-dmo.674439.2 [view at BCO-DMO]

Burkepile, D., Vega Thurber, R. (2021) **Relative abundance of phyla from Florida Keys National Marine Sanctuary, 2009-2013.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2021-08-06 doi:10.26008/1912/bco-dmo.674449.2 [view at BCO-DMO]

[table of contents | back to top]

Parameters

Parameter	Description	Units
sample_location_name	name of sample collection reef	unitless
latitude	latitude; north is positive	decimal degrees
longitude	longitude; east is positive	decimal degrees
SampleID	sample identifier	unitless
date_collected	date of collection formatted at yyyy-mm-dd	unitless
QuadratAsparagopsis	quadrat cover by Asparagopsis	unitless
QuadratAmphiroa_fragilisima	quadrat cover by Amphiroa fragilisima	unitless
QuadratAmphiroa_tribulis	quadrat cover by Amphiroa tribulis	unitless
QuadratAvrainvillea	quadrat cover by Avrainvillea	unitless
QuadratBrown_crust_Pseudolithoderma	quadrat cover by Brown crust Pseudolithoderma	unitless

QuadratBotryocladia	quadrat cover by Botryocladia	unitless
QuadratBryothamnion	quadrat cover by Bryothamnion	unitless
QuadratCCA	quadrat cover by crustose coralline algae	unitless
QuadratCeramium_nitens	quadrat cover by Ceramium nitens	unitless
QuadratCoelothrix	quadrat cover by Coelothrix	unitless
QuadratCryptonemia	quadrat cover by Cryptonemia	unitless
QuadratCyano_Lyngbia	quadrat cover by Cyano Lyngbia	unitless
QuadratCyano_Schythothirx	quadrat cover by Cyano Schythothirx	unitless
QuadratCyano_3	quadrat cover by Cyano 3	unitless
QuadratCyano_4	quadrat cover by Cyano 4	unitless
QuadratCyano_6	quadrat cover by Cyano 6	unitless
QuadratCyano_Other	quadrat cover by Cyano Other	unitless
QuadratDasya	quadrat cover by Dasya	unitless
QuadratDasya_2	quadrat cover by Dasya 2	unitless
QuadratDasycladus	quadrat cover by Dasycladus	unitless
QuadratDictyota_menstrualis	quadrat cover by Dictyota menstrualis	unitless
QuadratDictyota_pulchella	quadrat cover by Dictyota pulchella	unitless
QuadratDictyota_bart	quadrat cover by Dictyota bart	unitless
QuadratDictyota_pfaf	quadrat cover by Dictyota pfaf	unitless

QuadratDictyota_cilliolata	quadrat cover by Dictyota cilliolata	unitless
QuadratDictyota_cervicornis	quadrat cover by Dictyota cervicornis	unitless
QuadratDictyopteris	quadrat cover by Dictyopteris	unitless
QuadratDigenia	quadrat cover by Digenia	unitless
QuadratEctocarpus	quadrat cover by Ectocarpus	unitless
QuadratGalaxaura_obtusata	quadrat cover by Galaxaura obtusata	unitless
QuadratGalaxura_marginata	quadrat cover by Galaxura marginata	unitless
QuadratGelidiella	quadrat cover by Gelidiella	unitless
QuadratGracilaria_sp	quadrat cover by Gracilaria sp	unitless
QuadratGrateloupia	quadrat cover by Grateloupia	unitless
QuadratGreen_scuz	quadrat cover by Green scuz	unitless
QuadratHallymenia	quadrat cover by Hallymenia	unitless
QuadratHalimeda_opuntia	quadrat cover by Halimeda opuntia	unitless
QuadratHalimeda_scabra	quadrat cover by Halimeda scabra	unitless
QuadratHalimeda_goreauii	quadrat cover by Halimeda goreauii	unitless
QuadratHypnea_1	quadrat cover by Hypnea sp. 1	unitless
QuadratHypnea_2_Wrightiella_blodgettii	quadrat cover by Hypnea sp. 2 Wrightiella blodgettii	unitless
QuadratHypnea_3	quadrat cover by Hypnea sp. 3	unitless
QuadratHypnea_4	quadrat cover by Hypnea sp. 4	unitless

QuadratJania_adherens	quadrat cover by Jania adherens	unitless
QuadratLaurencia	quadrat cover by Laurencia	unitless
QuadratLaurencia_2	quadrat cover by Laurencia sp. 2	unitless
QuadratLaurencia_3	quadrat cover by Laurencia sp. 3	unitless
QuadratLiagora_sp	quadrat cover by Liagora sp	unitless
QuadratLobophora	quadrat cover by Lobophora	unitless
QuadratNeomeris	quadrat cover by Neomeris	unitless
QuadratPadina_spp	quadrat cover by Padina spp	unitless
QuadratPennicillus	quadrat cover by Pennicillus	unitless
QuadratPessyonelia	quadrat cover by Pessyonelia	unitless
QuadratRed_Dictyota_like	quadrat cover by Red Dictyota-like	unitless
QuadratRhipocephalus	quadrat cover by Rhipocephalus	unitless
QuadratSargassum_polyceratium	quadrat cover by Sargassum polyceratium	unitless
QuadratSargassum_hystrix	quadrat cover by Sargassum hystrix	unitless
QuadratSargassum_filipendula	quadrat cover by Sargassum filipendula	unitless
QuadratShort_tuf	quadrat cover by short algal turf: filamentous algae <0.5 cm in height	unitless
QuadratCodium_intertextum_Spongy_green	quadrat cover by Spongy green Codium intertextum	unitless
QuadratStypopodium	quadrat cover by Stypopodium	unitless

QuadratTall_turf	quadrat cover by Tall turf: algal turf >0.5 cm in height	unitless
QuadratTurbinaria	quadrat cover by Turbinaria	unitless
QuadratUdotea_spp	quadrat cover by Udotea spp	unitless
QuadratValonia	quadrat cover by Valonia	unitless
QuadratWrangelia_argus	quadrat cover by Wrangelia argus	unitless
QuadratWirebrush_alga	quadrat cover by Wirebrush alga	unitless
QuadratRed_macroalgae	quadrat cover by Red macroalgae	unitless
QuadratBrown_macroalgae	quadrat cover by Brown macroalgae	unitless
QuadratGreen_macroalgae	quadrat cover by Green macroalgae	unitless
QuadratUpright_calcified	quadrat cover by Upright calcified	unitless
QuadratTotal_articulated_corallines	quadrat cover by Total articulated corallines	unitless
DecileQuadratTotal_articulated_corallines	Decilequadrat cover by Total articulated corallines	unitless
QuadratTotal_Dictyota	quadrat cover by Total Dictyota	unitless
QuadratTotal_Hypnea	quadrat cover by Total Hypnea	unitless
QuadratTotal_Sargassum	quadrat cover by Total Sargassum	unitless
QuadratTotal_macroalgae	quadrat cover by Total macroalgae	unitless
QuadratTotal_cyanobacteria	quadrat cover by Total cyanobacteria	unitless
QuadratTotal_turf_algae	quadrat cover by Total turf algae	unitless
QuadratCrustose_and_turf	quadrat cover by Crustose and turf	unitless

QuadratTotal_upright_algal_cover	quadrat cover by Total upright algal cover	unitless
DecileQuadratTotal_upright_algal_cover	decile quadrat cover by Total upright algal cover	unitless
QuadratAgaricia	quadrat cover by Agaricia	unitless
QuadratAnemone	quadrat cover by Anemone	unitless
QuadratDichocoenia	quadrat cover by Dichocoenia	unitless
QuadratDiploria	quadrat cover by Diploria	unitless
QuadratGorgonian	quadrat cover by Gorgonian	unitless
QuadratMadracis	quadrat cover by Madracis	unitless
QuadratManicinia	quadrat cover by Manicinia	unitless
QuadratMeandrina	quadrat cover by Meandrina	unitless
QuadratMillepora	quadrat cover by Millepora	unitless
QuadratMontastrea_cav	quadrat cover by Montastrea cav	unitless
QuadratOther_inverts	quadrat cover by Other invertebrates	unitless
QuadratP_astreoides	quadrat cover by P astreoides	unitless
QuadratP_porites	quadrat cover by P porites	unitless
QuadratSiderastrea	quadrat cover by Siderastrea	unitless
QuadratSponge	quadrat cover by Sponge	unitless
QuadratStephanocoeania	quadrat cover by Stephanocoeania	unitless
QuadratSand	quadrat cover by Sand	unitless

QuadratTunicate	quadrat cover by Tunicate	unitless
QuadratZooanthid	quadrat cover by Zooanthid	unitless
QuadratExperimental	quadrat cover by Experimental	unitless
QuadratTotal_coral_cover	quadrat Total coral cover	unitless
QuadratTotal_invert_non_coral	quadrat cover by Total invertebrate non coral	unitless
QuadratTotal_invert_cover	quadrat Total invertebrate cover	unitless
QuadratTotal_cover	Quadrat Total cover	unitless

[table of contents | back to top]

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

[table of contents | back to top]

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.

[table of contents | back to top]

Funding

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

[table of contents | back to top]