Fish count data from the Caroline Islands and the Federal States of Micronesia collected from 2012-2014.

Website: https://www.bco-dmo.org/dataset/684177

Data Type: Other Field Results

Version: 1

Version Date: 2017-03-09

Project

» The impact of a large episodic disturbance on an invasive (outbreak) coral: Will Typhoon Maysak promote or suppress an invasive Montipora sp. Coral on reefs of Ulithi Atoll, Federated States of Micronesia? (DisturbImpactsCoral)

Contributors	Affiliation	Role
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Abstract

Fish count data from the Caroline Islands and the Federal States of Micronesia collected from 2012-2014.

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Coverage

Spatial Extent: **N**:7.058531 **E**:-146.976536 **S**:5.933554 **W**:-158.368892

Temporal Extent: 2012-07-03 - 2015-07-08

Dataset Description

Fish count data for 2012, 2013 and 2014.

Data associated with publication: Crane NL, Nelson P, Abelson A, Precoda K, Rulmal J Jr, et al. (2017) PLOS ONE.

Acquisition Description

Surveys were conducted using snorkel on the reef crest and the reef table, in shallow sites at depths between 1.5 and 3 meters.

Fish community characterization

All fish were identified to the species level and counted along 50 m transects, in the same habitat and area as the quadrats, parallel to the reef crest and in 1.5-5 m in depth. The transect count area extended from the sea floor to the surface of the water column and consisted of at least two 50 m long swaths surveyed sequentially at each site. For all transects in all years, the same diver Hirst counted mobile fish on a 5 m wide swath, before returning along the same transect and counting cryptic benthic fishes on a 1 m wide swath. The total lengths of all fishes were estimated to the nearest cm. For analysis of fish community structure, fish species were classified into one of Hive trophic guilds: 1. herbivores, 2. planktivores, 3. corallivores, 4. carnivores, and 5. piscivores. Species that have a wider trophic range (omnivores) were categorized by their main food preference according to the 5 categories mentioned above. Biomass was estimated using the published length/weight relationships most appropriate for the region (Adam et al., 2011; Froese & Pauly, 2000; Kulbicki et al., 2005). Sharks and large rays were occasionally seen on transects, but their overall low abundance makes band transects a poor approach to estimate their actual numbers and contribution to biomass. Therefore elasmobranchs were recorded, but not included in our calculations here.

Processing Description

We compared sites using agglomerative hierarchical clustering (Ward's minimum variance method; hclust in The R Stats Package, R Core Team, 2016) based on the Bray-Curtis dissimilarity index (for benthic data) and Cao dissimilarity Index (for fish data), following the recommendations of McCune and Grace (2002). We examined the effects of anthropogenic and physical environmental factors on fish community structure using permutational multivariate analysis of variance (PERMANOVA) based on distance matrices of the fish diversity at each site. To do so, we used adonis, in the package vegan (Oksanen et al. 2016), which partitions distance matrices among potential sources of variation. We Hit linear models to these distance matrices, and evaluated the pseudo-F ratios with a permutation test. The following model, stratiHied by year to control for potential inter-annual differences, fish ~ exposure + distance + population was selected by comparing the AIC score from models with all possible combinations of the following factors related to site characteristics: exposure (lagoonal or exposed), distance (distance in kilometers from the site to the village with jurisdiction), population (number of human inhabitants of the village with jurisdiction) and index (a measure of the site's orientation with respect to the prevailing northeast trade winds), from a single factor to all 5 factors. We also examined the relationship between fish community structure and benthic cover characteristics using PERMANOVA. The number of permutations for all of these tests was set at 999.

BCO-DMO Data Processing Notes:

-Data were converted from wide format to long format
-nd was added to all blank cells
-site, date, time, and transect columns were added to incorporate the information contained in the header of the file

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Related Publications

Crane, N. L., Nelson, P., Abelson, A., Precoda, K., Rulmal, J., Bernardi, G., & Paddack, M. (2017). Atoll-scale patterns in coral reef community structure: Human signatures on Ulithi Atoll, Micronesia. PLOS ONE, 12(5), e0177083. doi:10.1371/journal.pone.0177083

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Parameters

Parameter	Description	Units
species	Species of fish counted	unitless
morph	Morphology of fish; color and appearance	unitless
phase	Phase of fish counted	unitless
transect_width	Width of transect swam	meters
type	Trophic level of fish; 1. herbivores 2. planktivores 3. corallivores 4. carnivores and 5. piscivores. Species that have a wider trophic range (omnivores) were categorized by their main	unitless
size	Size category of fish observed	mm
date	Date of sampling; YYYY/MM/DD	unitless
time	Time of sampling; In some cases, the time is formatted as HH:MM, and in other cases it is just indicated if sampling occurred in the morning or the afternoon (AM or PM).	unitless
transect	Transect swam	unitless
site	Site of sampling	unitless
count	Count of species in particular size class	count

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Instruments

Dataset-specific Instrument Name	Camera
Generic Instrument Name	Camera
Dataset-specific Description	Used to capture quadrats
Generic Instrument Description	All types of photographic equipment including stills, video, film and digital systems.

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Deployments

Bernardi_2012

Website	https://www.bco-dmo.org/deployment/684153
Platform	shoreside Micronesia
Start Date	2012-06-28
End Date	2014-07-14

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Project Information

The impact of a large episodic disturbance on an invasive (outbreak) coral: Will Typhoon Maysak promote or suppress an invasive Montipora sp. Coral on reefs of Ulithi Atoll, Federated States of Micronesia? (DisturbImpactsCoral)

Website: http://onepeopleonereef.ucsc.edu

Coverage: Ulithi Atoll, Yap State, Federated States of Micronesia. Western Pacific Ocean, Caroline Islands

Extracted from the NSF award abstract: Ulithi Atoll, in the Federated States of Micronesia, is the fourth largest Atoll in the world, and was an important staging area for the US Navy 3rd fleet during WWII. The Atoll contains dynamic coral reefs, and communities of people that depend on them. Ulithi has been subjected to a number of human and natural disturbances, including Typhoon Ophelia that hit in 1960. Local fishermen believe that this event started an invasion process by a 'weedy' invasive coral that covers reefs, and removes essential habitat for fish and octopus, potentially threatening these ecosystems. Four years ago, local people invited the investigators to Ulithi to study the reefs and work together to enhance fisheries and reef health. The investigators sequenced the invading coral DNA and identified it as a new species of Montipora. However, its invasion dynamics remain a mystery. In early April 2015,

Ulithi was hit again by a major disturbance: super Typhoon Maysak. The Typhoon destroyed most structures on the island, and removed much of the coral formations visible from shore. Using their baseline data of the past four years, the investigators, along with a team of students, seek to map the effect of the Typhoon on the invasive Montipora. Using genomic sequencing, they hope to better understand the role of Typhoon Maysak on the establishment and dispersal of this invasive coral. This project provides a unique opportunity to study the effects of a rare event, and invasion processes, and to broadly disseminate findings, raising awareness about coral reefs, climate change, and unique human-natural coupled systems. Super typhoon Maysak struck Ulithi Atoll on March 31, 2015, where an invasive/outbreak species of Montipora has affected shallow coral reefs over at least the last 50 years. The research the investigators propose will elucidate the effects of this rare but high impact event on a biological invasion using genomics and reef sampling to investigate Micronesian reefs that were dominated by Montipora before the typhoon, and more 'pristine' reefs where Montipora was absent or in low densities. The investigators will be relating these findings to existing data that were collected from these sites over the past four years. These studies will advance our understanding of biological invasions in coral reef systems, explore the unusual occurrence of a coral species as an outbreak organism, and contribute to our knowledge of how high impact, episodic disturbances - likely to increase in frequency with the advance of global climate change - may affect threated coral reef ecosystems world-wide.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1546374

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