Species density from Braun-Blanquet seagrass surveys on clusters of artificial reefs at the Abaco Islands, Bahamas in May of 2022

Website: https://www.bco-dmo.org/dataset/922248
Data Type: Other Field Results
Version: 1
Version Date: 2024-03-14

Project
» Using novel ecosystem-scale experiments to quantify drivers of reef productivity in a heavily impacted coastal ecosystem (Reef Production Drivers)

Contributors	Affiliation	Role
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Abstract
Species density from Braun-Blanquet seagrass surveys for artificial reef clusters at the Abaco Islands, Bahamas in May of 2022.The site (PN) was constructed in May 2021 in the waters north of Little Abaco Island. Three clusters of nine reefs were constructed at the site. Each cluster was separated by at least 150 m and were constructed at ~3 m depth.

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Coverage

Location: Abaco Islands, The Bahamas
Spatial Extent: **N**:26.91192 **E**:-77.00752 **S**:26.341 **W**:-77.62688
Temporal Extent: 2022-05-14 - 2022-05-26

Dataset Description

See "Related Datasets" section for access to data and metadata from other datasets from the same surveys.

Methods & Sampling

At each distance from the reef a 1x1m quadrate was placed over the seagrass bed. The percent cover was then assessed for all species present (often for the macroalgae we were only able to identify to the genus-level). Braun-Blanquet survey method, density codes are as follows: 0.1 = single individual is present, 0.5 = multiple individuals are present but < 10%, 1 = 10-20% cover, 2= 20-40% cover, 3= 40-60% cover, 4= 60-80% cover, 5= 80-100% cover.

BCO-DMO Processing Description

* Sheet 1 in the submitted file BBSurveys2022_FinalNSF.xlsx (submitted to BCO-DMO 2024-04-18) was imported into the BCO-DMO data system for this dataset with values N/A as the missing data identifier.

* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]

* Date converted to ISO 8601 format

* Note: These data include currently unaccepted synonyms of the accepted taxon names. The supplemental file fish_and_invert_species_list.csv which includes names and identifiers for both the names used in the dataset and the equivalent currently accepted names (as of 2024-02-26).

* Reef cluster site list added from information in related dataset file FishSurveys2022_FinalNSF.xlsx

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Data Files

File	
922248_v1_bb-survery-seagrass-pn.csv	(Comma Separated Values (.csv), 26.87 KB) MD5:b33cd83d9a33a5724ed4553166942dfa
Primary data file for dataset ID 922248, version 1	

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Supplemental Files

File	
Reef Cluster Site List filename: reef_cluster_site_list.csv	(Comma Separated Values (.csv), 499 bytes) MD5:c1c109da3d9dd8eec65fca35dcf3f838
Artificial reef cluster site list for fish and invertebrate surveys conducted in 2022. Two different sites: reefs with name PN# were constructed in May 2021, and CM# were constructed in May 2022. At each site three clusters of nine reefs were constructed. Each cluster was separated by at least 150 m and were constructed at ~3 m depth. Column name, description, units: reef_name, Reef cluster identifier lat_dd, site latitude, decimal degrees lon_dd, site longitude, decimal degrees Construction_Month, Month of reef construction (format: %b, .e.g. "May") Construction_Year, Year of reef construction (format: %Y, e.g. "2021") Site_Description, Description of the site location and island.	

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Related Datasets

IsRelatedTo

Allgeier, J., Munsterman, K. (2024) **Fish data from fish and seagrass surveys on clusters of artificial reefs at the Abaco Islands, Bahamas in 2022.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-03-14 doi:10.26008/1912/bco-dmo.922228.1 [view at BCO-DMO]
Relationship Description: Datasets part of the same fish and seagrass surveys conducted in 2022 on artificial reef clusters in the Abaco Islands (created in 2021 and 2022).

Allgeier, J., Munsterman, K. (2024) **Invertebrate data from fish and seagrass surveys on clusters of artificial reefs at the Abaco Islands, Bahamas in 2021 and 2022.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-03-14 doi:10.26008/1912/bco-dmo.922236.1 [view at BCO-DMO]
Relationship Description: Datasets part of the same fish and seagrass surveys conducted in 2022 on artificial reef clusters in the Abaco Islands (created in 2021 and 2022).

Allgeier, J., Munsterman, K. (2024) **Seagrass blade height from fish and seagrass surveys on clusters of artificial reefs at the Abaco Islands, Bahamas in May of 2022.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-03-14 doi:10.26008/1912/bco-dmo.922242.1 [view at BCO-DMO]
Relationship Description: Datasets part of the same fish and seagrass surveys conducted in 2022 on artificial reef clusters in the Abaco Islands (created in 2021 and 2022).

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Parameters

Parameter	Description	Units
date	data survey was conducted	unitless
obs	observer	unitless
cluster	unique cluster ID	unitless
cluster_lat	latitude of cluster location	decimal degrees
cluster_lon	longitude of cluster location	decimal degrees
reef	unique reef ID	unitless
transect	Transect identifier (A, B, C, D)	unitless
distance	distance from the reef	meters (m)
Thalassia	Thalassia values are either 0.1 (single individual), 0.5 (< 0.1 proportion coverage), 1 (0.1-0.2), 2 (0.2-0.4), 3 (0.4-0.6), 4 (0.6-0.8), 5 (0.8-1.0).	unitless
Syringodium	Proportion (0-1) of sample that was covered by category 'Syringodium'. See Methods and Sampling section for more details.	unitless
Penicillus	Proportion (0-1) of sample that was covered by category 'Penicillus'. See Methods and Sampling section for more details.	unitless

Halimeda	Proportion (0-1) of sample that was covered by category 'Halimeda'. See Methods and Sampling section for more details.	unitless
Laurencia	Proportion (0-1) of sample that was covered by category 'Laurencia'. See Methods and Sampling section for more details.	unitless
Rhiphocephalus	Proportion (0-1) of sample that was covered by category 'Rhiphocephalus'. See Methods and Sampling section for more details.	unitless
Udotea	Proportion (0-1) of sample that was covered by category 'Udotea'. See Methods and Sampling section for more details.	unitless
Sponge	Proportion (0-1) of sample that was covered by category 'Sponge'. See Methods and Sampling section for more details.	unitless
Avrainvillia	Proportion (0-1) of sample that was covered by category 'Avrainvillia'. See Methods and Sampling section for more details.	unitless
Bataphora	Proportion (0-1) of sample that was covered by category 'Bataphora'. See Methods and Sampling section for more details.	unitless
Acetabularia	Proportion (0-1) of sample that was covered by category 'Acetabularia'. See Methods and Sampling section for more details.	unitless
Dictyosphaeria	Proportion (0-1) of sample that was covered by category 'Dictyosphaeria'. See Methods and Sampling section for more details.	unitless
Valonia	Proportion (0-1) of sample that was covered by category 'Valonia'. See Methods and Sampling section for more details.	unitless
Jania	Proportion (0-1) of sample that was covered by category 'Jania'. See Methods and Sampling section for more details.	unitless
unknown_species_1	Proportion (0-1) of sample area that was covered by category 'unknown_species_1', a consistently identified species of which the classification is unknown. Described as "green stringy." See Methods and Sampling section for more details.	unitless
unknown_species_2	Proportion (0-1) of sample area that was covered by category 'unknown_species_2', a consistently identified species of which the classification is unknown. Described as "fuzzy green finger." See Methods and Sampling section for more details.	unitless

unknown_species_3	Proportion (0-1) of sample area that was covered by category 'unknown_species_3', a consistently identified species of which the classification is unknown. Described as "soft brown stick." See Methods and Sampling section for more details.	unitless
Heterosiphonia	Proportion (0-1) of sample that is covered by category 'Heterosiphonia'. See Methods and Sampling section for more details.	unitless
Porites	Proportion (0-1) of sample that is covered by category 'Porites'. See Methods and Sampling section for more details.	unitless
Halidule	Proportion (0-1) of sample that is covered by category 'Halidule'. See Methods and Sampling section for more details.	unitless
Turf	Proportion (0-1) of sample that is covered by category 'Turf'. See Methods and Sampling section for more details.	unitless
Cyanobacteria	Proportion (0-1) of sample that is covered by category 'Cyanobacteria'. See Methods and Sampling section for more details.	unitless
Caulerpa	Proportion (0-1) of sample that is covered by category 'Caulerpa'. See Methods and Sampling section for more details.	unitless
other	Proportion (0-1) of proportion of sample area that is covered by an organism that does not have its own column. See Methods and Sampling section for more details.	unitless
animals	description of the animal. The ID and the count of individual animals in the quadrat	unitless
notes	notes from datasheet, etc.	unitless

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Project Information

Using novel ecosystem-scale experiments to quantify drivers of reef productivity in a heavily impacted coastal ecosystem (Reef Production Drivers)

Coverage: Caribbean coastal ecosystems

NSF Award Abstract:
Tropical coastal marine ecosystems (e.g., coral reefs, seagrass beds, and mangroves) are among the most productive ecosystems in the world providing important services, such as fisheries, to millions of people. Despite this, they are also among the most impaired ecosystems, necessitating improved understanding of the mechanisms that underpin their productivity. This project seeks to understand the key factors that drive ecosystem production in a degraded coastal ecosystem in Haiti using artificial reefs. Past research has shown

that artificial reefs have substantial potential to increase the number and diversity of plants and animals, but the extent to which this can be achieved at scales relevant to society remains unknown. This project is constructing clusters of artificial reefs to test how (1) spatial arrangement and (2) fishing pressure (fished/not fished) influence the productivity of seagrass, coral, and fish over the course of four years. The fishing treatment is being implemented through collaborations with local fishers whereby small-scale no-take zones are created around three of the six artificial reef clusters. A unique aspect of the research is that it capitalizes on the experimental design to simultaneously achieve an important conservation initiative, while testing ecological theory. Community engagement and outreach are integrated directly into the research and local fishers are being surveyed to assess the extent to which fishing occurred on any of the artificial reefs. This research represents a novel effort to integrate experimentation with cutting-edge community-based conservation initiatives in one of the most impoverished regions of the world. The project is improving strategies for conservation and reef management.

Identifying the factors that regulate the structure and function of ecosystems is a fundamental challenge for ecological theory and applied science. This challenge is often framed within the context of Top-Down (TD) versus Bottom-Up (BU) regulation, but the extent to which this framework can predict processes in complex, real-world ecosystems is not fully understood. It is now widely recognized that TD/BU factors do not act in isolation. For example, in many ecosystems, consumers contribute to both TD (via consumption) and BU (via excretion) pathways. Environmental factors, including human-induced change, can further alter the nature of these interactions. Quantifying the strength of TD and BU pathways and the extent to which they regulate the structure and function in highly dynamic ecosystems requires an experimental system that is sufficiently tractable that all its components can be quantified, while still being representative of real ecosystems. To address this challenge, this research project creates a unique ecosystem-scale artificial reef (AR) experiment in Haiti to test how two factors (AR structure, and fishing pressure) alter the strength of independent and interactive TD and BU pathways to regulate the structure and function of real-world reef ecosystems. Over the course of four years, the production of seagrass (surrounding the ARs), coral (transplanted onto the ARs), and fish (in and around the ARs) is being measured, providing a quantitative assessment of ecosystem-level production across the two treatments. Linear and structural equation models are used to measure the independent and interactive strengths TD and BU pathways, and to identify the suite of directional relationships between each trophic level that best predict overall ecosystem production. Harnessing the ability to use ecosystem-scale experiments and quantify production across all trophic levels in a highly complex, real-world system enables an unprecedented test of TD/BU theory.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1948622

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