Fish data from fish and seagrass surveys on clusters of artificial reefs at the Abaco Islands, Bahamas in 2022

Website: https://www.bco-dmo.org/dataset/922228
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
Fish data from fish and seagrass surveys on clusters of artificial reefs at the Abaco Islands, Bahamas in May of 2022. Data are presented for site PN, which was constructed in May 2021 at the Bight of Old Robinson, Great Abaco. At the site three clusters of nine reefs were constructed. 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**:26.34648 **E**:-77.00752 **S**:26.341 **W**:-77.01037
Temporal Extent: 2022-07 - 2022-12

Dataset Description

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

Methods & Sampling

Fish surveys were conducted using visual counts of all fish on a given artificial reef. Fish size was visually estimated to the nearest cm using total length (TL). All counts were exhaustive and lasted from 1-10 minutes depending on the number of fish. We recorded visual observation of floy tags – this was done opportunistically and when possible the species and color of tag were recorded.

Survey overview:

Fish surveys ~3 min on free dive on each reef at each cluster; 12-15min for each cluster survey.

BCO-DMO Processing Description

* Sheet "fish data" in submitted file FishSurveys2022_FinalNSF.xlsx (submitted to BCO-DMO 2024-04-18) was imported into the BCO-DMO data system as the primary table dataset.
* Sheet "metadata" contained multiple tables.
** The table with columns "date, notes" was exported added to the dataset as supplemental file fish_and_invert_survey_notes.csv."
** The note with heading "Survey overview" was added to the Methods & Sampling section of the metadata.
** The site information with columns "reef name,GPS data" was exported as a separate supplemental file reef_cluster_site_list.csv. Additional columns were added for the site description, and the separate lat, lon in decimal degree format.

* 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

* columns cluster_lat,cluster_lon added to the fish data table from the site information (using reef name provided in "Cluster" column).

* 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).

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Data Files

File
922228_v1_fish-data.csv (Comma Separated Values (.csv), 53.65 KB) MD5:4df167e17a057e0fe56013f59e53e112 Primary data file for dataset ID 922228, version 1

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Supplemental Files

File
Fish and Invertebrate Species List (with Taxon IDs) filename: fish_and_invert_species_list.csv (Comma Separated Values (.csv), 4.89 KB) MD5:12bf9ccb6ca461259cf841ff70c59cc8 A supplemental table containing organism identifications (common and latin names). These were matched at the World Register of Marine Species (WoRMS) and the taxon status (accepted, unaccepted) and taxon identifiers were added. Some are not the currently accepted synonyms, an additional column containing the currently accepted synonyms (as of 2024-02-26) was added. Column information (name, definition): type, organism type (fish or invert) common_name, common name as used in the main data table for the dataset. species_or_lowest_identifiable_taxon, Scientific name or lowest identifiable taxon for the common_name category. AphiaID, taxon identifier (AphiaID, see WoRMS) for the "species_or_lowest_identifiable_taxon" LSID, Lifescience Identifier (LSID) for the "species_or_lowest_identifiable_taxon"
Fish and Invertebrate Survey Notes filename: fish_and_invert_survey_notes.csv (Comma Separated Values (.csv), 1.31 KB) MD5:9602c4f537e21ec6b78ab1fef0520d64 Notes from the fish and invertebrate survey. Columns : date, notes.
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) **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).

Allgeier, J., Munsterman, K. (2024) **Species density from Braun-Blanquet 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.922248.1 [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
Observer	observer	unitless
Date	start date of survey (local time zone, Eastern Time EST/EDT)	unitless
Time	start time of survey (local time zone, Eastern Time EST/EDT)	unitless
Assembly_day	days after being built	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
Species	Organism identification category (this is the "common_name" column in Supplemental File: "Fish and Invertebrate Species List (with Taxon IDs)")	unitless
Count	abundance at each size class identified under the total length column	unitless
Total_length	Total length is a standard measure for fishes that includes the length of a fish measured from the tip of the snout to the tip of the longer lobe of the caudal fin.	centimeters (cm)
Transient	binary Y/N to identify transiet fish 0 or blank means no fish was observed	unitless
Floy_tag	binary Y/N to state whether the fish has a floy tag or not	unitless
Floy_color	color of floy tag if present	unitless
Floy_size	floy tag size if present: S, M, L	unitless
Floy_date	floy tag date if present	unitless
Floy_ID	floy tag ID if present	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

Funding Source	Award

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