Seagrass surveys of blade height around artificial reefs in shallow coastal waters off of Abaco, The Bahamas

Website: https://www.bco-dmo.org/dataset/873092
Data Type: Other Field Results
Version: 1
Version Date: 2022-05-12

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
These data are from seagrass surveys of blade height around artificial reefs in shallow (less than 4 meters) coastal waters in The Bight of Old Robinson, off of Abaco Island, The Bahamas from May to December 2021.

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Coverage

Spatial Extent: **N**:26.3465 **E**:-77.0075 **S**:26.341 **W**:-77.0104
Temporal Extent: 2021-06-06 - 2021-06-07

Methods & Sampling

We surveyed all benthic producer species within the seagrass beds using a 1-meter squared (m2) quadrat and a 10-centimeter squared (cm2) quadrat, including three seagrass species, 17 potential macroalgal species, and a cyanobacterial mat complex. Producers were identified to the lowest taxonomic level possible always at least to genus-level, with the exception of the cyanobacterial mat complex which likely consisted of multiple species of cyanobacteria that we were unable to determine with a high degree of specificity. Responses were determined using the modified Braun–Blanquet method.

Data Processing Description

Data Processing:
Data have not been processed in any way and consistent of only raw observational data..

BCO-DMO processing description:
- Adjusted field/parameter names to comply with BCO-DMO naming conventions
- Added a conventional header with dataset name, PI names, version date
- Added columns for latitude and longitude

- Split "Reef" column into two columns: "Cluster" and "Reef"
- Converted date to format YYYY-MM-DD per BCO-DMO standards

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Data Files

File
seagrassbladeheight_2021.csv (Comma Separated Values (.csv), 36.12 KB) MD5:918ebaf16c3df50573ec19f6cd43baaa Primary data file for dataset ID 873092

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Related Datasets

IsRelatedTo

Allgeier, J. (2022) **Fish surveys following the construction of clusters of artificial reefs in shallow coastal waters off of Abaco, The Bahamas from May to December 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-05-16 doi:10.26008/1912/bco-dmo.872990.1 [view at BCO-DMO]

Allgeier, J. (2022) **Seagrass community composition surveys around artificial reefs in shallow coastal waters off of Abaco Island, The Bahamas.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 2) Version Date 2022-11-23 doi:10.26008/1912/bco-dmo.873083.2 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
Date	date survey was conducted	unitless
Observer	initials of scientific observer (one observer:JEA)	unitless
Latitude	latitude of sampling station North	decimal degrees
Longitude	longitude of sampling station East (West is negative)	decimal degrees
Cluster	coral reef cluster (PN1, PN3, PN5)	unitless
Reef	unique reef ID	unitless
Transect	#1-4	unitless
Distance	distace from the reef	meters (m)
Subsample	#1-4	unitless
tt_shoot_count	number of Thalassia testudinum per 10x10cm quadrat	unitless
tt_bladeheight_1	height of random Thalassia testudinum blades 10x10cm quadrat	millimeters (mm)
tt_bladeheight_2	height of random Thalassia testudinum blades 10x10cm quadrat	millimeters (mm)
tt_bladeheight_3	height of random Thalassia testudinum blades 10x10cm quadrat	millimeters (mm)
tt_bladeheight_4	height of random Thalassia testudinum blades 10x10cm quadrat	millimeters (mm)
tt_bladeheight_5	height of random Thalassia testudinum blades 10x10cm quadrat	millimeters (mm)
sf_shoot_count	number of Syringodium filiforme shoots per 10x10cm quadrat	unitless
sf_bladeheight_1	height of random Syringodium filiforme blades 10x10cm quadrat	millimeters (mm)
sf_bladeheight_2	height of random Syringodium filiforme blades 10x10cm quadrat	millimeters (mm)
sf_bladeheight_3	height of random Syringodium filiforme blades 10x10cm quadrat	millimeters (mm)
sf_bladeheight_4	height of random Syringodium filiforme blades 10x10cm quadrat	millimeters (mm)
sf_bladeheight_5	height of random Syringodium filiforme blades 10x10cm quadrat	millimeters (mm)

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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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