Organisms collected on oyster reefs in the Mission Aransas National Estuarine Research Reserve, TX, USA from 2016 to 2021

Website: https://www.bco-dmo.org/dataset/875920
Data Type: Other Field Results
Version: 1
Version Date: 2022-06-29

Project
» RAPID: Human-Driven Trophic Cascades: Mesopredator Release and Recreational Fishing in Estuaries (Trophic cascades)

Contributors	Affiliation	Role
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Abstract
This dataset reports abundances of organisms collected on oyster reefs in the Mission Aransas in the National Estuarine Research Reserve (NERR), Texas, USA from 2016 to 2021.

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Coverage

Spatial Extent: **N**:27.89544 **E**:-96.96442 **S**:27.89544 **W**:-97.04072
Temporal Extent: 2016 - 2021

Methods & Sampling

Sampling and analytical procedures: Oyster reef communities were assessed using experimental cages or bioboxes (Reustle and Smee 2020). Bioboxes were 0.5 m2 x 0.25 cm tall and consist of a wooden frame that is covered with mesh to exclude fin fish and other large predators or not covered with mesh to act as a control. Twenty liters of sun-bleached oyster shells are added to each biobox, and the biobox is then embedded into an existing oyster reef. Bioboxes were placed in pairs separated by ~3.0 meters with pairs separated by ~100 meters. Groups of cages were placed in the northern Mission Aransas National Estuarine Research Reserve near Goose Island State Park in St. Charles Bay and another group near San Jose Island in Aransas Bay. Bioboxes were placed in late April to early May and remained in the field for 6-8 weeks. Modified throw traps were used to collect oyster communities inhabiting each cage or control, and oyster recruitment measured by counting the number of living oysters on a settle stick in each bioboxes.

Known Issues: No problems occurred with the funded research. However, we were using historic data so the dataset is not fully replicated. For example, we do not have exclusion data for 2017 or data from the southern sites in 2018.

Data Processing Description

Data Processing:
These data were analyzed using multivariate statistics using PRIMER™ (e.g., PERMAOVA, CAP, SIMPER).

BCO-DMO Processing description:
- Reorganized data for ease of reproducibility, resulting in the Identification and Abundance columns
- Missing data identifier ‘N/A’ replaced with 'nd' (BCO-DMO's default missing data identifier)
- Adjusted field/parameter names to comply with BCO-DMO naming conventions
- Added a conventional header with dataset name, PI names, version date

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Data Files

File
oyster_reef.csv (Comma Separated Values (.csv), 383.28 KB) MD5:3a2f3f2834e716b6269c7bd9c25dee17 Primary data file for dataset ID 875920

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Related Publications

Reustle, J. W., & Smee, D. L. (2020). Cloudy with a chance of mesopredator release: Turbidity alleviates top-down control on intermediate predators through sensory disruption. Limnology and Oceanography, 65(10), 2278–2290. Portico. https://doi.org/10.1002/lno.11452
Methods

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Parameters

Parameter	Description	Units
Cage_treatment	Control or predator exclusion	unitless
Site	Site code (GI = Goose Island State Park, St. Charles Bay, Northern Mission Aransas NERR ; SJ = San Jose Island, Aransas Bay, Southern Mission Aransas NERR)	unitless
Year	Year of collection in format YYYY	unitless
Salinity	Salinity measurement using handheld YSI	PSU
Identification	Organism identification name	unitless
Abundance	Abundance of organisms	unitless

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Instruments

Dataset-specific Instrument Name	Handheld YSI Pro 2030
Generic Instrument Name	Salinity Sensor
Dataset-specific Description	Point measurements of salinity were made using a handheld YSI Pro 2030.
Generic Instrument Description	Category of instrument that simultaneously measures electrical conductivity and temperature in the water column to provide temperature and salinity data.

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Project Information

RAPID: Human-Driven Trophic Cascades: Mesopredator Release and Recreational Fishing in Estuaries (Trophic cascades)

Coverage: Gulf of Mexico

NSF Award Abstract:
Human activity affects natural populations of organisms directly through exploitation and indirectly by changing how species interact with each other. This project is investigating the effect of fishing on an estuarine food web. In the oyster reef food chain, newly settled oysters are eaten by crabs, and the crabs are in turn eaten by fish. More fish predators mean fewer crabs and more oysters. Fish also reduce foraging by crabs, which further benefits oysters. Although small-scale experimental studies have measured the impact of fish exclusion on oyster reefs, the links between fishing, fish populations and oyster reefs require an estuary-scale experiment. Stay-at-home orders associated with the COVID-19 pandemic has curtailed fishing activity throughout estuaries. This project combines empirical experiments and fisheries monitoring data from before, during and after COVID-19-related restrictions to investigate how changes in fishing activity influence oyster reef food webs. Building on 10+ years of preexisting observations the dataset encompasses a 100-year flood, a hurricane, and now a pandemic, a rare opportunity to investigate the effects of low fishing pressure in the absence of other disturbances. The broader impacts of this study contribution of data towards optimizing management and conservation of marine resources. Oyster reefs are essential habitat that perform ecosystem services such as water filtration and shoreline stabilization, but they are also harvested as a commercial fishery. Interest in estuarine systems for recreation and fishing is high along the Gulf of Mexico. Public displays and outreach activities at the Dauphin Island Sea Lab will include results from this project to increase awareness of the effect of human activity on local ecosystems.

The loss of top predators can destabilize ecosystems by making them more prone to invasions, altering nutrient fluxes within and between habitats, and impeding recovery after disturbances. Overfishing reduces the abundance of higher order predators, leading to higher abundances of intermediate consumers or mesopredators. Mesopredator release can increase predation pressure on basal trophic levels, including foundation species. In estuaries, fin fish, many of which are targeted by both commercial and recreational anglers, provide an important trophic link and their removal or experimental exclusion can trigger mesopredator release. However, the extent that fishing alters communities remains poorly understood. Estuarine systems along the Gulf of Mexico have experienced nearly continuous and widespread exploitation for over a century, and the few examples of temporary releases from fishing pressure have co-occurred with other natural disasters. The COVID-19 pandemic has curtailed fishing and has provided a unique research opportunity. Using a Before After Control Impact (BACI) design, the effects of fishing pressure on top-down control is being investigated in a model system, oyster reefs. Fishing activity and fish stock assessments are compared with field experiments to determine top predator feeding activity, mesopredator abundances, and recruitment and growth of oysters. To gauge changes in the structure of estuarine food webs, the data are

being compared with 10+ years of preexisting results to isolate the effect of fishing activity from confounding factors associated with natural disasters like hurricanes and floods.

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-2032200

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