Oysters size and presence or absence of disease at intertidal and subtidal reefs in Apalachicola Bay and Ocholckonee Bays, FL, July-August 2016

Website: https://www.bco-dmo.org/dataset/821783
Data Type: Other Field Results
Version: 1
Version Date: 2020-07-29

Project
» Collaborative Research: RAPID: Quantifying mechanisms by which Hurricane Michael facilitates a stable-state reversal on oyster reefs (Oyster Reef Reversal)

Contributors	Affiliation	Role
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Abstract
Oysters size and presence or absence of disease at intertidal and subtidal reefs in Apalachicola Bay and Ocholckonee Bays, Florida, July-August 2016

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Coverage

Spatial Extent: **N**:29.97037 **E**:-84.33401 **S**:29.6718 **W**:-85.18216
Temporal Extent: 2016-07 - 2016-08

Dataset Description

Oysters size and presence or absence of disease from surveys at intertidal and subtidal reefs in Apalachicola Bay and Ocholckonee Bays, Florida, July-August 2016

Methods & Sampling

Site Selection- From Hanley et. al 2019, this was a multi-step process that first involved using ArcGIS to partition the bay's oyster reefs (commercial and non-commercial) into six zones. Zone assignment was based on the reef's relative distance by water from the river input (near, mid, far) as well as a reef's east-west orientation to the river (East Apalachicola and West Apalachicola). Next, we randomly selected three reefs out of all possible reefs (including the experimental reefs) within each zone.

Surveys- Methods for surveys done from 2013-2016 were taken from Hanley et al. 2019.

Surveys 2013-2016: On each reef subtidal reef, we obtained spatially balanced samples by extending four 20 m transects at 90 degree angles from the boat. Along each transect, we overlaid a 0.25 m2 weighted quadrat at the 5, 10, 15, and 20 m marks. For each quadrat, we collected the entire contents of the quadrat into a uniquely labeled mesh bag, transported the bag to the surface, and placed the bag on ice to be processed at the lab. For intertidal reefs, we sampled 2 quadrats per reef, ‘low’ (located at the low water level) and ‘high’ (2 m above the low transect) quadrats centered along a 20 m transect on each reef.

Lab Processing of samples collected during the survey: In the laboratory, we processed each quadrat sample to obtain the total mass (g), the size of the first 100 oysters encountered (not all samples contained 100 oysters), the density of all juvenile oysters (length < 25 mm), the density of all adult oysters (length > 25 mm), and the density of recently deceased oysters (valves intact and absence of sessile invertebrates within the internal shell cavity).

Data Processing Description

BCO-DMO Processing Notes:
- data submitted in Excel file "Apalachicola_Data_2013-2019_ABP_4.xlsx" sheet "Survey.Disease.Oysters" extracted to csv
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- replaced missing data 'NA', 'na', 'Na', 'nA' with 'nd'
- replaced 'y' and 'n' with 'yes' and 'no' to be consistent within dataset
- joined this table with sheet "Reef Location" table in order to include lat/lon info
- re-ordered columns
- sorted rows by {reef_type}{estuary}{region}{distance}{reef}{reef_name}{transect}{quadrat}

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Data Files

File
survey_disease_oysters.csv (Comma Separated Values (.csv), 52.21 KB) MD5:91877b5b40b4fad789349c06d32561e3 Primary data file for dataset ID 821783

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Supplemental Files

File
Habitat and species codes filename: Habitat_and_species_codes.pdf (Portable Document Format (.pdf), 449.38 KB) MD5:32e5977b815e148aa3802f613ee68cbb Habitat and species codes used in the project

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Related Publications

Hanley, T., White, J., Stallings, C., & Kimbro, D. (2019). Environmental gradients shape the combined effects of multiple parasites on oyster hosts in the northern Gulf of Mexico. Marine Ecology Progress Series, 612, 111–125. doi:10.3354/meps12849
Methods

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Parameters

Parameter	Description	Units
reef_type	subtidal or intertidal reef	unitless
estuary	name of the estuary: Apalachicola or Ocholckonee	unitless
region	east; west; or ochlockonee	unitless
month_harvest	month of harvest; 1 to 12	unitless
year_harvest	year of harvest; yyyy	unitless
distance	from the river: 1; 2; or 3. 1 is the closest and 3 is the furthest	unitless
reef	number of reef within reef.name categories	unitless
reef_name	name of reef	unitless
Lat	latitude; north is positive	decimal degrees
Long	longitude; east is positive	decimal degrees
transect	high/low for intertidal; C1/C2/S1/S2 for old reef sampling; N/E/S/W for more recent old sampling	unitless
quadrat	meter mark of the quadrat; refers to the location along a 20 meter transect at which point the Quadrat was deployed and the sample was taken. Usually the quadrats were deployed at 5 meter; 10 meter; 15 meter; and 20 meter marks on the transect tape.	unitless
diseased	disease status of the oysters measured in the associated transect/quadrat (yes/no)	unitless
species	species code for organisms found in quadrat; see Species Code supplemental data	unitless
status	status of the oyster; live or no data	unitless
size_mm	size of oyster	millimeters

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Instruments

Dataset-specific Instrument Name	YSI Pro 2030
Generic Instrument Name	Water Quality Multiprobe
Dataset-specific Description	Used to measure dissolved oxygen, temperature, salinity and pH.
Generic Instrument Description	An instrument which measures multiple water quality parameters based on the sensor configuration.

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Project Information

Collaborative Research: RAPID: Quantifying mechanisms by which Hurricane Michael facilitates a

stable-state reversal on oyster reefs (Oyster Reef Reversal)

Coverage: Sub-tropic estuarine waters, subtidal and intertidal in Apalachicola Bay and Ocholckonee Bay

NSF Award Abstract:

Ecosystems can exhibit "tipping points" whereby an environmental disturbance pushes an ecosystem into an altered state from which it does not recover, even when the environment normalizes. This may have happened to valuable oyster reefs in Northwest Florida in 2012, when drought and low river flow allowed predators of oysters to flourish and consume nearly all the oysters. Despite subsequent years of normal rainfall and river flow, oysters have not recovered, suggesting the ecosystem may have crossed a tipping point. However, the timing and magnitude of the disturbance from Hurricane Michael (2018) may have pushed the ecosystem back towards its original, healthy state. In this project, investigators make field observations to gauge how predators and oysters are responding to Hurricane Michael and conduct lab experiments to test how predators and oysters respond to hurricane rainfall conditions. Additionally, they use mathematical models to predict whether effects observed in the field and lab could lead to a shift back past the tipping point. This is a rare opportunity to study how oyster ecosystems can shift back from altered to healthy states. However, a rapid response is essential before seasonal changes in the weather and bay obscure hurricane impacts. This research has several broader impacts. First, it will expand the ecological theory of tipping points. Second, it can support the management of the Apalachicola Bay oyster fishery, such as insight into the likely success of restoration efforts. The team coordinates with the Apalachicola National Estuarine Research Reserve to this end. Finally, research outputs are incorporated into ongoing public education and training efforts.

Ecosystems can rapidly shift from their original, high-value state to a new, degraded one. Such shifts have been observed in many ecosystems, but it is sometimes difficult to identify the mechanisms that mediate the shift beyond a "tipping point" and - to a greater extent - those that could mediate a shift back to the original state. Improving our understanding and predictive capability of tipping points depends on identifying the mechanisms that underlie bi-directional system shifts. In 2012, the oyster reefs of Apalachicola Bay, FL abruptly shifted into an oyster-less state when prolonged drought and low river flow allowed marine oyster predators to flourish. Despite subsequent years of normal rainfall and flow, there has not been a return shift, suggesting this ecosystem may have entered an alternate stable state. The hypothesis of this work is that in 2018 Hurricane Michael provided a sufficient disturbance to shift the system back into the attracting basin for its original state (prior observations support this prediction). This project couples field observations and lab experiments with population modeling to test whether and how Hurricane Michael initiated a reversal shift. A rapid response is essential before seasonal variability in this ecosystem obscures hurricane effects. The proposal's intellectual merit is based on its ability to address a central goal in ecology: identifying and predicting ecosystem tipping points. Combining empirical observations and models is a promising approach to advance this goal, but has not been widely applied in the field, mainly because researchers are not in place at the time of a shift. Hurricane Michael provides a unique opportunity to address this knowledge gap.

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-1917015

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