Effect of flow environment on mud crab perceptive range based on field experiments in intertidal mudflats on Skidaway Island, GA, 2014-2016

Website: https://www.bco-dmo.org/dataset/750579
Data Type: Other Field Results, experimental
Version: 1
Version Date: 2018-12-03

Project
» The role of the sensory environment and predator chemical signal properties in determining NCE strength in cascading interactions on oyster reefs (SensoryNCE)

Contributors	Affiliation	Role
Weissburg, Marc	Georgia Institute of Technology (GA Tech)	Principal Investigator
Kubanek, Julia	Georgia Institute of Technology (GA Tech)	Co-Principal Investigator
Webster, Donald	Georgia Institute of Technology (GA Tech)	Co-Principal Investigator
Pruett, Jessica P.	Georgia Institute of Technology (GA Tech)	Student, Contact
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Mud crab predation on oyster spat in the presence of caged blue crab predators placed various distances away from mud crab refuge. Field experiments were conducted at two different sites on Skidaway Island, GA during two different tidal types to determine the effect of current speed and turbulence on mud crab perceptive range. These data were published in Pruett and Weissburg, 2018.

Table of Contents

Coverage

Spatial Extent: **N**:31.9615 **E**:-81.0125 **S**:31.9545 **W**:-81.0614
Temporal Extent: 2014-06-11 - 2016-06-09

Dataset Description

Mud crab predation on oyster spat in the presence of caged blue crab predators placed various distances away from mud crab refuge. Field experiments were conducted at two different sites on Skidaway Island, GA during two different tidal types to determine the effect of current speed and turbulence on mud crab perceptive range.

These data were published in Pruett and Weissburg, 2018.

Methods & Sampling

Mud crab perceptive range trials were performed in enclosures (2.2 m by 0.75 m by 0.3 m) that contained an oyster reef as a refuge for mud crabs at one end. Oyster shells were glued together to create artificial oyster clusters that were used to manipulate the placement of oyster spat within the enclosure. Four oyster spat (10-16 mm) were epoxied to the artificial oyster clusters and 4 clusters were placed within the constructed oyster reef and 4 clusters outside the reef. Fifteen mud crabs (8 crabs 15-20 mm CW, 4 mud crabs 20-25 mm CW, and 3 mud crabs 25-30 mm CW) were added to the oyster reef in the enclosure. Caged blue crabs (12-16 cm CW) were placed either 0.25, 0.5, 1.0, 1.5, or 2.0 m away from the center of the oyster reef. A caged blue crab was placed on both sides of the oyster reef in the direction of tidal flow with one caged blue crab in the enclosure and the other outside the enclosure. Empty blue crab cages were used for the control treatment.

Enclosures were deployed on intertidal mudflats at either Priest Landing or Skidaway Narrows during either mean tide or spring tide. Flow parameters differed between sites and tidal types based on previous work (Wilson et al. 2013). The number of oyster spat eaten by mud crabs inside and outside the refuge was counted after 24 hours. See Pruett and Weissburg, 2018 for full methods.

Data were statistically analyzed using R version 3.3.1.

Data Processing Description

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- re-formatted date from m/d/yyyy to yyyy-mm-dd
- reduced number of significant digits of normalized_eaten and refuge_use from 9 to 2 places to meet sampling precision methods

[table of contents | back to top]

Data Files

File
mudcrab_feeding.csv (Comma Separated Values (.csv), 14.04 KB) MD5:6d5f8b737f3af9587e006b1cb3a027d8 Primary data file for dataset ID 750579

[table of contents | back to top]

Related Publications

Pruett, J. L., & Weissburg, M. J. (2018). Hydrodynamics affect predator controls through physical and sensory stressors. Oecologia, 186(4), 1079–1089. doi:10.1007/s00442-018-4092-8
Results

Wilson, M. L., Webster, D. R., & Weissburg, M. J. (2013). Spatial and temporal variation in the hydrodynamic landscape in intertidal salt marsh systems. Limnology and Oceanography: Fluids and Environments, 3(1), 156–172. doi:10.1215/21573689-2373360
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
date	start date (local EST) of 24-hour mud crab perceptive range trial formatted as yyyy-mm-dd	unitless
site	location of mud crab perceptive range trial on Skidaway Island, GA	unitless
latitude	approximate latitude of trial site; north is positive	decimal degrees
longitude	approximate longitude of trial site; east is positive	decimal degrees
tidal_type	tidal type (mean or spring tide) during mud crab perceptive range	unitless
distance	distance caged blue crabs placed from mud crab refuge (control= no caged blue crab)	meters
total_eaten	number of oysters eaten by mud crabs	number of individuals
normalized_eaten	normalized total number of oysters eaten calculated by dividing the total number of oysters eaten in a distance treatment by the average number of oysters eaten in the controls during a given trial	unitless
refuge_use	the number of oysters eaten by mud crabs in the refuge divided by the total number of oysters eaten	unitless

[table of contents | back to top]

Deployments

SensoryNCE_2014

Website	https://www.bco-dmo.org/deployment/709363
Platform	Wassaw_Sound_GA
Start Date	2014-11-03
End Date	2014-11-06
Description	Wassaw Sound, Georgia

[table of contents | back to top]

Project Information

The role of the sensory environment and predator chemical signal properties in determining NCE strength in cascading interactions on oyster reefs (SensoryNCE)

Coverage: Intertidal and subtidal oyster reefs in Wassaw Sound, Georgia, US

Extracted from the NSF award abstract:

In this project, the investigators will examine the ability of top blue crab predators to indirectly benefit the abundance of basal oyster prey by reducing the density (consumptive effects, CEs) and suppressing foraging (non-consumptive effects, NCEs) of intermediate mud crab predators. These NCEs are mediated by chemical perception of aversive cues in blue crab urine and produce a behaviorally mediated trophic cascade. Through a series of manipulative experiments, the investigators will examine how the strength of this behaviorally-mediated trophic cascade is modulated and factors that influence perceptive range such as predator diet and intake rate, and the flow environment. The investigators will also determine the chemical identity, concentration and release rate of chemical cues.

Identifying the quantitative and molecular aspects of aversive cues, and linking them to behavioral responses that produce trophic cascades establishes the chemical basis of risk perception by prey and how this translates into cascading ecological effects. The use of perceptive range as a framework for evaluating the effects of both chemistry and environment provides an integrated view of processes affecting chemically-mediated NCEs. The use of a water borne predator-prey signaling system to test ideas on the strength of NCEs should have broad applications.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1234449

[table of contents | back to top]