Relative predation intensity within temperate seagrass habitat during June 2015 (Habitat_Fragmentation project)

Website: https://www.bco-dmo.org/dataset/714252
Data Type: Other Field Results
Version: 1
Version Date: 2017-08-29

Project
» Collaborative Research: Habitat fragmentation effects on fish diversity at landscape scales: experimental tests of multiple mechanisms (Habitat Fragmentation)

Contributors	Affiliation	Role
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Abstract
Our investigation of seagrass edge effects on mesopredators and larger predators took place in Back Sound, North Carolina (34 degrees 40 minutes North, 76 degrees 34 minutes West). Predation-driven mortality (loss rates of tethered individuals) of blue crabs and pinfish were monitored within a 5,600 m2 seagrass meadow at Jack's Island along the southern rim of Back Sound. These predation measurements were collected during June-July, 2015, in connection with the global-scale Zostera Experimental Network study.

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Coverage

Spatial Extent: **Lat**:34.66667 **Lon**:-76.56667
Temporal Extent: 2015-06-10 - 2015-06-24

Dataset Description

Our investigation of seagrass edge effects on mesopredators and larger predators took place in Back Sound, North Carolina (34 degrees 40 minutes North, 76 degrees 34 minutes West). Predation-driven mortality (loss rates of tethered individuals) of blue crabs and pinfish were monitored within a 5,600 m2 seagrass meadow at Jack's Island along the southern rim of Back Sound. These predation measurements were collected during June-July, 2015, in connection with the global-scale Zostera Experimental Network study.

Methods & Sampling

We utilized tethering trials as a proxy of predator-driven mortality of blue crabs and pinfish within edge and interior regions of the seagrass meadow at Jack’s Island. Our design consisted of 21 "edge" (0-1 m from seagrass-sandflat boundary) and 21 "interior"(>3 m from seagrass-sandflat boundary) plots, with each plot defined by two 1x1-m subplots separated from each other by 0.5 m (but with the entirety of each plot being at

the suitable distance for edge/interior designations). Each of the 42 total plots were separated from one another by >2 m. For both the edge and interior treatments, seagrass shoot density was reduced by 50% in a third of the plots, seagrass shoot density was reduced by 80% in another third of the plots, and seagrass shoot density was left at ambient in the final third of plots (all randomly assigned). This resulted in a 2x3 experimental design in which meadow location and shoot density were fully crossed. Reduction of shoot densities was achieved by deploying a 1x1-m quadrant with a 10x10 grid (with each grid cell = 0.01 m2). We then removed all seagrass in 50 or 80 of the cells for the 50% and 80% reduction treatments, respectively. The resultant shoot densities were as follows: ambient treatments had a mean of 575 shoots m-2, 50% reduction treatments had a mean of 283 shoots m-2, and 80% reduction treatments had a mean of 124 shoots m-2.

We deployed 126 tethered blue crabs (5.2 ± 0.1 cm carapace width) and 168 tethered pinfish (5.1 ± 0.1 cm total length) in plots over three and four trials, respectively. We ran one less trial with blue crabs due to the availability of specimens within our preferred size range during our experimental window. All crabs and pinfish were collected via small trawl on the day before deployment. During each trial, a tethered blue crab was randomly assigned to one of the subplots within each plot, while a tethered pinfish was placed in the remaining subplot (i.e., 42 juvenile blue crabs and 42 pinfish were deployed in a trial). Each tethering device consisted of a lawn staple as an anchor placed in the center of a subplot, connected to a 30-cm long section of 3.6-kg clear monofilament fishing line. For blue crabs, the free end of the monofilament was glued to the center of the crab’s carapace after making a lasso around the crab’s body. Blue crabs had each of their claws glued shut using Loctite super glue gel to prevent them from cutting the tether. Pinfish were tethered through the soft tissue immediately behind their lower jaw bone by piercing this tissue, threading the line through the piercing, and the tying an overhand knot in the line. As a method check, we individually tethered >40 blue crabs and >20 pinfish in laboratory tanks outfitted with artificial seagrass. Over a 4-day period, none of the tethered animals became free, tethered pinfish did not behave noticeably different that untethered pinfish also in the tank, and tethered animals did not become entangled in artificial seagrass blades.

Tethered blue crabs and pinfish were deployed in our field experiment ~3 hours before daytime high tides. Following deployment, each tethered animal was checked after 1 hour, 2 hours, 3 hours, and 24 hours to assess loss rates (presumably via predation). Individual blue crabs or pinfish missing at the 1-, 2-, 3-, and 24-hour checks were randomly assigned a survival time ranging between 0-1, 1-2, 2-3, and 3-24 hours, respectively, to acknowledge that we could not be sure within check intervals when predation occurred. Furthermore, this approach insured that we did not artificially reduce variances among replicates. Any animal remaining on its tether after 24 hours was assigned a survival time of 24 hours, and then released.

Data Processing Description

BCO-DMO Processing Notes:
- modified parameter names to conform with BCO-DMO naming conventions
- converted date values from MM/DD/YY to YYYYMMDD
- replaced all empty cells with 'nd' (no data)
- appended site name, latitude, and longitude coordinates to data

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Data Files

File	
nekton_predation.csv	(Comma Separated Values (.csv), 21.25 KB) MD5:bc5155e10b4405456b3fd1adbdd54ead
Primary data file for dataset ID 714252	

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Parameters

Parameter	Description	Units
replicate	Number on float to uniquely ID each tethered prey during each experimental trial.	unitless
start_date	Date on which tethers were deployed (monitored over 24 hours) in YYYYMMDD format	unitless
species	Speceies of observation; Crab = blue crab (Callinectes sapidus); Pinfish = pinfish (lagodon rhomboides)	unitless
tether_along_edge	Identifier for which the side of the seagrass meadow the species was tethered to. E = Edge (0-1m from seagrass-sandflat boundary); I = Interior (>3m from seagrass-sandflat boundary)	unitless
shoot_density	Denisty of seagrass in tethering plot. (A = ambient; 50 = 50% Reduction; 80 = 80% Reduction)	percent (pcnt)
prey_size	carapace width of blue crabs or the standard length of pinfish	milimeters (mm)
time_on_tether	duration time on tether	hours
lat	Our investigation of seagrass edge effects on mesopredators and larger predators took place in Back Sound, North Carolina (34 degrees 40 minutes North, 76 degrees 34 minutes West).	decimal degrees
lon	Our investigation of seagrass edge effects on mesopredators and larger predators took place in Back Sound, North Carolina (34 degrees 40 minutes North, 76 degrees 34 minutes West).	decimal degrees
site_name	name of the site	unitless

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Instruments

Dataset-specific Instrument Name	small trawl
Generic Instrument Name	Trawl_custom
Dataset-specific Description	All crabs and pinfish were collected via small trawl on the day before deployment.
Generic Instrument Description	A net towed through the water column designed to sample free-swimming nekton or fish, varies in design depending on the research project.

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Deployments

Fodrie_HabitatFragmentation

Website	https://www.bco-dmo.org/deployment/714268
Platform	Back_Sound_NC
Start Date	2014-05-01
End Date	2015-06-24
Description	Sampling from 6/10 through 6/25.

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Project Information

Collaborative Research: Habitat fragmentation effects on fish diversity at landscape scales: experimental tests of multiple mechanisms (Habitat Fragmentation)

Coverage: North Carolina

Amount and quality of habitat is thought to be of fundamental importance to maintaining coastal marine ecosystems. This research will use large-scale field experiments to help understand how and why fish populations respond to fragmentation of seagrass habitats. The question is complex because increased fragmentation in seagrass beds decreases the amount and also the configuration of the habitat (one patch splits into many, patches become further apart, the amount of edge increases, etc). Previous work by the investigators in natural seagrass meadows provided evidence that fragmentation interacts with amount of habitat to influence the community dynamics of fishes in coastal marine landscapes. Specifically, fragmentation had no effect when the habitat was large, but had a negative effect when habitat was smaller. In this study, the investigators will build artificial seagrass habitat to use in a series of manipulative field experiments at an ambitious scale. The results will provide new, more specific information about how coastal fish community dynamics are affected by changes in overall amount and fragmentation of seagrass habitat, in concert with factors such as disturbance, larval dispersal, and wave energy. The project will support two early-career investigators, inform habitat conservation strategies for coastal management, and provide training opportunities for graduate and undergraduate students. The investigators plan to target students from underrepresented groups for the research opportunities.

Building on previous research in seagrass environments, this research will conduct a series of field experiments approach at novel, yet relevant scales, to test how habitat area and fragmentation affect fish diversity and productivity. Specifically, 15 by 15-m seagrass beds will be created using artificial seagrass units (ASUs) that control for within-patch-level (~1-10 m2) factors such as shoot density and length. The investigators will employ ASUs to manipulate total habitat area and the degree of fragmentation within seagrass beds in a temperate estuary in North Carolina. In year one, response of the fishes that colonize these landscapes will be measured as abundance, biomass, community structure, as well as taxonomic and functional diversity. Targeted ASU removals will then follow to determine species-specific responses to habitat disturbance. In year two, the landscape array and sampling regime will be doubled, and half of the landscapes will be seeded with post-larval fish of low dispersal ability to test whether pre- or post-recruitment processes drive landscape-scale patterns. In year three, the role of wave exposure (a natural driver of seagrass fragmentation) in mediating fish community response to landscape configuration will be tested by deploying ASU meadows across low and high energy environments.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1635950

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