Data from scallop survival assays conducted as part of a larger concurrent study of fragmentation effects on estuarine faunal communities with Artificial Seagrass Units (ASU) in Back Sound, NC from July to September 2018

Website: https://www.bco-dmo.org/dataset/939581
Data Type: Other Field Results, experimental
Version: 1
Version Date: 2024-10-04

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
This dataset contains metadata and data from scallop survival assays conducted in 2018 (assays across landscape area x fragmentation per se treatments) as part of the following study published in Yarnall et al. (2024): To parse the influences of fragmentation components on scallop survival, we generated nine unique landscapes composed of artificial seagrass units (ASUs), were constructed to mimic Zostera marina. These landscapes were part of a larger-scale concurrent experiment, during which we examined seagrass fragmentation effects on estuarine faunal communities (Yarnall et al. In Press). Landscapes were designed to be treatments along orthogonal axes of seagrass percent cover of the landscape footprint (10%, 35%, 60%) and fragmentation per se, indexed by percolation probability (0.1, 0.35, 0.59). Relative scallop survival was measured by deploying tethered juvenile bay scallops in two density treatments. Five 24-h survival assay trials were conducted from July to September 2018. During each survival assay, observers snorkel surveyed tethers and recorded the number of live and dead scallops per treatment. Data were collected by Drs. F. Joel Fodrie and Amy H. Yarnall for the Estuarine Ecology Laboratory of the University of North Carolina at Chapel Hill's Institute of Marine Sciences.

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Coverage

Location: Oscar Shoal in Back Sound, NC, USA
Spatial Extent: **N**:34.706 **E**:-76.588 **S**:34.7 **W**:-76.604
Temporal Extent: 2018-07 - 2018-09

Methods & Sampling

To parse the influences of fragmentation components on scallop survival, we generated nine unique landscape grids of 15 × 15 cells. Each cell was the size of an ASU, making the landscape area = 234 m^2 (18-m × 13-m). These landscapes were part of a larger-scale concurrent experiment, during which we examined seagrass fragmentation effects on estuarine faunal communities (Yarnall et al. In Press). Landscapes were designed to be treatments along orthogonal axes of seagrass percent cover of the landscape footprint (10%, 35%, 60%) and fragmentation *per se*, indexed by percolation probability (0.1, 0.35, 0.59).

Relative scallop survival was measured using tethered juvenile bay scallops of initial shell height (SH) 3-5 mm, provided by the Castagna Shellfish Research Hatchery at The Virginia Institute of Marine Science, Eastern Shore Laboratory (VIMS ESL) in Wachapreague, VA. The knotted end of 10-cm segment of 12-lbs test monofilament was dotted with cyanoacrylate glue and pressed into a scallop's ventral shell ridge under a tab of duct tape. Each tether was then anchored to a 30-cm lawn staple and held overnight in aquaria to check attachment integrity. Tethers were then deployed across landscapes the following day.

To examine whether landscape configuration could mediate density-dependent predation rates on scallops, tethers were deployed in low (1x = 4 or 5 m^{-2}) and high (6x = 24 or 30 m^{-2}) density treatments (x was chosen based on scallop availability). All scallop tethers were placed ≤1-m from the seagrass-sandflat interface on randomly selected edge (interface-bordering) ASUs, to avoid potential edge effects. Five 24-h survival assay trials were conducted from July to September 2018. Because predation rates after 24 h were high during the first trial, when scallops were smallest, tethers were also checked at 2 h and 6 h during subsequent trials. However, preliminary analysis revealed that across trials, predation rates after 2 h and 6 h were too low to provide resolution among landscape treatments; therefore, only results for cumulative survival after 24 h are presented.

During each survival assay, observers snorkel surveyed tethers and recorded the number of live and dead scallops per treatment. During the first trial, ten tethered dead scallop shells (valves glued shut) were deployed as an additional tether integrity control. However, controls were depredated at similar rates to live scallops, as evinced by crushed shells. For all subsequent trials, control tethers were deployed in cages constructed from cuboid PVC frames covered by mesh VEXAR®. Attachment failure occurred in <3% of all caged-control tethers, therefore no adjustments to scallop recovery rates were necessary.

Depth note: Depth ranges were similar across all sites as they were located on a single shoal (Oscar Shoal in Back Sound, NC, USA). Depths typically ranged from <0.5 m (at low tide) to 1.5-2 m (at high tide).

Organism identifiers (common name, scientific name, LSID):
bay scallop, *Argopecten irradians*, urn:lsid:marinespecies.org:taxname:156817

Data Processing Description

All data were entered electronically into an Excel spreadsheet.

BCO-DMO Processing Description

* Sheet "Data" of submitted file "Scallop_Survival_Assay_2018.xlsx" was imported into the BCO-DMO data system for this dataset.
** In the BCO-DMO data system missing data identifiers are displayed according to the format of data you access. For example, in csv files it will be blank (null) values. In Matlab .mat files it will be NaN values. When viewing data online at BCO-DMO, the missing value will be shown as blank (null) values.

* DateTime with time zone column added "ISO_DateTime_UTC_In." Converted from Date_In and Time_In (from local EST/EDT to UTC) converted to ISO 8601 format.

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Data Files

File
939581_v1_scallop-survival-assays.csv (Comma Separated Values (.csv), 44.76 KB) MD5:3c29a42db3d1ac1e550c30bc63c9d97c Primary data file for dataset ID 939581, version 1

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Related Publications

Yarnall, A. H., Yeager, L. A., Lopazanski, C., Poray, A. K., Morley, J. M., Hurlbert, A., and Fodrie, F.J. Habitat area more consistently affects seagrass faunal communities than fragmentation per se.
Methods

Yarnall, A. H., Yeager, L. A., Lopazanski, C., Poray, A. K., Morley, J. W., Hurlbert, A. H., & Fodrie, F. J. (2024). Habitat area more consistently affects seagrass faunal communities than fragmentation per se. Ecological Monographs. Portico. https://doi.org/10.1002/ecm.1629
Results

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Related Datasets

IsRelatedTo

Yarnall, A., Fodrie, F. J., Lopazanski, C., Poray, A. K., Yeager, L. (2023) **Landscape fine-scale complexity of seagrass, fish and macroinvertebrate communities within Artificial Seagrass Units (ASU) in Back Sound, NC from July to September 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-17 doi:10.26008/1912/bco-dmo.891652.1 [view at BCO-DMO]
Relationship Description: Datasets collected concurrently as part of the same study in Back Sound, NC.

Yarnall, A., Fodrie, F. J., Lopazanski, C., Poray, A. K., Yeager, L. (2023) **Landscape parameters of seagrass, fish and macroinvertebrate communities within Artificial Seagrass Units (ASU) in Back Sound, NC from July to September 2018.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-03-27 doi:10.26008/1912/bco-dmo.891670.1 [view at BCO-DMO]
Relationship Description: Datasets collected concurrently as part of the same study in Back Sound, NC.

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Parameters

Parameter	Description	Units
Site_ID	Artificial seagrass unit (ASU) landscape name (Percent cover value-Percolation probability value)	unitless
Per_cov	Percent cover of ASUs in 234 m^2 landscape footprint (10, 35, 60)	percent (%)
Frag	ASU landscape fragmentation per se indexed by percolation probability (0.1, 0.35, 0.59)	unitless

lat	Landscape latitude north	decimal degrees
lon	Landscape longitude west	decimal degrees
Date_In	Date of scallop tether deployment (local time zone EST/EDT)	unitless
Time_In	Time of scallop tether deployment (local time zone EST/EDT, 24hr)	unitless
ISO_DateTime_UTC_In	DateTime with timezone of scallop tether deployment (ISO 8601 format in timezone UTC)	unitless
Check_num	Interval of scallop tether check 2 h, 6 h, 24 h	unitless
Date_check	Date of scallop tether check (local time zone EST/EDT)	unitless
Time_check	Time of scallop tether check (local time zone EST/EDT, 24hr)	unitless
H_tide	Time of high tide proximate to scallop tether check (local time zone EST/EDT, 24hr)	unitless
L_tide	Time of low tide proximate to scallop tether check (local time zone EST/EDT, 24hr)	unitless
WaterTemp_C	Surface water temperature at time of scallop tether check	degrees C
Sal_PSU	Surface salinity at time of scallop tether check	Practical Salinity Units (PSU)
Cell_coord	ASU landscape "cell coordinate" by C (column; out of 15) and R (row; out of 15) number. See "Methods & Sampling" section for additional details of survey design for grid cells.	unitless
Treatment	Scallop tether density treatment. CC= "Caged Controls" - dead scallop shell tether controls in a cage; DC= "Dead Controls" - dead scallop shell tether controls (not caged); H= "High density treatment"; L= "Low density treatment"	unitless
Density_initial	Number of scallop tethers deployed for high or low density treatment	number per meter squared (per m2)
Live_check	Number of live tethered scallops at time of check	count

Dead_check	Number (since last check) of dead/eaten/missing tethered scallops at time of check	count
Dead_total	Cumulative number (since deployment) of dead/eaten/missing tethered scallops at time of check	count
Shell_gone	Number of missing tethered scallops whether the complete tether is present in Dead_check	count
Shell_intactdead	Number of intact dead shells of tethered scallops in Dead_check	count
Shell_intacthalf	Number of intact half shells (i.e., one valve) of tethered scallops in Dead_check	count
Shell_fragment	Number of fragmented/chrushed tethered scallops in Dead_check	count
Tether_snipped	Number of missing tethered scallops where the tether has been snipped in Dead_check	count
Shell_chipped	Number of chipped shell tethered scallops in Dead_check	count
Shell_drilled	Number of drilled shell tethered scallops in Dead_check	count
Not_found	Number of tethers not relocated. This number was substracted from initial density (i.e., removed from the experiment)	count
Notes	Observational notes on tethered scallops	unitless

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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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