Scallop density survey data across landscape fragmentation per se treatments in June, July, and August 2019 in Back Sound, NC

Website: https://www.bco-dmo.org/dataset/939617
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 for scallop density surveys across landscape fragmentation per se treatments in June, July, and August 2019. These data were collected as part of the following study published in Yarnall et al. (2024): To explore the independent influence of fragmentation per se (patchiness) on mobile juvenile bay scallop (Argopecten irradians) density, we constructed 16 artificial seagrass unit (ASU) landscapes, consisting of four replicates each of four treatments. Fragmentation per se treatments consisted of three levels of patchiness while maintaining consistent total ASU area. We also examined the effect of patch-scale position on scallop densities. Freely mobile juvenile scallops were placed at a consistent density (indiv. m-2) across landscapes for three density survey trials, one each during June, July, and August 2019. Observers snorkel surveyed each landscape at 24 h, 48 h, and 72 h during each trail, and recorded the number of scallops per ASU. 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: 2019-06 - 2019-08

Dataset Description

ASU = artificial seagrass unit
VIMS ESL = Eastern Shore Laboratory | Virginia Institute of Marine Science

Methods & Sampling

To explore the independent influence of fragmentation *per se* (patchiness) on mobile juvenile bay scallop (*Argopecten irradians*) density, we constructed 16 artificial seagrass unit (ASU) landscapes (12-m x 10-m), consisting of four replicates each of four treatments. Fragmentation *per se* treatments consisted of three levels of patchiness (i.e., 1 patch, 12 patches, 24 patches) while maintaining consistent total ASU area (48 ASUs, 50 m^2 artificial seagrass). Between treatments of 12 and 24 patches, differences in configuration could be achieved by either varying interpatch distances or total footprint area. Therefore, we used two 12-patch treatments to consider these covariates separately, as indicated by footprint sizes (i.e., 12 patches-small versus 12 patches-large). We also examined the effect of patch-scale position on scallop densities. Relative 'inner' and 'outer' positions were operationally defined for 1-patch and multi-patch landscapes, separately. Within 1-patch landscapes, ASUs that bordered sandflat were considered 'outer' positions, while 'inner' positions were defined by ASUs that only bordered other ASUs. Within multi-patch landscapes, 'outer' positions were patches that had no additional patches between them and the landscape footprint border. 'Inner' position patches were centrally located patches in the landscape.

Freely mobile (non-tethered) juvenile scallops of SH 43.1 ± 6.8 mm [mean ± SD] were placed at a consistent density (indiv. m^{-2}) across landscapes for three density survey trials, one each during June, July, and August 2019. Prior to each trial, landscapes were snorkeled to confirm that no scallops were present. Due to the isolation of these ASU landscapes and the general rarity of scallops on Oscar shoal, we were reasonably certain all scallops in these landscapes were purposefully placed there, meaning there was no immigration from other ASU landscapes or natural seagrass. For June and July trials, all scallops were collected from a natural seagrass meadow located across a deep boating channel from the experimental landscapes. During August, a mixture of scallops from two sources was used: from the nearby meadow, and NC-descendant scallops of similar size provided by VIMS ESL. Before scallop placement in landscapes, all scallops were stored in outdoor estuary-fed flow-through aquaria for up to two weeks. During June and July trials, scallops were placed in all 16 landscapes at an initial density of 1 m^{-2} (i.e., one per ASU), allowing for resolution in landscape treatment effects while maintaining relative comparability to natural conditions in our system (i.e., 0.6 scallops m^{-2} in the nearby scallop-source meadow). By the conclusion of the July trial, landscapes along one shoal margin were becoming substantially buried under sediment due to wave/current action. Therefore, for the August trial the number of landscape treatment replicates was reduced to three to exclude the buried replicates, and a 1-patch landscape replicate was rebuilt in a calmer area of the shoal. In addition, during the August trial, the initial scallop density was increased to 2 m^{-2} (i.e., two per ASU) to increase resolution among habitat treatments. Observers snorkel surveyed each landscape at 24 h, 48 h, and 72 h during each trail, except for the 48-h survey in June, which was canceled due to inclement weather. During each survey, observers recorded the number of scallops per ASU. On rare occasions when scallops were found on sand <1 m from an ASU, their count was assigned to that nearest ASU, as they were likely still using the artificial seagrass mosaic as habitat.

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
Tulip whelk,*Fasciolaria*,urn:lsid:marinespecies.org:taxname:138001
Knobbed whelk,*Busycon carica*,urn:lsid:marinespecies.org:taxname:160185
Horse conch,*Triplofusus papillosus auct.*,urn:lsid:marinespecies.org:taxname:448509
Moon snail,*Neverita duplicata*,urn:lsid:marinespecies.org:taxname:160407
Lightning whelk,*Sinistrofulgur sinistrum*,urn:lsid:marinespecies.org:taxname:862934

Data Processing Description

All data were entered electronically into an Excel spreadsheet.

BCO-DMO Processing Description

* Sheet "Data" of submitted file "Scallop_Density_2019.xlsx" were imported into the BCO-DMO data system for

this dataset. Values "NA" imported as missing data values.
** 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.

* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]

* 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.

* Species names provided in email correspondence were added to the metadata for this dataset. LSIDs added from World Register of Marine Species (WoRMS) matches on 2024-10-10. "Triplofusus papillosus" matched to "Triplofusus papillosus auct.",urn:lsid:marinespecies.org:taxname:448509

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Data Files

File
939617_v1_scallop-density-survey.csv (Comma Separated Values (.csv), 665.74 KB) MD5:5721c4c665321404c42e2f0594d57515 Primary data file for dataset ID 939617, version 1

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Related Publications

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. (2024) **Canopy height and epiphyte biomass of artificial seagrass landscapes in June, July, and August 2019 in Back Sound, NC.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-10-10 doi:10.26008/1912/bco-dmo.939609.1 [view at BCO-DMO]
Relationship Description: Datasets collected concurrently as part of the same study.

Yarnall, A., Fodrie, F. J. (2024) **Data from minnow traps placed across landscape fragmentation per se treatments in June, July, and August 2019 in Back Sound, NC to accompany scallop density surveys.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-10-11 doi:10.26008/1912/bco-dmo.939592.1 [view at BCO-DMO]
Relationship Description: Datasets collected concurrently as part of the same study.

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Parameters

Parameter	Description	Units
Site_ID	Artificial seagrass unit (ASU) landscape name (Number of patches, footprint size, relicate letter)	unitless
Landscape	Landscape confirguration type (Number of patches, footprint size)	unitless
Num_patches	Number of patches in landscape configuration (1, 12, 24)	count
Footprint	Landscape footprint size (contiguous, small, large)	unitless
Rep_letter	Landscape configuration letter (a-e)	unitless
lat	Landscape latitude north	decimal degrees
lon	Landscape longitude west	decimal degrees
Date_check	Date of scallop density check (local time zone EST/EDT)	unitless
Month	Month of scallop density check	unitless
Check_num	Interval of scallop tether check 24 h, 48 h, 72 h	unitless
Time_check	Time of scallop density check (local time zone EST/EDT, 24h)	unitless
ISO_DateTime_UTC_check	DateTime with timezone of scallop density check (ISO 8601 format in timezone UTC)	unitless
H_tide	Time of high tide proximate to scallop tether check	unitless
L_tide	Time of low tide proximate to scallop tether check	unitless
Position	Patch-scale position (Inner, Outer)	unitless
Patch_type	Relative location of patch within landscape configuration (Inner, Outer, NA)	unitless
Edge_Interior	Edge or interior ASU	unitless

Cell_coord	ASU "cell coordinate" by C (column; out of 6) and R (row; out of 8) number	unitless
Scallop_density	Number of scallops on ASU Cell_coord	number per square meter (#/m2)
Sand_density	Number of scallops on sand <1-m from ASU Cell_coord	number per square meter (#/m2)
Tulip_whelk	Number of Tulip whelk (Fasciolaria). Life Science Identifier (LSID)=urn:lsid:marinespecies.org:taxname:138001	number per square meter (#/m2)
Knobbed_whelk	Number of Knobbed whelk (Busycon carica). Life Science Identifier (LSID)=urn:lsid:marinespecies.org:taxname:160185	number per square meter (#/m2)
Horse_conch	Number of Horse conch (Triplofusus papillosus auct.). Life Science Identifier (LSID)=urn:lsid:marinespecies.org:taxname:448509	number per square meter (#/m2)
Moon_snail	Number of Moon snail (Neverita duplicata). Life Science Identifier (LSID)=urn:lsid:marinespecies.org:taxname:160407	number per square meter (#/m2)
Lightning_whelk	Number of Lightning whelk (Sinistrofulgur sinistrum). Life Science Identifier (LSID)=urn:lsid:marinespecies.org:taxname:862934	number per square meter (#/m2)

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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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