# Canopy height and epiphyte biomass of artificial seagrass landscapes in June, July, and August 2019 in Back Sound, NC

**Website**: https://www.bco-dmo.org/dataset/939609
**Data Type**: Other Field Results, experimental
**Version**: 1
**Version Date**: 2024-10-10

**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 canopy height and epiphyte biomass of artificial seagrass landscapes 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. We were also interested in examining fine-scale complexity influences scallop density. In June, July, and August 2019 fine-scale habitat complexity metrics, including ASU canopy height and epiphyte biomass, were sampled across landscapes where mobile scallops were present. 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**:34.705 **E**:-76.59 **S**:34.705 **W**:-76.595
**Temporal Extent**: 2019-06 - 2020-02

## Dataset Description

ASU = artificial seagrass unit

**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.

We were also interested in the relative importance of landscape fragmentation *per se* versus fine-scale complexity metrics (i.e., artificial seagrass canopy height, epiphyte biomass) in influencing scallop density within structured seagrass. Therefore, in June, July, and August 2019 fine-scale habitat complexity metrics, including ASU canopy height and epiphyte biomass, were sampled from five ASU ribbons, haphazardly selected per landscape, to assess complexity across entire landscapes where mobile scallops were present.

The habitat features of ASUs have the potential to be modified by sediment burial or scour after installation. Therefore, during each of June, July, and August 2019, five ASU ribbons were haphazardly selected per landscape to assess complexity across entire landscapes. ASU ribbons were clipped at the sediment surface and measured to approximate canopy height (altered by ASU burial under sand). In the lab, epiphytes were scraped off each side of the ribbon (which was discarded), then dried for 12 h at 60˚C, and burned for 4 h at 500˚C to determine ash content (Peterson and Heck 2001). Ash-free dry epiphyte biomass (hereafter "epiphyte biomass") was calculated as dry weight – ash weight, then divided by the surface area of the ribbon to obtain standardized epiphyte biomass (mg $cm^{-2}$).

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).

Time note: Collections were performed in 2019 and subsequent analyses were performed in 2020 (see columns Date_collected, Date_scraping, Date_dried, Date_burned for exact dates).

Organism identifiers used in metadata (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_ASU_Fine-scale_Complexity_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_check." Converted from Date_check and

Time_check (from local EST/EDT to UTC) converted to ISO 8601 format.

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## Data Files

| File |
|---|
| **939609_v1_scallop-density-survey-finescale-complexity.csv** (Comma Separated Values (.csv), 26.03 KB) MD5:e9a1fb278cc02d18644c0027e9d08ec2<br>Primary data file for dataset ID 939609, version 1 |

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## Related Publications

Peterson, B., & Heck, K. (2001). An experimental test of the mechanism by which suspension feeding bivalves elevate seagrass productivity. Marine Ecology Progress Series, 218, 115–125. https://doi.org/10.3354/meps218115
*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. (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.*

Yarnall, A., Fodrie, F. J. (2024) **Scallop density survey data across landscape fragmentation per se treatments in June, July, and August 2019 in Back Sound, NC.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-10-04 doi:10.26008/1912/bco-dmo.939617.1 [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, replicate letter) | unitless |
| Landscape | Landscape configuration type (Number of patches, footprint size) | unitless |
| Num_patches | Number of patches in landscape configuration (1, 12,24) | integer |
| 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 |
| Month | Month of ASU ribbon collection (e.g. "June") | unitless |
| Date_collected | Date of ASU ribbon collection | unitless |
| Height | Length of ASU ribbon | millimeters (mm) |
| Date_scraping | Date of ASU ribbon epiphyte scraping | unitless |
| Tin_wt | Weight of tin for epiphyte scraping | grams (g) |
| Date_dried | Date of ASU ribbon epiphyte scraping was dried for 12 h in oven at 60 deg C | unitless |
| Dry_wt | Weight of tin and epiphyte scraping after drying | grams (g) |
| Date_burned | Date of ASU ribbon epiphyte scraping was burned for 4 h in oven at 500 deg C | unitless |
| Ash_wt | Weight of tin and epiphyte scraping after burning | grams (g) |

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## Instruments

| | |
|---|---|
| **Dataset-specific Instrument Name** | Scale: Ohaus H-5276 |
| **Generic Instrument Name** | scale or balance |
| **Generic Instrument Description** | Devices that determine the mass or weight of a sample. |

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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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