Log response ratios to seagrass edge and fragmentation effects from peer-reviewed literature

Website: https://www.bco-dmo.org/dataset/864783
Data Type: Other Field Results, document
Version: 1
Version Date: 2021-12-01

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 was obtained by searching the Institute of Science Information's (ISI) Web of Science, last accessed on May 13, 2021, to gather peer-reviewed literature examining edge effects and fragmentation effects on biogenic complexity, faunal densities, and predation in seagrass ecosystems. The dataset represents log response ratios to seagrass edge and fragmentation effects from these studies.

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Coverage

Spatial Extent: **N**:59.92275 **E**:-0.39808616973 **S**:-34.25 **W**:-9.740833
Temporal Extent: 1990-06 - 2017-08

Acquisition Description

Literature search and meta-analysis inclusion criteria
We conducted a search using the Institute of Science Information's (ISI) Web of Science (last accessed on May 13, 2021) to gather peer-reviewed literature examining edge effects and fragmentation effects on biogenic complexity, faunal densities, and predation in seagrass ecosystems. Search terms included 1) seagrass AND 2) edge effects OR fragmentation effects AND 3) density OR predation OR survival OR

mortality OR trophic interactions. We supplemented this database with additional articles known to us. All candidate studies were judged for inclusion in our meta-analysis based on the following criteria: 1) The study was an original experiment in a mesocosm or natural setting providing edge effect data (i.e., responses in patch edges vs. interiors) or fragmentation effect data (i.e., responses in fragmented vs. continuous landscapes) for one or more of our response metrics of interest in extractable form (i.e., table, figure, or text). Response metrics were natural seagrass shoot density, faunal density, and predation survival. Initially, we considered several metrics of biogenic complexity because they may respond to habitat configuration differently, yet shoot density was ultimately chosen as it was the most common metric reported. Shoot density data were only extracted from studies also examining faunal response metrics, because we were interested in examining faunal-habitat relationships in the context of proximate (e.g., shoot density) and ultimate (e.g., edge, fragmentation) drivers. For faunal density responses, if data for “nested” taxonomic levels were provided (e.g., fish, flounder), we extracted data for the lowest taxonomic level available. Prey survival responses included data expressed as, or converted to, proportion survival or survival time (e.g., h to consumption) of sessile or tethered prey. Only survival from uninhibited predator exposure was considered. 2) The response metric(s) included the mean, sample size, and either standard error (SE), standard deviation (SD), or confidence interval (CI). 3) Levels of edge effects (e.g., edge, interior) and fragmentation (e.g., fragmented, continuous) were typically expressed as discrete categories. Therefore, we accepted the operational definitions used by these studies, but also included meta-data such as edge/interior widths and distances, and fragmentation degree in our database to illustrate the range of definitions used across studies. All included studies examined fragmentation as a state (i.e., configuration), rather than an active process (i.e., changing configuration through time). For studies that included more than two discrete levels of edge (e.g., integer distances) or fragmentation (e.g., continuous, patchy, very patchy), only the most extreme levels were included in effect size calculations (e.g., the distances closest to the patch edge and center; the most continuous and fragmented landscape classifications). Figure data was extracted using DataThief III software (Tummers, 2006).

Calculating Log Response Ratios
Refer to the attached Supplemental File, "864783_Calculating_Log_Response_Ratios.pdf" for a description of how the log response ratios were calculated.

Processing Description

Data Processing:
All data were entered electronically into an Excel spreadsheet. Figure data were extracted using DataThief III software (Tummers, 2006). To quantify edge and fragmentation effects across studies, we calculated log response ratios (LRRs) using methods described by Hedges et al. (1999) within the R computing environment (v. 4.1.0; R Core Team 2021).

BCO-DMO Processing:
- Added columns for month_start, year_start, month_end, year_end;
- Adjusted field/parameter names to comply with BCO-DMO naming conventions;
- Removed commas or replaced them with semi-colons;
- Added a conventional header with dataset name, PI names, version date.

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Supplemental Files

File	
Calculating Log Response Ratios filename: 864783_Calculating_Log_Response_Ratios.pdf	(Portable Document Format (.pdf), 465.77 KB) MD5:19f41a8d54b8ac3387253c1a9fcdccdb
References filename: 864783_Complete_References.pdf	(Portable Document Format (.pdf), 428.86 KB) MD5:48823ed7460e21dcb875685574b2b96c

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Related Publications

Hedges, L. V., Gurevitch, J., & Curtis, P. S. (1999). THE META-ANALYSIS OF RESPONSE RATIOS IN EXPERIMENTAL ECOLOGY. Ecology, 80(4), 1150–1156. doi:10.1890/0012-9658(1999)080[1150:tmaorr]2.0.co;2
Results

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Parameters

Parameter	Description	Units
study_type	The focus of the study: edge effects or fragmentation effects, references may have both options in different rows	unitless
reference	Short formatted reference (i.e., Able 2005); for complete citations refer the Supplemental File "864783_Complete_References.pdf".	unitless
month_start	Approximate sampling start month of study	unitless
year_start	Approximate sampling start year of study	unitless
month_end	Approximate sampling end month of study	unitless
year_end	Approximate sampling end year of study	unitless
latitude	Approximate sampling latitude North	decimal degrees
longitude	Approximate sampling longitude East (West is negative)	decimal degrees
location	Name of the location where the study was conducted	unitless
global_region	Global region in which the study took place: North America, Europe, Asia-Pacific; Africa	unitless
sg_type	Denotes whether the experiement or survey took place with natural or artifical seagrass	unitless
sg_spp	Species of (natural or artificially immitated) seagrass in study; commas between species if more than one	unitless
frag_def	For study_type = fragmentation; Operational definitions of the fragmented landscape	Given in cell
cont_def	For study_type = fragmentation; Operational definitions of the continuous landscape	Given in cell
edge_def	For study_type = edge effect; Operational definitions of the patch edge	unitless
int_def	For study_type = edge effect; Operational definitions of the patch interior	unitless

covariate	If the publication separated results by a covariate (e.g., site, month, patch size), covariate decribed here	unitless
covariate_level	The level of the covariate (e.g., site a, site b); if 'all', data from non-independent spatial or temporal replicates have be combined according to Hedges et al. (1999)	unitless
data_source	Table, Figure, or Text page from which the data were collected	unitless
collected	Data collection method (e.g., gear type) used by the original publication author(s)	unitless
target_taxon	Faunal taxonomic level for which density or survival data were available (NA if biotic response is shoot density)	unitless
broad_taxon	Lowest available faunal taxonomic level for LRRi (NA if biotic response is shoot density)	unitless
lowest_taxon	Broad faunal taxon or guild: fish, invertebrate, nekton (NA if biotic response is shoot density)	unitless
guild	Habitat zonation of fauna	unitless
biotic_response	Shoot density, (faunal) Density, or Survival	unitless
RR	Response Ratio: The ratio of the mean response in patch edges (X_e) or fragmented landscapes (X_f) over the mean response in patch interiors (X_i) or continuous landscapes (X_c), respectively	unitless
LRRi	Ln of the response ratio	units
Vi	Sampling error term or within-experiment variance as calculated by Hedges et al. (1999)	units

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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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