Recruitment composition of sessile marine invertebrate communities across latitude (Competition and Predation across Latitude)

Website: https://www.bco-dmo.org/dataset/863126
Data Type: Other Field Results
Version: 1
Version Date: 2021-10-13

Project
» Community Effects of Competition and Predation across Latitude and Implications for Species Invasions (Competition and Predation across Latitude)

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Abstract
Composition of newly recruited communities of sessile marine invertebrates from coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Caging treatments were employed to test the effect of predation on recruitment. Monitoring began in Alaska in June 2015, California in May 2016, Mexico in June 2017 and Panama in December 2015.

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Coverage

Spatial Extent: **N**:55.4726 **E**:-79.5218 **S**:8.9128 **W**:-131.797
Temporal Extent: 2015-01-03 - 2018-06-14

Dataset Description

Composition of newly recruited communities of sessile marine invertebrates from coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Caging treatments were employed to test the effect

of predation on recruitment.

Methods & Sampling

Methodology:

Marine invertebrates recruited onto PVC settlement panels (14 x 14cm) that were hung face down on floating docks one meter below the water surface at local marinas at three coastal sites in each region (Alaska, California, Mexico, Panama). Panels were exchanged every two weeks with clean panels for 12 months. Communities were recruited under the following treatments: full cage (i.e. reduced predation), partial cage (i.e. procedural cage control; ambient predation) and (c) no cage (i.e. ambient predation). Caging materials had a mesh size of 0.635 cm.

Experiments were initiated in Alaska in June 2015, California in May 2016, Mexico in June 2017, and Panama in December 2015.

Sampling and analytical procedures:

Following the recruitment period, communities were retrieved and examined under a stereoscope. Newly recruited communities were assessed for number and identity of individuals. Recruitment was quantified on a standardized area of the panel (100 cm2 on a pre-assigned corner). Individuals were classified into distinct sessile morpho-taxonomic taxa based on a combination of growth form and taxonomy.

Data Processing Description

BCO-DMO Processing Notes:

- Dates converted to YYYY-MM-DD format

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Data Files

File	
h_biovision_dataarchive_recruitmentdata_28feb22-1.csv	(Comma Separated Values (.csv), 13.47 MB) MD5:321651cad406c8801fcbac91d3dfd47e
Primary data file for dataset ID 863126	

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Related Publications

Freestone, A. L., Torchin, M. E., Jurgens, L. J., Bonfim, M., López, D. P., Repetto, M. F., ... Ruiz, G. M. (2021). Stronger predation intensity and impact on prey communities in the tropics. Ecology, 102(8). doi:10.1002/ecy.3428
Related Research

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Parameters

Parameter	Description	Units
Region	Region where each taxon was collected (Alaska, California, Mexico, Panama)	unitless
Site_name	Complete site name	unitless
Site_code	Unique site abbreviation (two letter code)	unitless
Latitude	Latitude of site where communities recruited. Negative values indicate South.	decimal degrees
Longitude	Longitude of site where communities recruited. Negative values indicate West.	decimal degrees
Treatment_type	Treatment description. FC =full cage; NC = no cage; PC = partial cage	unitless
Panel_number	Panel (community) reference number. Note: these numbers can repeat within a region. Unique samples denoted by a combination of Panel_number and Date_retrieved.	unitless
Date_deployed	Date when experimental communities (panels) were deployed for a 2 week recruitment period. Format: YYYY-MM-DD.	unitless
Date_retrieved	Date when experimental communities (panels) were retrieved after a 2 week recruitment period. Format: YYYY-MM-DD.	unitless
Date_sampled	Date when experimental communities (panels) were sampled after retrieval. Format: YYYY-MM-DD.	unitless
TaxaName	Standardized morpho-taxonomic groups based on growth form and taxonomy. Anemone = Sea anemones; Bivalvia = Mussels, clams and oysters; BryoEncrSheet = Encrusting Bryozoans with sheet-like colonies; BryoErect = unspecific upright erect growth Bryozoans; BryoErectBranch = Arborescent hard-bodied colonial Bryozoans; BryoErectSoft = Colonial soft-bodied upright Bryozoans; Bryozoa = Bryozoan with unspecific growth; Cirripedia = Barnacles; Entoproct; Hydrozoa; Polychaeta = unspecific growth marine worms; PolySab = Soft tube building worms, Family Saballidae; PolySerp = Calcareous long tube worms, Family Serpullidae; PolySpiro = Calcareous spiral tube worms, Family Spirorbidae; Porifera = Sponges; Tunicata = unspecific growth ascidian; TuniCol = Colonial ascidians with sheet-like colonies; TuniSol = Solitary ascidians.	unitless
Count	Total number of individuals of each taxon on each panel	unitless

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Instruments

Dataset-specific Instrument Name	PVC settlement panels
Generic Instrument Name	Grooved PVC settlement plate
Dataset-specific Description	Marine invertebrates recruited onto PVC settlement panels (14 x 14cm) that were hung face down on floating docks one meter below the water surface at local marinas at three coastal sites in each region (Alaska, California, Mexico, Panama). Panels were exchanged every two weeks with clean panels for 12 months.
Generic Instrument Description	An artificial colonization substrate made of a sheet of PVC with engraved lines to roughen its surface. It is used to determine the extent of colonization and/or the diversity of settled organisms in a marine or artificial environment.

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Project Information

Community Effects of Competition and Predation across Latitude and Implications for Species Invasions (Competition and Predation across Latitude)

Coverage: Eastern Pacific in four coastal regions: Ketchikan, Alaska; San Francisco, California; La Paz, Mexico; and Panama City, Panama

Description from NSF award abstract:
Global patterns of biodiversity demonstrate that most of the species on earth occur in the tropics, with strikingly fewer species occurring in higher-latitude regions. Biologists predict that this global pattern of species diversity is likely shaped by thee ecological interactions between species. Yet few detailed experimental data exist that demonstrate how species interactions influence natural communities from the tropics to the arctic. Therefore, a significant opportunity exists to transform our understanding of how these fundamental species interactions shape patterns of biodiversity across the globe. Furthermore, these species interactions have the strong potential to limit potentially harmful biological invasions by non-native species, which are often transported by human activities that can breach historical dispersal barriers, such as ocean basins and continents. Biological invasions can cause undesired ecological and economic effects and are considered one of the primary drivers of global change. Through extensive field research on marine ecosystems along the Pacific Coast of North and Central America, from the tropics to the subarctic, this project will study ecological factors that shape global patterns of diversity and limit biological invasions.

Biologists have long theorized that the latitudinal diversity gradient may be shaped by stronger species interactions, such as competition and predation, occurring in the tropics than at higher latitudes. Prior research suggests that predation pressure is indeed stronger at lower latitudes, but it is unclear how interactive effects of predation and competition structure communities to maintain these diversity patterns in ecological time. This project represents an international research program to expand ecological understanding of species interactions across latitude. The objectives are to determine the relative influences of two primary species interactions, competition and predation, on patterns of species diversity, community assembly and sensitivity to species invasion. Field research will employ a large-scale experimental approach that focuses on sessile marine invertebrate communities across 47 degrees of latitude (over 7000 km). Experiments will manipulate levels of predation and competition for one year and will be conducted in four regions, ranging from the subarctic to the tropics: Alaska, California, Mexico, and Panama. Communities of sessile marine invertebrates, composed of both native and non-native species, will be examined iteratively under different predation and competition regimes to evaluate community dynamics. The relative importance of a suite of factors, including environmental conditions and recruitment rates, to interaction outcomes will be evaluated.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1434528

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