Richness of experimental marine invertebrate communities across latitude (Competition and Predation across Latitude)

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

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Abstract
Richness of sessile marine invertebrate communities from coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Communities developed for three or 12 months under nine different treatments that tested the effect of predation and competition. Caging was used to reduce predation pressure and biomass removals opened up space, a limiting resource in sessile communities.

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Coverage

Spatial Extent: **N**:55.4726 **E**:-79.5218 **S**:8.9128 **W**:-131.797
Temporal Extent: 2015-06-16 - 2018-09-12

Dataset Description

Richness of sessile marine invertebrate communities from coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Communities developed for three or 12 months under nine different treatments that tested the effect of predation and competition. Caging was used to reduce predation pressure and

biomass removals opened up space, a limiting resource in sessile communities.

Methods & Sampling

Methodology:

Marine invertebrate communities developed on PVC settlement panels (14 x 14 cm) hung on floating docks one meter below the water surface at local marinas at three coastal sites in each region (Panama, Mexico, California, Alaska). Communities developed for three or 12 months under the following treatments: caged (i.e. reduced predation), partial cage (i.e. procedural cage control; ambient predation) and (c) open (i.e. ambient predation). Caging material had a mesh size of 0.635 cm. These treatments were fully crossed with biomass removals of 0%, approximately 20% (actual 18%, 36cm2) or approximately 60% (actual 54%, 107cm2) panel surface scrapes. On panels assigned a removal treatment, a total of three parallel scrapes or one scrape positioned randomly on the surface of the panel to reach the 60% or 20% surface opening was performed, respectively. Communities that assembled for three months received two removal rounds (1 and 2 months after deployment) while those that assembled for 12 months received five rounds (1, 2, 6, 10, and 11 months after deployment) before the richness of each community was assessed. 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 assigned developmental period and approximately one month after the last biomass removal, communities were retrieved and brought back to a laboratory for assessment.

Sessile marine invertebrates from each community were identified to the lowest taxonomic level possible using a stereoscope and were assigned a species or a consistent morphospecies identifier. Identifications were confirmed by taxonomic experts and DNA barcodes whenever possible. Species richness provided here is a comprehensive list of sessile invertebrate species observed per community, including species that were captured in point count (composition) measures and those that were not.

Data Processing Description

BCO-DMO Processing Notes:

- Dates converted to YYYY-MM-DD format
- Strings removed from integers in Deploy_duration column

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Data Files

File	
abc_biovision_dataarchive_mainexp_3mo12mo_26may21-1.csv	(Comma Separated Values (.csv), 2.22 MB) MD5:397db3b911149db6c8756d1f3a374a01
Primary data file for dataset ID 861234	

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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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Related Datasets

IsRelatedTo

Freestone, A. L., Torchin, M. E., Bonfim, M., Jurgens, L. J., López, D. P., Repetto, M. F., Schlöder, C., Ruiz, G. E. (2022) **Biomass of experimental marine invertebrate communities across latitude (Competition and Predation across Latitude).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-09-28 doi:10.26008/1912/bco-dmo.861655.1 [view at BCO-DMO]

IsReferencedBy

Freestone, A. L., Torchin, M. E., Bonfim, M., Jurgens, L. J., López, D. P., Repetto, M. F., Schlöder, C., Ruiz, G. E. (2022) **Composition of experimental marine invertebrate communities across latitude (Competition and Predation across Latitude).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-09-22 doi:10.26008/1912/bco-dmo.861250.1 [view at BCO-DMO]

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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 developed. Negative values indicate South.	decimal degrees
Longitude	Longitude of site where communities developed. Negative values indicate West.	decimal degrees
Plate_ID	Unique panel (community) reference number	unitless
Deploy_date	Date when experimental communities (panels) were deployed for a 3 or 12 month developmental period. Format: YYYY-MM-DD.	unitless
Retrieve_date	Date when experimental communities (panels) were retrieved after a 3 or 12 month developmental period	unitless
Deploy_duration	Length of developmental period (3 or 12-month)	number of months
Treatment_type	Treatment description. full =full cage; open = no cage; partial = partial cage	unitless
Comp_removal	Biomass removal. 0 = no biomass removal; 20 = 20% surface scrape; 60 = 60% surface scrape	unitless
Type	Invertebrate type sessile or mobile	unitless
Morph_taxa	Family or higher taxonomic information. Bare = panel surface on point, no organism present	unitless
Morph_taxa_num	Unique morphospecies number identifier	unitless
MorphName	Lower taxonomic information (~genus/species, if available) based on best available information in the field	unitless
InvStatus	Invasion status: nat = native or cryptogenic, int = introduced	unitless

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Instruments

Dataset-specific Instrument Name	Stereoscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Sessile marine invertebrates from each community were identified to the lowest taxonomic level possible using a stereoscope and were assigned a species or a consistent morphospecies identifier
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

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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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