

Predation intensity on marine invertebrate communities across latitude observed using underwater video (Competition and Predation across Latitude)

Website: <https://www.bco-dmo.org/dataset/863158>

Data Type: Other Field Results

Version: 1

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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

Predation intensity recorded from exposed prey communities at coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Invertebrate communities developed under low predation for three or 12 months within cages. Mature prey communities were then exposed to ambient predation, with a high definition camera recording all predation events during the diurnal period over three days of exposure. This experiment provided an assessment of predation intensity (and predator identity) to complement predator exclusion experiments that measured impact of predators on prey community assembly.

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Coverage

Spatial Extent: N:55.4726 E:-79.5218 S:8.9128 W:-131.797

Temporal Extent: 2014-10-14 - 2017-09-30

Dataset Description

Predation intensity recorded from exposed prey communities at coastal sites across a latitudinal gradient

spanning the subarctic to the tropics. Invertebrate communities developed under low predation for three or 12 months within cages. Mature prey communities were then exposed to ambient predation, with a high definition camera recording all predation events during the diurnal period over three days of exposure. This experiment provided an assessment of predation intensity (and predator identity) to complement predator exclusion experiments that measured impact of predators on prey community assembly.

Acquisition Description

Methodology:

Marine invertebrate communities (prey) 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 (Alaska, California, Mexico, Panama). Communities developed for three or 12 months under reduced predation (in cages). Caging materials had a mesh size of 0.635 cm. Prey communities were temporarily retrieved, then re-deployed without a cage in the same location where they developed. A GoPro camera was mounted a fixed distance from the panel for a short-term, three-day experiment to test the intensity of ambient predation on prey communities.

Sampling and analytical procedures:

Following the assigned development period, prey communities were temporarily retrieved and brought back to a laboratory for assessment. Cages were removed and prey communities were re-deployed in their original location. Panels were attached to one end of an experimental apparatus with a high definition camera mounted 0.4m from the panel. Each panel/camera was mounted to an individual apparatus and deployed separately for five replicates per site per time period. Cameras recorded during the diurnal period for each day of the three-day exposure, with continuous video filming in the morning period (~7am-12pm) and timelapse images (1-second interval) in the afternoon (~12pm-5pm) in all regions. 4 hours of continuous video from the morning and 2 hours of timelapse footage (from the latest available time of day) was viewed, with data collected for each potential predator visit. A predator visit was defined as any mobile predator species (ie. fish) entering a zone one-half the width of the panel around all sides. Each row of data corresponds to a single predator visit on a prey community. Due to the nature of timelapse images, quantitative strike data is only recorded from continuous video footage. Blank fields or "nd" indicate NA values.

Processing Description

BCO-DMO Processing Notes:

- Changed dates to YYYY-MM-DD format
- Removed "mo" string from Deploy_duration column
- Removed "Day" string from Exposure_day column
- Removed "%" string from Size_relative column
- Replaced "," with ";" in Notes column

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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](https://doi.org/10.1002/ecy.3428)

Related Research

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Parameters

Parameter	Description	Units
Region	Region where experiment was conducted (Alaska, California, Mexico, Panama)	unitless
Site_code	Unique site abbreviation	unitless
Site_name	Complete site name	unitless
Latitude	Latitude of site where predation was observed. Negative values indicate South.	decimal degrees
Longitude	Longitude of site where predation was observed. Negative values indicate West.	decimal degrees
Deploy_duration	Length of prey community developmental period (3 or 12-month)	number of months
Plate_ID	Unique panel (prey community) reference number	unitless
Exposure_date	Date of video recording. Format: YYYY-MM-DD.	unitless
Exposure_day	Day of video recording (days 1-3) from three-day exposure experiment	unitless
Video_type	continuous = continuous video footage; timelapse = time-lapse images captured every one second	unitless
Time_interval	AM = morning; PM3 = late afternoon, PM2 = early/mid afternoon	unitless
Hours_processed	total hours processed per video segment (decimal hours)	hours
Predator_common_name	Common name of predator species observed from video	unitless
Predator_scientific_name	Scientific name of predator species observed from video	unitless
Size_relative	estimated size (total length) of predator; reported as % of panel width per visit; panel size is 14x14cm; to convert to estimated length (cm), DIVIDE column by 100 for decimal value, then MULTIPLY by 14 (cm panel length)	cm
Duration_seconds	duration of visit per predator taxa	seconds
Strike_Y_N	Y = visit resulted in predator strike; N = no strike observed during predator visit	unitless
Predator_indiv	alphabetically assigned per video per predator species; new individual label assigned each time the same (or new) species exits/enters the field of view	unitless
Prey_taxon_1	lowest taxonomic description identified for first prey target identified from single visit	unitless
Strikes_number1	total strikes observed on Prey_taxon_1	unitless
Prey1_consumed_Y_N	Y = consumption was observed; N = organism was removed during strike but consumption not observed; for Prey_taxon_1	unitless
Prey_taxon_2	lowest taxonomic description identified for second prey target identified from single visit	unitless
Strikes_number2	total strikes observed on Prey_taxon_2	unitless
Prey2_consumed_Y_N	Y = consumption was observed; N = organism was removed during strike but consumption not observed; for Prey_taxon_2	unitless
Prey_taxon_3	lowest taxonomic description identified for third prey target identified from single visit	unitless
Strikes_number3	total strikes observed on Prey_taxon_3	unitless
Prey3_consumed_Y_N	Y = consumption was observed; N = organism was removed during strike but consumption not observed; for Prey_taxon_2	unitless

Strikes_total	total number of predator strikes observed during visit across all prey items	unitless
Notes	additional notes recorded during video processing	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 three 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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