Intra-annual salinity and temperature variation in four regions 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
Temperature and salinity measurements from coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Environmental variables were obtained at 1 meter below the water surface and are represented in biweekly periods for one year.

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Coverage

Spatial Extent: **N**:55.4726 **E**:-79.5218 **S**:8.9128 **W**:-131.797
Temporal Extent: 2015-07-17 - 2018-06-13

Dataset Description

Temperature and salinity measurements from coastal sites across a latitudinal gradient spanning the subarctic to the tropics. Environmental variables were obtained at 1 meter below the water surface and are represented in biweekly periods for one year.

Methods & Sampling

Methodology:

Environmental variables were obtained from three coastal sites in each of four regions at 1 meter below the water surface. Sites were recreational marinas selected to conduct experiments on marine invertebrate communities. Temperature and salinity measurements were collected from each site for a minimum of one year. Monitoring began in Alaska in June 2015, California in May 2016, Mexico in June 2017 and Panama in December 2015.

Sampling and analytical procedures:

Three HOBO temperature data loggers were deployed at each site to record water temperature every hour for the one-year sampling period. Minimum, maximum and mean temperatures were calculated in biweekly periods. Salinity measurements were recorded biweekly from four standardized locations at each site and averaged.

Data Processing Description

BCO-DMO Processing Notes:

- Converted dates to YYYY-MM-DD format

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Data Files

File	
g_biovision_dataarchive_envdatabiweekly1m_11jun21-1.csv	(Comma Separated Values (.csv), 28.12 KB) MD5:20f66a68c7a4634e3e178ed53fde2835
Primary data file for dataset ID 863108	

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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 measurements were taken (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 measurements were taken. Negative values indicate South.	decimal degrees
Longitude	Longitude of site where measurements were taken. Negative values indicate West.	unitless
Date	End date of each two-week interval for which temperature and salinity measurements were obtained. Format: YYYY-MM-DD.	unitless
Julianday	Standardized continuous count of days, i.e., day-of-the year. From 0 to 366.	unitless
SalinityMean	Mean biweekly salinity in ppt obtained from 1m below the water surface.	ppt
TempBiweeklyMean	Mean biweekly temperature in degrees C obtained from 1m below the water surface.	degrees Celcius
TempBiweeklyMin	Minimum biweekly temperature in degrees C obtained from 1m below the water surface.	degrees Celcius
TempBiweeklyMax	Maximum biweekly temperature in degrees C obtained from 1m below the water surface.	degrees Celcius

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Instruments

Dataset-specific Instrument Name	ProQuatro handheld multiparameter meter, YSI
Generic Instrument Name	Multi Parameter Portable Meter
Dataset-specific Description	Salinity measurements were recorded biweekly from four standardized locations at each site and averaged.
Generic Instrument Description	An analytical instrument that can measure multiple parameters, such as pH, EC, TDS, DO and temperature with one device and is portable or hand-held.

Dataset-specific Instrument Name	HOBO Pendant, Onset, Model UA-002-08
Generic Instrument Name	Onset HOBO Pendant Temperature/Light Data Logger
Dataset-specific Description	Three HOBO temperature data loggers were deployed at each site to record water temperature every hour for the one-year sampling period.
Generic Instrument Description	The Onset HOBO (model numbers UA-002-64 or UA-001-64) is an in-situ instrument for wet or underwater applications. It supports light intensity, soil temperature, temperature, and water temperature. A two-channel logger with 10-bit resolution can record up to approximately 28,000 combined temperature and light measurements with 64K bytes memory. It has a polypropylene housing case. Uses an optical USB to transmit data. A solar radiation shield is used for measurement in sunlight. Temperature measurement range: -20 deg C to 70 deg C (temperature). Light measurement range: 0 to 320,000 lux. Temperature accuracy: +/- 0.53 deg C from 0 deg C to 50 deg C. Light accuracy: Designed for measurement of relative light levels. Water depth rating: 30 m.

Dataset-specific Instrument Name	Salinity Handheld Refractometer
Generic Instrument Name	Refractometer
Dataset-specific Description	Salinity measurements were recorded biweekly from four standardized locations at each site and averaged.
Generic Instrument Description	A refractometer is a laboratory or field device for the measurement of an index of refraction (refractometry). The index of refraction is calculated from Snell's law and can be calculated from the composition of the material using the Gladstone-Dale relation. In optics the refractive index (or index of refraction) n of a substance (optical medium) is a dimensionless number that describes how light, or any other radiation, propagates through that medium.

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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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