

Semibalanus balanoides populations surveys from the southwest of England, UK in 2011-2012 (EUROWINTER2 project)

Website: <https://www.bco-dmo.org/dataset/637445>

Data Type: Other Field Results

Version: 2016-01-29

Project

» [Climate Change and Biogeography: Effects of Extreme Events](#) (EUROWINTER2)

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Dataset Description

This dataset contains survey results of *Semibalanus balanoides* in southwestern UK, 2011-2012

Southward AJ, Crisp DJ. 1963. Barnacles of European waters. Catalogue of main marine fouling organisms, Vol. 1: Barnacles. Organisation for Economic Co-operation and Development Publications, Paris

Methods & Sampling

During early June of 2010 and 2011, 14 intertidal sites were sampled at approximately 10 km intervals, encompassing over 250 km of the coast of Southwest England. During 2012, a subset of 11 of the sites was sampled. At each site, we sampled barnacle populations within the mid-tidal range where *Semibalanus balanoides* are found if present by haphazardly positioning quadrats within this zone. We photographed barnacles attached to the substratum along with a metric tape for determining the size and density of barnacles in each sample. Sites selected for photographic sampling appeared representative of the location. If no individuals identifiable as *S. balanoides* could be located at a site after 30 min of searching, the species was assumed to be absent or very rare at the site, and a density of zero was recorded.

Data Processing Description

A subset of at least 5 images (out of 10 to 30) was selected for analysis from each site during each year. These images were included based on focus quality, as barnacles outside the focal plane could not be

identified. Because of variation in the flatness of the underlying rock, the size of the available space in focus in each image varied; the countable area ranged from 5 to 155 cm², with a mean quadrat size of 32.4 cm². Images were imported into the open-source software ImageJ (Abramoff et al. 2004) for subsequent analysis. *Semibalanus balanoides* individuals were identified based on plate number and shape as described by Southward & Crisp (1963). Differentiation of *S. balanoides* from other common intertidal species in the region, including *Chthamalus stellatus*, *C. montagui*, and *Elminus modestus*, is relatively straightforward, as *S. balanoides* has a diamond shaped operculum and 2 of its 6 shell plates are much narrower than the others (Southward 1976). Individuals were assigned to 3 age classes: young of the year (YOY) 1-year olds and older adults. YOY are readily recognized by having white plates that are well defined, whereas adults are more stained and brown in color and typically have significant fusion and weathering of the plates. The metric tape in each of the photographic quadrats was used to calibrate the ImageJ measurement tool, which was subsequently used to calculate the average density of *S. balanoides* individuals of each age class at each site.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date, reference information
- renamed parameters to BCO-DMO standard
- reformatted date from d-Mon-yy to yyyy-mm-dd
- longitude-180 calculated from lon-360
- replaced blank cells with 'nd'

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Data Files

| File |
|---|
| barnacle_survey_E2.csv (Comma Separated Values (.csv), 41.05 KB) MD5:53c4dc5718bdb0ae158e025600a81624 |
| Primary data file for dataset ID 637445 |

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Related Publications

Abramoff, M.D, Magalhães, P.J., Ram, S.J. 2004. Image processing with ImageJ. *Biophotonics International* 11(7): 36–42
Software

Rognstad, R., Wetthey, D., & Hilbish, T. (2014). Connectivity and population repatriation: limitations of climate and input into the larval pool. *Marine Ecology Progress Series*, 495, 175–183. doi:[10.3354/meps10590](https://doi.org/10.3354/meps10590)
General

Southward, A. J. (1976). On the taxonomic status and distribution of *Chthamalus stellatus* (Cirripedia) in the north-east Atlantic region: with a key to the common intertidal barnacles of Britain. *Journal of the Marine Biological Association of the United Kingdom*, 56(04), 1007. doi:10.1017/s0025315400021044
<https://doi.org/10.1017/S0025315400021044>
Methods

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Parameters

| Parameter | Description | Units |
|--------------------|---|-----------------|
| site | sampling location | unitless |
| lat | latitude; north is positive | decimal degrees |
| lon | longitude from 0 to 180 degrees; east is positive | decimal degrees |
| lon_360 | longitude from 0 to 360 degrees; east is positive | decimal degrees |
| date | collection date | yyyy-mm-dd |
| filename | filename | unitless |
| filename_orig | original file name | unitless |
| area | measured area in photograph | cm ² |
| age_lt_1yr | number of individuals less than 1 year old | individuals |
| age_eq_1yr | number of individuals 1 year old | individuals |
| age_gt_1yr | number of individuals older than 1 year | individuals |
| pcent_cover_lt_1yr | percent cover of individuals less than 1 year old per cm ² | percent |
| pcent_cover_eq_1yr | percent cover of individuals 1 year old per cm ² | percent |
| pcent_cover_gt_1yr | percent cover of individuals older than 1 year per cm ² | percent |
| comment | comments | unitless |

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Instruments

| | |
|---|--|
| Dataset-specific Instrument Name | |
| Generic Instrument Name | Camera |
| Generic Instrument Description | All types of photographic equipment including stills, video, film and digital systems. |

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Deployments

EUROWINTER2-UK

| | |
|--------------------|---|
| Website | https://www.bco-dmo.org/deployment/637476 |
| Platform | SW_England |
| Start Date | 2011-05-10 |
| End Date | 2012-06-12 |
| Description | population studies |

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Project Information

Climate Change and Biogeography: Effects of Extreme Events (EUROWINTER2)

Website: http://tbone.biol.sc.edu/forecasting_test

Coverage: Atlantic coast of Europe from central Portugal to northern Scotland

The long term goal of this project is to make verifiable forecasts of the biodiversity consequences of climate change in the coastal zone. By falsifying some and corroborating other biogeographic hypotheses, the investigators will establish a mechanistic framework for forecasting that can be verified by hindcasting the biogeographic changes that have been documented over the past century of climate change. The confluence of the rich biogeographic history of the European intertidal, the extreme conditions of the past 3 cold winters, and our rapidly expanding abilities in ecological forecasting provide a unique opportunity to make extraordinary progress in forecasting biodiversity responses to climate change. The investigators will quantify the metapopulation dynamics of ecologically dominant intertidal species to determine mechanisms responsible for setting geographic limits, and develop long term forecasts of future change. This research will also allow them to test the effect of episodic extreme events on the usefulness of ensemble methods for biogeographic forecasting. In a changing climate, with increasing frequencies of extreme events, it is important to determine whether the biogeography can ever "catch up", or whether the time lags caused by the demographic storage effect and connectivity will prevent the biology from ever tracking the long term change. The methods for ecological engineer and biodiversity forecasting and hindcasting that are described here have general applicability to marine habitats worldwide. All ecosystems have ecologically dominant species that control the rest of the assemblage of organisms, and they all are metapopulations whose connectivity and age structure determines their sensitivity to climate change and extreme events via the demographic storage effect. The players change from place to place and the oceanographic context also changes, but the methods applied here are broadly transferable.

Intellectual Merit: The results of this study will impact dramatically the discourse on the impacts of climate change. Results to date have centered on descriptions of gradual biogeographic range changes and exploration of the mechanisms driving those changes. Rarely in this literature is there discussion of the importance of broadscale episodic catastrophic events on biogeographic ranges, or how to capture those events in forecasting ecological response to climate change. A central prediction of climate change is an increase in the frequency of such potentially catastrophic climatic events which have the power to periodically reset the range boundaries of species in a ratchet-like manner. Of central interest is the degree to which such resets by extreme events determine long-term biogeographic patterns due to the combination of metapopulation dynamics and time lags caused by "storage effects" of long-lived individuals.

Broader Impacts: This project will produce an annotated bibliography of biogeographic data from the Portuguese, Spanish, and French biodiversity literature of the 19th and early 20th centuries, much of which is unavailable in North America. The project will develop a climate change atlas of the European coast including measures of historical risk and the distribution of extreme events. A forecast atlas of the next century will be developed by coupling population models to regional climate forecasts. These products will be used as models of ways to translate scientific results into products of greater utility. The PIs have used this approach in their web-based 7-day ecological forecasts of stress in marine communities, which are in the initial phase of transition to NOAA operational status. The PIs have also engaged policy makers and have worked closely with resource managers.

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Funding

| Funding Source | Award |
|--|-----------------------------|
| NSF Division of Ocean Sciences (NSF OCE) | OCE-1129401 |
| National Aeronautics & Space Administration (NASA) | NNX11AP77G |

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