

Intertidal population surveys of mussels and barnacles along European coast (Spain, France) from the European Atlantic intertidal 40N to 50N; 9.5W to 1E from summer 2010 (EUROWINTER project)

Website: <https://www.bco-dmo.org/dataset/3590>

Version:

Version Date: 2012-01-04

Project

» [Response of European Intertidal Communities to the Severe Winter of 2009-2010](#) (EUROWINTER)

Contributors	Affiliation	Role
Wethey, David S	University of South Carolina	Principal Investigator
Hilbish, Thomas J	University of South Carolina	Co-Principal Investigator
Woodin, Sarah A	University of South Carolina	Co-Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

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Dataset Description

Field surveys were carried out on rocky and sedimentary shores at 20 to 50 km intervals from central Portugal to the French side of the eastern English Channel in the summers of 2005 - 2007. Many of these sites were revisited in the summer of 2010.

Methods & Sampling

Field surveys of shores were carried out by teams of 2 to 4 people, all familiar with identification of the relevant species. At each rocky shore location, average densities of barnacles were determined in the zone of maximum abundance, based on counts of individuals in multiple quadrats. When densities were 100 m⁻² or less, they were measured in 0.25 m² quadrats. When densities were greater than 100 m⁻², they were measured in 0.01 m² quadrats. If no individuals were found in 30 minutes of searching, the species was reported as absent. At each sedimentary shore location, average densities of polychaetes were determined in the zone of maximum abundance, based on counts of tube caps (*Diopatra* spp.) or fecal casts (*Arenicola*). When densities were 0.1 m⁻² or less, nearest neighbor distances were measured, and then converted to densities by the Clark and Evans (1954) relationship. When densities were greater than 0.1 m⁻², they were measured with 0.25 m² quadrats. Densities were converted to a log₁₀ scale (ACFORN: Abundant, Common, Frequent, Occasional, Rare, Not seen). For barnacles we used the scale of Crisp and Southward (1958) in which a density of 1 cm⁻² or above is scored as Abundant. For polychaetes we used a scale in which 100 m⁻² or greater is scored as abundant. For both groups, a species was scored as Rare when only a few individuals were found in 30 min of searching.

Mytilus mussels can only be identified to species by genotyping. Individuals were collected from the intertidal zone during the field surveys described above. Samples of the margin of mantle tissue were collected from

each individual and preserved in 95% ethanol. Total genomic DNA was extracted following the protocol of Rawson et al. (1999) and each individual was assayed at the single locus nuclear marker Glu-5' (Inoue et al., 1995), which is diagnostically differentiated among allopatric populations of *M. edulis* and *M. galloprovincialis* (Rawson et al., 1996).

Data Processing Description

Lower detection limit: if no individuals were found in 30 minutes of searching, the species was reported as absent.

Related references:

ACFOR scale: Crisp, D. J., Southward, A. J., 1958. The distribution of intertidal organisms along the coasts of the English Channel. *Journal of the Marine Biological Association of the United Kingdom* 37, 157-208.

Nearest Neighbor method: Clark, P. J., Evans, F. C., 1954. Distance to nearest neighbor as a measure of spatial relationships in populations. *Ecology* 35, 445-453.

Paper on this dataset: Wethey, D. S., Woodin, S. A., Hilbish, T. J., Jones, S. J., Lima, F. P., Brannock, P. M. 2011. Response of intertidal populations to climate: effects of extreme events versus long term change. *Journal of Experimental Marine Biology and Ecology* 400:132-144.

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Data Files

File
eurowinter.csv (Comma Separated Values (.csv), 96.43 KB) MD5:aa461f0c1cb3423c01b0d0a5e37de5dc Primary data file for dataset ID 3590

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Parameters

Parameter	Description	Units
comments	barnacles: average density score according the to the ACFORN log10 scale (see above); mussels: nuclear marker assayed	text
count	counts of individuals in multiple quadrats	integer
country	country of sampling	text
day_utc	day of sampling in UTC time	1 to 31
family	taxonomic family name	text
genus	taxonomic genus name	text
lat	latitude; north is positive	decimal degrees
locality	locality of sampling	text
lon	longitude; east is positive	decimal degrees
month_utc	month of sampling in UTC time	1 to 12
occurrence_status	log10 scaled density based on ACFORN score	text
sample_descrip	description of sampling method; either area or time searched	minutes or square meters
species	taxonomic species name	text
stage	either adult or young of the year	text
state_province	state or province of sampling	text
taxon	either mussels or barnacles	text
time_utc	UTC time of sampling	HHmm
year	year of sampling in UTC time	YYYY

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Deployments

EuroWinter-2010

Website	https://www.bco-dmo.org/deployment/58763
Platform	intertidal_Europe
Start Date	2010-05-25
End Date	2010-07-04
Description	Intertidal population surveys of barnacles and mussels along the European coast (Portugal, Spain, France)

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Project Information

Response of European Intertidal Communities to the Severe Winter of 2009-2010 (EUROWINTER)

Coverage: European Intertidal

The winter of 1999-2000 in Europe was the coldest since 1740 and had extraordinary effects on intertidal

The winter of 1962-63 in Europe was the coldest since 1740 and had catastrophic effects on intertidal populations, including mass mortality of many species and contraction of geographic ranges by hundreds of kilometers. Some species and their associated communities took almost 50 years to return to their previous range limits. The severe winter of 2009-10 in Europe appears to have been virtually identical to that of 1962-63, based on sea surface temperature measurements from MODIS satellites and International Comprehensive Ocean-Atmosphere Data Set (ICOADS) data. The aftermath of this winter offers an outstanding opportunity to test the mechanisms controlling the biogeographic limits of major ecosystem engineering species in rocky and sedimentary intertidal habitats on a continental scale, and to understand the role of rare climatic events in controlling continental patterns of community composition. Because the PIs have data at high spatial resolution on abundance from over 300 locations at 20-50 km spacing over the affected coasts from the past 5 years, they are in an excellent position to detect the geographic scale of the effects of the winter of 2009-10, but they need to move quickly to distinguish among alternative mechanisms controlling the biogeographic distribution. This project will conduct field campaigns in the summer of 2010 to determine the effects of the one of the coldest winters in 50 years on the geographic distribution of ecologically dominant rocky and sedimentary shore species.

The PIs will test the following geographic hypotheses:

1) The northern geographic range limit of the southern species is set by adult intolerance of winter cold, mediated by a) reproductive failure or b) mortality. 2) The northern geographic range limit of the southern species is set by adult intolerance of summer cold, mediated by reproductive failure. 3) The southern geographic limit of the northern species is set by adult intolerance of warm winters, mediated by reproductive failure. 4) The southern geographic limit of the northern species is set by adult or juvenile intolerance of warm summer conditions.

The PIs will send two teams to Europe to collect data in the summer of 2010 to test these hypotheses. The PIs, two graduate students and an undergraduate will resurvey the more than 300 sites measured by their group in 2006-2009 from central Portugal to Scotland.

The results are likely to impact dramatically the discourse on impacts of climate change. Results to date, including those of the PIs, have centered on descriptions of gradual biogeographic range changes and exploration of the mechanisms driving those changes. A central prediction of climate change, however, is the increasing frequency of potentially catastrophic climatic events like the winters of 1962-63 and 2009-10 which have the potential to periodically reset the range boundaries of species in a ratchet-like manner.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1039513

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