A series of coordinates and ranges from South and North America to which species occurrences are mapped according to a model (CoastBenthBiogeo project)

Website: https://www.bco-dmo.org/dataset/554893
Data Type: model results
Version: working
Version Date: 2015-04-01

Project
» A mechanistic understanding of biogeographic patterns and life histories in benthic organisms in advective coastal environments (CoastBenthBiogeo)

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Dataset Description

This dataset describes a series of points along the coast of South and North America, and the alongshore distance of the path connecting those points. A species occurrence on the East Coast of North America is mapped to an alongshore distance by finding the geographic point in this coordinate system closest to the occurrence, and then assigning to the occurrence the alongshore distance associated with that geographic point.

The complete dataset methodology is detailed in Pappalardo P, Pringle J, Wares J, and J Byers (2015): The location, strength, and mechanisms behind marine biogeographic boundaries of the east coast of North America. Ecography 38: 001–010, 2015

There are two datasets associated with this coordinate system:
http://www.bco-dmo.org/dataset/554871: Database of marine invertebrate dispersal parameters and species ranges (NE Coast N. America)
and
http://www.bco-dmo.org/dataset/555322: Database of marine invertebrate dispersal parameters, species ranges and lat-lon ranges (NE Coast N. America)

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Data Files

File
alongcoastcoords.csv(Comma Separated Values (.csv), 83.58 KB) MD5:4eb0e618e991edc276bcd2f7c6c6579e Primary data file for dataset ID 554893

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Parameters

Parameter	Description	Units
lon	longitude of a point	decimal degrees; negative is West
lat	latitude of a point	decimal degrees; positive is North
distance	the distance of the point from Tierra del Fuego along the path defined by the points	kilometers

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Deployments

lab_UNH-model

Website	https://www.bco-dmo.org/deployment/58056
Platform	UNH
Start Date	1999-01-01
End Date	2011-10-01
Description	model results **Methods & Sampling** This deployment is a series of locations of benthic animals gleaned from the literature and GBIF in order to study coastal assemblages and life history.

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Project Information

A mechanistic understanding of biogeographic patterns and life histories in benthic organisms in advective coastal environments (CoastBenthBiogeo)

Coverage: East Coast of North America

Description from NSF award abstract:
The biological and physical mechanisms that establish and maintain species boundaries in the ocean are controversial. Contributing factors are offspring of species with planktonic larvae being physically transported outside their natal range, and adults thriving when transplanted into regions immediately beyond their natural distributions. It is unclear, however, why long-distance dispersal of a benthic organism's larva should persist on evolutionary timescales. There is more larval dispersal from natal habitat than would seem propitious. Furthermore, long larval duration is known to increase reproductive output for species persistence, makes population retention of favorable alleles less likely, and reduces the genetic diversity of the population.

The Co-PIs have shown that maintenance of range boundaries for a species are governed by a function

analogous to that derived for allelic frequency/genetic clines in the coastal ocean. As with other recent advances in biodiversity theory, this work suggests a convergence between conditions that maintain the distribution of alleles within species and those that maintain the distribution of species themselves. This confluence of theory provides substantial opportunity for development of inter- and intra-species competition in an advective environment. It potentially would unify genetic and population-level theory, and create a holistic view of life in advective environs.

It is clear from preliminary work that a synthesis would depend critically on tradeoffs between dispersal mode and successful reproductive output. The theory would be developed both by pushing its analytical envelope, and by drawing upon extensive, existing databases to quantitatively constrain reproductive and dispersal tradeoffs. For example, although tradeoffs between larval quantity versus quality (i.e., many "energetically cheap" larvae versus few "highly provisioned" individuals) have long been the subject of qualitative models, they have not been quantitatively defined for life history characteristics of different benthic marine taxa. Combining analytical developments and observed life-history tradeoffs would provide 1) evolutionarily stable states for a range of dispersal strategies, 2) mechanisms that define species boundaries as a function of physical (e.g., temperature and alongshore variation in currents) and biological (like larval mortality) parameters and 3) quantitative origins of dispersal behaviors that would locally retain larvae, and result in relationships between inter- and intra-species fitness.

Such findings would predict species boundary locations and the presence/absence of various dispersal strategies as a function of local circulation, environmental conditions and their gradients. Predictions would be tested against data on species ranges gathered as part of an extensive literature and database search.

This research would allow a better mechanistic understanding species' ranges that occur due to changes in the Earth's climate. For example, this study will test the hypothesis that warming favors species with longer larval planktonic duration. Therefore, high-latitude areas now dominated by species with direct development would shift to a mixture of planktonic dispersers and direct developers as the climate warms. The research would allow managers to understand how disruption to habitat can alter species ranges by changing alongshore sources and transport of planktonic larvae. A quantitative theory of species range will also help managers understand what sets the ultimate limits of recently introduced exotic species, allowing improvement of management strategies.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0961344
NSF Division of Ocean Sciences (NSF OCE)	OCE-0961830

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