Data from 120 parent-offspring matches identified in fish on the Belizean Barrier Reef in 2013.

Website: https://www.bco-dmo.org/dataset/738704

Data Type: Other Field Results

Version: 1

Version Date: 2018-06-18

Project

» An Integrative Investigation of Population Connectivity Using a Coral Reef Fish (Elacatinus Dispersal I)

Contributors	Affiliation	Role
Buston, Peter	Boston University (BU)	Principal Investigator, Contact
D'Aloia, Cassidy C.	Woods Hole Oceanographic Institution (WHOI)	Co-Principal Investigator
Ake, Hannah	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

Data from 120 parent-offspring matches identified in fish on the Belizean Barrier Reef in 2013.

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Coverage

Spatial Extent: **Lat**:16.789722 **Lon**:-88.075833

Temporal Extent: 2013 - 2013

Dataset Description

Data from 120 parent-offspring matches identified in gobies from parentage analysis. Sampling took place on the Belizean Barrier Reef in 2013.

Acquisition Description

We surveyed a 41 km-long transect of the Belize Barrier reef, centered at Carrie Bow Cay, by SCUBA to conduct a genetic parentage study of the reef fish *Elactinus lori*. All underwater sampling was conducted using SCUBA at an average (±SD) depth of 16.03 ± 2.19 m. A waypoint was recorded from the boat at the beginning and end of every collection dive, with the midpoint of each dive taken as the location for all individuals sampled on that dive. To collect settlers, we sampled ~ 100 individuals every kilometer. Individuals were collected from the outsides of sponges using slurp guns and placed them in plastic bags. At the surface, settlers were anesthetized with MS-222. For adults, we collected non-lethal tissue samples at three regions along the transect (n ≈ 1,000 per region). Each adult was collected with a slurp gun and restrained in a net; we took a small tissue sample from the caudal fin using scissors. All tissue was stored in 95% EtOH. At each adult collection sponge, we also measured: sponge depth (m, using dive computers), number of tubes per sponge, and length of largest sponge tube (nearest cm, using a tape measure).

Otoliths were extracted from the 120 settlers that were assigned to parents. Otoliths were dissected, cleared of tissue, immersed in oil for 2-7 days, and rings were counted under a 50× oil immersion lens

Further details on all methods can be found in D'Aloia et al. (2015), *PNAS.*

Processing Description

The column “distance” was calculated using ArcMap 10.1 (ESRI).

BCO-DMO Data Processing Notes:

-Added year column based on metadata provided by the PI
-Replaced missing identifier "." with nd

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Related Publications

D’Aloia, C. C., Bogdanowicz, S. M., Francis, R. K., Majoris, J. E., Harrison, R. G., & Buston, P. M. (2015). Patterns, causes, and consequences of marine larval dispersal. Proceedings of the National Academy of Sciences, 112(45), 13940–13945. doi:10.1073/pnas.1513754112

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Parameters

Parameter	Description	Units
year	Year of sampling	unitless
offspring_id	Unique ID for each offspring	unitless
parent1_id	Unique ID for each parent	unitless
parent2_id	Unique ID for each second parent (if assigned)	unitless
distance	Net distance between parents and offspring	kilometers
origin_region	Region where settler came from (North=N; Central=C; South=S;)	unitless
direction	Direction larva travelled (North=N; South=S)	unitless
settler_pld	Length of settler's larval phase	days
settler_sl	Standard length of settler	millimeters
sponge_length	Length of largest sponge tube	centimeters
sponge_tubes	Number of tubes per sponge	count
depth	Depth at base of sponge	meters

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Instruments

Dataset-specific Instrument Name	GPSMAP 76Cx (Garmin)
Generic Instrument Name	GPS receiver
Dataset-specific Description	Used to collect GPS data
Generic Instrument Description	Acquires satellite signals and tracks your location.

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Deployments

Belize_2010

Website	https://www.bco-dmo.org/deployment/704795
Platform	lab Buston
Description	Buston lab expeditions to Belize beginning in 2010.

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Project Information

An Integrative Investigation of Population Connectivity Using a Coral Reef Fish (Elacatinus Dispersal I)

Website: http://people.bu.edu/buston/lab/Welcome.html

Coverage: Belizean Barrier Reef System (16.803 degrees North 88.096 degrees West)

Understanding the patterns, causes and consequences of larval dispersal is a major goal of

21st century marine ecology. Patterns of dispersal determine the rates of larval exchange, or connectivity, between populations. Both physical factors (e.g., water movement) and biological factors (e.g., larval behavior) cause variation in population connectivity. Population connectivity, in turn, has major consequences for all aspects of an organism's biology, from individual behavior to metapopulation dynamics, and from evolution within metapopulations to the origin and extinction of species. Further, understanding population connectivity is critical for the design of effective networks of marine reserves, creation of vital tools in conservation, and the development of sustainable fisheries. Over the last decade, three methods, each of which tells something slightly different, have emerged as leading contenders to provide the greatest insights into population connectivity. First, coupled biophysical models make assumptions regarding water flow, larval behavior and ecology, to predict population connectivity. Second, indirect genetic methods use spatial distributions of allele frequencies to infer population connectivity. Third, direct genetic methods use parentage analyses, tracing recruits to specific adults, to measure population connectivity. Despite advances, lack of integration means that we do not know the predictive skill of biophysical models, or the extent to which patterns of dispersal predict spatial genetic structure. The overall objective of this proposal is to conduct an integrated investigation of population connectivity, using all three methods in one tractable system: the neon goby, Elacatinus lori, on the Belizean Barrier Reef. There are three motives for this choice of study system: i) fourteen highly polymorphic microsatellite loci have been developed, facilitating the assignment of recruits to parents using parentage analyses and the measurement of dispersal; ii) the physical oceanography of the Belizean Barrier Reef is well-studied, facilitating the development and testing of coupled biophysical models; and, iii) E. lori has a relatively small biogeographic range, facilitating analysis of the spatial distribution of allele frequencies throughout its range. Broader Impacts. The grant will support one postdoc and two graduate students who will be trained in scientific diving, marine fieldwork, population genetics, biophysical modeling, and mathematical modeling, and will gain collaborative research experience. PIs will incorporate research findings in their courses, which cover all these topics. The grant will also broaden participation of under-represented groups by supporting six undergraduates from groups traditionally underrepresented in STEM fields. In each year of the project there will be an All Participants meeting to reinforce the network of participants. A project website will be developed, in English and Spanish, on the theme of larval dispersal and population connectivity. This will include a resource for K-12 marine science educators developed in collaboration with a marine science educator. All PIs will ensure that results are broadly disseminated to the scientific community and general public via appropriate forms of media.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1260424

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