Distribution of new E. lori settlers arriving on sponge habitat in South Water Caye, Belize in 2015.

Website: https://www.bco-dmo.org/dataset/728435
Data Type: Other Field Results
Version: 1
Version Date: 2018-02-27

Project
» Collaborative Research: The Role of Larval Orientation Behavior in Determining Population Connectivity (Elacatinus Dispersal II)

Contributors	Affiliation	Role
Buston, Peter	Boston University (BU)	Principal Investigator
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Abstract
Distribution of new E. lori settlers arriving on sponge habitat in South Water Caye, Belize in 2015.

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Coverage

Spatial Extent: **Lat**:16.815333 **Lon**:-88.0815
Temporal Extent: 2015-05-28 - 2015-07-25

Dataset Description

Distribution of new *E. lori* settlers (i.e., individuals <10mm with minimal pigment) arriving from the water column.

These data were included in Figure 9 and Table 4 of:

Majoris, JE; D'Aloia CC, Francis RK, Buston PM (Accepted) Differential persistence favors habitat preferences that determine the distribution of a reef fish. Behav. Ecol.

Methods & Sampling

To observe the distribution of new settlers arriving from the water column, the 120 tagged sponges were cleared of settlers and then surveyed for new settlers every 24 – 48 hrs throughout two lunar cycles (28 May – 25 July 2015). We constructed a generalized linear mixed-effects model (GLMM; distribution = binomial; link = logit) using the 'lme4' package in R (Bates et al. 2015) to evaluate how habitat and social variables influence the distribution of new settlers on sponge habitat. The arrival of multiple new settlers on an individual sponge was rare. Therefore, we investigated the relationship between the presence or absence of an *E. lori* settler (0 or 1,

respectively) and all habitat and social variables. Sponge ID was included as a random effect to control for repeated observations of the same 120 tagged sponges.

Data Processing Description

R version 3.2.3

BCO-DMO Data Processing Notes:

- dates reformatted to yyyy/mm/dd
- periods replaced with underscores in column names
- missing identifier replaced with nd

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Data Files

File
newsettler_distribution.csv (Comma Separated Values (.csv), 471.98 KB) MD5:d1c7b79a0dac01ef42454a5d0ae0bcab Primary data file for dataset ID 728435

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Related Publications

Bates, D., Maechler, M., & Bolker, B. (2013). lme4: Linear mixed-effects models using S4 classes. R package version 0.999999-2.
Software

Majoris, J. E., D'Aloia, C. C., Francis, R. K., & Buston, P. M. (2018). Differential persistence favors habitat preferences that determine the distribution of a reef fish. Behavioral Ecology, 29(2), 429–439. doi:10.1093/beheco/arx189
Results

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Parameters

Parameter	Description	Units
Date	Date of observation; YYYY/MM/DD	unitless
Lunar_day	Day in lunar cycle	day
Sp_ID	Tag number from 1 - 120 used to identify sponges	unitless
Sp_depth	Depth at base of the spongein feet	feet
Sp_depth_m	Depth at base of the sponge in meters	meters

Sp_species	Sponge species: Aplysina fistularis (Y); or Agelas conifera (B)	unitless
Sp_size	Maximum tube length of sponge	centimeters
Sp_tubes	Number of sponge tubes greater than 10 centimeters	number
Res_pres	Residents presence (1) or absence (0)	unitless
Res_n	Number of residents observed on each sponge	number
Rep_pres	Reproduction (ie: clutch) present (1) or absent (0)	unitless
New_set_pres	New settler presence (1) or absence (0) on a tagged sponge (i.e. individuals less than 10mm with minimal pigmentation that settled to the sponge from the water column)	unitless
New_set_n	Number of new settlers observed on a tagged sponge	number
Ns1	Standard length of new settlers on sponge	millimeters
Ns2	Standard length of new settlers on sponge	millimeters
Ns3	Standard length of new settlers on sponge	millimeters
Ns4	Standard length of new settlers on sponge	millimeters
Ps_pres	Post-settler presence (1) or absence (0) on a tagged sponge (i.e. E. lori individuals 10mm or greater but 18mm or less standard length that moved to the sponge from elsewhere on the reef)	unitless
Ps_n	Number of post-settlers observed on a tagged sponge	number
Ps1	Standard length of post-settlers	millimeters
Ps2	Standard length of post-settlers	millimeters
Ps3	Standard length of post-settlers	millimeters

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Project Information

Collaborative Research: The Role of Larval Orientation Behavior in Determining Population Connectivity (Elacatinus Dispersal II)

Coverage: Belizean Barrier Reef System

Description from NSF award abstract:
Understanding how far young fish move away from their parents is a major goal of marine ecology because this dispersal can make connections between distinct populations and thus influence population size and dynamics. Understanding the drivers of population dynamics is, in turn, essential for effective fisheries management. Marine ecologists have used two different approaches to understand how fish populations are connected: genetic methods that measure connectivity and oceanographic models that predict connectivity. There is, however, a mismatch between the predictions of oceanographic models and the observations of genetic methods. It is thought that this mismatch is caused by the behavior of the young, or larval, fish. The objective of this research is to study the orientation capabilities of larval fish in the wild throughout development and under a variety of environmental conditions to see if the gap between observations and predictions of population connectivity can be resolved. The project will have broader impacts in three key areas: integration of research and teaching by training young scientists at multiple levels; broadening participation of undergraduates from underrepresented groups; and wide dissemination of results through development of a website with information and resources in English and Spanish.

The overall objective of the research is to investigate the role of larval orientation behavior throughout ontogeny in determining population connectivity. This will be done using the neon goby, Elacatinus lori, as a model system in Belize. The choice of study system is motivated by the fact that direct genetic methods have already been used to describe the complete dispersal kernel for this species, and these observations indicate that dispersal is less extensive than predicted by a high-resolution biophysical model; E. lori can be reared in the lab from hatching to settlement providing a reliable source of larvae of all ages for proposed experiments; and a new, proven behavioral observation platform, the Drifting In Situ Chamber (DISC), allows measurements of larval orientation behavior in open water. The project has three specific objectives: to understand ontogenetic changes in larval orientation capabilities by correlating larval orientation behavior with developmental sensory anatomy; to analyze variation in the precision of larval orientation in different environmental contexts through ontogeny; and to test alternative hypotheses for the goal of larval orientation behavior, i.e., to determine where larvae are heading as they develop.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459546

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