Ontogeny of swimming endurance of larval Amphiprion percula, Elacatinus lori, and Elacatinus colini from Belize in 2015.

Website: https://www.bco-dmo.org/dataset/739171
Data Type: experimental
Version: 1
Version Date: 2018-06-22

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

Recorded swimming duration of larval Amphiprion percula, Elacatinus lori, and Elacatinus colini measured throughout development from hatching through settlement.

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Coverage

Spatial Extent: **Lat**:16.815333 **Lon**:-88.0815
Temporal Extent: 2015 - 2015

Dataset Description

Recorded swimming duration of larval Amphiprion percula, Elacatinus lori, and Elacatinus colini measured throughout development from hatching through settlement.

Methods & Sampling

To determine the effect of fish age and size on the endurance of larvae from hatching through the onset of settlement, we evaluated the swimming duration of A. percula larvae at 0, 4, and 8 dph (day post hatch), and of E. lori and E. colini at 0, 10, 20, and 30 dph. At the start of each trial, an individual larva was acclimated to the flume for 2 min with water flowing at a velocity of < 1 cm s-1. If the larva displayed normal orientation and swimming behavior during acclimation, then the velocity was increased to a fixed setting of 2, 4, 6, 8 or 10 cm s-1. Swimming duration was recorded as the total time that a larva swam before being expelled from the flume or collected on the back mesh, minus the 2 min acclimation period. At slower flow velocities (2 – 4 cm s-1), some late-stage larvae (i.e., A. percula: 8 dph; Elacatinus spp.: 30 dph) chose to settle on the bottom rather than swim in the water column and were therefore removed from the data set.

Data Processing Description

R version 3.2.3

BCO-DMO Data Processing Notes:

-replaced empty cells with nd
-reformatted date to yyyy/mm/dd
-replaced species codes in sp column with full species name
-changed location codes to full names based on metadata

Data Files

File
endurance.csv(Comma Separated Values (.csv), 62.25 KB) MD5:a67db14bbe41e6c4e83389e65171197b Primary data file for dataset ID 739171

Related Publications

Majoris, J. E., Catalano, K. A., Scolaro, D., Atema, J., & Buston, P. M. (2019). Ontogeny of larval swimming abilities in three species of coral reef fishes and a hypothesis for their impact on the spatial scale of dispersal. Marine Biology, 166(12). https://doi.org/10.1007/s00227-019-3605-2
Methods
,
Methods
,
Results

Parameters

Parameter	Description	Units
date	Date of swim trial; yyyy/mm/dd	unitless
location	Indicates whether trials were completed in the lab at Boston University or in the field in Belize.	unitless
species	Reef fish species	unitless
batch_id	Unique label indicating clutch or batch identity	unitless
dph	Age in days post hatch	days post hatch
stand_dph	A larva's age/the expected age at settlement for each species (i.e. 30 days post hatch (dph) for Elacatinus, 8 dph for A. percula).	percent
speed	Flow rate during the trial	centimeters per second
time_sec	A larva's swimming duration in seconds	seconds
dist_cm	The equivalent distance a larva swam	centimeters
TL	Total length	milimeters
SL	Standard length	milimeters
BD	Body depth	milimeters
PA	Propulsive area	milimeters

Instruments

Dataset-specific Instrument Name	Custom designed swimming flume
Generic Instrument Name	Swimming Flume
Dataset-specific Description	Used to analyze fish swimming behavior
Generic Instrument Description	A tool used to analyze and quantify fish swimming behavior, physiology, and performance.

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.

Funding