Determining the effects of prey combination on larval Elacatinus colini standard length and survival.

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

Contributors	Affiliation	Role
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Abstract
Determining the effects of prey combination on larval Elacatinus colini standard length and survival.

Table of Contents

Coverage

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

Dataset Description

Determining the effects of prey density and combination on the standard length and survival of larval Elacatinus lori and E. colini.

Methods & Sampling

Rotifer density experiment: To determine optimal rotifer density for newly hatched E. lori and E. colini, survival and growth of larvae were evaluated under 4 different rotifer density treatments: 0 (unfed control), 10, 15, and 20 rotifers ml-1. Twelve, 6.5-L rearing bins were set up for each species, allowing for 3 replicates per density treatment. On the day of hatch (0 dph), 25 larvae were transferred to each rearing bin. Rotifer density treatments were assigned to bins at the start of trials using a complete randomized block design. Following daily water exchange, each rearing bin was dosed with the assigned rotifer density. There was no significant difference in water quality parameters among rotifer density treatments (all Kruskal-Wallis tests, $p > 0.05$). On day 6, all surviving larvae were collected from the rearing bins, counted and photographed using a dissection microscope. The photographs of larvae were used to compare larval size (SL) among rotifer density treatment. Artemia density experiment: To determine the optimal density of Artemia for culturing E. lori and E. colini larvae,

the survival and growth of larvae were evaluated under 4 density treatments: 0 (unfed control), 3, 6, and 9 Artemia ml-1. A pilot experiment indicated that >40% of E. colini larvae began consuming Artemia nauplii at 6 dph. Therefore, for each species, larvae from a single clutch were reared communally in a 38-L rearing bin and fed 15 rotifers ml-1 from 0 – 6 dph. On day 6, surviving larvae were distributed evenly among twelve, 6.5-L rearing bins (3 bins per Artemia density treatment). Due to differential survival to day 6, the number of larvae distributed among the rearing bins varied by species (E. lori: n=20 larvae bin-1; E. colini: n=14 larvae bin-1). Artemia density treatments were assigned to bins at the start of trials using a complete randomized block design. Following daily water exchange, each bin was dosed with rotifers (15 ml-1) and the assigned Artemia density. The photographs of larvae were used to compare larval size (SL) among Artemia density treatments. Plankton, Rotifers and Artemia Experiment: To determine the suitability of wild caught plankton for rearing larvae in the lab in Belize, the growth and survival of E. colini larvae fed a combination of rotifers and Artemia (RA) was compared with larvae fed solely on wild caught plankton (P). Prey combination treatments were assigned to bins at the start of trials using a complete randomized block design. On the day of hatch (0 dph), 25 larvae were transferred to each of six, 6.5-L rearing bins (3 bins per prey combination). Rotifers (15 ml-1) or plankton (≤10 ml-1) were fed to larvae beginning at 0 dph. However, Artemia (3 ml-1) were not included in the RA diet until 6 dph. Due to natural variation in the quantity of plankton collected in the field each evening, the average density of plankton fed to larvae was 5.3 ± 3.8 prey ml-1 (mean ± SD). Following daily water exchange, each rearing bin was dosed with the assigned prey combination. Water quality parameters were not significantly different between prey treatments (all Wilcoxon Rank-sum tests, $p > 0.05$). On day 14, all remaining larvae were counted and photographed. The photographs of larvae were used to compare larval size (SL) among prey treatments.

Data Processing Description

R version 3.2.3

BCO-DMO Data Processing Notes:

-replaced "." with nd -replaced species codes in sp column with full species name -reformatted column names to comply with BCO-DMO standards -reformatted date to yyyy/mm/dd -combined rotifer, artemia, and PRA files

[table of contents | back to top]

Data Files

File
aquaculture.csv (Comma Separated Values (.csv), 115.88 KB) MD5:5bde3e9123cd86171f85befed1f68269 Primary data file for dataset ID 739162

[table of contents | back to top]

Related Publications

Majoris, J. E., Francisco, F. A., Atema, J., & Buston, P. M. (2018). Reproduction, early development, and larval rearing strategies for two sponge-dwelling neon gobies, Elacatinus lori and E. colini. Aquaculture, 483, 286–295. doi:10.1016/j.aquaculture.2017.10.024
Results
,
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
date	Date of swim trial; yyyy/mm/dd	unitless
sp	Reef fish species	unitless
batch_id	Identifies the clutch or batch of larvae	unitless
treat	Prey type treatment: Artemia; Rotifers; or a combination of plankton, Rotifers, and Artemia (PRA).	unitless
density	Prey density treatments: 0 = unfed control; 3; 6; 9	prey per mililiter
combination	Prey combination	unitless
bin_id	Rearing bin ID (1 -24)	unitless
larva_id	Larva ID	unitless
surv	Survival (1 = larva survived; 0 = larva perished)	unitless
TL1	Total length measurements of each larva	milimeter
TL2	Total length measurements of each larva	milimeter
TL3	Total length measurements of each larva	milimeter
tl_avg	Average of the 3 total length measurements of a larva	milimeter
SL1	Standard length measurements of each larva	milimeter
SL2	Standard length measurements of each larva	milimeter
SL3	Standard length measurements of each larva	milimeter
sl_avg	Average of the 3 standard length measurements of a larva	milimeter
BD1	Body depth measurements of each larva	milimeter

BD2	Body depth measurements of each larva	milimeter
BD3	Body depth measurements of each larva	milimeter
bd_avg	Average of the 3 body depth measurements of a larva	milimeter

[table of contents | back to top]

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.

[table of contents | back to top]

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.

[table of contents | back to top]

Funding

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

[table of contents | back to top]