Sex ratio and GSI data for M. beryllina collected offshore of Pt. Lobos, California from 2009 to 2010.

Website: https://www.bco-dmo.org/dataset/712919
Data Type: Other Field Results
Version: 1
Version Date: 2017-08-04

Project
» Impacts of size-selective mortality on sex-changing fishes (Goby size-selection)

Contributors	Affiliation	Role
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Abstract
Sex ratio and GSI data for M. beryllina collected offshore of Pt. Lobos, California from 2009 to 2010.

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Coverage

Spatial Extent: **Lat**:38.078633 **Lon**:-122.06896

Dataset Description

This dataset contains the sex ratio and mean gonadosomatic index (GSI) of female M. beryllina collected offshore of Pt. Lobos California. Full description of details is provided in Brander et al. (2013).

Methods & Sampling

Methodology from: Brander et al., 2013

Fish Collecting and Processing

Fish were collected monthly from the urban and ranch beaches from March through October of 2009 and 2010, as previously described. All research was done in accordance with the University of California, Davis Institutional Animal Care and Use Committee (IACUC), under approved protocol #13353. Captured fish were kept in a cooler with aeration and transported back to the UC Davis Bodega Marine Lab, Bodega Bay, CA, for processing. During the 2009 sampling season approximately 20 fish from each site were kept alive and held in

aquaria at 5–10 ppt salinity for 4–5 months to serve as depurated controls for gene expression analyses. The remaining fish were anesthetized in accordance with IACUC protocol #13353, sacrificed, and livers were immediately removed and snap-frozen on liquid nitrogen for RNA extraction. Gonads were removed, weighed, and fixed for 24 hours in Davidson's solution followed by storage in phosphate buffered 10% formalin. Fish length and sex were recorded prior to and following dissection, respectively. Fish mass was measured after gonad removal and used in addition to gonad mass to obtain a total mass for gonadosomatic index (GSI) calculation (GSI = gonad mass/total mass). Sagittal otoliths were extracted, mounted on slides, photographed, and growth increments were counted and measured based on previously described methods.

Length, Sex Ratio, GSI

Because fish length, sex ratio, and GSI were expected to vary over the sampling period, we tested for differences among sites in those variables while including year and Julian date as covariates in a linear model (length) or logistic regression (sex ratio and GSI). Because no females were seined from the urban beach after July in either 2009 or 2010, GSI analysis was ended at that time point.

Data Processing Description

Scripts that were used to process these data can be found here: github.com/jwilsonwhite/IPM_statespace.

BCO-DMO Data Processing Notes:

-added column "investigator" to capture the metadata used to describe the table.
-dates were reformatted from mm/dd/yy to yyyy/mm/dd
-blank cells were replaced with nd
-data were sorted by site, then date
-reformatted column names to comply with BCO-DMO standards

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Data Files

File
raw_pattern.csv (Comma Separated Values (.csv), 1.16 KB) MD5:52326488f9fa5da8b87abe53030d5880 Primary data file for dataset ID 712919

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Related Publications

Brander, S. M., Connon, R. E., He, G., Hobbs, J. A., Smalling, K. L., Teh, S. J., … Cherr, G. N. (2013). From 'Omics to Otoliths: Responses of an Estuarine Fish to Endocrine Disrupting Compounds across Biological Scales. PLoS ONE, 8(9), e74251. doi:10.1371/journal.pone.0074251
Methods

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Parameters

Parameter	Description	Units
Investigator	Investigator that collected these data	unitless
Site	Site where data were collected	unitless
Date	Date of data collection; YYYY/MM/DD	unitless
MeanGSI	Mean gonadosomatic index of females	count
Total	Total number of adult M. beryllina collected	count
Fs	Number of females in sample	count
Ms	Number of males in sample	count

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Instruments

Dataset-specific Instrument Name	Beach seine
Generic Instrument Name	Purse-seine Fishing Gear
Dataset-specific Description	Used to collect samples
Generic Instrument Description	A purse seine is a large wall of netting deployed in a circle around an entire school of fish. The seine has floats along the top line with a lead line of chain along the bottom. Once a school of fish is located, a skiff pulls the seine into the water as the vessel encircles the school with the net. A cable running along the bottom is then pulled in, "pursing" the net closed on the bottom, preventing fish from escaping by swimming downward. The catch is harvested by bringing the net alongside the vessel and brailing the fish aboard.

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Deployments

White_2012

Website	https://www.bco-dmo.org/deployment/713241
Platform	shoreside Calif_shore
Start Date	2009-03-20
End Date	2013-10-09
Description	Menidia beryllina individuals were collected from Suisan Bay, California for spawning experiments.

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Project Information

Impacts of size-selective mortality on sex-changing fishes (Goby size-selection)

Coverage: Southern California, Santa Catalina Island

Description from NSF award abstract:
Many marine fish species change sex during their lifetimes, and many of them are targets of commercial and recreational fishing. The timing of sex change in these animals is often related to body size, so populations typically consist of many small fish of the initial sex (usually female) and few large fish of the other sex (usually male). In nature, smaller fish are at a greater risk of mortality due to predation, but fishermen tend to seek larger fish. Thus fishing that targets larger individuals may skew sex ratios, removing enough of the larger sex to hinder reproduction. However, the extent to which size-selective mortality affects sex-changing fishes is poorly understood. This research will explore the effects of size-selective mortality on the population dynamics of sex-changing species using an integrated set of field experiments and mathematical models. It will provide the first experimental exploration of the sensitivity of different sex-change patterns and reproductive strategies to selective mortality. The results will advance our knowledge of the susceptibility and resilience of sex-changing organisms to different types of size-selective mortality and will reveal how sex-changing species can recover after size-selection ceases, as in populations within marine reserves where fishing is suddenly prohibited. The findings will inform fisheries management policies, which do not currently consider the ability of a species to change sex in setting fisheries regulations.

This project will consist of a three-year study of the effects of size-specific mortality on sex-changing fishes. Field experiments will use three closely related rocky-reef fishes that differ in sex-change pattern and are amenable to field manipulation and direct measurement of reproductive output. The species include a protogynous hermaphrodite (a female-to-male sex-change pattern common among harvested species) and two simultaneous hermaphrodites that differ in their ability to switch between male and female. Two types of experiments will be conducted on populations established on replicate patch reefs at Santa Catalina Island, California: (1) sex ratios will be manipulated to determine when the scarcity of males limits population-level reproductive output; and (2) experiments cross-factoring the intensity of mortality with the form of size-selection (i.e., higher mortality of large or small individuals) will test the demographic consequences of size-selective mortality. In concert with the field experiments, size- and sex-structured population models (integral projection models) will be developed for use in three ways: (1) to evaluate how different types of selective mortality should affect population dynamics; (2) to predict outcomes of the field experiments, testing/validating the model and allowing direct prediction of the ecological significance of short-term selection; and (3) to fit to existing survey data for a fourth species, a widely fished, sex-changing fish, inside and outside of marine reserves. Part (3) will evaluate whether and how quickly the mating system and reproductive output of that species (not directly measurable in the field) is recovering inside reserves. This integrated set of field experiments and models will yield novel insight into the effects of size-selective mortality on the population dynamics of sex-changing marine species.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1435473

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