

Larval Sebastes Diet and Morphometric Data from R/V Bob and Betty Beyster, R/V Shearwater BBB2102, BBB2104, SW2104, BBB2101 from January to April 2021 (RAPID Anchovy Response project)

Website: <https://www.bco-dmo.org/dataset/940302>

Data Type: Cruise Results

Version: 1

Version Date: 2024-10-11

Project

» [RAPID: Understanding the unprecedented anchovy response to warm-water conditions in the California Current](#) (RAPID Anchovy Response)

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Abstract

This dataset includes body morphometrics of analyzed species of larval Rockfish (*Sebastes* spp.) from Bongo plankton net tows conducted in the subtropical Southern California Bight from January to April 2021. The larvae were dissected and the gut content analyzed. Prey taxa, development stage, length and width are also included in the data. Net tows were carried out on several cruises aboard R/V Bob and Betty Beyster and R/V Shearwater.

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Coverage

Location: Southern California Bight and the Surrounding Coastal Areas

Spatial Extent: N:33.88995 E:-117.3841 S:32.848 W:-119.37

Temporal Extent: 2021-01-24 - 2021-04-06

Methods & Sampling

Specimen Collection

Larval rockfish were collected using a 71cm diameter dual Bongo plankton net system with 505 µm mesh nets and equipped with a small CTD to record depth and physical variables during horizontal net tows at a ship speed of 1.5-2.5 knots down to 28.9-36 m depth.

Collection Location Details

This study is carried out within the temperate to subtropical Southern California Bight and surrounding coastal areas between 32° and 35° N, and 117° and 120° W. Specific locations sampled fall within the CalCOFI and CCE-LTER programs quarterly survey grid from lines 76.7 to 93.4 and stations 26 to 55.

Specimen Processing and Measurement Methods

Once the net was retrieved the nets were gently rinsed with saltwater. The content of the cod-ends were immersed in a saltwater ice slurry to hopefully increase retention of gut contents, then concentrated onto a 300 µm mesh sized sieve, transferred into glass jars and preserved in tris-buffered 95% ethanol.

Rockfish larvae were sorted from the samples. 161 individuals were selected to represent a range of sample stations and growth stages and measured (standard length, body depth, head length). Rockfish larvae were genetically identified as described in Thompson et al. (2016). The entire digestive tracts of the selected larvae were removed and dissected. Recovered prey items were identified to class or order level and by development stage (when applicable), length and widths were measured of all prey using an eyepiece micrometer, and measurements were converted to mm. Total body length was used for all organisms except copepods, where prosome length was measured instead. Length and width measurements are only given for prey intact enough to allow these measurements to be taken accurately.

Deployment Details

Each cruise is composed of one or more day trips using one of the two research vessels. The two-three letters indicate the research vessel, the four digits indicates YYYY.

- Winter 2021 sampling took place during cruises BBB2101 and BBB2102
- Spring 2021 sampling took place during cruises BBB2104 and SW2104

BCO-DMO Processing Description

- Removed units from column names (unit information can be found in the parameters section of the BCO-DMO metadata page).
- Spaces in column names replaced with underscores ("_").
- Corrected the spelling of "Sebates" to "Sebastes" in the primary data file.
- "Sebastes unidentified" replaced with "Sebastes" in the primary data file.
- Standardized capitalization of taxon terms represented in the primary data file.
- Standardized representation of taxon terms within the primary data file ("Euphausiid" changed to "Euphausiacea", "Eucalanid" changed to "Eucalanidae", "Tintinnid" changed to "Tintinnida", and "Bivalve" changed to "Bivalvia").
- AphiaIDs and LSIDs added from WoRMS database to represent Species and Prey Taxa in new columns in the primary data file.

Problem Description

Unicellular and soft-bodied organisms likely underrepresented in gut contents due to their small size and fragile structure. "Copepoda" category includes copepods not identified to a higher taxonomic resolution; may include representatives from other copepod categories.

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Related Publications

Walsh, K. A., Thompson, A. R., Kwan, G. T., Semmens, B. X., Fennie, H. W., & Swalethorp, R. (2024). Diet and Size-at-Birth Affect Larval Rockfish Condition and Survival. <https://doi.org/10.1101/2024.04.07.588270>
Results

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Related Datasets

IsRelatedTo

Semmens, B. X., Landry, M. R. (2023) **Zooplankton abundance and size data from Bongo plankton net tows conducted in the subtropical Southern California Bight during February and April 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-11-30 doi:10.26008/1912/bco-dmo.915900.1 [[view at BCO-DMO](#)]

Relationship Description: Associated in situ zooplankton abundance and size information.

Semmens, B. X., Landry, M. R., Swalethorp, R. (2022) **CTD data from Bongo plankton net tows from RV Bob and Betty Beyster and RV Shearwater cruises in the Southern California Bight from fall 2020 to spring 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-03-10 doi:10.26008/1912/bco-dmo.871003.1 [[view at BCO-DMO](#)]

Relationship Description: CTD data collected during the associated Bongo plankton net tows.

Semmens, B. X., Landry, M. R., Swalethorp, R. (2023) **Abundances of larval Northern Anchovy (*Engraulis mordax*), Rockfish (*Sebastes* spp., and other/unidentified larvae from Bongo plankton net tows conducted in the subtropical Southern California Bight from January to April 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2023-05-02 doi:10.26008/1912/bco-dmo.895121.1 [[view at BCO-DMO](#)]

*Relationship Description: Associated larval *Sebastes* spp. abundance data.*

Semmens, B. X., Landry, M. R., Swalethorp, R. (2024) **Collected Larval *Sebastes* spp. Otolith and Morphometric Data from R/V Bob and Betty Beyster, R/V Shearwater BBB2102, BBB2104, SW2104, BBB2101 from January to April 2021 (RAPID Anchovy Response project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2024-10-11 <http://lod.bco-dmo.org/id/dataset/940324> [[view at BCO-DMO](#)]

*Relationship Description: Associated otolith morphometric data from the same collection of larval *Sebastes* spp.*

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Parameters

Parameter	Description	Units
Cruise	Cruise identifier.	unitless
ISO_DateTime_UTC	Date and time in UTC.	unitless
ISO_DateTime_PDT	Date and time in PDT (local).	unitless
Line	California Cooperative Oceanic Fisheries Investigations (CalCOFI) line.	unitless
St	California cooperative Oceanic Fisheries Investigations (CalCOFI) station.	unitless
Lat	Latitude in decimal degrees; a positive value indicates a northern coordinate.	decimal degrees
Long	Longitude in decimal degrees; a negative value indicates a western coordinate.	decimal degrees

Tow_Depth	Max depth of net.	meters (m)
Mesh_Size	Bongo net mesh size.	micrometers (um)
Larva_ID	Larval rockfish identifier.	unitless
Growth_Stage	Growth stage classification.	unitless
Species	Sebastes species name.	unitless
Species_AphiaID	Aphia ID associated with the scientific name listed in the Species column.	unitless
Species_Isid	LSID associated with the scientific name listed in the Species column.	unitless
SL	Standard length.	millimeters (mm)
BD	Body length.	millimeters (mm)
HL	Head length.	millimeters (mm)
Prey_Taxa	Prey item ID (taxonomic resolution varies between groups).	unitless
Prey_Taxa_AphiaID	Aphia ID associated with the listed prey taxa.	unitless
Prey_Taxa_Isid	LSID associated with the listed prey taxa.	unitless
Prey_Stage	Prey development stage.	unitless
Length	Prey length (prosoma length for Copepods).	millimeters (mm)
Width	Prey width.	millimeters (mm)

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Instruments

Dataset-specific Instrument Name	Bongo Plankton Net System
Generic Instrument Name	Bongo Net
Dataset-specific Description	Larval fish were collected using a 71-centimeter (cm) diameter dual Bongo plankton net system equipped with a small CastAway-CTD. The Bongo was equipped with two 505-micrometer (μm) mesh-size nets and a flowmeter mounted in the center of one of them.
Generic Instrument Description	A Bongo Net consists of paired plankton nets, typically with a 60 cm diameter mouth opening and varying mesh sizes, 10 to 1000 micron. The Bongo Frame was designed by the National Marine Fisheries Service for use in the MARMAP program. It consists of two cylindrical collars connected with a yoke so that replicate samples are collected at the same time. Variations in models are designed for either vertical hauls (OI-2500 = NMFS Pairvet-Style, MARMAP Bongo, CalVET) or both oblique and vertical hauls (Aquatic Research). The OI-1200 has an opening and closing mechanism that allows discrete "known-depth" sampling. This model is large enough to filter water at the rate of 47.5 m ³ /minute when towing at a speed of two knots. More information: Ocean Instruments, Aquatic Research, Sea-Gear

Dataset-specific Instrument Name	Zeiss Stemi 2000-C Dissecting Microscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Larvae were measured, dissected, and prey identified and measured under a Zeiss Stemi 2000-C dissecting microscope equipped with a micrometer ocular.
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of reflection and absorption of visible light. Includes conventional and inverted instruments. Also called a "light microscope".

Dataset-specific Instrument Name	CastAway-CTD
Generic Instrument Name	SonTek CastAway-CTD
Dataset-specific Description	Larval fish were collected using a dual Bongo plankton net system equipped with a small CTD to record depth and physical variables during horizontal net tows at a ship speed of 1.5 to 2.5 knots down to 14 to 36 meters (m) depth, depending on bottom depth.
Generic Instrument Description	The Sontek CastAway-CTD (manufactured by Xylem) is a handheld castable instrument that provides instantaneous profiles of temperature, salinity, and sound speed. Each cast is referenced with both time and location using its built-in GPS receiver. The CastAway software displays profiles of the casts in addition to mapping the locations of the data collection points. The CastAway-CTD has a 5 Hz response and sampling rate, accurate to 0.1 (PSS-78), 0.05° Celsius. Conductivity range is 0 to 100,000 $\mu\text{S}/\text{cm}$. Temperature range is -5° to 45° Celsius. Pressure range is 0 to 100 decibars. Further specs and information can be found on the manufacturer's website: https://www.xylem.com/en-us/brands/wtw/wtw-products/castaway-ctd/

Deployments

BBB2102

Website	https://www.bco-dmo.org/deployment/871650
Platform	R/V Bob and Betty Beyster
Start Date	2021-02-01
End Date	2021-02-01

BBB2104

Website	https://www.bco-dmo.org/deployment/871651
Platform	R/V Bob and Betty Beyster
Start Date	2021-04-06
End Date	2021-04-07

SW2104

Website	https://www.bco-dmo.org/deployment/871652
Platform	R/V Shearwater
Start Date	2021-04-13
End Date	2021-04-15

BBB2101

Website	https://www.bco-dmo.org/deployment/871649
Platform	R/V Bob and Betty Beyster
Start Date	2021-01-23
End Date	2021-01-24

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Project Information

RAPID: Understanding the unprecedented anchovy response to warm-water conditions in the California Current (RAPID Anchovy Response)

Coverage: Southern California Bight and surrounding coastal areas between 32° and 35° N, and 117° and 120° W

NSF Award Abstract:

Like many species of small pelagic marine fish, recruitment and productivity of Northern Anchovy fluctuate by orders of magnitude among years. When abundant, the anchovy support a wide range of marine species, including marine mammals, seabirds and a diverse group of marine fishes. Anchovy, which previously thrived during periods of cool-water temperatures and strong coastal upwelling, are currently booming with abundances far in excess of any historical record, even though the California Current Ecosystem is experiencing an unprecedented marine heat wave. This unexpected occurrence challenges the most basic understanding of the mechanisms driving population dynamics in the species. This project is investigating the effects of trophic relationships on population productivity by capitalizing on the immediate research

opportunity afforded by the novel, yet ephemeral, state of a local marine heat wave. Findings from the work are being used to develop a mechanistic model of coastal pelagic fish population dynamics generally, and anchovy dynamics in particular. Funded field and lab work are supporting opportunities for undergraduate training and research, and are generating open-access data that serve the research and teaching/training communities into the future.

This RAPID project augments the scheduled Fall research cruises jointly run by the California Cooperative Oceanic Fisheries Investigation and the California Current Ecosystem Long-Term Ecological Research programs. Together, these programs conduct regional oceanographic surveys that include anchovy spawning grounds and larval nursery areas. The RAPID-augmented sampling is designed to test the emerging hypothesis that anchovy populations are trophodynamically mediated at the larval stage, whereby high recruitment results from increased trophic transfer efficiency from the base of the food web. Larval diets and prey selection analyses are being paired with amino acid compound-specific isotope analysis ($\delta^{15}\text{N}$) of the larvae and prey field to generate detailed information on larval trophic ecology. Larval diets and plankton community structure are being related to available data on upwelling and productivity to assess environmental and biological drivers to trophic transfer efficiency. Collectively, these analyses are revealing how food chain length is regulated at the larval level through prey selection, at the prey level through community composition, and at the base of the food chain via coastal upwelling and primary production. Furthermore, this project is establishing whether the current trophic level of anchovy larvae is equal to that of historic population booms and if this is the result of favorable feeding conditions throughout their habitat. Findings from the study are generating a mechanistic understanding of the trophic underpinnings of small pelagic fish population productivity in coastal upwelling systems.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

Location Description:

This study is carried out within the temperate to subtropical Southern California Bight and surrounding coastal areas between 32° and 35° N, and 117° and 120° W. Specific locations sampled fall within the CalCOFI and CCE-LTER programs quarterly survey grid from lines 76.7 to 93.4 and stations 26 to 55.

Project Affiliations:

[California Current Ecosystem Long-term Ecological Research Program \(CCE-LTER\)](#)
[California Cooperative Oceanic Fisheries Investigations \(CalCOFI\)](#)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2053719

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