Zooplankton community abundances from meter net tows on multiple cruises on RV/Savannah in the South Atlantic Bight, Mid-Continental Shelf from 2015-2017

Website: https://www.bco-dmo.org/dataset/692753
Data Type: Cruise Results
Version: 3
Version Date: 2020-04-08

Project
» The cryptic diet of the globally significant pelagic tunicate Dolioletta gegenbauri (Uljanin, 1884.) (Doliolid Diet)

Contributors	Affiliation	Role
Frischer, Marc E.	Skidaway Institute of Oceanography (SkIO)	Principal Investigator
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Abstract
Zooplankton community abundances from meter net tows taken on multiple cruises RV/Savannah cruises in the South Atlantic Bight, Mid-Continental Shelf from August 2015 to December 2017.

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Coverage

Spatial Extent: **N**:31 **E**:-80.2082 **S**:29.9447 **W**:-80.642
Temporal Extent: 2015-08-04 - 2017-12-05

Dataset Description

This dataset includes zooplankton counts and abundances from meter net tows on multiple cruises on RV/Savannah in the South Atlantic Bight, Mid-Continental Shelf from August 2015 to December 2017.

Latitude and longitude data are included in version 3.

Methods & Sampling

Zooplankton was collected from 31°N to 29°N aboard the R/V Savannah at the 25m and 40m isobaths using a 1M (mouth opening) 5M length 200 µm mesh cone plankton net equipped with a filtering (202 µm mesh) cod-end. The mouth of the net was mounted in a swivel towing frame that allowed the opening of the net to track the water current. A mechanical flow meter (General Oceanics Part# 2030RC) was mounted in the center of the net. Flowmeter measurements for 2015 cruises (pdf) The net was deployed from a gently drifting ship and

the entire water column was sampled by lowering the net to near the bottom and retrieving it (oblique tow). Net speed was maintained at approximately 15 meters per minute. Once retrieved the contents of the net were collected on a 200 µm sieve and preserved in 60% non-denatured ethanol.

Samples were split twice to create four subsamples using a Folsom plankton splitter.

One of the subsamples was diluted to a known volume and stirred gently. Dilutions were adjusted depending on the density of zooplankton so that sufficient numbers of species were present in each sample to obtain a reliable estimate of the major taxonomic groups in each sample. Replicate aliquots from the subsample were counted under a dissecting microscope using a Bogorov counting chamber. The volume of sample counted was adjusted based on the density of zooplankton present but was generally 5 ml. A Stempel pipette was used to dispense the counted volume.

In the case where the identity was uncertain, representative examples of the unidentified zooplankton were identified by DNA barcoding. DNA extractions were performed using the DNeasy Blood & Tissue Kit (Qiagen) according to manufacturer's protocol except that samples were macerated and homogenized with Kimble/Kontes Cordless Motor, the proteinase K incubation was extended to ~24 hours (overnight) and the volume of elution buffer AE varied depending on sample size (60ul for most). For DNA quantitation and quality testing, one (1) ul of DNA was used to measure the 260/280 ratio using the Thermo Scientific™ NanoDrop Lite Spectrophotometer. The presence of high molecular weight DNA in each extract was visually confirmed by agarose (1%) gel electrophoresis. Good quality DNA extractions, inferred by 260/280 ratio and electrophoresis, were selected for amplification by Polymerase Chain Reaction (PCR) of a fragment of the mitochondrial cytochrome oxidase subunit I (mtCOI) gene. A 708 base-pair mtCOI gene fragment was amplified using the consensus primer pairs LCO-1490 (5'-GGTCAACAAATCATAAAGATATTGG-3') and HCO-2198 (5'-TAAACTTCAGGGTGACCAAAAAATCA-3') (Folmer et al. 1994). Amplification was facilitated using a Bio-Rad T100Thermocycler with GoTaq Hot Start Green Master Mix. Cycling conditions were: 10 min at 95 °C; 35 cycles of 30 sec at 95 °C, 1 min at 47 °C and 1 min at 72 °C; and 10 min at 72 °C. PCR product quality and quantity was assessed by 2% agarose gel electrophoresis and subsequently sequenced by Eurofins Genomics. DNA sequences obtained were compared to a reference database library using the Basic Local Alignment Search Tool (BLAST) (Altschul et al. 1990) available at the National Center for Biotechnology Information (NCBI) and Bold Systems Identification engine for CO1 gene.

Data Processing Description

The abundance of each zooplankton group was estimated accounting for all sample dilution and extrapolated based on the calculated initial net sampling volume. No further data processing was involved. All data was reviewed by at least one other expert. If outliers were identified all calculations were confirmed and in cases where errors were not obvious the sample was re-counted.

BCO-DMO Processing Notes:
Version 1 [2017-04-28]: (2015 data)
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- blank values were replaced with no data value 'nd'
- added columns for cruise id, station, date, time, lat, lon, volume filtered, cast, replicate, splits, taxon_1

Version 2 [2020-02-24] (2015-2017 data)
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- blank and ND values were replaced with 'nd'
- date was converted to yyyy-mm-dd and ISO_DateTime_UTC was added
- "Jekyll Is" was replaced with "Jekyll Is" (one space between words)
- replaced blanks with zeroes in 'splits' column

Version 3 [2020-04-08] (2015-2017 data; includes lats/lons)
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- blanks, NO DATA, and ND values were replaced with 'nd'
- date was converted to yyyy-mm-dd and ISO_DateTime_UTC was added
- latitude and longitude were converted from degrees, minutes, seconds to decimal degrees.

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Data Files

File
zooplankton_abundance_v3_rs.csv (Comma Separated Values (.csv), 755.86 KB) MD5:86a45fbd56315fbb701000d83c0190ab Primary data file for dataset ID 692753

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Related Publications

Walters, T. L., Lamboley, L. M., Lopez-Figueroa, N. B., Rodriguez-Santiago, A. E., Gibson, D. M., & Frischer, M. E. (2018). Data from: Diet and trophic interactions of a circumglobally significant gelatinous marine zooplankter, Dolioletta gegenbauri (Uljanin, 1884) [Data set]. Dryad. https://doi.org/10.5061/DRYAD.99P2308 https://doi.org/10.5061/dryad.99p2308
Related Research

Walters, T. L., Lamboley, L. M., López-Figueroa, N. B., Rodríguez-Santiago, Á. E., Gibson, D. M., & Frischer, M. E. (2018). Diet and trophic interactions of a circumglobally significant gelatinous marine zooplankter, Dolioletta gegenbauri (Uljanin, 1884). Molecular Ecology, 28(2), 176–189. doi:10.1111/mec.14926
Results

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Parameters

Parameter	Description	Units
cruise_id	cruise identifier	unitless
date	local date	unitless
time_tow	local time of the replicate tow	unitless
lat_decdeg	latitude; north is positive	decimal degrees
lon_decdeg	longitude; east is positive	decimal degrees
station_depth_water	sampling depth	meters
mesh	mesh opening size	microns
vol_filt	volume of water filtered by net for a replicate tow	cubic meters (m^3)
cast	cast number	unitless
replicate	replicate tow number; two tows were taken at each station	unitless
splits	number of times the sample was split; fraction of sample = 1/n^2 so splits=2 means 1/4 of sample was processed. Except for splits = 0, this means the entire sample was used for the taxonomic count.	splits
taxon_1	taxon 1: holoplankton or meroplankton	unitless
taxon_2	most specific taxonomic group identified	unitless
dilution_factor	sample dilution factor	unitless
count_aliquot_1	first aliquot raw count from replicate sample split	number of individuals per sample
count_aliquot_2	second aliquot raw count from replicate sample split	number of individuals per sample
count_mean	mean raw count	number of individuals per sample
count_sample	calculated average abundance of individuals per sample	number of individuals per sample
abundance_m3	estimated abundance	individuals per cubic meter of water
ISO_DateTime_UTC	UTC date and time of tow in ISO format: yyyy-mm-ddTHH:MM:SSZ	yyyy-MM-dd'T'HH:mm:ss'Z'

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Automated DNA Sequencer
Generic Instrument Description	General term for a laboratory instrument used for deciphering the order of bases in a strand of DNA. Sanger sequencers detect fluorescence from different dyes that are used to identify the A, C, G, and T extension reactions. Contemporary or Pyrosequencer methods are based on detecting the activity of DNA polymerase (a DNA synthesizing enzyme) with another chemoluminescent enzyme. Essentially, the method allows sequencing of a single strand of DNA by synthesizing the complementary strand along it, one base pair at a time, and detecting which base was actually added at each step.

Dataset-specific Instrument Name	mechanical flow meter (General Oceanics Part# 2030RC)
Generic Instrument Name	Flow Meter
Dataset-specific Description	Used to measure volume of water passing through the plankton net.
Generic Instrument Description	General term for a sensor that quantifies the rate at which fluids (e.g. water or air) pass through sensor packages, instruments, or sampling devices. A flow meter may be mechanical, optical, electromagnetic, etc.

Dataset-specific Instrument Name	
Generic Instrument Name	Folsom Plankton Splitter
Dataset-specific Description	Used to split plankton samples into equivalent subsamples.
Generic Instrument Description	A Folsom Plankton Splitter is used for sub-sampling of plankton and ichthyoplankton samples.

Dataset-specific Instrument Name	meter net
Generic Instrument Name	Meter Net
Dataset-specific Description	1M (mouth opening) 5M length 200 µm mesh cone plankton net equipped with a filtering (202 µm mesh) cod-end. The mouth of the net was mounted in a swivel towing frame that allowed the opening of the net to track the water current. A mechanical flow meter (General Oceanics Part# 2030RC) was mounted in the center of the net.
Generic Instrument Description	A meter net is a plankton net with a one meter diameter opening and a mesh size of .333 mm, towed horizontally, obliquely or vertically, also known as a Ring Net.

Dataset-specific Instrument Name	Thermo Scientific™ NanoDrop Lite Spectrophotometer
Generic Instrument Name	Spectrophotometer
Dataset-specific Description	Used for DNA quantitation and quality testing.
Generic Instrument Description	An instrument used to measure the relative absorption of electromagnetic radiation of different wavelengths in the near infra-red, visible and ultraviolet wavebands by samples.

Dataset-specific Instrument Name	Bio-Rad T100Thermocycler
Generic Instrument Name	Thermal Cycler
Generic Instrument Description	A thermal cycler or "thermocycler" is a general term for a type of laboratory apparatus, commonly used for performing polymerase chain reaction (PCR), that is capable of repeatedly altering and maintaining specific temperatures for defined periods of time. The device has a thermal block with holes where tubes with the PCR reaction mixtures can be inserted. The cycler then raises and lowers the temperature of the block in discrete, pre-programmed steps. They can also be used to facilitate other temperature-sensitive reactions, including restriction enzyme digestion or rapid diagnostics. (adapted from http://serc.carleton.edu/microbelife/research_methods/genomics/pcr.html)

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Deployments

SAV-15-19

Website	https://www.bco-dmo.org/deployment/692295
Platform	R/V Savannah
Start Date	2015-08-03
End Date	2015-08-05
Description	Doliolid studies

SAV-15-31

Website	https://www.bco-dmo.org/deployment/692325
Platform	R/V Savannah
Start Date	2015-12-01
End Date	2015-12-02
Description	Doliolid studies

SAV-16-04

Website	https://www.bco-dmo.org/deployment/768826
Platform	R/V Savannah
Start Date	2016-02-17
End Date	2016-02-18
Description	Doliolid studies

SAV-16-06

Website	https://www.bco-dmo.org/deployment/672529
Platform	R/V Savannah
Start Date	2016-03-06
End Date	2016-03-12
Description	More information is available from Rolling Deck to Repository (R2R): https://www.rvdata.us/search/cruise/SAV-16-06

SAV-16-08

Website	https://www.bco-dmo.org/deployment/768829
Platform	R/V Savannah
Start Date	2016-03-16
End Date	2016-03-17
Description	Doliolid studies

SAV-16-11

Website	https://www.bco-dmo.org/deployment/768835
Platform	R/V Savannah
Start Date	2016-04-12
End Date	2016-04-13
Description	Doliolid studies

SAV-16-15

Website	https://www.bco-dmo.org/deployment/768836
Platform	R/V Savannah
Start Date	2016-05-12
End Date	2016-05-13
Description	Doliolid studies

SAV-17-16

Website	https://www.bco-dmo.org/deployment/767055
Platform	R/V Savannah
Start Date	2017-08-16
End Date	2017-08-19

SAV-17-19

Website	https://www.bco-dmo.org/deployment/768884
Platform	R/V Savannah
Start Date	2017-10-09
End Date	2017-10-10
Description	Doliolid studies

SAV-17-22

Website	https://www.bco-dmo.org/deployment/768886
Platform	R/V Savannah
Start Date	2017-10-31
End Date	2017-11-01
Description	Doliolid studies

SAV-17-23

Website	https://www.bco-dmo.org/deployment/768888
Platform	R/V Savannah
Start Date	2017-11-07
End Date	2017-11-08
Description	Doliolid studies

SAV-17-25

Website	https://www.bco-dmo.org/deployment/768890
Platform	R/V Savannah
Start Date	2017-12-05
End Date	2017-12-06
Description	Doliolid studies

SAV-16-05

Website	https://www.bco-dmo.org/deployment/794100
Platform	R/V Savannah
Start Date	2016-03-01
End Date	2016-03-03
Description	Doliolid studies

SAV-16-07

Website	https://www.bco-dmo.org/deployment/794102
Platform	R/V Savannah
Start Date	2016-03-14
End Date	2016-03-14

SAV-16-09

Website	https://www.bco-dmo.org/deployment/794104
Platform	R/V Savannah
Start Date	2016-03-22
End Date	2016-03-24

SAV-16-10

Website	https://www.bco-dmo.org/deployment/794108
Platform	R/V Savannah
Start Date	2016-03-25
End Date	2016-03-25
Description	Student Cruise

SAV-16-12

Website	https://www.bco-dmo.org/deployment/794111
Platform	R/V Savannah
Start Date	2016-04-17
End Date	2016-04-22
Description	LTER cruise

SAV-16-13

Website	https://www.bco-dmo.org/deployment/794114
Platform	R/V Savannah
Start Date	2016-04-26
End Date	2016-05-01

SAV-16-14

Website	https://www.bco-dmo.org/deployment/794118
Platform	R/V Savannah
Start Date	2016-05-03
End Date	2016-05-10

SAV-17-17

Website	https://www.bco-dmo.org/deployment/794140
Platform	R/V Savannah
Start Date	2017-08-22
End Date	2017-08-31

SAV-17-18

Website	https://www.bco-dmo.org/deployment/794143
Platform	R/V Savannah
Start Date	2017-09-28
End Date	2017-10-02

SAV-17-20

Website	https://www.bco-dmo.org/deployment/794147
Platform	R/V Savannah
Start Date	2017-10-11
End Date	2017-10-11

SAV-17-21

Website	https://www.bco-dmo.org/deployment/794149
Platform	R/V Savannah
Start Date	2017-10-24
End Date	2017-10-26

SAV-17-24

Website	https://www.bco-dmo.org/deployment/794151
Platform	R/V Savannah
Start Date	2017-11-13
End Date	2017-11-16

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Project Information

The cryptic diet of the globally significant pelagic tunicate Dolioletta gegenbauri (Uljanin, 1884.) (Doliolid Diet)

Coverage: South Atlantic Bight

Project description from NSF award abstract:
Gelatinous (soft-bodied) zooplankton can play a crucial role in food webs and in cycling of materials in the world's oceans, and it has been suggested that they may become even more important in the future. However,

because they are so difficult to study, gelatinous species remain poorly understood. This is especially true for smaller filter feeding gelatinous animals such as pelagic tunicates (salps, larvaceans, and doliolids). For example, it remains unclear what and how much these abundant filter feeders eat in nature and who eats them. This project will address this large and significant knowledge gap by using a combination of new and traditional methods to investigate the diet of the gelatinous pelagic tunicate *Dolioletti gegenbauri*, a species common on productive continental shelves such as the South Atlantic Bight. This project will also help train the next generation of ocean scientists to be competent in classical biology, modern molecular biology, and ecosystem modeling. Training will also focus on increasing representation of African Americans in the future science, technology, engineering, and math (STEM) workforce.

This study will provide the first quantitative estimates of the in situ diet of a key continental shelf gelatinous zooplankton species, the doliolid *Dolioletta gegenbauri*. Large blooms of doliolids have the potential to control the trophic structure of shelf pelagic ecosystems by shunting primary production to the microbial food web and by limiting copepod production via the consumption of their eggs. The long-term objective is to understand the ecological role and significance of doliolids in continental shelf pelagic ecosystems, specifically the underlying processes that lead to their high level of spatial and temporal patchiness. The basic questions to be addressed here include: What do doliolids eat, in situ, at different life stages? Are early life stages of larger metazoans important components of their diets? Do doliolids act as trophic cascade agents promoting primary production and phytoplankton diversity? Because of methodological challenges, there have not yet been definitive studies addressing these fundamental questions. In this project, the investigators will conduct field-based studies that will combine state-of-the art molecular techniques with more traditional methods in zooplankton ecology to answer questions about trophic interactions. Monthly oceanographic expeditions in the South Atlantic Bight will allow the research team to study wild doliolids at different time points in their life cycle and under different plankton bloom conditions. Application of recently developed molecular diagnostic assays will enable the quantitative description of the diversity and quantity of prey consumed, unbiased by experimental manipulation. Additional experimental and theoretical modeling will allow the investigators to link these data with larger ecological significance and scale.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459293
NSF Division of Ocean Sciences (NSF OCE)	OCE-1459510

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