Doliolid abundance, carbon and nitrogen content, chlorophyll-a, temperature, salinity, and depth from CTD casts from 25 RV Savannah cruises at the South Atlantic Bight, 2015-2017

Website: https://www.bco-dmo.org/dataset/692279

Data Type: Cruise Results

Version: 2

Version Date: 2019-05-29

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

Doliolid abundance, carbon and nitrogen content, chlorophyll-a, temperature, salinity, and depth from CTD casts from 25 RV Savannah cruises at the South Atlantic Bight, 2015-2017.

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Coverage

Spatial Extent: **N**:31 **E**:-80.2082 **S**:29.9447 **W**:-80.642

Temporal Extent: 2015-05-19 - 2015-12-02

Dataset Description

This dataset includes Doliolid abundance, carbon and nitrogen content, depth, temperature, salinity and in situ chlorophyll a from 25 cruises on the RV/Savannah at the South Atlantic Bight, Mid-Continental Shelf, (31 N 80 W) during 2015-2017. From the bottle samples, the following parameters were also measured:
- Average chemical extracted size fractionated total and > 8 um chlorophyll a and phaeophytin (mg m-3)
- Total and size fractionated (<10 um) POC (mg m-3 and mole L-1)
- Total and size fractionated (<10 um) PON (mg m-3 and mole L-1)
- Total and size fractionated (<10 um) delta13C (per mil vs PDB standard)
- Total and size fractionated (<10 um) delta15N (per mil vs air N2)
- Average delta13C (per mil vs PDB standard) and delta15N (per mil vs air N2) of starved D. gegenbauri zooids.
- D. gegenbauri abundance (individuals m-3)

Acquisition Description

Depth, Temperature, salinity and in situ chlorophyll a salinity were recorded during the cruise from the real-time CTD data feed, recorded in log books. Complete CTD cast records are included as an independent dataset associated with this deployment. Surface values were recorded during the period when the CTD rosette entered the water and were logged once values had stabilized. Near bottom values were logged when CTD had reached its maximum deployment depth and values stabilized.

Extracted chlorophyll a and phaeophytin values were determined following overnight extraction in 90% acetone essentially as described by Parsons et al. (1984) after filtering 100 – 250 ml of water sample through either 0.2 microns (total) or 8 microns (> 8 microns) polycarbonate membrane filters. Filtrations were conducted in a darkened room. Filtration times were kept to less than 20 minutes per sample and less than 10 mm Hg vacuum. Following filtration, filters were placed directly into clean extraction tubes and stored frozen at -20ºC. Filters were extracted and analyzed within one week of collection. Fluorescence was measured using a 10AU Turner Designs fluorometer that was calibrated regularly using a chlorophyll standard solution (Sigma Chl std cat #C6144 – 1 mg). Standard curves were prepared as a 12-point dilution series from 0.05 – 500 micrograms L-1.

Water particulate organic matter (POC and PON) concentrations and isotopic composition were estimated from water samples (200 – 500 ml) filtered through pre-combusted Whatman GF/F filters. Filters were dried and stored at 60 deg.C until analysis.

Organic matter (C and N) isotopic composition of animals was also estimated. Individual animals were placed in 8x10 mm tin cups (Elemental Microanalysis) with a minimum of fluid, and dried at 60ºC for at least 48 hours prior to analysis. Samples were stored in 48-well plates at 60ºC prior to final preparation.

Sample analysis for %C, % N, d13C and d15N were performed on a ThermoFisher Delta V plus isotope ratio mass spectrometer interfaced to a Thermo Flash Elemental analyzer (Fry 1992). Isotopic and elemental composition calibrations were performed using commercially available powdered chitin (Sigma Chemical), which in turn had been calibrated against a variety of international (USGS 40 Glutamic Acid) and commercial (Elemental Microanalysis B2151 and B2155) isotopic and compositional standards. Chitin standards were run at the start of each analysis across the range of C amounts anticipated to be present in the samples, and every 10 samples as a drift check.

Processing Description

All data collected is thoroughly reviewed and quality controlled prior to finalization and reporting. Data that exceeded two standard deviations from mean data (of 3 or more samples) were flagged and removed. With respect to data for isotopic composition analysis, samples that did not contain sufficient biomass for instrument detection were not included and reported as NA (not available). In cases where observations were not logged, data is reported as NR (not reported). In cases where sample was not analyzed, data are reported as nd (not done). Blank data cells indicate data that are currently being analyzed.

BCO-DMO Processing Notes:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- changed ND, NR, NA to nd to allow BCO-DMO statisticker to work
- replaced blanks with nd
- converted lat and lon to decimal degrees
- converted date from m/d/yyyy to yyyy-mm-dd

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Related Publications

Fry, B., Brand, W., Mersch, F. J., Tholke, K., & Garritt, R. (1992). Automated analysis system for coupled .delta.13C and .delta.15N measurements. Analytical Chemistry, 64(3), 288–291. doi:10.1021/ac00027a009

Parsons T, Takahashi M, Hargrave B, (1984) Biological Oceanographic Processes. 3rd ed. Pergamon Press, England, pp. 330.

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Parameters

Parameter	Description	Units
date_local	local date formatted as yyyy-mm-dd	unitless

cruise_id	cruise identifier; official R2R designation	unitless
alt_cruise_id	alternate cruise identifier	unitless
cast	cast number	unitless
depth	depth of sample	meters
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
temp_surface	Surface temperature; observed surface temperature recorded during a CTD cast.	degrees Celsius
temp_bottom	Bottom temperature; observed bottom (1-2 meters off the bottom) temperature recorded during a CTD cast.	degrees Celsius
sal_surface	Surface salinity ; observed surface salinity recorded during a CTD cast.	Practical Salinity Units (PSU)
sal_bottom	Bottom salinity; observed salinity near bottom (1-2 meters off the bottom) recorded during a CTD cast	Practical Salinity Units (PSU)
chla_surface_fluor	Surface Chlorophyll a fluorescence; observed surface (1-5M) in situ fluorescence recorded during a CTD cast.	mg m-3
chla_bottom_fluor	Bottom Chlorophyll a fluorescence; observed bottom (1-2 meters off the bottom) in situ fluorescence recorded during a CTD cast.	mg m-3
chla_nr_bot_extr	Total Chlorophyll a (near bottom) chemical extracted mg m-3; Average of 3 samples of acetone extracted chlorophyll a collected at ~ depth of the chlorophyll maximum.	mg m-3
phaeo_total_nr_bot_extr	Total Phaeophytin (near bottom) chemical extracted mg m-3; Average of 3 samples of acidified acetone extracted chlorophyll a collected at depth of the chlorophyll maximum.	mg m-3

gt8uml_chla_nr_bot_extr	Greater than 8 µm chlorophyll a fraction (near bottom) chemical extracted mg m-3; Average of 3 samples of acetone extracted chlorophyll a collected at depth of the chlorophyll maximum.	mg m-3
gt8uml_phaeo_nr_bot_extr	Greater than 8 µm phaeophytin (near bottom) chemical extracted mg m-3; Average of 3 samples of acidified acetone extracted chlorophyll a collected at depth of the chlorophyll maximum.	mg m-3
POC_ug	Water Total POC; Concentration of particulate organic carbon (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	ug C L-1
POC_moles	Water Total POC; Concentration of particulate organic carbon (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	moles C L-1
PON_ug	Water Total PON; Concentration of particulate organic nitrogen (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	ug N L-1
PON_moles	Water Total PON; Concentration of particulate organic nitrogen (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	moles N L-1
lt10um_POC_ug	Water	ug C L-1
lt10um_POC_moles	Water < 10 um POC; Concentration of particulate organic carbon (near bottom) in less than 10 micron size fraction; Average of 3 water samples collected at depth of the chlorophyll maximum.	moles C L-1
lt10um_PON_ug	Water < 10 um PON; Concentration of particulate organic nitrogen (near bottom) in less than 10 micron size fraction; Average of 3 water samples collected at depth of the chlorophyll maximum.	ug N L-1

lt10um_PON_moles	Water < 10 um PON; Concentration of particulate organic nitrogen (near bottom) in less than 10 micron size fraction ; Average of 3 water samples collected at depth of the chlorophyll maximum.	moles N L-1
POC_13C	Water Total POC 13C; 13-Carbon isotopic fraction of total particulate organic carbon (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	per mil vs PDB standard
PON_15N	Water Total PON 15N; 15-Nitrogen isotopic fraction of total particulate organic nitrogen (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	per mil vs air N2
lt10um_POC_13C	Water < 10 um POC; 13-Carbon isotopic fraction of less than 10 micron fraction particulate organic carbon (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	per mil vs PDB standard
lt10um_PON_15N	Water < 10 um PON 15N; 15-Nitrogen isotopic fraction of less than 10 micron fraction particulate organic nitrogen (near bottom); Average of 3 water samples collected at depth of the chlorophyll maximum.	per mil vs air N2
D_geg_gonozooid_13C	D. gegenbauri (gonozooid); 13-Carbon isotopic fraction of wild caught Dolioletta gegenbauri gonozooids; Average of all animals captured per sample.	per mil vs PDB standard
D_geg_gonozooid_15N	D. gegenbauri (gonozooid); 15-Nitrogen isotopic fraction of wild caught Dolioletta gegenbauri gonozooids; Average of all animals captured per sample.	per mil vs air N2
D_geg_nurse_13C	D. gegenbauri (nurse); 13-Carbon isotopic fraction of wild caught Dolioletta gegenbauri nurses; Average of all animals captured per sample.	per mil vs PDB standard
D_geg_nurse_15N	D. gegenbauri (nurse). 15-Nitrogen isotopic fraction of wild caught Dolioletta gegenbauri gonozooids; Average of all animals captured per sample.	per mil vs air N2

D_geg_phorozooid_13C	D. gegenbauri (phorozooid); 13-Carbon isotopic fraction of wild caught Dolioletta gegenbauri phorozooids; Average of all animals captured per sample.	per mil vs PDB standard
D_geg_phorozooid_15N	D. gegenbauri (phorozooid). 15-Nitrogen isotopic fraction of wild caught Dolioletta gegenbauri phorozooids; Average of all animals captured per sample.	per mil vs air N2
D_geg_abund	D. gegenbauri abundance; Average concentration of D. gegenbauri (all life phases) from 2 depth integrated oblique net tows.	individuals M-3
D_geg_abund_stdev	D. gegenbauri abundance (Stdev); Standard deviation of D. gegenbauri (all life phases) from 2 depth integrated oblique net tows.	individuals M-3

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Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24 or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	
Generic Instrument Name	CTD profiler
Generic Instrument Description	The Conductivity, Temperature, Depth (CTD) unit is an integrated instrument package designed to measure the conductivity, temperature, and pressure (depth) of the water column. The instrument is lowered via cable through the water column and permits scientists observe the physical properties in real time via a conducting cable connecting the CTD to a deck unit and computer on the ship. The CTD is often configured with additional optional sensors including fluorometers, transmissometers and/or radiometers. It is often combined with a Rosette of water sampling bottles (e.g. Niskin, GO-FLO) for collecting discrete water samples during the cast. This instrument designation is used when specific make and model are not known.

Dataset-specific Instrument Name	10AU Turner Designs fluorometer
Generic Instrument Name	Turner Designs Fluorometer -10-AU
Generic Instrument Description	The Turner Designs 10-AU Field Fluorometer is used to measure Chlorophyll fluorescence. The 10AU Fluorometer can be set up for continuous-flow monitoring or discrete sample analyses. A variety of compounds can be measured using application-specific optical filters available from the manufacturer. (read more from Turner Designs, turnerdesigns.com, Sunnyvale, CA, USA)

Dataset-specific Instrument Name	ThermoFisher Delta V
Generic Instrument Name	Isotope-ratio Mass Spectrometer
Dataset-specific Description	A ThermoFisher Delta V plus isotope ratio mass spectrometer interfaced to a Thermo Flash Elemental analyzer was used for isotope carbon and nitrogen analyses.
Generic Instrument Description	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

Dataset-specific Instrument Name	Thermo Flash Elemental analyzer
Generic Instrument Name	Elemental Analyzer
Dataset-specific Description	Sample analysis for %C, %N , d13C and d15N were performed on a ThermoFisher Delta V plus isotope ratio mass spectrometer interfaced to a Thermo Flash Elemental analyzer.
Generic Instrument Description	Instruments that quantify carbon, nitrogen and sometimes other elements by combusting the sample at very high temperature and assaying the resulting gaseous oxides. Usually used for samples including organic material.

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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-15-10

Website	https://www.bco-dmo.org/deployment/692323
Platform	R/V Savannah
Start Date	2015-05-19
End Date	2015-05-20
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-16-02

Website	https://www.bco-dmo.org/deployment/768822
Platform	R/V Savannah
Start Date	2016-01-26
End Date	2016-01-27
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-16-08

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-16-20

Website	https://www.bco-dmo.org/deployment/768841
Platform	R/V Savannah
Start Date	2016-06-15
End Date	2016-06-16
Description	Doliolid studies

SAV-16-23

Website	https://www.bco-dmo.org/deployment/768847
Platform	R/V Savannah
Start Date	2016-07-06
End Date	2016-07-07
Description	Doliolid studies

SAV-16-27

Website	https://www.bco-dmo.org/deployment/768848
Platform	R/V Savannah
Start Date	2016-08-11
End Date	2016-08-12
Description	Doliolid studies

SAV-16-33

Website	https://www.bco-dmo.org/deployment/768851
Platform	R/V Savannah
Start Date	2016-09-30
End Date	2016-10-01
Description	Doliolid studies

SAV-16-34

Website	https://www.bco-dmo.org/deployment/768857
Platform	R/V Savannah
Start Date	2016-10-18
End Date	2016-10-19
Description	Doliolid studies

SAV-16-37

Website	https://www.bco-dmo.org/deployment/768859
Platform	R/V Savannah
Start Date	2016-11-01
End Date	2016-11-02
Description	Doliolid studies

SAV-16-40

Website	https://www.bco-dmo.org/deployment/768861
Platform	R/V Savannah
Start Date	2016-12-07
End Date	2016-12-08
Description	Doliolid studies

SAV-17-01

Website	https://www.bco-dmo.org/deployment/768866
Platform	R/V Savannah
Start Date	2017-01-04
End Date	2017-01-05
Description	Doliolid studies

SAV-17-03

Website	https://www.bco-dmo.org/deployment/768868
Platform	R/V Savannah
Start Date	2017-02-02
End Date	2017-02-03
Description	Doliolid studies

SAV-17-04

Website	https://www.bco-dmo.org/deployment/768870
Platform	R/V Savannah
Start Date	2017-03-30
End Date	2017-03-31
Description	Doliolid studies

SAV-17-06

Website	https://www.bco-dmo.org/deployment/768872
Platform	R/V Savannah
Start Date	2017-04-20
End Date	2017-04-21
Description	Doliolid studies

SAV-17-11

Website	https://www.bco-dmo.org/deployment/768874
Platform	R/V Savannah
Start Date	2017-06-17
End Date	2017-06-18
Description	Doliolid studies

SAV-17-14

Website	https://www.bco-dmo.org/deployment/768881
Platform	R/V Savannah
Start Date	2017-07-11
End Date	2017-07-12
Description	Doliolid studies

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

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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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