Zooplankton abundance from Isaacs-Kid Midwater Trawl (IKMT) hauls from RVIB Nathaniel B. Palmer NBP1801 in the Ross Sea, Jan.-Feb. 2018

Website: https://www.bco-dmo.org/dataset/792385
Data Type: Cruise Results
Version: 4
Version Date: 2020-05-11

Project
» Using Bio-acoustics on an Autonomous Surveying Platform for the Examination of Phytoplankton-zooplankton and Fish Interactions in the Western Ross Sea (bio-acoustic plankton surveys)

Contributors	Affiliation	Role
Saba, Grace	Rutgers University	Principal Investigator
Copley, Nancy	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Isaacs-Kid Midwater Trawl (IKMT) hauls were conducted during the R/V Nathaniel B. Palmer cruise NBP18-01 in Jan-Feb 2018. These data represent the zooplankton species and abundance analysis resulting from these sample collections. A companion dataset of ring net tow abundances is also available.

Table of Contents

- Coverage
- Dataset Description
  - Methods & Sampling
  - Data Processing Description
- Data Files
- Parameters
- Instruments
- Deployments
- Project Information
- Funding

Coverage

Spatial Extent: **N**:-74.7731 **E**:172.9985 **S**:-76.7504 **W**:164.1588
Temporal Extent: 2018-01-10 - 2018-02-16

Dataset Description

Isaacs-Kid Midwater Trawl (IKMT) hauls were conducted during the R/V Nathaniel B. Palmer cruise NBP18-01 in Jan-Feb 2018. These data represent the zooplankton species and abundance analysis resulting from these sample collections. A companion dataset of ring net tow abundances is also available.

Methods & Sampling

Sample collection: Net tows and mid-water trawls were conducted in the western Ross Sea, Antarctica on board the R/V Nathaniel B. Palmer in January-February 2018 (cruise number 18-01). Both the ring net (1 m diameter, 333 um mesh, non-filtering cod end) and the Issacs-Kidd Midwater Trawl (IKMT, 1.8 m frame, 500 um mesh, non-filtering cod end) were fitted with a calibrated General Oceanics flow meter. Contents of each tow were concentrated and preserved with buffered formaldehyde (4% final concentration) in 500 ml wide-mouth glass jars. Samples were sent back to the home laboratory (Rutgers University) for analysis.

Analyses: Contents of each tow (or a subsample if the density of zooplankton or fish was high) were sorted by taxa and, in some cases, developmental stage. Measurements for abundance were conducted using a dissecting microscope (Zeiss Discovery.V8).

Volume of water (cubic meter) that passed through the net/trawl during each tow was calculated using flowmeter rotor constant, flowmeter start and end values, and the area of net opening.

Abundance per cubic meter per tow/trawl was then calculated for each species and, in some cases, developmental stage, by dividing the number of individuals for each species/developmental stage by the volume of water.

Data Processing Description

BCO-DMO Processing Notes:
version 1:
- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- in Method column, replaced commas with semicolons
- converted latitudes and longitudes to decimal degrees
- two columns were named 'Latitude end'; renamed second one 'lon_end_decdeg' as it's clearly a longitude.
- reformatted start and end date and times to ISO-format (from m/d/yy to yyyy-mm-ddTHH:MM:SSZ)
version 2:
- same as v1 - changes didn't 'take'.
version 3:
- corrected ISO_DateTime_UTC by removing an extra ":00" at end of the string (eg. 2018-01-10T02:04:00:00Z)
version 4:
- revised volume filtered and zooplankton abundance values.

[table of contents | back to top]

Data Files

File
ikmt_abund.csv (Comma Separated Values (.csv), 3.25 KB) MD5:cbe14892833d8e698bbf074d8737f3e0 Primary data file for dataset ID 792385

[table of contents | back to top]

Parameters

Parameter	Description	Units
Method	Collection method specified; either a 1-m diameter ring net with 333um mesh or an Isaacs Kidd Midwater Trawl with a 1.8-m frame	unitless
Tow_Trawl_number	Tow/Trawl number provided in chronological order during the cruise	unitless
ISO_DateTime_UTC_start	UTC date and time the tow/trawl started; ISO formatted	yyyy-MM-dd'T'HH:mm:ss'Z'

ISO_DateTime_UTC_end	UTC date and time the tow/trawl ended; ISO formatted: YYYY-MM-DDTHH:MM:SSZ	unitless
lat_start_decdeg	Latitude/Location where the tow/trawl started	decimal degrees
lon_start_decdeg	Longitude/Location where the tow/trawl started	decimal degrees
lat_end_decdeg	Latitude/Location where the tow/trawl ended	decimal degrees
lon_end_decdeg	Longitude/Location where the tow/trawl ended	decimal degrees
Net_depth_m	Water depth the ring net or trawl were towed	meters
Bottom_depth_m	Water depth at location of tow/trawl	meters
SST_deg_C	Sea Surface Temperature at time and location of tow/trawl	Degrees Celsius
Flowmeter_start	Calibrated General Oceanics flowmeter reading at start of tow/trawl; used in calculations for water volume that passed through the net/trawl	unitless
Flowmeter_end	Calibrated General Oceanics flowmeter reading at end of tow/trawl; used in calculations for water volume that passed through the net/trawl	unitless
Volume_m3	Volume of water that passed through the net/trawl; calculated using flowmeter data and area of net opening	cubic meters
Euphausiids_Euphausia_crystallorophias	Abundance of Euphausia crystallorophias	number/meter^3
Ecrystallorophias_small_juveniles	Abundance of E crystallorophias small juveniles	number/meter^3
Euphausia_superba	Abundance of Euphausia superba	number/meter^3
Thysanoessa_macrura	Abundance of Thysanoessa macrura	number/meter^3
Amphipods_Vibilia_stebbingi	Abundance of Vibilia stebbingi	number/meter^3
Primno_macropa	Abundance of Primno macropa	number/meter^3

Themisto_gaudichaudii	Abundance of Themisto gaudichaudii	number/meter^3
Hyperoche_sp	Abundance of Hyperoche sp.	number/meter^3
Eusirus_sp	Abundance of Eusirus sp.	number/meter^3
Chaetognaths_Pseudosagitta	Abundance of Pseudosagitta	number/meter^3
Pteropods_Limacina_rangii	Abundance of Limacina rangii	number/meter^3
Clione_limacina_antarctica	Abundance of Clione limacina antarctica	number/meter^3
Spongiobranchaea_australis	Abundance of Spongiobranchaea australis	number/meter^3
Fish_Pleuragramma_antarctica_adult_juv	Abundance of Pleuragramma antarctica adults and juveniles	number/meter^3
Pleuragramma_antarctica_larvae	Abundance of Pleuragramma antarctica larvae	number/meter^3
Channichthyidae	Abundance of Channichthyidae	number/meter^3
Decapods_Notocrangon_antarcticus	Abundance of Notocrangon antarcticus	number/meter^3
Other_Polychaeta	Abundance of other Polychaeta	number/meter^3
Ctenaphora	Abundance of Ctenaphora	number/meter^3
Medusae	Abundance of Medusae	number/meter^3

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Isaacs-Kid Midwater Trawl
Generic Instrument Name	Isaacs-Kidd Midwater Trawl
Dataset-specific Description	Rectangle framed net (1.8 m x 1.8 m) with 500 um mesh and a non-filtering cod end. Used to collected zooplankton during the Ross Sea cruise.
Generic Instrument Description	A trawl with a pentagonal mouth opening and a dihedral depressor vane as part of the mouth opening. IKMTs come in various dimensions (refer to individual dataset documentation). The original IKMTs were 10 foot (304 cm) and 15 foot (457 cm) at the mouth. The 10 foot IKMT net was 31 feet (9.45 m) in length (Wiebe and Benfield 2003).

Dataset-specific Instrument Name	Zeiss Discovery V8 Dissecting microscope
Generic Instrument Name	Microscope - Optical
Dataset-specific Description	Optical microscope with magnification for observation of the Ross Sea cruise tow/trawl samples. Used to taxonomically identify and count collected zooplankton during the Ross Sea cruise.
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	ring net
Generic Instrument Name	Ring Net
Dataset-specific Description	Plankton net with 1 m diameter, 333 um mesh, non-filtering cod end. Used to collected zooplankton during the Ross Sea cruise.
Generic Instrument Description	A Ring Net is a generic plankton net, made by attaching a net of any mesh size to a metal ring of any diameter. There are 1 meter, .75 meter, .25 meter and .5 meter nets that are used regularly. The most common zooplankton ring net is 1 meter in diameter and of mesh size .333mm, also known as a 'meter net' (see Meter Net).

[table of contents | back to top]

Deployments

NBP1801

Website	https://www.bco-dmo.org/deployment/778919
Platform	RVIB Nathaniel B. Palmer
Report	https://service.rvdata.us/data/cruise/NBP1801/doc/NBP1801DATA.pdf
Start Date	2017-12-16
End Date	2018-03-03
Description	Start Port: Punta Arenas, Chile End Port: Hobart, Australia

[table of contents | back to top]

Project Information

Using Bio-acoustics on an Autonomous Surveying Platform for the Examination of Phytoplankton-zooplankton and Fish Interactions in the Western Ross Sea (bio-acoustic plankton surveys)

Coverage: Terra Nova Bay, Western Ross Sea, Antarctica

NSF Award Abstract:

The Ross Sea is the one of the most productive regions in Antarctica and supports large populations of several key species in the Ross Sea food web, including copepods, crystal krill (Euphausia crystallorophias), and Antarctic silverfish (Pleuragramma antarcticum). Copepods and crystal krill dominate the diets of Antarctic silverfish, the dominant fish species in the high Antarctic zone, and silverfish are a major link between lower (copepods, krill) and higher (fishes, marine mammals, flighted birds, Adélie and Emperor penguins) trophic levels. Despite the significance of these key species, there is limited understanding of copepod, krill, and silverfish mesoscale distribution, spatial structure of age/maturity classes, and their interactions with physical drivers within the Ross Sea. Autonomous underwater profiling gliders are a developing technology that offers the potential for providing high spatial, temporal, and depth resolution data on regional scales. The project will test the capability of a multi-frequency echo sounder integrated into a Slocum Webb glider with the aim of providing the first glider-based acoustic assessment of simultaneous distributions of three trophic levels in the Ross Sea. Complementary glider sensors measuring physical, chemical, and biological parameters will provide mesoscale and sub-mesoscale hydrographic information from which phytoplankton-zooplankton-fish interactions and the relationships between these organisms and physics drivers (sea ice, circulation features) will be investigated. The approach proposed here, glider acoustics, is relatively new and has the potential to be transformational for investigating food webs and the Ross Sea ecosystem.

Researchers will modify and integrate an Acoustic Zooplankton and Fish Profiler (AZFP) multi-frequency echo sounder into a Slocum Webb G2 glider with the capability to differentiate between krill and other types of zooplankton, including copepods, and different sizes of krill and silverfish. The AZFP will be complemented with the existing glider sensors including a CTD, a WET Labs BB2FL ECO puck configured for simultaneous chlorophyll fluorescence (phytoplankton biomass) and optical backscatter measurements, and an Aanderaa Optode for measuring dissolved oxygen. The new sensor suite will be tested during a four-week glider deployment, where it will conduct acoustic surveys to map distribution and abundance of multiple zooplankton taxa and silverfish during the austral summer along the Terra Nova Bay polynya ice shelf and in adjacent continental shelf waters. The relationships between phytoplankton-zooplankton-fish distributions and the physical drivers of zooplankton and silverfish species and size distributions will be investigated. Coordinated ship-based acoustic sampling and net tows/trawls will be conducted multiple times during the glider deployment to validate glider acoustic-based species, size, and abundance measurements. Open accessible, automated data produced during this project will be made available through RUCOOL (Rutgers University Center for Ocean Observing Leadership) and THREDDS (Thematic Real-time Environmental Data Distribution System). The production of consistent, vertically-resolved, high resolution glider-based acoustic measurements will define a successful outcome of this project that should help in identifying the challenges in their use as a potentially cost-effective, automated examination of food webs in the Antarctic.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Office of Polar Programs (formerly NSF PLR) (NSF OPP)	OPP-1743035

[table of contents | back to top]