Echosounder data (38kHz) collected along the slope between Faial and Pico Island Azores in November and December of 2021

Website: https://www.bco-dmo.org/dataset/921981
Data Type: Other Field Results
Version: 1
Version Date: 2024-03-12

Project
» RAPID: Too hot to hold: Effects of unseasonable warming on the Azores nekton community and its keystone taxon (Too hot to hold)

Contributors	Affiliation	Role
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Abstract
We collected 38 kHz scientific grade echosounding along the slope between Faial and Pico Island Azores. These data span night and day time periods and were aimed at measuring the diel vertical migration of the deep scattering layer in the area. The transducer was mounted near the transom of a boat and was submerged 0.5 meters below the surface.

Table of Contents

Coverage

Location: Field echosounding took place near Faial and Pico Islands, Azores archipelago (38.3003° N, 28.3522°W)
Spatial Extent: **Lat**:38.3003 **Lon**:-28.3522
Temporal Extent: 2021-11-29 - 2021-12-02

Methods & Sampling

Deployments: Day-trips aboard a 21-foot RIB while winds were less than 15 knots. Data span November 29 to December 2nd.

Sampling was completed with a BioSonics DTX Extreme scientific echosounder and a 38kHz transducer. Transducer was coated in soap prior to deployment to prevent bubbles on surface. Sampling took place along depth range spanning 100-500 meters while the boat transited at 1.5 knots above bottom.

Data Processing Description

The echosounding data (.dt4) were not edited. The data from the instrument in .dt4 format was viewed on Visual Aquatic v1.0.0.13146 and exported as csv format. The tabular csv form of the dataset was used for the primary format of this BCO-DMO dataset (see Data Files section). Additional columns were added by BCO-DMO for lat,lon, and datetime (see BCO-DMO Processing Notes section).

The .dt4 files are provided in the Supplemental Files section. The .dt4 files can be loaded in Visual Aquatic, provided through Biosonics Inc, and it includes post-processing capabilities.

BCO-DMO Processing Description

* Submitted file "Rapid_Azores_Echosounding.csv" was imported into the BCO-DMO data system for this dataset.
* Lat lon columns added from values provided in metadata.
* ISO_DateTime_UTC column added (ISO 8601 format) from local timestamp provided in Azores time GMT-1

[table of contents | back to top]

Data Files

File	
921981_v1_echosounder-38khz.csv	(Comma Separated Values (.csv), 166.32 KB) MD5:1828e3a22fb6d9b0235b1e83c2c84a07
Primary data file for dataset ID 921981, version 1. This data is also provided in an alternate format (see Supplemental file " Echosounder data (38kHz) in .dt4 format").	

[table of contents | back to top]

Supplemental Files

File	
Echosounder data (38kHz) in .dt4 format filename: echosounder38kHz_dt4-format.zip	(ZIP Archive (ZIP), 223.13 MB) MD5:d227f4fbcd071b4bb1fdab3281c773f2
Data in format (dt4) are specific to the instrument manufacturer and can be viewed using Visual Acquatic software from BioSonics. This is an alternate form of the dataset from the main data table provided as "921981_v1_echosounder-38khz.csv" (see "Data Files" section) which requires no proprietary software to view or use. This zip file contains the following files: 'day1N_20211129_154458.dt4' 'day1N_20211129_161458.dt4' 'day1N_20211129_164458.dt4' 'day 2S20211202_163454.dt4' 'day 2S20211202_170454.dt4' 'day 2S20211202_171857.dt4'	
Echosounder 38kHz configuration filename: ADP Biosonics Configuration for NAAMES - 38kHz.pdf	(Portable Document Format (.pdf), 434.08 KB) MD5:690ba0a1c4cbb3ceffca25cdb2b0ea68
Configuration screenshots for echosounder (38kHz) as shown in Visual Acquisition software (Biosonics, Inc.).	

[table of contents | back to top]

Related Publications

BioSonics (2020). Visual Aquatic User Guide version (r13145) May 26, 2020. Available from https://www.biosonicsinc.com/support/customer-downloads/ accessed 2024-01-04.

Methods

BioSonics (2022). Visual Aquatic 1.0. Available from https://www.biosonicsinc.com/download/visual-aquatic-1-0/
Software

[table of contents | back to top]

Parameters

Parameter	Description	Units
Time	Date and time. Local Time zone = GMT-01:00	unitless
FileName	Filename of the .dt4 file (see Supplemental Files). day1N_20211129_154458.dt4 = "TimePeriod_YYYYMMDD_HHMMSS.dt4"	unitless
TransducerName	38 kHz 10° Split = Transducer frequency_Beam Angle_BeamType	unitless
TransducerNumber	ID of transducer. Only a BioSonics DTX Extreme 38 kHz transducer was used.	unitless
ReportNumber	Data were analyzed in '10 Ping bins', and Report Number is the nth bin analyzed	unitless
FirstPingNumber	First ping of new report	unitless
LastPingNumber	Last ping of new report	unitless
BottomStatus	Valid/Invalid response outlining whether bottom could be detected	unitless
BottomElevation_m	water depth	meters (m)
PlantStatus	Valid/Invalid response outlining whether plant could be detected	unitless
lat	Site latitude	decimal degrees
lon	Site longitude	decimal degrees
ISO_DateTime_UTC	DateTime with time zone (UTC) in 8601 format.	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	
Generic Instrument Name	BioSonics DT-X Digital Scientific Echosounder
Dataset-specific Description	BioSonics DTX Extreme scientific echosounder and a 38kHz transducer
Generic Instrument Description	The BioSonics DT-X Digital Scientific Echosounder is available in single or spilt beam configuration. The resultant data set comprises 38 and 120 kHz split beam data. The DT-X Digital Scientific Echosounder is used for stock assessment, biomass estimates, and habitat mapping. DT-X digital transducers are available in a range of frequencies (38, 70, 120, 200, and 420 kHz) and beam patterns in split beam or single beam. Up to 5 transducers can be mulltiplexed for simultaneous data collection in any combination of frequencies and transducer orientations. The BioSonics split beam echosounder data can be analyzed for fish quantity, individual sizes, direction of travel through the acoustic beam. Data analysis is done using BioSonics, Echoview, or Sonar4/5-Pro software (and other options are available). Additional information is available from: BioSonics DT-X Digital Echosounder (http://www.biosonicsinc.com/product-overview.asp), BioSonics (http://www.biosonicsinc.com), Echoview (http://www.echoview.com/), and Sonar4/5-Pro (http://tid.uio.no/~hbalk/sonar4_5/index.htm).

[table of contents | back to top]

Project Information

RAPID: Too hot to hold: Effects of unseasonable warming on the Azores nekton community and its keystone taxon (Too hot to hold)

Coverage: Azores

NSF Award Abstract
Across the globe it has become increasingly clear that climate change is influencing animal movement patterns. The daily vertical migration of marine animals such as squid is often termed “the largest migration on Earth.” Understanding the impacts of climate change on diel vertical migration is essential for an understanding of how ocean ecosystems will fare with increasing temperatures. Central Atlantic waters are ca. 2-3 °C above normal; this unusual warming event provides a short and urgent window of opportunity to examine how global warming will affect this huge migration. The movements and energetics of squid and their larger community are being measured using traditional oceanographic methods and innovative, new high-resolution sensor and motion tags. The new data are providing novel insights into how warm temperatures are affecting movements, migrations, changes in biomass, and other energetic consequences of behavioral responses to environmental change. The project leverages an animal group (squid) that links top predators and smaller prey within a complex trophic web. As a group, squids are one of the world’s largest fisheries, they are of global food-resource importance, and they are prey for many commercially important fish species (tuna, swordfish), sea birds and marine mammals. Predicting climate-driven changes on these animals and their daily migratory patterns is critical for sustainable resource management. Educational broader impacts are focused on training opportunities for graduate and undergraduate students with emphasis on recruiting participants from underrepresented groups. The graduate students are gaining international experience in field work and scientific collaborations.

Diel vertical migrations are a vital process of ocean energy exchange that are influenced by the physical environment, yet few experimental data address how warming affects these migrations. Central Atlantic waters are ca. 2-3° C above normal, extending stratified summer conditions and stressful warmer waters into a key time of year when organisms “expect” greater mixing and cooler oceans. These fleeting warm-water conditions present a unique opportunity to study how a vertically migrating nekton community and its key

component (squid) are adjusting their movements to balance energetic demands and expenditures. Building from a suite of before-and-after data, this project is examining the response of the migratory community and the squid to unusually warm, physiologically stressful, ocean conditions during a critical life-stage. The prediction is that the community and squid are utilizing an energetically costly set of responses, leading to altered movement patterns and decreased densities of migratory organisms in surface waters at night. The timeframe of the project coincides with a period when squid invest in somatic and reproductive growth via substantial foraging and interactions within the larger nekton community. New data are being collected to (i) examine movement ecology and energetics by tagging Loligo forbesii squid near the Azores using novel motion tags and environmental sensors (ITAGs), (ii) quantify the nekton community and prey layer density and movements via scientific echosounders in locations overlapping with tagged animals, (iii) characterize environmental conditions using standard oceanographic casts, surface satellite data, and the eco-sensor data from animal-borne tags, and (iv) assess vertical movement and habitat use changes as seasonality progresses using longer-term, lower resolution, movement tags. The central hypothesis being tested is that the migratory community is responding to thermal stress by changing vertical migration patterns and feeding strategies. These responses have negative consequences on the squid’s energy balance and lead to higher foraging costs and decreased feeding success.

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.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2203204

[table of contents | back to top]