Euphausiid DNA barcode metadata and accession numbers collected from cruises in the Red Sea, the western North Atlantic, the Sargasso Sea, the Southeast North Atlantic Ocean, and Arabian Sea (Red Sea Krill project)

Website: https://www.bco-dmo.org/dataset/622522
Version: 3
Version Date: 2016-05-04

Project
» Red Sea Krill (Red Sea Krill)

Contributors	Affiliation	Role
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Dataset Description

Euphausiid DNA barcode metadata and accession numbers for DNA sequences for mitochondrial cytochrome oxidase I (COI) barcode regions. Specimens were collected in the Red Sea, Atlantic and Pacific Oceans.

Methods & Sampling

Specimens of each of the five euphausiid species identified from the alcohol-preserved samples were prepared for PCR amplification and DNA sequencing. DNA sequences for the COI barcode region were determined for Euphausia diomedeae (4 individuals); E. sanzoi (2); E. sibogae (4); Stylocheiron abbreviatum (3); and S. affine (4). The designated GenBank Accession Numbers can be used to access the GenBank records, which include data and metadata for all specimens (Table 2). Additional specimens of each species (except Euphausia sanzoi) were identified from archived samples from cruises in the NE Pacific; NW, NE, and SE Atlantic; and Arabian Sea (Fig. 4), and were analyzed using the same methods.

DNA was purified from individual euphausiids using the DNeasy Blood and Tissue Kit (Qiagen, Valencia, CA) using standard protocols, except that elution volumes were reduced usually to 100-200 µL. A ~708 base-pair region of the mitochondrial cytochrome oxidase subunit I (COI) gene was amplified using consensus primers (Folmer et al., 1994) and published PCR amplification protocols (Bucklin et al., 2010b). The PCR products were run on 2% agarose gels and purified using the QIAquick Gel Extraction Kit (QIAGEN) following the manufacturer's instructions, with an elution volume of 35 µL. DNA sequencing was done using a commercial service (Eurofins MWG Operon, Louisville, KY) following all protocols and instructions provided.

See "Related Datasets" for data that can be joined to this dataset using the column "tow."

Data Processing Description

DNA sequences were manually checked for accurate machine reading using the Molecular Evolutionary Genetics Analysis (MEGA, Ver. 6) software package (Tamura et al., 2013). DNA sequences to be analyzed were aligned and forward and reverse reads were reconciled using CLUSTAL-W, as implemented in MEGA (Thompson et al., 1997). MegaBLAST searches were conducted in GenBank to confirm the accuracy and validity of the sequences. DNA sequences that could not be verified and validated, including aberrant or highly divergent sequences, were omitted from the dataset. Published DNA sequences for the COI barcode region were obtained from GenBank (see e.g., Bucklin et al., 2007) and included in the sequence alignment for comparative analysis. Both the original alignment and an alignment trimmed to a 500 bp region in common among all sequences were used. In the latter case, any sequence shorter than the target 500 bp region was removed from further analysis, with the exception of several shorter sequences for Red Sea specimens.

A pairwise distance matrix showing within and between species differences (p-distances) for all sequences was determined and mean and standard deviations for within and between species were calculated. Pairwise p-distances were visually displayed as heat maps. A Neighbor Joining tree analysis was carried out in MEGA Ver.6 (Tamura et al., 2013) with Kimura-2-Parameter distances (a = 0.5). Node support was obtained after 1,000 bootstraps.

BCO-DMO Processing:
- added conventional header with dataset name, PI name, version date
- renamed parameters to BCO-DMO standard
- replaced space with underscore

2016-04-27 revision: [replaces version: 2015-10-28]
- added live links to NCBI GenBank, columns for cruise_id, station, tow, and net

2016-05-04: added links to MOC-CTD data from other BCO-DMO datasets, where available

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Data Files

File
krill_barcodes_v3.csv (Comma Separated Values (.csv), 16.19 KB) MD5:337ae03e5daadf41b4ad5488086a34a3 Primary data file for dataset ID 622522

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Parameters

Parameter	Description	Units
species	Euphausiid species name	unitless
voucher_num	Bucklin lab specimen voucher number	unitless
NCBI_accession	GenBank accession number	unitless
region	geographical area of collection	unitless
date	date collected	yyyy-mm-dd
lat	latitude; north is positive	decimal degrees
lon	longitude; east is positive	decimal degrees
depth_range	depth range sampled	meters
cruise_id	cruise identification	unitless
station	sequential station	unitless
tow	tow identification	unitless
net	net number	unitless
comment	comments	unitless
inst	type of gear used to sample zooplankton: MOC-1 = MOCNESS-1meter; MOC-25 = MOCNESS-1/4 meter;	

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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	
Generic Instrument Name	Midwater Trawl
Dataset-specific Description	a Krill trawl with a 38 m2 mouth area, and with a Multisampler unit attached to the rear end. The Multisampler unit has five nets mounted on a frame, similar to the MOCNESS, and is also remotely controlled. Also called a "Macroplankton Trawl". Heino, M., Porteiro, F.M., Sutton, T.T., Falkenhaug, T., Godø, O.R., and Piatkowski, U. (2011) Catchability of pelagic trawls for sampling deep-living nekton in the mid-North Atlantic. ICES Journal of Marine Science 68, 377–389. Krafft, B.A., Melle, W., Knutsen, T., Bagøien, E., Broms, C., Ellertsen, B., Siegel, V., (2010) Distribution and demography of Antarctic krill in the Southeast Atlantic sector of the Southern Ocean during the austral summer 2008. Polar Biology 33, 957–968.
Generic Instrument Description	A mid-water or pelagic trawl is a net towed at a chosen depth in the water column to catch schooling fish such as herring and mackerel. Midwater trawl nets have very large front openings to herd schooling fish toward the back end where they become trapped in the narrow "broiler". The sides of the deployed net are spread horizontally with two large metal foils, called "doors," positioned in front of the net. As the trawler moves forward, the doors, and therefore the net, are forced outward, keeping the net open. This instrument designation is used when specific make and model are not known.

Dataset-specific Instrument Name	MOC-25
Generic Instrument Name	MOCNESS.25
Generic Instrument Description	The Multiple Opening/Closing Net and Environmental Sensing System or MOCNESS is a family of net systems based on the Tucker Trawl principle. The MOCNESS-1/4 carries nine 1/4-m2 nets usually of 64 micrometer mesh and is used to sample the larger micro-zooplankton.

Dataset-specific Instrument Name	MOC-1
Generic Instrument Name	MOCNESS1
Generic Instrument Description	The Multiple Opening/Closing Net and Environmental Sensing System or MOCNESS is a family of net systems based on the Tucker Trawl principle. The MOCNESS-1 carries nine 1-m2 nets usually of 335 micrometer mesh and is intended for use with the macrozooplankton. All nets are black to reduce contrast with the background. A motor/toggle release assembly is mounted on the top portion of the frame and stainless steel cables with swaged fittings are used to attach the net bar to the toggle release. A stepping motor in a pressure compensated case filled with oil turns the escapement crankshaft of the toggle release which sequentially releases the nets to an open then closed position on command from the surface. -- from the MOCNESS Operations Manual (1999 + 2003).

Dataset-specific Instrument Name	
Generic Instrument Name	Reeve Net
Generic Instrument Description	A Reeve Net is a conventional ring net with a very large acrylic cylindrical cod-end (30 liters) designed to collect fragile gelatinous animals. The net is lowered to a particular depth and then hauled slowly back to the surface (5-10 m/min). Reeve (1981) also described a double net system with no bridle and flotation at the net mouth that is attached to a roller mechanism that rides on a tow wire. The roller system is locked in place by a pressure release device. Once below a set pressure, the roller and nets are released and they float slowly up the wire, gently collecting the zooplankton, without being influenced by the motion of the vessel and associated vertical wire movements. (from Wiebe and Benfield, 2003)

Dataset-specific Instrument Name	
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

Thuwal-2014-01

Website	https://www.bco-dmo.org/deployment/620087
Platform	R/V Thuwal
Start Date	2014-01-07
End Date	2015-01-12
Description	Three day trips to sample krill at ECDEEP station near Economic City, Saudi Arabia, north of KAUST.

NH1208

Website	https://www.bco-dmo.org/deployment/58830
Platform	R/V New Horizon
Report	http://hdl.handle.net/1834/43090
Start Date	2012-08-09
End Date	2012-09-18
Description	The primary objective of this cruise was to quantify the distribution, abundance, species composition, shell condition, and vertical migratory behavior of oceanic thecosome pteropods in the northeast Pacific, and correlate these quantities to concurrent measurements of carbonate chemistry. Underway data collection and station activities were conducted on a transect running between 35 and 50N along CLIVAR line P17N. Six instrument types were used: (1) a 1-m2 MOCNESS plankton net system and a 1-m diameter Reeve net; (2) a profiling Video Plankton Recorder mounted on the CTD package that includes a Rosette system with Niskin bottles for water sampling; (3) a deep (500 meter) towed broadband acoustic scattering system; (4) a surface narrowband multi-frequency acoustic scattering system; (5) an underway multi-parameter inorganic carbon analyzer and a GO underway pCO2 system; and (6) a suite of chemistry-related lab instruments for bottle sample analysis including a DIC auto-analyzer, an alkalinity auto-titrator, and an Agilent spectrophotometer for pH measurement. The R/V New Horizon departed from Newport OR, and set a course for the transect start point at 50N 150W. Following instrument package test deployments over the continental shelf, the transect ran in a single zig-zag between the start point and the end at 35N 135W; a total of 34 stations were sampled along the transect, every 1/2 degree of latitude. In addition 10 other stations were sampled with a Reeve net for live experimental pteropods. The science party, divided into biology and chemistry teams conducted 24-hour operations. Cruise information and original data are available from the NSF R2R data catalog.

OC473

Website	https://www.bco-dmo.org/deployment/58720
Platform	R/V Oceanus
Report	http://hdl.handle.net/1834/43091
Start Date	2011-08-07
End Date	2011-09-01
Description	The primary objective of the proposed research is to quantify the distribution, abundance, species composition, shell condition, and vertical migratory behavior of oceanic thecosome pteropods in the northwest Atlantic and northeast Pacific, and correlate these quantities to hydrography and concurrent measurements of carbonate chemistry, including vertical and horizontal distributions of aragonite saturation. During OC473, the first cruise in the Atlantic, a combination of underway data collection and station activities will be conducted along a transect spanning 15 degrees of latitude (35° to 50° N) in the northwest Atlantic, employing six instrument packages: (1) a 1-m2 MOCNESS plankton net system; (2) a profiling Video Plankton Recorder / CTD package, including bottles for water sampling; (3) a deep (500m) towed broadband acoustic scattering system ; 94) a hull-mounted narrowband multi-frequency acoustic scattering system. It is possible that the hull mounted transducers will suffer from noise when the vessel is underway and so as a backup we will have a surface-towed sled with a backup complement of transducers; 5) an underway multi-parameter inorganic carbon analyzer and 6) a suite of chemistry-related instruments including a DIC auto-analyzer for discret bottle sample analysis, an alkalinity auto-titrator for bottle analysis and an Agilent spectrophotometer for discrete pH measurement. Supporting documentation: Cruise track image Cruise information and original data are available from the NSF R2R data catalog.

ANT-XXIV_1

Website	https://www.bco-dmo.org/deployment/57857
Platform	R/V Polarstern
Report	http://epic.awi.de/28985/1/Sch2009ad.pdf
Start Date	2007-10-26
End Date	2007-11-27

RHB0603

Website	https://www.bco-dmo.org/deployment/57686
Platform	NOAA Ship Ronald H. Brown
Report	http://www.cmarz.org/CMarZ_RHBrown_April06/Cruise_Report/working.htm
Start Date	2006-04-10
End Date	2006-04-30

TT045

Website	https://www.bco-dmo.org/deployment/57706
Platform	R/V Thomas G. Thompson
Start Date	1995-03-14
End Date	1995-04-10

AKES-2

Website	https://www.bco-dmo.org/deployment/644723
Platform	R/V GO_Sars
Report	http://dmoserv3.bco-dmo.org/data_docs/Red_Sea_Krill/cruise_Surveyreport_AKES-2_270508.pdf
Start Date	2008-02-19
End Date	2008-03-28
Description	From Cape Town, South-Africa to survey the Southern Ocean along two transects, to and from Astridryggen, including finer mapping around Bouvetøya and experimental work on krill (AKES). AKES (Antarctic Krill and Ecosystem Studies) is IMR's project to investigate target strength of krill (Euphausia superba) and mackerel ice fish (Champsocephalus gunnari), and the abundance of pelagic fish and squid in the Bouvetøy area. The main objectives are: - to evaluate the links between the krill resources and distribution in the area and Bouvetøya based mammals and birds - to study krill biology and ecology - to establish TS (Target strength; the ability of an organism to reflect sound) for krill and ice fish - to study aggregations of krill, fish and plankton relative to the hydrography - to compare aggregations and abundance of krill and plankton relative to hydrography in Antarctica and Nordic Seas - stomach contents and feeding behavior of krill and fish.

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Project Information

Red Sea Krill (Red Sea Krill)

Coverage: Red Sea

The krill population at station ECDEEP was characterized via MOCNESS sampling and CTD casts.

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Funding

Funding Source	Award
King Abdullah University of Science and Technology (KAUST)	KAUST-Kaartvedt-2014

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