XBT data from SEEPC cruises collected on the R/V Oceanus (OC471-02), R/V Atlantis (AT26-15, AT21-02, AT29-04), R/V Cape Hatteras (CH0912), and R/V Endeavor (EN531) from 2011-2015 (SEEPC project)

Website: https://www.bco-dmo.org/dataset/563054
Data Type: Cruise Results
Version: 2
Version Date: 2015-12-01

Project
» Connectivity in western Atlantic seep populations: Oceanographic and life-history processes underlying genetic structure (SEEPC)

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Dataset Description

SEEPC XBT data (depth, temperature, sound velocity).

Methods & Sampling

XBTs were deployed over a spatial spacing, dependent on the number of ACMs per transect available. 10nm spacing was desired where possible while underway.

Probe information:

OC471-02:
Probe Type : T-7
Terminal Depth : 760 m
Depth Equation : Standard
Depth Coeff. 1 : 0.0
Depth Coeff. 2 : 6.472
Depth Coeff. 3 : -0.00216

Depth Coeff. 4 : 0.0
Pressure Pt Correction: 100.0%
all casts: Sound velocity derived with assumed salinity: 34.50 ppt

AT21-02:
Probe Type : T-6
Terminal Depth : 460 m
Depth Equation : Standard
Depth Coeff. 1 : 0.0
Depth Coeff. 2 : 6.472
Depth Coeff. 3 : -0.00216
Depth Coeff. 4 : 0.0
Pressure Pt Correction: 100.0%
Sound velocity derived with assumed salinity:
T6_00002.EDF: 35.10 ppt
T6_00003.EDF: 35.09 ppt
T6_00004.EDF: 35.09 ppt
T6_00005.EDF: 34.45 ppt
T6_00006.EDF: 34.43 ppt
T6_00007.EDF: 33.98 ppt
T6_00008.EDF: 34.17 ppt
T6_00009.EDF: 34.30 ppt
T6_00010.EDF: 34.58 ppt
T6_00011.EDF: 34.54 ppt
T6_00012.EDF: 33.47 ppt
T6_00013.EDF: 33.30 ppt
T6_00014.EDF: 33.30 ppt
T6_00015.EDF: 33.10 ppt
T6_00016.EDF: 33.10 ppt
T6_00017.EDF: 32.80 ppt

CH0912:
Probe Type : T-6
Terminal Depth : 460 m
Depth Equation : Standard
Depth Coeff. 1 : 0.0
Depth Coeff. 2 : 6.691
Depth Coeff. 3 : -0.00225
Depth Coeff. 4 : 0.0
Pressure Pt Correction: 100.0%
all casts: Salinity : 30.00 ppt

AT26-15:
Probe Type : T-7
Terminal Depth : 760 m
Depth Equation : Standard
Depth Coeff. 1 : 0.0
Depth Coeff. 2 : 6.472
Depth Coeff. 3 : -0.00216
Depth Coeff. 4 : 0.0
Pressure Pt Correction: 100.0%
all casts: Sound velocity derived with assumed salinity: 35.00 ppt

Data Processing Description

The data has been minimally processed. Low-level data processing was completed, mainly to convert binary data to CSV. The originally submitted *.EDF files are text files, produced when the data were collected and have not had any further processing.

BCO-DMO Processing:

- added conventional header with dataset name, PI name, version date
- used script EDF2xbt.pl to remove original headers and add parameter names
- parameter names modified to conform to BCO-DMO convention
- date reformatted to YYYYMMDD
- added cruise_id and year columns

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Data Files

File
SEEPC_XBT.csv (Comma Separated Values (.csv), 20.32 MB) MD5:0f0a68c45d467a90434c945d61d91f24 Primary data file for dataset ID 563054

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Parameters

Parameter	Description	Units
cruise_id	cruise identification	unitless
year	year	YYYY
date	date	YYYYMMDD
time	time	HHMM
ISO_DateTime_UTC	Date/Time (UTC) ISO formatted based on ISO 8601:2004(E)	YYYY-mm-ddTHH:MM:SS[.xx]Z (UTC time)
yrday_utc	UTC day and decimal time; as 326.5 for the 326th day of the year or November 22 at 1200 hours (noon)	unitless
lat	latitude; negative denotes South	decimal degrees
lon	longitude; negative denotes West	decimal degrees
Xseq	XBT Sequence Number	integer
depth_xbt	XBT depth	meters
temp_xbt	XBT temperature	degrees celsius
snd_vel	sound velocity	meters/second

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Instruments

Dataset-specific Instrument Name	XBT
Generic Instrument Name	Expendable Bathythermograph
Dataset-specific Description	Lockheed Martin Sippican T6 model XBT
Generic Instrument Description	An XBT is an expendable free-fall temperature probe that provides a profile of measured temperature against depth calculated from a fall-rate model. For example, two popular XBT models are the T-5 and T-7 probes from Sippican. More information is available from Lockheed Martin Sippican at URL: http://www.sippican.com/.

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Deployments

OC471-02

Website	https://www.bco-dmo.org/deployment/521430
Platform	R/V Oceanus
Report	http://dmoserv3.whoi.edu/data_docs/SEEPC/OC471-02_cruise_report.pdf
Start Date	2011-05-17
End Date	2011-05-20
Description	cruise for SEEPC project. Cruise information and original data are available from the NSF R2R data catalog. Science Objectives (from Cruise Planning Synopsis): Preliminary science activities at 3 Barbados seep sites (El Pilar, Orenoque A, Orenoque B) on the accretionary wedge for return visit to sites with DSRV Alvin in May-June 2012. Part of the Seep Connectivity Project funded by NSF to investigate historical and contemporary linkages among Barbados, Gulf OF MExico, and Blake Ridge seep species. Science Activities At each site: 1) Sub-bottom profiling to locate seep areas 2) MOCNESS tow for larval sampling 3) Deep-water (35 m HOB) mooring deployment (current meter, 2 sediment/larval traps per mooring) 4) Bone/wood package deployment

AT26-15

Website	https://www.bco-dmo.org/deployment/517377
Platform	R/V Atlantis
Start Date	2014-05-21
End Date	2014-06-14
Description	Start: Depart Gulfport, MS 05/21/2014 End: Arrive St. Petersburg, FL 06/14/2014 The AT26-15 cruise was conducted as part of the project "Connectivity in western Atlantic seep populations: Oceanographic and life-history processes underlying genetic structure" (SeepC) funded by NSF OCE-1031050. The cruise included coordinated deployments of DSV Alvin and AUV Sentry. Science objectives (from the WHOI Cruise Planning Synopsis): The primary objective of the SeepC Project is to advance our general knowledge of connectivity in the deep sea using taxa found at seeps as model systems. The focus is on species and processes occurring in the Intra-American Sea (including the Caribbean, Gulf of Mexico, and eastern seaboard of the US), with attention to oceanographic circulation, life histories, and genetics. Our efforts include improving the oceanographic model for the IAS near the seabed using current data from moorings at several depths and locations and coupling this model to a Lagrangian larval transport model. We stress the importance of iterative interactions among the science teams to advance our understanding of connectivity in the deep sea through descriptive and hypothesis-driven research. We will develop effective and best methods for hypothesis testing under the constraints of working in a relatively inaccessible environment and will build capacity in understanding connectivity in deep-sea systems.

AT21-02

Website	https://www.bco-dmo.org/deployment/535929
Platform	R/V Atlantis
Report	http://dmoserv3.whoi.edu/data_docs/SEEPC/AT21-02_CruiseREPORT.pdf
Start Date	2012-06-01
End Date	2012-06-17
Description	Cruise information and original data are available from the NSF R2R data catalog. http://www.whoi.edu/cruiseplanning/synopsis.do?id=1942 The primary objective of the SeepC Project is to advance our general knowledge of connectivity in the deep sea using taxa found at seeps as model systems. The focus is on species and processes occurring in the Intra-American Sea (including the Caribbean, Gulf of Mexico, and eastern seaboard of the US), with attention to oceanographic circulation, life histories, and genetics. Science objectives (from the WHOI Cruise Planning Synopsis): Mooring recoveries and sampling at 3 Barbados seep sites (El Pilar, Orenoque A, Orenoque B) plus MOCNESS tows and some mapping (multibeam, CHIRP). We may add sample sites if we are able to undertake an advance SENTRY survey in the region (pending request). Our aim would be to add new sites separated by as much as 150-200 km max along a depth gradient and along an isobath. Use of SENTRY would allow us to undertake precision sampling of known sites, 1 to 1.5 days per station at each of 6 to 8 seep stations. This is part of the Seep Connectivity Project funded by NSF to investigate historical and contemporary linkages among Barbados, Gulf of Mexico, and Blake Ridge seep species. Activities at each site: 1) Sub-bottom profiling to locate seep areas 2) MOCNESS tows for larval sampling 3) Mooring recoveries (current meter, 2 sediment/larval traps per mooring) 4) Intensive sampling of seep fauna for genetic and reproduction studies

CH0912

Website	https://www.bco-dmo.org/deployment/521433
Platform	R/V Cape Hatteras
Report	http://dmoserv3.whoi.edu/data_docs/SEEPC/CH0912_cruise_report.pdf
Start Date	2012-11-01
End Date	2012-11-03
Description	SEEPC project cruise. Cruise information and original data are available from the NSF R2R data catalog.

EN531

Website	https://www.bco-dmo.org/deployment/521426
Platform	R/V Endeavor
Report	http://dmoserv3.whoi.edu/data_docs/SEEPC/Cruise.Report.EN531-08-14.2013.pdf
Start Date	2013-08-15
End Date	2013-08-18
Description	SEEPC project cruise. Cruise information and original data are available from the NSF R2R data catalog.

AT29-04

Website	https://www.bco-dmo.org/deployment/568866
Platform	R/V Atlantis
Report	http://dmoserv3.whoi.edu/data_docs/SEEPC/AT29-04_SeepC_cruise_report.pdf
Start Date	2015-07-08
End Date	2015-07-28
Description	Science objectives (from the WHOI Cruise Planning Synopsis): The primary objective of the SeepC Project is to advance our general knowledge of connectivity in the deep sea using taxa found at seeps as model systems. The focus is on species and processes occurring in the Intra-American Sea (including the Caribbean, Gulf of Mexico, and eastern seaboard of the US), with attention to oceanographic circulation, life histories, and genetics. Questions that apply in shallow-water systems motivate this study: What phylogeographic breaks occur in the system? It is important to distinguish between phylogeography and connectivity. A phylogeographic break implies a long history of isolation or possibly cryptic speciation, while genetic population structure indicates gene flow is reduced, but still ongoing or recent. Do collections from different sites indicate a panmictic population of a given species? This is the fundamental question about connectivity and the scale of population genetic variation in marine species with planktonic larvae and it comprises extent of gene flow, directionality, and relative contributions. What bio-physical processes underlie observed connectivities? Biological processes (e.g., larval distributions in the water column, timing of reproduction, and planktonic larval duration) and physical processes of transport and dispersion interact to determine connectivity. Our efforts include improving the oceanographic model for the IAS near the seabed using current data from moorings at several depths and locations and coupling this model to a Lagrangian larval transport model. We stress the importance of iterative interactions among the science teams to advance our understanding of connectivity in the deep sea through descriptive and hypothesis-driven research. We will develop effective and best methods for hypothesis testing under the constraints of working in a relatively inaccessible environment and will build capacity in understanding connectivity in deep-sea systems. Science Activities: 1) Two mooring recoveries; 2) Alvin seep sampling: mussels, clams, tubeworms, and associated animals; targeting at least 30 individuals per species (manips, net, slurp); carbonates; 3) Sentry plankton sampling; 4) MOCNESS tows; 5) Sentry high-resolution mapping; 6) CTD casts; 7) XBTs; 8) Shipboard acoustics (methane plumes). BCO-DMO Note: Using Alvin dive positions for mapserver until full cruise track becomes available on rvdata.us.

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Project Information

Connectivity in western Atlantic seep populations: Oceanographic and life-history processes underlying genetic structure (SEEPC)

Coverage: Western Atlantic, Gulf of Mexico, Intra-American Sea

This project will evaluate connectivity on spatial scales that match those at which vent systems are being studied (3500 km), with a set of nested seeps (within the Barbados system) within which connectivity can be explored at more local spatial scales (30 to 130 km), and with species that span depth (600 m to 3600 m) and geographic ranges (30 km to 3500 km) and that have diverse life-history characteristics. Five deep-sea seep systems in the Intra- American Sea (IAS) are targeted: Blake Ridge, Florida Escarpment, Alaminos Canyon, Brine Pool, Barbados (El Pilar, Orenoque A, Orenoque B). The primary objective is to advance our general knowledge of connectivity in the deep sea. The focus is on species and processes occurring in the IAS, with attention to oceanographic circulation, life histories, and genetics. Questions that apply in shallow-water systems motivate this study:

1. What phylogeographic breaks occur in the system? It is important to distinguish between phylogeographic history and connectivity. A phylogeographic break with no shared alleles between populations implies a long

history of isolation or possibly cryptic speciation.

2. Are populations connected by ongoing migration? This is the fundamental question about connectivity and the scale of genetic variation in marine species with planktonic larvae.

3. What biophysical processes underlie observed connectivities? Biological processes (e.g., larval distributions in the water column, timing of reproduction, and planktonic larval duration) and physical processes of transport and dispersion interact to determine connectivity.

The oceanographic model for the IAS will be improved and coupled to a Lagrangian larval transport model. The field program includes time-series sampling of larvae at seeps with records of current velocities, water column sampling to determine larval distribution potential, shipboard studies of larval biology and behavior, and sampling of benthic target species. Phylogenetic and population genetic tools will be used to explore historical and contemporary gene flow. Iterative interactions among the science teams will advance our understanding of connectivity in the deep sea and to develop effective and best methods for hypothesis testing under the constraints of working in a relatively inaccessible environment. Since their discovery, deep-sea chemosynthetic ecosystems have been novel systems within which to test the generality of paradigms developed for shallow-water species. This study will explore scale-dependent biodiversity and recruitment dynamics in deep-sea seep communities, and will identify key factors underlying population persistence and maintenance of biodiversity in these patchy systems.

Google Earth map showing positions of stations, CTD, XBT, multibeam locations (KMZ file dlownload)

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1029841

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