CTD data from moorings collected on multiple cruises from the Gulf of Mexico and N. Atlantic, 2011-2014 (SEEPC project)

Website: https://www.bco-dmo.org/dataset/561504
Data Type: Cruise Results
Version:
Version Date: 2016-12-28

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

Contributors	Affiliation	Role
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Methods & Sampling

Measurements taken to within 50 meters of ocean bottom of Salinity (Conductivity), Temperature, Depth, Fluorescence, and Oxygen Saturation. Various SeaBird-branded shipboard CTD instruments were calibrated, deployed, cleaned, and re-calibrated after arrival on station, depending on logistics. Data sampling interval was evenly spaced temporally, the spatial sampling interval varied depending on the winch speed, generally 1 m/s for the majority of the sampling the water column.

Data Processing Description

If necessary, acquisition files were converted from hex to ascii, then split into upcast and downcasts. Downcasts were bin-averaged to 1 meter or 1 decibar. Extraneous parameters were retained, but are not displayed.

BCO-DMO Processing Notes:

Most profiles were resubmitted as converted from .hex to .cnv., bin-averaged, and the down-casts and up-casts split.

BCO-DMO further processed the data as follows.

AT2102:
The .hex files were reprocessed using Seabird Routines in Virtual Box Windows XP to output the variables in consistent order between stations.
Salinity from the primary sensor was included in station 1.
Files were bin-averaged on depth to be consistent with the original unaveraged file which did not include pressure.
Pressure was output as a variable
Casts were split into upcast and downcast.
Spans were compared with original full profiles to be sure data were identical.
Parameter names were made consistent with BCO-DMO standards.
Flag was not displayed since it is all zeroes.

The following parameters were not displayed for each deployment:
AT2615 -- secondary sensor data, altimeter, and flag
AT2904 -- accelerometer, altimer, flag, lat and lon that were recorded at every sample (after checking with D. McVeigh)
CH0912 -- flag
OC471-02 -- flag
PE14-11 -- nbf, lat, lon, and flag nbf = number of bottles fired
WS15271 -- accelerometer altimeter Oxygen_volt, and flag

Variable order was not consistent between deployments. Therefore, the data is located under each deployment rather than from this landing page:
AT21-02: pres, depth, temp, sal, oxygen, fluor
AT2615: pres, temp, temp2, cond, trans, fluor, O2sat, alt, time_elapsed, depth, density, sal, sound_vel
CH0912: depth, sal, temp, O2sat, CDOM
OC471-02: depth, temp, sal, fluor, oxygen
PE14-11: depth, sal, temp, oxygen, fluor
AT2904: cond_mS, density, depth, fluor, lathide, lonhide, N2O, O2, sal, temp
WS15271: depth, sal, temp, altimeter, cond_mS, density, oxygen, N2O, fluor

Dates on osprey and in top level.dat files updated to reflect versions that are currently served.

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Parameters

Parameter	Description	Units
cruise_id	cruise identifier	dimensionless
sta	station identifier	dimensionless
cast	number of cast	dimensionless
ISO_DateTime_UTC	UTC date and time ISO formatted	YYYY-MM-DDTHH:MM:SS[.xx]Z
year	year reported as yyyy	YYYY
month	month reported as mm	MM
day	day reported as dd	DD
yrday_utc	UTC day and decimal time	dimensionless
time	start time of cast reported as hhmm	HHMM
lon	longitude (east is positive)	decimal degrees
lat	latitude (north is positive)	decimal degrees
depth	sampling depth	meters
temp	Temperature	degrees Celsius
sal	Salinity	PSU
O2sat	oxygen concentration	milliliters/liters
fluor	fluorescence	milligrams/meter^3
press	sampling pressure	decibars
N2O	Nitrous Oxide	milliliters per liter
cond	Water conductivity	Siemens per meter or milliSiemens per centimeter
density	Water density	kilograms per meter^3
sound_vel	Water sound velocity	meters per second
trans	Beam transmission from WET Labs C-Star	percent

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Instruments

Dataset-specific Instrument Name	CTD
Generic Instrument Name	CTD Sea-Bird
Dataset-specific Description	Sea-Bird Model varied by vessel.
Generic Instrument Description	Conductivity, Temperature, Depth (CTD) sensor package from SeaBird Electronics, no specific unit identified. This instrument designation is used when specific make and model are not known. See also other SeaBird instruments listed under CTD. More information from Sea-Bird Electronics.

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Deployments

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.

PE14-11

Website	https://www.bco-dmo.org/deployment/521436
Platform	R/V Pelican
Report	http://dmoserv3.whoi.edu/data_docs/SEEPC/PE14-11_cruise_report.pdf
Start Date	2013-11-04
End Date	2013-11-08
Description	SEEPC project cruise. Cruise information and original data are available from the NSF R2R data catalog.

WS15271

Website	https://www.bco-dmo.org/deployment/663791
Platform	R/V F.G. Walton Smith
Start Date	2015-09-28
End Date	2015-10-02
Description	SEEPC project cruise

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

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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