

# Polychaetes Table 2: Polychaetes species - Particulate Organic Carbon (POC) values by station in the Gulf of Mexico from 1997-1999 (Deep Sea Benthic Dynamics project)

Website: <https://www.bco-dmo.org/dataset/565332>

Version: 31 August 2015

Version Date: 2015-08-31

## Project

» [Reproductive and Geographic Evidence for Source-Sink Dynamics in Deep-Sea Benthic Communities](#) (Deep Sea Benthic Dynamics)

Contributors	Affiliation	Role
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## Dataset Description

Polychaetes - Table 2 - Polychaetes species - Particulate Organic Carbon (POC) values by station

Data tables for:

Stuart et al. (to be submitted to Journal of Biogeography). Nestedness and species replacement along bathymetric gradients in the deep sea reflect productivity: a test with polychaete assemblages in the oligotrophic NW Gulf of Mexico.

## Methods & Sampling

**Database for Stuart et al. (to be submitted to Journal of Biogeography). Nestedness and species replacement along bathymetric gradients in the deep sea reflect productivity: a test with polychaete assemblages in the oligotrophic NW Gulf of Mexico.**

This study focuses on the two most western sampling transects (Fig. 1) of the Deep Gulf of Mexico Benthos (DGoMB) Study in the northern Gulf (Rowe & Kennicutt, 2008; Wei et al., 2010). The transects include 13 sampling stations extending from 213 to 3146 m across the bathyal zone, and 3 deeper stations off the continental margin at 3526-3732 m. Samples were collected with a 0.20 m<sup>2</sup> box corer, and sieved on a 300µm screen. The fauna analyzed here is the polychaete worm fraction of the samples.

We used Baselga's (2010, 2012)  $\beta$ -diversity metrics to assess the relative importance of turnover and nestedness; the R package Betapart was used. We used BINMATNEST (Rodríguez-Gironés & Santamaría, 2006) to determine the nested rank order of sampling stations with depth and POC flux; the R package

Bipartite was used.

Baselga, A. (2010) Partitioning the turnover and nestedness components of beta diversity. *Global Ecology and Biogeography*, 19, 134-143.

Baselga, A. (2012) The relationship between species replacement, dissimilarity derived from nestedness, and nestedness. *Global Ecology and Biogeography*, 21, 1223-1232.

Rodríguez-Gironés, M. A. & Santamaría, L. (2006) A new algorithm to calculate the nestedness temperature of presence-absence matrices. *Journal of Biogeography*, 33, 924-935.

Rowe, G.T. & Kennicutt, M.C. (2008) Introduction to the Deep Gulf of Mexico Benthos Program. *Deep Sea Research II*, 55, 2536-2540.

Wei, C., Rowe, G.T., Hubbard, G.F., Scheltema, A.H., Wilson, G.D.F., Petrescu, I., Foster, J. M., Wicksten, M. K., Chen, M., Davenport, R., Soliman, Y. & Wang, Y. (2010) Bathymetric zonation of deep-sea macrofauna in relation to export of surface phytoplankton production. *Marine Ecology Progress Series*, 399, 1-14.

## Data Processing Description

### BCO-DMO Processing Notes

- Generated from original file "Data Polychaetes Western Gulf of Mexico for Stuart et al paper 2 worksheets.xlsx, Sheet 2" contributed by Carol Stuart
- Parameter names edited to conform to BCO-DMO naming convention found at [Choosing Parameter Name](#)

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## Data Files

File
<b>DSBD_Polych_Table2.csv</b> (Comma Separated Values (.csv), 556 bytes) MD5:f066634ab4283f0ff4562bf7d0ff316e
Primary data file for dataset ID 565332

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## Parameters

Parameter	Description	Units
Station	Station Id	text
Latitude	Latitude (South is negative)	decimal degrees
Longitude	Longitude (West is negative)	decimal degrees
POC_Lutz	POC_Lutz	mg C m-2d-1
Depth	Depth	meters

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## Deployments

### DSBD\_GoMx

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/565193">https://www.bco-dmo.org/deployment/565193</a>
<b>Platform</b>	lab Deep Sea Benthic Dynamics
<b>Start Date</b>	1997-11-01
<b>End Date</b>	1999-05-15
<b>Description</b>	Synthesis of measurements from multiple cruises

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## Project Information

### Reproductive and Geographic Evidence for Source-Sink Dynamics in Deep-Sea Benthic Communities (Deep Sea Benthic Dynamics)

**Coverage:** Deep-Sea East and West Atlantic and Gulf of Mexico

#### *Description from NSF award abstract:*

Many hypotheses have been proposed to explain deep-sea species diversity including competition, predation, physical disturbance, patch mosaics, coarse-grained environmental heterogeneity, metapopulation dynamics mediated by dispersal, and a host of abiotic factors. Evidence supporting these ideas comes largely from spatio-temporal patterns of alpha- (local) diversity. This investigator and collaborators proposed an alternative explanation based on species depth ranges. Abyssal populations of mollusks do not comprise a unique assemblage, but are mainly deeper attenuated range extensions of bathyal populations. Densities of many abyssal populations are so extraordinarily low, especially for minute organisms with low mobility and separate sexes, that it is implausible they could be reproductively viable. Most have larval dispersal ability. This suggested that many abyssal populations are maintained by source-sink dynamics. They suffer chronic local extinction from vulnerabilities to Allee effects, and persist through continued immigration from more abundant bathyal source populations. Source-sink dynamics provides a broad synthetic framework within which other potential causes of diversity (above) can act. It also resolves the long-standing paradox of how abyssal diversity could be shaped by interactions when density is so low. The theory does not require that abyssal communities be ecologically structured. They may be mostly a passive consequence of dispersal.

This project will apply two tests for source-sink dynamics: 1. The investigators will perform a direct test by examining reproductive patterns in molluscan species whose bathymetric ranges span the lower bathyal zone and the abyss. Since rare abyssal populations are predicted not to be reproductively viable, they should show diminished gamete production, and no evidence of mating. 2. They will conduct an extensive new synthesis of geographic evidence for source-sink dynamics. Geographic patterns, are currently the primary evidence available on very large spatial scales, and are invaluable for identifying taxonomic and geographical scenarios for future reproductive studies. Recent advances in nested analysis allow us to determine statistically whether abyssal communities are nested subsets of bathyal communities as predicted by source-sink theory. Newly available large datasets include Pan Atlantic distributions of gastropods, bivalves, and cumaceans from the Woods Hole Oceanographic Institution's Benthic Sampling Program; mollusks, asteroids and holothurians from Southampton Oceanography Centre's sampling program in the Porcupine Seabight and Abyssal Plains, and macrofaunal taxa from Texas A&M's Deep Gulf of Mexico Benthic Program. The investigator makes specific predictions about which groups should show geographic evidence of source-sink dynamics based on their natural history and the productivity regime. This synthesis will also contribute significantly to documenting and understanding beta diversity, the most important remaining challenge in deep-sea community ecology.

The source-sink hypothesis has the potential to unify and synthesize the large number of disparate theories of community structure in the deep-sea benthos. The research will also dramatically increase the number of computerized datasets on biogeographic distributions. The single greatest obstacle to expanding our understanding of macroecology in the deep sea is the near absence of data on species ranges. This also has vital implications for conservation and sustainable development of the deep-sea ecosystem. Without much more information on geographic ranges, it is currently impossible to gauge the extinction potential of deep-sea species.

#### References for the Data Analyses:

Brault, S., Stuart, C.T., Wagstaff, M.C. & Rex, M.A. (2012) Geographic evidence for source-sink dynamics in deep-sea neogastropods of the eastern North Atlantic: an approach using nested analysis. *Global Ecology and Biogeography*, 22,433–439. doi:[10.1111/geb.12005](https://doi.org/10.1111/geb.12005)

Brault, S., Stuart, C.T., Wagstaff, M.C., McClain, C.R., Allen, J.A. & Rex, M.A. (2013) Contrasting patterns of  $\alpha$ - and  $\beta$ -diversity in deep-sea bivalves of the eastern and western North Atlantic. *Deep-Sea Research II*, 92,157–164. doi:[10.1016/j.dsr2.2013.01.018](https://doi.org/10.1016/j.dsr2.2013.01.018)

Wagstaff, M., Howell, K.L., Bett, B. J., Billett, D. S. M., Brault, S., Stuart, C. T. & Rex, M. (2014)  $\beta$ -diversity of deep-sea holothurians and asteroids along a bathymetric gradient (NE Atlantic). *Marine Ecology Progress Series*, 508,177–185. doi:[10.3354/meps10877](https://doi.org/10.3354/meps10877)

Stuart, C.T., Brault, S., Rowe, G.T., Wei, C-L., Wagstaff, M., McClain, C.R., & Rex, M.A. Nestedness and species replacement along bathymetric gradients in the deep sea reflect productivity: a test with polychaete assemblages in the oligotrophic NW Gulf of Mexico. *Journal of Biogeography* (to be submitted)

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## Funding

Funding Source	Award
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1129612</a>

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