

# Nitrogen isotopes of coral skeleton-bound organic matter from various sampling locations world-wide

**Website:** <https://www.bco-dmo.org/dataset/683097>

**Data Type:** Other Field Results

**Version:** 2

**Version Date:** 2018-09-13

## Project

» [Collaborative Research: Identifying the Role of Basin-scale Climate Variability in the Decline of Atlantic Corals](#)  
(Coral climate effects)

Contributors	Affiliation	Role
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## Abstract

This dataset contains the average CS-d15N (nitrogen isotopes of coral skeleton-bound organic matter) values for three sampling locations. Sampling occurred in the Oman margin in 1996, Kiritimati (Christmas Island) in 1998, and Bermuda in 2014.

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## Coverage

**Spatial Extent:** N:32.45811 E:157.4 S:1.87 W:-64.83445

**Temporal Extent:** 1996 - 2014

## Dataset Description

These data were published in Wang et al., 2016 and Wang et al., 2018.

The following table is a statistical summary of results:

[Table1, Wang et al., 2016](#) (pdf)

## Methods & Sampling

The “age” for these corals were determined by either counting growth rings on X-ray images of the coral skeleton or matching with other parameters (Sr/Ca or oxygen isotopes) in the same coral skeleton.

At each site, the core-averaged skeletal d15N was first calculated by averaging all available d15N data in each coral core. Then the site-averaged skeletal d15N was calculated by averaging the core-averaged skeletal d15N of all coral cores from the same site.

Samples from Bermuda were collected from a single brain coral (of the species *Diploria labyrinthiformis*) at Hog Reef, Bermuda (32.45811, -64.83445) in July of 2014 at a depth of 3m.

For more details, see Wang et al., 2016.

## Data Processing Description

BCO-DMO processing notes:

- \* added a conventional header with dataset name, PI name, version date
- \* modified parameter names to conform with BCO-DMO naming conventions
- \* blank values replaced with no data value 'nd'
- \* Changed site name "Christmas Island" to "Kiritimati Island" to be consistent with publication referenced.
- \* added sampling depth, sampling year, approximate latitude and longitude site locations that were included in a statistical summary table.
- \* rounded fractional calendar year to three decimal places in Oman data
- \* dataset v1: 2017-02-27 replaced by dataset version v2: 2018-09-14. Data from Bermuda added to the dataset.

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## Data Files

File
<b>N_coral_toplevel.csv</b> (Comma Separated Values (.csv), 9.62 KB) MD5:86142702252864b9514c1d56ad10f64c Primary data file for dataset ID 683097

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## Related Publications

Wang, X. T., A. L. Cohen, V. Luu, H. Ren, Z. Su, G. H. Haug, D. M. Sigman (2018), Natural forcing of the North Atlantic nitrogen cycle in the Anthropocene. *Proceedings of the National Academy of Sciences*.

doi:[10.1073/pnas.1801049115](https://doi.org/10.1073/pnas.1801049115).

*Results*

Wang, X. T., Sigman, D. M., Cohen, A. L., Sinclair, D. J., Sherrell, R. M., Cobb, K. M., ... Ren, H. (2016). Influence of open ocean nitrogen supply on the skeletal  $\delta^{15}\text{N}$  of modern shallow-water scleractinian corals. *Earth and Planetary Science Letters*, 441, 125–132. doi:[10.1016/j.epsl.2016.02.032](https://doi.org/10.1016/j.epsl.2016.02.032)

*Methods*

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## Parameters

Parameter	Description	Units
site	Location of sampling	unitless
collection_year	Year of collection in format yyyy	unitless
lat_approx	Approximate latitude of sampling site	decimal degrees
lon_approx	Approximate longitude of sampling site	decimal degrees
site_depth	Depth of sampling location	meters
age	Age of coral colony sampled	decimal year
depth	Depth (middle interval) within sample core	centimeters
CS_d15N_avg	Average Coral Skeletal d15N. d15N is the ratio of stable isotopes 15N:14N.	permil (0/00) vs air
CS_d15N_1sd	First standard deviation of Coral Skeletal d15N. d15N is the ratio of stable isotopes 15N:14N.	permil (0/00) vs air

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## Instruments

<b>Dataset-specific Instrument Name</b>	IRMS
<b>Generic Instrument Name</b>	Isotope-ratio Mass Spectrometer
<b>Dataset-specific Description</b>	Used "denitrifier method" with isotope ratio mass spectrometer (IRMS)
<b>Generic Instrument Description</b>	The Isotope-ratio Mass Spectrometer is a particular type of mass spectrometer used to measure the relative abundance of isotopes in a given sample (e.g. VG Prism II Isotope Ratio Mass-Spectrometer).

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## Deployments

### CoralClimateProj\_Kiritimati

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/683164">https://www.bco-dmo.org/deployment/683164</a>
<b>Platform</b>	Kiritimati
<b>Description</b>	<p>Sampling took place in 1998</p> <p><b>Methods &amp; Sampling</b> Sampling took place in 1998.</p>

### CoralClimateProj\_Oman\_margin

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/683168">https://www.bco-dmo.org/deployment/683168</a>
<b>Platform</b>	Oman_margin
<b>Description</b>	<b>Methods &amp; Sampling</b> Sampled in 1996

### **CoralClimateProj\_Bermuda**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/746181">https://www.bco-dmo.org/deployment/746181</a>
<b>Platform</b>	shoreside Bermuda

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## **Project Information**

### **Collaborative Research: Identifying the Role of Basin-scale Climate Variability in the Decline of Atlantic Corals (Coral climate effects)**

**Coverage:** Bermuda and wider Caribbean

*Text from the NSF award abstract:*

Human carbon dioxide emissions are causing measureable changes in ocean conditions. Many of these changes negatively affect coral reef ecosystems, reducing their ability to provide food, arable land, tourist destinations and coastline protection for hundreds of millions of people worldwide. This project focuses on the effects of enhanced stratification, caused by ocean warming, on the growth of reef-building corals across the Caribbean and Bermuda. Enhanced stratification impacts primary productivity which generates food for corals. Initial data generated by the investigators suggest that Atlantic coral growth has declined in the last 5 decades in response to these changes. A laboratory-based experiment is designed to test this hypothesis. If verified, the projected decline in Atlantic primary productivity through the 21st century could potentially rival and will certainly exacerbate the effects of warming and ocean acidification on coral reef ecosystems across the North Atlantic. Support is provided for graduate research, and undergraduate participation is facilitated through the Woods Hole Oceanographic Institution Summer Fellowship and the Bermuda Institute of Ocean Sciences-Princeton Environmental Institute Summer Internship Programs. The results will be presented at national and international meetings and disseminated in a timely manner through peer-reviewed publications. All data produced through this program will be archived in the Biological and Chemical Oceanographic Data Management Office.

Anthropogenic climate change has emerged as a principle threat to coral reef survival in the 21st century. In addition to ocean warming and acidification, global climate models project enhanced stratification of the upper oceans through the 21st century and a consequent decline in productivity, by up to 50%, in the North Atlantic. This project employs controlled laboratory manipulation experiments to test the link between productivity and growth of the dominant reef-building corals across the Caribbean and Bermuda. Preliminary data generated by the investigators, including multi-decade long coral growth histories and nitrogen isotope ratios of coral tissue and skeleton, suggest that coral growth across the region has declined over the past 50 years in response to productivity changes already underway. If the link between ocean circulation, productivity decline, and coral growth is verified, the projected 21st century decline in productivity could rival and will certainly exacerbate the effects of warming and ocean acidification on North Atlantic coral reef ecosystems.

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## **Funding**

<b>Funding Source</b>	<b>Award</b>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1537338</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1536547</a>
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1536368</a>

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