

# Gulf Stream Warm-Core and Cold-Core Rings integrated Euphausiid abundance and zooplankton biomass from multiple cruises in the North Atlantic from 1972-1982 (NAtIDarkData project)

**Website:** <https://www.bco-dmo.org/dataset/552287>

**Version:** nearly perfect

**Version Date:** 2017-07-24

## Project

» [North Atlantic Dark Data: Rings](#) (NAtIDarkData)

Contributors	Affiliation	Role
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## Dataset Description

These data are zooplankton collected and identified in the 1970s and 1980s as part of the cold-core and warm-core rings multidisciplinary programs and other related projects. They have been filtered and post-processed. Included are zooplankton biomass and euphausiid species abundance from 306 tows and related metadata taken on 34 research cruises in the Northwest Atlantic. The zooplankton biomass and euphausiid catch data and the associated environmental information were acquired using ring nets, net systems, and CTD/rosettes (Conductivity-Temperature-Depth) and Niskin bottles. Ring net, Bongo net and MOCNESS (Multiple Opening and Closing Nets and Environmental Sensing Systems) tows were quantified using flow meters calibrated to provide volumes of water filtered for each tow.

**A note about 'nd':** Traditionally 'nd' is taken to mean 'no data'. Within that meaning, however, there is much variability. Here 'nd' could mean the more traditional 'we tried and got bad or no data'. It could mean 'these data are not considered relevant to the overall effort'. Finally, 'nd' could mean 'does not exist'.

This particular dataset is a re-display of the dataset [Integrated Euphausiid Abundance and Zooplankton Biomass](#) with the individual zooplankton under a general heading of 'species'.

## References:

Wiebe, P. [ed] 1983. Interdisciplinary study of Gulf Stream warm-core rings physics, chemistry, and biology. Report of the Warm-Core Rings Data Workshop. July 6-19, 1983. Whispering Pines Conference Center, W. Alton Jones Campus, University of Rhode Island, West Greenwich, Rhode Island. [http://dmoserv3.bco-dmo.org/data\\_docs/NAtIDarkData/Wiebe\\_Report\\_WCR\\_DataWorkshop\\_AltonJones\\_July1983.pdf](http://dmoserv3.bco-dmo.org/data_docs/NAtIDarkData/Wiebe_Report_WCR_DataWorkshop_AltonJones_July1983.pdf)

## Methods & Sampling

The original acquisition and processing of these data was documented in cruise reports and peer-reviewed

papers:

Hunt, M. and P.H. Wiebe. 1980. A data base for zooplankton net tow data. W.H.O.I. Technical Report 80-28. 65 pp.

Joyce, T.M., & Wiebe, P.H. (1983). Warm core rings of the Gulf Stream. *Oceanus*, 26(2), 34-44.

McGowan, J. A., & Brown, D. M. (1966). A new opening-closing paired zooplankton net. Scripps Institute of Oceanography Reference, 66/23, 1-56.

Ring Group (Backus, R.H., G.R. Flierl, D. Kester, D.B. Olson, D. Richardson, A. Vastano, P.H. Wiebe and J. Wormuth). (1981). Gulf Stream cold core rings: Their physics, chemistry, and biology. *Science*, 212, 1091-1100.

Wiebe, P.H., E.M. Hulburt, E.J. Carpenter, A.E. Jahn, G.P. Knapp, III. S.H. Boyd, P.B. Ortner, and J.L. Cox. 1996. Gulf Stream cold core rings: Large scale interaction sites for open ocean planktonic communities. *Deep-Sea Res.* 23: 695-710.

Wiebe, P.H. and G.R. Flierl. 1983. Euphausiid invasion/dispersal in Gulf Stream cold core rings. *Aust. J. Mar. Freshwater Res.* 34(4): 625-652.

Wiebe, P.H., N.J. Copley, and S.H. Boyd. 1992. Coarse-scale horizontal patchiness and vertical migration in newly formed Gulf Stream warm-core ring 82-H. *Deep-Sea Res.* 39, Suppl. 1: 247-278.

## Data Processing Description

Recovering these data started with the metadata: how, when and where the zooplankton data were collected. The metadata being sought are summarized in Table 1. As noted above, the data reside in notebooks, cruise reports, old computer files, and blue cover reports. However, the crucial element that makes the effort possible is the presence of the scientist who conducted the research for which the samples were collected and remembers many important details about where to look and what to look for. At one time some of the data were entered into a main-frame based database system, which has since disappeared (Hunt and Wiebe, [12]).

The search began systematically with the listing of all of the cruises that were participated on in the 1970s and 1980s, and then seeking out the information/data listing the zooplankton net tows. All of the data included cruise ids, station information, tow information, net descriptions rudimentary or otherwise, latitudes and longitudes, times and instrument depths, often including multiple sampling depths with the same net system.

Information was not often complete in the analysis notebooks and this required going back into the original cruise log books and crosschecking with other published papers.

For some cruises there was a personal log that had information to fill in the blanks. There were also errors. The most potentially damaging errors were those of station position. Degrees and decimal minutes were sometimes converted to decimal degrees by simply moving the decimal place and not first dividing the minutes by 60. In addition, sometimes a discrepancy was found between the same information in two different sources. Those errors had to be tracked down using as many other sources as possible.

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## Data Files

File
<b>integrated_zoo.csv</b> (Comma Separated Values (.csv), 1.27 MB) MD5:a023bbd26c54a05d138c6e25cd8e0c7f
Primary data file for dataset ID 552287

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## Parameters

Parameter	Description	Units
cruiseid	unique identifier for cruise	text
year	year	YYYY
month_local	month of year	mm
day_local	day of year	dd
time_local	local time of zooplankton collection	hhmm
ISODateTime_local	ISO 19115-2 Standard Date and time	formidable format
lat	latitude of tow. North is positive	decimal degrees
lon	longitude of tow. West is negative	decimal degrees
region	location on the Earth	text
depth_max	maximum depth of tow	meters
depth_mid	middle depth of tow	meters
vol_filt	volume filtered; i.e. how much water went through the net	cubic meters
disp_vol_Mm3	displacement volume	milliliters per 1000 cubic meters
integ_disp_vol	integrated displacement volume	milliliters per square meter
Carbon	Integrated Carbon	millimoles per square meter
depth_10degISO	depth of 10 degree isotherm	meters
dist_RiCntr	distance to the ring center	kilometers
biomass_50	Depth at which cumulative percent of the biomass equals 50 percent; i.e. half the biomass of the water column sampled	meters
species	individual species names - a binomial	text
abundance	number of animals caught per square meter	number per square meter
tow	sequential number of tow	number
tow_type	which instrument was used	text

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## Instruments

<b>Dataset-specific Instrument Name</b>	Bongo Net
<b>Generic Instrument Name</b>	Bongo Net
<b>Generic Instrument Description</b>	A Bongo Net consists of paired plankton nets, typically with a 60 cm diameter mouth opening and varying mesh sizes, 10 to 1000 micron. The Bongo Frame was designed by the National Marine Fisheries Service for use in the MARMAP program. It consists of two cylindrical collars connected with a yoke so that replicate samples are collected at the same time. Variations in models are designed for either vertical hauls (OI-2500 = NMFS Pairovet-Style, MARMAP Bongo, CalVET) or both oblique and vertical hauls (Aquatic Research). The OI-1200 has an opening and closing mechanism that allows discrete "known-depth" sampling. This model is large enough to filter water at the rate of 47.5 m <sup>3</sup> /minute when towing at a speed of two knots. More information: Ocean Instruments, Aquatic Research, Sea-Gear

<b>Dataset-specific Instrument Name</b>	Meter Net
<b>Generic Instrument Name</b>	Meter Net
<b>Generic Instrument Description</b>	A meter net is a plankton net with a one meter diameter opening and a mesh size of .333 mm, towed horizontally, obliquely or vertically, also known as a Ring Net.

<b>Dataset-specific Instrument Name</b>	MOC1D
<b>Generic Instrument Name</b>	MOCNESS-1D
<b>Generic Instrument Description</b>	The Double MOCNESS 1D carries 20 1m <sup>2</sup> nets usually of mesh size 335micron and is designed to collect macrozooplankton. This MOCNESS system uses the same underwater and shipboard electronic system for operation and data acquisition as other MOCNESS systems. The nets are opened and closed sequentially by commands transmitted from the surface deck unit through a single conducting cable to the underwater unit. The command circuit has a provision to permit commands to be sent to either the left or right set of nets when using the double MOCNESS-1D. - from Wiebe et al, 1985.

<b>Dataset-specific Instrument Name</b>	MOC1
<b>Generic Instrument Name</b>	MOCNESS1
<b>Generic Instrument Description</b>	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-m <sup>2</sup> 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).

## Deployments

### G191

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541940">https://www.bco-dmo.org/deployment/541940</a>
<b>Platform</b>	R/V Gosnold
<b>Start Date</b>	1972-06-12
<b>End Date</b>	1972-06-14

### G197

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541944">https://www.bco-dmo.org/deployment/541944</a>
<b>Platform</b>	R/V Gosnold
<b>Start Date</b>	1972-08-15
<b>End Date</b>	1972-08-15
<b>Description</b>	This is one point from a cruise but it's the only point we have. It is associated with the Rings Data being recovered.

### All-71

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541947">https://www.bco-dmo.org/deployment/541947</a>
<b>Platform</b>	R/V Atlantis II
<b>Start Date</b>	1972-09-21
<b>End Date</b>	1972-10-14
<b>Description</b>	This deployment is a collection of locations for stations for the meter net to collect zooplankton for the Rings projects.

### CH111

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541956">https://www.bco-dmo.org/deployment/541956</a>
<b>Platform</b>	R/V Chain
<b>Start Date</b>	1973-02-07
<b>End Date</b>	1973-02-18
<b>Description</b>	Not the real cruise track. A collection of station locations. <b>Methods &amp; Sampling</b> These positions are the station positions, not the ship's track.

### KN35

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541960">https://www.bco-dmo.org/deployment/541960</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1973-11-24
<b>End Date</b>	1973-12-03
<b>Description</b>	Resurrected station locations for the Rings project. Not really a cruise track, but for mapping purposes we made it so. DMO.

#### KN38

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541964">https://www.bco-dmo.org/deployment/541964</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1974-03-12
<b>End Date</b>	1974-04-03
<b>Description</b>	These 'cruise track' positions are station positions for the Rings project zooplankton tows.

#### All-85

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/58766">https://www.bco-dmo.org/deployment/58766</a>
<b>Platform</b>	R/V Atlantis II
<b>Start Date</b>	1974-10-12
<b>End Date</b>	1974-10-23
<b>Description</b>	1. in-situ filtration sampling at selected depths and locations between Bermuda and Woods Hole; 2. in-situ tests of the Longhurst-Hardy Plankton Recorder (LHPR) system using SCUBA; 3. studies of the phytoplankton, zooplankton, and fish of Gulf Stream rings with emphasis on spatial patterns of phytoplankton and hydrographic factors; 4. tests of the newly constructed Multiple Opening/Closing Net and Environmental System (MOCNESS); 5. studies of bird migration patterns; 6. studies to examine differences in gene frequencies in fish across physical-chemical stress gradients; 7. analyses of mesopelagic fish blood for differences in ionic concentrations. The positions are not the cruise track. The positions here are station locations for zooplankton tows.

#### CH125

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541971">https://www.bco-dmo.org/deployment/541971</a>
<b>Platform</b>	R/V Chain
<b>Start Date</b>	1975-08-04
<b>End Date</b>	1975-08-17
<b>Description</b>	These positions are not exactly the cruise track. They are station positions for zooplankton tows. This is part of a resurrected dark data set. At the beginning there are only two locations - the first and the last zooplankton tow locations -- but more locations will be filled in when there is time.

#### KN53

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541975">https://www.bco-dmo.org/deployment/541975</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1975-11-14
<b>End Date</b>	1975-12-02
<b>Description</b>	These locations are not exactly the cruise track. They are station locations for Zooplankton tows. This is part of a resurrected dark data set. Only the first and last station locations are here to symbolize the cruise track. More locations will be added later as time permits. From <a href="http://dla.whoi.edu/catalog/dla_search/results/taxonomy%3A74113">http://dla.whoi.edu/catalog/dla_search/results/taxonomy%3A74113</a> [not currently available, 2018-08-20] GEOSECS Program, Project FAMOUS; subjects: transient traces in the ocean, bathymetry. Scientists: Luyendyk, B.P.; Teal, John M.; Metcalf, William G.; Haedrich, R. L. ; Worthington, L. Valentine ; Barvenik, F.W. ; Bradley, K.F. ;Hess, F.R.; Brewer, P.G. ; Bowen, Vaughn T. ; Burke, J.C. ; Jenkins, W.J. related subjects: Panulirus II (Ship) related subjects: R/V Oceanus related subjects: USS Mentor related subjects: R/V Knorr

#### OC07

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541979">https://www.bco-dmo.org/deployment/541979</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1976-06-07
<b>End Date</b>	1976-06-07
<b>Description</b>	We only have one position from this cruise.

#### KN62

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541982">https://www.bco-dmo.org/deployment/541982</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1976-12-04
<b>End Date</b>	1976-12-20
<b>Description</b>	These positions are station locations and not cruise tracks per se. This is all we have for this cruise. We are charting the location of the zooplankton tows from the Rings Projects.

#### KN65

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541986">https://www.bco-dmo.org/deployment/541986</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1977-04-11
<b>End Date</b>	1977-04-30
<b>Description</b>	These positions are not the complete cruise track. These positions are a subset and represent the locations of the zooplankton tows which are a part of the Rings Projects.

#### EN11

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541990">https://www.bco-dmo.org/deployment/541990</a>
<b>Platform</b>	R/V Endeavor
<b>Start Date</b>	1977-07-31
<b>End Date</b>	1977-08-17
<b>Description</b>	These positions are not the whole cruise track. They represent some of the zooplankton collection stations. We will be adding more positions as time permits.

#### KN71

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/541994">https://www.bco-dmo.org/deployment/541994</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1977-10-23
<b>End Date</b>	1977-11-16
<b>Description</b>	These positions represent only a portion of the cruise track. They are the location of some of the scientific stations, but they are all we have at the moment. More positions will be added to the cruise track as time allows.

#### All-101

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542002">https://www.bco-dmo.org/deployment/542002</a>
<b>Platform</b>	R/V Atlantis II
<b>Start Date</b>	1978-06-23
<b>End Date</b>	1978-07-13
<b>Description</b>	These positions are not the complete cruise track. They represent the locations of zooplankton tows that are part of the Rings Projects.

#### SH-001

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542007">https://www.bco-dmo.org/deployment/542007</a>
<b>Platform</b>	F/V Super Horse
<b>Start Date</b>	1981-04-29
<b>End Date</b>	1981-04-29
<b>Description</b>	This fishing vessel was used as a ship of opportunity and went to one station to tow for zooplankton.

#### SH-002

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542010">https://www.bco-dmo.org/deployment/542010</a>
<b>Platform</b>	F/V Super Horse
<b>Start Date</b>	1981-05-12
<b>End Date</b>	1981-05-12
<b>Description</b>	This fishing vessel was used as a ship-of-opportunity to occupy stations as part of the Rings Projects. Only one location is recorded.

#### OC98

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542013">https://www.bco-dmo.org/deployment/542013</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1981-05-29
<b>End Date</b>	1981-05-29
<b>Description</b>	This is the only location recorded for this cruise. It is the location of a MOCNESS tow and is part of the Rings Projects.

#### SH-003

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542016">https://www.bco-dmo.org/deployment/542016</a>
<b>Platform</b>	F/V Super Horse
<b>Start Date</b>	1981-06-29
<b>End Date</b>	1981-06-29
<b>Description</b>	This was a ship of opportunity for the Rings Project and only one station was recorded. This is the location of a zooplankton tow.

#### SH-004

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542019">https://www.bco-dmo.org/deployment/542019</a>
<b>Platform</b>	F/V Super Horse
<b>Start Date</b>	1981-07-28
<b>End Date</b>	1981-07-28
<b>Description</b>	This is the only location reported for this cruise. It was a ship of opportunity used to facilitate the collection of zooplankton as part of the Rings Projects.

#### SH-005

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542022">https://www.bco-dmo.org/deployment/542022</a>
<b>Platform</b>	F/V Super Horse
<b>Start Date</b>	1981-08-19
<b>End Date</b>	1981-08-19
<b>Description</b>	This is the only position for this cruise. This was a ship of opportunity to enable zooplankton collection in a Gulf Stream Ring.

#### OC106

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542030">https://www.bco-dmo.org/deployment/542030</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1981-10-27
<b>End Date</b>	1981-10-27
<b>Description</b>	This position is the only one for this cruise. If other positions become known, they will be added. This is the position of a zooplankton tow during one of the Rings Project cruises.

#### OC109

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542033">https://www.bco-dmo.org/deployment/542033</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1981-11-23
<b>End Date</b>	1981-11-23
<b>Description</b>	This deployment has only one known point at this time. When more locations become available, they will be added. This point represents a zooplankton tow which was a part of the Rings Projects.

#### OC111

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542035">https://www.bco-dmo.org/deployment/542035</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1981-12-11
<b>End Date</b>	1981-12-13
<b>Description</b>	This is not really the entire cruise track. Instead, these are the two positions of zooplankton tows taken during this cruise and the only representation of the cruise track that we have at the moment. When more locations become available, we will add them.

#### OC112

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542058">https://www.bco-dmo.org/deployment/542058</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1982-01-05
<b>End Date</b>	1982-01-05
<b>Description</b>	This is the only position we have for this cruise at the present time. When and if more locations become available, we will add them to the ship's track. This was the location of a zooplankton tow that was part of the Rings Projects.

#### OC114

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542074">https://www.bco-dmo.org/deployment/542074</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1982-02-08
<b>End Date</b>	1982-02-08
<b>Description</b>	This is the only position we have for this cruise at this time. It represents one of the stations where a net tow was made for zooplankton as part of the Rings Projects.

#### OC116

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542078">https://www.bco-dmo.org/deployment/542078</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1982-03-11
<b>End Date</b>	1982-03-15
<b>Description</b>	These positions are the only cruise track positions that we currently have. These represent stations where zooplankton tows were done as part of the Rings Projects. If and when more locations become available, they will be added as time permits.

**OC118**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542082">https://www.bco-dmo.org/deployment/542082</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1982-04-19
<b>End Date</b>	1982-05-02
<b>Description</b>	These locations are not the real ship's track. They represent only those locations where zooplankton tows were made. If and when more cruise track locations become available, they will be added as time allows.

**OC121**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542086">https://www.bco-dmo.org/deployment/542086</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1982-06-16
<b>End Date</b>	1982-06-29
<b>Description</b>	These locations only represent a portion of the ship's track. These positions are where tows were done to collect zooplankton as part of the Rings Projects. As more ship's track locations become available, they will be added as time permits.

**OC125**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542090">https://www.bco-dmo.org/deployment/542090</a>
<b>Platform</b>	R/V Oceanus
<b>Start Date</b>	1982-08-10
<b>End Date</b>	1982-08-22

**KN98**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542094">https://www.bco-dmo.org/deployment/542094</a>
<b>Platform</b>	R/V Knorr
<b>Start Date</b>	1982-09-27
<b>End Date</b>	1982-10-16
<b>Description</b>	These locations represent only a portion of the ship's track. They are the locations of zooplankton tows taken during the Rings Project. When more locations become available, they will be added as time permits.

**All-110**

<b>Website</b>	<a href="https://www.bco-dmo.org/deployment/542025">https://www.bco-dmo.org/deployment/542025</a>
<b>Platform</b>	R/V Atlantis II
<b>Start Date</b>	1981-09-21
<b>End Date</b>	1981-10-05
<b>Description</b>	These positions are only a portion of the cruise track. They represent the station locations where zooplankton tows were done and are the only positions we have at the present time for the cruise. More station positions will be added to the track as time permits. All the locations are found in the data.

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## Project Information

### North Atlantic Dark Data: Rings (NAtIDarkData)

**Coverage:** North Atlantic, Sargasso Sea, NW Atlantic Slope Water

Recent changes in NSF and other agency data policies (NSF11060, 2011; OSTP memo 2013) mandating timely and open access to data and information generated in the course of US funded research have resulted in a relatively rapid change in the culture of data sharing. Technological advances, policy changes, and increased awareness of the need for and benefits of well-curated data make it much more likely that recently generated research results will be made publicly available and in a timely manner. However, many scientific data were generated at a time when the technology for curation, storage, and dissemination were primitive or non-existent, and data sharing was not viewed as essential. In addition, many of the datasets were created by projects that make up the "long tail", smaller projects that form the bulk of the projects funded by agencies such as NSF (Heidorn, 2008). Data from these projects have in the past been poorly curated and thus less visible to other scientists, largely not available, and hence named "Dark Data" (Heidorn, 2008). But as Sinha et al. (2013) emphasize, without access to the types of historical observations or legacy data that make up the "dark data" in the "long tail" of science, emerging scientific challenges will not be addressable. "...making these data available on demand must be one of the highest priorities for any enterprise seeking to develop a cyberinfrastructure capable of promoting new ways to examine the earth system through time" (Sinha et al., 2013). The paucity of marine ecosystem data available to conduct cutting edge research and the critical need for the rescue of past data were also highlighted in a recent EarthCube End-User Domain Workshop Report "Articulating Cyberinfrastructure Needs of the Ocean Ecosystem Dynamics Community" (Kinkade et al., 2013). (from proposal to NSF, 2014)

There are significant dark datasets currently unavailable from multidisciplinary programs funded in the 1970's and 1980's such as those from the Northwest Atlantic cold-core and warm-core rings (The Ring Group, 1981; Joyce and Wiebe, 1983). The bulk of the data served here will be from the Rings projects.

The Cold-Core Rings (CCR) studies, [1972-1976] and Warm-Core Rings (WCR) Program, [1981-1982], were major research projects in the 1970s and 1980s. Large oceanic eddies or rings form when Gulf Stream waters first meander, then separate, forming a ring of Gulf Stream water around a core of cold Slope Water or a core of warm Sargasso Sea water. The CCRs move south or southwest from their point of origin into the Sargasso Sea and are initially 150-300 kilometers in diameter and 2500-3500 meters deep. They can persist as identifiable features for up to 2 years. WCRs move to the west/southwest in the Slope Water north of the Gulf Stream. They are 100 to 200 km in diameter, extend to at least 1500 m deep, and exist for a shorter period of time (usually less than a year) before gradually breaking up and rejoining the Gulf Stream. Both of these kinds of rings form about 5 to 8 times a year.

Rings are particularly interesting to the biologist because species living north and south of the Gulf Stream are distinctly different. Thus temperate species from the Slope Water or tropical-subtropical species from the Sargasso Sea are isolated during ring formation within their particular ring structure. Thus, a community of animals from one area is expatriated in the territory of another community of animals. As a ring decays, the water gradually takes on the physical and chemical characteristics of the surrounding non-ring water. Species outside the ring invade the ring habitat while those expatriated go to local extinction. This phenomenon

provides for a large-scale natural ecological experiment that was the focus of the ring's studies.

This project is digitizing data from 33 cruises to the Northwest Atlantic Ocean that are locked in notebooks and old digital file formats and preparing them for serving online in a publically available data repository (BCO-DMO).

Each dataset has been the subject of extensive data recovery efforts and the work is continuing.

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