

Estimated abundances of viruses and bacteria determined in samples collected in the Eastern Tropical North Pacific (ETNP) on R/V New Horizon cruise NH1315 during June 2013

Website: <https://www.bco-dmo.org/dataset/823094>

Data Type: Cruise Results

Version: 1

Version Date: 2020-09-02

Project

» [Ecology and biogeochemical impacts of viruses in marine oxygen minimum zones](#) (OMZ Viruses)

Contributors	Affiliation	Role
Brum, Jennifer R.	University of Arizona (UA)	Principal Investigator
Rauch, Shannon	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract

Estimated abundances of viruses and bacteria via epifluorescence microscopy of samples collected in the Eastern Tropical North Pacific oxygen minimum zone region (ETNP OMZ) on R/V New Horizon cruise NH1315 from 13-28 June 2013.

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Coverage

Spatial Extent: N:18.92 E:-104.89 S:18.92 W:-108.799

Temporal Extent: 2013-06-19 - 2013-06-22

Dataset Description

Estimated abundances of viruses and bacteria via epifluorescence microscopy of samples collected in the Eastern Tropical North Pacific oxygen minimum zone region (ETNP OMZ) on R/V New Horizon cruise NH1315 from 13-28 June 2013.

Methods & Sampling

Detailed protocols, including suggestions from the scientific community, are published on the lab website at <https://u.osu.edu/viruslab/protocols/> and maintained on protocols.io at <https://www.protocols.io/workspaces/sullivan-lab>.

Samples were collected from the Eastern Tropical North Pacific oxygen minimum zone region (ETNP OMZ) during the OMZ Microbial Biogeochemistry Expedition cruise (R/V NewHorizon,13-28 June 2013). Seawater was collected from 16 depths spanning the mixed layer, oxycline, OMZ core, and below the OMZ. Collections were

made using Niskin bottles on a rosette. Samples were preserved with EM-grade glutaraldehyde (2% final concentration), flash-frozen in liquid nitrogen and stored between -72 °C and -80 °C until analysis.

Viral and bacterial concentrations were determined based on a previously described method (Noble and Fuhrman, 1998) in which thawed samples were filtered onto 0.02-µm- pore-size filters (Anodisc, Whatman, GE Healthcare Life Sciences, Piscataway, NJ, USA), stained with SYBR Gold nucleic acid stain (Invitrogen, Life Technologies, Carlsbad, CA, USA) and enumerated using an epifluorescence microscope (Axio Imager. D2, Zeiss, Jena, Germany).

Data Processing Description

BCO-DMO Processing:

- added station latitude and longitude;
- added date (from related dataset <https://www.bco-dmo.org/dataset/629125>).

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Data Files

File
microbial_abund.csv (Comma Separated Values (.csv), 1.23 KB) MD5:2e7ac141f669eeb62707e3acb47d2af8
Primary data file for dataset ID 823094

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Related Publications

Noble, R., & Fuhrman, J. (1998). Use of SYBR Green I for rapid epifluorescence counts of marine viruses and bacteria. *Aquatic Microbial Ecology*, 14, 113–118. doi:[10.3354/ame014113](https://doi.org/10.3354/ame014113)
Methods

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Parameters

Parameter	Description	Units
Sample	Unique sample identifier	unitless
Viruses	Concentration of viruses (viruses per ml)	per milliliter
v_stdev	Standard deviation of virus concentration	per milliliter
Bacteria	Concentration of bacteria (bacteria per ml)	per milliliter
b_stdev	Standard deviation of bacteria concentration	per milliliter
VBR	Virus to bacteria ratio	unitless
VBR_stdev	Standard deviation of VBR	unitless
Station	Station where sample was collected	unitless
Depth	Depth of sample	meters (m)
Latitude	Station latitude	degrees North
Longitude	Station longitude	degrees East
Date	Date; format: YYYY-MM-DD	unitless

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Instruments

Dataset-specific Instrument Name	Epifluorescence microscope
Generic Instrument Name	Fluorescence Microscope
Dataset-specific Description	Epifluorescence microscope (Axio Imager. D2, Zeiss, Jena, Germany)
Generic Instrument Description	Instruments that generate enlarged images of samples using the phenomena of fluorescence and phosphorescence instead of, or in addition to, reflection and absorption of visible light. Includes conventional and inverted instruments.

Dataset-specific Instrument Name	Niskin bottles
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

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Deployments

NH1315

Website	https://www.bco-dmo.org/deployment/628427
Platform	R/V New Horizon
Start Date	2013-06-13
End Date	2013-06-28
Description	Oxygen Minimum Zone Microbial Biogeochemistry Expedition (OMZoMBiE) Proposed Sampling Stations Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

Ecology and biogeochemical impacts of viruses in marine oxygen minimum zones (OMZ Viruses)

NSF Award Abstract:

Marine oxygen minimum zones (OMZs) are regions of the world's oceans that have low or no oxygen. Often referred to as "dead zones" because of their lack of larger organisms, OMZs actually support specific microbial communities adapted to survive in these low-oxygen regions. These microbes perform metabolic processes that produce greenhouse gases such as methane, and significantly alter global nitrogen budgets. In turn, viruses can alter every aspect of microbial communities by causing mortality and altering microbial functions; yet we know little regarding how viruses affect OMZ ecosystems, which is limiting our ability to predict future changes to the Earth system as these OMZs expand over time. This proposed research seeks to fill this knowledge gap by examining the types of viruses that are present in OMZs, as well as how they alter microbial communities and their impact on global processes. In the broader perspective, this proposed work will provide extensive datasets for 7 marine OMZ regions that can be interrogated through publically-available analysis tools, thus enabling environmental science for both research and educational purposes including real-world research experience in undergraduate classes to strengthen scientific education. One postdoc, two graduate students, and undergraduate students will be trained and mentored during this project. Furthermore, the work will facilitate international collaboration with leading microbial oceanographers from across the world.

This project will use recent advances in quantitative environmental viral analysis to rapidly enhance our knowledge of OMZ viral communities through examination of 100s of samples from 7 globally-distributed marine OMZ regions with varying levels of oxygen depletion. The specific aims of the project are to (i) gain a basic understanding of viral abundances, viral-induced microbial mortality, and viral community structure, as well as the environmental conditions that drive differences in these parameters, and (ii) assess the effects of viruses on nutrient and gas cycling in OMZs. These aims will be accomplished through analyzing viral

metagenomes to assess how viral communities differ among the 7 diverse OMZ regions, and how they diverge from communities in oxygenated waters. Further, the viral metagenomes will be coupled with microbial metagenomes to assess virus-host dynamics and the effects of viral-induced mortality on microorganisms performing key metabolic functions. Finally, the abundance and expression of viral-encoded metabolic genes will be used to perform gene-based biogeochemical modeling to determine the extent of viral influences in OMZ biogeochemical cycling.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1658040

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