Metal uptake rates of the polar diatom Chaetoceros RS19 in +Zn and +Co incubation studies from January 2020 (MM Saito project)

Website: https://www.bco-dmo.org/dataset/859581
Data Type: experimental
Version: 1
Version Date: 2021-08-30

Project
» Marine Microbial Investigator Award: Investigator Mak Saito (MM Saito)

Program
» Marine Microbiology Initiative (MMI)

Contributors	Affiliation	Role
Saito, Mak A.	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Kellogg, Riss	Massachusetts Institute of Technology (MIT)	Student, Contact
Newman, Sawyer	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Metal uptake rates of the Ross Sea diatom isolate Chaetoceros RS19 measured after growth in +Zn +Co media amendments. Uptake rates are calculated as the specific growth rate (units of d-1) multiplied by the P-normalized metal quota.

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Coverage

Spatial Extent: **Lat**:-76.48338 **Lon**:177.12379
Temporal Extent: 2020-01 - 2020-01

Dataset Description

Metal uptake rates of the Ross Sea diatom isolate *Chaetoceros* RS19 measured after growth in +Zn+Co media amendments. Uptake rates are calculated as the specific growth rate (units of d^{-1}) multiplied by the P-normalized metal quota. Datasets of growth rates and metal quotas were submitted in tandem.

Methods & Sampling

Methodology:

Sampling and analytical procedures:

The steady-state net uptake rates (*r*) of Fe, Mn, Ni, Cu, Zn, Cd, and Co were also calculated as the cellular metal quota (Q) multiplied by the specific growth rate (m) of double addition cultures (Sunda and Huntsman 1995). Methods for cellular metal quotas and for growth rates are provided in their respective dataset pages.

Data Processing Description

BCO-DMO Processing Notes:

- Renamed fields to meet BCO-DMO naming conventions

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Data Files

File
chaetocerosrs19_uptake_rates_bcodmo-1.csv (Comma Separated Values (.csv), 747 bytes) MD5:f806bb9225ead4c5b87b0cfcc06274b2 Primary data file for dataset ID 859581

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Related Publications

Kellogg, R. M., Moran, D. M., McIlvin, M. R., Subhas, A. V., Allen, A. E., & Saito, M. A. (2022). Lack of a Zn/Co substitution ability in the polar diatom Chaetoceros neogracileRS19. Limnology and Oceanography, 67(10), 2265–2280. Portico. https://doi.org/10.1002/lno.12201
Results

Sunda, W. G., & Huntsman, S. A. (1995). Cobalt and zinc interreplacement in marine phytoplankton: Biological and geochemical implications. Limnology and Oceanography, 40(8), 1404–1417. doi:10.4319/lo.1995.40.8.1404
Related Research

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Related Datasets

IsRelatedTo

Kellogg, R., Saito, M. A. (2021) **Growth rates of the polar diatom Chaetoceros RS19 under various +Zn and +Co conditions from September 2019 (MM Saito project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-08-31 doi:10.26008/1912/bco-dmo.858743.1 [view at BCO-DMO]

Kellogg, R., Saito, M. A. (2021) **Metal quotas (ratios of Metal:P) of the polar diatom Chaetoceros sp. RS19 in +Zn and +Co incubation studies from January 2020 (MM Saito project).** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2021-08-30 doi:10.26008/1912/bco-dmo.859211.1 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
log_Zn2plus	Log of calculated free Zn2+ ion concentration in media. [Zn2+]	moles per liter (mol/L)
log_Co2plus	Log of calculated free Co2+ ion concentration in media. [Co2+]	moles per liter (mol/L)
Growth_rate_average	Average growth rate of replicates A and B	per day (d-1)
FE_uptake_rate	Uptake rate of iron (Fe)	millimoles iron per mol phosphorus per day
MN_uptake_rate	Uptake rate of manganese (Mn)	millimoles manganese per mol phosphorus per day
NI_uptake_rate	Uptake rate of nickel (Ni)	millimoles nickel per mol phosphorus per day
CU_uptake_rate	Uptake rate of copper (Cu)	millimoles copper per mol phosphorus per day
ZN_uptake_rate	Uptake rate of zinc (Zn)	millimoles zinc per mol phosphorus per day
CD_uptake_rate	Uptake rate of cadmium (Cd)	millimoles cadmium per mol phosphorus per day
CO_uptake_rate	Uptake rate of cobalt (Co)	millimoles cobalt per mol phosphorus per day

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Instruments

Dataset-specific Instrument Name	Thermo ICAP-Q plasma mass spectrometer
Generic Instrument Name	Inductively Coupled Plasma Mass Spectrometer
Dataset-specific Description	The steady-state net uptake rates (r) of Fe, Mn, Ni, Cu, Zn, Cd, and Co were also calculated as the cellular metal quota (Q) multiplied by the specific growth rate (m) of double addition cultures (Sunda and Huntsman 1995). Methods for cellular metal quotas and for growth rates are provided in their respective dataset pages.
Generic Instrument Description	An ICP Mass Spec is an instrument that passes nebulized samples into an inductively-coupled gas plasma (8-10000 K) where they are atomized and ionized. Ions of specific mass-to-charge ratios are quantified in a quadrupole mass spectrometer.

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Project Information

Marine Microbial Investigator Award: Investigator Mak Saito (MM Saito)

In support of obtaining deeper knowledge of major biogeochemically relevant proteins to inform a mechanistic understanding of global marine biogeochemical cycles.

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Program Information

Marine Microbiology Initiative (MMI)

Website: https://www.moore.org/initiative-strategy-detail?initiativeId=marine-microbiology-initiative

A Gordon and Betty Moore Foundation Program.

Forging a new paradigm in marine microbial ecology:

Microbes in the ocean produce half of the oxygen on the planet and remove vast amounts of carbon dioxide, a greenhouse gas, from the atmosphere. Yet, we have known surprisingly little about these microscopic organisms. As we discover answers to some long-standing puzzles about the roles that marine microorganisms play in supporting the ocean's food webs and driving global elemental cycles, we realized that we still need to learn much more about what these organisms do and how they do it—including how they evolved and contribute to our ocean's health and productivity.

The Marine Microbiology Initiative seeks to gain a comprehensive understanding of marine microbial communities, including their diversity, functions and behaviors; their ecological roles; and their origins and evolution. Our focus has been to enable researchers to uncover the principles that govern the interactions among microbes and that govern microbially mediated nutrient flow in the sea. To address these opportunities, we support leaders in the field through investigator awards, multidisciplinary team research projects, and efforts to create resources of broad use to the research community. We also support development of new instrumentation, tools, technologies and genetic approaches.

Through the efforts of many scientists from around the world, the initiative has been catalyzing new science through advances in methods and technology, and to reduce interdisciplinary barriers slowing progress. With our support, researchers are quantifying nutrient pools in the ocean, deciphering the genetic and biochemical bases of microbial metabolism, and understanding how microbes interact with one another. The initiative has five grant portfolios:

Individual investigator awards for current and emerging leaders in the field.
Multidisciplinary projects that support collaboration across disciplines.
New instrumentation, tools and technology that enable scientists to ask new questions in ways previously not possible.
Community resource efforts that fund the creation and sharing of data and the development of tools, methods and infrastructure of widespread utility.
Projects that advance genetic tools to enable development of experimental model systems in marine microbial ecology.
We also bring together scientists to discuss timely subjects and to facilitate scientific exchange.

Our path to marine microbial ecology was a confluence of new technology that could accelerate science and an opportunity to support a field that was not well funded relative to potential impact. Around the time we began this work in 2004, the life sciences were entering a new era of DNA sequencing and genomics, expanding possibilities for scientific research – including the nascent field of marine microbial ecology. Through conversations with pioneers inside and outside the field, an opportunity was identified: to apply these new sequencing tools to advance knowledge of marine microbial communities and reveal how they support and influence ocean systems.

After many years of success, we will wind down this effort and close the initiative in 2021. We will have invested more than $250 million over 17 years to deepen understanding of the diversity, ecological activities and evolution of marine microbial communities. Thanks to the work of hundreds of scientists and others involved with the initiative, the goals have been achieved and the field has been profoundly enriched; it is now positioned to address new scientific questions using innovative technologies and methods.

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Funding

Funding Source	Award
Gordon and Betty Moore Foundation: Marine Microbiology Initiative (MMI)	GBMF3782
NSF Division of Ocean Sciences (NSF OCE)	OCE-1657766
NSF Division of Ocean Sciences (NSF OCE)	OCE-1658030
NSF Division of Ocean Sciences (NSF OCE)	OCE-1736599
NSF Division of Ocean Sciences (NSF OCE)	OCE-1850719

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