Temperature and salinity measured at the UConn dock in Groton, CT, USA, associated with DNA collection

Website: https://www.bco-dmo.org/dataset/854554
Data Type: Other Field Results
Version: 1
Version Date: 2021-06-23

Project
» Collaborative Research: Combining single-cell and community 'omics' to test hypotheses about diversity and function of planktonic ciliates (Ciliate Omics)

Contributors	Affiliation	Role
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Abstract
This dataset includes temperature and salinity measurements collected from the UConn dock in Groton CT, USA (41° 18' 59" N, 72° 03'39" W), in association with DNA collection. Measurements were made weekly from January 2020 to April 2021.

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Coverage

Spatial Extent: **Lat**:41.31639 **Lon**:-72.06083
Temporal Extent: 2020-01-24 - 2021-04-06

Acquisition Description

Samples were collected at the UConn dock in Groton, CT, USA (41° 18' 59" N, 72° 03'39" W). Dock sampling was conducted weekly using a 20 um mesh plankton net, bulb thermometer, and temperature-corrected salinity refractometer. On some dates, cells were picked for single-cell genome/transcriptomes. There is a gap in the data between 2020-03-20 and 2020-05-01 when sampling was suspended due to COVID-19.

Processing Description

BCO-DMO Processing:
- removed empty rows;
- renamed fields to conform with BCO-DMO naming conventions;
- removed the Notes column (empty);
- changed date format to YYYY-MM-DD;
- added ISO8601 datetime (UTC) fields.

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Parameters

Parameter	Description	Units
Date	Date of sampling (local time zone EST/EDT); format: YYYY-MM-DD	unitless
Time_of_High_Tide_local	Time of high tide (local time zone EST/EDT); format: hh:mm	unitless
Time_of_Dock_Tow_local	Time of dock tow (local time zone EST/EDT); format: hh:mm	unitless
Temperature	Water temperature	degrees Celsius
Salinity	Water salinity	parts per thousand (PPT)
ISO_DateTime_UTC_High_Tide	Date and time (UTC) of high tide in ISO8601 format: YYYY-MM-DDThh:mmZ	unitless
ISO_DateTime_UTC_Dock_Tow	Date and time (UTC) of dock tow in ISO8601 format: YYYY-MM-DDThh:mmZ	unitless

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Instruments

Dataset-specific Instrument Name	20 um mesh plankton net
Generic Instrument Name	Plankton Net
Generic Instrument Description	A Plankton Net is a generic term for a sampling net that is used to collect plankton. It is used only when detailed instrument documentation is not available.

Dataset-specific Instrument Name	temperature-corrected salinity refractometer
Generic Instrument Name	Refractometer
Generic Instrument Description	A refractometer is a laboratory or field device for the measurement of an index of refraction (refractometry). The index of refraction is calculated from Snell's law and can be calculated from the composition of the material using the Gladstone-Dale relation. In optics the refractive index (or index of refraction) n of a substance (optical medium) is a dimensionless number that describes how light, or any other radiation, propagates through that medium.

Dataset-specific Instrument Name	bulb thermometer
Generic Instrument Name	Thermometer

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Project Information

Collaborative Research: Combining single-cell and community 'omics' to test hypotheses about diversity and function of planktonic ciliates (Ciliate Omics)

Website: http://microzooplankton.uconn.edu

Coverage: New England continental shelf

NSF Award Abstract:
Planktonic ciliates are key members of marine food webs where they serve diverse roles, including as food chain links between smaller microbes and larger plankton. Due to their small size and difficulties in identifying and cultivating them, we know less about ciliate diversity and distributions in the ocean than we do about larger organisms such as fish and invertebrates. Previous work from this team measured ciliate diversity in coastal waters and found that distinct genetic variants were separated in time and space in a way that could be related to factors such as ocean temperature, salinity, and depth gradients. Many questions remained unanswered, and it is important to understand the environmental factors that control the diversity and distribution of plankton such as ciliates to predict how these organisms may respond to a changing enviroment in the coming decades. This project focuses on: 1) how ciliate species are delineated using single-cell genomics and transcriptomics; 2) DNA-based studies of all ciliates and other planktonic members of the SAR clade (Stramenopila, Alveolata, Rhizaria), which will provide ecological context; 3) in situ gene expression by single-cell and meta- transcriptomics; and 4) laboratory studies of gene expression in cultivated ciliate species. This project involves training of postdoctoral scholars, graduate students, and undergraduates. The researchers are committed to creating diverse and inclusive research labs; recruitment of participants will be done through partnership with appropriate groups on our campuses. The project integrates with summer Research Experiences for Undergraduates (REU) activities at both Smith College and UCONN (including the UCONN/Mystic Aquarium joint REU), which are especially focused on underrepresented students. This project also enhances efforts to broaden understanding of biodiversity in partnership with the UCONN Noyce Scholars Program, which facilitates career-changing STEM professionals to become teachers in underserved secondary schools.

This project will assess distributions of reproductively-isolated species, determined using a new method to characterize regions of the ciliate germline genome. Furthermore, it will use phylogenomic methods to

identify clade-specific transcripts (e.g. those of spirotrich ciliates) within metatranscriptomes from the shelf environment and to expand knowledge of ciliate function with single-cell transcriptomics of field-collected cells. These approaches will be a substantial improvement over the culture-based methods that are potentially biased towards "weedy" species in the ocean. The combination of definitive species identification with assessment of function via single-cell and meta- transcriptomics promises to provide significant advances in marine plankton ecology. The research focuses on two broad questions: 1) does the observed high diversity in phylogenetically-informative genes reflect reproductive isolation and functional differentiation in planktonic ciliates? and 2) do different co-occurring species of planktonic ciliates show substantial functional differences that correspond to different niches in the ocean? The project assesses species boundaries (i.e. reproductive isolation) through analyses of patterns in the germline micronuclei of planktonic ciliate morphospecies; characterizes transitions of closely-related ciliates across ecological gradients in the ocean; and examines functional differences within and between species, and in communities, through analyses of transcriptomics.

This award reflects NSF's statutory mission and has been deemed worthy of support through evaluation using the Foundation's intellectual merit and broader impacts review criteria.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1924570
NSF Division of Ocean Sciences (NSF OCE)	OCE-1924527

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