In situ temperature measurements from eelgrass meadow field sites along the west coast of North America recorded from July 2019 to July 2021

Website: https://www.bco-dmo.org/dataset/877355
Data Type: Other Field Results
Version: 1
Version Date: 2022-10-14

Project
» Collaborative Research: The role of a keystone pathogen in the geographic and local-scale ecology of eelgrass decline in the eastern Pacific (Eelgrass disease)

Contributors	Affiliation	Role
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Gomes, Carla P.	Cornell University (Cornell)	Co-Principal Investigator
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Stachowicz, John J.	University of California-Davis (UC Davis)	Co-Principal Investigator
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Abstract
As part of field surveys to measure effects of eelgrass wasting disease, HOBO temperature loggers were deployed from July 2019 to July 2021 at field sites along the west coast of North America to provide a continuous record of in situ temperatures.

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Coverage

Spatial Extent: **N**:55.739078 **E**:-117.10621 **S**:32.62535 **W**:-133.342896
Temporal Extent: 2019-06-04 - 2021-11-07

Methods & Sampling

In-situ temperature measurements
As part of field surveys to measure effects of eelgrass wasting disease, HOBO temperature loggers were deployed to provide a continuous record of in situ temperatures.

Temperature loggers (HOBO MX 2201 and UA-001-64, Onset, Bourne, MA) were deployed at each eelgrass

meadow site. Loggers were secured to metal stakes in the sediment, resting approximately 2 cm above the sediment surface. To provide a continuous record of in situ temperature, loggers were swapped out during surveys as needed.

Field surveys
Field surveys of eelgrass meadow sites were conducted at mid-summer low tides at field sites along the west coast of North America in the U.S. and Canada. Samples and data were collected within the intertidal area of 32 eelgrass meadows distributed in six regions (Alaska, British Columbia, Washington, Oregon, California -Bodega Bay, and California -San Diego). Surveys were conducted between late June and early August in 2019, 2020, and 2021 by teams from six institutions.

For each site, three 20 meter transects were laid parallel to the shore at the shoreward/upper edge of continuous eelgrass, and three lower/ intertidal 20 meter transects were laid at least 4 meters closer to the water. To assess disease impacts, eelgrass blades and shoots were collected for analysis at each meter along the transect. Shoot density and canopy cover were measured at the same 4 meter intervals. See Related datasets section for 'Shoot Metrics', 'Shoot Density', and 'Eelgrass Disease Metrics'.

Salinity was measured at the time of sampling using a refractometer. Transect locations were recorded using a hand-held GPS (exact model varied between field locations).

Data Processing Description

BCO-DMO Processing:
- Imported data from source file "NSFWD_HOBO_all.csv" into the BCO-DMO data system.
- Joined this temperature data with the file "eelgrass_study_revised_site_metadata.csv" which had coordinates converted to decimal degrees and consistent LocationNames.
- Added conventional header with dataset name, PI name, version date.
- Modified parameter (column) names to conform with BCO-DMO naming conventions.

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Data Files

File
temp_logger_data.csv (Comma Separated Values (.csv), 472.75 MB) MD5:978b332b0d2b06a48a869b67de30d8a1 Primary data file for dataset ID 877355

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Related Publications

Aoki, L. R., Rappazzo, B., Beatty, D. S., Domke, L. K., Eckert, G. L., Eisenlord, M. E., Graham, O. J., Harper, L., Hawthorne, T. L., Hessing-Lewis, M., Hovel, K. A., Monteith, Z. L., Mueller, R. S., Olson, A. M., Prentice, C., Stachowicz, J. J., Tomas, F., Yang, B., Duffy, J. E., … Harvell, C. D. (2022). Disease surveillance by artificial intelligence links eelgrass wasting disease to ocean warming across latitudes. Limnology and Oceanography, 67(7), 1577–1589. Portico. https://doi.org/10.1002/lno.12152
Related Research

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Related Datasets

IsSupplementTo

Harvell, D., Gomes, C. P., Hawthorne, T., Stachowicz, J. J., Duffy, J. E., Aoki, L. (2022) **Eelgrass disease**

metrics from ecological field surveys along the eastern Pacific coast in June through August of 2019, 2020, and 2021. Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-10-13 doi:10.26008/1912/bco-dmo.879780.1 [view at BCO-DMO]

Harvell, D., Gomes, C. P., Hawthorne, T., Stachowicz, J. J., Duffy, J. E., Aoki, L. (2022) **Eelgrass shoot density measurements taken during ecological field surveys along the eastern Pacific coast in June through August of 2019, 2020, and 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-10-13 doi:10.26008/1912/bco-dmo.879764.1 [view at BCO-DMO]

Harvell, D., Gomes, C. P., Hawthorne, T., Stachowicz, J. J., Duffy, J. E., Aoki, L. (2022) **Eelgrass shoot metrics from ecological field surveys in six regions along the eastern Pacific coast in June through August of 2019, 2020, and 2021.** Biological and Chemical Oceanography Data Management Office (BCO-DMO). (Version 1) Version Date 2022-10-13 doi:10.26008/1912/bco-dmo.878857.1 [view at BCO-DMO]

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Parameters

Parameter	Description	Units
DateTime_Obs	Datetime record of the in-situ temperature logger time of observation	units
ID	Location ID to identify temperature logger locations. ID is a compilation of region, site code, tidal height, and transect number.	units
Region	Two-letter identifier for the geographic region where the sample was collected (AK=Alaska, BC=British Columbia, WA=Washington, OR=Oregon, BB=Bodega Bay in California, SD=San Diego in California)	units
Location_Name	Full name of each sampling site (eelgrass meadow) where samples were taken	units
Site_Code	One-letter identifier for the site within a geographic region where the sample was collected (A, B, C, D, E, F)	units
Transect	Integer indicating the transect at which samples were collected. Upper transects = 1, 2, 3; Lower transects = 4, 5, 6.	units
Tidal_Height	Single letter indicating the tidal height at which samples were collected. U = upper tidal height; L = lower tidal height	units
Temp	Temperature recorded from HOBO logger	units
Serial_Number	Serial number identifying a specific temperature logger deployed in the eelgrass meadow	units
TransectBeginDecimalLatitude	Latitudinal coordinate for the beginning of the transect (meter 0)	units
TransectBeginDecimalLongitude	Longitudinal coordinate for the beginning of the transect (meter 0)	units
TransectEndDecimalLatitude	Latitudinal coordinate for the end of the transect (meter 20)	units
TransectEndDecimalLongitude	Longitudinal coordinate for the end of the transect (meter 20)	units
Year	Year in which temperatures were measured	units

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Instruments

Dataset-specific Instrument Name	HOBO MX2201 temperature logger
Generic Instrument Name	Onset HOBO Pendant MX2201 temperature logger
Generic Instrument Description	The Onset HOBO MX2201 is an in-situ instrument for wet or underwater applications. It supports soil temperature, temperature, and water temperature. A one-channel logger that records up to approximately 96,000 measurements or internal logger events with 8K bytes memory. It has a polypropylene housing case. Uses Bluetooth to transmit data. Can be used with a solar radiation shield. Measurement range: -20 deg C to 70 deg C. Accuracy: +/- 0.50 deg C from 0 deg C to 50 deg C. Water depth rating: 30.5 m

Dataset-specific Instrument Name	HOBO UA-001-064 temperature logger
Generic Instrument Name	Onset HOBO Pendant Temperature/Light Data Logger
Generic Instrument Description	The Onset HOBO (model numbers UA-002-64 or UA-001-64) is an in-situ instrument for wet or underwater applications. It supports light intensity, soil temperature, temperature, and water temperature. A two-channel logger with 10-bit resolution can record up to approximately 28,000 combined temperature and light measurements with 64K bytes memory. It has a polypropylene housing case. Uses an optical USB to transmit data. A solar radiation shield is used for measurement in sunlight. Temperature measurement range: -20 deg C to 70 deg C (temperature). Light measurement range: 0 to 320,000 lux. Temperature accuracy: +/- 0.53 deg C from 0 deg C to 50 deg C. Light accuracy: Designed for measurement of relative light levels. Water depth rating: 30 m.

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Project Information

Collaborative Research: The role of a keystone pathogen in the geographic and local-scale ecology of eelgrass decline in the eastern Pacific (Eelgrass disease)

Coverage: West coast of North America, from San Diego to Alaska

This project is part of the Marine Global Earth Observatory (MarineGEO), directed by the Smithsonian's Tennenbaum Marine Observatories Network (TMON); a global network of partners focused on understanding how coastal marine ecosystems work—and how to keep them working https://marinegeo.si.edu/

NSF Abstract:

Pathogens may be unrecognized key species in many ecosystems, causing massive impacts on other species and habitats despite the microscopic size of disease-causing organisms. Yet the triggers to disease epidemics likely involve complex interactions among changing environmental conditions and associated biological communities. In the ocean, understanding disease outbreaks has been hindered by inadequate knowledge of how these various influences interact to determine susceptibility and resilience to disease. This project integrates research in community and disease ecology with microbial genomics, geospatial analysis, and state-of-the-art computational approaches toward an unprecedented understanding of the causes and consequences of wasting disease in eelgrass, an important vegetation type supporting coastal and estuarine ecosystems throughout the northern hemisphere. The research advances frontiers in understanding the growing but poorly appreciated threat of marine diseases, how disease ecology interacts with environmental change, and its consequences for the extensive ecosystems and coastal communities that depend on

eelgrass, across 23 degrees of latitude along the Pacific coast of North America. The research will inform better management of threatened seagrass ecosystems, which provide important services including fisheries habitat, erosion control, carbon storage, and capture of nutrient runoff. The research will foster integrative approaches in the next generation, including high school students, undergraduates, graduate students, and postdocs working on the project, and each investigator's institution will work to recruit participants from under-represented groups. Best practices developed under this award, including the Eelisa disease app and drone mapping, will be disseminated for broader surveillance of seagrass disease and coastal habitat quality by both professional and citizen scientists in coordination with the Global Ocean Observing System's (GOOS) develpoment of seagrass extent as an Essential Ocean Variable.

The triggers to marine disease epidemics are likely complex, and progress in understanding them has been hindered by a poor understanding of the multifaceted ecological context of the host-disease interaction. This project's overarching goal is to disentangle the web of direct and indirect interactions by which changing climate mediates prevalence of eelgrass wasting disease, and its consequences for threatened but important eelgrass ecosystems. The centerpiece is a comparative, cross-scale survey of eelgrass community composition, microbiome, and disease prevalence along thermal gradients of latitude and exposure to the ocean, providing the first coast-wide picture of disease dynamics in response to environmental change. In situ sampling will be linked to dynamics of eelgrass at landscape scales using unmanned aerial systems (drones) to quantify high-resolution changes in eelgrass extent and habitat quality. Experiments will test how the diverse biological community mediates impacts of the pathogen on eelgrass ecosystems.

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-1829890
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829922
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829921
NSF Division of Ocean Sciences (NSF OCE)	OCE-1829992

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