

# Environmental observations and infected host and dinospore counts in Salt Pond, Falmouth, Massachusetts, USA from 2018 through 2019

**Website:** <https://www.bco-dmo.org/dataset/805612>

**Data Type:** Other Field Results

**Version:** 1

**Version Date:** 2020-03-10

## Project

» [Trojan Horses in the Marine Realm: Protist Parasite-host Dynamics in Coastal Waters](#) (Coastal Parasites)

Contributors	Affiliation	Role
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## Abstract

Salt Pond is a shallow, seasonally stratified coastal salt pond located in Falmouth, Massachusetts, USA and it is proximal to the labs at Woods Hole Oceanographic Institution (WHOI). This estuarine system is tidally influenced by Vineyard Sound and receives inputs of freshwater primarily from groundwater. Seasonal abiotic factors and nutrient availability in the seasonally stratified water column influence the growth and abundance of diverse microbial taxa within this system, providing an ideal setting to study syndinian parasites and host diversity temporally and across oxygen gradients. Salt Pond has anoxic waters that come within 2-3 meters of the water surface in summer and bottom waters that become increasingly sulfidic due to bacterial sulfate reduction as seasonal stratification intensifies.

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## Coverage

**Spatial Extent:** Lat:41.54482 Lon:-70.62723

**Temporal Extent:** 2018-03-19 - 2019-08-09

## Dataset Description

Salt Pond is a shallow, seasonally stratified coastal salt pond located in Falmouth, MA and it is proximal to the labs at Woods Hole Oceanographic Institution (WHOI). This estuarine system is tidally influenced by Vineyard Sound and receives inputs of freshwater primarily from groundwater. Seasonal abiotic factors and nutrient availability in the seasonally stratified water column influence the growth and abundance of diverse microbial taxa within this system, providing an ideal setting to study syndinian parasites and host diversity temporally

and across oxygen gradients. Salt Pond has anoxic waters that come within 2-3 meters of the water surface in summer and bottom waters that become increasingly sulfidic due to bacterial sulfate reduction as seasonal stratification intensifies.

## Methods & Sampling

For the field sampling protocol, please see the attached Supplemental File [FieldSamplingProtocol\\_2018\\_BCO-DMO.docx](#).

For information concerning the in-situ hybridization, please see the Supplemental Files [CARD-FISH Protocol.pdf](#) and [Reagents for CARD-FISH .pdf](#).

## Data Processing Description

### BCO-DMO Processing Notes:

- added conventional header with dataset name, PI name, version date
- modified parameter names to conform with BCO-DMO naming conventions
- added lat and lon fields
- reformatted date to yyyy-mm-dd
- joined environmental, infection, and spore count datasets on the sample date, cast number, and depth fields.

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## Data Files

File
<b>combined.csv</b> (Comma Separated Values (.csv), 49.83 KB) MD5:47da7c0ecc5d4eec8f7f34a03f816d3d Primary data file for dataset ID 805612

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## Supplemental Files

File
<b>CARD-FISH Protocol for dataset 805612</b> filename: CARD-FISH_Protocol.pdf (Portable Document Format (.pdf), 171.08 KB) MD5:59c1e7dbbe753debbd1a62f2eb161b43 Contains information relevant to accomplishing in situ hybridization.
<b>Field Sampling Protocol for dataset 805612</b> filename: FieldSamplingProtocol_2018_BCO-DMO.docx (Octet Stream, 14.22 KB) MD5:842829fb66c6c6440437d4c193843591 Document describing sampling and types of samples collected.
<b>Reagents for CARD-FISH for dataset 805612</b> filename: Reagents_for_CARD-FISH.pdf (Portable Document Format (.pdf), 139.05 KB) MD5:0f8561bc90fb4c7214b3a0123327cd84 Contains information relevant to accomplishing in situ hybridization.

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## Parameters

Parameter	Description	Units
Sample_ID	Sample_ID C = cast (replicates 1 and 2) D = depth (1=2m; 2=3m; 3=4m)	unitless
Sampling_Date	date of sampling	unitless
Depth	depth of sample	meters (m)
Month	Month of sample as text	unitless
Temperature	Water temperature	degrees Celsius
Salinity	Water salinity	parts per thousand (ppt)
Dissolved_Oxygen	Dissolved Oxygen	milligrams per liter (mg/L)
NH4	NH4	micromolar
NO2_NO3	NO2_NO3	micromolar
Moon_Phase_Illumination	Moon phase	percent illumination
Day_Length	length of day as hours:minutes converted to a decimal	decimal hours
Avg_wind	Average wind speed measured at the Coast Guard Station at Woods Hole	miles per hour (mph)
Max_Gust	Maximum wind gust speed measured at the Coast Guard Station at Woods Hole	miles per hour (mph)
Wind_Direction	Direction of wind as compass direction converted to degrees	degrees
Tide	tide level at sampling (low=1;slack=2;high=3)	unitless
Tide_text	Textual representation of tide level	unitless
Vol_Filtered_mL	amount of water filteres	milliliter (mL)
Infection_Count	number of cells exhibiting infection by CARD-FISH	count
No_of_grids_counted	number of grids counted	count
No_of_cells	total number of cells counted	count
Total_euk_count	# of cells divided by # of grids counted then multiplied by microscope correction factor 7693	unknown
Percent_infected	Infection_Count divided by Total_euk_count	unitless (percent)
Cast	replicates (1 or 2)	unitless
No_Spores	dinospores counted by CARD-FISH	count
Vol_Filtered	amount of water filtered	milliliter (mL)
spores_per_L	spore count multiplied by 8; multiplied by 50	count per liter (count/L)
lat	latitude of sampling location with positive values indicating North	decimal degrees
lon	longitude of sampling location with negative values indicating West	decimal degrees

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## Instruments

<b>Dataset-specific Instrument Name</b>	Go-Flo bottle
<b>Generic Instrument Name</b>	GO-FLO Bottle
<b>Dataset-specific Description</b>	~2L Go-Flo bottle for sampling water
<b>Generic Instrument Description</b>	GO-FLO bottle cast used to collect water samples for pigment, nutrient, plankton, etc. The GO-FLO sampling bottle is specially designed to avoid sample contamination at the surface, internal spring contamination, loss of sample on deck (internal seals), and exchange of water from different depths.

<b>Dataset-specific Instrument Name</b>	YSI datasonde
<b>Generic Instrument Name</b>	YSI Sonde 6-Series
<b>Dataset-specific Description</b>	YSI datasonde to record temperature, salinity and oxygen
<b>Generic Instrument Description</b>	YSI 6-Series water quality sondes and sensors are instruments for environmental monitoring and long-term deployments. YSI datasondes accept multiple water quality sensors (i.e., they are multiparameter sondes). Sondes can measure temperature, conductivity, dissolved oxygen, depth, turbidity, and other water quality parameters. The 6-Series includes several models. More from YSI.

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## Project Information

### Trojan Horses in the Marine Realm: Protist Parasite-host Dynamics in Coastal Waters (Coastal Parasites)

**Coverage:** Salt Pond, Falmouth, MA

#### *NSF Award Abstract:*

The ecological importance of parasitic dinoflagellates has been recognized for some time, particularly during epidemic outbreaks that cause mass mortality of their hosts, damage to aquaculture, and render commercially valuable Crustacea unpalatable. The dominate parasitic dinoflagellate group found in international global ocean surveys is referred to as MALV II Syndiniales. In the planktonic environment, the MALV II Syndiniales group not only exerts top-down controls on their prey populations, but based on their apparent ubiquity and abundance, they likely shape the pools of nutrients in marine water columns. Data on cultured samples reveals this hyper-diverse group can infect a wide range of protist hosts, as well as copepods, and fish larvae. Gaps in knowledge of the specificity and dynamics of the host-parasite interactions contribute to difficulties in estimating the impacts on the coastal ecosystems. In this project, researchers combine novel methods in microscopy, genomics, and chemistry to track host-parasite dynamics at a coastal site over an annual cycle followed by modeling to assess the impacts on microbial ecosystem dynamics. The researchers will engage undergraduate and high school students in field and laboratory research activities. In addition, support for a graduate student is included along with plans to disseminate the research results more broadly through publications and presentations.

Syndiniales parasitism is a widespread, albeit under-studied symbiotic interaction in the marine environment and little is known about regulation of protist populations by these parasites. In spite of their cosmopolitan distribution in the global ocean and their apparent abundance in molecular datasets of protist marker genes, little is known about the ecology of these parasites and almost no genomic data exists for them. In this project, the researchers combine high-resolution sampling, water chemistry (including nutrients) analyses, molecular marker gene analyses, fluorescence in situ hybridization, single cell genomics, and modeling to produce the first focused assessment of host-MALVII parasite dynamics and ecology at the community level in a coastal marine ecosystem. The researchers will evaluate temporal dynamics of host and parasite diversity and will examine temporal variation in levels of infection of the protist community and host-parasite specificity using high-resolution sampling in Salt Pond, Falmouth, MA, and in situ hybridization microscopy. Molecular approaches include amplicon tag high throughput sequencing, leveraging the emerging third generation sequencing technology, Oxford Nanopore's MinION to elucidate host-parasite identities. The researchers will also apply advances in single-cell genome sequencing to inform on strain-specific genome content, including the molecular mechanisms underpinning protist parasitism. Contributions to pools of particulate and dissolved organic matter will be estimated for several of the most commonly infected host taxa in Salt Pond using laboratory experiments, providing the first set of values for modeling impacts of Syndiniales parasitism on pools of organic and inorganic nutrients.

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
<a href="#">NSF Division of Ocean Sciences (NSF OCE)</a>	<a href="#">OCE-1851012</a>

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