Salinity and temperature data collected at the MBL dock in Woods Hole, MA, USA in 2012 (Mnemiopsis feeding in turbulence project)

Website: https://www.bco-dmo.org/dataset/554408
Version: 27 March 2015
Version Date: 2015-03-27

Project
» Turbulence and Suspension Feeding - a New Approach using the Lobate Ctenophore Mnemiopsis Leidyi (Mnemiopsis feeding in turbulence)

Contributors	Affiliation	Role
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Dataset Description

Salinity, temperature, and depth data collected at the MBL dock, Woods Hole, MA, USA.

Reference:
Sutherland, K.R., Costello, J.H., Colin, S.P., and Dabiri, J.O. 2014. Ambient fluid motions influence swimming and feeding by the ctenophore *Mnemiopsis leidyi*. J. Plankton Res. 36(5): 1310–1322. doi:10.1093/plankt/fbu051

Methods & Sampling

Wind data originated from a local weather station located at the Woods Hole Oceanographic Institution (within 150 m of the sampling location). The temperature and salinity were measured using a Hach Hydrolab MiniSonde 4a.

Methods and precision described in:
Sutherland, K.R., Costello, J.H., Colin, S.P., and Dabiri, J.O. 2014. Ambient fluid motions influence swimming and feeding by the ctenophore *Mnemiopsis leidyi*. J. Plankton Res. 36(5): 1310–1322. doi:10.1093/plankt/fbu051

Data Processing Description

BCO-DMO edits:
- Modified parameter names to conform with BCO-DMO naming conventions.

- Moved date, time_range, and wind_speed into columns.
- Replaced spaces with underscores in 'location' column.
- Inserted lat and lon of the pier (using values provided on the metadata form).
- Replaced blanks with 'nd' and added comments that were in box to the comment column.

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Data Files

File
hydrography_summary.csv (Comma Separated Values (.csv), 3.20 KB) MD5:249f6930cbb57d329be3c0996e548574 Primary data file for dataset ID 554408

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Parameters

Parameter	Description	Units
location	Description of sampling location.	text
lat	Latitude of sampling location.	decimal degrees
lon	Longitude of sampling location.	decimal degrees
date	Month, day, and year of sampling. (Local time zone, EST)	mmddyyyy
time_range	Time range during which wind speed and air temperature were recorded. ?	HHMM
time_start	Start of time range during which wind speed and air temperature were recorded. ?	HHMM
time_end	End of time range during which wind speed and air temperature were recorded. ?	HHMM
wind_speed_range	Range of wind speeds recorded.	meters per second (m/s)
wind_speed_min	Minumum wind speed recorded.	meters per second (m/s)
wind_speed_max	Maximum wind speed recorded.	meters per second (m/s)
air_temp	Air temperature.	degrees Celsius (C)
time_hydrography	Time of hydrography measurements.	HHMM
depth	Sampling depth.	meters (m)
salinity	Salinity.	PSU
temp	Water temperature.	degrees Celsius (C)
comment	Comments.	text

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Instruments

Dataset-specific Instrument Name	Hach Hydrolab MiniSonde 4a
Generic Instrument Name	Water Quality Multiprobe
Dataset-specific Description	The temperature and salinity were measured using a Hach Hydrolab MiniSonde 4a.
Generic Instrument Description	An instrument which measures multiple water quality parameters based on the sensor configuration.

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Deployments

MBL_Dock_0812

Website	https://www.bco-dmo.org/deployment/554399
Platform	MBL
Start Date	2012-08-14
End Date	2012-08-14
Description	Field surface turbulence measurements made at the MBL dock, Woods Hole, MA, USA, August 14, 2012.

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Project Information

Turbulence and Suspension Feeding - a New Approach using the Lobate Ctenophore Mnemiopsis Leidyi (Mnemiopsis feeding in turbulence)

Coverage: Marine Biological Laboratory dock, Woods Hole, MA

Description from NSF award abstract:
Prey selection, intake and, ultimately, the trophic impact of predators are determined by a succession of events that occur at the organismal level -- individual interactions among predators prey, and their environments. Furthermore, because the majority of predator-prey interactions occur in moving fluids, it is critical to observe and quantify predator-prey interactions within a hydrodynamic context. Successful predictions of trophic patterns in natural settings are limited by the ability to: 1) observe directly the effects of turbulence on feeding in pelagic organisms; 2) understand the mechanistic bases of animal-fluid interactions in turbulent environments; and 3) relate quantitative observations from still-water laboratory studies to nature. These limitations are pervasive in studies of trophic exchange within the larger scope of marine ecology.

Recent technological advances, and the combined expertise of the Co-PIs, enables meaningful studies of the influence of turbulence on feeding by the notoriously invasive lobate ctenophore, *Mnemiopsis leidyi*. *Mnemiopsis* is a delicate gelatinous predator which uses a laminar feeding current to entrain and capture prey. Using a remarkably effective feeding strategy, zooplankton standing stocks and overall zooplankton biodiversity are reduced, and standing stocks of phytoplankton are increased via a trophic cascade. Like many suspension feeders, however, the feeding current produced by *Mnemiopsis* may be vulnerable to hydrodynamic disruption by ambient flows. In fact, turbulent events may change the behavior, distribution and prey selection of lobate ctenophores such as *Mnemiopsis*. This species is an ideal model organism to determine the mechanisms by which turbulence affects trophic exchange patterns of ecologically influential planktonic suspension feeders.

Involving a combination of laboratory and in situ methods to quantify, at the organismal level, this study will determine effects of turbulent flows on the feeding mechanics and predator-prey interactions of *Mnemiopsis*. Understanding how these turbulent effects translate to the community level will be accomplished via in situ sampling techniques that relate natural turbulence levels to ingestion rates, prey selection and predatory

impact of *Mnemiopsis* in the field. This approach extends beyond current laboratory and modeling studies, with the potential of establishing clear cause-and-effect relationships.

This research will: 1) directly quantify turbulent effects on in situ predator-prey interactions; 2) provide mechanistic understanding of key variables influencing the ecological impact of an important invasive marine species; and 3) develop a novel approach for studying small-scale physical-biological interactions both in the laboratory and in the field.

Knowing how turbulence affects feeding in lobate ctenophores is valuable at the scale of the organism, as well as ecologically. The approach developed here also may be applied to a variety of other turbulence-dominated situations (e.g., mixing at fronts, animal-marine snow interactions) or to other organisms (other plankton, benthic-water column exchanges). In all cases, the outcomes depend upon small-scale physical-biological processes.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061353
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061182
NSF Division of Ocean Sciences (NSF OCE)	OCE-1061268

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