CTD profiles from 2012 to 2019 in the Gulf of Maine

Website: https://www.bco-dmo.org/dataset/843463
Data Type: Cruise Results
Version: 1
Version Date: 2021-03-05

Project
» WHCOHH - Physiological and behavioral plasticity in harmful algal bloom dynamics: variation across different habitats (WHCOHH Algal Bloom Dynamics)

Program
» Woods Hole Center for Oceans and Human Health (WHCOHH)

Contributors	Affiliation	Role
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Abstract
CTD profiles from 2012 to 2019 in the Gulf of Maine.

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Coverage

Spatial Extent: **N**:44.983 **E**:-66.113 **S**:41.528 **W**:-70.793
Temporal Extent: 2012-05-23 - 2019-08-12

Methods & Sampling

Sea-Bird SBE 9 CTD data measurements using Sea-Bird Software SBE Seasave at standard CTD stations: profiles (down casts) with water sampling (up casts).

Data Processing Description

Sea-Bird Software SBE Data Processing. All CTD profiles have been binned using 1db pressure bin.

Station numbers ending with .2 are station named with with "a" at the end (usually this is second cast at the same location when primary cast failed for some reason).

BCO-DMO Processing notes:

- Adjusted station numbers (everything ending with .0 to integer) to join with location file
- Concatenated all ctd files, added file names as Cruise IDs
- Adjusted headers to comply with database requirements
- Rounded fields to 3 and 4 decimales
- Converted dates to ISO format

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Data Files

File
ctd_profilesd_all.csv (Comma Separated Values (.csv), 7.58 MB) MD5:f9daf175bb6c05a95a870a5f32981e04 Primary data file for dataset ID 843463
WHCOHH_CTD_Profiles filename: CTD_profiles.zip (ZIP Archive (ZIP), 3.94 MB) MD5:c0f0fbde8810eef1fe3ceb47c0778538

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Parameters

Parameter	Description	Units
Cruise_ID	cruise identifier	unitless
Station_Number	Station number	unitless
Latitude	Latitude	degN
Longitude	Longitude	degW
ISO_DateTime_UTC	Sampling ISO DateTime UTC time zone	unitless
TimeElapsed	Elapsed time	sec
PrDM	Pressure	db
T090C	Temperature	degC
C0	Conductivity	S/m
WetStar	Fluorescence 1	mg/m^3
Sbeox0V	Raw oxygen	V
Sal00	Salinity	unitless
SigmaA	Sigma-theta density	kg/m^3
Sbeox0	Dissolved oxygen concentration	ml/L
pH	pH	unitless
flECO_AFL	Fluorescence 2	mg/m^3
Trans	Beam transmission	percentage (%)
AltM	Altimetry	m
PAR	PAR/Irradiance	microEinsteins/m^2/second
seaTurbMtr	Turbidity	NTU
sPAR	SPAR/Surface Irradiance	microEinsteins/m^2/second
WetStarV	Fluorescence 1 voltage	V

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Instruments

Dataset-specific Instrument Name	SeaBird 911+ Rosette 24-position, 10-liter bottle Rosette with dual T/C sensors
Generic Instrument Name	CTD Sea-Bird SBE 911plus
Dataset-specific Description	SeaBird 911+ Rosette 24-position, 10-liter bottle Rosette with dual T/C sensors At each station, CTD casts measured temperature, salinity and PAR. Water samples collected at depths of 300, 250, 200, 150, 120, 100, 80, 60, 40, 30, 20, 10 m, and the surface were filtered and preserved for nutrient analysis.
Generic Instrument Description	The Sea-Bird SBE 911 plus is a type of CTD instrument package for continuous measurement of conductivity, temperature and pressure. The SBE 911 plus includes the SBE 9plus Underwater Unit and the SBE 11plus Deck Unit (for real-time readout using conductive wire) for deployment from a vessel. The combination of the SBE 9 plus and SBE 11 plus is called a SBE 911 plus. The SBE 9 plus uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 plus and SBE 4). The SBE 9 plus CTD can be configured with up to eight auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorescence, light (PAR), light transmission, etc.). more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Digiquartz
Generic Instrument Name	Pressure Sensor
Generic Instrument Description	A pressure sensor is a device used to measure absolute, differential, or gauge pressures. It is used only when detailed instrument documentation is not available.

Dataset-specific Instrument Name	SBE 43 Dissolved Oxygen Sensor
Generic Instrument Name	Sea-Bird SBE 43 Dissolved Oxygen Sensor
Generic Instrument Description	The Sea-Bird SBE 43 dissolved oxygen sensor is a redesign of the Clark polarographic membrane type of dissolved oxygen sensors. more information from Sea-Bird Electronics

Dataset-specific Instrument Name	Seapoint Turbidity
Generic Instrument Name	Seapoint Turbidity Meter
Generic Instrument Description	The Seapoint Turbidity Meter detects light scattered by particles suspended in water, generating an output voltage proportional to turbidity or suspended solids.

Dataset-specific Instrument Name	WET Labs WETstar Fluorometer
Generic Instrument Name	WETStar CDOM Fluorometer
Dataset-specific Description	These low cost, low power optical sensors provide comparable performance to other fluorometers at a fraction of their cost, power requirements, and size. The WETStar uses a novel optical flow design that allows for both pump-through and flow-through applications. It is easily mated with CTD packages. Provides calibrated, high-resolution (60 Hz signal and 1 Hz average) chlorophyll-a measurement of mechanically stimulated bioluminescence to assess water column ecosystem dynamics. The potted optics block results in long term stability of the instrument and the optional anti-biofouling technology delivers truly long term field measurements. more information from Wet Labs
Generic Instrument Description	The WETStar CDOM fluorometer measuring fluorescence as a proxy for dissolved matter absorption.

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Deployments

CT2015-01

Website	https://www.bco-dmo.org/deployment/846019
Platform	R/V Connecticut
Start Date	2015-05-07
End Date	2015-05-07

CT2015-04

Website	https://www.bco-dmo.org/deployment/846022
Platform	R/V Connecticut
Start Date	2015-08-06
End Date	2015-08-07

CT2016-01

Website	https://www.bco-dmo.org/deployment/846024
Platform	R/V Connecticut
Start Date	2016-05-03
End Date	2016-05-05

CT2016-02

Website	https://www.bco-dmo.org/deployment/846026
Platform	R/V Connecticut
Start Date	2016-07-19
End Date	2016-07-20

CT2018-01

Website	https://www.bco-dmo.org/deployment/846028
Platform	R/V Connecticut
Start Date	2018-04-30
End Date	2018-05-02

CT2018-02

Website	https://www.bco-dmo.org/deployment/846030
Platform	R/V Connecticut
Start Date	2018-07-18
End Date	2018-07-19

CT2019-01

Website	https://www.bco-dmo.org/deployment/846032
Platform	R/V Connecticut
Start Date	2019-06-12
End Date	2019-06-17

CT2019-02

Website	https://www.bco-dmo.org/deployment/846034
Platform	R/V Connecticut
Start Date	2019-07-09
End Date	2019-07-11

CT2019-03

Website	https://www.bco-dmo.org/deployment/846035
Platform	R/V Connecticut
Start Date	2019-08-13
End Date	2019-08-13

GC2016-01

Website	https://www.bco-dmo.org/deployment/846037
Platform	R/V Gulf Challenger
Start Date	2016-10-05
End Date	2016-10-07

TI603

Website	https://www.bco-dmo.org/deployment/845975
Platform	R/V Tioga
Start Date	2012-05-23
End Date	2012-05-25

TI606

Website	https://www.bco-dmo.org/deployment/845977
Platform	R/V Tioga
Start Date	2012-06-11
End Date	2012-06-11

TI623

Website	https://www.bco-dmo.org/deployment/845979
Platform	R/V Tioga
Start Date	2012-08-04
End Date	2012-08-05

TI661

Website	https://www.bco-dmo.org/deployment/845981
Platform	R/V Tioga
Start Date	2013-04-28
End Date	2013-04-28

TI667

Website	https://www.bco-dmo.org/deployment/845983
Platform	R/V Tioga
Start Date	2013-05-14
End Date	2013-05-16

TI670

Website	https://www.bco-dmo.org/deployment/845985
Platform	R/V Tioga
Start Date	2013-05-30
End Date	2013-05-31

TI672

Website	https://www.bco-dmo.org/deployment/845987
Platform	R/V Tioga
Start Date	2013-06-12
End Date	2013-06-13

TI677

Website	https://www.bco-dmo.org/deployment/845989
Platform	R/V Tioga
Start Date	2013-07-08
End Date	2013-07-09

TI691

Website	https://www.bco-dmo.org/deployment/845991
Platform	R/V Tioga
Start Date	2013-08-03
End Date	2013-08-07

TI747

Website	https://www.bco-dmo.org/deployment/845993
Platform	R/V Tioga
Start Date	2014-05-02
End Date	2014-05-03

TI751

Website	https://www.bco-dmo.org/deployment/845995
Platform	R/V Tioga
Start Date	2014-05-20
End Date	2014-05-22

TI752

Website	https://www.bco-dmo.org/deployment/845997
Platform	R/V Tioga
Start Date	2014-06-06
End Date	2014-06-06

TI758

Website	https://www.bco-dmo.org/deployment/845999
Platform	R/V Tioga
Start Date	2014-06-15
End Date	2014-06-17

TI762

Website	https://www.bco-dmo.org/deployment/846001
Platform	R/V Tioga
Start Date	2014-07-10
End Date	2014-07-12

TI770

Website	https://www.bco-dmo.org/deployment/846003
Platform	R/V Tioga
Start Date	2014-07-25
End Date	2014-07-27

TI813

Website	https://www.bco-dmo.org/deployment/846006
Platform	R/V Tioga
Start Date	2015-06-17
End Date	2015-06-18

TI817

Website	https://www.bco-dmo.org/deployment/846008
Platform	R/V Tioga
Start Date	2015-07-07
End Date	2015-07-08

TI831

Website	https://www.bco-dmo.org/deployment/846011
Platform	R/V Tioga
Start Date	2015-08-02
End Date	2015-08-05

TI906

Website	https://www.bco-dmo.org/deployment/846013
Platform	R/V Tioga
Start Date	2016-10-20
End Date	2016-10-20

TI972

Website	https://www.bco-dmo.org/deployment/846015
Platform	R/V Tioga
Start Date	2017-07-17
End Date	2017-07-22

TI978

Website	https://www.bco-dmo.org/deployment/846017
Platform	R/V Tioga
Start Date	2017-08-09
End Date	2017-08-11

WJ2017-01

Website	https://www.bco-dmo.org/deployment/846043
Platform	R/V Warren Jr.
Start Date	2017-06-29
End Date	2017-07-01

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Project Information

WHCOHH - Physiological and behavioral plasticity in harmful algal bloom dynamics: variation across different habitats (WHCOHH Algal Bloom Dynamics)

The goal of this project is to identify commonalities and differences in regional bloom dynamics for two key harmful algal bloom (HAB) taxa, *Alexandrium fundyense* and *Pseudo-nitzschia* spp. *The project's* ***central hypothesis*** *is that HAB global biogeography and variable bloom and toxin dynamics are determined by a common repertoire of physiological and behavioral responses to environmental forcings and that the ability to understand, forecast, and mitigate HAB events requires a deep understanding of the plasticity of these repertoires within species and between populations.* Novel, targeted, efficient, and data-rich *in situ* sampling paradigms developed with previous WHCOHH funding have revealed numerous unforeseen aspects of *A. fundyense* dynamics in the Nauset Marsh (NM), a long-studied inshore "model" bloom habitat. It is now clear that accurate rate estimates and behavioral patterns are needed for modeling and forecasting, and that these need to be generated as much as possible through *in situ* observation, a recognized strength of the WHCOHH. In this project, the approach includes deployments of a portable, solar-powered observatory platform supporting remotely controlled instruments and profiling capabilities, the centerpiece being the IFCB, a unique autonomous underwater microscope for the *in situ* detection of rates of growth, accumulation, mortality, and life cycle stage conversions. Variability in environmental forcing across years and among habitats provides a proxy for future climate scenarios, revealing the responses of these key HAB organisms under natural conditions. These novel observational and analytical approaches will be used to characterize the

behaviors and responses of *A. fundyense* across a range of other habitats and environmental regimes. They will also be directed towards *Pseudo-nitzschia* spp., a group that presents a growing public health threat to the northeast U.S. Improved understanding of critical physiological and behavioral features of both taxa are essential for accurate predictions of their climate responses and assessment of short- and long-term human health impacts.

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Program Information

Woods Hole Center for Oceans and Human Health (WHCOHH)

Website: https://www2.whoi.edu/site/whcohh/

Coverage: Western N. Atlantic, Arctic

NSF Award Abstract

The mission of the Woods Hole Center for Oceans and Human Health is to protect the public health through enhanced understanding of how oceanic and environmental processes including climatic variation affect the population dynamics of toxin producing organisms, and the risks from exposure to their potent neurotoxins. Factors affecting the distribution, survival, proliferation, and toxicity of harmful algal bloom (HAB) species still are poorly known, despite their enormous consequences for human health. Three research projects and two cores comprise the Center. The Center structure will facilitate the integration among projects, and the integration of research with education and community engagement activities. The Center will engage stakeholders, facilitate education on HAB science at many academic levels, and strengthen public knowledge about HAB blooms and their impacts. The Center is jointly supported by NSF and by the National Institute for Environmental Health Sciences (NIEHS).

The research activities of the Center will focus on two key HAB taxa: Alexandrium fundyense that produces the saxitoxins responsible for paralytic shellfish poisoning (PSP), and Pseudo-nitzschia spp. that produce domoic acid responsible for the amnesic shellfish poisoning (ASP) syndrome. Novel, targeted, efficient, and data-rich sampling approaches developed by the applicants and applied in situ have revealed that critical aspects of A. fundyense dynamics in natural settings differ dramatically from those inferred from laboratory studies, indicating plasticity in response to climate. The research proposed will build on these new and fundamental insights into what regulates blooms, and on the Center's established strengths in ocean observation technologies and modeling, to predict how environmental variables may influence population dynamics of known and emerging HAB threats. Hindcast simulations compared with climate data records in the Gulf of Maine will assess model performance and uncertainty. Forecasts run for a range of potential climate scenarios can help quantify future public health risks. Similarly, specific cells have been identified in the developing brain that are targets of HAB toxins, findings giving insights into developmental toxicological mechanisms. These will guide studies to address the scope of toxin effect in the developing central nervous system, potentially linking developmental exposures to adult consequences. Studies of new mechanisms of toxin action will include determination of the effects of combined or repeated exposure to sub-lethal levels of saxitoxin and domoic acid, and possible silent neurotoxicity, at different life stages in the zebrafish model.

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.

The data management plan for the program can be found here.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1314642
NSF Division of Ocean Sciences (NSF OCE)	OCE-1840381
National Institutes of Health (NIH)	NIH-P01ES021923
National Institutes of Health (NIH)	NIH-P01ES028938

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