Bottle sampling from 2012 to 2019 in the Gulf of Maine

Website: https://www.bco-dmo.org/dataset/843467
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
Bottle sampling from 2012 to 2019 in the Gulf of Maine.

Table of Contents

- Coverage
- Dataset Description
  - Methods & Sampling
  - Data Processing Description
- Data Files
- Parameters
- Instruments
- Deployments
- Project Information
- Program Information
- Funding

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

BCO-DMO Processing notes:

- Adjusted station numbers (everything ending with .0 to integer) to join with location file

- Concatenated all bottle 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

[table of contents | back to top]

Data Files

File	
bottle_data_all.csv	(Comma Separated Values (.csv), 905.89 KB) MD5:32cbb1e1606d89b06a20d3dbc0a9319a
Primary data file for dataset ID 843467	
WHCOHH_Bottle_Data filename: CTD_BTL_data.zip	(ZIP Archive (ZIP), 241.70 KB) MD5:fed265e022c6fa21c290e6dd79614df2
Bottle data from 2012 to 2019 related to the Woods Hole Center for Ocean and Human Health project	

[table of contents | back to top]

Parameters

Parameter	Description	Units
Cruise_ID	Ship ID, year and cruise number	unitless
CTD_Cast_Number	description	unitless
Latitude	latitude	degN
Longitude	longitude	degW
Bottle	niskin number	unitless
Sal00	salinity	unitless
Sigma_00	sigma-theta density	kg/m^3
Sbeox0	dissolved oxygen concentration	ml/L
TimeS	elapsed time	sec
PrDM	pressure	db

T090C	temperature	degC
C0	conductivity	S/m
WetStar	fluorescence 1	mg/m^3
Sbeox0V	raw oxygen	V
Scan	scan number	unitless
Ph	pH	unitless
CStarTr0	Beam Transmission, WET Labs C-Star	%
AltM	altimetry	m
Par	PAR/Irradiance	microEinsteins/m^2/second
FlECO_AFL	fluorescence 2	mg/m^3
SeaTurbMtr	turbidity	NTU
Spar	SPAR/Surface Irradiance	microEinsteins/m^2/second
Xmiss	beam transmission, Chelsea/Seatech	%
ISO_DateTime_UTC	DateTime of sampling in UTC timezone and in ISO format (yyyy-mm-ddThh:mm:ssZ)	unitless

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Sea-Bird SBE 9
Generic Instrument Name	CTD Sea-Bird 9
Dataset-specific Description	Sea-Bird SBE 9 CTD data measurements
Generic Instrument Description	The Sea-Bird SBE 9 is a type of CTD instrument package. The SBE 9 is the Underwater Unit and is most often combined with the SBE 11 Deck Unit (for real-time readout using conductive wire) when deployed from a research vessel. The combination of the SBE 9 and SBE 11 is called a SBE 911. The SBE 9 uses Sea-Bird's standard modular temperature and conductivity sensors (SBE 3 and SBE 4). The SBE 9 CTD can be configured with auxiliary sensors to measure other parameters including dissolved oxygen, pH, turbidity, fluorometer, altimeter, etc.). Note that in most cases, it is more accurate to specify SBE 911 than SBE 9 since it is likely a SBE 11 deck unit was used. more information from Sea-Bird Electronics

[table of contents | back to top]

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

[table of contents | back to top]

Project Information

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

Alexandrium catenella and *Pseudo-nitzschia* spp. threaten human health through their production of potent neurotoxins that respectively cause Paralytic Shellfish Poisoning and Amnesic Shellfish Poisoning. Both are widespread across coastal waters of the U.S. and globally. Environmental factors alter marine ecosystems in many unanticipated ways, and a major concern is that the occurrence of these harmful algal blooms (HABs) and their concomitant human health impacts will grow. This project addresses key uncertainties regarding the impact of environmental variability on the timing and severity of HABs through detailed biological and ecological study of *Alexandrium* and *Pseudo-nitzschia* blooms within the Gulf of Maine (GOM). The GOM is an ideal system because of the long history of regional HAB issues and associated groundbreaking research by WHCOHH. Comprehensive studies of bloom physiology, toxicity, and oceanographic drivers have led to construction of coupled physical-biological models that have improved our understanding of key HAB dynamics and set the stage for continued interdisciplinary investigation of mechanisms at the cellular-to-GOM scale that are relevant to human exposure and health. In particular, the physiological responses of these HABs — growth, toxicity, and life cycle transitions — to shifting environmental conditions remain uncertain. **We hypothesize that long-term trends in HAB risks in the GOM are inherently linked to physiological processes and toxin dynamics that are driven by ecological stimuli**. This project's aims are designed to illuminate the role of life cycle dynamics and cellular physiology in determining the occurrence of *Alexandrium* and *Pseudo-nitzschia* blooms. We apply a wide variety of innovative approaches for study of natural populations in situ, leveraging a unique region-scale HAB observing system (HABON-NE). Aims 1 and 2 focus on *A. catenella* and seek to characterize cyst dormancy cycles, cyst formation, and subsequent bloom termination. These aims build upon prior successful approaches and models from study of inshore systems, asking the question if open water populations of the GOM are governed by similar dynamics. Aim 3 investigates the physiology underlying the emerging bloom dynamics of *Pseudo-nitzschia* in the GOM with in situ physiological observation coupled with targeted metatranscriptomics. Through the direct assessment of life cycle processes and physiology of HABs in the GOM, the results from this work will be directly applicable to the successful integration of physiology into models (Project 2) and inform estimates of potential risk for human exposure to

HAB toxins (Project 3).

[table of contents | back to top]

Program Information

Woods Hole Center for Oceans and Human Health (WHCOHH)

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

Coverage: Western N. Atlantic, Arctic

Overall Abstract:
The Woods Hole Center for Oceans and Human Health (WHCOHH) will comprise a strong and integrated set of research projects using novel in situ sampling technologies and modeling approaches building on prior research to address how environmental factors influence harmful algal bloom (HAB) dynamics and human exposure to HAB toxins, a serious and global human health threat. The **overall objective** is to protect public health through enhanced understanding of how oceanic processes affect the intensity and distribution of toxin-producing HABs and to understand the potential health risks from exposure even to low levels of their potent neurotoxins, especially during susceptible stages of life. The Center will focus on two key HAB taxa: *Alexandrium catenella*, which produces the saxitoxins responsible for paralytic shellfish poisoning (PSP), and *Pseudo-nitzschia* spp., which produce domoic acid responsible for amnesic shellfish poisoning (ASP) syndrome, both are expanding geographically. Novel, targeted, efficient, and data-rich sampling approaches developed by the applicants and applied *in situ* in natural settings have revealed new controls of *A. catenella* population dynamics, and have identified possible new environmental links regarding toxic *Pseudo-nitzschia* species. Project 1 will examine further the physiological and environmental variables affecting these HABs, which may underlie population adaptation in different habitats and different environmental regimes. Project 2 will incorporate these new and fundamental insights on bloom regulation into coupled population models to predict HAB events, a key step toward being able to quantify future risks from this recurrent public health threat. In biomedical studies with the zebrafish model, Project 3 has identified myelination in the developing brain as a target of domoic acid. They will use transgenic zebrafish and single-cell RNA-sequencing to identify the cell-specific mechanisms underlying effects of domoic acid, saxitoxin, and the cyanotoxin anatoxin-a in zebrafish embryos *in vivo* and will use human iPSC-derived 3D brain systems *in vitro* to elucidate toxin effects on neural and glial cell differentiation in human cells. Studies also will determine whether prior exposure to ubiquitous persistent organic pollutants may modify effects of subsequent exposure to saxitoxin and domoic acid. All projects will collaborate to link oceanic processes to human exposure, helping to define the exposure of susceptible human subpopulations. The Community Engagement Core will facilitate integration of the research with education and engagement of resource managers and other stakeholders. We also will improve awareness of emerging HAB issues for the public health community and develop new educational materials and interactive activities for K-12 classrooms, and for health care providers. An Administrative Core will encourage open discussion of planning, integration, and communication, and provide rigorous evaluation of progress in all aspects of the program.

NSF Award Abstract: See https://www.nsf.gov/awardsearch/show-award?AWD_ID=2418297

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

[table of contents | back to top]

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

[table of contents | back to top]