All bottle data collected from cruises W0306A, W0308C, AT11-17, AT11-30, TUIM14MV, TN200 from the Coastal Waters off Washington State and Vancouver Island; 2004-2006 (ECOHAB-PNW project)

Website: https://www.bco-dmo.org/dataset/3228
Version: 30 January 2009
Version Date: 2009-01-30

Project
» ECOHAB - Pacific Northwest (ECOHAB-PNW)

Contributors	Affiliation	Role
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Dataset Description

ECOHAB/PNW - All Bottle Data
PSEUDO_NITZSCHIA, NUTRIENT, DOMOIC ACID and CTD Data

METADATA
Station = ECOHAB-PNW station sampled.
Survey = Designated Survey or Period defined for each cruise.
Date (GMT) = Date of sample.
Event = Name assigned to the sampling event.
Source = Sample source type (BKT=bucket; CTD=conductivity,temperature,depth; NET=net tow).
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POSITION Information
Depth(M) = Depth in meters of sample.
depthID = Unique ID in ECOHAB-PNW database; can delete.
long dd = Longitude in decimal degrees.
lat dd = Latitude in decimal degrees.
==========
PSEUDO_NITZSCHIA DATA
PN RelAbund = Quantative measurement of Pseudo-nitzschia relative abundance as opposed to other organisms present in a net tow sample viewed under the microscope.
PN Total (cells/L) = Total number of Pseudo-nitzschia cells present. (cell counts)

%PN (p/m) = Percentage of Pseudo-nitzschia comprised of pungens/multiseries species.
%PN (a/f/h) = Percentage of Pseudo-nitzschia comprised of australis/fraudulenta/heimii species.
%PN (pd/d) = Percentage of Pseudo-nitzschia comprised of pseudo-deli/delicatissima series.
Chl-a(µg/L) = Chlorophyll-a.
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NUTRIENT DATA
NO3+NO2(µM) = Nitrate + Nitrite.
SiO2(µM) = Silicate.
H2PO4(µM) = Phosphorus.
==========
DOMOIC ACID DATA
RBA pDA (nM) = Particulate domoic acid measured using the Receptor Binding Assay method.
ELISA pDA (ng/L) = Particulate domoic acid measured using the ELISA method.
dDA(nM) = Dissolved domoic acid.
Bacteria(cells/L) = Bacteria.
Cyanobacteria(cells/L) = Cyanobacteria.
Fe(nM) = Iron.
==========
CTD DATA COLLECTED AT TIME BOTTLE WAS TAKEN
bottle = Niskin Bottle position of the CTD Rosette.
Pr = Pressure (deciBars).
DepS = Actual Depth (meters).
temp1 = Primary Temperature (degrees Celsius).
temp2 = Secondary Temperature (degrees Celsius).
sal1_uncorrected = Salinity from primary Temperature and Conductivity sensors, uncorrected (psu).
sal2_uncorrected = Salinity from secondary Temperature and Conductivity sensors, uncorrected (psu).
sal1_corrected = Salinity from primary Temperature and Conductivity sensors, corrected by calibration (psu).
sal2_corrected = Salinity from secondary Temperature and Conductivity sensors, corrected by calibration (psu).
par = Irradiance, Photosynthetically Activated Radiation (a measure of light intensity).
v_fl = Fluorescence Voltage.
fls = Seapoint Fluorometer measurement of Chloraphyll concentration (mg per liter), uncalibrated.
v_transmiss = Transmissonmeter Voltage.
bat = Beam Attenuation (no units).
v_ox = Oxygen voltage from SeaBird SBE43 oxygen sensor, uncalibrated.
sbeox0ML_L = Oxygen concentration from SeaBird SBE43 oxygen sensor (ml per liter), uncalibrated.
v_par = Photosynthetically Activated Radiation - voltage.

References: These include analysis methods.
Trainer, V. L., B. M. Hickey, E. J. Lessard, W. P. Cochlan, C. G. Trick, M. L. Wells, A. MacFadyen, and S. K. Moore. 2009.
Variability of Pseudo-nitzschia and domoic acid in the Juan de Fuca eddy region and its adjacent shelves.
Limnol. Oceanogr. 54: 289-308.

Trainer, V. L., M. L. Wells, W. P. Cochlan, C. G. Trick, K. A. Baugh, B. D. Bill, B. F. Beall, and N. Lundholm. submitted.
A massive toxigenic bloom of Pseudo-nitzschia cuspidata off the Washington State coast.
Limnol. Oceanogr.

Wells, M. L., C. G. Trick, W. P. Cochlan, M. P. Hughes, and V. L. Trainer. 2005.
Domoic acid: The synergy of iron, copper, and the toxicity of diatoms.
Limnol. Oceanogr. 50: 1908-1917.

Methods & Sampling

References: These include analysis methods.
Trainer, V. L., B. M. Hickey, E. J. Lessard, W. P. Cochlan, C. G. Trick, M. L. Wells, A. MacFadyen, and S. K. Moore. 2009.
Variability of Pseudo-nitzschia and domoic acid in the Juan de Fuca eddy region and its adjacent shelves.
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Domoic acid: The synergy of iron, copper, and the toxicity of diatoms.
Limnol. Oceanogr. 50: 1908-1917.

Data Processing Description

BCO-DMO Processing Notes
Generated from original file EHPNW_Btl_Data_Hickey.xls
contributed to BCO-DMO as a single, multisheet spreadsheet by Nancy Kachel
Worked with only the single "EH_All_Data" sheet (contains data from all cruises)

BCO-DMO Edits
- Parameter names modified to conform to BCO-DMO convention
- empty cells filled with "nd" (no data)
- date reformatted to YYYYMMDD
- spaces replaced with underscores in misc text fields (Cruise, Station, etc)
- decimal data values padded to consistent decimal places
- Cruise changed from "Cruise_1,2,3,4" to ECOHAB_1, etc for consistency with other data sets

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Data Files

File
AllBottle.csv (Comma Separated Values (.csv), 1.43 MB) MD5:fb56684be5a05e5493e34e3c25a39228 Primary data file for dataset ID 3228

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Parameters

Parameter	Description	Units
Cruise	ECOHAB-PNW cruise name	text
Station	ECOHAB-PNW station sampled	text
Survey	Designated Survey or Period (defined for each cruise)	text
date	Date of sample (GMT)	YYYYMMDD
Event	Name assigned to the sampling event (BKT=bucket; CTD=conductivity;temperature;depth; NET=net tow)	text

Source	Sample source type	text
depth	Depth of sample	meters
depthID	Unique ID in ECOHAB-PNW database	integer
lon	longitude position of sample	decimal degs (West is negative)
lat	latitude position of sample	decimal degs (South is negative)
PN_RelAbund	Quantative measurement of Pseudo-nitzschia relative abundance as opposed to other organisms present in a net tow sample viewed under the microscope.	integer
PN_Total	Total number of Pseudo-nitzschia cells present (cell counts)	cells/L
percentPN_p_m	Percentage of Pseudo-nitzschia comprised of pungens/multiseries species	percent
percentPN_a_f_h	Percentage of Pseudo-nitzschia comprised of australis/fraudulenta/heimii species	percent
percentPN_pd_d	Percentage of Pseudo-nitzschia comprised of pseudo-deli/delicatissima series	percent
Chl_a	Chlorophyll-a	micrograms/liter
NO3_NO2	Nitrate + Nitrite	microM
SiO2	Silicate	microM
H2PO4	Phosphorus	microM
RBA_pDA	Particulate domoic acid measured using the Receptor Binding Assay method	nM
ELISA_pDA	Particulate domoic acid measured using the ELISA method	ng/L
dDA	Dissolved domoic acid	nM

Bacteria	Bacteria	cells/L
Cyanobacteria	Cyanobacteria	cells/L
Fe	Iron	nM
bottle	Niskin Bottle position of the CTD Rosette	integer
Pr	Pressure	deciBars
DepS	Actual Depth	meters
temp1	Primary Temperature	Degrees Celsius
temp2	Secondary Temperature	Degrees Celsius
sal1_uncorrected	Salinity from primary Temperature and Conductivity sensors; uncorrected	psu
sal2_uncorrected	Salinity from secondary Temperature and Conductivity sensors; uncorrected	psu
sal1_corrected	Salinity from primary Temperature and Conductivity sensors; corrected by calibration	psu
sal2_corrected	Salinity from secondary Temperature and Conductivity sensors; corrected by calibration	psu
par	Irradiance; Photosynthetically Activated Radiation (a measure of light intensity)	????
v_fl	Fluorescence Voltage	????
fls	Seapoint Fluorometer measurement of Chloraphyll concentration; uncalibrated	Mg per liter
v_transmiss	Transmissonmeter Voltage	volts
bat	Beam Attenuation	(nounits)

v_ox	Oxygen voltage from SeaBird SBE43 oxygen sensor; uncalibrated	volts
sbeox0ML_L	Oxygen concentration from SeaBird SBE43 oxygen sensor; uncalibrated	Ml per liter
v_par	Photosynthetically Activated Radiation - voltage	volts

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Instruments

Dataset-specific Instrument Name	Niskin Bottle
Generic Instrument Name	Niskin bottle
Generic Instrument Description	A Niskin bottle (a next generation water sampler based on the Nansen bottle) is a cylindrical, non-metallic water collection device with stoppers at both ends. The bottles can be attached individually on a hydrowire or deployed in 12, 24, or 36 bottle Rosette systems mounted on a frame and combined with a CTD. Niskin bottles are used to collect discrete water samples for a range of measurements including pigments, nutrients, plankton, etc.

Dataset-specific Instrument Name	CTD Seabird SBE 43
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 the manufacturer: https://www.seabird.com/products/sbe-43-dissolved-oxygen-sensor

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Deployments

W0306A

Website	https://www.bco-dmo.org/deployment/58001
Platform	R/V Wecoma
Report	http://bcodata.whoi.edu/ECOHAB_PNW/ECOHAB_Cruise1_Report.pdf
Start Date	2003-06-02
End Date	2003-06-23
Description	W0306A: This is ECOHAB_1 (ECOHAB Cruise 1) First cruise of the 6 ECOHAB/PNW cruises. Numbered sequentially from Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6. .

W0308C

Website	https://www.bco-dmo.org/deployment/58002
Platform	R/V Wecoma
Report	http://bcodata.whoi.edu/ECOHAB_PNW/ECOHAB_Cruise2_Report.pdf
Start Date	2003-08-30
End Date	2003-09-19
Description	W0308C: This is ECOHAB_2 (ECOHAB Cruise 2). Second cruise of the 6 ECOHAB-PNW cruises. Numbered sequentially from Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6.

AT11-17

Website	https://www.bco-dmo.org/deployment/58003
Platform	R/V Atlantis
Report	http://bcodata.whoi.edu/ECOHAB_PNW/ECOHAB_Cruise3_Report.pdf
Start Date	2004-09-08
End Date	2004-09-28
Description	AT11-17: This is ECOHAB_3 (ECOHAB Cruise 3). Third cruise of the 6 ECOHAB-PNW cruises. Numbered sequentially from Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6. Original cruise data are available from the NSF R2R data catalog

AT11-30

Website	https://www.bco-dmo.org/deployment/58004
Platform	R/V Atlantis
Report	http://bcodata.whoi.edu/ECOHAB_PNW/ECOHAB_Cruise4_Report.pdf
Start Date	2005-07-07
End Date	2005-07-27
Description	AT11-30: This is ECOHAB_4 (ECOHAB Cruise 4). Fourth cruise of the 6 ECOHAB-PNW cruises. Numbered sequentially from Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6 Original cruise data are available from the NSF R2R data catalog

TUIM14MV

Website	https://www.bco-dmo.org/deployment/58005
Platform	R/V Melville
Report	http://bcodata.whoi.edu/ECOHAB_PNW/ECOHAB_Cruise5_Report.pdf
Start Date	2005-09-02
End Date	2005-09-22
Description	Cruise TUIM14MV is also known as ECOHAB_5 (ECOHAB Cruise 5) the fifth cruise of the 6 ECOHAB-PNW cruises; numbered sequentially from Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6. Cruise information and original data are available from the NSF R2R data catalog.

TN200

Website	https://www.bco-dmo.org/deployment/58006
Platform	R/V Thomas G. Thompson
Report	http://bcodata.whoi.edu/ECOHAB_PNW/ECOHAB_Cruise6_Report.pdf
Start Date	2006-09-11
End Date	2006-10-04
Description	Cruise TN200 is also known as ECOHAB_6 (ECOHAB Cruise 6) the sixth of 6 ECOHAB-PNW cruises that are numbered sequentially from Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6. Cruise information and original data are available from the NSF R2R data catalog.

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Project Information

ECOHAB - Pacific Northwest (ECOHAB-PNW)

Coverage: Off the Pacific Northwest coast

ECOHAB-PNW is a 5-year multi-disciplinary project that will study the physiology, toxicology, ecology and oceanography of toxic Pseudo-nitzschia species off the Pacific Northwest coast.

This program studies the physiology, toxicology, ecology and oceanography of toxic Pseudo-nitzschia species off the Pacific Northwest coast, a region in which both macro-nutrient supply and current patterns are primarily controlled by seasonal coastal upwelling processes. Recent studies suggest that the seasonal Juan de Fuca eddy, a nutrient rich retentive feature off the Washington coast serves as a "bioreactor" for the growth of phytoplankton, including diatoms of the genus Pseudo-nitzschia. Existing ship of opportunity data are consistent with the working hypothesis that the seasonal Juan de Fuca eddy is an initiation site for toxic Pseudo-nitzschia that impact the Washington coast and that upwelling sites adjacent to the coast are less likely to develop toxicity.

The long-term program goal is to develop a mechanistic basis for forecasting toxic Pseudo-nitzschia bloom development here and in other similar coastal regions in Eastern Boundary upwelling systems.

Specific study objectives are:
- 1.To determine the physical/biological/chemical factors that make the Juan de Fuca eddy region more viable for growth and sustenance of toxic Pseudo-nitzschia than the nearshore upwelling zone;
- 2. To determine the combination of environmental factors that regulate the production, accumulation, and/or release of domoic acid (DA) from Pseudo-nitzschia cells in the field;
- 3. To determine possible transport pathways between DA initiation sites and shellfish beds on the nearby coast.

The scientific operations of this study included obtaining multi-disciplinary data from a large scale grid, sampling water properties while following a drifter, deployment of surface drifters, satellite imagery, laboratory studies using water collected at selected sites, and numerical modeling of both the circulation and chlorophyll concentration. Water samples included macronutrients, iron, particulate and dissolved domoic acid, Pseudo-nitzschia species and numbers. Experiments were done to estimate growth and grazing rates. Moored arrays were deployed to provide time series of currents and water properties from May to October, each year from 2003-2006. Numerical modeling studies on a fine scale grid focused on the seasonal development
of the Juan de Fuca eddy and its change in structure during selected wind conditions. Conditions favorable to release of phytoplankton from the eddy region were assessed.

After four years of field work the research team is able to describe a possible sequence of events necessary to ingestion of domoic acid by coastal shellfish:
(1) Plankton must become concentrated in the bloom source region. ECOHAB PNW studies suggest this requires
a period of downwelling-favorable or lightly fluctuating winds.

(2) Next the plankton must undergo stress sufficient to cause an increase in cellular toxin: in the Juan de Fuca eddy region toxin can be found on any survey of the region in both early and late summer within a 21 day time scale.
(3) Patches of toxic plankton must then escape from the offshore source region. For the Juan de Fuca eddy region
escape is favored during upwelling-favorable wind conditions that allow the geostrophic constraint of the eddy circulation pattern to be broken.
(4) The patch must move alongshore to sites with shellfish populations, and
(5) must retain its toxicity during the time period of transport. For a toxic source in the Juan de Fuca eddy this requires southward advection across the shelf, as occurs during periods of upwelling-favorable winds in summer and early fall. ECOHAB PNW studies show that toxin can be maintained in the 7-14 days required for transport. For an Oregon source such as Heceta bank to impact the Washington shelf, this requires northward
advection across the shelf, as occurs during periods of downwelling-favorable winds in spring.
(6) Last, the toxic patch must move onshore to coastal beaches and/or estuaries,
(7) where it must remain there for a period sufficient for significant ingestion by shellfish.

Cruises/Platforms:
Cruise = ECOHAB-PNW cruises, numbered sequentially from
Cruise_1 - Cruise_6 as ECOHAB_1 - ECOHAB_6.

Cruise_1=ECOHAB_1, R/V Wecoma, W0306A, June 2-23, 2003 Cruise Report
Cruise_2=ECOHAB_2, R/V Wecoma, W0308C, August 30 - September 19, 2003 Cruise Report
Cruise_3=ECOHAB_3, R/V Atlantis, AT11-17, September 8-28, 2004 Cruise Report
Cruise_4=ECOHAB_4, R/V Atlantis, AT11-30, July 7-27,2005 Cruise Report
Cruise_5=ECOHAB_5, R/V Melville, TUIM14MV, September 2-22, 2005 Cruise Report
Cruise_6=ECOHAB_6, R/V Thomas G. Thompson, TN200, Sept. 11- Oct. 4, 2006 Cruise Report

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-0234587
National Oceanic and Atmospheric Administration (NOAA)	NA170P2789

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