Winter survey data from Lake Erie from Dec 2022 to Mar 2023

Website: https://www.bco-dmo.org/dataset/949394
Data Type: Cruise Results
Version: 1
Version Date: 2025-01-28

Project
» Lake Erie Center for Fresh Waters and Human Health (Great Lakes Center)

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Abstract
This dataset includes winter survey data from Lake Erie collected on USCGC Neah Bay, CCGS Griffon, and CCGS Samuel Risley from December 2022 to March 2023. The survey includes environmental observations, physico-chemical data, chlorophyll, total and dissolved nutrients. The Lake Erie Center for Fresh Waters and Human Health is a five-year, multi-institutional effort aimed at understanding the environmental factors and ongoing changes that influence the growth and toxicity of cyanobacterial harmful algal blooms (cHABs) in Lake Erie.

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Coverage

Location: Laurentian Great Lakes (Lake Erie, Lake St. Clair, Lake Huron, Lake Superior, Lake Michigan)
Spatial Extent: **N**:46.4531 **E**:-79.9013 **S**:41.2513 **W**:-87.4225
Temporal Extent: 2022-12-06 - 2023-03-17

Dataset Description

Lake Erie Center for Fresh Waters and Human Health

The Lake Erie Center for Fresh Waters and Human Health is a five-year, multi-institutional effort aimed at understanding the environmental factors and ongoing changes that influence the growth and toxicity of cyanobacterial harmful algal blooms (cHABs) in Lake Erie. The Center will support three research projects. Specifically these projects address the following aims: first, how environmental cues promote or constrain the proliferation of cHAB species in mixed populations; second, how environmental cues influence toxin production

by cHAB species; third, how other member of the microbial assemblage influence cHAB growth and toxicity. The Center will provide a Community Engagement Core to lead outreach activities that will inform the general public on the effects of cHABs by efforts that include: (1) a community engaged scholarship training for scientists associated with the Center, (2) community-engaged scholarship training for practitioners or community members associated with the Center, and (3) a stakeholder needs assessment for Great Lakes and environmental health literacy to inform general outreach information needs. A citizen science engagement with charter boat captains will further develop a near real-time database on cHAB severity in Lake Erie, and the Facilities Core will provide metadata that not only serve the three stated research projects, but also yield a database available to all Great Lakes scientists. The outcomes are to involve community stakeholders and researchers in the Great Lakes on issues regarding human health, climate change and awareness of threats to our fresh water resources.

Methods & Sampling

The vessel came to a stop when the predetermined sampling station was reached, at a time decided on by the ship's command. The location and time of sampling was recorded, as well as the environmental conditions. The trained crew members of the vessel then used a YSI water quality sonde to collect data and that was recorded. A Secchi disc with measurement indicators every 10 centimeters was then deployed and recordings were taken on both the upcast and downcast and then the average was calculated. A Van Dorn water sampler was then used to collect water at a depth of 1 meter. Water samples were then transferred to 1 L polyethylene storage bottles or 2 L plastic storage bottles, and stored in a dark place at 4 oC until picked up by personnel on the same day. The samples were then transported in coolers containing ice packs to Bowling Green State University (BGSU).

Sub-samples for chlorophyll a were taken at BGSU using 0.4 um polycarbonate membranes and a vacuum filtration system. The filter was placed in a screw cap polyethylene centrifuge tube and stored in a dark freezer until extraction. The samples were extracted using 90% acetone and kept at -20 oC for 24 hours, and chlorophyll was measured using a TD-700 fluorometer (Welschmeyer, 1994).

Total and dissolved nutrient samples were held in acid-washed 250 mL polyethylene bottles, and stored in a dark freezer at -20 oC until they were ready to be analyzed. Dissolved nutrient sub-samples were taken by filtering the agitated sampled water through 0.22 um filters. The samples were then shipped to the National Center for Water Quality Research at Heidelberg University (Tiffin, OH).

Deployments

Samples for this survey were collected on the following deployments:

- GR-2023-01: CCGS GRIFFON (Icebreaker)
- GR-2023-02: CCGS GRIFFON (Icebreaker)
- GR-2023-03: CCGS GRIFFON (Icebreaker)
- NB-2023-01: USCG NEAH BAY (Ice Cutter)
- NB-2023-02: USCG NEAH BAY (Ice Cutter)
- NB-2023-03: USCG NEAH BAY (Ice Cutter)
- NB-2023-04: USCG NEAH BAY (Ice Cutter)
- NB-2023-05: USCG NEAH BAY (Ice Cutter)
- NB-2023-06: USCG NEAH BAY (Ice Cutter)
- NB-2023-07: USCG NEAH BAY (Ice Cutter)
- SR-2023-01: CCGS SAMUEL RISLEY (Icebreaker)
- SR-2023-02: CCGS SAMUEL RISLEY (Icebreaker)

Data Processing Description

The meteorological data was taken directly from readings using vessel instruments, marine forecasts, and expert observations. The physico-chemical data was obtained using a YSI 600QS multiparameter sonde, and nutrient concentrations were analyzed at the National Center for Water Quality Research at Heidelberg University. Fluorometric classification of phytoplankton was measured using a FluoroProbe (bbe Moldaenke GmbH, Schwentinental, Germany), and plankton taxonomic classification and cell enumeration was conducted by Aquatic Taxonomy Specialists (Malinta, OH). The extractive chlorophyll was read using a TD-700

Fluorometer (Turner Designs Inc., San Jose, CA), the sample concentrations were then calculated with the equation below, and the averages for each site were calculated from the triplicate samples.

Chla = ((reading*$volume_{extracted}$)/$volume_{filtered}$)* dilution factor

BCO-DMO Processing Description

- Imported Winter_Lake_Erie_2023_Metadata.csv" into BCO DMO system
- Combined "Date" and "Time" to create "ISO_DateTime_UTC" field in ISO UTC format in "Winter_Lake_Erie_2024_Metadata.csv"
- Converted "Date" to ISO YYYY-mm-dd format
- Corrected longitude value in row 8 to be negative, in line with actual location
- Replaced dashes with underscores in the "Wind_speed" field to prevent conversion to dates
- Modified parameter names to conform with BCO-DMO system requirements for all files
- Exported file as "949394_v1_winter_lake_erie_2022-2023.csv"

Note: Deployment metadata was not provided, so deployments are provided in list form via the methods section.

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Data Files

File
949394_v1_winter_lake_erie_2022-2023.csv (Comma Separated Values (.csv), 8.90 KB) MD5:b74bd5c2bd8db6a993ee91de28e0dc8e Primary data file for dataset ID 949394, version 1

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Parameters

Parameter	Description	Units
Station	Station of sample collection	unitless
Deployment	Cruise ID	unitless
Alt_Station	Alternate cruise descriptions	unitless
Lake	Lake sampled	unitless
Date	Date of sample collection in yyyy-mm-dd format	unitless
Time_EST	Time of survey (EST); format: hh:mm	unitless
ISO_DateTime_UTC	Date and time of survey (UTC) formatted to ISO8601 standard: YYYY-MM-DDThh:mmZ	unitless

Lat	Latitude of sample collection; positive values = North	decimal degrees
Long	Longitude of sample collection; positive values = East	decimal degrees
Water_Depth	Maximum depth of water at sampling location	meters (m)
Ice_Cover	Percent ice cover around sampling area	percent (%)
Snow_Cover	Percent snow cover on ice around sampling area	percent (%)
Ice_Type	Ice type	unitless
Ice_Thickness	Thickness of ice	inches (in)
Air_Temp	Air temperature	Degrees Celsius
Water_Temp	Water temperature measured at surface	Degrees Celsius
DO	Dissolved mg of oxygen per litre of water	microgram per liter (µg L-1)
DO_percent	Dissolved oxygen percent	percent (%)
Cond	Conductivity	microsiemens per centimeter (uS/cm)
pH	pH	unitless (pH scale)
Sechhi	Average from upcast and downcast readings; measure of water transparency	meters (m)
Baro_Press	Barometer reading	Hg
Wind_speed	Wind speed	Knots (Kt)
Wind_direction	Wind direction in cardinal (compass) directions	unitless
Wind_degrees	Wind direction reports as compass degrees	degree
Weather	Description of weather conditions	unitless

Comments	Comments	unitless
Chlorophyll_LessThan_0_2um	Extracted 0.2um chlorophyll	ug/L
F	Dissolved Nutrients: Fluoride	microgram per liter (µg L-1)
CL	Dissolved Nutrients: Chloride	microgram per liter (µg L-1)
NO2	Dissolved Nutrients: Nitrite	microgram per liter (µg L-1)
NO3	Dissolved Nutrients: Nitrate	microgram per liter (µg L-1)
SO4	Dissolved Nutrients: Sulfate	microgram per liter (µg L-1)
SIO2	Dissolved Nutrients: Silica	microgram per liter (µg L-1)
NH3	Dissolved Nutrients: Ammonia	microgram per liter (µg L-1)
SRP	Dissolved Nutrients: Soluble Reactive Phosphorus	microgram per liter (µg L-1)
Total_Phosphorus	Total Phosphorus	microgram per liter (µg L-1)
Total_Nitrogen	Total Nitrogen	microgram per liter (µg L-1)

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Instruments

Dataset-specific Instrument Name	Sample bottles, 1 or 2 L (Nalgene or equivalent), Plastic wash bottle, 500 mL
Generic Instrument Name	Bottle
Dataset-specific Description	Water samples are then transferred to 1 L polyethylene storage bottles or 2 L plastic storage bottles, and stored in a dark place at 4 oC until picked up by personnel on the same day. Total and dissolved nutrient samples will be held in acid-washed 250 mL polyethylene bottles, and stored in a dark freezer at -20 oC until they are ready to be analyzed.
Generic Instrument Description	A container, typically made of glass or plastic and with a narrow neck, used for storing drinks or other liquids.

Dataset-specific Instrument Name	FluoroProbe
Generic Instrument Name	Fluorometer
Dataset-specific Description	Fluorometric classification of phytoplankton was measured using a FluoroProbe (bbe Moldaenke GmbH, Schwentinental, Germany), and plankton taxonomic classification and cell enumeration was conducted by Aquatic Taxonomy Specialists (Malinta, OH).
Generic Instrument Description	A fluorometer or fluorimeter is a device used to measure parameters of fluorescence: its intensity and wavelength distribution of emission spectrum after excitation by a certain spectrum of light. The instrument is designed to measure the amount of stimulated electromagnetic radiation produced by pulses of electromagnetic radiation emitted into a water sample or in situ.

Dataset-specific Instrument Name	National Center for Water Quality Research at Heidelberg University
Generic Instrument Name	Nutrient Autoanalyzer
Dataset-specific Description	Total and dissolved nutrient samples will be held in acid-washed 250 mL polyethylene bottles, and stored in a dark freezer at -20 oC until they are ready to be analyzed. Dissolved nutrient sub-samples will be taken by filtering the agitated sampled water through 0.22 um filters. The data will then be shipped to the National Center for Water Quality Research at Heidelberg University (Tiffin, OH).
Generic Instrument Description	Nutrient Autoanalyzer is a generic term used when specific type, make and model were not specified. In general, a Nutrient Autoanalyzer is an automated flow-thru system for doing nutrient analysis (nitrate, ammonium, orthophosphate, and silicate) on seawater samples.

Dataset-specific Instrument Name	Secchi disc
Generic Instrument Name	Secchi Disc
Dataset-specific Description	A Secchi disc with measurement indicators every 10 centimeters will then be deployed and recordings will be taken on both the upcast and downcast.
Generic Instrument Description	Typically, a 16 inch diameter white/black quadrant disc used to measure water optical clarity

Dataset-specific Instrument Name	TD-700 fluorometer
Generic Instrument Name	Turner Designs 700 Laboratory Fluorometer
Dataset-specific Description	The extractive chlorophyll was read using a TD-700 Fluorometer (Turner Designs Inc., San Jose, CA), the sample concentrations were then calculated with the equation below, and the averages for each site were calculated from the triplicate samples.
Generic Instrument Description	The TD-700 Laboratory Fluorometer is a benchtop fluorometer designed to detect fluorescence over the UV to red range. The instrument can measure concentrations of a variety of compounds, including chlorophyll-a and fluorescent dyes, and is thus suitable for a range of applications, including chlorophyll, water quality monitoring and fluorescent tracer studies. Data can be output as concentrations or raw fluorescence measurements.

Dataset-specific Instrument Name	Vacuum manifold system to accommodate 3 filter funnels
Generic Instrument Name	vacuum manifold
Dataset-specific Description	Vacuum manifold system to accommodate 3 filter funnels
Generic Instrument Description	A device that is used for the vacuum-driven processing of multiwell strips or plates, or spin columns.

Dataset-specific Instrument Name	2 L Van Dorn water sampler
Generic Instrument Name	Van Dorn water sampler
Dataset-specific Description	A Van Dorn water sampler will then be used to collect water at a depth of 1 meter.
Generic Instrument Description	A free-flushing water sample bottle comprising a cylinder (polycarbonate, acrylic or PVC) with a stopper at each end. The bottle is closed by means of a messenger from the surface releasing the tension on a latex band and thus pulling the two stoppers firmly into place. A thermometer can be mounted inside the bottle. One or more bottles can be lowered on a line to allow sampling at a single or multiple depth levels. Van Dorn samplers are suitable for for physical (temperature), chemical and biological sampling in shallow to very deep water. Bottles are typically lowered vertically through the water column although a horizontal version is available for sampling near the seabed or at thermoclines or chemoclines. Because of the lack of metal parts the bottles are suitable for trace metal sampling, although the blue polyurethane seal used in the Alpha version may leach mercury. The Beta version uses white ASA plastic seals that do not leach mercury but are less durable.

Dataset-specific Instrument Name	YSI 600QS multiparameter sonde
Generic Instrument Name	YSI Sonde 6-Series
Dataset-specific Description	The physico-chemical data was obtained using a YSI 600QS multiparameter sonde, and nutrient concentrations were analyzed at the National Center for Water Quality Research at Heidelberg University.
Generic Instrument Description	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

Lake Erie Center for Fresh Waters and Human Health (Great Lakes Center)

Website: https://www.bgsu.edu/great-lakes-center.html

Coverage: Laurentian Great Lakes

NSF Award Abstract:
The Lake Erie Center for Fresh Waters and Human Health is a five-year, multi-institutional effort aimed at understanding the environmental factors and ongoing changes that influence the growth and toxicity of cyanobacterial harmful algal blooms (cHABs) in Lake Erie. The Center will support three research projects. Specifically these projects address the following aims: first, how environmental cues promote or constrain the proliferation of cHAB species in mixed populations; second, how environmental cues influence toxin production by cHAB species; third, how other member of the microbial assemblage influence cHAB growth and toxicity. The Center will provide a Community Engagement Core to lead outreach activities that will inform the general public on the effects of cHABs by efforts that include: (1) a community engaged scholarship training for scientists associated with the Center, (2) community-engaged scholarship training for practitioners or community members associated with the Center, and (3) a stakeholder needs assessment for Great Lakes and environmental health literacy to inform general outreach information needs. A citizen science engagement with charter boat captains will further develop a near real-time database on cHAB severity in Lake Erie, and the Facilities Core will provide metadata that not only serve the three stated research projects, but also yield a database available to all Great Lakes scientists. The outcomes are to involve community stakeholders and researchers in the Great Lakes on issues regarding human health, climate change and awareness of threats to our fresh water resources.

The Center is jointly supported by NSF and by the National Institute for Environmental Health Sciences (NIEHS).

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
NSF Division of Ocean Sciences (NSF OCE)	OCE-1840715

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