Geochemical concentrations (ppm) of six elements measured in Atlantic croaker otoliths

Website: https://www.bco-dmo.org/dataset/784969
Data Type: Other Field Results
Version: 1
Version Date: 2019-12-24

Project
» Collaborative Research: Consequences of sub-lethal hypoxia exposure for teleosts tracked with biogeochemical markers: a trans-basin comparison (OtolithHypoxia)

Contributors	Affiliation	Role
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Abstract
Geochemical concentrations (ppm) of six elements measured in otoliths of Atlantic croaker sampled on board of the R/V Oregon II during the NOAA Seamap Fall Groundfish Survey of 2014 (Oct 10 to Nov 4) and 2015 (Oct 8 to Nov 22).

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Coverage

Temporal Extent: 2014-10-21 - 2015-11-22

Dataset Description

Geochemical concentrations (ppm) of six elements measured in otoliths of Atlantic croaker sampled on board of the R/V Oregon II during the NOAA Seamap Fall Groundfish Survey of 2014 (Oct 10 to Nov 4) and 2015 (Oct 8 to Nov 22).

Methods & Sampling

Otolith element concentrations for each individual fish (labeled as “HMU ####”) were measured at the

University of Austin, Jackson School of Geosciences using laser ablation inductively coupled mass spectrometry. Standard reference materials included a National Institutes of Standards and Technology glass standard (NIST-612) and a United States Geological Survey microanalytical carbonate standard pressed pellet (MACS-3). Otolith element concentrations were quantified along the longest dorso-ventral axis spanning the core (i.e. hatch) to the edge (i.e. death). Please reference Altenritter et al. (2018) and Altenritter and Walther (2019) for detailed information on sampling and analysis, instrumentation, and data processing.

Data Processing Description

Raw element intensities were converted to element concentrations (ppm) in the data reduction program Iolite.

BCO-DMO processing notes:

- Adjusted titles to comply to database requirements
- Rounded Distance header to 3 decimals

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Data Files

File	
otolith_concentrations.csv	(Comma Separated Values (.csv), 61.86 MB) MD5:e5eb355409047d8c7868525c2af6ab69
Primary data file for dataset ID 784969	

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Related Publications

Altenritter, M. E., & Walther, B. D. (2019). The Legacy of Hypoxia: Tracking Carryover Effects of Low Oxygen Exposure in a Demersal Fish Using Geochemical Tracers. Transactions of the American Fisheries Society, 148(3), 569–583. doi:10.1002/tafs.10159
Results

Altenritter, M., Cohuo, A., & Walther, B. (2018). Proportions of demersal fish exposed to sublethal hypoxia revealed by otolith chemistry. Marine Ecology Progress Series, 589, 193–208. doi:10.3354/meps12469
Results

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Parameters

Parameter	Description	Units
Distance	Otolith transect distance traversed by laser; distance across the otolith.	Microns (um)
Mg_m24	Concentration of Magnesium isotope 24	Parts per million (ppm)
Mg_m25	Concentration of Magnesium isotope 25	Parts per million (ppm)
Mn_m55	Concentration of Manganese isotope 55	Parts per million (ppm)
Sr_m88	Concentration of Strontium isotope 88	Parts per million (ppm)
In_115	Concentration of Indium isotope 115	Parts per million (ppm)
I_m127	Concentration of Iodine isotope 127	Parts per million (ppm)
Ba_m138	Concentration of Barium isotope 138	Parts per million (ppm)
Fish_ID	Fish ID; number of each individual fish	unitless

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Instruments

Dataset-specific Instrument Name	Agilent 7500ce ICP-Q-MS
Generic Instrument Name	Mass Spectrometer
Dataset-specific Description	Analytical instrumentation included an Agilent 7500ce ICP-Q-MS coupled with a UP-193 FX laser ablation system
Generic Instrument Description	General term for instruments used to measure the mass-to-charge ratio of ions; generally used to find the composition of a sample by generating a mass spectrum representing the masses of sample components.

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Deployments

2014_NOAA_Seamap_Fall_Groundfish_Survey

Website	https://www.bco-dmo.org/deployment/565653
Platform	R/V Oregon II
Start Date	2014-10-21
End Date	2014-11-04

2015_NOAA_Seamap_Fall_Groundfish_Survey

Website	https://www.bco-dmo.org/deployment/652751
Platform	R/V Oregon II
Start Date	2015-10-08
End Date	2015-11-22
Description	For more information about this cruise see the "NOAA OFFICE of MARINE & AVIATION OPERATIONS" page: http://www.omao.noaa.gov/find/projects/3421-southeast-area-monitoring-an...

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Project Information

Collaborative Research: Consequences of sub-lethal hypoxia exposure for teleosts tracked with biogeochemical markers: a trans-basin comparison (OtolithHypoxia)

Coverage: Northern Gulf of Mexico, Baltic Sea, and Lake Erie

Description from NSF award abstract:
Hypoxia occurs when dissolved oxygen concentrations in aquatic habitats drop below levels required by living organisms. The increased frequency, duration and intensity of hypoxia events worldwide have led to impaired health and functioning of marine and freshwater ecosystems. Although the potential impacts of hypoxic exposure are severe, there is little known about the consequences of systemic, sub-lethal exposure to hypoxic events for populations and communities of fishes. The objective of this project is to determine whether sub-lethal exposure to hypoxia during early life stages leads to poor growth and hence increased mortality. This project will use "environmental fingerprint" methods in fish ear stones (otoliths) retrospectively to identify periods of hypoxia exposure. The project will compare consequences of hypoxia exposure in different fish species from the Gulf of Mexico, the Baltic Sea, and Lake Erie, thus examining the largest anthropogenic hypoxic regions in the world spanning freshwater, estuarine, and marine ecosystems.

This project will employ long-term, permanent markers incorporated into fish otoliths to identify life-long patterns of sub-lethal hypoxia exposure far beyond time spans currently achievable using molecular markers. This work will capitalize on patterns of geochemical proxies such as Mn/Ca and I/Ca incorporated into otoliths and analyzed using laser ablation inductively coupled plasma mass spectrometry to identify patterns of sub-lethal hypoxia exposure. The investigators will then determine whether exposure results in differential growth and survival patterns compared to non-exposed fish by tracking cohorts over time and identifying characteristics of survivors. Because this work involves multiple species in multiple hypoxic regions, it will allow cross-system comparisons among unique ecosystems. The results from this project will thus provide unprecedented insight into effects of hypoxia exposure in three major basins using novel biogeochemical proxies, thereby paving the way for a fuller understanding of the impacts of "dead zones" on coastal resources.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1633020

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