Identity of sciaenid eggs collected from the Gulf of Mexico Estuary near Port Aransas, Texas from 2020 to 2022

Website: https://www.bco-dmo.org/dataset/878631
Data Type: Other Field Results
Version: 2
Version Date: 2023-09-19

Project
» Counter-gradient Flow of Fatty Acids in Marine Food Webs Through Egg Boons (Egg Boon Food Webs)

Contributors	Affiliation	Role
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Abstract
This dataset represents the identity (based on PCR results) of sciaenid eggs from the Gulf of Mexico Estuary near Port Aransas, Texas. Egg samples were collected from 20 August, 2020 through 8 March, 2022 from the research pier at UTMSI, located in the Aransas Pass inlet. Egg samples were collected bi-weekly during the Red Drum spawning season (August – December) and monthly outside the Red drum spawning season from two locations. Eggs were sorted by morphology to isolate sciaenid eggs and molecular PCR techniques were applied to subsamples of eggs to confirm the species identification.

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Coverage

Spatial Extent: **N**:27.9362 **E**:-97.0218 **S**:27.8396 **W**:-97.0727222
Temporal Extent: 2020-08-21 - 2022-03-08

Methods & Sampling

Sampling and analytical procedures:
Egg samples were collected from 20 August, 2020 through 8 March, 2022 from the research pier at the University of Texas Marine Science Institute (UTMSI), located in the Aransas Pass inlet by deploying a 500-micron mesh plankton net. Egg samples were also collected by deploying a plankton net from a small boat from a location outside the extent of the Red drum egg boon in the Aransas Bay (Mud Island) from 20 August, 2020- December 2021. Egg samples were collected bi-weekly during the Red Drum spawning season (August – December) and monthly outside the Red drum spawning season from both locations. Eggs were sorted by morphology to isolate sciaenid eggs and molecular PCR techniques were applied to subsamples of eggs to confirm the species identification.

DNA was extracted from a single egg using a commercial kit (Thermo scientific Gene JET genomic DNA purification kit K0721). The following cycle conditions were used to run PCRs: an initial denaturing step of 94°C for 2 minutes followed by 30 cycles of 30 seconds at 94°C; 30 s at 60°C and 1 minute at 72°C, with a final extension of 5 min at 72°C. A species-specific primer set (NADH dehydrogenase 4 mtDNA gene) was used to identify wild caught sciaenid eggs (Carreon-Martinez et al., 2010). A set of universal primers (18S ribosomal RNA gene) was used as a positive control for the DNA extraction and PCR reaction. PCR products were size separated by gel electrophoresis (1.5% agarose) and visualized by 1% ethidium bromide solution (Fisher-Scientific). The species-specific primers identified southern king fish (550 bp), gulf kingfish(400 bp), black drum (350 bp), red drum (651 bp), Atlantic croaker (850 bp), and spotted seatrout (1201 bp) using DNA ladder.

** Note: Eggs were not tested for black drum if egg collection date was outside the spawning season of black drum and egg size was smaller than 1.00 millimeters

FAML: pier at in Corpus Christi Channel, Port Aransas, TX, United States, Fisheries and Mariculture Laboratory of the University of Texas Marine Science Institute (lat. 27.8396111, lon. -97.0727222);

MI: Mud Island in Aransas Bay, TX, United States (lat. 27.9362222, lon. -97.0217777)).

Data Processing Description

Dataset version 1 (2022-12-01):
- File "Egg PCR Final Data 2020-2022.xlsx" (submitted 2022-07-08 by email) was imported into the bco-dmo data system.
- Converted dates to format (YYYY-MM-DD)
- Adjusted field/parameter names to comply with BCO-DMO naming conventions
- Added columns for Latitude and Longitude
- Added a conventional header with dataset name, PI names, version date

Dataset version 2 (2023-09-19):
* Sheet 1 of file "Egg PCR Final Data 2020-2022.xlsx" (submitted by email Jun 22, 2023) was imported into the BCO-DMO data system.

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Data Files

File
878631_v2_egg_pcr.csv (Comma Separated Values (.csv), 24.99 KB) MD5:8ebd64a43c53056c43df370dccf4c340 Primary data table for dataset 878631 version 2

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Supplemental Files

File
Species List and Taxonomic Identifiers filename: 878631_species_list.csv (Comma Separated Values (.csv), 605 bytes) MD5:7694dad49fa3f919cf0957c8437548bd Species list for this dataset. This table provides the scientific names for the common names provided as the dataset column names. The scientific names were added from names provided in related BCO-DMO dataset 908171 "Stable Isotope measurements – field and lab samples". Scientific names for Black Drum and Gulf Kingfish added using the names provided in the methods reference for this dataset Carreon-Martinez et al., (2010). Column information: Column_name_in_dataset, The column name in the data table for this dataset which is an organism common name Scientific_name, Corresponding scientific name for the common name AphiaID, Taxonomic identifier (AphiaID, see World Register of Marine Species) LSID, Lifescience identifier (LSID)

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Related Publications

Carreon-Martinez, L. B., Holt, S. A., Nunez, B. S., Faulk, C. K., & Holt, G. J. (2010). The use of polymerase chain reaction for the identification of sciaenid eggs. Marine Biology, 157(8), 1889–1895. https://doi.org/10.1007/s00227-010-1441-5
Methods

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Parameters

Parameter	Description	Units
Egg_size	Size of the egg collected	millimeters
Collection_date	date of egg collection in format: YYYY-MM-DD	unitless
UIN	Unique identifiction number	unitless
Site	location where sample was collected (FAML: pier at in Corpus Christi Channel, Port Aransas, TX, United States, Fisheries and Mariculture Laboratory of the University of Texas Marine Science Institute (lat. 27.8396111, lon. -97.0827222); MI: Mud Island in Aransas Bay, TX, United States (lat. 27.9362222, lon. -97.0217777))	unitless
Latitude	latitude North of sample collection	decimal degrees
Longitude	longitude East (West is negative) of sample collection	decimal degrees
DNA_extraction_date	Date DNA was extracted from egg in format YYYY-MM-DD	unitless
Date_analyzed	Date PCR was run in format YYYY-MM-DD	unitless
Red_Drum	Eggs positively (POS) or negatively (NEG) identified as red drum based on the presence of species specific NADH band on gel electrophoresis	unitless
Gulf_Kingfish	Eggs positively (POS) or negatively (NEG) identified as Gulf kingfish based on the presence of species specific NADH band on gel electrophoresis	unitless
Southern_Kingfish	Eggs positively (POS) or negatively (NEG) identified as southern kingfish based on the presence of species specific NADH band on gel electrophoresis	unitless
Spotted_Seatrout	Eggs positively (POS) or negatively (NEG) identified as spotted seatrout based on the presence of species specific NADH band on gel electrophoresis	unitless
Atlantic_Croaker	Eggs positively (POS) or negatively (NEG) identified as atlantic croaker based on the presence of species specific NADH band on gel electrophoresis	unitless
Black_Drum	Eggs positively (POS) or negatively (NEG) identified as black drum based on the presence of species specific NADH band on gel electrophoresis	unitless

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Instruments

Dataset-specific Instrument Name	Aria Mx Real-Time PCR System, Agilent Technologies
Generic Instrument Name	Thermal Cycler
Generic Instrument Description	A thermal cycler or "thermocycler" is a general term for a type of laboratory apparatus, commonly used for performing polymerase chain reaction (PCR), that is capable of repeatedly altering and maintaining specific temperatures for defined periods of time. The device has a thermal block with holes where tubes with the PCR reaction mixtures can be inserted. The cycler then raises and lowers the temperature of the block in discrete, pre-programmed steps. They can also be used to facilitate other temperature-sensitive reactions, including restriction enzyme digestion or rapid diagnostics. (adapted from http://serc.carleton.edu/microbelife/research_methods/genomics/pcr.html)

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Project Information

Counter-gradient Flow of Fatty Acids in Marine Food Webs Through Egg Boons (Egg Boon Food Webs)

Coverage: Gulf of Mexico estuary at Port Aransas, Texas

NSF Award Abstract:
Marine animals release extremely large numbers of eggs when they spawn. Most of these eggs are eaten by animals ranging from microscopic plankton to fish. Many egg consumers are smaller than the animals that released the eggs, representing a reversal of the usual food web. The consumption of eggs provides animals with highly nutritious molecules called essential fatty acids which are very concentrated in eggs. These essential fatty acids are important for the health of animals and the health of the whole ecosystem. When marine fishes form spawning aggregations to coordinate the timing and location of spawning, they release trillions of eggs. This results in an "egg boon" an immense but temporary concentration of highly nutritious fatty acids. This project combines field-based sampling with laboratory experiments to assess how fatty acids in the egg boons affect food webs. The project is determining whether consumption of eggs is beneficial to the condition of the egg consumers. New findings from this project are advancing the understanding of aquatic food webs and contributing to improved management of marine resources. For example, commercial harvest of fish can remove tons of fatty acids from an ecosystem by reducing egg boons and leading to cascading and unforeseen effects on those biological communities. The project is fostering the participation of women in science by substantially advancing the professional training of a female postdoctoral fellow. The project is supporting K-12 STEM education through inquiry-based and place-based programs for teachers and youth. Findings are being communicated to the public locally and nationally through participation in public lectures and contributions to the Science and the SeaTM radio program, podcast, and website.

Super-abundances of eggs released in temporally and spatially discrete patches create pulsed nutritional resources for egg consumers, called "egg boons", which are potentially important components of marine food webs. While various marine animals have been shown to consume eggs, the role of egg boons in energy transfer through food webs has received little attention. Three hypotheses are being tested: 1) egg boons provide a pathway through which essential fatty acids (EFAs) are redistributed counter to the main direction of trophic flow; 2) stores of EFAs in egg consumers increase during egg boons and remain elevated after the spawning season; and 3) egg boons are beneficial to the condition of egg consumers. The proposed research takes advantage of an annual egg boon produced by a spawning aggregation of the marine fish, red drum (Sciaenops ocellatus) near Port Aransas, Texas. In a combination of field sampling and laboratory experiments, fatty acid profiles, lipid content, and bulk stable isotope ratios are measures used to define trophic links between the egg boon and a selection of lower-trophic-level taxa. Egg boons are simulated in laboratory feeding experiments that are designed to enhance interpretation of data collected from field based sampling by comparing taxa that consume fish eggs with those that do not. A nucleic acid biomarker (RNA/DNA ratios) is being used to assess changes in condition that can be attributed to egg consumption in target taxa. In the environment, the importance and persistence of counter-gradient flow of fatty acids in the food web is being gauged through comparisons of samples taken inside and outside the spatial and temporal extent of the egg

boon. The effects of egg consumption on consumers is being quantified in controlled experiments to identify dietary biomarkers of egg consumption in consumer tissues that can be applied to field samples. The proposed research examines how egg consumption redistributes EFAs within food webs and provides a context for considering potential controls and trophic bottlenecks that cannot be explained from the traditional element-limitation models. The integration of fatty acid and stable isotope approaches is expected to provide greater resolution for tracking organic matter through food webs and to advance the application of multi-tracer techniques in trophic investigations. Further, if egg boons are indeed an important nutritional subsidy to select groups of consumers, then subsequent studies investigating the energetic contribution of egg boons to secondary production in marine food webs are warranted. An analysis of how reduction or removal of egg resources through the harvest of fishes in spawning aggregations changes nutrient flow in food webs could have implications for ecosystem-based fisheries management.

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Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-2023618

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