Fatty acid measurements for various marine samples collected from the Gulf of Mexico Estuary near Port Aransas, Texas from 2020 to 2022 as well as of red drum eggs spawned from captive adults from 2020 to 2022

Website: https://www.bco-dmo.org/dataset/908698
Data Type: Other Field Results
Version: 1
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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Nair, Parvathi	University of Texas - Marine Science Institute (UTMSI)	Co-Principal Investigator
Heyl, Taylor	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager
York, Amber D.	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Fatty acid measurements for various marine samples collected from the Gulf of Mexico Estuary near Port Aransas, Texas from 2020 to 2022, as well as eggs and food sources from the laboratory and commercial sources from 2020 to 2022.

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Coverage

Spatial Extent: **N**:27.9362 **E**:-97.0218 **S**:27.6469 **W**:-97.3150222
Temporal Extent: 2020-07-01 - 2023-03-21

Methods & Sampling

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); TPWD: Texas Parks and Wildlife Department, Corpus Christi, TX, United States (lat. 27.646877, lon. -97.3150222))

Methods and Sampling:

A sampling of likely egg consumers, egg non-consumers, pelagic plankton, and benthic sediments began in July 2020 and ended in March 2022. Samples were collected from two field sites, one in the vicinity of the Red Drum spawning aggregation (Aransas Pass Inlet) and the other outside the extent of the egg boon (Mud Island

in Aransas Bay) by deploying a 500-micron (µm) mesh plankton net. Animals in the plankton net were sorted immediately after collection and transferred to holding tanks to evacuate their guts for 3-4 hours. Each sample was then rinsed twice in distilled water and frozen at -80°C for subsequent fatty acid analysis.

Basal resources were collected by pumping seawater from the Aransas Pass Channel adjacent to the University of Texas Marine Science Institute's Fisheries and Mariculture Laboratory and filtering the seawater through sieves of three different mesh sizes to obtain three size fractions of plankton samples (10-60 µm, 100-200 µm, and 200-500 µm). Bottom sediment was collected using a grab sampler and passed through a 60-µm sieve to obtain benthic particulate organic matter. Samples of jellyfish and small fishes were taken with dip nets, cast nets, or seines and processed as described above for analysis.

Fatty acid profiles were measured for samples of fish eggs, marine animals, and basal resources collected from the field as well as eggs and marine animals used in laboratory experiments. The time between collection and analysis ranged from 2 months to a year.

For fatty acid analysis, each sample was lyophilized, homogenized, and weighed. Lipids were cold extracted from a known subsample (by weight) of the homogenized and lyophilized tissue using chloroform/methanol/water (8:4:3 v/v) following the method of Folch et al. (1957. Journal of Biological Chemistry 226:497–507) with 0.01% (w/v) butylated hydroxytoluene as an antioxidant. For small taxa or taxa with low lipid content (e.g., ctenophores), several individuals were pooled into one sample. Fatty acid methyl esters (FAME) were prepared by transesterification with 14% boron trifluoride in methanol (Morrison and Smith 1964. Journal of Lipid Research 5:600–608) following saponification of the total lipid using 0.5M potassium hydroxide in methanol. FAMEs were measured by gas chromatography with flame ionization detector following procedures described by Faulk and Holt (2005. Aquaculture 249:231–243). Measurements were expressed in terms of concentration (mg per g dry weight) and composition (% of total fatty acids). Fatty acids were identified by comparison with commercial standards.

Known Issues:
Quality control procedure
Principal components analysis for each taxon was performed on the mg g-1 dw and percent total fatty acids data, separately. Individual samples for which the score on the first or second principal component axis were greater than 4 standard deviations from the taxon mean were removed from the data set.

A primary check value was assigned as follows:

1 Perfectly fine

2 Data not evaluated because of too few data points for principal components analysis

The quantification limit for individual fatty acids is 0.013 mg g-1 dry weight

Measured values of any fatty acid less than 0.013 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%.

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

Identified peaks from the gas chromatograms were quantified using commercial FAME standards, such as Supelco 37 Component FAME mix, polyunsaturated fatty acid mix no. 3 (PUFA-3), and bacterial acid methyl ester mix (BAME).

BCO-DMO Processing Description

BCO-DMO Data Manager Processing Notes:
* Sheet 1 of file "Field FA data 2020-2022.xlsx" (submitted jun 22, 2023 by email) was imported into the BCO-DMO data system with values "NA" as missing data values.
** Missing data values are displayed differently based on the file format you download. They are blank in csv

files, "NaN" in MatLab files, etc.
* Column names adjusted to conform to BCO-DMO naming conventions designed to support broad re-use by a variety of research tools and scripting languages. [Only numbers, letters, and underscores. Can not start with a number]
* Dates converted to ISO 8601 format
* one instance of FAMl with lowercase l changed to FAML for consistency with the rest of the dataset and related datasets.
* lat lon columns added from locations in metadata
* updated longitude for site TPWD (update provided by submitter) lon. -97.3150222

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Data Files

File
908698_v1_fatty_acid_field-animals_lab-eggs.csv (Comma Separated Values (.csv), 555.07 KB) MD5:4d0943ecada08bbbb1fcd4fa2d23f6d5 Primary data table for dataset 908698 version 1

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Supplemental Files

File
Species List and Taxonomic Identifiers filename: 908698_species_list.csv (Comma Separated Values (.csv), 6.27 KB) MD5:532bdea38c345436d6a5a2b1b198a080 Unique species list for this dataset with the matched taxonomic identifiers. Match performed using the World Register of Marine Species (WoRMS) taxa match tool on 2023-12-05. All exact matches to known taxonomic names. Taxon_in_dataset "Salpa" for "salps" was matched to family taxon Salpidae. columns: Taxon_in_dataset, Taxon(category) name in the dataset which may contain lifestage terms as well as taxon name (e.g. "Sciaenops ocellatus lab eggs"). ScientificName, Taxon name matched to the "Taxon_in_dataset" which does not include lifestage terms or sp. Common_name_in_dataset, Common name in the dataset for the category AphiaID, Taxonomic identifier (AphiaID) for the taxonomic name used in the dataset (see World Register of Marine Species) LSID, Lifesciences Identifier (LSID) for the taxonomic name used in the dataset. Taxon status, Status of the name used in the dataset (denotes if the currently accepted name or a currently unaccepted synonym as of the date 2023-12-05) ScientificName_accepted, The currently accepted name for the taxonomic name used in the dataset. AphiaID_accepted, The taxonomic identifier (AphiaID) for the currently accepted name (see World Register of Marine Species)

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Parameters

Parameter	Description	Units
Taxon	Taxonomic grouping of sample	unitless
Common_name	Common name of sample	unitless
Sample_ID	Sample identifier for a taxon on a sampling date	unitless

Year	Year sample was collected	unitless
Month	Month sample was collected	unitless
Date_collected	Date sample was collected. ISO 8601 format	unitless
Date_analyzed	Date sample was collected. ISO 8601 format	unitless
Classification	Taxonomic group to which sample belongs	unitless
Notes	Notes about sample	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; MI: Mud Island in Aransas Bay, TX, United States; TPWD: Texas Parks and Wildlife Department, Corpus Christi, TX, United States.	unitless
lat	Site latitude	decimal degrees
lon	Site longitude	decimal degrees
Length	Bell diameter in centimeter for cnidarians; total length in centimeter for fish; carapace length in centimeter for crabs	centimeters (cm)
Primary_check	Primary QC check	unitless
C14_pt_0_mg	measured value of fatty acid 14:0 ; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C15_pt_0_mg	measured value of fatty acid 15:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C16_pt_0_mg	measured value of fatty acid 16:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)

C16_pt_1n7_mg	measured value of fatty acid 16:1n-7; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C16_pt_2n4_mg	measured value of fatty acid 16:2n-4; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
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C16_pt_3n4_mg	measured value of fatty acid 16:3n-4; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C17_pt_1_mg	measured value of fatty acid 17:1; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_0_mg	measured value of fatty acid 18:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_1n9_mg	measured value of fatty acid 18:1n-9; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_1n7_mg	measured value of fatty acid 18:1n-7; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_2n6_mg	measured value of fatty acid 18:2n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_3n6_mg	measured value of fatty acid 18:3n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)

C18_pt_3n4_mg	measured value of fatty acid 18:3n-4; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_3n3_mg	measured value of fatty acid 18:3n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C18_pt_4n3_mg	measured value of fatty acid 18:4n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C20_pt_1n9_mg	measured value of fatty acid 20:1n-9; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
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C20_pt_5n3_mg	measured value of fatty acid 20:5n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)

C22_pt_1n11_mg	measured value of fatty acid 22:1n-11; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C22_pt_4n6_mg	measured value of fatty acid 22:4n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C22_pt_5n6_mg	measured value of fatty acid 22:5n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C22_pt_5n3_mg	measured value of fatty acid 22:5n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C22_pt_6n3_mg	measured value of fatty acid 22:6n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C20_pt_0_mg	measured value of fatty acid 20:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
Ci_15_pt_0_mg	measured value of fatty acid iso-15:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C14_pt_1_mg	measured value of fatty acid 14:1; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
Ci_17_pt_0_mg	measured value of fatty acid iso-17:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
Ca_15_pt_0_mg	measured value of fatty acid anteiso-15:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)

Ci_16_pt_0_mg	measured value of fatty acid iso-16:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	milligrams per gram dry weight (mg g-1 dw)
C14_pt_0_pct	measured value of fatty acid 14:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C15_pt_0_pct	measured value of fatty acid 15:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
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C16_pt_1n7_pct	measured value of fatty acid 16:1n-7; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C16_pt_2n4_pct	measured value of fatty acid 16:2n-4; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C17_pt_0_pct	measured value of fatty acid 17:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C16_pt_3n4_pct	measured value of fatty acid 16:3n-4; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C17_pt_1_pct	measured value of fatty acid 17:1; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C18_pt_0_pct	measured value of fatty acid 18:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids

C18_pt_1n9_pct	measured value of fatty acid 18:1n-9; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C18_pt_1n7_pct	measured value of fatty acid 18:1n-7; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C18_pt_2n6_pct	measured value of fatty acid 18:2n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
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C18_pt_4n3_pct	measured value of fatty acid 18:4n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C20_pt_1n9_pct	measured value of fatty acid 20:1n-9; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C20_pt_2n6_pct	measured value of fatty acid 20:2n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
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C22_pt_1n11_pct	measured value of fatty acid 22:1n-11; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C22_pt_4n6_pct	measured value of fatty acid 22:4n-6; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
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C22_pt_6n3_pct	measured value of fatty acid 22:6n-3; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C20_pt_0_pct	measured value of fatty acid 20:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids

Ci_15_pt_0_pct	measured value of fatty acid iso-15:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
C14_pt_1_pct	measured value of fatty acid 14:1; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
Ci_17_pt_0_pct	measured value of fatty acid iso-17:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
Ca_15_pt_0_pct	measured value of fatty acid anteiso-15:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids
Ci_16_pt_0_pct	measured value of fatty acid iso-16:0; quantification limit is 0.00044 mg g-1 dry weight; Measured values less than 0.00044 mg g-1 dw were changed to 0.000 mg g-1 dw and its corresponding value for percentage of total fatty acids was changed to 0.0%	% total fatty acids

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Instruments

Dataset-specific Instrument Name	Shimadzu GC-2014 gas chromatograph with a flame ionization detector
Generic Instrument Name	Gas Chromatograph
Generic Instrument Description	Instrument separating gases, volatile substances, or substances dissolved in a volatile solvent by transporting an inert gas through a column packed with a sorbent to a detector for assay. (from SeaDataNet, BODC)

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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:

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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