

Data Documentation

Dataset Information

Dataset Title:

NOAA RESTORE Science Program: Gulf-wide assessment of habitat use and habitat-specific production estimates of nekton in turtlegrass (*Thalassia testudinum*): Nekton and primary producer stable isotopes in turtlegrass-dominated seagrass beds in the northern Gulf of America (formerly Gulf of Mexico), 2018-05-23 to 2018-10-3

Description:

This dataset consists of stable isotope data from turtlegrass-dominated seagrass beds of the northern Gulf of America (formerly Gulf of Mexico), including Lower Laguna Madre, TX; Coastal Bend, TX; Chandeleur Islands, LA; St. George Sound, FL; Cedar Key, FL, and Charlotte Harbor, FL. Data are in spreadsheet format.

Purpose:

The overarching goal of this project is to conduct a management-driven, Gulf of America (formerly Gulf of Mexico)-wide assessment of the use of turtlegrass as habitat by nekton and to evaluate the support provided to blue crabs, a commercially valuable species, using habitat-specific production estimates. This project was a collaboration between The University of Southern Mississippi, Dauphin Island Sea Lab, University of Florida, and Florida Fish and Wildlife Research Institute.

The data in this accession were funded by the NOAA RESTORE Science Program (ROR - <https://ror.org/0042xzm63>) under award NA17NOS4510093 to The University of Southern Mississippi.

Methods:

Sample Collection

Nekton and primary producer sources were collected from May23–October 3, 2018 at six sites spanning the range of turtlegrass distribution in the Northern GOM. Two sites were located in Texas (Lower Laguna Madre [LM] and the Texas Coastal Bend [CB]), one site in Louisiana (Chandeleur Islands [LA]), and three sites in Florida, (St. George Sound [AP], Cedar Key [CK], and Charlotte Harbor [CH]).

Sampling stations at each of the six sites were chosen using a stratified random sampling method of hexagonal tessellation in which a grid of hexagons (500 or 750 m edge) was overlaid on the mapped areal extent of known turtlegrass cover at each site, and 25 hexagons with > 50% turtlegrass cover were randomly selected to conduct surveys. In cases where no turtlegrass was found at a station, or stations were inaccessible, alternative hexagons were chosen and new stations were randomly generated. Mean distance between the farthest sampling stations at each site was 22.5 ± 2.4 km (Laguna Madre, TX = 20 km, Coastal Bend, TX = 20 km, Chandeleur Islands, LA = 24 km, Saint George Sound, FL = 21 km, Cedar Key, FL = 25 km, and Charlotte Harbor = 25 km).

All animal and vegetation samples were collected as part of a survey to assess nekton habitat use in turtlegrass environments. Larger nekton and drift macroalgae samples were collected at each site using a 4.8 m flat trawl towed from a boat for 2–3 minutes at a speed of 3.7–5.6 km min⁻¹, and smaller nekton and additional macroalgae samples were collected using an 0.75 m wide epibenthic sled pulled by hand a distance of 13.3 m at a speed of ~0.3 m s⁻¹. All individuals were measured for standard length (SL) and total length (TL) (carapace width, CW, for crabs) prior to processing to account for changes in $\delta^{15}\text{N}$ values related to diet changes with size, and were identified to the lowest practical taxonomic level. Because of logistical difficulties in identifying different macroalgae species, macroalgae samples were identified based on functional traits and major taxa grouping (e.g., Rhodophyta, red branching macroalgae). At each site, trawl and epibenthic sled surveys were conducted on different days to prevent disturbance to the habitat. Approximately five individuals of each species collected at each site were retained for analysis. Vascular plant samples of all seagrass species and adjacent marsh species were collected by hand at a subset of five stations across each site. All epiphytes present on macrophyte leaves were removed by gently scraping with a razor blade and macroalgae samples were picked free of visible meiofauna and detritus to avoid isotopic signature contamination. Benthic microalgae (BMA) were collected at a subset of five stations at each site using a glass plate collector methodology (Dillon et al. 2015), in which paired collector plates were partially pushed in the sediment at each station, retrieved after one week, rinsed to remove sediment, separated, and scraped to collect microalgae. Suspended particulate organic matter (POM) samples were collected at five representative stations at each site using 60 mL plastic syringes with 2.5 cm glass fiber filters. All nekton and primary producer samples were transported on ice and frozen at the Gulf Coast Research Lab, The University of Southern Mississippi prior to isotopic analysis.

A subset of 30 common nekton taxa representing multiple trophic levels, feeding strategies, and ecological niches were collected and used for stable isotope analyses, including five seagrass species (turtlegrass, shoal grass, manatee grass, widgeon grass, and star grass), two mangrove species (*Avicennia germinans* and *Rhizophora mangle*), two C3 marsh plant species (*Phragmites* sp. and *Juncus roemerianus*), two C4 marsh plant species (*Sporobolus alterniflorus* and *Sporobolus pumilus*), 20 macroalgae groups, POM samples, and BMA samples. Small invertebrates, primary producers, fish, and POM samples were processed whole, whereas subsamples of muscle tissue were taken from larger fish and invertebrates such as pinfish (*Lagodon rhomboides*), pigfish (*Orthopristis chrysoptera*), and inshore lizardfish (*Synodus foetens*). Smaller individuals for some taxa (e.g., Hippolytid shrimp) within a single collection at each station were combined to achieve enough mass for isotopic analysis.

Nekton and primary producer samples were rinsed with deionized (DI) water to remove sediment, dried to a constant weight at 60°C using a drying oven, then ground to a fine powder using either a mortar and pestle or a Wiley mill equipped with a #20 or #40 mesh delivery tube. Samples were stored in clean scintillation vials in desiccators prior to analysis and POM samples were acid fumed for 24 hrs using concentrated hydrochloric acid (HCl) to remove inorganic carbonates. All macroalgae taxa were rinsed once with 10% HCl and three times with DI water to remove inorganic carbonates. After each DI water rinse, samples were shaken vigorously using a Vortex mixer (GENIE SI-0235, Scientific Industries), centrifuged, and decanted. Following the final rinsing, acid washed samples were dried in a drying at 60°C for 24 hrs. Acid-washed portions of macroalgae samples were used for carbon isotope analysis and unwashed portions were used for nitrogen analysis because acid washing is known to bias $\delta^{15}\text{N}$ values (Pinnegar & Polunin 1999). Samples were packed into tin capsules and analyzed for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ signatures following standardized protocols (Levin & Currin 2012, Olsen et al. 2014) using continuous-flow stable isotope ratio mass spectrometry (CF-IRMS) with a Costech 93 Elemental Combustion System

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coupled to a Thermo-Fisher Scientific Delta V Advantage Isotope Ratio Mass Spectrometer at the Gulf Coast Research Lab Stable Isotope Facility.

Most (95%) nekton and primary producer samples were analyzed in duplicate, aside from some samples with limited material and POM samples, which were analyzed as single samples (5%). Carbon and nitrogen stable isotope values were calculated according to the formula

$$\delta X = [(R_{\text{sample}}/R_{\text{standard}}) - 1] \times 10^3$$

where X is ¹³C or ¹⁵N and R is the ratio of heavy to light isotopes (¹³C/¹²C or ¹⁵N/¹⁴N) for the samples or the standard (PeeDee belemnite [PDB] carbon or atmospheric dinitrogen [N₂]).

Cited Publications:

- Levin LA, Currin C (2012) Stable isotope protocols: sampling and sample processing. Scripps Institution of Oceanography, University of California, San Diego, <https://escholarship.org/uc/item/3jw2v1hh>
- Olsen Z, Fulford R, Dillon K, Graham W (2014) Trophic role of gulf menhaden *Brevoortia patronus* examined with carbon and nitrogen stable isotope analysis. Marine Ecology Progress Series 497:215-227. DOI: 10.3354/meps10519

Associated Datasets:

- Darnell, Kelly M.; Darnell, M. Zachary; Smee, D. Lee; Martin, Charles W.; Hall, Margaret O.; Furman, Bradley. (2024). NOAA RESTORE Science Program: Gulf-wide assessment of habitat use and habitat-specific production estimates of nekton in turtlegrass (*Thalassia testudinum*): Nekton abundance, size, biomass, and associated environmental parameters in turtle-grass dominated seagrass beds in the northern Gulf of America (formerly Gulf of Mexico), 2018-05-14-2019-09-06. NOAA National Centers for Environmental Information. Dataset. [in prep]
- NOAA RESTORE Science Program: Gulf-wide assessment of habitat use and habitat-specific production estimates of nekton in turtlegrass (*Thalassia testudinum*): Blue crab growth and mortality rates, 2018-05-14 to 2018-08-15. NOAA National Centers for Environmental Information. Dataset. [in prep]

People & Projects

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Partners:

- The University of Southern Mississippi
- Dauphin Island Sea Lab
- University of South Alabama
- University of Florida
- Florida Fish and Wildlife Research Institute

Funding:

- US DOC; NOAA; NOS; NCCOS; RESTORE Science Program (ROR - <https://ror.org/0042xzm63>)
Award Number: NA17NOS4510093

Associated Online Resources:

- National Centers for Coastal Ocean Science. 2020. RESTORE Sponsored Research Project: Gulf-wide assessment of habitat use and habitat-specific production estimates of nekton in turtlegrass (*Thalassia testudinum*).
<https://inport.nmfs.noaa.gov/inport/item/66730>
- RESTORE Project, Gulf-wide assessment of habitat use and habitat-specific production estimates of nekton in turtlegrass (*Thalassia testudinum*)
<https://restoreactscienceprogram.noaa.gov/projects/turtlegrass>
- Project website: <http://www.darnellseagrasssecologylab.com/turtlegrass>

Extents

Start Date: 2018-05-23

End Date: 2018-10-03

Northern Boundary: 29.98204

Southern Boundary: 26.0819

Western Boundary: -97.2812

Eastern Boundary: -82.0594

Keywords

Sea Areas, Water Bodies, Marine Protected Areas:

- Gulf of America (formerly Gulf of Mexico)
- Laguna Madre, Texas
- Redfish Bay, Texas
- Chandeleur Sound, Louisiana
- St. George Sound, Florida
- Charlotte Harbor, Florida

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- Breton National Wildlife Refuge
- Apalachicola, FL
- Coastal Bend, TX
- Cedar Key, FL

NCCOS Keywords:

- NCCOS Research Topic > Ecological and Biogeographic Assessments
- NCCOS Research Location > Region > Gulf of America (formerly Gulf of Mexico)
- NCCOS Research Data Type > Field Observation

File Information

Total File Size: 1.9 MB total, 3 files in 1 folder (unzipped), 427 KB (zipped)

Data File Format(s):

- .CSV

Data Files:

- isotope_master.csv

Documentation Files:

- BrowseGraphic.png
- DataDocumentation.PDF

Table 1: Data Dictionary: isotope_master.csv. This file contains one row per sample. Empty cells indicate not applicable for that sample.

Column	Variable	Label	Definition	Units	Range
1	row ID	row	Unique row designation for each sample	NA	NA
2	sample ID	ID	Unique ID number that is create by combining the site, sampling season (early or late), station number, and individual id number	NA	NA
3	site code	site	Sampling site across the northern Gulf. Sites include Lower Laguna Madre (LM), Coastal Bend (CB), Chandeleur Islands (LA), St. George Sound (AP), Cedar Key (CK), and Charlotte Harbor (CH)	NA	NA
4	sampling period	sample_period	Indicates when sample was collected in 2018, early or late summer. Early = May/June Late = September/October	NA	NA
5	station code	station	Unique station sample was collected at within a given site	NA	NA
6	sample latitude	lat	Latitude given in decimal degrees	decimal degrees	26.0818-29.9820

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7	sample longitude	long	Longitude given in decimal degrees	decimal degrees	-97.2812- -82.0594
8	sample type	sample_type	General organismal category of sample. Options include mangrove, c4 marsh plant, c3 marsh plant, POM, benthic microalgae, crab, epiphyte, macroalgae, fish, seagrass, sponge, shrimp	NA	NA
9	individual ID	individual_ID	Unique number associated with each specific sample	NA	1-11129
10	sampling date	date_collected	Date sample was collected	MM/DD/YYY	5/23/18- 10/3/18
11	dominant substrate	substrate	Substrate sample was collected in. Options include terrestrial, marine, bare, seagrass, and water	NA	NA
12	sampling gear	gear	Gear used to collect each sample. Options include: Hand-picked, filtered, razor, sled seagrass core, tether seagrass core, sled, and trawl	NA	NA
13	common name	species_common	Common name of species collected	NA	NA
14	scientific name	species_scientific	scientific name of species collected	NA	NA
15	drying date	date_dried	Date sample was dried prior to grinding for stable isotope analysis	MM/DD/YYY	1/15/20– 12/11/20
16	grinding date	date_ground	Date sample was ground prior to grinding for stable isotope analysis	MM/DD/YYY	1/22-20- 12/14/20
17	packing date	date_packed	Date sample was packed into stable isotope tins	MM/DD/YYY	2/6/20- 12/14/20
18	tray name	tray_name	SI tray sample was packed in	NA	NA
19	analyzed date	date_analyzed	Date sample was analyzed using Mass spec at GCRL Stable Isotope Lab	MM/DD/YYY	3/4/20- 10/15/20
20	acidification date	date_acidified	Date sample was acidified using HCl to remove carbonates (only used for samples high in calcium carbonate)	MM/DD/YYY	10/27/20- 1/14/21
21	repacked date	date_packed_2	Date sample was packed into stable isotope tins for reanalysis	MM/DD/YYY	7/16/20- 1/15/21
22	tray name 2	tray_name_2	SI tray sample was packed in for reanalysis	NA	NA
23	reanalyzed date	date_re_analyzed	Date sample was reanalyzed	MM/DD/YYY	8/28/20- 3/4/21
24	tray name 3	tray_name_3	SI tray sample was packed in for a second reanalysis	NA	NA
25	second repacked date	date_packed_3	Date sample was packed into stable isotope tins for second reanalysis	MM/DD/YYY	11/9/20- 1/15/21

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26	second reanalysis date	date_re_analyzed_2	Date sample was reanalyzed a second time	MM/DD/YYYY	3/4/21-3/4/21
27	standard length	sl_mm	Standard length of organism in mm	mm	12-225
28	total length	tl_mm	Total length of organism in mm	mm	6-271
29	carapace width	cw_mm	Carapace width of organism in mm (only used for crabs)	mm	6-125
30	filtered water	water_filtered_ml	Amount of seawater sample filtered through 2.5 cm glass fiber filter in 60 ml syringe	ml	50-790
31	sample dilution	sample_dilution	Dilution concentration used for sample in Mass spec	%	57-89
32	carbon amplitude	mean_ampl_44	The mean Carbon (44) amplitude recorded for the sample on the Mass spec in counts per second	cps	425-12333
33	nitrogen amplitude	mean_ampl_28	The mean Nitrogen (28) amplitude recorded for the sample on the Mass spec in counts per second	cps	449-6066.5
34	uncorrected $\delta^{13}\text{C}$ ratio	d 13C/12C	Raw stable isotope ratio of 13C over 12 C	‰	-40.013- -16.642
35	uncorrected $\delta^{15}\text{N}$ ratio	d 15N/14N	Raw stable isotope ratio of 15N over 14N	‰	-6.888-8.539
36	$\delta^{13}\text{C}$ correction	13C Correction	Correction applied to 13C values to account for variability in signal from Mass spec	‰	-0.29057142- 0.776
37	$\delta^{15}\text{N}$ correction	15N Correction	Correction applied to 15C values to account for variability in signal from Mass spec	‰	-0.163- 0.394571429
38	corrected $\delta^{13}\text{C}$ ratio	mean_Corrected 13C	13C values that have been corrected using 13C correction to account for variability in signal from Mass spec	‰	-40.3035714- -2.105
39	corrected $\delta^{15}\text{N}$ ratio	mean_Corrected 15N	15N values that have been corrected using 15N correction to account for variability in signal from Mass spec	‰	-7.051- 15.3758
40	$\delta^{13}\text{C}$ standard deviation	sdc13C	Standard deviation of the mean corrected 13C values for each sample (samples were done in duplicates)	‰	0- 1.923330445
41	$\delta^{15}\text{N}$ standard deviation	sdc15N	Standard deviation of the mean corrected 15N values for each sample (samples were done in duplicates)	‰	0- 3.151574924
42	percent nitrogen	mean_Amt%N	Mean percent nitrogen of the sample (samples were done in duplicates)	%	0.2653795- 21.0624
43	percent carbon	mean_Amt%C	Mean percent carbon of the sample (samples were done in duplicates)	%	11.8579298- 78.77160895

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44	sample C:N ratio	mean_C:N	Mean carbon to nitrogen ratio of the sample (Samples were done in duplicates)	NA	2.861893596-85.07309995
45	miligrams C	mean_mgC	Mean miligrams of carbon in sample	mg	0.04866141-1.633378053
46	miligrams N	mean_mgN	Mean miligrams of nitrogen in sample	mg	0.011123347-0.910037161
47	POM blank carbon amplitude	ave blank ampl 44	Average Carbon (44) amplitude signal for blank samples. This was used for calculating POM stable isotope ratios.	cps	792-1120
48	POM blank carbon fraction	fraction blank	Fraction of corrected POM sample associated with the blank correction	NA	0.066731533-0.357680723
49	POM sample carbon fraction	fraction sample	Fraction of corrected POM sample associated with the sample	NA	0.642319277-0.933268467
50	POM blank $\delta^{13}\text{C}$	del 13C blank	Carbon stable isotope ratio for POM blank samples	‰	-40.3035714-34.93792819
51	corrected POM blank $\delta^{13}\text{C}$	blank corrected 13C	Corrected carbon stable isotope ratio for POM samples using blanks to make correction for POM samples	‰	-28.0666525-14.62910088
52	POM miligrams C	mgC/L	Milligrams of carbon per liter for POM samples	mg C/L	0.158481593-2.349288398
53	POM miligrams N	mgN/L	Milligrams of nitrogen per liter for POM samples	mgN/L	0.037838008-0.314409046
54	POM micromoles C	uM C	Micromoles of Carbon in POM sample	uM	13.20679938-195.7740332
55	POM micromoles N	uM N	Micromoles of Nitrogen in POM sample	uM	2.702714857-22.457789
56	POM sample C:N ratio	molar C:N	Molar C:N ratio of POM sample	NA	4.886493796-14.34777735
57	POM acid carbon amplitude	acid_ampl_44	Carbon amplitude (44) of acid washed POM sample	cps	506-11427
58	POM acid nitrogen amplitude	acid_ampl_28	Nitrogen amplitude (28) of acid washed POM sample	cps	399-12055
59	acid corrected $\delta^{13}\text{C}$ ratio	acid_Corrected 13C	Carbon stable isotope ratio that has been corrected via acid washing	‰	-27.1983496-10.40524293
60	acid corrected $\delta^{15}\text{N}$ ratio	acid_Corrected 15N	Nitrogen stable isotope ratio that has been corrected via acid washing	‰	-0.731-9.9064
61	acid corrected	acid_Amt%N	Mean percent nitrogen of the acid washed sample (samples were done in duplicates)	%	0.5883761-5.4913108

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	percent nitrogen				
62	acid corrected percent carbon	acid_Amt%C	Mean percent carbon of the acid washed sample (samples were done in duplicates)	%	16.368052-49.3998432
63	acid corrected C:N ratio	acid_C:N	Mean C: N ratio in acid washed sample	NA	7.355416476-46.90764809
64	acid corrected miligrams C	acid_mgC	Mean miligrams of carbon in acid washed sample	mg	0.07401185-2.437341335
65	acid corrected miligrams N	acid_mgN	Mean miligrams of nitrogen in acid washed sample	mg	0.006960265-0.340179545
66	final $\delta^{13}\text{C}$ ratio	final13c	Final Carbon 13 stable isotope ratio for sample. This is the corrected value that should be used for all data analysis	‰	-29.5581202-3.243142857
67	final $\delta^{15}\text{N}$ ratio	final15n	Final Nitrogen 15 stable isotope ratio for sample. This is the corrected value that should be used for all data analysis	‰	-7.051-15.3758
68	final C:N ratio	final_cn	Final C:N ratio for sample. This is the corrected value that should be used for all data analysis	NA	2.861893596-152.7216586
69	final C:N ratio standard deviation	sd_cn	Final standard devition of the C:N ratio for the sample. This is the corrected value that should be used for all data analysis	‰	0-4.913003063
70	sample notes	notes	Relevant information about a specific sample	NA	NA

Document Information

Date: 2025-06-03

Resource Provider: NCCOS Data Manager, nccos.data@noaa.gov, US DOC; NOAA; NOS; National Centers for Coastal Ocean Science (NCCOS)

Comment: This data documentation describes data files archived as a NOAA NCEI data accession, and is intended to provide dataset-level metadata for the purposes of discovery, use, and understanding.

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