Concentrations of phospholipid-linked fatty acids (PLFAs) in the surface sediments of three marsh ponds in PIE-LTER (Rowley, MA) from 2014.

Website: https://www.bco-dmo.org/dataset/738160
Data Type: Other Field Results
Version: 1
Version Date: 2018-06-05

Project
» Eutrophication Effects on Sediment Metabolism and Benthic Algal-bacterial Coupling: An Application of Novel Techniques in a LTER Estuary (Benthic_PP_at_TIDE)

Contributors	Affiliation	Role
Spivak, Amanda	Woods Hole Oceanographic Institution (WHOI)	Principal Investigator
Ake, Hannah	Woods Hole Oceanographic Institution (WHOI BCO-DMO)	BCO-DMO Data Manager

Abstract
Concentrations of phospholipid-linked fatty acids (PLFAs) in the surface sediments of three marsh ponds in PIE-LTER (Rowley, MA). Data were collected over 11 weeks in the summer and fall of 2014.

Table of Contents

Coverage

Spatial Extent: **Lat**:42.738349 **Lon**:-70.809432
Temporal Extent: 2014 - 2014

Dataset Description

Concentrations of phospholipid-linked fatty acids (PLFAs) in the surface sediments of three marsh ponds in PIE-LTER (Rowley, MA). Data were collected over 11 weeks in the summer and fall of 2014.

Methods & Sampling

The three ponds are located in the high marsh (1.43-1.46 m above North American Vertical Datum of 1988) of the Plum Island Ecosystems – Long Term Ecological Research (PIE-LTER) site. Surface sediments were collected weekly for TOC, TN, $\delta^{13}C$, and $\delta^{15}N$ (June 25-August 13 and November 11-25, 2014). Cores (5 cm diameter x 2 cm deep) were collected from three 1 m^2 quadrats placed at random locations along two crisscrossing transects in each pond. Sediments were combined in combusted glass vials to form composite samples and stored (-80 °C) until analysis. Lipid biomarker compounds were extracted using a modified Bligh & Dyer (1959) method (Spivak and Reeve 2015). Sediments were extracted with a methanol : chloroform :

phosphate buffer saline mixture (2:1:0.8, v:v:v) using a microwave-accelerated reaction system (MARS6); samples were heated to 80°C for 10 min with continuous stirring. Samples were then partitioned and the organic phase removed. The total lipid extract was concentrated under N_2 and samples were eluted on silica gel columns with chloroform, acetone (F1/2), and methanol (F3) (Guckert et al. 1985). The F3 (phospholipids) was dried under N_2 and saponified with 0.5 M NaOH at 70°C for 4 h. Saponified samples were acidified and extracted 3 times with hexane. The extract was methylated with acidic methanol (95:5 methanol:HCl) and heated overnight at 70°C to form fatty acid methyl esters (FAME). Samples were analyzed with an Agilent 7890 gas chromatograph with the effluent split ~70:30 between a 5975C mass spectrometer and a flame ionization detector. Compounds were separated on an Agilent DB-5 ms column (60 m, 0.25 mm inner diameter, 0.25 µm film). FAME concentrations were quantified using methyl heneicosanoate as an internal standard. FAs are designated A:BωC, where A is the number of carbon atoms, B is the number of double bonds, and C is the position of the first double bond from the aliphatic '*ω*' end of the molecule. Iso- and anteiso refer to whether the methyl group of branched compounds is attached to the penultimate or antepenultimate carbon atom.

Data Processing Description

BCO-DMO Data Processing Notes:

-reformatted column names to comply with BCO-DMO standards
-reformatted date to "yyyy-mm-dd"
-filled in blank cells with "nd"

[table of contents | back to top]

Data Files

File
PLFA.csv (Comma Separated Values (.csv), 5.86 KB) MD5:04c6a3c6f452e3d5ad303159b5823805 Primary data file for dataset ID 738160

[table of contents | back to top]

Related Publications

Spivak, A. C., Gosselin, K. M., & Sylva, S. P. (2018). Shallow ponds are biogeochemically distinct habitats in salt marsh ecosystems. Limnology and Oceanography. doi:10.1002/lno.10797
Results
,
Methods

[table of contents | back to top]

Parameters

Parameter	Description	Units
Pond	Site number	unitless
Week	Week number	unitless

Season	Season at time of sampling	unitless
Tide	Tide type	unitless
Sampling_Date	Sampling date; yyyy/mm/dd	unitless
C12_0	Concentration C12 0	per mil
iso_C13	Concentration iso C13	per mil
anteiso_C13	Concentration anteiso C13	per mil
C13_0	Concentration C13 0	per mil
iso_C14	Concentration iso C14	per mil
C14_0	Concentration C14 0	per mil
iso_C15	Concentration iso C15	per mil
anteiso_C15	Concentration anteiso C15	per mil
C15_0	Concentration C15 0	per mil
iso_C16	Concentration iso C16	per mil
iso_16_1w9c	Concentration iso 16 1w9c	per mil
iso_16_1w9t	Concentration iso 16 1w9t	per mil
iso_16_1w7	Concentration iso 16 1w7	per mil
C16_0	Concentration C16 0	per mil
methyl_10_C16	Concentration 10 methyl C16	per mil
iso_C17	Concentration C17	per mil

anteiso_C17	Concentration anteiso C17	per mil
C17_1	Concentration C17 1	per mil
C17_0	Concentration C17 0	per mil
C18_4	Concentration C18 4	per mil
C18_2	Concentration C18 2	per mil
C18_1	Concentration C18 1	per mil
C18_0	Concentration C18 0	per mil
iso_C19_0	Concentration iso C19 0	per mil
C19_1	Concentration C19 1	per mil
C20_4w6	Concentration C20 4w6	per mil
C20_5w3	Concentration C20 5w3	per mil
C20_3	Concentration C20 3	per mil
C20_2	Concentration C20 2	per mil
C20_1	Concentration C20 1	per mil
C20_0	Concentration C20 0	per mil
C22_6w6	Concentration C22 6w6	per mil
C22_6w3	Concentration C22 6w3	per mil
C22_5w6	Concentration C22 5w6	per mil
C22_5w3	Concentration C22 5w3	per mil

C22_1	Concentration C22 1	per mil
C22_0	Concentration C22 0	per mil
C24_0	Concentration C24 0	per mil
C25_0	Concentration C25 0	per mil
C26_0	Concentration C26 0	per mil
C28_0	Concentration C28 0	per mil
C30_0	Concentration C30 0	per mil

[table of contents | back to top]

Instruments

Dataset-specific Instrument Name	Agilent 7890 gas chromatograph
Generic Instrument Name	Gas Chromatograph
Dataset-specific Description	Used to analyze samples
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)

Dataset-specific Instrument Name	Corer
Generic Instrument Name	Push Corer
Dataset-specific Description	Used for sediment samples
Generic Instrument Description	Capable of being performed in numerous environments, push coring is just as it sounds. Push coring is simply pushing the core barrel (often an aluminum or polycarbonate tube) into the sediment by hand. A push core is useful in that it causes very little disturbance to the more delicate upper layers of a sub-aqueous sediment. Description obtained from: http://web.whoi.edu/coastal-group/about/how-we-work/field-methods/coring/

[table of contents | back to top]

Deployments

Plum_Island

Website	https://www.bco-dmo.org/deployment/669365
Platform	shoreside Massachusetts
Start Date	2012-07-27
End Date	2012-08-15
Description	Plum Island, MA; LTER sites

[table of contents | back to top]

Project Information

Eutrophication Effects on Sediment Metabolism and Benthic Algal-bacterial Coupling: An Application of Novel Techniques in a LTER Estuary (Benthic_PP_at_TIDE)

Coverage: Plum Island Estuary, Rowley Massachusetts

Extracted from the NSF award abstract:
This project will address how rates of benthic microalgal production respond to eutrophication and geomorphological changes in human-impacted tidal creeks. Excess nutrient loading increases benthic algal biomass and likely stimulates production rates but the magnitude of nutrient and geomorphological effects on rates of production is unknown. Will changes in benthic algal productivity affect algal-bacterial coupling? Furthermore, how is algal-bacterial coupling affected by geomorphological changes, which may be exacerbated by excess nutrient loading but can also occur in pristine marshes?

This project will take advantage of the infrastructure of the TIDE project, a long-term saltmarsh eutrophication experiment at the Plum Island Ecosystem - Long Term Ecological Research site in Northeastern Massachusetts. Specifically, the PIs will measure benthic metabolism and examine algal- bacterial coupling in fertilized and ambient nutrient tidal creeks in the first field season. The following field season, they will compare sediment metabolism and carbon dynamics on slumped tidal creek walls (i.e. areas where low marsh has collapsed into the tidal creek) to that on the bottom of tidal creeks. In both years, gross and net production will be determined using an innovative triple oxygen isotope technique and traditional dissolved oxygen and inorganic carbon flux measurements. Comparisons between these methods will be useful in informing studies of sediment metabolism. Lipid biomarkers will be used to characterize the sources of organic matter to creek sediments, and stable isotope analysis of bacterial specific biomarkers to identify the sources of organic carbon utilized by sediment bacteria. The biomarkers will reveal whether sediment bacteria use organic matter substrates, such as benthic microalgal carbon, selectively or in proportion to availability. Overall, results from the proposed study will provide important information about how sediment carbon dynamics in shallow tidal creeks respond to long term eutrophication. Furthermore, findings will enhance understanding of the role of tidal creeks in coastal biogeochemistry.

[table of contents | back to top]

Funding

Funding Source	Award
NSF Division of Ocean Sciences (NSF OCE)	OCE-1233678

[table of contents | back to top]