Characterizing energy sources to saltmarsh consumers along a salinity gradient

Jill A. Olin1, Paola Lopez-Duarte2, Ken Able3, Joel Fodrie4, Olaf Jensen3, Charles Martin5, Mike Polito6, Brian Roberts7

1Michigan Technological University, 2University of North Carolina at Charlotte, 3Rutgers University, 4University of North Carolina at Chapel Hill, 5University of Florida, 6Louisiana State University, 7Louisiana Universities Marine Consortium

*jaolin@mtu.edu

DIVERSIONS – PULSE EVENTS

Saltmarshes are subject to a wide range of natural (e.g., herbivory, storms) and anthropogenic (e.g., oil spills, flow modifications) disturbances, all of which can affect ecosystem function. Efforts to restore ecosystem function by reintroducing tidal flow or otherwise restoring hydrologic patterns are being proposed to offset saltmarsh loss in Louisiana.

The construction of river diversions, such as the West Point a la Hache (WPH) siphon that reconnect the Mississippi River to adjacent estuaries to supply sediment and nutrients to downstream areas, has become core synergistic components of the Louisiana Coastal Master Plan.

Questions remain however as to how river diversions and changes in freshwater flow dynamics influence the ecological trajectory, food web structure, and function of saltmarsh.

To understand how river diversions influence these processes, our Objective is to identify and quantify the carbon use and pathways to nekton consumers experiencing different freshwater flow conditions.

Saltmarshes at varying distances from the WPH siphon near Port Sulfur, Barataria Bay, Louisiana were chosen and represent a salinity gradient with high (3.3-5.4 psu), moderate (4.4-6.2 psu), and low (6.1-11.0 psu) freshwater influence.

PRODUCTION TO CONSUMERS

Primary producers. Primary production sources were distinguished based on representative fatty acid biomarkers. Phytoplankton and Phytobenthos differ from vascular plants based on greater contributions of diatom and bacterial groups.

Carbon contribution to saltmarsh consumers. Consumers vary in their use of carbon resources. Gulf Killifish associated with detrital biomarkers. Atlantic Croaker and Spot associated with flagellate and diatom biomarkers. In contrast, Blue Crab showed no clear biomarker associations.

Carbon use differs across the salinity gradient. All consumers derive carbon from multiple sources, specifically detrital, benthic and pelagic pathways. Consumers at the low-influence, higher salinity site had greater contributions of carbon derived from vascular plants relative to other sites.

CONCLUSIONS & NEXT STEPS

Marsh consumers have the capacity to use different production resources across sites.

Vascular/Terrestrial plants contribute a greater proportion of carbon for 1st and 2nd consumers at higher salinity sites.

Measure of vascular plant biomass will be used to compare the availability of carbon as resources for consumers.

We will compare carbon flow derived from stable isotopes with nekton community abundance and composition during future periods of low (2018) and high freshwater (2019, 2020).

Acknowledgements. We thank G. Turner (LSU), T. Mauney (LSU), J. Johnson (LSU), T. Aepelbacher (LSU), N. Rabalais (LUMCON), W. Morrison (LUMCON), S. Zeigler (UNC), M. Shaw (Rutgers), J. Pincin (Rutgers), K. Plank (Rutgers NSF-REU), K. Faber (Rutgers NSF-REU), C. Noji (Rutgers), A. Vastano (Rutgers), K. Johnson (UWindsor), M. Arts (Ryerson), B. Jacobs (Ryerson). Funding for this research was provided by a grant from the BP/Gulf of Mexico Research Initiative to the CWC. The funding agency had no role in the design, execution or analyses associated with this project.