NUTRIENT OVER-ENRICHMENT AND BROWN TIDE RESULT IN LIGHT LIMITATION OF SEAGRASS COMMUNITIES IN THE INDIAN RIVER LAGOON

Brian E. Lapointe, Laura W. Herren, ***Rachel A. Brewton****, and Pamela Alderman*
Harbor Branch Oceanographic Institute, Florida Atlantic University, 5600 US 1, Fort Pierce, Florida, USA, 34946

Historically, extensive seagrass meadows were common throughout the Indian River Lagoon (IRL) in east-central Florida, USA. Between 2011 and 2017, widespread catastrophic seagrass losses (~ 95%) occurred in the IRL following unprecedented harmful algal blooms (HABs), including persistent brown tides (*Aureoumbra lagunensis*). Little is known about how dissolved nutrients and chlorophyll *a* are related to light limitation or how biochemical factors, such as the elemental composition (C:N:P) and stable isotope signatures ($\delta^{13}C$, $\delta^{15}N$), of seagrasses within the IRL relate to coverage. Accordingly, we conducted a survey from 2013 - 2015 at 20 sites to better understand these relationships. Results showed a negative correlation between DIN and salinity, indicating freshwater inputs as a DIN source. Seawater N:P ratios and chlorophyll *a* concentrations were higher in the urbanized, poorly-flushed northern IRL segments. K_d values were higher in the wet season and exceeded seagrass light requirements (0.8 m^{-1}) for restoration, demonstrating light limitation. Species distribution varied by location. *Halodule wrightii* was ubiquitous, whereas *Syringodium filiforme* was not found in the northernmost segments. *Thalassia testudinum* was only present in the two southernmost segments that had the lowest TDN and highest light availability (K_d). Blade %N and %P also frequently exceeded critical values of 1.8% and 0.2%, respectively, especially in the northern segments. Further, $\delta^{15}N$ was positively correlated with ammonium, suggesting wastewater as a major N source. The $\delta^{13}C$ values indicated a trend of increasing light limitation from south to north, which helps explain the recent catastrophic loss of seagrasses in the northern IRL. Overall, elemental composition reflected high N-availability and seagrass species distributions were relatable to spatial trends in N and light limitation. For effective restoration, resource managers must reduce N-loading to the IRL to diminish HABs and increase light availability. Regular biochemical monitoring of seagrass tissue should also be implemented during restoration efforts.

PRESENTER BIO: Ms. Brewton is a research coordinator with over 10 years of experience in water quality, fisheries, and ecosystem health. She has a diverse background conducting biological research in environments spanning from groundwater to offshore. She is a part-time Ph.D. student at Florida Atlantic University in the Geosciences department.