

# High Frequency Monitoring of Diel-Cycling and Episodic Hypoxia In Northern Gulf of Mexico Estuaries

Brandon M. Jarvis, James D. Hagy III, John C. Lehrter, and Michael C. Murrell

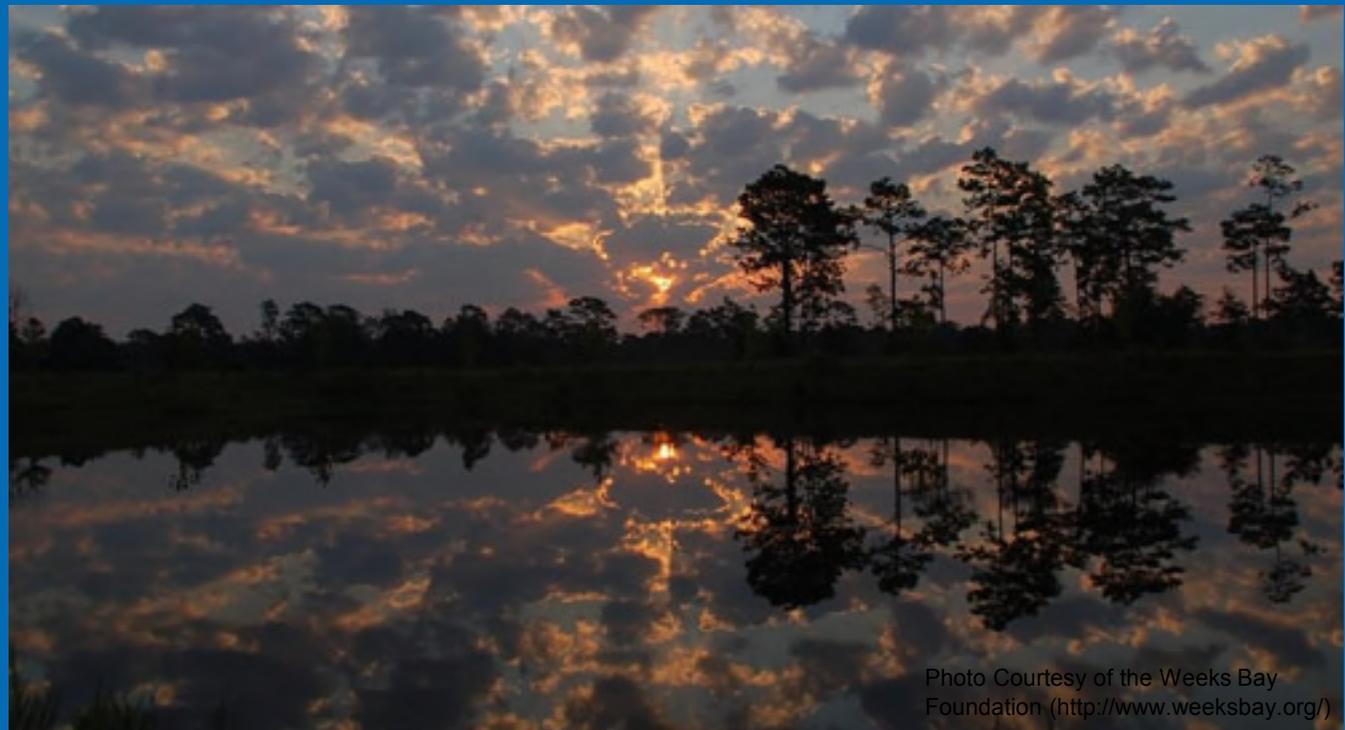
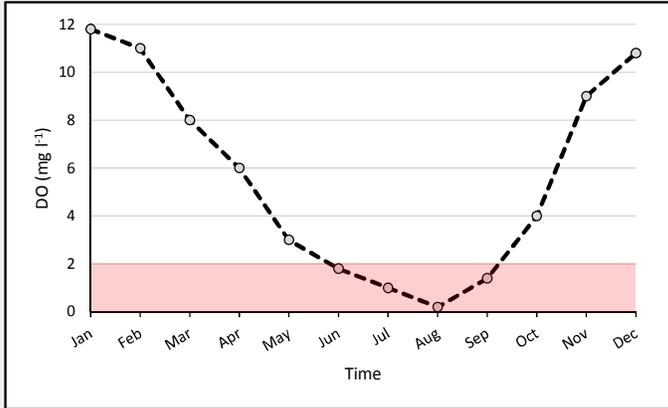


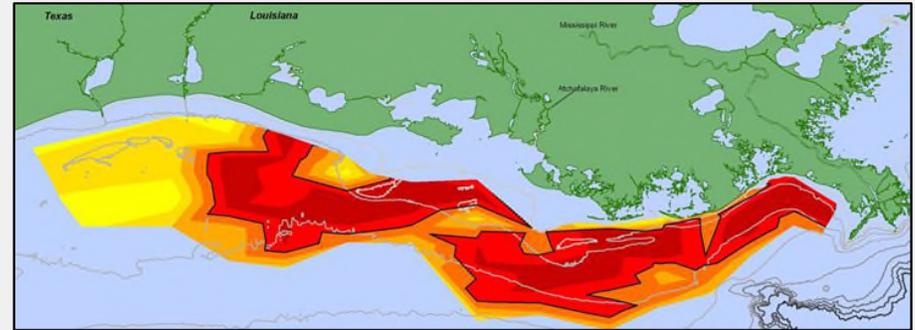
Photo Courtesy of the Weeks Bay  
Foundation (<http://www.weeksbay.org/>)

# Modes of Hypoxia

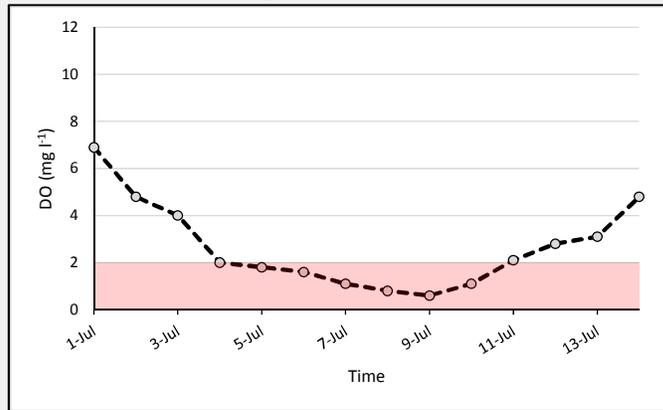
## Seasonal



Persistent stratification

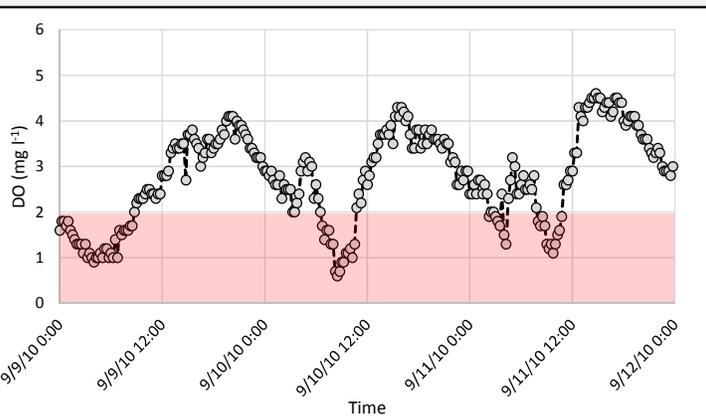


## Episodic



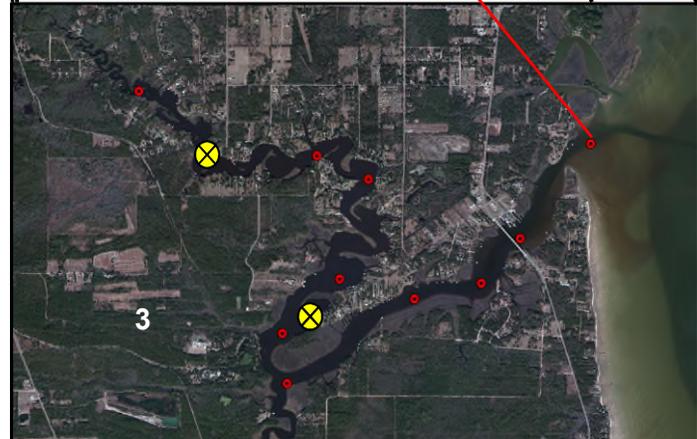
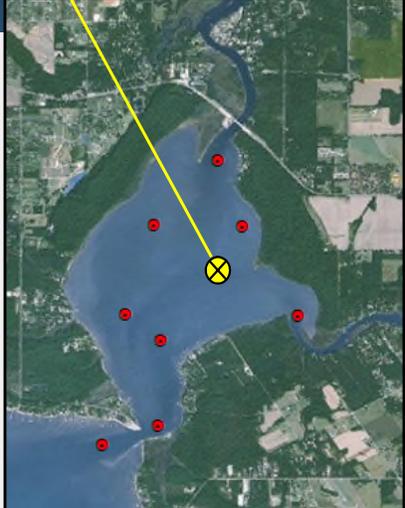
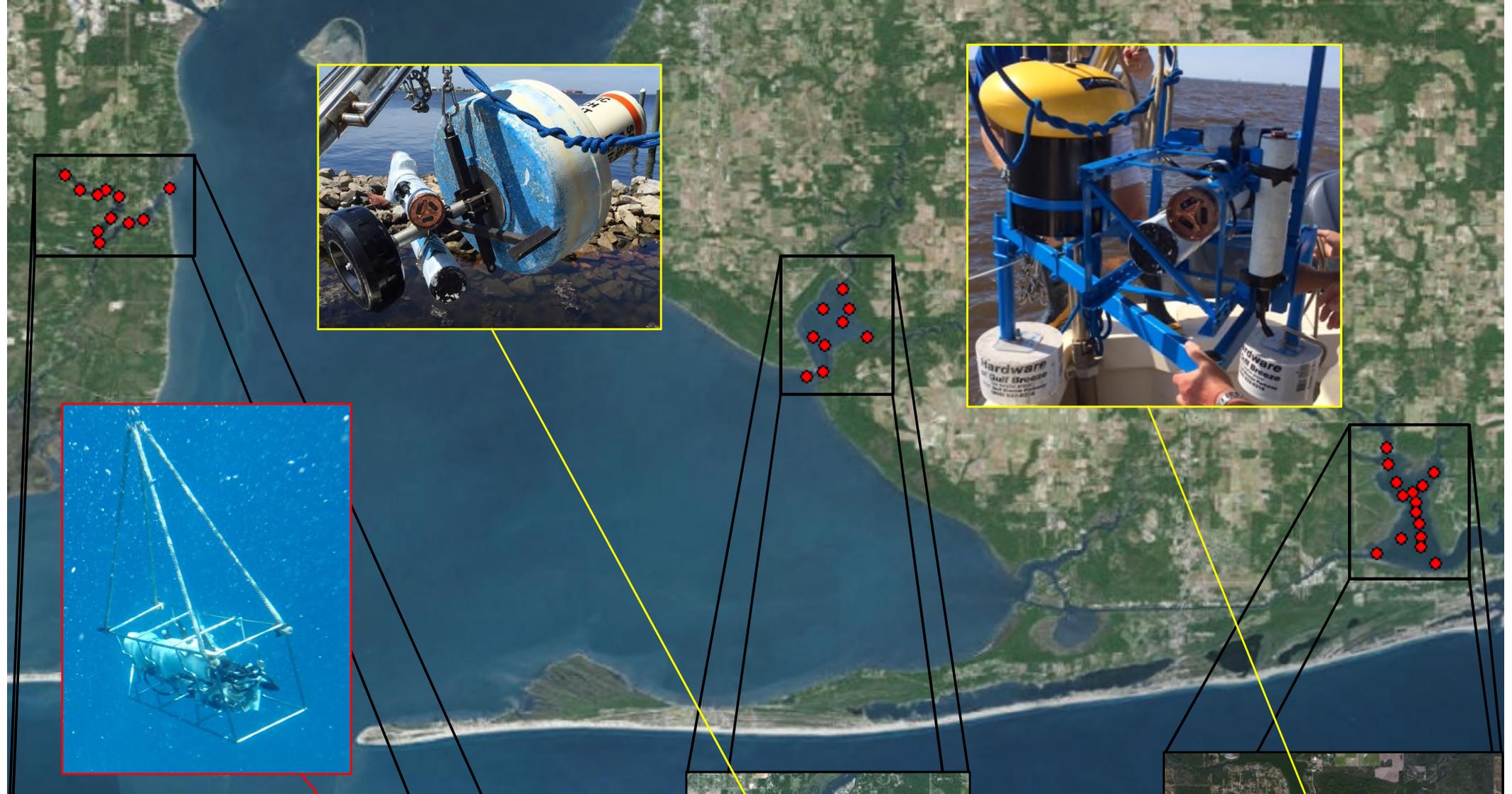
Driven by regional weather patterns, tidal events, etc.

## Diel



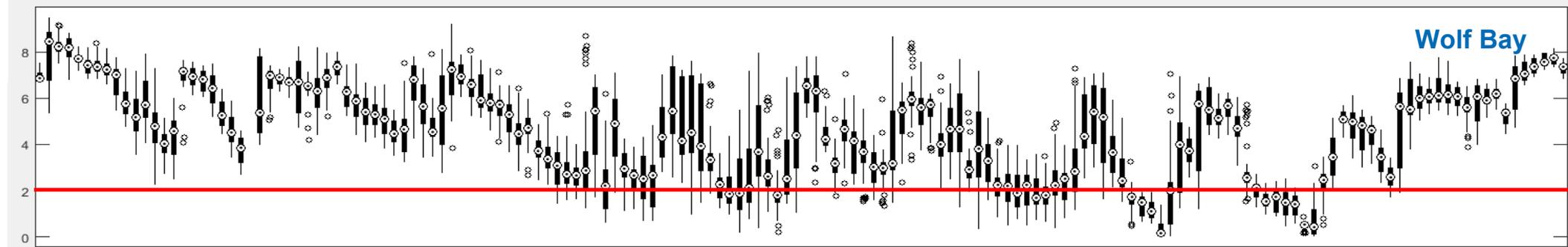
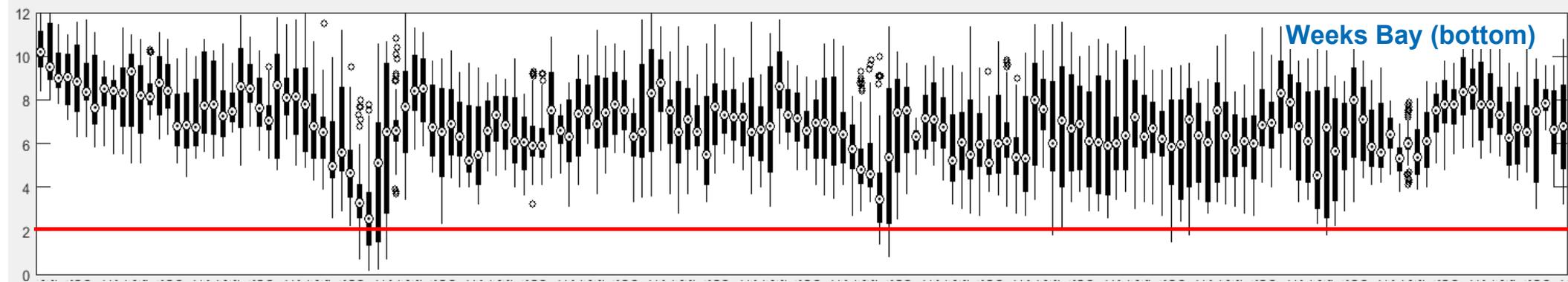
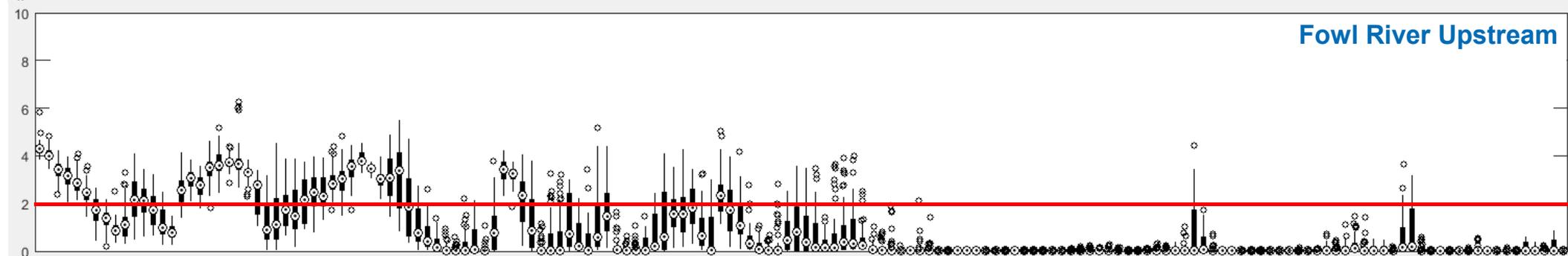
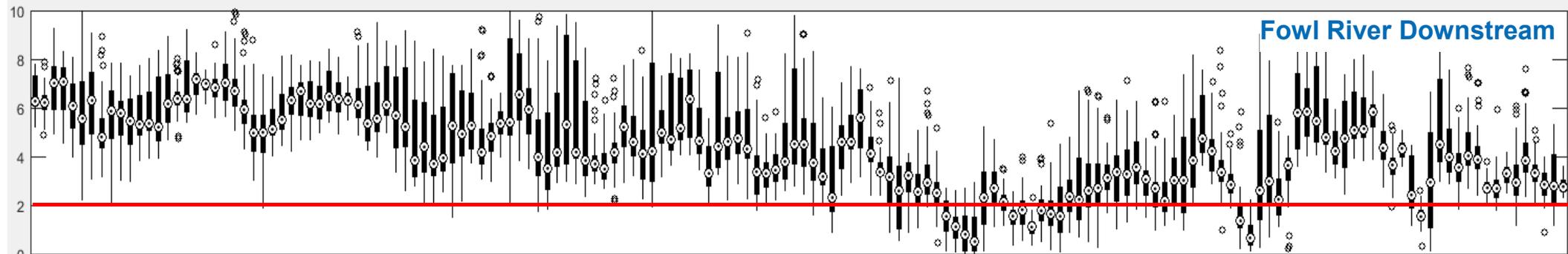
Driven by diel cycles of production and respiration.

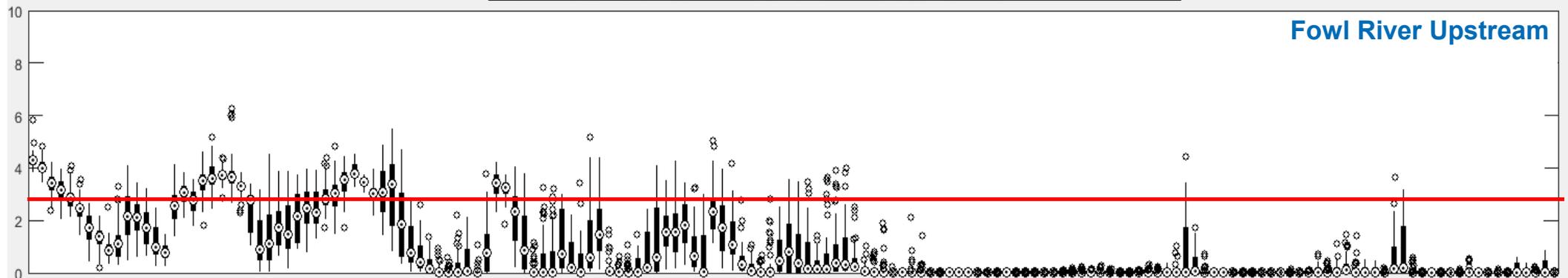
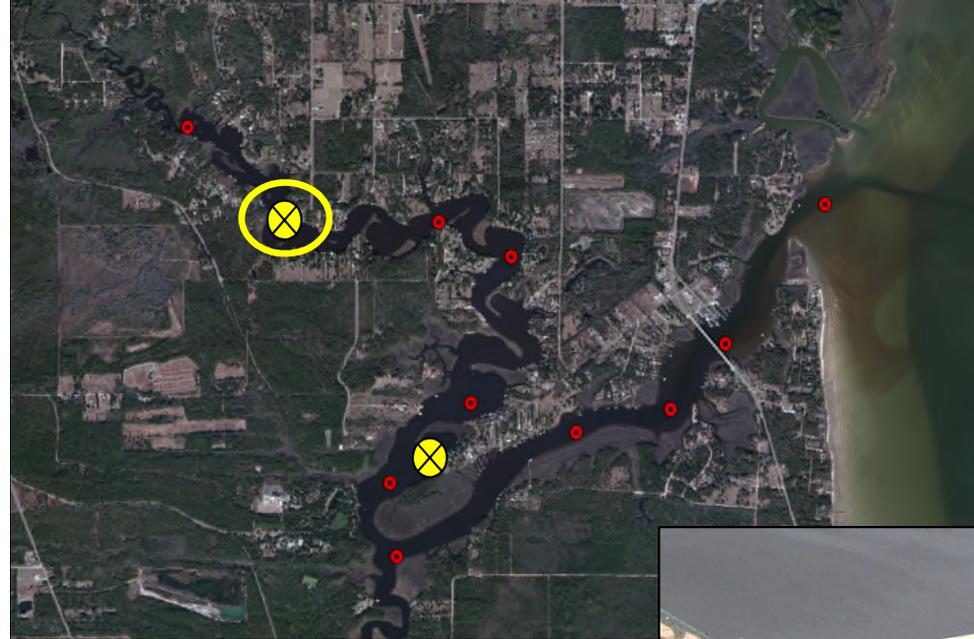




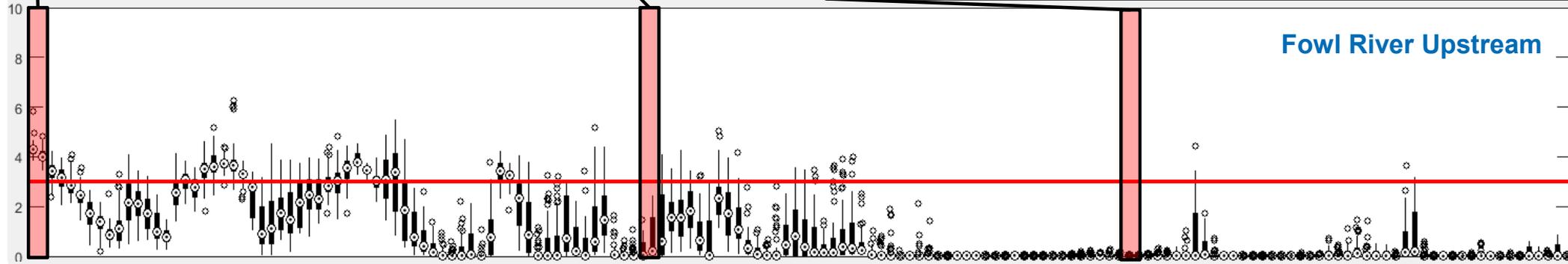
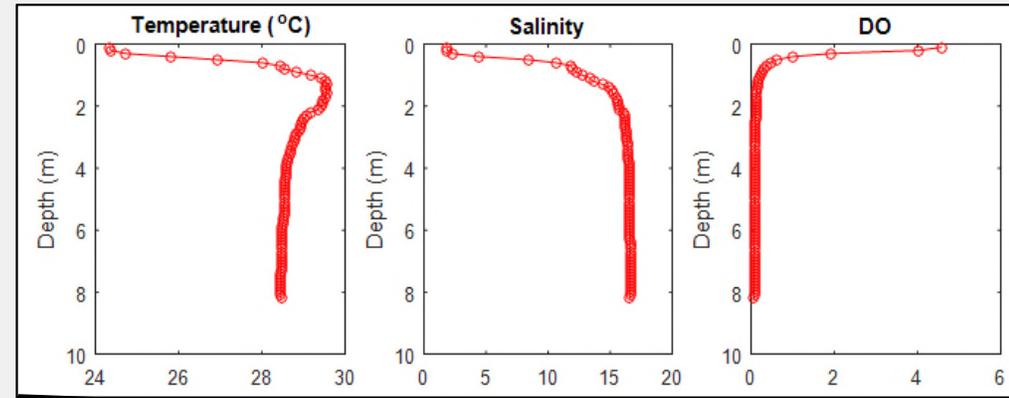
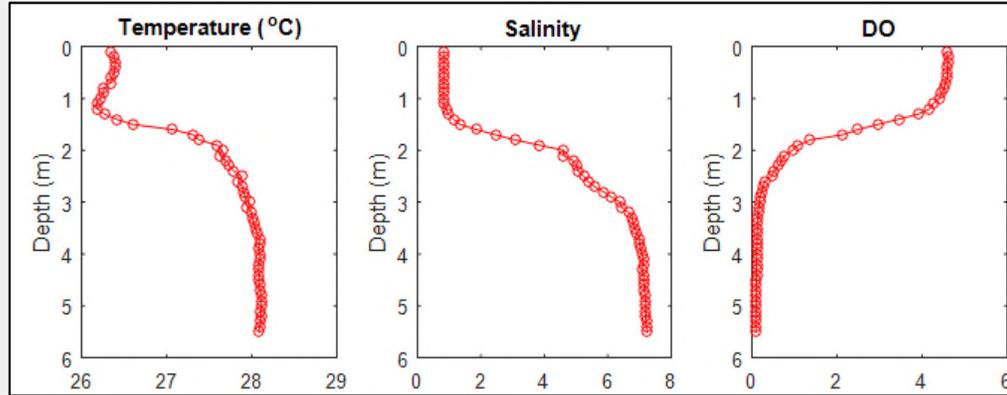
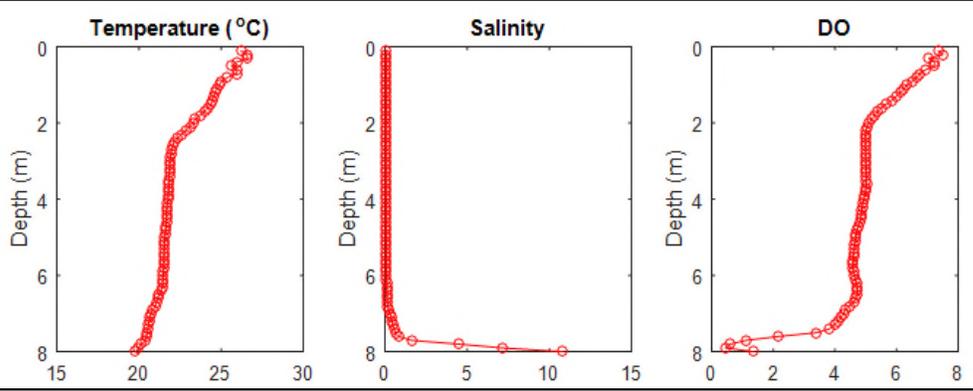
3

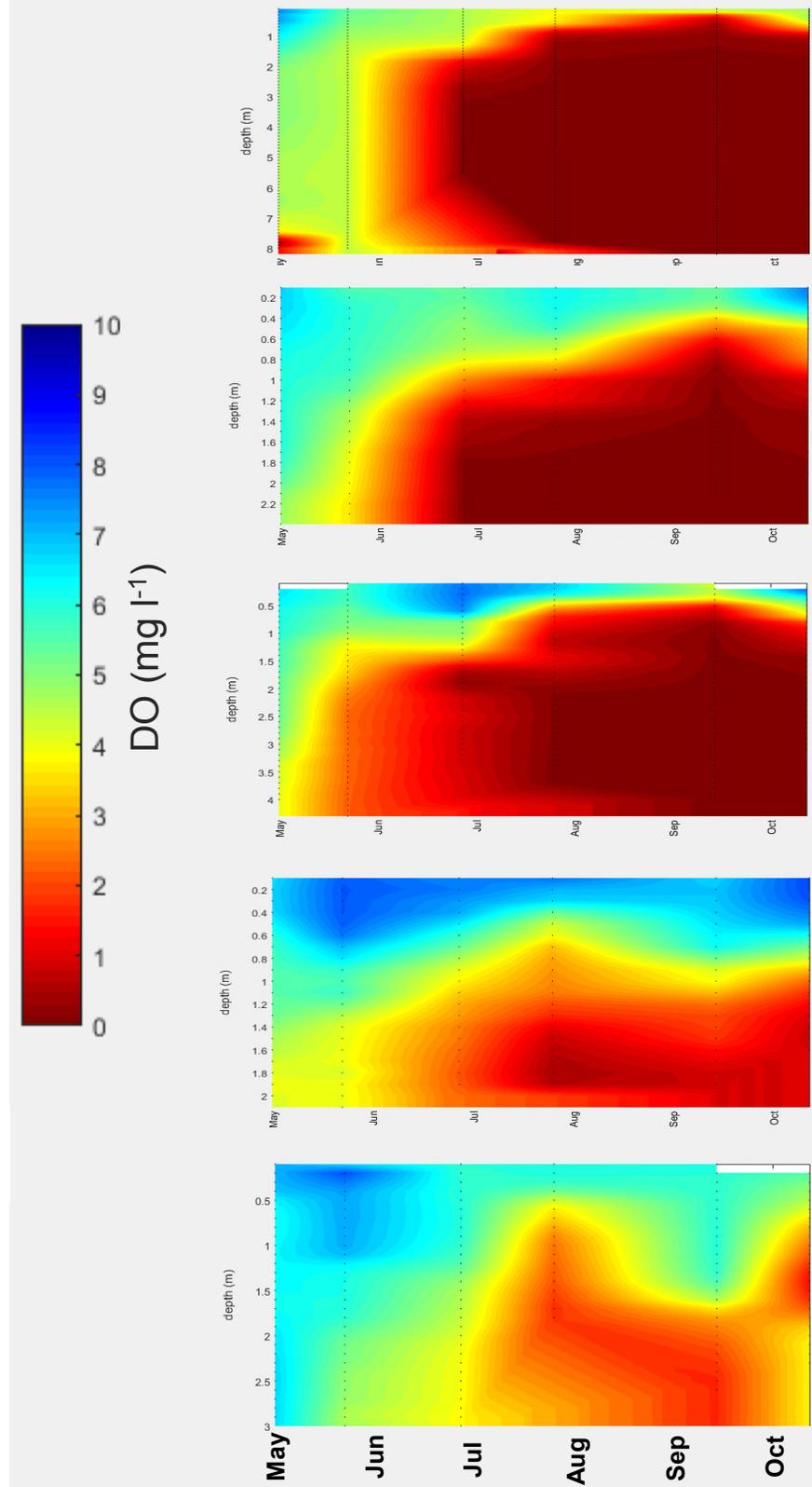
# Bottom Water O<sub>2</sub>





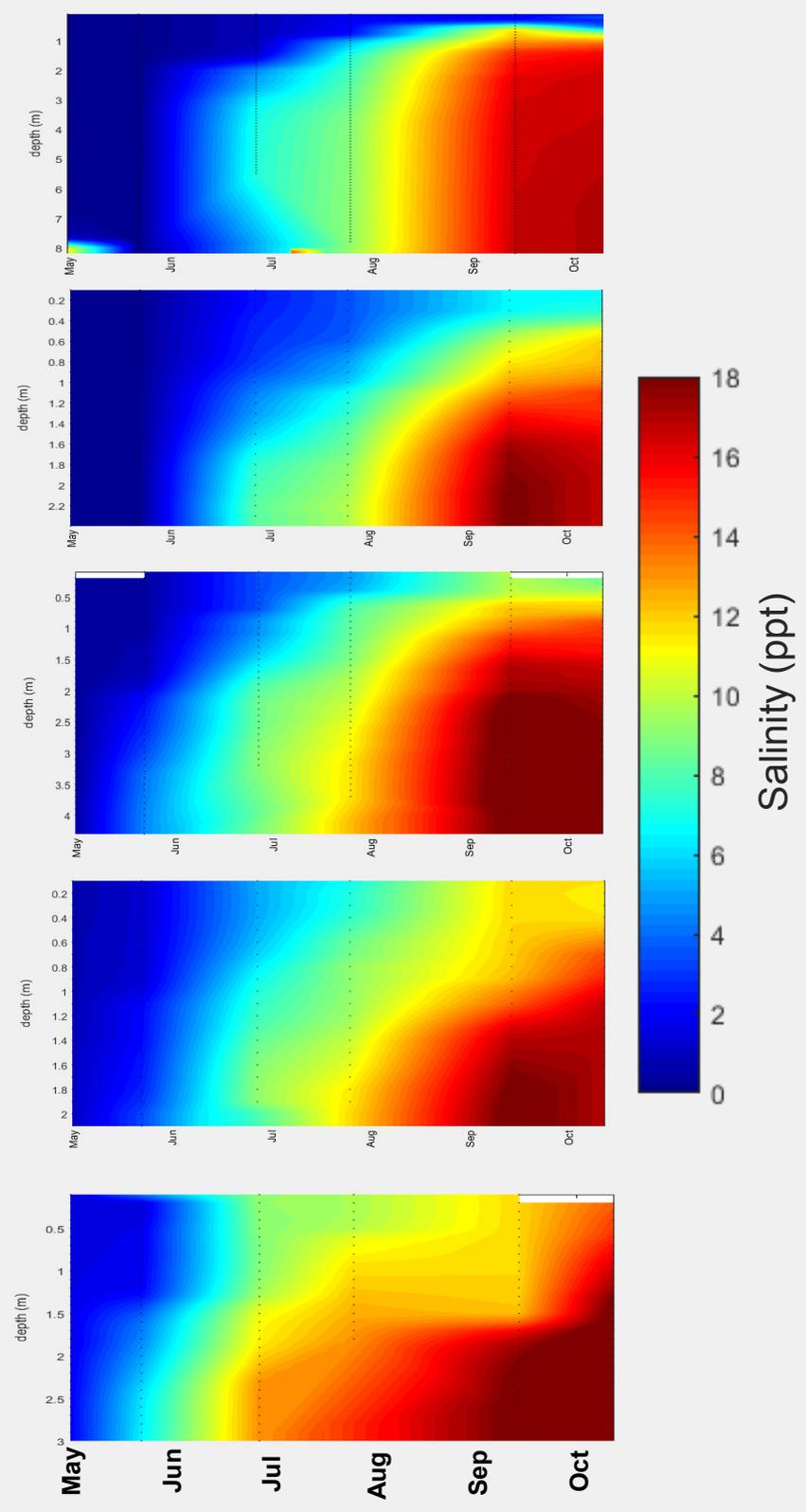
# Strengthening Stratification

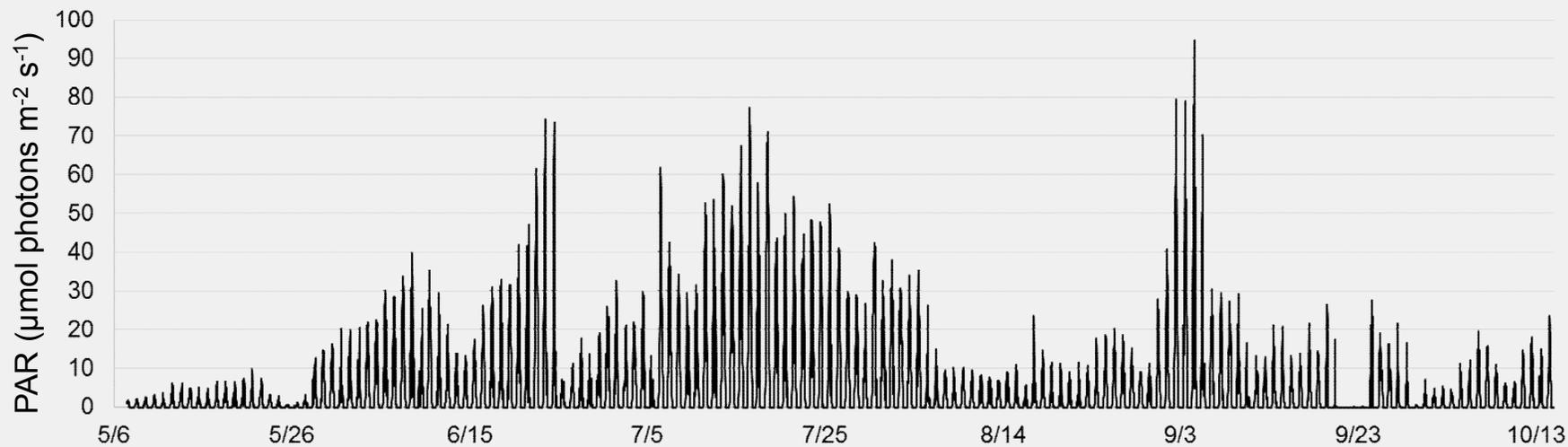
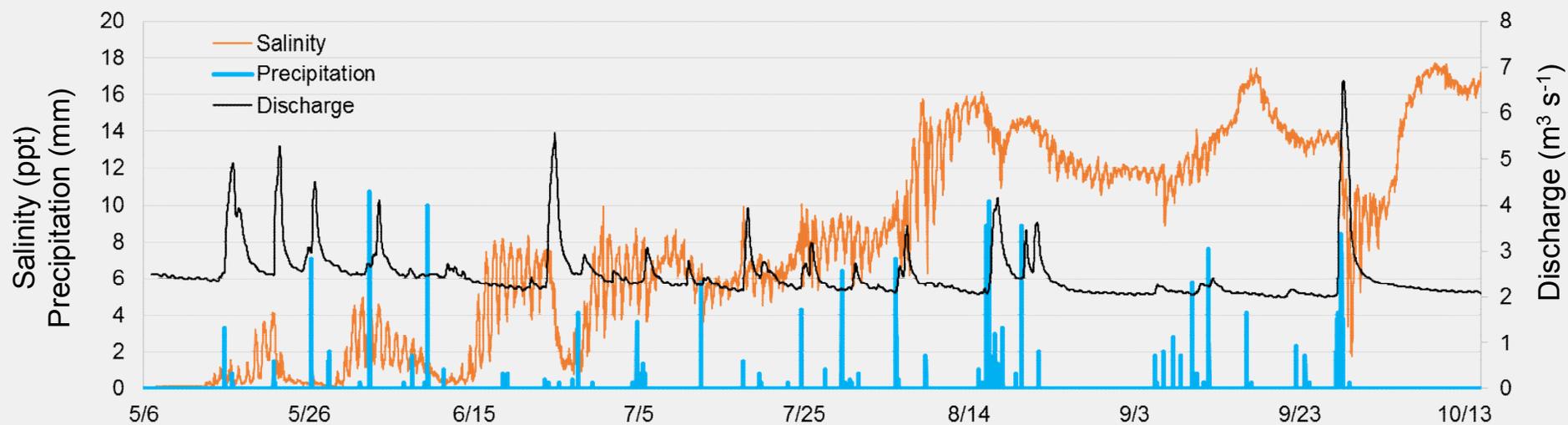
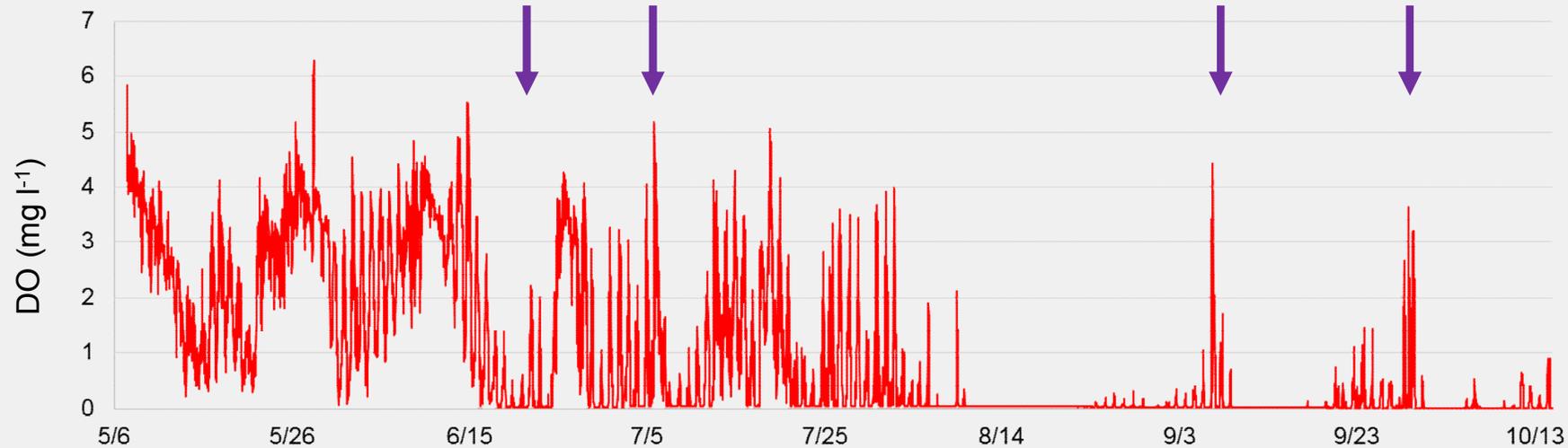




Upstream

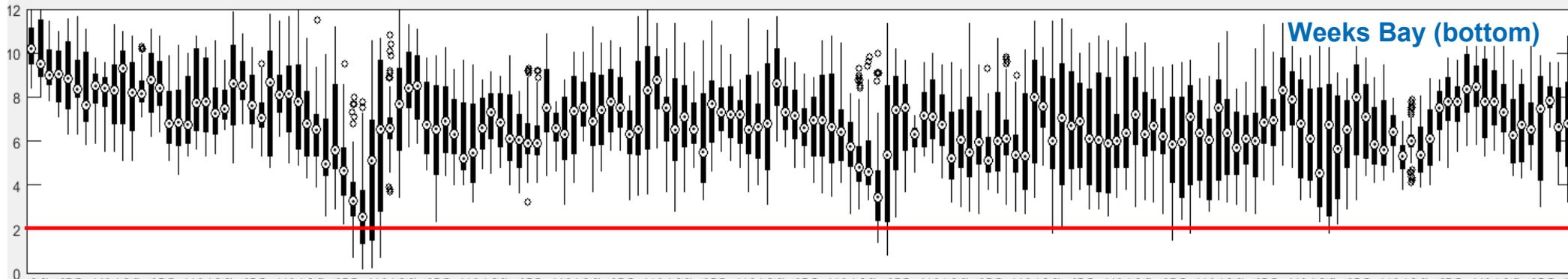
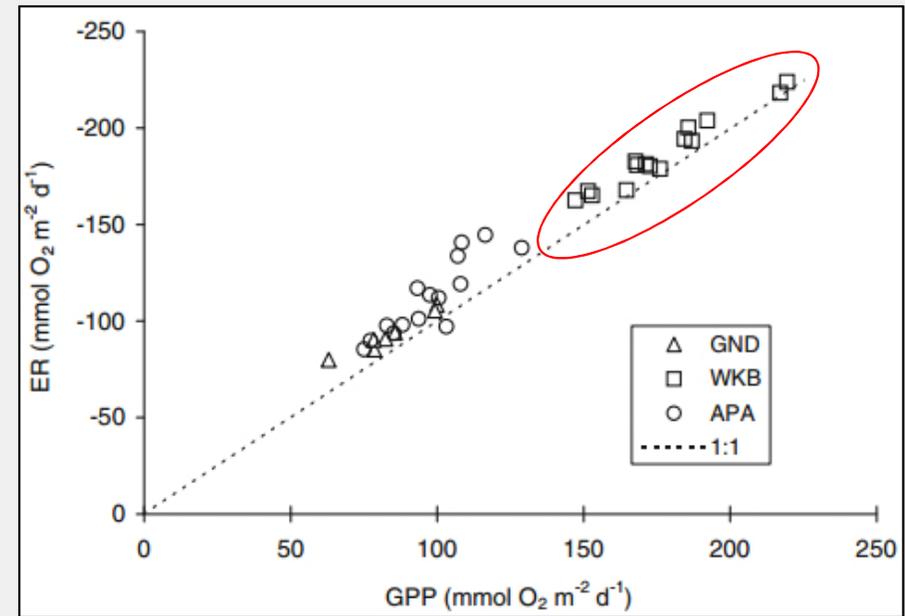
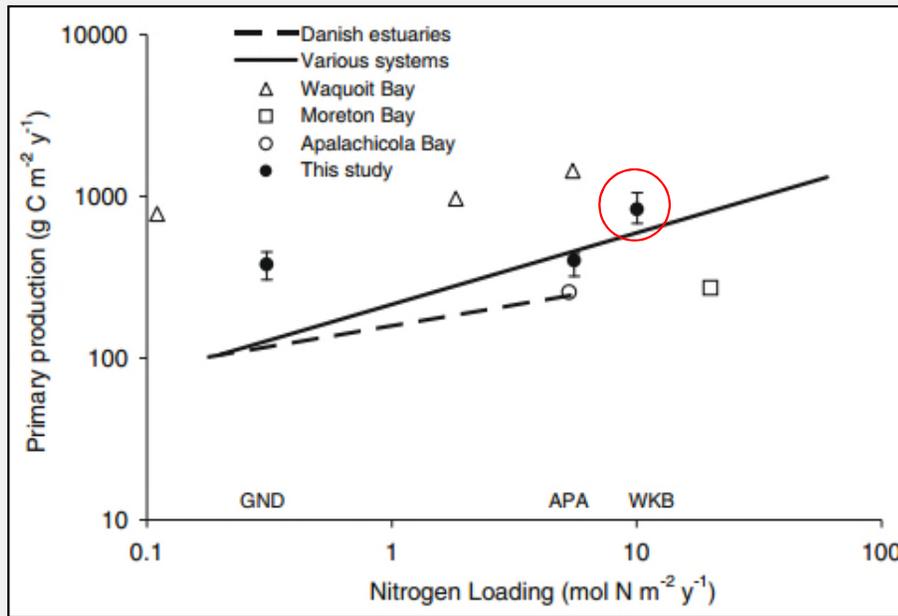
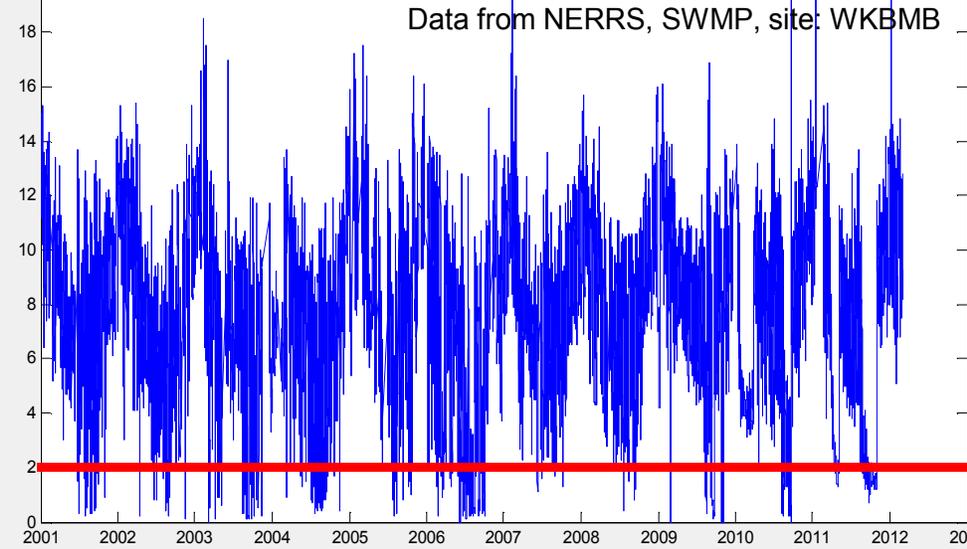
Downstream



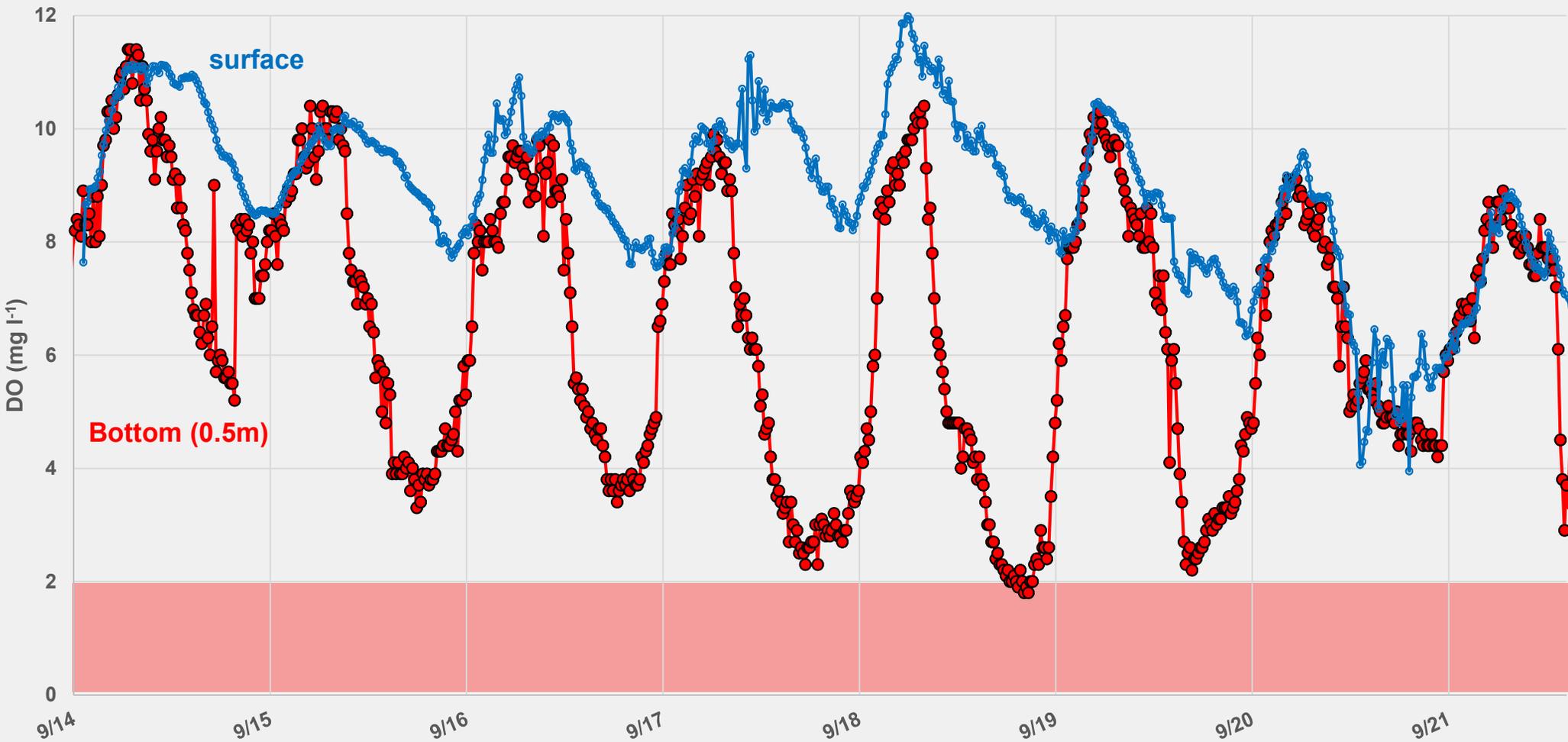
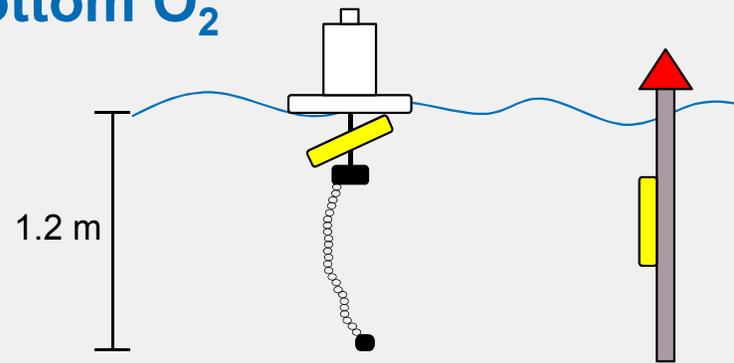


# Missing Hypoxia in Weeks Bay?

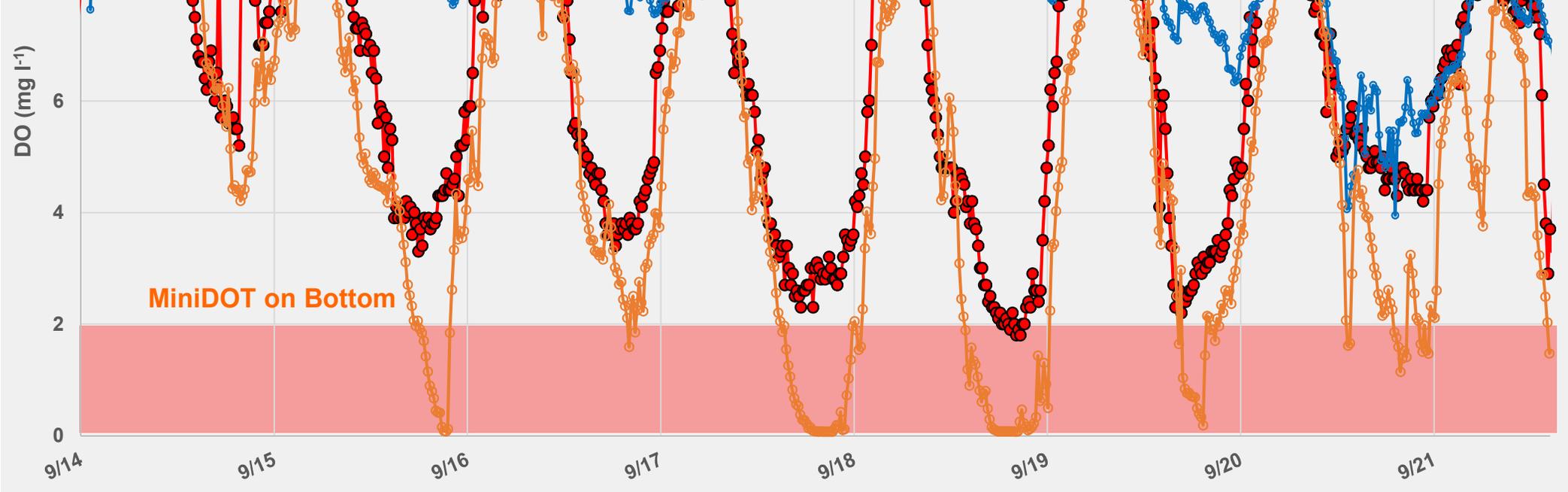
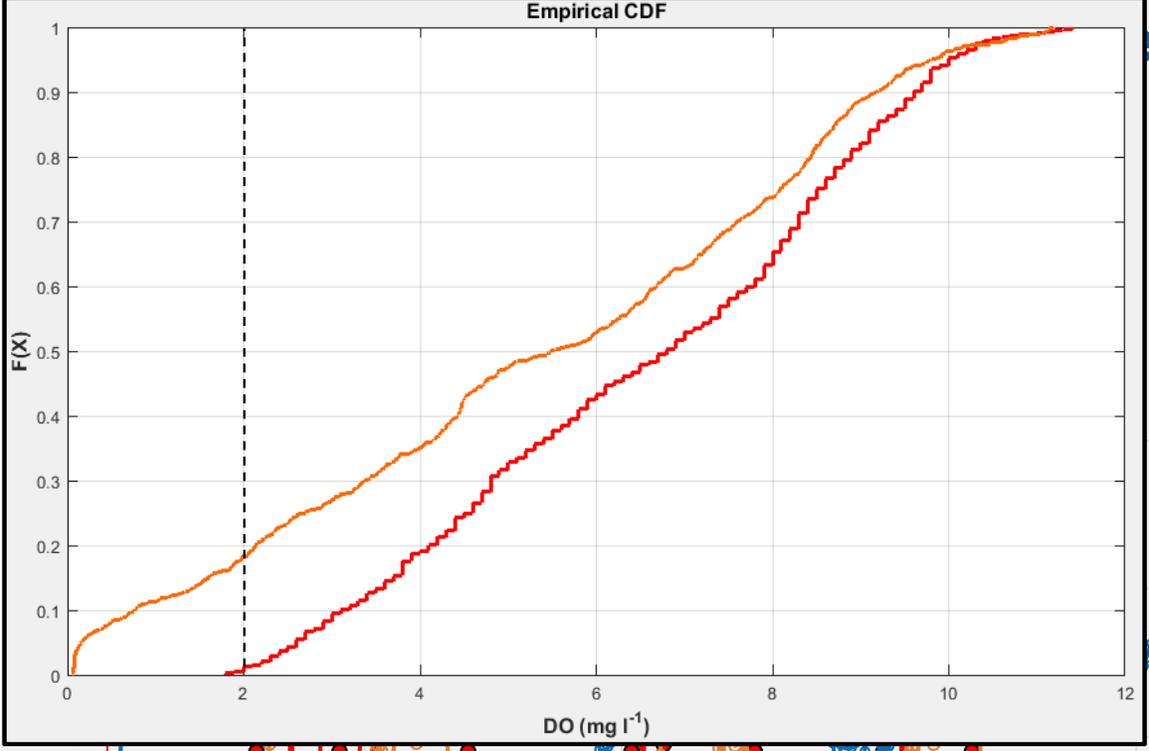
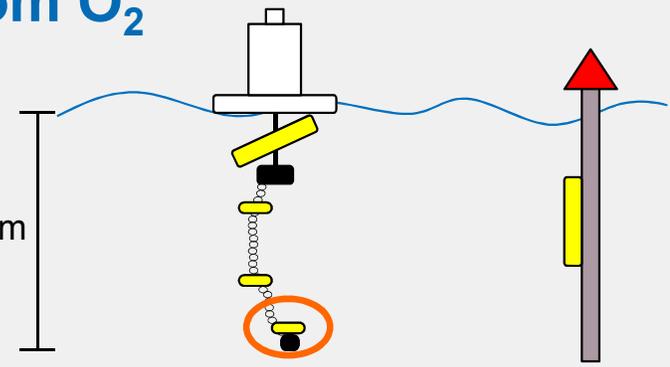
- Large seasonal and diurnal fluctuations in DO.
- High ecosystem metabolism driven by high nutrient loading and elevated primary production.



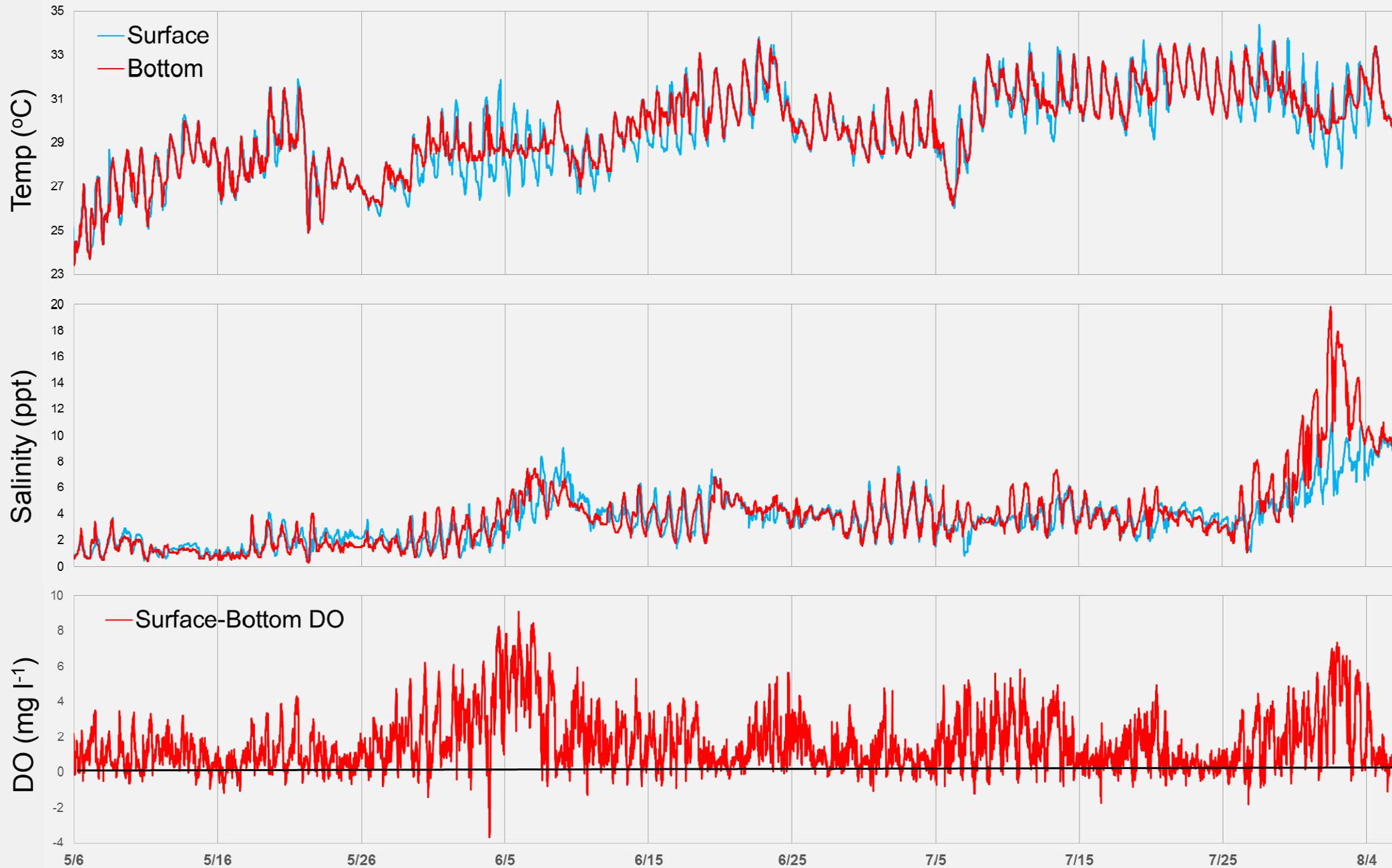
# Weeks Bay Surface and Bottom O<sub>2</sub>



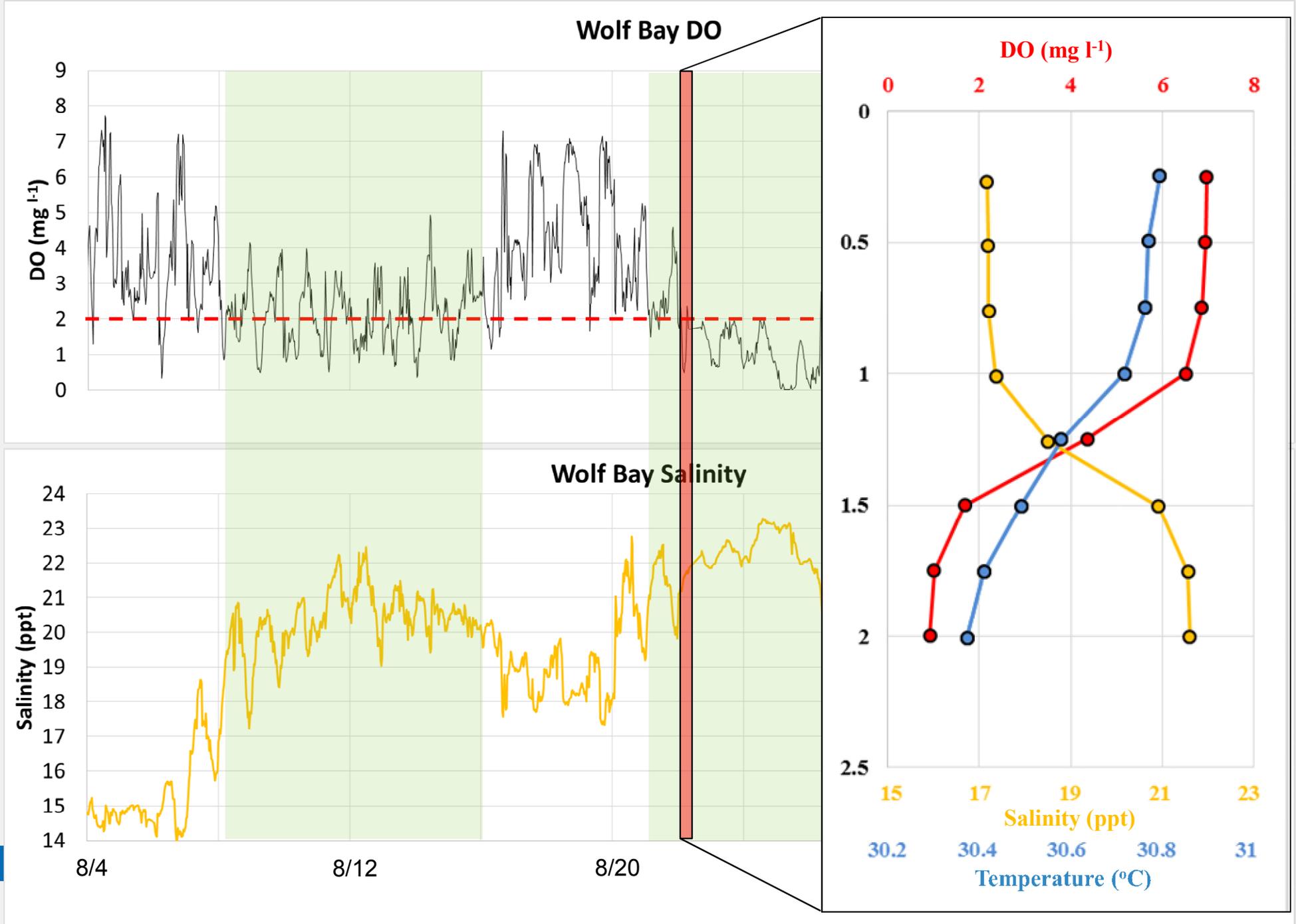
# Surface and Bottom O<sub>2</sub>



# Shallow Vertical Structure (~0.5m difference)



# Episodic Hypoxia –Pycnocline Strength



# Lessons Learned

- Stratification critical to episodic hypoxia despite extremely shallow environments.
  - Seasonal/Regional weather patterns, freshwater discharge, and tidal fluctuations play a role.
  - Small vertical gradients can yield significant differences in O<sub>2</sub> concentrations.
  - Deployment configuration must be carefully considered.
  
- Spatial and temporal shifts in hypoxia challenge our understanding of estuarine health.
  - Combine fixed site continuous monitoring with spatial hydrographic surveys.
  - Risk underestimating prevalence of low oxygen with survey based sampling designs alone.

# Small Business Innovation Research Sensors Microsite

- The Federal government is a significant driver of sensor innovation: investing in low cost, portable, easy-to-use technologies to facilitate the collection of real time, reliable measurement information.

## The new SBIR Sensors Research Microsite:

- is a central web location to promote collaboration across Small Business Innovation Research (SBIR) agencies in the area of sensor technology.
- makes it easier for sensor developers to locate relevant funding opportunities across federal agencies.

Participating agencies:



Visit the site! <https://www.sbir.gov/Sensor-technology-for-the-21st-century>