

Can we use stable isotopes to measure sublethal stress in the Eastern oyster, *Crassostrea virginica*?

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Low Dissolved Oxygen

- Hypoxia & anoxia are increasing
- Gulf of Mexico
 - Dead Zone (LA)
 - “Jubilees” (AL)
- Ecological & economic effects
- Oil-spill related low DO?



Hypoxia & bivalves

- Lack of field studies
- Lack of scale
- Both nutritive & other physiological stress



Assessing stress

- Stable isotopes (SI)
 - Same element, different # neutrons
 - Weight difference leads to fractionation
 - Trophic shift C (0-1‰: De Niro & Epstein 1978)
 - Trophic shift N (2-5 ‰: Minagawa & Wada 1984)
 - $\delta^H X = [(R_{\text{sample}}/R_{\text{standard}} - 1)] * 1000$
 - Starvation increases ^{15}N of tissues



Questions?



- Does low DO stress alter SI ratios?
- Can we use SI to detect stress?
- Can we detect a difference between pre & post spill stress?
- Can we couple SI ratios w/ molecular techniques to define a mechanism of stress?

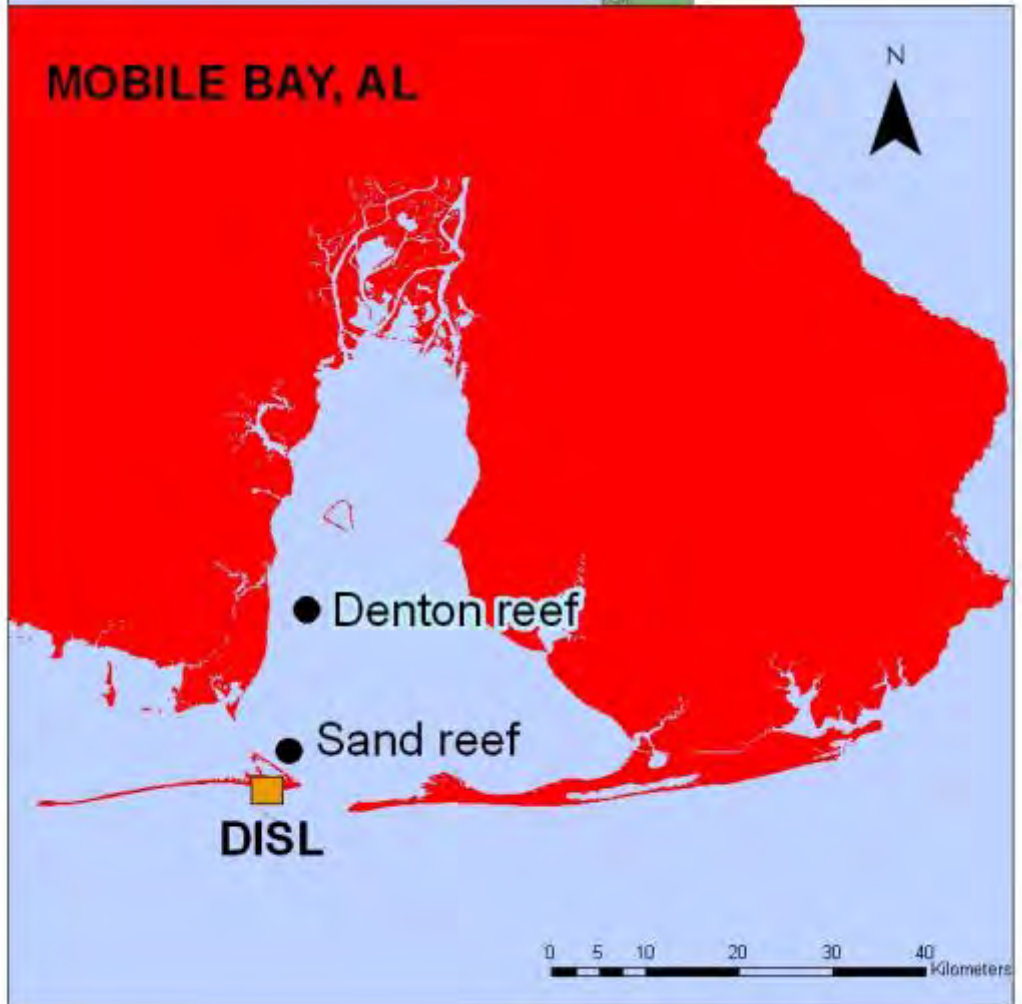
Study Area

Reef	DO (mg l^{-1})
Denton	3.7 ± 0.5
Sand	6.0 ± 0.6

GULF COAST, USA

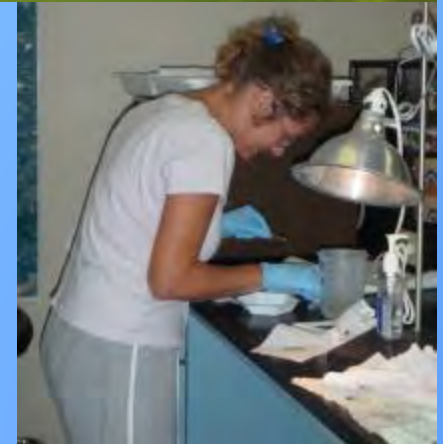
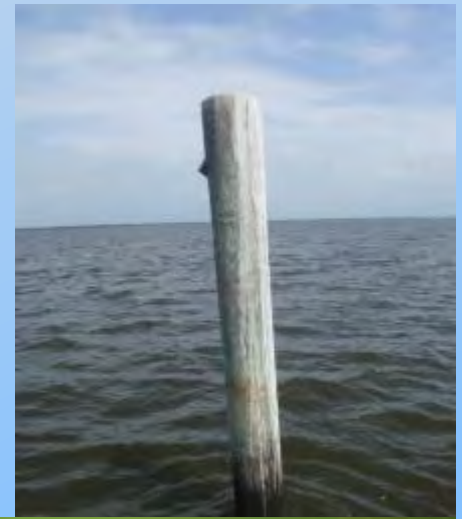


MOBILE BAY, AL

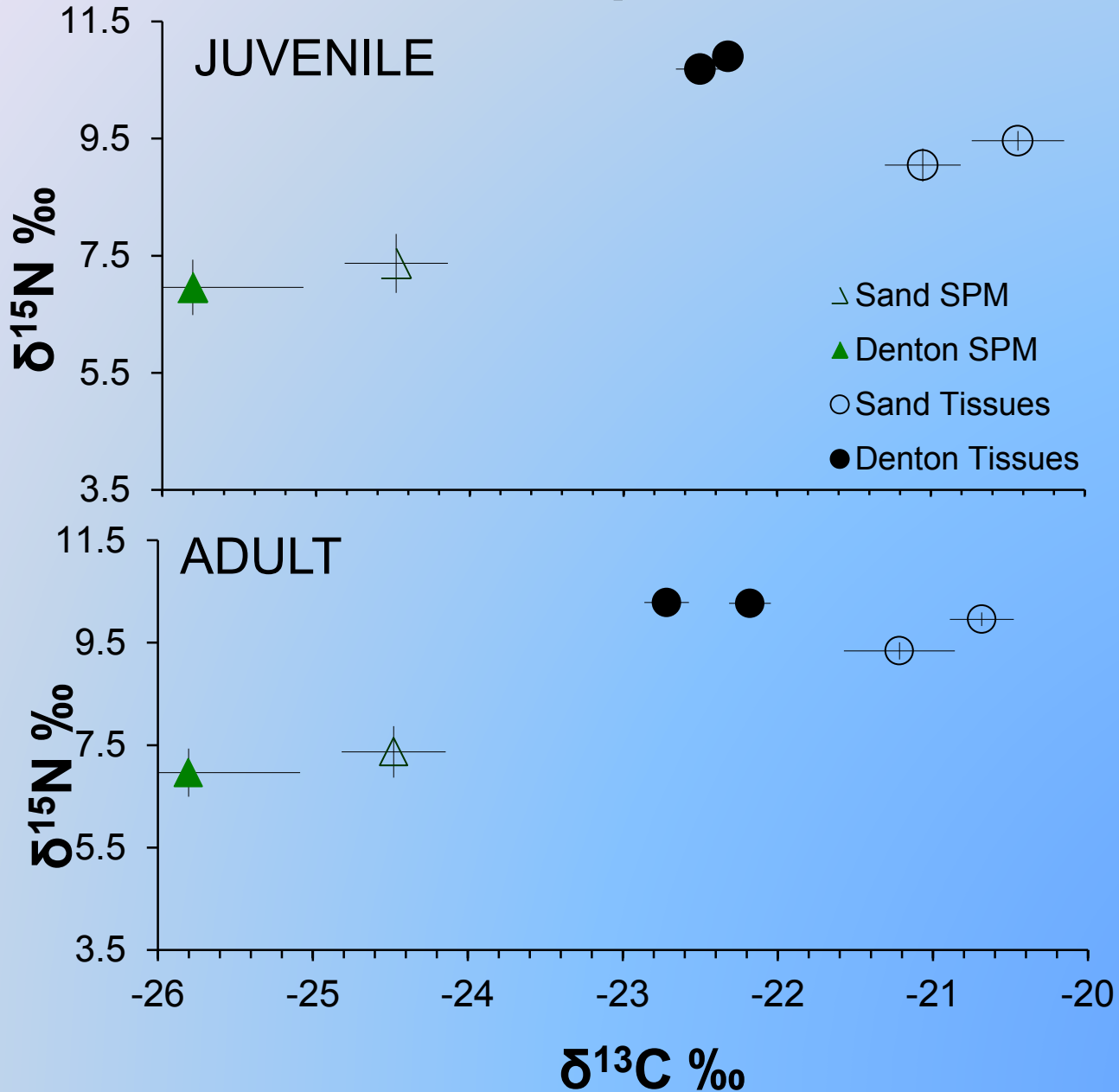


Methods

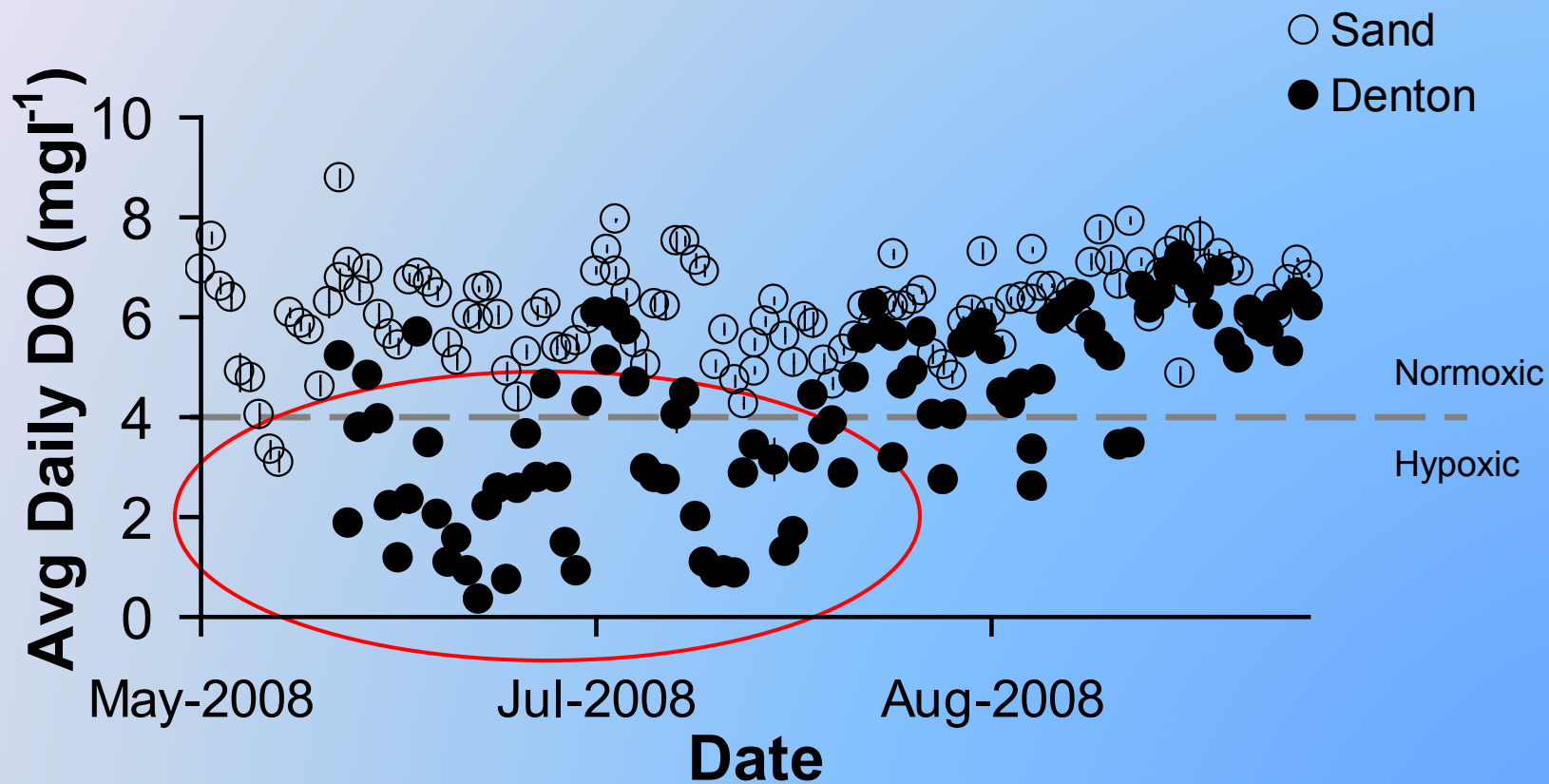
- Summer 2008 & 2010
- Transplanted oysters
- Deployed data sondes
- Collected ~2 wks
 - Measured growth & survival
 - Dissected target tissues
- Processed for protein & SIA



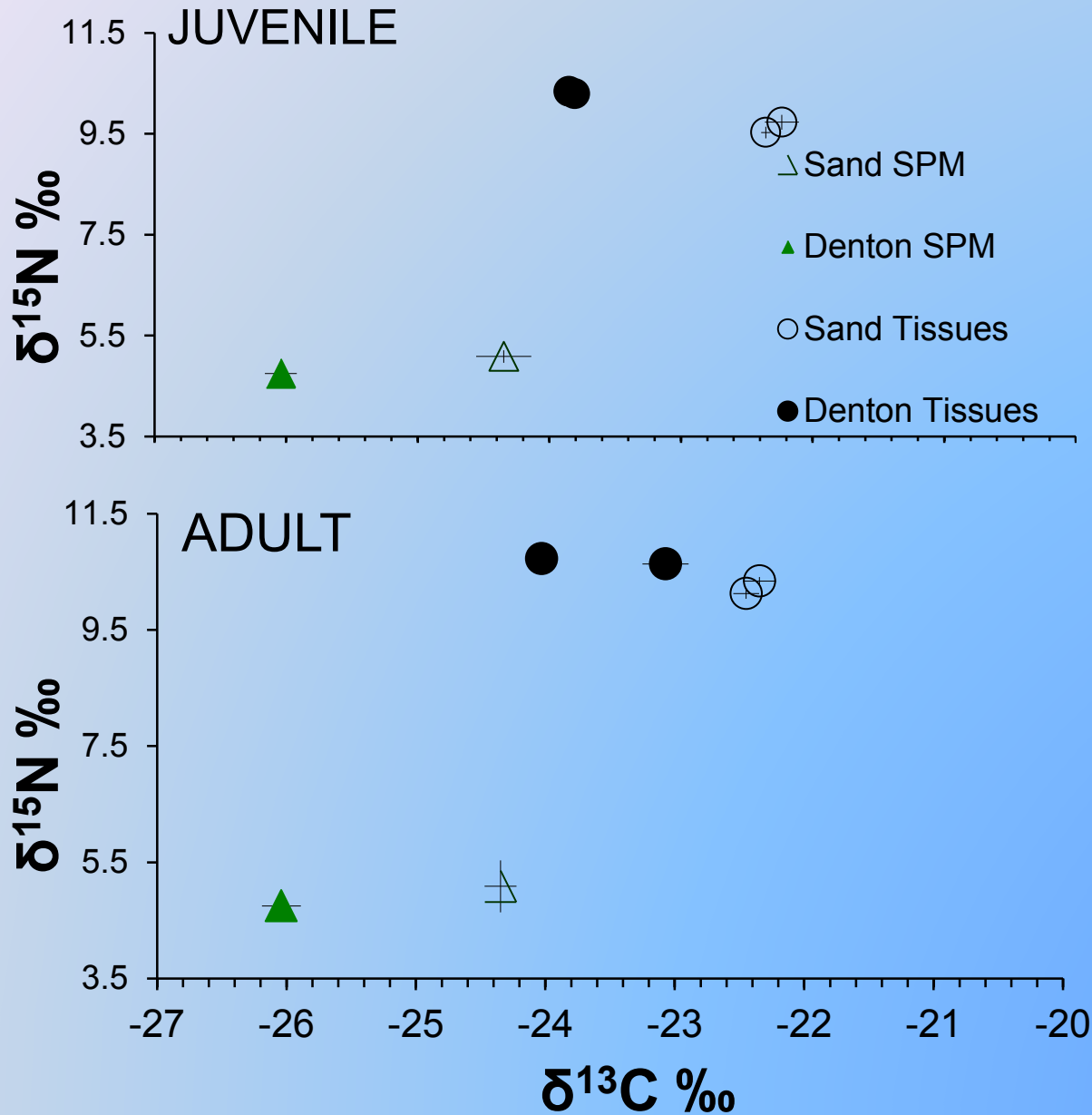
Stable Isotopes - 2008



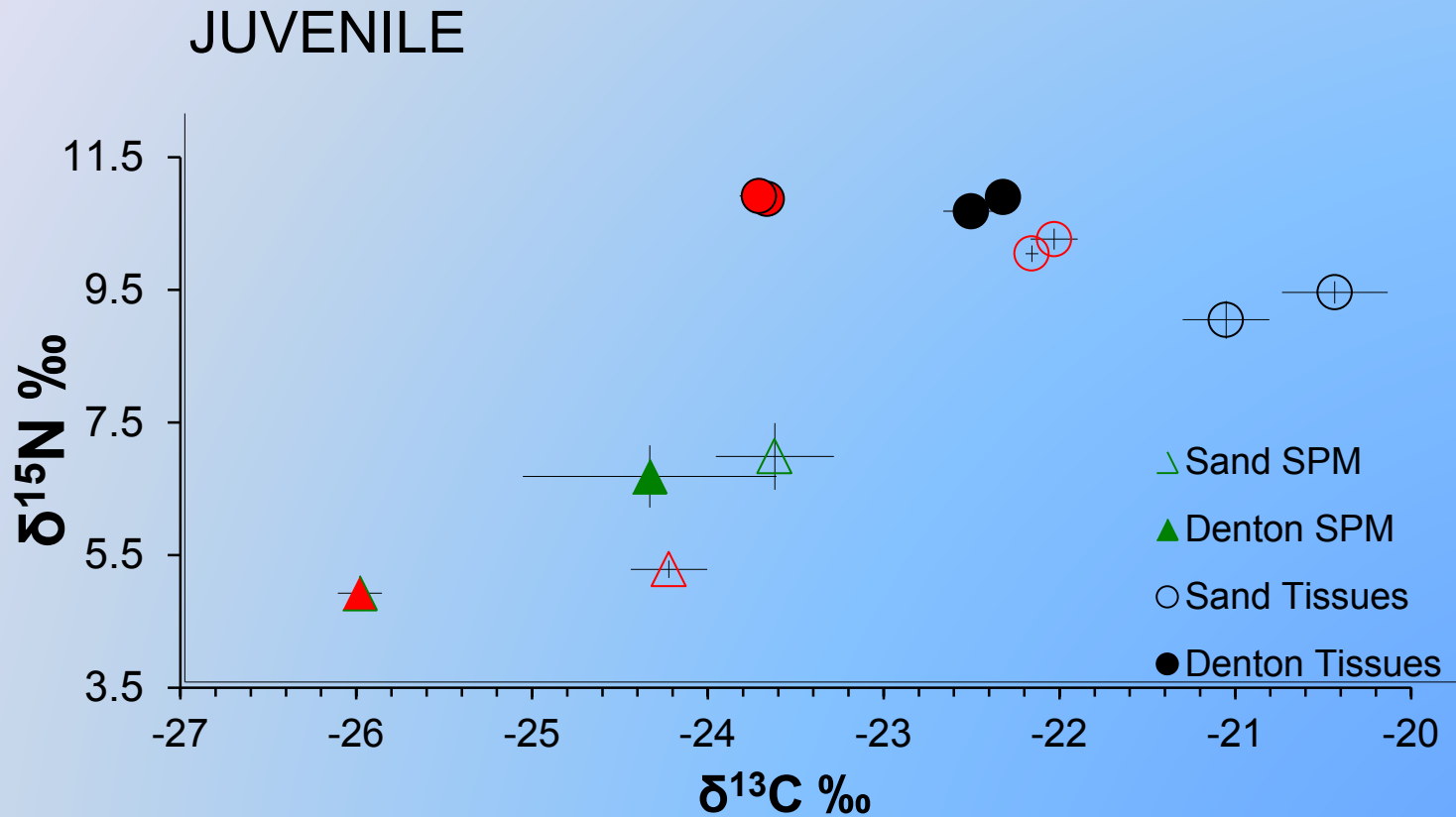
Dissolved Oxygen



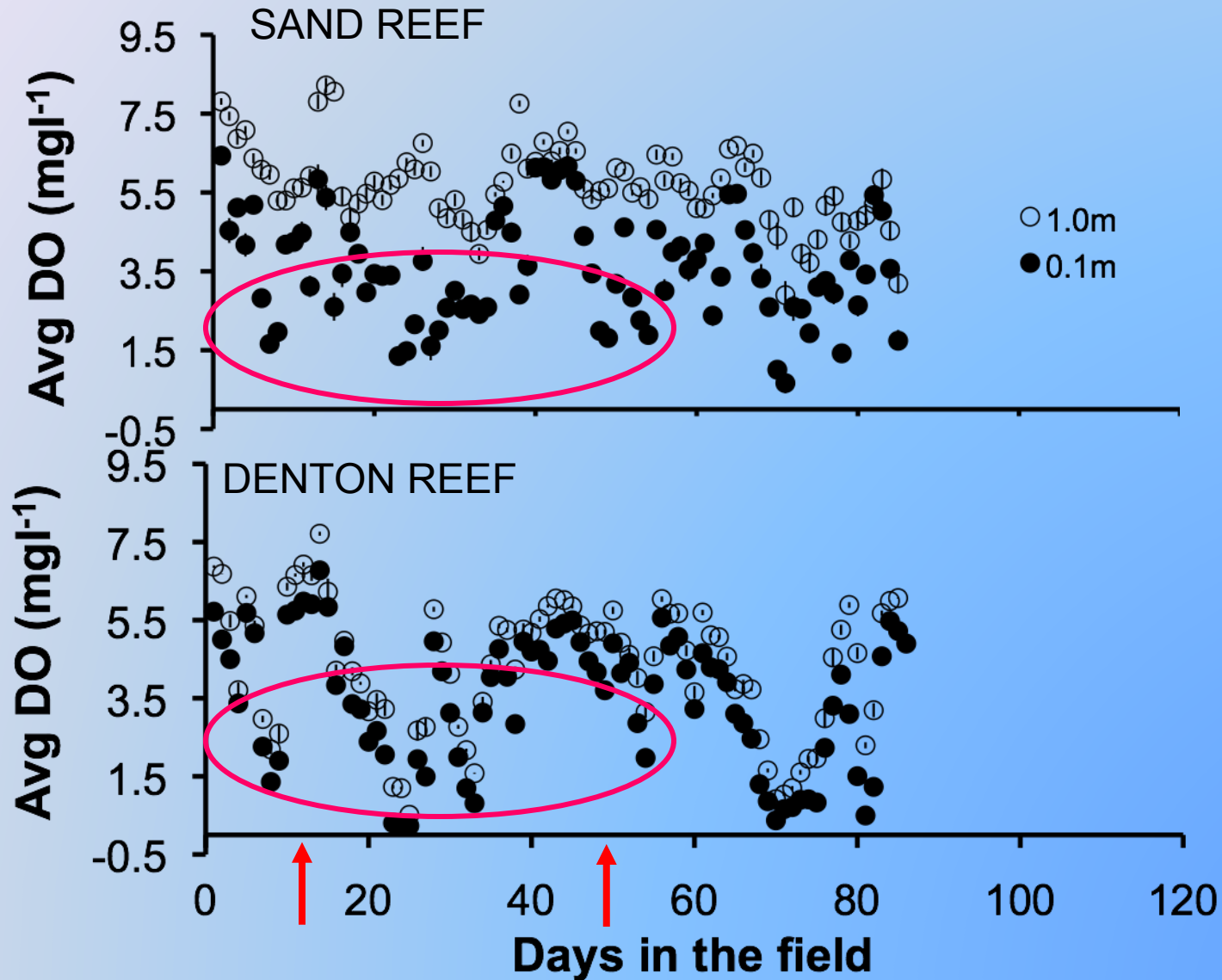
Stable isotope values - 2010



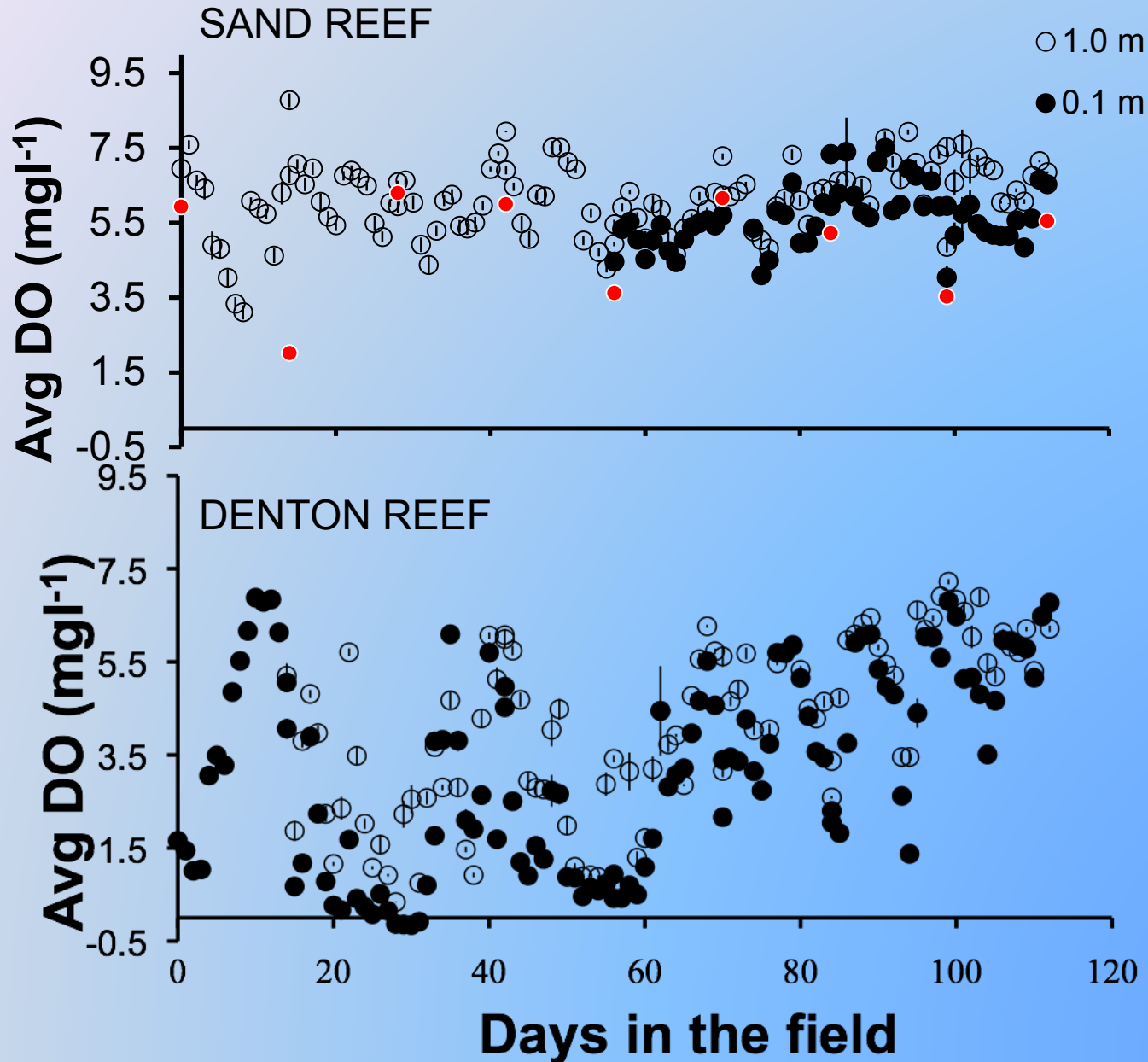
Stable Isotopes – years combined



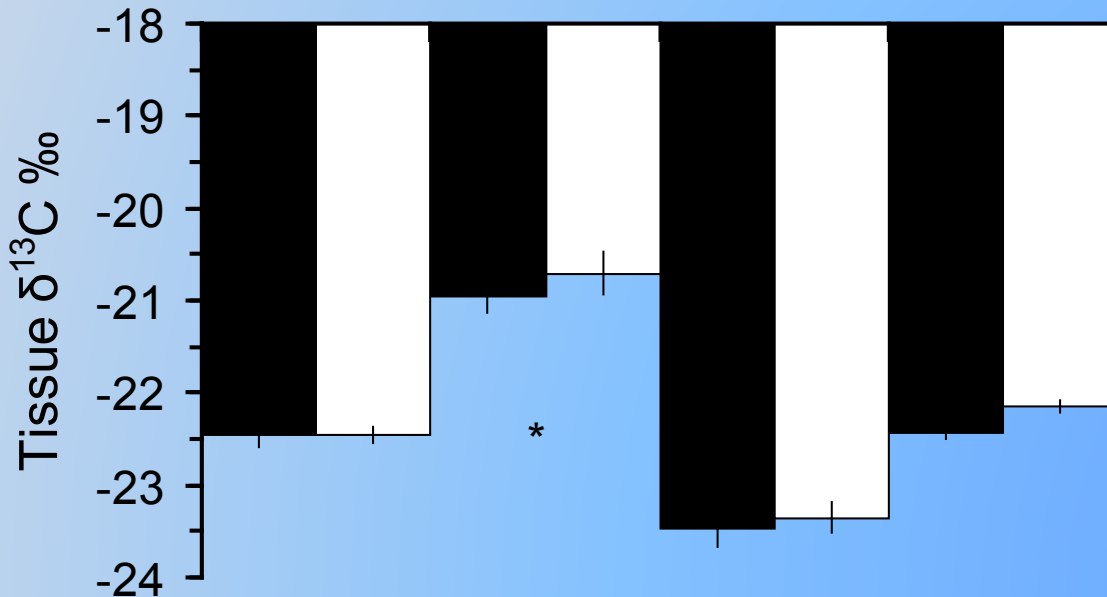
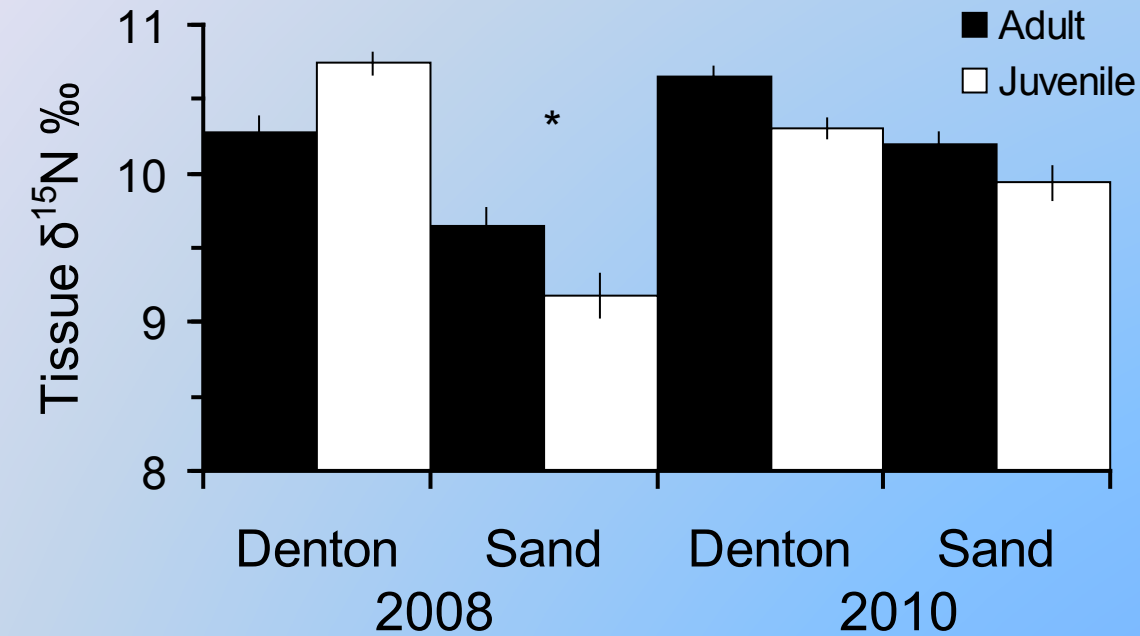
Dissolved Oxygen - 2010



Dissolved Oxygen - 2008



Stable isotope values



Summary

- N stable isotope ratios
 - No difference in food
 - Oysters heavier at hypoxic site (2008)
 - Oyster SI ratios similar among sites (2010)
 - DO+ other stress?
- Oil spill effects...?



Summary

- SI ratios may be useful to detect condition and provide...
 - technique for measuring cumulative stress
 - food web reconstruction



Ongoing work...

- PAH analysis

- Denton reef: 3 - 300 ngL⁻¹

- Sand reef: 10 - 270 ngL⁻¹

(M. Dailey, C. Thornton, K. Willett – The University of MS)

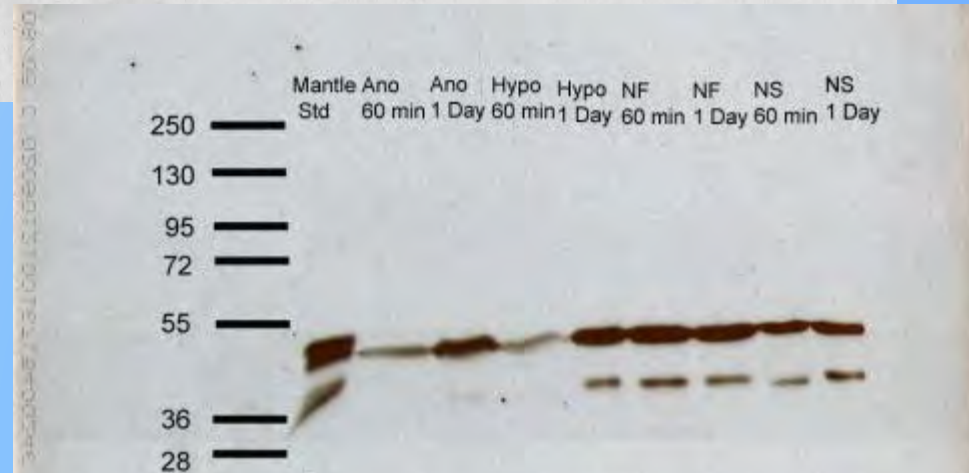


Ongoing work...

- Controlled lab experiment



- Protein analysis





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