



Macroalgal ecophysiology and water quality characterization of *in situ* and aquaculture-raised macroalgae from Charleston Harbor, SC, USA



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Introduction:

- Ulva* spp. & *Gracilaria tikvahiae* are native species of macroalgae useful as foodstuff, biologically active compounds, & bioindicators of various pollutants in Charleston Harbor.
- We aim to establish a baseline of macroalgal ecophysiological data, water quality analysis, and contaminant identification.
- Understanding seasonal trends of pollutants and nutrients can help increase knowledge of local ecophysiology and uncover seasonal trends in contaminant abundance.



Questions

- Q1:** How do biotic and abiotic water quality parameters change seasonally in Charleston Harbor?
- Q2:** Does the abundance of fecal coliform bacteria & *V. parahaemolyticus* in water and on targeted algae vary seasonally?
- Q3:** Would algae harvested from Charleston Harbor be safe for human consumption based on heavy metals and bacterial levels?
- Q4:** How does macroalgal physiology change spatially and temporally in Charleston Harbor, and between wild versus aquaculture-raised algae?

Preliminary Results:

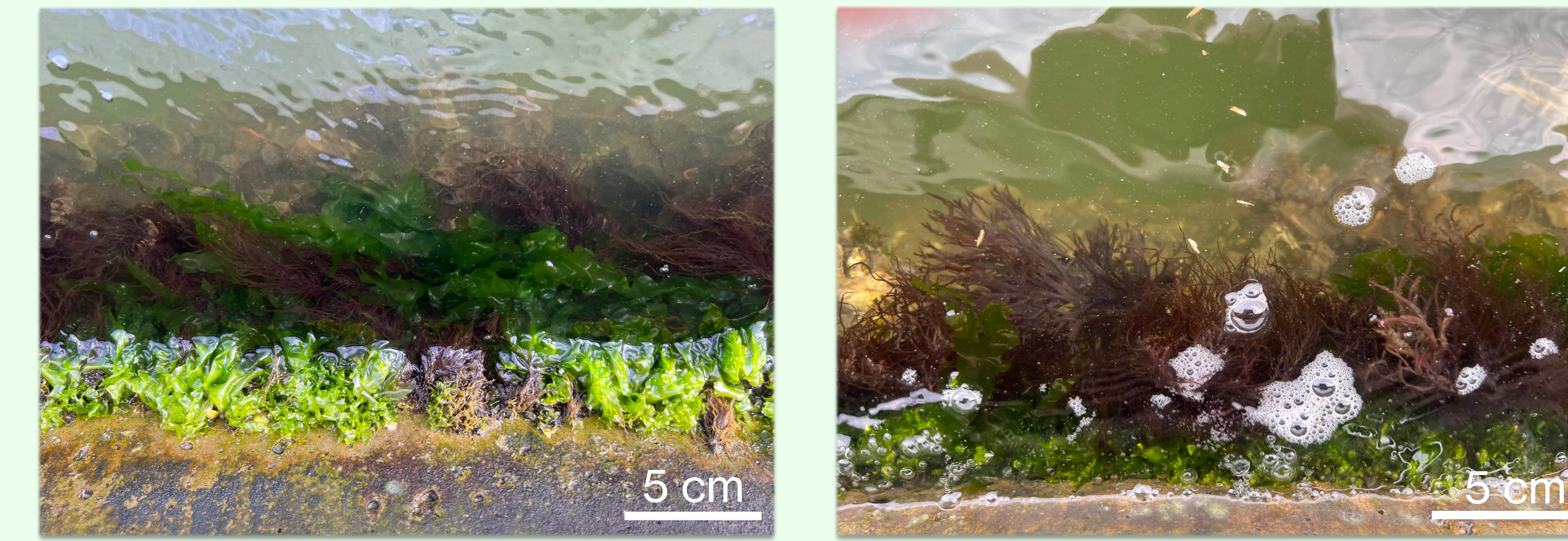


Figure 3: *Ulva* spp. & *G. tikvahiae* growing attached to floating docks at James Island Yacht Club.

Methods:

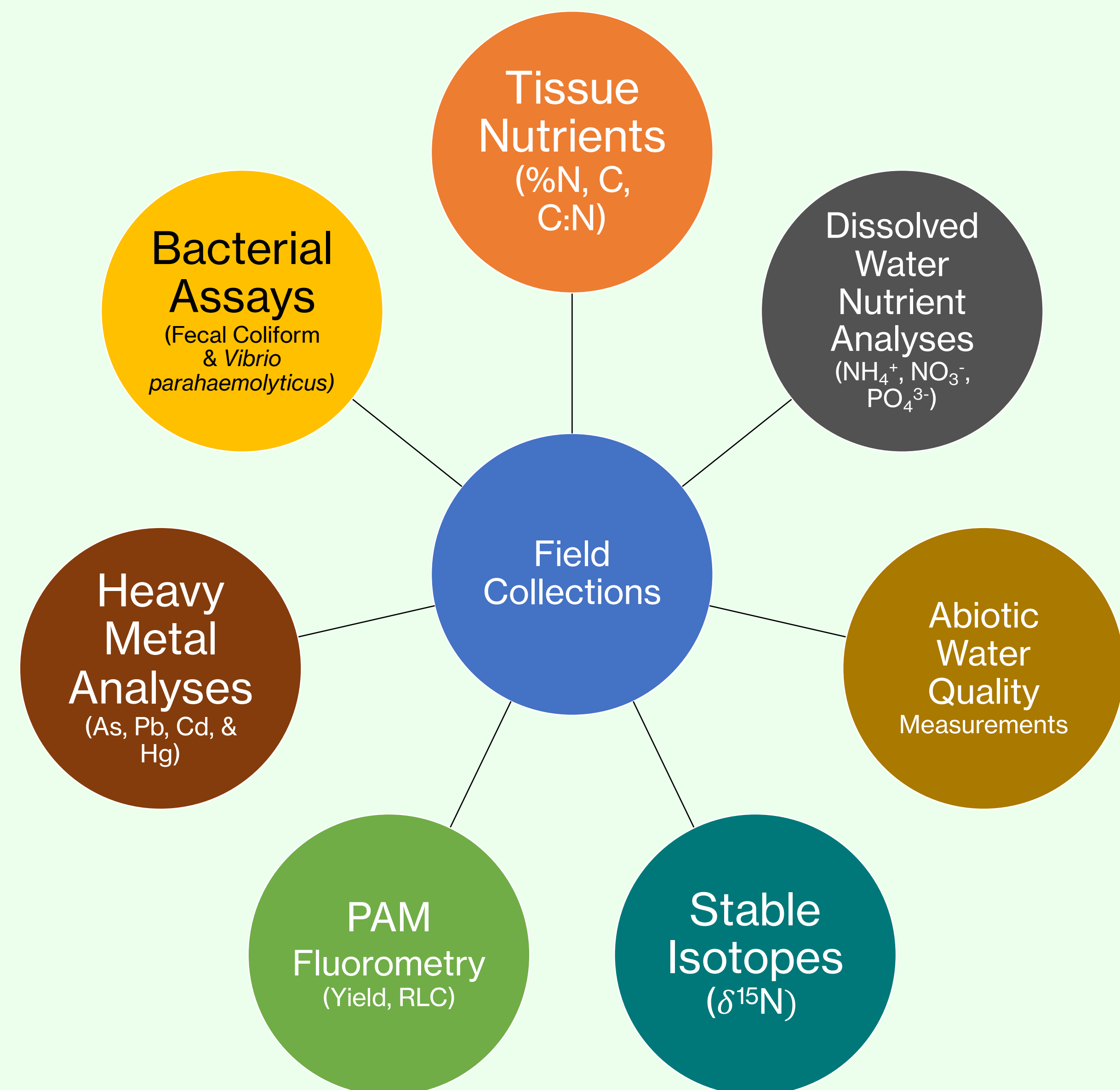


Figure 1. Bacterial assays, PAM fluorometry readings, abiotic water quality measurements, and dissolved water nutrient analyses will be conducted at the College of Charleston, while $\delta^{15}\text{N}$ and tissue nutrient analyses will be conducted at the University of Hawai'i at Mānoa's Biogeochemical Stable Isotope Facility. Heavy metal analyses will be conducted at CofC or via an outside laboratory.

Field Sites



Figure 2: Map of sampling locations & site images. A: Charleston Maritime Center, B: Shem Creek Park, C: SCDNR MRI Tanks, D: James Island Yacht Club

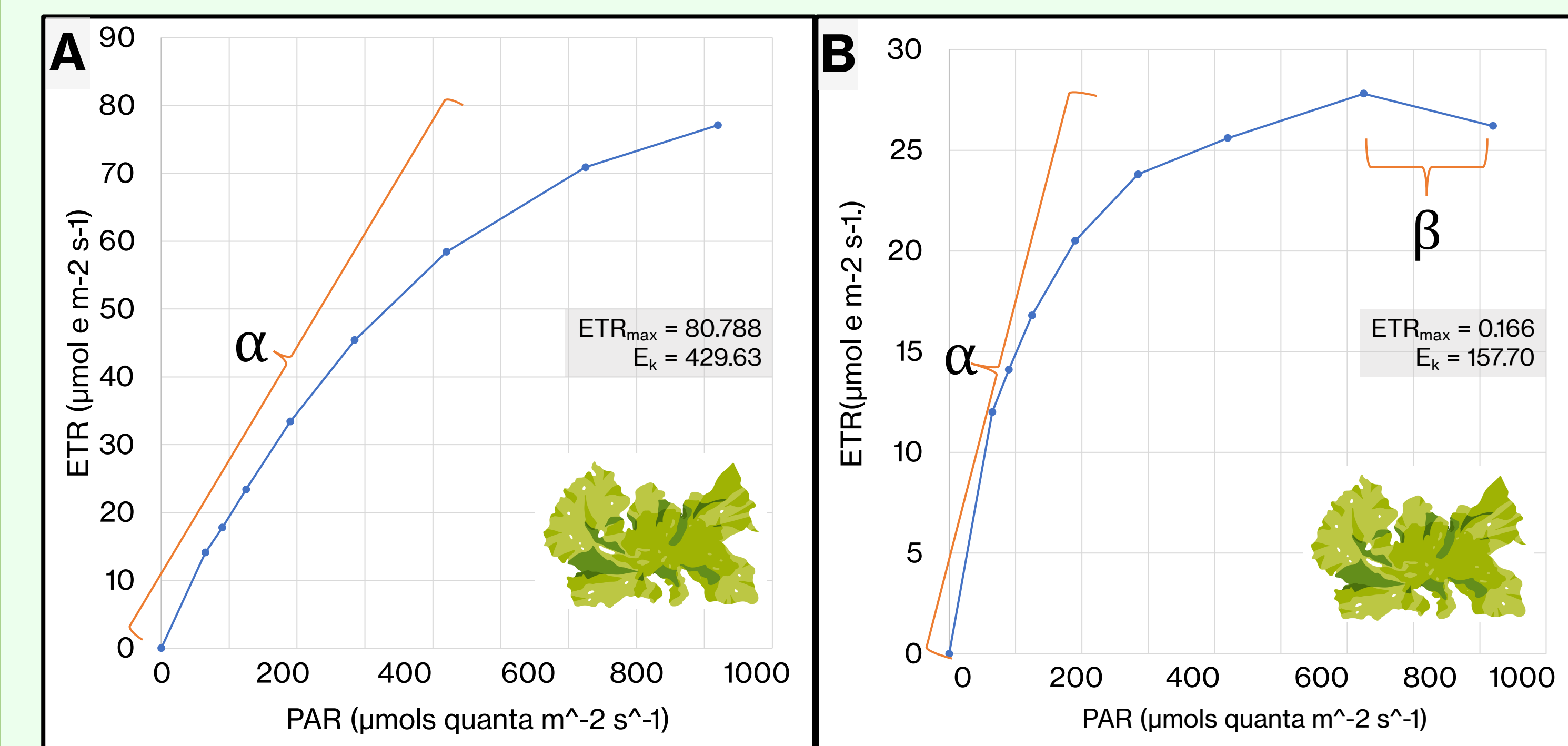


Figure 4: *Ulva* sp. photosynthetic measurements using a Junior PAM from James Island Yacht Club (A) and Shem Creek (B). The rapid light curves show each alga's electron transport rate (ETR) of photosystem II (PSII) at increasing levels of photosynthetically active radiation (PAR).

Table 1: Abiotic water quality parameters from each sampling location on 30 Sept 2023.

Site ID	Shem Creek Park	Charleston Maritime Center	James Island Yacht Club	SCDNR MRI <i>Ulva</i> Tank	SCDNR MRI <i>Gracilaria</i> tank
Average Temperature (°C)	24.78	24.68	24.88	26.83	26.95
Average Salinity (PSU)	30.48	25.20	25.53	27.28	27.49
Average PAR in first 0.5 m ($\mu\text{E/s}^1/\text{cm}^2$)	1924.28	1691.16	130.71	1275.72	1226.62
Max Depth (m)	3.01	4.91	4.21	0.5	0.5

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