

Measurements of Aquatic Species Biodiversity along Managed and Tidal Regions of the Suisun Marsh

Introduction

- Suisun Marsh is a heavily managed brackish water environment located within the San Francisco Bay Tidal estuary system¹.
- Fresh and saltwater inputs as well as agricultural and industrial runoff¹ make the water quality of the Suisun Marsh dynamic.
- Fish diversity and invertebrate abundance may be subjected to changes due to water quality fluctuations².

Objectives:

- To determine how fish & invertebrate abundance and diversity vary between wetland management regimes.
- To examine how fish diversity varies along a salinity gradient.

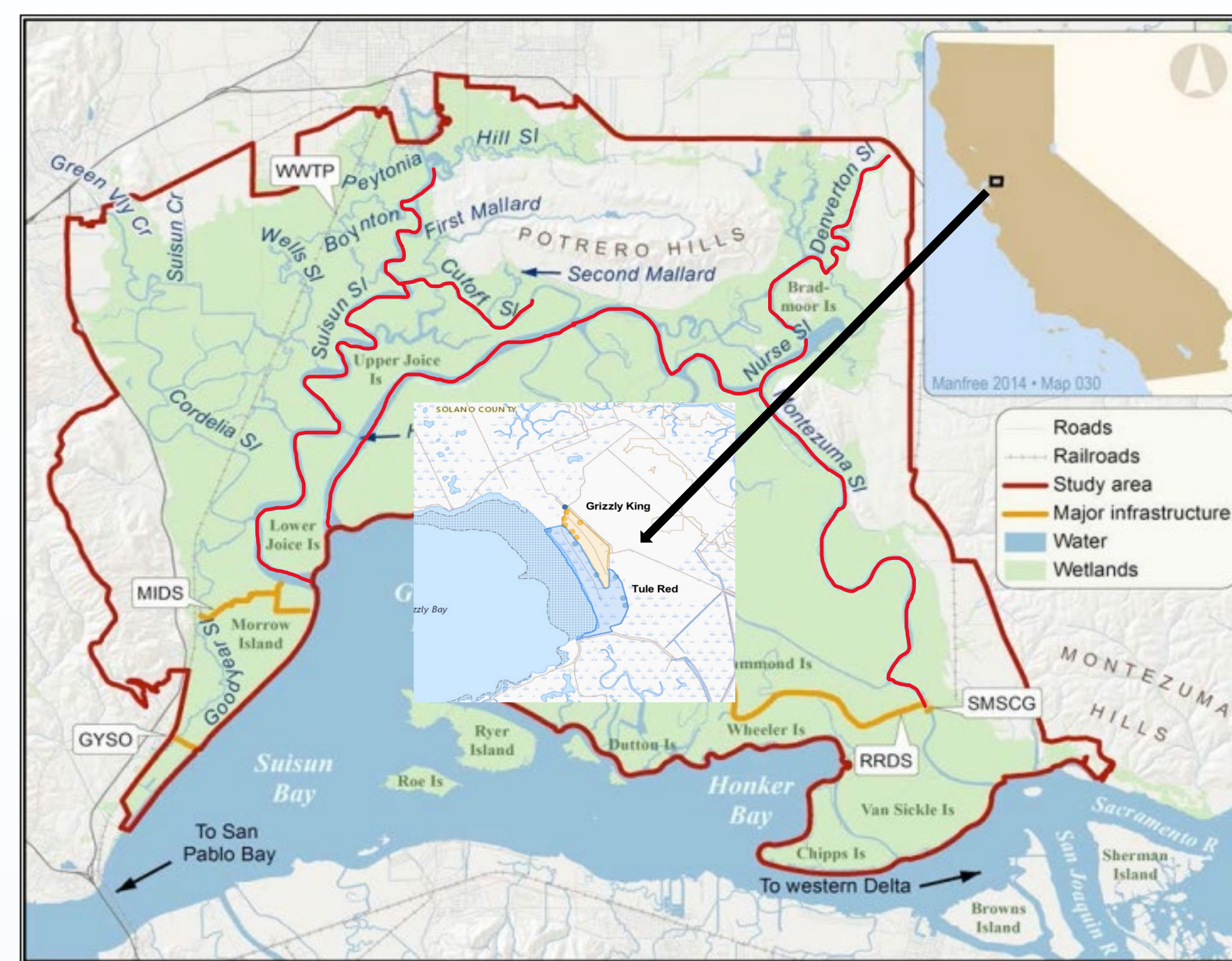
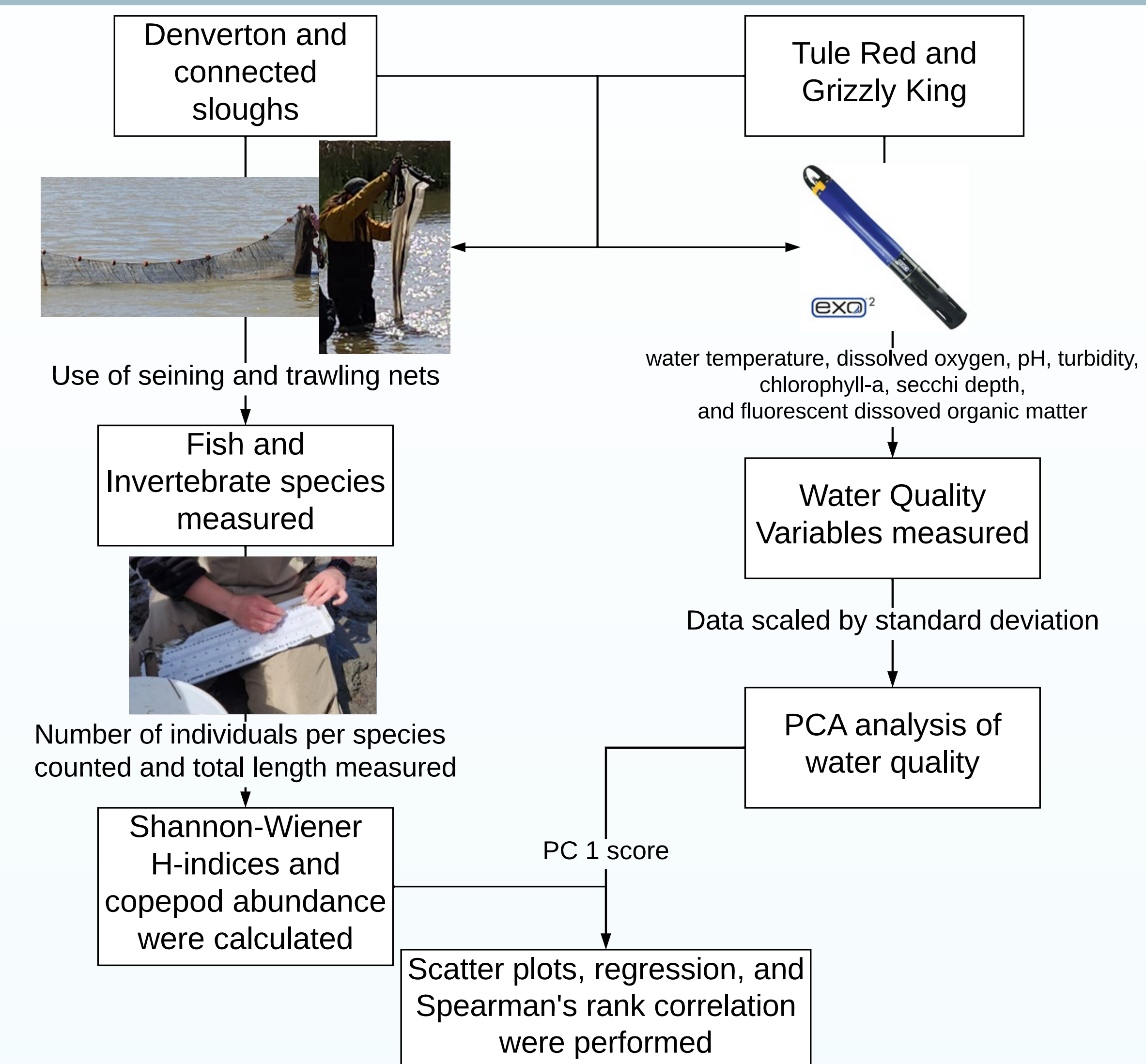


Figure 1. Locations of the study sites. Grizzly King (managed) and Tule Red (restored to tidal) situated close to Grizzly Bay. The red lines within the Suisun Marsh boundary indicate the major sloughs that were sampled. Maps obtained from O'Rear et al (2022)⁵.

Methodology



Results

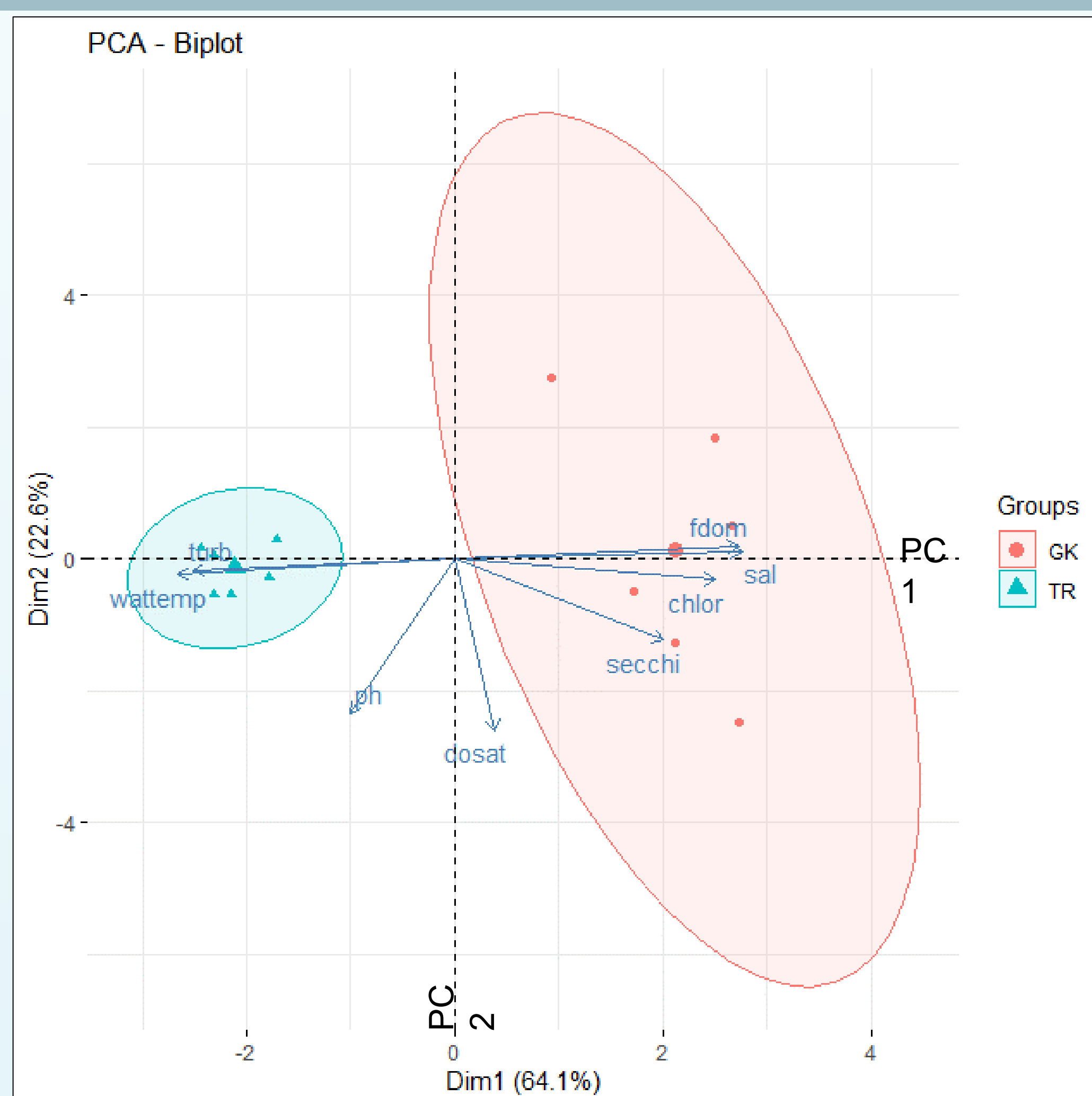


Figure 2. Principal component analysis (PCA) of water quality variables from Tule Red (TR) and Grizzly King (GK). Chlorophyll- α and salinity were positively correlated with principal component 1 (PC 1) while water temperature and turbidity were negatively correlated with PC 1. PC 2 was mostly driven (negatively) by pH and dissolved oxygen. GK sites were grouped along positive PC 1 axis while TR were group on the negative axis.

Conclusion

- Grizzly King and Tule Red differ in water quality (Fig. 2). One explanation is that hydrological management of GK decreases waterflow, increasing residence time and salt concentrations². Variability in GK could result from a greater mixture of emergent plants and halophytic forbs characteristic of managed marshes³.
- The Spearman correlation suggests a negative, but non-significant trend between copepod abundance and fish diversity in both sites. This is likely an artifact of small sample size, but perhaps in areas of high fish diversity there is a greater diversity of food resources that depress copepod abundances.
- Data implied that managed regions have greater fDOM and chlorophyll- α concentration, which coincide with the high copepod abundance. The higher rates coincided with low turbidity in GK.
- Though non-significant, high fish diversity and abundance is more likely to be found in low salinity waters along the sloughs of northeastern Suisun Marsh. Perhaps high salinity levels exclude freshwater fish species and fish food⁴.

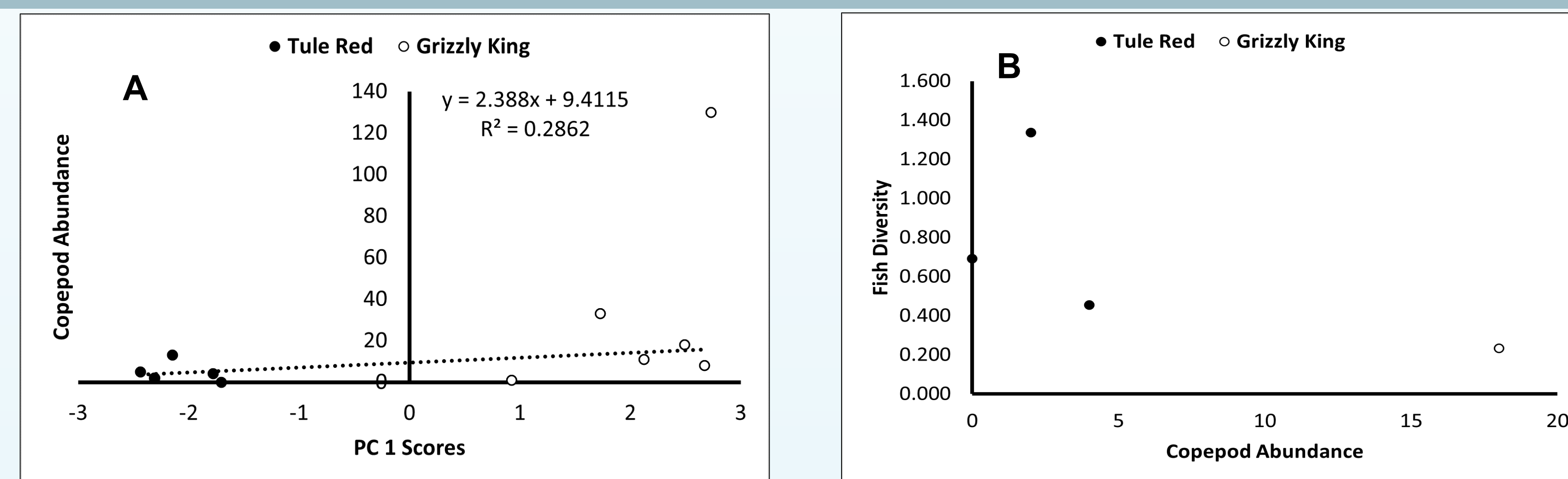


Figure 3. (A) Regression analysis of copepod abundance and PC 1 scores based on water variables. The relationship was not significant ($P=0.4$). **(B)** A scatterplot between copepod abundance and fish diversity. Spearman's rank coefficient suggests negative correlation between copepod abundance and fish diversity; however, the relationship was non-significant ($\rho=-0.80$, $P=0.2$).

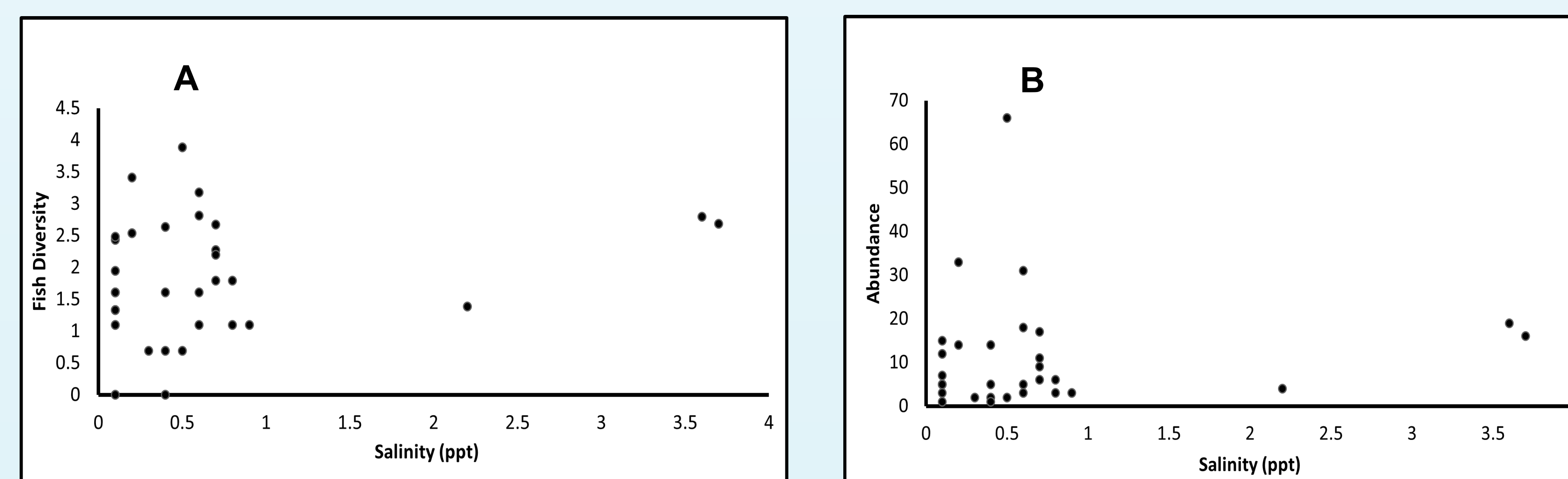


Figure 4. (A) Regression analysis of fish diversity and salinity across varying slough locations in northeastern Suisun Marsh indicated no significant relationship ($R^2 = 0.049$, $P= 0.22$). **(B)** Regression analysis of fish abundance and salinity across slough locations across the Suisun Marsh indicated no significant relationship ($R^2 = 0.010$, $P= 0.572$). Note that the results remain unaffected when the three extreme salinity values are excluded.

References

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