A Tale of Two Rivers: Water Quality and Zooplankton Abundance in the Low-Salinity Zone

Dennis Finger[1], Laurel Richardson[1], and Arthur Barros[2]

[1] Division of Integrated Science & Engineering, California Department of Water Resources, West Sacramento, CA

[2] Bay-Delta Office, California Department of Fish & Wildlife, Stockton, CA

INTRODUCTION

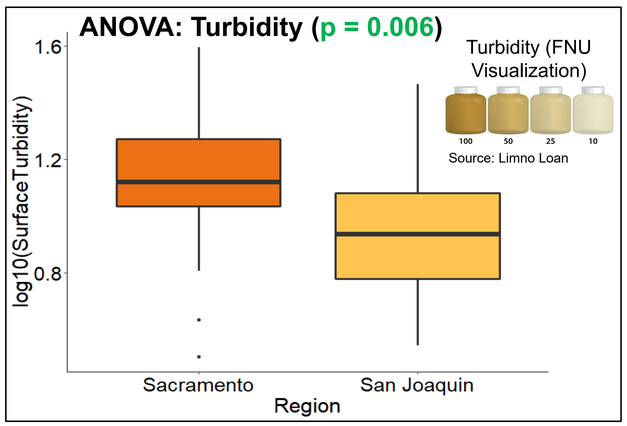
- In the San Francisco Estuary, the Low-Salinity Zone (LSZ) is defined where bottom specific conductance measures between 2000 and 6000 µS/cm (~1-3 ppt).
- The LSZ is important habitat for the endangered Delta Smelt. Interactions between tidal currents, salinity, and bathymetry can cause particulates and microorganisms such as zooplankton (an important fish food source) to become entrapped in this zone.
- LSZ location in the estuary changes with freshwater outflow. During low-flow conditions, the LSZ moves upstream and can split into two geographically distinct zones in the Sacramento and San Joaquin Rivers (see center panel map).
- Here we compare water quality and zooplankton abundance in the Sacramento and San Joaquin River LSZs to see if there are significant ecological differences between the split LSZs.

METHODS

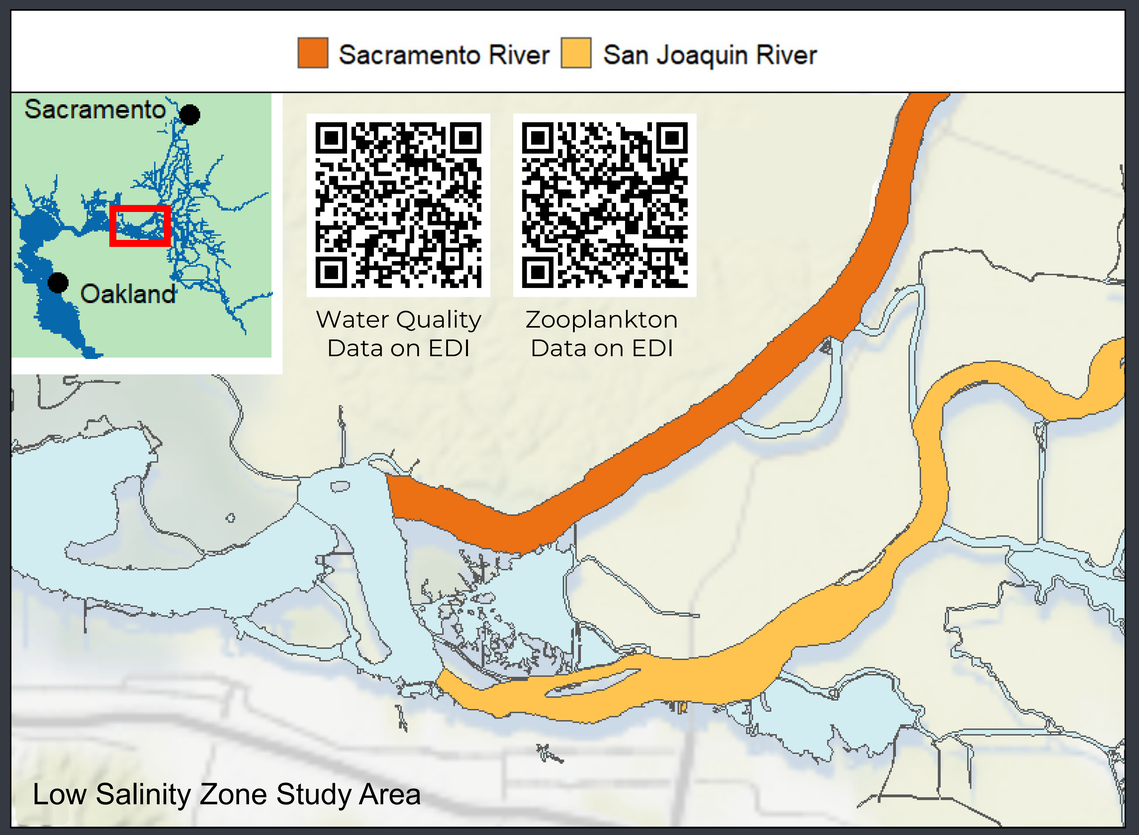
- Samples were collected monthly in the LSZ from 2014-2021 by the Environmental Monitoring Program (EMP). For this analysis, we only considered samples where the LSZ was upstream of the Confluence.
- Water quality was analyzed at DWR's Bryte Laboratory.
- Zooplankton taxa were identified and enumerated by taxonomists at CDFW.
- Analysis of Variance (ANOVA) was used to compare water quality and the abundance of specific zooplankton taxa in the Sacramento and San Joaquin River LSZs.

RESULTS: WATER QUALITY

- Turbidity in the LSZ was significantly higher in the Sacramento River (15.4 ± 7.1 NTU) compared to the San Joaquin (10.2 ± 5.7 NTU).
- Other water quality constituents we examined (chlorophyll a, dissolved nitrate+nitrite, ammonia, and orthophosphate) did not differ significantly.



Zooplankton abundance and **turbidity** in the Low-Salinity Zone were **greater** in the Sacramento River compared to the San Joaquin River.



EMP EST. 1975

DEPARTMENT OF WATER RESOURCES · STATE OF CALIFORNIA

CALIFORNIA DEPARTMENT OF FISH & WILDLIFE

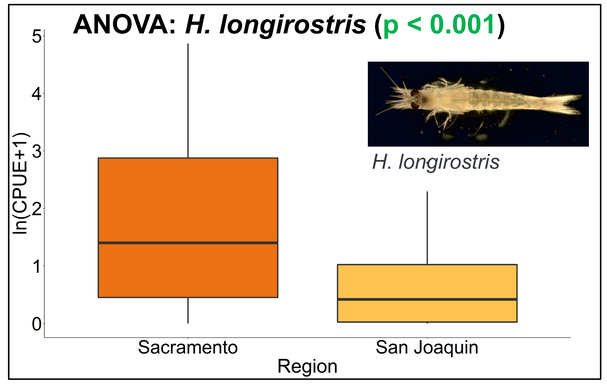
BUREAU OF RECLAMATION

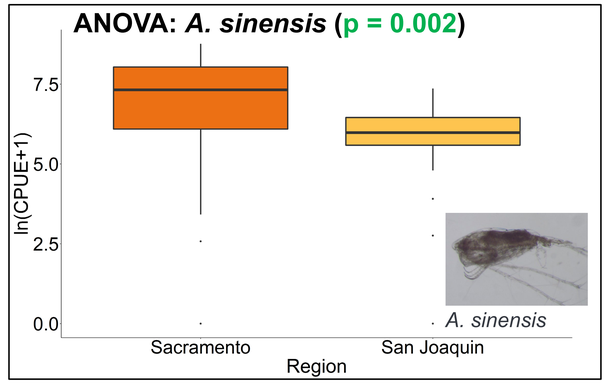
ACKNOWLEDGEMENTS

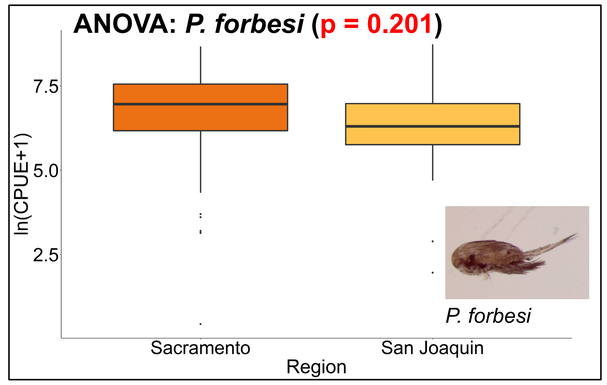
We would like to thank the EMP field crew, CDFW Bay-Delta Office Senior Laboratory Assistants, and Betsy Wells, Rosie Hartman, Ted Flynn, and Brittany Davis for their support and guidance. EMP is funded jointly by DWR and the United States Bureau of Reclamation.

RESULTS: ZOOPLANKTON

- Zooplankton in the LSZ were generally more abundant in the Sacramento River, with significantly larger populations of both *Hyperacanthomysis longirostris*, and *Acartiella sinensis*. The abundance of *Pseudodiaptomus forbesi* did not differ significantly between the two rivers. (Photos by Tricia Bippus)







CONCLUSIONS

- Chlorophyll a and other water quality parameters in the LSZ apart from turbidity did not differ significantly between the Sacramento and San Joaquin River, suggesting other physical or biogeochemical differences between the two rivers may be contributing to the observed differences in zooplankton abundance.
- Low turbidity may drive vertical migration of zooplankton in the San Joaquin River, resulting in lower sampling detection if they are avoiding predation by hiding in the substrate. Regardless, the availability of *H. longirostris* and *A. sinensis* to pelagic predators is higher in the Sacramento River LSZ during the day.
- In a changing climate, flows in the estuary are expected to vary more greatly from year to year. These results provide important insight into possible ecological repercussions caused by changes in the LSZ's location.