Zooplankton Trophic Ecology in the San Francisco Estuary During Summer as Determined by Stable Isotope Analysis

Kyla BradyLong\textsuperscript{1,3}, Steven Westbrook\textsuperscript{2,3}, Julien Moderan\textsuperscript{3} and Wim Kimmerer\textsuperscript{3}

\textsuperscript{1}California Polytechnic State University, San Luis Obispo, \textsuperscript{2}California State University, Chico, \textsuperscript{3}Romberg Tiburon Center for Environmental Studies, San Francisco State University

Introduction & Objectives

- Declines in the abundance of several pelagic fish species have prompted investigation into food web interactions within the estuary and delta. This area is characterized by low primary production and pelagic food webs much longer than previously thought. As consumers stable isotope composition reflects that of their food, we use it to identify the sources of organic matter and to describe trophic relationships among the different species.

Methods

- Collected samples of zooplankton larger than 100µm and particulate organic matter (POM) along the estuary from freshwater to ~25‰ psu from June 2012 to February 2013.
- Preserved zooplankton samples at -20°C.
- Zooplankton species were sorted into ~0.5mg samples for isotope analysis.
- Stable Isotope Analysis by EA-IRMS (Elemental Analyzer-isotopic ratio mass spectrometer)

Results for June and July (2012)

- More variable for T. dextrilobatus at higher salinity

Species Key:
- Acartiella sinensis
- Hyperacanthomysis longirostris
- Pseudodiaptomus forbesi
- Tortanus dextrilobatus
- Acartia hudsonica
- Amphipod
- Basmina sp
- Corophium sp
- Cragon crangan (adult)
- Limnoithona tetraspina
- Microcystis
- Oithona davisae
- Paleamon macrodactylus zoea
- Sinocalanus doerrii

Conclusions & Implications

- High \( ^{15}\text{N} \) variability at low salinity: varying bacterial degradation of organic matter at the base of the food web and/or human impact (N from sewage, fertilizers...)
- Low \( ^{14}\text{N} \) variability at high salinity: lower diversity of trophic pathways and trophic levels
- Microcystis not a good candidate for being a primary food source for any of the zooplankton due to its \(^{15}\text{C} \) enriched state
- Evidence confirms carnivorous nature of Tortanus dextrilobatus and Acartia sinensis.
- Given the \(^{15}\text{N} \) enrichment for trophic levels, T. dextrilobatus and A. sinensis most likely feeding on A. hudsonica and P. forbesi, respectively
- Microcystis and Aphanizomenon are more \(^{15}\text{C} \) enriched than all other organisms.
- Tortanus dextrilobatus and Acartiella sinensis are both \(^{15}\text{N} \) enriched as compared to the other zooplankton sampled.

Acknowledgements:
A huge thanks to all the students in the Kenneth lab for all their help and for a fun summer! Thanks to Department of Fish and Game and the Interagency Ecological Program for providing us with their samples as well as the UC Davis Stable Isotope Facility for analyzing our samples. Thanks to David Bell and Ewald Moll in the lab for their help with sampling.

References: