DELTA SCIENCE FELLOW 2016

Delta Stewardship Council
Delta Science Program

Sea Grant California

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WHY THIS RESEARCH MATTERS

The Sacramento-San Joaquin Delta has lost 95% of its historical wetlands, drastically altering the flow of carbon from wetlands into aquatic habitats and food webs. In fact, carbon cycling in general is inextricably linked to most of the problems facing the Delta, including loss of organic soils, climate change impacts, drinking water concerns, and the basis for the food web that supports Delta ecology. With extensive plans for restoration of around 30,000 acres in the Delta already underway, there is a great need to identify how various types of restoration will impact carbon cycling and lower food web dynamics.

The effect of particulate organic carbon composition on zooplankton growth in tidal wetlands of the Sacramento-San Joaquin Delta

The survival of *Eurytemora affinis*, a common calanoid copepod in the Delta, is dependent on access to bioavailable carbon through both marine and terrestrial food resources. *Jennifer Harfmann*

PROJECT

The primary objectives of this project were to investigate how changes in particulate organic carbon sources in the Delta affect zooplankton abundance and health; and the degree to which zooplankton incorporate vegetation into their diet, in order to address how changes in food sources affect carbon transfer in the lower aquatic food web. As a Delta Science Fellow, Harfmann conducted laboratory studies of zooplankton feeding dynamics, used genetic analysis to determine the stomach contents of zooplankton, and monitored their survival on different types of diets to determine what food sources were necessary or optimal for survival.

RESULTS

Initial results confirmed that zooplankton will eat food sources from land (vegetation) as well as the sea (algae). In addition, the study showed that zooplankton had high survival rates when provided a diet consisting of food sources from both marine and terrestrial sources. This suggests that the presence of both marine and terrestrial food sources are critical in supporting the lower aquatic food web.

MANAGEMENT APPLICATIONS

Ultimately the findings of this research could help inform restoration efforts to ensure they provide sufficient and appropriate forage to support native fish populations in the Delta. By analyzing zooplankton gut content using genetic methods, the study presents a novel technique that can be used to shed new light on lower food web dynamics.

The finding that a diet containing both terrestrial vegetation and algae increases survival indicates that both algal and vegetative food sources are critical in supporting the lower aquatic food web. This implies that a diverse landscape, containing both open water and marshlands, could augment zooplankton populations in a restored Delta, helping to create a solid basis for a healthy aquatic food web.

Water samples were collected in Suisun Marsh, a brackish water marsh between the Delta and the San Francisco Bay.
Jennifer Harfmann

PRESENTATIONS

Harfmann JL, Kurobe T, Bergamaschi BA, Teh SJ, Hernes PJ. 2018. Linking metagenomics data with chemical biomarkers to investigate the role of terrestrial organic matter in estuarine zooplankton diet. Poster. *Association for the Sciences of Limnology and Oceanography Summer Meeting*, Victoria, BC, Canada, 10-15 June 2018.

Harfmann JL, Kurobe T, Bergamaschi BA, Teh SJ, Hernes PJ. 2018. The contribution of detritus to copepod diet in the San Francisco Bay Estuary. Poster. *Interagency Ecological Program Workshop*, Folsom, CA, USA, 6-8 March 2018.

Harfmann JL, Hernes PJ, Kurobe T, Bergamaschi BA. 2017. A combined biomarker and metagenomics study of copepod diet across a spectrum of food qualities. Poster. *13th Biennial State of the Estuary Conference*, Oakland, CA, USA, 10-11 October 2017

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