California Sea Grant Delta Science Fellowship Spotlight:
Dr. Michelle Jungbluth

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SEA GRANT FELLOW:	Dr. Michelle Jungbluth
RESEARCH FOCUS:	Larval longfin smelt
RESEARCH LOCATION:	San Francisco Bay Estuary
CURRENT OCCUPATION:	2017 – 2019 Sea Grant Fellow Adjunct Assistant Professor of Biology Estuary & Ocean Science Center San Francisco State University
EDUCATION:	2007 B.S. in Biology, University of Wisconsin at Madison 2012 M.S. & 2016 Ph.D. in Biological Oceanography, University of Hawaii at Mānoa

Sea Grant Fellow Q & A WITH DR. MICHELLE JUNGBLUTH

Q: Why did you choose to pursue a career path in science?

A: I have always been a curious and observant person. When I was growing up in the Midwest, I spent all of my free-time outdoors in a nearby stretch of forest searching for patches of ladybugs and exploring the woods. I wondered why the ladybugs would always come back to one particular spot where I could find them every year. Early experiences like this shaped my love for the wonders of nature, which motivated me to continue my career path in science.

Q: Can you briefly describe your research?

A: As a Sea Grant Delta Science Postdoctoral Research Fellow, the goal of my research is to reveal the previously 'invisible' contributors to the diets of larval fish in the San Francisco Estuary. The main species I am focused on is the threatened native fish, the longfin smelt, a close relative to the well-known, endangered 'Delta smelt'.

I am comparing its diet to the highly similar and more abundant larval Pacific herring. Studying larval fish diets is not easy. The items that are seen under the microscope can be hard to identify since they are partially digested, and soft-bodied prey, like worms or small jellyfish, may be entirely missed because they are digested more rapidly. By using DNA sequencing, I am able to amplify all DNA present in the entire contents of the stomach and intestines, which allows me to identify all of the organisms that have been ingested by the fish before it was captured, regardless of their condition.

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Q: What drew you to the study of Longfin in the San Francisco Estuary? Why is this an important issue that needs to be researched further?

A: The longfin smelt is a threatened native fish species that relies on freshwater areas in the upper estuary and Delta for spawning. Since the 1980s, there has been a decline in the animal populations throughout the San Francisco Estuary, from fishes to their food, the zooplankton – the little-known, mostly microscopic animal that serves as the first consumers in aquatic food webs and are a critical food source for larger predators like larval fishes. We think that one of the important causes for the decline in fishes is a decline in zooplankton food resources for the larval fishes.

As a result of my research, we will gain important information about what food resources are critical for the survival of larval longfin smelt, where those food resources can be found by comparing diets across habitats and areas of the Estuary, and whether longfin smelt larvae are competing with the Pacific herring for overlapping food resources. Defining what the critical food resources are and how they differ across space and time is an essential step towards better understanding how food webs have changed in the San Francisco Estuary and Delta, including what we can do to provide better support for the organisms living there.

Q: What are some of the most interesting things you have learned from your research?

A: Preliminary results of my analysis so far show quite a few exciting things, and much more will come with my continued in-depth analysis. Many of the prey items that are more difficult to identify were more clearly described using DNA, and some of them were a complete surprise.

I found one species' DNA that we previously knew very little about. This may be a new species description to add to the knowledge of zooplankton that make the Estuary their home. I also found an abundance of the species *Hydra olactis* in the diets of some fish, an organism we would not otherwise be able to see without the benefit of DNA.

Also, the visual gut analysis found fish eggs in the diets of larval longfin; my DNA results suggest that at least some of these eggs were from the Pacific herring. Pacific herring attach their eggs to surfaces similar to how longfin smelt and other fishes spawn, so this suggests that the longfin smelt larvae do at least some of their feeding near the bottom or amongst marsh plants.

Q: How will this research help to inform our understanding of the Delta and habitat restoration efforts for longfin smelt?

A: By obtaining clear identification of species like the *Hydra olactis* or Pacific herring eggs that are important in the diets of longfin smelt and other fish, we get better clues to what habitats are being utilized as essential nursery grounds in the Delta and Estuary. If the prey types found indicate that these fish rely on restored tidal marsh habitats and a type of surface-attached or native prey item, we can focus our restoration efforts on those important nursery grounds, surveying for specific species to make sure our efforts are providing appropriate resources for our struggling fish populations.

Q: What are your plans after completing your fellowship?

A: I am looking forward to continuing my work on important food web issues in the San Francisco Estuary and Delta. In the short term, I am transitioning into an Adjunct Faculty appointment at San Francisco State University and continuing to work with my research mentor, Dr. Wim Kimmerer at the Estuary and Ocean Science Center, on projects related to gaining a better understanding of food webs in the Estuary and Delta.

I will be starting a new project with Dr. Kimmerer that will resolve the mysterious food web contradictions that remain to be answered. Beyond that project, I aim to carry on with research investigating and characterizing essential habitat and zooplankton prey populations for the native fish in the estuary. I hope to soon find a permanent Faculty or Research Scientist position in the Bay Area where I would continue to serve as a member of the local scientific community, build on our knowledge of food web interactions and inform management actions to support the health of our Estuary.