Jellyfish Throwdown: Invasive versus Native

Brooke Bemowski¹, Trisha Huynh², Lindsay J. Sullivan³, and Wim Kimmerer⁴

¹California State University of Long Beach, 1250 Bellflower Boulevard, Long Beach, California 90840
²California Polytechnic State University of San Luis Obispo, 1 Grand Avenue, San Luis Obispo, California 93407
³Romberg Tiburon Center for Environmental Studies, San Francisco State University 3152 Paradise Drive Tiburon, California 94920

Identification

Jellyfish are characterized by their gelatinous bodies (~95% water) and two tissue layers (endoderm and ectoderm). Morphological traits assist in further categorizing jellyfish by species.

**Blackfordia virginica**
- 0.41-12.00 mm
- Short, evenly spaced tentacles
- Gonad on radial canal
- Wide radial canal
- Wide ring canal
- Fluted lips

**Maeotias marginata**
- 0.88-37.00 mm
- Cloth focused tentacles
- Longitudinal organ
- Evenly spaced tentacles
- Fluted lips

**Moerisia lyonsi**
- 0.54-1.83 mm
- Evenly spaced tentacles
- Longitudinal organ
- Large tentacle bulb

**Pleurobrachia bachei**
- 0.43-5.83 mm
- Creme (comb rows of fused cilia, for movement)
- Apical sense organ
- Radial canal
- Tentacle sheath

**Obelia sp.**
- 0.5-2.5 mm
- Lobed lips
- Spherical gonad on radial canal

Background

Since the 1950s three invasive (non-native) species of gelatinous zooplankton (jellyfish) have established populations in the San Francisco Estuary. As jellyfish populations increase they compete for resources in the ecosystem. Jellyfish and endangered delta smelt share the same food source: crustacean zooplankton, especially copepods. Determining the abundance and species composition of jellyfish in the estuary can provide a better understanding of their role in the food web.

Objective

Determine the diversity (number of species) and abundance of jellyfish in the San Francisco Estuary

Methods

- Monthly plankton tows were used to collect samples at 9 stations across the San Francisco Estuary from 2010-2012
- Samples were preserved in formaldehyde and stained with rose bengal
- Samples were removed from formaldehyde, transferred to water and placed in plexiglass trays
- Trays were placed atop a light box and manually scanned for jellyfish using a magnifying glass and probe
- Jellyfish were removed from samples, placed under a microscope, and identified
- Using a camera-equipped microscope, photographs and measurements were taken on a computer

Results

**Percent Composition of Jellyfish in the San Francisco Estuary**

- **B. virginica**
- **M. marginata**
- **M. lyonsi**
- **P. bachei**
- **Obelia sp.**
- **Other**

*Other jellyfish did not have enough identifying features to determine species.

Conclusions

- The most abundant species in the San Francisco Estuary are **B. virginica**, **M. marginata**, and **P. bachei**.
- 70% of jellyfish found in the estuary are invasive species. As new competitors for food, they could impact delta smelt and native jellyfish populations.

Acknowledgements: We would like to thank Lindsay J. Sullivan for mentoring us during this research, Brooke Bemowski, Trisha Huynh, Lindsay J. Sullivan, and Wim Kimmerer for their help throughout this project, and the Romberg Tiburon Center including Carrie Fong, Carrie Ann Sharitt, and Wim Kimmerer, for their help throughout this project, and the Romberg Tiburon Center for Environmental Studies and the STAR program for providing this research opportunity.

Any opinions, findings, and conclusions or recommendations expressed in this material are those of the authors and do not necessarily reflect the views of the funders.

The material is based upon work supported by the Charles Colson Prize for Excellence in Undergraduate Teaching (Brian A. Hubbard, Wim Kimmerer, and Lindsay J. Sullivan), the National Science Foundation Grant No. 1614149 (Brian A. Hubbard, Wim Kimmerer, Lindsay J. Sullivan), and the California State University Long Beach’s STEM Success Grant (CSU Fresno).