Mysid and Amphipod Trends from 2011 to 2017 using FMWT Data

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Introduction

The planktonic macroinvertebrate community of the San Francisco Estuary (SFE) serves as an important food source for threatened and declining pelagic fish. The distribution and abundance of mysid shrimp and amphipod species are changing in response to environmental conditions as well as invasive species introductions. Tracking these changes is crucial to understanding the dynamics and health of the food upon which estuarian fish species rely.

Research Questions

- What differences exist in mysid and amphipod abundance and species composition between regions
- How has regional abundance of Mysids and Amphipods changed over the course of study?
- Do trends in mysid BPUE differ from those in CPUE?
- How has species composition changed across varying environmental conditions?

Methods

- Sampling conducted at 32 station throughout estuary
- Samples Collected monthly from September – December
- Using a 50-micron net in a 10-minute stepped oblique tow

- Mysids identified and enumerated since 2011
- Amphipods identified and enumerated since 2013

Calculations

Catch per Unit Effort (CPUE)

Volume Filtered = Δ Flowmeter * Calibration Factor * Net Area

CPUE = Catch / Volume Filtered

Biomass per Unit Effort (BPUE)

Wet Weight = Sp. Length-Weight Relationship * Length

Dry Weight = Wet Weight * 0.2 (Cushing *et al* 1958)

Carbon Weight = Dry Weight * 0.6 (Cushing *et al* 1958)

Volume Filtered = Δ Flowmeter * Calibration Factor * Net Area

BPUE = Carbon Weight / Volume Filtered

Discussion

Mysid BPUE proportions suggest that minor species are more important in terms of food for fish than would be inferred from CPUE alone. It also gives credence to the idea that replacement of native Neomysis spp. with the invasive Hyperacanthomysis longirostris in dominance of the system may have a negative effect on food availability for fish.

The shift in the amphipod community seen in Suisun Bay between 2016 and 2017 may be the result of a very wet winter lowering the salinity of the region and flushing out the more saline assemblage. Specific conductance of surface water collected coincident to mysid and amphipod sampling suggests salinity may be involved in the shift, but further analysis would be required to firmly establish a link.

Creating specific length to weight ratios for individual amphipod species or genera such as those established for mysids would improve the ability to discern how shifts in species composition, like that seen in Suisun Bay, relate to food availability for fish.

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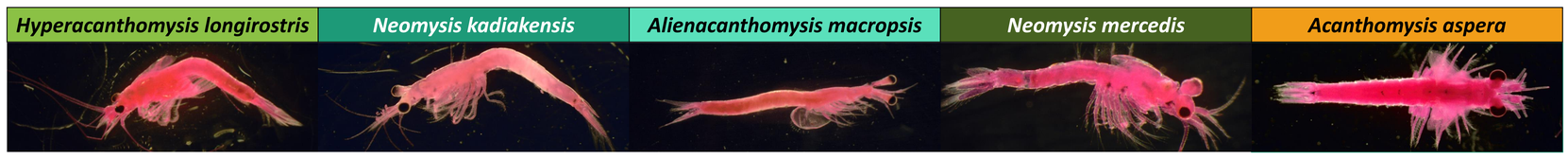
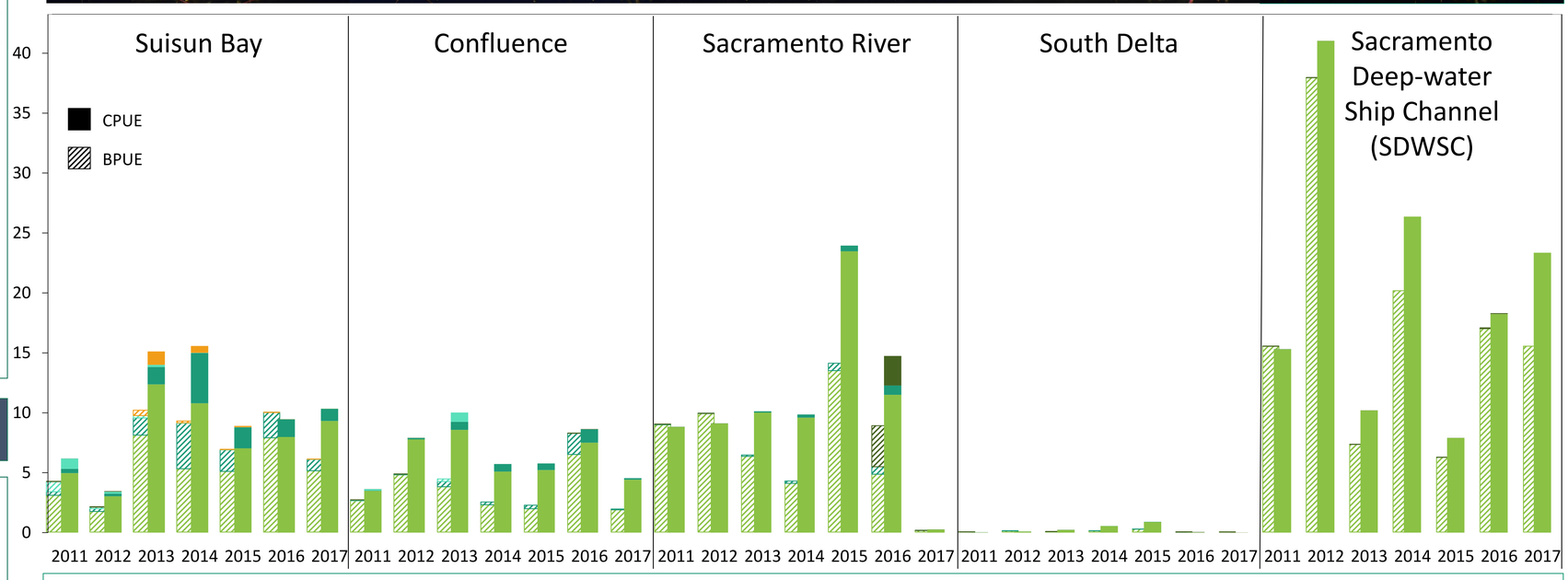
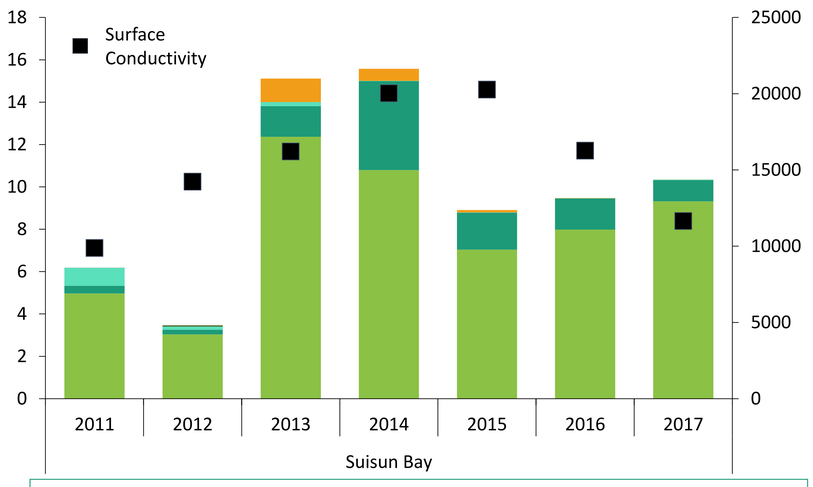
Photo credit: Tricia Bippus and various CDFW staff

Mysid Results

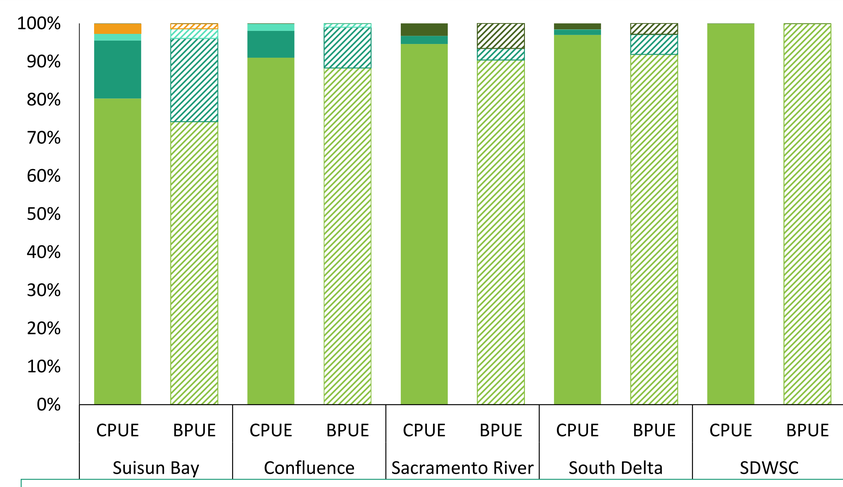




Annual mean mysid CPUE and BPUE by region. Color coding indicates species, pattern describes CPUE or BPUE. Unit scale to the left: CPUE in number per cubic meter of water. Unit scale to the right: BPUE in milligrams of Carbon per cubic meter of water.



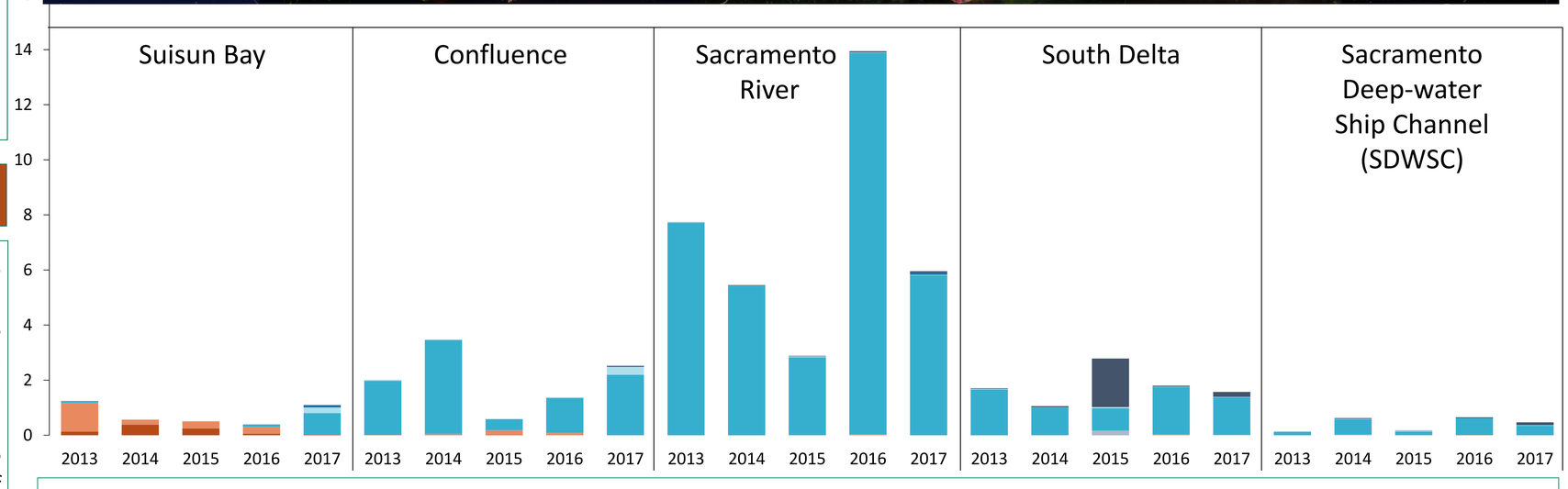
Annual mean CPUE for Suisun Bay. Scale to the left: CPUE in number per cubic meter of water. To the right: surface water specific conductance, micosiemens.



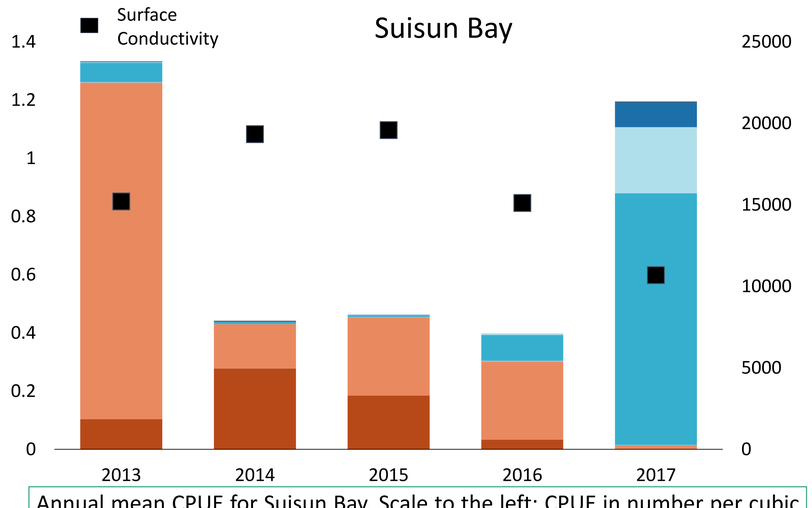
Mysid species composition of catch as a proportion of total CPUE or BPUE by region. Color indicates species, pattern indicates either CPUE or BPUE.

Mysid abundance showed substantial and regular variation between regions. The SDWSC consistently had the highest mysid CPUE and BPUE, while the South Delta consistently had the lowest. Year to year variation in CPUE and BPUE does not trend significantly over the course of the study. CPUE and BPUE follow each other with the notable exception of a few instances of divergence; wherein, annual average CPUE for a region may increase from the previous year, but average BPUE decreases and vice versa. Species composition remained relatively constant in all regions despite variation in environmental conditions across years. Everywhere, *Hyperacanthomysis longirostris* accounted for over 75% of the CPUE and BPUE. *Neomysis kadiakensis* and *Neomysis mercedis* constitute a larger proportion of the total BPUE than the total CPUE.

Amphipod Results



Annual mean amphipod CPUE by region. Color coding indicates species. Unit scale to the left: CPUE in number per cubic meter of water.



Annual mean CPUE for Suisun Bay. Scale to the left: CPUE in number per cubic meter of water. To the right: surface water specific conductance, micosiemens.

Amphipod abundance showed regular variation between regions. The Sacramento River had the highest amphipod CPUE and BPUE, while the SDWSC and Suisun Bay had the lowest. Year to year variation in CPUE and BPUE does not trend significantly over the course of the study. CPUE and BPUE follow each other with the notable exception of a few instances of divergence; wherein, annual average CPUE for a region may increase from the previous year, but average BPUE decreases and vice versa. Species composition remained relatively constant in the Confluence, Sacramento River, South Delta, and SDWSC, where *Gammarus daiberi* dominated. In Suisun Bay, species composition shifted dramatically over the course of the study. *Corophium alienense* and *Ampelisca abdita* were replaced between 2016 and 2017 by *Gammarus daiberi*, *Americorophium spinicorne*, and *Americorophium stimpsoni*. Species level length to weight ratios have not been developed for the studied amphipod species so species specific BPUE could not be calculated.