



# Functional Response of Protected Larval Stage Delta Smelt (*Hypomesus transpacificus*)



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## Background

### Delta smelt

- It is a protected slender-bodied fish (5 to 7 cm)
- Most delta smelt have a one year life cycle
- It is endemic to the San Francisco Estuary, CA
- Feed on various zooplankton, mainly copepods

### *Pseudodiaptomus forbesi*

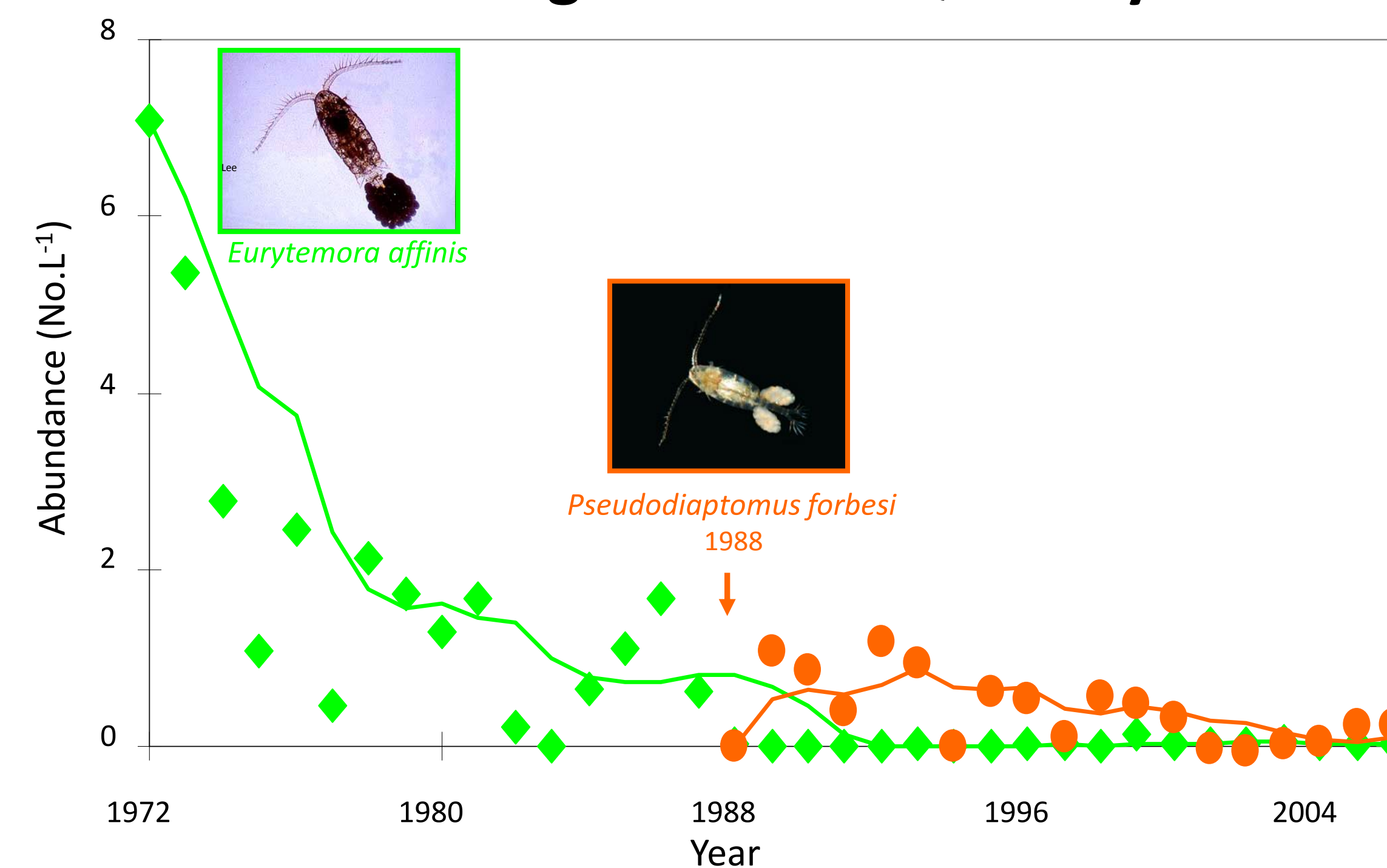
- Important smelt food (=copepod)
- Introduced from China
- Appeared in San Francisco Estuary in 1987
- Functionally equivalent to “native” *Eurytemora affinis*

## Objectives

- Study the functional response of 2 different larval ages of delta smelt
- Determine the maximum feeding rate

(This is a report looking at a small portion of a much larger study.)

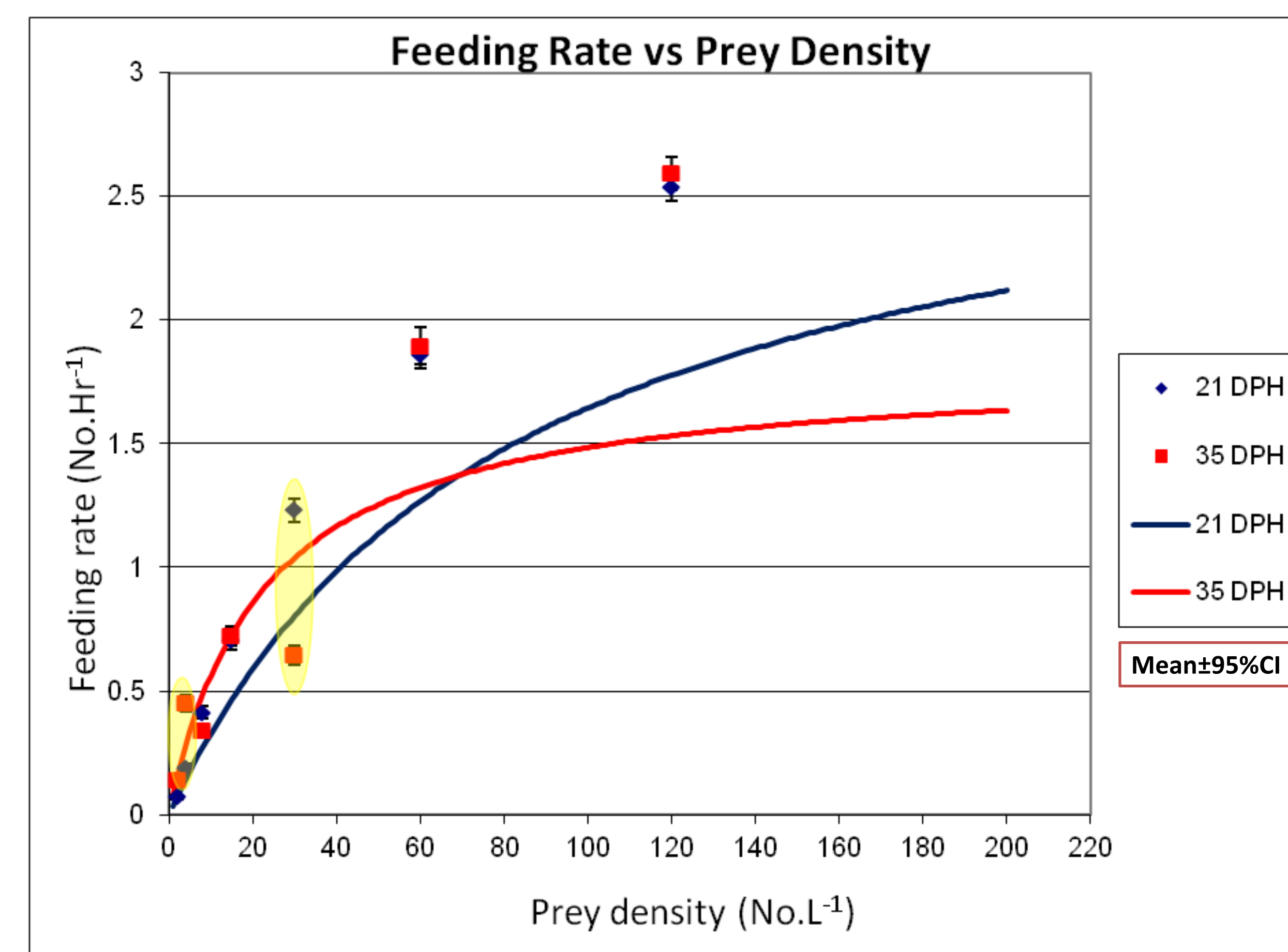
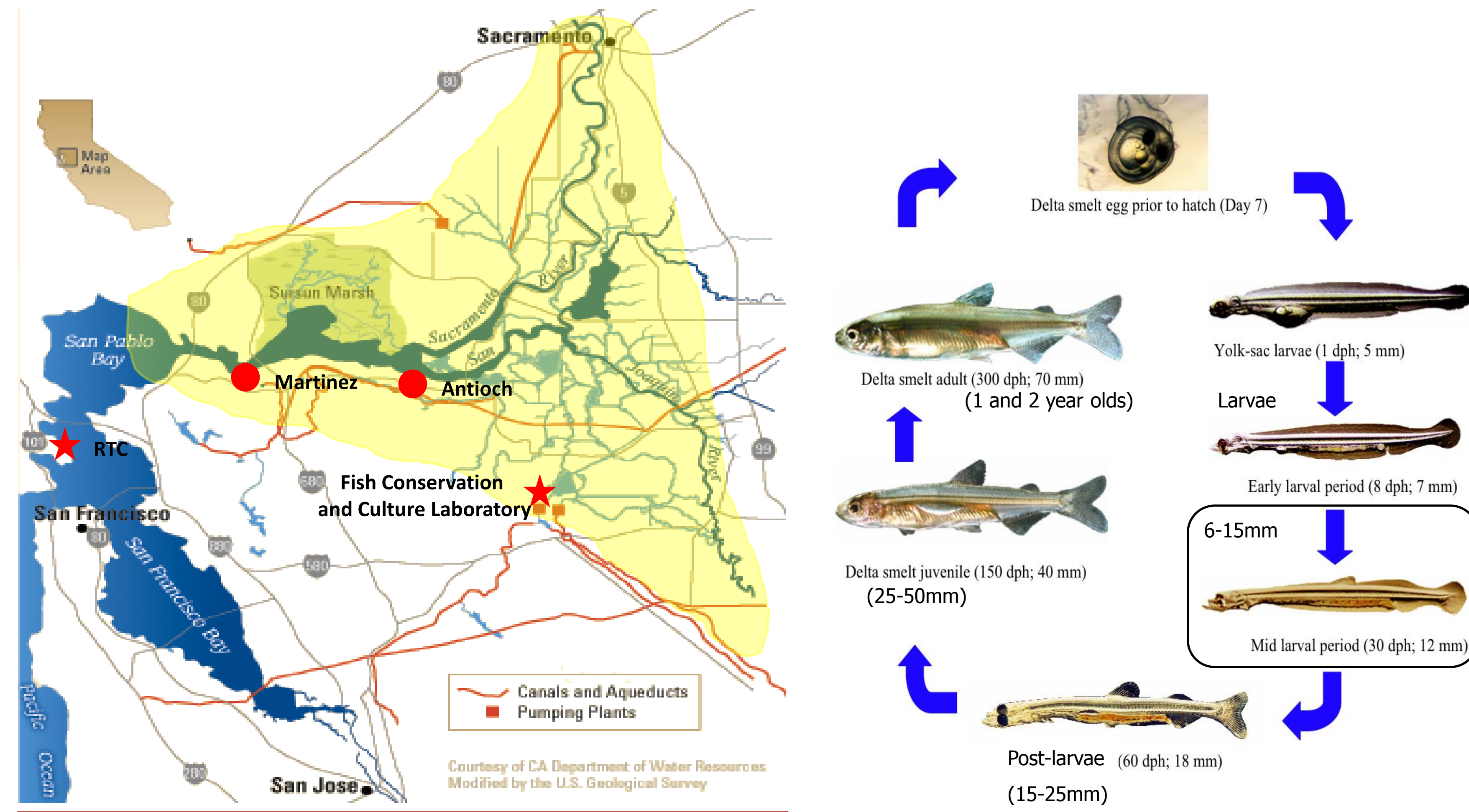
## Changes in Food Quantity



Historical prey density of *P. forbesi* and *E. affinis*. The combined prey density is currently less than 1 L<sup>-1</sup>. (A. Mueller-Solger, unpublished)

## Acknowledgements

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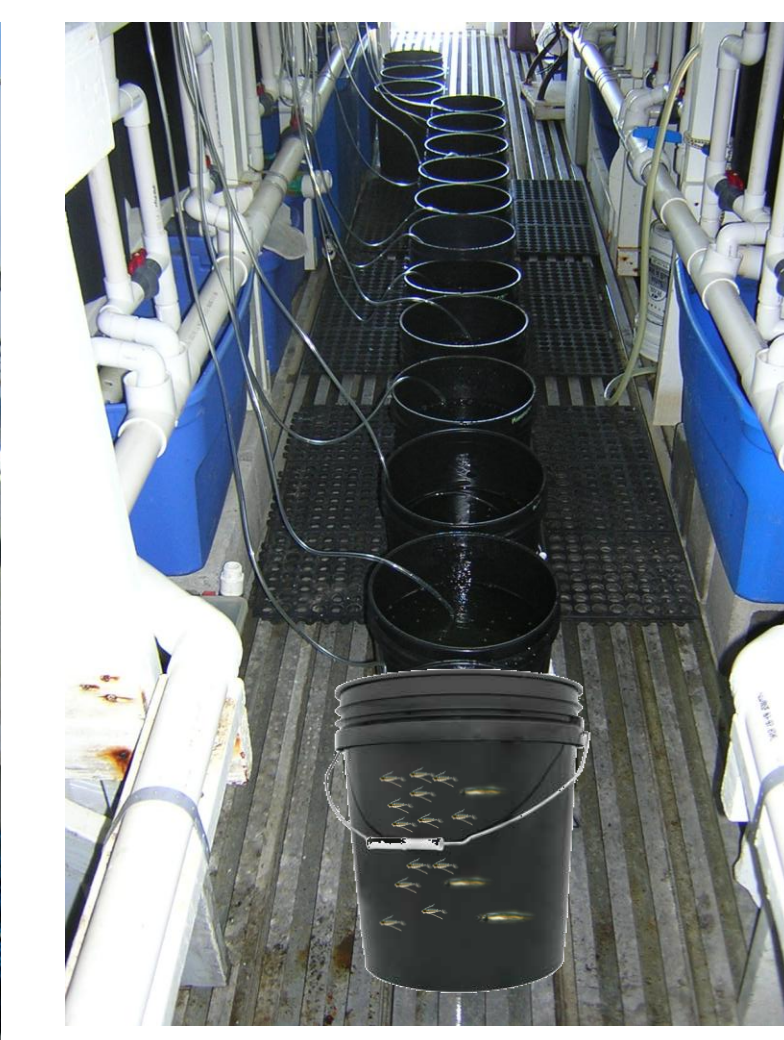
Scatter plot showing feeding rates for the two larval ages, 21 DPH and 35 DPH. Highlighted points are where feeding rates shows significant difference

## Methods

- Collected copepods from the field using plankton nets
- Copepods were counted or estimated for each prey concentration
- Used fish cultured by the Fish Conservation and Culture Laboratory in Byron, CA
- The 2 ages tested were 21 Days Post Hatch (DPH) and 35 DPH
- Delta smelt were set in 15 L buckets with 7 different concentration of copepods for 2 hours
- Contents of buckets were preserved in vials with formalin
- Uneaten copepods counted
- Fish stomachs and intestines were dissected and eaten copepods counted
- Copepod numbers were then graphed and the maximum feeding rate was calculated



Plankton nets used for copepod collection



Buckets with delta smelt and copepods at Byron Lab



Dissection microscope used for counting copepods and dissecting fish

## Results

- Prey ingestion did not reach maximum feeding rate within the given densities

### For 21 DPH

- Max feeding rate found to be 3 copepods per hour
- Half of max feeding rate found at 81 copepods per liter

### For 35 DPH

- Max feeding rate found to be 2 copepods per hour
- Half of max feeding rate found at 22 copepods per liter

## Conclusion

- Optimal prey densities (>22 L<sup>-1</sup>) are far greater than the prey density (<1 L<sup>-1</sup>) in the estuary
- This could negatively affect survival of future delta smelt due to food limitation



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