Comparison Of Adult Delta Smelt Prey Use Between Wet (2011) And Dry (2012) Winters

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delta smelt

Introduction

Delta smelt (*Hypomesus transpacificus*) is one of several pelagic fishes in the San Francisco Estuary that have suffered a steep decline in abundance in recent years, yet increased in number during the wet year of 2011. There is little information on adult delta smelt feeding habits during winter months, when their gonads mature for the energetically demanding spring spawning period. We present delta smelt's use of prey that occurred during the wet and dry winters of 2011 and 2012, respectively (Figure 1).

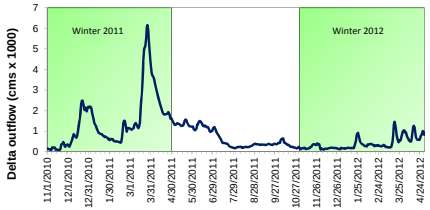

Figure 1. Delta freshwater outflow (cubic meters per second) from DAYFLOW between November 1, 2010 and April 30, 2012.

Methods

Delta smelt were collected from Suisun Bay (Low Salinity Zone (LSZ)) upstream through Cache-Slough (CS) and Sacramento River Deep Water Ship Channel (SRDWSC) by CDFW's Fall Midwater Trawl and Spring Kodiak Trawl surveys during winter 2011 (November 2010 - April 2011) and winter 2012 (November 2011 - April 2012). Fish were brought to the CDFW laboratory (Stockton, CA) for examination of stomach contents with zooplankton identified to the lowest possible taxonomic level. Diet data from the LSZ were limited to winter 2012.

Results

- A total of 575 delta smelt stomachs contributed to this analysis.
- Food items, by percent number in stomachs, for both winter periods consisted mostly of calanoid and cyclopoid copepods and cladocerans (Figures 2-4).
- The majority of food items found in stomachs from the Sacramento River – CS-SRDWSC during winter 2011 were calanoid copepods (62%), of which the genera was dominated by *Sinocalanus doerrii* (44%) and *Pseudodiaptomus forbesi* (42%) (Figure 2). Cladocerans were also numerous in stomachs (28%), with the category comprised of unidentified (58%), *Daphnia* spp. (32%), and other species (10%). Cyclopoid copepods only contributed 5% to the total prey number.
- The majority of food items found in stomachs from the LSZ during winter 2012 were cyclopoid copepods (67%) and cladocerans (20%) (Figure 3). The category cyclopoid copepods was dominated by *Acanthocyclops vernalis* (21%) but other genera included *Oithona*, *Diacyclops*, *Eucyclops*, *Macrocyclops*, *Mesocyclops*, *Homocyclops*, *Paracyclops* and *Halicyclops*.

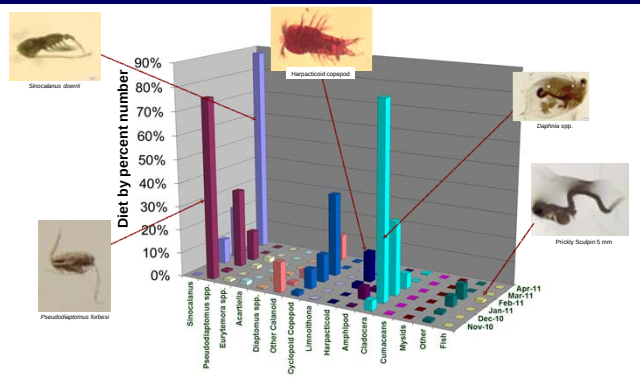

Figure 2. Diet composition by percent number of prey types from delta smelt collected in the Sacramento River upstream through the CS-SRDWSC November 2010 through April 2011 (n=164).

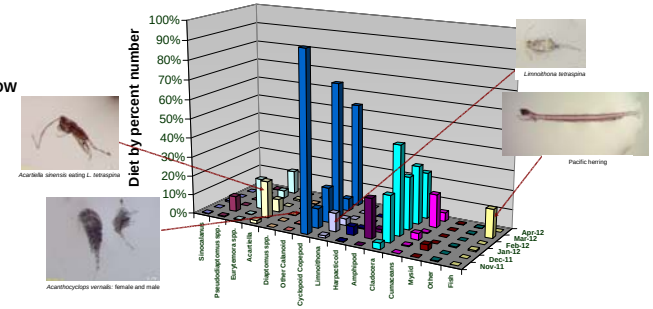

Figure 3. Diet composition by percent number of prey types from delta smelt collected in the Low Salinity Zone November 2011 through April 2012 (n=221).

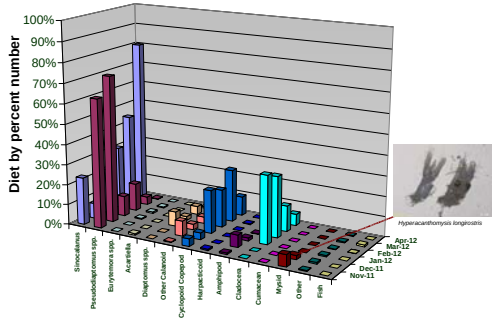

Figure 4. Diet composition by percent number of prey types from delta smelt collected in the CS-SRDWSC November 2011 through April 2012 (n=190).

Results Cont.

- The majority of food items found in stomachs from the CS-SRDWSC during winter 2012 were calanoid copepods (65%), the category comprised mostly of *S. doerrii* (48%) and *Pseudodiaptomus spp.* (11%) (Figure 4). Another calanoid, *Osphranticum* spp., was found in low quantities in 15.4% of fish. Similarly, in 15.6% of all fish, *Diaptomus* spp. were found, but were in relatively low quantities per fish. Other major food items included cyclopoid copepods (15%) and cladocerans (17%), with *Daphnia* spp. being the most commonly consumed (58%) of cladocerans.
- Delta smelt consumed numerically few of the larger mysid, amphipod (*Corophium* spp. and *Gammarus* spp.), and cumacean zooplankton prey types (Figures 2-4), and prey size appeared to increase with increasing size of delta smelt (Figure 5).

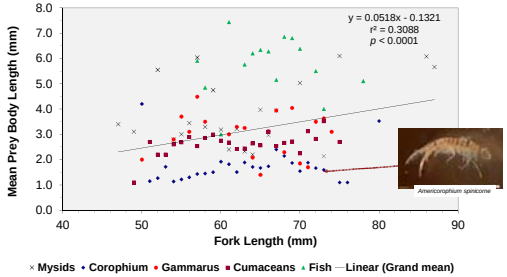

Figure 5. Mean prey body length (mm) of large prey items per fork length (mm) of delta smelt collected November 2011 through April 2012. A regression line was run through the grand mean of all the prey category mean body lengths.

Conclusions

- Winter diets were dominated numerically by small zooplankton, copepods and cladocerans. Delta smelt, as they grew, ate increasingly large prey, so low numbers in stomachs could be due to lack of availability of larger prey.
- The types of prey consumed were similar in both winters in CS-SRDWSC, which follows seasonal abundance of zooplankton, yet the amount of prey types found in stomachs differed between years with a greater percentage of cladocerans consumed in 2011 than 2012.
- The differences between CS-SRDWSC and LSZ prey use during winter 2012 could reflect different regional abundances of prey.
- This analysis reported diet by percent number, which could under-estimate the contribution of larger, less frequently consumed prey such as mysids, amphipods, and larval fish.
- This work is ongoing and future efforts will examine other measures of feeding behavior, including feeding incidence and stomach fullness.

Acknowledgements

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