Chironomidae in the Delta: Where are They?

Melanie LeGro, Heather Fuller

California Department of Water Resources

Background

•Midge fly larvae and pupae are an important food source for pelagic and open-water shoal fish such as late juvenile Chinook salmon, late juvenile Sacramento splittail, late juvenile American shad, early and late juvenile Mississippi silverside, and early juvenile Rainwater killifish.[1]

•The Chironomidae family of midge flies was examined in this analysis.

•Midge flies begin life at the larval stage in river and lake benthos. Some species of Chironomidae create cases of sediment using saliva secretions. Chironomidae larvae pupate in the cases and the pupa swims to the water surface. An adult midge fly emerges from the water surface to complete the life cycle.[2]

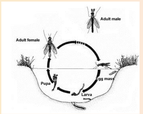


Image from http://www.ces.ncsu.edu/depts/ent/notes/Urban/midges.htm. Downloaded on Feb. 11, 2014.

Methods

•A Generalized Random Tessellation Stratified (GRTS) special study was conducted from 2007 through 2011 by the Bay-Delta Monitoring and Analysis section of the California Department of Water Resources.

•Sampling was conducted in May and October of each year.

•175 sites were sampled in the Sacramento-San Joaquin Delta and Suisun and San Pablo Bays. 50 Fixed sites were sampled in May and October of every year. The other Variable 125 sites changed yearly.

•Benthic sampling required using a hydraulic winch and Ponar dredge. Environmental data such as sediment, turbidity, dissolved oxygen, pH, specific conductance, chlorophyll fluorescence, water temperature, and depth were collected.

•The three most common genera of the Chironomidae family found in the Delta: *Chironomus, Procladius,* and *Psectrocladius* were analyzed.

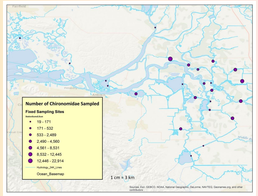


Figure 1. Fixed sampling sites and the geographical region each site is categorized in.

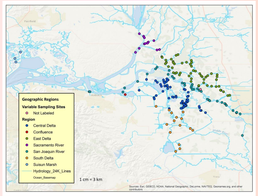


Figure 2. Variable sampling sites and the geographical region each site is categorized in.

Figures 1 and 2 show the Fixed and Variable sites. Sampling sites were categorized into 7 regions: Central Delta, Confluence, East Delta, Sacramento River, San Joaquin River, South Delta, and Suisun Marsh.

Results

Figure 3. Total Chironomidae larvae and pupae sampled at Fixed and Variable sites for May and October of the 2007-2011 study period.

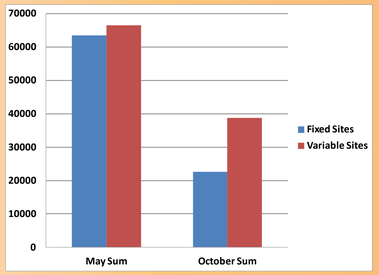


Figure 3 shows Chironomidae larvae and pupae were more abundant in May than October of the study period.

Figure 4. Total sums of Chironomidae larvae and pupae found at Fixed sampling sites in each geographical region of the study.

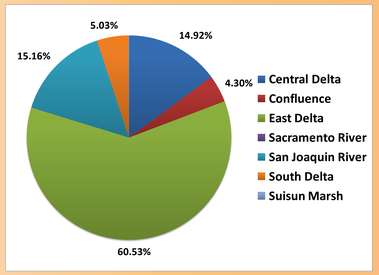
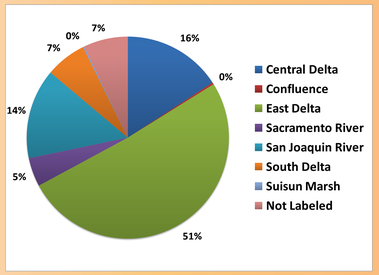
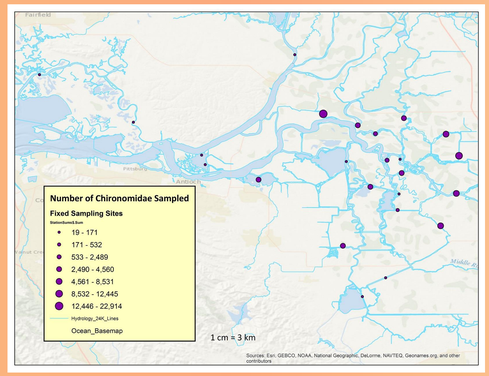


Figure 5. Total sums of Chironomidae larvae and pupae found at Variable sampling sites in each geographical region of the study.



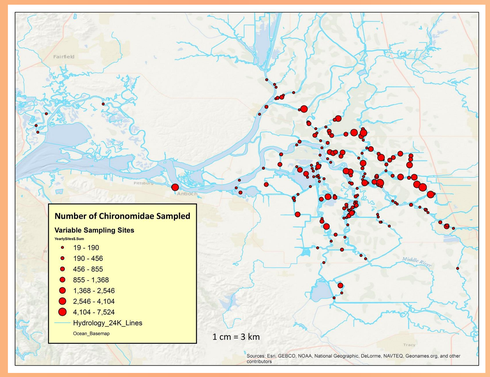
Both pie charts show the regions of the San Francisco Estuary where this particular fish food source is most likely to be found.

Figure 6. Total Chironomidae abundance at the Fixed sites for May and October of the 2007 through 2011 study period.



The maps display the regions where you would likely find this particular fish food source. Sites with no Chironomidae present for all five years of the study are not pictured on the maps.

Figure 7. Total Chironomidae abundance at the Variable sites for May and October of the 2007 through 2011 study period.



Results (continued)

Figure 8. Total sums of Chironomidae found at each sediment type for the Fixed sampling sites.

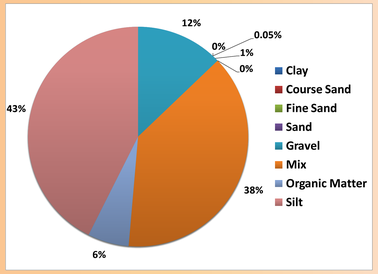
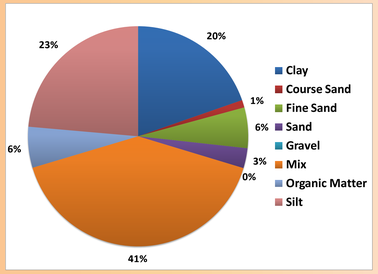


Figure 9. Total sums of Chironomidae found at each sediment type for the Variable sampling sites.



Conclusions

•The data for the Fixed and Variable sites demonstrate the larger overall abundance in May.

•The majority of Chironomidae larvae and pupae, greater than 80% of the sampled genera, were found inland in the East Delta, Central Delta, and San Joaquin River regions. Less than 5% of larvae and pupae were found in the Suisun marsh, San Pablo Bay, and Confluence regions.

•Chironomidae were most abundant in regions with mixed sediment. Chironomidae were secondly most abundant in silt and next abundant in clay. This suggests Chironomidae larvae are most likely to be found in an area with softer and finer sediments as opposed to coarse sediments like sand.

Where do we go from here?

•Determine if turbidity levels affect predation of Chironomidae larvae and pupae.

•Examine how hydrology affects the regional abundance of Chironomidae.

•Compare GRTS data to the monthly benthic monitoring data collected by the Bay-Delta Monitoring and Analysis section to determine if current sampling methods and sites accurately represent the full range of benthic species in the Delta.

Citations

1. Grimaldo, L.F., Stewart, A.R., and Kimmerer, W. 2009. *Dietary Segregation of Pelagic and Littoral Fish Assemblages in a Highly Modified Tidal Freshwater Estuary*. Marine and Coastal Fisheries: Dynamics, Management, and Ecosystem Science, 1:1, 200-217.
2. Hilsenhoff, W.L. 2001. Diversity and Classification of Insects and Collembola. In: Thorp, J.H., Covich, A.P., eds, *Ecology and Classification of North American Freshwater Invertebrates.* American Press, p. 661-731.
3. Kurth, R. and M. Nobriga. 2001. Food Habits of Larval Splittail. Interagency Ecological Program for the San Francisco Estuary Newsletter 14(3):40-42.

Acknowledgements

I would like to thank Heather Fuller, Scott Waller, Kris Jones, Sarah Lesmeister, Shaun Philippart, Tiffany Brown, Bill Templin, Karen Gehrts, Jared Frantzich, Taylor Hollingshead, Manuel Serrato, and Roberta Elkins for all of their expert advice and time spent editing. I would also like to thank the GRTS field crew for all of their hard work collecting data for this study. Lastly, I want to thank the California Department of Water Resources and the Interagency Ecological Program for their support.