Surprising Invertebrates Common on the Bottom of Ship Channels of Our California Delta

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Wetlands, mainly marshes and flooded farms, have dominated this largest set of shorelines within California, the California Delta. But truly deep, ~13-meter (40-feet) -deep areas also are extensive there, a deep habitat reportedly used by white sturgeon, green sturgeon, salmon species, and other fishes. Diverse, novel, benthic sampling methods are being applied to these difficult-to-sample bottoms of ~13-m-deep dredged ship channels, and nearby, naturally deep areas, NW of Stockton, CA. Initial sampling during fall through spring, 2014-15, already has yielded surprising, previously unreported diversities and population densities of live sponge colonies, hydroids, and several taxa of live freshwater mollusks, among of other epibenthic and infaunal macro invertebrates there. Epifauna were common on these firm, muddy bottoms, swept by quite swift, murky freshwater. With secchi depths measuring 50 ~ 120 cm, no detectable light reaches these 13-meter-deep habitats, yet drift plants often are common there. Many epifauna there are suspension feeders, analogous to several organisms observed previously in Delta boat houses, in deep shade. Yet naturally, equally deep (and deeper) regions of the historical San Joaquin River are not far from ship channels. Centers of those river channel sites reportedly were never dredged, but apparently maintained deep naturally, through periodic scour such as during floods. With fishes associated with these deep bottoms, these deep channels may turn out to be a surprisingly naturally occurring, and sometimes man-made, significant habitat in our otherwise shallow Delta. Gratitude is extended to San Francisco Bay Wildlife Society and MWH Global, with encouragement of other agencies, for making this ongoing, expanding work possible on these otherwise rarely studied Delta resources.

Keywords: San Joaquin River, Delta, Dredged Ship Channel, Benthic Invertebrate Ecology

Poster Topic: Biological Species: Invertebrates

Benthic Response to Water Quality and Biotic Pressures in Lower South Bay-Alviso-Coyote Creek

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Benthic communities are monitored because they reflect the water quality over their lifetime, in some cases these communities may control available carbon resources, and are common prey for birds, larger invertebrates and fish. Benthic communities monitor stressful environments because they are stationary, accumulate contaminants, and respond, sometimes dramatically, to low and high phytoplankton biomass as well as low oxygen conditions.

Benthic communities can also affect water quality by grazing pelagic food resources and increasing the rate of nutrient regeneration through feeding and bioturbating the sediment. South Bay is a system dependent on phytoplankton as the base to the food web. Despite abundant nutrients, South Bay has limited phytoplankton production in the last several decades due to poor light conditions and high grazing losses.

Our primary objective is to characterize the South Bay's benthic community to determine if the observed changes can be attributed to water quality or biological pressures.

We analyzed the benthic community's species and functional composition. This analysis incorporated samples collected from Coyote Creek in 2009-2014 and Guadeloupe Slough, Alviso Slough, and Artesian Slough in 2014. The Coyote Creek Benthic community data showed a transition in the numerically dominant species, from bivalves in 2009- fall 2013 to amphipods in fall 2013-2014.

While amphipods and bivalves were both present year round in Guadeloupe and Alviso sloughs, amphipods were numerically dominant in the early months of 2014 and bivalves were the numerical dominant during the summer of 2014.

Changes to the numerically dominant species in the lower South Bay and the associated Sloughs represent changes in prey species and hence food quality to predators.

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Keywords: Benthic Community, Invasive Species, South SF Bay

Poster Topic: Biological Species: Invertebrates

Ramshorn Snails: Temperature, Density and Ammonia Effects on Growth and Fecundity

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Ramshorn snail (*Helisoma Anceps*) is an aquatic freshwater snail native to the California Delta. They are essential for the Delta Smelt larvae culture at the UC Davis Fish Conservation and Culture Laboratory (FCCL). Several experiments were conducted in this study investigating the effects of feed, stocking density, temperature, and ammonia on their growth, fecundity, incubation period, and hatching rate. Results show there was no significant difference on the growth, sexual maturation, and fecundity among the four food sources (algae pellets, algae pellets with oyster shell, fish feed, and fish feed with oyster shell) tested except for the egg amounts produced by the fish feed group, which was significantly lower. A significant increase of growth and fecundity was observed in the lowest stocking density (6 snails/125 mL) versus the higher densities (20 and 40 snails/125 mL). In addition, snails stocked in the lowest density started producing eggs around 30-40 days post hatch (dph), while snails in the two higher densities did not spawn until 70-80 dph. Temperature had significant effects on the growth and fecundity of the snails as well. Within the three temperatures (12, 16, and 20°C) tested, the growth and fecundity increased with the increasing of temperature. The incubation period of egg clutches increased in relation to temperature, and a significantly lower hatching rate was found at 12°C. Another factor affecting the hatching rate dramatically was the ammonia level eggs were exposed to. Four ammonia levels (0, 5, 10, and 20 mg/L) were tested, and results show a negative effect on the hatching rate when the ammonia concentration was increased. An ammonia concentration of 20 mg/L proved to be out of the survivable range, resulting in a hatching rate of 0%. No effect was observed on the incubation time with a fixed temperature at 20°C during the ammonia trials.

Keywords: Delta, aquatic freshwater snail, temperature, density, ammonia

Poster Topic: Biological Species: Invertebrates

Copepods, Fish and Clams Need Omega-3 Fatty Acids Too: Application of a Phytoplankton Food Quality Index

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Phytoplankton are the largest living component of biomass in San Francisco Bay and the primary food source upon which the Bay's consumers, such as copepods, crabs, flatfish and shrimp, ultimately depend. The patterns and processes of phytoplankton biomass variability in this estuary are well-studied, but what about the quality of this food resource for consumers? Food quality varies with phytoplankton attributes such as cell size, palatability, and biochemical composition. We address one biochemical component, the phytoplankton derived long-chain fatty acids (LCEFA). LCEFA cannot be synthesized by animals, yet are essential dietary components and serve as indicators of food quality for consumers. We used results of a new meta-analysis that indexes phytoplankton food quality based on differences in LCEFA content and essential fatty acid ratios among algal groups. This index reflects the greater nutritional value of diatoms, dinoflagellates, and cryptophytes, due to their higher LCEFA content and larger fatty acid ratios, as compared to that of chlorophytes and cyanobacteria. We applied the index to our USGS multi-decadal time series of phytoplankton community composition to explore seasonal, spatial, and long-term patterns of phytoplankton food quality in the different sub-embayments of San Francisco Bay.

Keywords: phytoplankton, nutritional value, food quality, diatom, essential fatty acids

Poster Topic: Biological Species: Invertebrates