2018 Benthic Invertebrate Summary

Introduction

Benthic monitoring by the Environmental Monitoring Program is conducted monthly at 10 sampling sites distributed throughout several estuarine regions from San Pablo Bay upstream through the Sacramento-San Joaquin Delta (**Figure 1**). 2018 was a below normal water year for both the Sacramento Valley and San Joaquin Valley. Many benthic invertebrate species demonstrate extreme interannual and seasonal variability even in relatively average water years, and the contrast between this drier year following a very wet water year in 2017 likely contributed to some of the patterns we saw during this time compared to previous years.

San Pablo Bay

The most saline of our sites, D41 and D41A, are polyhaline sites in San Pablo Bay. At D41 in 2018, the most numerous species was the non-native amphipod *Ampelisca abdita*, whose density peaked abruptly in July to almost 38,000 individuals per square meter (**Figure 2**), the highest density seen in years. At D41A, there were high densities of the invasive clam *Potamocorbula amurensis* as well as *A. abdita*, with both species peaking between May and September (**Figure 3**).

Suisun Bay

In Suisun Bay and Grizzly Bay in 2018, our mesohaline sites D6 and D7 both saw high numbers of the invasive clam *P. amurensis*, which reached peak density of over 35,000 individuals per square meter in January at D6 and comprised over 98% of all organisms in 2018 (**Figure 4**), similar to other recent years. At D7, the most abundant organism was the non-native amphipod *Corophium alienense*, followed by *P. amurensis* which was down from its 2016-2015 high (**Figure 5**).

Confluence

At the confluence of the Sacramento and San Joaquin rivers, site D4's oligohaline community was comprised in 2018 largely of the amphipods *Americorophium spinicorne* and *Gammarus daiberi*, which each had spring and fall peaks. The oligochaete *Varichaetadrilus angustipenis* had the highest average density through the year, without seasonal peaks (**Figure 6**). The invasive clam *Corbicula fluminea* had notably lower densities in 2018 than in 2017, in which they had their highest densities over the last decade.

Central Delta

In the Sacramento River, freshwater site D24 was dominated by *Corbicula fluminea*, whose numbers averaged 3,576 per square meter over the course of 2018. There was also a significant seasonal increase in densities of the amphipod *Gammarus daiberi* between September and December (**Figure 7**).

In the San Joaquin River, freshwater site D16 (at Twitchell Island) was dominated in 2018 by remarkable density peaks in March and April of the amphipods *Americorophium spinicorne*, *Gammarus daiberi*, and *Americorophium stimpsoni* (**Figure 8**).

In Old River, freshwater site D28A had a diverse community in 2018. There were high densities of the ostracod crustacean *Cyprideis sp. A* and the sabellid worm *Manayunkia speciosa* in December, as well as a peaks of oligochaete *Variachaetadrilus angustipenis* in April and September. The amphipod *G. daiberi* also saw peak densities in September and October (**Figure 9**).

Southern Interior Delta

Further upstream in the San Joaquin River, site P8 at Buckley Cove had high numbers of *C*. *fluminea* in July and August and a peak of the sabellid worm *Manayunkia speciosa* in April (although *M. speciosa* was well down from the much high densities seen in 2014-2016). In addition to a diverse community of freshwater oligochaetes and aquatic insects, the amphipod *Americorophium stimpsoni* experienced a peak density in June at P8 (**Figure 10**).

At Clifton Court Forebay, freshwater site C9 was dominated by a variety of annelids in 2018. *Varichaetadrilus angustipenis, Limnodrilus hoffmeisteri*, and *Ilyodrilus frantzi* were present at high densities throughout the year. The amphipod *Hyalalla* sp. A experienced a dramatic peak in density in May, and the small snail *Physa* sp. A saw a peak in April 2018 (**Figure 11**). Site C9 is regularly one of our most biodiverse sites, with a large number of species present at low densities.

Figures



Figure 1. Locations of the Environmental Monitoring Program's (EMP) benthic monitoring stations.



Figure 2. Density of benthic organisms, by month, collected at station D41 (San Pablo Bay) in 2018. *



Figure 3. Density of benthic organisms, by month, collected at station D41A (San Pablo Bay) in 2018.*



Figure 4. Density of benthic organisms, by month, collected at station D6 (Suisun Bay) in 2018.*



Figure 5. Density of benthic organisms, by month, collected at station D7 (Grizzly Bay) in 2018.*



Figure 6. Density of benthic organisms, by month, collected at station D4 (Confluence) in 2018.*



Figure 7. Density of benthic organisms, by month, collected at station D24 (Sacramento River at Rio Vista) in 2018.*



Figure 8. Density of benthic organisms, by month, collected at station D16 (San Joaquin River at Twitchell Island) in 2018.*



Figure 9. Density of benthic organisms, by month, collected at station D28A (Old River) in 2018.*



Figure 10. Density of benthic organisms, by month, collected at station P8 (San Joaquin River at Buckley Cove) in 2018.*



Figure 11. Density of benthic organisms, by month, collected at station C9 (Clifton Court) in 2018.*