

2012-2016 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**). EMP staff collected four replicate bottom grab samples at each station using a Ponar dredge with a sampling area of 0.052 m².

The Sacramento-San Joaquin Delta's invertebrate benthic community is highly diverse. Over 450 different species in twelve different phyla have been collected since 1976. Each site's community composition is determined largely by how fresh or salty its water is, but is also affected by many other factors.

The years 2012-2016 brought a period of increasing drought effects. Many benthic invertebrate species demonstrate extreme interannual and seasonal variability even in relatively average water years, and the drought likely contributed to some of the patterns of changes we saw during this time.

Benthic Invertebrate Community Data

The most saline of our sites, D41 and D41A, are polyhaline sites in San Pablo Bay. At both sites, one of the most numerous species was the amphipod *Ampelisca abdita*. At D41 there was also a significant increase from 2012-2015 of the phoronid *Phoronopsis harmeri*, followed by a decrease in 2016. In 2016, the tunicate *Molgula manhattanensis* was also present in high numbers (**Figure 2**). At D41A, the invasive overbite clam *Potamocorbula amurensis* density dropped to very low numbers during 2013-2015, but saw a brief increase in spring 2016 (**Figure 3**).

In Suisun Bay and Grizzly Bay, our mesohaline sites D6 and D7 were both dominated from 2012-2016 by *Potamocorbula amurensis*, which could reach densities of tens of thousands per square meter. At D6, *P. amurensis* comprised over 95% of all organisms between 2012-2016 while the small cumacean crustacean *Nippoleucon hinumensis* has a sharp increase in 2016 (**Figure 4**). At D7, over half of the organisms were *P. amurensis*, but the amphipod *Corophium alienense* also formed a large proportion of the community (**Figure 5**).

At the confluence of the Sacramento and San Joaquin rivers, site D4's oligohaline community was comprised in 2012 largely of the amphipods *Americorophium spinicorne* and *Americorophium stimpsoni*. This gave way in 2013 to a community dominated during 2013-2016 by the sabellid worm *Laonome calida* and the oligochaete worm *Limnodrilus hoffmisteri*, with the oligochaete worm *Varichaetadrilus angustipenis* present at high numbers throughout 2012-2016 (**Figure 6**).

In the Sacramento River, freshwater site D24 was dominated by the invasive clam *Corbicula fluminea*, although its numbers (which peaked in 2011) dropped steadily through the 2012-2016 period. There were also significant numbers of the amphipod *Gammarus daiberi* and the oligochaete *Variachaetadrilus angustipenis*, which has been found at higher numbers since 2015 (**Figure 7**).

In the San Joaquin River, freshwater site D16 (at Twitchell Island) was dominated during 2012-2016 by the clam *Corbicula fluminea* and the amphipods *Gammarus daiberi* and *Americorophium spinicorne*, which in particular was present in higher numbers throughout 2016 than in 2012-2015 (**Figure 8**). Further upstream in the San Joaquin River, site P8 at Buckley Cove saw a sharp increase over 2012-2016 (and dating back to 2007) of the sabellid worm *Manayunkia speciosa*, in addition to a diverse community of freshwater oligochaetes and amphipods (**Figure 9**).

In Old River, freshwater site D28A had a diverse community in 2012-2016. Similar to site P8, there were large numbers of *Manayunkia speciosa*, as well as the oligochaete *Variachetadrilus angustipenis*, the ostracod crustacean *Cyprideis* sp. A, and the amphipods *Americorophium spinicorne* and *Gammarus daiberi* (**Figure 10**). Many of these species hit very low numbers following the wet winter of 2011, and saw dramatic increases in 2013.

At Clifton Court Forebay, freshwater site C9 saw decreases beginning in 2012 of several oligochaete worms that had high densities in the wet year of 2011 (*Limnodrilus hoffmeisteri*, *Varichaetadrilus angustipenis*, and *Ilodrilus frantzi*), and an increase in the oligochaete *Aulodrilus pigueti* and in the ostracod *Cyprideis* sp. A. in 2014-2015 (**Figure 11**). The sabellid worm *Manayunkia speciosa* and the amphipod *Americorophium spinicorne* also saw peaks in 2014. Many of these species decreased to much lower levels in 2015-2016.

Figures

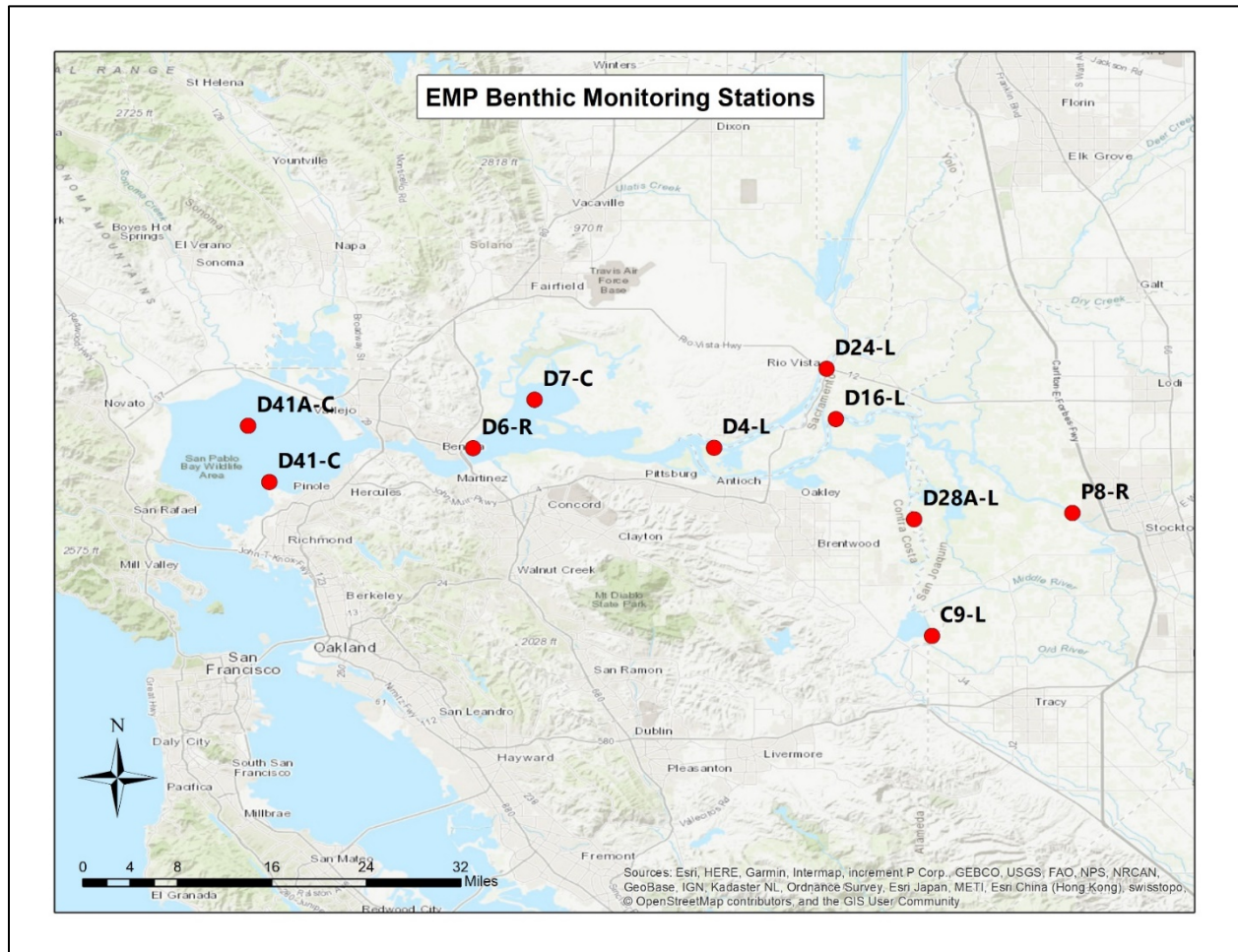


Figure 1. Locations of the Environmental Monitoring Program's (EMP) benthic monitoring stations.

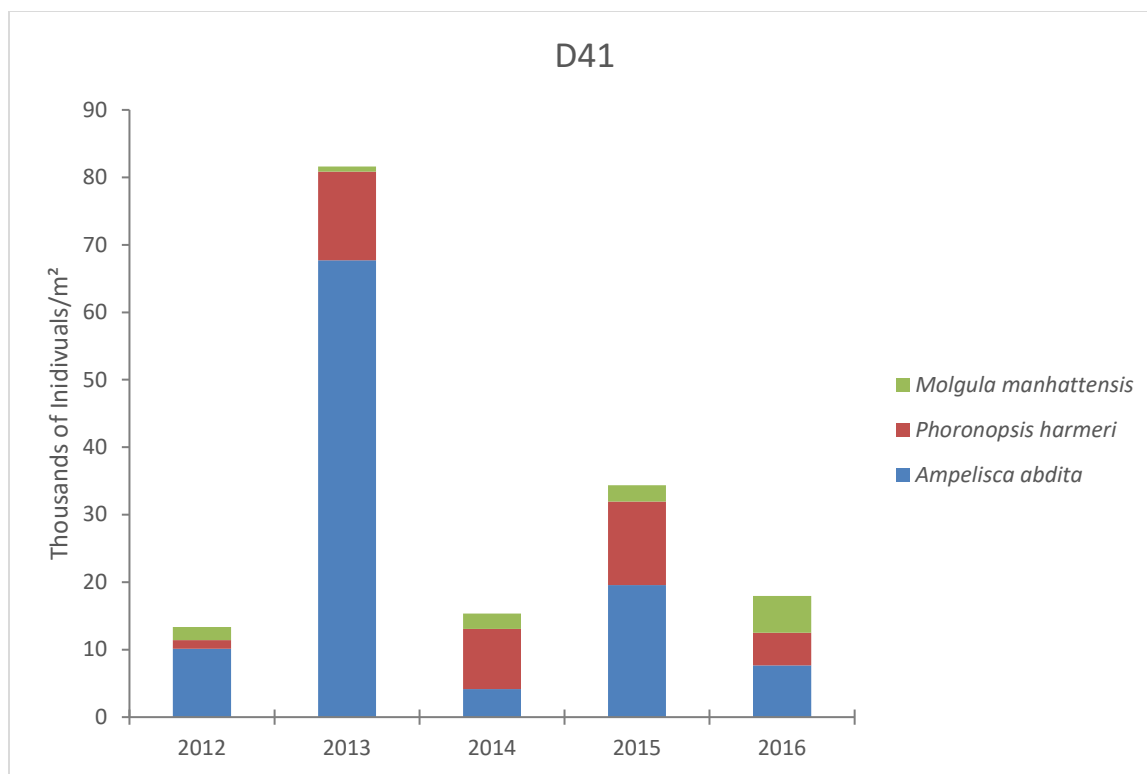


Figure 2. Density of benthic organisms, grouped by species, collected at station D41 (San Pablo Bay) in 2012-2016. *

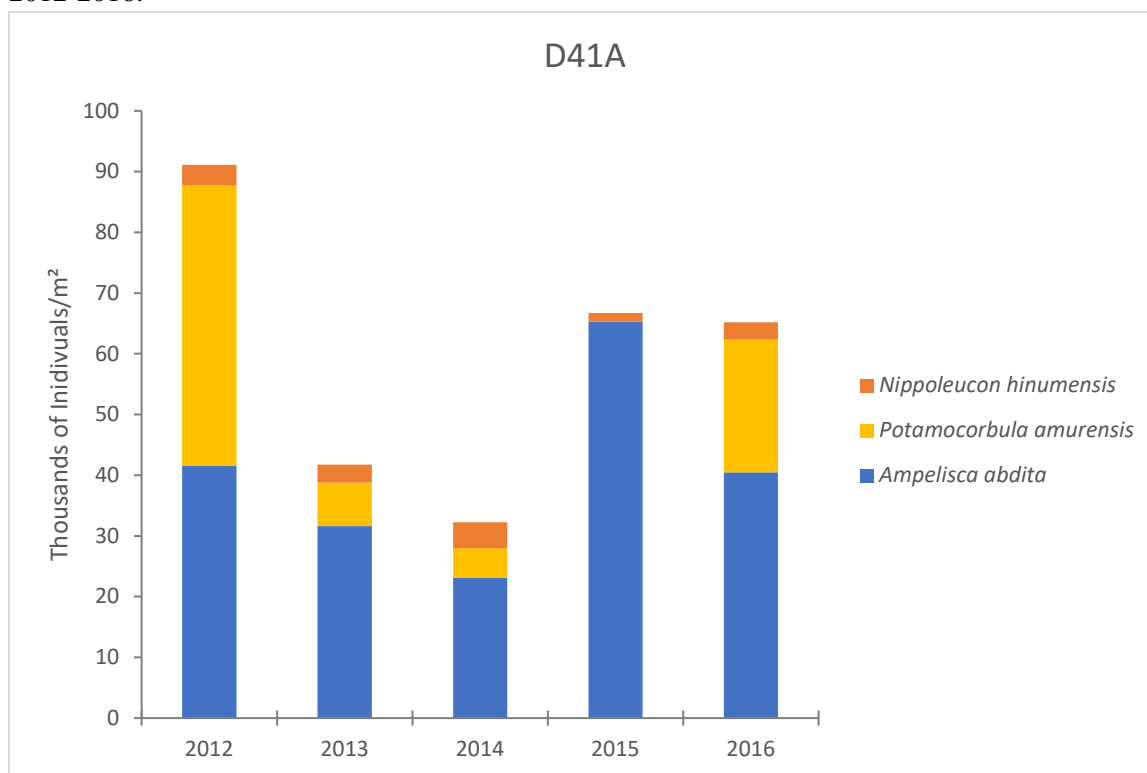


Figure 3. Density of benthic organisms, grouped by species, collected at station D41A (San Pablo Bay) in 2012-2016. *

*Not all species collected at each site are shown in the charts; only the numerically dominant species are featured.

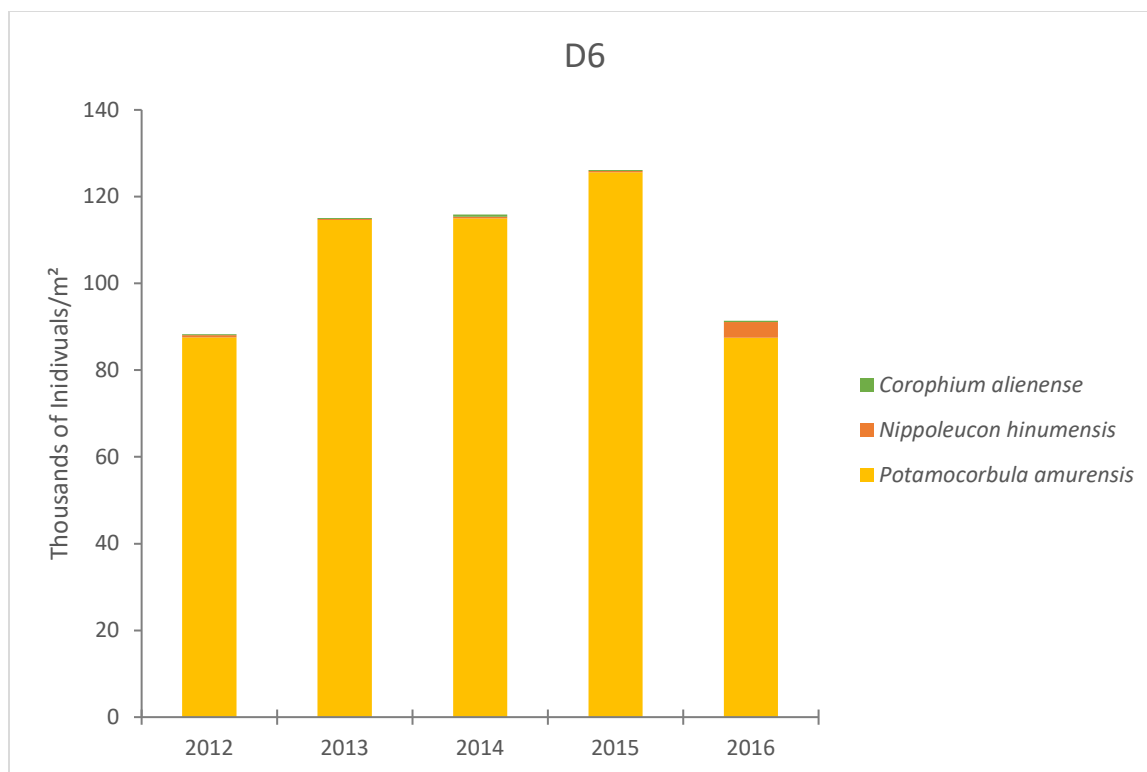


Figure 4. Density of benthic organisms, grouped by species, collected at station D6 (Suisun Bay) in 2012-2016.*

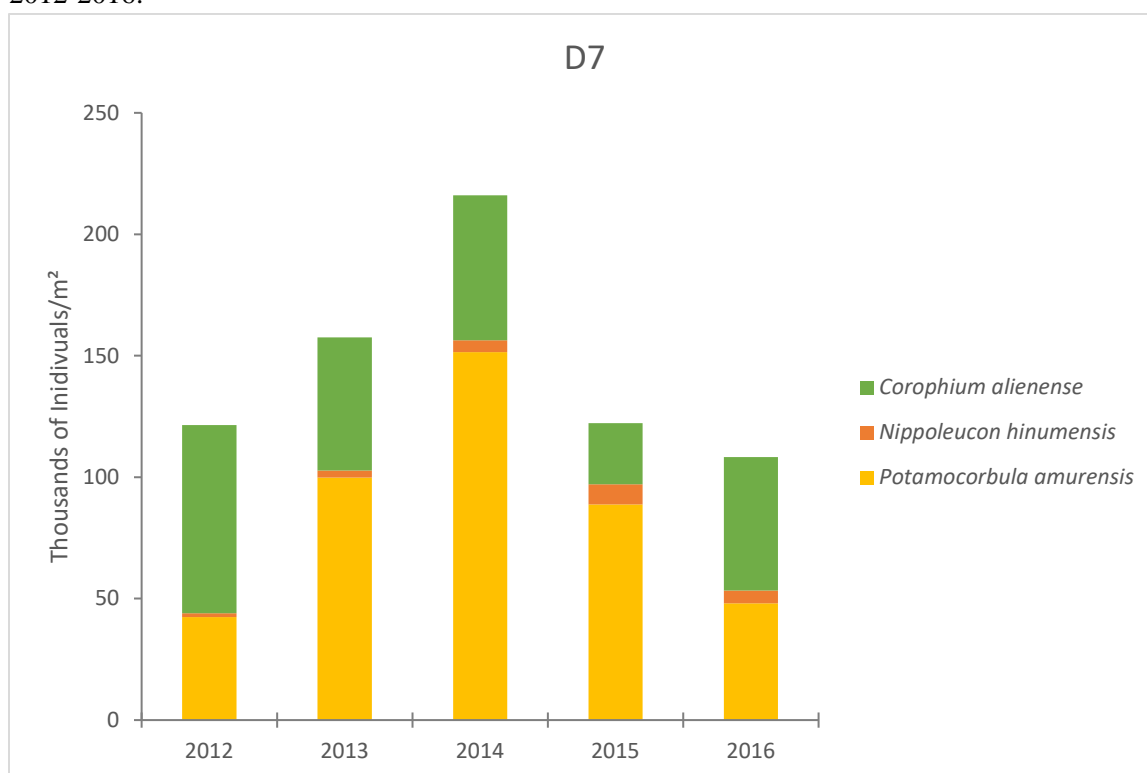


Figure 5. Density of benthic organisms, grouped by species, collected at station D7 (Grizzly Bay) in 2012-2016.*

*Not all species collected at each site are shown in the charts; only the numerically dominant species are featured.

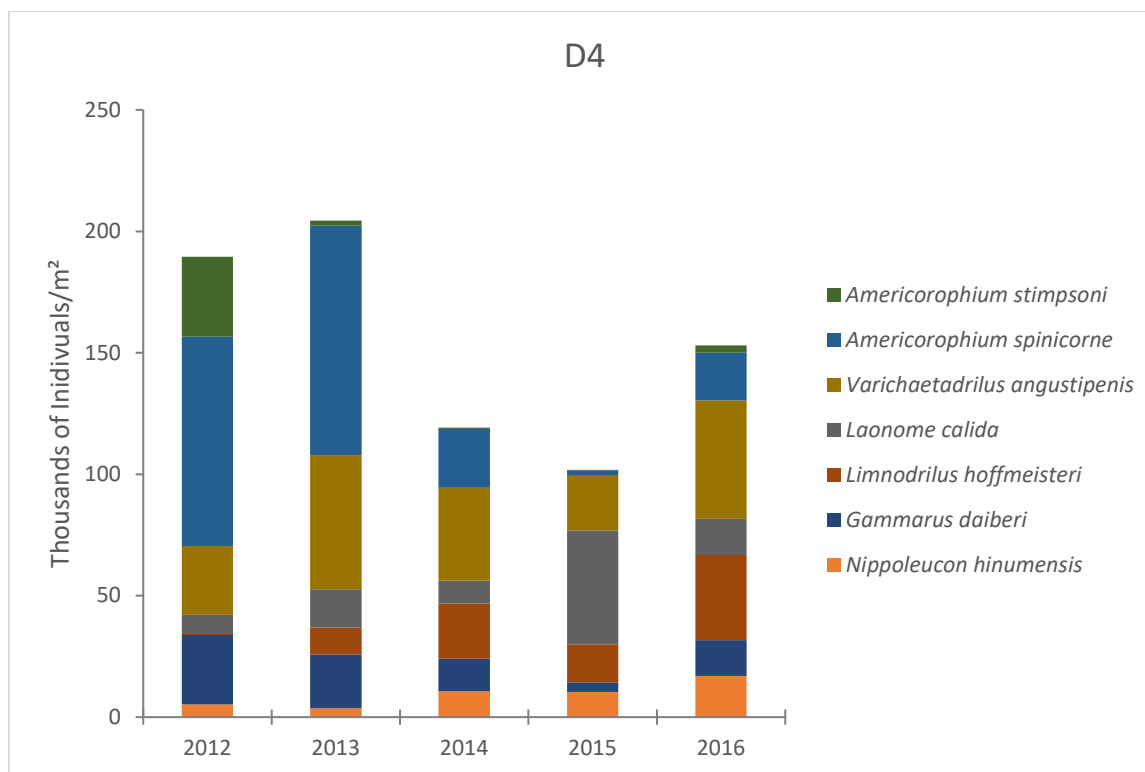


Figure 6. Density of benthic organisms, grouped by species, collected at station D4 (Confluence) in 2012-2016.*

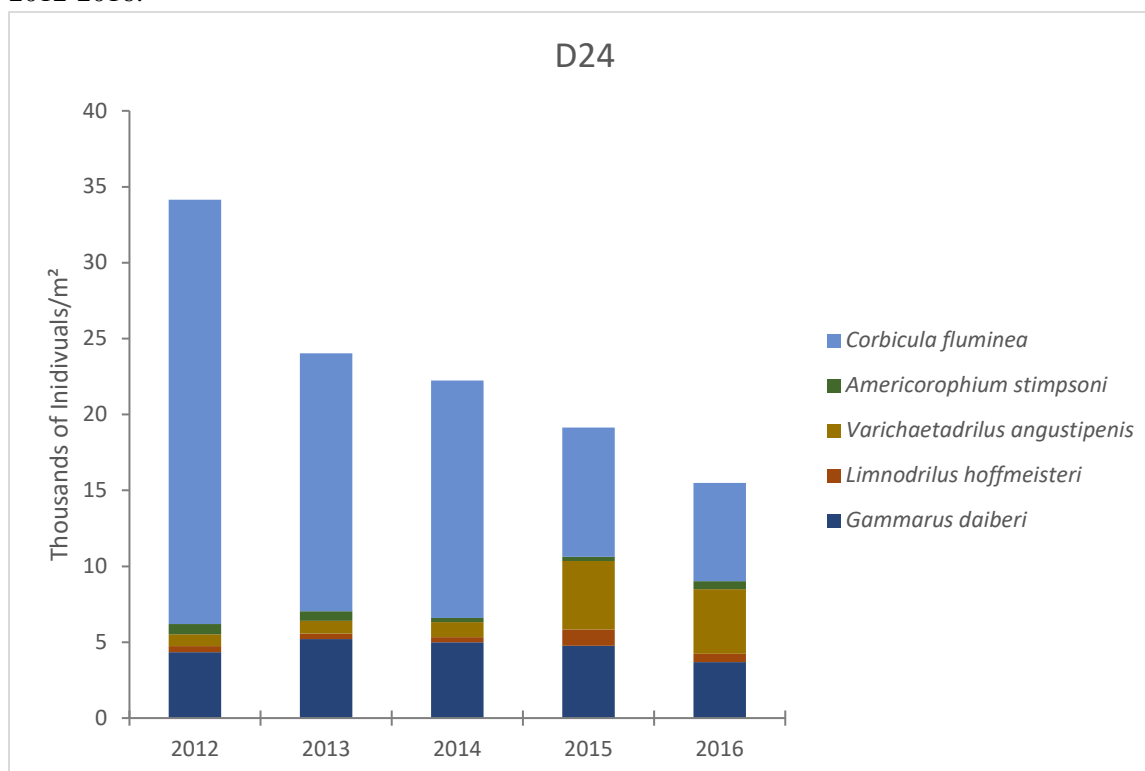


Figure 7. Density of benthic organisms, grouped by species, collected at station D24 (Sacramento River at Rio Vista) in 2012-2016.*

*Not all species collected at each site are shown in the charts; only the numerically dominant species are featured.

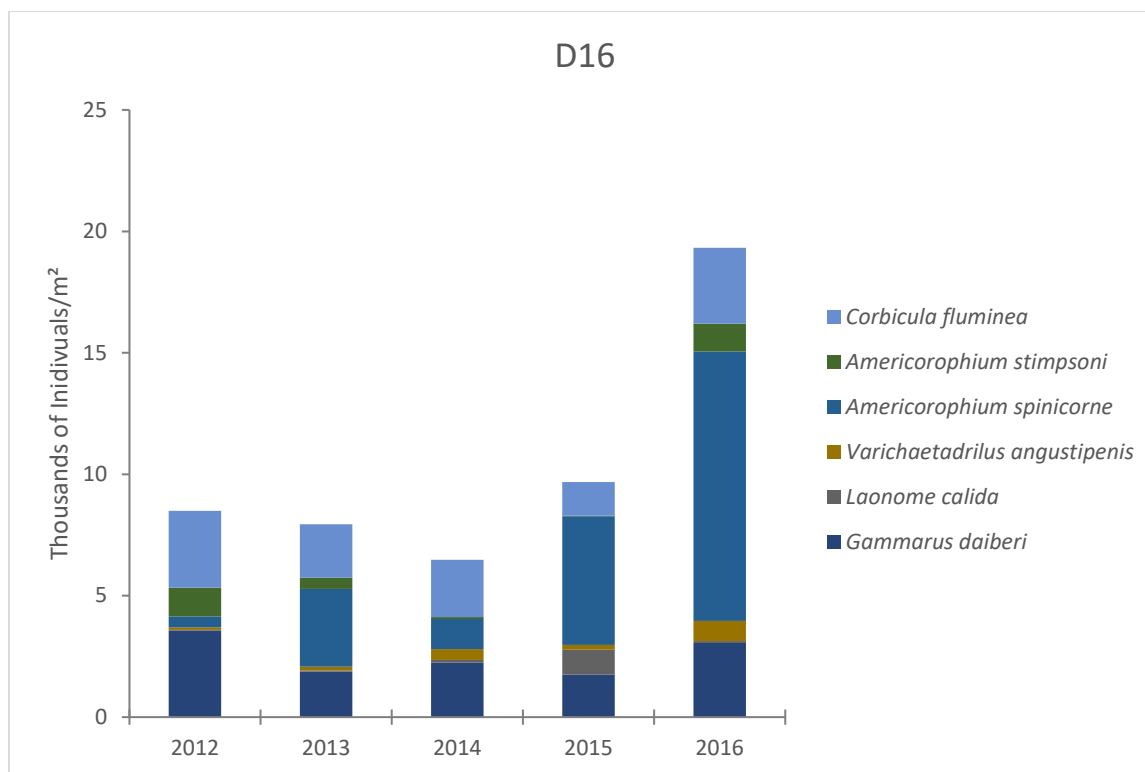


Figure 8. Density of benthic organisms, grouped by species, collected at station D16 (San Joaquin River at Twitchell Island) in 2012-2016.*

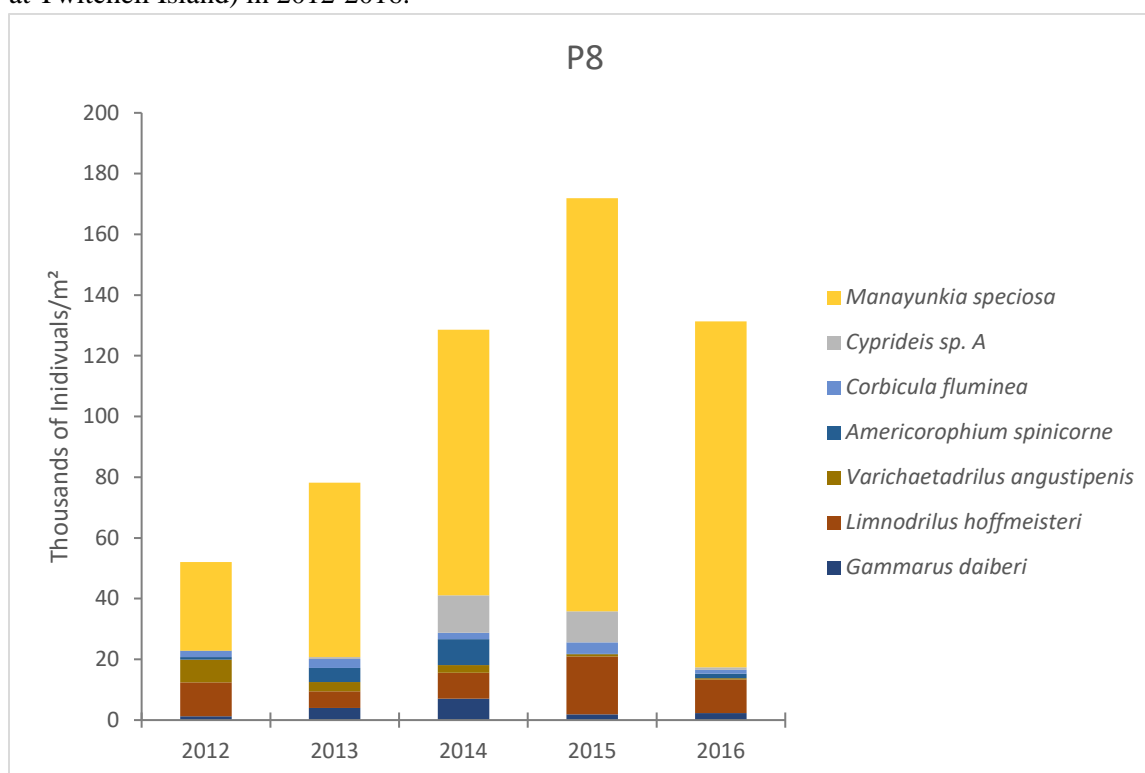


Figure 9. Density of benthic organisms, grouped by species, collected at station P8 (San Joaquin River at Buckley Cove) in 2012-2016.*

*Not all species collected at each site are shown in the charts; only the numerically dominant species are featured.

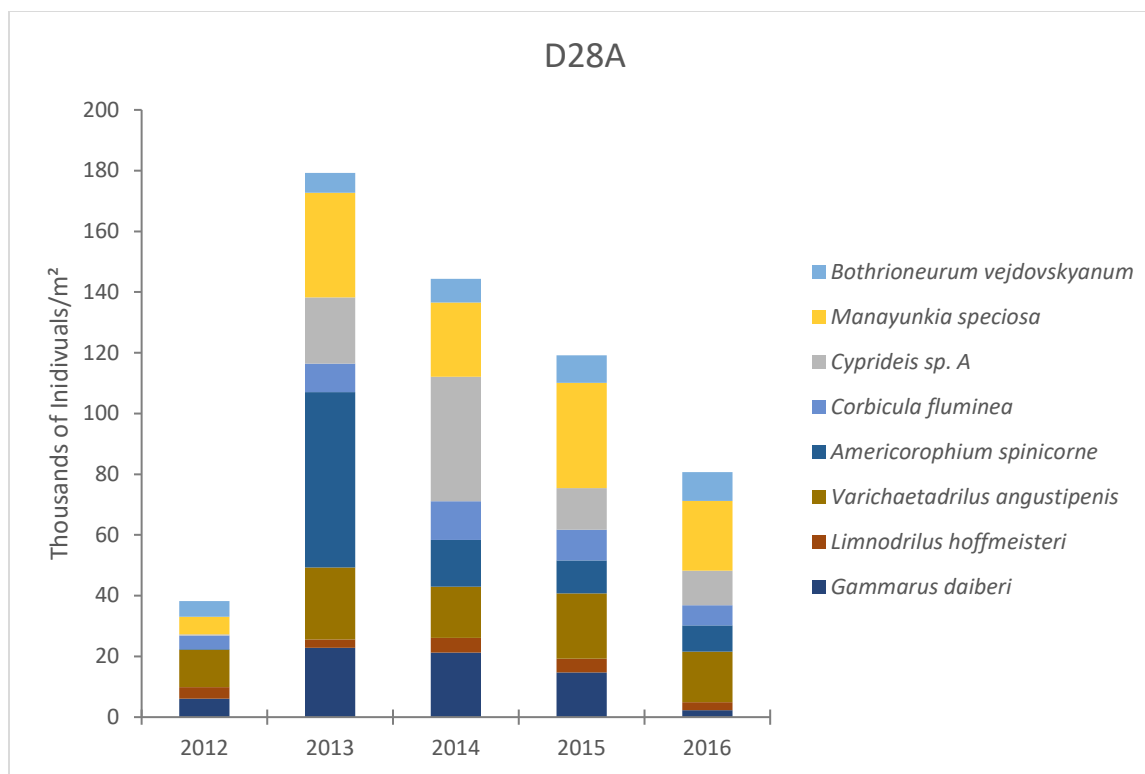


Figure 10. Density of benthic organisms, grouped by species, collected at station D28A (Old River) in 2012-2016.*

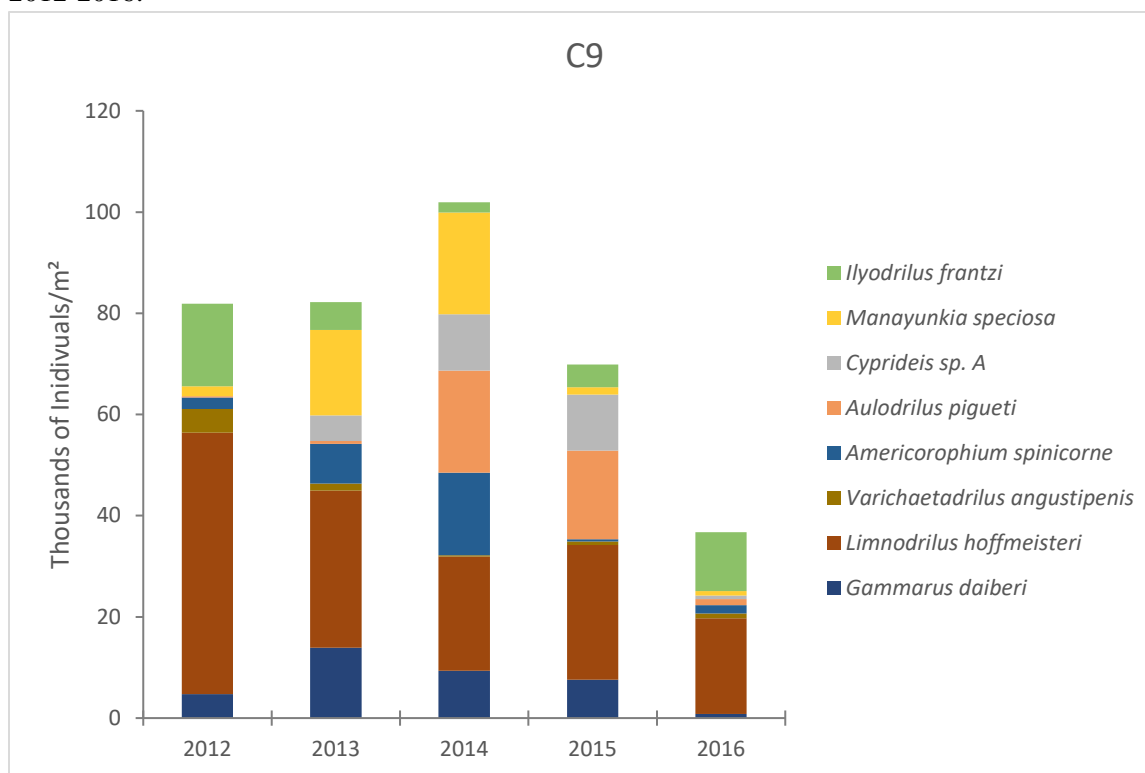


Figure 11. Density of benthic organisms, grouped by species, collected at station C9 (Clifton Court) in 2012-2016.*

*Not all species collected at each site are shown in the charts; only the numerically dominant species are featured.