



Summer 2018 IEP Seasonal Monitoring Report

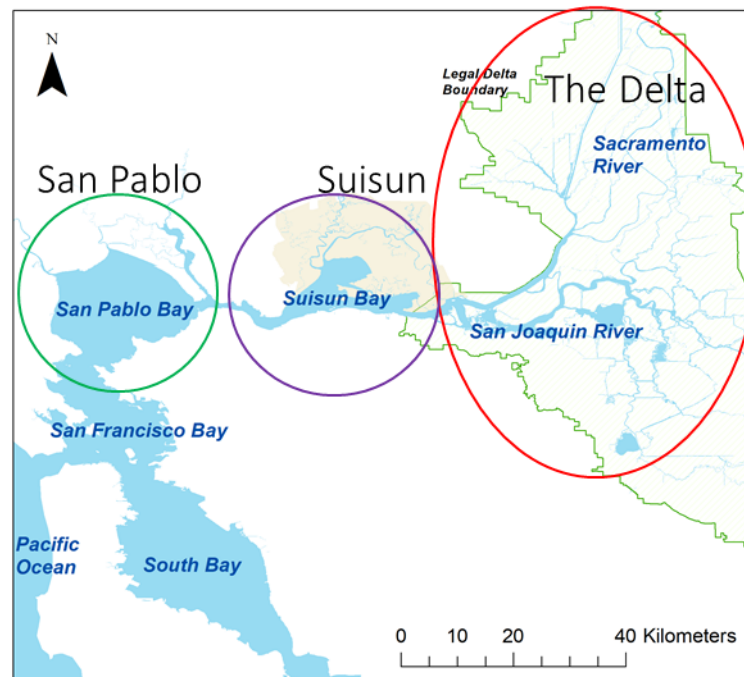
Interagency Ecological Program for the San Francisco Estuary
This report shows trends in water quality, plankton, and fish across multiple IEP surveys for June, July, and August of 2018.

Regions of the Estuary

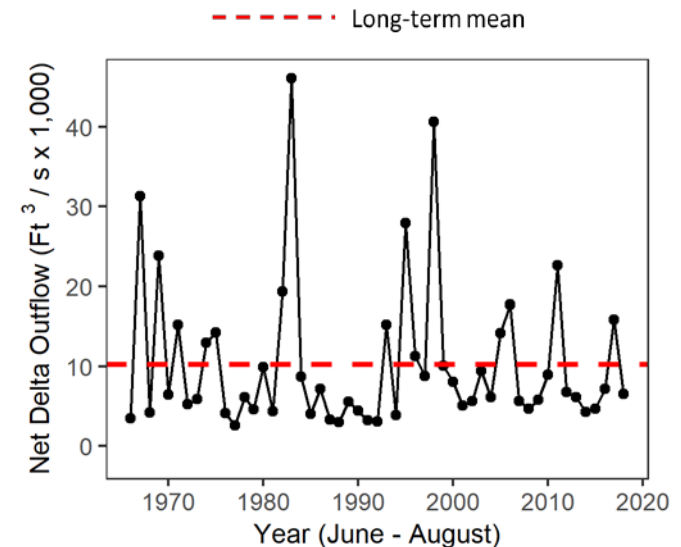
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Metadata



Delta Outflow



- Freshwater flow influences water quality, plankton, and fish populations.
- Summer flow is driven primarily by rainfall, snowmelt, and upstream dam releases.
- The Summer of 2018 had slightly lower outflow than normal.

Disclaimer: While substantial efforts are made to ensure the accuracy of these data, complete accuracy of data sets cannot be guaranteed. This report was developed by the IEP Synthesis Team.

For questions, comments, or corrections, contact Rosemary Hartman – Rosemary.Hartman@water.ca.gov

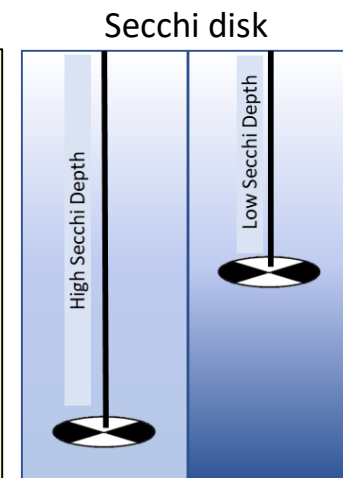
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Secchi Depth

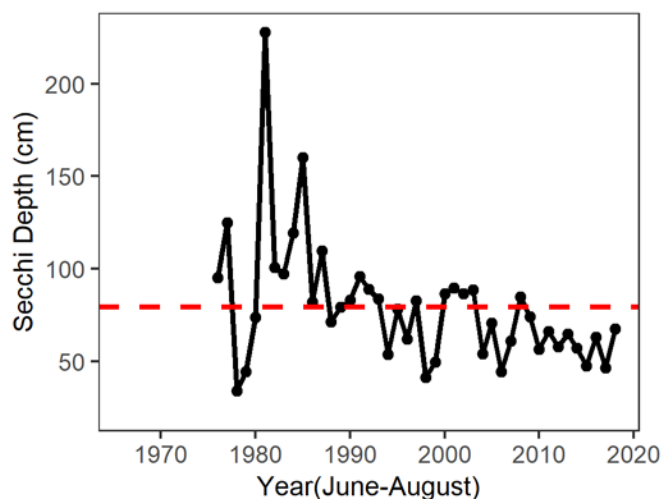
Background

- Organisms in this ecosystem are adapted to high turbidity conditions, and reductions in turbidity can have many negative ecological effects.
- Higher values for Secchi depth indicate lower turbidity.
- Secchi depth is measured monthly by DWR's [Environmental Monitoring Program](#) by dropping a black-and-white disk in the water until it disappears.

For more information, see: Schoellhamer, D. H. 2011. Sudden clearing of estuarine waters upon crossing the threshold from transport to supply regulation of sediment transport as an erodible sediment pool is depleted: San Francisco Bay, 1999. *Estuaries and Coasts* 34(5):885-899.

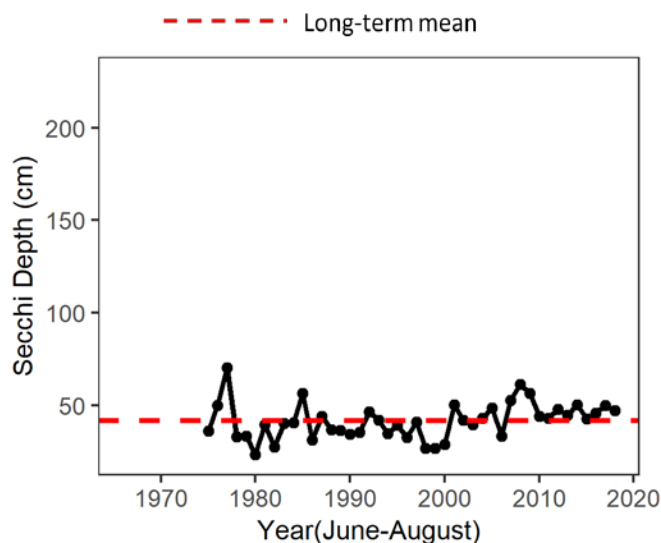


San Pablo Bay



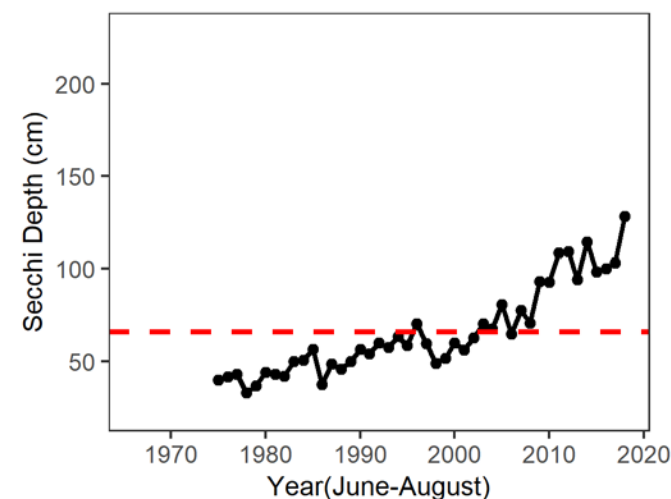
In 2018, San Pablo bay was close to the long-term average.

Suisun Bay



In 2018, Suisun Bay was also close to the long-term average.

The Delta



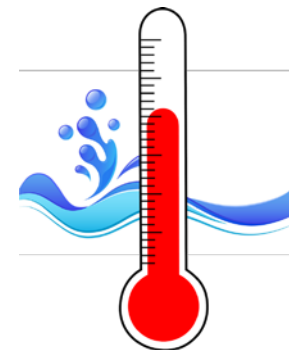
In 2018, the Delta was much clearer than average, the clearest Summer on record.

Water Temperature

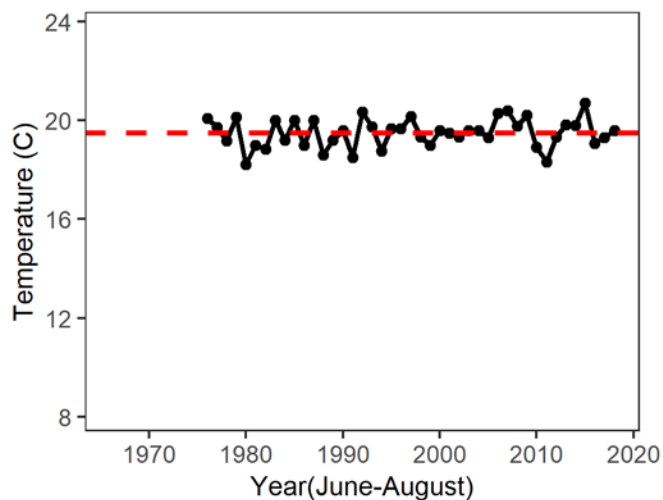
Background

- Water temperature is monitored monthly by DWR's [Environmental Monitoring Program](#).
- High temperature can increase productivity and may trigger harmful algal blooms.
- Increasing Summer temperatures may limit juvenile smelt survival.
- Summer temperatures are lower closer to the ocean and slightly higher in the Delta.

For more information see: Lehman, P. W., T. Kurobe, S. Lesmeister, D. Baxa, A. Tung, and S. J. Teh. 2017. Impacts of the 2014 severe drought on the *Microcystis* bloom in San Francisco Estuary. Harmful Algae 63(Supplement C):94-108.

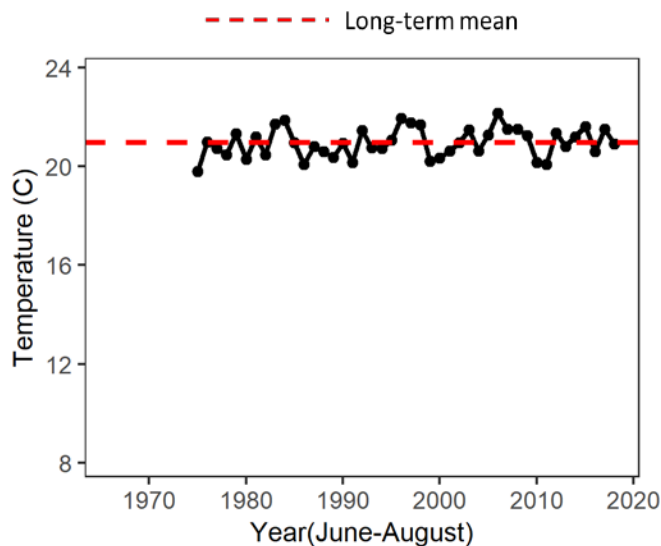


San Pablo Bay



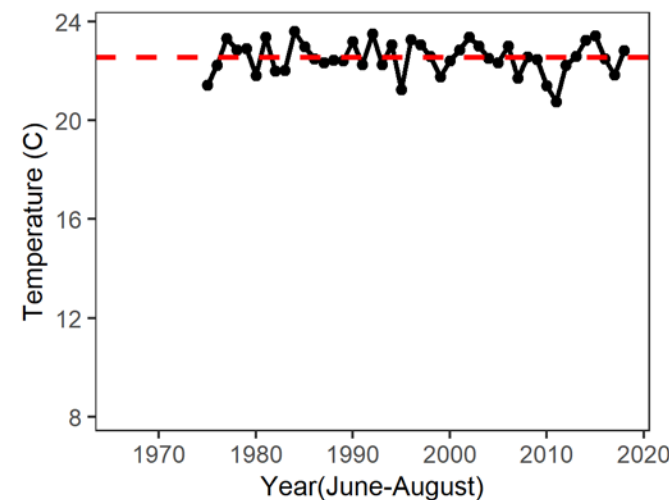
In 2018, San Pablo Bay temperatures were similar to the long-term average.

Suisun Bay



In 2018, Suisun Bay was similar to the long-term average.

The Delta



In 2018, the Delta was similar to the long-term average.

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Chlorophyll

Background

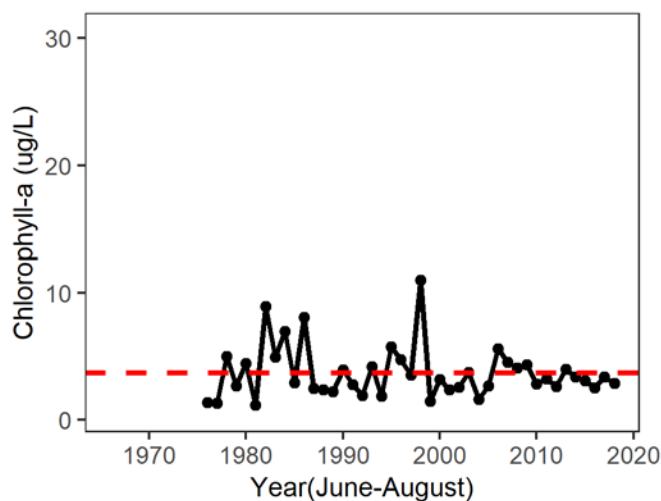
- Chlorophyll is an indicator of phytoplankton production, which is highest during the Summer.
- Phytoplankton is the base of the pelagic food web. It is sampled monthly by DWR's [Environmental Monitoring Program](#).
- The invasion of the clam *Potamocorbula amurensis* caused a decline in phytoplankton and zooplankton after 1986 – especially in Suisun Bay.

For more information see: Cahoon, T. and T. Brown 2018. Phytoplankton, Chlorophyll-a and Pheophytin-a Status and Trends 2017. IEP Newsletter 32(1):14-20.

Phytoplankton

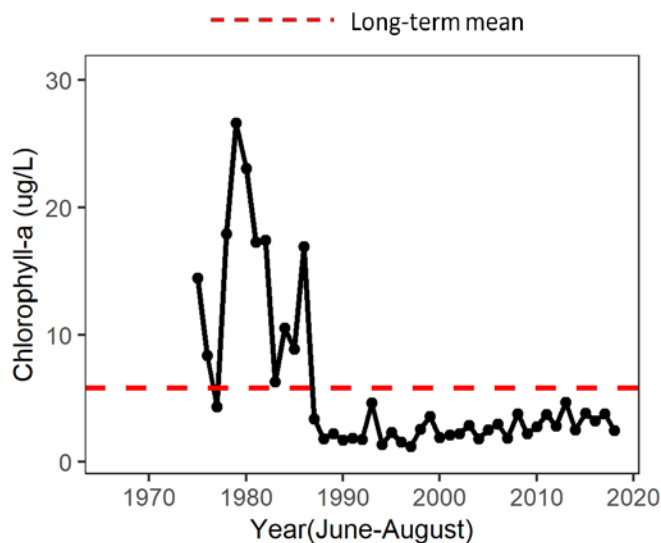


San Pablo Bay



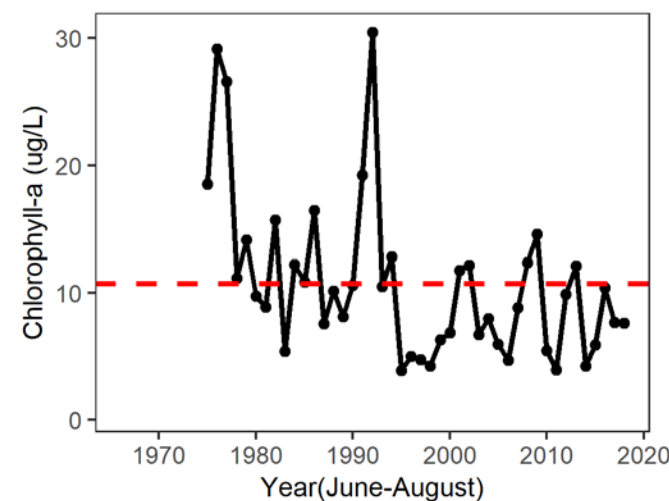
In 2018, San Pablo Bay chlorophyll was about average.

Suisun Bay



In 2018, Suisun Bay chlorophyll was slightly below average.

The Delta



In 2018, the Delta chlorophyll was also slightly below average.

Zooplankton

Background

- Zooplankton is sampled monthly by the CDFW/[DWR Environmental Monitoring Program](#), but sampling in San Pablo Bay did not begin until 1998.
- Zooplankton are an important food source for pelagic fish.
- Calanoid copepods and mysids are particularly good fish food. Cyclopoid copepods are not as good for fish food.
- Biomass tends to be highest in summer.

For more information see: Hennessy, A. 2018. Zooplankton Monitoring 2017. IEP Newsletter 32(1):21-32.

Copepod



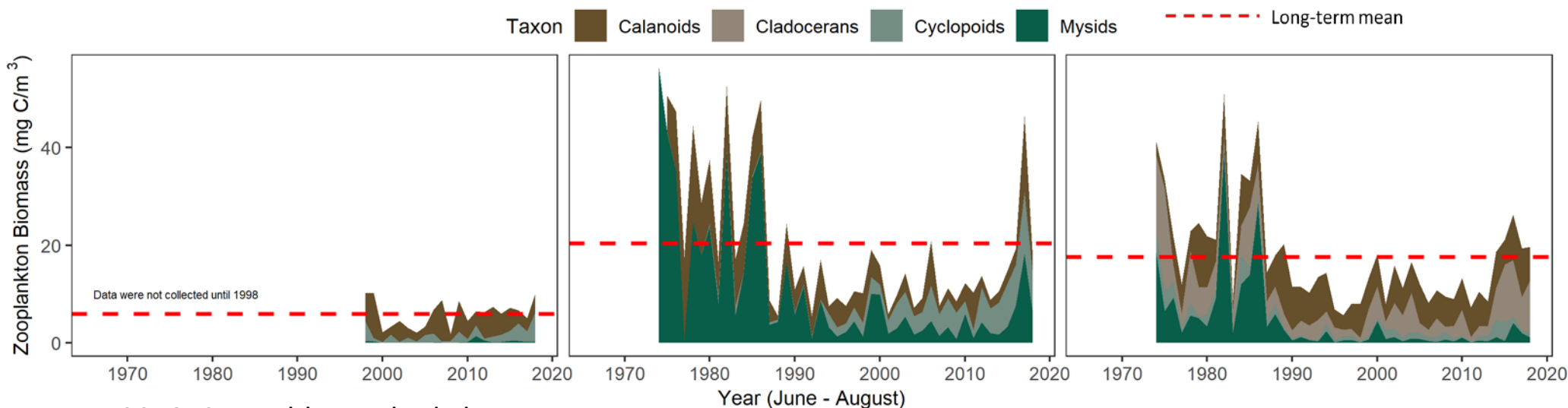
Mysid



San Pablo Bay

Suisun Bay

The Delta



In 2018, San Pablo Bay had about average biomass, mostly cyclopoid copepods

In 2018, Suisun Bay also had slightly lower than average total biomass, mostly mysids.

In 2018, the Delta had about average total biomass, mostly cladocerans

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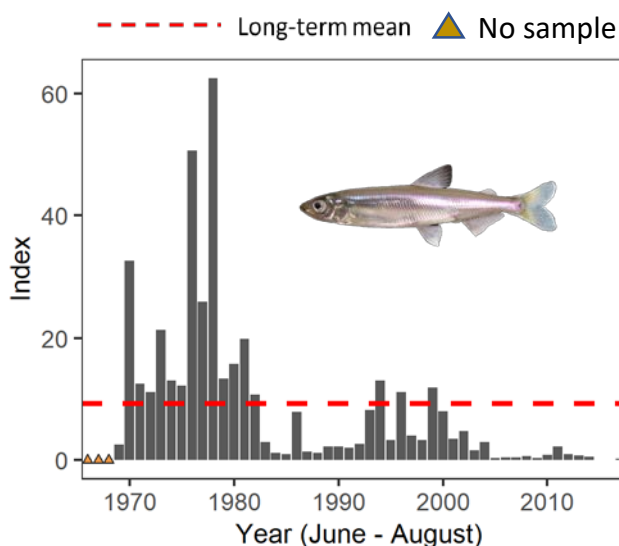
Fish

Background

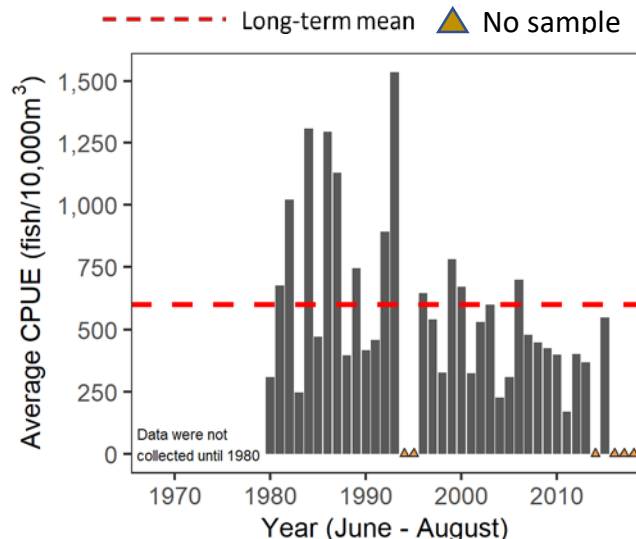
- Delta Smelt, listed as threatened by the Endangered Species Act, have been tracked by [CDFW's Townet Survey](#) since 1959 in Suisun Bay, San Pablo Bay, and the Delta.
- Northern Anchovy are an important forage fish in the brackish-saline regions of the estuary. They are sampled best by [CDFW's San Francisco Bay Study](#).
- Sacramento Pikeminnow is a native cyprinid that is one of the few piscivorous native fish in the Delta. They are sampled by [DJFMP's beach seine surveys](#) throughout the estuary.

For more information, see: Hieb, K., J. Bautista, and J. Giannetta. 2018. Bay Study Fishes Status and Trends Report for the San Francisco Estuary, 2012–2016. IEP Newsletter 31(2):3-43.

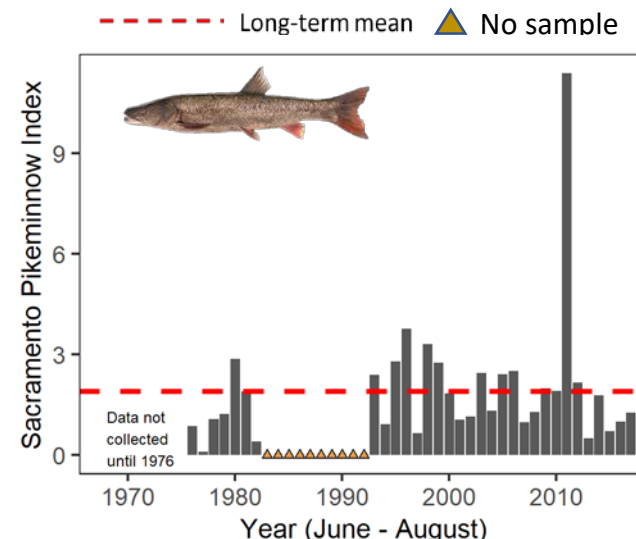
Delta Smelt - Townet



Northern Anchovy – Bay Study



DJFMP – Sac Pikeminnow



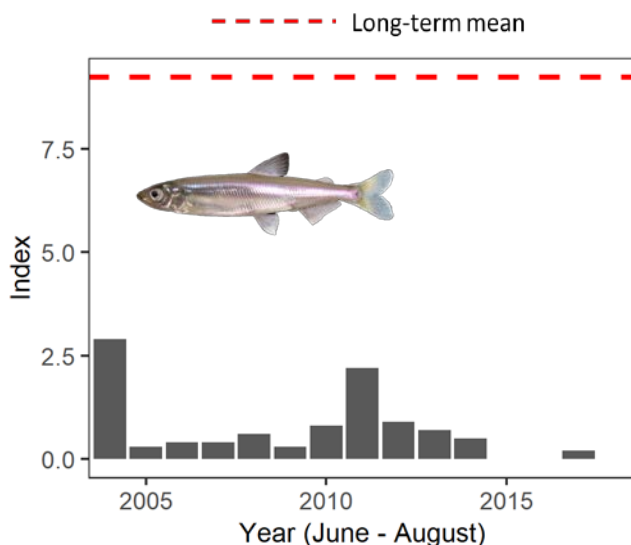
Recent Trends: 2004-2018

Background

- Delta Smelt have been in severe decline over the past two decades, with a [Summer Townet index](#) of zero in 2015, 2016 and 2018.
- *Microcystis* is a toxic cyanobacteria first found in the Delta in 1998. *Microcystis* presence has been documented by EMP and the [Summer Townet Survey](#) during their water quality sampling.
- Aquatic vegetation in the Delta has increased significantly in recent years. This vegetation is composed mostly of non-native invasive plant species and is categorized as either floating or submerged types. Coverage is estimated by [UC-Davis](#) using remote sensing of the North and Central Delta.

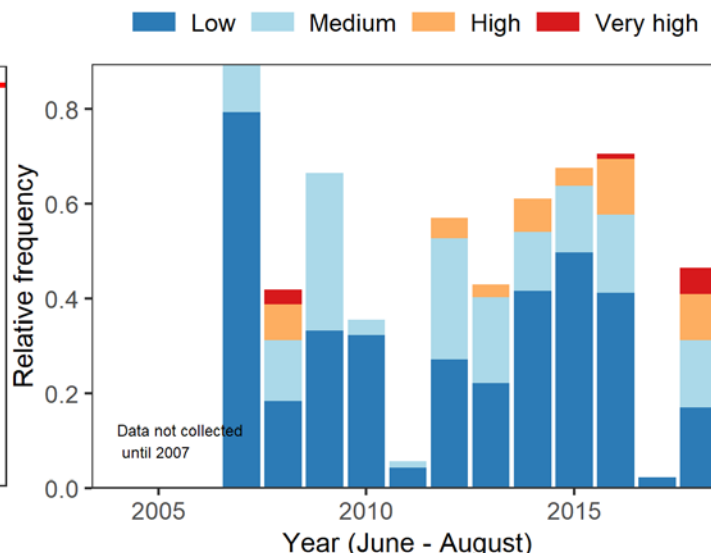
For more information, Ta et al. 2017. Invasive aquatic vegetation management in the Sacramento–San Joaquin River Delta: status and recommendations. San Francisco Estuary and Watershed Science 15(4)

Delta Smelt - Towntnet



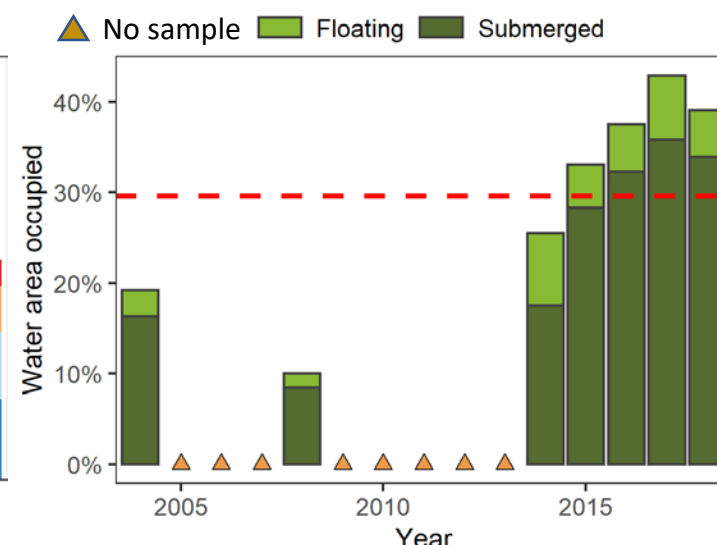
The 2018 Delta Smelt index was 0.

Microcystis



2018 had more observations of very high *Microcystis* than previous years.

Aquatic Vegetation



Aquatic vegetation was slightly lower than 2017, but higher than average.

Interagency Ecological Program Seasonal Monitoring Report

Metadata for Summer 2018

Version: 1.0

Last Updated: 2020-03-24

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Overview

Long-term ecological surveys have been a core function of the Interagency Ecological Program (IEP) since the program's inception in the 1970s. The IEP Seasonal Monitoring Report presents the full time series for selected water quality, plankton, and fisheries surveys conducted by IEP in a single graphical report. While the report is not a comprehensive view of all the data collected by IEP, it is intended to provide a general overview of the longevity and breadth of IEP survey work. A major goal of this report is to illustrate the scope of IEP surveys and emerging trends in the San Francisco Bay-Delta ecosystem to the public, potential science collaborators, and IEP and other resource agency managers and directors. The report is generated on a quarterly basis, with different set of ecosystem variables and surveys highlighted in each season. The report is developed by IEP scientists (including leads for monitoring surveys and the IEP Lead Scientist) and is reviewed by the IEP Science Management Team and Coordinators before online publication.

General Information

Season Definitions

This report covers a suite of key IEP data sets relevant to the summer season, which we defined as the months of June, July, and August. For data sets collected throughout the year, such as water temperature, we only used data from this three-month period to generate graphs. For data sets that are

season-specific, we include the entire sampling period, even if it does not overlap exactly with our season definition (for example, aquatic vegetation surveys sometimes occurred in September or October). Data from other times of year will be featured in the corresponding future seasonal reports (i.e., fall, winter, spring). The other seasons (for future reports) are defined as follows: Fall = September to November, Winter = December to February, Spring = March to May.

Geographic Region Definitions

Many of the data sets in the report are represented by a panel of three plots, one for each of three geographic regions: San Pablo Bay, Suisun Bay, and the Sacramento-San Joaquin Delta. This subdivision of data sets is designed to facilitate comparison among major regions that differ in a variety of characteristics. San Pablo Bay includes data collected east of Point San Pablo and west of the Carquinez Strait. Suisun Bay includes data collected east of the Carquinez Strait and west of the town of Collinsville. The Delta includes data east of Collinsville. Data sets are represented as a single graph when the data are only collected within a single region (e.g., Net Delta Outflow) and for wide-ranging organisms that frequent multiple regions (e.g., Delta Smelt).

Year Ranges

Most of the graphs in the report have an x-axis range from 1966 to 2018. This start year was selected because it is the year of initiation for the Fall Midwater Trawl survey, one of the longest-running surveys. Standardizing the year range on the x-axis facilitates visual comparison across data sets. The entire time series for nearly all data sets fits within this time range. Data sets that began before 1966 were truncated for purposes of consistency within the report. The graphs in the Recent Trends section of the winter report range from 2004 to 2018.

Calculations for Data Points

The points plotted on the graphs represent mean values. Means are generated by averaging data over the three months of the winter season for a given year (June-August) and across sites within a given region where relevant (e.g., water quality and plankton data sets). The dotted horizontal line indicates the average value over the entire period of record.

Data Sets

Flow

Data Source: Department of Water Resources, Environmental Planning and Information Branch

Metric Used: Net Delta Outflow Index, which is estimated using a summation of river inflows, precipitation, agricultural consumptive demand, and project exports.

Year Range: 1967-2017. The entire data set includes 1929-2017 but was truncated to conform to the year range of the rest of the data sets in the report.

Additional Information: <https://www.water.ca.gov/Programs/Environmental-Services/Compliance-Monitoring-And-Assessment/Dayflow-Data>

Water Quality: Secchi depth, Temperature, Chlorophyll-a

Data Source: Department of Water Resources, Environmental Monitoring Program

Metric Used: Monthly discrete water quality data

Year Range: 1975 – 2017

Stations by Region

San Pablo: Stations = 4, years: 1976-2017

Suisun: Stations = 11, years: 1975-2017

Delta: Stations = 29, years: 1975-2017

Additional Information: <https://water.ca.gov/Programs/Environmental-Services/Water-Quality-Monitoring-And-Assessment>

Zooplankton: Biomass of Calanoids, Cyclopoids, Cladocerans, and Mysids

Data Source: California Department of Fish and Wildlife, Zooplankton Study

Metric Used: Biomass of zooplankton (milligrams of carbon per cubic meter) based on monthly surveys.

Year Range: 1975 – 2018

Stations by Region

San Pablo: Stations = 2, years: 1998-2018. Note: One station sampled consistently since 1998 and the other one since 2003.

Suisun: Stations = 6, years: 1975-2018

Delta: Stations = 8, years: 1975-2018

Additional Information: <https://www.wildlife.ca.gov/Conservation/Delta/Zooplankton-Study>

Northern Anchovy

Data Source: California Department of Fish and Wildlife, San Francisco Bay Study (Region 3, Bay Delta)

Metric Used: Average catch per unit effort (CPUE) for adult Northern Anchovy is derived from Bay Study's Midwater trawl, which samples pelagic fishes and retrieved obliquely such that all depths are sampled equally.

Year Range: 1980-2018

Stations: 52

More Information: <https://www.wildlife.ca.gov/Conservation/Delta/Bay-Study>

Sacramento Pikeminnow – Beach Seine Survey

Data Source: US Fish and Wildlife Service, Lodi Field Office, Delta Juvenile Fish Monitoring Program

Metric Used: For a given year-month combination, Sacramento Pikeminnow catch per unit effort (CPUE) was calculated as the sum of Pikeminnow catch divided by the sum of volume sampled, over all stations sampled. The annual index was calculated as the mean of the monthly CPUE values from that year.

Year Range: 1976-2018.

Stations: 75 stations; see program metadata for site sampling histories.

Additional Information: https://www.fws.gov/lofi/juvenile_fish_monitoring_program/jfmp_index.htm

Delta Smelt

Data Source: Summer Townet Survey

Metric Used: Catches of age-zero Delta Smelt at each index station are weighted by a station-specific weighting factor, summed for all index stations and divided by 1000 to calculate the survey index. The annual index is calculated from the first two survey indices. This method was chosen for consistency with the index calculated by the California Department of Fish and Wildlife.

Year Range: 1959-2018

Note: The Summer Townet Survey was initiated in 1959, but no index was calculated 1966-1968.

Stations: 31

Additional Information: <https://wildlife.ca.gov/Conservation/Delta/Townet-Survey>

Microcystis

Data Source: Summer Townet Survey and Environmental Monitoring Program

Metric Used: *Microcystis* bloom presence and intensity are measured on a qualitative scale with 5 categories: absent, low (widely scattered colonies), medium (adjacent colonies), high (contiguous colonies), and very high (concentration of contiguous colonies forming mats/scum).

Year Range: 2007 - 2018

Stations: 69

Additional Information: <https://wildlife.ca.gov/Conservation/Delta/Townet-Survey>
<https://water.ca.gov/Programs/Environmental-Services/Water-Quality-Monitoring-And-Assessment>

Aquatic Vegetation

Data Source: Acquired from Shruti Khanna at California Department of Fish and Wildlife.

Metric Used: Percent water area occupied by vegetation was estimated from hyperspectral imagery collected once per year. This metric was calculated for each of the two types of vegetation, floating and submerged, by dividing estimated acres of vegetation by estimated total wetted area of the Delta and multiplying by 100. Note that this is a conservative estimate of submerged aquatic vegetation because this type of vegetation is difficult to capture with remote sensing imagery. Also note that, although this plot is included in the summer report, the data were collected during most years in fall when vegetation biomass is at a maximum in the Delta.

Year Range: 2004-2018. For 2005-2007, vegetation coverage estimates are available but were not included in the plot because they are undergoing re-processing to better match methodologies used for the rest of the time series. No data were collected 2009-2013. These surveys have been funded in a piecemeal fashion and are not part of any agency's formal monitoring program.

Stations: The coverage estimates included in the plot are based on an area representing about a third of the full legal delta, including parts of the Central and North Delta (Figure 1). These regions have been monitored because they represent important habitat for endangered delta smelt. The region for the Central Delta ranges from the northernmost extent of Twitchell Island to the southern extent of Rhode Island in the north-south orientation and from the western extent of Sherman Island to eastern extent of Fourteen-Mile Slough in the east-west orientation. The region for the North Delta ranges from the northernmost extent of Liberty Island to the southern extent of Prospect Island in the north-south orientation and the western extents of Lindsey Slough to the eastern extent of Prospect Island.

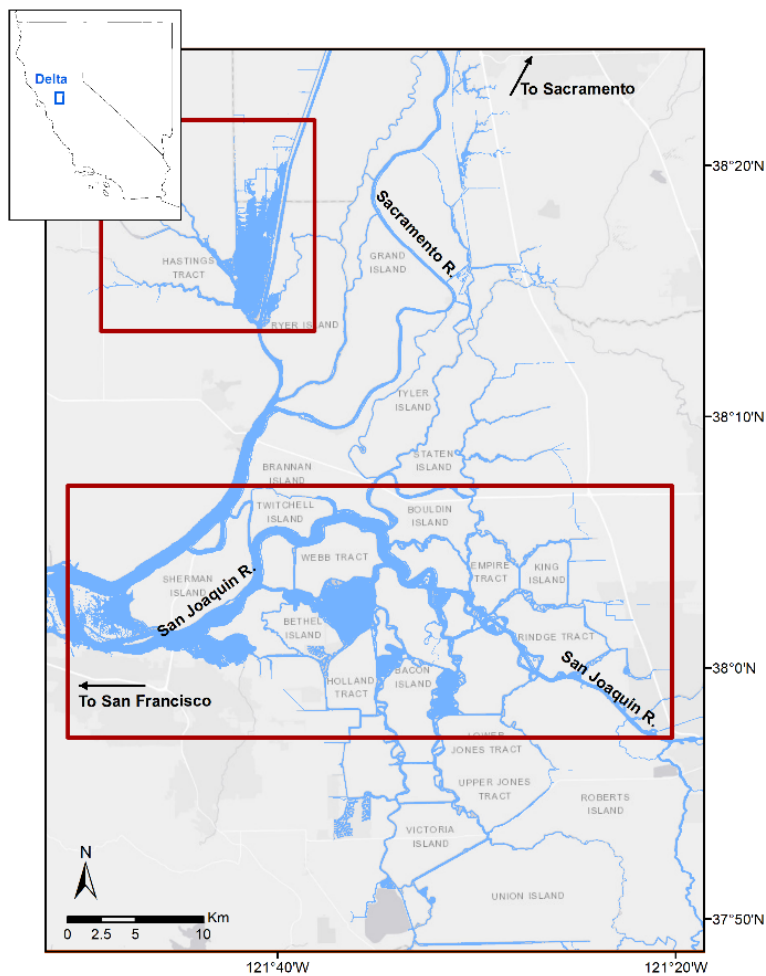


Figure 1. Map of the Sacramento-San Joaquin River Delta with the two focal regions shown within the red bordered boxes.

Additional Information: These data are not currently available to the public, though efforts are under way to provide them on Bay-Delta Live (<https://www.baydeltalive.com/>).