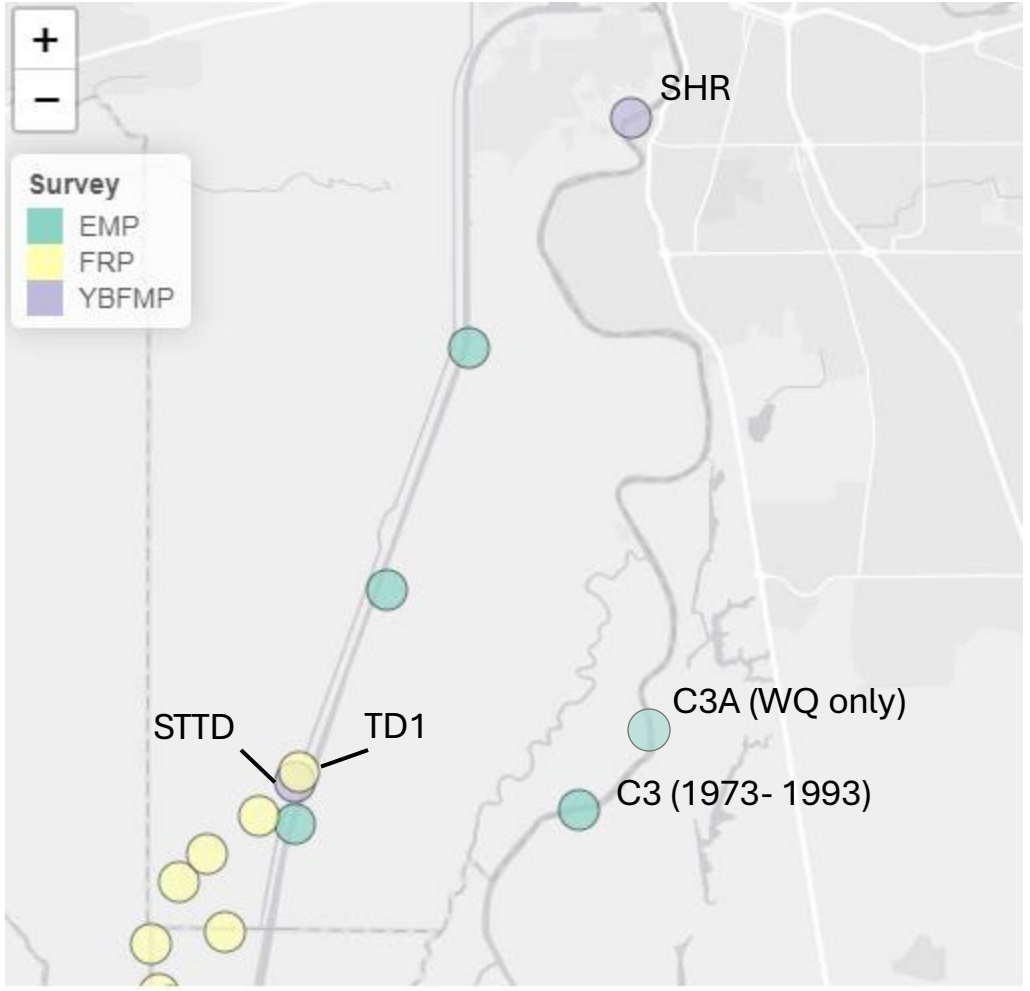
Zooplankton sampling program comparison

Program	Net type	Tow type	Net dia. (m)	Mesh size (µm)	Duration (min)	Stations
20mm	CB	Stepped obliq.	0.13	160	10	52
EMP	CB	Oblique	0.13	160	10	24
EMP	pump	N/A	N/A	43	vol. = 19.8 gal	24
FMWT	CB	Oblique	0.13	160	10	40
STN	CB	Oblique	0.13	160	10	42
YBFMP	conical	***Horiz. (<0.5m)***	***0.5***	150	5	***2***
YBFMP	conical	***Horiz. (<0.5m)***	***0.5***	***50***	2	***2***
DOP	conical	Horiz. (~0.5m & mid-channel depth)	0.2, 0.2	150, 150	5	24
FRP	CB	Benthic and oblique	0.15, 0.15	150, 150	5	34

Note: Clarke Bumpus (CB) nets for 20mm, FMWT, STN are mounted atop larval frames and towed at the same time. The tow duration targets larval smelt, so the smaller CB nets are used to avoid net clogging during the long tows.

Zooplankton sampling program locations

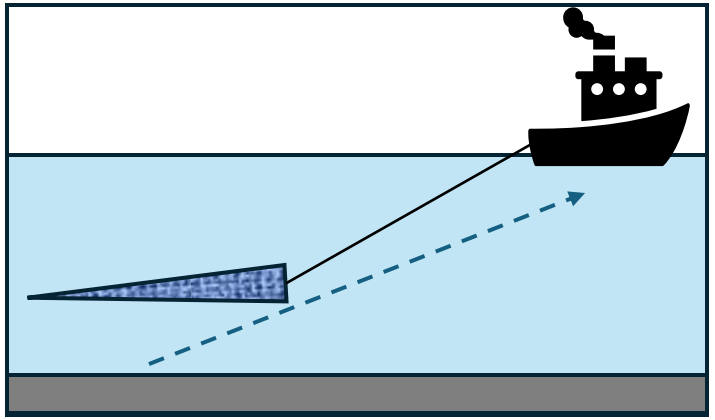
- YBFMP is the only long-term monitoring program collecting zooplankton on the lower Sacramento River above the confluence
- All other programs have more stations, and replicate habitat type
- DJFMP and EDSM collects water quality near SHR, and EMP collects water quality near Hood (zooplankton was discontinued in 1993; see map)
- FRP has a station (Toedrain 1) near STTD



Credit: IEP

Summary of SFE/Delta Zooplankton Sampling Programs

- *Oblique tows* and vertical hauls are the most common methods for freshwater zooplankton
- Most long-term monitoring programs in SF Bay/Delta conduct *oblique tows*
  - Samples the *entire water column* from bottom to surface
  - Some important taxa are demersal (near bottom) during daytime and only migrate to surface at night
- Major differences of YBFMP zoop sampling:
  - Only two stations (each a different habitat type)
  - Only samples the top of the water column
  - Uses larger net mouth diameter
  - Samples microzooplankton (with a net)
  - Samples the lower Sacramento River above the confluence



Other considerations

A study of zooplankton sampling methods (Mack et al. 2012) found:

- Mesh size ≤ 61µm is needed to quantify copepod nauplii, rotifers, and, to a lesser extent, small Cladocera (e.g., *Bosmina*)
- Mesh size 64µm was at best 60% but as low as 35% filtering efficiency in productive/high sediment waters
- Mesh size **≥ *100µm has > 94% filtering efficiency*** even with high sediment/productivity
- A flowmeter can account for efficiency, but using a pump gets around issues with filtering efficiency and net clogging
- Some taxa are diel and/or tidal vertical migrators
  - May only catch by sampling at night and during flood tide

Recommendations

- Smaller diameter zooplankton net (~0.2m)
  - Reduces clogging and makes processing easier for taxonomist
- Oblique tows or depth tows
  - Comparative study of horizontal vs. oblique tows at STTD and SHR, at ebb and flood tides
- Pump sampling for microzooplankton
  - Eliminate efficiency and clogging issues
- Add stations (especially in the bypass)
  - Year-round above and below STTD (e.g., BL2, BL5)
  - Inundation (e.g., Fremont weir, Sacramento Bypass)
- Sample during flood tides (ideally towards the end)