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Can directed outflow improve rearing habitat and growth of Delta Smelt?

Freshwater outflow from the Sacramento-San Joaquin River-Delta has been considered the primary driver of Delta Smelt abundance, yet the mechanism for the effect has remained elusive. The 2009 biological opinion (USFWS) for continued operation of the CVP and SWP requires fall outflow (RPA-4) as one action to support Delta Smelt. Directed fall outflow for Delta Smelt has occurred in only 2 (2011 & 2017) of the 8 years since implementation of this opinion. Here we examined life history attributes (growth, hatchdate, migration history) of Delta Smelt during years of directed outflow and other years with low outflow to assess the response of Delta Smelt vital rates to augmented outflow. Despite higher than normal fall flows in 2011 and 2017, other attributes of nursery habitat differed. In 2011, the spring warm-up was delayed and hatchdates where much later than in other years. In addition, growth and life history diversity was higher than other years including the recent extreme wet year in 2017. Our analyses suggest, freshwater outflow is not the sole driver of delta smelt growth and recruitment success. Temperature may be the critical link in understanding recruitment success of Delta Smelt. Unfortunately, this lesson comes as the population has reached levels indicative of collapse, and resent climatic trends portend a future warming prediction 50-years ahead of schedule.