

October 16, 2017

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Subject: Food - Not Increased Delta OutFlow is Needed for the Bay-Delta Estuary

The State Water Resources Control Board (Water Board) recently posted several documents in preparation for new hearings to consider revisions to the current Bay/Delta water quality objectives. I read with some chagrin a tenant throughout that higher Delta Outflows are needed to better protect fish. This conclusion is simply not correct. I worked as a biologist and a manager on mostly Bay-Delta issues for the State for 38 years, first for the Water Board (28 years) and then for the Department of Water Resources (10) years. I retired in 2011 and do some independent consulting mostly on geeky water right issues.

While I agree with the fact that flows and cold water in the upstream areas of rivers that feed the Bay/Delta Estuary (Estuary) are important, these needs should be addressed on a case-by-case basis in each upstream river system. However, unlike the tributaries where flows are everything, Delta Outflow is a minor component of the flows in the Bay/Delta Estuary, which is dominated by the tides that flow in and out twice a day. The tidal flow is more than thirty times greater than the current Delta Outflow this fall. Fish in the Estuary have adapted to this dynamic environment by being able to live in large swings of salinity and their ability to “surf” the tides to both maintain position and actually travel upstream when they want.

Delta smelt numbers have been shown to have no relationship with Delta Outflow in the spring. There was a theory that fall flows could be important, but this theory was debunked years ago. Splittail do better at higher flows, but this has been shown to be related to more flood plain spawning habitat upstream. Perhaps the best case for winter and spring Delta Outflow is longfin smelt. There used to be a good overall relationship between the numbers of young longfin smelt and Delta Outflow. However, this relationship has degraded over time. Currently, that relationship has degraded so badly that Delta Outflows have very little effect on longfin smelt. For example, the current relationship has flattened to the point that even if one devoted the volume of three full Folsom Reservoirs there would be no measurable improvement in longfin smelt numbers.

A major question is “why has longfin relationship with flow degraded so badly?” This is an ecological question that nobody seems to be willing to address. In the

early 2000's when biologists were trying to figure out why the abundance level of many fish like delta and longfin smelt had dropped so precipitously, we assembled a group of outside experts to advise the State on why the actions we were taking were not working to improve the abundance level of targeted fish. A quote from one of those experts that has stuck with me was: "You have to remember that fish are like teenage boys – all they think about is food and sex". While this is perhaps a slight overstatement (there is also football), it is a good analogy. Fish are always looking for their next meal and one marvels at the ability of fish like salmon to travel great distances to reproduce.

It is all about food. So let's look at food. There is a good relationship developed by an ecologist named Nixon (1988) that shows for many different ecosystems including estuaries, when primary production (food) increases there is an increase in secondary production (fish). The Bay/Delta Estuary was in about the middle of this relationship prior to the mid-1980's. However, once the Asian clam invaded the Estuary from ship ballast, the primary production dropped by about an order of magnitude. This primary production has continued to drop, which many believe is due to the ammonia discharges from the Sacramento Regional Wastewater Treatment Plant. Whatever the cause, with an order of magnitude drop in food production one would expect the abundance level of fish to also drop by the same amount. That is exactly what has happened. But worse, the type of food available has also shifted. The Estuary used to be dominated by diatoms at the base of the food web. Now, it is mostly green and bluegreen algae, the latter of which can be toxic. The zooplankton types have also shifted from good food sources to a new one called *limnothonia*, now the most dominate zooplankton in the Delta and not a very good food source. A Zooplankton call *Neomysis* was so abundant and such an important food source historically that the Water Board set salinity standards in 1971 to protect it in Water Right Decision 1379. I even did research on them while in graduate school. However, even though those standards were met, *Neomysis* virtually disappeared from the Estuary by the late 1990's and is now considered "inconsequential as a food source". In response to all of this, there has been a shift in the numbers of fish from pelagic fish like delta and longfin smelt to predatory boney fish like largemouth bass, sunfish, etc. These kinds of ecological shifts are not related to Delta Outflow.

Many scientists have recognized this shift in the basic ecological functioning of the Bay/Delta Estuary. The cause for this ecological shift is often attributed to "multiple factors". Why would one think that adjusting just one factor like the flow "knob" would fix this. We have tried that before and it has done no good. Repeating the same thing and expecting something different to happen is the definition of insanity. The only area of the Estuary where delta smelt populations are increasing is the Cache Slough area: an area basically unaffected by flows and ammonia, but has high productivity. There is much to be learned there.

Having worked for the Water Board, I am sympathetic that you want to do something within your jurisdiction to help with the Bay/Delta situation. To your

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credit you have taken action to eliminate ammonia discharges from the Sacramento Regional Wastewater Treatment plant to the Sacramento River. The problem is we are years away from that improved treatment process going on line. More Delta Outflow will not help with the Delta fish situation. Longfin have been shown to spawn in large numbers in smaller Bay tributaries in wet years, which has nothing to do with Delta Outflow but everything to do with local rainfall. It might feel good to do something to please some environmental groups, but if the Water Board continues to go down the myopic track of focusing on Delta Outflow as the major part of "the fix", it will fail with large amounts of water lost and we will be back here in another 10 years doing it again. What is needed is an ecological approach and it starts with looking at ways to increase the right kinds of food.

It is food not Delta Outflow.

A handwritten signature in blue ink that reads "Gerald E. Johns". The signature is written in a cursive style with a large, looped 'J' at the end.

Gerald E. Johns

P.S. I have lots of charts and graphs that explain all this in more detail and would be willing to make presentations to anyone who desires a more detailed briefing. The opinions expressed here, while correct, do not necessary reflect those of my past or current employers. No one paid me for this. This issue has concerned me for over a decade and I cannot sit idly by while regulatory mistakes are repeated and the Estuary does not benefit.

cc.

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