11 October, 2007

John Kirlin, Executive Director
Delta Vision Blue Ribbon Task Force
650 Capitol Mall, 5th Floor
Sacramento, California 95814

RE: Role of Outflow in the Bay Delta Estuary

Dear Mr. Kirlin:

Like many others interested in the Delta Vision Blue Ribbon Task Force process, I have followed many of the proceedings using the webcast feature. As you know, the drawback to relying on webcasts is that it limits the availability of real-time discussion of some of the materials being presented to the Task Force. For that reason, I am providing this short written comment on a discussion that occurred at the September 27th Task Force meeting.

The discussion involved an exchange between Task Force member Sunne McPeak and DWR Deputy Director Jerry Johns about the relationship between Delta outflow and fishery resources. I am concerned that the abbreviated exchange at the meeting might cause the Task Force to draw inaccurate inferences. I would therefore like to draw the Task Force's attention to some scientific references that might give more complete answers to member McPeak's questions.

As stated by Mr. Johns, longfin smelt have shown a long-term relationship to outflow (or X2). However, this relationship was not the sole or even principal basis for the X2 standard. Workshops convened by San Francisco Estuary Project in 1991 to develop a scientific basis for managing freshwater discharge to the bay (SFEI 1993) documented remarkably clear relationships of flow (or X2) with not only longfin smelt but with striped bass survival, the planktonic shrimp Neomysis mercedis, the benthic shrimp Crangon franciscorum, starry flounder and even total organic carbon. It was this diverse assemblage of ecosystem elements that supported the development of an X2 standard. These relationships were further described in the peer-reviewed scientific literature (Jassby et al. 1995).

Species' relationships with X2 changed after the invasion of the overbite clam, but in most cases the slope of the relationship remained similar, but the intercept changed. Put another way, a given amount of outflow led to fewer fish than before, but more outflow still continued to translate into more fish (Kimmerer 2002.)

Mr. Johns suggested that longfin smelt were no longer responding to outflow because of an increase in abundance of the newer, and possibly less nutritious, copepod, Limnoithona. However, evidence to date suggests that Limnoithona is a very small part of longfin smelt diet (Steve Slater DFG pers. Comm.). Thus, there is no reason to think that Limnothoina's abundance in the estuary has contributed to the decline of the longfin smelt population.

In addition, the high outflows in the spring of 2006 led to the highest longfin smelt abundance of the POD years (although still lower than in comparable earlier years). Thus, even given the POD, outflow can affect the overall abundance of longfin smelt.

As part of the POD investigations, the spatial distribution of summertime and fall habitats occupied by delta smelt, striped bass yearlings and threadfin shad has been quantitatively defined. Summer habitat has shown a long-term decline since the 1980s due to decreased turbidity, likely caused by the spread of Egeria that filters sediment from the water column. This reduction in suitable summertime habitat has reduced the suitability of the southern delta for the relevant fish species. The fall habitat volume is largely controlled by salinity (and, thus, the volume of freshwater outflow to the bay) . In addition the POD years were characterized by a general decrease in the amount of fall habitat. (Feyrer et al 2007 and Nobriga et al. in press, galley copies available from the authors or myself). This reduction in fall habitat coincides with the POD and is thought to have contributed to the vulnerability of these species to greater rates of entrainment during the POD years (described in numerous recent POD public presentations and in the upcoming POD report for 2007, in preparation).

Thus, in recent years scientists have developed a better understanding of how outflow controls habitat for some species and, in the POD years, how habitat characteristics have interacted with other factors in determining fish abundance. It would be unfortunate if the Delta Vision Blue Ribbon Panel were to infer from the information presented that such habitats are no longer important to pelagic species.

Very truly yours,

Bruce Herbold, PhD
Fish Ecologist

Feyrer, F., M. Nobriga, and T. Sommer. 2007. Multi-decadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, U.S.A. Canadian Journal of Fisheries and Aquatic Sciences 64:723-734

Jassby, A.D., W. J. Kimmerer, S.G. Monismith, C. Armor, J.E. Cloern, T.M. Powell, J.R. Schubel, and T.J. Vendlinski. 1995. Isohaline position as a habitat indicator for estuarine populations. Ecological Applications 5:272-289

Kimmerer, W.J. 2002. Effects of freshwater flow on abundance of estuarine organisms: physical effects or trophic linkages? Marine Ecology Progress Series 243:39-55.

Nobriga, M., T. Sommer, F. Feyrer, and K. Fleming. 2007. Long-term trends in summertime habitat suitability for delta smelt, *Hypomesus transpacificus*. San Francisco Estuary and Watershed Science. (In press)