STATE WATER RESOURCES CONTROL BOARD
PERIODIC REVIEW OF THE 1995 WATER QUALITY CONTROL PLAN FOR THE SAN FRANCISCO BAY/SACRAMENTO-SAN JOAQUIN DELTA ESTUARY

PUBLIC WORKSHOP JANUARY 12, 2005
TOPIC #5 – DELTA OUTFLOW

Comments of the California Department of Fish and Game

It has long been recognized that the magnitude of delta outflow is positively correlated with ecosystem health in the San Francisco Bay estuary (Estuary) and its tributary streams. The State Water Resources Control Board's (SWRCB) 1995 Water Quality Control Plan (WQCP) utilizes Estuary salinity objectives as a surrogate for measuring outflow. Specifically, the WQCP establishes objectives for the position of the lateral point in the Estuary where daily average salinity is 2 parts per thousand near the bottom of the water column (known as X2). The position of X2 generally moves oceanward as outflow increases.

The 2 ppt salinity position objectives included in the WQCP are the direct result of scientific investigations conducted in the early 1990s regarding the relationships between the 2 ppt isohaline and estuarine resources (SFEP 1993, Jassby et al. 1995). In addition to the finding that there were many well-behaved statistical relationships between estuarine resources and the position of the 2 ppt isohaline, it was also concluded that at least a rudimentary understanding existed for the causal mechanisms underlying many of the relationships.

In the judgment of the California Department of the Fish and Game, the X2 objectives articulated in the WQCP have been an effective vehicle for maintaining the ecological benefits of outflow and therefore a suite of estuarine species dependent on flows. Since the adoption of the current WQCP, Department biologists working in concert with their colleagues in the Interagency Ecological Program and the academic community have continued to monitor key estuarine resources and examine their relationships to X2 and other factors. In many cases the relationships observed in the early 1990s have remained fundamentally the same. For example, two estuarine species, the shrimp *Crangon franciscorum* (Figure 1) and the longfin smelt (*Spirinchus thaleichthys*) (Figure 2) continue to exhibit the strong associations with X2. For some species the relationship to X2 has become less clear. For example, severe general declines in the abundance of the Mysid shrimp Neomysis mercedis and juvenile striped bass (*Morone saxatilus*) have confounded the examination of the relationships of these

species to X2. In these cases X2 may still influence abundance, but this influence has apparently been clouded by the effects of other factors.

As was noted in the early 1990s, there are many mechanisms, some well understood and others not, underlying the relationships between outflow, expressed as X2, and various estuarine indicators. The positive association between splittail production and outflow is likely the result of greater availability of spawning and rearing habitat (inundated floodplain) provided by high river flow conditions (Figure 3). There is strong evidence suggesting that the recent positive association between spring outflow levels and delta smelt production (Figure 4) results from the fact that higher flows position rearing habitat downstream of the interior Delta, reducing juvenile smelt exposure to cross-Delta transport flows and exports. Greater production of food in the upper portion of the Estuary under higher outflow conditions likely contributes to the positive association between outflow and longfin smelt production. For the Bay shrimp, *Crangon franciscorum,* enhanced food availability, expansion of brackish water habitat, and enhanced tidal circulation (upstream transport) all likely contribute to their observed greater production under higher outflow conditions. The benefits of these mechanisms are enhanced by greater outflows and consistent with X2 occurring more oceanward.

Given the diversity of potential mechanisms underlying the positive association between outflow and various ecological indicators, managing X2 standards requires close collaboration between interested parties and careful consideration of the specific actions employed to manage the standards. Specifically, flexible application of X2 standards to enhance public trust resources would require this collaboration and careful consideration of resource implications. The California Department of Fish and Game is open to flexible application of X2 standards as long as such flexing is made in a collaborative fashion, and that implementation of adjustments benefit public trust resources and require fishery agency approval. The existing Data Assessment Team (DAT) and Water Operations Management Team (WOMT) are forums where this collaboration could be accomplished.

In conclusion, the California Department of Fish and Game supports retention of an X2-based outflow standard, which will serve to ensure the broad ecological benefits associated with robust outflow levels.

References

San Francisco Estuary Project. 1993. Managing Freshwater Discharge to the San FranciscoBay/Sacramento-San Joaquin Estuary: The scientific basis for an estuarine standard. Conclusions and recommendations of members of the scientific, policy, and management communities in the Bay/Delta Estuary. 17 pages, plus appendices.

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(1): 272-289.

Figure 1. Bay Shrimp Year Class Strength vs. X2
IEP Bay Study Otter Trawl
1980 through 2004

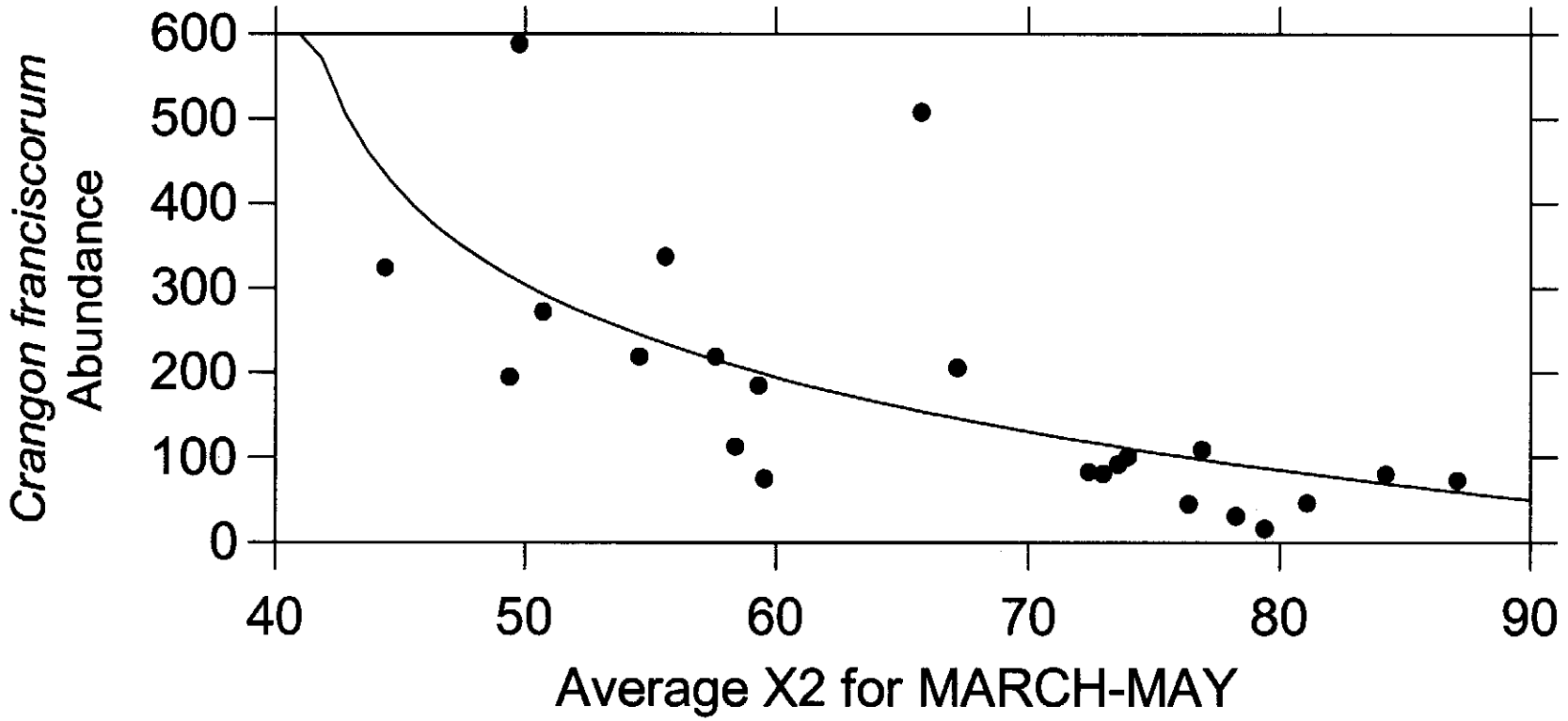

Figure 2. Longfin Smelt Abundance vs. X2
IEP Fall Midwater Trawl
1967 through 2004

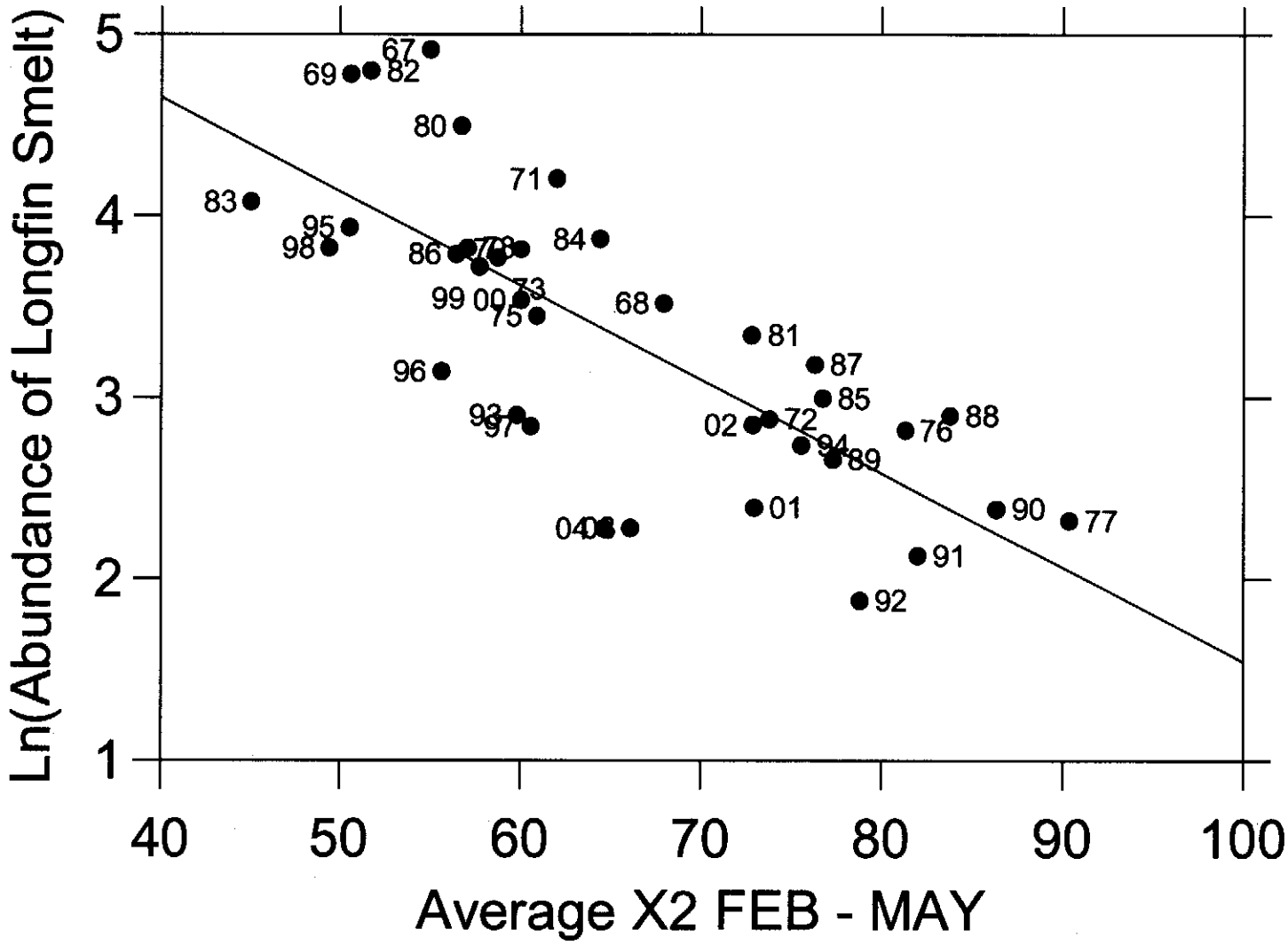

Figure 3. Days of floodplain inundating flow vs FMWT Splittail Age-0 Abundance (Top) and Beach Seine Abundance (Bottom)

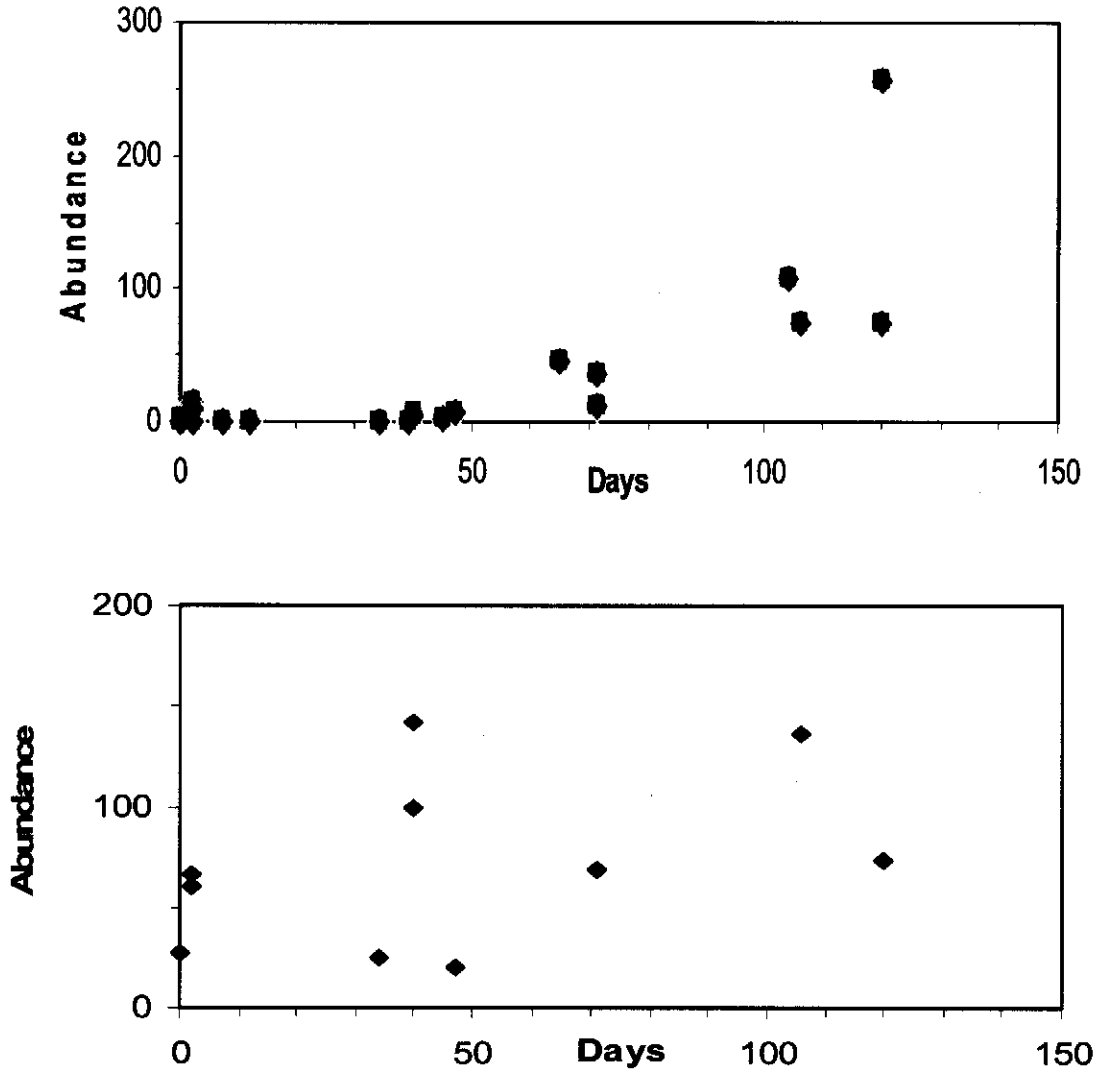

Figure 4. Delta Smelt Abundance and X2