Input to the New Lines of Evidence Panel

Brad Cavallo, Science Director, Westlands Water District

The Panel has been provided with a considerable body of information to review. Instead of recommending additional sources, I offer some general observations. Westlands Water District (WWD) is a water contractor with a direct interest in Delta export operations. However, these observations are offered based on my extensive professional experience as a fisheries biologist working on related issues during my tenure at WWD (since early 2025) and previously on behalf State agencies and as an independent scientific consultant. It is hoped that these observations may help "connect the dots" between available analyses and questions the Panel has been asked to consider.

1. This isn't a new topic. Scientific investigations of hypothesized far-field export effects (effects on fish that occur away from the export facilities themselves) have been going on for more than thirty years. Acoustic tagging (AT) studies (which began in ~2007) are just the most recent and best tool we've had for studying the issue. When AT studies began, expectations for (finally) shedding light on hypothesized far-field export effects were clear. For example, the Six-Year Acoustic Tag Experiment prescribed in the 2009 NMFS Biological Opinion stated its objective was: "*To confirm proportional causes of mortality due to flows, exports and other project and non-project adverse effects on steelhead smolts out-migrating from the San Joaquin basin and through the southern Delta*."
2. We have a lot of data. More than 4,000 acoustically tagged juvenile salmonids were used to assess export effects in the South/Central Delta (Review Document #10) and more than 14,000 for the North/Central Delta (Review Document #3). Importantly, these observations span a broad range of water project operations and environmental conditions (See Appendix B in each of the Review Documents cited above).
3. Results from AT studies showing positive associations with flow in riverine (non-tidal) channels and negative associations with water temperatures (for example) have been broadly published, accepted and where possible incorporated into water project operations (an ongoing effort).
4. In contrast, despite being the same method and very often the same scientific investigations, export-related findings have been reported less often and to date have not appreciably influenced export regulations. Generalized assessment of hypothesized far-field effects with available AT data is not difficult (see Review Document #3). The Panel should consider that the relative paucity of peer-reviewed publications examining export effects reflects the tendency of researchers (and scientific journals) to disfavor reporting on null effects (e.g. Nuzzo 2015).
5. In interpreting findings of export effect studies, one perspective I've encountered previously on this issues is that the absence of strong, negative export effects demonstrates that existing export restrictions work. This claim ignores the fact that existing regulations actively restrict exports when fish entrainment events occur. The intent of restricting exports in these circumstances is to improve the survival of fish that are still at risk from "far-field" export effects. Because the observed data already reflect regulated operations, they speak only to effects within the observed range of exports. Higher export levels than regulations currently allow might cause substantial

harm, but that should not prevent us from drawing reasonable conclusions within the range of exports where we currently have observations.

6. Another perspective is that study findings should have little bearing on export management because exports should be minimized while juvenile salmonids are in the Delta for precautionary reasons. That is, there may be effects we cannot study effectively so it's safer (for fish) just to restrict exports as much as possible. While the caution is appreciated, this perspective ignores that export regulations do not occur in isolation. Rather, seasonal export restrictions have far-reaching impacts on water project operations. Water stored in reservoirs that cannot be released for through-Delta conveyance in April (for example) because of export restrictions will instead be released and conveyed in summer months. Is it better for stored water to be released in spring months so that it can benefit juvenile salmonids in their downstream migration to the Delta, or is it better to hold that water back and release in summer when export restrictions are relaxed? The answer depends on the benefit we expect juvenile salmonids to receive from spring reservoir releases relative to the hypothesized harm of recovering those releases via exports. Acoustic tagging data (that provided for your review and numerous prior studies focusing on flow effects upstream of the Delta) suggest the benefits of such an operation (for juvenile salmonids) may substantially exceed the harms, but these sorts of tradeoffs cannot be considered (or experimentally evaluated) if export regulations are based on precautionary practices rather than careful scientific analyses that can account for system-wide net benefits.
7. Though we know more about export effects than is commonly understood, there are areas that warrant further investigation. Rather than additional observational studies under existing regulations, the Panel should consider recommending export operational experiments paired with intensive AT studies designed to test specific hypotheses. These studies could include conveyance flow releases (as suggested in #6) so that net benefits from alternative operations could be considered. Special attention to AT receivers in the Central and South Delta will be needed as this is the area where export effects are most likely to occur.

Literature cited

Nuzzo, R. How scientists fool themselves – and how they can stop. *Nature* **526**, 182–185 (2015). https://doi.org/10.1038/526182a