Draft Individual Review Form

Proposal number: 2001-K217-3 **Short Proposal Title:** Juvenile salmon migratory behavior

1a) Are the objectives and hypotheses clearly stated?

Yes.

1b1) Does the conceptual model clearly explain the underlying basis for the proposed work?

Yes. However, the conceptual model indicates that the study will not address the entire array of variables that potentially affect juvenile chinook salmon migratory behavior. Thus, uncontrolled variables are likely to confound results.

1b2) Is the approach well designed and appropriate for meeting the objectives of the project?

See 1b1. Also, the selection of yearling Mokelumne River hatchery fish for release in the San Joaquin River and south delta appears to be illogical, as this life stage represents only a small fraction of juvenile salmon migrating through the delta. Yearlings were probably chosen for their ability to tolerate the radio transmitters and not necessarily because the represent April-May outmigrants, which are mostly substantially smaller. The use of Coleman fish for November-December releases in the Sacramento River is only applicable to late-fall run fish and as a surrogate for spring-run outmigrants. Fall-run chinook, which are the most abundant outmigrants, are not directly addressed. Finally, there is no reason to expect that naive, stressed (from handling, tagging, and transport) hatchery fish moved directly from the hatchery to the delta will behave in the same manner as unstressed wild fish that have already experienced a large portion of their oceanward migration.

So few fish are needed that it should be possible to capture and hold sufficient wild fish for this study (150 fish in 3 months). Why rely on hatchery fish that are probably not representative?

1c1) Has the applicant justified the selection of research, pilot or demonstration project, or a full-scale implementation project?

The applicant justifies this research project based on the need for this information and past use of this methodology for studying migrations.

1c2) Is the project likely to generate information that can be used to inform future decision making?

It will provide such information, but the decisions based on this information may be erroneous because the results are likely to be flawed for the reasons described in this review.

2a) Are the monitoring and information assessment plans adequate to assess the outcome of the project?

This is questionable, as the exact plans for monitoring the radio-tagged fish are not adequately described. The number and location of fixed monitoring stations are critical for obtaining useful results because many fish are likely to be "lost" between periods of boat monitoring. Fixed stations will record these fish as they pass and, if interrogated frequently, allow more efficient search to re-acquire signals from tagged fish.

2b) Are data collection, data management, data analysis, and reporting plans well-described, scientifically sound and adequate to meet the proposed objectives?

Maximizing the number of observations soon after releases may bias results towards abnormal behavior related to handling, tagging, and transport to the release sites. I realize the limitations in the active lifetime (What is the expected battery life?) of these small tags, but still question the use of a method that has a high probability of yielding biased results. Long-term radio-tracking has a higher likelihood of producing valid results than the proposed short term tracking. Consistently releasing fish in the morning may also bias results.

The applicant does not describe how the hypotheses will be tested. What statistical tests are proposed and what is the power of these tests given the anticipated sample sizes?

3) Is the proposed work likely to be technically feasible?

Past work has tracked radio-tagged juvenile salmon, so it can be done. However, as I have said before, I am skeptical about the validity of data collected from naive and stressed hatchery fish. None of the literature cited in the proposal that specifically deals with radio-tagging juvenile salmon has appeared in the peer-reviewed primary literature. Why hasn't it received that kind of scrutiny? Until this work in the delta has received that type of validation, it cannot be considered technically appropriate.

4) Is the proposed project team qualified to efficiently and effectively implement the proposed project?

Based on the applicants' past experience, they appear to be qualified.

Miscellaneous comments

One would expect newly released juvenile salmon to move with the tidal currents, especially as they are stressed and in an unfamiliar environment. The fact that the applicant indicates that in past studies only "some" of the fish migrated "faster" during ebb tides than during the flood suggests a lack of normal behavior because all fish should exhibit this behavior if they are to reach the ocean in a reasonable amount of time.

Previous sampling in mid-channel and along shore has already led to the inference that outmigrating juveniles use the center of the channel. Radio-tagging was not necessary to determine that.

Spring/neap tide variations in migratory behavior should already be available from extensive trawling by the USFWS at Sacramento and Chipps Island.

Overall Evaluation	**Provide a brief explanation of your summary rating**
Summary Rating ☐ Excellent ☐ Very Good ☐ Good ☐ Fair XXXX ☐ Poor	All the above comments concerning the likelihood of obtaining useful and unbiased information from this study lead to this rating. These include use of hatchery rather than wild fish, inappropriate size or life stage of the experimental fish, bias due to "unnatural" behavior, poor description of study design as it relates to number and placement of fixed radio-tracking stations, and lack of a statistical design for testing hypotheses.