COLLEGE OF THE HOLY CROSS

Department of Biology

September 14, 2013

Subject: Independent Scientific Review of the 2013 IEP Management, Analysis, and Synthesis Team (MAST) report titled "An updated conceptual model for delta smelt: our evolving understanding of an estuarine fish."

Independent reviewer:

Dr. William V. Sobczak
Associate Professor of Biology
Director of Environmental Studies
College of the Holy Cross
Worcester, MA 01610
wsobczak@holycross.edu
508-793-3752

Overall summary comments:

The 2013 IEP MAST report is a well organized scholarly monograph that 1) reviews and evaluates the substantial existing primary literature on delta smelt, 2) incorporates this current body of knowledge into population and ecosystem conceptual models, and 3) generates testable hypotheses for scientists and managers to strategically focus future delta smelt research and adaptive management plans. The report is authored by ~20 of the leading delta scientists and managers representing a wide diversity of state and federal agencies and professionally conveys the "current state of our scientific knowledge" on delta smelt population biology, ecology, and management. Delta smelt management is inherently challenging due to delta smelt's complex life cycle, sensitivity to multiple environmental stressors, and low abundances. The MAST report is a testament to the impressive body of work and scientific knowledge that has been amassed over the last decade.

The MAST authors have responded to previous independent review suggestions and have organized the document around the formulation of contemporary conceptual models that incorporate population biology, ecology, environmental stressors, and hydrological drivers. The conceptual models include processes that that can be segregated into delta seasons and are used to logically highlight a series of critical processes that can be articulated as explicit, testable hypotheses. This framework is powerful because it encapsulates the synthesized knowledge of over 100+ technical scientific articles in a manner that allow delta scientists and managers to move forward in a logical, strategic, and justified manner. This is especially valuable when managing an endangered species with a complex life cycle and environment. From a pragmatic perspective, the MAST report framework helps make best use of limited resources and time.

Responses to "questions provided to help reviewers formulate their comments":

Please note that I have evaluated and commented on the MAST report with the same standards I would as an associate editor for Ecology and NSF-DEB Ecosystems panelist.

Q1: Are objectives of the report clearly described? Fully addressed? Do the authors go beyond these objectives/questions?

MAST authors provide clear objectives and questions. The strategy to develop the conceptual models (as outlined above) was a great organizing framework. The questions are clearly stated in lines 432-451 and guide the synthesis and document organization. Overall, the objectives are well addressed; however, the MAST draft I was asked to review is missing Ch.6 –which will contain future adaptive management plans, a more quantitative life-cycle/population model, and impact of 2012 data. Obviously this is a critical omission and would be necessary for a complete review of the 2013 Final MAST report.

The authors were restrained and did not go beyond the questions. They provide testable hypotheses that are clearly stated, justified, and connected to conceptual model(s), but there are not explicit, detailed links to FLaSH or other future adaptive management projects. The missing Ch.6 may handle these linkages in a more direct manner? In my opinion, the MAST report begs for more connections to the implementation and execution of FlaSH.

Q2: Are conclusions and recommendations supported by evidence and analyses? And related questions.

The MAST report is an extremely impressive synthesis of a large body or peer-reviewed science. The level of scholarship is what would be expected at NSF and leading scientific journals. The citations are numerous in every section of the report and include a wide diversity of disciplines and scientists. The synthesis provides "the state of the science and knowledge" regarding delta smelt. The MAST report is written in a scholarly and professional manner by a diverse team of highly-regarded environmental scientists and managers.

Q3: Are the data and analyses handled competently and appropriately?

Overall, I was very impressed by how the MAST team handled a wide diversity of data sets that required a diversity of analyses. The abundant use of supportive citations in the peer-reviewed literature help support many of the approaches. The collective team has long had to grapple with difficult analysis and statistical challenges regarding long-term trawl sampling, small sample sizes, hydro-year comparisons, and residual effects from variable responses in different stages of the delta smelt's complex life cycle. Many of these issues are frontier areas in the field of ecology and certainly not limited to delta smelt population analysis. I am very comfortable with the construction of the conceptual models.

The semi-quantitative life-cycling modeling effort that will appear in Ch.6 will certainly warrant careful scrutiny and be difficult to construct with the complexities of the population's life cycle and multiple stressors. Progress here is important, but will have limitations and needs to be used as an evolving model. I'm unable to critically comment on the Allee effects, and level of threat to the population. This section was less supported, but is an emerging research area.

Q4: Is the report's organization effective?

As stated above, the framework and logical, linear flow of the document are excellent for such a highly technical and scholarly monograph. The draft MAST report is also written in a singular style and "voice" which is difficult when working with a large team of authors. This could readily be turned into a scholarly book for general ecology, fish biology, and environmental management audiences.

Related, the title is excellent and true to the product.

Q5: Is the report objective? Is the tone impartial?

I will build on comments above. The authors of this report are highly regarded throughout the scientific community and have long worked to report their research in top peer-reviewed journals. The vast number of peer-reviewed articles cited to support the work is a herculean accomplishment. This is first-rate scientific scholarship on the "state of our knowledge" regarding delta smelt biology and ecology.

Q6: What other significant improvements, if any, might be made to the report?

1. The report would benefit from having a table that describes the water year designation criteria, since the water year classification is pivotal to the questions being asked and adaptive management actions. This would be especially useful for those not familiar with the delta.

2. Early in the document, the report should define "abundance index" since the long-term trawl data are central to establish an appropriate baseline for population recovery. The term is cryptic for those unfamiliar with these data.

3. I like how all of the potential multiple stressors were discussed individually and treated in a neutral non-weighted manner. I'm familiar with much of the primary literature in these sections, and have no substantial concerns with the authors' assessment of the literature.

4. One of the dangers of having so many complex figures is that it can be hard to parse those that are most critical to the report's chief findings, as opposed to supporting a minor point. It may be useful to poll the authors and ask them to identify the 5-10 most essential figures. For example, Figure 43 was weighted heavily in my reading of the report. I recognize that this is a technical, scholarly monograph, but it may be useful to have a brief synopsis for decision makers.

5. The final key points are simplistic and vague, and were known prior to the 2013 MAST report. I think the authors should carefully rethink this section and break it up into three components:

A) Important points regarding the delta smelt population that have been rigorously supported and the 2013 MAST report help validate. Synthesis establishing core concepts in our understanding of delta smelt.

B) Important new insights that emerged from the MAST and have improved our understanding of the delta smelt's biology and ecology. In other words, topics that were found to be important but in need of more information. Large synthesis projects usually yield some surprises.

C) Important voids or uncertainties in our understanding of delta smelt. A thorough scholarly synthesis in any scientific field should arrive at areas in need of advancement, future research, and investment.

6. The "overall next steps section" is also very vague and could have been written prior to the 2013 MAST report. The 2013 MAST report's emerging conceptual model of delta smelt should inform this section. This section requires careful thought and should be guided by the impressive MAST report. The authors should provide a crystal clear blueprint and future work plan. Failure to do this will limit the report's impact and usefulness. The work should galvanize the collective delta smelt research community moving forward. The 2013 MAST report is a major scientific accomplishment that should proudly be shared publically at the Bay-Delta Science Conference. This should also be a time to explicitly state and share the most salient research needs moving forward. The 2013 MAST report should highlight a few high priority research needs.

One College Street Worcester, MA 01610-2395 508 793-2656 Fax 508 793-2696