Proposal Reviews

#191: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

University of California, Davis

Research and Restoration Technical Panel Review	
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Research and Restoration Technical Panel Review:

CALFED Bay-Delta 2002 ERP PSP
Research and Restoration Technical Panel Review Form

Proposal Number: 191

Applicant Organization: University of California, Davis

Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

Review:

Please provide an overall evaluation summary rating:

Superior: outstanding in all respects;
Above Average: Quality proposal, medium or high regional value, and no significant administrative concerns;
Adequate: No serious deficiencies, no significant regional impediments, and no significant administrative concerns;
Not Recommended: Serious deficiencies, significant regional impediments or significant administrative concerns.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Superior	**This project was ranked as a low to medium priority for regional research needs and good by all the outside reviewers. Some administrative issues were raised that are not within the control of the PIs. The major flaw in this proposal is the investigators inadequate understanding of the limitation and background chemistry for the hard part analyses (otolith and fin rays). The major flaws in the methodology placed this proposal in the not recommended category.**
-Above average	
-Adequate	
XNot recommended	

1. **Goals and Justification.** Does the proposal present a clear statement of goals, objectives and hypotheses? Does the proposal present a clear justification and conceptual model for the project?

   The goals, hypotheses and objectives were clearly stated. The principal goal is to establish an approach that could be used to assess the effects of metal contaminants (likely exposure) on fishes within three different major habitats of the system. The proposed concept is good but the some of the proposed methods for execution of the project badly miss the mark.

2. **Likelihood of Success (Approach, Feasibility, Capabilities and Performance Measures).** Is the project likely to succeed based on the approach, feasibility and project team capabilities? Are the proposed performance measures adequate for measuring the project's success?

This project was judged as good by all outside reviewers. The consensus among external reviewers was that the project team is generally capable and qualified to conduct this research and that elements of the project have merit. However, there are some major deficiencies in the proposed methods. One external reviewer described their results to date with otoliths and fin rays (as documented in the proposal by figures) as fanciful. A second reviewer noted strong concerns with their methods and data as well. A consensus of the external reviewers believes that the research team does not fully understand the limitations of the elemental fingerprinting technique for the application they propose. This one major deficiency makes success of this project highly unlikely as proposed, and if executed as proposed, could generate misleading results.

3. **Outcomes and Products.** Will the project advance the state of scientific knowledge in general and/or make an important contribution to the state of knowledge of the Bay-Delta Watershed? For restoration proposals, is the project likely to contribute to ecosystem restoration or species recoveries in a significant way? Will the project produce products useful to decision-makers and scientists?

   Given the serious concerns about the elemental fingerprinting, it seems unlikely that the project as proposed will provide products that will be useful to decision-makers.

4. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The external reviewer felt the budget was reasonable in spite of its high total. Given the low regional rankings and the low probability of completing the elemental fingerprinting with success the benefit of pursuing this project as proposed is questionable.

5. **Regional Review.** How did the regional panel(s) rank the proposal (High, Medium, Low)? Did the regional panel(s) identify significant benefits (regional priorities, linkages with other activities, local involvement) or impediments (local constraints, conflicts with other activities, lack of local involvement) to this proposal? What were they?

   Regional reviewers rated this project as a low to medium priority project for ERP (1L;2M). The rationale is that this particular proposal offers few mechanisms and information linkages for use by management. The regional reviewers were also discouraged by the lack of effort to seek local involvement for the project and seemed to be largely unaware of the proposal in advance. They were concerned that it was basically a lab study without proven applicability to ERP goals.

6. **Administrative Review.** Were there significant concerns about the proposal with regard to the prior performance, environmental compliance and budget administrative reviews? What were they?

   Only one significant administrative issue was raised. The repeated renegotiation of standard contract terms by the vice Chancellor for Research at UCD has caused administrative headaches at CalFed.

Miscellaneous comments:

None

Bay Regional Review:

Proposal Number: 191

Applicant Organization: University of California, Davis

Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

Overall Ranking: **X**Low **-**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

The panel supports research that delivers scientific information which improves understanding and allows for management options/actions based on research outcomes/products. Proposal describes few mechanisms for informationn linkage and use of info by decision-makers, so it was not highly ranked by the panel.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   Fish collection being done wiht other Calfed studies or using fish from exisiting UCD captive stock

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   More applicable to other regions (MMR-6:Ensure recovery of at-risk species by developing conceptual undrestanding + multi-region models)

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   -Yes **X**No

   How?

   Linkages to bypass studies and CalFed studies stated but poor/no mechanism for info transfer or implementation.

4. Does the project adequately involve local people and institutions?

   -Yes **X**No

How?

Proposal glosses over importance of informing local/regional stakeholders and agency decision-makers. Describes no mechanisms for managment implementation of outcomes/info.

Other Comments:

"Tracking" aspect overstated. No field study of sturgeon but has a lab component?? Study didn't link / build upon to previous CalFed funded UCD sturgeon studies - why not???

Delta Regional Review:

Proposal Number: 191

Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

Overall Ranking: **-**Low **X**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

This is a solid but not essential project.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   o The project timetable appears reasonable. Project staff have collaborated previously and are experienced in work identified in this proposal. Otolith, fin ray and organ tissue samples will be obtained from ongoing fish sampling programs or from aquaculture operations independent from this proposal. This provides a highly reliable source of samples. Further, the entities responsible for collecting/aquacultural activities also are responsible for securing relevant permits for the fish, thereby eliminating the need for this project to obtain permits.

   o Laboratory work will be conducted in established facilities on the UC Davis campus.

   o No CEQA or NEPA documents will be required to complete the proposal.

   o It is not evident from the text when the products would be produced (i.e. the final report, poster presentations, and scientific journal publications.) The timetable on page 14 merely indicates these products will occur during the course of the project.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   o This project is consistent with ERP Draft Stage 1 Delta and Eastside Tributaries Region Restoration Priority # 2 (Restore + rehabilitate floodplain habitat) and Multi-Region restoration priorities #5 (ensure that restoration is notthreatened by degraded water quality)and 6 (Ensure recovery of at-risk species by developing conceptual understanding + models that cross multiple regions).

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   XYes **-**No

How?

o This proposal is linked with the CALFED-funded study Chronic Toxicity of Environmental Contaminants in Sacramento Splittail (Pogonichthys macrolepidotus): A Biomarker Approach (CALFED 99-N07).

o The results from this study are applicable to restoration efforts potentially affected by contaminant uptake and in understanding differences in contaminant exposure for fish in different habitats in the San Francisco Estuary and adjacent regions.

o The text indicates that this proposal is consistent with Central Valley Project Improvement Act Section 3406(b)(1) and with the long-term goal of the CALFED Science Program.

4. Does the project adequately involve local people and institutions?

-Yes **X**No

How?

o The report indicates that the project will have no public involvement because it is research-oriented and 75% of the work will be conducted on the UC Davis campus. No public outreach program is identified. There is no indication of public and/or stakeholder sentiments on the proposal. Apparently no attempts were made nor will be made to solicit such sentiment. o The text indicates there will be no third party impacts associated with the project.

Other Comments:

XX

Sacramento Regional Review:

Proposal Number: 191

Applicant Organization: University of California, Davis

Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

Overall Ranking: **-**Low **X**Medium **-**High

Provide a brief summary explanation of the committee's ranking:

The panel ranked the laboratory investigation of metal and temperature stressors high, however panel felt that management benefits of field study components were low, particularly the utility of otolith/fin ray fingerprinting to trace life history patterns. Additionally, although the project is research covering a wide geographic area, some efforts should have been directed at local contact. Informing local stakeholders/institutions is a critical component of CALFED restoration efforts and should be implemented prior to submitting proposals.

1. Is the project feasible based on local constraints?

   XYes **-**No

   How?

   Proponents have record of similar projects, although management application particularly relative to assessing restoration efforts in the near-term seems highly speculative. Identification under laboratory conditions of metallic contaminant effects as well as identification of sources and levels of metallic contaminants as specified, seems to have potential for future management actions. More questionable is the management benefit achieved through the trace element fingerprinting, particularly given the geographic scope.

2. Does the project pursue the restoration priorities applicable to the region as outlined in the PSP?

   XYes **-**No

   How?

   Proposal addresses Sacramento Region #7, "Develop Conceptual Models to Support Restoration of River, Stream and Riparian Habitat", and Multi-Regional Bay-Delta restoration priority #5, "Ensure that restoration is not threatened by degraded environmental water quality.

   As stated above, near-term applicability of trace element fingerprinting seems questionable.

3. Is the project adequately linked with other restoration activities in the region, such as ongoing implementation projects and regional planning efforts?

   XYes **-**No

How?

Proposal is integrated with past studies conducted by proponents (all of which have demonstrable results); however there seems to be little integration with ongoing efforts of other research.

4. Does the project adequately involve local people and institutions?

-Yes **X**No

How?

Proposal seems well integrated among agency/academic representatives working in the various areas, however has admittedly not involved local people and institutions. Proponents state "This is a research project where 75% of the work will be conducted within a research university at UCD. As such local, environmental, landowner, conservancies groups were not aware of this project." While nature of proposal may make it difficult to adequately involve local people/institutions, the very essence and ultimate success of current restoration efforts is based upon local involvement. Proponents should therefore have made an attempt, particularly since there are extant partnerships already in place for other restoration efforts, particularly within the bypasses (Sutter and Yolo).

Other Comments:

Proposal seems to have questionable near-term management benefit.

External Scientific: #1

Research and Restoration External Scientific Review Form

Proposal Number: **191**

Applicant Organization: **University of California, Davis**

Proposal Title: **ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	Provide a brief explanation of your summary rating
-Excellent	**Good-proposal subject has merit and interest to CALFED goals.**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The goals are stated, although they are a somewhat confusing mix of tasks focused on metal contamination. There is no doubt that this is a timely and important subject for the Delta. The proposed project seeks to demonstrate the use of health indices to understand effects of metal contamination on three different habitats (fish species) as well as investigate the use of elemental fingerprinting to track migration of the three target species.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

A clear conceptual model is outlined in a figure and in the text. The selection of a research project is justified because much of what they propose to do is investigative and aimed at determining if the proposed approach has merit.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   There is much about the proposed approach that I like but it also has some significant weaknesses. I like the condition indices, histopathology, age and growth and the laboratory studies with splittail and sturgeon all could provide useful information. The weak link is the hard part chemistry to trace migration. I believe they are promising more with the hard part chemistry than they will be able to deliver. Elemental fingerprinting has been oversold in the recent literature and although the technique has significant merit it also has some serious limitations that are often overlooked. They state that they will work through a list of at least 28 target elements that have been listed for hard part chemistry previously. We now known that many of the elements likely to be on their list are not fully incorporated into the calcium matrix and hence are of little use as tracers. All of these have been used extensively before and appear in the peer-reviewed literature. There are many more on the list that occur in extremely low concentrations and are also likely to be useless because of detection limits and other problems (contamination), especially for laser ablation. They dont need to know exactly where the fish migrated to if they can break down their life history and sample in various habitat where they are likely to spend time. With a knowledgable biologist like Moyle involved he should be able to reconstruct likely patterns of movement and habitat use based upon current and previous collections. This would be less precise but in my view a more satisfactory end result. The lab experiments would give them a chance to get a better understanding of incorporation of their target metals into the hard parts of fish bone without spending a lot of time on trying to sort out migratory patterns.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   All the proposed research is technically feasible. Success will be more likely without trying to analyze migratory patterns by hard part chemistry. Inherent in the trace element reconstruction of migration patterns is knowing where all the high trace element signatures are within the environment and understanding exactly how they will be incorporated with changing temperatures, seasons, salinity, food habits, stage of maturity, etc. I know this team has some experience with this and data. Nevertheless I think success with this element is unlikely. This team is experienced and has worked on metal contaminant studies in the past and should be successful. The scale of the project is reasonable for the number of investgators.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   Performance measures are listed in the proposal. They cant really be used to quantify project performance. QA/QC protocols are promised

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   There is a detailed products/outcomes section speculating on the value of the data if they are successful. No products such as reports, papers are listed in this section but 6 peer-reviewed publications are promised elsewhere. There is not a clear plan for how the data will be used. They promise to incorporate their findings into the collaborators analysis package. They dont elaborate.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   This team has the background and expertise to conduct this research. Infrastructure appears to be in place as well.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   As with many of these multi-investigator proposals the budget is high but perhaps not unreasonable for the number of elements to the work.

Miscellaneous comments:

External Scientific: #2

Research and Restoration External Scientific Review Form

Proposal Number: **191**

Applicant Organization: **University of California, Davis**

Proposal Title: **ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

None

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**The use of LA-ICP-MS is a promising approach to evaluating spatial and temporal patterns of metal exposure in freshwater and estuarine fish species. The laboratory and field components that address this technology could be funded as a demonstration project. The fish health components of the proposal are not well coordinated. They do not adequately address the project's objectives, and are not likely to lead to interpretative outcomes.**
-Good	
XPoor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The goals, objectives, and hypotheses for this proposal are not clearly stated and they are, to a certain extent, internally inconsistent. The stated aims are to "demonstrate the use of health indices on three different habitat fish species to assist in testing the effectiveness of Sutter and Yolo Bypass floodplains, to determine migratory patterns of splittail and longfin smelt, and to investigate the metallic contaminants effects on fish health". These appear to be three different specific aims, with different fish species of concern (the proposal is actually focused on four or possibly five fish species), and different geographical areas of concern. The only consistencies are the proposed methodologies - i.e. the use of LA-ICP-MS

and ICP-MS to evaluate exposures to metals, and the use of condition indices and histopathology to evaluate the impacts of metals on the health of exposed fish.

Collectively, the organization of the proposal gives the impression that the authors are not addressing a specific contaminant problem per se. Rather, the focus is on the application of novel technologies (and the LA-ICP-MS in particular) to several different (and unrelated) problems in the Sacramento and San Joaquin Estuary. The downside of this approach is that the application of the technology is given more weight than the natural resource management questions, and there are important disconnects between the objectives.

Rating--fair

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   The study is justified in the broad sense that the sublethal impacts of metals on freshwater, estuarine, and anadromous fish species are still poorly understood. Moreover, using LA-ICP-MS to determine the legacy of metal exposures for individual fish is a novel and very promising technical innovation. This technique, in combination with more conventional analytical methodologies, could substantially improve our understanding of the spatial and temporal patterns of metal exposure throughout the natural geographical ranges of different fish species. However, a key postulation of the proposal is that the technique will work as intended, and this has not yet been demonstrated (this is currently the second objective of Task 1).

   The validation of the LA-ICP-MS technique may be better suited as a stand alone demonstration project. Without this validation, it is questionable whether the application of the technique to fish in the Yolo Bypass, migratory smelt, sturgeon and the other fish species is justified.

   Rating--fair

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   As noted above, this proposal has three different objectives. The first is to evaluate the impacts of contaminants on the health of fish that use the Yolo Bypass floodplain, to ensure that long-term contaminant exposures are not somehow impacting the viability of natural populations that utilize the floodplain for spawning or rearing habitat. As noted by the authors, there are other contaminants (e.g. pesticides) that may pose problems for fish in the floodplain. By focusing exclusively on metals, the project may miss important impacts of other chemical stressors. Moreover, the authors do not make a convincing case that histologic lesions in various fish tissues can be clearly related to changes in fish productivity at the scale of natural populations. To do this, the project might use laboratory studies to compare the prevalence of metals-induced lesions in gonadal tissues to various measures of reproductive impairment in Sacramento splittail or an appropriate surrogate species. No such experiments are proposed. The other measures of fish health (i.e. condition index) are potentially nonspecific, and they may be too coarse to causally link metal exposures to a reduction in fitness for the fish of concern in the Yolo Bypass floodplain.

The second objective is to determine migratory patterns of Sacramento splittail and longfin smelt. Presumably, the migratory patterns of splittail and smelt are already reasonably well known for the Sacramento and San Joaquin estuary. Apparently, the specific aim of the proposal is to evaluate migratory patterns with specific reference to metals-contaminated freshwater and estuarine habitats. The proposal is unclear on this point - i.e., there is a reference to fish migratory patterns in the Specific Goals (#6) but no corresponding hypothesis to be tested. Presumably, the authors intend to use elemental fingerprinting to determine residence time in polluted habitats, and relate these exposure data to the life histories of the fish species in question. It is important to point out that residence time is not the same thing as migratory behavior and the approach, as it is presently structured, is not specifically addressing migratory behavior. Moreover, the proposal is exclusively focused on diet as the primary route of exposure to metals. Critically, the authors do not consider the scientific literature that shows that migratory fish avoid some metals at very low concentrations [see, for example, Hansen et al., 1999. Differences in neurobehavioral responses of chinook salmon and rainbow trout to copper and cobalt: behavioral avoidance. Environ. Tox. Chem. 18:1972-1978]. For certain metals that occur in fish habitat, the fish nervous system, and not the reproductive system, may be the most important determinant of exposure and therefore adverse health affects. The authors are assuming that fish are passive integrators of metals via their diets. However, it is also possible (and even likely) that avoidance behaviors in contaminated habitats may reduce body burdens for some metals. This would confound many interpretations of the elemental fingerprinting data.

The third objective is to investigate the effects of metallic contaminants on fish health. Inexplicably, the proposal shifts away from bluegills and longfin smelt (the species for the field components in Task 1) and focuses instead on sturgeon for the laboratory exposures in Task 2. This approach is questionable because, according to the authors, the laboratory data collected "will be used to compare and evaluate the findings of our field study". Moreover, splittail and sturgeon were chosen because they eat Asian clams and are in intimate contact with contaminated sediments in the estuary. Consequently, the laboratory experiments in Task 2 are not well matched to Hypotheses 1 & 2 (a disconnect between the laboratory and field components of the proposal). Instead, a principal goal of the laboratory experiments is to validate the use of LA-ICP-MS to fingerprint the otoliths and fin rays of fish with known exposure histories. As mentioned above, these experiments are probably more appropriate for a demonstration project.

Rating--poor

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

The approach is well documented and is technically feasible. However, if the LA-ICP-MS elemental fingerprinting technique does not work as the authors anticipate, the likelihood of success will be substantially reduced. The scale of the project is only partially consistent with the objectives. The project may significantly expand our understanding of sublethal metal exposures in fish. However, the proposed measures of impaired fish health (e.g., gonadal lesions) will not be sufficient to predict impacts on the survival or performance of metals-exposed fish in a way that will be meaningful for natural resource managers who oversee the conservation and recovery of at-risk species. In addition, the project's objectives are not internally consistent, and the field studies are not consistent with the laboratory studies. These factors also diminish the feasibility of the project.

Rating--fair

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The investigators have experience conducting CALFED-funded research, and the current project includes appropriate performance measures.

   Rating--very good

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   The proposed research will result in several peer-reviewed toxicological publications and technical reports as appropriate. The products may be of value for monitoring the metallic exposure status of different fish species in the Sacramento and San Joaquin Estuary. However, interpretive outcomes (i.e., predicting the impacts of ecologically representative, sublethal metal exposures at biological scales above the individual animal) are unlikely.

   Rating--good

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   The applicants are well qualified to implement the work as proposed.

   Rating--excellent

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   Rating--excellent

Miscellaneous comments:

Why have the investigators chosen to send the LA-ICP-MS samples to the Beijing Research Institute of Uranium Geology for elemental analyses? What assurances can they provide that this organization will process the samples in a timely fashion, and with the appropriate QA/QC measures?

External Scientific: #3

Research and Restoration External Scientific Review Form

Proposal Number: **191**

Applicant Organization: **University of California, Davis**

Proposal Title: **ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**This proposal is neither concise or clearly written. However, there are some very positive merits of the proposal that warrant funding consideration. These include lab experiments with metal and temperature stressors. I believe the field component of this study will lead to ambiguous results unless a more accurate technique (rearing fish pens by habitat type) can be used to scientifically separate where fish rear and accumulate biomass from.**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   The goals of this project are ambitious, yet clearly stated. The ability to test hypothesis 1 will be impossible to test if the Yolo Bypass doesn't flood during the next two years. Hypothesis 3 will be difficult to assess since splittail and longfin smelt range between all three habitats suggested as the mechanism for possible differences.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project

justified?

This study is clearly justified since contaminants can substantially affect resident fish species. However, I believe the conceptual model is severely limited in scope since there is no mechanism cited for the variability in contaminant exposure sources (within regions). Also, specific study tasks are not clearly linked between each other.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   The approach is sound but there are so potential flaws in the study design. The applicants wish to use otolith analysis to determine rearing locations. This will be very difficult to do within the estuary since splittail and longfin can range a good distance between areas over the period of a short weeks. How will the applicants know where a substantial amount of biomass is accumulated from different regions? I don't know if possible to accurately pinpoint daily increments on adult splittail or longfin to evaluate this task.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

   Certain task of the project are feasible, specifically the lab component studies. I don't know how feasible to accomplish all tasks since many them rely on field collections, which may not be so easy to acquire. Laser techniques with fish otoliths seem feasible for younger fish, but probably not for adults.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The applicants indicate no performance measures are available for lab methods yet, therefore they are not applicable.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   The applicants do not list any timeframes for expected products. Information from this study will be beneficial towards improving the state of knowledge in the estuary.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   The track record of the applicants is excellent. I think they are well qualified to do this study.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

The budget seems reasonable for the lab component and the work proposed.

Miscellaneous comments:

External Scientific: #4

Research and Restoration External Scientific Review Form

Proposal Number: **191**

Applicant Organization: **University of California, Davis**

Proposal Title: **ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT**

Conflict of Interest Statements:
I have no financial interest in this proposal.
XCorrect
-Incorrect

In the blank below please explain any connection to proposal, to applicant, co-applicant or subcontractor or to submitting institution (write "none" if no connection):

none

Review:

Please provide an overall evaluation summary rating:

Excellent: outstanding in all respects;
Good: quality but some deficiencies;
Poor: serious deficiencies.

Overall Evaluation Summary Rating	**Provide a brief explanation of your summary rating**
-Excellent	**The general approach of using elements in otoliths and (perhaps) fin rays as indicators of migration history and pollution exposure is well conceived and relatively widely applied (at least for migrations between marine and river systems). However, potential problems with the laser ablation ICP-MS analyses, and a lack of expertise, combined with an apparent ignorance of much of the latest literature in the field, makes me unable to fully endorse this proposal.**
XGood	
-Poor	

1. **Goals.** Are the goals, objectives and hypotheses clearly stated and internally consistent? Is the concept timely and important?

   This proposal seeks to examine the possibility of tracing fish migration pathways using chemical constituents in otoliths. This might be considered a quite routine concept, but the authors propose to correlate the migration information with toxicological exposure determined from chemical and histological analyses of other tissues. This will provide a second level of information that makes the proposal potentially more powerful. If the authors could accomplish their stated goals, I think that the work proposed here would make a significant contribution to fish ecology and toxicology.

2. **Justification.** Is the study justified relative to existing knowledge? Is a conceptual model clearly stated in the proposal and does it explain the underlying basis for the proposed work? Is the selection of research, pilot or demonstration project, or a full-scale implementation project justified?

   There is little doubt that the authors have provided an ambitious research plan. Some of the work that they propose should be relatively easy to accomplish. However, other aspects require a reasonable amount of faith. For instance, it should be relatively easy to trace movements of fish from freshwater to estuarine and marine systems based on Sr/Ca and/or Ba/Ca ratios. However, I have much less faith in their ability to get useful information out of elements that may be more indicative of pollution exposure (e.g. Ni, Cu). I will outline specific methodological difficulties below, but briefly it appears that these elements only make it into otoliths in extremely small quantities. Going to fin rays may indeed help as far as these elements are concerned, but unfortunately fin rays are metabolically active, and therefore it cannot be assumed that fin ray chemistry will accurately and permanently record chemical exposure. Some pilot data is provided from a single otolith of a splittail (Fig. 3a,b). However, the authors seem to make considerably more of this data than would seem to be justified. The Sr/Ca and Ba/Ca scans are at least consistent with their interpretations, but the suggestion that Hg and Pb in the otoliths is somehow related to changes in Sr and Ba seems pretty fanciful. At least some of the data suffer from instrumentation oversights (52Cr, 65Cu, for instance, have significant isobaric interferences). I felt that it would be a substantial risk to fully fund this work without a more careful demonstration that elements characteristic of pollution exposure can be quantified in otoliths. This has been examined in the literature before: Hansen and Zdanowicz (J. Fish Biol. 54: 656-668, 1999) looked at metals in body tissues and otoliths of Atlantic croaker collected from heavily polluted areas in the Gulf of Mexico. They concluded that although the tissues showed elevated levels of the metals of interest, this did not show up in otoliths. Overall, I was struck with the fact that it would be more efficient to perform the lab work first to determine if the approach was going to be at all useful before launching a full-scale field effort. Perhaps a smaller amount of funding over 2 years to complete the lab study might be appropriate.

3. **Approach.** Is the approach well designed and appropriate for meeting the objectives of the project? Are results likely to add to the base of knowledge? Is the project likely to generate novel information, methodology or approaches? Will the information ultimately be useful to decision-makers?

   I thought that the approach outlined here is generally well-designed and may be capable of meeting the objectives. If successful, the project should generate novel information, although methodologies and approaches are reasonably standard. The novelty will come from the combination of otolith chemistry and tissue chemistry from the same individuals. As stated earlier, this approach has been used before, but has not been pursued to the degree proposed here. Ultimately, the ability to determine habitat residency of individual fish through otolith chemistry or other means will be very useful for decision makers. They will be particularly powerful means of determining the effectiveness of mitigation efforts, and in a "characteristics of survivors" approach could be used to determine those areas that should be protected (i.e. produce significant numbers of recruits to adult populations). Unfortunately, this aspect isn't stressed in the current proposal. I am much less optimistic that the proposal will be able to come up with useful "health indices", which strikes me as being ill-defined jargon of limited use.

4. **Feasibility.** Is the approach fully documented and technically feasible? What is the likelihood of success? Is the scale of the project consistent with the objectives?

A major component of the study proposes to determine trace element concentrations in otoliths and fin rays. However, judging by the proposal, the authors are unaware of a number of potential difficulties with such an approach. For instance, the authors suggest that they will use at least "28 elements published in the literature as our target elements". More recent studies have suggested that, especially when using laser ablation, this list of elements is more reasonably kept at 5 to 6 (Campana and Thorrold, Can. J. Fish. Aquat. Sci. 58: 30-38, 2001). Similarly, the isotopes chosen for analysis do not indicate much familiarity with trace element analyses of carbonates. Due to isobaric interferences, most people do not use 44Ca, 52Cr, any of the Ni isotopes, or 65Cu, at least in low (r = 300 on the Element) resolution. Most of the elements that they are apparently going to analyze are below laser ablation detection limits even with an instrument as sensitive as the Element. Pre-concentration apparently works for at least some of these elements in solution-based mode (see Yoshinaga et al. J. Anal. Atom. Spectrom. 14: 1589-1592, 1999; Yoshinaga et al. Mar. Chem. 69: 91-97, 2000), but obviously this is impossible with laser ablation. Overall, I was not convinced that there was the necessary expertise within the PI group to adequately perform the ICP-MS analyses. This impression was reinforced by their interpretations of Figure 3.

5. **Project-Specific Performance Measures.** Does the project include appropriate performance measures to measure success relative to the project's goals and objectives? Is there enough detail as to how the performance measures will be quantified? For restoration projects, are monitoring plans explicit and detailed enough to determine if performance measures will be adequately assessed?

   The authors make little mention of the methods by which performance will be measured, beyond the obligatory anticipation of peer-reviewed papers from the work.

6. **Products.** Are products of value likely from the project? Specifically for restoration projects, are products of value also likely from the monitoring component? Are interpretative outcomes likely from the project?

   As stated above, I think that the general approach outlined here will, if successful, provide quite unique information on habitat use and potential population source and sinks of fish populations. However, I am less certain that the group of investigators have all the relevant expertise necessary to pull the study off.

7. **Capabilities.** What is the track record of applicants in terms of past projects? Is the project team qualified to efficiently and effectively implement the proposed project? Do they have available the infrastructure and other aspects of support necessary to accomplish the project?

   The applicants have had previous funding from CALFED (99-N07). Apparently 2 papers have been submitted for publication, although we are given no specifics. I am not sure how this publication record stands up to other CALFED grants, but this would be a quite low rate of productivity from other federal granting institutions such as NSF. The project team seems to be lacking experience in laser ablation ICP-MS analyses, at least based on publication records of the PIs. Infrastructure support seems to be adequate, although I am not sure why they would go to China to conduct the ICP-MS analyses when similar instruments are available at UC Santa Cruz and UC Santa Barbara, amongst other locations I am sure.

8. **Cost/Benefit Comments.** Is the budget reasonable and adequate for the work proposed?

   The budget certainly appeared adequate, and presumably could be economized somewhat if an award was to be made. I think it would be easier to assess the cost/benefit of the proposed research if we were given more pilot information on the likelihood of successful implementation

of the approach. Better yet might be if the lab study was funded first to perform a proof of concept.

Miscellaneous comments:

I suggest that that the lab study of this work could be initially funded as a proof of concept. Only if the lab study looked promising would I commit funds to a larger field effort by the PIs.

Prior Performance/Next Phase Funding: #1

New Proposal Number: 191

New Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

1. Prior CALFED project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   ERP 99-N07 ? Chronic Toxicity of Environmental Contaminants in Sacramento Splittail- A Biomarker Approach

2. Prior CVPIA project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   N/A

3. Have negotiations about contracts or contact amendments with this applicant proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

   -Yes **X**No -N/A

   If no, please explain any difficulties:

   The Office of Vice Chancellor for Research at UC Davis has requested numerous and repeated requests for revisions of the standard contract terms. Only a few of these issues were raised in the PSP process. Reconciling these issues has required extensive staff time for CALFED and other State agencies. This repeated negotiation has resulted in a delay of contract execution for up to 2 years.

4. Are the status, progress, and accomplishments of the applicant's current CALFED or CVPIA project(s) accurately stated?

   XYes -No -N/A

   If no, please explain any inaccuracies:

5. Is the applicant's progress towards these project(s)' milestones and outcomes to date satisfactory?

   XYes -No -N/A

   If no, please explain deficiencies:

6. Is the applicant's reporting, records keeping, and financial management of these projects satisfactory?

   XYes -No -N/A

If no, please explain deficiencies:

UC Davis has had consistent difficulty communicating internally and externally regarding its fiscal documentation. Reconciling financial issues with UC Davis has proved very problematic. The financial situations raised by UC Davis have proved to be the most difficult within the NFWF managed CALFED contracts.

7. Will the project(s) be ready for next phase funding in 2002, based on its current progress and expenditure rates?

XYes **-**No **-**N/A

If no, please explain:

Other Comments:

The difficulties expressed above are limited to UC Davis campus only.

The Principal Investigators and other project researches have been very professional and effective in meeting the goals of the project.

Prior Performance/Next Phase Funding: #2

New Proposal Number: 191

New Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

1. Prior CALFED project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

   97-C06 Role of Contaminants in the Decline of Delta Smelt in the Sacramento-San Joaquin Estuary

2. Prior CVPIA project numbers, titles, and programs: (*list only projects for which you are the contract manager*)

3. Have negotiations about contracts or contact amendments with this applicant proceeded smoothly, without persistent difficulties related to standard contract terms and conditions?

   XYes -No -N/A

   If no, please explain any difficulties:

4. Are the status, progress, and accomplishments of the applicant's current CALFED or CVPIA project(s) accurately stated?

   XYes -No -N/A

   If no, please explain any inaccuracies:

5. Is the applicant's progress towards these project(s)' milestones and outcomes to date satisfactory?

   XYes -No -N/A

   If no, please explain deficiencies:

6. Is the applicant's reporting, records keeping, and financial management of these projects satisfactory?

   XYes -No -N/A

   If no, please explain deficiencies:

7. Will the project(s) be ready for next phase funding in 2002, based on its current progress and expenditure rates?

   -Yes -No **X**N/A

If no, please explain:

Other Comments:

Final report has been delayed. Recipient provided explanation and is justified. Coordination could be improved but not considered significant.

Environmental Compliance:

Proposal Number: 191

Applicant Organization: University of California, Davis

Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

1. Are the legal or regulatory issues that affect the proposal identified adequately in the proposal?

   XYes **-**No

   If no, please explain:

   Scientific Collecting Permit and Federal Take Permits have been obtained.

2. Does the project's timeline and budget reflect adequate planning to address legal and regulatory issues that affect the proposal?

   XYes **-**No

   If no, please explain:

   Permits have been obtained so no budget or timeline is necessary.

3. Do the legal and regulatory issues that affect the proposal significantly impair the project's feasibility?

   -Yes **X**No

   If yes, please explain:

Other Comments:

Budget:

Proposal Number: 191

Applicant Organization: University of California, Davis

Proposal Title: ASSESSING HEALTH INDICES AND MIGRATORY PATTTERNS OF FISH TO SUPPORT RESTORATION EFFORT

1. Does the proposal include a detailed budget for each year of requested support?

   XYes -No

   If no, please explain:

2. Does the proposal include a detailed budget for each task identified?

   XYes -No

   If no, please explain:

3. Does the proposal clearly state the type of expenses encompassed in indirect rates or overhead costs?

   XYes -No

   If no, please explain:

4. Are appropriate project management costs clearly identified?

   XYes -No

   If no, please explain:

5. Do the total funds requested (Form I, Question 17A) equal the combined total annual costs in the budget summary?

   XYes -No

   If no, please explain (for example, are costs to be reimbursed by cost share funds included in the budget summary).

   State funds (rounded off).

6. Does the budget justification adequately explain major expenses?

   XYes -No

If no, please explain:

7. Are there other budget issues that warrant consideration?

   -Yes **X**No

   If yes, please explain:

Other Comments: