

Agenda Item: 6c
Meeting Date: October 12, 2006

**CONSIDERATION OF A RESOLUTION RECOMMENDING THAT
THE DEPARTMENT OF FISH AND GAME PROCEED WITH AWARDING
A CALFED ECOSYSTEM RESTORATION PROGRAM GRANT TO THE
UNIVERSITY OF CALIFORNIA AT DAVIS FOR THE PROJECT:
MONITORING RESPONSES OF THE DELTA SMELT
POPULATION TO MULTIPLE RESTORATION ACTIONS IN
THE SAN FRANCISCO ESTUARY**

Summary: This resolution recommends to the Department of Fish and Game that it proceed with an Ecosystem Restoration Program agreement to support the revised project Monitoring Responses Of The Delta Smelt Population To Multiple Restoration Actions In The San Francisco Estuary, described in Attachment 1 of Resolution 06-10-04. The agreement total is up to \$1,499,181.

Recommended Action: The California-Bay Delta Authority adopt the attached Resolution 06-10-04.

Background

Monitoring Responses Of The Delta Smelt Population To Multiple Restoration Actions In The San Francisco Estuary, submitted in response to the CALFED Bay-Delta Program Ecosystem Restoration Program (ERP) 2004 Monitoring and Evaluation Solicitation received a recommendation of "Reconsider if Revised." The 2004 Monitoring and Evaluation project proposals address ERP's intent to understand the effects of resource management, restoration, species recovery and other activities in the Bay-Delta. "Reconsider if Revised" is the status given to those proposals that are high priorities, and are being considered for funding if they are revised to address comments identified in reviews by the grant selection panel.

In revising this proposal, the proponent and the POD Management Team worked closely with ERP staff to address the review comments and received further review by the ERP implementing agencies, who are engaged in the ongoing process of reconsidering revised CALFED ERP proposals. These proposed projects must meet the priorities referenced in the 2004 Monitoring and Evaluation Proposal and Submittal Package; CALFED planning documents, including the CALFED Record of Decision, Draft Stage 1 Implementation Plan, or current Multi-Year Program Plan. This project was originally considered in Resolution 05-08-04. The original recommended amount for this proposal was up to \$1,482,480. The current proposal is requesting up to \$1,499,181, an increase of \$16,701.

Delta smelt adults are monitored by the fall mid-water trawl survey from October to December. Delta smelt are primarily an annual species with a small number of individuals living and potentially spawning at two years of age. Adult delta smelt spawn in freshwater in spring when water temperatures fall within about 15-20°C. Adult fish are monitored for reproductive state and spawning distribution by the spring Kodiak trawl survey. In dry years delta smelt spawn primarily in the North Delta region, while in wet years spawning is more evenly distributed among regions, including the Napa River. Restoration actions may improve spawning success in different regions by creating shallow-water habitat or by improving water quality. However, if restored habitats are dominated by exotic fishes such as inland silversides, improvements in spawning could be offset by increased predation on delta smelt larvae.

Delta smelt hatch out as yolk-sac larvae and begin to feed at about 5 mm total length. At about 15-20mm delta smelt are considered post-larvae. This life-stage is monitored by the 20mm survey from April to June. The smelt then tend to move seaward so that they are in the Low-Salinity Zone by July.

Pesticides are known to occur in the regions occupied by larval and post-larval delta smelt. Pesticides that enter the habitat with freshwater run-off from agricultural fields in late winter may impair egg or sperm development in some regions.

Feeding success and exposure to toxic pesticides may be especially important, either directly causing mortality or, more likely, by impairing growth and reducing survival. Rapid growth during early life history is an essential feature of recruitment success in fishes because losses to predation tend to be highest on the smallest fish. Feeding success at first feeding and later may be particularly poor for delta smelt because the composition of their zooplankton prey has been changed dramatically by the introduction of several exotic species over the last 2-3 decades. Biomass of calanoid copepods, which are the principal prey of delta smelt, has been lower in preferred feeding areas since 1987. Total copepod biomass has been supplemented since 1993 by the introduced cyclopoid copepod *Limnoithona tetraspina*, but this copepod is apparently too small to be readily consumed by delta smelt.

The juvenile stage is monitored primarily by the summer tow-net survey from June to August, and the September fall mid-water trawl survey. A recruitment bottleneck may occur in late summer as juveniles transition into the adult stage. Models indicate that survival during this transition may be density dependent in some years. Approximately 60 percent of juveniles have growth impairments due to poor feeding success at this life-stage. Food abundance, competition, and habitat volume are commonly associated with density-dependent survival and a similar relationship exists for juvenile striped bass, but the factors contributing to this pattern of density dependence or to poor-feeding success in late summer are currently unknown.

A variety of ecosystem restoration actions have been implemented to “improve and increase aquatic habitat and ecological functions” (CALFED 2000) in the hope of restoring the delta smelt population. However, a coherent plan to investigate the

relative importance of various mechanisms influencing the population or the effectiveness of the restoration initiatives does not exist. Local monitoring for fish occurs at a few of the restoration sites, but there is no way to track the extent to which delta smelt use restored sites and whether restoration benefits those individuals or the population. Similarly, extensive monitoring of most life stages of delta smelt by the Interagency Ecological Program (IEP), which produces the official measures of delta smelt abundance, can detect trends in the population in space and time, but cannot reveal causes of spatial or temporal variability in delta smelt. Both types of monitoring are vital components for assessing the potential benefits of restoration actions; however, both must be explicitly linked with quantitative measures of the mechanisms by which changes in habitat influence the population

Attachment 1 of Resolution 06-10-04 describes the *Monitoring Responses Of The Delta Smelt Population To Multiple Restoration Actions In The San Francisco Estuary* project and how it helps achieve ERP goals. The revised proposal is available at:
http://www.delta.dfg.ca.gov/erp/docs/2006grants/2004revised_SmeltMonitoringRevised.pdf

The Water Security, Clean Drinking Water, Coastal and Beach Protection Act of 2002, Water Code Division 26.5, annotated (Proposition 50) specifies that the ERP implementing agencies may disburse funds through grants (79505.6 Water Code Division 26.5). This ERP 2004 Monitoring and Evaluation proposal is being recommended for funding based on the following selection criteria:

- The proposal is for an eligible project within the meaning of Proposition 50 because it implements the CALFED Bay-Delta Program's ecosystem restoration program.
- The proposal meets the goals and objectives of the CALFED Program.
- The proposal meets the priorities referenced in the 2004 Monitoring and Evaluation Proposal and Submittal Package.

Fiscal Information

Funding Source: Proposition 50 CALFED Ecosystem Restoration Program Funds

Term: Two years from executing the agreement

Total Amount: \$1,499,181

List of Attachments

Resolution 06-10-04

Contact

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**CALIFORNIA BAY-DELTA AUTHORITY
RESOLUTION 06-10-04**

**RECOMMENDING THAT THE DEPARTMENT OF FISH AND GAME PROCEED
WITH AWARDING A CALFED ECOSYSTEM RESTORATION PROGRAM GRANT
TO THE UNIVERSITY OF CALIFORNIA AT DAVIS FOR THE
PROJECT MONITORING RESPONSES OF THE DELTA SMELT POPULATION
TO MULTIPLE RESTORATION ACTIONS IN THE SAN FRANCISCO ESTUARY**

WHEREAS, the Ecosystem Restoration Program presents a comprehensive vision for improving and increasing aquatic and terrestrial habitats and improving ecological functions in the Bay-Delta ecosystem; and

WHEREAS, those State and Federal agencies with CALFED Program restoration funds have coordinated their efforts to solicit for, and select, the best projects to implement the Ecosystem Restoration Program, with assistance of the staff from the California Bay-Delta Authority; and

WHEREAS, the Department of Fish and Game has received an appropriation of Proposition 50 Bay-Delta Ecosystem Restoration Account funds in its Fiscal Year 2004-05 Budget which has been reappropriated in Fiscal Year 2005-06; and

WHEREAS, the Department of Fish and Game may distribute funds through grants; and

WHEREAS, a primary goal of the CALFED Ecosystem Restoration Program (ERP) is to recover at-risk native species; and

WHEREAS, delta smelt (*Hypomesus transpacificus*), is an at-risk native species and currently listed as threatened under the Federal and State Endangered Species Acts; and

WHEREAS, this project seeks to understand and measure the relative importance of various mechanisms influencing the delta smelt population; and

WHEREAS, the proposal listed in Attachment 1 constitutes an eligible project for purposes of receiving Proposition 50, Bay-Delta Ecosystem Restoration Account funds; and

WHEREAS, the proposal listed in Attachment 1 currently meets the objectives of the CALFED Program; and

WHEREAS, approval of this proposal shall be conditioned upon the recipient complying with all applicable laws and regulations; and

NOW, THEREFORE, BE IT RESOLVED that the California Bay-Delta Authority recommends that the Department of Fish and Game fund the project, Monitoring Responses of The Delta Smelt Population To Multiple Restoration Actions In The San Francisco Estuary, through a CALFED Ecosystem Restoration Program agreement in the amount of up to \$1,499,181.

CERTIFICATION

The undersigned Assistant to the California Bay-Delta Authority does hereby certify that the foregoing is a full, true, and correct copy of a resolution duly and regularly adopted at a meeting of the Authority held on October 12, 2006.

Dated: _____

Julie E. Alvis
Assistant to the California Bay-Delta Authority

Ecosystem Restoration Project Description

Proposal Number: ERP-04-S14

Applicant Organization: University of California at Davis

Proposal Title: Monitoring Responses of The Delta Smelt Population To Multiple Restoration Actions In The San Francisco Estuary

Recommended funding: \$1,499,181

Description: The primary goals are to understand the interaction of key vital parameters for delta smelt, evaluate the performance of delta smelt at a variety of scales, and coordinate data collection and results with the IEP and other monitoring programs, thereby facilitating the work of the interagency Data Assessment Team (DAT) in refining the Delta Smelt Risk Assessment Matrix (DSRAM).

A key objective of the project is to collaborate with the system-wide monitoring by the IEP and with local monitoring efforts at restoration sites to collect and archive delta smelt for analysis. Another objective is to apply the same methods to fish collected during water export operations at the South Delta facilities. The proposed monitoring is conceived as Phase 1 of a multi-phase project, with the intention of further refining methodologies, increasing the numbers of samples, and encouraging involvement by all relevant restoration projects as they are implemented. The partnerships initiated with this project will also provide a highly interdisciplinary approach that may serve as a backbone onto which additional projects funded from diverse sources may be linked.

The project will make concurrent, linked measurements of the following population variables to help understand how environment, restoration, and management activities affect the fish:

1. Growth efficiency and body condition
2. Impairments from exposure to toxic chemicals
3. Survival to the adult stage
4. Spawning success
5. Food composition and abundance

The following activities will be conducted:

Coordinate with the current and proposed pelagic organism decline (POD) studies, and contribute where appropriate to a variety of POD and CALFED Science research efforts.

Field specimens will be collected in cooperation with the ongoing IEP monitoring surveys, federal and state fish salvage monitoring, and from efforts at restoration sites as they get underway. In particular, fish caught during three surveys, targeting different life stages, will be used extensively:

- Spring Kodiak Trawl spawning survey (SKT)
- Summer juvenile Tow-Net Survey (TNS)
- Fall Mid-water Trawl survey (MWT)

Delta smelt growth will be evaluated by measuring incremental change in larval and juvenile otoliths. The chemical composition of otoliths will be measured at the core of the otolith to provide data on the micro-chemical signature of the natal habitat. Transects across the otolith will also be analyzed to provide information on smelt habitat use at the regional scale. Trace elemental composition and isotopic ratios within the otoliths will be measured using Laser Ablation techniques. Water samples from the aquatic habitats of captured fish will also be taken at about the time of fish sampling. The trace elemental and isotopic ratios of waters will be compared to those measured in the fish otoliths, and potential relationships will be quantified. Existing conceptual models of smelt abundance and distribution will be updated with the data and analysis results.

Semi-quantitative and qualitative histopathological diagnostic techniques will be performed on about 500 whole larval smelt specimens each year of the contract. Histopathology data will be used to distinguish potential impacts associated with poor feeding success from those due to exposure to toxic chemicals.

Bioassays will be performed on captive-bred delta smelt to evaluate long-term influences of sub-lethal stressors. The responses of fish organs and tissues to poor feeding or exposure to toxic chemicals over time will be quantitatively measured and qualitatively characterized. Results from laboratory bioassays will be compared with the histopathology diagnosis of field-caught specimens. Thresholds of smelt survival with respect to toxins, poor-feeding, and toxins combined with poor feeding, time and location, in both laboratory and field settings will be investigated.

Recent feeding by field-caught delta smelt will be quantified by gut content analysis. Food availability for field-caught smelt will be quantified using plankton samples taken concurrently with the sampling for delta smelt. Plankton counting and analyses will be done in collaboration with the IEP/POD. Arrangements will be made to take plankton samples in conjunction with the other surveys from which gut contents will be analyzed. All of these data will be placed in context using data from the long-term IEP zooplankton monitoring program (1972 – present), and the results of the concurrent CALFED foodweb project. An analysis describing the feeding characteristics of field-caught delta smelt and food availability will be performed.

A final list of manuscripts, derived from the project, will be prepared for submission to peer reviewed journals.