Call for Study Concepts

to be considered for further development and funding as part of the
2013 IEP Workplan

I. Synopsis

The Interagency Ecological Program for the San Francisco Estuary (IEP) is soliciting study concepts to advance the understanding of environmental drivers and ecological processes that control the population dynamics and resilience of fishes in the San Francisco Estuary. Fish species of particular interest include the native delta smelt (*Hypomesus transpacificus*), longfin smelt (*Spirinchus thaleichthys*), Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*), and the introduced striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), threadfin shad (*Dorosoma petenense*), and Mississippi silverside (*Menidia beryllina*). Environmental drivers and ecological processes of particular interest include contaminants, hydrology, turbidity, temperature, salinity, nutrient cycling, predation, interactions among native and introduced species, and spatial dynamics of food resources. Study concepts aimed at improving monitoring, assessment, and environmental management in the estuary are especially welcome. **The deadline for submission of study concepts is Sunday, July 1, 2012.**

II. Overview

From 2002 to 2010, abundance indices of four pelagic fish species (delta smelt, longfin smelt, age-0 striped bass, and threadfin shad) in the San Francisco estuary were at or near record low levels. This pelagic fish collapse has become known as the Pelagic Organism Decline (POD). Abundance indices of three of the four POD fish species (delta smelt, longfin smelt, age-0 striped bass) improved in 2011 while abundance of the fourth POD fish species (threadfin shad) remained low.

Central Valley salmon and steelhead populations have also experienced severe declines. The Sacramento River Winter-run Chinook salmon population (SRWC) was the first Central Valley salmonid to be listed under the Endangered Species Act in 1989. SRWC numbers increased in the early 2000s, but collapsed again in 2007. The more abundant Sacramento River fall-run Chinook salmon population (SRFC) also suddenly collapsed in 2007, resulting in a Federal disaster declaration for parts of the west coast salmon fishery from 2008-2010. SRFC abundance increased in 2010, but SRWC numbers remain very low. The role of the estuary in Chinook salmon and steelhead population dynamics and viability remains unclear.

Since 2005, the IEP has conducted coordinated studies about the role of habitat characteristics, sources of mortality, stock-recruitment effects, and food resources in the POD. Results of the IEP POD investigations have been described in several synthesis reports and numerous publications. While much has been learned, uncertainties remain, especially about the role of contaminants in the POD and about the effectiveness of management actions aimed at reversing the POD and the declines of salmonid populations.

The recent improvements in POD fish abundance indices and SRFC returns offer opportunities to improve our conceptual and quantitative models about the environmental drivers and ecological processes that control the population dynamics and resilience of fishes in the San Francisco Estuary. They may also offer an opportunity to evaluate the

effectiveness of management approaches and actions aimed at conservation of native fishes and fish habitat in the estuary. This includes approaches described in the final staff draft of the Delta Stewardship Council's Delta Plan, actions currently under consideration as part of the evolving Bay-Delta Conservation Plan (BDCP) and actions contained in the 2008 U.S. Fish and Wildlife Service (FWS) and the 2009 National Marine Fisheries Service (NMFS) Biological Opinions on the long-term operations of the Central Valley Project and State Water Project. Finally, studies are needed that help inform the design of an ecologically relevant regional monitoring program (RMP) for contaminants in the Delta.

We are seeking focused study concepts about how contaminants, hydrology, turbidity, temperature, salinity, nutrient cycling, predation, interactions among native and introduced species, and spatial dynamics of food resources affect the population dynamics and resilience of native delta smelt, longfin smelt, Chinook salmon, steelhead, striped bass, largemouth bass, threadfin shad, and Mississippi silverside in the San Francisco Estuary. The goal is to improve monitoring and link the effects of environmental drivers and ecological processes to conservation and management actions contained in the Delta Plan, BDCP, and the NMFS and FWS Biological Opinions Examples include field, laboratory, and modeling investigations and assessments of current and alternative monitoring methods and sampling designs, innovative monitoring and data management technologies, and evaluations of the effectiveness and interactive effects (*e.g.* synergies, trade-offs) of conservation and water management actions for delta smelt, longfin smelt, and salmonids.

III. Participation and Funding

Any public agency, university, nonprofit organization, or private party capable of entering into a contract or grant agreement with the State or federal government may submit a study concept. The anticipated amount of total available funding is approximately $2,000,000. The anticipated funding length is one year with a possibility (but no guarantee) of no-cost extensions and funding supplementation or renewals.

IV. Submittal Requirements

The deadline for submission of study concepts is Sunday, July 1, 2012. Complete the study concept form and email it to ksouza@dfg.ca.gov by midnight, July 1, 2012. Please attach a statement of your qualifications or Curriculum Vitae, but do not append any additional material to the form. You may briefly provide additional information in a cover letter written within the body of your email.

V. Study Concept Review and Selection

Study concepts will undergo internal IEP merit review by the IEP Management Team, Management, Analysis and Synthesis Team (MAST) and IEP Coordinators. They will be evaluated and selected based on compliance with the submittal requirements, overall intellectual merit (includes likelihood of advancing knowledge, scientific soundness, originality, creativity, clarity, and logical organization), feasibility, likelihood of success, responsiveness to the priority research topics outlined below, and the qualifications and past performance of the applicants. Selected study concepts may be subject to additional independent scientific peer review as part of annual reviews of Biological Opinions conducted by independent review panels convened by the Delta Science Program.

VI. Selection Notification and Next Steps

Notifications about selection results will be sent to all study concept authors by August 5, 2012, and full proposals may be requested at this time. Full proposals will be needed

approximately 3 weeks after notification of selection and they will be reviewed by the IEP Management Team, MAST members and IEP Coordinators. Relevant full proposals may be subject to additional independent scientific peer review as part of the Biological Opinion annual reviews. Final notification about funding will be given after approval of the 2013 IEP Work Plan by the IEP Agency Directors that is expected to occur on September 19, 2012.

VII. Priority Research Topics

The study concept priority topics were developed by the MAST in consultation with other scientists, agency managers, IEP Project Work Teams, stakeholders and the Federal Science Task Force. They are derived from the conceptual models guiding the IEP POD investigations and the 2011 fall low salinity habitat studies (summarized in USBR 2011) and are aimed at addressing uncertainties about ecological processes and management outcomes. Synthetic studies that integrate across topic areas and questions are also welcome.

Topic 1: Fish population dynamics, health, and distribution.

Background:

The IEP has long monitored fish abundance and distribution in the San Francisco estuary, but uncertainties remain about reproduction, growth, survival, and health of many fish species of interest in the estuary as well as about their distribution in less intensely monitored regions of the estuary such as shallow water areas and the Cache Slough complex in the north Delta. Fish species of particular interest include the native delta smelt (*Hypomesus transpacificus*), longfin smelt (*Spirinchus thaleichthys*), Chinook salmon (*Oncorhynchus tshawytscha*) and steelhead (*Oncorhynchus mykiss*), and the introduced striped bass (*Morone saxatilis*), largemouth bass (*Micropterus salmoides*), threadfin shad (*Dorosoma petenense*), and Mississippi silverside (*Menidia beryllina*).

Specific questions to address:

A. How can existing or new monitoring, modeling, or other methods be applied to better characterize fish population dynamics, health, and distribution in the estuary?

B. How does survival of salmonids vary between the north and south Delta and under different hydrological conditions?

C. How do salmonids use the Cache Slough complex?

D. What is the status and distribution of wild steelhead populations in the estuary?

Topic 2: Physical and chemical habitat effects on fish populations.

Background:

The physical and chemical habitat quantity and quality experienced by native and non-native fishes, their predators, and their food resources is characterized by interacting dynamic and stationary (geographically fixed) abiotic habitat components. The focus here is on gaining a better understanding of how interactions of stationary abiotic habitat components such as bathymetry, sediment supply, and contaminant sources with dynamic abiotic habitat components such as flows, salinity, turbidity, temperature, and contaminant concentrations affect life stages of fish species of interest (see Topic 1) in different seasons and regions of the estuary.

Specific questions to address:

A. How can existing or new monitoring, modeling, or other methods be applied to better define, monitor, and assess fish habitat in the estuary?

B. What, if any, is the relationship between turbidity and/or other dynamic habitat components such as flow, temperature, and salinity and native fish migration, survival, growth, and/or reproduction in the estuary?

C. What is the frequency of occurrence and distribution of acute and chronic toxicity of ambient water to fishes and their food items in the estuary, and how is it affected by the interaction of stationary and dynamic habitat components?

D. What are the distribution, transport, fate, concentration, and effects of contaminants including pesticides, ammonia, and metals that may have lethal or sublethal effects on fishes and their food items in the estuarine low-salinity zone, and how are these affected by the interaction of stationary and dynamic habitat components?

E. How do interacting dynamic and stationary habitat components affect seasonal nutrient patterns in the estuary?

F. How do interacting dynamic and stationary habitat components affect survival of outmigrating salmonids in the north and south Delta?

G. What, if any, is the relationship between habitat quantity and quality and the continued low abundance of threadfin shad in the south and central Delta?

Topic 3: Food web effects on fish populations (bottom-up effects).

Background:

This research topic is intended to provide new insights into the effects of interacting dynamic and stationary (geographically fixed) habitat components on food web dynamics affecting native and introduced fishes in different regions of the estuary.

Specific questions to address:

A. To what extent are native fishes limited by food supply, and how does this vary with season and/or hydrology?

B. Do shoals offer better food resources to young striped bass than deep channels? Could this explain the apparent distributional shift of young striped bass from channel to shoal habitat?

C. How do interacting dynamic and stationary habitat components affect seasonal zooplankton abundance and distribution and their nutritional value for fishes in the estuary? What does this mean for spatial and temporal variation in access to food for native fishes?

D. How do interacting dynamic and stationary habitat components affect the seasonal distribution and abundance of bivalves in the estuary? How does this affect clam grazing rates?

E. How do interacting dynamic and stationary habitat components affect the seasonal distribution and abundance of amphipods in the estuary? How does this affect the food supply for native fishes?

F. How do interacting dynamic and stationary habitat components affect the occurrence, distribution, and intensity of harmful algal blooms and their effects on fishes?

Topic 4: Effects of piscivores or water diversions on fish populations (top-down effects).

Background:

This research topic is intended to provide insights into the effects of interacting dynamic and stationary (geographically fixed) habitat components on predation and water diversion effects on populations of fish species of interest (see Topic 1) in different regions of the estuary.

Specific questions to address:

A. How do interacting dynamic and stationary habitat components affect predation rates on delta smelt, longfin smelt, and/or native salmonids?

B. How do interacting dynamic and stationary habitat components affect impacts of existing water diversions on delta smelt, longfin smelt, and/or native salmonids? How would this change with new diversion points on the Sacramento River, as proposed by the BDCP?

Key References (with electronic hyperlinks)

Baxter, R., Breuer, R., Brown, L., Conrad, L., Feyrer, F., Fong, S, Gehrts, K., Grimaldo, L.., Herbold, B., Hrodey, P., Mueller-Solger, A., Sommer, T., and K. Souza. 2010. 2010 Pelagic Organism Decline Work Plan and Synthesis of Results. Available at http://www.water.ca.gov/iep/docs/FinalPOD2010Workplan12610.pdf .

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US Bureau of Reclamation. 2011. Adaptive Management of Fall Outflow for Delta Smelt Protection and Water Supply Reliability. Available at http://www.fws.gov/sfbaydelta/documents/Adaptive%20Management%20of%20Fall%20Outflow%20for%20Delta%20Smelt%20Protection%20and%20Water%20Supply%20Reliability.pdf .

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