State of California
The Resources Agency

DEPARTMENT OF FISH AND GAME

REPORT TO THE FISH AND GAME COMMISSION

A STATUS REVIEW OF THE THREATENED DELTA SMELT (*Hypomesus transpacificus*) IN CALIFORNIA

Approved by
Donald Koch, Director
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California Department of Fish and Game

June 2008

Report to the Fish and Game Commission:
A Status Review of the Threatened Delta Smelt (*Hypomesus transpacificus*) in California

EXECUTIVE SUMMARY

Background

Pursuant to the California Endangered Species Act (CESA) (Fish and Game Code §§ 2050 et seq.), this report reviews the best scientific evidence available regarding the threatened delta smelt (*Hypomesus transpacificus*) and makes recommendations to the California Fish and Game Commission (Commission) regarding its management and recovery, including a recommendation that a petition to change the species' status under CESA from threatened to endangered be granted.

On February 7, 2007, the Commission received a petition from The Bay Institute, Center for Biological Diversity, and Natural Resources Defense Council requesting an emergency action to uplist delta smelt from threatened to endangered. The Commission denied the request for an emergency rulemaking and instead proceeded under a standard rulemaking.

On June 7, 2007, the Commission determined that the petition contained sufficient information to indicate that the petitioned action may be warranted and published a notice of acceptance of the petition for consideration. CESA requires that within twelve months from the publication of such notice, the Department of Fish and Game (Department) must provide a review of the status of the species concerned in the petition. This report contains the results of the Department's review.

Findings

The delta smelt is a small fish endemic to the Sacramento-San Joaquin Estuary. Delta smelt are euryhaline and much of the year are typically most abundant in or immediately upstream from the low-salinity zone, where incoming saltwater and outflowing freshwater mix. This species feeds exclusively on zooplankton, spawns in freshwater, and usually only lives for one year. Survey data indicates that the population of delta smelt has declined substantially since the 1970s.

The Department finds that the delta smelt should be uplisted as an endangered species based on Section 670.1(i) of Title 14 of the California Code of Regulations and Section 2074.6 of the Fish and Game Code. The Department's finding is based on the following:

1. While the complete relationship between delta smelt abundance and water diversions is not clear, all life stages of delta smelt are vulnerable to entrainment in these diversions and there are negative statistical relationships between various measures of delta smelt abundance and aspects of water project operations. Whether or not diversions are directly responsible for the delta smelt population decline, their direct and indirect impacts on the population may have adverse population-level effects.

2. Delta smelt are threatened by habitat modifications including but not limited to changes in the character and position of the salinity gradient, increasing water clarity, and increasing non-native aquatic vegetation. An increase in salinity in Suisun Bay caused by increased water diversions, upstream storage, and the extended drought has constricted the delta smelt to only a portion of its former range. Other habitat alterations include changes in food items and expansion of many exotic species.

3. The decline in abundance of some zooplankton, including *Eurytemora affinis* and *Neomysis mercedis,* is a threat to the persistence and recovery of delta smelt.

4. A number of exotic fish and invertebrate species have been introduced into the Sacramento-San Joaquin Estuary. Although none of these species has been directly linked to the decline in delta smelt abundance, their presence has led to distinct changes in the Estuary's biota and through competition and predation may inhibit delta smelt recovery.

5. Low numbers of spawning delta smelt may result in reproductive (year-class) failure. The relatively low fecundity of this species and its planktonic larvae suggest that year-class success of the delta smelt depends on reproduction by large numbers of fish.

6. Although there is not direct evidence of delta smelt suffering mortality or stress from contaminants, some water samples from the Delta were toxic to standard aquatic organisms in laboratory trials, and if there is similar toxicity it may have adverse effects on the delta smelt population.

7. There is little evidence concerning the role of disease and parasites in the decline of delta smelt. Should the importance of either or both be demonstrated, they could prevent the recovery of delta smelt from current low population levels.

8. Competition and predation cannot be ruled out as threats to delta smelt.

Recommendations

Petition Action

1. The Commission should find that changing the classification of delta smelt to endangered is warranted.

2. The Commission should publish notice of its intent to amend Title 14 CCR 670.5 to change the classification of delta smelt to endangered.

Management/Recovery Measures

The Department's objective is the protection of a sufficient number of delta smelt to insure their long-term survival and recovery in their native habitat and range.

Because there is not yet a quantitative basis for estimating the benefits of any given action(s), assuring delta smelt persistence and recovery during the foreseeable future will continue to involve implementing management measures and evaluating their success empirically.

The Department believes the following actions would have population-level benefits for delta smelt:

- Reduce entrainment and loss of adult, juvenile, and larval delta smelt at the SWP and CVP diversions from the south Delta.

- Reduce entrainment and loss of adult, juvenile, and larval delta smelt at agricultural diversions in the Delta.

- Reduce entrainment and loss of adult, juvenile, and larval delta smelt at the Mirant power plants in Antioch and Pittsburg.

- Modify operations of the SWP and CVP to improve and/or expand pelagic habitat for delta smelt.

- Reduce pollution of the San Francisco Estuary by chemicals harmful to delta smelt and their food web.

- Re-evaluate and revise the extant delta smelt recovery goals and reclassification criteria.

- Make reliable estimates of delta smelt losses at SWP and CVP diversions from the south Delta.

- Rear populations of delta smelt in captivity for possible release into the wild as part of recovery or experimental efforts.

- Make reliable estimates of delta smelt absolute abundance.

Public Response

Comments in response to the current petition were invited and received (Appendix A).

Report to the Fish and Game Commission:
A Status Review of the
Delta Smelt (*Hypomesus transpacificus*)
in California

INTRODUCTION

Petition History

On February 7, 2007, the Fish and Game Commission (Commission) received a petition from The Bay Institute Center for Biological Diversity and Natural Resources Defense Council to use emergency rulemaking to list delta smelt as an endangered species under the California Endangered Species Act (CESA). On February 16, 2007, the Commission referred the petition to the Department of Fish and Game (Department) for evaluation.

On March 30, 2007, the Department responded to the Commission's referral with a letter indicating that the while the petitioned rationale for emergency rulemaking was insufficient, the petition was complete and a report on the Department's evaluation of the petition was being prepared.

On April 12, 2007, the Commission denied the request for an emergency action but continued under a standard rulemaking procedure. On June 7, 2007, the Commission accepted the petition for consideration and noticed their action in the June 22, 2007 California Regulatory Notice Register. (Fish & G. Code § 2074.2.) CESA requires that within twelve months of the publication of the notice of a petition's acceptance for consideration the Department shall provide a written report regarding the status of the species. (Fish & G. Code § 2074.6.)

Department Review

This report contains the results of the Department's review and the Department's recommendation to the Commission, based on the best scientific information available, whether the petition is warranted. It also identifies habitat that may be essential to the continue existence of the species and suggests prudent management activities and other recovery actions.

The Department has contacted affected and interested parties, invited comment on the petition, and requested any additional scientific information that may be available, as required under Section 2074.4, Fish & G. Code (Appendix A).

LIFE HISTORY

Description

The delta smelt, *Hypomesus transpacificus*, is a small euryhaline fish which reaches adult sizes of about 55-70 mm standard length (Moyle 2002) although some have reached lengths near 130 mm. It is translucent with a silvery, steel-blue streak along its sides. Other related smelt species found in the Sacramento-San Joaquin Estuary include longfin smelt, *Spirinchus thaleichthys*, and the wakasagi, *Hypomesus nipponensis* (Moyle 2002).

Delta smelt can be distinguished from other smelt by: 1) a small flexible maxilla (upper jaw bone) that does not extend past the middle of the eye, 2) the lack of strong striations on the gill cover, 3) pectoral fins that reach less than two-thirds of the way to the base of the pelvic fins, and 4) fin ray counts of 9-10 on the dorsal fin, 10-12 on the pectoral fins, 8 on the pelvic fins, and 15-17 on the anal fin (Moyle 2002). Further descriptive information can be found in Moyle (2002) and descriptions of larvae can be found in Wang (1986; 1991).

Taxonomy

Delta smelt were once thought to be a population of the widely-distributed pond smelt, *Hypomesus olidus*. *H. olidus* was subsequently separated into *H. olidus* (not present in California waters) and *H. transpacificus*. *H. transpacificus* was subsequently attributed with two subspecies, the delta smelt (*H. transpacificus transpacificus*) and the wakasagi (*H. transpacificus nipponensis*). The two subspecies have since been split into two distinct species, *H. transpacificus* and *H. nipponensis* (Moyle, *et al.* 1986).

Range

Delta smelt are found only in the Sacramento-San Joaquin Estuary (Moyle, *et al*. 1992; Moyle 2002). They have been found as far upstream in the Sacramento River as the mouth of the Feather River and as far as Mossdale on the San Joaquin River. Their normal downstream limit appears to be western Suisun Bay, although during episodes of high outflow they can occur in the Napa River, San Pablo Bay and San Francisco Bay (Moyle, *et al.* 1992).

Age and Growth

Delta smelt are fast growing and short-lived (Moyle 2002). The majority of growth is within the first 7 to 9 months of life when the fish grow to about 50-70mm

Most delta smelt die after spawning in the spring although a few survive to a second year (Bennett 2005). Second-year fish can grow to lengths near 130 mm (FL).

Diet

Delta smelt feed entirely on zooplankton (Moyle, *et al*. 1992; Bennett 2005). Gut contents of larval fish show that the diet consists mainly of calanoid copepods and copepod nauplii. As delta smelt grow larger, their primary food is calanoid copepod and larger amphipod.

Reproduction

Spawning occurs from late winter to early summer. Ready-to-spawn (ripe) females are generally found from December to June. Delta smelt spawn in freshwater (Moyle, *et al*. 1992; Bennett 2005) or in slightly brackish water in or above the low-salinity zone.

Female delta smelt mature at 55-70 mm and fecundity ranges from about 2000 to 12000 eggs for females up to about 100 mm (FL) (Bennett 2005).

Possible spawning locations have been reported to include dead-end sloughs (Radtke 1966), inshore areas of the Delta (Moyle 2002), edges of rivers (Moyle, *et al*. 1992), and river areas under tidal influence with temperatures ranging from 15-20 degrees Celsius (Bennett 2005).

Spawning substrate is not known, but spawning is thought to occur in the water column above vegetation or in open water above sandy or rocky substrates (Wang 1986; Bennett 2005). Delta smelt eggs likely attach to rocks, gravel, tules, cattails, tree roots, and emergent vegetation (Wang, 1986; Moyle, *et al*. 1992).

Hatching generally occurs in 12-14 days. Larvae drift with the currents downstream toward the low-salinity zone (Moyle, *et al*. 1992).

HABITAT REQUIREMENTS

Delta smelt are found only in the Sacramento-San Joaquin Estuary.

Except during the winter spawning season, most delta smelt reside in salinities ranging from 0.2-2.0 psu (Bennett 2005). They live principally in the upper portion of the water column and tolerate water temperatures from approximately 6-25ºC.

Adequate river flow is necessary for larvae to move from upstream spawning areas to suitable rearing habitat. Suitable water quality is necessary such that maturation is not impaired by pollutant concentrations. The specific period when the conditions identified above are important for successful larval transport varies among years, depending on when peak spawning occurs and on the water-year type.

Suitable water quality within the estuary is necessary to provide delta smelt larvae and juveniles a protective and food-rich environment in which to mature to adulthood. The specific geographic area critical to the maintenance of suitable rearing habitat extends eastward from Carquinez Strait, up the Sacramento River to its confluence with Three Mile Slough, and south along the San Joaquin River.

Adult delta smelt must have unrestricted access to suitable spawning habitat during a period that may extend from December to July, and flows and water quality necessary to attract migrating adults to spawning habitat in the Sacramento and San Joaquin River channels and their tributaries. Specific cues for adult migration are not known.

Delta outflow affects geographical distribution of delta smelt and their survival. As flows increase and saltwater is repelled, more of the population occurs in Suisun Bay and San Pablo Bay and less occurs in the Delta. When delta smelt were more abundant, a large proportion of the population was found in Suisun Bay and the surrounding areas.

POPULATION SIZE

The Department does not presently accept as valid any estimate of absolute abundance.

Abundance is a very important population metric, because it speaks to the risks particular to small populations. These so-called Allee effects include loss of genetic diversity, difficulty finding mates, and increased vulnerability to predation.

A stock-recruitment relationship for delta smelt has been detectable in recent years, suggesting both that factors affecting juvenile survival have recently changed (Baxter *et al.* 2008; Feyrer *et al.* 2007) and that rebuilding the stock from current low abundance will be slow and/or require large changes.

Signatories to the Interagency Ecological Program (particularly the U.S. Fish and Wildlife Service) are attempting to develop a rigorous estimate of absolute abundance.

ABUNDANCE TREND

Delta smelt were historically one of the most common open-water fish in the upper Sacramento-San Joaquin Estuary (Radtke 1966; Stevens and Miller 1983). Delta smelt abundance has often fluctuated considerably from year to year.

Two long-term surveys conducted by the Department are used to index the abundance of delta smelt. The unit-less relative abundance indices for delta smelt have substantial management utility and interpretation of year-to-year changes in the indices must be made recognizing that the relationship between the indices and absolute abundance is not known.

The 'summer tow-net' survey began in 1959 and provides the longest historical record of delta smelt abundance. The peak index was 62.5 in 1978. The index for 1993 — when delta smelt were listed under the endangered species acts — was 8.2. The index for 2007 was 0.4 and immediately preceded by the two lowest-ever indices (Figure 1).

The 'fall midwater trawl' survey began in 1967 and covers nearly the entire range of delta smelt distribution. The peak index was 1673 in 1970. The index for 1993 — when delta smelt were first listed under the endangered species acts — was 1078. The index for 2007 was 28 and immediately preceded by the three lowest-ever indices (Figure 2).

Both indices show a boom-and-bust cycle of abundance with a steep decline in the 1980s and another steep decline in the 2000s. The persistently-low indices in the 2000s are despite sometimes-favorable springtime environmental conditions and intensive management efforts attributable in part to endangered species act listings.

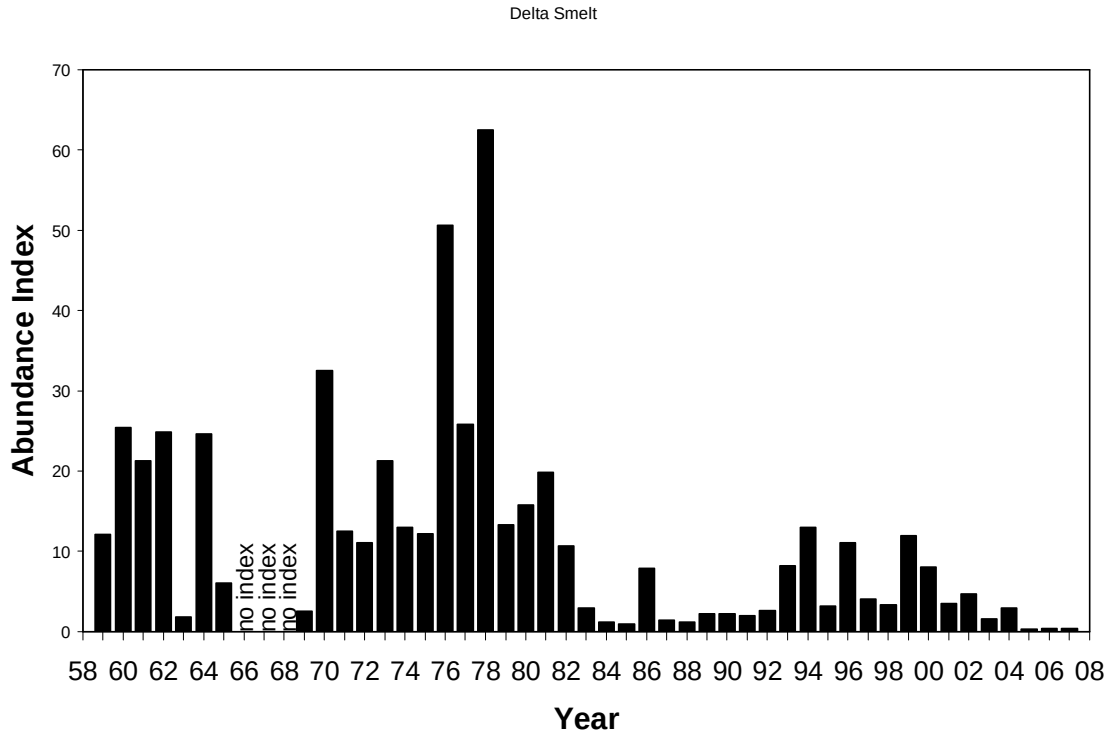

Figure 1 Delta smelt abundance indices from the tow-net survey

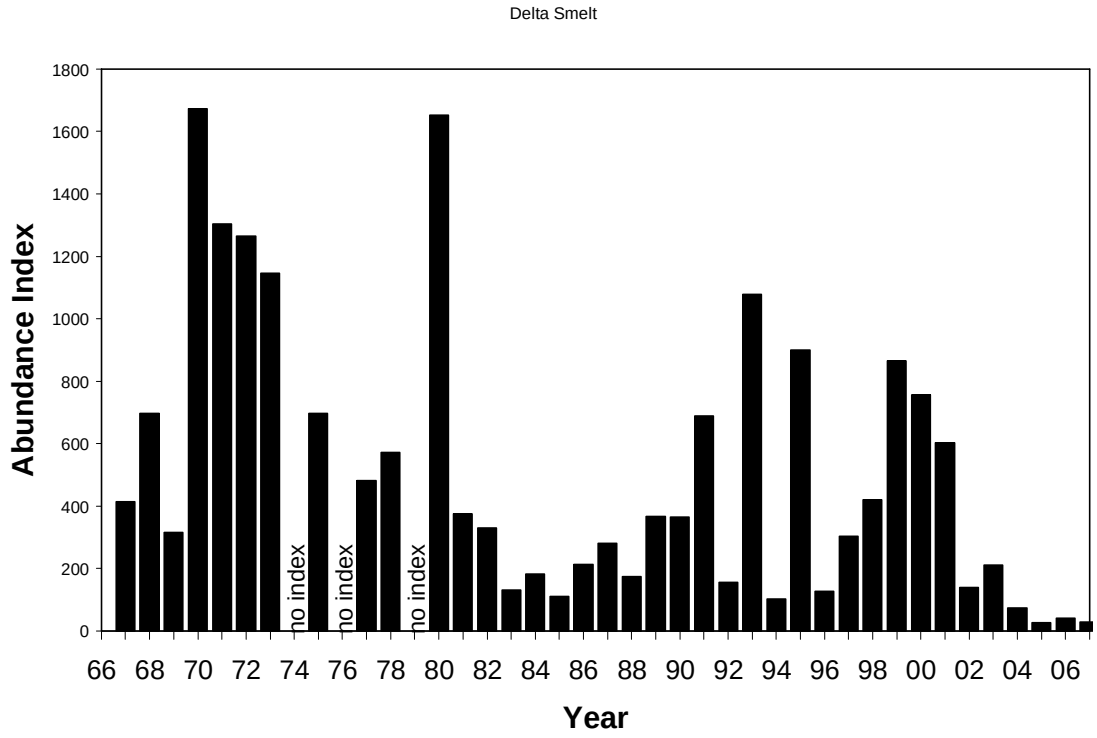

Figure 2 Delta smelt abundance indices from the fall midwater trawl survey

Some shorter-term surveys also show a decline in delta smelt abundance since listing in 1993 (Bennett 2005).

Because trends in the abundance indices probably equate to trends in risk attributable to Allee effects, the risks to delta smelt due to this factor alone have never been greater.

FACTORS AFFECTING DELTA SMELT ABUNDANCE

A conceptual model (Baxter *et al.* 2008) for the recent decline of delta smelt and several pelagic fishes is useful to describe the factors likely affecting delta smelt abundance. The following is an incomplete description of the model's major components with examples of how they are thought to apply to delta smelt.

Previous Abundance — The stock-recruit relationship describes the numbers of spawning fish and the numbers of young they produce that survive to adulthood. Even under favorable environmental conditions, low adult stocks may result in juvenile abundance so low that subsequent numbers of adults are also low. Due to the stock-recruit relationship among delta smelt, it is very likely that present low abundance of spawning delta smelt affects subsequent abundance of adult delta smelt (Feyrer *et al.* 2007).

Habitat — Habitat for delta smelt is predominantly open water with suitable salinity, turbidity, temperature, levels of contaminants, and prey. There has been a decline in fall habitat environmental quality for delta smelt (Feyrer *et al.* 2007) and some water collected from delta smelt habitat in the San Francisco Estuary during June and July of 2007 caused significant mortality to larval delta smelt in laboratory studies (Werner *et al.* 2008).

Top Down — Predation on delta smelt and entrainment of delta smelt into diverted water flows likely reduces delta smelt abundance. For example, around the year 2000 the loss of delta smelt to SWP/CVP exports increased and the loss of delta smelt to striped bass (DFG unpublished data) and largemouth bass (Brown and Michniuk 2007) likely increased. Similarly, the inland silverside is a very abundant introduced fish with a range that overlaps delta smelt and has food habits that probably result in predation on early life-stages of delta smelt.

Bottom Up — Long-term and recent changes in food web function have changed the quality and availability of food for delta smelt. As a consequence, delta smelt and some other pelagic fishes in the San Francisco Estuary have been adversely affected. For example, feeding by the non-native overbite clam (*Corbula amurensis*) reduced primary productivity (Kimmerer 2002; Alpine and Cloern 1992) and a consequential reduction in fish biomass is likely.

NATURE AND DEGREE OF THREAT

The Department has a significant understanding of the *nature* of threats, but to aid management efforts the Department seeks additional understanding of the *degree* of threats. Toward that end, the Department is working with agency and outside experts to define causes, design appropriate studies, and develop potential solutions to the delta smelt decline. Since 2005, that effort has been implemented largely through the Interagency Ecological Program's Pelagic Organism Decline work plans (IEP 2005; IEP 2006; IEP 2008 in prep.).

CURRENT MANAGEMENT

Delta smelt were listed April 1993 as threatened under the Federal Endangered Species Act (FESA) (Title 14 CCR 670.5) and December 1993 as threatened under the CESA. Management efforts are informed by extensive on-going research and monitoring of delta smelt abundance, distribution, biology, and ecology. Current management efforts include habitat protection and restoration, and near-real time management of flows and diversions attributable to operation of the SWP and CVP diversions in the south Delta.

CONCLUSIONS

The delta smelt is a native fish with a small range confined to the upper Sacramento-San Joaquin Estuary. The delta smelt is vulnerable to extinction because (1) it is short-lived, (2) it has relatively low fecundity, (3) introductions of exotic organisms have altered its habitat, distribution, food supply, and possibly abundance, (4) water projects have adversely modified its habitat, distribution, food supply, and probably abundance. Threats to the delta smelt population are likely to continue or increase.

We have examined several measures of delta smelt abundance and found that they all indicate that the population has declined substantially since listing in 1993. Our evaluation of factors potentially affecting delta smelt abundance did not specify the exact cause(s) of this decline.

An endangered species is "…in serious danger of becoming extinct throughout all, or a significant portion, of its range due to one or more causes, including loss of habitat, change in habitat, overexploitation, predation, competition, or disease…" (Fish & G. Code § 2062).

The Department believes that the delta smelt population is in imminent danger of extinction. Based on the best scientific information available (Fish and G. Code § 2074.6), the Department thus believes that the most prudent action is to change the classification of delta smelt to endangered.

RECOMMENDATIONS

Petition Action

1. The Commission should find that changing the classification of delta smelt to endangered is warranted.

2. The Commission should publish notice of its intent to amend Title 14 CCR 670.5 to change the classification of delta smelt to endangered.

Management/Recovery Measures

The Department's objective is the protection of a sufficient number of delta smelt to insure their long-term survival and recovery in their native habitat and range.

Because there is not yet a quantitative basis for estimating the benefits of any given action(s), assuring delta smelt persistence and recovery during the foreseeable future will continue to involve implementing management measures and evaluating their success empirically.

The Department believes the following actions would have population-level benefits for delta smelt:

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- Reduce entrainment and loss of adult, juvenile, and larval delta smelt at agricultural diversions in the Delta.

- Reduce entrainment and loss of adult, juvenile, and larval delta smelt at the Mirant power plants in Antioch and Pittsburg.

- Modify operations of the SWP and CVP to improve and/or expand pelagic habitat for delta smelt.

- Reduce pollution of the San Francisco Estuary by chemicals harmful to delta smelt and their food web.

- Re-evaluate and revise the extant delta smelt recovery goals and reclassification criteria.

- Make reliable estimates of delta smelt losses at SWP and CVP diversions from the south Delta.

- Rear populations of delta smelt in captivity for possible release into the wild as part of recovery or experimental efforts.

- Make reliable estimates of delta smelt absolute abundance.

ECONOMIC CONSIDERATION

The Department is not required to prepare an analysis of economic impacts (Fish & G. Code, Section 2074.6).

LITERATURE CITED

Alpine, A. E. and J. E. Cloern. 1992. Trophic interactions and direct physical effects control phytoplankton biomass and production in an estuary. Limnol. Oceanogr. 37(5): 946-955.

Baxter, R., R. Breuer, L. Brown, M. Chotkowski, F. Feyrer, M. Gingras, B. Herbold, A. Mueller-Solger, M. Nobriga, T. Sommer, and K. Souza. 2008. Pelagic Organism Decline Progress Report: 2007 Synthesis of Results. Interagency Ecological Program for the San Francisco Estuary. Sacramento, California. http://www.science.calwater.ca.gov/pdf/workshops/POD/IEP_POD_2007_synthesis_report_031408.pdf

Bennett, W .A. 2005. Critical assessment of the delta smelt population in the San Francisco estuary, California. San Francisco Estuary and Watershed Science. Vol. 3, Issue 2 (September 2005), Article 1. http://repositories.cdlib.org/jmie/sfews/vol3/iss2/art1

Brown, L. R., and D. Michniuk. 2007. Littoral fish assemblages of the alien-dominated Sacramento–San Joaquin Delta, California 1980–1983 and 2001–2003. Estuaries and Coasts. 30: 186-200.

Feyrer, F., M. Nobriga, and T. Sommer. 2007. Multi-decadal trends for three declining fish species: habitat patterns and mechanisms in the San Francisco Estuary, California, U.S.A. Canadian Journal of Fisheries and Aquatic Sciences 64:723-734

IEP (Interagency Ecological Program for the San Francisco Estuary). 2005. Interagency Ecological Program 2005 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary. http://www.science.calwater.ca.gov/pdf/workshops/SP_workshop_pod_pelagic_decline_workplan_070105.pdf

IEP (Interagency Ecological Program for the San Francisco Estuary). 2006. Interagency Ecological Program 2006-2007 Work Plan to Evaluate the Decline of Pelagic Species in the Upper San Francisco Estuary. http://www.science.calwater.ca.gov/pdf/workshops/POD/IEP_POD_2006-7_Workplan_010906.pdf

Kimmerer, W.J. 2002. Effects of freshwater flow on abundance of estuarine organisms: physical effects or trophic linkages. Marine Ecology Progress Series 243:39-55.

Moyle, P.B., R.A. Daniels, B. Herbold, and D.M. Baltz. 1986. Patterns in distribution and abundance of a noncoevoled assemblage of estuarine fishes in California. Fishery Bulletin. 84(1): 105-118

Moyle, P.B., B. Herbold, D.E. Stevens, and L.W. Miller. 1992. Life history and status of Delta smelt in Sacramento-San Joaquin Estuary, California. Transactions of the American Fisheries Society. 121:67:77.

Moyle, P. B. 2002. Inland Fishes of California. University of California Press, Berkeley, California, USA.

Radtke, L. D. 1966. Distribution of smelt, juvenile sturgeon and starry flounder in the Sacramento-San Joaquin Delta. Fish Bulletin 136. Sacramento (CA):California Department of the Fish and Game. 115-129.

Stevens, D. E. and L.W. Miller. 1983. Effects of river flow on abundance of young Chinook salmon, American shad, longfin smelt, and delta smelt in the Sacramento-San Joaquin river system. North American Journal of Fisheries Management. 3:425-437

Wang, J. C. S. 1986. Fishes of the Sacramento-San Joaquin Estuary and adjacent waters, California: A guide to the early life histories. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. Technical Report 9. Sacramento, California.

Wang, J. C. S. 1991. Early life stages and early life history of the delta smelt, *Hypomesus transpacificus*, in the Sacramento-San Joaquin Estuary, with comparison of early life stages of the longfin smelt, Spirinchus thaleichthys. Interagency Ecological Study Program for the Sacramento-San Joaquin Estuary. Technical Report 28. Sacramento, California.

Werner, I., L. Deanovic, D. Markiewicz, M. Stillway, N. Offer, R. Connon, and S. Brander. 2008. Pelagic Organism Decline (POD): Acute and chronic invertebrate and fish toxicity testing in the Sacramento-San Joaquin Delta 2006-2007. Final Report. Aquatic Toxicology Laboratory, School of Veterinary Medicine, University of California Davis, Davis, California. 135 pp.

APPENDIX A: PRESS RELEASE AND RESPONSES

Department of Fish and Game

NEWS RELEASE FOR IMMEDIATE RELEASE 08:002 Jan. 9, 2008

Contact(s) Marty Gingras, Supervising Biologist, DFG Bay Delta Region (209) 948-3702

Delta Smelt Information Requested

The Department of Fish and Game (DFG) requests data and comments on a petition to uplist Delta smelt under the California Endangered Species Act (CESA).

The California Fish and Game Commission is considering a petition to change the status of delta smelt from "threatened" to "endangered" under CESA. The petition was filed in April 2007 by the Bay Institute, the Center for Biological Diversity and the Natural Resources Defense Council.

Pursuant to the provisions of Section 2074.6 of the Fish and Game Code, DFG must complete a status review of the species and provide a written report to the Fish and Game Commission that indicates, based upon the best scientific information available, whether or not uplisting the Delta smelt from threatened to endangered under CESA is warranted. DFG will submit its report to the Commission on June 20, 2008. Comments from interested and affected parties, including members of the public and local agencies, are requested by February 29.

The Delta smelt (*Hypomesus transpacificus*) is a small native fish listed as threatened under both CESA and the Federal Endangered Species Act. Delta smelt live only in the Sacramento-San Joaquin River Delta. Because the fish is listed as threatened under CESA, California law already prohibits take of Delta smelt unless authorized by DFG. However, the abundance of Delta smelt has declined since its listing as threatened in 1993.

DFG's Fall Midwater Trawl fish survey completed in December found considerably low abundance of Delta smelt in the San Francisco Estuary and Delta. The annual survey collects several small pelagic fishes from 116 sites located between San Pablo Bay and the lower reaches of the Sacramento and San Joaquin rivers and provides data on these species. Results from the survey are posted at http://www.delta.dfg.ca.gov/data/mwt/.

Please send data and comments related to the petitioned action and/or the status of Delta smelt to DFG Supervising Biologist Marty Gingras at the Department of Fish and Game, Re: Delta Smelt Petition, 4001 North Wilson Way, Stockton, CA 95205; by electronic mail to: mgingras@dfg.ca.gov with "Re: Delta Smelt Petition" in the subject line; or, by fax to: (209) 946-6355, Attention: Marty Gingras, Re: Delta Smelt Petition.

From: <jdeckerfff@aol.com>
To: <mgingras@dfg.ca.gov>
Date: 1/10/2008 4:19 PM
Subject: Delta smelt

Dear Mr. Gingras:
I strongly support listing the Delts smelt as an Endangered species in California under the appropriate endangered species act. They are a valuable part of the Delta food chain and have been pressed with past conditions.
Best Regards Judy Decker Inouye, member San Jose Flycasters, Golden West Women Flyfishers, Peninsula Fly fishers

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From: "loretta #273" <lorvamp@hotmail.com>
To: <mgingras@dfg.ca.gov>
Date: 1/11/2008 1:47 PM
Subject: Delta Smelt Petition

Marty,

As a member of the Golden West Women's Flyfishers, Oakland Casting Club and other CA fishing groups, I support listing the Delta Smelt as Endangered under the California Endangered Species Act in order to protect this key fish from totalling disappearing from the Delta.

The Delta is a world class natural resource that needs protection of its native inhabitants. The Delta smelt is a crucial part of the food chain for the various animals and fish that live there.

Sinccerely,

Loretta Strickland

From: Jim N/A <helicon01@pacbell.net>
To: <mgingras@dfg.ca.gov>
Date: 1/16/2008 9:26 AM
Subject: Re: Delta Smelt Petition

Mr. Gingras,

I favor listing the Delta smelt as an endangered species. The decline of the Delta Smelt population to record low numbers and the apparent crash of the delta ecological cycle from water diversion, non native Species and pollution are contributing factors. Delta fish kills at the canal pumps are also a contributing factor. Unless action is taken immediately the Delta smelt will be extinct.

Thank You,
James Volberding
Coastside Fishing club Member
Pittsburg, Ca

From: "Brenda Rose" <rosebudrose@comcast.net>
To: <mgingras@dfg.ca.gov>
Date: 1/18/2008 11:17 AM
Subject: Delta Smelt Petition

This e-mail is in response to an article published in Livermore's The Independent on Jan. 17th asking the public about whether the smelt should be made an endangered species - ABSOLUTELY.

The smelt are 'an indicator' of the health of our environment within the Delta. We must pay attention and avoid changes that will have a negative impact on our precious resources. With the presence of the smelt, the environment can renew itself by staying in balance and protect our most valuable resource - water. Once the eco-balance is shifted, we can no longer protect our water which all living things, man and animal, rely on for sustenance. Don't allow 'growth & development' to dictate how we manage our life-sustaining water, it MUST to be the other way around. And, the smelt are the 'guardians' of our water's health, sort of to speak. They are the first to let us know when our water quality is being compromised.

If placing the smelt on the Endangered Species list will force those affecting our water resource to be good stewards (i.e., water contractors, waste treatment, stocking of fish, etc.), then there shouldn't be any hesitation to make the right choice. Earth is a 'closed environment', and we need to maintain a balance if we are to survive. Don't sell us out for money. We need to listen to what our environment is telling us and stop the current way of doing business if we are to save this planet we live in. I praise the judge who made the unpopular decision to decrease pumping water in order to help the smelt population and I hope the DFG has the same courage and place the smelt on the Endangered Species list.

Brenda J. Rose
5858 Dresslar Circle
Livermore, CA 94550

From: "Paul Rusanowski" <paul.rusanowski@shipleygroup.com>
To: <mgingras@dfg.ca.gov>
Date: 1/21/2008 8:59 AM
Subject: Re: Delta Smelt Petition
Attachments: Rep Miller ltr Delta health 2006.doc

Marty I am writing to you in regard to the uplisting of Delta Smelt form Threatened to Endangered under CESA. First I want to state that I wholeheartedly support this move as it should have occurred much earlier. This move will help draw attention to the problems on the delta and the fact that people must come together to solve them now. The status quo is not acceptable and cannot go on without a collapse of the delta ecosystem as we have known it.

Secondly, although this may not be the right forum, I think it is important to understand that merely changing the status of the Delta Smelt under the CESA, in and of itself will not significantly change the plight faced by the smelt in the near future. Much more than a paper transaction is desperately needed. I have outlined a few ideas below that I think can help restore the delta and significantly improve the habitat quality needed by the Delta Smelt and other species in jeopardy due to our current water practices. Perhaps by including them here, these ideas will reach more of the scientists, regulators, and policy makers that can implement these types of changes in the immediate future, rather than after we have lost important species such as the Delta Smelt from the ecosystem.

I have included as an attachment letter I wrote to Representative George Miller in 2006 that contains some of the approaches that can be used to help revive the delta ecosystem. I think the statements made in the letter are still germane today. I have also elaborated on them and included a few other comments below.

As I stated above I think it is critical to change the status of the Delta Smelt to endangered if for no other reason than to call attention to the fact that action is needed now. So, what are the immediate actions to take. I think serious consideration should be given to the comments made by John Engbring of the USFWS to build a canal to carry water from further up the river to the present system, rather than continuing to withdraw water at the present location. Along the same lines I think that a porous dike can be built that would allow filtered water to enter an impoundment which could then be pumped into the existing system. Both approaches involve changing the point of intake and the quality of water reaching the pumps. These actions will have an immediate effect on saving the Delta Smelt. By pumping water from an impoundment that doesn't have the juvenile and larval forms in it we eliminate an impact. The same thing occurs when water is withdrawn further up stream. These are both immediate and cost effective solutions that will save the Delta Smelt. I think they are cost effective because shutting down the transport of water to Southern California will have disastrous economic consequences that are likely to result in extensive delays due to litigation while the Delta Smelt disappear (*regardless of the CESA designation).

I believe that a porous dike would be one of the most cost effective filtration systems for water that is pumped out of the delta. I believe that we need to think in terms of surface filtration area versus flow rates. To reduce the entrainment we need to filter out the larval and juvenile forms that are to be preserved and maintain an acceptable flow to the pumps. That means we need to spread out the area from which water is being withdrawn. Since the pumps are already in place that means we have to move the point of intake of water to another location and build a canal to transport that filtered water to the pumps.

That could be accomplished by building a porous dike that will pass water over a distance of one to several miles into an impoundment on the other side. The water in the impoundment then flows to the present pump locations through a short canal. The porous dike concept is similar to a flowing river that is losing water to near surface groundwater. Water is moving into or out of the river based on groundwater dynamics through a porous medium (sands and gravels) By sizing the sands and gravels to exclude the larvae and juveniles of concern, and providing a linear dike to reduce the flow rate to an acceptable level, we create an artificial flow that can sustain the pump withdrawal requirements without the entrainment impacts presently experienced in the delta.

I think the second issue that needs to be addressed to save the Delta Smelt and other species in the delta is the recycling of water back to the delta from Southern California. A large portion of the water that flows from the delta is for non consumptive use and ends up flowing into the ocean following wastewater treatment. I would expect that substantially more than 50% of the water sent to Southern California could be returned to the delta as tertiary treated reclaimed water. While this might be deemed expensive, it is far cheaper than an alternative that curtails or eliminates this water from being sent to Southern California. If a return viaduct or pipeline system were put in place to move tertiary treated wastewater from treatment facilities in Southern California to the top of Tejon Pass, gravity would take over and move that water all the way back to the Delta through the San Joaquin River. As the water flows into the San Joaquin Valley it would provide recreational opportunities, additional water for agriculture (which is grossly oversubscribed in the Central Valley), replenishment of valley aquifers, and probably a host of other uses as it flows back to the Delta. The water could then make another cycle to Southern California once it reaches the Delta.

While this may seem farfetched at first, I think the cost of building such infrastructure will prove to be small compared to the benefits to the citizens and businesses in California. As an example of potential benefits, the reclaimed water could provide sufficient dilution of the concentrated selenium waters in the Western San Joaquin Valley near Kesterson, to allow them to be discharged into the San Joaquin River after limited treatment to lower the selenium concentration. Present solutions being considered for this selenium rich water are running into the billion dollar range.

Once the cycling of water is implemented between the Delta and Southern California there would be sufficient flows of fresh water into the Delta to manage water resources to improve the health of this vital ecosystem and begin effective restoration of its resources. Once the pressure to fight over limited water resources is removed we have the opportunity to resolve issues and prevent future problems. We know from the past what not to do. By recycling water back to the Delta we create the water supplies that allow us to craft management practices for the future that will prevent us from reliving the mistakes of the past.

These are two solutions that address actions to be taken in the immediate future that will help to save the Delta Smelt and other delta species in jeopardy. They are solutions that

may be quite timely once people understand the gravity of the situation and that fighting and litigation will not solve the problem.

Thank you for the opportunity to comment on the petition to uplist the Delta Smelt. If I can be of further assistance in actions taken to save this species, and other delta species, please do not hesitate to contact me.

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From: Cheryl Wright <casa134@yahoo.com>
To: <mgingras@dfg.ca.gov>
Date: 1/21/2008 9:48 AM
Subject: Delta Smelt Petition

This e mail is in response to an article published in Livermore's The Independent on Jan. 17th asking the public about whether the smelt should be made an endangered species – ABSOLUTELY.

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If placing the smelt on the Endangered Species list will force those affecting our water resource to be good stewards (i.e., water contractors, waste treatment, stocking of fish, etc.), then there shouldn't be any hesitation to make the right choice. Earth is a 'closed environment', and we need to maintain a balance if we are to survive. Don't sell us out for money. We need to listen to what our environment is telling us and stop the current way of doing business if we are to save this planet we live in. I praise the judge who made the unpopular decision to decrease pumping water in order to help the smelt population and I hope the DFG has the same courage and place the smelt on the Endangered Species list.

Regards from a concerned citizen,
Cheryl Wright
Livermore, CA

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http://mobile.yahoo.com/;_ylt=Ahu06i62sR8HDtDypao8Wcj9tAcJ

From: "" <zilferworth@excite.com>
To: <mgingras@dfg.ca.gov>
Date: 1/21/2008 2:56 PM
Subject: Delta Smelt Petition
Please do not raise the listing status of the Delta Smelt to "endangered." We Zone 7 water customers are depending on the delta for our source of water. Humans are more important than fish!

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From: "Jennifer Carolan" <JCarolan@livermore.k12.ca.us>
To: <mgingras@dfg.ca.gov>
Date: 1/22/2008 11:11 AM
Subject: smelt

Please save the smelts!

Jennifer Carolan

From: "Tom Cannon" <tcannon@wildlandsinc.com>
To: <mgingras@dfg.ca.gov>
Date: 1/10/2008 10:14 AM
Subject: delta smelt petition

Hi Marty,
These are analyses I conducted as a member of the CALFED DCC/TDF Team updated to 2003 information. I sent you my white paper long ago. I don't want to be directly involved anymore because it is simply too frustrating. I have no credibility without a PhD and peer reviewed papers on the subject.

My Interpretation of data analysis: The smelt population cannot be sustained under its present controlling factors. Not only is recruitment of juveniles and adults significantly negatively related to exports, recruitment is also significantly positively related to stock

size. Not only is young survival compromised by exports, but subsequent young production is reduced further by lower stock levels. Together these factors create a "double whammy" or accelerated population decline that could led to "recruitment failure" or "stock collapse". Maintaining export levels above 4000 6000 cfs would continue the downward population spiral and probably eliminate any chance for recovery. Under these conditions there would be no alternative given legislative criteria but to consider smelt "endangered".

An argument can be made that exports are not necessarily the cause and effect factor of the decline. However, given exports have many direct and indirect effects on population mechanisms (e.g., growth and survival) that directly affect smelt, we could expect no worse an indictment of exports. Regardless, the present state of the population and where it is going is not debatable. Modification of exports would be a most reasonable adaptive management experiment to start to bring about smelt recovery there are many other actions that should be immediately implemented to save the smelt.

These hypotheses were presented for data through 2003. They can be tested by simply adding 2004 2007 data points in a standard hypotheses testing approach.

Facts:

1. Recruitment is statistically significantly related to export (1969 2003 data).

2. Recruitment is statistically significantly related to stock size (1969 2003 data).

3. The multivariate model with both export (independent) and recruitment (dependent) variables is highly significant this would be something DFG could easily undertake and promote in their review of the smelt population. It could take a simple stock recruitment, non linear, multivariate model such as a modified Ricker Stock Recruitment model it really doesn't matter, they all portray a highly significant relationship. I have never seen such a clean and obvious stock recruitment environmental factor relationship for a fish population. It is almost as good as elephant or whale population dynamics and models. DFG/IEP staff should have done this long ago.