Endangered Species Facts

Delta Smelt *Hypomesus transpacificus*

Photo source: B. Moose Peterson/USFWS Digital Library

The delta smelt is a *threatened species*. Threatened species are plants and animals whose population numbers are so low that they may become endangered in the future.

***Endangered species* are plants and animals that are in immediate danger of becoming extinct.**

The U.S. Environmental Protection Agency's (EPA) Endangered Species Protection Program (ESPP) will help ensure that pesticide use does not jeopardize the survival of listed species.

Endangered Species Protection Program (ESPP)

Hypomesus transpacificuss

Description and Ecology

Status Threatened, listed March 5, 1993.

Critical Habitat Designated December 19, 1994.

Appearance The delta smelt typically grows to 2.4–2.8 inches in length. Except for the steel-blue sheen on its sides, its delicate, slender body appears nearly transparent. Its eyes appear large. Its relatively small mouth has little, pointed teeth on the upper and lower jaws. A small, fleshy fin (adipose fin) sits atop the back between the dorsal fin and the tail.

Range Delta smelt are found only in the Sacramento-San Joaquin estuary in California. Historically, populations were found from Suisun Bay, east to the Delta area, and then upstream in the Sacramento River to about Isleton and upstream in the San Joaquin River to about Mossdale. Locations are dependant upon stage in the life cycle and extent of water outflow from the Sacramento and San Joaquin Rivers. When outflow was greater, delta smelt congregated in upper Suisun Bay and the Montezuma Slough. As a result of increasing water diversions and drought, the center of species abundance has shifted east to the Sacramento River channel in the Delta.

Habitat This shift in the species center of abundance arises from the fact that while the delta smelt is a euryhaline (saltwater tolerant) species, it is seldom found where sea water makes up more than 1/3 of the total water. The locations of delta smelt are tied to the freshwater side of the mixing zone (where the salt and freshwater meet). As drought and river water diversions reduce the outflow of freshwater downstream, the mixing zone is drawn upstream into the river channels. There the mixing zone is compressed and limited to the deeper river channels where the current may be faster and more turbulent, shoals absent, and the usual species richness (microzooplankton) of the mixing zone limited. Larvae require high densities of microzooplankton. These high densities occur when the mixing zone occupies a large geographic area such as Suisun Bay, which has shoals, sloughs, wetland edges, and suitable spawning substrate at depths less than 13 feet. Low outflows keep adult delta smelt and their larvae upstream in the deep, narrow channels of the rivers and delta, where food production is limited by the inability of sunlight to penetrate water depths.

Reproduction and Life Cycle While spawning can occur from January through July, low outflow tends to eclipse the season from March to mid-May. Spawning occurs in sloughs and shallow, edge-waters of channels in the upper Delta. Each female broadcasts 1,200–2,600 eggs. Eggs sink to the bottom and adhere to rocks, gravel, tree roots, and submerged vegetation or branches. With optimum temperatures eggs hatch in 9–14 days. Feeding begins in another 4–5 days.

Initially the larvae have an oil globule that buoys them just above the bottom where they are able to feed on rotifers and other microscopic prey. After the swim bladder develops, the 0.6–0.7 inch long larvae are able to rise higher in the water column and be whisked downstream to within or just upstream of the mixing zone. There prey should be abundant and their own growth rapid. By August the juveniles are 1.6–2.0 inches in length. At this time the marked absence of older adults suggests they may not live much beyond spawning. This defines the delta smelt as an annual species. For the next several months the growth rate of the delta smelt juveniles slows down while their bodies ready for reproduction.

The prey of the delta smelt are small crustaceans and insect larvae, and consist primarily of a native copepod, *Eurytemora affinis*. Recently an exotic copepod species from the Yangtze area of China and Japan, *Pseudodiaptomus forbesi*, has been replacing *E. affinis*. While delta smelt appear to consume this exotic species, the full impact of its presence is unknown. Another exotic species, the overbite clam, was discovered in Suisun Bay in 1986. After a multi-year drought that eliminated much of the benthic community of Suisun Bay, the

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population of overbite clams spread. Its numbers and their filtration rate can impact the phytoplankton population and, as a result, the overall food web. Striped bass, white catfish, and black crappies prey upon delta smelt.

While populations of delta smelt have fluctuated from year to year, drought from 1987 to 1992 severely impacted the delta smelt numbers. A rebound in the population the following year was attributed to a wetter winter and spring. Since then the numbers, of what once was one of the most common pelagic fish in the Sacramento–San Joaquin estuary, have dropped significantly. Critical habitat was designated for this species on December 19, 1994. However, by 2005 the population of delta smelt was perhaps as little as 2.4% of the estimated population in 1993 when the delta smelt was listed as "threatened."

Recovery Plan The U.S. Fish and Wildlife Service (FWS) developed a recovery plan for the delta smelt in 1996. Recovery plans outline reasonable actions that FWS believes are required to recover or protect listed species. FWS prepares recovery plans, sometimes with the assistance of recovery teams, contractors, state agencies, and others. Recovery plans do not necessarily represent the views nor the official positions or approvals of any individuals or agencies, other than FWS, involved in the plan formulation. Approved recovery plans are subject to modification as dictated by new findings, changes in species' status, and the completion of recovery tasks.

Delta Smelt Information Sources

Primary Reference Beacham, Walton, Castronova, Frank F., and Sessine, Suzanne (eds.), 2001. *Beacham's Guide to the Endangered Species of North America*, Gale Group, New York. Vol. 2, pp. 908–912.

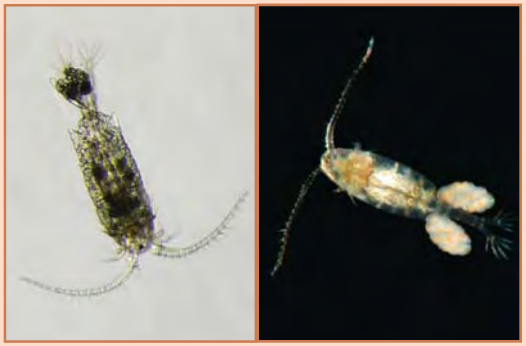
Listing Notice U.S. Fish and Wildlife Service, 1993. Federal Register 58, No. 42, pp. 12854-12864, March 5, 1993. http://ecos.fws.gov/docs/federal_register/fr2235.pdf

Critical Habitat Designation U.S. Fish and Wildlife Service, 1994. Federal Register 59 No. 242, pp. 65256-65279, December 19, 1994. http://ecos.fws.gov/docs/federal_register/fr2751.pdf

Recovery Plan U.S. Fish and Wildlife Service. 1996. Sacramento_San Joaquin Delta Native Fishes Recovery Plan. U.S. Fish and Wildlife Service, Pacific Region, Portland, Oregon. 195 pp. http://ecos.fws.gov/docs/recovery_plan/961126.pdf

Photo of the San Joaquin-Sacramento River Delta courtesy of Dave Polaschek.

Photo of Suisun Bay courtesy of Mike Huisking.



Native copepod Eurytemora affinis (magnified, left), and introduced Pseudodiaptomus forbesi (right), prey of the delta smelt. Both images courtesy of Jeffery R. Cordell, Copepod Gallery, University of Washington.

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