LONG TERM MANAGEMENT STRATEGY

Background Information for Dredgers' Assessments of Potential Impacts on the Longfin Smelt in San Francisco Bay

The agencies of the Long Term Management Strategy for the Placement of Dredged Material in the San Francisco Bay Region (LTMS) are providing the following background information to assist non-federal dredgers in conducting assessments of whether or not their project may result "take" of threatened longfin smelt, as defined by the California Endangered Species Act (CESA). The agencies are in no way suggesting a take determination for an individual project. This document may be revised in the future as additional information becomes available.

The Need for Incidental Take Permits

On June 25, 2009, the longfin smelt (*Spirinchus thaleichthys*) was declared a threatened species under CESA. The California Department of Fish and Game (DFG) has stated that dredging project sponsors in San Francisco Bay will need to conduct assessments of whether their projects will "take", (i.e., hunt, pursue, catch, capture, or kill) this threatened species. If the project will result in take, the project sponsor will need to apply to DFG for an incidental take permit.

Once the determination is made, the dredging project sponsor should provide a copy of the assessment to the state agencies including the San Francisco Bay Regional Water Quality Control Board (Water Board), San Francisco Bay Conservation and Development Commission (BCDC) and California Department of Fish and Game (DFG). If the project is expected to take longfin smelt, the project sponsor should apply directly to DFG for a take permit. Once a take permit is issued, the project sponsor should provide it to both the Water Board and BCDC.

Relevant Aspects of Longfin Smelt Life History and Habitat Requirements

DFG provides the following life history information on its website (DFG, 2009):

> Longfin smelt are pelagic, estuarine fish…. Presently, the only California collections made in the 1990s have been from the Klamath River and San Francisco Bay. Longfin smelt reach a maximum size of about 150 mm TL.…
>
> Maturity is reached toward the end of their second year. As they mature in the fall, adults found throughout San Francisco Bay migrate to brackish or freshwater in Suisun Bay, Montezuma Slough, and the lower reaches of the Sacramento and San Joaquin Rivers. Spawning probably takes place in freshwater.
>
> In April and May, juveniles are believed to migrate downstream to San Pablo Bay; juvenile longfin smelt are collected throughout the Bay during the late spring, summer and fall…. Juveniles tend to inhabit the middle and lower portions of the water column.

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The California Department of Water Resources provided the following additional information in its application for an incidental take permit for the California State Water Projects:

> **Spawning**
>
> …The downstream extent of longfin smelt spawning reportedly occurs in upper Suisun Bay around Pittsburg and Montezuma Slough in Suisun Marsh (Wang 1986, 1991, Moyle 2002). However, some spawning may also occur at the southern tip of San Francisco Bay [Baxter 2008 unpublished]….
>
> **Larvae/Juveniles**
>
> Longfin smelt embryos hatch in approximately 40 days (at 7°C) (Dryfoos 1965, Moyle 2002). Larvae quickly move into the upper part of the water column and are transported downstream into more brackish areas of the estuary (Moyle 2002). Post-larval longfin smelt are reportedly associated with deep-water habitats (Rosenfield and Baxter 2007). Larvae are most abundant in the water column from January through April (DFG unpublished, as cited in Reclamation 2008). Metamorphosis into juveniles probably begins 30-60 days after hatching, depending on water temperature (Emmett et al. 1991, Moyle 2002).
>
> During years when high freshwater outflows occur when larvae are being transported downstream, most larvae are transported to Suisun and San Pablo Bays; during years with lower outflow, larvae are transported into the western Delta and Suisun Bay (Baxter 2000, Baxter et al. 1999, Moyle 2002)….
>
> **Adults**
>
> …During most year adults concentrate in San Pablo Bay during April-June and become more dispersed in late summer (many moving into central San Francisco Bay) (Moyle 2002). The concentration of longfin smelt in deepwater habitats, combined with their migration into marine water during the summer suggests that longfin smelt may be relatively intolerant of the warmer waters in the estuary. The population gradually moves upstream during fall and winter to spawn….

The NatureServe[1] Explorer database also has summarized the life history of the longfin smelt, including the following information:

> **Reproduction Comments:** Spawns in second year in southern part of range.… According to Wang (1986, cited in USFWS 1994), spawns as early as November, as late as June, with peak February-April (evidently pertains to California). Females lay 5000-24,000 adhesive eggs. Eggs hatch in about 40 days (Lee et al. 1980). Young move downstream to lake or sea. Some adults survive spawning. In the Sacramento-San Joaquin system, California, good recruitment is positively correlated with high outflows into Suisun and San Pablo bays (better rearing habitat than areas farther upstream).

[1] NatureServe is a non-profit conservation organization whose mission is to provide the scientific basis for effective conservation action. All species and ecological community data presented in NatureServe Explorer at http://www.natureserve.org/explorer were updated to be current with NatureServe's central databases as of February 6, 2009. This report was printed on July 13, 2009.

Habitat Comments: Habitat includes a wide range of temperature and salinity conditions in coastal waters near shore, bays, estuaries, and rivers (Moyle 2002); …. In estuaries this fish usually is found in the middle or bottom of the water column (Moyle 2002)…. Spawning occurs in fresh water, over sandy-gravel substrates, rocks, and aquatic plants (Moyle 2002). Anadromous populations spawn in fresh water close to the ocean. After hatching, larvae move up into surface waters and are transported downstream into brackish-water nursery areas….

Adult Food Habits: Invertivore, Piscivore

Immature Food Habits: Invertivore, Piscivore

Food Comments: Eats small crustaceans and fishes

Length: 14 centimeters

Longfin smelt tolerate salinities ranging from fresh to nearly pure seawater and can survive summer temperatures up to 20°C (68°F) (UCCE 2003). According to Baxter (1999), "the mean temperature at which age-0 longfin smelt were found ranged from 16 to 18 °C in late spring, summer and fall, to about 11.5 °C in winter." The monthly mean temperature ranged from about 9 °C in January to about 19 °C in June for age-1 longfin smelt (Baxter 1999). Baxter (1999) concludes:

> The distribution of age-1 longfin smelt appears to be influenced by high water temperatures. Age-1 longfin smelt have been collected in salinities from freshwater to sea water, but their distribution generally contracts from estuary-wide in the winter to mainly Central Bay by late summer and fall. Water temperatures in South Bay and the west delta generally reach their maxima between July and September and age-1 longfin smelt are rare during this period.

Overview of Potential Impacts of Dredging and Disposal

Potential impacts on longfin smelt include entrainment of eggs, larvae, juveniles or adults during dredging, and exposure to suspended sediments and contaminants during disposal of dredged material. DFG's status report (2009b) on longfin smelt provides the following summary of impacts:

> Little is known about the impacts to longfin smelt attributable to dredging and sand mining in the San Francisco Estuary, but operations conducted in freshwater could entrain adults, eggs, and larvae during winter spawning and incubation while operations in saltwater could entrain juveniles and adults in summer and fall. Loss of longfin smelt to dredging and sand mining operations may be a threat to longfin smelt recovery….
>
> Dredging and sand mining occurs at locations throughout the lower estuary, and effects to water-surface-oriented larvae, mobile juveniles, and adults are expected to be small and localized. However, dredge spoil disposal may create an unavoidably-large plume that exposes fish to re-suspended contaminants, gill-clogging sediments, and possibly low-oxygen water (LFR Levine-Fricke 2004). A review of direct and indirect dredging effects on fishes and benthos can be found in LFR Levine-Fricke (2004)….

Entrainment. The likelihood of entrainment varies depending on the vulnerability of the life stage, the likelihood that the vulnerable life stage is present, and the type of dredging equipment used. Entrainment of eggs along with sediment would only be expected to occur in spawning areas, i.e., in fresh water over sandy or gravel substrates, rocks or aquatic plants.

Past studies have reported entrainment of demersal fish (living near or in the bottom substrates). Appendix J of the LTMS Final EIS/EIR (1998) states, "Larval and juvenile stages in particular are vulnerable to entrainment in dredging equipment."

Longfin smelt have been observed in hopper dredges during past studies (Larson and Moehl 1990). A Technical Note prepared by the U.S. Army Engineer Research and Development Center (Reine and Clarke 1998) states, that "mechanical dredges are not generally treated in an entrainment context." Possible reasons for neglible entrainment by mechanical dredges are avoidance of increased turbidity and suspended sediment as a result of physical disturbance of the bottom substrate and avoidance of low-frequency vibrations caused by lowering the bucket into the water (Stevens 1981).

DFG's status report on longfin smelt (2009) provides the following additional information on entrainment:

> Two suction-dredge fish-entrainment studies for the local area were available and reviewed. Both indicated that few individual fish were entrained during dredging and that those species were predominantly bottom-dwellers (i.e., not longfin smelt)….
>
> Dredging and sand mining during winter and spring pose a threat to longfin smelt eggs. Egg entrainment is potentially the most serious effect, because other life stages are not associated with the bottom (i.e., larvae) or can move away from the intake (juveniles and adults).

Previous and Potential Future Restrictions on Dredging to Protect Longfin Smelt

Longfin smelt was a candidate species for listing under the federal Endangered Species Act at the time that the LTMS Final EIS/EIR was being prepared. Table J-2 identified direct entrainment by dredge in San Pablo Bay, and Suisun Bay (including marshes), as a potential impacts on longfin smelt. Table J-2 includes a work window from September 1 to November 30 from the Carquinez Bridge to Collinsville, and from August 1st to January 31st in San Pablo Bay, to protect longfin smelt, with consultation required at all other times.

According to the Department of Fish and Game, longfin smelt presence data (Baxter 2008, unpublished) supports allowing dredging between June and October only for projects in the Delta and south San Francisco Bay, defined as the area south of a line from Hunter's Point to San Leandro Bay.

In 2008, the Fish and Game Commission adopted an emergency regulation under Section 749.3, Title 14, CCR, for incidental take of longfin smelt during the candidacy period, i.e., the period when longfin smelt was being evaluated as a threatened species under CESA. This regulation addressed sand and gravel mining in rivers and streams:

> Take of longfin smelt incidental to otherwise lawful dredging or extraction of sand or gravel resources in a stream or river is authorized for the longfin smelt candidacy period except any dredging activity in the Sacramento-San Joaquin

> Delta east of the river kilometer 90 Sherman Island is prohibited during the effective period of this regulation…

This interim regulation to protect longfin smelt did not address dredging or sand mining in the Bay.

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