LONGFIN SMELT

Spirinchus thaleichthys Ayers, 1860
(Osmeridae)

Global rank G5 (10Aug1998)
State rank S4S5 (24Jun1996; reviewed 5May2006)
State rank reasons
Moderately widespread in southcoastal and southeastern Alaska. Apparently locally abundant throughout range, although overall population size unknown. Trends unknown, but no evidence of declines. Potential threats include pollution and alteration of freshwater and marine habitats. Effects of climate change on marine environment unknown, but of concern.

Taxonomy
Previously regarded as two separate species: *S. dilatus* (longfin smelt) and *S. thaleichthys* (Sacramento smelt). The two forms have been synonymized (Lee et al. 1980). Populations from Washington and the Sacramento-San Joaquin Delta are similar genetically but differ significantly in gene frequencies; Stanley et al. (1995) stated that the delta population warrants management as an isolated and genetically distinct entity. Nonanadromous populations in Harrison and Pit lakes, British Columbia, have been recognized as an undescribed species (*Spirinchus* sp. 1) by some authors.

See Begle (1991) for a classification and phylogeny of osmeroid fishes based on morphology.

General description
An anadromous smelt, body is elongate, slender, and compressed. Head short, mouth large and oblique with long upper jaw reaching at least to below the middle of the eye in adults (Morrow 1980). Color is brown or olive dorsally, silvery white laterally and ventrally (Scott and Crossman 1973, Mecklenburg et al. 2002). No concentric markings on operculum. Pectoral fin longer than head. Fins usually pigmented along the rays, but inter-ray membranes clear (Scott and Crossman 1973). Gill rakers long, 38–47mm on first arch. Teeth small and fine, present on both jaws, tongue, vomer and palatines (Morrow 1980).
Length (cm) 10-14 average (20 max.)

Reproduction
Breeding males develop anal shelf, protruding lateral line, and rough tubercles on scales and

fins (Mecklenburg et al. 2002). Adults spawn at age 2 in streams not far from the sea. In British Columbia and most of range, spawning occurs October-December (Morrow 1980); in California, December-February. According to Wang (1986 in USFWS 1994), this species spawns as early as November, as late as June, with peak February-April (this information evidently pertains to California). Females lay 5,000-24,000 adhesive eggs (average approximately 18,000; Morrow 1980), deposited singly, which hatch in about 40 days (Lee et al. 1980). Young likely rear in fresh water for a considerable time (young fish up to 7.2 cm long have been taken in the Fraser River; see sources in Morrow 1980) before moving downstream to lake or sea. A few adults survive spawning, most die soon after (Scott and Crossman 1973, Morrow 1980). In the Sacramento-San Joaquin system, California, good recruitment is positively correlated with high outflows into Suisun and San Pablo bays which provide better rearing habitat than areas farther upstream.

Ecology
Smelt are important as food for birds and piscivorous fishes. Harvested for subsistence use by dipnet and gillnet in Alaska (Shields 2005).

Larvae school either with other longfin smelt or with Delta smelt, making identification difficult.

Migration
Most populations anadromous; migrate up coastal rivers to spawn. Males precede females to spawning sites. A few populations landlocked.

Food
Eats primarily small crustaceans. Juveniles in freshwater feed on a shrimplike crustacean,

Neomysis mercedis, as well as insect larvae and other bottom-dwelling crustaceans (Dryfoos 1965, Scott and Crossman 1973, Morrow 1980). Adults and juveniles at sea feed on small crustaceans, especially copepods, cumaceans and euphausiids (Morrow 1980).

Habitat
Coastal waters near shore, bays, estuaries, and rivers, and some lakes in British Columbia and Washington. Harvested from 137 m depth in the sea. Although the longfin smelt is reportedly unable to swim between estuaries, unverified records indicate presence up to several miles offshore in both California and Alaska (USFWS 1994). In estuaries usually found in mid to lower water column. Lake adults in deep water by day, move upward at night. Anadromous populations spawn in fresh water close to the ocean; spawning occurs over sand-gravel substrates, rocks, or aquatic plants (USFWS 1994). After hatching, larvae move into surface waters and are transported downstream to brackish-water nursery areas.

Global range
Pacific coast of North America from the Sacramento-San Joaquin estuary and Monterey Bay, California, north to Hinchinbrook Island, Prince William Sound, Alaska; landlocked in Harrison and Pit lakes, British Columbia, and lakes Washington and Union, Washington (Page and Burr 1991). Nonanadromous populations in Harrison and Pit lakes, British Columbia, have been regarded as an undescribed species by some authors. Range includes Willapa Bay, Skagit Bay, Columbia River, Grays Harbor, and Puget Sound in Washington, Coos Bay and Yaquina Bay in Oregon, Fraser River estuary and near Prince Rupert and Vancouver in British Columbia, Dixon Entrance, Yakutat Bay, Prince William Sound, and Cook Inlet in Alaska, Klamath River mouth (few confirmed records), Humboldt Bay (large decline, possibly extirpated), Eel River mouth (little suitable habitat, no recent records), Van Duzen River mouth (possibly extirpated), and the San Francisco Bay-Sacramento-San Joaquin estuary (possibly extirpated) in California (USFWS 1994, Moyle et al. 1995).

State range
Shelikof Strait, southwestern Gulf of Alaska including Cook Inlet and Prince William Sound, south along coast through Southeast Alaska (Mecklenburg et al. 2002, Shields 2005).

Global abundance
Except for abundance information documenting declines in California, only general information is available. In the 1970s, this fish was considered abundant in Humboldt Bay, California, but since 1983 numbers have plummeted. In 1982, the fall midwinter abundance index was 62,929, the second highest on record, while the index was 73 in 1992, 792 in 1993, and 523 in 1994. Despite extensive sampling it has not been collected from Humboldt Bay since 1994. Small numbers may still occur in the Eel (little suitable habitat, no recent records) and Klamath (few confirmed records, two males collected in 1992) river estuaries, California (Moyle et al. 1995). May be common in Willapa Bay, Skagit Bay, and Puget Sound in Washington and in Coos Bay and Yaquina Bay in Oregon; evidently common to highly abundant in the Columbia River and Grays Harbor, Washington. In Alaska, large numbers are found in the Gulf of Alaska (USFWS 1994).

State abundance
Current population size unknown, but considered locally and seasonally abundant, appearing chiefly during spawning runs (Morrow 1980). Large numbers apparently found in the Gulf of Alaska 5 to 6 miles offshore (USFWS 1994).

Global trends
Except for well-documented declines in California, there is a lack of trend information for the remainder of the range, where populations are generally considered common or abundant (USFWS 1994). In California, the species has declined dramatically in the Sacramento-San Joaquin estuary and has apparently disappeared from Humboldt Bay. The remaining California populations are small and of uncertain status (Moyle et al. 1995). See Global abundance comments.

State trends
Unknown.

Global protection
No information available on protected sites; habitat protected where species occurs in nearshore waters of national and state parks, preserves and wildlife refuges. Petitioned for listing under the Federal Endangered Species Act (ESA) in 1992; the U.S. Fish and Wildlife Service subsequently found listing of this species or of the Sacramento-San Joaquin River estuary population in California unwarranted at the time (USFWS 1994). See the Sacramento-San

Joaquin Delta native fishes recovery plan (USFWS 1995) for specific protection needs in California.

State protection
Habitat protected where species occurs in nearshore waters of national and state parks, preserves and wildlife refuges.

Global threats
Threats have been defined only in areas of known declines in the California portion of the range. Declines in the Sacramento-San Joaquin estuary in California are due mainly to the effects of water diversions from the Delta. Low flows result in upstream displacement of the productive freshwater-saltwater mixing zone, constricting the size of favorable habitat and exposing the fish to water project pump intakes and structures (USFWS 1994). It is unlikely that many individuals survive entrainment, but the degree of effect on larvae is not well known (Moyle et al. 1995). Low flows also fail to disperse larvae downstream into productive nursery areas in Suisun Bay (USFWS 1994, Moyle et al. 1995). Other potential threats include pesticide runoff from agricultural areas and invasion by exotic species such as clams and copepods (Moyle et al. 1995, USFWS 1995). The causes for decline in northern California estuaries are unknown but probably similar to those in the Sacramento-San Joaquin estuary (Moyle et al. 1995). Sedimentation due to human activities may also have an effect on northern California estuaries. The loss of tidal marsh habitat and resulting reduced productivity, together with reduced flows in the Mad River due to water diversions and land reclamation, may be responsible for disappearance from Humboldt Bay, California. Due to a two-year life cycle, relatively brief periods of reproductive failure could lead to extirpations (USFWS 1994).

State threats
Potential threats include habitat alteration, reproductive failure and effects of climate change. Freshwater and estuarine habitats may be threatened by pollution (nearshore chronic and acute pollution, including oil spills, wastewater effluent) and reduced fish passage due to diversion of water, although this is unlikely to impact Alaska populations as severely as those in California. Other habitat alteration and impacts to survival could result from dams, timber harvest, mining, and sedimentation (ADFG 2005). High interannual variability is suggested by saltwater trawl surveys; due to their short 2-year life cycle this species is sensitive to relatively brief periods of reproductive failure (USFWS 1994, ADFG 2005). Broad-scale climatic shifts affecting marine ecological conditions are also of potential concern, especially at northerly latitudes where these affects are magnified (ADFG 2005).

State research needs
Information needed on life history, population structure, migration patterns, distribution, abundance, trophic ecology, and habitat needs/use, including instream flow optima. Collect biological samples to determine size, sex ratio, and age structure of populations (ADFG 2005).

Global inventory needs
Obtain specific information on the number of populations and abundance rangewide. Monitor selected populations across range to determine trends.

State inventory needs
Alaska population is poorly known; information needed on general distribution, abundance and trends. Surveys to measure abundance and identify trends should be conducted at index locations. Survey river mouths to the determine limits of upstream spawning habitat (ADFG 2005).

Global conservation and management needs
See State conservation and management needs. Also see restoration objectives for California populations outlined in the Sacramento-San Joaquin Delta native fishes recovery plan (USFWS 1995).

State conservation and management needs
Although likely low, current harvest levels are not monitored; develop protocols to monitor locations, timing, magnitude and level of harvest. Identify and map important habitat areas (marine, estuarine and freshwater) from literature review and survey data (ADFG 2005).

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Acknowledgements

State Conservation Status, Element Ecology & Life History Author(s): McClory, J.G., S. Schoen and T.A. Gotthardt, Alaska Natural Heritage Program, Environment and Natural Resources Institute, University of Alaska Anchorage, 707 A Street, Anchorage, AK. http://aknhp.uaa.alaska.edu.
State Conservation Status, Element Ecology & Life History Edition Date: 5May2006

Life history and Global level information were obtained from the on-line database, NatureServe Explorer (www.natureserve.org/explorer). In many cases, life history and Global information were updated for this species account by Alaska Natural Heritage Program zoologist, Tracey Gotthardt. All Global level modifications will be sent to NatureServe to update the on-line version.

Global Element Ecology & Life History Edition Date: 14Sep1993
Global Element Ecology & Life History Author(s): Hammerson, G.

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