PACIFIC LAMPREY

TAXONOMY

Scientific name: *Lampetra tridentata* (Gairdner, 1836)
Common name: Pacific lamprey
Family: Petromyzontidae

Taxonomic comments:
All northern hemisphere lampreys belong to the subfamily Petromyzontinae; Alaska species are members of the tribe Lampetrini and genus *Lampetra*. The Goose Lake population of *L. tridentata*, presumably derived from sea-run populations from the Klamath drainage, likely deserves recognition as a distinct subspecies (Moyle et al. 1989). Populations in Lake Cowichan and Mesachie Lake, British Columbia, formerly included in *L. tridentata*, is now regarded as a distinct species, *L. macrostoma* (Beamish 1987).

DESCRIPTION

Basic description: A large anadromous and parasitic fish.

General description:
Characterized by the presence of three (in rare cases, two) large sharp teeth on the supraoral bar and three points on each of the central four lateral tooth plates. Elongate body, eel-like, more or less cylindrical toward the head, compressed toward the tail. Two dorsal fins arise far back on body; dorsal fins higher in males than females. Posterial teeth absent. Adults fresh from sea are blue-black to greenish above, silvery to white below. Spawning adults become reddish brown (Morrow 1980). A large lamprey that may grow to over 40 cm total length; however, dwarf landlocked populations do exist in Oregon and California at 19-27 cm total length.

Length (cm): 76

Reproduction:
Spawning occurs in the spring following migration into freshwater. According to Wydoski and Whitney (1979) spawning occurs in June-July in Washington. In southern California, spawning likely begins by late January in most years, and spawning may continue into April (Chase 2001). Female fecundity in Oregon streams ranges from 98,000 to 238,400 eggs (Close et al. 2002). Eggs hatch in 2 to 3 weeks. Ammocoetes remain in stream; metamorphose in 4-6 years (late September-October). Form *macrostoma* in British Columbia: spawns May-August, probably spends 6 years as larva and 2 years as subadult-adult before reproducing; metamorphosis July-October (Beamish 1987). This is the only species of lamprey in which some individuals (from Washington) are known to spawn more than once (Page and Burr 1991).

Ecology:
Can represent a large portion of the biomass in streams where they are abundant, thus making them an important component along with aquatic insects in processing nutrients, nutrient storage, and

nutrient cycling (Close et al. 2002). Young adult lampreys migrating downstream may have buffered juvenile salmonids from predation by birds and fishes and may be an important buffer for upstream migrating adult salmon from marine mammal predators. Overall, very important forage species for various freshwater and marine predators (e.g. freshwater fishes, birds, and marine mammals) (Close et al. 2002).

Migration:
Mainly anadromous; newly metamorphosed individuals migrate from parent stream to Pacific Ocean. In the Santa Clara River in southern California, upstream migration began as early as mid-December or as late as mid-March; peak migration occurred in March in most years (Chase 2001). Goose Lake, California, population migrates up to 20-30 km between lake and tributary stream.

Food:
Adults parasitic on fishes; attach and feed on body fluids. Parasitic stage may last 20-40 months (Lee et al. 1980) (probably 1-2 years in Goose Lake, California, population: Moyle et al. 1989). Ammocoetes (larvae) are filter feeders; feed on microscopic plant and animal material.

Phenology:
Adults die soon after spawning.

Habitat:
Ammocoetes inhabit shallow backwater and eddy areas along edges of streams in mud, silt and sand (Lee et al. 1980). In southern California, adults apparently spend approximately one year in fresh water prior to spawning (Chase 2001). Adults spawn in runs and riffles in rock-, sand-, or gravel-bottomed clear streams, in shallow depressions, or crude nests, 2 inches deep and 4-5 inches in diameter, at the heads of riffles (Wydoski and Whitney 1979). Lake populations in British Columbia spawn at creek mouths, sometimes move up to a few 100 m up creek (Beamish 1987). Goose Lake, California, population spawns in gravel riffles of tributary streams, far enough upstream such that there is adequate ammocoete habitat (muddy backwaters) downstream from the breeding area (Moyle et al. 1989). Maximum depth at sea about 1,400m but usually less than 250m. In Alaska, ammocoetes remain in silt, mud, and sand in shallow eddies and backwaters of streams for 4 or 5 years, then metamorphose, migrate to sea at age 5 or 6, feed at sea 12-14 months, migrate over ~4 months to reach headwater areas, and spawn the following spring (Mecklenburg et al. 2002).

STATUS

Global rank: G5 (1998-08-10)
Global rank reasons:
Widespread distribution around the margins of the northern Pacific Ocean; specific occurrence data are limited, but evidently there are many occurrences in North America; declines have occurred in some areas, but appears to be very abundant in other locations; threatened by dams and habitat degradation.

State rank: S4S5 (2004-06-15)
State rank reasons:
Widespread distribution; most common in marine waters from Bering Sea near Nome to southeast Alaska. Overall abundance and trends unknown, but often found with some local abundance. Threats are minimal. Taken as food on lower Yukon and Kuskokwim Rivers; harvest is currently not documented. Systematics need study.

DISTRIBUTION AND ABUNDANCE

Range:
Global range:
Spawning adults and ammocoetes occur in rivers of the Pacific Coast from the Bering Sea in Alaska to the Santa Ana River, southern California; also off Baja California and along the Pacific coast of Asia (Lee et al. 1980, Page and Burr 1991). In Asia, occurs as far south as the Yuhutu River, Hokkaido, Japan (Scott and Crossman 1973). Adults are wide-ranging in the Pacific Ocean. Dwarf landlocked forms are known from Goose Lake and its tributaries in Oregon and California, Cottonwood Reservoir in Lake County, Oregon and Cowichan Lake, British Columbia (Scott and Crossman 1973, Moyle et al. 1995).

State range:
Found in coastal rivers from Bering Sea near Nome through Southeast Alaska. Known freshwater occurrences include Wood River (Bristol Bay), small streams of Unalaska Island, Moose River (Kenai Peninsula), Copper and Tazlina Rivers (Prince William Sound), Naha River (Yes Bay) and from several locations in southeast (Mecklenburg et al. 2002).

Abundance:
Global abundance:
Information on abundance is limited to an estimate in a British Columbia river (Beamish and Levings 1991) and spotty counts of ammocoetes at fish screen traps and adults during spawning migrations at dams (Weeks 1991, 1993). Migration of young adults out of the Nicola River (Fraser River System, British Columbia) from 1984-1988 was estimated to be approximately 176,000, 19,000, 90,000, and 102,000; at the same time, approximately 749,000, 909,000, 920,000, and 650,000 large ammocoetes, age four to five years, left the river. This indicates the species is abundant in the Fraser River (Beamish and Levings 1991). Counts of ammocoetes conducted by the Army Corps of Engineers at Little Goose Dam, Oregon from 1983-1989 ranged from 19,000 to 65,000 individuals. These numbers are small compared to counts from the 1960s (Weeks 1993). Experimental counts of adults at Bonneville Dam on the Columbia River, Oregon, from 1987-1989 yielded 200, 817, and 6 individuals, respectively (Weeks 1991).

State abundance:
Unknown, but often found in Alaska with some local abundance.

Trends:
Global trend:
Information on range wide population trends is not available. In Oregon there have been widespread observations of sharp declines, but with very little supporting data (Weeks 1991,1993).

The Goose lake population has declined in abundance since 1992 (Moyle et al. 1995). The population in Elsie Lake in British Columbia has apparently been extirpated (Beamish and Northcote 1989).

State trend:
Unknown.

EXISTING PROTECTION

Global protection:
No known protected sites. The Goose Lake population is listed as threatened in California (Moyle et al. 1995). The state of Oregon listed the Pacific lamprey as a sensitive species in 1993 and followed with protected status in 1996 (Kostow 2002).

State protection:
Pacific lamprey is classified by the Alaska Department of Fish and Game as a commercial species. Protected where they occur in Wrangell-St. Elias, Glacier Bay, Kenai Fjords and Lake Clark National Parks, Togiak and Kenai National Wildlife Refuges, and Aniakchak National Monument.

CHALLENGES

Global challenges:
Historically used extensively for food, trade, ceremonial, and medicinal purposes by Indian tribes in Oregon and British Columbia (Scott and Crossman 1973, Weeks 1991). In the 1940s commercially harvested at Willamette Falls on the Willamette River, Oregon. Harvests averaged 300,000 pounds annually and were used to produce a chemical to aid in blood coagulation. Currently, commercial harvest at Willamette Falls ranges from 3,000 to 11,000 pounds annually and is sold as bait or to biological supply houses. Commercial harvest is now prohibited in some areas in Oregon. However, Indian tribes still harvest lamprey for personal use. At Willamette Falls, native harvests are probably comparable to the present level of commercial harvest. In Oregon, native harvests now occur primarily at Bonneville Dam and to a lesser extent at Sherar Falls on the Deschutes River and Willamette Falls, on the Willamette River. Current causes of declines are probably the result of obstructions (i.e., dams) that prevent spawning migration of adults and cause habitat degradation of spawning and larval rearing areas (Weeks 1991). The population in Elsie Lake in British Columbia, was apparently extirpated approximately seven years after a dam was constructed at the lake outlet (Beamish and Northcote 1989). A 1990 spill of hydrochloric acid in John Day River, Oregon, resulted in the death of an estimated 10,000 ammocoetes (Weeks 1991). The Goose Lake, California, population may be negatively affected by dams and other obstructions that prevent adults from reaching spawning areas and by stream channelization, grazing, and diversions of water for irrigation, which may cause ammocoete habitat to dry up or become unsuitable (Moyle et al. 1989 and 1995). The degree of this threat was estimated as moderate by the Oregon Heritage Program.

State challenges:
Lampreys are taken as food in Lower Kuskokwim and Yukon rivers and possibly elsewhere in Alaska. Anadromous lampreys appear to have similar habitat needs to salmonids (Vadas 2000), and salmonid stocks in many areas of the Pacific have seen strong declines. Concerns for habitat

destruction and degradation include effects both within streams (e.g. channelization, flow alteration, temperature, impoundment, passage, sedimentation) and coming from outside the stream (e.g. pollution, riparian zone loss, changes to ocean and lake conditions, and climate change).

RESEARCH AND INVENTORY NEEDS

Global research needs:
Monitor several populations throughout range to determine trends. Determine threats and the degree of threats.

State research needs:
Baseline information of distribution, migration, population size, habitat requirements and threats in Alaska are needed. Collection of biological samples necessary to determine size, sex ratio, and age structure of the population. Lamprey diversity in Alaska is poorly documented; systematics studies needed. Importance as forage to freshwater and marine predators needs study, as does this species' role as a parasitic predator of salmonids.

Global inventory needs:
Determine the number of populations and abundance range wide.

State inventory needs:
Monitor abundance and trends in populations; study the viability of lamprey as a commercial species. Obtain local knowledge on lamprey distribution, relative abundance, and harvest. Involve local communities in harvest monitoring effort.

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:
See State conservation and management needs below.

State conservation and management needs:
Obtain local knowledge on lamprey distribution, relative abundance, and harvest. Involve local communities in monitoring harvest effort.

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Global Conservation Status Factors Author: M.K. Clausen, August 1998
Global Element Ecology and Life History Author: G. Hammerson April 2002
