

RIVER LAMPREY



TAXONOMY

Scientific name: *Lampetra ayresii* (Gunther, 1870)

Common name: river lamprey

Family: Petromyzontidae

Taxonomic comments:

Now considered distinct from *L. fluviatilis*, its European analog (Vladykov and Follett 1958). Genetically and morphologically similar to its satellite species, western brook lamprey (*L. richardsoni*), which overlaps in range and is an exclusively freshwater nonparasitic form (Mecklenburg et al. 2002). Specific name was formerly spelled "*ayresi*," but the original spelling ends with *-ii*, so *ayresii* is the correct spelling (Nelson et al. 2004); *L. ayresi* is still generally accepted and common in the literature.

DESCRIPTION

Basic description: An anadromous, parasitic lamprey.

General description:

Body elongate and eel-like, fins yellow; caudal fin with a dark gray blotch, lobed and connected to anal fin-like fold (anal fin well-developed in female, weakly developed in male). Color dark yellow or brown to silver-gray or blue-black above, silver or white below. Seven gill openings on each side, mouth is jawless; a rounded oral sucker with teeth present on and around tongue. Body size and color are the most important distinguishing characteristics at the species level, but arrangement of teeth is most useful at the generic level; supraoral tooth bar with 2 large cusps, absence of posterial teeth, and one sharp, well-developed tongue tooth.

Length (cm): range 12-29, max. 31

Reproduction:

In California, spawns late April-May. In British Columbia, spawning occurs in winter (Beamish and Youson 1987). Adults die shortly after spawning. Females produce about 11,000-37,000 eggs (Morrow 1980). Ammocoete (larval) stage lasts several years; transformation into adult stage occurs when ammocoetes reach about 12 cm in British Columbia, where metamorphosis begins in July and is completed in April of the following year (Beamish and Youson 1987). In general, spawning behavior is largely undocumented (Morrow 1980).

Ecology:

Adults may be eaten by game fishes during spawning migrations. Utilized fresh or smoked by some human cultures (Lamb and Edgell 1986).

Sometimes called predators, rather than parasites, because they consume flesh of their hosts, which likely do not often survive attacks (Beamish and Williams 1976, Beamish and Youson 1987). In the Fraser River plume, British Columbia, river lampreys kill an estimated 2-8 million salmon and 18-20 million herring annually (Beamish and Youson 1987). In the Strait of Georgia, British Columbia, approximately 667,000 lampreys were responsible for the deaths of about 60 million juvenile fishes in 1975 (Beamish 1980).

Migration:

Metamorphosed individuals migrate to sea and return to freshwater to spawn. In British Columbia, adults migrate back into freshwater by September (Beamish and Youson 1987).

Food:

Ammocoetes filter feed on algae and microscopic organisms in stream water from burrows in sediment. Adults are parasitic on various fish species including Pacific herring (*Clupea harengus pallasii*), American shad (*Alosa sapidissima*), steelhead (*Salmo gairdneri*) and 5 species of salmon (*Oncorhynchus* spp.); mid-sized salmonids are primary prey (Roos et al. 1973, Beamish and Williams 1976, Bond et al. 1983, Beamish and Youson 1987). Adults attack fish in salt or fresh water, feeding mainly on muscle tissue and body fluids.

Phenology:

Nocturnal migrations reported for many populations, but migration and spawning may occur night and day (Beamish 1980, Beamish and Youson 1987).

Habitat:

Fresh and salt water. Confined to major river systems, not smaller streams like its satellite species, *L. richardsoni* (Beamish pers. comm.). Ammocoetes burrow in mud in silty backwaters of streams. Adults are anadromous, feeding in estuaries and at sea (Lee et al. 1980). In British Columbia congregates immediately upriver of salt water just prior to metamorphosis; enters ocean from May to July (Beamish and Youson 1987). Adults probably spend much of their lives in estuaries (Moyle et al. 1989). Spawns in small, clean tributary streams, over gravel riffles. Probably spawns in saucer-shaped nests in sand and gravel (Wydoski and Whitney 1979). Habitat requirements are very similar to those of salmonids, and presence of lamprey ammocoetes is often an excellent indicator of salmon populations and habitat (Beamish pers. comm.).

STATUS

Global rank: G4 (26Jan2005)

Global rank reasons:

Spotty, moderately widespread distribution in west-coastal North America; possibly declining in some areas; possibly threatened by habitat alteration and degradation. Apparently secure at present, but better information on current status is needed.

State rank: S2 (21Jun2005)

State rank reasons:

Known distribution restricted to a few locations in southeastern Alaska. Population status and trends unknown, but suspected uncommon. Few threats, although there is potential concern related to habitat alteration and degradation.

DISTRIBUTION AND ABUNDANCE

Range:

Global range:

Occurs as widely scattered, isolated populations along the Pacific Slope, from the Sacramento-San Joaquin drainage, California, to Tee Harbor near Juneau, Alaska (Lee et al. 1980, Page and Burr 1991, Moyle et al. 1995, Moyle 2002). In California, recorded from the lower Sacramento and San Joaquin drainages (especially the Stanislaus and Tuolumne rivers); the Napa River, Sonoma Creek, and Alameda Creek (tributaries to San Francisco Bay); in Salmon Creek and in tributaries to the lower Russian River (Sonoma County); a single adult female was captured at Cape Horn Dam in the Eel River; this species has not been adequately surveyed in most California streams (Moyle 2002). In Oregon, river lampreys have been found at sites 182 km apart in the Columbia and Yaquina rivers (Moyle 2002). According to the Center for Biodiversity, the species has not been documented in the Columbia River or anywhere in Oregon since 1980. Detailed distribution records are not available for Washington; known only from Lake Washington (Beamish pers. comm.). In British Columbia, in the center of the range, river lampreys have been reported from the Strait of Georgia and Fraser River (Beamish and Neville 1995). In southeastern Alaska, species has been recorded north of Juneau at Tee Harbor-Lynn canal area, Douglas Island, Taku River, and in Portland Canal (Mecklenburg et al. 2002). Probably occurs coastally in areas south of Juneau.

State range:

Southeastern Alaska, north of Juneau at Tee Harbor-Lynn canal area, Douglas Island, Taku River, and in Portland Canal (Mecklenburg et al. 2002). Probably occurs coastally in areas south of Juneau.

Abundance:

Global abundance:

This species may be very common locally, especially at the ammocoete stage, making up a large part of the stream biomass where present; as adults, abundance is difficult to monitor because the species is anadromous (Beamish pers. comm.). Little specific abundance information is available, and general comments regarding abundance are contradictory. According to Scott and Crossman (1973), probably uncommon in British Columbia although more abundant to the south. However, Moyle et al. (1995) and Moyle (2002) reported it was abundant in British Columbia, the center of the range, but has relatively few records from California, the southernmost portion of the range. Considered uncommon by Page and Burr (1991). In California, probably most abundant (but not observed in large numbers) in the Sacramento-San Joaquin river system (Moyle et al. 1989). Possibly sparse in Washington rivers, where few have been documented (Wydoski and Whitney 2003). Uncommon in Alaska (Mecklenburg et al. 2002).

In the Strait of Georgia, British Columbia, Beamish and Williams (1976) estimated 667,000-6,206,000 adult individuals in 1976, and 6,500,000 adults in 1979, with a corresponding average density of 27 ammocoetes/m² for the area in that year (Beamish and Youson 1987).

State abundance:

Specific information on abundance is lacking. Not often found in Alaska (Mecklenburg et al. 2002) and considered limited in abundance (Morrow 1980). However, may be very common locally, especially at the ammocoete stage, but is difficult to monitor at adult anadromous stage (Beamish pers. comm.).

Trends:

Global trend:

Specific information on population trends is not available. According to Moyle et al. (1995) and Moyle (2002), population numbers are unknown in California but are likely declining, coincident with the degradation of suitable spawning and rearing habitat in the lower reaches of larger rivers. Because these lampreys are easy to overlook, they may be more abundant than available information indicates (Moyle 2002). Apparently doing well in Fraser River, British Columbia, possibly because sturgeon predators are heavily fished there (Beamish pers. comm.).

State trend:

Unknown.

PROTECTION

Global protection:

Unknown.

State protection:

Species afforded no formal protection in Alaska. Subsistence and commercial lamprey harvest is regulated by the Alaska Department of Fish and Game (ADFG).

CHALLENGES

Global challenges:

Specific threats and their effects are undefined. Potentially threatened by habitat alteration and degradation due to dams, diversions, pollution, channelization/dredging, urbanization, and other factors (Moyle et al. 1995). Renaud (1997) stated that the major cause of lamprey species' declines in the Northern Hemisphere is habitat degradation through pollution and stream regulation (dams). Stream regulation has altered some habitats and prevented access to spawning grounds (Renaud 1997).

State challenges:

Threats to this species generally unknown in Alaska; habitat is probably close to pristine in most areas. Habitat degradation through pollution and stream flow regulation (dams) is a primary cause of general lamprey declines elsewhere in the Northern Hemisphere (Renaud 1997), but is likely not a serious threat in Alaska. Lampreys appear to have habitat needs and life histories similar to

anadromous salmon; therefore, in areas where salmon populations are declining, co-occurring lampreys may also be at risk.

RESEARCH AND INVENTORY NEEDS

Global research needs:

See State research needs.

State research needs:

Baseline information needed on population age structure, diet, migration, and species identification. Research needed on the effects of *L. ayresii* predation on populations of salmon and other fishes. Taxonomic status of lampreys is poorly studied; continued genetic research is needed to determine whether subgenera *Lethenteron* and *Lampetra* should actually have full generic status. Research needed on habitat associations, requirements, and threats. Importance as prey to freshwater and marine predators needs study, as does the species' role as a salmonid parasite. Compare *ayresii* populations from different geographic locations to identify morphological differences, if any.

Global inventory needs:

Determine the number of populations and abundance rangewide. Monitor selected populations throughout the range to determine trends. Investigate threats and their effects.

State inventory needs:

Determine population size and trend in Southeast Alaska. Key or important habitats are largely undescribed; identify freshwater lakes and streams used by ammocoetes and metamorphosing adults. Identification of ammocoetes is easily learned and very useful both for determining lamprey population status as well as identifying salmon habitat and likely presence; field identification training for fisheries workers would be worthwhile and add to our knowledge of both groups of fish (Beamish pers. comm.).

CONSERVATION AND MANAGEMENT NEEDS

Global conservation and management needs:

See State conservation and management needs.

State conservation and management needs:

Conserve spawning habitat where susceptible to pollution and development; monitor populations to determine trends. Develop unified protocols for fisheries researchers statewide to share data, coordinate sampling efforts, and collect specimens for genetic analysis (ADFG 2005). Since this species' habitat requirements are similar to those of salmon, specific lamprey populations may need protection where salmon habitat is known to be threatened.

LITERATURE CITED

- Alaska Department of Fish and Game (ADFG). 2005. Our wealth maintained: a strategy for conserving Alaska's diverse wildlife and fish resources. A Comprehensive Wildlife Conservation Strategy emphasizing Alaska's nongame species. Submitted to the U.S. Fish and Wildlife Service, Anchorage, AK.
- Beamish, R. J. 1980. Adult biology of the river lamprey (*Lampetra ayresi*) and the Pacific lamprey (*Lampetra tridentata*) from the Pacific coast of Canada. *Can. J. Fish. Aqua. Sci.* 37:1906-1923.
- Beamish, R. J. 2005. Personal communication between Richard Beamish, Pacific Biological Station, Fisheries and Oceans Canada, and Jodi McClory, Alaska Natural Heritage Program, Anchorage, AK, in the form of review comments for the draft conservation status report on *Lampetra ayresi*.
- Beamish, R. J. and C. E. M. Neville. 1995. Pacific salmon and Pacific herring mortalities in the Fraser River plume caused by river lamprey (*Lampetra ayresi*). *Can. J. Fish. Aqua. Sci.* 52(3): 644-650.
- Beamish, R. J., and N. E. Williams. 1976. A preliminary report on the effects of river lamprey (*Lampetra ayresii*) predation on salmon and herring stocks. Technical report no. 611. Department of the Environment Canada, Pacific Biological Station, Nanaimo, B.C.
- Beamish, R. J., and J. H. Youson. 1987. Life history and abundance of young adult *Lampetra ayresi* in the Fraser River and their possible impact on salmon and herring stocks in the Strait of Georgia. *Can. J. Fish. Aqua. Sci.* 44:525-537.
- Bond, C. E., T. T. Kan, and K. W. Myers. 1983. Notes on the marine life of the river lamprey, *Lampetra ayresi*, in Yaquina Bay, Oregon, and the Columbia River estuary. *Fishery Bulletin* 81:165-167.
- Lamb, A., and P. Edgell. 1986. Coastal fishes of the Pacific Northwest. Harbour Publishing Co., Madeira Park, B.C.
- Lee, D. S., C. R. Gilbert, C. H. Hocutt, R. E. Jenkins, D. E. McAllister, and J. R. Stauffer, Jr. 1980. Atlas of North American Freshwater Fishes. North Carolina State Museum of Natural History. 867 pp.
- Mecklenburg, C.W., T.A. Mecklenburg and L.K. Thorsteinson. 2002. Fishes of Alaska. American Fisheries Society. Bethesda, MD. 1037 pp.
- Morrow, J.E. 1980. The freshwater fishes of Alaska. Alaska Northwest Publishing Company, Anchorage, AK.

- Moyle, P. B. 2002. Inland fishes of California. Revised and expanded. University of California Press, Berkeley, CA. xv + 502 pp.
- Moyle, P. B., J. E. Williams, and E. D. Wikramanayake. 1989. Fish species of special concern of California. Final report submitted to California Dept. of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA. 222 pp.
- Moyle, P. B., R. M. Yoshiyama, J. E. Williams, and E. D. Wikramanayake. 1995. Fish species of special concern in California. Second edition. California Department of Fish and Game, Inland Fisheries Division, Rancho Cordova, CA. iv + 272 pp.
- Nelson, J. S., E. J. Crossman, H. Espinosa-Perez, L. T. Findley, C. R. Gilbert, R. N. Lea, and J. D. Williams. 2004. Common and scientific names of fishes from the United States, Canada, and Mexico. American Fisheries Society, Special Publication 29, Bethesda, MD. 386 pp.
- Page, L. M., and B. M. Burr. 1991. A field guide to freshwater fishes: North America north of Mexico. Houghton Mifflin Company, Boston, MA. 432 pp.
- Renaud, C. B. 1997. Conservation status of Northern Hemisphere lampreys (Petromyzontidae). *Journal of Applied Ichthyology* 13: 143-148.
- Roos, J.F., P. Gilhousen, S.R. Killick and E.R. Zyblut. 1973. Parasitism on juvenile Pacific salmon (*Oncorhynchus*) and Pacific herring (*Clupea harengus pallasii*) in the Strait of Georgia by the river lamprey (*Lampetra ayresii*). *J. Fish. Res. Board Can.* 30:565-568.
- Scott, W. B., and E. J. Crossman. 1973. Freshwater fishes of Canada. Fisheries Res. Bd. Canada, Bull. 184. 966 pp.
- Vladykov, V.D., and W.I. Follett. 1958. Redescription of *Lampetra ayresii* (Gunther) of Western North America, a species of lamprey (Petromyzontidae) distinct from *Lampetra fluviatilis* (Linnaeus) of Europe. *J. Fish. Res. Board Can.* 15:47-77.
- Wydoski, R. S., and R. R. Whitney. 1979. Inland fishes of Washington. The University of Washington Press, Seattle, WA.
- Wydoski, R. S., and R. R. Whitney. 2003. Inland fishes of Washington. Second edition, revised and expanded. American Fisheries Society, Bethesda, MD, in association with University of Washington Press, Seattle, WA. xiii + 322 pp.

Acknowledgements

State Conservation Status, Element Ecology & Life History Author(s): McClory, J.G. and T.A. Gotthardt, Alaska Natural Heritage Program, Environment and Natural Resources Institute, University of Alaska Anchorage, 707 A Street, Anchorage, AK 99501, <http://aknhp.uaa.alaska.edu>.

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Reviewer(s): Richard Beamish, Pacific Biological Station, Fisheries and Oceans Canada, Nanaimo, B.C.

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