

# ARCTIC LAMPREY

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## TAXONOMY

**Scientific name:** *Lampetra camtschatica*

(Tilesius, 1811)

**Common name:** Arctic lamprey, lamprey eel

**Family:** Petromyzontidae

**Taxonomic comments:**

Systematics and nomenclature debated; previously recognized as *Lampetra japonica*; current correct name is *L. camtschatica* (see

sources in Mecklenburg et al. 2002). Subgenus is *Lethenteron*, which has been regarded as a distinct genus by some authors (but not by Page and Burr 1991 or Robins et al. 1991). Closely related and likely ancestral to the nonparasitic American brook lamprey, *Lampetra appendix* (synonym: *L. lamottenii*) and Alaskan brook lamprey, *L. alaskensis* (Docker et al. 1999, Mecklenburg et al. 2002).



Recent genetic data (mitochondrial cytochrome b) indicate *L. camtschatica* and *L. alaskensis* are genetically identical (*L. alaskensis* is considered a derivative or satellite species of *L. camtschatica*; Lang pers. comm.). However, if life history is not a valid criterion for defining species, then on basis of morphology and genetic similarity all three species mentioned (*L. appendix*, *L. camtschatica* and *L. alaskensis*) may be referred to as *L. camtschatica* (Mecklenburg et al. 2002). Hardisty and Potter (1971) included both *L. alaskensis* and *L. camtschatica* in the subgenus *Lethenteron*.

## DESCRIPTION

**Basic description:** An anadromous, parasitic lamprey.

**General description:**

Body elongate and eel-like with two dorsal fins arising far back on the body (second with a dark blotch), and caudal fin connected to anal fin-like fold (well-developed in female, weakly developed in male). Brown to blue-black above, light brown, yellow or silver beneath. 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, presence of posterial teeth, and sharp, well-developed tongue teeth. Ammocoetes (larvae) usually gray above and lighter below (McPhail and Lindsey 1970).

**Length (cm):** range 13-36, max. 62

**Reproduction:**

Spawning occurs in spring, generally late May-early July at water temperatures of 12-15°C (Heard 1966). Female may spawn with more than one male. Up to 100,000 eggs laid by female; eggs hatch

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within a few weeks. Ammocoete stage lasts at least 1 year, possibly up to 4 years. Metamorphosis occurs in fall (Hardisty and Potter 1971, Scott and Crossman 1973).

### **Ecology:**

Life cycle is complex; long-lived larval stage is followed by metamorphosis in which lamprey develop eyes and teeth, then migrate to sea to feed by attaching parasitically to various species of fish. Host species include salmon (*Oncorhynchus* spp.), rainbow trout (*O. mykiss*), pygmy whitefish (*Prosopium coulteri*), ciscoes (*Coregonus* spp.), and three-spined stickleback (*Gasterosteus aculeatus*; Heard 1966, Scott and Crossman 1973). Adults return to freshwater streams to spawn, and die shortly afterward.

An important forage species for various freshwater and marine predators: eggs, larvae and adults preyed on by various fishes including burbot (*Lota lota*), Northern pike (*Esox lucius*) and inconnu (*Stenodus leucichthys*); also taken by gulls, especially when lamprey are concentrated in shallow streams during migration. Declining stream levels in late spring and summer may strand ammocoetes in dry stream edges. At sea, adults may compete for host fishes with Pacific lamprey (*L. tridentata*) where ranges overlap (Scott and Crossman 1973). In Alaska, often found co-occurring with Alaskan brook lamprey, *L. alaskensis* (Mecklenburg et al. 2002). Early descriptions of resident freshwater nonparasitic Arctic lamprey are now believed to refer to Alaskan brook lamprey, as no resident freshwater populations of *L. camtschatica* occur in North America (Mecklenburg et al. 2002, Renaud pers. comm.).

Marks to host fishes resulting from attachments of Arctic lamprey were reported on up to 60% of pink salmon (*O. gorbuscha*) in the Gulf of Amur, Kamchatka Peninsula, and caused scarring to 60% of herring (*Clupea pallasii*) captured in the White Sea (see sources in Beamish and Youson 1987).

An extremely oily fish; approximately 38% of an adult's body weight is oil (Gay 2003). Harvested for subsistence use by Alaskan Natives on the Yukon and Kuskokwim Rivers (Brelsford et al. 1987, Keim 2000). A small commercial fishery on the Yukon River commenced in 2003 (Hayes and Salomone 2004).

Lamprey generally thought of as occurring in species pairs, one species being parasitic and anadromous and its congener a nonparasitic freshwater resident; *L. camtschatica* is sympatric with dwarf freshwater derivative *L. alaskensis* (Mecklenburg et al. 2002).

### **Migration:**

Metamorphosed lampreys move downstream to sea, lakes, or larger rivers during August-November. Adults migrate upstream to spawn in spring. Migrating adults often seen in vast swarms, particularly at obstructions (Scott and Crossman 1973).

### **Food:**

Invertivore, piscivore. Ammocoetes filter-feed on microscopic plants and animals. Adults parasitize and consume blood and body juices of various host fishes (Scott and Crossman 1973, Morrow 1980); see Ecology comments.

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### **Phenology:**

Ammocoetes primarily active at night, burrow into sediments during the day. Adult spawning migrations may occur day and night.

### **Habitat:**

In nonbreeding season, at sea to 50 m depth. Ammocoetes burrow into soft stream margins and beds of silty mud in backwaters. Spawns in clear streams of moderate flow, out of the main current at water temperatures of 12-15°C. Nest is a depression or pit constructed by both sexes in gravel (Heard 1966). Habitat requirements apparently very similar to those of anadromous salmonids (Beamish pers. comm.).

## **STATUS**

**Global rank:** G4 (05Sep1996)

### **Global rank reasons:**

Apparently secure.

**State rank:** S4 (21Jun2005)

### **State rank reasons:**

The most commonly occurring lamprey in Alaska; widely distributed. Overall abundance and trends unknown, but often found with some local abundance. Threats are minimal, although a commercial fishery for this species was initiated on the Lower Yukon River in 2003. Harvested for subsistence use although level of harvest is currently undocumented. Systematics needs study.

## **DISTRIBUTION AND ABUNDANCE**

### **Range:**

#### **Global range:**

In Alaska, from Kenai Peninsula north along Bering Sea drainages and east along Arctic Ocean drainage as far as Anderson River; eastward across North America to Northwest Territories and south to Great Slave and Artillery Lakes. Almost circumpolar, from Lapland eastward to Kamchatka, Russia and south to Japan and Korea (McPhail and Lindsey 1970).

#### **State range:**

Widespread throughout the state from the Kenai Peninsula north along Bering Sea drainages and east along Arctic coast as far as the Anderson River. Occurs inland up the Yukon, Kuskokwim and Tanana River drainages and around St. Lawrence Island. Absent from Southeast Alaska (Morrow 1980, Mecklenburg et al. 2002).

### **Abundance:**

#### **Global abundance:**

Unknown; varies locally and seasonally. Considered the most commonly occurring lamprey in Alaska, often found with some local abundance.

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### **State abundance:**

Unknown, although considered the most commonly occurring lamprey in Alaska, often found with some local abundance. Large numbers ascend the lower Yukon, Kuskokwim and Naknek Rivers to spawn (Morrow 1980, Mecklenburg et al. 2002). In November 2003, about 50,000 lbs. were commercially harvested on the lower Yukon River during a six hour fishery (Hayes and Salomone 2004).

### **Trends:**

#### **Global trend:**

Unknown.

#### **State trend:**

Unknown.

## **PROTECTION**

### **Global protection:**

No protective measures or legislation encompassing this species in Canada except for the general protection offered by the Habitat Sections of the Fisheries Act (Houston 1991). No formal protection in the U.S. (Renaud 1997).

### **State protection:**

Species afforded no formal protection in Alaska. Subsistence and commercial harvests are regulated by the Alaska Department of Fish and Game (ADFG). Classified as a commercial species by ADFG.

## **CHALLENGES**

### **Global challenges:**

Threats to spawning habitat include pollution and water flow regulation or dams. Since little is known about local abundance and population trends, there is the potential for overharvest in subsistence and commercial fisheries. Lamprey appear to have habitat needs and life histories similar to anadromous salmon; therefore, in areas where salmon populations are declining, lamprey may also be at risk. The U.S.-Canadian lamprey control program focuses on eradication of the invasive sea lamprey (*Petromyzon marinus*) in the Great Lakes region, and is not generally a threat to Arctic lamprey throughout their North American range. May be threatened in Europe by industrial pollution of spawning streams and capture of ammocoetes for use as bait (Lelek 1987, Renaud 1997).

### **State challenges:**

Possible threats include pollution of spawning streams resulting from industrial and mining development. There is the potential for overharvest by subsistence and commercial fisheries since little is understood about abundance and population trends of this species. Lamprey appear to have habitat needs and life histories similar to anadromous salmon; therefore, in areas where salmon populations are declining, co-occurring lamprey may also be at risk.

## RESEARCH AND INVENTORY NEEDS

### **Global research needs:**

Taxonomic status needs clarification; genetic studies are needed to better define the relationship between *L. alaskensis* and *L. appendix*. Understanding of taxonomic status and evolutionary history of this and other lamprey species may be improved by study of permanent freshwater populations and their relationship to anadromous life-forms of the same species (although no permanent freshwater populations of the Arctic lamprey are known from North America), as well as satellite species. Continue to investigate effects of parasitism on host species populations.

### **State research needs:**

Baseline information needed on population age structure, diet, migration, and species identification. Importance as prey to freshwater and marine predators needs study, as does the species' role as a salmonid parasite.

### **Global inventory needs:**

Compile existing data (e.g., commercial fish records, subsistence harvest documentation) throughout range to better assess population status (ADFG 2005). Conduct surveys at index locations to gauge population trend.

### **State inventory needs:**

Obtain local knowledge on lamprey distribution, relative abundance, and harvest. Conduct surveys at index locations to gauge population trend.

## CONSERVATION AND MANAGEMENT NEEDS

### **Global conservation and management needs:**

A conservation status assessment is especially needed in Asia, where almost no information exists for this species (Renaud 1997).

### **State conservation and management needs:**

Determination of population size and trends is a priority for management of subsistence and commercial fisheries. Involve local communities in harvest monitoring effort. Develop sampling protocols to monitor locations, timing, and magnitude of commercial and subsistence harvest. Document the magnitude of commercial fisheries for lampreys in the state; collect samples to provide insight into size and age class, species composition, and sex ratios. Develop unified protocols for fisheries researchers statewide to share data, coordinate sampling efforts, and collect specimens for genetic analysis. Identify and protect important spawning areas from pollution and habitat degradation (ADFG 2005).

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