



Fisheries Fact Sheet

Lamprey (West Coast)

*Lampetra ayresi**Lampetra tridentata*

Two species of parasitic lamprey are found in both freshwater and saltwater on Canada's west coast. As adults, river lamprey (*Lampetra ayresi*) occur in some nearshore marine areas for only a few months during the summer while Pacific lamprey (*Lampetra tridentata*) occur in almost all marine areas and remain in saltwater for several years before returning to spawn in coastal streams.

RIVER LAMPREY

River lamprey spend approximately five years as larvae (or ammocoetes) in freshwater. During this period they are found in the sandy, muddy areas of rivers and streams. They have no eyes or teeth and feed on tiny, often single-cellular plants and animals. Beginning in July, the larvae that are ready to go to sea begin to change into the adult form. This process is called metamorphosis and represents a dramatic and rather rapid transformation of external and internal features. Eyes, a sucking disc and teeth develop and changes occur to all internal organ systems. Changes are complete by October and the larva is now a juvenile.

The juvenile river lamprey probably moves to gravel areas and remains in the stream without feeding until May or June of the next year. Movement into saltwater thereafter is rapid and feeding occurs almost immediately upon contact with prey species such as herring or salmon. Actively feeding river lamprey often can be observed in schools of herring around marinas and docks. Unlike other lampreys that consume body fluids, the river lamprey prefers to attack on the dorsal portion

of the prey, consuming chunks of flesh. The white, exposed wounds of dying herring are often visible when schools of smaller herring appear around boats and docks in June and July.

Once the juveniles have entered the ocean they remain in the surface waters, often in the vicinity of the mouths of large rivers. They increase in size by about 11-14 cm and 12-18 g during the period July to September. Maximum lengths are about 31 cm. By the end of September they are rarely found in saltwater, indicating that they are beginning to return to freshwater. The exact time of entry into freshwater may vary among stocks and individuals.

Spawning occurs in the spring from April to June. During spawning both sexes dig shallow nests in the gravel of the stream by picking up small stones with their suckorial disc and carrying the stones out of the nest. The female then attaches to a large stone in the nest and the male attaches to the head of the female. The male coils its body around the female and fertilizes the eggs that sometimes are squeezed out of the female by the male. The eggs are adhesive and stick to the small stones in the nest. Most females die almost immediately following spawning, while males remain at the nest site for approximately three weeks before they, too, die. The length of adult life, from the onset of metamorphosis until death following spawning, is two years.

Eggs hatch in two to three weeks depending on the water temperature. As soon as the yolk sac is absorbed, the young larvae leave the gravel and move into the sandy, silty areas of the stream.

PACIFIC LAMPREY

The life history of larval Pacific lamprey is similar to larval river lamprey. Unlike juvenile river lamprey, juvenile Pacific lamprey migrate into saltwater over the period November to June of the following year. Movement into saltwater may be initiated by high water levels caused by the fall rains, but not all lamprey from all streams enter saltwater at the same time. The average size of juveniles when they enter saltwater is 13 cm. Pacific lamprey move into deeper water in all marine areas where they probably begin to feed immediately. They feed on a variety of fishes including salmon, herring, hake, pollock, flatfish (including halibut) and rockfish. They also have been reported to attack whales. Pacific lamprey are frequently found attached to pink salmon off the southwest coast of Vancouver Island or on sockeye salmon in the vicinity of the Fraser River.

Mature adults exhibit a considerable variation in size, ranging from 16 cm to over 70 cm depending on their river of origin. However, the average size of most Pacific lamprey ranges from 30-40 cm. It is not known if the range in size is related to the duration of saltwater life, the availability of food or some other cause. It has been shown that Pacific lamprey can remain in saltwater for three to four years and it is suspected that most remain at sea for three and a half years.

Adults return to freshwater from April to June and complete their upstream migration by late September. Fish returning in the spring exhibit exceptional migratory instincts in freshwater, often migrating considerable distances that include passage through rapids and up vertical waterfalls. Using their suctorial disc and flips of their tail, Pacific lamprey can move up a 2 m vertical wall in about 15 minutes. Adults remain in the streams and rivers over winter and spawn April to July in the following year. Spawning behaviour is similar to the river lamprey and both sexes die shortly after spawning. The freshwater residence of the returning adults is about 12 months, during which no known feeding occurs and individuals shrink by approximately 20 percent of their maximum length. The average length of life of the adult from the onset of metamorphosis until death following spawning appears to be five years.

NONANADROMOUS PREDACEOUS LAMPREY

Not all predaceous lamprey go to sea (i.e., are anadromous). Nonanadromous or "landlocked" forms exist in some lakes and rivers in Canada and the United States. These lamprey are similar to the Pacific lamprey although some people believe they are sufficiently distinct to be called separate species.

In British Columbia, nonanadromous predaceous lamprey have been found in Lake Cowichan and in Mesachie Lake. Little is known about their life history at this time except that larvae are found in the lake and metamorphosis occurs at approximately the same time as the other species. Adults range in length from 15-25 cm and feed heavily on the resident salmonids in these lakes. More than 50 percent of the salmonids examined in Mesachie Lake had scars or wounds resulting from lamprey attacks and many salmonids killed by lamprey attacks were found on the bottom of the lake.

PREDATION ON RIVER AND PACIFIC LAMPREY

Adult lamprey are consumed in nature by sea lions and seals and in the laboratory by fish such as dogfish and blackcod. Mink also have been observed to feed on lamprey. It is interesting that some sea lions and seals thought to be feeding on salmon were actually feeding on lamprey.

In Europe, lamprey have long been considered a delicacy. In fact, King Henry I of England is reported to have died from eating an excessive amount of lamprey. Markets for lamprey also exist in Japan, yet except for some local demand, no major fishery has developed in British Columbia.

EFFECTS ON COMMERCIAL FISHES

Lamprey appear to be important predators of commercial fishes. Studies have indicated that millions of juvenile herring and salmon are killed by river lamprey in the Strait of Georgia. A rough guess of the number of larger fish killed by each Pacific lamprey during its saltwater residence would be about 300-400 individuals but an estimate of the total mortality cannot be made until approximate estimates of Pacific lamprey abundance can be made. Since larval Pacific lamprey are thought to occur in almost all coastal rivers and streams, the number of fish killed either directly or indirectly by their attacks is thought to be important.

While there is evidence that the abundance of parasitic lamprey is increasing in areas such as Babine Lake and the Fraser River, much of our recent awareness simply results from increased attention given to the study of lamprey. However, because many people are familiar with the story of the destruction of commercial fishes and fisheries in the Great Lakes as a result of the parasitic attacks of the sea lamprey (*Petromyzon marinus*), the question naturally arises whether or not we could have a similar problem in the future on the west coast of Canada. At this time we do not have sufficient information about the biology and relative abundance of the two parasitic species to identify the effects lamprey are having on the size of fish stocks. We also need to determine if we are changing natural controlling factors that might result in drastic increases in lamprey abundance as occurred in the Great Lakes. It is important to remember that lamprey are one of the most primitive fishes still present in the oceans. Since lamprey and prey co-existed long before Europeans arrived on the Pacific coast, we can assume that some kind of balance has evolved to ensure an adequate supply of prey for lamprey. We would expect that unless major alterations to this balance occur, we would not see major increases in lamprey abundance.

Perhaps the greatest danger to west coast fish stocks will occur if the habitat for larvae is improved as a result of increased deposits of silt in rivers and the enrichment of rivers and lakes with nutrient waste. There could also be a serious problem if more stocks of lamprey become "landlocked," or if "landlocked" forms are introduced into major lakes.

The public can assist this study by reporting observations of lamprey or lamprey attacks and, whenever possible, by freezing specimens of lamprey. All reports should be sent to the Pacific Biological Station in Nanaimo, Vancouver Island, British Columbia, or given to a local fishery officer.