

Status of the Lake Lamprey, *Lampetra macrostoma*, in Canada*

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Lampetra macrostoma (Lake Lamprey) is a newly discovered and rare species of freshwater parasitic lamprey. It is a derivative of *Lampetra tridentata* (Pacific Lamprey) and differs from it morphologically primarily by the large size of its disc, and physiologically because of its freshwater habitat. It feeds heavily on freshwater salmonids and poses a definite threat to them if it is introduced into other systems.

La lamproie à grand disque, *Lampetra macrostoma* est une espèce rare de lamproie parasitique dulçaquicole récemment découverte. Elle tire son origine de la lamproie du Pacifique, *Lampetra tridentata*, dont elle diffère surtout par la grande taille du disque et son cycle vital en eau douce. Cette lamproie est un important prédateur de salmonidés dulçaquicoles et constitue une menace certaine pour les autres salmonidés si elle vient qu'à s'introduire dans d'autres systèmes aquatiques.

Key Words: Lake Lamprey, *Lampetra macrostoma*, parasitic lampreys, British Columbia, rare and endangered species, petromyzontiformes.

The Lake Lamprey, *Lampetra macrostoma*, (Figure 1) is endemic to Vancouver Island and the Lake Cowichan watershed. It is the only known *L. tridentata* (Pacific Lamprey) derivative in Canada and the only known freshwater parasitic lamprey in British Columbia. A number of *L. tridentata* derivatives are found in southern Oregon and northern California. These derivatives have freshwater parasitic and freshwater nonparasitic life histories. Several are rare and one, *Lampetra minima*, was purposely eradicated and now is extinct. While some may feel that all parasitic lampreys should be eradicated, it must be remembered that lampreys are one of the most successful groups of living fishes. The Lake Lamprey and the other *L. tridentata* derivatives offer an excellent opportunity to study the reasons for the success of lampreys and it is therefore important that these rare species be conserved.

Distribution

The Lake Lamprey has been found only in two adjacent lakes (Lake Cowichan and Mesachie Lake) on Vancouver Island, British Columbia (Figure 2). The larger lake is the 34-km-long Lake Cowichan, which has a mean depth of 51 m and a maximum depth of 150 m. The much smaller lake, Mesachie Lake, is 2.7 m long with a surface area of approximately 59 hectares and drains into Lake Cowichan.

Protection

There are no existing proposals for either the protection or the control of this species. If the

distribution is confined to the two known lakes, the species is rare. It is a potentially serious source of salmonid mortality, and should not be allowed to enter other lakes.

Population Size and Trends

No population estimates exist. The incidence of wounding and scarring suggests that the population fluctuates. There is no indication that the population is in danger of extinction but research on this species should be continued. Further study is needed to clarify its biological and taxonomic relationships with its close relative, the Pacific Lamprey.

Habitat

The known distribution is extremely restricted. It is probable that its distribution results from anomalous patterns of glaciation during the last glacial period. There is no indication that habitat loss is reducing distribution; in fact, increasing siltation of lakes and rivers may be increasing habitat for ammocoetes. The species is a lake spawner and would be affected by loss of shallow-water gravelly areas used for spawning. Spawning may also occur in some creeks tributary to the system.

General Biology

Like all lampreys, the Pacific Lake Lamprey breeds only once. It is not possible to age lampreys accurately; however, an "educated guess" is that the species is about eight years old when it reproduces (six years as a larva and two years as a young adult and adult). As with all lampreys, it is believed that population size influences reproduction success as well as the sex ratio.

*Rare status assigned by COSEWIC April 1986.



FIGURE 1. Head and tail region of a 22.8-cm *Lampetra macrostoma* photographed live and captured in Lake Cowichan, November 1980.

Lampreys appear to be able to increase abundance relatively rapidly, indicating a relatively high yield per recruit at low population levels. Also, lampreys are known to be at least 300 million years old; hence, they are one of our most primitive and successful fishes. This indicates that the Lake Lamprey may be resourceful and capable of adjusting to a variety of pressures.

The biology of the Lake Lamprey has not been well studied; however, it is known that spawning occurs from May to August and, during this period, there is an aggregation of males and females. Spawning has been observed at the mouth of several creeks. Water spawning area varied from 20 cm to more than 2 m. Spawning occurred in the shallow water, but could not be studied in the deeper water. Larval lamprey are found in the lake in the vicinity of creeks and occasionally in the creeks, but always close to the lake. No Lake Lampreys have been found more than a few hundred metres upstream of the lake in the few creeks that have been examined, and there were no lampreys in the creek connecting Mesachie Lake and Lake Cowichan, suggesting that this species spawns in the lake and young remain in the lake. Spawning behaviour as observed in the laboratory is similar to the behaviour reported for *L. richardsoni*, Western Brook Lamprey, and *L. tridentata* by Pletcher (1963). It is only during the spawning period that adult lampreys are easily captured. Behaviour of young adults at other times is largely unknown and unstudied. Feeding juveniles have been caught by anglers when they have towed live fish on "stringers"

behind their boat. While it is rare to land live lampreys in this manner, one fisherman landed three live Lake Lampreys that had attached themselves to a live Cutthroat Trout, *Salmo clarki*.

The Lake Lamprey metamorphoses into a young adult from July to October. From October to the spring of the following year, the young adult probably remains in the gravel. In the spring, the young adult begins feeding and attacks large numbers of young salmonids including age 1 and 2 Coho Salmon, *Oncorhynchus kisutch*. Feeding continues throughout the summer and fall and into the winter. It is believed that spawning occurs the following year, two years after metamorphosis.

Feeding juvenile adults readily attack resident fishes. Carl (1953) reported that eight out of ten fish examined from Lake Cowichan had evidence of lamprey attacks. Beamish (1982) observed that up to 50% of the salmonids captured in Mesachie Lake throughout the year had evidence of lamprey attacks. The large percentage of wounded and scarred fish may indicate that this lamprey feeds without killing a high percentage of its hosts. Since salmonids remain in the lake and the lake is still popular for sport fishermen, it appears that the Lake Lamprey coexists with its hosts in a manner similar to the landlocked Sea Lamprey, *Petromyzon marinus*, in Cayuga Lake, New York (Wigley 1959). Beamish (1982) reported that in one sample of 221 salmonids 15% had wounds that penetrated deeply into the body and could cause mortality. Thus some mortality does occur. Although the species prefers Coho Salmon and Cutthroat

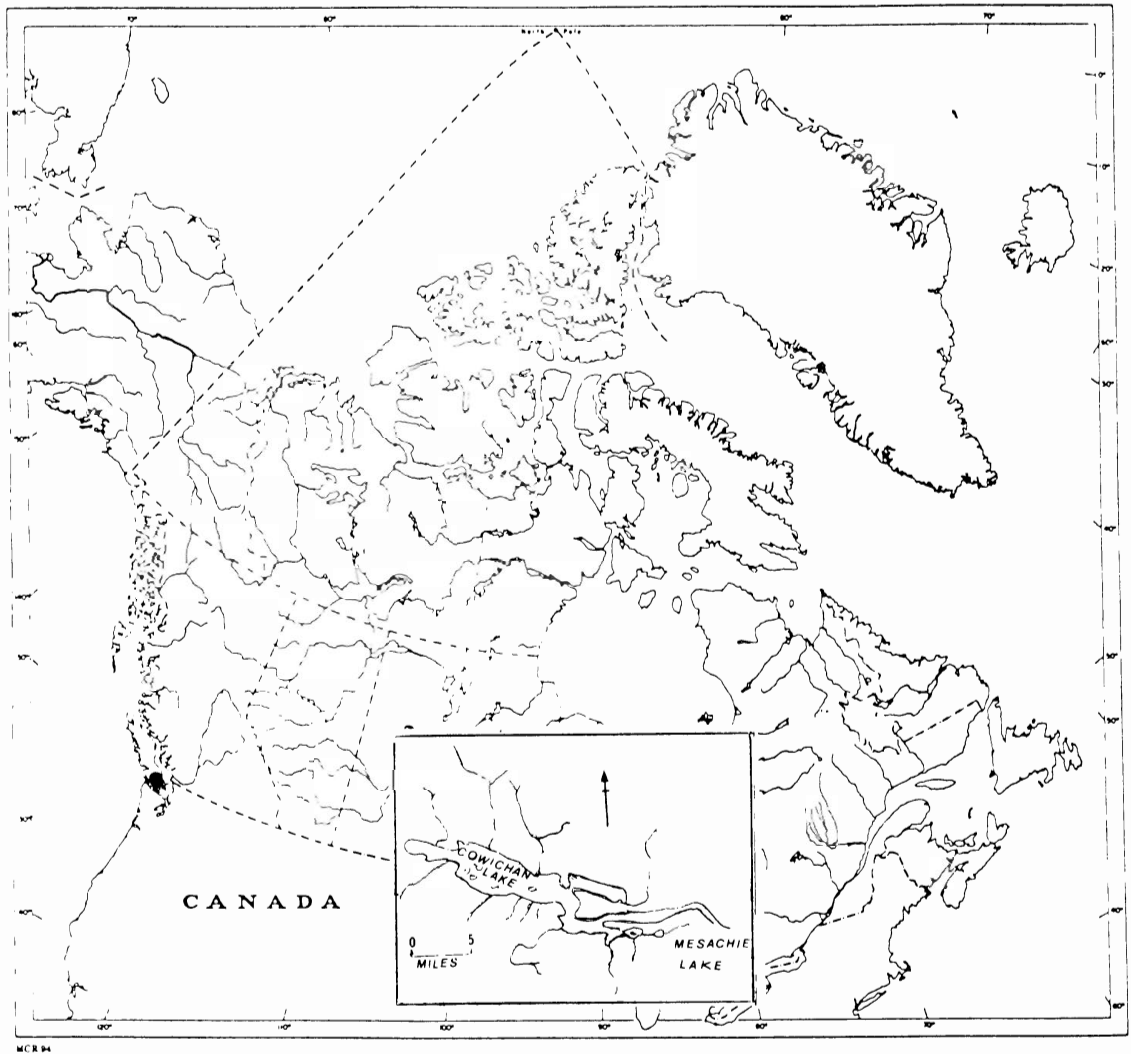


FIGURE 2. Distribution of the Lake Lamprey, *Lampetra macrostoma*.

Trout, other salmonids such as Dolly Varden, *Salvelinus malma*, are attacked.

No Pacific Lamprey adults or ammocoetes have been found in the same areas as the Lake Lamprey. Pacific Lamprey do exist in the river flowing out of Lake Cowichan, but it is unknown if they occur in the lake. The timing and length of spawning period of the Lake Lamprey is different from that of the Pacific Lamprey that occur in the same area of British Columbia (Beamish 1980). The lake spawning habit and the late spawning period could offer effective isolation from the Pacific Lamprey.

It is important to note that this lamprey readily

survives and feeds as a young adult in freshwater whereas its close relative, the Pacific Lamprey, can not be kept as a young adult in freshwater (Beamish 1980, unpublished data).

Limiting Factors

Unknown.

Special Significance of the Species

The Lake Lamprey is endemic to Canada and is only known to exist on Vancouver Island. It is of considerable scientific interest, but it is unlikely that the general public in Canada would understand or

support its preservation and protection. Its occurrence in Lake Cowichan is of particular interest to the understanding of the glacial history of Vancouver Island. It is probable that this species will also provide important information about evolutionary processes in lampreys.

Evaluation

Comments from fishermen about the incidence of observed lamprey wounds suggest that the population fluctuates. Although no population estimates exist, there has been no indication that there is a long-term decline in numbers. Due to its restricted distribution, the species is rare in Canada.

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