

# Updated Status of the Vancouver Island Lake Lamprey, *Lampetra macrostoma*, in Canada<sup>†</sup>

R. J. BEAMISH

Department of Fisheries and Oceans, Pacific Biological Station, 3190 Hammond Bay Road, Nanaimo, British Columbia V9R 5K6, Canada.

Beamish, R. J. 2001. Updated status of the Vancouver Island Lake Lamprey, *Lampetra macrostoma*, in Canada. *Canadian Field-Naturalist* 115(1): 127-130.

The Vancouver Lamprey was originally described in 1982 from a restricted area on Vancouver Island. It is a derivative of *Lampetra tridentata* (Pacific Lamprey), but has a larger disc and is able to survive and feed in freshwater. It feeds heavily on freshwater salmonids and juvenile anadromous Coho Salmon, *Oncorhynchus kisutch*, and would be a predator of other salmonids if it is introduced into other systems.

**Key Words:** Vancouver Island Lake Lamprey, Lamproie à grand disque, *Lampetra macrostoma*, parasitic lampreys, British Columbia, rare and endangered species, Petromyzontiformes.

The Vancouver Island Lake Lamprey, *Lampetra macrostoma*, (Figure 1) is endemic to Vancouver Island and is the only known *Lampetra tridentata*, Pacific Lamprey, derivative in Canada. It is also the only freshwater parasitic lamprey known from British Columbia. Originally described by Beamish (1982), the species was designated by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) as Vulnerable in 1986 (Beamish 1987).

## Distribution

The Vancouver Island Lake Lamprey has been found only in two adjacent lakes, Cowichan Lake and Mesachie Lake, on Vancouver Island, British Columbia (Figure 3). Recently, two other populations of freshwater, parasitic *Lampetra tridentata* like lamprey have been reported from Village Bay Lake, Quadra Island and West Lake, Nelson Island, British Columbia (Figure 3), but their relationship with *Lampetra macrostoma* has not been studied. The larger lake is the 34 km long Cowichan Lake, which has a mean depth of 51 m and a maximum depth of 150 m. The much smaller lake, Mesachie Lake is 2 km to 7 km long and has a surface area of approximately 59 hectares and a generally uniform depth of 33 m.

## Protection

There is no proposed protection or control for this species. If the distribution is confined to the two known lakes, then the species is rare. As local fishermen do not "like" this species, it may become endangered unless its importance as an isolated

species is appreciated. It is also a potentially serious source of salmonid mortality, if introduced to other lakes.

The Conservation Data Centre ranks the species as G1, S1, i.e., both globally and provincially critically imperiled and the Province (British Columbia) as "Red", i.e., threatened.

## Population Size and Trend

No population estimates exist. The incidence of wounding and scarring on prey suggests that the population fluctuates. There is no indication that the population is in danger of extinction, but research on this species should be controlled. There has been no research since the mid-1980s. Further study is needed to identify biological and taxonomic relationships with its close relative the Pacific Lamprey and the two other reported *Lampetra tridentata* like specimens. There has been a recent decline in wild Coho, *Oncorhynchus kisutch*, (DFO 1998) and this may affect the survival or prey preference.

## 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 gravel areas used for spawning.

## General Biology

Like all lake lampreys, the Vancouver Island Lake Lamprey reproduces only once. It is not possible to age a lamprey accurately, however, an "edu-

<sup>†</sup>Vulnerable status originally assigned by COSEWIC April 1986, reaffirmed April 1998.



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

cated guess" is that the species is about 8 years old when it reproduces (6 years as a larva and 2 years as a young adult and adult).

Lampreys appear to be able to increase in abundance relatively rapidly, indicating a relatively high rate of juvenile survival 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 this species and lamprey in general may be adaptable and capable of adjusting to a variety of pressures if allowed to behave naturally. However, this species is not found outside of the two lakes described and it is captured and killed by sport fishermen.

Thus, the biology of the Vancouver Island Lake Lamprey has not been well studied. It is known that spawning occurs from May to August, and during this period, there is an aggregation of males and females on the gravel based deltas. Spawning has been observed at the mouth of several creeks. Spawning areas varied from 20 cm to more than 2 m deep. Spawning occurred in the shallow water, but we could not determine if it occurred in water deeper than 15 cm. Larval lamprey are found in the lake in the vicinity of creeks and occasionally in the creeks, but always close to the lake. No Vancouver Island Lake Lamprey have been found more than a few hundred meters upstream of the lake in the few creeks that have been examined, and there were no lamprey in the creek connecting Mesachie Lake and Cowichan lake. This suggests that this species spawns in each lake and young remain in the lake. Spawning behaviour as observed in the laboratory is similar to the behaviour reported for *Lampetra richardsoni* and *Lampetra tridentata* by Pletcher (1963). It is only during the spawning period that adult lamprey 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 lamprey in this manner, one fisherman landed three live Vancouver Island Lake Lamprey that had attached themselves to a live Cutthroat Trout (*Oncorhynchus clarki*).

The Vancouver Island Lake Lamprey metamorphoses into a young adult from July to October. From October to spring of the following year the young adult probably remains in the gravel. In spring, the young adult begins feeding and attacks large numbers of young salmonids, including age 1 and 2 Coho Salmon. Feeding juveniles readily attack resident fishes. Carl (1953) reported that 8 out of 10 fish examined from Cowichan Lake had evidence of lamprey attacks. Beamish (1982) observed that up to 50% of the salmonids captured in Mesachie Lake throughout the years had evidence of lamprey feeds without killing its hosts. Since salmonids remain in the lake and the lake is still popular for sport fishermen, it appears that the Vancouver Island Lake Lamprey coexists with its hosts in a manner similar to the landlocked Sea Lamprey, *Petromyzon marinus* in Cayuga Lake, New York, USA (Wigley 1959). Beamish (1982) reported that in one sample of 221 salmonids, 15% had wounds that penetrated deeply into the body



FIGURE 2. Coho showing fresh scar from a Lake Lamprey. The salmon was 19 cm in length and found dead on the bottom of Mesachie Lake. Notice the size of the scar relative to the size of the fish and the healed wound posterior to the fresh wound.

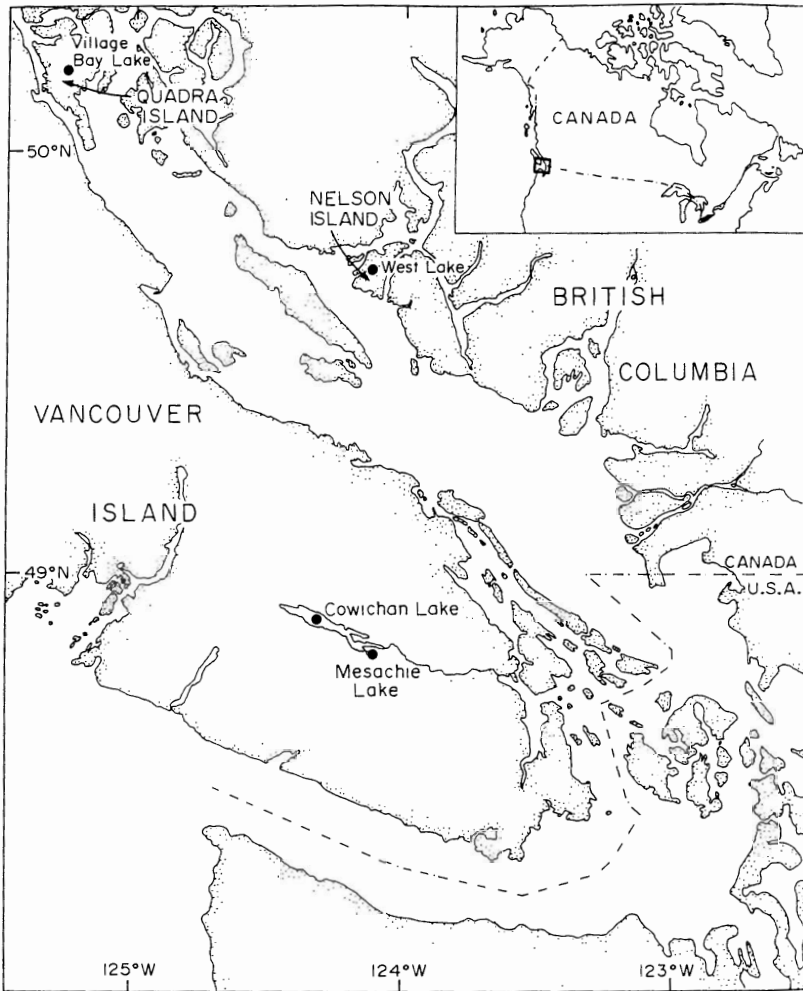


FIGURE 3. Distribution of the Vancouver Island Lake Lamprey, *Lampetra macrostoma*.

(Figure 3) and could cause mortality, thus some mortality does occur. The species feeds primarily on Coho Salmon and Cutthroat Trout. However, other salmonids such as Dolly Varden (*Salvelinus malma*) are attacked.

No Pacific Lamprey adults of ammocoetes have been found in the same area as the Vancouver Island Lake Lamprey. Pacific Lamprey do exist a few kilometers from the lake in the river flowing out of Cowichan Lake, but it is unknown if they occur in the lake. The timing and length of spawning period of the Vancouver Lamprey is different from the Pacific Lamprey that occur in the same area of British Columbia (Beamish 1980). The lake spawning habitat and the late spawning period could offer reproductive isolation from the Pacific Lamprey. It is important to note that this lamprey readily sur-

vives and feeds as a young adult in freshwater, whereas its close relative, the Pacific lamprey, cannot be kept as a young adult in freshwater (Beamish 1980; and unpublished data).

#### Limiting Factors

Unknown.

#### Special Significance of the Species

The Vancouver Island 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 some sectors of the general public would understand or support its preservation and protection. Its occurrence in Cowichan Lake is of particular interest to the understanding of glacial history of Vancouver Island. Confirming the closest

relatives and the molecular genetic dating of the time it split off from a common ancestor would contribute to the study of glacial refugia on 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. There has not been an assessment of this species since the mid-1980s, but its restricted distribution indicates that it will probably remain confined to Cowichan Lake and Mesachie Lake. The abundance could be guessed to be between one or two thousand adults in both lakes. It is also possible that the recent decline in coho abundance has affected the survival or feeding habits, or both, but there have been no studies.

### Acknowledgments

I thank COSEWIC for the opportunity to present this manuscript.

### Literature Cited

- Beamish, R. J.** 1980. The adult biology of the river lamprey (*Lampetra ayresi*) and the Pacific lamprey (*Lampetra tridentata*) from the Pacific coast of Canada. Canadian Journal of Fisheries and Aquatic Sciences 37: 1906–1923.
- Beamish, R. J.** 1982. *Lampetra macrostoma*, a new species of freshwater parasitic lamprey from the west coast of Canada. Canadian Journal Fisheries and Aquatic Sciences 39: 736–747.
- Beamish, R. J.** 1987. Status of the Lake Lamprey, *Lampetra macrostoma*, in Canada. Canadian Field-Naturalist 101: 186–189.
- Carl, G. C.** 1953. Limnobiology of Cowichan Lake, British Columbia. Journal of the Fisheries Research Board of Canada 9: 417–449.
- Department of fisheries and Oceans (DFO).** 1998. Coho salmon final report. Coho Response Team, Fisheries and Oceans Canada, Pacific Region, Vancouver, British Columbia, 508 pages.
- Pletcher, F. I.** 1963. The life history and distribution of lampreys in the Salmon and certain other rivers in British Columbia, Canada. M.Sc. thesis, University of British Columbia, Vancouver, British Columbia, 195 pages.
- Wigley, R. L.** 1959. Life history and distribution of lampreys of Cayuga Lake, New York, U.S. Fish and Wildlife Service Fisheries Bulletin 154: 561–617.

Accepted 29 May 2000