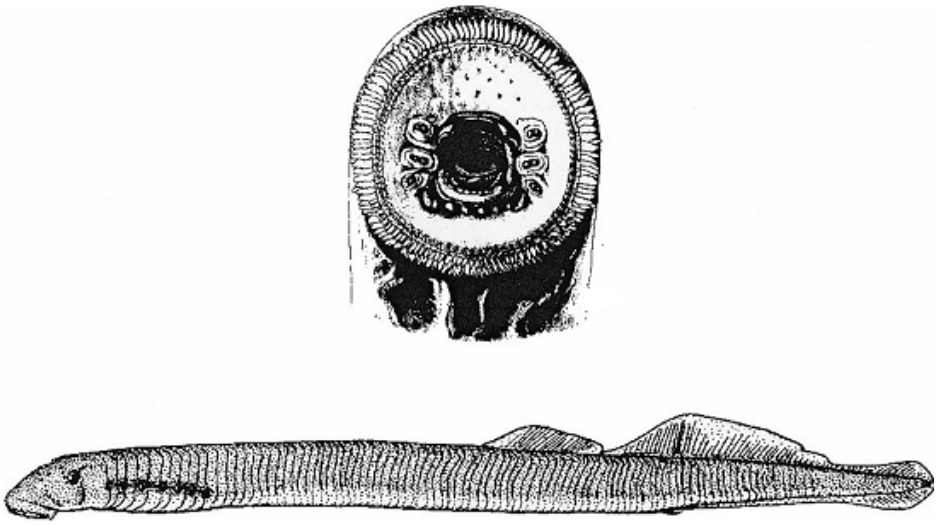
COSEWIC
Assessment Status Report

on the

Morrison Creek Lamprey
Lampetra richardsoni

in Canada



ENDANGERED
2000

COSEWIC
COMMITTEE ON THE STATUS OF
ENDANGERED WILDLIFE
IN CANADA

COSEPAC
COMITÉ SUR LA SITUATION DES
ESPÈCES EN PÉRIL
AU CANADA

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Morrison Creek lamprey — Male Morrison Creek lamprey, *Lampetra richardsoni.* Photograph provided by R.J. Beamish, DFO, Pacific Biological Station, Nanaimo, BC.

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COSEWIC
Assessment Summary

Assessment Summary – May 2000

Common name
Morrison Creek Lamprey

Scientific name
Lampetra richardsoni

Status
Endangered

Reason for designation
Endemic to British Columbia, this single, small population is susceptible to habitat loss from urban development and highway construction.

Occurrence
British Columbia

Status history
Designated Threatened in April 1999. Status re-examined and designated to Endangered in May 2000. Last assessment based on an existing status report.

COSEWIC
Executive Summary
from the 1999 Status Report

Morrison Creek Lamprey
Lampetra richardsoni

Lampreys (Petromyzonidae) are a successful group of vertebrates that have survived for close to 350 million years and have had a conservative evolution. The reason for their evolutionary success is not known but may be attributed to their ability to change among the three adult life history types; anadromous and parasitic, nonanadromous and parasitic, and, nonanadromous and non-parasitic. Direct evidence for this possibility comes from a rare population of *Lampetra richardsoni* that is presently known only from Vancouver Island, Canada. This population produces a potentially parasitic and a non-parasitic adult life history type each year, both of which are nonanadromous. The parasitic form is an undescribed variety of *Lampetra richardsoni*, the Morrison Creek variety. Although the Morrison Creek variety could be considered a new species on the basis of morphology and life history type, the genetic similarity which exists between the two forms indicates that the variety is probably not a new species but rather a unique morph of a single population, representing an intermediate step in the evolution of *Lampetra richardsoni* from an anadromous parasitic ancestor.

Distribution

This polymorphic population of *Lampetra richardsoni* has only been found in the Morrison Creek watershed, located on Vancouver Island, British Columbia, Canada.

Protection

There are currently no protection provisions for the Morrison Creek western brook lamprey.

Population Numbers, Sizes and Trends

There are no reliable population estimates of *Lampetra richardsoni* in Morrison Creek. Data suggest that the Morrison Creek variety was relatively stable during the initial studies which ran from 1978 to 1984, but that their numbers have declined in recent years.

Habitat

The Morrison Creek area is characteristic of interlinking wetlands, with meadows, thick brush, beaver dams and open beaver ponds. The stream bed is dominated by compressed till with limited patches of small gravels and an abundance of stream debris which provide habitat diversity The specific habitat features required to support a polymorphic population of lamprey are not known.

General Biology

The biology of the Morrison Creek variety is not fully understood. Aside from an extended post-metamorphic period and the ability to be parasitic, its biology is very similar to that of typical *Lampetra richardsoni.* Typical Lampetra richardsoni remain in fresh water throughout their entire life cycle and begin to reproduce in May and June, spawning only once. After hatching, the young quickly burrow into the soft bottom sediments where they spend an unknown time (possibly three to seven years) as filter feeding ammocoetes before metamorphosing into juveniles.

The population of *Lampetra richardsoni* in Morrison Creek begins metamorphosis in July or August and two adult forms appear in the spring of the following year: a spawning variety, typical *Lampetra richardsoni*, and a parasitic variety which is not completely mature and could delay another year before spawning. No distinction can be made, however, between the two morphs of the population when they are ammocoetes.

The unusual biology of the Morrison Creek variety appears to represent a key phase of lamprey evolution. The inability to osmoregulate in salt water, the feeding habit in the laboratory, the precocious development in males, and the delayed organ development indicate that the variety is intermediate between a parasitic and non-parasitic form.

Special Significance

The existence of a lamprey population in Canada that produces two distinct life history types has only been described from Morrison Creek. This rare population represents an important transition in the evolution of adult life history types in lampreys and may be the key to understanding why lampreys have developmental timing may explain both the success of lampreys and the presence of two adult life history types among lampreys as a group.

Limiting Factors

The survival of the Morrison Creek *Lampetra richardsoni* complex depends on the protection of the entire lamprey population and its habitat. There has been concern that rapid development in the area has overwhelmed the ability to protect sensitive habitat. Residential development has encroached on the mainstem of the creek and has

resulted in an alteration of the riparian vegetation which poses a definite threat to fish habitat. A recent concern is the short-term and long-term effects of highway construction on fish habitat in Morrison creek, significant loss of fish numbers in a presumably small population, combined with a considerable loss of habitat may prevent the survival of this rare species complex.

COSEWIC MANDATE

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) determines the national status of wild species, subspecies, varieties, and nationally significant populations that are considered to be at risk in Canada. Designations are made on all native species for the following taxonomic groups: mammals, birds, reptiles, amphibians, fish, lepidopterans, molluscs, vascular plants, lichens, and mosses.

COSEWIC MEMBERSHIP

COSEWIC comprises representatives from each provincial and territorial government wildlife agency, four federal agencies (Canadian Wildlife Service, Parks Canada Agency, Department of Fisheries and Oceans, and the Federal Biosystematic Partnership), three nonjurisdictional members and the co-chairs of the species specialist groups. The committee meets to consider status reports on candidate species.

DEFINITIONS

Species	Any indigenous species, subspecies, variety, or geographically defined population of wild fauna and flora.
Extinct (X)	A species that no longer exists.
Extirpated (XT)	A species no longer existing in the wild in Canada, but occurring elsewhere.
Endangered (E)	A species facing imminent extirpation or extinction.
Threatened (T)	A species likely to become endangered if limiting factors are not reversed.
Special Concern (SC)*	A species of special concern because of characteristics that make it particularly sensitive to human activities or natural events.
Not at Risk (NAR)**	A species that has been evaluated and found to be not at risk.
Data Deficient (DD)***	A species for which there is insufficient scientific information to support status designation.

* Formerly described as “Vulnerable” from 1990 to 1999, or “Rare” prior to 1990.
** Formerly described as “Not In Any Category”, or “No Designation Required.”
*** Formerly described as “Indeterminate” from 1994 to 1999 or “ISIBD” (insufficient scientific information on which to base a designation) prior to 1994.

The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) was created in 1977 as a result of a recommendation at the Federal-Provincial Wildlife Conference held in 1976. It arose from the need for a single, official, scientifically sound, national listing of wildlife species at risk. In 1978, COSEWIC designated its first species and produced its first list of Canadian species at risk. Species designated at meetings of the full committee are added to the list.

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R.J. Beamish
L.A. Chapman
J.H. Youson

1999

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ABSTRACT

The Morrison Creek western brook lamprey, is a distinct and rare population of the widely distributed western brook lamprey, *Lampetra richardsoni,* and it is endemic to a small creek on Vancouver Island, Canada. This special population produces both non-parasitic and potentially parasitic adult life history types, representing a unique type of polymorphism in lampreys. The Morrison Creek population demonstrates that a linkage between parasitic and non-parasitic lampreys exists and provides an opportunity to study lamprey speciation and evolution. However, this rare population is at risk since its habitat is currently facing substantial development pressures. The Morrison Creek *Lampetra richardsoni* population must be protected as it has important implications for our understanding of lamprey taxonomy and evolution, and the potentially parasitic variety represents a life history that is difficult to classify with our existing knowledge.

INTRODUCTION

Lampreys (Petromyzonidae) are a successful group of vertebrates that have survived for close to 350 million years and have had a conservative evolution (Forey and Janvier, 1994). The reason for their evolutionary success is not known but may be attributed to their ability to change among the three adult life history types; anadromous and parasitic, nonanadromous and parasitic, and, nonanadromous and non-parasitic (Beamish, 1987). Direct evidence for this possibility comes from a rare population of *Lampetra richardsoni* that is presently known only from Vancouver Island, Canada. This population produces a potentially parasitic and a non-parasitic adult life history type each year, both of which are nonanadromous. The parasitic form is an undescribed variety of *Lampetra richardsoni* which we are tentatively calling the Morrison Creek variety. It should be noted that the variety has not been given official taxonomic status, despite its distinctive life history and morphology relative to *Lampetra richardsoni.* The variety is parasitic in the laboratory and the taxonomy of lampreys uses adult life history type as a species specific character (Zanandrea, 1959; Vladykov and Kott, 1979; Potter, 1980). Therefore, in a sense, this population produces two species according to conventional lamprey taxonomy. However, although the Morrison Creek variety could be considered a new species on the basis of morphology and life history type, the genetic similarity which exists between the two forms indicates that the variety is probably not a new species but rather a unique morph of a single population (Beamish and Withler, 1986).

It is thought that the Morrison Creek variety represents an intermediate step in the evolution of *Lampetra richardsoni* from an anadromous parasitic ancestor (Beamish, 1985; Beamish and Withler, 1986; Youson and Beamish, 1991). The parasitic morph offers a rare opportunity to study the product of an evolutionary transition and to improve our understanding of lamprey taxonomy and evolution. For this reason, it is imperative that the Morrison Creek *Lampetra richardsoni* population is preserved and protected.

DISTRIBUTION

The known distribution is extremely restricted, for this polymorphic population of *Lampetra richardsoni* has only been found in the Morrison Creek watershed, located on Vancouver Island, British Columbia, Canada (Figures 1 and 2). Morrison Creek is a small freshwater stream which originates from a series of springs (Beamish, 1985). Stream channels in the higher gradient headwaters are typically 1-2 m wide and about 3-4 m in width at the lower reaches (Lough, 1995; Beamish, 1985). Morrison Creek runs for approximately 35 kilometers until its confluence with the Puntledge River

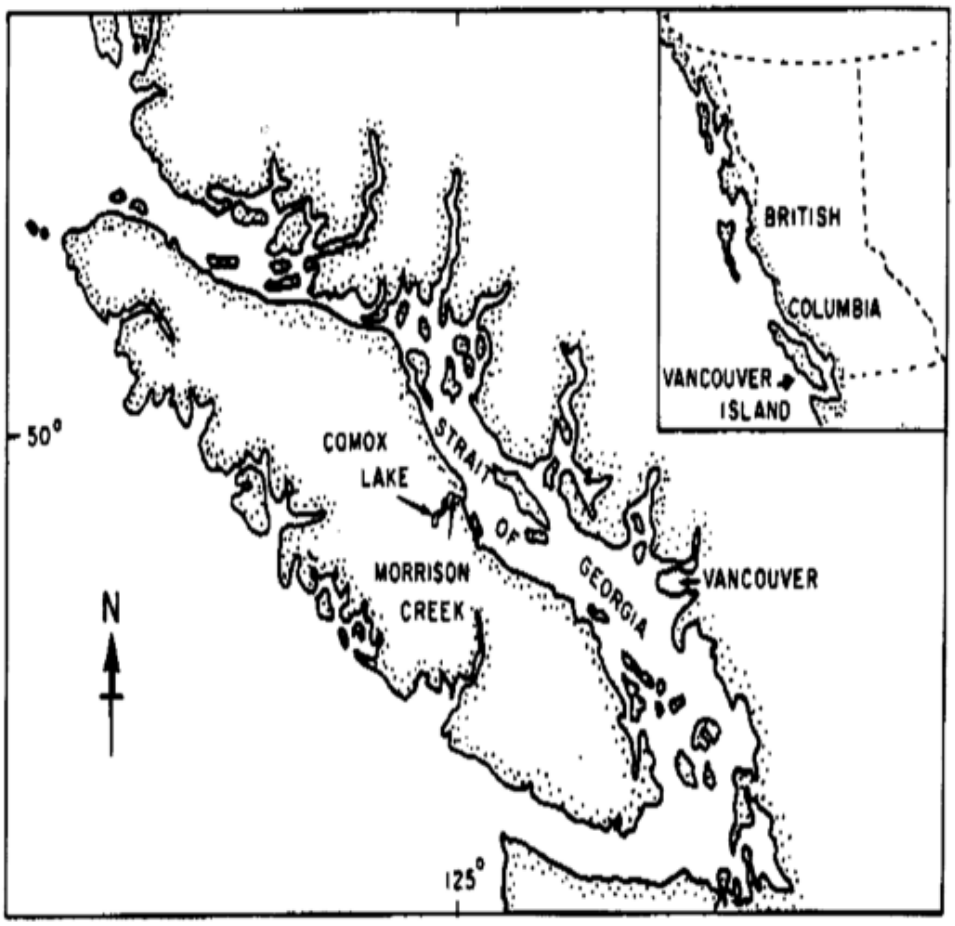

Figure 1. Location of Morrison Creek in British Columbia.

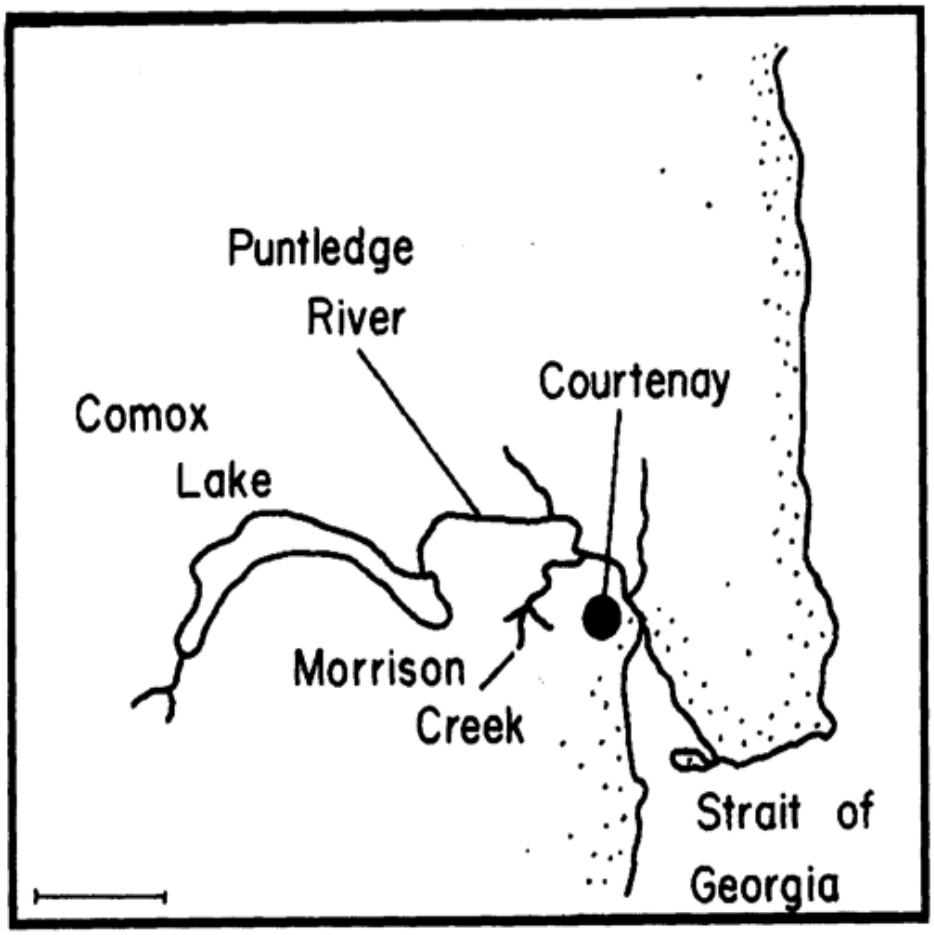

Figure 2. Location of Morrison creek on Vancouver Island, the scale represents 4.2 km.

system, a few kilometers upstream of the ocean (Beamish, 1985). Small numbers of the anadromous *Lampetra tridentata* have also been found in Morrison Creek (Beamish and Withler, 1986).

PROTECTION

There are currently no protection provisions for the Morrison Creek western brook lamprey. However, due to the problems of declining wild Coho stocks in the Strait of Georgia, there has been an increased effort to protect and enhance fish habitat. A sensitive habitat atlas was created for the Comox-Strathcona region. It highlights the areas which contain sensitive aquatic and terrestrial habitat so that they are considered in any proposed land developments (Comox-Strathcona Sensitive Habitat Atlas, 1995). Fish habitat in these areas are subject to fisheries protection regulations and guidelines, however, sometimes encroachment into sensitive habitats can not be avoided, and development plans must resort to mitigation and compensation strategies to replace the losses.

POPULATION NUMBERS, SIZES AND TRENDS

There are no reliable population estimates of *Lampetra richardsoni* in Morrison Creek. The number of spawning individuals (considered to be typical *Lampetra richardsoni*) caught in traps exceeded the number of the variety that have been captured (Beamish and Withler, 1986). Furthermore, a sample of 18 metamorphosed lampreys collected in Morrison Creek produced 2 silver forms (the Morrison Creek variety) and the rest matured, spawned and died in the spring as would typical *Lampetra richardsoni* (Beamish, 1985). Data suggest that the Morrison Creek variety was relatively stable during the initial studies which ran from 1978 to 1984 (Beamish, 1985). However, it is possible that their numbers have declined in recent years (Beamish, unpublished data). The adults of the Morrison Creek variety range in size from 10 to 15 cm, and it is thought that their length increases after metamorphosis are small (Beamish, 1985). The sex ratio of the variety appears to be about 80% male and the males contain gonads in an advanced stage of maturity at a time when females are immature or just beginning to mature (Beamish, 1985). A difficulty has been the inability to catch adults after the summer (or rather to distinguish them from recently metamorphosed lampreys), thus the biology and fate of the variety in Morrison Creek is unknown after the summer period (Beamish, 1985).

HABITAT

Habitat studies conducted on the upper watershed (Lough, 1995; Knight and Blood, 1997) indicate that the Morrison Creek area is characteristic of interlinking wetlands, with meadows, thick brush, beaver dams and open beaver ponds. The stream bed is dominated by compressed till with limited patches of small gravels and an abundance of stream debris which provide habitat diversity (Lough, 1995).

The creek is known for its Coho salmon*, Oncorhynchus kisutch,* habitat and is a major contributor of Coho to the Puntledge River system (personal communication: Brian Allen, Department of Fisheries and Oceans, 148 Port Agusta, Comox, BC). The specific habitat features required to support a polymorphic population of lamprey are not known.

The area surrounding Morrison Creek has, in the past, been disturbed by logging and mining activities which contribute to its complex hydrology (Knight and Blood, 1997). Evidence of development pressures are also seen in the mainstem of the creek where streambank degradation and the removal of in-stream debris has resulted in a loss of the pool / riffle complex (personal communication: Brian Allen, Department of Fisheries and Oceans, 148 Port Agusta, Comox, BC).

GENERAL BIOLOGY

The biology of the Morrison Creek variety is not fully understood. Aside from an extended post-metamorphic period and the ability to be parasitic, its biology is very

similar to that of typical *Lampetra richardsoni* (Beamish, 1985). Typical *Lampetra richardsoni* from Morrison Creek remain in fresh water throughout their entire life cycle and begin to reproduce in May and June (Youson and Beamish, 1991). The lamprey spawn only once and their eggs are deposited in river bed gravel. After hatching, the young quickly burrow into the soft bottom sediments where they spend an unknown time (possibly three to seven years) as filter feeding ammocoetes before metamorphosing into juveniles.

The population of *Lampetra richardsoni* in Morrison Creek begins metamorphosis in July or August and two adult forms appear in the spring of the following year: a spawning variety (Figure 3: C and D) with advanced signs of sexual maturation, typical *Lampetra richardsoni*, and a parasitic variety (Figure 3: A and B), which is not completely mature and could delay another year before spawning (Beamish, 1987; Youson and Beamish, 1991). No distinction can be made, however, between the two morphs of the population when they are ammocoetes.

Electrophoretic and morphological evidence (Beamish and Withler, 1986; Beamish, 1987) has shown that the two forms of *Lampetra richardsoni* in Morrison Creek belong to a single population, thus forming a species complex. For instance, the non-parasitic morph is more genetically similar to the parasitic morph than it is to other *Lampetra richardsoni* populations from different streams. It is uncertain, however, whether the two morphs breed as independent lines. It is possible that the Morrison Creek variety does not survive to reproduce as its internal development at metamorphosis is not complete in all individuals (Youson and Beamish, 1991). However, some individuals of the variety spawn successfully in the laboratory and produce viable eggs which hatch into larvae (Beamish, 1985). Given that spawning was successful in the laboratory, it is possible that the variety is reproducing in Morrison Creek. Identical allelic frequencies indicate that genetic exchange occurs between the two forms of *Lampetra richardsoni* in Morrison Creek (Beamish and Withler, 1986).

The Morrison Creek variety is able to live for one year longer than typical *Lampetra richardsoni* as demonstrated in the laboratory (Beamish, 1987). Youson and Beamish (1991) found that the delayed maturation in males of the Morrison Creek variety allowed the retention of a functional digestive system which would provide an opportunity for feeding. The variety fed (on both live and dead fishes) and grew under laboratory conditions from July until mid-November and matured over the following spring (Beamish, 1985). It is uncertain, however, whether the Morrison Creek variety feeds in the stream, feeding may occur for only a short period and on food items other than live fishes (Beamish, 1985). However, it is also possible that the variety does not feed in Morrison Creek and simply perishes before spawning.

The Morrison Creek variety, when not in spawning condition, is easily distinguished from typical *Lampetra richardsoni* by its silver color and counter shading, which develops in early spring, and by its prominent teeth (Beamish, 1985). It was noted that the feeding variety maintained in the laboratory lost the silver color and became uniformly dark by the end of September (Beamish, 1985).

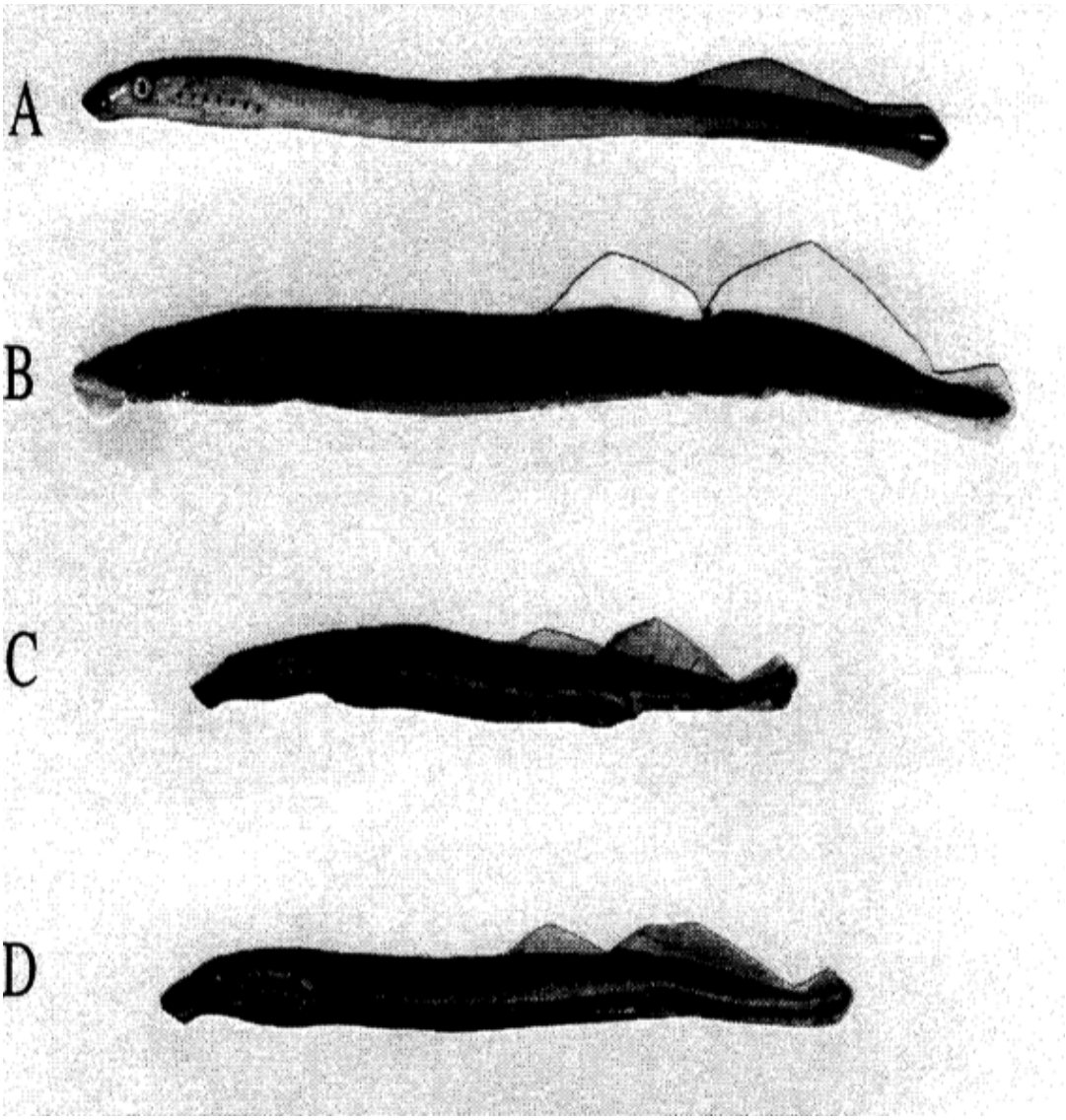

Figure 3. (A) Male of the Morrison Creek variety showing counter shading which develops in the spring following metamorphosis. The variety can live for one year longer than typical *Lampetra richardsoni* and is capable of feeding during this time under laboratory conditions. Total length is 13 cm. (B) Mature male of the Morrison Creek variety brought into the laboratory in June 1981 and reared to maturity in 1982. Total length is 18.5 cm. (C) Mature female and (D) mature male, typical *Lampetra richardsoni* from Morrison Creek, which spawn and die in the spring after metamorphosis. Total lengths are 12.5 cm and 11 cm respectively.

The variety appears to be very similar to the closely related *Lampetra ayresi* but it differs in the number of cusps on some teeth, some aspects of its morphology, in colour, and it is not able to osmoregulate in salt water (Beamish, 1985). It is possible that the Morrison Creek variety may be a natural hybrid of *Lampetra richardsoni* and *Lampetra ayresi,* however, *Lampetra ayresi* have not been found in the Morrison Creek or surrounding watersheds (Beamish, 1985; Beamish and Withler, 1986). Furthermore, no ammocoetes in Morrison Creek with pigmentation patterns typical of *Lampetra ayresi* crosses have been found (Beamish and Withler, 1986).

Youson and Beamish (1991) compared the internal morphology of the two morphs and suggest that the intermediate parasitic lifestyle is due to a slower sexual maturation and, possibly, a slower and incomplete metamorphosis. The incomplete metamorphosis was particularly evident in females, which were far less developed than males, and this may account for the abnormal sex ratio (Youson and Beamish, 1991). In addition, males of the parasitic variety were found to contain gonads in an advanced stage of maturity with no external signs of maturation and were capable of feeding (Beamish, 1985; Beamish and Withler, 1986; Beamish, 1987; Youson and Beamish, 1991). This is the first documentation of a lamprey that is actively feeding in an advanced stage of maturity (Beamish and Withler, 1986; Youson and Beamish, 1991). The unusual biology of the Morrison Creek variety appears to represent a key phase of lamprey evolution. The inability to osmoregulate in salt water, the feeding habit in the laboratory, the precocious development in males, and the delayed organ development indicate that the variety is intermediate between a parasitic and non-parasitic form (Beamish, 1985; Beamish and Withler, 1986; Beamish, 1987; Youson and Beamish, 1991).

SPECIAL SIGNIFICANCE

The existence of a lamprey population in Canada that produces two distinct life history types has only been described from Morrison Creek. This rare population represents an important transition in the evolution of adult life history types in lampreys and may be the key to understanding why lampreys have been successful for over 300 million years.

Lampetra richardsoni is a close relative of the anadromous parasitic *Lampetra ayresi*, and they are considered to be a paired species (Zanandrea, 1959; Vladykov and Kott, 1979; Potter, 1980). The evolutionary relationship between members of a paired species remains uncertain, although there is a widely accepted view that the non-parasitic form evolved from an anadromous parasitic form (Vladykov and Kott, 1979; Potter, 1980). The Morrison Creek variety is intermediate between the non-parasitic *Lampetra richardsoni* and the parasitic *Lampetra ayresi* in its biology and morphology (Beamish and Withler, 1986). According to Zanandrea (1959, 1961), a freshwater feeding phase may be an intermediate step in the evolution of freshwater non-parasitic lampreys from anadromous parasitic forms. The existence of the Morrison Creek variety provides evidence of this intermediate freshwater feeding phase.

Histological evidence indicates that the freshwater parasitic lifestyle of *Lampetra richardsoni* in Morrison Creek is the result of a delayed sexual maturation and, possibly, a delayed and incomplete metamorphosis (Youson and Beamish, 1991). Based on this evidence from the Morrison Creek population, it has been suggested that the appearance of the two morphs within a single population may not necessarily represent an intermediate evolutionary transition but rather the sensitivity of lamprey metamorphosis to environmental factors (Youson, in press). It is hypothesized that the two forms may be the result of a recent heterochrony during metamorphosis which has affected the post metamorphic rate of sexual maturation (Youson, in press). This sensitivity to environmental factors and the change in developmental timing may explain both the success of lampreys and the presence of two adult life history types among lampreys as a group.

In any case, the presence of a parasitic variety of *Lampetra richardsoni* is of special significance to the scientific community as it demonstrates the very close relationship between the two life history types and has important implications to lamprey systematics (Beamish, 1985; Beamish and Withler, 1986). It appears to show that during metamorphosis, it is possible to direct the life history type into two directions. The occurrence of polymorphic populations such as the *Lampetra richardsoni* population found in Morrison Creek also confounds the use of life history type as a basis for defining species (Beamish and Withler, 1986).

LIMITING FACTORS

The survival of the Morrison Creek *Lampetra richardsoni* complex depends on the protection of the entire lamprey population and its habitat. There has been concern that rapid development in the area has overwhelmed the ability to protect sensitive habitat (Comox-Strathcona Sensitive Habitat Atlas, 1995). Residential development has encroached on the mainstem of the creek and has resulted in an alteration of the riparian vegetation which poses a definite threat to fish habitat. A recent concern is the short-term and long-term effects of highway construction on fish habitat in Morrison creek. The B.C. Ministry of Transportation and Highways has proposed to cross two sections of Morrison Creek sometime during 1999 (Lough, 1995; Vancouver Island Highway Project Schedule, 1998). The major fisheries concerns at these crossings are the potential loss of a considerable amount of fish habitat and the possible loss of fish passage at one of the crossings (Ship Environmental Consultants, 1993).

Although mitigation options have proposed to replace habitat loss with an equal area of new habitat, it should not be assumed that all habitat conservation needs will be met in this way (Lough, 1995; Knight and Blood, 1997). It is important that existing fish populations are not compromised by mitigation and enhancement projects and that consideration is given to the effects of these activities on all species within the system.

Given the potential impacts of development pressures, the survival of *Lampetra richardsoni* in Morrison Creek is highly at risk. A significant loss of fish numbers in a presumably small population, combined with a considerable loss of habitat may prevent the survival of this rare species complex.

EVALUATION

Due to its restricted distribution and threatened habitat, the polymorphic population of *Lampetra richardsoni* in Morrison Creek is both threatened and endangered. There is an urgent need to protect this most unusual and poorly understood species complex.

TECHNICAL SUMMARY

Morrison Creek Lamprey
Lampetra richardsoni

DISTRIBUTION

Extent of occurrence in Canada: < 100 km^2
Extent of occurrence in North America: Canadian endemic
Area of occupancy in Canada: < 50 km^2
Range jurisdiction: BC

POPULATION INFORMATION

Total number of individuals in Canadian population: Unknown
Number of mature individuals in the Canadian population: Unknown, but sex ratio is 80% ♂♂
Generation Time: 4-9 years
Population Trend: Decline
% decline over 10 years or 3 generations: Unknown
Number of sub-populations: N/A
Number of extant sites: 1
Number of historic sites from which species has been extirpated: 0
Is the population fragmented: No
Does the species undergo fluctuations: No

THREATS

Habitat loss and degradation resulting from residential development and highway construction.

RESCUE POTENTIAL

As the single population of a Canadian endemic there is no rescue potential.

ACKNOWLEDGMENTS

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LITERATURE CITED

Beamish, R.J. 1985. Freshwater parasitic lamprey on Vancouver Island and a theory of the evolution of the freshwater parasitic and non-parasitic life history types, p. 123-140. *In* R.E. Foreman, A. Gorbman, J.M. Dodd, and R. Olson [ed.] Evolutionary biology of primitive fishes. Plenum Publishing Corporation, New York, NY. 463 p.

Beamish, R.J. 1987. Evidence that parasitic and non-parasitic life history types are produced by one population of lamprey. Can. J. Fish. Aquat. Sci. 44: 1779-1782.

Beamish, R.J. 1987. Status of the Lake Lamprey, *Lampetra macrostoma*, in Canada. Canadian Field-Naturalist 101(2):186-189.

Beamish, R.J., and R.E. Withler. 1986. A polymorphic population of lampreys that may produce parasitic and a non-parasitic varieties, p. 31-49. *In* T. Uyeno, R. Arai, T. Taniuchi, and K. Matsuura [ed.] Indo-Pacific fish biology: Proceedings of the second international conference on Indo-Pacific fishes. Ichthyological Society of Japan, Tokyo. 983 p.

Forey, P., and P. Janvier. 1994. Evolution of early vertebrates. Am. Scient. 82:554-565.

Knight, L., and D. Blood. 1997. Wildlife Habitat Mapping Inland Island Highway Cumberland Road To Campbell River. Prepared for Vancouver Island highway Project, B.C. Ministry of Transportation and Highways, Victoria, B.C.

Lough, M.J. & Associates, and Thurber Engineering Ltd. 1995. Morrison Creek Fish Habitat Study Maple Lake To Lake Trail Road). Report to Vancouver Island Highway Project, Ministry of Transportation and Highways, Courtenay, B.C.

Lough, M.J. & Associates 1995. Morrison Creek Fish Habitat Study -Addendum- Prepared for Vancouver Island Highway Project, Ministry of Transportation and Highways, Victoria, B.C.

Potter, I.C. 1980. the Petromyzontiformes with particular reference to paired species. Can. J. Fish. Aquat. Sci. 37: 1641-1657.

Comox-Strathcona Sensitive Habitat Atlas, 1995. A Co-operative project of the Province of British Columbia, and the Regional District Comox-Strathcona.

Ship Environmental Consultants. 1993. Vancouver Inland Island Highway Study. Fisheries Impact Assessment Vol. IV, Section 442. B.C. Ministry of Transportation and Highways, Victoria, B.C.

Vancouver Island Highway Project (sub-projects and schedules). 1998. Ministry of transportation and Highways, Victoria, B.C.

Vladykov, V.D. and E. Kott. 1979. Satellite species among the holarctic lampreys. Can. J. Zool., 57: 860-867.

Youson, J.H., and R.J. Beamish. 1991. Comparison of the internal morphology of adults of a population of lampreys that contains a non-parasitic life-history type, *Lampetra richardsoni,* and a potentially parasitic form, *L. richardsoni* var. *marifuga.* Can. J. Zool. 69: 628-637.

Youson, J.H. (in press) Lamprey metamorphosis: An ancient and labile developmental strategy. In: Environment, Ontogeny and Physiology in Evolution. Edited by R. Pearson. Guernica press, Toronto.

Zanandrea, G. 1959. Recenti recherche sulle forme “appaite” di lamprede dell’ Italia e del Danubio, Boll. Zool. 26: 545-554.

Zanandrea, G. 1961. Studies on European lampreys. Evolution (Lawrence, Kans.), 15: 523-534.

PERSONAL COMMUNICATIONS

Brian Allen, Community Advisor, Department of Fisheries and Oceans (Habitat Assessment Branch), 148 Port Agusta, Comox, BC., Oral Interview Regarding Habitat Description and protection of Habitat in Morrison Creek, 1998.

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Dr. Richard Beamish is currently the senior scientist at the Pacific Biological Station in Nanaimo$_1$ B.C. and is the former Director of the Station. He has been the Canadian Government Commissioner on the International Pacific halibut Commission (IPHC) since 1990, and is a member of the Canadian delegation to the North Pacific Marine Science Organization (P ICES) and the North Pacific Anadormous Fish Commission (NPAFC). Recently Dr. Beamish was awarded the Order of Canada for his contribution to fisheries science. Dr. Beamish is currently studying factors affecting the carrying capacity of the Strait of Georgia for salmon and other commercially important species. He also studies the association between long-term climate trends and longterm changes in fish abundance in the northern North Pacific Ocean, and methods for age determination of fishes. He has studied lamprey biology and taxonomy for over 20 years and has described several new species.

Dr. John Youson is a Professor of Zoology at the University of Toronto, Scarborough Campus. He is an expert in developmental biology and has authored or co-authored 211 refereed research articles as well as a number of book chapters. The primary research organism in his laboratory is the lamprey. His research has been at the forefront in a wide variety of topics, ranging from taxonomy to the manipulation of metamorphosis. Of particular importance was the description of a method for induction of precocious metamorphosis in sea lampreys to permit year- round studies of the factors affecting metamorphosis. Dr. Youson has also studied pacific Coast lampreys particularly the developmental biology of *L.ayresi and* the variety from Morrison Creek.

Lesley Ann Chapman currently is employed at Island Scallops Ltd. on Vancouver Island as an Algal Culturist. She graduated from the Fisheries and Aquaculture Program at Malaspina University College, Nanaimo, B.C. in 1997. In addition to her interests in Aquaculture, Lesley has a concern for protection and preservation of aquatic ecosystems on Vancouver Island. Her interest in *Lampetra dchardsoni marifuga* is related to her experience with the rivers and streams associated with their habitat.