

# Confirmation of Cowichan Lake Lamprey (*Entosphenus macrostomus*) Spawning Activity in Mesachie Lake, British Columbia in 2021

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## TABLE OF CONTENTS

LIST OF FIGURES.....	iii
ABSTRACT .....	iv
RÉSUMÉ.....	v
INTRODUCTION.....	1
METHODS .....	1
RESULTS.....	4
DISCUSSION.....	5
ACKNOWLEDGEMENTS .....	6
REFERENCES.....	6

## LIST OF FIGURES

Figure 1. Map of Mesachie Lake depicting connection to Bear Lake and Cowichan Lake via Mesachie Creek. Spawning area in Mesachie Lake indicated with an "X" at the confluence of Halfway Creek and Mesachie Lake.....	2
Figure 2. Example of a lamprey trap line. Photograph shows Vexar® weir held in place with rebar and six minnow traps at the base. ....	3
Figure 3. Photograph of Vexar® extruded diamond mesh used in lamprey trap lines in Mesachie Lake, 2021. ....	3
Figure 4. Female Cowichan Lake Lamprey in spawning condition caught June 2021 in a trap on the alluvial fan at the outlet of Halfway Creek, Mesachie Lake. ....	5

## ABSTRACT

Wade, J. and P. Grant. 2021. Confirmation of Cowichan Lake Lamprey (*Entosphenus macrostomus*) Spawning Activity in Mesachie Lake, British Columbia in 2021. Can. Manuscr. Rep. Fish. Aquat. Sci. 3229: v + 7 p.

Cowichan Lake Lamprey (Vancouver Lamprey) is a threatened species, endemic to three interconnected lakes on Vancouver Island: Cowichan Lake, Bear Lake and Mesachie Lake. Field studies in Mesachie Lake have not been conducted since 2008. At that time, four adults were caught in traps at the mouth of Halfway Creek, the inlet to Mesachie Lake during the spawning season. As more than twelve years have passed and development has occurred around Mesachie Lake, this study was undertaken to confirm the presence of animals in spawning condition and/or actively spawning. No lamprey were seen actively spawning or nest building but two lamprey in spawning condition were caught in traps on the spawning grounds during the spawning season, confirming a population still remains within Mesachie Lake.

This study also discovered a potential connectivity issue on Mesachie Creek which connects Mesachie Lake with Bear Lake and Cowichan Lake. Barriers to fish passage may result in isolation of lamprey in Mesachie Lake and impact prey availability. It is recommended that further studies be conducted to accurately map Mesachie Creek, characterize the seasonal extent of this connectivity issue and develop potential remediation plans.

## RÉSUMÉ

Wade, J. and P. Grant. 2021. Confirmation of Cowichan Lake Lamprey (*Entosphenus macrostomus*) Spawning Activity in Mesachie Lake, British Columbia in 2021. Can. Manuscr. Rep. Fish. Aquat. Sci. 3229: v + 7 p.

La lamproie du lac Cowichan (lamproie de Vancouver) est une espèce menacée, endémique à trois lacs interreliés de l'île de Vancouver : le lac Cowichan, le lac Bear et le lac Mesachie. Aucune étude sur le terrain n'a été effectuée dans le lac Mesachie depuis 2008. À ce moment, quatre lamproies adultes ont été capturées dans les pièges à l'embouchure du ruisseau Halfway, l'entrée du lac Mesachie, durant la saison de la fraie. Comme plus de douze ans se sont écoulés depuis la dernière étude et que les environs du lac Mesachie ont été aménagés depuis, on a mis en œuvre la présente étude pour confirmer la présence de lamproies en état de reproduction ou en train de se reproduire activement. On n'a observé aucune lamproie se reproduisant activement ou construisant un nid, mais on a capturé deux lamproies en condition de reproduction dans les pièges placés dans les aires de reproduction durant la saison de fraie, ce qui est venu confirmer qu'une population se trouve encore dans le lac Mesachie.

Cette étude a également permis d'observer un problème potentiel de connectivité dans le ruisseau Mesachie, qui relie le lac Mesachie au lac Bear et au lac Cowichan. Les obstacles au passage du poisson pourraient entraîner l'isolement des lamproies dans le lac Mesachie et avoir une incidence sur la disponibilité des proies. Il est recommandé de réaliser d'autres études pour cartographier avec précision le ruisseau Mesachie, caractériser l'étendue saisonnière de ce problème de connectivité et élaborer des plans d'assainissement potentiels.

## INTRODUCTION

Cowichan Lake Lamprey (*Entosphenus macrostomus*), a parasitic, freshwater lamprey, is found only in three interconnected lakes on Vancouver Island: Mesachie Lake, Bear Lake and Cowichan Lake, including portions of their tributaries. The species was listed as Threatened on Schedule 1 of the *Species at Risk Act* (SARA) in 2003. These three lakes are protected as critical habitat as well as parts of major tributaries which play an important role in spawning and rearing (DFO, 2019). Halfway Creek, the inflow to Mesachie Lake is one such tributary. The delta in Mesachie Lake, the lower 100 m of Halfway Creek as well as the riparian areas extending 30 m on either side of the 100 m of the creek are also critical habitat.

Water levels in Cowichan Lake are regulated by a weir to manage the downstream conservation and anthropogenic needs of the watershed. Therefore, scientific efforts at the lake have focused on filling knowledge gaps for Cowichan Lake Lamprey, which specifically relate to water management decisions, in order to ensure its long-term viability within its natural range (i.e. Wade and MacConnachie, 2016; Wade, 2019; Wade et al., 2017; Wade et al., 2018a; Wade et al., 2018b; Chaudhuri et al., 2020; Wade et al., 2021).

Conversely, Mesachie Lake is largely unaffected by changing water levels and therefore studies specific to the species in this lake have not been a conservation priority. The last time a study was conducted in Mesachie Lake was in 2008, describing a spawning survey in the delta area of Halfway Creek in Mesachie Lake (Beamish and Wade, 2008). As no studies have been conducted on Cowichan Lake Lamprey in Mesachie Lake in the last twelve years, this study was conducted to determine if a population still remains within Mesachie Lake.

## METHODS

Three trap lines were installed on the alluvial fan at the outlet of Halfway Creek in Mesachie Lake (Figure 1). Trap lines used in 2021 are the same as those described in Beamish and Wade (2008) and Wade et al. (2018b) (Figure 2). Each trap line consists of one mesh weir made of Vexar® held in place with 1.5–2 m long rebar at the beginning, middle and end of each panel (approximately 4 m long). Rebar is driven into the substrate with a sledge hammer and the Vexar® panel is affixed to the rebar with black cable ties. Vexar® extruded diamond mesh (1 cm diameter) was used to ensure that the hole size would not allow a lamprey to pass through (Figure 3). Three minnow traps were placed at the bottom of each side of the Vexar® panel, resting on the substrate. Each minnow trap was tied in place with dark coloured string. A total of eighteen minnow traps were installed across the three separate trap lines.



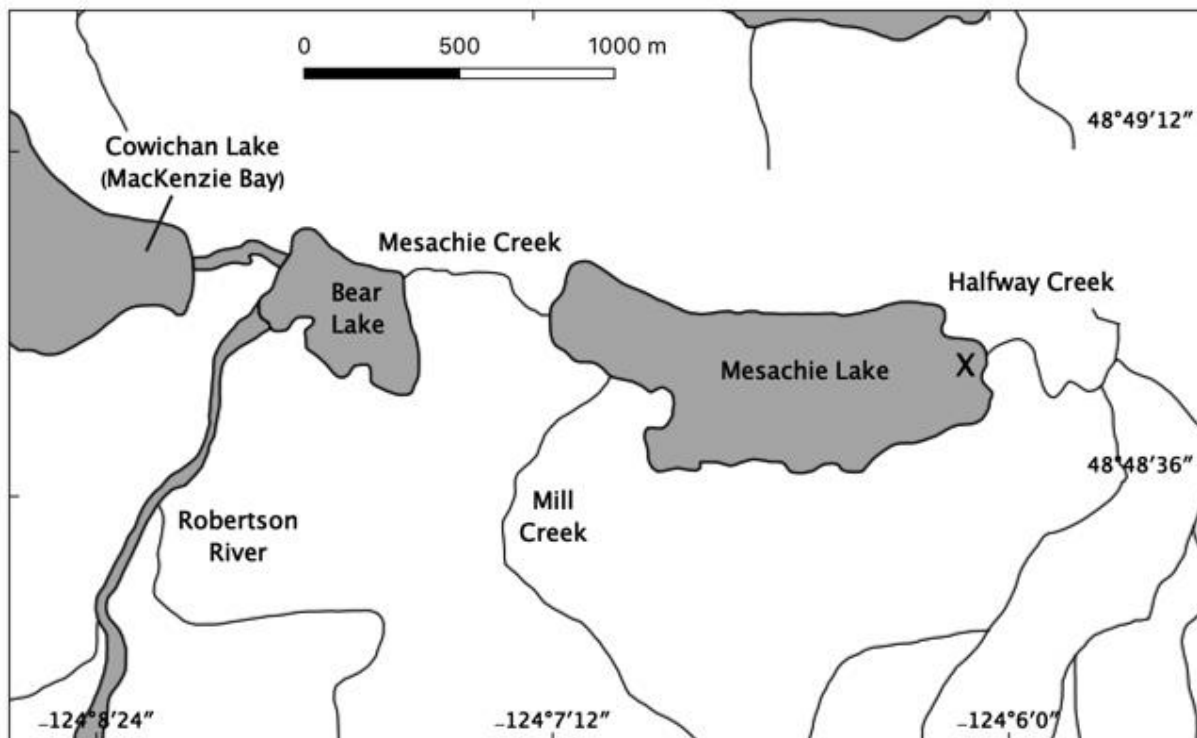
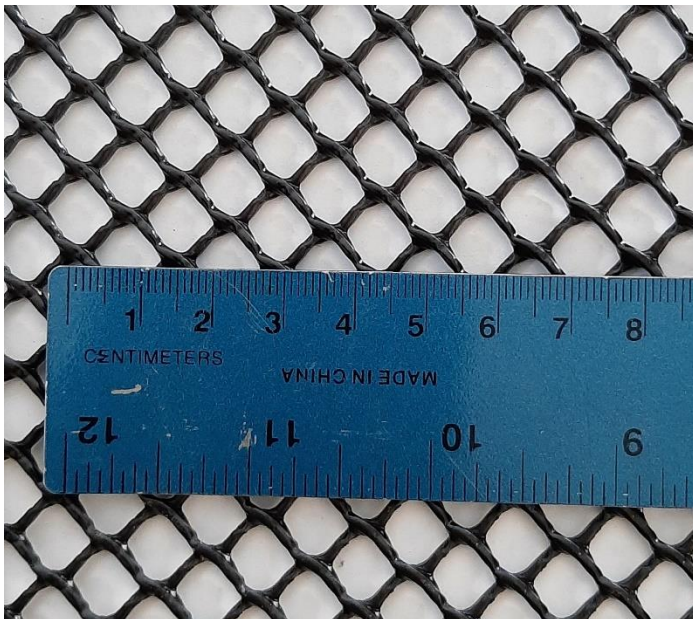


Figure 1. Map of Mesachie Lake depicting connection to Bear Lake and Cowichan Lake via Mesachie Creek. Spawning area in Mesachie Lake indicated with an "X" at the confluence of Halfway Creek and Mesachie Lake.



**Figure 2. Example of a lamprey trap line. Photograph shows Vexar® weir held in place with rebar and six minnow traps at the base.**



**Figure 3. Photograph of Vexar® extruded diamond mesh used in lamprey trap lines in Mesachie Lake, 2021.**

The trap line functions as a weir; lamprey swim up onto the alluvial fan, encounter the fence, swim along the fence and into the minnow traps. The diameter of the entrance and exit holes of the minnow traps is small enough that it is difficult for lamprey of this size to exit.

One trap line was deployed on June 7, 2021 and two more were deployed on June 10; all trap lines were removed on June 17. The traps were checked daily in order to minimize stress and harm to both lamprey and bycatch. All bycatch was enumerated and released. Lamprey were measured for length, photographed, and released onto the alluvial fan. No anesthesia was required as the fish used their oral disc to suck onto a measuring board while measurements and photographs were collected. Sex was determined based on morphometric descriptions of lamprey (spp.) in Kott et al. (1988), based on Smith et al. (1968) and Hardisty and Potter (1971), which are consistent with that described for *E. macrostomus* in Wade et al. (2018b).

The alluvial fan at the outlet of Halfway Creek was searched daily for signs of lamprey nest building or spawning. As this species makes rudimentary nests which could be mistaken for depressions caused by humans or other animals, unless lamprey were directly observed in the act of nest building or spawning, these activities cannot be confirmed by depressions in the substrate.

All work was conducted with the authorization of a DFO Species at Risk Scientific permit.

## RESULTS

Traps were placed in the alluvial fan at confluence of Halfway Creek and Mesachie Lake (48.812153 -124.100521). All traps were in place for a total of 24 trapping days (total number of traps x effective trapping days); trap line 1 was in place for 10 days (n=6 traps), trap lines 2 and 3 for seven days each (n=6 traps each). Trap 1 was vandalized one night but was still capable of fishing; it was repaired and no vandalism occurred subsequently.

A total of 75 salmonid fry, 78 Signal Crayfish (*Pacifastacus leniusculus*), 30 Three-Spined Stickleback (*Gasterosteus aculeatus*) and 3 sculpin (*Cottus* spp.) were caught. Two Cowichan Lake Lamprey were caught separately (168 and 170 mm total length), both in trap line 1 on June 11<sup>th</sup> and June 15<sup>th</sup>. Both fish were females in spawning condition (Figure 4). These were identified as two unique individuals as they differed morphometrically and in appearance.

No lamprey were observed actively nest-building or spawning.

Once animals in spawning condition were observed, traps were removed and the study terminated.





**Figure 4. Female Cowichan Lake Lamprey in spawning condition caught June 2021 in a trap on the alluvial fan at the outlet of Halfway Creek, Mesachie Lake.**

## **DISCUSSION**

The focus of this study was to confirm spawning activity or the presence of animals in spawning condition in Mesachie Lake. Since being first described in 1982 (Beamish, 1982), research to understand the basic biology of the species has been limited. However, there is information to inform habitat requirements for the species, including descriptions of spawning habitat and nest building (Wade et al., 2018a; 2018b). Unlike other freshwater, parasitic lamprey species, spawning adults and ammocoetes (larvae) of Cowichan Lake Lamprey are thought to be dependent on alluvial fan habitat, shallow riparian habitats and mouths of inflowing rivers and streams for spawning and early rearing (Wade et al., 2018b; Beamish and Wade, 2008). Although knowledge gaps for the life history of this species exist, Cowichan Lake Lamprey have been reported in spawning condition as early as May 3<sup>rd</sup> and as late as August 18<sup>th</sup> (Beamish and Wade, 2008). The deployments of traps in June was therefore timed to align with this spawning period. This study found two females in spawning condition in traps placed on the alluvial fan, where the species is known to spawn (Beamish and Wade 2008). The two individuals could be distinguished based on morphometrics and physical appearance. Once confirmation that animals in spawning condition were on the spawning grounds during spawning season, likely indicating a viable population still remains within Mesachie Lake, traps were removed and the study terminated to minimize disturbance to the species.

This study also discovered a potential connectivity issue on Mesachie Creek which connects Mesachie Lake with Bear Lake and Cowichan Lake. Barriers to fish passage

may result in isolation of lamprey in Mesachie Lake and impact prey availability. Two local recreational fishermen could not recall seeing scars on fish caught in Mesachie Lake and commented that fishing in the lake was poor in recent years. Lamprey scarred cutthroat trout were once very common on fish caught in Mesachie Lake (Beamish and Wade, 2008). This local information highlights the potential isolation of Mesachie Lake through extended periods, which should be investigated to determine if remediation is necessary and to ensure the long-term viability of the Cowichan Lake Lamprey within its natural range.

## ACKNOWLEDGEMENTS

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## REFERENCES

- Beamish, R. J. 1982. *Lampetra macrostoma*, a new species of freshwater parasitic lamprey from the west coast of Canada. *Can. J. Fish. Aquat. Sci.* 37: 736–747.
- Beamish, R.J., and Wade, J. 2008. Critical habitat and the conservation ecology of the freshwater parasitic lamprey, *Lampetra macrostoma*. *Canadian Field-Naturalist* 122(4): 327–337.
- Chaudhuri, C., Wade, J., and Robertson, C. 2020. Fluctuating water levels influence access to critical habitats for threatened Cowichan Lake lamprey. *FACETS* 5: 48–502.
- Fisheries and Oceans Canada (DFO). 2019. Action Plan for the Vancouver Lamprey (*Entosphenus macrostomus*) in Canada. *Species at Risk Act* Action Plan Series. Fisheries and Oceans Canada, Ottawa. iv + 39 p.
- Hardisty, M.W., and Potter, I.C. 1971. The general biology of adult lampreys. In: *The Biology of Lampreys*, Vol. 1. Academic Press, London, p.127–206.
- Kott, E., Renaud, C.B., and Vladykov, V.D. 1988. The urogenital papilla in the Holarctic lamprey (Petromyzontidae). *Environ. Biol. Fishes* 23: 37–43.
- Smith, A.J., Howell, J.H., and Piavis, G.W. 1968. Comparative embryology of five species of lampreys of the upper Great Lakes. *Copeia* 1968: 46–469.

- Wade, J. 2019. Can we learn from other freshwater parasitic lampreys to help manage Cowichan Lake Lamprey (*Entosphenus macrostomus*). Can. Manuscr. Rep. Fish. Aquat. Sci. 3184: v + 29 p.
- Wade, J., Dealy, L., Hodes, V., and Grant P. 2018a. Identifying factors contributing to the successful spawning and early rearing of Cowichan Lake Lamprey (*Entosphenus macrostomus*). Can. Manuscr. Rep. Fish. Aquat. Sci. 3169: v + 13 p.
- Wade, J., Dealy, L., and MacConnachie, S. 2018b. First record of nest building, spawning and sexual dimorphism in the threatened Cowichan Lake lamprey *Entosphenus macrostomus*. End. Sp. Res. 35: 39–45.
- Wade, J., Lovestrom, N., and MacConnachie, S. 2017. Observed reductions in spawning and rearing habitat availability for Cowichan Lamprey (*Entosphenus macrostomus*) during drought conditions. Can. Data Rep. Fish. Aquat. Sci. 1269: v + 10 p.
- Wade, J., and MacConnachie, S. 2016. Cowichan Lake Lamprey (*Entosphenus macrostomus*) ammocoete habitat survey 2012. Can. Manuscr. Rep. Fish. Aquat. Sci. 3088: iv + 15 p.
- Wade, J., Dealy, L., Stephen, C, Lewis, T., and Grant, P. 2021. Supporting climate change adaptation actions for the conservation of the threatened Cowichan Lake Lamprey through low cost monitoring of critical habitat. Can. Manuscr. Rep. Fish. Aquat. Sci. 3227: vi + 17 p.