

Occurrence and Growth Patterns of the American Brook Lamprey, *Lethenteron lamottenii*, in the Ottawa River

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Ammocoetes, transforming ammocoetes, and adults of the American Brook Lamprey, *Lethenteron lamottenii*, are reported for the first time from the Ottawa River. Specimens were caught only from the sandy areas of three islands when the water temperature was between 13 and 25°C. Lampreys were not present in the shallow water (< 1.1 m) when water temperatures were less than 10°C. The largest ammocoete captured was 198 mm long and weighed 10.4 g. The prebranchial and branchial lengths (as a percentage of total length) became proportionately shorter as length increased and the trunk and tail lengths became proportionately longer with increasing length. This showed that morphometric characters undergo changes particularly during early larval life. The length–weight relationship, $\log WT = 2.819 \log TL - 5.467$, and the decrease in the values for the Fulton's condition factor with increasing length further demonstrate that growth was allometric.

Key Words: lamprey, ammocoetes, *Lethenteron lamottenii*, body proportions, condition, length-weight, pigmentation, habitat, Ottawa River.

The American Brook Lamprey, *Lethenteron lamottenii*, occurs in Canada in streams flowing into the St. Lawrence River, Lake Champlain, in the Great Lakes (other than the eastern portion of Lake Ontario), and in the Noire, St. Anne de la Perade, and St. Maurice Rivers of Quebec (Scott and Crossman 1973). Vladykov (1972) reported its occurrence in the Gatineau River (a tributary of the Ottawa River) below the Petites Chutes at Limbourg, Quebec, where 10 adults were collected on 17 May 1959. No other collections have been made since then in the Ottawa or Gatineau rivers.

The purpose of this study is to report the first occurrence of the American Brook Lamprey in the Ottawa River and to describe some aspects of its growth.

Materials and Methods

American Brook Lamprey were collected with a backpack electrofisher (type VII, Smith-Root Inc., Vancouver, Washington) in the shallow water of the Ottawa River near Ottawa, Ontario. Sampling was done along the north and south shorelines of the Ottawa River, in all small creeks flowing into the river, and around Kettle Island, Upper Duck Island, and Lower Duck Island in an area from Lac Deschenes to just east of Lower Duck Island (Figure 1). Additional sampling was done near the mouth of the Petite Blanche River (45°30'N, 74°32'W) and Green Creek (45°28'N, 74°33'W). The study area has been described by Ericksson (1974) and Hanson and Qadri (1980). Water temperatures reached 25°C in late July and early August 1979 in the shallow water around Upper Duck Island.

From samples collected at 2-wk intervals from 4

June to 7 November 1979, we kept 271 ammocoetes, 9 transforming ammocoetes, and 3 newly transformed adults. Additional sampling was done at 2-wk intervals from 5 May to 18 June 1980. Specimens were preserved in a 5% formalin solution and transported to the laboratory where total length (mm) and wet weight (to the nearest 0.01 g) of specimens blotted dry were recorded. The Fulton's condition factor, $K(TL)$ (Hile 1941; Lagler 1956), was calculated for each specimen and the means and standard errors for 10-mm length-groups calculated. The length–weight relationship was determined for total length (mm) and wet weight (g) by the least squares method of linear regression (Ricker 1975). The mean values for the lengths of the prebranchial, branchial, trunk, and tail regions (as a percentage of total length) were calculated for 42 ammocoetes in 10-mm length-classes. The relationship of these same characters to total length were calculated by linear regression by the least squares method. Pigmentation patterns were recorded for the same 42 ammocoetes following the method described by Vladykov (1950). All specimens have been deposited with the National Museums of Canada Ichthyological Collection (NMC 80: 958–962).

Results

American Brook Lamprey were not captured in the Ottawa River, or its small tributaries, above the Chaudière Falls. Specimens were not caught along the shorelines or from the small tributaries of the Ottawa River below the Chaudière Falls, but ammocoetes were common around Kettle Island, Upper Duck Island, and Lower Duck Island.

The shorelines of the islands differ from the shore-

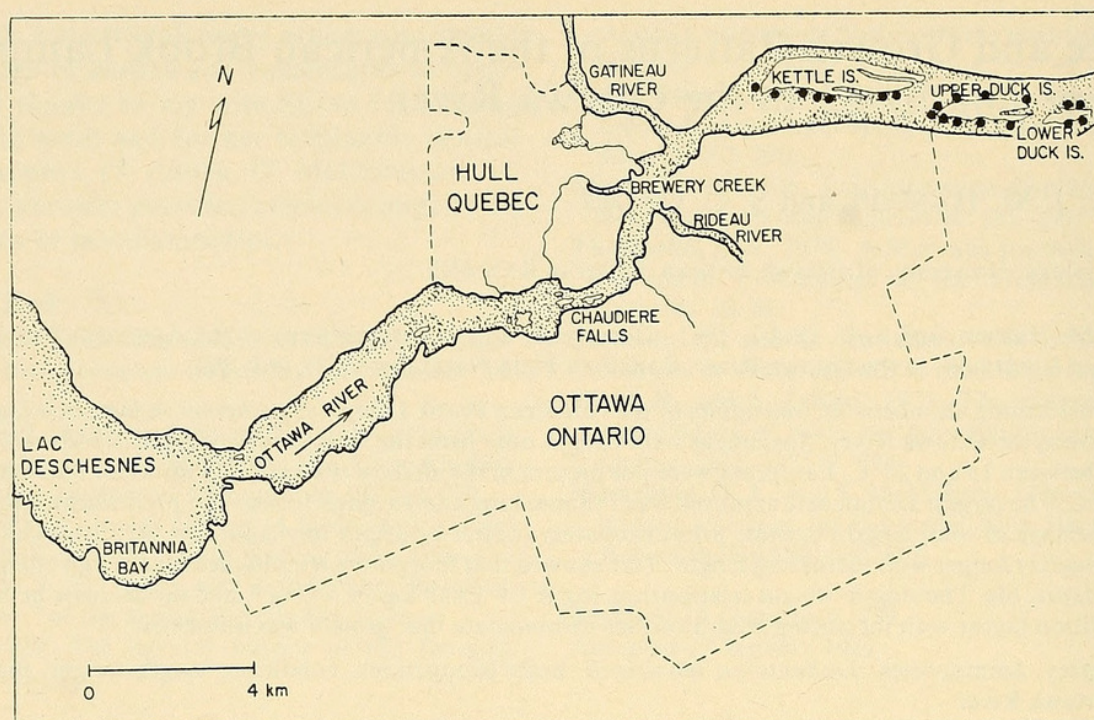


FIGURE 1. Sampling sites where *Lethenteron lamottenii* was collected in the Ottawa River, Ottawa-Hull area.

lines of the main river channel in that the substrate of the former is mostly sand and the substrate of the latter is mostly clay. Ammocoetes were not collected from the eastern tip of Kettle Island which has a hard clay substrate nor were there any present along the north shoreline of Kettle Island which is subjected to pollution and dredging activities by the Canadian International Paper Company at Gatineau, Quebec.

The large ammocoetes, transforming ammocoetes, and newly transformed adults were usually taken among the emergent vegetation in depths less than 0.3 m. Lampreys were not present in the shallow water (<1.1 m) after temperatures decreased to 10°C in October 1979, but ammocoetes were present in the shallow water on 5 May 1980, when the water temperature was 16°C.

The upper lip and suborbital areas of 42 American Brook Lamprey ammocoetes were devoid of pigment and the prebranchial blotch was absent. The branchial region above the branchial openings was without pigment for about 2 mm, leaving a whitish band below the dorsal pigmented area. The pigmentation on the caudal fin varied from weak to moderate; an unpigmented margin was always present. At capture, the newly transformed adults were yellow-brown on the dorsal surface and the sides and the ventral surface were silver-grey. The number of trunk myomeres ranged from 65 to 70 (usually 68) for 42 ammocoetes. The three adults had 69, 70, and 71 myomeres. The values obtained for the body proportions of 42 ammocoetes divided into 10-mm length-groups showed the changes occurring in the different body

areas throughout larval life. The prebranchial and branchial regions became proportionately shorter with increasing body length, this process occurring more rapidly in the smaller length-classes, and leveling off at about the 140- to 149-mm length-class (Figure 2). The relative lengths for the trunk and tail regions increased with total length and leveled off somewhat at about the 140- to 149-mm length-class (Figure 3). After 160-169 mm, there seemed to be a slight decrease in the relative length of the trunk region and a slight increase in the tail region.

The total length of the 271 ammocoetes and 9 transforming ammocoetes had a range from 60 to 198 mm and 134 to 202 mm, respectively. The three newly transformed adults were 146, 166, and 181 mm in total length. The linear regression fitting the data for length and weight of ammocoetes was $\log WT = 2.819 \log TL - 5.467$, $n = 271$, $r = 0.9947$. As the slope of the length-weight relationship shows that the weight is proportionately less as length increased, the values for Fulton's condition factor should decrease as the ammocoetes grow. The values for Fulton's condition factor decreased from a value of 0.185 for the smallest ammocoetes to a value of 0.129 for the longest ammocoetes (Figure 4).

Discussion

The typical habitat of *L. lamottenii* was described by Vladykov (1949) as cold brooks and small rivers, usually in association with Slimy Sculpin (*Cottus cognatus*) and Brook Char (*Salvelinus fontinalis*), and by Morman (1979) as pool-riffle streams with low

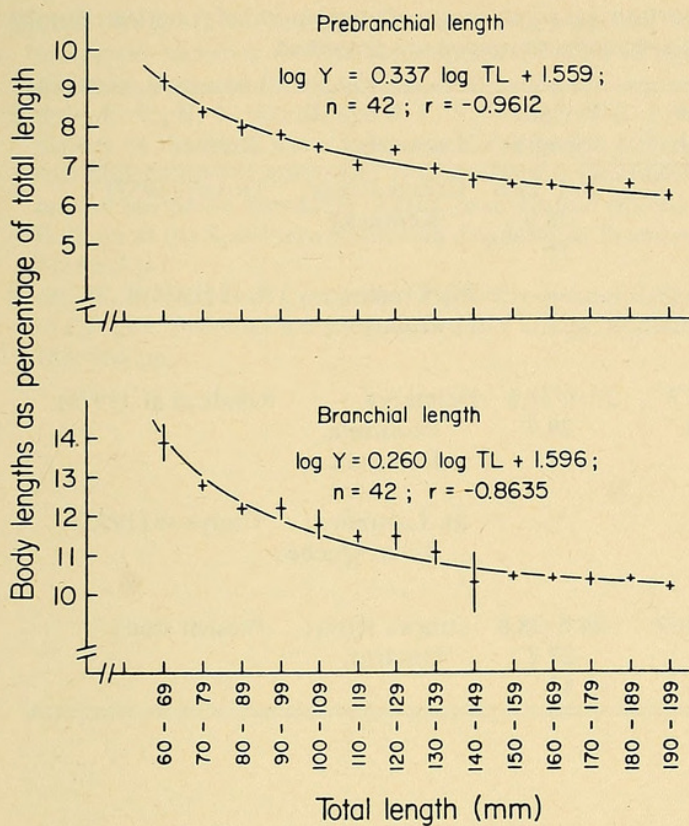


FIGURE 2. Mean value for the relative length of the prebranchial and branchial regions of *Lethenteron lamottenii* for each 10-mm ammocoete length-group.

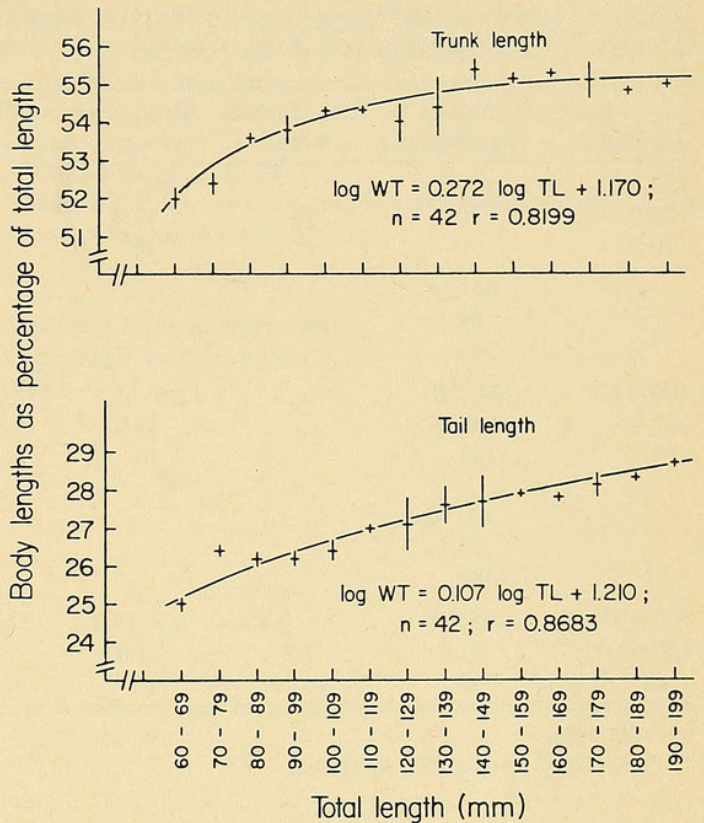


FIGURE 3. Mean value for the relative length of the trunk and tail regions of *Lethenteron lamottenii* for each 10-mm ammocoete length-group.

temperatures and stable bottom. In Delaware, habitats occupied varied from mud to sand at the Coastal Plain localities to clay and gravel at the Piedmont localities with water temperatures ranging from 9.0 to 12°C (Rohde et al. 1976). The Ottawa River population differs in that it inhabits a large river, and the ammocoetes were only found in the sandy areas of three large islands when water temperatures were between 13.0 and 25°C. The ammocoetes were not found in shallow water at temperatures below 10°C (mid-October) when, presumably, they had moved into deeper waters.

The patterns of pigmentation of the different body areas of the larval American Brook Lamprey from the Ottawa River correspond to the descriptions given by Vladykov (1950) for specimens collected in tributaries of the St. Lawrence River in Quebec.

Ammocoetes collected in Delaware apparently show proportionately longer tail and branchial lengths but shorter trunk lengths (Rohde et al. 1976) than the Ottawa River population (Table 1); specimens from Kentucky have similar branchial and tail lengths (Distler 1957). Such comparisons do not, however, show the ontogenic changes in body propor-

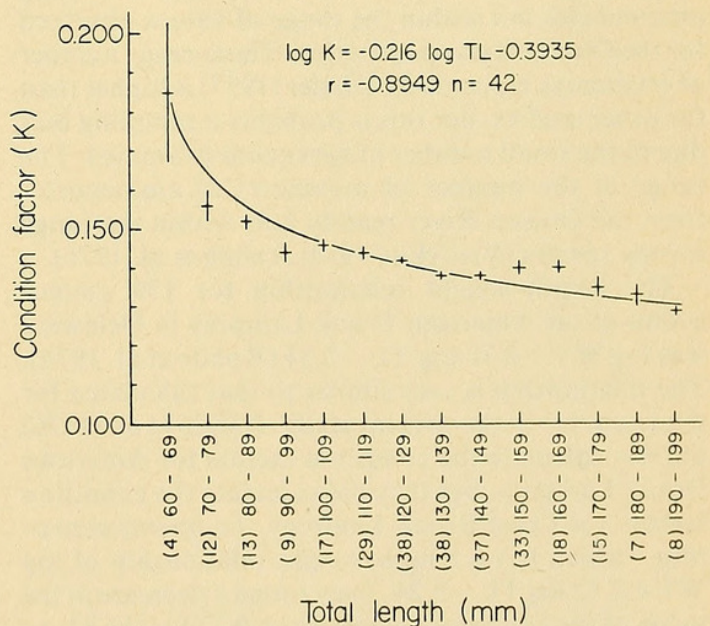


FIGURE 4. Condition factor of ammocoetes of *Lethenteron lamottenii* from the Ottawa River, Ottawa-Hull area. Means and 95% confidence limits are presented. Sample size in each 10-mm length-group is in parentheses.

TABLE 1—Comparison of the number of myomeres and body proportions (as a percentage of total length) of American Brook Lamprey from various drainages. Ranges, means, and number of specimens examined are presented

| TL (mm) | No. of myomeres | Prebranchial length | Branchial length | Trunk length | Tail length | Location | Source |
|---------|--------------------|---------------------|------------------|--------------|-------------|------------------------------|---------------------|
| 133–182 | 69–73 | — | 10.4–12.2 | — | 26.1–29.6 | Greasy Creek, Kentucky | Distler (1957) |
| 158.0 | 70.8 | | 11.4 | | 28.0 | | |
| 16 | 16 | | 16 | | 16 | | |
| — | 65–74 ^a | — | — | — | — | Big Creek, Ontario | Kott (1974) |
| | 69.1 | | | | | | |
| | 303 | | | | | | |
| 100–143 | 64–72 ^b | — | 12.6–14.4 | 51.0–53.7 | 27.7–31.6 | Delmarva Peninsula, Delaware | Rohde et al. (1976) |
| 121.0 | 68.0 | | 13.3 | 52.0 | 29.7 | | |
| 19 | 101 | | 19 | 19 | 19 | | |
| — | 63–70 | — | — | — | — | St. Lawrence River, Quebec | Vladykov (1950) |
| | 67.1 | | | | | | |
| | 381 | | | | | | |
| 65–197 | 65–70 | 6.0–9.4 | 9.3–14.7 | 51.5–56.0 | 24.6–28.8 | Ottawa River, Ontario | Present study |
| 130.0 | 67.9 | 7.2 | 11.4 | 54.3 | 27.2 | | |
| 42 | 42 | 42 | 42 | 42 | 42 | | |

^a Adults only.^b Ammocoetes and adults combined.

tions relative to body length. The number of specimens studied from both the Delaware and Kentucky populations was small and only included a narrow (<50 mm) range of lengths. With the exception of the upper limit of the range for tail length for the Delaware population, the ranges of values reported for the body proportions of the Delaware and Kentucky ammocoetes fall within the range of values observed for the Ottawa River population. The average number of myomeres reported by Distler (1957) is higher than for other studies, but this is probably a sampling bias due to the small number of specimens examined. The range of the number of myomeres of ammocoetes from the Ottawa River readily falls within the range for the species (Vladykov 1950; Rohde et al. 1976).

The length–weight relationship for 139 ammocoetes of the American Brook Lamprey in Delaware was $\log WT = 2.76 \log TL - 5.31$ (Rohde et al. 1976). The relationship is very similar to that calculated for the lampreys in the present study. Rohde et al. (1976) did not calculate the condition factors for American Brook Lamprey, but they did calculate the condition factors for Least Brook Lamprey, *Lampetra aepyptera*, which has a length–weight relationship of $\log WT = 2.72 \log TL - 5.24$. They found a decrease in the value of the condition factors from 0.32 for the 11- to 20-mm length-group to 0.20 for the largest ammocoetes (121–130 mm). Hardisty (1944) also found that the value of the condition factor decreased with increasing length for *Lampetra planeri*. More studies are needed to determine if this pattern of allometric

growth observed by Hardisty (1944), Rohde et al. (1976), and in the present study occurs with all lamprey ammocoetes.

Literature Cited

- Distler, D. A.** 1957. Some differential characteristics of ammocoetes of two species of lampreys *Lampetra aepyptera* (Abbott) and *Lampetra lamottenii* (LeSueur). M.Sc. thesis, University of Louisville, Kentucky. 32 pp.
- Ericksson, C.** 1974. A two-year study of the higher aquatic plant community in a section of the Ottawa River, Canada, with emphasis on its role in mercury uptake. M.Sc. thesis, University of Ottawa, Ottawa. 156 pp.
- Hanson, J. M., and S. U. Qadri.** 1980. Observations on the biology of Black Crappie, *Pomoxis nigromaculatus* (LeSueur), in the Ottawa River. *La Naturaliste Canadien* 107: 35–42.
- Hardisty, M. W.** 1944. The life history and growth of the Brook Lamprey (*Lampetra planeri*). *Journal of Animal Ecology* 13: 110–122.
- Hile, R.** 1941. Age and growth of the Rock Bass, *Ambloplites rupestris* (Rafinesque), in Nebish Lake, Wisconsin. *Transactions of the Wisconsin Academy of Sciences, Arts, and Letters* 33: 189–337.
- Kott, E.** 1974. A morphometric and meristic study of a population of the American Brook Lamprey, *Lethenteron lamottenii* (LeSueur) from Ontario. *Canadian Journal of Zoology* 52(8): 1047–1055.
- Lagler, K. F.** 1956. *Freshwater fishery biology*. Wm. C. Brown Company, Dubuque, Iowa. 421 pp.
- Morman, R. H.** 1979. Distribution and ecology of lampreys in the lower peninsula of Michigan, 1957–1975. *Great Lakes Fishery Commission Technical Report* 33. 59 pp.

- Ricker, W. E.** 1975. Computation and interpretation of biological statistics of fish populations. Bulletin of the Fisheries Research Board of Canada 191: 382 pp.
- Rohde, F. C., R. G. Arndt, and J. C. S. Wang.** 1976. Life history of the fresh water lampreys, *Okkelbergia aepyptera* and *Lampetra lamottenii* (Pisces: Petromyzonidae), on the Delmarva peninsula (East Coast, United States). Bulletin of the Southern California Academy of Sciences 75: 99-111.
- Scott, W. B., and E. J. Crossman.** 1973. Freshwater fishes of Canada. Fisheries Research Board of Canada, Bulletin 184: 966 pp.
- Vladykov, V. D.** 1949. Quebec lampreys. List of species and their economical importance. Department of Fisheries, Quebec 26: 67 pp.
- Vladykov, V. D.** 1950. Larvae of eastern American lampreys. 1—Species with two dorsal fins. La Naturaliste Canadien 77 (3-4): 73-95.
- Vladykov, V. D.** 1972. Lampreys of the Ottawa area. Trail and Landscape 6(4): 105-132.

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95(3), 261–265. <https://doi.org/10.5962/p.352372>.

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