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# A New Nonparasitic Species of Lamprey, Genus *Lethenteron* (Petromyzonidae), from Eastern Tributaries of the Gulf of Mexico, U.S.A.

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**Summary**

A new nonparasitic lamprey, *Lethenteron meridionale,* from streams of the Tennessee, the Alabama, and the Tombigbee river systems, is described and illustrated. The holotype (NMC 74-249) is deposited in the National Museum of Natural Sciences, Ottawa, Canada. The species is distinguishable from *Lethenteron lamottenii,* its nearest relative, by fewer myomeres (50–58), dentition, and pigmentation. By its row of posterial teeth *L. meridionale* is easily separable from *Lampetra aepyptera,* which occurs in the same watersheds. The description is based on an examination of 79 transformed individuals and two ammocoetes.

**Résumé**

Cet article décrit le *Lethenteron meridionale,* une espèce nouvelle de lamproie non parasite des ruisseaux tributaires des rivières Tennessee, Alabama et Tombigbee. L'holotype (NMC 74-249) se trouve au Musée national des Sciences naturelles, à Ottawa, Canada. Cette nouvelle espèce diffère du *Lethenteron lamottenii,* par sa dentition, sa pigmentation et son nombre inférieur de myomères (de 50 à 58). Sa rangée de dents postérieures la distingue aussi de la *Lampetra aepyptera* qu'on rencontre dans les mêmes réseaux hydrographiques. La description se fonde sur une étude de 79 individus métamorphosés et de deux ammocètes.

**V. D. Vladykov**

Vadim D. Vladykov was born in Russia and studied at Charles University in Prague, where he specialized in zoology and anthropology, receiving his Ph.D. in 1925. In 1930 Dr. Vladykov came to Canada, and from 1930 to 1936 was employed by the Biological Board of Canada (now the Fisheries Research Board of Canada) as a fisheries biologist. In 1936 he became a Canadian citizen. For the next two years he worked as a fisheries biologist for the State of Maryland and as professor of ichthyology at the University of Maryland. In 1938 he returned to Canada and joined the Biology Department of the University of Montreal as professor of ichthyology, a post he held until 1942. From 1943 to 1958 he was director of the Biological Laboratory of the Quebec Department of Fisheries. In 1958 he joined the staff of the University of Ottawa as professor of biology, a position he held until his retirement in 1973, at which time he was appointed professor emeritus. In the same year he accepted the honorary position of research associate at the National Museum of Natural Sciences. Dr. Vladykov was elected a fellow of the Royal Society of Canada in 1963.

Dr. Vladykov is credited with more than 185 publications, and his specialties are the biology of the American eel and the taxonomy of salmonids, sturgeons, and, especially, Holarctic lampreys. He has described several new species of lampreys from Europe and North America. Among Dr. Vladykov's contributions to science, the studies of particular significance are those dealing with the description of characters by which larval lampreys (ammocoetes) of nonparasitic species and those of the parasitic sea lamprey *(Petromyzon marinus)* can be distinguished. This work now enables biologists to separate larvae of nonparasitic lampreys from those of parasitic lampreys, a task formerly impossible. For Canada and the United States this is a great financial and ecological saving, because treatment of streams and brooks is now restricted to those which contain larvae of the destructive sea lampreys. In recognition of his study of lampreys, a new species from central Europe was described under the name *Eudontomyzon vladykovi* Oliva & Zanandrea, 1959.

**Edward Kott**

Edward Kott obtained his academic training from the University of Toronto. He received his B.A. in 1960 and his Ph.D. in 1964. From 1963 to 1965 he was a lecturer in biology at Lakehead University, Thunder Bay, Ontario. In 1965 Dr. Kott joined the Fisheries Research Board of Canada, and from 1965 to 1967 worked at the Marine Ecology Laboratory of the Bedford Institute of Oceanography, Dartmouth, Nova Scotia. He is now associate professor of biology at Wilfrid Laurier University, Waterloo, Ontario. His research has been in the ecology of small mammals, community studies, and the ecology and systematics of lampreys. At present Dr. Kott is working in cooperation with Dr. V.D. Vladykov on the systematics of North American lampreys.

**S. Pharand-Coad**

Sylvie Pharand-Coad was born in Hull, Quebec, in 1950. She graduated from the University of Ottawa with an Honours B.Sc. in Zoology in 1972 and a B.Ed. in 1973. For four years (1971–74), Mrs. Pharand-Coad worked as a research assistant to Dr. V. D. Vladykov on the systematics of Holarctic lampreys. Her research interests are centred on the systematics and ecology of lampreys, amphibians, and reptiles. At present she is a high-school science teacher with the Ottawa Board of Education.

## Introduction

The senior author (Vladykov 1973) recently described a nonparasitic lamprey, *Lampetra pacifica,* from the western United States. To compare critically this western species with the nonparasitic *Lampetra aepyptera,* from eastern and southeastern United States, he wrote to W.V. Brigham, who had just (1973) described spawning of *Lampetra aepyptera* in Tennessee. Thanks to Dr. Brigham's cooperation, we were able to obtain specimens of *L. aepyptera* from several institutions in the following states: Alabama, Arkansas, Georgia, Kentucky, Maryland, Ohio, and Tennessee.

Upon examining the specimens received, we found two species of nonparasitic lampreys, one of which is *Lampetra aepyptera* (Abbott 1860), the other, which we here treat as a new species, referred to the genus *Lethenteron* Creaser and Hubbs 1922, of the family Petromyzonidae.*

The aim of the present article is to describe this new species and compare it with two other nonparasitic species, *Lampetra aepyptera* and *Lethenteron lamottenii*** (Le Sueur 1827).

*Alternate spellings of the family are found in the literature (Vladykov 1974).

**The name *lamottenii* is now, commonly without valid reason, spelled as *lamottei* (American Fisheries Society, Committee on Names 1970).

## Methods and Materials

All measurements and counts were typically made on the left side of the specimen, as established by Vladykov and Follett (1965).

### Measurements

All measurements are expressed as percentages of the total length of the specimen; the disc length (d) is also expressed as a percentage of the branchial length ($B_1$–$B_7$). The following abbreviations are used, as in Vladykov and Follett (1965).

| | |
|---|---|
| a–C | *Tail length,* the distance from the posterior edge of the cloacal slit to the end of the caudal fin. |
| $B_7$–a | *Trunk length,* the distance from the posterior edge of the last (seventh) branchial opening to the anterior edge of the cloacal slit. |
| $B_1$–$B_7$ | *Branchial length,* the distance from the anterior edge of the first branchial opening to the posterior edge of the last (seventh) branchial opening. |
| d | *Disc length,* longitudinal diameter, with the oral fimbriae included, measured with the disc closed. |
| d–$B_1$ | *Prebranchial length,* the distance from the anterior edge of the disc (in transformed individuals) or of the upper lip (in ammocoetes) to the anterior edge of the first branchial opening. |
| $hD_2$ | *Second dorsal fin maximum height,* measured along the highest fin ray. |
| 0 | *Eye length,* the horizontal diameter of the eye. |
| TL | *Total length,* the distance from the anteriormost oral fimbria to the end of the caudal fin. |

In addition, the number of oral papillae, the number of anterior oral fimbriae contained within a section equal to the width of the base of the supraoral lamina, and the number of velar tentacles were counted.

In identifying ammocoetes, the number of trunk myomeres and body proportions were used. Pattern and intensity of pigmentation on head and tail were also noted (Vladykov 1950).

**Material Examined**

The material of the new species of *Lethenteron* consists of 79 transformed individuals from southern United States: 65 from Tennessee, 11 from Alabama, and 3 from Georgia; and 2 ammocoetes: one each from Tennessee and Alabama.

The comparative material of *Lampetra aepyptera* consists of 53 transformed individuals (28 from Alabama, 3 from Arkansas, 5 from Kentucky, 6 from Maryland, 3 from Ohio, and 8 from Tennessee) and 13 ammocoetes (10 from Alabama and 3 from Kentucky). Data for each collection are given in the Appendix.

***Lethenteron meridionale* sp. nov.**
Gulf Brook Lamprey
Figures 1–6

**Etymology**
The species name *meridionale* is derived from the Latin *meridies* for midday, or south, and refers to the southern distribution. It is used in the neuter form to agree with *Lethenteron.*

**Holotype**
An adult male 104 mm in total length from Blue Springs Creek, a tributary of the Tennessee River, near Hillsboro, Coffee County; 3 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2830, now re-catalogued as NMC 74-249. It bears the plastic tag W667.

This new nonparasitic species belongs to the genus *Lethenteron* Creaser and Hubbs 1922. This genus is well characterized by the arrangement of its teeth (Vladykov and Follett 1967).

**Diagnosis**
The new species clearly differs from its nearest relative, *Lethenteron lamottenii* (Le Sueur), also nonparasitic, by its low number of trunk myomeres in transformed specimens, varying between 50 and 58 (average 54), whereas in *L. lamottenii* the myomeres range from 64 to 74 (average 68). Other differences are summarized in Table 12.

From another nonparasitic species, *Lampetra aepyptera* (Abbott) living in the same watersheds, *Lethenteron meridionale* is readily distinguishable by possession of posterials,* varying in number from 10 to 21 (average 15.4). Posterials are completely lacking in *aepyptera,* as in all other species of *Lampetra.* Other differences between *meridionale* and *aepyptera* are given in Tables 7 and 11.

**Characters of Holotype**
The holotype, a male 104 mm in total length when received.

Measurements of the holotype — referable to maturity stage 3 (Vladykov and Follett 1965) — each expressed as a percentage of total length, are: prebranchial length, 10.6; trunk length, 46.6; tail length, 30.8; maximum height of the second dorsal fin, 5.3; disc length, 6.3; eye length, 1.9. Disc length as a percentage of branchial length is 59.1. Trunk myomeres (Figures 1 and 2), 52.

The already cornified teeth are small. On each side of the disc there are three inner lateral teeth, all unicuspid. On the anterior field there are about 34 teeth, all practically the same size; on the posterior field there is a single row of 18 small posterials. The supraoral lamina is provided with one cusp at each end; the infraoral lamina has about 12 weakly developed cusps; the marginals are in two rows. The three lingual laminae are so poorly developed that the cusps are uncountable (Figure 3).

Colour of the specimen preserved in 4–5% formalin is dark greyish brown on the flanks and back, and whitish along the ventral surface.

Although the holotype is in the early stage of maturity, the dorsal fins are already high and close together, and the genital papilla is well-developed. There is an extensive, dark pigmentation of vertically elongated spots on the dorsal fins. A dark blotch surrounds the posterior section of the notochord; towards the edges of the caudal fin, the pigment becomes less pronounced (Figure 1).

**Characters of Paratypes**
Collection data for paratypes are given in the Appendix.

Transformed Specimens

*Total length* (Tables 1 and 2)
The 55 males examined range in total length from 96 to 136 mm (average 115.8 mm); the 24 females range from 96 to 141 mm (average 116.7 mm).

*Body proportions* (Tables 1 and 2)
For the 55 males the average measurements as percentages of total length are: prebranchial length, 11.7 (range 10.2–12.9); branchial length, 10.2 (range 9.1–11.4); trunk length, 48.0 (range 43.6–52.7); tail length 30.2 (27.3–33.9); maximum height of second dorsal fin, 4.5 (3.0–5.7); eye length, 1.8 (range 1.5–2.1); disc length, 5.2 (4.2–6.5). Disc length as a percentage of branchial length is 51.5 (range 41.7–66.7).

* It is regrettable that Scott and Crossman (1973) omitted posterials on their schematic drawings of the disc of *L. lamottenii,* in spite of the fact that these teeth are always present in all species of *Lethenteron.*

For the 24 females the average measurements are: prebranchial length, 10.7 (range 7.8–13.0); branchial length, 10.0 (range 9.3–11.4); trunk length, 51.4 (49.2–53.9); tail length 28.0 (26.0–30.3); maximum height of second dorsal fin, 3.8 (range 2.5–5.1); eye length, 1.7 (range 1.4–2.1); disc length, 4.8 (range 2.8–5.7). Disc length as a percentage of branchial length is 47.5 (range 27.6–57.1).

*Trunk myomeres* (Table 5)
The number of trunk myomeres in the transformed specimens of *meridionale* varies from 50 to 58 (average 53.8).

*Dentition* (Tables 7–9)
The teeth are small and often not fully cornified; hence some counts of them are uncertain. The teeth on the anterior field are uniformly small, averaging 16.1 (range 5–34) in number. The single row of posterials is typical for all species of the genus *Lethenteron.*

The posterials range in number from 10 to 21 (average 15.4), but are often weakly developed and difficult to count. The supraoral lamina has two blunt cusps, one at each end; as an exception, one specimen, Tag W533, from Alabama, has a strongly developed median cusp on the supraoral lamina.

The rounded and weakly developed cusps on the infraoral lamina average 9.9, ranging from 6 to 13 in number.

The typical number of inner laterals in the genus *Lethenteron* is six, three on each side of the disc. Infrequently, fewer than six (rarely as many as eight) cornified inner laterals develop in *meridionale.* In three specimens (Table 8) all inner laterals are lacking. The average number of inner laterals is 5.5 (range 0–8). Although in the genus *Lethenteron* all inner laterals are typically bicuspid, in *L. meridionale* they are usually unicuspid.

The marginals tend to form two rows around the disc.

The transverse and longitudinal lingual laminae are weakly developed and the cusps are uncountable.

An enlarged median cusp on the transverse lamina is typical of other species of *Lethenteron* (Figure 4), but does not develop in *L. meridionale.*

*Other characters*
Velar tentacles were counted in two specimens of *meridionale* where only three tentacles were found: one median with a single lateral on either side.

The average number of oral papillae around the disc in 55 specimens of *L. meridionale* is 14.2 (range 8–25). The number of anterior fimbriae within the width of the base of the supraoral lamina is somewhat variable. In 10 specimens from Tennessee the average is 17.2 (range 13–22) and in 5 from Alabama the average is 11.0 (range 9–15). The difference between the Tennessee and Alabama specimens appears to be related to the width of the supraoral lamina, which averages 2.6 mm in Tennessee specimens and 1.9 mm in those from Alabama.

There are dark chromatophores in the buccal cavity but none extend onto the tongue.

*Colouration* (Table 10)
The sides and back of specimens fixed in 4–5% formalin are greyish brown and the lower surface is whitish.

Dark pigmentation on the second dorsal fin, if developed, consists of a series of vertically elongated narrow dark spots. There is a distinct black blotch (Figures 1 and 2) on the caudal fin. The intensity of dark pigmentation varies with the geographical region; in specimens from the Tennessee–Mississippi drainage pigmentation is very pronounced, in contrast with those from the Tombigbee and Alabama rivers, where it is weakly developed.

*Sexual dimorphism*
The external appearance of males and females of *Lethenteron meridionale* is similar to that of *L. lamottenii* as described by Vladykov (1949).

There are sexual differences in body proportions (Tables 1, 2, and 4). Disc length (d), prebranchial length (d–$B_1$) and tail length (a–C) are greater in males; females have a relatively longer trunk ($B_7$–a).

All specimens were in prespawning condition. One female (Tag W556, from Alabama), maturity stage 3, 122 mm in length, collected on 5 December 1963, had 2,154 eggs averaging 0.63 mm in diameter.

Ammocoetes

Only two ammocoetes were available, one from Tennessee (Tag W677), 100 mm long, and the other from Alabama (Tag W552),

142 mm. Body proportions expressed as percentages of total length were as follows: d–$B_1$, 7.0–8.5; $B_1$–$B_7$, 11.2–12.5; $B_7$–a, 50.5–53.5; a–C, 28.5. The myomeres number 54 and 55.

As in the transformed specimens, the ammocoete from Tennessee is more heavily pigmented than the one from Alabama. The limited number of specimens does not permit a critical description of the ammocoetes of *Lethenteron meridionale.*

## Comparison of *Lethenteron meridionale* with *L. lamottenii*

In the Tennessee River tributaries from which the holotype and topotypes of *L. meridionale* were obtained, one male and one female of *L. lamottenii* (Tags W679 and W680) were collected, in Putnam County, Tennessee.

These Tennessee specimens of the two nonparasitic species are compared in Table 12. The principal differences are found in the number and degree of development of different types of teeth (Figures 2 and 4). The number of myomeres in *meridionale* is 50–58, whereas each of the two specimens of *lamottenii* from Tennessee has 68. Smith-Vaniz (1968) indicated 63–70 for *lamottenii* from the Tennessee River system in Alabama, and Trautman (1957) reported 63–73 from Ohio. Several authors, Valdykov (1949), Manion and Purvis (1970), and Kott (1974), observed a similar number in material from the St. Lawrence River and Great Lakes areas.

Another striking difference between *meridionale* and *lamottenii* is in dark pigmentation of the second dorsal fin. In *meridionale* there are often several vertical narrow spots, whereas in *lamottenii* individual spots are absent, but a dark-brown tint made up of minute chromatophores is noticeable over the fin membrane (Figures 1 and 5).

*Lethenteron meridionale* is a small species, attaining less than 150 mm in total length, whereas some individuals of *L. lamottenii* have been reported to reach a "gigantic" size, up to 300 mm (Manion and Purvis 1970), but ordinarily reach 217 mm (Kott 1974).

### Comparison of *Lethenteron meridionale* with *Lampetra aepyptera*

In exterior appearance *Lethenteron meridionale* and *Lampetra aepyptera* are similar (Figure 2). For this reason all specimens that we now identify as *meridionale* were originally determined as *Lampetra aepyptera* in collections of the University of Alabama.

Similarity between *meridionale* and *aepyptera* was observed in number of trunk myomeres (Tables 5 and 6), in dark pigmentation of fins, and in size. However, a close examination of body proportions (Tables 1–4) and dentition (Tables 7–9) revealed differences. See Table 10 for degree of pigmentation.

*Lethenteron meridionale* and *Lampetra aepyptera* are compared in detail in Table 11. The principal differences between them are in numbers and degree of development of teeth on the anterior and posterior fields. The number of anterials average 16 (range 7–34) in *meridionale* and 8 (range 2–21) in *aepyptera*. The posterials are always present in all species of *Lethenteron*. In *meridionale* the number of posterials averages 15.9 (range 10–21). In all species of *Lampetra,* including *aepyptera,* the posterials are absent (Figures 3 and 6). Even in histological sections, Seversmith (1953) found no evidence of posterials in *aepyptera.*

The number of inner laterals averages 5.5 (range 0–8) in *meridionale* and 4.6 (range 1–6) in *aepyptera*. In our material three specimens of *meridionale* are devoid of inner laterals. A similar loss in *aepyptera* was reported by Raney (1952).

Two counts suggest that the fecundity of *meridionale* may be significantly higher than that of *aepyptera:* a 122-mm female of *meridionale* (Tag W556, from Alabama) contained 2,154 eggs, whereas a 118-mm specimen of *aepyptera* (Tag W537, also from Alabama) collected on 2 February 1963, contained 1,547.

*Lethenteron meridionale* and *Lampetra aepyptera* are placed in separate genera on the basis of the presence or absence of posterial teeth. In spite of their allocation to different genera, the two species are similar in myomere number, size, pigmentation, and reduction in number of teeth. One can speculate that these similarities may be due to parallelism, in which case assignment to different genera is warranted. Or, *aepyptera* may have lost its posterials and may share a recent common ancestor with *meridionale.* Lamprey collections from other Gulf states would hopefully cast light on this problem.

### Geographical Distribution of *Lethenteron meridionale*

This species has been collected so far only in freshwater streams in the eastern drainage of the Gulf of Mexico, that is, in Tennessee, Alabama, and Georgia. In Tennessee it has been collected in several tributaries of the Tennessee River system. It is significant to note that in streams of Putnam County, Tennessee, *lamottenii* and *aepyptera* are present in addition to *meridionale.* Several samples of *meridionale* were obtained from the Mobile Basin to which the Alabama and Tombigbee rivers belong. From the Alabama River system *meridionale* has been collected in Georgia and Alabama. Specimens have also been obtained from the Tombigbee River in Alabama.

The distribution of *meridionale* corresponds to that of 16 other freshwater species of Alabama, which Smith-Vaniz (1968) concluded probably originated in the Tennessee River system, whence they invaded the headwaters of the Alabama River system and Tombigbee River.

Figure 1
Enlarged photographs of the head and tail regions of *Lethenteron meridionale,* holotype, Tag W667, ♂, total length 104 mm, from Tennessee.

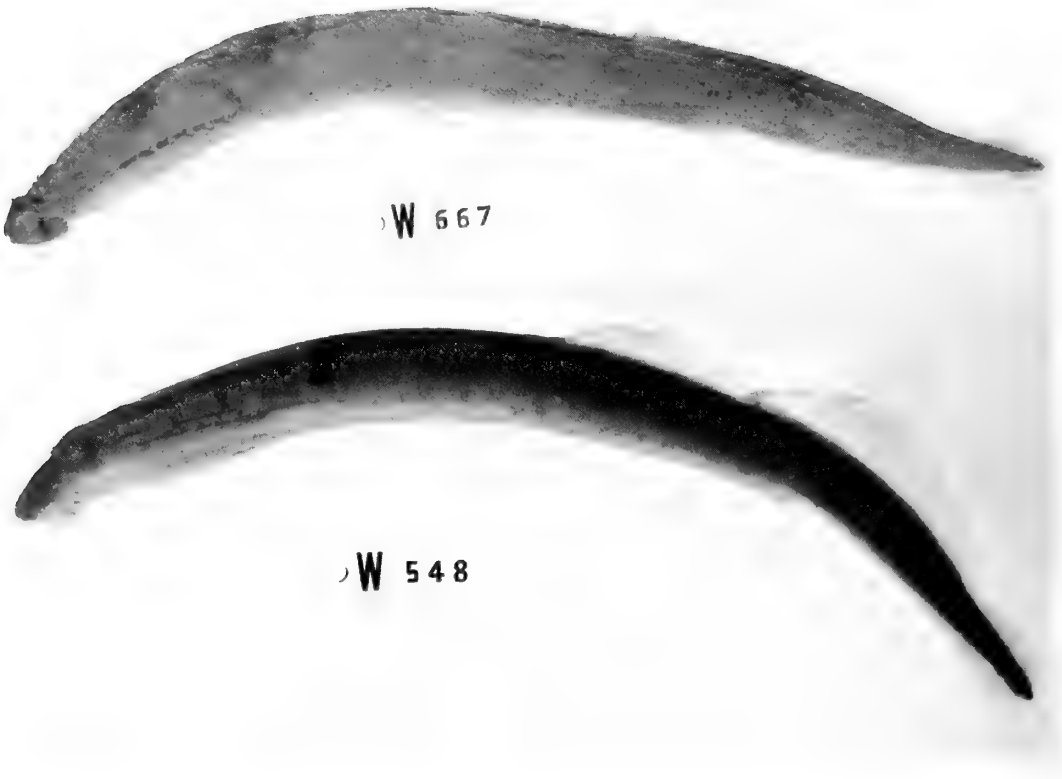


Figure 2
Enlarged photographs of two nonparasitic lampreys. *Upper: Lethenteron meridionale,* Tag W667, holotype, ♂ , total length 104 mm, from Tennessee. *Lower: Lampetra aepyptera,* Tag W548, ♂ , total length 99 mm, from Alabama.

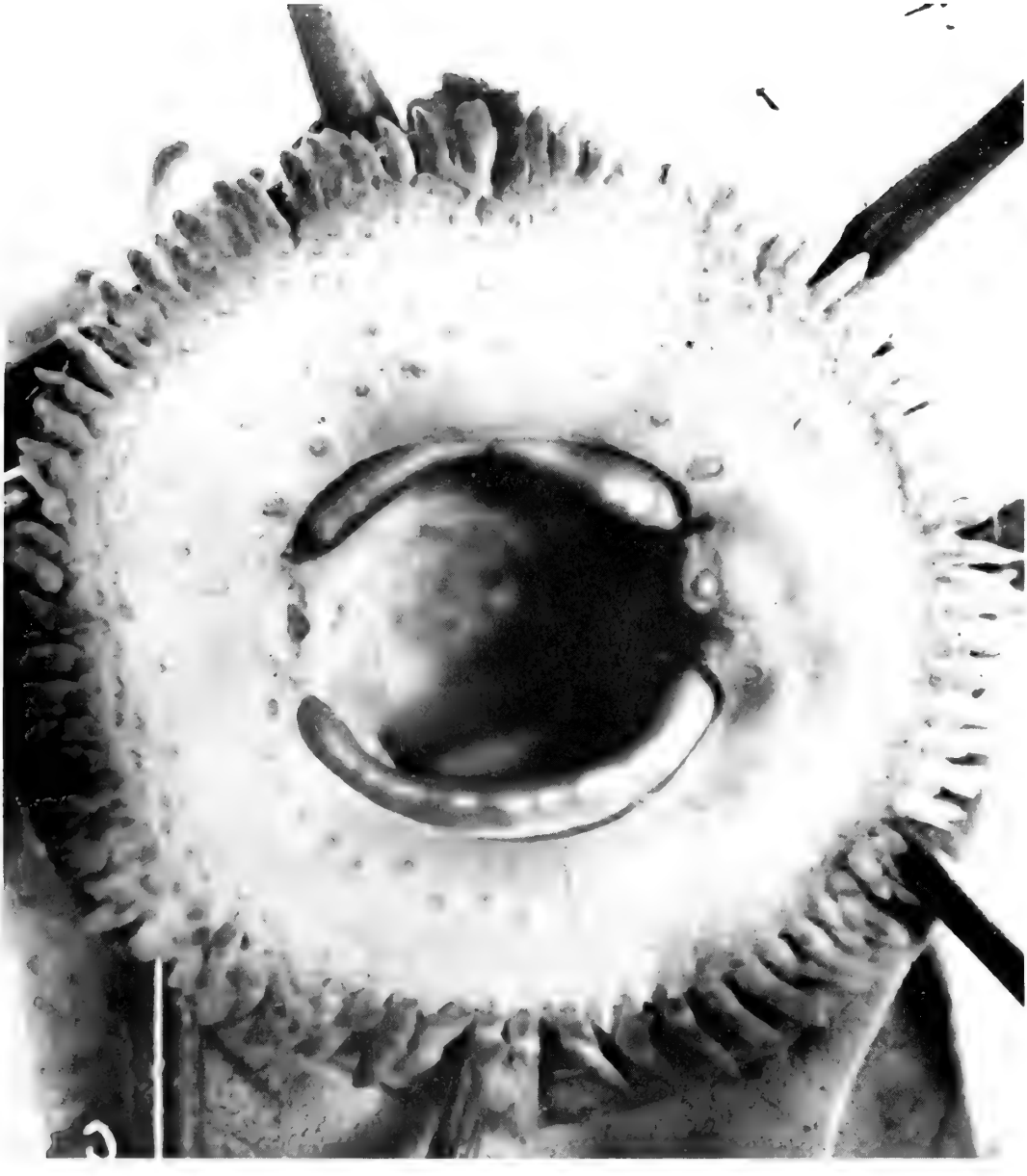

Figure 3
Enlarged photograph of the disc of *Lethenteron meridionale,* holotype, Tag W667, ♂, total length 104 mm, from Tennessee.

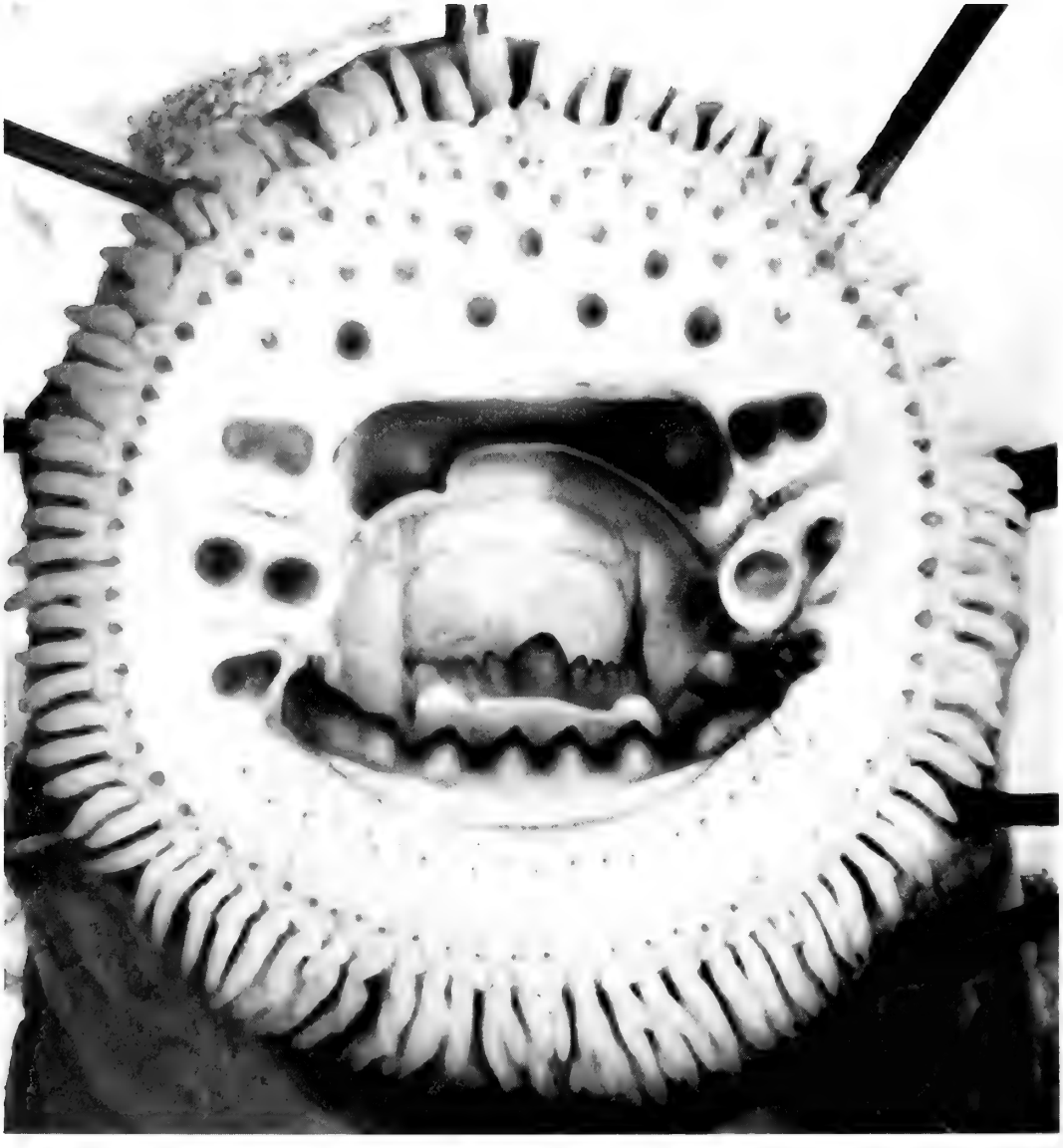

Figure 4
Enlarged photograph of the disc of *Lethenteron lamottenii,* Tag W681, ♂ , total length 162 mm, from Gatineau River, Quebec, collected on 17 May 1958, by M. Corbeil and A. Lutz.

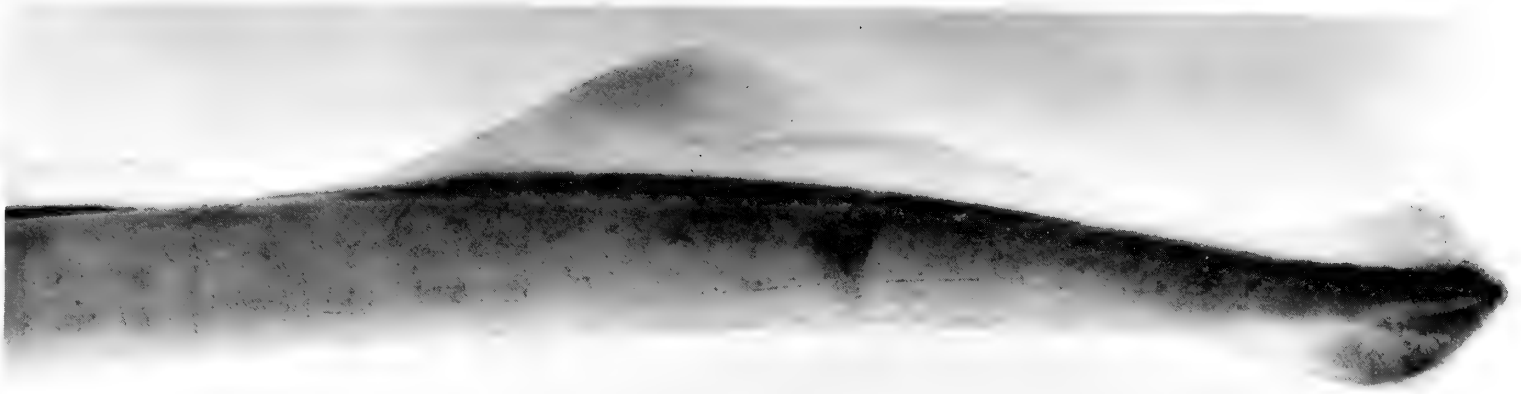

Figure 5
Enlarged photograph of the tail region of *Lethenteron lamottenii,* Tag W681, ♂, total length 162 mm, from Gatineau River, Quebec, collected on 17 May 1958, by M. Corbeil and A. Lutz.

Figure 6
Enlarged photograph of the disc of *Lampetra aepyptera,* Tag W572, ♂ , total length 93 mm, from Alabama.
*Note:* The pinning of the disc for photography caused a certain distortion on the left side of the photograph. Hence, three small supplementary marginal teeth, which could be mistaken for posterial teeth, are brought closer to the infraoral lamina.

Table 1
Body proportions (as percentages of total length) of 55 males of *Lethenteron meridionale* from Tennessee, Alabama, and Georgia

| Tag No. | TL (mm) | d–$B_1$ / TL | $B_1$–$B_7$ / TL | $B_7$–a / TL | a–C / TL | $hD_2$ / TL | 0 / TL | d / TL | d / $B_1$–$B_7$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Tennessee | | | | | |
| W673 | 96 | 12.5 | 9.9 | 45.8 | 31.8 | 5.2 | 2.1 | 5.2 | 52.6 |
| W634 | 97 | 12.4 | 10.3 | 45.9 | 31.4 | 5.2 | 2.1 | 6.2 | 60.0 |
| W618 | 98 | 12.8 | 9.7 | 48.5 | 29.1 | 4.6 | 2.0 | 5.1 | 52.6 |
| W670 | 98 | 12.8 | 9.7 | 45.4 | 32.1 | 5.1 | 2.0 | 5.6 | 57.9 |
| W633 | 101 | 11.4 | 9.9 | 48.5 | 29.7 | 5.0 | 2.0 | 5.4 | 55.0 |
| **W667*** | 104 | 12.1 | 10.6 | 46.6 | 30.8 | 5.3 | 1.9 | 6.3 | 59.1 |
| W615 | 105 | 12.9 | 11.4 | 44.3 | 31.0 | 4.8 | 1.9 | 6.2 | 54.2 |
| W631 | 105 | 12.4 | 10.5 | 46.7 | 30.5 | 4.8 | 1.9 | 6.3 | 59.1 |
| W645 | 105 | 11.9 | 10.0 | 48.6 | 29.5 | 5.2 | 1.9 | 5.7 | 57.1 |
| W635 | 105 | 12.4 | 11.0 | 46.2 | 30.5 | 4.8 | 1.9 | 5.7 | 57.1 |
| W632 | 108 | 12.5 | 9.7 | 46.3 | 31.5 | 5.6 | 1.9 | 6.5 | 66.7 |
| W643 | 109 | 12.4 | 10.6 | 47.7 | 29.4 | 5.0 | 1.8 | 5.5 | 52.2 |
| W668 | 109 | 11.0 | 10.6 | 49.1 | 29.4 | 4.6 | 1.8 | 5.5 | 52.2 |
| W629 | 110 | 12.3 | 10.5 | 46.4 | 30.9 | 5.5 | 1.8 | 5.0 | 47.8 |
| W639 | 110 | 12.7 | 10.0 | 47.3 | 30.0 | 5.5 | 1.8 | 5.5 | 54.5 |
| W637 | 111 | 10.8 | 10.8 | 47.7 | 30.6 | 5.4 | 1.8 | 5.4 | 50.5 |
| W644 | 111 | 12.2 | 10.8 | 45.0 | 32.0 | 5.4 | 1.8 | 5.4 | 50.5 |
| W613 | 112 | 12.1 | 10.7 | 45.5 | 31.7 | 5.4 | 1.8 | 5.4 | 50.0 |
| W660 | 112 | 12.9 | 10.7 | 45.5 | 30.8 | 4.9 | 1.8 | 5.8 | 54.2 |
| W671 | 112 | 12.1 | 9.8 | 47.3 | 30.8 | 4.9 | 1.8 | 5.8 | 59.1 |
| W648 | 113 | 12.4 | 9.7 | 46.9 | 31.0 | 5.3 | 1.8 | 5.3 | 54.5 |
| W661 | 113 | 11.9 | 11.1 | 46.0 | 31.0 | 4.4 | 1.8 | 6.2 | 56.0 |
| W666 | 113 | 11.5 | 9.7 | 49.6 | 30.1 | 4.9 | 1.8 | 5.8 | 59.1 |
| W657 | 114 | 11.8 | 10.5 | 47.4 | 30.3 | 4.8 | 1.8 | 5.7 | 54.2 |
| W674 | 114 | 11.8 | 9.6 | 47.8 | 30.7 | 4.8 | 1.8 | 5.7 | 59.1 |
| W646 | 115 | 11.7 | 9.1 | 47.8 | 31.3 | 5.2 | 1.7 | 5.7 | 61.9 |
| W659 | 115 | 12.2 | 9.6 | 48.3 | 30.0 | 4.8 | 1.7 | 6.1 | 63.6 |
| W658 | 115 | 11.3 | 10.0 | 48.3 | 30.4 | 5.2 | 1.7 | 5.2 | 52.2 |
| W612 | 116 | 11.2 | 9.9 | 47.0 | 31.5 | 3.4 | 1.7 | 4.7 | 47.8 |
| W619 | 116 | 12.1 | 9.9 | 45.7 | 32.3 | 5.6 | 1.7 | 5.2 | 52.2 |
| W630 | 116 | 12.5 | 10.3 | 48.7 | 28.4 | 5.2 | 1.7 | 5.6 | 54.2 |
| W638 | 117 | 12.0 | 10.3 | 43.6 | 34.2 | 5.1 | 1.7 | 5.6 | 54.2 |
| W649 | 117 | 12.0 | 10.3 | 45.3 | 32.5 | 4.7 | 1.7 | 4.7 | 45.8 |
| W665 | 117 | 12.0 | 9.8 | 48.3 | 29.9 | 4.7 | 1.7 | 5.6 | 56.5 |
| W642 | 119 | 11.8 | 10.1 | 46.2 | 31.9 | 5.0 | 1.7 | 5.5 | 54.2 |
| W647 | 119 | 11.3 | 10.1 | 46.2 | 31.9 | 5.0 | 1.7 | 5.5 | 54.2 |
| W672 | 120 | 12.1 | 10.0 | 46.7 | 31.3 | 5.0 | 1.7 | 5.4 | 54.2 |
| W636 | 122 | 12.3 | 11.1 | 45.9 | 30.3 | 4.9 | 1.6 | 5.3 | 48.1 |
| W616 | 124 | 12.1 | 10.5 | 47.6 | 29.8 | 5.2 | 2.0 | 6.5 | 61.5 |
| W640 | 124 | 11.7 | 10.9 | 45.6 | 31.9 | 4.4 | 1.6 | 5.2 | 48.1 |

Table 1

| Tag No. | TL (mm) | d–$B_1$ / TL | $B_1$–$B_7$ / TL | $B_7$–a / TL | a–C / TL | $hD_2$ / TL | 0 / TL | d / TL | d / $B_1$–$B_7$ |
|---|---|---|---|---|---|---|---|---|---|
| W656 | 124 | 11.7 | 9.3 | 45.2 | 33.9 | 5.6 | 1.6 | 5.6 | 60.7 |
| W641 | 126 | 11.9 | 10.3 | 47.6 | 30.1 | 4.4 | 1.6 | 5.6 | 53.8 |
| W655 | 126 | 11.5 | 9.5 | 47.2 | 31.7 | 5.2 | 1.6 | 5.2 | 54.2 |
| W676 | 132 | 10.2 | 9.8 | 52.7 | 27.3 | 3.0 | 1.5 | 4.5 | 46.2 |
| W677 | 136 | 11.0 | 9.9 | 50.4 | 28.7 | 3.7 | 1.5 | 4.8 | 48.1 |
| Mean | 112.8 | 12.0 | 10.2 | 47.0 | 31.0 | 5.0 | 1.8 | 5.5 | 54.7 |
| | | | | Alabama | | | | | |
| W533 | 116 | 11.2 | 9.5 | 50.7 | 30.2 | 3.9 | 1.7 | 4.3 | 45.5 |
| W581 | 116 | 12.1 | 10.3 | 50.0 | 27.6 | – | 1.8 | 5.2 | 50.0 |
| W583 | 116 | 11.2 | 9.5 | 50.0 | 29.3 | – | 1.7 | 6.0 | 63.6 |
| W582 | 117 | 11.5 | 9.8 | 49.6 | 29.1 | – | 2.1 | 5.6 | 56.5 |
| W555 | 118 | 11.4 | 10.2 | 50.0 | 28.4 | 3.0 | 1.7 | 4.2 | 41.7 |
| W554 | 122 | 11.1 | 10.2 | 50.8 | 27.9 | 3.7 | 1.6 | 4.9 | 48.0 |
| W558 | 131 | 10.3 | 9.2 | 51.9 | 28.6 | 3.1 | 1.5 | 4.2 | 45.8 |
| Mean | 119.4 | 11.3 | 9.8 | 50.4 | 28.7 | 3.4 | 1.7 | 4.9 | 50.2 |
| | | | | Georgia | | | | | |
| W596 | 103 | 12.1 | 11.2 | 45.1 | 31.2 | 4.9 | 1.9 | 5.0 | 47.8 |
| W598 | 110 | 11.8 | 10.5 | 49.5 | 28.6 | 4.5 | 1.8 | 5.2 | 50.5 |
| W597 | 123 | 11.8 | 10.2 | 45.5 | 32.5 | 5.7 | 1.6 | 5.7 | 56.0 |
| Mean | 112.0 | 11.9 | 10.6 | 46.7 | 30.8 | 5.0 | 1.8 | 5.2 | 50.5 |
| Combined Mean | 114.7 | 11.7 | 10.2 | 48.0 | 30.2 | 4.5 | 1.8 | 5.2 | 51.5 |

*Holotype

Table 2
Body proportions (as percentages of total length) of 24 females of *Lethenteron meridionale* from Tennessee and Alabama

| Tag No. | TL (mm) | $\frac{d-B_1}{TL}$ | $\frac{B_1-B_7}{TL}$ | $\frac{B_7-a}{TL}$ | $\frac{a-C}{TL}$ | $\frac{hD_2}{TL}$ | $\frac{O}{TL}$ | $\frac{d}{TL}$ | $\frac{d}{B_1-B_7}$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Tennessee | | | | | |
| W650 | 96 | 13.0 | 10.4 | 50.5 | 26.0 | 4.7 | 2.1 | 5.7 | 55.0 |
| W620 | 99 | 12.1 | 10.6 | 50.5 | 26.8 | 5.1 | 2.0 | 5.6 | 52.4 |
| W621 | 100 | 12.0 | 10.0 | 51.0 | 27.0 | 5.0 | 2.0 | 5.5 | 55.0 |
| W662 | 105 | 11.4 | 11.4 | 50.0 | 27.1 | 4.3 | 1.9 | 4.8 | 41.7 |
| W626 | 107 | 10.7 | 10.3 | 52.3 | 26.6 | 4.2 | 1.9 | 4.7 | 45.5 |
| W627 | 108 | 10.6 | 10.2 | 52.8 | 26.4 | 4.6 | 1.9 | 5.1 | 50.0 |
| W622 | 109 | 11.0 | 9.6 | 50.9 | 28.4 | 4.6 | 1.8 | 4.6 | 47.6 |
| W623 | 109 | 11.5 | 10.6 | 50.0 | 28.0 | 4.6 | 1.8 | 5.0 | 47.8 |
| W669 | 109 | 11.5 | 10.6 | 51.8 | 26.1 | 4.7 | 1.8 | 5.0 | 47.8 |
| W625 | 111 | 10.8 | 9.5 | 52.3 | 27.5 | 4.5 | 1.8 | 5.0 | 52.4 |
| W652 | 111 | 11.3 | 9.9 | 51.7 | 27.6 | 4.7 | 1.7 | 4.7 | 47.8 |
| W628 | 113 | 11.1 | 9.3 | 51.8 | 27.9 | 4.4 | 1.8 | 5.3 | 57.1 |
| W651 | 114 | 10.5 | 10.1 | 51.8 | 28.1 | 4.4 | 1.8 | 5.3 | 52.2 |
| W624 | 115 | 10.9 | 9.6 | 51.3 | 28.3 | 4.3 | 1.7 | 4.8 | 50.0 |
| W653 | 116 | 10.8 | 9.9 | 51.7 | 27.6 | 4.7 | 1.7 | 4.7 | 47.8 |
| W663 | 116 | 11.2 | 11.2 | 49.6 | 28.0 | 4.7 | 1.7 | 5.2 | 46.2 |
| W664 | 116 | 10.3 | 9.5 | 51.7 | 28.4 | 3.9 | 1.7 | 4.3 | 45.5 |
| W654 | 118 | 11.4 | 11.4 | 50.0 | 27.1 | 4.3 | 1.9 | 4.8 | 47.1 |
| W617 | 119 | 10.1 | 10.1 | 49.6 | 30.3 | 3.4 | 1.7 | 4.2 | 41.7 |
| W675 | 141 | 7.8 | 10.3 | 53.9 | 28.0 | 2.5 | 1.4 | 2.8 | 27.6 |
| Mean | 111.6 | 11.0 | 10.2 | 51.3 | 27.6 | 4.4 | 1.8 | 4.9 | 48.1 |
| | | | | Alabama | | | | | |
| W553 | 119 | 10.5 | 9.7 | 51.3 | 28.6 | 2.9 | 1.7 | 4.6 | 47.8 |
| W543 | 121 | 9.1 | 9.9 | 53.7 | 27.3 | 2.9 | 1.7 | 4.5 | 45.8 |
| W556 | 122 | 10.7 | 10.2 | 49.2 | 29.9 | 3.3 | 1.6 | 4.5 | 44.0 |
| W557 | 125 | 10.8 | 9.6 | 52.0 | 27.6 | 3.2 | 1.6 | 4.8 | 50.0 |
| Mean | 121.8 | 10.3 | 9.8 | 51.5 | 28.3 | 3.1 | 1.7 | 4.6 | 46.9 |
| Combined Mean | 116.7 | 10.7 | 10.0 | 51.4 | 28.0 | 3.8 | 1.7 | 4.8 | 47.5 |

Table 3
Body proportions (as percentages of total length) of 23 males and 12 females of *Lampetra aepyptera* from Tennessee and Alabama

| Tag No. | TL (mm) | d–$B_1$ / TL | $B_1$–$B_7$ / TL | $B_7$–a / TL | a–C / TL | $hD_2$ / TL | 0 / TL | d / TL | d / $B_1$–$B_7$ |
|---|---|---|---|---|---|---|---|---|---|
| | | | | **Males** | | | | | |
| | | | | Tennessee | | | | | |
| 5072 (VDV) | 121 | 11.6 | 11.2 | 50.4 | 28.9 | 5.0 | 2.1 | 5.8 | 51.8 |
| 5073 (VDV) | 134 | 11.9 | 10.1 | 50.4 | 28.7 | 5.0 | 1.9 | 6.0 | 59.2 |
| 5075 (VDV) | 135 | 11.9 | 10.4 | 48.5 | 29.6 | 5.0 | 1.9 | 5.9 | 57.1 |
| 5071 (VDV) | 142 | 11.6 | 10.6 | 48.9 | 28.9 | 5.5 | 2.1 | 6.3 | 60.0 |
| 5074 (VDV) | 142 | 12.0 | 10.6 | 50.0 | 28.5 | 7.0 | 2.1 | 6.7 | 63.3 |
| 5076 (VDV) | 145 | 10.3 | 10.7 | 49.7 | 31.4 | 5.5 | 1.7 | 6.2 | 58.0 |
| Mean | 136.5 | 11.6 | 10.6 | 49.7 | 29.3 | 5.5 | 2.0 | 6.2 | 58.2 |
| | | | | Alabama | | | | | |
| W517 | 91 | 11.5 | 9.3 | 48.4 | 30.8 | 4.4 | 1.6 | 5.5 | 58.8 |
| W548 | 99 | 12.6 | 10.6 | 47.5 | 29.3 | 5.1 | 2.0 | 6.1 | 57.1 |
| W549 | 99 | 12.6 | 10.6 | 48.5 | 28.3 | 5.1 | 2.0 | 6.1 | 57.1 |
| W524 | 101 | 13.4 | 10.4 | 46.5 | 29.7 | 5.0 | 2.0 | 5.9 | 57.1 |
| W539 | 107 | 12.6 | 10.3 | 48.1 | 29.0 | 4.7 | 1.9 | 6.5 | 63.6 |
| W540 | 109 | 11.5 | 9.6 | 48.6 | 30.3 | 5.5 | 1.8 | 5.0 | 52.4 |
| W530 | 110 | 11.4 | 10.0 | 49.1 | 29.5 | 5.0 | 1.8 | 5.0 | 50.0 |
| W550 | 111 | 11.3 | 9.5 | 50.5 | 28.8 | 4.1 | 1.8 | 5.0 | 52.4 |
| W528 | 112 | 12.1 | 9.8 | 47.8 | 30.4 | 6.3 | 1.8 | 5.8 | 59.1 |
| W526 | 112 | 11.6 | 9.8 | 49.6 | 29.0 | 4.9 | 1.8 | 5.4 | 54.5 |
| W531 | 115 | 10.9 | 9.6 | 50.0 | 29.6 | 3.5 | 1.7 | 4.3 | 45.5 |
| W551 | 118 | 11.4 | 9.7 | 48.7 | 30.9 | 4.2 | 1.7 | 5.1 | 52.2 |
| W578 | 119 | 11.8 | 10.5 | 48.3 | 29.4 | 4.6 | 1.7 | 5.9 | 56.0 |
| W579 | 122 | 11.5 | 10.7 | 48.4 | 29.5 | 4.9 | 1.6 | 5.3 | 50.0 |
| W546 | 123 | 11.4 | 10.6 | 49.2 | 28.9 | 3.3 | 2.0 | 5.3 | 50.0 |
| W522 | 124 | 12.1 | 10.1 | 47.2 | 30.6 | 4.8 | 1.6 | 5.6 | 56.0 |
| W580 | 128 | 11.7 | 10.5 | 47.7 | 30.1 | 4.7 | 1.6 | 5.9 | 55.6 |
| Mean | 110.1 | 11.7 | 10.0 | 48.6 | 29.8 | 4.5 | 1.8 | 5.4 | 54.3 |
| Combined Mean | 117.0 | 11.7 | 10.3 | 49.2 | 29.6 | 5.0 | 1.9 | 5.8 | 56.3 |
| | | | | **Females** | | | | | |
| | | | | Tennessee | | | | | |
| 5070 (VDV) | 140 | 11.4 | 10.4 | 53.2 | 28.6 | 6.0 | 1.8 | 5.0 | 48.2 |
| 5069 (VDV) | 151 | 10.9 | 10.3 | 54.3 | 27.8 | 5.5 | 1.7 | 5.6 | 54.8 |
| Mean | 145.5 | 11.2 | 10.4 | 53.8 | 28.2 | 5.8 | 1.8 | 5.3 | 51.5 |
| | | | | Alabama | | | | | |
| W544 | 95 | 11.1 | 8.9 | 50.5 | 28.9 | 4.2 | 1.6 | 4.7 | 52.9 |
| W518 | 97 | 11.3 | 9.8 | 51.5 | 27.3 | 4.6 | 2.1 | 5.2 | 52.6 |
| W529 | 99 | 12.6 | 10.1 | 50.0 | 27.3 | 4.5 | 2.0 | 5.6 | 55.0 |
| W532 | 102 | 10.8 | 9.8 | 51.5 | 27.9 | 3.4 | 1.5 | 4.9 | 50.0 |
| W519 | 103 | 9.2 | 10.2 | 50.5 | 30.1 | 4.4 | 1.5 | 4.9 | 47.6 |

Table 3

| Tag No. | TL (mm) | $\frac{d-B_1}{TL}$ | $\frac{B_1-B_7}{TL}$ | $\frac{B_7-a}{TL}$ | $\frac{a-C}{TL}$ | $\frac{hD_2}{TL}$ | $\frac{0}{TL}$ | $\frac{d}{TL}$ | $\frac{d}{B_1-B_7}$ |
|---|---|---|---|---|---|---|---|---|---|
| W523 | 106 | 11.3 | 9.9 | 51.4 | 27.4 | 4.7 | 1.9 | 4.7 | 47.6 |
| W541 | 107 | 10.7 | 10.3 | 50.9 | 28.0 | 3.3 | 1.4 | 5.1 | 50.0 |
| W542 | 111 | 10.4 | 10.4 | 50.9 | 28.4 | 3.6 | 1.8 | 4.5 | 43.5 |
| W547 | 112 | 10.3 | 10.3 | 50.4 | 29.0 | 3.6 | 1.8 | 4.9 | 47.8 |
| W537 | 118 | 9.3 | 9.3 | 50.8 | 30.5 | 3.0 | 1.7 | 3.8 | 40.9 |
| Mean | 105.4 | 10.7 | 10.0 | 50.8 | 28.6 | 4.0 | 1.8 | 4.9 | 49.0 |
| Combined Mean | 112.1 | 11.0 | 10.2 | 52.3 | 28.4 | 4.9 | 1.8 | 5.1 | 50.3 |

Table 4
Comparison of average body proportions (as percentages of total length) of *Lethenteron meridionale* and *Lampetra aepyptera*, based on Tables 1–3

| Species | Sex | No. of specimens | TL (mm) | $\frac{d–B_1}{TL}$ | $\frac{B_1–B_7}{TL}$ | $\frac{B_7–a}{TL}$ | $\frac{a–C}{TL}$ | $\frac{hD_2}{TL}$ | $\frac{0}{TL}$ | $\frac{d}{TL}$ | $\frac{d}{B_1–B_7}$ |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *L. meridionale* | ♂ | 55 | 114.7 | 11.7 | 10.2 | 48.0 | 30.2 | 4.5 | 1.8 | 5.2 | 51.5 |
| | | | 96–136 | 10.2–12.9 | 9.1–11.4 | 43.6–52.7 | 27.3–33.9 | 3.0–5.7 | 1.5–2.1 | 4.2–6.5 | 41.7–66.7 |
| *L. aepyptera* | ♂ | 23 | 112.0 | 11.7 | 10.3 | 49.2 | 29.6 | 5.0 | 1.9 | 5.8 | 56.3 |
| | | | 91–145 | 10.3–13.4 | 9.3–11.2 | 46.5–50.5 | 28.3–31.4 | 3.3–7.0 | 1.6–2.1 | 4.3–6.7 | 45.5–63.6 |
| *L. meridionale* | ♀ | 24 | 116.7 | 10.7 | 10.0 | 51.4 | 28.0 | 3.8 | 1.7 | 4.8 | 47.5 |
| | | | 96–141 | 7.8–13.0 | 9.3–11.4 | 49.2–53.9 | 26.0–30.3 | 2.5–5.1 | 1.4–2.1 | 2.8–5.7 | 27.6–57.1 |
| *L. aepyptera* | ♀ | 12 | 112.1 | 11.0 | 10.2 | 52.3 | 28.4 | 4.9 | 1.8 | 5.1 | 50.3 |
| | | | 95–151 | 9.2–12.6 | 8.9–10.4 | 50.0–54.3 | 27.3–30.5 | 3.0–6.0 | 1.4–2.1 | 3.8–5.6 | 40.9–55.0 |

Table 5
Number of trunk myomeres of transformed *Lethenteron meridionale* from Tennessee, Alabama, and Georgia; sexes combined.

| Locality | Date | TL (mm) | Number of specimens | Number of myomeres 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tennessee (Tennessee River drainage) | | | | | | | | | | |
| Bean's Cr. | 4 Feb. 1968 | 96–120 | 6 | – | 1 | – | 1 | 1 | – | 3 | – | – | 54.3 |
| Blue Springs Cr. | 3 Feb. 1968 | 104–117 | 7 | – | – | 1 | 2 | 1 | 1 | 2 | – | – | 54.1 |
| Bradley Cr. | 3 Feb. 1968 | 97–126 | 30 | – | 3 | 2 | 8 | 5 | 6 | 5 | 1 | – | 53.9 |
| Bradley Cr. trib. | 3 Feb. 1968 | 96–126 | 10 | 1 | 2 | – | 2 | 3 | 1 | 1 | – | – | 53.1 |
| Henley Cr. | 3 Feb. 1968 | 98–119 | 3 | – | – | 1 | 1 | 1 | – | – | – | – | 53.0 |
| Hurricane Cr. | 28 Mar. 1968 | 112 | 1 | – | – | 1 | – | – | – | – | – | – | 52.0 |
| Spring Cr. | ? | 131–142 | 3 | – | – | – | – | 1 | – | 2 | – | – | 55.3 |
| Unnamed Cr., Winchester Spring | 28 Mar. 1968 | 105–124 | 2 | – | – | – | 1 | 1 | – | – | – | – | 53.5 |
| Total | | 96–142 | 63 | 1 | 7 | 5 | 15 | 13 | 8 | 13 | 1 | – | 53.8 |
| | | | Alabama (Tombigbee and Alabama river drainages) | | | | | | | | | | |
| Binnion Cr. | 5 Dec. 1963 | 118–131 | 6 | – | – | – | – | 1 | 2 | 2 | – | 1 | 55.7 |
| Blue Cr. | 24 Jan. 1966 | 121 | 1 | – | – | – | – | 1 | – | – | – | – | 54.0 |
| Coldwater Spring | 31 Aug. 1966 | 116 | 1 | – | – | – | – | 1 | – | – | – | – | 54.0 |
| Cr. near Tuscaloosa | 15 Mar. 1963 | 116–117 | 3 | – | – | – | – | 1 | 1 | 1 | – | – | 55.0 |
| Total | | 116–131 | 11 | – | – | – | – | 4 | 3 | 3 | – | 1 | 55.2 |
| | | | Georgia (Alabama River drainage) | | | | | | | | | | |
| Blue Spring | 4 Mar. 1966 | 110 | 1 | – | – | – | – | 1 | – | – | – | – | 54.0 |
| Spring run-off, Varnell | 4 Mar. 1966 | 121 | 1 | – | – | 1 | – | – | – | – | – | – | 52.0 |
| Unnamed Spring, Dalton | 4 Mar. 1966 | 123 | 1 | – | – | – | 1 | – | – | – | – | – | 53.0 |
| Total | | 110–123 | 3 | – | – | 1 | 1 | 1 | – | – | – | – | 54.0 |
| Combined total | | 96–142 | 77 | 1 | 7 | 6 | 16 | 18 | 11 | 16 | 1 | 1 | 54.0 |

Table 6
Number of trunk myomeres of transformed specimens of *Lampetra aepyptera* from Tennessee and Alabama; sexes combined.

| Locality | Date | TL (mm) | Number of specimens | Number of Myomeres 50 | 51 | 52 | 53 | 54 | 55 | 56 | 57 | 58 | 59 | Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | Tennessee (Tennessee River drainage) | | | | | | | | | | | |
| Falling Water R. | ? | 121–151 | 8 | – | – | – | – | 6 | 1 | 1 | – | – | – | 54.4 |
| | | | Alabama (Tennessee, Tombigbee, and Alabama river drainages) | | | | | | | | | | | |
| Beaver Cr. | 12 Mar. 1966 | 112 | 1 | – | – | – | – | – | – | 1 | – | – | – | 56.0 |
| Big Sandy Spring | 8 Mar. 1964 | 99–118 | 5 | – | – | – | – | 3 | 1 | – | – | 1 | – | 55.0 |
| Carroll's Cr. | 15 Mar. 1963 | 107–111 | 2 | – | – | – | – | – | 1 | – | 1 | – | – | 56.0 |
| Cave Spring | 5 Mar. 1967 | 107 | 1 | – | – | – | – | 1 | – | – | – | – | – | 54.0 |
| Gurley Cr. | 1 Mar. 1970 | 119–128 | 3 | – | – | – | – | 2 | 1 | – | – | – | – | 54.3 |
| Hurricane Cr. | 22 Mar. 1956 | 91–103 | 3 | – | – | – | – | 1 | – | – | 1 | – | 1 | 56.7 |
| Little Cypress Cr. | 23 Mar. 1967 | 99 | 1 | – | – | – | 1 | – | – | – | – | – | – | 53.0 |
| Middle Cypress Cr. | 29 Jan. 1969 | 102–123 | 2 | 1 | – | – | 1 | – | – | – | – | – | – | 51.5 |
| New R. | 3 Apr. 1965<br>30 Mar. 1968 | 112–124 | 2 | – | – | – | – | – | – | 2 | – | – | – | 56.0 |
| Polebridge Cr. | 2 Feb. 1963 | 118 | 1 | – | – | – | – | – | – | 1 | – | – | – | 56.0 |
| Shultz Cr. | 29 Mar. 1966 | 95 | 1 | – | – | – | 1 | – | – | – | – | – | – | 53.0 |
| Sipsey R. | 25 Feb. 1966 | 110 | 1 | – | – | – | – | 1 | – | – | – | – | – | 54.0 |
| South Sandy Cr. | 1 Apr. 1962<br>17 Jan. 1964 | 109–123 | 2 | – | – | – | – | 1 | 1 | – | – | – | – | 54.5 |
| Unnamed Spring, Lauderdale Co. | 23 Mar. 1967 | 101–106 | 2 | – | – | 2 | – | – | – | – | – | – | – | 52.0 |
| Total | | 91–128 | 27 | 1 | – | 2 | 3 | 9 | 4 | 4 | 2 | 1 | 1 | 54.6 |
| Combined Total | | 91–151 | 35 | 1 | – | 2 | 3 | 15 | 5 | 5 | 2 | 1 | 1 | 54.5 |

Table 7
Number of anterial and posterial teeth, and infraoral cusps, on the discs of *Lethenteron meridionale* and *Lampetra aepyptera* from Tennessee, Alabama, and Georgia; sexes combined.

| State | No. of anterial teeth | | | No. of posterial teeth | | | No. of infraoral cusps | | |
|---|---|---|---|---|---|---|---|---|---|
| | No. of specimens | Mean | Range | No. of specimens | Mean | Range | No. of specimens | Mean | Range |
| | | | | *Lethenteron meridionale* | | | | | |
| Tennessee | 58 | 16.7 | 7–34* | 31 | 15.9 | 10–21 | 57 | 10.1 | 6–13 |
| Alabama | 9 | 10.9 | 5–14 | 3 | 11.3 | 11–12 | 8 | 8.5 | 7–11 |
| Georgia | 3 | 21.3 | 15–24 | 2 | 13.5 | 11–16 | 2 | 9.0 | 8–10 |
| Combined Mean | 70 | 16.1 | 5–34 | 36 | 15.4 | 10–21 | 67 | 9.9 | 6–13 |
| | | | | *Lampetra aepyptera* | | | | | |
| Tennessee | 8 | 7.5 | 3–12 | 8 | 0 | – | 7 | 12.7 | 9–15 |
| Alabama | 23 | 8.1 | 2–14** | 23 | 0 | – | 21 | 8.2 | 5–12 |
| Combined Mean | 31 | 7.9 | 2–21 | 31 | 0 | – | 28 | 9.0 | 5–15 |

* 34 anterial teeth in holotype.
**One specimen has 21 anterial teeth.

Table 8
Number of inner lateral teeth, combined for both sides of disc, in *Lethenteron meridionale* and *Lampetra aepyptera* from Tennessee, Alabama, and Georgia;* sexes combined.

| Species | No. of specimens | Number of inner lateral teeth | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | Mean |
| *L. meridionale* | 77 | 3 | 2 | 2 | – | 3 | 2 | 61 | 2 | 2 | 5.5 |
| | | 3.9** | 2.6 | 2.6 | – | 3.9 | 2.6 | 79.2 | 2.6 | 2.6 | 100.0 |
| *L. aepyptera* | 31 | – | 2 | 2 | 4 | 3 | 8 | 12 | – | – | 4.6 |
| | | – | 6.5** | 6.5 | 12.9 | 9.7 | 25.8 | 38.6 | – | – | 100.0 |

* From Georgia we have three specimens of *L. meridionale* and none of *L. aepyptera.*
**Figures in this line are percentages.

Table 9
Frequency of occurrence of cusps on inner lateral teeth in *Lethenteron meridionale* and *Lampetra aepyptera* from Tennessee, Alabama, and Georgia;* sexes combined.

| Inner lateral teeth | No. of cusps | *L. meridionale* | | *L. aepyptera* | |
|---|---|---|---|---|---|
| | | % | Mean no. of cusps | % | Mean no. of cusps |
| Anterior | 1 | 91.7 | 1.1 | 63.9 | 1.4 |
| | 2 | 8.3 | | 36.1 | |
| Middle | 1 | 73.5 | 1.3 | 33.3 | 1.7 |
| | 2 | 26.5 | | 61.1 | |
| | 3 | – | | 5.6 | |
| Posterior | 1 | 84.8 | 1.2 | 85.1 | 1.1 |
| | 2 | 15.2 | | 14.9 | |
| Supplementary posterior | 1 | 100.0 | 1.0 | – | – |

*From Georgia we have three specimens of *L. meridionale* and none of *L. aepyptera.*

Table 10
Dark pigmentation of the second dorsal and caudal fins of *Lethenteron meridionale* and *Lampetra aepyptera* from Tennessee and Alabama.

| Species | State | No. of specimens | Second dorsal fin | | | | Caudal fin | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | absent | weak | moderate | strong | absent | weak | moderate | strong |
| *L. meridionale* | Tennessee | 64 | – | 11 | 37 | 16 | 4 | 23 | 29 | 8 |
| | | | – | 17.2* | 57.8 | 25.0 | 6.3 | 35.9 | 45.3 | 12.5 |
| | Alabama | 10 | 1 | 9 | – | – | 7 | 3 | – | – |
| | | | 10.0* | 90.0 | – | – | 70.0 | 30.0 | – | – |
| *L. aepyptera* | Tennessee | 8 | – | – | 1 | 7 | – | – | 4 | 4 |
| | | | – | – | 12.5* | 87.5 | – | – | 50.0 | 50.0 |
| | Alabama | 12 | 1 | 7 | 3 | 1 | 9 | 2 | 1 | – |
| | | | 8.3* | 58.4 | 25.0 | 8.3 | 75.0 | 16.7 | 8.3 | – |

*Figures in this line are percentages.

Table 11
Detailed comparison of *Lethenteron meridionale* with *Lampetra aepyptera*, based on Tables 1–9. Numbers in italics refer to means, and ranges (in parentheses), for each character.

| Character | *L. meridionale* | *L. aepyptera* |
|---|---|---|
| **Similarities** | | |
| Supraoral lamina | with two cusps, one at each end | with two cusps, one at each end |
| Marginals | in a double row | in a double row |
| All lingual laminae | typically with obsolete cusps | typically with obsolete cusps |
| Number of myomeres | *54.0* *(50–58)* | *54.5* *(50–59)* |
| Number of velar tentacles | 3 | typically 3 |
| Buccal cavity | pigmented | pigmented |
| Tongue | nonpigmented | nonpigmented |
| Dark pigmentation of second dorsal and caudal fins | quite similar | quite similar |
| Body proportions, except length of disc and height of second dorsal fin | similar | similar |
| Total length (mm), sexes combined | 96–141 | 91–151 |
| **Differences** | | |
| Posterial teeth | present | absent |
| Anterial teeth (type) | small, uniform, but numerous | small, uniform, but few |
| Anterial teeth (number) | *16.1* *(7–34)* | *8.1* *(2–21)* |
| Total number of inner lateral teeth | *5.5* *(0–8)* | *4.6* *(1–6)* |
| Middle lateral tooth | typically with one cusp | typically with 2 cusps |
| Infraoral lamina and number of cusps | cusps degenerate *9.9* *(6–13)* | cusps degenerate *9.0* *(5–15)* |
| Number of oral papillae | *14.2* *(8–25)* | *15.8* *(10–24)* |
| Length of disc as percentage of TL | male: *5.2* *(4.2–6.5)* female: *4.8* *(2.8–5.7)* | male: *5.8* *(4.3–6.7)* female: *5.1* *(3.8–5.6)* |
| Height of second dorsal fin as percentage of TL | male: *4.5* *(3.0–5.7)* female: *3.8* *(2.5–5.1)* | male: *5.0* *(3.3–7.0)* female: *4.9* *(3.0–6.0)* |
| Number of eggs and their diameter | 2,154 (0.6 mm) | 1,543 (0.8 mm) |
| Length of female | 122 mm | 118 mm |

Table 12
Comparison of two nonparasitic species of *Lethenteron* from Tennessee. Numbers in italics refer to means, and ranges (in parentheses), for each character.

| Character | *L. meridionale* | *L. lamottenii* |
|---|---|---|
| Anterial teeth | uniform in size | of two sizes: large near supraoral lamina and smaller towards marginals |
| Number of posterial teeth | *15.9* *(10–21)* | *21.5* *(20–23)* |
| Total number of inner lateral teeth | *5.5* *(0–8)* | *6.0* *(6)* |
| cusps on inner lateral teeth | all typically with one cusp | all bicuspid |
| Infraoral lamina and number of cusps | cusps degenerate *10.1* *(6–13)* | cusps prominent *9.5* *(9–10)* |
| Marginal teeth | in two rows | in one row |
| All lingual laminae | with cusps typically obsolete | with cusps well developed |
| Transverse lingual lamina | middle cusp not enlarged | middle cusp enlarged |
| Number of myomeres | *53.8* *(50–58)* | *68.0* *(68)* |
| Number of velar tentacles | 3 | 7 |
| Buccal cavity | pigmented | nonpigmented |
| Dark pigmentation of second dorsal fin | several vertical narrow spots | dark-brown tint without distinct spots |
| Total length (mm) | 96–141 | 153–162 |

## Appendix

Complete data for the collections of *Lethenteron meridionale* and *Lampetra aepyptera* used in this study appear in the following sequence:

1 Tag number. Small white plastic tags (15 mm long by 5 mm wide) of two series were used.
Series *a*: On one side of the tag is the letter W, followed by a number; on the other side "Canada" is written.
Series *b*: On one side there is only a number, and on the other the letters VDV, the initials of the senior author, appear.
2 Number of specimens
3 Sex (in transformed specimens)
4 Total length
5 Localities in each river system (presented alphabetically)
6 Date of collection
7 Collector
8 Repository institution abbreviated as follows:

| | |
|---|---|
| ASUMZ | Arkansas State University Museum of Zoology, State University, Arkansas |
| AU | Auburn University, Auburn, Alabama |
| CBL | Chesapeake Biological Laboratory, Solomons, Maryland |
| EKU | Eastern Kentucky University, Museum of Fishes, Richmond, Kentucky |
| INHS | Illinois Natural History Survey, Urbana, Illinois |
| NMC | National Museum of Natural Sciences, National Museums of Canada, Ottawa |
| TTU | Tennessee Technological University, Cookeville, Tennessee |
| UAIC | University of Alabama Ichthyological Collection, University, Alabama |

9 Catalogue number of repository institution

### *Lethenteron meridionale*

Holotype and Topotypic Paratypes

W662–66 and 668 (3♀, 105–16 mm; 3♂, 109–17 mm); collected with holotype, W667 (now NMC 74-249); Blue Springs Creek, a tributary of the Tennessee River, near Hillsboro, Coffee County; 3 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2830.

Other Paratypes

*Tennessee: Tennessee River system*
W669–74 (one♀, 109 mm; 5♂, 96–120 mm); Bean's Creek, 2 miles southeast of Hillsboro at Stephenson, Coffee County; 4 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2837.

W620–49 (9♀, 99–115 mm; 21♂, 97–126 mm); Bradley Creek at Hillsboro, Coffee County; 3 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2831.

W650–61 (5♀, 96–118 mm; 7♂, 112–26 mm); unnamed spring, tributary of Bradley Creek at Hillsboro, Coffee County; 3 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2832.

W612 (one♂, 116 mm); Elk River at Elk Head, Grundy County; 3 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2835.

W617–19 (one♀, 119 mm; 2♂, 98–116 mm); Henly Creek, 2.1 miles southeast of Pelham, Grundy County; 3 February 1968; J.S. Jandebeur and J.D. Williams; UAIC 2834.

W613 (one♂, 112 mm); Hurricane Creek, at Awalt, Franklin County; 28 March 1968; J.S. Jandebeur and J.D. Williams; UAIC 2866.

W675–77 (one♀, 141 mm; 2♂, 132–36 mm), W978 (one ammocoete, 142 mm); Spring Creek, Putnam County; date and collector unknown; TTU.

W615–16 (2♂, 105–24 mm); unnamed creek, 2 miles southwest of Winchester Spring, Franklin County; 28 March 1968; J.S. Jandebeur and J.D. Williams; UAIC 2864.

*Alabama: Tombigbee River system*
W553–58 (3♀, 119–25 mm; 3♂, 118–31 mm), W552 (one ammocoete, 100 mm); spring tributary of Binnion Creek, Samantha, Tuscaloosa County; 5 December 1963; J.D. Williams and W.M. Howell; UAIC 1091.

W543 (one♀, 121 mm); Blue Creek about 1¾ miles north of Vina, Frankline County; 24 January 1966; B. Wall and H.T. Boschung; UAIC 1837.

W533 (one♂, 116 mm); Coldwater Spring, 5.7 miles west of Oxford, Calhoun County; 31 August 1966; J.D. Williams, J.G. Armstrong, and B.R. Wall; UAIC 2349.

W581–83 (3♂, 116–17 mm); first creek south of Tuscaloosa on Alabama highway 69, Tuscaloosa County; 15 March 1963; A.B. Stapp and J. Barnes; UAIC 991.

*Georgia: Alabama River system*
W598 (one♂, 110 mm); Blue Spring, 0.55 miles north of Varnell, Whitfield County; 4 March 1966; R.D. Caldwell and W.M. Howell; UAIC 1868.

W596 (one♂, 113 mm); spring west of U.S. highway 41, 6.8 miles south of Dalton, Whitfield County; 4 March 1966; R.D. Caldwell and W.M. Howell; UAIC 1873.

W597 (one♂, 123 mm); spring pond run-off, ¼ mile north of Varnell, Whitfield County; 4 March 1966; R.D. Caldwell and W.M. Howell; UAIC 1871.

### *Lampetra aepyptera*

*Alabama: Alabama, Tennessee, and Tombigbee River systems*
W526 (one♂, 112 mm); Beaver Creek, 4.4 miles northwest of Aliceville, Pickens County; 12 March 1966; R.D. Caldwell and H.T. Boschung; UAIC 1892.

W902 (one ammocoete, 80 mm); Big Reedy Creek, tributary to Alabama River, 1.6 miles north of Choctaw Bluff, Clarke County; 8 April 1972; J.R. Ramsey and W.L. Shelton; AU 6268.

W547–51 (one♀, 112 mm; 4♂, 99–118 mm); Big Sandy Spring, Tuscaloosa County; 8 March

1964; R.D. Caldwell and J.C. Hall; UAIC 1225.

W541–42 (2♀, 107–11 mm); tributary to Carroll's Creek, 5 miles north of Tuscaloosa, Tuscaloosa County; 15 March 1963; J.D. Williams and W.M. Howell; UAIC 1837.

W539 (one♂, 107 mm); Cave Spring, 1½ miles east of junction of Morgan County; 5 March 1967; J.G. Armstrong and J.D. Williams; UAIC 1982.

W578–80 (3♂, 119–28 mm); Gurley Creek, on U.S. route 79 near Blout–Jefferson County line, Jefferson County; 1 March 1970; Lee Barclay and Vickie Barclay; UAIC 3342.

W517–19 (2♀, 97–103 mm, one♂, 91 mm); branch of Hurricane Creek at Alberta City, Tuscaloosa County; 22 March 1956; W. Herndon and J. Zambernard; UAIC 796.

W572 (one♀, 93 mm); Hurricane Creek, Tuscaloosa, Tuscaloosa County; 23 March 1956; L.B. Cooper; UAIC 711.

W523–24 (one♀, 106 mm; one♂, 101 mm); unnamed spring, Lauderdale County; 23 March 1967; J. Armstrong and T. Jandebeur; UAIC 1991.

W529 (one♀, 99 mm); Little Cypress Creek, ½ mile west of Zip City, Lauderdale County; 23 March 1967; B.R. Wall, H. Harima, and J.F. Thompson; UAIC 2509.

W531–32 (one♀, 102 mm; one♂, 115 mm); tributary of Middle Cypress Creek at Bethel Berry Church, Lauderdale County; 29 January 1969; Wall, Harima, and Mettee; UAIC 3240.

W522 (one♂, 124 mm); New River below U.S. highway 278 at Natural Bridge, Marion County; 30 March 1968; Caldwell, Wall and Barclay; UAIC 2885.

W528 (one♂, 112 mm); New River below U.S. highway 278 at Natural Bridge, Marion County; 3 April 1965; J.D. Williams, D. Caldwell, and W.M. Howell; UAIC 1593.

W537 (one♀, 118 mm); Polebridge Creek, 11 miles north of Tuscaloosa, Tuscaloosa County; 2 February 1963; J.D.W. and W.M. Howell; UAIC 1161.

W544 (one♀, 95 mm); Schultz Creek, 4 miles north of Centerville, Bibb County; 29 March 1966; W.M. Howell; UAIC 1903.

W896–900 (5 ammocoetes, 66–125 mm); Seven Springs, tributary to Choccolocco Creek, 1.3 miles north-northeast of Choccolocco, Calhoun County; 11 September 1971; J.E. McCaleb and L.L. Ramsey; AU 4819.

W530 (one♂, 110 mm); tributary of Sipsey River, 2 miles south of Fayette, Tuscaloosa County; 25 February 1966; R.D. Caldwell and Bill Shamblen; UAIC 1863.

W540 (one♂, 109 mm); South Sandy Creek, Talladega National Forest, Bibb County; 1 April 1962; T.H. Walker, R.B. Phillips, and B. Hepner; UAIC 882.

W546 (one♂, 123 mm); South Sandy Creek, Tuscaloosa County; 17 January 1964; R.D. Caldwell and W.M. Howell; UAIC 1112.

W892–95 (4 ammocoetes, 98–132 mm); Town Creek, tributary to Cotaco Creek near Somerville, Morgan County; 12 July 1966; G.R. Hooper; UAIC 1848 and UAIC 1873.

*Arkansas: Mississippi River system*

W742 (one♂, 110 mm); Piney Creek, Izard County; 17 February 1973; W.J. and R.S. Matthews and G.L. Harp; ASUMZ 1878.

W740–41 (2♂, 110–12 mm); Saddle Mill Pond branch, South Folk River, Fulton County; 27 January 1973; G.L. Harp; ASUMZ.

*Kentucky: upper Mississippi River system*

W2316 (one♂, 150 mm); Clear Creek, 2 miles southeast of Disputanta, Rockcastle County; 20 March 1966; Steve Stacy; EKU 168.

W607 (one♂, 143 mm); creek, 6 miles south of Fairdale, Bullitt County; 7 April 1968; R.T. Schaaf; INHS.

W609–10 (2♂, 121–36 mm); creek one mile west of Means, Montgomery County; 12 April 1968; P.W. and D.M. Smith; INHS.

W747–49 (3 ammocoetes, 62–67 mm); north fork of Rough River, Breckinridge County; 18 April 1970; Branson and Class; EKU 421.

W608 (one♀, 140 mm); Walters Creek, 4 miles north of Magnolia, Larue County; 28 March 1964; M.E. Braasch and P.W. Smith; INHS.

*Maryland: Chesapeake Bay basin*

W1104–08 (one♀, 92 mm; 4♂, 100–12 mm);tributary of Battle Creek, 5 miles southwest of Prince Frederick, Calvert County; 4 April 1964; Brooke Kaine; CBL 2266.

W1101 (one♀, 128 mm); below Uriebille Pond, Kent County; 14 November 1958; J. Longwell; CBL 1969.

*Ohio: Ohio River system*

W588–89 (one♀, 113 mm; one♂, 135 mm); Crane Hollow, Ohio River, Hocking County; 20 April 1967; Andrew White; UAIC 2846.

W587 (one♂, 123 mm); Laurelville; 17 April 1969; Andrew White; UAIC 4504 .

*Tennessee: Tennessee River system*

5069–76 (VDV), (2♀, 140–51 mm; 6♂, 121–45 mm); Falling Water River, 7½ miles southeast of Cookeville, Putnam County; date and collector unknown; TTU.

## References Cited


**Abbott, C.C.**
(1860). Descriptions of new species of American freshwater fishes. Proc. Acad. Nat. Sci. Phila. 1860: 325–28.

**American Fisheries Society, Committee on Names of Fishes**
(1970). A list of common and scientific names of fishes from the United States and Canada, 3rd ed., by Reeve M. Bailey, et al. Am. Fish. Soc. Spec. Publ. no. 6. 150 pp.

**Brigham, W.U.**
(1973). Nest construction of the lamprey, *Lampetra aepyptera.* Copeia 1973: 135–36.

**Creaser, C.W., and C.L. Hubbs**
(1922). A revision of the Holarctic lampreys. Occas. Pap. Mus. Zool. Univ. Mich. 120. 14 pp.

**Kott, Edward**
(1974). A morphometric and meristic study of a population of the American brook lamprey, *Lethenteron lamottei* (Le Sueur), from Ontario. Can. J. Zool. 52: 1047–55.

**Le Sueur, C.A.**
(1927). American ichthyology, or natural history of the fishes of North America. New Harmony, Ind. 6 pp.

**Manion, P.J., and H.A. Purvis**
(1970). Giant American brook lampreys, *Lampetra lamottei,* in the upper Great Lakes. J. Fish. Res. Board Can. 28: 616–20.

**Raney, E.C.**
(1952). A new lamprey, *Ichthyomyzon hubbsi,* from the upper Tennessee River system. Copeia 1952: 93–99.

**Scott, W.B., and E.J. Crossman**
(1973). Freshwater fishes of Canada. Fish. Res. Board Can. Bull 184. 966 pp.

**Seversmith, H.F.**
(1953). Distribution, morphology and life history of *Lampetra aepyptera,* a brook lamprey, in Maryland. Copeia 1953: 225–32.

**Smith-Vaniz, W.F.**
(1968). Freshwater fishes of Alabama. Auburn University, Agricultural Experiment Station, Auburn, Ala. 211 pp.

**Trautman, M.B.**
(1957). The fishes of Ohio. Ohio State University Press, Columbus. 683 pp.

**Vladykov, V.D.**
(1949). Quebec lampreys (Petromyzonidae). 1, List of species and their economic importance. Contrib. Dep. Fish., Quebec, no. 26, 67 pp.
(1950). Larvae of eastern American lampreys (Petromyzonidae). 1, Species with two dorsal fins. Nat. can. 77: 73–95.
(1973). *Lampetra pacifica,* a new nonparasitic species of lamprey (Petromyzontidae from Oregon and California. J. Fish. Res. Board Can. 30: 205–13.
(1974). Request for a ruling on the stem of family-group names based on the type-genus *Petromyzon* Linnaeus, 1758. Z.N. (S.) 2045. Bull Zool. Nomencl. 30: 198–99.

**Vladykov, V.D., and W.I. Follett**
(1965). *Lampetra richardsoni,* a new nonparasitic species of lamprey (Petromyzonidae) from western North America. J. Fish. Res. Board Can. 22: 139–58.
(1967). The teeth of lampreys (Petromyzonidae): their terminology and use in a key to the Holarctic genera. J. Fish. Res. Board Can. 24: 1067–75.