



## ***Lethenteron ninae*, a new nonparasitic lamprey species from the north-eastern Black Sea basin (Petromyzontiformes: Petromyzontidae)**

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### **Abstract**

*Lethenteron ninae* sp. n., a nonparasitic lamprey, is described from rivers of western Transcaucasia in Russia and Abkhazia. It is distinguished from the other species of Lampetrinae in Europe and west Asia (Black Sea basin) by the combination of the following character states: adults with a dark blotch near the apex of the second dorsal fin; exolaterals absent; posterials either absent or more commonly present in a single incomplete row of 3–7 teeth (a toothless gap in the middle); transverse lingual lamina with 9–15 unicuspid teeth, the median one markedly enlarged; supraoral lamina with two unicuspid teeth separated by a toothless bridge; 1–2 rows of anterials, usually 2; first row of anterials with 5–7 unicuspid teeth; oral fimbriae, 69–99; trunk myomeres in both ammocoetes and adults, 56–62; and in ammocoetes, trunk not mottled and tongue precursor bulb clearly triangular, with a wide base and a pointed apex bearing few cirri.

**Key words:** *Lethenteron ninae*, new species, taxonomy, morphology, Transcaucasia, Black Sea basin

### **Introduction**

*Lampetra* Bonnaterre, 1788 (seven species; anadromous and freshwater; North Atlantic Ocean basin in Europe and North Atlantic and North Pacific ocean basins in North America; parasitic and nonparasitic), *Eudontomyzon* Regan, 1911 (at least four species; freshwater; Baltic, Black and Mediterranean Sea basins in Europe and western Transcaucasia, and the Northwest Pacific Ocean basin of China and North Korea in Asia; parasitic and nonparasitic) and *Lethenteron* Creaser & Hubbs, 1922 (at least six species; anadromous and freshwater; Arctic Ocean basin, Northwest Pacific Ocean basin south to Japan, Northeast Pacific Ocean basin in Alaska, Northwest Atlantic Ocean basin in North America, and the Adriatic Sea basin; parasitic and nonparasitic) are morphologically the closest genera within the lamprey subfamily Lampetrinae *sensu* Nelson (2006). This subfamily is characterized by having tuberculated or papillose velar tentacles, 60–70 trunk myomeres in most species, and unpigmented lateral-line neuromasts in many of the species (Gill *et al.* 2003) and contains, besides the three genera mentioned above, *Caspiomyzon* Berg, 1906 (one species; anadromous; Caspian Sea basin; parasitic), *Tetrapleurodon* Creaser & Hubbs, 1922 (two species; freshwater; Santiago River basin of southern Mexico; nonparasitic and parasitic), and *Entosphenus* Gill, 1862 (seven species; anadromous and freshwater; North Pacific Ocean basin in North America and Asia; parasitic and nonparasitic). *Eudontomyzon* is distinct in having labial teeth present on all fields of the oral disc (rarely absent on the posterior field in *E. mariae*). In *Lampetra*, labial teeth are present only on the anterior field (except in the enigmatic North American *L. aepyptera* (Abbott, 1860) where they are also present on the exolateral and posterior fields). *Lethenteron* is distinguishable by the presence of a single, either complete or

incomplete, row of posterial teeth, the absence of exolateral teeth, and, in most species, the presence of a dark blotch near the apex of the second dorsal fin.

*Lampetra*, *Eudontomyzon* and *Lethenteron* are widespread in Eurasia, being represented in Europe and western Asia by the following species: *Lampetra fluviatilis* (Linnaeus, 1758); *L. lanceolata* Kux & Steiner, 1972; *L. planeri* (Bloch, 1784); *Eudontomyzon danfordi* Regan, 1911; *E. hellenicus* Vladykov, Renaud, Kott & Economidis, 1982; *E. mariae* (Berg, 1931); *Eudontomyzon* sp. (discussed in Kottelat *et al.* (2005)); *Lethenteron camtschaticum* (Tilesius, 1811); *L. kessleri* (Anikin, 1905) (considered a synonym of *L. reissneri* (Dybowski, 1869) in Kottelat & Freyhof (2007)); *L. zanandreae* (Vladykov, 1955) (assigned to *Lampetra* by Kottelat & Freyhof (2007)). Kottelat (1997) treated *Eudontomyzon vladykovi* Oliva & Zanandrea, 1959 as a distinct species and Holčík & Šorić (2004) re-established *Eudontomyzon stankokaramani* Karaman, 1974; however, both are considered synonyms of *E. mariae* by some authors. We too, prefer to leave them in the synonymy until a more comprehensive study of the variation in morphology of the widely distributed *E. mariae* (Adriatic, Aegean, Baltic, and Black Sea basins) has been done. An adult parasitic lamprey of uncertain taxonomic status and identified as *Lampetra* sp. was recently found in the Sea of Azov (Naseka & Diripasko 2008).

Following Berg (1931, 1948), brook lampreys from rivers of Western Transcaucasia have been assigned in the literature to *E. mariae*, without any taxonomic examination except for a short paper by Kokotshashwili (1942) on a lamprey from a rivulet near Batumi. The latter author provided a drawing of the oral disc of the lamprey, which clearly shows the diagnostic characters of *Eudontomyzon* (a broad supraoral lamina and the presence of exolaterals and posterials). Later, *L. lanceolata* Kux & Steiner, 1972 was described from the Iyidere River (the Black Sea basin) near Trabzon, Turkey, and Bogutskaya & Naseka (2004) concluded that this species, rather than *E. mariae*, is the one distributed in Russian Western Transcaucasia. Since 2004, we have collected a lamprey from a number of rivers in Russian Western Transcaucasia (Sochi District) and have found that it differs from both *E. mariae* and *L. lanceolata*. It is described below as a new species.

## Material and methods

A number of authors (Hubbs & Trautman 1937; Vladykov 1950, 1955; Vladykov & Follett 1967; Potter 1968; McPhail & Lindsey 1970; Renaud 1982; Potter & Hilliard 1987; Khidir & Renaud 2003) have proposed methods for making counts and measurements in ammocoetes and adult lampreys. We added a few new characters in adults (e.g., some measurements in the caudal region). Most of the characters used are shown and explained in Table 1 and Figs. 1, 3, 7 and 8. All measurements on specimens of the new species were taken within a short period of time to avoid problems due to differential shrinkage of body sections, which occur during initial fixation in 4–5% formalin, followed by preservation in 70% ethanol. The description and counting of the labial teeth in the various fields exclude the row of marginal teeth. The number of trunk myomeres includes the first myomere whose anterior myoseptum lies on or is posterior to the posterior edge of the 7<sup>th</sup> branchial opening and the last myomere in which the lower angle of its posterior myoseptum lies at or is anterior to the anterior edge of the cloacal slit. The oral fimbriae are flattened leaf-like structures that lie along the periphery of the oral disc. The extent of pigmentation coverage and the defined areas for those various characters in ammocoetes follows Renaud (1982): -, absent to trace; +, 1% to < 25%; ++, 25% to < 75%; +++, ≥ 75%. The new species is based on the description of nine ammocoetes and 13 recently metamorphosed adults. *Eudontomyzon mariae* *s.l.* exhibits a wide variation in some taxonomic characters (Renaud 1982; Holčík & Delić 2000; Stefanov & Holčík 2007), which is why we base our comparisons on type and topotypical specimens.

Abbreviations: CMNFI, Canadian Museum of Nature Fish Collection, Ottawa; SNP, Sochi National Park; ZISP, Zoological Institute of Russian Academy of Sciences, St. Petersburg. TL, total length; b, bicuspid tooth; u, unicuspid tooth.

**TABLE 1.** Measurements of adults of *Lethenteron ninae* sp. n., *Lampetra lanceolata* and *Eudontomyzon mariae*.

Characters (Landmarks*)	<i>Lethenteron ninae</i> ZISP 54431-54435, CMNFI 2008-0059			<i>Lampetra lanceolata</i> CMNFI 1986-0913		<i>Eudontomyzon mariae</i> ZISP 23124, CMNFI 1986-0718	
	Holotype	Paratypes (n = 12)	Mean (n = 13)	Paratype		Syntypes (n = 32)	Mean
	mm	% of TL	% of TL	mm	% of TL	% of TL	% of TL
Total length (1-2)	163.8	130.6–166.0		124.0		157.0–198.0	
Prebranchial length (1-3)	14.1	8.7–11.3	9.9	14.0	11.3	9.8–12.3	11.2
Branchial length (3-4)	16.7	9.6–10.9	10.3	13.5	10.8	10.8–12.6	11.7
Interbranchial opening length (5-6)	1.9	1.2–2.0	1.6	2.5	2.0	1.1–1.9	1.5
Branchial depth (7-8)	11.2	5.4–6.9	6.1	8.5	6.9	-	-
Disc length (1-9)	6.0	3.8–5.2	4.5	6.5	5.2	3.5–6.0	4.9
Eye length (10-11)	2.1	1.4–2.0	1.7	2.5	2.0	1.4–2.1	1.8
Interocular width	4.8	2.8–4.0	3.3	5.0	4.0	2.4–3.6	3.0
Snout length (1-10)	8.3	4.8–6.9	5.7	8.5	6.9	5.5–8.2	6.8
Postocular length (11-3)	4.1	2.7–3.6	3.0	4.5	3.6	2.4–3.5	3.1
Prenostril length (1-12)	5.7	4.0–6.0	4.5	7.5	6.1	4.0–6.4	5.3
Trunk length (4-13)	86.0	50.1–53.6	51.7	64.0	51.6	45.8–55.0	49.0
Trunk depth (15-16)	10.1	5.7–6.7	6.2	7.5	6.1	-	-
Tail length (14-2)	45.6	25.7–29.2	27.7	36.0	29.0	24.1–30.9	27.5
First dorsal fin length (15-17)	20.7	10.6–12.5	11.8	15.5	12.5	-	-
First dorsal fin depth (21-22)	2.5	1.7–2.1	1.9	2.5	2.0	-	-
Second dorsal fin length (17-18)	37.4	20.9–26.2	23.4	32.5	26.2	-	-
Second dorsal fin depth (23-24)	4.7	3.3–4.4	3.6	5.5	4.4	-	-
Caudal fin length (18-2)	15.6	6.5–11.9	10.3	13.5	10.8	-	-
Tail depth at junction of second dorsal and caudal fins (19-20)	4.7	2.0–3.0	2.6	2.5	2.0	-	-
Maximum depth of caudal fin (25-26)	7.7	4.0–5.6	4.8	7.0	5.6	-	-
Tail depth at maximum depth of caudal fin (27-28)	2.2	1.0–1.6	1.2	2.0	1.6	-	-

\* For explanations see Fig. 1a–c.

### *Lethenteron ninae*, sp. n.

(Figs. 2, 3a, 4a, 5, 6, 7a, 8)

**Holotype.** ZISP 54431 (adult female, TL 163.8 mm; 43°48'35"N 39°36'54"E, Shakhe River at Khartsyz, Black Sea basin, Sochi District, Russia; coll. S.B. Tuniyev, 27 Sept. 2007).

**Paratypes.** ZISP 54432 (2 adults, TL 145.1–158.7 mm, same data as for holotype); ZISP 54433 (adult female, TL 166.0 mm, 43°34'21"N 40°00'38"E, Mzymta River at Kazachiy Brod, Black Sea basin, Sochi District, Russia; coll. S.B. Tuniyev, 20 Sept. 2006); ZISP 54434 (4 adults, TL 131.7–163.7 mm, 4 ammocoetes, TL 90.0–120.0 mm, 43°26'26"N 40°01'30"E, Chakhtsutsyr Stream at Gumariya, Psou River basin, Black Sea basin, Sochi District, Russia; coll. S.B. Tuniyev, 17–24 Dec. 2006); CMNFI 2008-0059 (1 adult, TL 149.5 mm, same data as ZISP 54434); ZISP 54435 (4 adults, TL 130.6–162.5 mm; 2 ammocoetes, TL 99.6–104.5 mm; 42°45'36"N 41°27'59"E, Mokva River, Black Sea basin, Abkhazia, Georgia; coll. S.B. Tuniyev, 24 Sept. 2007); ZISP 54436 (6 ammocoetes, TL 124.1–141.8 mm, 43°39'01"N 40°04'27"E, Mzymta River in Adler, Black Sea basin, Sochi District, Russia; coll. S.B. Tuniyev, 14 Jan. 2008).

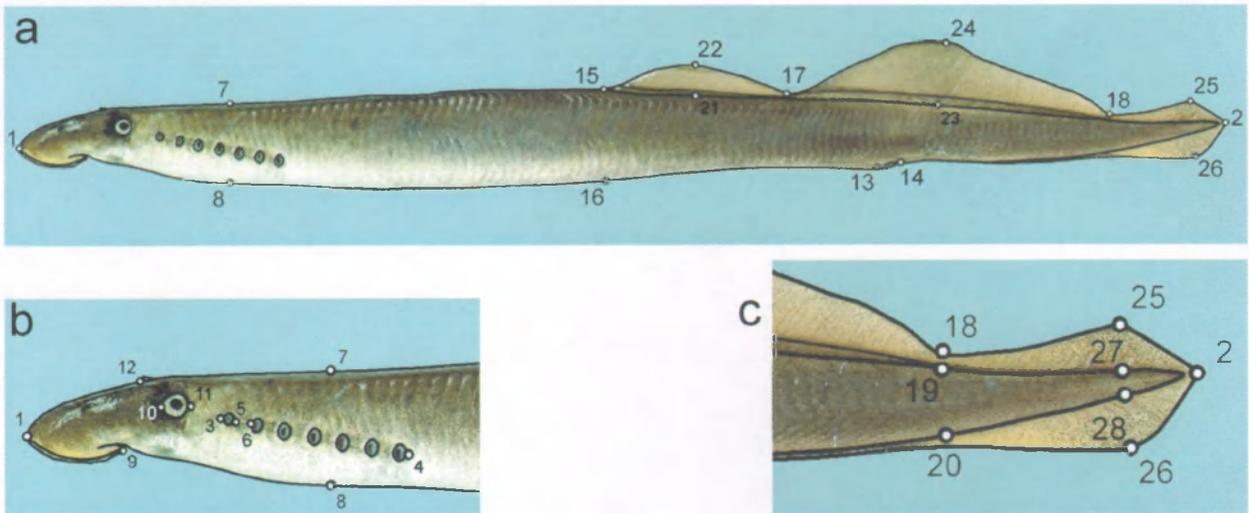


FIGURE 1 a-c. Measurement landmarks of a lamprey adult. For explanations see Table 1.

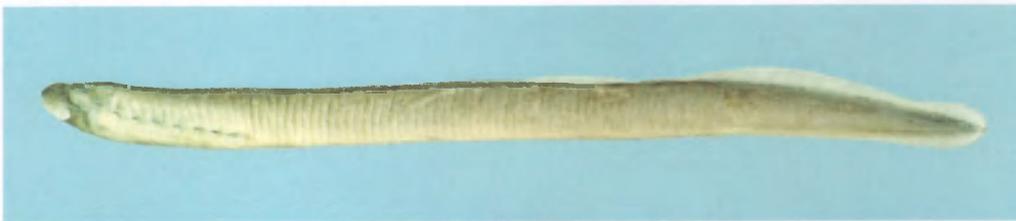


FIGURE 2. Ammocoete of *Lethenteron ninae*, paratype (ZISP 54436, TL 126.9 mm, Mzymta River).

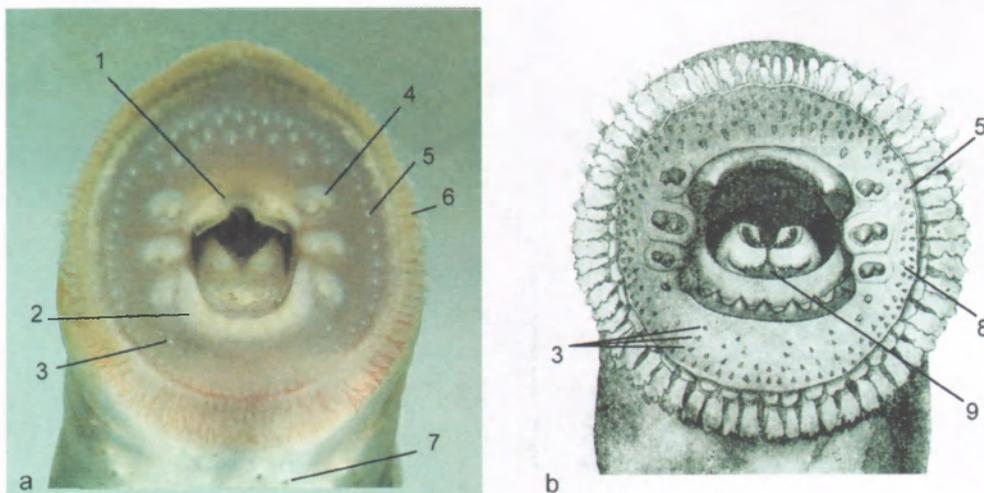


FIGURE 3. Oral disc. a, *Lethenteron ninae*, holotype (photo made from live specimen, ZISP 54431, TL (after preservation) 163.8 mm, Shakhe River); b, *Eudontomyzon mariae* (from Berg 1931: Pl. 4, FIGURE 2, syntype, TL 192 mm). 1, supraoral lamina; 2, infraoral lamina; 3, posterial teeth (one incomplete row in *L. ninae* and three rows in *E. mariae*); 4, anterior endolateral bicuspid tooth; 5, row of marginal teeth; 6, fimbriae; 7, ventral pigmented neuromast; 8, exolateral teeth; 9, transverse lingual lamina.

**Non-type material:** SNP 23 (ammocoete, TL 120.6 mm, Shakhe River, Black Sea basin, Sochi District, Russia; coll. B.S. Tuniyev, 7 May 1986); SNP 65 (ammocoete, TL 141.5 mm, Mzymta River, Black Sea basin, Sochi District, Russia; coll. A.M. Naseka, J. Freyhof, V.A. Drogan, 11 July 2001); ZISP uncat. (5 ammocoetes, TL 128.0–148.0 mm, 42°45'36"N 41°27'59"E, Mokva River, Black Sea basin, Abkhazia, Georgia; coll. A.M. Naseka, N.G. Bogutskaya,

S.B. Tuniyev, A.N. Ivanitskiy, 30 July 2007); ZISP uncat. (ammocoete, TL 140.6 mm, 43°11'38"N 40°17'38"E, Bzyb' River at village of Alakhodzy, Black Sea basin, Abkhazia, Georgia; coll. A.M. Naseka, N.G. Bogutskaya, S.B. Tuniyev, A.N. Ivanitskiy, 2 Aug. 2007).

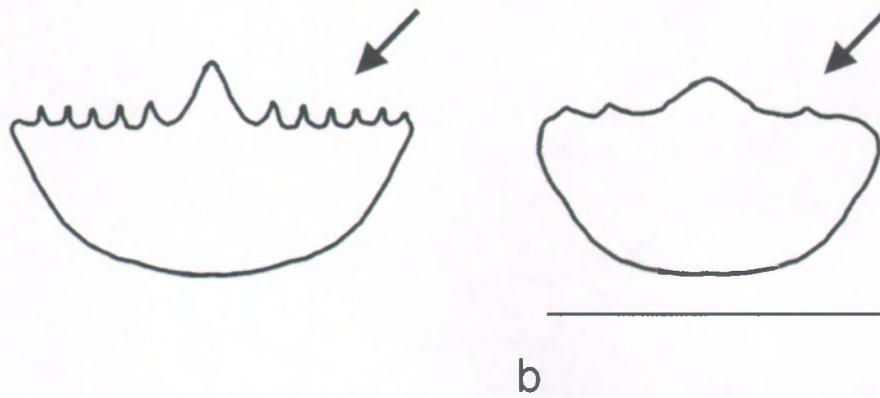
**Diagnosis.** *Lethenteron ninae* is distinguished from the other species of Lampetrinae in Europe and West Asia (Black Sea basin) by possessing the following character states: adults with a dark blotch near the apex of the second dorsal fin; exolaterals absent; posteriors present in one incomplete row (i.e., a toothless gap in the middle) or occasionally absent; transverse lingual lamina with 9–15 unicuspid teeth, the median one markedly enlarged; supraoral lamina with two unicuspid teeth separated by a toothless bridge; 1–2 rows of anterials, usually 2; first row of anterials with 5–7 unicuspid teeth; oral fimbriae, 69–99; trunk myomeres in both ammocoetes and adults, 56–62; in ammocoetes, trunk not mottled, cheek and upper prebranchial area extensively pigmented ( $\geq 75\%$  coverage) and tongue precursor bulb clearly triangular, with wide base and pointed apex bearing few cirri.

**Description.** *Ammocoetes* (Fig. 2, Table 2). The maximum size found in our material was 148 mm TL. However, we expect that ammocoetes attain a length larger than 166 mm TL as the adults reach this length. Trunk myomeres were 56–60 (Table 2). The bulb of the tongue precursor is clearly triangular, with a wide base and a pointed apex bearing few cirri (Fig. 7a). Ammocoetes (live and freshly preserved specimens) are grey along the back with lighter undersides without mottling (Fig. 2). External pigmentation is generally well developed. In most specimens the pigmentation coverage of the upper lip, cheek, upper prebranchial and upper branchial areas is about 75% or more (Fig. 2; Table 2).

**TABLE 2.** Measurements, trunk myomeres, and pigmentation of ammocoetes of *Lethenteron ninae*, *sp. n.*, *Lampetra lanceolata* and *Eudontomyzon mariae*. The numbers in parentheses are the means for relative measurements and trunk myomeres and the frequencies for pigmentation. Pigmentation coverage is as follows: -, absent to trace; +, 1% to <25%; ++, 25% to <75%; +++,  $\geq 75\%$ .

Characters	<i>Lethenteron ninae</i> ZISP 54434-54436 Paratypes (n = 9)	<i>Lampetra lanceolata</i> CMNFI 1986-0914 (n = 3)	<i>Eudontomyzon mariae</i> ZISP 29159 (n = 4)
Total length, mm	90–142	84–143	55–167
Prebranchial length (% TL)	7.0–7.9 (7.6)	7.3–8.3 (7.9)	7.0–7.5 (7.2)
Prenostril length (% TL)	2.4–2.9 (2.6)	2.4–3.0 (2.7)	2.0–2.3 (2.1)
Branchial length (% TL)	12.5–13.7 (12.9)	11.5–13.1 (12.2)	11.2–13.4 (12.1)
Interbranchial opening length (% TL)	1.5–2.2 (1.7)	1.8–2.1 (2.0)	1.3–1.8 (1.5)
Trunk length (% TL)	50.4–54.0 (51.9)	50.6–52.8 (51.8)	52.1–55.5 (53.7)
Tail length (% TL)	25.1–28.7 (26.7)	25.9–28.0 (27.1)	24.1–27.7 (25.7)
Trunk myomeres	56, 57, 58 (2), 59 (3), 60 (2)	58, 60, 62	62, 63, 65, 67
Upper lip pigmentation	+(1), ++(2), +++(6)	-(2), +(1)	-(2), +(2)
Cheek pigmentation	++(3), +++(6)	-(3)	-(2), +(1), ++(1)
Subocular pigmentation	-(2), +(1), ++(3), +++(3)	-(3)	-(4)
Upper prebranchial pigmentation	+++ (9)	-(3)	-(4)
Lower prebranchial pigmentation	+(3), ++(6)	-(3)	-(4)
Upper branchial pigmentation	++(3), +++(6)	+(2), ++(1)	-(3), +(1)
Lower branchial pigmentation	-(9)	-(3)	-(4)
Ventral branchial pigmentation	-(8), +(1)	-(3)	-(4)
Caudal fin pigmentation	+(9)	+(2), undetermined (1)	-(2), +(1), +++(1)

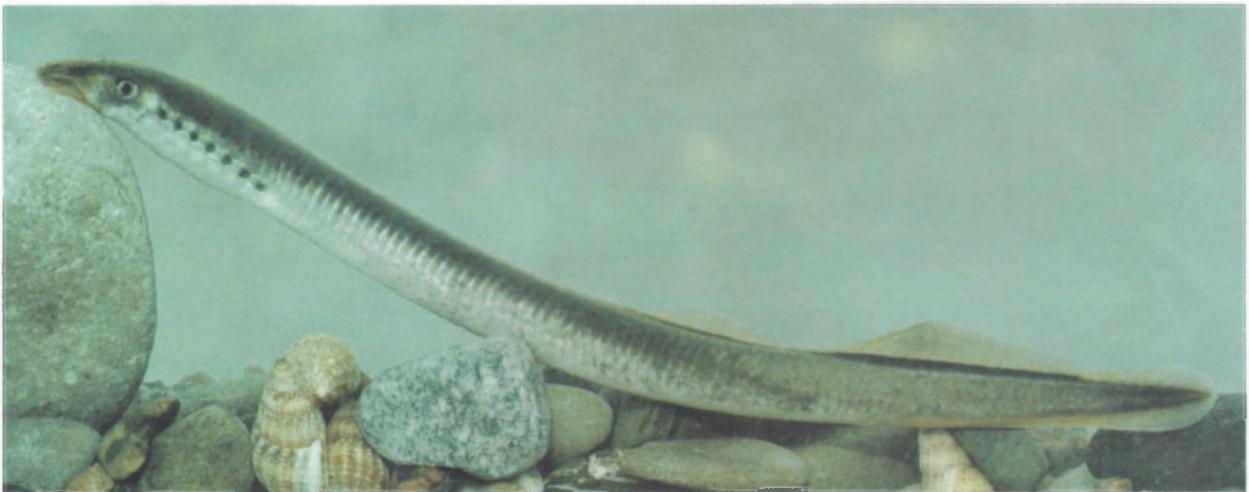
Other areas have either slight (1% to <25%) pigmentation coverage (caudal fin) or are unpigmented (lower branchial and ventral branchial) (Table 2). Internally, the pigmentation coverage of the areas lateral to the elastic ridge is slight and it is absent on the tongue precursor bulb (Fig. 7a). Lateral line neuromasts are unpigmented. The caudal fin shape is either spade-like or rounded (Fig. 2).



**FIGURE 4.** Transverse lingual lamina. a, *Lethenteron ninae*, paratype (formula 6u-I-5u); b, *Eudontomyzon mariae*, syntype (formula 1u-I-2u). Scale bar: 1 mm. Arrows show the differences.



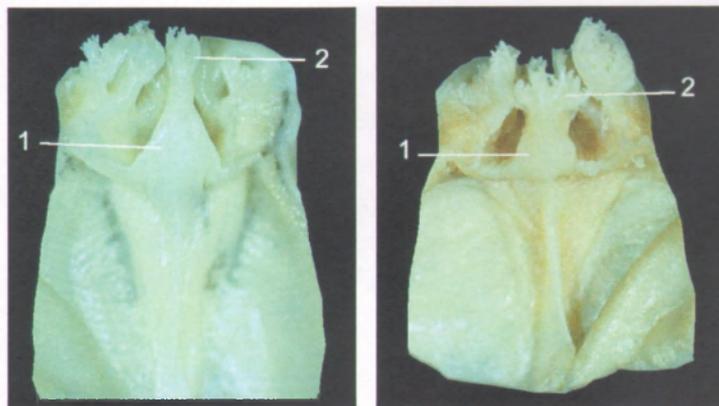
**FIGURE 5.** *Lethenteron ninae*, paratype (ZISP 54435, TL 162.5 mm, Mokva River).



**FIGURE 6.** *Lethenteron ninae*, holotype (photo made from live specimen, ZISP 54431, TL (measured after preservation) 163.8 mm, Shakhe River).

*Adults* (Figs. 5-6, Tables 1-2). We do not describe here morphometric data of the new species and do not compare it with other species because our material includes only recently metamorphosed adults while type material of *E. mariae* and *L. lanceolata* comprise only spawning and spent individuals collected in the spring. It is known that natural shrinkage occurs in lampreys not only when they go through metamorphosis but also when adults become sexually mature, and therefore, only adults at a given stage of development may be compared. The oral disc is shown in Fig. 3a. The transverse lingual lamina has 9-15 unicuspid teeth (9 teeth in the holotype), the median one markedly enlarged (Fig. 4a). Longitudinal lingual laminae are straight, each with 5-9

unicuspid teeth (not seen in the holotype). The supraoral lamina has two unicuspid teeth separated by a toothless bridge. The infraoral lamina has 7 unicuspid teeth (in four specimens including holotype), 5 unicuspid 1 bicuspid (2), 1 bicuspid 5 unicuspid (2), 1 bicuspid 3 unicuspid 1 bicuspid (2) and three other formulae also found in one specimen each. Three endolaterals occur on both sides of the oral disc, all bicuspid (including in the holotype) in most specimens, but the middle or bottom endolateral is sometimes tricuspid. There are 1–2 rows of anterials, usually 2 (1 in the holotype). The first row of anterials has 5–7 (5 in four specimens, 6 in two specimens and 7 in two specimens, including holotype) unicuspid teeth. Exolaterals are absent in all specimens. Posterials are absent (in three specimens) or first and only row of posterials incomplete with 1–5 unicuspid, rarely bicuspid, teeth on each side (two unicuspid – toothless gap – two unicuspid in holotype). There are 7 velar tentacles (in two specimens dissected; Fig. 8), the median one is shorter than the adjacent lateral ones and the tentacles have tubercles on the dorsal aspect. There are no wings. Number of trunk myomeres is 58–62 (58 in holotype). The number of myomeres to the origin of first dorsal fin is 31–36 (34 in holotype). The number of myomeres to the end of the first dorsal fin is 44–50 (47 in holotype). The number of oral fimbriae is 69–99 (93 in holotype; 74–90 in most specimens). The caudal-fin shape is spade-like (Fig. 5) or rounded (Fig. 6). Coloration of live and freshly preserved recently metamorphosed adults is not mottled; it is greyish with the back darker than the belly. The caudal fin is slightly (1% to < 25% coverage) to moderately (25% to < 75% coverage) pigmented, almost hyaline in some specimens (Fig. 5). There is a dark blotch near the apex of the second dorsal fin (Figs. 5 and 6). The lateral-line neuromasts are darkly pigmented on the ventral surface (Fig. 3a) and in the prebranchial region (Figs. 5 and 6) in some individuals and unpigmented in others.



**FIGURE 7.** Tongue precursor in ammocoete. a, *Lethenteron ninae* (paratype); b, *Eudontomyzon mariae* (ZISP 29159). 1, bulb; 2, cirri.

**Distribution.** *Lethenteron ninae* is known from rivers of the Black Sea coast in Russia and Abkhazia (Fig. 9) (from west to east): Psezuapse, Shakhe, Mzymta, Psou (Chakhtsutsyr Stream), Bzyb', Mokva (Tuniyev 1999; Drogan 2002; Bogutskaya & Naseka 2004; Tuniyev 2005, 2006, 2008; data published herein). Berg (1948) reports ammocoetes from near Novorossiysk that he assigns to *E. mariae*, but these may belong to *L. ninae*. A lamprey is also known from Mchishta and Kodori rivers and Bebesyr Lake in Abkhazia (Barach 1960; Elanidze 1983) and from Inguri and Makhindzhauri rivers and rivulets near Batumi further east in Georgia (De Filippi 1865; Kokotshashwili 1942; Barach 1960; Elanidze 1983) but its identification needs to be established.

**Habitat and biology.** Ammocoetes are found in silt, sand or fine pebble sediment in sections with slow or no current, usually in the middle and low reaches of rivers (Fig. 10), often in shallows at banks or backwaters at depths of about 10–50 cm, among submerged plants (*Rumex acetosella*, *Polygonum* sp., *Juncus* sp., Poaceae). In general, the abundance is relatively low, 1–8 (averaging 2) individuals per 100 m<sup>2</sup>, but in some localities in the Psou and Mzymta rivers there were up to 400 individuals of all sizes per 100 m<sup>2</sup>.

Adults and ammocoetes are commonly caught together. First post-metamorphosis individuals are found in the second half of September in the Mzymta and Shakhe rivers and those in the Psou River (Chakhtsutsyr Stream) in the second half of December. Ammocoetes caught in the Mokva River in September and kept in aquarium started metamorphosis at the end of November and completed it by the middle of December.

**Etymology.** The new species is named after Nina Bogutskaya in appreciation of her contribution to the knowledge of Eurasian freshwater fishes. It is treated as a noun in the genitive case. Common name: Western Transcaucasian brook lamprey.



FIGURE 8. Velar tentacles in *Lethenteron ninae* (paratype).



FIGURE 9. Distribution data on *Lethenteron ninae* (asterisk: type locality Shakhe River, circle: localities of paratypes); *Lethenteron zanandreae* (hexagon: type locality Guà di Lonigo River, Vicenza, Italy); *Lampetra lanceolata* (square: type locality Iyidere River, near Trabzon, Turkey); *Eudontomyzon mariae* (triangle: type locality Severskiy Donets River, near Khar'kov, Ukraine).

**Comparisons.** The new species was assigned to the genus *Lethenteron* because it possesses the diagnostic characters of this genus, namely, the absence of exolaterals and the usual presence of a single albeit incomplete row of posterials. In western Eurasia, the latter character is shared by *L. ninae* and *L. zanandreae*, which was known from the Po River drainage and the adjacent Adige River basin of northern Italy, but is now considered to have scattered populations along the Adriatic coast from central Italy to Bosnia-Herzegovina (Kottelat & Freyhof 2007). *Lethenteron ninae* differs from *L. zanandreae* by having 56–62 trunk myomeres (vs. 52–60) in both ammocoetes and adults, and a dark blotch on the second dorsal fin of the adults (vs. no blotch). From geographically proximate *E. mariae*, it differs by the presence of dark blotch on second dorsal fin in adults (vs. no blotch), the absence of exolaterals (vs. 1–4 rows of exolaterals, see Fig. 3b), 1–2 rows of anterials with the first row having 5–7 teeth (vs. 3–5

rows, first row with 5–10 teeth), transverse lingual lamina with 9–15 well developed teeth, the median one markedly enlarged (*vs.* 3–7 teeth, see Figs. 3b, 4b), caudal fin usually slightly pigmented or hyaline (*vs.* moderately to usually extensively pigmented), 56–62 trunk myomeres in both ammocoetes and adults (*vs.* 62–73), tongue precursor bulb triangular with pointed apex bearing few cirri in ammocoetes (Fig. 7a) (*vs.* bulbous with widened apex bearing numerous cirri, Fig. 7b), upper lip, cheek, upper prebranchial and upper branchial areas in ammocoetes commonly extensively pigmented (Fig. 2, Table 3) (*vs.* non-pigmented to slightly pigmented, Table 2) and live and freshly-preserved (1–3 yrs) ammocoetes not mottled (*vs.* mottled; this character taken from Holčík (1986)). As to comparison with *L. lanceolata* from the Black Sea basin in north-eastern Turkey, we could examine only one adult paratype of this species (Table 3) and three topotypic ammocoetes (Table 2). The paratype of *L. lanceolata* has no exolaterals and only one very small posterial tooth on the far right side, and thus belongs to *Lampetra*. *Lethenteron ninae* differs from *Lampetra lanceolata* by having a single incomplete row of 3–7 posterials (the row is rarely absent), 9–15 cusps on the transverse lingual lamina with the median one markedly enlarged (*vs.* one enlarged median cusp with no adjacent lateral cusps), 5–7 teeth in the first row of anterials (*vs.* 9), 69–99 oral fimbriae (*vs.* about 124) and the cheek and upper prebranchial area extensively pigmented in ammocoetes (Fig. 2) (*vs.* unpigmented).

**TABLE 3.** Trunk myomeres, dentitional characters and oral fimbriae in *Lethenteron ninae*, *sp. n.*, *Lampetra lanceolata* and *Eudontomyzon mariae*. The numbers in parentheses are the frequencies for character states. Abbreviations: b, bicuspid; u, unicuspid.

Characters	<i>Lethenteron ninae</i> ZISP 54431-54435, CMNFI 2008-0059		<i>Lampetra lanceolata</i> CMNFI 1986-0913	<i>Eudontomyzon mariae</i> ZISP 23124, CMNFI 1986-0718
	Holotype	Paratypes (n = 12)	Paratype	Syntypes (n = 32)
Trunk myomeres	58	58 (2), 59 (4), 60 (3), 61 (2), 62	64	63 (3), 64 (4), 65 (2), 66 (4), 67 (4), 68 (5), 69 (5), 71 (2), 72 (2), 73
Supraoral lamina	I-I	I-I (12)	I-I	I-I (31), I-1u-I
Endolaterals	2-2-2 (2)	2-2-2 (11), 2-3-2 (4), 2-2-3 (3), undetermined (6)	2-2-2 (2)	1-2-2 (19), 1-2-1 (7), 2-2-2 (7), 1-1-2-2 (7), 2-2-1 (5), 1-1-1 (3), 1-1-2 (3), 1-2-2-2 (3), 1-1-2-1 (2), 1-3-1, 2-1-1, 2-3-2, 1-2-2-1, 2-1-2-2, 1-1-2-1-1
Infraoral lamina	7u	7u (3), 5u1b (2), 1b5u (2), 1b3u1b (2), 3u1b3u, 6u1b, 1b4u1b	6u	5u, 7u (10), 8u (8), 9u (5), 10u (2), 5u1b, 6u1b (2), 7u1b, 1b3u1b, 1b4u1b
Rows of anterials	1	1 (3), 2 (7), undetermined (2)	1	3 (11), 4 (17), 5 (4)
Rows of exolaterals	0 (2)	0 (12)	0 (2)	1 (7), 2 (31), 3 (22), 4 (4)
Rows of posterials	1	0 (3), 1 (6), undetermined (3)	1	1 (17), 2 (13), 3 (2)
First arterial row	7u	5u (4), 6u (2), 7u, undetermined (5)	9u	5u (2), 6u (4), 7u (15), 8u (7), 9u (2), 10u, 1b8u
First posterial row	Incomplete: 2u-gap-2u	Absent (3) Incomplete (6): 1u-gap-4u, 2u-gap-1u, 3u-gap-1u, 2u-gap-2b3u, 4u-gap-1u1b, 1b1u-gap-2u1b, undetermined (3)	Incomplete: gap-1u	Complete (19): 13u (2), 14u (3), 15u, 16u (2), 17u (4), 18u (5), 19u, 1b10u Incomplete (13): gap-1u, 1u-gap-5u, 2u-gap-1u, 2u-gap-2u, 3u-gap-1u, 3u-gap-3u, 4u-gap-7u (2), 6u-gap-4u, 7u-gap-5u, 7u-gap-6u, 14u-gap-3u, 2u-gap-2u1b
Transverse lingual lamina	4u-I-4u	6u-I-5u (4), 5u-I-5u (2), 7u-I-7u (2), 4u-I-4u, 5u-I-4u, undetermined (2)	0-I-0	1u-I-1u, 1u-I-2u, 2u-I-2u, 3u-I-3u, undetermined (28)
Longitudinal lingual laminae	undetermined (2)	5, 6, 7(2), 8, 9(7), undetermined (12)	undetermined (2)	10, 11, undetermined (62)
Oral fimbriae	93	69, 74 (2), 78, 79, 87, 89 (2), 90, 93, 94, 99	about 124	88, 90, 92, 93, 95, 98 (examined in 6 specimens only)

**Comparative material.** *Eudontomyzon mariae*: ZISP 23124 (26 syntypes: spawning adults, TL 157–198 mm; Severskiy Donets River near Khar'kov, Don River drainage, Black Sea basin, Ukraine; 24 April – 5 May 1930); CMNFI 1986-0718 (6 syntypes: spawning adults, TL 171–183.5 mm; same data as ZISP 23124); ZISP 29159 (2 adults, TL 137–171 mm, 4 ammocoetes, TL 55–167 mm; Severskiy Donets River, Don River drainage, Black Sea basin, Ukraine; 1923-1930).

*Lampetra lanceolata*: CMNFI 1986-0913 (paratype: spent female, TL 124 mm; mouth of Iyidere River near Trabzon, Black Sea basin, Turkey; 20 April 1969); CMNFI 1986–0914 (3 ammocoetes, TL 84–143 mm; Iyidere River, near Trabzon, Black Sea basin, Turkey; June 1971).



**FIGURE 10.** Mzymta River (in the late autumn), a typical habitat of *Lethenteron ninae*.

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