STONE LOACHES FROM THE HEADWATERS OF THE BULGAN RIVER (MONGOLIAN ALTAI) (TELEOSTEI: CYPRINIFORMES: NEMACHEILIDAE: *BARBATULA*)

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ABSTRACT: Two sympatric species of loaches, *Barbatula* cf. *altayensis* Zhu, 1992 and *B. karabanowi* Prokofiev, 2018, occur in the upper reaches of the river Bulgan in Mongolia. They represent the only fish taxa found in the studied part of the river. Significant morphological differences between these species support their apparent belonging to the different phyletic lineages. *Barbatula* cf. *altayensis* is characterized by the following combination of characters: nostrils closely set; lips furrowed, upper lip with medial indentation weak to absent, lower lip with medial lobes barely separated, furrowed, lateral lobes absent; scale cover well developed; broad head with muscular cheeks; 44–45 vertebrae; 89–105 lateral-line pores; pigmentation pattern consisting of transverse bars or isolated well spaced blotches. A set of peculiar features (mouth structure and position of nares, characters of sexual dimorphism, strong ossification of the otic portion of the cephalic laterosensory system) supposes an isolated position of *B. altayensis* within the genus. The second species, *B. karabanowi*, belongs to the "blunt-snouted" complex of species related to *B. toni* sensu stricto. Within the other members of this complex it is most similar to *B. dsapchynensis* from the basin of Zavhan River (Lake Valley, Mongolia) but differs from this and other species of *Barbatula* by the following combination of characters: nostrils widely spaced; snout relatively broad, ratio between maximum head width and width of snout at anterior nares equal to 1.44–1.57; lips smooth, upper lip with short indentation; lower lip with short but well developed lateral lobes and oval mental lobes lacking conical protrusions; scale cover reduced; 42–44 vertebrae (usually 43); 75–88 lateral-line pores; paired fins with rounded tips; pigmentation pattern usually with densely distributed and partially fused irregular spots and streaks. The morphological proximity between *B. karabanowi* and *B. dsapchynensis* may indicate a possibility of links between the basins of Bulgan and Zavhan in the past.

KEY WORDS: Siberian loaches, western Mongolia, systematics, zoogeography, sympatry

The Bulgan River is a fairly large drainage in western Mongolia and the adjacent part of the Xinjiang Uygur Autonomous Region of China. Having its source at the foot of the Dushin-Ula Mountain, it collects water from the eastern slopes of the main ridge of the Mongolian Altai and flows south and west to enter the Dzungarian Plain, where it is called Urungu River. The Urungu flows into the system of the Ulungur lakes represented by two large bodies of water (Baga-Nur and Ulungur) connected by a channel. While the Urungu basin was endorheic during the historical period, obviously in the pluvial epochs it had periodically acquired a connection with the Kara-Irtysh River, which flows only at 1.5 km to the north. In 1969 the lake Ulungur was connected by an artificial canal with the Kara-Irtysh River, through which there is currently a constant drainage to the Irtysh basin. The ichthyofauna of the plain and foothill parts of the river is composed mainly by the fish species common for the Irtysh basin (Baasanzhav et al., 1983; Kimura et al., 1992; Tang et al., 2012), although an endemic species of dace, more similar to the species from the lake Issyk-Kul rather to the Siberian dace from the Ob basin, was described (Koch & Paepke, 1998). There is no exact information about the species composition of the fishes from the mountainous portion of the river flowing along Bayan-Ölgii aimag.

The stone loaches are long-time known from the Bulgan River drainage, but traditionally they were reported under the name *Nemacheilus barbatulus* (= *Barbatula*) *toni* (i.e., Baasanzhav et al., 1983). However, in most recent publication of the Mongolian authors (Baasanzhav, Tsendayush, 2001: 124) the Tibetian loach (as *Noemacheilus* (sic!) *stoliczkai*) was also reported as “may be [present] in Bulgan”. This is undoubtedly a misidentification (Prokofiev, 2007a). Kottelat (2006: 54–55) does not exclude the presence of *Barbatula altayensis* in the Bulgan River drainage, as the latter was described from the geographically close area in the headwaters of the Irtysh (= Ertix) River in Xinjiang (Zhu, 1992); however, he had no specimens from Bulgan. Thus, an adequate morphological and taxonomical analysis of the Bulgan loaches was never conducted.

In July 2008 I had an opportunity to inspect a section of the upper portion of the Bulgan River situated approximately 40 km below the source (Fig. 1). The samples were made at three closely situated sites: (1) in the riverbed (47°05'12.7´´ N, 91°01'42.2´´ E); (2) in a branch with relatively slow current and dense thickets of submerged aquatic vegetation (47°04´46.4´´ N, 91°02´36.1´´ E), and (3) in a section of the riverbed about 5 km downstream of the first sampling point at the mouth of a small stream flowing into the main stream (47°00'46.8´´ N, 91°02'39.3´´ E). Here, stone loaches were the only fish found; however, two different species belonging to the genus *Barbatula* were collected from all three sites. One of them was tentatively identified as *B. altayensis* while the second species was recently described as a new for science (Prokofiev, 2018). It is the aim of the present paper to provide a detailed comparative study of both these species.

MATERIAL AND METHODS

All data were taken from fishes fixed in 4 % formaldehyde (after anaesthesia) and stored in 70–75 % ethanol. Counts, measurements and terminology follow Prokofiev (2015, 2018). Meristic characters were counted from 20 specimens of each species; all of them were radiographed, and dorsal- and anal-fin ray counts were also verified from X-rays. The last two branched rays articulating on a single pterygiophore in the dorsal and anal fins were counted as a single ray. Eight specimens of each species were dissected for investigation of the internal soft anatomy, gonadal maturity and qualitative analysis of the stomach and gut content. Stages of the gonadal maturity were established according to Bucholtz et al. (2008). Comparative materials used for this study were already listed by Prokofiev (2007b, 2015, 2016a, 2018). Abbreviations used are the following: a. s. l., above sea level; C&S, specimens cleared and stained by alizarine red S; n, number of studied specimens; SL, standard length; wc/wn, ratio of greatest width of head to width at level of anterior nostrils; uncat., uncatalogued specimens; institutions: IEE, A. N. Severtsov Institute of Ecology and Evolution, Moscow; ZIN, Zoological Institute, Saint-Petersburgh; ZMMU, Zoological Museum of the Moscow State University.

TAXONOMY

***Barbatula* cf. *altayensis* Zhu, 1992**

(Figs. 2, 3A–B, 4A–F)

Material examined: Totally 30 specimens, Mongolia, Bayan-Ölgii aimag, headwaters of the river Bulgan: ZMMU 23828, 7 specimens (1 C&S), 98–125 mm SL, 47°04´46.4´´ N, 91°02´36.1´´ E, 21 July 2008, electrofishing; IEE uncat., 12 specimens (4 C&S), 17–107 mm SL, 47°05'12.7´´ N, 91°01'42.2´´ E, altitude 2057 m a. s. l., night 20–21 July 2008 (fish-trap), 21 July 2008 (electrofishing); IEE uncat., 11 specimens (1 C&S), 30–126 mm SL, 47°00'46.8´´ N, 91°02'39.3´´ E, altitude 2003 m a. s. l., 21 July 2008, from the mouth of a small creek and the nearby riverbed, electrofishing.

Diagnosis: Differs from all known species of *Barbatula* in the unique structure of the lips (Figs. 4A-D) lacking lateral lobes and possessing the furrowed mental lobes barely separated from the lower lip (or fully absent in some populations?) (vs. at least mental lobes always well developed, smooth and well separated from the lip), and in the thickened ("muscular") cheeks (Fig. 3A), especially in the spawning males. Other important features for identification include the nares closely spaced (vs. separated in all other Asiatic species except *B. minxianensis*, *B. nuda* and *B. sawadai*); medial indentation of the upper lip weak or absent (vs. deep in *B. nuda* and in the species bearing the conical protrusions on the mental lobes (*B. conilobus*, *B. dgebuadzei*, *B. golubtsovi*, *B. sawadai*)); snout blunt (vs. pointed in *B. tomiana* and in less extent in *B. conilobus* and *B. golubtsovi*); scale cover well developed (vs. reduced or absent in *B. conilobus*, *B. dgebuadzei*, *B. golubtsovi*, *B. karabanowi*, *B. nuda* and *B. tomiana*); 44–45 vertebrae (vs. 37–39 in *B. oreas*, 45–47 (mean 46) in *B. golubtsovi*, and 39–44 (mean 42–43) in all other species except *B. dgebuadzei*, *B. restricta* and *B. tomiana*); 89–105 body lateral-line pores (vs. 60–90 in all other members of the genus); pigment pattern on the dorsum and flanks formed by the variably developed irregular transverse bars and/or isolated well spaced spots (Fig. 2) (vs. saddle-like transverse bars on the dorsum and/or bars and spots on the flanks variably transversely or longitudinally confluent to each other in transverse or longitudinal direction (except some populations of *B. tomiana* from the upper Ob basin, which share similar pigmentation pattern with *B. altayensis*).

Description: For general appearance see Fig. 2; morphometric data are provided in Table 1. Body elongate, cylindrical in front of dorsal-fin origin and laterally compressed behind dorsal-fin base; dorsal contour weakly arched between nape and dorsal-fin origin. Head conical, depressed, broad; snout broadly rounded to bluntly pointed at tip, wc/wn = 1.50–1.67, usually 1.56 or greater. Nostrils closely spaced (Figs. 3A-B). Nasal flap triangular, short, reaching to or almost to the hind margin of posterior nostril when pressing back. Mouth arched; lower jaw spoon-shaped; dentiform process weakly developed. Lips strongly furrowed; upper lip complete, with weak (less than one-third of width of upper lip in depth), sometimes almost completely undeveloped medial indentation. Lateral lobes of lower lip absent. Mental lobes of lower lip broad and furrowed, scarcely separated from the rest of lip but with conspicuous posterior ends, lacking conical protrusions (Figs. 4A-D). Maxillary barbel reaching to vertical of anterior third to middle of eye. Supraorbital sensory canal complete, not confluent with infraorbital canal; supratemporal commissure continuous (65 % of cases, 3 pores) or interrupted (2 + 2 pores) (as exception can be continuous but contains 4 pores); pores in other cephalic sensory canals: 8 in supraorbital, 14 in infraorbital, 9–10 in preoperculo-mandibular. Uppermost preopercular pore situated at level of mouth corner or above it, at level of distalmost point of snout. Body lateral line complete, with pores small (except some anteriormost ones) and numerous (89–105 in number).

Dorsal fin with 3-4 (usually 3) unbranched and 7 branched rays; anal fin with 3 unbranched and 5 branched rays; tips of dorsal and anal fins rounded, their distal margins straight. Dorsal and pelvic fins originate on the same vertical; pelvic fins not reaching to anus. Pectoral fins with one unbranched and 10–11 branched rays; tip formed by 2nd and 3rd, rarely only by 2nd and as exception by 1st to 3rd branched rays. Pelvic fins with one unbranched and 7 branched rays; tips formed by 2nd branched ray. Caudal fin with 9 + 8–9 main rays (8 + 7–8 branched) and 7(8) + 6(7) procurrent rays, moderately emarginate (ratio between length of outermost and innermost branched caudal ray usually equal to 1.27-1.36, as exception, up to 1.21), with lobes rounded, equal in length.

Body completely scaled, scales present even in anterior half of predorsal region and on belly; however, scales can be barely visible by the naked eyes in anterior half of body in preserved specimens but always was documented after staining with alizarine. Scales non-imbricate; all scales on body with large focal zone. Skin smooth. Anus situated about one eye diameter in front of anal-fin origin. Intestine with two flexures, the upper one lying behind stomach. Free portion of gas bladder absent.

Coloration in preservative: Background coloration yellowish to olive-yellowish with brownish to grayish-black pattern. Dark pattern usually bold and well expressed, represented by 7 to 9 transverse dorsal bars not forming a saddle-like appearance, conspicuous both in front and behind dorsal-fin origin, sometimes continuing onto flanks, sometimes not. Flanks ornamented by short usually oblique or wavy bars and/or isolated irregular spots, sometimes confluent with dorsal bars (at least in part). Pattern on flanks considerably varied in density (Figs. 2A-B), rarely dark patter inconspicuous and as exception can be absent on flanks (Fig. 2C), though short bars on dorsum always retained, vague in front of dorsal-fin origin but more or less distinct behind dorsal-fin base. Dorsal- and caudal-fin rays marked by pronounced grayish to blackish mottles forming irregular transverse streaks; pectoral-, pelvic- and anal-fin rays with similar but much less conspicuous mottles, much less numerous on pelvic- and anal-fin rays (often absent on pelvic fins). Peritoneum shaded with weak brownish tint and mottled with brownish melanophores in upper parts, much larger and denser along vertebral column.

Osteology: Neither parietal and pterotic, nor sphenotic and epiotic in contact; instead, unossified space (small lateral fontanelle) surrounded by all these bones, sometimes almost completely hidden by outer margin of parietal. Suture between supraethmoid-ethmoid and prevomer obliterated. Canal-bearing ossification of lacrimal well developed, dermal portion of this bone rather broad. Extratemporal fused with posttemporal; sensory canal on posttemporal widely opened from above; anteriormost intracanal ossifications of body lateral line large; intracanal ossifications of temporal portion of infraorbital canal tube-like, large, but not fused to each other, and posteriormost ossification not fused with pterotic; supratemporal commissure lacking bony roof (Fig. 4E). Symplectic with very weak posteroventral process. Lower margin of opercle straight. Basihyal Y-shaped, with broadly and smoothly concave anterior margin and rounded tips of lateral processes. Urohyal rather small, its posterior process 2.7-3.0 times as long as lateral processes; hind margin deeply incised. Basibranchial-4 absent; two pharyngobranchials; no plate-like process on epibranchial-4. Pharyngeal bones rather deep, lacking a cancellate structure but sometimes possessing 1-2 large openings at base of ventrolateral process, which is massive, triangular, with broad base and pointed apex; dorsal limb of pharyngeal bone somewhat curved (Fig. 4F). Functional teeth small, not numerous (7-9). Three pectoral bony radials. Mesocoracoid firmly attached (fused with retention of suture?) to cleithrum. Anterior processes of pelvic bones with shallow notch (about one-quarter of total length of pelvis or less in depth); in cleared and stained paratype anterior process of pelvis from left side lacking notch but bearing a series of indentations (anomaly). Vertebrae 4 + 40–41 = 44-45 (44 in 43% of specimens, n = 20), predorsal vertebrae 4 + 12–13 in number. Neural complex very low, with shallow concavity posteriad ("boat-shaped"). Posterior processes of bony air-bladder capsule moderately developed. Manubrium moderately short and broad. Five, rarely six hypurals in caudal skeleton, epural present.

Sexual dimorphism: All dissected fishes have gonads of III to V stage of maturity. Breeding males possess minute isolated epidermal tubercles on skin of dorsal, lateral and ventral surface of head, of back immediately behind the head, of throat and anterior portion of breast including the bases of pectoral fins; similar tubercles cover an unbranched and outer 6-7 branched pectoral-fin rays, the latters being thickened and broadened, especially the outermost ones. Cheeks of males conspicuously thickened and inflated ("muscular"); thickening developed also along the dorsal and ventral margins of caudal peduncle in its posterior half. Some thickening of cheeks and dorsal and ventral margins of caudal peduncle expressed in ripe females also, but in much lesser extent. There are no differences between sexes in length of paired fins: though limits are greater in females rather than in males (pectoral- and pelvic-fin length 13.9–17.0 % and 11.1–12.4 % of SL vs. 15.5–17.5 % and 12.2–12.9 % respectively), they are widely overlapping and their means are similar.

Gastrointestinal content: Stomach and intestine of all dissected specimens have been filled by chironomid larvae; in one specimen (ripe male 105 mm SL) a large simuliid larva was found in stomach, but intestine of this specimen have been densely filled by chironomid larvae.

Remarks: Morphological features of the studied fishes are well corresponded to the original description of *B. altayensis*, which was based on eight specimens collected from the Kelanghe River, a tributary of the Ertix (= Kara-Irtysh) River in Xinjiang (47°52´ N, 88°06´ E) (Zhu, 1992). The only discrepancy with the original description is the more or less expressed mental lobes, though barely separated from the rest of the lower lip, while the mental lobes were described by Zhu (1992) as totally absent in the type specimens. In the all specimens available, even if a furrow separating the mental lobe shows no differences from the subsequent furrows of the lower lip, the posterior ends of the mental lobes are always well distinguishable (Figs. 4A–D). However, the lips are pictured as uniformly furrowed without any expression of the mental lobes on the figure in the original description (Zhu, 1992: 242, Fig. 2). The type series of *B. altayensis* is housed in Nanjing Institute of Geology and Limnology, P. R. China (Zhu, 1992; Kottelat, 2012). Unfortunately, I could not receive any reply from this institution; thus, no additional information from the type specimens can be available for me. Most probably, the original drawing is erroneous because it is not clear how the lower lip can be attached to skin without any expression of mental lobe as figured by Zhu, although some geographical variability in a degree of development of the mental lobes can not be formally excluded. However, as I am unable to reexamine the type specimens, by the formal reasons I identify the Bulgan specimens tentatively (as *Barbatula* cf. *altayensis*).

Barbatula altayensis can be easily distinguished from all other species of the genus by the absence of the lateral lobes of the lower lip and by the structure of the mental lobes (or their total absence, if the data from the original description are correct). Although fishes from the upper Bulgan River possess the mental lobes, the latter are deeply furrowed and barely separated from the rest of the lower lip in contrast to the well separated smooth mental lobes in the other species of *Barbatula*, oval in shape (*B. toni*, *B. tomiana*, *B. markakulensis*, *B. dsapchynensis*, *B. nuda* etc), or with conical protrusions (complex of species from the Central-Asiatic endorheic drainages and *B. sawadai* from the Selenga basin, see Prokofiev (2016a)). Within the other members of the genus only *B. nuda* from the basins of Tumen and Daling Rivers in north-eastern China shares closely spaced nostrils in combination with absence of the conical protrusions on the mental lobes; however, it sharply differs from *B. altayensis* by the large oval mental lobes, almost smooth lips with the deep medial indentation of the upper lip, reduced scale cover and lower vertebral count (40–42 vs. 44–45) (Cao et al., 2012).

The very peculiar features of the species under consideration are the extremely strong development of the intracanal ossifications of the temporal portion of the infraorbital canal and the anteriormost body lateral line, and the fusion of the extratemporal and posttemporal, both are not known in any other *Barbatula* species.

Comparison with the sympatric species *B. karabanowi* is given under description of the latter.

***Barbatula karabanowi* Prokofiev, 2018**

(Figs. 3C–D, 4G, 5)

Material examined: Totally 59 specimens, Mongolia, Bayan-Ölgii aimag, headwaters of the river Bulgan: ZMMU 23829, holotype, 97 mm SL, 47°04´46.4´´ N, 91°02´36.1´´ E, 21 July 2008, electrofishing; ZMMU 23830, paratypes, 11 specimens (1 C&S), 84.5–111 mm SL, some data as holotype; IEE uncat., Mongolia, Bayan-Ölgii aimag, headwaters of the river Bulgan: 31 specimens, 18–95 mm SL, 47°05'12.7´´ N, 91°01'42.2´´ E, altitude 2057 m a. s. l., night 20–21 July 2008 (fish-trap), 21 July 2008 (electrofishing); 16 specimens, 24–89 mm SL, 47°00'46.8´´ N, 91°02'39.3´´E, altitude 2003 m a. s. l., 21 July 2008, from the mouth of a small creek and the nearby riverbed, electrofishing.

Diagnosis: *Barbatula karabanowi* is distinguished from the other representatives of the genus in Asia in the following characters in combination: lips smooth (vs. more or less furrowed in all other described species except *B. nuda*; however, the latter differs in possession of the deep (instead of weak) medial indentation of the upper lip); mental lobes oval, smooth, well separated from the lower lip, lacking conical protrusions (vs. furrowed and barely separated from the lower lip in *B. altayensis*; bearing conical protrusions in *B. conilobus*, *B. dgebuadzei*, *B. golubtsovi* and *B. sawadai*); lateral lobes of the lower lip short but well developed (vs. absent in *B. altayensis*, long in *B. conilobus*, *B. dgebuadzei* and *B. golubtsovi*); nares well separated (vs. closely spaced in *B. altayensis*, *B. minxianensis*, *B. nuda* and *B. sawadai*); snout relatively wide and bluntly pointed (wc/wn = 1.44-1.57, vs. narrow and sharply pointed, wc/wn = 1.55-2.10 in *B. conilobus*, *B. golubtsovi* and *B. tomiana*); scale cover reduced (vs. well developed in *B. altayensis*, *B. compressirostris*, *B. dsapchynensis*, *B. markakulensis*, *B. minxianensis*; *B. oreas*, *B. potaninorum*, *B. restricta*, *B. sawadai* and *B. toni*); vertebrae 42-44 (mean 43) (vs. 37-39 in *B. oreas*, 43-45 (mean 44 or 45) in *B. conilobus* and *B. dgebuadzei*, 44-45 in *B. altayensis*, and 45-47 (mean 46) in *B. golubtsovi*); 75-88 body lateral-line pores (vs. 89-105 in *B. altayensis*); tips of the paired fins rounded (vs. pointed in *B. markakulensis* and *B. restricta*); pigment pattern on the dorsum and flanks formed by the densely set and partially fused irregular spots and streaks (Fig. 5A).

Description: For general appearance see Figs. 5A-C; morphometric data are provided in Table 1. Body elongate, cylindrical in front of dorsal-fin origin and laterally compressed behind dorsal-fin base; dorsal contour weakly arched to uniformly deep between nape and dorsal-fin origin. Head conical, depressed; snout bluntly pointed at tip, wc/wn = 1.44-1.57. Nostrils widely spaced (space between center of posterior nostril and anterior border of eye equal to space from center of posterior nostril to hind margin of nasal flap) (Figs. 3C-D). Nasal flap triangular, short, reaching up to a center of posterior nostril when pressing back. Mouth arched; lower jaw spoon-shaped; dentiform process weakly developed. Lips smooth; upper lip with short medial indentation, not exceeding one-third of width of upper lip in depth. Lateral lobes of lower lip well developed but short, equal to one-quarter of maxillary barbel length. Mental lobes of lower lip well separated, oval, smooth, lacking conical protrusions; in most cases lower lip possessing an additional deep furrow mesially from mental lobe on each side, the rest of lip being smooth (Fig. 5D). Maxillary barbel reaching to vertical of hind margin of eye. Supraorbital sensory canal complete, not confluent with infraorbital canal; supratemporal commissure continuous; pores in cephalic sensory canal system: 8 in supraorbital, 13-14 in infraorbital; 9-10 in preoperculo-mandibular, 3 in supratemporal commissure. Uppermost preopercular pore situated at level of tip of snout or little below it. Body lateral line complete, with 75–88 pores.

Dorsal fin with 3-4 (usually 3) unbranched and 7 branched rays; anal fin with 3 unbranched and 5 branched rays; tips of dorsal and anal fins rounded, their distal margins straight. Dorsal and pelvic fins usually originate on the same vertical, rarely pelvic fins positioned somewhat behind this vertical, under level of anterior third of dorsal-fin base; pelvic fins reaching far before anus. Pectoral fins with one unbranched and 11 branched rays; tip formed by 2nd or by 2nd and 3rd, rarely by 1st to 3rd, and as exception by 1st and 2nd branched rays. Pelvic fins with one unbranched and 7 branched rays (often seventh ray being small and closely attached to sixth one); tips formed by 2nd branched ray, rarely by 1st and 2nd. Caudal fin with 9 + 9 main rays (8 + 8 branched) and 7(8) + 6(7) procurrent rays, weakly emarginate (ratio between length of outermost and innermost branched caudal ray usually equal to 1.11-1.19, as exception, up to 1.25), with lobes rounded, equal in length.

Scales absent, or isolated widely spaced scales present on flanks between dorsal- and caudal-fin bases; all scales with large central focal zone. Skin smooth. Anus situated about one eye diameter in front of anal-fin origin. Intestine with two flexures, the upper one lying behind stomach or only reaching its ventral margin. Free portion of gas bladder absent.

Coloration in preservative: Background coloration yellowish with grayish-brown, olive-brown to brownish-black pattern. Dorsum with short oblique or transverse bars, sometimes complete and uniform, sometimes fragmented onto separate spots, never extending onto flanks. Flanks usually with dense pattern of wavy streaks and irregular spots often confluent with each other to forming reticulate or “tigroid” appearance (Figs. 5A-B). Dark pattern usually sharply pronounced, rarely indistinct, and in some specimens developed at dorsal contour of body and/or on caudal peduncle; as exception, pattern completely lacking on flanks (but short obscure dorsal bars always retaining) (Fig. 5C). Fin rays indistinctly mottled, mottles present on dorsal-, caudal- and usually pectoral-fin rays, as exception, on pelvic-fin rays, but sometimes disappearing on all fins. Peritoneum discoloured to brownish, usually pale-yellowish-brown in anterior half of abdominal cavity and transparent in posterior half, with moderately sparse isolated melanophores, more densely distributed along vertebral column.

Osteology: Sphenotic contacting epiotic, separating parietal and pterotic, but in two cases this contact lost from one side, forming small lateral fontanelle surrounded by these four bones. Suture between supraethmoid-ethmoid and prevomer expressed in posterior half of contact of these bones only, obliterated anteriad. Canal-bearing ossification of lacrimal large. Symplectic somewhat expanded caudad, but lacking posteroventral process. Lower margin of opercle almost straight. Basihyal with broadly and smoothly concave anterior margin. Urohyal small, its posterior process twice as long as lateral processes; hind margin with two conspicuous incisions. Basibranchial-4 absent; two pharyngobranchials; no plate-like process on epibranchial-4. Pharyngeal bones rather gracile, with cancellate structure; functional teeth rather large and not numerous (6-8); ventrolateral process of pharyngeal bone longer than in *B. altayensis*, narrower at base, obliquely truncated to weakly forked at apex; dorsal limb of pharyngeal bone straight (Fig. 4G). Three pectoral bony radials. Mesocoracoid firmly attached (fused?) to cleithrum. Anterior processes of pelvic bones with deep and broad notch (about one-half of total length of pelvis in depth). Vertebrae 4 + 38–40 = 42-44 (usually 43; 44 in 27% of cases, n = 20), predorsal vertebrae 4 + 11-13 in number. Neural complex “boat-shaped”. Posterior processes of bony air-bladder capsule as in *Barbatula* cf. *altayensis* or somewhat shorter and more rounded. Manubrium moderately short and broad. Five hypurals in caudal skeleton, epural present.

Sexual dimorphism: Males of III-IV stages of gonadal maturity possess very small and scarcely distributed epidermal tubercles on skin of dorsal, lateral and ventral surface of head and of throat (isthmus). Up to 8 outer branched pectoral-fin rays can be expanded, but tubercles on them are very small and sparse, inconspicuous. Probably none of males exhibits a full development of breeding tubercles despite the high stages of gonadal maturity. There are females with gonads up to IV (V?) stage, many of them show some expansion of the outermost branched pectoral-fin rays (but without epidermal tubercles) and possess epidermal tubercles on skin of head almost as developed as in males. Cheeks not thickened. Paired fins equal in length in both sexes.

Gastrointestinal content: Stomach and intestine of all dissected specimens had contained mostly the larvae of stoneflies (Plecoptera), or stoneflies and chironomids, in few cases the remains of the gammarid crustaceans or only chironomid larvae were found (in 2 and 1 of 8 dissected specimens, respectively).

Remarks: *Barbatula karabanowi* belongs to a complex of species grouped around *B. toni* (the so-called “blunt-snouted” loaches of Prokofiev (2007b)), which is characterized by the following characters in combination: snout bluntly pointed to broadly rounded, weakly narrowed toward the tip (wc/wn around 1.4 or 1.5 vs. 1.6-2.0, usually around 1.8 in *B. tomiana* (apparently also a complex of very similar species distributed from the upper Ob to Selenga basins: Prokofiev, 2016b)); well spaced nostrils (vs. closely spaced in *B. altayensis*, *B. minxianensis* and *B. nuda*; all these species appear to be not related to any others); mouth with short but well developed lateral lobes and well developed, smooth, oval mental lobes lacking conical protrusions (vs. lateral lobes absent, mental lobes furrowed and barely separated from the lip in *B. altayensis*, or bearing conical protrusions in the complex of species from the Central-Asiatic endorheic drainages and *B. sawadai* from the Selenga basin) (Prokofiev, 2016a, 2016b). The following species of this complex are known from the basins neighbouring to the Bulgan River: *B. compressirostris* (*B. sibirica* as a synonym, but further researches required), *Barbatula* sp. 1 (*fide* Prokofiev, 2016b), *B. markakulensis* (restricted to the Markakul Lake in the basin of Irtysh) and *B. restricta* in the Ob basin, and *B. dsapchynensis* in the Zavhan basin. Members of this complex are not known in the Chovd River system of western Mongolia. Formerly all these species were referred to *B. toni*; however, this species is restricted in distribution to the waterbodies of Russian Far East, north-east China and Korea (currently apparently several species mixed under this name here). Taxonomic position of the populations of Siberian loach distributed between the Ob and Amur basins is uncertain, though at least in the Selenga basin the "blunt-snouted" loaches represent a separate species (or more than one species, further researches required) (Prokofiev, 2007b, 2014, 2015, 2016a, 2016b). *Barbatula oreas* from Japan (Hokkaido) and probably South Korea and *B. potaninorum* with uncertain distribution in north China (Cao et al., 2012) also belong to this complex.

Within the members of this complex only *Barbatula* sp. 1 (Prokofiev, 2016b) from the headwaters of the Chulysman River (upper Ob basin) and probably from the upper Enissei drainage is similar to *B. karabanowi* in loss of the scale cover; however, it differs from *B. karabanowi* in a number of other respects, i.e. the lips furrowed, caudal fin truncated, supraethmoid-ethmoid separated from prevomer, flanks with large wavy bars forming a "tigroid" appearance (Prokofiev, 2007b, 2016b).

Barbatula karabanowi differs from all the other members of the "blunt-snouted" species complex (including the unnamed species from the Selenga basin) by the great reduction or total loss of the scale cover (vs. well developed and complete at least from the level of the dorsal-fin origin). *Barbatula karabanowi* is most similar to *B. dsapchynensis* from the basin of Zavhan (Lake Valley, western Mongolia) in possession of the smooth lips (vs. furrowed in all other species of this complex) and the small-spotted pattern of pigmentation forming more or less reticulate appearance and without saddle-like bars on dorsum (vs. elements of dark pattern larger or dorsal saddle-like bars present in the other species). However, besides the reduction of the scale cover *B. karabanowi* differs from *B. dsapchynensis* in the following respects: sphenotic contacting epiotic (vs. lateral fontanelle in *B. dsapchynensis*); posterior processes of the bony air-bladder capsule short and broad (vs. absent in *B. dsapchynensis*); some body proportions, i.e. caudal peduncle longer (18.6-20.2 vs. 16.2-18.7% of SL), dorsal and pelvic fins less shifted back (predorsal and prepelvic distances 51.5-53.9 and 52.3-53.9% of SL, respectively, vs. 54.1-56.8 and 55.4-57.9%), smaller eyes (11.4-13.8 vs. 14.0-16.3% of head length), longer posterior process of the urohyal (twice as long as the lateral processes vs. less than 1.5), in average shorter paired fins (pectoral- and pelvic-fin length 15.2 (14.0-18.6) and 12.2 (11.3-14.0) % of SL, respectively, vs. 17.4 (15.7-20.2) and 14.0 (13.3-15.3) %), and in the lower modal count of the pectoral-fin rays (11 vs. 12).

The Far Eastern *B. toni* further differs from *B. karabanowi* by the scales mostly with small eccentric focal zone (vs. large and central focal zone in *B. karabanowi* when scales being present), completely light-coloured peritoneum (vs. usually pale-brownish in anterior half of the abdominal cavity), and supraethmoid-ethmoid completely separated from prevomer (vs. partly fused); however, among the upper Ob's loaches referring to *B. compressirostris* (Prokofiev, 2016b) all the aforementioned characters can be variable from population to population (this may indicates onto existence of a complex of species mixed under this name in its current sense). Nevertheless, the absence or strong reduction of the scale cover (vs. well developed at least behind the level of the dorsal-fin origin) and the smooth lips (vs. furrowed) distinguish *B. karabanowi* from all populations of *B. compressirostris* known to me. In both species the specimens with dark pattern more or less disappearing exist (up to 10-20% of specimens per sample); however, being pronounced ones the elements of dark pattern are smaller and more numerous in *B. karabanowi* in contrast to *B. compressirostris*. Some populations of *B. tomiana* from the upper Ob basin consist of the superficially similar loaches having a pigment pattern forming by the small and numerous partially fused spots and streaks and possessing the scale cover reduced to absent; however, *B. tomiana* can be easily distinguished from *B.*

karabanowi in its sharply pointed snout (wc/wn 1.6-2.0, usually around 1.8 vs. 1.4-1.6) and deeply forked caudal fin (vs. only slightly emarginate).

Barbatula karabanowi further differs from *B. markakulensis* by the less pointed paired fins (tips formed by 2nd or 2nd and 3rd branched ray in 85% of specimens instead of 1st or 1st and 2nd in *B. markakulensis*). The body pigmentation in the syntypes of *B. markakulensis* (fresh material is not available) is badly faded at present; however, it seems that a transversely-barred component of pattern is prevailed (Fig. 6). *Barbatula karabanowi* further differs from *B. restricta* by the dorsal profile of the body weakly arched to almost straight before the dorsal-fin origin (vs. continuously raised from the nape to the dorsal-fin origin) and by the less pointed paired fins (tips formed by 1st and 2nd branched rays in *B. restricta*); from *B. oreas* by much lower vertebral count (42-44 vs. 37-39 according Sawada (1982)); from *B. potaninorum* by the number of the branched dorsal-fin rays (7 vs. 6), and by the position of the pelvic fins at or behind the vertical of the dorsal-fin origin (vs. in front of this vertical in *B. potaninorum*).

Barbatula karabanowi differs from the sympatric species *B.* cf. *altayensis* by the nares widely separated (vs. closely spaced), by the mouth structure (see Figs. 4A-C and 5D), by the scale cover reduced or absent (vs. well developed), by the lower counts of the vertebrae and lateral line pores (42-44 and 75-88 vs. 44-45 and 89-105, respectively), by a narrower head and interorbital space (Fig. 3, Table 1) and by the "non-muscular" cheeks in both sexes (vs. thickened, especially in the males), by the common development of the intracanal ossifications of the temporal portion of the infraorbital sensory canal (vs. strongly ossified), by the shape of the pharyngeal bones (see Figs. 4F,G), by the longer barbels (see Table 1) and by the color pattern (see Figs. 2 and 5A-C).

DISCUSSION

Loaches from the headwaters of the river Bulgan show one more case of sympatric occurrence of two *Barbatula* species in one pond, as both species were caught simultaneously in the same sampling point. A brief review of such cases was provided by Prokofiev (2016a). In contrast to other known cases, in the headwaters of Bulgan the loaches of the genus *Barbatula* represent the only kind of fishes found in the studied section of the river. Samplings in the main watercourse were hampered by its great width and depth and very strong current; thus, it can not be excluded that the large cyprinid or salmonid fishes could not be caught. However, despite all efforts for sampling by all available harvesting tools (electrofishing, fish-traps, hand and gill nets, hook-and-line), none juvenile or adult specimens of other fish taxa were collected anywhere, including off-shore bays, branches or creeks running to the main channel, although loaches were abundant. The so-called "loach monocenoses" (in terms of Turdakov (1954)) are well known for the mountainous waterbodies; however, in most cases they are formed by a single widespread species demonstrating a wide range of morphological variability, which allows to master the different ecological niches (microbentosophages, omnivores, algophagous scrapers) (Turdakov, 1954, 1963; Prokofiev, 2007a). Thus, the presence of two species showing a restricted morphological variability and occupying a similar ecological niche (microbentosophages inhabiting the same biotope according to direct visual observations) represent a very unusual situation. It should be noted, however, that composition of the food lump in two species of the Bulgan loaches is different: while gastrointestinal content of *B.* cf. *altayensis* is composed almost exclusively by the chironomid larvae, in the gastrointestinal tract of *B. karabanowi* the larvae of much larger size (Plecoptera) are dominated. Thus, it can not be ruled out that the differences in the structure of the mouth, as well as slight differences in the structure of the pharyngeal bones (see Figs. 4F-G), may be due to the adaptations for the consumption of smaller objects by *B.* cf. *altayensis*. In connection with the foregoing, a special study of the feeding habits of the Bulgan loaches is necessary.

It is also interesting, that the breeding tubercles were well developed in the males of *B.* cf. *altayensis* only, although the females of both species exhibit the high stages of gonadal maturity. It cannot be ruled out that the differences in the development of the breeding tubercles between two species represent a species-level character; on the other hand, the differences in the time of spawning between these two sympatric species may also be possible. Personal observations of the spawning of *B. barbatula* in the Istra River (Moscow Region) had shown that the females of IV–V stages of the gonadal maturity appear since first half of December (Prokofiev, 2007b) while the male's breeding tubercles are developed close to the spawning time only (April–May in Moscow Region). Based on the preserved specimens of the various species from the various localities it can be speculated that a completing of the vitellogenesis far before spawning is characteristic for the females of *Barbatula* in general. Perhaps it is caused by the secondary origin of the seasonal prevalence of spawning in *Barbatula*.

Some morphological traits of *B. altayensis* (unique mouth structure, strong ossification of the intracanal bony elements in the temporal region of the seismosensory system, thickened "muscular" cheeks in males) are not characteristic for the species of the genus *Barbatula* and probably suppose an isolated position of this species within the genus. Speciation in *Barbatula* is supposed to be allopatric; sympatric species pairs have been originated from the ancestors settled from the different Plio-Pleistocene refugia (Prokofiev, 2007b, 2016a). Thus, it is likely that *B. altayensis* inhabiting a small area in the basins of Kara-Irtysh and Urungu represents an autochthonous element of the fauna, and its ancestors could have existed here before the Plio-Pleistocene orogenesis. In contrast, *B. karabanowi* belongs to a widespread species complex (the so-called "blunt-snouted" loaches including *B. toni* and similar species) distributed throughout northern Asia. Members of this complex share no any of the aforementioned specializations of *B. altayensis* and lack an unique derived character (presence of the conical protrusions on the mental lobes) characteristic for a complex of species inhabiting the Central Asiatic endorheic basins and a part of the Selenga drainage (*B. conilobus*, *B. dgebuadzei*, *B. golubtsovi* and *B. sawadai*). Although an only stabile morphological difference between the so-called "blunt-" and "sharp-snouted" loaches (shape of snout: Prokofiev, 2007, 2016b) may appears phylogenetically irrelevant, the preliminary molecular data indicate a deep genetic divergence between the "blunt-" and "sharp-snouted" loaches from the upper Ob and Selenga drainages (B. A. Levin & A. M. Prokofiev, unpublished data). The nearby basins are inhabited by the following species of the "blunt-snouted" loaches: (1) *B. compressirostris*, *B. markakulensis*, *B. restricta* and *Barbatula* sp. 1 in the upper Ob basin; (2) *B. dsapchynensis* in Zavhan, and (3) an unnamed species (or more than one species (?), no available names) in the Selenga system. The "sharp-snouted" loaches (perhaps several species of which only *B. tomiana* from the upper Ob was named) are known from the upper Ob and Selenga drainages. Within these species *B. karabanowi* is most similar morphologically to the Zavhanian *B. dsapchynensis* (see remarks at description of the former). On this ground it can be assumed that these species may have a common ancestor. It is interesting that in the Lake Valley the “blunt-snouted” loaches are known from the Zavhan basin only but have been never reported from the Chovd basin. Therefore, if we exclude a Pleistocene extinction of the “blunt-snouted” lineage in the Chovd basin, past connections between the Bulgan and Zavhan basins cannot be excluded. The “blunt-snouted” loaches could have entered the Zavhan basin from the upper Ob system through Bulgan, not through Chovd, although the latter option seems to be more obvious according to the present hydrographic system. Anyway, all the other *Barbatula* loaches inhabiting the Central-Asiatic endorheic basin belong to the complex of species characterized by the presence of the conical protrusions on the mental lobes (Prokofiev, 2016a, 2016b). Since the loaches of both lineages (“blunt-snouted” and with conical protrusions) coexist in the basins of Zavhan and Selenga, there is no reason to believe that the “blunt-snouted” loaches could have been supplanted by the members of the lineage with conical protrusions in the Chovd (or any other) basin. It seems more reasonable to assume that the “blunt-snouted” loaches could penetrate to the Central-Asiatic endorheic basin along its southwestern periphery only during the Pleistocene alteration of the former hydrographic system of western Mongolia (Sytchevskaya, 1989).

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LITERATURE CITED

Baasanzhav, G., Dgebuadze, Yu. Yu., Dyomin, A. N., Dulmaa, A., Ermokhin, V. Ya., Lapin, V. I., Ryabov, I. N. & Tugarina, P. Ya. 1983. Review of the species of the ichthyofauna of Mongolian People Republic. In: Sokolov, V. E. (Ed.), Fishes of Mongolian People Republic. Nauka, Moscow: pp. 102-224. [in Russian]

Baasanzhav, G. & Tsendayush, A. 2001. Fishes of Mongolia. Admon, Ulaanbaatar: 180 pp., 30 pls. [in Mongolian]

Bucholtz, R. H., Tomkiewicz, J. & Dalskov, J. 2008. Manual to determine gonadal maturity of herring (*Clupea harengus* L.). DTU Aqua-report 197-08. National Institute of Aquatic Resources, Charlottenlund: 45 pp.

Cao, L., Causee, R. & Zhang, E. 2012. Revision of the loach species *Barbatula nuda* (Bleeker 1865) (Pisces: Balitoridae) from North China, with a description of a new species from Inner Mongolia. Zootaxa, 3586: 236–248.

Kimura, S., Mori, T., Kataoka, T., Hosoya, K., Wu, H.-L. & Suzuki, K. 1992. Preliminary report on a collection of freshwater fishes from the Altai district, Northern Xinjiang, China. Bull. Fac. Biores. Mie Univ., 7: 91-105.

Koch, F. & Paepke, H.-J. 1998. Zur Kenntnis der Gattung *Leuciscus* Cuvier in der Mongolei mit Beschreibung einer neuen Art (Pisces, Cyprinidae). Mitt. Zool. Mus. Berlin, Zool., 74 (2): 157-171.

Kottelat, M. 2006. Fishes of Mongolia. A check-list of fishes known to occur in Mongolia with comments on systematics and nomenclature. The World Bank, Washington: xi + 103 pp.

Kottelat, M. 2012. Conspectus cobitidum: an inventory of the loaches of the world (Teleostei: Cypriniformes: Cobitoidei). Raffl. Bull. Zool., suppl. 26: 1-199.

Prokofiev, A. M. 2007a. Materials towards the revision of the genus *Triplophysa* Rendahl, 1933 (Cobitoidea: Balitoridae: Nemacheilinae): A revision of nominal taxa of Herzenstein (1888) described within the species “*Nemachilus*” *stoliczkae* and “*N.*” *dorsonotatus*”, with the description of the new species *T. scapanognatha* sp. nova. Voprosy Ikhtiol., 47 (1): 5-25. [in Russian]

Prokofiev, A. M. 2007b. Morphology, systematics and origin of the stone loach genus *Orthrias* (Teleostei: Balitoridae: Nemacheilinae). KMK Scientific Press Ltd, Moscow: 110 pp. [in Russian, with English summary]

Prokofiev, A. M. 2014. Book review. Kottelat M. Conspectus cobitidum: an inventory of the loaches of the World (Teleostei: Cypriniformes: Cobitoidei) // Raffles Bull. Zool. 2012. Suppl. No. 26. 199 p. Voprosy Ikhtiol., 54 (2): 243-248. [in Russian]

Prokofiev, A.M. 2015. A new species of *Barbatula* from the Russian Altai (Teleostei: Nemacheilidae). Zootaxa, 4052 (4): 457-464.

Prokofiev, A. M. 2016a. Loaches of the genus *Barbatula* (Nemacheilinae) of the Zavkhan River basin (Western Mongolia). Voprosy Ikhtiol., 56 (6): 655-669. [in Russian]

Prokofiev, A. M. 2016b. Redescription and systematic position of nominal loach species *Nemacheilus compressirostris* and *N. sibiricus* (Nemacheilidae). Voprosy Ikhtiol., 56 (4): 391-402. [in Russian]

Prokofiev, A. M. 2018. A new species of *Barbatula* from the headwaters of the Bulgan River in western Mongolia (Teleostei: Nemacheilidae). Zootaxa, 4407 (2): 267-274.

Sawada, Y. 1982. Phylogeny and zoogeography of the superfamily Cobitoidea (Cyprinoidei, Cypriniformes). Mem. Fac. Fish. Hokkaido Univ., 28 (2): 65-223.

Shatunovskij, M. I. 1983. Introduction. In: Sokolov, V. E. (Ed.), Fishes of Mongolian People Republic. Nauka, Moscow: pp. 7-10. [in Russian]

Sytchevskaya, E. K. 1989. Freshwater ichthyofauna of the Neogene of Mongolia. Trans. Joint Soviet-Mongolian Paleontol. Exped., 39: 1-144 [in Russian]

Tang, F.J., Brown, A. & Keerjiang, A. 2012. Fish community successions in Lake Ulungur: a case of fish invasions in fragile oasis. Russ. J. Biol. Invasions, 3 (1): 76-80.

Turdakov, F. A. 1954. Fishes of Kirghizia. Izatelstvo KirghizFAN, Frunze: 172 pp. [in Russian]

Turdakov, F. A. 1963. Fishes of Kirghizia. 2nd edition. Izdatelstvo AN KirgSSR, Frunze: 283 pp. [in Russian]

Zhu, S.-q. 1992. Three new species of Nemacheilinae fishes from China (Cypriniformes: Cobitidae). Acta zootax. sin., 17 (2): 241-247. [in Chinese, with English summary]

Table 1. Measurements of *Barbatula* spp. from the headwaters of the Bulgan River. Mean counts are given in parentheses.

Character	*B.* cf. *altayensis* (n = 10)	*B. karabanowi*	
		Holotype	Paratypes (n = 8)
SL, mm	90–123	97	86–114
In % of SL			
Head length	20.7–23.2 (22.0)	22.7	22.1–24.2 (22.7)
Greatest body depth	13.5–15.7 (14.6)	15.5	13.5–15.5 (14.3)
Least depth of caudal peduncle	8.5–10.4 (9.5)	8.8	8.1–8.8 (8.6)
Caudal peduncle length	18.1–20.6 (19.4)	19.1	18.6–20.2 (19.4)
Predorsal distance	51.9–54.6 (53.5)	51.6	51.5–53.9 (52.5)
Prepelvic distance	51.9–54.6 (53.5)	53.6	52.3–53.9 (53.0)
Preanal distance	71.2–74.2 (73.3)	74.2	73.3–75.4 (74.6)
Pecto-ventral distance	30.1–33.0 (31.9)	30.9	29.1–32.5 (30.9)
Ventro-anal distance	18.9–21.3 (20.2)	20.6	20.6–22.8 (21.6)
Pectoral-fin length	13.9–17.5 (16.2)	14.4	14.0–18.6 (15.2)
Pelvic-fin length	11.1–12.9 (12.3)	11.3	11.3–14.0 (12.2)
Length of outermost branched caudal-fin ray	15.5–18.6 (17.0)	15.5	14.9–18.6 (16.0)
Length of innermost branched caudal-fin ray	12.2–14.4 (13.1)	13.4	12.9–16.3 (13.8)
Dorsal-fin base length	8.7–10.3 (9.4)	9.8	9.1–11.6 (10.4)
Anal-fin base length	6.1–7.2 (6.8)	6.7	6.6–8.2 (7.1)
Dorsal-fin height	14.8–17.5 (16.2)	16.5	15.2–16.5 (15.9)
Anal-fin height	13.0–15.5 (13.7)	12.4	12.4–14.5 (13.4)
Distance from anus to anal-fin origin	2.4–3.1 (2.7)	2.1	1.9–2.9 (2.3)
In % of head length			
Snout length	42.9–47.8 (44.2)	45.5	40.9–45.5 (43.1)
Horizontal diameter of eye	11.4–13.6 (12.6)	11.4	11.4–13.8 (12.4)
Bony interorbital width	21.4–26.1 (22.9)	18.2	18.2–22.9 (20.2)
Length of inner rostral barbel	16.0–18.3 (17.5)	18.2	15.9–20.8 (18.9)
Length of outer rostral barbel	19.6–23.9 (21.5)	27.3	25.0–27.3 (26.5)
Length of maxillary barbel	19.6–26.1 (23.4)	29.6	28.2–30.0 (29.2)
Greatest width of head	53.6–65.2 (58.1)	50.0	45.0–50.0 (48.5)
Width of head at level of anterior nostrils	34.8–40.0 (37.1)	31.8	31.8–34.1 (32.2)

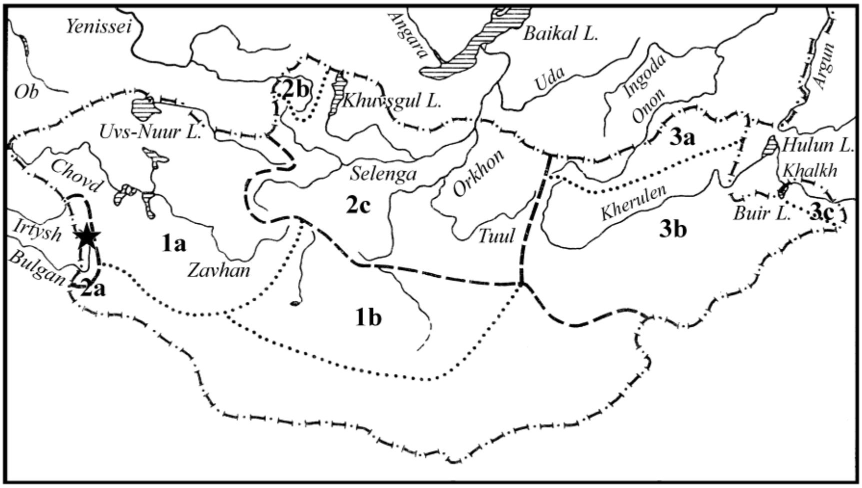

Figure 1. Hydrographic system of Mongolia (modified from Shatunovskij (1983)) and area of sampling of the present materials (star). Abbreviations: (1) Central-Asiatic endorheic basin (1a: Lake Valley; 1b: Gobi Lakes); (2) Polar basin (2a: Urungu drainage; 2b: Darkhad basin, upper Yenissei drainage; 2c: Baikal-Selenga drainage); (3) Pacific basin (3a: Onon drainage; 3b: Kherulen drainage; 3c: Khalkh drainage).

Figure 2. *Barbatula* cf. *altayensis*, ZMMU nr. 23828, lateral view of fishes: (A) SL 123 mm (most typical color pattern); (B) SL 98 mm; (C) SL 114 mm.

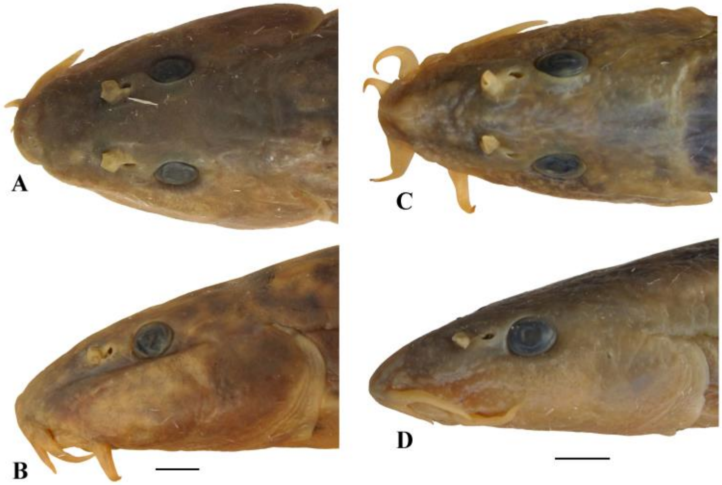

Figure 3. *Barbatula* cf. *altayensis* (A, B) and *B. karabanowi* (holotype) (C, D), head shape and position of nares: (A, C) dorsal view; (B, D) lateral view. Scale bar: 3 mm.

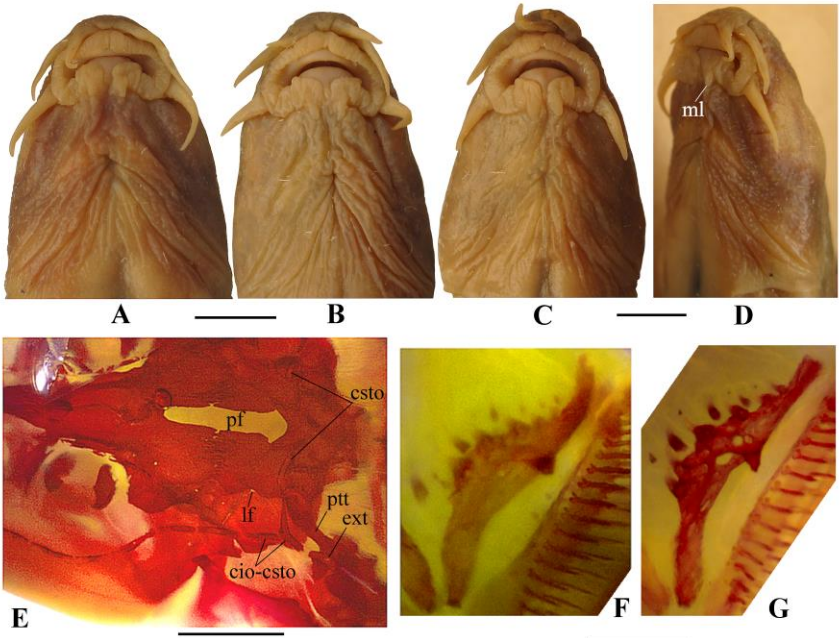

Figure 4. *Barbatula* cf. *altayensis*, ZMMU nr. 23828 (A–F) and *B. karabanowi* (paratype) (G): (A–C) mouth structure, ventral view, variations in development of mental lobes; (D) ventrolateral view of head, same specimen as on Fig. 4C; (E) temporal portion of cephalic seismosensory system; (F, G) pharyngeal bones, ventral view. Abbreviations: cio-csto, intracanal ossifications at fork of infraorbital canal and supratemporal commissure; csto, ossifications of supratemporal commissure (interrupted, 2 + 2 pores); ext, extratemporal; lf, lateral fontanelle; ml, mental lobe of lower lip; pf, posterior (fronto-parietal) fontanelle; ptt, posttemporal. Scale bars: (A–E) 5 mm; (F, G) 2 mm.

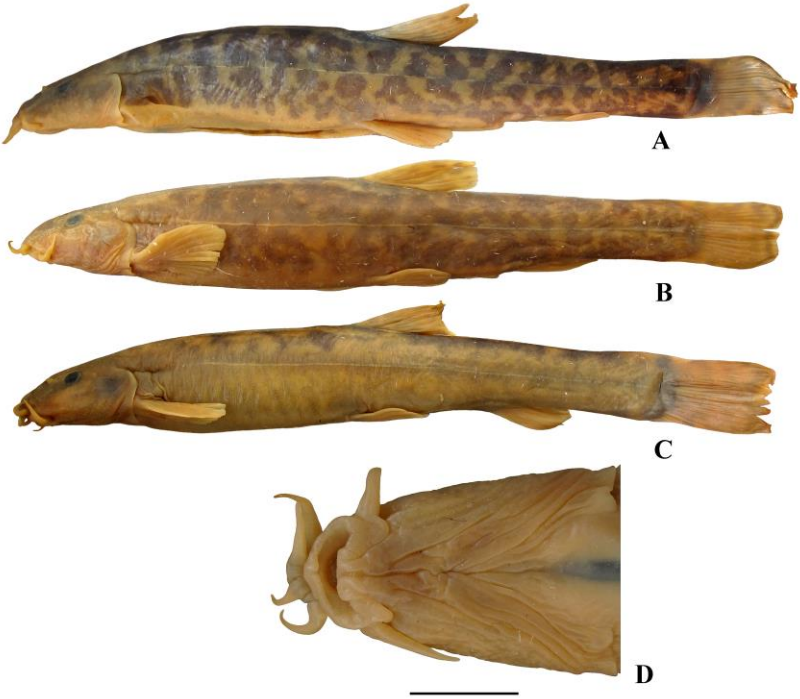

Figure 5. *Barbatula karabanowi*: (A–C) lateral view of fishes: (A) holotype, ZMMU nr. 23829, SL 97 mm (most typical color pattern); (B) paratype, ZMMU nr. 23830, SL 105 mm; (C) paratype, ZMMU 23830, SL 114 mm); (D) mouth structure (holotype), scale bar – 5 mm.

Figure 6. *Barbatula markakulensis*, syntype, ZIN nr. 26864, SL 68.2 mm: (A) lateral view; (B) dorsal view; (C) mouth structure, ventral view, scale bar – 3 mm.