

ORIGINAL ARTICLE

Benthic macroinvertebrates of the watercourses of the South Khangai (Mongolia)

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Submitted: 13.09.2017. Accepted: 25.11.2017

Based on the original material collected in June 2010, a list of aquatic invertebrates found in the watercourses of the endorheic basins of the South Khangai is given. A total of 129 species, mainly widespread transpalearctic animals, have been found. In general, the fauna is depleted, but contains a certain number of peculiar endemics.

Key words: Mongolia; Khangai; macrobenthos; Ephemeroptera; Diptera; Plecoptera; Trichoptera

Introduction

Reophylic invertebrates of Mongolia are studied quite irregularly. Most hydrobiological and hydroentomological studies are traditionally carried out in the rivers of the Selenga Basin on the northern slope of the Khangai and the Khövsgöl Lake region, a lesser attention is paid to the Kerulen Basin in the northeast and to inland basins in the west and south of the country (Zaika, 2012; Maasri, Gelhaus, 2012; Narangarvuu et al., 2015). The latter are of particular interest, since they have been existing in isolation from large river systems for considerable time and thus can exhibit a certain faunistic and ecological originality. The purpose of this work is to provide a preliminary description of the faunal diversity of macroinvertebrates in water bodies of the Southern Khangai.

The sources of most of the rivers of the South Khangai are located in zone of the highland tundra or semi-desert, at an altitude of 2.600-3.000 m. Steeply falling from the ridge, they flow to the south towards the Gobi Desert, gradually losing water content and flow velocity and significantly mineralizing (including due to the massive grazing of cattle in floodplain meadows). The total length of such rivers does not exceed several hundred kilometers (usually within 300-350); as a result, they form a saline swamp or a small lake in the middle of a stony desert, without further drain.

Materials and methods

During the route expedition in June 2010 we examined middle course of seven rivers and several springs on the slopes of the South Khangai in the area of their intersection with the Ulan-Bator-Altai Highway (the length of the section is about 600 km), at altitudes from 1.600 to 1.900 m. They are the rivers Olgi gol, Taatsyn gol, Shargaljuut gol, Tuyn gol, Naryin gol, Baydrag gol and Tsagaan gol (Fig. 1). This is almost all the watercourses available in the region (except for the sources of the Zavkhan River). The collected material includes 55 samples of macrozoobenthos; the selection was carried out using a standard hydrobiological scoop-net with an area of 0.02 m².

Results and discussion

In the watercourses of the South Khangai we found 129 species of macroinvertebrates belonging to the classes Turbellaria, Oligochaeta, Hirudinea, Gastropoda, Bivalvia, Crustacea and Insecta. The most species-rich group was Insecta presented by 108 species; their dominance is generally typical for the Palearctic (Chertoprud, 2010).

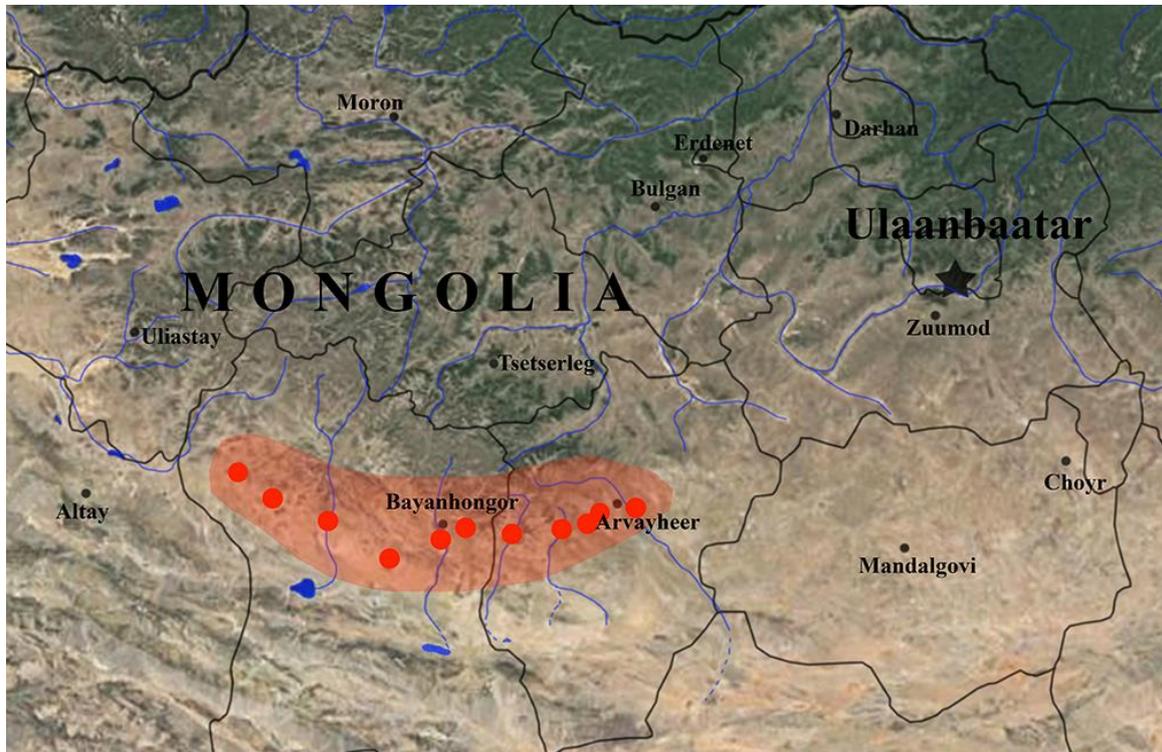


Fig. 1. Map of Central Mongolia; red dots indicate sample sites.

Planarians (Plathelminthes: Turbellaria: Planariidae) of the single species *Phagocata* cf. *sibirica* (Sabussow, 1903) was found in plenty only once, in rheocrene near the village Nariynteel (45 ° 57'13.16 "N, 101 ° 26'10.81" E). Up to now, it has not been known for the region.

Oligochaetes (Annelida: Oligochaeta) in the watercourses of the region are represented by at least seven species of four families. *Enchytraeus* sp. (Enchytraeidae), *Lumbriculus variegatus* (Müller, 1774), *Stylodrilus* sp.-1 (with two-toothed chaetae) and *Stylodrilus* sp.-2 (with single-toothed chaetae) were found in springs and small streams of the mountain steppe; *Nais barbata* Muller, 1774 (Naididae) occurred in the thickets of the fountain moss and on the stones of the whitewaters of small rivers, especially abundant in the Tsagaan gol River (46 ° 10'9.56 "N, 99 ° 2'9.20" E); *Isochaetides* sp. and *Tubifex tubifex* (Müller, 1774) (Tubificidae) were met in silt and silted sand of most of the watercourses.

Leeches (Annelida: Hirudinea) are represented by three species. *Piscicola* sp. (Piscicolidae) was found in the Naryin gol River (46° 0'58.85"N, 100°20'40.85"E), *Alboglossiphonia hyalina* (O. F. Müller, 1774) (Glossiphoniidae), *Erpobdella* cf. *vilnensis* (Liskiewicz, 1925) (Erpobdellidae) occurred in the Baydrag gol River (46°10'45.17"N, 99°15'46.18"E). The latter, perhaps, belongs to the undescribed species of this group, known from the Baikal region (Utyevsky et al., 2015).

Gastropods (Mollusca: Gastropoda) found in the watercourses of the region mainly inhabit floodplain puddles and lakes, falling into the flowing waters accidentally. In the rhypal zone of the most rivers the following mollusks were found in hanging macrophytes: *Gyraulus chinensis* (Dunker, 1848), *G. infraliratus* (Westerlund, 1876) (Planorbidae), *Lymnaea (Peregriana) intermedia* Lamarck, 1822, *L. (Radix) auricularia* (Linnaeus, 1758) and *L. (Orientogalba) viridis* Qoy et Gaimard, 1832 (Lymnaeidae). Also, *L. (Sibirigalba) sibirica* (Westerlund, 1885) (Lymnaeidae) was singly recorded in a helocrene source of mountain tundra (46 ° 2'37.57 "N, 102 ° 27'40.50" E).

Bivalve mollusks (Mollusca: Bivalvia) in the watercourses of the region are represented by two species of the superfamily: *Musculium creplini* (Dunker, 1845) (Sphaeriidae) living on the muds of the rhypal zone of most rivers and *Odhneripisidium (Tuvapisidium)* cf. *popovae* Starobogatov et Streletzkaia, 1967 (Pisidiidae) (Fig. 2), forming mass clusters in helocrene source near Arweichar town (46 ° 2'37.57 "N, 102 ° 27'40.50" E). Apparently, this is the most eastern finding of a representative of the relict subgenus *Tuvapisidium*, and the first one outside the Great Lakes Basin in Mongolia and Tuva. Also, the Naryin gol shore sediments contained empty, probably subfossil shell of *Odhneripisidium* (s.str.) sp. (Pisidiidae).

Amphipods (Crustacea: Amphipoda) are represented by two species of the family Gammaridae: *Gammarus* cf. *dabanus* Tachteew et Mekhanikova, 2000 found in mountain springs and rivers on the territory of Bayankhorg aimak and *G. lacustris* Sars, 1863 found in helocrene source near Arweichair town (46° 2'37.57"N, 102°27'40.50"E).

Among amphibiotic insects inhabiting the watercourses of the South Khangai the most numerous were Diptera (64 species), considerably less Ephemeroptera (13 species), beetles (13 species) and caddisflies (11 species); six species of Plecoptera and one Heteroptera were also noted.

Mayflies (Ephemeroptera) are represented by 13 species of six families. *Ameletus inopinatus* Eaton, 1887 (Ameletidae) was found in the Tuyn gol River only (the vicinity of Bayankhorg town). Larvae of *Siphonurus lacustris* Eaton, 1870 (Siphonuridae) were also found here; they inhabited floodplain flows and rhypal zone of the main course. Almost in all the watercourses of the region (except the Olgi gol, where no mayfly was found) *Serratella ignita* (Poda, 1761) (Ephemerellidae) and *Caenis rivulorum* Eaton, 1884 (Caenidae) occurred. *Cinygmula cava* (Ulmer, 1927) and *Epeorus (Belovius) pellucidus*

(Brodsky, 1930) were found on stony whitewaters of large rivers (at least 5-6 meters in width), while *Paracinygmula joernensis* (Bengtsson, 1909) (Heptageniidae) inhabited plants in relatively calm streams.

The watercourses of the South Khangai are characterized by a very specific fauna of swimming rheophilic Baetidae mayflies represented here by at least six species.

The most common were the peculiar larvae of *Baetopus* sp., which possibly belongs to one of the two endemic species described from the northern regions of Mongolia, *Baetopus asiaticus* Soldan, 1978 or *B. montanus* Soldan, 1978. Since larva of *B. montanus* is not described in detail (Waltz, 2002), and in *B. asiaticus* larval stage is still unknown at all, a reliable identification of the material from the Khangai is impossible at that moment. In any case, the found larvae significantly differ from European *B. wartensis* Keffermüller, 1960 by elongated and narrow tergalia and a number of traits of the oral appendages.

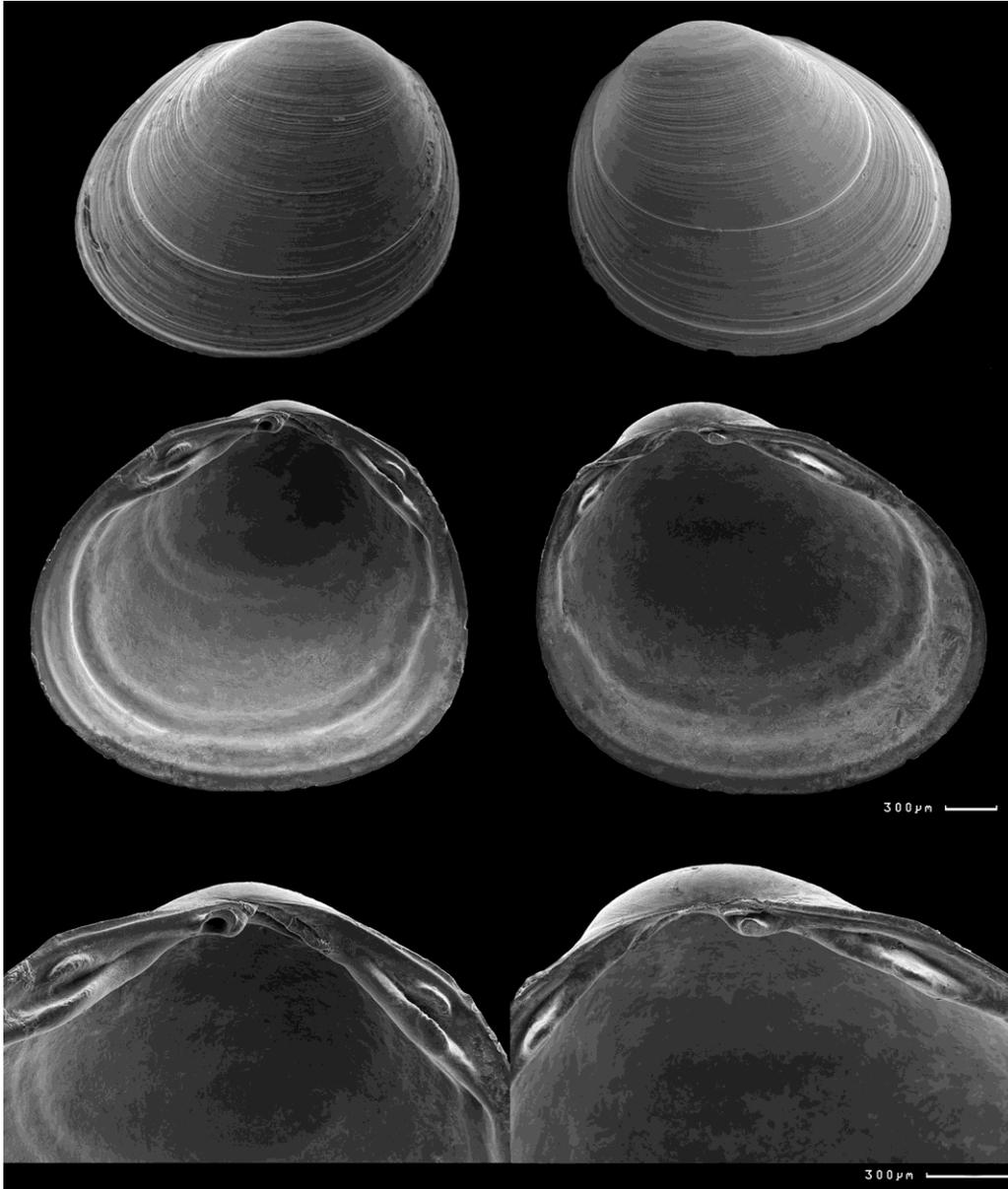


Fig. 2. Valves and hinge structure of *Odhneripisidium* (*Tuvapisidium*) cf. *popovae* from helocrene source near Arweichar town.

Acentrella charadra Sroka & Arnekleiv, 2010, found in all the rivers, also has a peculiar body structure: it is distinguishable from the type specimens, which were described from south-eastern Kazakhstan, with a long paracercus (12 segments). The same feature is characteristic of the populations that we discovered in regions of Xinjiang (China) adjacent to Mongolia (unpubl. data). This species, endemic for the desert zone of Central Asia, has already been discovered in the rivers of the southern slope of the Khangai (Klyuge, Novikova, 2011).

Previously recorded from north and west Mongolia *Baetis vernus* Curtis, 1834 and *B. feles* Kluge, 1980 in the watercourses of the South Khangai were met quite regularly; *B. feles* choose rather streams and small rivers, while *B. vernus* prefers large (from 5-6 meters wide) watercourses. Together with the latter insect, transpalaeartic *B. buceratus* Eaton, 1870 was found quite regularly. It was also known from the Selenga and Kerulen Basin, but absent in faunal reports and catalog of the ephemeropteran fauna of Mongolia (Soldan et al., 2009).

Procloeon unguiculatum (Tshernova, 1941), common in many regions of Mongolia, was met only once in the watercourses of the South Khangai: the larvae were recorded in the rhyphal zone of the Baydrag gol River.

Stoneflies (Plecoptera) are presented by six species, previously recorded from Mongolia. Almost everywhere in the region the following species were found: *Agneta extrema* (Navás, 1912) (Perlidae), *Diura bicaudata* (Linnaeus, 1758), *Skwala pusilla* (Klapálek, 1912) и *Isoperla kozlovi* Zhiltzova, 1972 (Perlodidae). Larvae of *I. obscura* (Zetterstedt, 1840) inhabited the Olgi gol River (46°23'2.30"N, 102°50'0.80"E) only, and *Nemoura arctica* Esben-Petersen, 1910 (Nemouridae) was found in the Tuyn gol River near Bayankhanhorg town (46°10'22.69"N, 100°43'12.59"E).

The only rheophilic species of heteropterans (**Heteroptera**) found in the region was *Micronecta griseola* Horvath, 1899. It inhabited the silted shallows of relatively large rivers, the Shargaljuut gol and Baydrag gol.

Water beetles (Coleoptera). Almost all of the coleopterans found in the watercourses of the Southern Khangai were previously noted for Mongolia (Shaverdo, 2008; Short, Kanda, 2006; Short et al., 2010). Of the 13 species, only five are true rheophiles that occur regularly in watercourses. They are *Haliphus steppensis* Guignot, 1954 (Halipidae), *Ochthebius* sp. (Hydraenidae), *Oreodytes mongolicus* (Brinck, 1943), *O. septentrionalis* (Gyllenhal, 1826) and *Nebrioporus airumilus* (Kolenati 1845) (Dytiscidae). The other species are mostly limnophilic and occur sporadically in rivers. They are *Agabus adpressus* Aubé, 1837, *A. coxalis* Sharp, 1882, *Hygrotus impressopunctatus* (Schaller, 1783), *H. unguicularis* (Crotch, 1874) (Dytiscidae), *Hydrobius fuscipes* (Linnaeus, 1758), *Laccobius minutus* (Linnaeus, 1758), *Helophorus* spp. (Helophoridae). In addition, *Heterocerus* sp. (Heteroceridae) was found in soft grounds near the water's edge in the Shargaljuut gol River (46° 4'43.41"N, 100°48'0.13"E).

Caddisflies (Trichoptera). The fauna of caddisflies of the Southern Khangai is somewhat depleted and has a generally Siberian appearance. *Brachycentrus americanus* (Banks, 1899) (Brachycentridae) ubiquitously occurred and dominated on stony grounds. In the large rivers with marked whitewaters and low level of silting (the Shargaljuut gol, Tuyn gol, Baydrag gol), the litorheophilic *Ceratopsyche nevae* (Kolenati, 1858) (Hydropsychidae) occurred on the current of 0.3-0.6 m/s, while *Apatania majuscula* McLachlan, 1872 (Apataniidae), *Goera tungusensis* Martynov, 1909 (Goeridae) and *Dicosmoecus palatus* (McLachlan, 1872) (Limnephilidae) were found on low (up to 0.3 m/s) current. On mosaic substrates, in the rhipal zone, *Anabolia servata* (McLachlan, 1880), *Arctocia concentrica* (Zetterstedt, 1840), *Asynarchus* cf. *amurensis* (Ulmer, 1905), *Limnephilus coenosus* Curtis, 1834 (Limnephilidae) were common, *Hydroptila* spp. (Hydroptilidae) were singly noted. In the only examined rheocene (45 ° 57'13.16 "N, 101 ° 26'10.81" E) *Apatania zonella* (Zetterstedt, 1840) (Apatanidae) dominated on the rocky grounds.

Not being able to discuss in detail the ecological preferences and the occurrence of the observed **Diptera** species, we grouped their list according to the principle of relation to the substrate. A number of taxa (especially Chironomidae) are first noted for the fauna of Mongolia.

Dipterans characteristic of soft (sandy and muddy) grounds: *Psectrotanypus sibiricus* Kruglova et Chernovskij, 1940, *Pseudodiamesa* gr. *nivosa*, *Prodiamesa olivacea* (Meigen, 1818), *Chironomus* spp., *Cladotanytarsus* gr. *mancus*, *Constempellina* sp., *Cryptochironomus* gr. *defectus*, *Micropsectra* sp., *Paratanytarsus* cf. *austriacus* (Kieffer, 1924), *Paratendipes nudisquama* (Edwards, 1929), *Saetheria* sp., *Stictochironomus crassiforceps* (Kieffer, 1921) (Chironomidae); *Culicoides* spp., *Palpomyia* spp. (Ceratopogonidae); *Tipula* (*Arctotipula*) *caliginosa* Savchenko, 1961 (Tipulidae); *Hexatoma* spp., *Phylidorea temelskin* (Podenas et Gelhaus, 2001), *Rhabdomastix laeta* (Loew, 1873) (Limoniidae); *Chrysops caecutiens* (Linnaeus 1758) (Tabanidae); *Lispe* spp. (Muscidae).

Dipterans characteristic of solid (rocky) grounds: *Diamesa* spp., *Pagastia orientalis* (Chernovskij, 1949), *Cricotopus* spp., *Euryhopsis cilium* Oliver, 1981, *Orthocladius* (s. str.) spp., *Orthocladius* (*Eudactylocladius*) sp., *Orthocladius* (*Euorthocladius*) sp., *Parakiefferiella* sp., *Rheocricotopus* spp., *Thienemanniella* gr. *clavicornis*, *Tvetenia* spp., *Rheotanytarsus* sp. (Chironomidae); *Archesimulium tumulosum* (Rubzov, 1956), *Eusimulium* sp., *Gnus decimatum* (Dorogostajsky, Rubzov et Vlasenko, 1935); *Sulcinephria octodecimfiliata* Rubtsov et Violovich, 1965, *Tetisimulium alajense* (Rubzov, 1939) (Simuliidae); *Agathon decorilarva* Brodskij, 1954 (Blephariceridae); *Wiedemanniella* sp. (Empididae).

Dipterans characteristic of mosaic shore grounds: *Thienemannimyia* sp., *Acricotopus longipalpus* Reiss, 1968, *Cricotopus* spp., *Diplocladius cultriger* Kieffer, 1908; *Heterotrissocladius* cf. *marcidus* (Walker, 1856); *Hydrobaenus* gr. *pilipes*, *Paracladius* sp., *Thienemanniella gracilis* Kieffer, 1909, *Trissocladius brevipalpis* Kieffer, 1908, *Polypedilum bicrenatum* Kieffer, 1921, *P. paraviceps* Niitsuma, 1992, *P. sordens* (van der Wulp, 1874), *Polypedilum* spp. (Chironomidae); *Dicranota* spp. (Pediidae).

Dipterans characteristic of the water's edge of various watercourses: *Nephrotoma* sp., *Tipula* (*Yamatotipula*) *pierrei* Tonnoir, 1921, *T. (Savtshenkia)* sp. (Tipulidae); *Bazarella* sp., *Pericoma* cf. *pannonica* Szabó, 1960, *Tonnoiriella pulchra* (Eaton, 1893) (Psychodidae); *Nemotelus* sp., *Oxycera meigenii* Staeger, 1844 (Stratiomyidae); *Aphrosylus* sp. (Dolichopodidae); *Scatella* sp., *Setacera* spp. (Ephydriidae); *Chrysogaster cemiteriorum* (Linnaeus, 1758), *Eristalis* sp. (Syrphidae).

Thus, the fauna of rheophilic macroinvertebrates of the Southern Khangai is somewhat depleted, especially in comparison with the fauna of the adjacent Selenga and Amur Basins, but contains a number of specific, endemic and subendemic elements, such as *Odhneripisidium* (*Tuvapisidium*) sp., *Acentrella charadra* Sroka & Arneklev, 2010, *Baetopus* sp. A detailed study of such uncertainly identified animals as *Phagocata* cf. *sibirica*, *Isochaetides* spp., *Erpobdella* cf. *vilnensis*, *Gammarus* cf. *dabanus* can improve and expand this list.

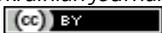
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Citation:

Palatov, D.M., Maryinskiy, V.V. (2017). Benthic macroinvertebrates of the watercourses of the South Khangai (Mongolia). *Ukrainian Journal of Ecology*, 7(4), 644-648.



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