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Insectivores (Soricomorpha, Mammalia) from the Pliocene and Pleistocene of Transbaikalia and Irkutsk region (Russia)

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Abstract

Remains of Talpidae and Soricidae have been found in Pliocene and Pleistocene sediments of 10 localities in Western Transbaikalia and the Irkutsk Region. They belong to five genera and 15 species. Besides fossil (*Petenyia* sp., *Sorex palaeosibiriensis*) and Recent taxa (*Asioscalops altaica*, *Crocidura* sp., *Neomys fodiens*, *Sorex minutissimus*, *Sorex minutus*, *Sorex roboratus*, Sorex cf. *isodon* and *Sorex* cf. *daphaenodon*) known from Asia, descriptions of two *Sorex* species from the Baikal region (*Sorex erbajevae* and *Sorex baikalensis*) are given. Thus, the number of fossil *Sorex* species cited to date from Asia has increased to 21.

1. Introduction

Central and East Asia are regarded as the cradle of various taxa, including those that appeared in Europe as immigrants in the course of the Pliocene and Pleistocene. However, the current knowledge of fossil insectivore mammals from Asia is very limited. In general, the diversity of fossils depends mainly on the intensity of palaeontological research, which is greater in Europe and in North America than in Asia. Although shrews are a major element in most late Cenozoic micromammal assemblages, studies of this group are usually of secondary importance in comparison with those on rodents. So there is only vague taxonomic information about fossil soricids and insectivore mammals in general.

The Recent fauna of shrews of the genus *Sorex* include 74 species (Lapini and Testone, 1998; Wolsan and Hutterer, 1998; Brünner et al., 2002). They populate almost the entire Holarctic with the exception of North Africa: 38 species inhabit North America (37 endemic and one common with Asia); 31 species inhabit Asia (24 endemic, six common with Europe and one common with North America); and only 12 species are known in Europe (six endemic and six common with Asia). In the past shrews were widely distributed in Eurasia and in North America. However, from the vast Asian continent only 16 extinct forms have been described, in contrast to 34 fossil *Sorex* species from North America and 28 from Europe (Harris, 1998; Rzebik-Kowalska, 1998, 2005; Storch et al., 1998; Zaitsev and Baryshnikov, 2002). Taking into consideration the different geological history and different past climatic conditions in Europe and Asia, it is safe to assume that Asia must have been inhabited by many more forms than are known at present. In this connection, new information about fossil insectivore mammal fauna from Asia is very valuable and important.

2. Material

The material received from Dr. Margarita Erbajeva comes from 10 localities of Transbaikalia [Zasukhino II, Tologoi I.1, Tologoi II.2, Tologoi 3 (upper layer)] and of the Irkutsk Region (Rykovo, Razdolinskaya 7 Cave, Kozlovka Cave, Bolshaya Baidinskaya Cave, Kurtun I Cave and Malta site). Tologoi I.1 is dated to the early Late Pliocene (MN16b), and Zasukhino II and Tologoi II.2 to the Early Pleistocene. The other localities are of Late Pleistocene. Detailed description, measurements and photographs of the materials from these sites, especially of new fossil *Sorex* species, is given in a separate paper (Rzebik-Kowalska, 2007). *Sorex gracilimus* Thomas, 1907 and *Sorex praecaecutiens* Mezhzherin, 1972 identified previously have not been found among the studied material. The recognition and description of the latter form has never been published.

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3. Systematics

Superorder Insectivora (*sensu* Novacek, 1986)
Order Lipotyphla Haeckel, 1866
Suborder Soricomorpha Saban, 1954
Family Talpidae Fischer von Waldheim, 1817
Genus *Asioscalops* Stroganov, 1941
Asioscalops altaica Nikolsky, 1883

The size and morphology of one mole mandible from Razdolinskaya 7 Cave lies in the range of variation of *A. altaica* Nikolsky, 1883, the only Recent mole living in Central Siberia. Three other Recent moles, the European *Talpa europaea* Linnaeus, 1758 and the Siberian *Mogera vogura* Temminck, 1842 and *Mogera robusta* Nehring, 1891 have larger teeth, and they do not reach Baikalia at present. The eastern range boundary of *T. europaea* is in the vicinity of the Irtish River and two species of *Mogera* have ranges further eastwards (East China, Primorie, Japan, Korea, etc.).

Talpidae gen. et sp. indet.

The second mole mandible from Razdolinskaya 7 Cave is larger than the one mentioned above. It is badly preserved and cannot be identified to the genus level.

Shrews (Soricidae) represent two subfamilies: the Crocidurinae and Soricinae.

Family Soricidae Fischer von Waldheim 1817
Subfamily Crocidurinae Milne-Edwards, 1868–1874
Genus *Crocidura* Wagler, 1832
Crocidura sp.

One mandible of *Crocidura* Wagler, 1832 was found in the Tologoi II.2 locality. The small size of this mandible is close to that of the Recent *Crocidura suaveolens* (Pallas, 1811) which occupies a vast territory from Spain to Korea and is present in North Africa, but it is not known in the high latitudes of Eurasia. Two other Siberian species of *Crocidura*, *Crocidura lasiura* Dobson, 1980 and *Crocidura sibirica* Dukelsky 1930 are much larger than the extinct form from Transbaikalia. As the material is very scarce and badly preserved, the mandible from Tologoi II.2 is identified as *Crocidura* sp.

Unfortunately, knowledge of the fossil *Crocidura* in Asia is very limited. So far, only three specifically named species are known: *Crocidura wongi* Pei, 1936, and *Crocidura horsfieldi* (Tomes, 1856) from China and *Crocidura dzinezumi* (Temminck, 1842) from Japan; all three species are of Pleistocene age. From Asia, only Crocidurinae gen. et sp. indet. or *Crocidura* sp. was listed by Storch et al. (1998).

Subfamily Soricinae Fischer von Waldheim, 1817
Tribe Blarinellini Reumer, 1998
Genus *Petenyia* Kormos, 1934
Petenyia sp.

Four fragments of mandibles found in Tologoi I.1, dated to the early Late Pliocene (MN16b) have been identified as belonging to the fossil genus *Petenyia* Kormos, 1934. Three species are currently accepted, two taxa from Europe (*Petenyia hungarica* Kormos, 1934, *Petenyia dubia* Bachmayer and Wilson, 1970) and one (*Petenyia katrinae* Qiu and Storch, 2000) from Asia. In Asia, besides *P. katrinae*, *Petenyia* sp. was cited from several localities of West Siberia, Mongolia and Transbaikalia. The Asiatic species *P. katrinae* can be distinguished from the European species by the morphology of the upper teeth. Unfortunately, in Tologoi I.1 the upper jaws are not found. Without more and better preserved material, the specific position of *Petenyia* from Tologoi I.1 cannot be fixed (cf. Rzebik-Kowalska, 1998; Qiu and Storch, 2000).

Tribe Neomyini Matschie, 1909
Genus *Neomys* Kaup, 1829
Neomys fodiens (Pennant, 1771)

The morphology of two mandible fragments from Kozlovka Cave allowed the identification of these remains as *Neomys* Kaup, 1829, and their large size indicates *N. fodiens* (Pennent, 1771). The other four fossil species of *Neomys*: *Neomys newtoni* Hinton, 1911, *Neomys browni* Hinton, 1911, *Neomys hintoni* Zaitsev and Baryshnikov (2002), and *Neomys intermedius* Brunner, 1952, and two Recent *Neomys anomalus* Cabrera, 1907, and *Neomys teres* Miller, 1908 (= *Neomys schelkovnikovi* Satunin, 1913) are much smaller than the Siberian form. As well, at present they are not present in the vicinity of Lake Baikal (Rzebik-Kowalska, 1998; Zaitsev and Baryshnikov, 2002).

N. fodiens is the only species of this genus recently living in the Baikal area. It occupies a large range within the Northern and Middle (Central) Palaearctic. Fossil remains of *N. fodiens* are known in Europe from the Middle Pleistocene. This discovery in Asia is the first record of fossil *N. fodiens* in this continent.

Tribe Soricini Fischer von Waldheim, 1817
Genus *Sorex* Linnaeus, 1758
Among materials from Siberia, nine taxa of the genus *Sorex* have been recorded.
Sorex minutissimus Zimmermann, 1780

One mandible of *S. minutissimus* Zimmermann, 1780 was found in Bolshaya Baidinskaya Cave. Today, the area of distribution of the smallest Recent *Sorex* extends from Finland to East Siberia and Japan. In the past extinct forms of this species were known mainly from Europe. In the Pleistocene the range of *S. minutissimus* spread westwards (Poland, Germany, France, England) and southwards (Slovakia, Austria, Bulgaria) (Rzebik-Kowalska, 1998). In Asia, fossil *S. minutissimus* was listed by Storch et al. (1998), from the Middle Pleistocene of Honshu Island in Japan.

Sorex minutus Linnaeus, 1766

Fossil remains of *S. minutus* Linnaeus, 1766 were found in two localities (Caves Kozlovka and Razdolinskaya 7). Today, it occupies a large area from North Spain to the western bank of Lake Baikal. In Europe it is known since the Early Pliocene (dating back about five million years). Therefore, it was the first of the living *Sorex* species that appeared in the European continent and persisted there until Recent time (Rzebik-Kowalska, 2005). In Asia, fossil *S. minutus* are scarce. It was found in the Early Pleistocene deposits of China (Storch et al., 1998).

The origin and phylogenetic relationship of *S. minutus* with other fossil and Recent *Sorex* is not clear. According to Storch (1995), the probable ancestor of *S. minutus* could be *S. minutoides*, described from the Late Miocene locality Ertemte 2 in China.

Sorex roboratus Hollister, 1913

One well-preserved mandible from Bolshaya Baidinskaya Cave does not differ from mandibles of the Recent east Palaearctic shrew, *S. roboratus* Hollister, 1913. According to Yudin (1989) it currently inhabits a large territory, from the eastern bank of the Ob River to Chukotka and Primorie. This is the first fossil record of *S. roboratus*.

Sorex cf. *isodon* Turov, 1924 and *Sorex* cf. *daphaenodon* Thomas, 1907

Two other species, *Sorex* cf. *isodon* Turov, 1924 and *Sorex* cf. *daphaenodon* Thomas, 1907, known from Bolshaya Baidinskaya and Kozlovka caves respectively, are similar in size and morphological features to the Recent taxa *S. isodon* Turov, 1924 and *S. daphaenodon* Thomas, 1907.

The currant area of distribution of *S. isodon* is a large territory of northeastern Eurasia, from Scandinavia to Kamchatka, the Kuril Islands, Sakhalin, and Primorie. However, the southern boundary of its range is not clear. *S. daphaenodon* also inhabits a large area of the eastern Palaearctic, including Transbaikalia and Pribaikalie. These two species are identified for the first time in the fossil record from Asia.

Three other *Sorex* species discovered in south Siberia are extinct forms:

Sorex palaeosibiriensis Mezhzherin, 1972

Sorex palaeosibiriensis is found in Cave Razdolinskaya 7, located in Prebaikalia. It was known only from its type locality in Western Transbaikalia (Mezhzherin, 1972).

Mezhzherin (1972) presented satisfactory descriptions, a photograph of the mandible, and measurements of *S. palaeosibiriensis* as well as the description of another species, *S. praecaecutiens*. He stated that these species were described for the first time by Mezhzherin and Pokatilov in a 1969 paper from the Early Pleistocene locality situated in the vicinity of Ulan Ude, Transbaikalia. However, no paper was published by Mezhzherin and Pokatilov in 1969. In this situation, according to the ICZN, the exact date of these two species descriptions is the year 1972, and the name of the author is Mezhzherin.

Sorex erbajevae Rzebik-Kowalska, 2007

The remains of *S. erbajevae* were found in six localities: Rykovo II, Bolshaya Baidinskaya Cave, Kozlovka Cave, Kurtun I, Tologoi 3 (upper layer) and Malta. The moderate size of specimens suggests that they could belong to the Recent *Sorex caecutiens* Laxmann, 1788 or *Sorex tundrensis* Merriam, 1900; as well they are similar in size to *S. palaeosibiriensis.* Other living or fossil Siberian *Sorex* are smaller or larger and their teeth morphology is quite different. *S. erbajevae* resembles in its morphology the fossil *S. praecaecutiens* described by Mezhzherin (1972) from the vicinity of Ulan Ude. However, *S. praecaecutiens* is much larger than *S. erbajevae.*

Sorex baikalensis Rzebik-Kowalska, 2007

This species is known from Razdolinskaya 7 Cave. *S. baikalensis* is characterized by its large size and somewhat bulbous teeth, resembling those of European species of subgenus *Sorex* (*Drepanosorex*) Kretzoi, 1941 (Reumer, 1985). The size of shrews from Razdolinskaya 7 Cave is also more or less similar to that of several *Sorex* species (e. g. *Sorex unguiculatus* Dobson, 1890, *S. araneus* Linnaeus, 1758, *S. isodon*, *S. daphaenodon*, and *S. roboratus*) existing today in Siberia. In its teeth morphology, *S. baikalensis* differs from all Recent and fossil *Sorex* species of similar size known at present.

4. Conclusion

The fossils from 10 localities of the Baikalian region contain 96 remains of insectivore mammals. They are represented mostly by mandible fragments and belong to two families (Talpidae and Soricidae), five genera (*Asioscalops*, *Crocidura*, *Petenyia*, *Neomys*, and *Sorex*), 15 species and 49 individuals. Tables 1 and 2 show the species compositions in the localities. Six species of shrews

Table 1
Shrews from the early Late Pliocene–Early Pleistocene localities

	Zasukhino II	Tologoi I.1	Tologoi II.2
Soricidae			
Crocidura sp.	–	–	+
Petenyia sp.	–	+	–
Sorex			
Sorex sp. (medium size)	+	–	–

Table 2
Shrews from the Late Pleistocene localities of the Baikalian region

	Razdolinskaya 7	Kozlovka	B. Baidinskaya	Kurtun I (upper l.)	Tologoi 3	Malta	Rykovo II
Talpidae							
Asioscalops							
A. altaica Nikolsky, 1883	+	–	–	–	–	–	–
Talpidae gen. et sp. indet.	+	–	–	–	–	–	–
Soricidae							
Neomys							
N. fodiens (Pennant, 1771)	–	+	–	–	–	–	–
Sorex							
S. minutissimus Zimmermann, 1780	–	–	+	–	–	–	–
S. minutus Linnaeus, 1766	+	+	–	–	–	–	–
S. palaeosibiriensis Mezhzherin, 1972	+	–	–	–	–	–	–
S. erbajevae Rzebik-Kowalska, 2007	–	+	+	+	+	+	+
S. roboratus Hollister, 1913	–	–	+	–	–	–	–
S. cf. *isodon* Turov, 1924	–	–	+	–	–	–	–
S. cf. *daphaenodon* Thomas, 1907	–	+	–	–	–	–	–
S. baikalensis Rzebik-Kowalska, 2007	+	–	–	–	–	–	–

(*N. fodiens*, *S. minutissimus*, *S. minutus*, *S. roboratus*, *S.* cf. *isodon*, and *S.* cf. *daphaenodon*) and one mole (*A. altaica*) are Recent species of Siberian fauna, and four other shrews (*Petenyia* sp., *S. palaeosibiriensis*, *S. erbajevae*, and *S. bajkalensis*) are extinct species. The generic and specific status of the mole (Talpidae gen. et sp. indet.) and of two shrews (*Crocidura* sp., and *Sorex* sp.) is uncertain, as are their relationships in living or extinct forms.

The insectivore remains were distributed irregularly in the localities. The most abundant specimens, belonging to five species (two moles and three shrews), were found in Razdolinskaya 7 Cave. Bolshaya Baidinskaya and Kozlovka Caves yielded remains of four species (all shrews), and in the other localities remains of only one species of shrew have been found. Among insectivores the most numerous species were shrews of the genus *Sorex*. Others (moles and shrews of the genera *Crocidura*, *Petenyia* and *Neomys*) were very scarce (usually one taxon was present).

The predominant forms in the paleontological materials were middle-sized shrews. When more than one *Sorex* species was present, they belonged to different size categories: small, middle and large. The Kozlovka Cave fauna included small-sized *S. minutus*, middle-sized *S. erbajevae* and large *S.* cf. *dapahaenodon*; in Razdolinskaya 7 Cave there were small-sized *S. minutus*, middle-sized *S. palaeosibiriensis* and large-sized *S. baikalensis*. Similar size distribution exists in the recent faunas, and competition was avoided by adaptation to different ecological niches in the past as well.

For the first time, fossils of four Recent species of shrews, *N. fodiens*, *S. roboratus*, *S.* cf. *isodon* and *S.* cf. *daphaenodon*, and two new extinct *Sorex* species (*S. erbajevae* and *S. baikalensis*) are recorded from Asia. This has increased the number of extinct species of the genus *Sorex*, known in Asia, from 16 to 21.

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