

Distribution of Zokors (*Myospalax*, Rodentia) in Transbaikalia

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Abstract—The ranges of all three zokor (*Myospalax*) species, the little-studied burrowing rodent, are described in southeastern Transbaikalia, Russia, based on the results of special expeditions. *Myospalax aspalax* inhabits only the Onon River basin, *M. psilurus* populates the forested steppe in the Argun River basin and the upper reaches of the Borzya River (a tributary of the Onon River), while *M. armandii* is known only from the Klichkinskii Mountain Range. The distribution area of *M. armandii* is very small (less than 2000 km²) and is isolated from the other parts of the range (in China). The zokor species in the region are shown to be parapatric, with no sympatry being involved. The ranges of *M. psilurus* and *M. armandii* are the closest, the distance between the closest settlements being less than 5 km. Reduction in the zokor distributions is observed in Transbaikalia. It is advisable to include *M. armandii* on the Red Data list of Russia.

Keywords: *Myospalax aspalax*, *Myospalax armandii*, *Myospalax psilurus*, range, Siberia

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INTRODUCTION

The zokors *Myospalacinae* Lilljeborg 1866 are a group of highly specialized burrowing rodents of East Asia. The taxonomy of the group remains a subject for discussion. Analysis of the phylogenetic reconstructions using molecular genetic markers gave grounds to consider modern zokors in the family of mole rats *Spalacidae* as a subfamily of *Myospalacinae* (Norris et al., 2004), represented by one genus (*Myospalax*) (Fan and Shi, 1982; Musser and Carleton, 1993) or two genera (*Myospalax* and *Eospalax*) (Zheng, 1994; Zhou, C. and Zhou, K., 2008). The group recognizes from five to 11 species (Wilson and Reeder, 2005; Norris, 2017); in Russia there are up to five species (Pavlinov and Lisovskiy, 2012). The main part of the ranges of these species, except for the Altai zokor, extend within the territory of China and Mongolia (Zhang et al., 1997; Wilson and Reeder, 2005; Smith and Xie, 2013; Norris, 2017). In eastern Russia, there are two peripheral areas of the zokor range: in Southeastern Transbaikalia and in the south of Primorskii krai.

Until recently, the distribution of two species of zokors was assumed on the territory of Transbaikalia: Daurian (*Myospalax aspalax* (Pallas 1776)) and North China (Manchurian) (*M. psilurus* Milne-Edwards 1874) ones. The ranges were described by Nekipelov (1960), and later by Kirilyuk and Korablev (2003). However, at the beginning of the 21st century, a previ-

ously unknown genetic form of zokors was revealed in Transbaikalia (Korablev and Pavlenko, 2007). Later, on the basis of morphological analysis, it was assigned to a new species for the fauna of Russia, which was proposed to be called the Armand's zokor (*M. armandii* Milne-Edwards 1867) (Puzachenko et al., 2009). These innovations have not yet been generally admitted (Pavlinov and Lisovskiy, 2012; Lisovskiy et al., 2019). In this work, we follow the point of view we outlined earlier (Puzachenko et al., 2009; Tsvirka et al., 2011; Pavlenko et al., 2015). According to this point of view, it is proposed to consider the morphologically and genetically differentiated form of zokors from the Klichkinskii Range as the Armand's zokor.

Correct taxonomic assessment and nomenclature clarifications, including the spelling of the species name, will be made after the completion of the study of material from China. In this work, we consider it possible (and expedient) to use the Russian name in the spelling given in the article by Puzachenko et al. (2009, p. 108).

According to new data on the taxonomy, the Manchurian zokor (*M. psilurus* sensu lato) in Transbaikalia is represented by the form *M. psilurus epsilanus* or can be considered as a separate species, *M. epsilanus*. This view is different from *M. psilurus* sensu stricto, known from Primorye (Puzachenko et al., 2014; Pavlenko et al., 2014, 2014a).

Thus, the data of morphological and genetic analysis give reason to believe that in Transbaikalia there live zokors of three genetically and morphologically discrete taxa of species rank: *M. aspalax* (Pallas 1776), *M. armandii* (Milne-Edwards 1867), and *M. epsilanus* (Thomas 1912). However, the boundaries of the modern ranges of these species are described very approximately, and it has also been suggested that these species are parapatric (Pavlenko et al., 2014a, 2015).

Taking into account the new information on the taxonomy of the zokors inhabiting Transbaikalia, accurate data on the distribution of these species are important for assessing their conservation status and adequate measures for the management and conservation of populations. The Red Data Book of Russia includes only the peripheral population of the Manchurian zokor from Primorskii krai (*Krasnaya kniga...*, 2001). The Manchurian zokor (in the old interpretation, pooled both *M. psilurus epsilanus*, and *M. armandii*) is included in the Red Data Book of Transbaikalia (category 3, rare species) (*Krasnaya kniga...*, 2012).

The purpose of our work is to provide information on the modern boundaries of the zokors ranges in Southeastern Transbaikalia based on many years of field research in the context of new taxonomic data.

MATERIALS AND METHODS

The article is based on field studies of zokors in Southeastern Transbaikalia, from 2004 to 2018. The expeditions covered all the steppe and forest–steppe regions of southeastern Transbaikalia. The most thoroughly investigated are Klichkinskii Range, its spurs, and adjacent territories. During the road routes, traces of the presence of zokors were recorded by characteristic soil mounds in suitable biotopes. For the purpose of a more efficient search, we interviewed local residents (hunters, shepherds, etc.) and then checked the received survey data on the territory. Catching of live animals was carried out mainly in two ways: with the hands while watching for the opened near-surface passage and with traps no. 0 wrapped in cloth. At the initial stages of research, most of the captured zokors were subjected to standard zoological measurements and dissection, and skulls were collected. In subsequent years, the main part of the animals, after visual inspection, photography, in vivo measurements of body weight and length, and sex determination, were released back to the place of capture. Genetic samples were taken from animals from a significant part of the localities. In those cases where zokors were released, samples for genetic analysis were collected using a minimally invasive method (taking a piece of tissue from the tip of the tail). The collected craniological material and tissue samples are kept in the bioresource collection of the Federal Scientific Center of the East Asian Terrestrial Biodiversity of the Far East Branch,

Russian Academy of Sciences, in the Laboratory of Evolutionary Zoology and Genetics, and partly in the Siberian Zoological Museum (Novosibirsk). Genetically typed material is listed in Table 1 based on previously published papers by the authors (Pavlenko and Korablev, 2003; Korablev and Pavlenko, 2007; Tsvirka et al., 2011, 2014; Pavlenko et al., 2014, 2015; Puzachenko et al., 2014) based on the study of the karyotype, electrophoretic variants of proteins as biochemical markers of genes (transferrin), PAPD-PCR analysis, and markers of the mitochondrial genome (hypervariable region of the mtDNA control region).

The external appearance of the animals and the biotopes characteristic of the species are shown in Fig. 1. By its appearance *M. aspalax* easily differs from the other two Transbaikalian species in the light silvery monochromatic coat color (Fig. 1b). The coloration of *M. psilurus epsilanus* (Fig. 1c) and *M. armandii* (Fig. 1a) is gray–brown with a whitish spot on the back of the head. The characteristic coloration of the ventral side of *M. armandii* is gray–brown with well-defined depigmented spots of irregular shape located in the anal or thoracic region (Fig. 1f). In other species of zokors of the fauna of Russia, a similar type of coloration was not found either in Transbaikalia, or in Primorskii krai or Altai, according to our observations (Fig. 1g). Furthermore, *M. armandii* has a different coloration of the abdominal side of the body, and it also differs from *M. psilurus epsilanus* with its “bulging” conspicuous eyes and thicker tail. In addition, in the Armand’s zokor, the coloration of the dorsal side of the body is more reddish. Thus, in appearance, it is not difficult to distinguish between living animals of these species.

In total, over the years, 208 individuals of these three types of zokors were captured: 113 Daurian (of which more than half of the individuals are from one locality), 65 Manchurian, and 31 Armand (Table 1; Fig. 2).

RESULTS AND DISCUSSION

The area of the Daurian zokor in Russia is confined to the Onon River basin (Fig. 2). The western boundary of the species range runs in the Kyrinskii district of Transbaikalia along the Altano-Kyrinskii Basin (in Mongolia, up to the headwaters of the Onon and Selenga rivers (Puzachenko et al., 2009)). Further to the east, the modern northern boundary of the distribution of the Daurian zokor runs along the left bank of the Onon River almost everywhere without departing further than several kilometers from the banks of this river. In the original description by P.S. Pallas (1778), there is a mention of the habitation of the Daurian zokor along the valley of the left tributary of the Onon–Ili rivers, but it is not currently noted here (our data).

Table 1. Location and number of zokors caught in Transbaikalia

No. on card	Locality	Year (s)	<i>n</i>
<i>Myospalax aspalax</i>			
1	Akshinskii district, near Narasun*	2005, 2007	6
2	Akshinskii district, near Aksha	2009	1
3	Akshinskii district, near Ust-Ilya, left bank of the Onon River, the mouth of Ulan-Zagatai Creek	2009	4
4	Akshinskii district, near Mogoitui, the mouth of the Mogoitui River	2009	1
5	Ononskii district, near Couranzha*	2005	2
6	Ononskii district, near Novyi Durulgui*	2005	1
7	Ononskii district, between the villages of Kubuhai and Bain-Tsagan, Butyvken Lake	2011–2017	62
8	Ononskii district, near Nizhnii Tsasuchei (right bank of the Onon River) (multiple sublocalities)*	1999, 2009, 2011, 2014	14
9	Ononskii district, between the villages of Urta-Khargana and Builesan, Ukshinda Lake (two sublocalities)	2009, 2015	5
10	Ononskii district, between the villages of Bain-Tsagan and Novaya Zarya, Forest–Steppe cluster of the Dauriskii Reserve	2011	4
11	Ononskii district, near Ikaral (right bank of the Onon River)*	2004	2
12	Baleiskii district, near Undino-Poselier, the mouth of the Unda River (left bank)*	1999, 2009	3
13	Olovyanninskii district, mouth of the Ulyatui River	2015, 2016	2
14	Borzinskii district, Adun-Chelon Mountains, village of Loja	2015	2
15	Borzinskii district, Adun-Chelon Mountains, Tsagan-Obo	1999, 2008	5
<i>Myospalax psilurus</i>			
16	Borzinskii district, near Kurunzulai, a tributary of the Achikan River	2013	1
17	Borzinskii district, near Ust-Ozernaya*	2004	4
18	Borzinskii district, northwest of the village of Tsagan-Olui, top of the Otsolui valley	2011	9
19	Borzinskii district, south of the village of Tsagan-Olui, Gurbansha River*	1999, 2004	14
20	Aleksandrovo-Zavodskii district, near Mankovo	2011	1
21	Aleksandrovo-Zavodskii district, near Vasilievskii Khutor	2014	1
22	Gazimuro-Zavodskii district, near Gazimurskii Kavykuchi, Kavykuchi River	2009	3
23	Aleksandrovo-Zavodskii district, near Kuznetsovo, Gazimur River	2011	2
24	Aleksandrovo-Zavodskii district, west of the village of Butuntai, Atangech valley	2012	1
	Aleksandrovo-Zavodskii district, west of the village of Butuntai, Konyukhova valley	2012	1
	Aleksandrovo-Zavodskii district, west of the village of Butuntai, Kruchina valley	2012	2
	Aleksandrovo-Zavodskii district, near Butuntai, Borzya River*	2005, 2009	2
25	Aleksandrovo-Zavodskii district, north of the village of Pohekui, right bank of Kaldyगतui Creek, Volchikha valley	2012	1
26	Aleksandrovo-Zavodskii district, near Savvo-Borzya, Buldurutui Creek	2013	1
27	Kalган district, near Dono*	2006	3
	Priargunskii district, north of the village of Byrka, Ditkin valley (left bank of the Verkhnyaya Borzya River)	2011	1

Table 1. (Contd.)

No. on card	Locality	Year (s)	<i>n</i>
28	Priargunskii district, north of the village of Byrka, Harganatui valley	2013	1
	Priargunskii district, north of the village of Byrka, Boyamsha Creek (left bank of the Upper Borzya River) (three sublocalities)	2011	4
	Priargunskii district, between the villages of Dono and Byrka, Beletui valley (left bank of the Verkhnyaya Borzya River)	2012	1
29	Kalgan district, near Kalga*	2006	2
	Priargunskii district, Kalgukan River valley*	2006	2
30	Kalgan district, near Chuprovo, Ildikan River	2011	2
31	Nerchinsko-Zavodskii district, upper Urov River, mouth of the Bol. Bambuya River	2011	1
32	Nerchinsko-Zavodskii district, near Bol. Zerentui, upper reaches of the Bol. Zerentui River	2009	2
33	Nerchinsko-Zavodskii district, near Nerchinskii Zavod, Serebryanka River	2012	1
34	Nerchinsko-Zavodskii district, near Zerentui Mountain, Bolshoi Zerentui River	2011	1
35	Nerchinsko-Zavodskii district, near Chashino-Ildikan, Ildikan River	2012	1
36	Priargunskii district, near Zorgol*	2007	2
<i>Myospalax armandii</i>			
37	Krasnokamenskii district, between the villages of Kovyli and Margucek*	2004	2
	Krasnokamensk district, near Kovyli*	2004	4
38	Krasnokamenskii district, 25 km along the road from the village of Sektui Milozan toward the village of Kovyli*	2004	2
39	Krasnokamensk district, near the village of Tselinny, top of the Karganatui valley*	2006	5
40	Aleksandrovo-Zavodskii district, north of the village of Pochekui, left bank of Kaldygatui Creek	2012	3
	Aleksandrovo-Zavodskii district, near Mulino (three sublocalities)	2013	4
41	Priargunskii district, west of the village of Byrka, Northui valley	2012	1
42	Priargunskii district, near Byrka (Byrka River)	2012	1
43	Priargunskii district, near Ust-Tasurkai, Valestuy valley*	2005	2
44	Priargunskii district, east of the village of Byrka*	2005, 2014	6
45	Priargunskii district, east of the town of Solovukha (1065 m)	2011	1

* Localities from which animals were genetically typed and studied morphologically (Puzachenko et al., 2009; Tsvirka et al., 2011; Puzachenko et al., 2014; Pavlenko et al., 2015).

Along the Onon River valley, the Daurian zokor is now reliably found to the north (downstream) to the mouth of the Unda River. In the mid-20th century, Nekipelov (1960) noted that the northern boundary of the area reaches the village of Kirocha (25 km north of the mouth of the Unda River). To the east, the Daurian zokor occurs no further than 20–25 km from the Onon River, only along the openings of the Adun-Chelon mountain range, moving to the east about 30–40 km. Moreover, from the Unda River, the boundary of the area runs along the valley of the Kalanguy River (tributary of the Unda), further along the valley of the Ulyatui River up to the village of the same name. To

the south it is limited by Tsugolsk Ridge and again departs quite far from the Onon River along the aforementioned spurs of the Adun-Chelon mountain range. The southern boundary of the area runs from Adun-Chelon along the mouth of the Borzya River (slightly to the south of the village of Kholui-Baza), along the southern outskirts of Tsasucheiskii pine forest (Fig. 1e) and goes to Mongolia in the area of the village of Builesan. In the adjacent part of Mongolia, the Daurian zokor is found along the Russian boundary in mountainous areas around the city of Khukh-Ula, north and northeast of the Duchin-Gol River, in the interfluvium of Duchin-Gol and the Uldzy River.

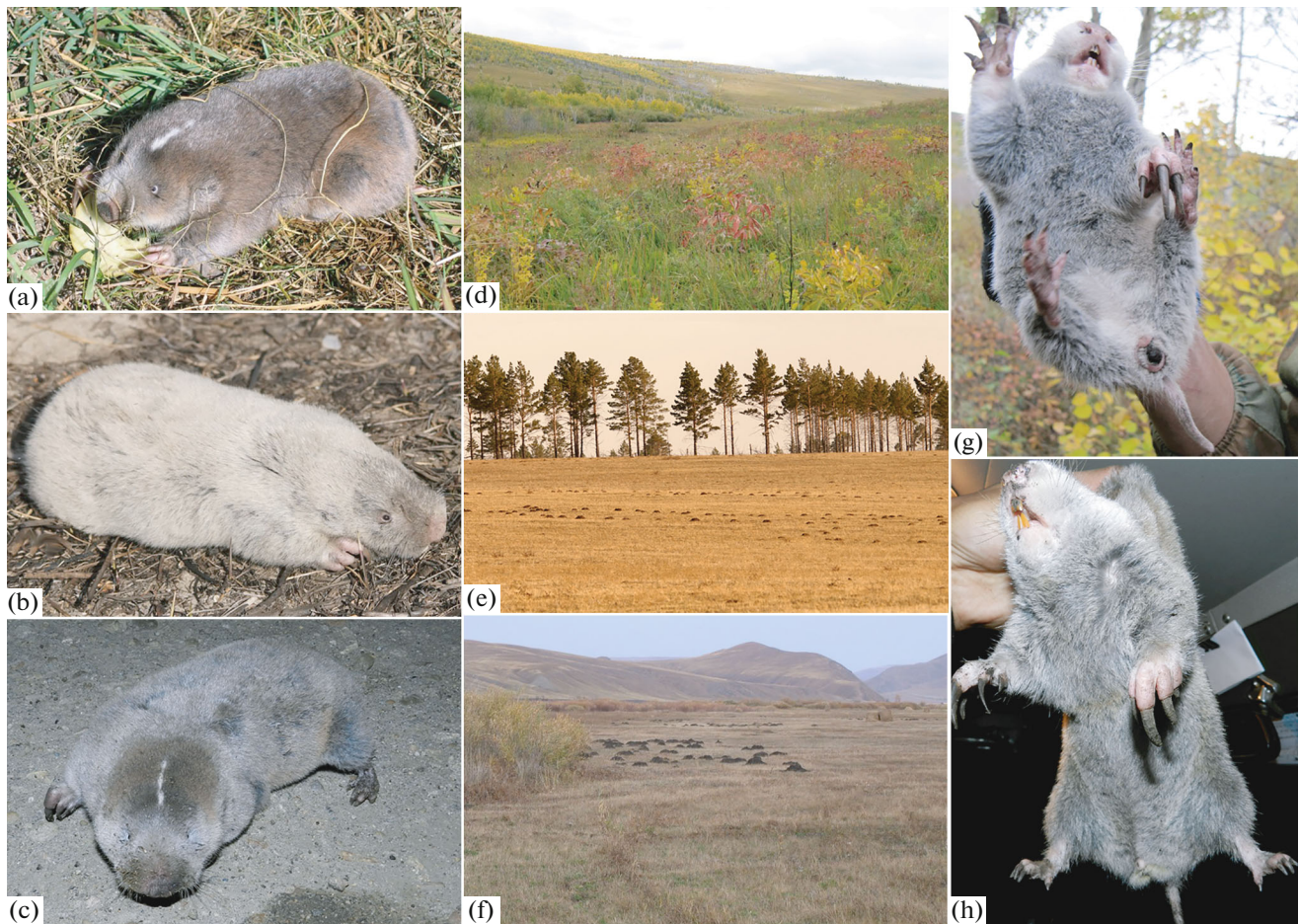


Fig. 1. (a–c) Appearance and differences in the color of the ventral side of zokors inhabiting in Transbaikalia, as well as (d–f) biotopes characteristic of species: (a, g) *Myospalax armandii*; (b) *M. aspalax*; (c, h) *M. psilurus epsilanus*; (d) typical habitat of *M. armandii*, a forb meadow in the spurs of Klichinskii Range, near Byrka; (e) a section of a steppe meadow on the outskirts of Tsasucheykskii pine forest with numerous mounds of *M. aspalax*; (f) soil mounds of *M. psilurus* on haymaking in a floodplain meadow, Dono River valley, outskirts of Dono.

The most southeastern find of traces of the presence of zokors is known on one of the right tributaries of the Uldzy River in the willow-covered valley south of the village of Dashbalbar. We have not traced the range of the Daurian zokor to the west of the places indicated in Mongolia.

The site of the modern range of the Manchurian zokor in Russia is located in the southeastern regions of Transbaikalia (Fig. 2). To the west, the boundary of the range passes in Borzinskii district between the villages of Klyuchevskoye and Tsagan-Olui on Nerchinskii Ridge. According to Nekipelov (1960), the Manchurian zokor was previously found in the vicinity of the village of Klyuchevskoe. To the north of this village, the boundary of the Manchurian zokor area runs along the left bank of the Borzya River, then passes to the right bank between the villages of Oldonda and Kurunzulai. Further to the east, the northern boundary of the area covers the treeless part of the Borzya River basin, and along the Gazimur River penetrates

much further north, not reaching ten kilometers to the village of Gazimurskii Zavod. To the east, the well-known range of the Manchurian zokor stretches along the forest–steppe through the villages of Dono (Fig. 1f), Kalga, and Chashino-Ildikan. The northeastern margin of the area in Transbaikalia covers the Nerchinsko-Zavodskii district: the valleys of the Lower Borzya River, its tributaries, the upper reaches of the Urov River (up to the village of Urovskie Klyuchi), and the bank of the River Argun to the north a few kilometers north of the village of Serednyaya. Along the Argun River to the south, the Manchurian zokor is known before the confluence of the Verkhnyaya Borzya River, and according to Nekipelov (1960), to the mouth of the Urulyungui River. The well-known modern southern boundary of the area runs along the Verkhnyaya Borzya River; its right component is the Talman-Borzya River, the lower reaches of Zalgatui Creek, the Elan valley, and on the right bank of the Kaldygatui Creek, the Byrka River (a

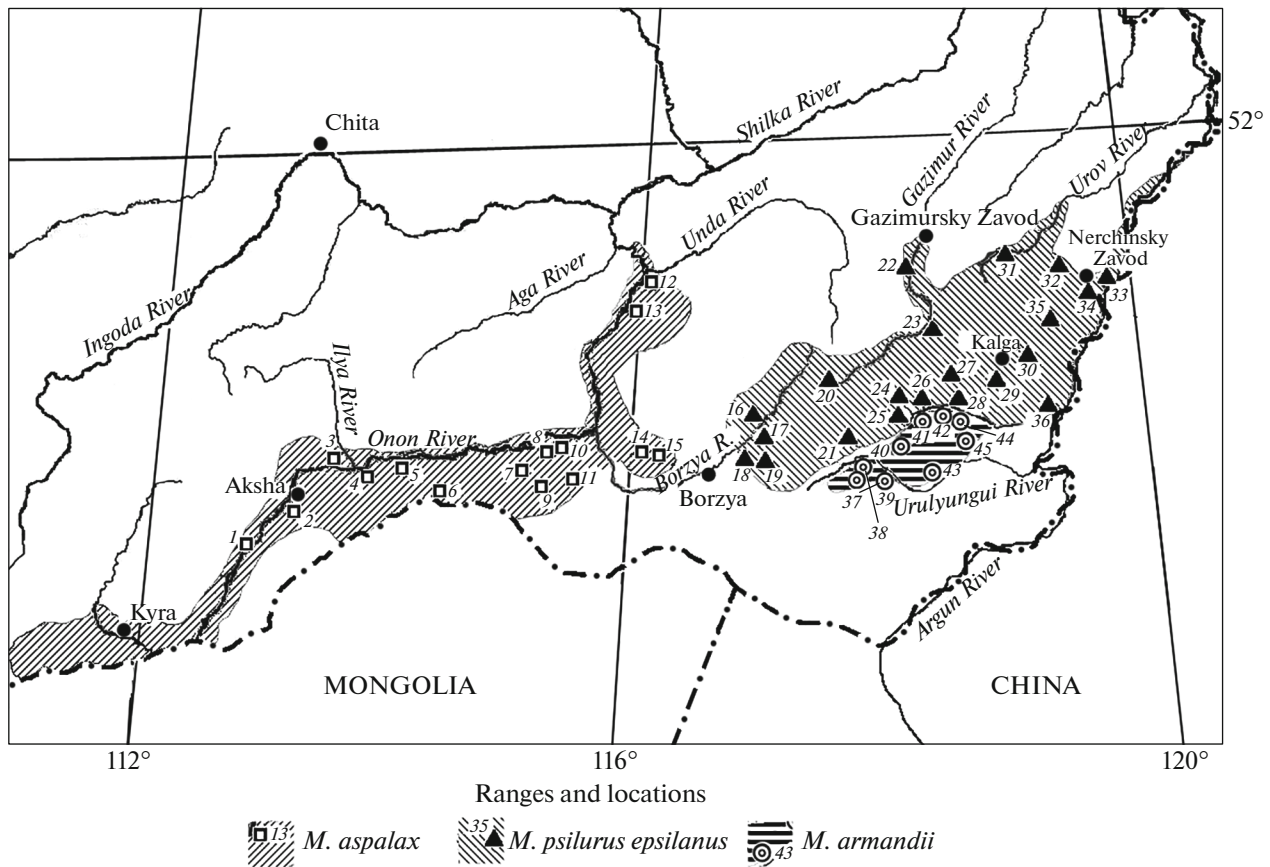


Fig. 2. Ranges of zokors (*Myospalax*) in Transbaikalia (hatching) and places of capture of *M. aspalax*, *M. psilurus epsilon*, and *M. armandii*. Numbers of localities are the same as in Table 1.

tributary of the Uurlyungui River), along the southern spurs of Nerchinskii Ridge. Of interest is a communication by Fetisov (1944) about the habitation of the Manchurian zokor to the west of the village of Nizhnii Tsasuchei (Ononskii district, right bank of the Onon River), which is almost 150 km west of the boundary of the known modern range. At the same time, the author pointed out that in the rest of the Akshinskii, Kyrinskii, and south of the Olovyanninskii (now Ononskii) districts, only the Daurian zokor inhabited. All known modern finds of zokors in the Ononskii district (including the vicinity of the village of Nizhnii Tsasuchey) belong to *M. aspalax*.

The Russian section of the range of the Armand's zokor is located within Klichinskii Range (Fig. 1d) to the south of the range of the Manchurian zokor. The eastern boundary of this section runs to the west of the Byrka–Dosatui highway (Priargunskii district). The northern boundary of the area coincides with the southern boundary of the modern area of the Manchurian zokor: the Verkhnyaya Borzya River, Talman-Borzya River, the lower reaches of Zalgatui Creek, the Elan valley, Kaldygatui Creek, the Byrka River, and the Uurlyungui River. The westernmost locations of

the Armand's zokor are known 10–12 km southwest of the village of Kovyli. Here, the species was recorded near birch groves growing in the most elevated part of the Klichinskii Range and along the northern foothills between the village of Kovyli and Margucek station. The southern boundary of the distribution of this species in Transbaikalia runs in the vicinity of the villages of Novoivanovka, Ust-Tasurkai, and Uurlyungui. To the east, between the estuaries of the Uurlyungui and Verkhnyaya Borzya rivers, we were not able to find traces of zokor habitation, although according to the testimony of local residents, animals were found here several decades ago. The total area of the Armand's zokor range within Transbaikalia is less than 2000 km². The estimated range of the Armand's zokor was given earlier (Puzachenko et al., 2009, Fig. 10, p. 109). The species was described based on materials from the collections of father David Armand, the estimated coordinates of the type locality (N 42.283°, E 118.88°) belong to Inner Mongolia (China) (Puzachenko et al., 2009, p. 108). Correct data on the distribution and configuration of its range in China will be possible upon completion of the currently undertaken research of collection material from

China. The limited habitat in Transbaikalia and the absence of settlements in the areas on the boundary with China in the Argun region give grounds to believe that the area we have identified is currently isolated from the main massif of the range.

In the literature (Nekipelov, 1960), there is an indication of the possibility of overlapping or contact of the ranges of the Daurian and Manchurian zokors in the vicinity of the villages of Ulyatui, Burulyatui, and Dolgokycha. According to our data, traces of the presence of zokors (judging by the soil mounds and several captured individuals of *M. aspalax*) are found from the floodplain of the Onon River up the Ulyatui River valley to the village of the same name. To the east and south of the village of Ulyatui, there are forest-covered areas uncharacteristic for zokors. Beyond the watershed (Tsugolskii Range) in the area of the villages of Burulyatui and Dolgokycha and further near the village, we were unable to find any traces of zokor presence in Kalangui, although according to polls, ground mounds occasionally occurred several decades ago in the area of the village of Burulyatui. There is also information from Nekipelov (1960) that traces of the presence of zokors were noted in the area of the villages of Dolgokycha, Turga, and Antiya. The questions remain unclear: were the zokors preserved in this territory, did the two species coexist in this area, or did the ranges of the Daurian and Manchurian zokors overlap? To the south of the area under consideration, the modern range of the Daurian zokor is separated from the Manchurian area by a dry steppe plain (unsuitable for habitation by the zokor) in the middle reaches of the Turga and Borzya rivers (tributaries of the Onon).

Undoubtedly, the assumption about the joint habitation of the Manchurian and Daurian zokors in the vicinity of the village of Tsagan-Olui, Borzinskii district (Ognev, 1947), made on the basis of collection fees transferred to Skalon (1935), allegedly from the vicinity of this village, is incorrect. Subsequently, numerous collections of zokors from this area (Nekipelov, 1960), including our data (23 animals from several places), confirmed the existence of a single species here, the Manchurian zokor.

An interesting pattern of ranges contact between the Manchurian and Armand zokors was revealed. To the west, the ranges of species are divided by a wide swampy valley of the Urulyungui River and its tributary the Byrka River, further by the much narrower, but also swampy valleys of Kaldygatui Creek, the Elan valley, Zalgatui Creek, and further along the Talman-Borzya and Verkhnyaya Borzya rivers. Despite the fact that it should not be difficult for zokors to cross these streams and their valleys (with the exception of the Urulyungui and Byrka rivers), on the soil surface (for example, when the young of the year settled), we

recorded these species strictly on different banks. The closest to each other the settlements of the Manchurian and Armand's zokors were found was at a distance of about 5 km in two areas: near the village of Pohekui (Fig. 2; Table 1: localities 28 and 42) and near Byrka (Fig. 2; Table 1: locations 25 and 40).

Thus, according to the data obtained, the modern ranges of all three species of zokors in Transbaikalia do not overlap. At the same time, the distance between the modern ranges of the Daurian and Manchurian zokors is at least 50 km (although in the past it may have been less); for the Daurian and Armand zokors, it is about 100; and between the nearest settlements of the Armand and Manchurian zokors, it is no more than 5 km. Attempts to find a zone of cohabitation of different species of zokors in Transbaikalia were not crowned with success, although the contact of species is possible between the Armand zokors and Manchurian zokors, and, at least in the recent past, between Daurian and Manchurian zokors.

According to polling information and some published data, zokors were more widespread in the recent past in Transbaikalia. A survey of local residents showed that in many areas potentially suitable for the habitation of zokors, the animals have disappeared in recent decades after their purposeful extermination. First of all, this situation is observed in the habitats of the Manchurian and Armand's zokors. In our experience, catching these species is less laborious than the Daurian zokor. Some published information also testifies to the wider former range of zokors. The first description of the Daurian zokor (Pallas, 1788) was made in the valley of the Ilya River (left tributary of the Onon River). Pallas indicated that this species was found in the Ilya River valley up to its watershed with the River Tura (a tributary of the Ingoda River). At present, the Daurian zokor has been registered by us only at the mouth of the Ilya River at the confluence with the Onon River. We examined the lower and middle reaches of the Ilya River (within Alkhanai National Park), and local residents were interviewed. Based on these data, it was concluded that the Daurian zokor is either absent or extremely rare upstream.

In the first half of the 20th century, zokors in Transbaikalia were actively hunted for the sake of their pelts, which led to the almost complete extermination of animals in a number of places (Skalon, 1935; Skalon and Nekipelov, 1936; Nekipelov, 1946). Currently, zokors are not hunted in Transbaikalia for the sake of pelts (according to the results of our surveys, the sole hunter who regularly caught the Daurian zokor in the Akshinskii district for fur was identified). The decline in the zokor population could have been a consequence of the plowing of land, which probably happened during the Soviet period. But at present, agriculture in Transbaikalia within the range of zokors is

carried out to a limited extent and does not pose a significant threat. At the same time, attempts to destroy zokors as “pests of hayfields” are being conducted with varying success everywhere. In this regard, the Manchurian zokor and, to a lesser extent, the Armand’s zokor are more vulnerable than the Daurian zokor, since their catching is less laborious, and their habitats most often coincide with the best hayfields. This is confirmed by the information obtained during interviews with local residents, and the absence of the Manchurian zokor on permanent hayfields, although small numbers of animals remain on the outskirts of mown areas. The main harm from the activity of zokors lies in the heaps of soil thrown out by them (the size of mounds can reach 1 m in diameter), which complicates the process of haymaking.

Information on the ecology of zokors in Transbaikalia is insufficient; recently, no special works, except for the one published by us on the Daurian zokor (Bazhenov, 2016), have been carried out. A number of features of each of the three studied species can be noted in the distribution of zokors in Transbaikalia. The range of the Daurian zokor is largely associated with the area of distribution of light sandy and sandy loam soils, although the species also does not avoid rubble. Such soils in Eastern Transbaikalia are most typical for the right bank of the Onon River, where vegetation is mainly represented by steppe meadows and areas of pine forests (Fig. 1e). The Manchurian zokor prefers to dig holes in waterlogged loamy and clayey soils typical of true meadows in the valleys of the forest–steppe rivers of Southeastern Transbaikalia (Fig. 1f). The Armand’s zokor, known in Transbaikalia only from the territory of Klichkinskii Ridge, is noted mainly on the boundary of the forest (birch groves) and meadows (Fig. 1d); burrows are located in moderately moist loamy soils, often gravelly. Thus, by the biotopic preferences, the Daurian zokor is the most xerophilous species, and the Manchurian zokor is the least xerophilic; the Armand’s zokor occupies an intermediate position between them.

CONCLUSIONS

Our studies have shown that the ranges of all three species of zokors inhabiting Transbaikalia do not overlap, although there are zones of likely contact of the ranges (modern or in the recent past) of the Manchurian zokor with the two other species. The area of *M. aspalax* is confined to the basin of the Onon River, mainly to its right bank. A wide area in the Argun River basin (and partly in the upper and lower reaches of the Borzya River, a tributary of the Onon) is the territory of *M. psilurus*. On Klichkinskii Ridge south of the range of the Manchurian zokor, is the common *M. armandii*. The range of the Armand’s zokor in Russia is extremely small and amounts to no more than

2000 km², and this site is isolated from the main range in China.

There has been a decrease in the ranges (and, probably, the number) of the Manchurian and Armand’s zokors under the influence of economic activity: during the plowing of land and deliberate slaying from the territories used for hayfields.

All this suggests the need to monitor populations to determine the conservation status of the zokors of Transbaikalia, as we noted earlier (Bazhenov, 2012). *M. armandii* and *M. psilurus* must be considered as different species in the Red Data Book of Transbaikalia, where these species are at present combined under a single name (“Manchurian zokor”). At the same time, we already recommend that the Armand’s zokor be included in the Red Data Book of Russia as an isolated population declining in numbers. At present, in the proposed new edition of the Materials for the Red Book of the Russian Federation, this species is absent not only in the main list, but it is also not included in the “List of objects of the animal world that need special attention to their state in the natural environment” (Ilyashenko et al., 2018). This task has become especially urgent in connection with the planned intensification of economic activity associated with the creation of a priority development area in the southeastern part of Transbaikalia. In relation to the other two species of zokors, the recommendations are not so definite, but we note that if we consider the population of the Manchurian zokor from Transbaikalia as an independent species in relation to the population included in the Red Data Book of the Russian Federation living in Primorskii krai, it is also necessary to clarify its conservation status.

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COMPLIANCE WITH ETHICAL STANDARDS

Conflict of interest. The authors declare that they have no conflict of interest.

Statement on the welfare of animals. All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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