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A new record of the Evoron vole (Rodentia, Arvicolinae: *Alexandromys evoronensis*) in the Far East

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Abstract. *Alexandromys evoronensis* is the endemic vole of the Russian Far East. The range of the species is still unclear. Previously, this species was found in two intermontane areas of the Khabarovsk Krai and one area of the Amur Oblast. We recorded this species in a new location in August 2021 and August 2022. It is a small intermountain area of the western spurs of the Bureinsky Range, in the Tyrma River valley, Khabarovsk Krai (50°01'17.55"N, 132°03'02.60"E). A total of eight Evoron voles were caught here. Karyotyping of one female (2n = 36) revealed a similarity with the karyotype of the *Argi* chromosomal race of the *A. evoronensis*. New records of the voles in the Tyrma River valley expand the range of Evoron vole and indicate more southerly habitats than previously stated.

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Keywords: Russian Far East, fauna, Evoron vole, new findings, new record, karyotype

Новая находка эворонской полевки *Alexandromys evoronensis* (Rodentia, Arvicolinae) на Дальнем Востоке

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Аннотация. *Alexandromys evoronensis* — эндемик Дальнего Востока России. Ареал вида все еще не ясен. Ранее этот вид был обнаружен в двух межгорных районах Хабаровского края и одном в Амурской области. Мы обнаружили этот вид в новой точке: небольшой межгорной долине реки Тырма западных отрогов Буреинского хребта, Хабаровском крае (50°01'17.55" с. ш., 132°03'02.60" в. д.) в августе 2021 и 2022 гг. Всего здесь поймано восемь особей эворонской полевки. Каритипирование одной самки (2n = 36) выявило сходство с каритипом хромосомной расы "Argi" этого вида. Нахождение полевок в долине р. Тырма расширяет ареал эворонской полевки и указывает на более южные места обитания.

Ключевые слова: Дальний Восток России, фауна, эворонская полевка, новые находки, каритип

Introduction

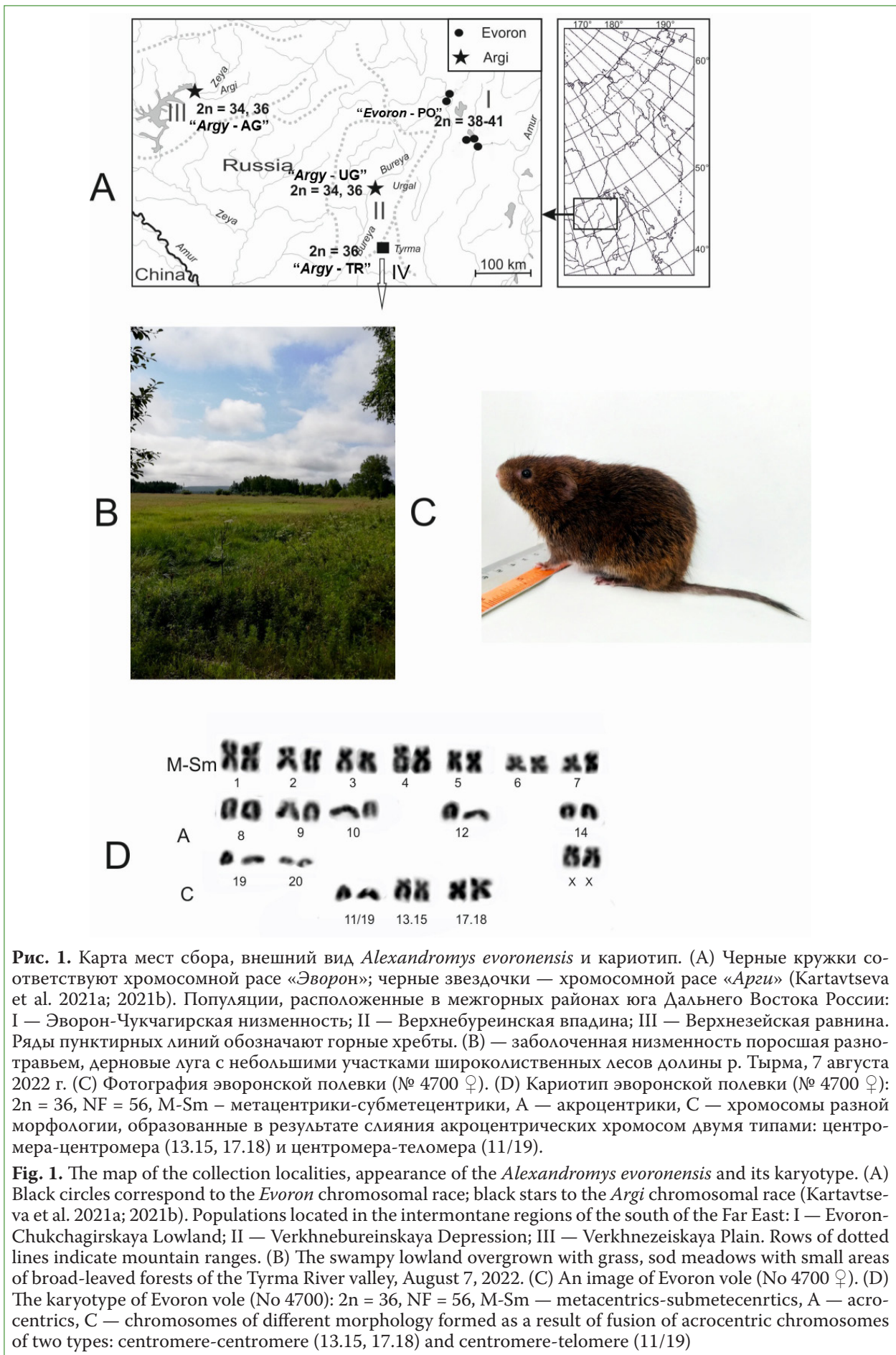
The Evoron vole *Alexandromys evoronensis* (Kovalskaya et Sokolov, 1980) is the endemic vole found in the south of the Russian Far East. The species is unusual in multiple structural chromosomal rearrangements — both tandem and centromeric fusions are in a heterozygous state. Eleven chromosomes — seven acrocentrics (A) and four metacentrics (M) — are involved in multiple structural rearrangements with the formation of 20 variants of karyotypes (Kartavtseva et al. 2021a). It has been suggested that the species is at the stage of speciation that is accompanied by multiple rearrangements — a rare case these days (Kartavtseva et al. 2021a).

The species was first described from a population No I (Fig. 1: A) of Evoron-Chukchagir

lowland, Lake Evoron valley in the Khabarovsk Krai, Russian Far East, according to morphological, chromosomal (2n = 38–40, NF = 52–58) and hybridological comparisons with morphologically related species (Kovalskaya, Sokolov 1980). Later, these characteristics were reviewed — 2n = 38–41, NF = 54–59 (Kartavtseva et al. 2021a).

Recently, two more isolated populations No II and No III in of the species were found in the two intermountain areas of the Russian Far East: the Verkhnebureinskaya Depression in the Khabarovsk Krai (population No II) and the Verkhnezeya Plain in the Amur Oblast (population No III) (Fig. 1: A) (Sheremetyeva et al. 2017a; 2017b).

Differential staining of animal chromosomes from the two new localities showed



their similarity in the number of chromosomes and the nature of chromosome variability ($2n = 34, 36, 37, NF = 51-56$). They were named the “Argi” chromosomal race. Individuals with the maximum number ($2n = 38-41, NF = 54-59$) from terra typica were named the Evoron chromosomal race (Kartavtseva et al. 2021b).

The nine chromosomes: two metacentrics (No 6 and No 7) and seven acrocentrics (Nos 11, 13, 14, 15, 17, 18 and 19) of the Argi chromosomal race are involved in two types of structural rearrangements. The first rearrangement is a tandem fusion (Nos 11/19 A, 13/15 A, 17/18 A, 6/7/14 submetacentrics (Sm)). The second is a Robertsonian translocation with the formation of two metacentrics (Nos 13.15 and Nos 17.18). The karyotype with $2n = 34$ with a rare tandem fusion of three autosomes — two meta-submetacentrics (No 6 and No 7) and one acrocentric (No 14) — forms a large biarmed chromosome (Nos 6/7/14 Sm). Most chromosomes are heterozygous except for chromosome 11/19.

Only four chromosomes of the Evoron chromosomal race area involved in chromosomal rearrangements (1 M, 4M, 17 A, 18 A). The tandem fusion (1/4 Sm) was found in this

chromosomal race only (Kartavtseva et al. 2021a).

The study of mt DNA (Sheremetyeva et al. 2023) showed a low level of genetic differentiation of the three populations (I – III) however, the new population (IV) of this species requires further research to understand inter-population variability.

To date, there is no data on the distribution boundaries of the species. Each new discovery of individuals belonging to this species contributes to the knowledge about the species and its morphological and genetic features. The reported study focuses on new records of the Evoron vole in a previously unexplored region and describes its karyotype. The characteristics of the karyotype made it possible to confidently attribute the individuals under study to the Evoron vole.

Material and methods

In total, eight voles were caught from the natural population of voles in the Tyrma River valley, Verkhnebureinsky District, Khabarovsk Krai (Fig. 1: A, Table 1 and Table 2). Our location was along the road running along the left bank of the river from the village Tyrma to the village Alanap (population IV, Argy – TR).

Таблица 1

**Характеристика промеров тела (в мм) особей *Alexandromys evoronensis*,
отловленных в 2021–2022 гг. в долине р. Търма**

Table 1

**Body measurements (mm) of *Alexandromys evoronensis* specimens caught in 2021–
2022 in the Tyrma River valley**

Year/ Год	Collection number/ Зоологический номер	Sex/ Пол	Age/ Возраст	Body length / длина тела	Tail length / длина хвоста	Foot length длина/ ступни	Ear length/ длина уха	Tail-to-body length ratio, %/ Соотношение длины тела к длине хвоста
2022	4766	♀	sad	100	30	20	13	33.3
2022	4793	♂	ad	123	47	23	15	26.2
2022	4798	♂	ad	132	57	19	14	23.2
2022	4799	♀	ad	132	52	20	17	25.4
2022	4800	♀	ad	136	46	21	15	29.7
2022	4803	♂	ad	124	43	21	18	28.8
2021	4804	♀	ad	115	—	22	15	—
2021	9-22	♀	ad	113	48	20	13	23.5

Таблица 2

Промеры тела (мм, средние числа (min – max)), хромосомных рас *Alexandromys evoronensis* из четырех популяций

Table 2

Body measurements (mm, average (min – max)) of *Alexandromys evoronensis* from four populations

Популяция «Хромосомная раса» Локалитет / Population Chromosomal race Locality	Number of animals	Body length / длина тела	Tail length / длина хвоста	Foot length длина/ ступни	Ear length / длина уха	Tail-to-body length ratio / Соотношение длины тела к длине хвоста (%)	Source/ Источник
I Evoron — PO (52°25.42'N, 136°29.67'E)	39	141.26 (108–167)	58.66 (38–73)	19.82 (18–22)	14.24 (12–18)	23.96	Kartavtseva et al. 2022
II Argy — UG (51°05'54.49"N, 132°33'04.79"E)	6	130.50 (109–144)	53.00 (37–58)	21.17 (20–22)	14.83 (12–17)	26.4	Kartavtseva et al. 2022
III Argy — AG (54°40'10.62"N, 129°06'39.73"E)	54	137.15 (100–162)	54.00 (34–74)	19.32 (12–24)	14.14 (11–19)	26.05	Kartavtseva et al. 2022
IV Argy — TR (50°01'17.55"N, 132°03'02.60"E)	7	125 (113–136)	48.8 (43–57)	20.8 (19–23)	15.2 (13–18)	26.1	Our data/ Наши данные

In 2021, (Fig. 1: B), we caught 2♀ voles (set 162 Sherman traps). In 2022, we caught six voles (3♂ and 3♀) (set 353 Sherman traps). One female (Fig. 1: C) was karyotyped (No 4800). Standard measurements of the body of eight animals studied for the first time are given in Table 1. The comparison of body measurements of voles was carried out for the two chromosomal races studied previously (Kartavtseva et al. 2022) from three (I–III) geographic populations (Fig. 1: A): I — chromosomal race *Evoron* — PO; II — chromosomal race *Argy* — UG, III — chromosomal race *Argy* — AG. For body measurement see Table. 2. The first word in the quotation marks means the name of the chromosomal race, the two capital letters mean the locality (PO — the Polina Osipenko Village, UG — the Urgal River, AG — the Argi River, TR — the Tyrma River).

Chromosome preparations were prepared under laboratory conditions according to the standard method from bone marrow. Meta-

phase plates were analyzed using an Axio Imager 1 microscope at the Center for Collective Use of the Federal Scientific Center for Biodiversity, Far East Branch, Russian Academy of Sciences.

Results and discussion

The karyotype with $2n = 36$, $NF = 56$ (Fig. 1: D) contains 18 biarmed and 16 acrocentric autosomes. The X chromosome is a medium-sized submetacentric. This karyotype corresponds to the Evoron vole of the *Argi* race (Kartavtseva et al. 2021a). Chromosome numbers are assigned according to the previously published data for voles with 36 chromosomes: karyotype $2n = 36b$. Without differential staining of chromosomes, we cannot confidently state which chromosomes underwent structural rearrangements and the type of these rearrangements.

Body measurements of the Evoron vole from four populations (Table 2 and Fig. 2) show two groupings. The first group includes

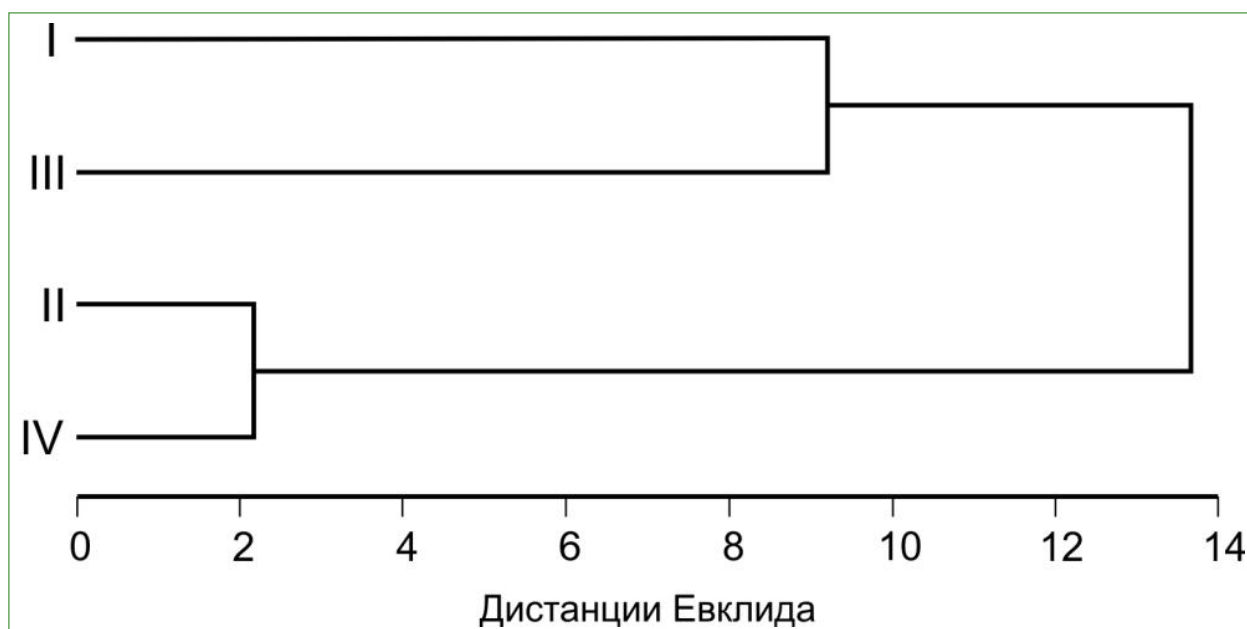


Рис. 2. Классификация выборок (I – IV) *Alexandromys evoronensis* по данным промеров тела методом UPGMA.

Fig. 2. Classification of *Alexandromys evoronensis* (I – IV) using UPGMA body measurements (given in Euclidean distances)

populations I and III, the second populations II and IV. Population IV studied by us for the first time is similar to population II. The Tyrma and Urgal rivers (population II) originate in the southwestern slopes of the Bureinsky Range and flow into the Bureya River (Fig. 1: A). In the lower reaches, the Tyrma River makes a sharp bend, inside which swampy lowlands overgrown with grass and tussock meadows with small areas of broad-leaved forests predominate (Fig. 1: B). Both populations (II and IV) are located in the western spurs of the Bureinsky Range. These populations may have a common origin.

However, drawing the conclusion about the similarity of populations with those stud-

ied previously requires further morphological and genetic investigation. Karyotyping of one female ($2n = 36$) revealed a similarity with the *Argi* chromosomal race of the *A. evoronensis* (karyotype $36 = 36b$) from populations II and III. The new records of voles in the Tyrma River valley expand the range of Evoron vole and indicates more southerly habitats than previously stated.

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