

## Far-Eastern grey voles (Rodentia: Cricetidae: *Alexandromys*) from Bolshoi Shantar Island

Nikolai E. Dokuchaev

**ABSTRACT.** Ognev (1929) assigned grey voles from Bolshoi Shantar Island to the root vole, separating them in a subspecies *Microtus* (= *Alexandromys*) *oeconomus shantaricus* Ognev, 1929. However, the shape of first lower molar anterior cup does not allow attributing of these specimens to root vole. Among Far-Eastern grey voles inhabiting the neighboring mainland, Gromov's vole (*Alexandromys gromovi* Vorontsov et al., 1988) is listed. The attribution of the voles from Shantar Island to the latter species is confirmed by the similarity in fur coloration, exterior, occlusal surface pattern of m1, and geographic proximity. The final conclusion could be made after the molecular analysis of the Far-Eastern grey voles from Bolshoi Shantar Island and mainland. In the event of their identity according to the priority rule, both should get the name *Alexandromys shantaricus* (Ognev, 1929), and *A. gromovi* should be considered as a junior synonym of the latter.

**KEY WORDS:** *Alexandromys oeconomus shantaricus*, *Alexandromys gromovi*, Bolshoi Shantar Island, Far-Eastern grey voles.

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## Дальневосточные серые полевки (Rodentia: Cricetidae: *Alexandromys*) острова Большой Шантар

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**РЕЗЮМЕ.** Серых полевок с острова Большой Шантар Огнев (1929) отнес к полевке-экономке, выделив их в отдельный подвид *Microtus* (= *Alexandromys*) *oeconomus shantaricus* Ognev, 1929. Изучение зубов, однако, показало, что по форме передней непарной петли первого нижнего коренного зуба эти полевки не могут быть полевками-экономками. Среди дальневосточных серых полевок, населяющих сопредельные с Шантарскими островами материковые территории, числится полевка Громова (*Alexandromys gromovi* Vorontsov, Boeskorov, Lyapunova et Revin, 1988). Из-за сходства в окраске меха, экстерьере и рисунке жевательной поверхности m1, и с учетом географического распространения, делается предположение об идентичности этих таксонов. Окончательный вывод можно будет сделать после молекулярного анализа форм дальневосточных серых полевок острова и материковой части. В случае их идентичности, согласно правилу приоритета, они должны будут получить название *Alexandromys shantaricus* (Ognev, 1929), с переходом названия *A. gromovi* в младшие синонимы.

**КЛЮЧЕВЫЕ СЛОВА:** о-в Большой Шантар, дальневосточные серые полевки, *Alexandromys oeconomus shantaricus*, *Alexandromys gromovi*.

### Introduction

Shantar Islands is an archipelago of 15 big and small islands which are located in the west “corner” of the Sea of Okhotsk between E 136°29' and 138°25', and N 54°20' and 55°10' in the entrance to the Tugursk Bay. All islands are of continental origin, separated from the mainland 9.5–10 thousand years ago (Velizhanin, 1976). Bolshoi Shantar Island is the largest among them (Fig. 1).

Because of the relatively recent separation of Bolshoi Shantar Island from the mainland, the rodent species that inhabit it do not differ from the mainland's ones. At

least two red-backed voles — *Myodes rutilus* (Pallas, 1779) and *Craseomys rufocanus* (Sundevall, 1846), as well as Siberian flying squirrel *Pteromys volans* (L., 1758), red squirrel *Sciurus vulgaris* L., 1758, and Siberian chipmunk *Tamias sibiricus* (Laxmann, 1769) belong to the same subspecies as on the mainland (Kostenko, 2000). Grey voles from Bolshoi Shantar were identified as root vole (Ognev, 1929). However, this species identification should be checked. In the voles' diagnosis Ognev noted that they are characterized by rich reddish-brown fur color, shortened tail, wide skull, and a more complicated structure of the first lower molar. Based on these characters Ognev separated these

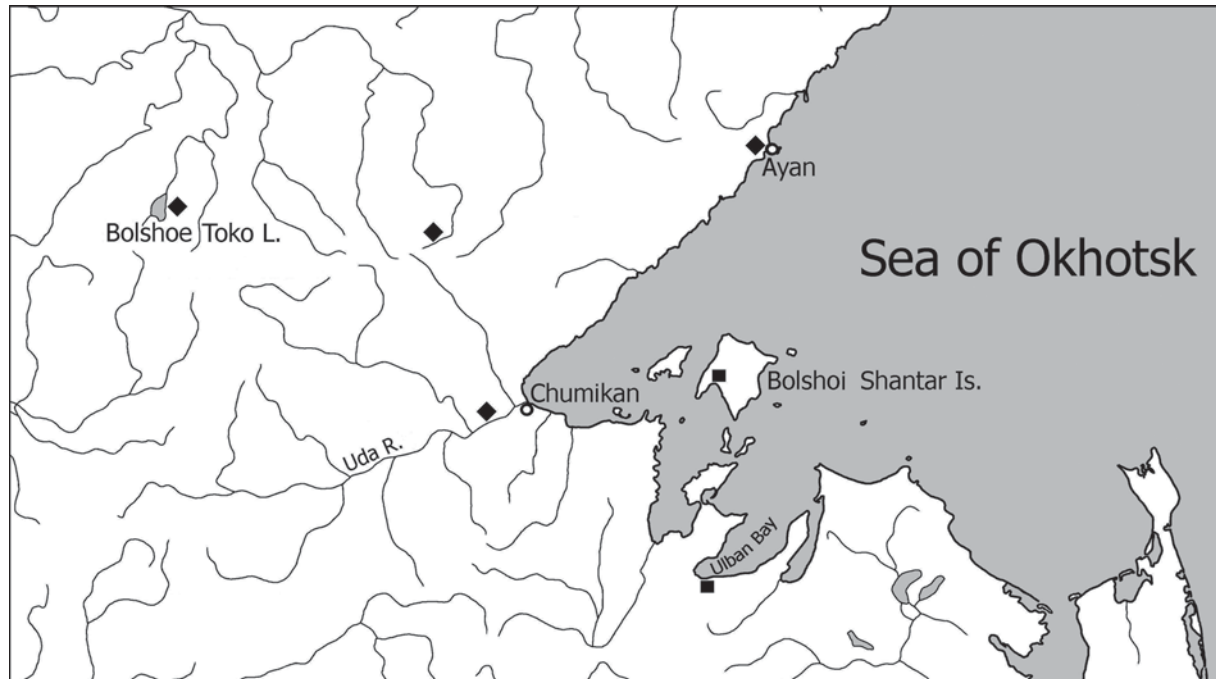


Figure 1. Map of species findings: *Alexandromys oeconomus shantaricus* (squares), and *Alexandromys gromovi* (diamonds); (by Ognev, 1929; Vorontsov *et al.*, 1988; Bannikova *et al.*, 2010; Lissovsky *et al.*, 2010; Sheremetyeva *et al.*, 2010).

voles in a new subspecies *Microtus* (= *Alexandromys*) *oeconomus shantaricus* Ognev, 1929. Ognev (1950) extended the range of this new subspecies to the entire coast of Sea of Okhotsk from Ulban Bay in the South (Fig. 1) up to Penzhina River basin in the North.

Zoologists from the Institute of Biology and Soil Science, Far Eastern Branch of Russian Academy of Sciences (Vladivostok, Russia) in 1973 and 1977 years collected the series of Far-Eastern grey voles in Bolshoi Shantar Island. They did versatile comparison of these voles and root voles from other territories of the Far East (Kostenko & Allenova, 1983, 1989). Considering the obvious differences Kostenko (2000) supposed that *A. oeconomus shantaricus* can constitute a separate species, but he did not make a final conclusion. Thus, this form until recently remained in status of subspecies of root vole (Gromov & Polyakov, 1977; Pavlinov & Rossolimo, 1987; Gromov & Erbajeva, 1995; Kostenko, 2000; Musser & Carleton, 2005; Abramson & Lissovsky, 2012).

Gromov's vole was originally identified as one of subspecies of *A. maximowiczii* (Vorontsov *et al.*, 1988). Morphological, karyological, and genetic studies that were later conducted allowed to consider the “*gromovi*” form as an independent species (Sheremetyeva *et al.*, 2003, 2009; Frisman *et al.*, 2009; Bannikova *et al.*, 2010; Lissovsky *et al.*, 2010; Haring *et al.*, 2011).

During the description of subspecies *A. maximowiczii gromovi* it was already noted that there are differences in morphotypes of first lower molar m1 between right and left jaws (Vorontsov *et al.*, 1988). Detailed

study of m1 in Gromov's voles (Voyta *et al.*, 2013) also had shown that some individuals have “*oeconomus-like*” fusion between anterior cap (AC) and T5. This fusion clearly differentiates Gromov's voles, root vole, and Mongolian vole *A. mongolicus* (Radde, 1861) from other species (Voyta *et al.*, 2013).

## Material and methods

Only five specimens of *A. oeconomus shantaricus* were available for study (Fig. 3a–e). Three specimens of *A. oeconomus shantaricus* (including holotype) deposited in the Zoological Museum of Moscow State University (ZMMU, Moscow, Russia), and two in the Zoological Institute of the Russian Academy of Sciences (ZIN, Saint Petersburg, Russia). The variation of m1 morphotypes in several *Alexandromys* species from Siberia and Far-Eastern Russia was studied based on the specimens from ZMMU, ZIN and IBPN (Institute of Biological Problems of the North, Far Eastern Branch of the Russian Academy of Sciences, Magadan, Russia) collections, including Far-Eastern grey voles from Bolshoi Shantar Island and Gromov's vole (for specimens ID see Appendix). Due to the limited material from Shantar Islands my research based mainly on the AC shape of the first lower molar m1. The peculiarities in fur coloration, exterior (tail length), and two measurements (“a” and “b”; see Fig. 2) of m1 (separately for the right and left m1) were also taken into account.

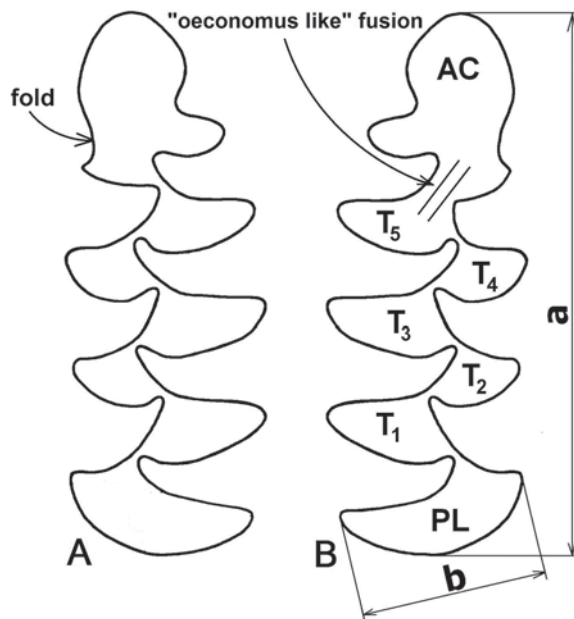


Figure 2. The elements of first lower molar m1 occlusal pattern of Gromov's vole: AC — anterior cap; PL — posterior lobe;  $T_{1-5}$  — triangles of the occlusal surface. Measurements: a — m1 length; b — posterior lobe width. A — m1 with seven enamel-dentine closed loops on occlusal surface; B — m1 with six enamel-dentine closed loops on occlusal surface, and "oeconomus-like" fusion.

## Results

The first lower molar of the holotype specimen of *A. oeconomus shantaricus* (ZMMU S-31137) showed seven separate enamel-dentine islets and four buccal salient angles (BSA). There is a slight asymmetry in the expression of the buccal fold of the AC. In the right jaw, it is less prominent than in the left one (Fig. 3a).

Specimen ZMMU S-127218 showed the similar to the type specimen occlusal surface morphology (Fig. 3b). The ZMMU S-31138 demonstrated simple AC, and "oeconomus-like" fusion between AC and T5 for both sides (Fig. 3c). Two specimens from ZIN collection (ZIN 69487 and ZIN 69488) have asymmetric AC and different expressions of "oeconomus-like" fusion of this (Fig. 3d, e). The Gromov's vole occlusal surfaces of m1 showed on Figure 3 (f, g). The specimen ZMMU S-187549 has six separate enamel-dentine islets, while ZMMU S-187550 has seven ones. Other studied specimens had different transitional variants. Thereby, among Far-Eastern grey vole specimens from Bolshoi Shantar Island and Gromov's vole demonstrated most unstable elements on m1 than another species of mainland. This result according to previously morphological studies (Vorontsov *et al.*, 1988; Voyta *et al.*, 2013).

## Discussion

The most specimens of root vole are known to have six enamel-dentine islets and three BSA of m1 (Gromov & Erbajeva, 1995). Sometimes the simple buccal side of AC formed convexity without buccal fold, whereby the fourth angle does not appear (Kovaleva *et al.*, 2002; Kropacheva *et al.*, 2012). Specimens ZMMU S-31137 and ZMMU S-127218 from Bolshoi Shantar Island showed seven enamel-dentine islets and four BSA of m1. The rest ones demonstrated six enamel-dentine islets (except left m1 of ZIN 69487), "oeconomus-like" fusion between AC and T5, and buccal fold of AC. Therefore none of five specimens of Far-Eastern gray voles from Bolshoi Shantar Island can belong to root vole by the m1 occlusal surface patterns.

Average m1 length of grey voles from Bolshoi Shantar Island was  $2.9 \pm 0.09$  mm, and posterior lobe width was  $1.2 \pm 0.05$  mm ( $n=10$ ). In root vole from northern part of Sea of Okhotsk coast the same measurements were as  $2.8 \pm 0.01$  mm, and  $1.1 \pm 0.01$  mm ( $n=60$ ) correspondingly. The Gromov's vole they were  $2.6 \pm 0.15$  mm, and  $1.0 \pm 0.07$  mm ( $n=14$ ). Thereby voles from Bolshoi Shantar Island are larger than *A. oeconomus* and *A. gromovi* from the mainland. Perhaps we have here so-called "island effect", when the individuals in islands are larger than in the mainland.

Kostenko and Allenova (1989) treated Far-Eastern grey voles from Bolshoi Shantar Island as root vole. They conducted a comparative morphological analysis of root vole throughout Far East of Russia and showed that specimens from Bolshoi Shantar Island had shorter tails (Kostenko & Allenova, 1989). Voles from Bolshoi Shantar Island have tail length ranged from 25–41 mm (average 33.2 mm;  $n=9$ ). According to Sheremetyeva with co-authors (2003, 2009) the tail length of adult individuals of the Gromov's voles was 34–36 mm (average 35 mm;  $n=7$ ). Type specimen of Gromov's vole from Bolshoe Toko Lake (young specimen) has tail length only 22.6 mm. Thus, the tail length the Far-Eastern grey voles from Bolshoi Shantar Island and Gromov's vole are pretty close, and differ to another *Alexandromys* species, which inhabiting along the continental coast of the Okhotsk Sea (Krivosheev, 1984).

One of the distinguishing characteristics of Far-Eastern grey voles from Bolshoi Shantar Island is their rich reddish-brown color of fur on the back (Ognev, 1929; Kostenko & Allenova, 1983, 1989). The Gromov's vole coloration also noted: the back is of dark grey-brown color dominated ochre-brown tones (Sheremetyeva *et al.*, 2003, 2009). So both forms resemble in fur color.

During the last sea-level regression, Bolshoi Shantar Island was fused with the mainland. The adjacent mainland territories currently inhabited by the following species of Far-Eastern grey voles: *A. oeconomus* (Pallas, 1776), *A. fortis* (Buchner, 1889), *A. maximowiczii* (Schrenck, 1859), and *A. gromovi* (Vorontsov *et al.*, 1988) (Dokuchaev, 2012). Considering to the geo-

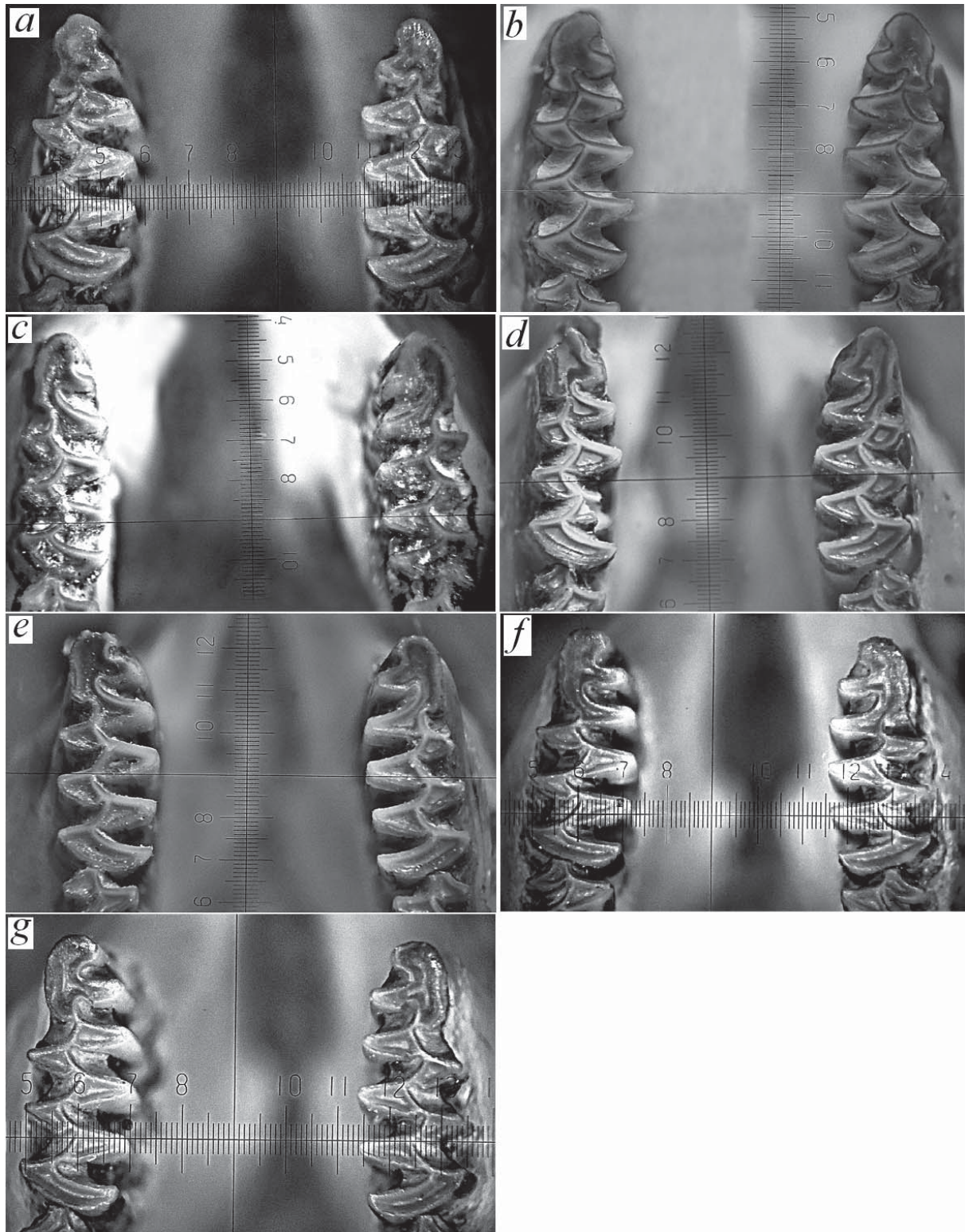


Figure 3. The first lower molars of *Alexandromys* voles from Bolshoi Shantar Island: a — S-31137 (holotype of *A. o. shantaricus*, ZMMU), b — S-127218 (ZMMU), c — S-31138 (ZMMU), d — 69487 (ZIN), e — 69488 (ZIN); and Gromov's vole: f — S-187549 (ZMMU), g — S-187550 (ZMMU).

graphical location, peculiarities in fur coloration, exterior (tail length), and the m1 occlusal surfaces patterns the form "*A. oeconomus shantaricus*" and Gromov's vole maybe represent as the island and mainland populations of the same species. The final conclusion could be made after the molecular analysis of the Far-Eastern grey voles from Bolshoi Shantar Island. In the event of their identity according to the priority rule, both should get the name *Alexandromys shantaricus* (Ognev, 1929), and *A. gromovi* should be considered as a junior synonym of the latter.

ACKNOWLEDGMENTS. I would like to thank three anonymous reviewers for their helpful comments and useful recommendations regarding a previous version of the manuscript. The study was supported in part by Russian Federation Basic Research grant No. 12-04-00018-a.

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## APPENDIX

The list of specimens used for measurements of m1. Information is in the following order: scientific name, geographical locality, geographical coordinates in parenthesis, housed place, sample size in parenthesis, specimen ID.

*Alexandromys oeconomus shantaricus*: Bolshoi Shantar Island, Khabarovsk Territory, Russia (54°52'N, 137°29'E) — ZMMU ( $n=3$ ): S-31137, S-31138, S-127218; ZIN ( $n=2$ ): 69487, 69488.

*A. gromovi*: Ayan, Khabarovsk Territory, Russia (56°27'N, 138°09'E) — ZMMU ( $n=1$ ): S-87335; Dzhana River, Khabarovsk Territory, Russia (55°31'N, 134°05'E) — ZMMU ( $n=1$ ): S-187569; Uchur River basin, Khabarovsk Territory, Russia (55°46'N, 134°11'E) — ZMMU ( $n=5$ ): S-187547, S-187549, S-187550, S-187565, S-187567.

*A. oeconomus*: Okhotsk environs, Khabarovsk Territory, Russia (59°29'N, 143°18'E) — IBPN ( $n=2$ ): 1064, 1065; Magadan environs (59°34'N, 150°49'E) — IBPN ( $n=3$ ): 3835, 3836, 3837; Khasyn River, Magadan Province (60°04'N, 150°44'E) — IBPN ( $n=1$ ): 1067; Elikchan Lakes, Magadan Province (60°45'N, 151°47'E) — IBPN ( $n=25$ ): 1068, 1069, 1070, 1071, 1072, 1073, 1074, 1075, 1076, 1077, 1078, 1079, 1080, 1081, 1082, 1083, 1084, 1087, 1088, 1089, 1091, 1092, 4358, 4360, 4361.