

### ON TWO SPECIES OF THE GENUS *PERONOMERUS* (COLEOPTERA: CARABIDAE) OF THE RUSSIAN FAUNA

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**Summary.** A review of the ground beetle genus *Peronomerus* Schaum, 1864, occurring in the Russian Far East (*P. auripilis* Bates, 1883 and *P. fumatus* Schaum, 1854), is given. The data on distribution of these species in Russia are summarized, their distinctive characters are discussed, and a key for determination is provided. Reliable data on findings of *P. fumatus* in Russia are provided for the first time; it is also recorded for the first time for the fauna of South Korea.

**Key words:** ground beetles, Coleoptera, Carabidae, Panagacini, *Peronomerus*, *Euschizomerus*, key, new records, Russian Far East, South Korea.

**Б. М. Катаев, К. В. Макаров, А. В. Ковалев. О двух видах рода *Peronomerus* (Coleoptera: Carabidae) фауны России // Дальневосточный энтомолог. 2024. N 495. С. 10-16.**

**Резюме.** Дан обзор видов жужелиц рода *Peronomerus* Schaum, 1864 (*P. auripilis* Bates 1883 and *P. fumatus* Schaum, 1854), встречающихся на Дальнем Востоке России. Обобщены данные о распространении этих видов в России, обсуждены их отличительные признаки и составлен ключ для их определения. Точные данные о находках *P. fumatus* в России указываются впервые; этот же вид впервые указан для фауны Южной Кореи.

#### INTRODUCTION

*Peronomerus* Schaum, 1864 is a ground beetle genus of the tribe Panagacini distributed in East and Southeast Asia from India and Sri Lanka in the west to Japan in the east and to New Guinea in the southeast (Häckel & Farkač, 2012). The most distinctive feature of this genus is the male protarsus, in which only the first tarsomere is enlarged and protrudes lateroapically along the inner margin (Figs 5, 12). The genus includes six species with more or less wide ranges. In the fauna of Russia, only one species, *P. auripilis* Bates 1883, was reliably known from the Primorsky krai (Kryzhanovskij, 1983; Lafer, 1989; Kryzhanovskij *et al.*, 1995; Baehr, 2003). Recently, another species, *P. fumatus* Schaum, 1854, was recorded for

the Russian Far East (Häckel & Farkač, 2012; Häckel & Kirschenhofer, 2017), but without any additional information. Due to the lack of specific data on the occurrence of this species in Russia, Sundukov and Makarov (2017) considered these records erroneous and excluded *P. fumatus* from the Russian fauna. Subsequent attempts to find out what these records were based on were unsuccessful (Martin Häckel, pers. com.). Meanwhile, in 2021, one of the authors of this paper found a female of *P. fumatus* in the Primorsky krai. A study of the available material in the collections showed that a female of this species was also collected in the Primorsky krai back in 1985, but was erroneously identified as *P. auripilis*, since the characters used at that time for the discrimination of these species did not allow reliable identification of females. Finally, in 2022, a male of *P. fumatus* was also found in the Primorsky krai, which made the identification more reliable.

The purpose of this paper is to summarize the data on the distribution of *P. auripilis* and *P. fumatus* in Russia and provide the characters for their discrimination.

## MATERIAL AND METHODS

The following abbreviations are used for the depositories of the specimens examined: FSCB – Federal Scientific Center of the East Asia Terrestrial Biodiversity, Far Eastern Branch, Russian Academy of Sciences, Vladivostok, Russia; MPU – Moscow Pedagogical University, Moscow, Russia; SIEE – the reference collection of D.N. Fedorenko at A.N. Severtsov Institute of Ecology and Evolution, Russian Academy of Sciences, Moscow, Russia; ZIN – Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia; cIKAB – collection of I.I. Kabak, Saint Petersburg, Russia; cSIVN – collection of S.N. Ivanov, Vladivostok, Russia.

Standard methods were applied for treating the material. Measurements were made under the stereomicroscope LOMO MBS 10 using an ocular-micrometer and were taken as follows: body length, measured from anterior margin of clypeus to the elytral apex along the suture; length of pronotum (PL), measured along its median line, and maximum width of pronotum (PW) measured at its broadest points; twelve males and females of each species were measured.

Photographs were taken with a Canon EOS 5D Mark III camera with a Canon MP-E 65 mm macro lens; slide with male genitalia were photographed with a Canon EOS 6D camera attached to a Zeiss AxioScope.A1 microscope. In both cases, the extended focus technique was used. All illustrations were processed using Zerene Stacker software.

## RESULTS

### *Peronomerus auripilis* Bates, 1883

Figs 1–6, 13–17, 23–25, 29, 30

MATERIAL EXAMINED. **Russia:** Khabarovskiy krai: Bikin Distr., Zvenjevaya, 18.VIII 1985, 1 ♀, O. Kabakov leg. (ZIN). Primorsky krai: Pozharsky Distr.: “Ussuri Riv., Nizhne-mikhailovskaya”, 21.VI 1899, 1 ♂, G. Suvorov leg. (ZIN); Dalnerechensk Distr.: “Ussuri Riv., 60 versts lower of Iman”, VI 1899, 1 ♂, 1 ♀, G. Suvorov leg. (ZIN); Spassk Distr.: shore of Lake Khanka, near Turiy Rog Vill., 27.VI 2015, 1 ♀, S. Ivanov leg. (MPU); Knorring, 10 km SW Spassk, at light, 18.VII 1981, 1 ♂, E. Kosheleva leg. (FSCB); Khanka Distr.: Kamen-Rybolov, Lake Khanka, 5.VII 1908, 1 ♂, A. Chersky leg. (ZIN); Ussuriysk Distr.: “right bank of Ussuri Riv. lower of Nikolsk [Ussuriysk] (20 versts)”, VI 1899, 1 ♂, G. Suvorov leg.

(ZIN); Suputinsky dok, 8.VII 1961, 1 ♀, O. Kabakov leg. (ZIN); same data but 12.VII 1961, 1 ♂, (ZIN); Ussuriysk, VIII 1968, 1 ♂, V. Shablinovsky (ZIN); Ussuriysk env., 8 km E from Kaymanovka, at light, 20–22.VII 2011, 1 ♂, 1 ♀, S. Ivanov leg. (cSIVN); Kaymanovka Vill. env., at light, 24.VII 1992, 1 ♀, S. Beloborodov leg. (MPU); Kamenushka Vill. env., 20–30.VII 1992, 1 ♀, S. Khvylya leg. (MPU); Kamenushka Vill. near Ussuriysk, at light, 22.VI 1987, 1 ♂, D. Fedorenko leg. (SIEE); same data but 17.VI 1987, 1 ♀, (SIEE). Anuchino Distr.: Vinogradovka, 4.VIII 1929, 1 ♀, A. Kirichenko leg. (ZIN); Nadezhdinsky Distr.: mouth of Suifun Riv., left bank, meadow, 4. VI 1967, 1 ♀, G. Lafer leg. (FSCB); Khasan Distr.: Zarubino, 29.VII 1969, 1 ♂, M. Danilevsky leg. (cIKAB); Barabash, 26.VII 1981, 1 ♀, S. Murzin leg. (cIKAB); 8 km of Khasan City, env. Golubinyy Utes, at light, 22–24.VII 2018, 4 ♂, 4 ♀, S. Ivanov leg. (cSIVN); same data, 1 ♂, 1 ♀, (MPU); sandy littoral of Tumangang river valley, 12.VII 1959, 1 ♂, R. Vasiliev leg. (ZIN).

In addition, 4 ♂ and 1 ♀ from Japan (ZIN) were examined.

**COMPARATIVE DIAGNOSIS.** Body length 8.0–9.7 mm. Dorsum black, with a golden shine (Figs 1, 2). Basal antennomere reddish brown, other antennomeres dark brown to black, much darker than basal antennomere. Body pubescence yellow; setae on elytral disc very dense, noticeably deflected backward and usually relatively shorter than those in *P. fumatus*. Pronotum relatively narrower (PW/PL 1.27–1.33, mean 1.30). Fourth pro-, meso- and metatarsomeres in both sexes more shallowly emarginated apically, with apical angles not forming long lobes (as in Figs 2–6). Male genitalia (Figs 13–17, 23–25, 29, 30): median lobe of aedeagus sharply bent at middle (Fig. 14) and with a very large narrow sclerotized process in internal sac (Figs 29, 30); ventrobasal lobe of everted endophallus large, bent caudally (Fig. 24), with large spines; the right laterobasal lobe larger than the left lobe, covered with spines (Fig. 25); gonopore shifted to the left, its sclerite asymmetrical – the left part with a long appendage (Figs 23–25).

**DISTRIBUTION.** The species has been described from Japan (Honshu: “Marshes, Ogura Lake; Uyeno and Honjo, in Tokio”) (Bates, 1883). It is also known from the northeastern part of China (Heilongjiang, Jilin, Liaoning, Beijing, and Hebei) and the Russian Far East (Häckel & Kirschenhofer, 2014; Makarov & Sundukov, 2022). Based on the examined material, in the Russian Far East it is distributed throughout the Primorsky krai, reaching the very south of the Khabarovskiy krai (Bikin District).

**ECOLOGY.** In Russia, the species occurs in meadows, banks of rivers and lakes, and edges of nemoral forests (Lafer, 1983).

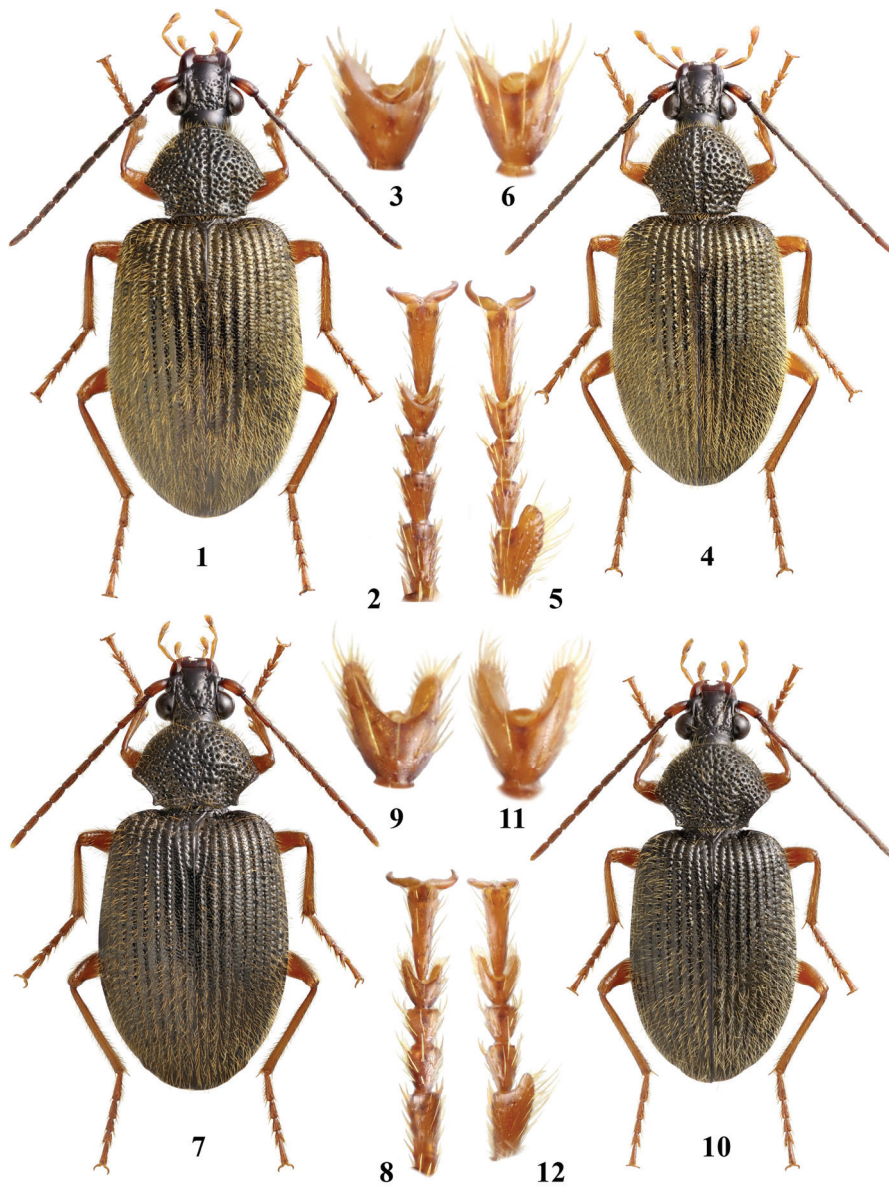
#### ***Peronomerus fumatus* Schaum, 1854**

Figs 7–12, 18–22, 26–28, 31, 32

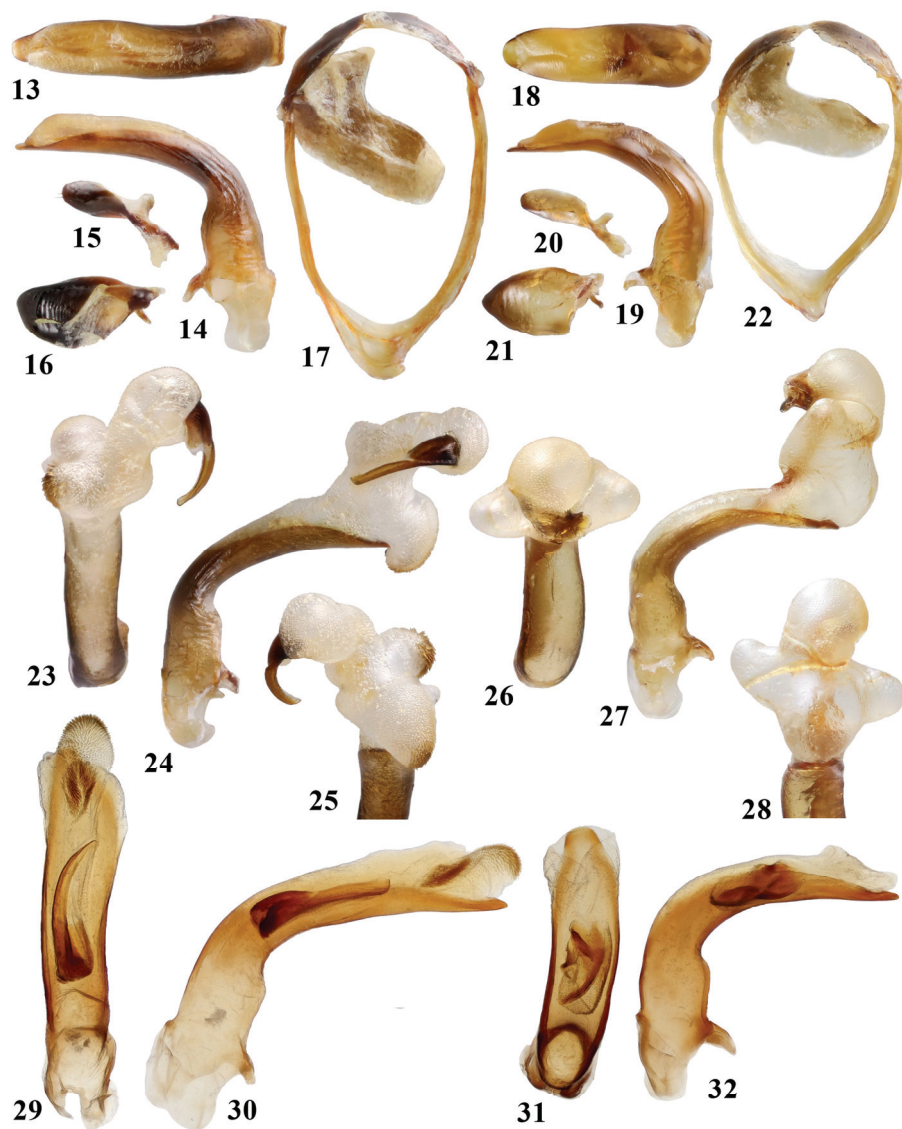
**MATERIAL EXAMINED.** **Russia:** Primorsky krai: Anuchino Distr.: 3 km W Novovaravovka Vill., Simonov Klyuch stream, 43.961748°N, 132.945617°E, riparian forest, sweeping herbaceous vegetation in the flood channel, 30.VI 2021, 1 ♀, A. Kovalev leg. (ZIN); Oktyabrsk Distr.: Pokrovka Vill. env., Mt. Sinelovka, meadow at foot of slope, 8.V 2022, 1 ♂, M. Sergeev leg. (ZIN); Khasan Distr.: Andreevka Vill. env., at light, 6.VIII 1985, 1 ♀, S. Sinev leg. (ZIN).

In addition, 2 ♂ from Hong Kong, 2 ♂ and 1 ♀ from “China”, 1 ♀ from Korea, and 4 ♂ and 3 ♀ from Vietnam were examined (all in ZIN).

**COMPARATIVE DIAGNOSIS.** Body length 7.0–8.6 mm. Dorsum black, without a golden shine (Figs 7, 10). Antennae brown to dark brown, with one to three basal antennomeres slightly paler than other. Body pubescence yellowish white; setae on elytral disc sparser than those in *P. auripilis*, only slightly deflected backward and usually relatively longer.



Figs 1–12. *Peronomerus* species, all dorsal view: 1–6 – *P. auripilis* (Primorsky krai); 7–12 – *P. fumatus* (Primorsky krai); 1, 4, 7, 10 – habitus; 2, 5, 8, 12 – left protarsus; 3, 6, 9, 11 – fourth protarsomere; 1–3, 7–9 – females, 4–6, 10–12 – males.



Figs 13–32. Male genitalia of *Peronomerus* species: 13–17, 23–25, 29, 30 – *P. auripilis* (Primorsky krai); 18–22, 26–28, 31, 32 – *P. fumatus* (Primorsky krai); 13, 14, 18, 19, 29–32 – median lobe of aedeagus; 15, 16, 20, 21 – parameres; 17, 22 – genital ring; 23–28 – median lobe of aedeagus with everted internal sac; 13, 18, 23, 26, 29, 31 – dorsal view; 25, 28 – caudal view; other – lateral view.

Pronotum relatively wider (PW/PL 1.29–1.36, mean 1.33). Fourth pro-, meso- and metatarsomeres in both sexes deeply emarginated apically (as in Figs 8–12), with apical angles forming long lobes (about a third of length of corresponding fifth tarsomere). Male genitalia (Figs 18–22, 26–28, 31, 32): median lobe of aedeagus stout and strongly arcuate (Fig. 19), without a large sclerotized process in internal sac (Figs 31, 32); everted endophallus (Figs 26–28) with two laterobasal lobes approximately equal in size, without distinct ventrobasal lobe and spines; gonopore in a medial position, the left part of the surrounding sclerite larger than the right.

**DISTRIBUTION.** The most distributed species of the genus occupying the most part of the genus range. Originally described from Hong Kong (Schaum, 1854), it is widely distributed from India and Sri Lanka in the west to Japan and the Philippines in the east, to the Russian Far East in the north, and to Sumatra and the Bismarck Archipelago in the southeast (Häckel & Farkač, 2012). The species is widespread in the eastern and central parts of China (Häckel & Kirschenhofer, 2014) and in the Primorsky krai of Russia. Although *P. fumatus* is widely distributed in East Asia, it is still not recorded from Korea. We examined a male of this species labeled “Sagori [between Busan and Daegu, near Cheongdo-gun, South Korea] 13.IX 1900 *P. Schmidt*” (in Russian) (ZIN).

**ECOLOGY.** Not studied. Probably similar to *P. auripilis*.

**REMARKS.** The comparative original descriptions and available keys (Jedlička, 1965; Xie & Yu, 1991) usually include the shape of the pronotum, coloration, and character of pubescence to differentiate *P. fumatus* and *P. auripilis*. In our opinion, the shape of the pronotum in both species is highly variable, and the character of pubescence may also vary in some extent. According to our data, in addition to the male genitalia, the most reliable distinctive features for identification of these species are the coloration of the dorsum (Figs 1, 2 *versus* 7, 10) and the shape of the fourth tarsomere (Figs 3, 6 *versus* 9, 11) as described here in the diagnoses. We emphasize that the latter character has not been used before; at least we were unable to find any mention of it in the literature although the shape of the fourth tarsomere is one of the main characters used for the discrimination of the genera within Panagaeini. It is interesting that in the shape of the fourth tarsomere with long lateroapical lobes, *P. fumatus* is somewhat similar to the representatives of the genus *Euschizomerus* Chaudoir, 1850, from which, however, it is well distinguished by the enlarged first protarsomere of the male. In addition, the lateroapical lobes of the fourth tarsomere in the members of *Euschizomerus* are usually longer, reaching approximately half the length of the fifth tarsomere in most species.

*Peronomerus nigrinus* Bates, 1873 from Japan shares all its distinctive features with *P. fumatus*, including male genitalia (see, for example, Kasahara, 1992), and probably represents at most a geographical form of this species. However, we have no material from Japan to draw definitive conclusion.

#### Key to Russian species of *Peronomerus*

1. Fourth pro-, meso- and metatarsomeres in both sexes more shallowly emarginated apically, with apical angles not forming long lobes (Figs 2–6). Dorsum black, with a golden shine (Figs 1, 2). Median lobe of aedeagus sharply bent at middle (Fig. 14) and with a very large narrow sclerotized process in internal sac (Figs 29, 30) ..... *P. auripilis*
- Fourth pro-, meso- and metatarsomeres in both sexes deeply emarginated apically (Figs 8–12), with apical angles forming long lobes (about a third of length of corresponding fifth tarsomeres). Dorsum black, without a golden shine (Figs 7, 10). Median lobe of aedeagus more strongly arcuate (Fig. 19), without a large sclerotized process in internal sac (Figs 31, 32) ..... *P. fumatus*

## ACKNOWLEDGEMENTS

We are very grateful to Dmitry Fedorenko (Moscow), Ilia Kabak (Saint Petersburg), Maxim Sergeev and Sergey Ivanov (both Vladivostok) for loan or donation of the specimens from the collections under their care. Some aspects of this study were discussed with Seiji Morita (Tokyo). Liang Hongbin (Beijing) kindly helped with the translation from Chinese.

The study of Boris Kataev was performed within the framework of State project No. 122031100272-3.

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