

New Scarab-Beetle Species (Coleoptera, Scarabaeidae, Aphodiinae, Orphninae) from Central Asia and Southern Africa

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Abstract—Three new scarab-beetle species are described. *Aphodius moronensis* sp. n. (northern Mongolia) and *A. kozlovi* sp. n. (eastern Tibet) with modified spurs on fore tibiae in males are placed in the *falcispinis* group of the subgenus *Agolius* but are similar to the *grafi* group of the subgenus *Chilothorax* in the shape of parameres and elytral pattern. The new species differ from *A. falcispinis* in the shape of the spur; *A. moronensis* sp. n. also differs in the shape of the body and parameres. *Orphnus transvaalensis* sp. n. is the second apterous *Orphnus* species found in Southern Africa. It differs from the closely related *O. harrisoni* in the shape of parameres, position of the horn-like clypeal process, and in a smaller body size.

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In the present paper, new species of two large scarab-beetle genera, *Aphodius* Ill. (Aphodiinae) and *Orphnus* MacLeay (Orphninae), are described.

Aphodius moronensis sp. n. (Northern Mongolia) and *A. kozlovi* sp. n. (Eastern Tibet) are similar to *A. falcispinis* W. Kosh. and therefore placed in the subgenus *Agolius* Mulsant et Rey in the *A. falcispinis* species-group separated by Král (1997). The shape of the parameres and elytral pattern of the two species, however, are more similar to those in members of the *grafi* species-group of the subgenus *Chilothorax* Motschulsky (Frolov, 2002). The subgenus *Chilothorax*, as treated in my previous works (Frolov, 2001, 2002a, 2002b), is probably a non-monophyletic group. Phylogenetic relations among the members of this group as well as relations to the other subgenera need further research which is beyond the scope of the present contribution.

In 2008, I described apterous *Orphnus harrisoni* from Little Karoo, an area in South Africa arid and rich in endemics (Frolov, 2008). Recently I had the opportunity to examine the material from the State Zoological Museum, Dresden, where I found a specimen from Mpumalanga, similar to *O. harrisoni*. A detailed examination of this specimen has shown that it differs from *O. harrisoni* in a number of characters that cannot be accounted for by the inter-specific variability of the later species.

The material used for this study is deposited in the following institutions: the Zoological Institute of the

Russian Academy of Sciences, St.-Petersburg (ZIN); State Zoological Museum, Dresden (SMTD); the Hungarian Museum of Natural History, Budapest (HNHM).

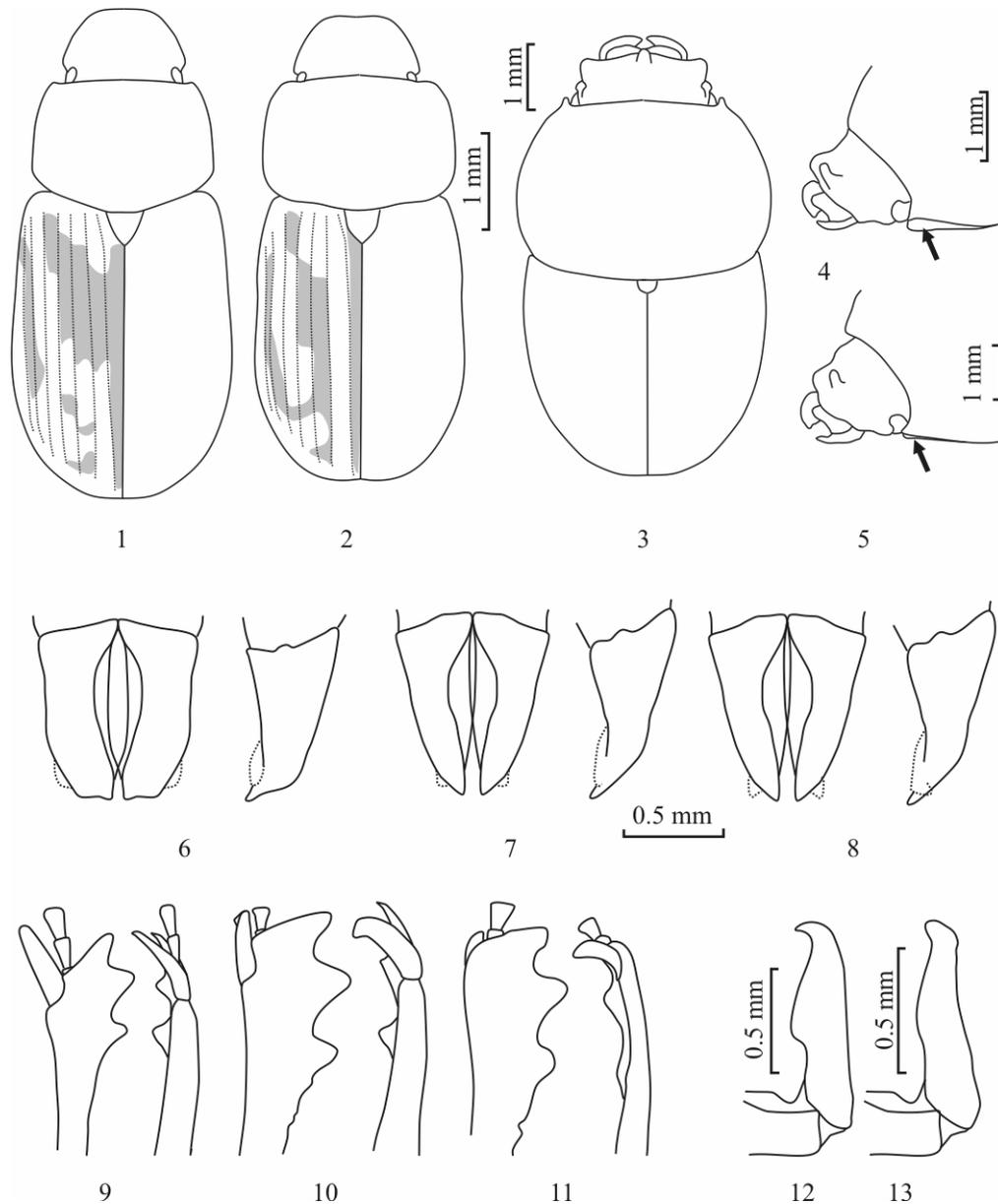
SUBFAMILY APHODIINAE

Aphodius (Agolius) moronensis Frolov, sp. n.
(Figs. 1, 6, 11).

Diagnosis. The new species differs from the putatively related *A. falcispinis* W. Kosh. and *A. kozlovi* sp. n. in the apical spur of the fore tibia which is strongly curved inwards and barely visible from above, in proportions of body segments, and in more curved apices of parameres (lateral view).

Description. Male, holotype (Fig. 1). Body length 4.2 mm. Head shiny, with blackish brown disc and somewhat paler anterior margin and sides of clypeus, relatively sparsely punctate (punctures separated by 2–4 their diameters). Clypeus wide, with feeble, almost indistinct sinuation anteriorly, rounded aside sinuation. Genae rounded, almost not separated from lateral margin of clypeus, distinctly protruding past eyes, with a few long setae. Frontoclypeal suture visible as fine line interrupted medially. Head disc without tubercles. Eye as wide as distance between eye and gula in ventral view.

Pronotum narrower than elytra base, shiny, dark brown on disc and pale brown laterally. Its anterior margin not bordered, lateral margins and base finely bordered. Disc with relatively dense double punctua-



Figs. 1–13. *Aphodius* spp. and *Orphnus* spp.: (1, 6, 11) *A. moronensis*, sp. n., (2, 7, 9) *A. kozlovi*, sp. n., (8, 10) *A. falcispinis* W. Kosh., (3, 4, 13) *O. transvaalensis*, sp. n., (5, 12) *O. harrisoni* Frolov [(1–3) habitus; (4–5) head and pronotum, lateral view; (6–8) parameres, lateral and dorsal view; (9–11) fore tibiae of males, dorsal and medial views; (12, 13) parameres, lateral view.

tion (punctures separated by 1.5–3 their diameters, small punctures about 3 times smaller than larger ones and less densely distributed). Posterior angles of pronotum obtusely rounded, sides with sparse yellowish setae.

Scutellum narrow, triangular, shiny, brown, sparsely punctate, smooth.

Elytra pale brown with darker sutural intervals and brown longitudinal maculae on 2nd–7th elytral intervals. Humeral dents absent. Elytral intervals feebly convex, finely punctate (punctures separated by

4–5 their diameters). Sides and apices of elytra with minute pale setae. Elytral striae fine and shallow.

Ventral side of body brown, legs pale brown. Metasternal disc flat.

Spur of fore tibia relatively short, rounded apically, strongly curved downwards (Fig. 11), hardly visible from above, in contrast to that of *A. falcispinis* (Fig. 10), which is longer, well-visible from above, and distinctly curved inwards. Lower spur of middle tibia acute apically, longer than half of upper spur. 1st tarsomere slightly longer than upper spur of hind

tibia and as long as 3 following tarsomeres combined. Adjoining apical setae of middle and hind tibiae short and about equal in length.

Parameres relatively wide in dorsal view and somewhat more curved in lateral view in comparison with those of *A. falcispinis* and *A. kozlovi* sp. n. (Figs. 6–8). Apices of parameres acute and strongly sclerotized, with small, feebly sclerotized processes on ventral sides.

Female unknown.

Etymology. The name of the species is derived from toponym Mörön.

Type material. Holotype, male with labels “Mongolia: Chövsgöl aimak 60 km WNW von der Stadt Mörön, 1800 m. Exp. Dr. Z. Kaszab, 1968” and “Nr. 984 19.VI.1968” (HNHM).

Aphodius (Agolius) kozlovi Frolov, sp. n.
(Figs. 2, 7, 9).

Diagnosis. *A. kozlovi* sp. n. is similar to *A. falcispinis* W. Kosh. but can be distinguished from it in the apical spur of fore tibia, which is not curved inwards and acute apically. The shape of the parameres is similar in both the species, but in the examined specimens of *A. kozlovi* sp. n. and *A. falcispinis*, the weakly sclerotized processes on the parameres of the former are somewhat shorter. The elytral pattern is more distinct in *A. kozlovi* sp. n. The two later characters are probably not quite reliable and therefore separation of the females of these species can be difficult. *A. kozlovi* sp. n. differs from *A. moronensis* sp. n. in the shape of the fore-tibial spur and relatively wider pronotum and less curved apices of the parameres in lateral view.

Description. Male, holotype (Fig. 2). Body length 4.1 mm. Head shiny, with blackish brown disc and somewhat paler anterior margin and sides of clypeus, relatively densely punctate (punctures separated by 1–2 their diameters). Clypeus wide, with feeble, almost indistinct sinuation anteriorly, widely rounded aside sinuation. Genae rounded, almost not separated from lateral margin of clypeus, distinctly protruding past eyes, with several long setae. Frontoclypeal suture visible as fine line interrupted medially. Head disc without tubercles. Eye as wide as distance between eye and gula in ventral view.

Pronotum as wide as elytra base, shiny, dark brown on disc and pale brown laterally. Its anterior margin not bordered, lateral margins and base finely bordered.

Disc with relatively dense, double punctuation (punctures separated by 2–3 their diameters, small punctures about 3 times smaller than larger ones and less densely distributed). Posterior angles of pronotum obtusely rounded, sides with sparse short yellowish setae.

Scutellum narrow, triangular, shiny, brown, sparsely punctate, smooth.

Elytra pale brown with darker sutural intervals and brown longitudinal maculae on elytral 3rd–7th intervals. Humeral dents absent. Elytral intervals slightly convex, finely punctate (punctures separated by 4–5 their diameters). Sides and apices of elytra with minute pale setae. Elytral striae fine and shallow.

Ventral side of body brown, legs pale brown. Metasternal disc flat.

Spur of fore tibia relatively long, slightly curved downwards (Fig. 9), slightly shorter than 3 first tarsomeres combined. Lower spur of middle tibia acute apically, longer than half of upper spur. 1st tarsomere as long as upper spur of hind tibia and slightly shorter than 3 succeeding tarsomeres combined. Adjoining apical setae of middle and hind tibiae short and subequal in length.

Parameres of *A. kozlovi* sp. n. (Fig. 7) are similar to those of *A. falcispinis* (Fig. 8), with acute and strongly sclerotized apices and with small, weakly sclerotized processes on ventral sides.

Female can be distinguished from male by narrower pronotum, denser punctuation on head and pronotum, and by shorter and slender apical spur on fore tibia. This spur as long as, or shorter than 2 first tarsomeres combined.

Variability. The body size of the paratypes varies from 4.1 to 5.0 mm. The brown elytral pattern is less developed in some specimens than in the holotype.

Etymology. The species is named after Petr Kuz'mich Kozlov (1863–1935), a renowned Russian explorer of Central Asia and leader of the expedition to Tibet in 1899–1901. During this expedition, the type specimens of *A. kozlovi* sp. n. were collected.

Material examined. Holotype, male with labels (all labels are in Russian): “Vodorazd. Golub. i Zhelt. rr. [= Chang Jiang and Huang He rivers watershed], rechka Gorin-chyu [= Gorin-chyu River]. Ok. 14.000' [ca. 4250 m], V.1901. Eksp. Kozlova [= Kozlov's exped.]” (ZIN). Paratypes: 2 females and 3 males, as holotype; 3 males with label “Bass. Golub. r., rechka Go-chyu [= Jiang River basin, Go-chyu River]. Ok. 13.500', V.1901. Eksp. Kozlova [= Kozlov's exped.]”

male and female with label "Yu. sklon khr. Burkhan-Budda [= southern slope of the Burhan Budai Shan Mt. Range], dol. oz. Alyk-nor [= valley of Lake Alyk-nor] [Alag Hu, 35°30' N, 96°50' E], 30.V.1900. Eksp. Kozlova;" male with label "Bass. Zhelt. r., rechka Serg-chyu [= Huang He River basin, Serg-chyu River]. 13.500', V.1901. Eksp. Kozlova [= Kozlov's exped.];" male with label "Dol. ozer. verkh. Khuan-khe [= upper Huang He River valley], Kon. VI.1900. Eksp. Kozlova." All paratypes are deposited in ZIN.

SUBFAMILY ORPHNINAE

Orphnus (Parorphnus) transvaalensis Frolov, sp. n.
(Figs. 3, 4, 13)

Diagnosis. *O. transvaalensis* sp. n. is most similar to another apterous *Orphnus* species recently described from South Africa, *O. harrisoni* Frolov, 2008, but differs from it in the following characters: rounded apices of parameres (Fig. 13), horn-shaped process on anterior margin of clypeus, wider and more curved part of propleura between lateral margin of pronotum and longitudinal keel on propleura (Fig. 4), and smaller body. In *O. harrisoni*, apices of the parameres are acute and more curved in lateral view (Fig. 12), the horn-shaped process is situated approximately at the center of the clypeus, part of the propleura between the lateral margin of the pronotum and the longitudinal keel is narrow (Fig. 5), the body length is 6.9–8.0 mm.

Description. Male, holotype (Fig. 3). Body size 5.2 mm, strongly shiny, monotonous dark brown. Clypeus wide, with somewhat convex anterior margin, rounded laterally. Genae very small, not protruding past eyes. Clypeus with slender horn-shaped tubercle (Fig. 4). Dorsal surface of clypeus sparsely punctate.

Pronotum strongly convex, with rounded lateral margins, about 1.5 times as wide as long. Disc of pronotum with punctures separated by 3–4 puncture diameters on disc, punctures becoming sparser laterally and anteriorly.

Scutellum rounded apically, small (constituting about 1/20 of length of elytra).

Elytra strongly convex, coarsely punctate, without humeral umbones. Wings absent.

Shape of fore tibia typical of *Orphnus* species. Fore tibia with 3 relatively long outer teeth; lateral margin basad of outer teeth not crenulate; ventral surface smooth, with 2 rows of setae along sides and several very long setae in middle. Middle and hind legs similar in shape; hind femora and tibiae about 1/8 longer

than middle femora and tibiae. Middle and hind tibiae almost impunctate, with apical margin curved, and with small transverse keel and 2 apical spurs.

Abdominal sternites irregularly punctate, pubescent with long sparse setae. Sternite VI as long medially as sternites II–V combined.

Parameres with rounded apices in lateral view (Fig. 13). Internal sac of aedeagus without sclerotized armature.

Etymology. The name of the species originates from the historical name of the north-eastern part of South Africa (Transvaal Province).

Type material. Holotype, male with labels "Bonnefoi Transvaal [probably, Bonnefoi farm in Mpumalanga, RSA, 25°55' S, 30°11' E]," "Transvaal," "Coll. C. Felsche Kanf 20, 1918," "spec. ign.," "Gen.? Orphnidarum," "Orphnus species?," "Staatl. Museum für Tierkunde Dresden" (SMTD).

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