

**A contribution to knowledge of the Aphodiidae (Coleoptera) IV.
Review of the *Aphodius* ILLIGER species of the subgenus *Carinaulus*
TESAŘ with a description of 11 new species from
the Palearctic and Oriental regions**

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ČERVENKA R. 2000: A contribution to knowledge of the Aphodiidae IV. Review of the *Aphodius* ILLIGER species of the subgenus *Carinaulus* TESAŘ with a description of 11 new species from the Palearctic and Oriental regions. *Acta Musei Moraviae, Scientiae biologicae* (Brno) 85: 29–51. – Eleven new species of the subgenus *Carinaulus* TESAŘ (genus *Aphodius* ILLIGER) from China (*A. armandidavidi*, *A. dundarum*, *A. gansuicus*, *A. imitabilis*, *A. jakli*, *A. krali*, *A. milanikodymi*, *A. tryznai*, *A. wrzecionkoi*, *A. zhanglaensis* spp.nov.), and India (*A. meghalayensis* sp.nov.) are described and compared with related species. Diagnostic characters including male genitalia are illustrated. A description of the male of *Aphodius vseteckai* TESAŘ is given. Subgenus *Oxyaphodius* BALTHASAR, 1965 is considered a junior synonym of the subgenus *Carinaulus* TESAŘ. A key to species of the subgenus *Carinaulus* TESAŘ is given.

Key words: Taxonomy, Coleoptera, Scarabaeoidea, Aphodiidae, *Aphodius*, *Carinaulus*, *Oxyaphodius*, new species, new synonymy, Palearctic and Oriental regions

Introduction

Carinaulus TESAŘ, 1945 is a subgenus of *Aphodius* ILLIGER (Coleoptera, Scarabaeoidea, Aphodiidae). It was described as a monotypic subgenus based on type species *A. (C.) vseteckai* TESAŘ, 1945 from western China, Sichuan province.

BALTHASAR (1961) described another species *A. (C.) pucholti* from eastern China and later *A. (C.) dierli* BALTHASAR, 1967, the first species distributed outside Chinese borders (Nepal).

BALTHASAR (1965) described the monotypic subgenus *Oxyaphodius* BALTHASAR, 1965 [type species: *A. (O.) sikkimensis* BALTHASAR, 1965] differing from *Carinaulus* in the structure of the elytra. The material examined by the author of the present paper proved that a sharp border in elytral structure between subgenus *Carinaulus* and *Oxyaphodius* does not exist and therefore the subgenus *Oxyaphodius* is considered as a junior synonym of subgenus *Carinaulus*.

NIKOLAJEV (1979) described *Aphodius (Carinaulus) nigrocarinatus* NIKOLAJEV, 1979 from the Russian far east, which was later synonymized by STEBNICKA & GALANTE (1991) with *Aphodius (Agrilinus) inexpectatus* BALTHASAR, 1935. In the opinion of the author of this paper, this species belongs in the subgenus *Carinaulus*.

The final species of the subgenus *Carinaulus* – *A. (C.) coreensis* KIM, 1986 – was described from Korea.

The descriptions of further eleven new species of the subgenus *Carinaulus* and a key to the species of the subgenus are subject of this paper.

Abbreviations

DKCP	David Král collection, Prague, Czech Republic
MHK	Museum Hradec Králové, Czech Republic
MHNG	Muséum d'Histoire Naturelle, Geneve, Switzerland
MNHNP	Muséum national d'Histoire Naturelle, Paris, France
MNP	Národní muzeum v Praze, Prague, Czech Republic.
RCCP	Radek Červenka collection, Prague, Czech Republic.

Subgenus *Carinaulus* TESÁŘ, 1945

Aphodius (*Carinaulus*) TESÁŘ, 1945: 66. **Type species:** *Aphodius* (*Carinaulus*) *vseteckai* TESÁŘ, 1945: 66 (by monotypy).

Aphodius (*Oxyaphodius*) BALTHASAR, 1965: 314. **Type species:** *Aphodius* (*Oxyaphodius*) *sikkimensis* BALTHASAR, 1965: 314 (by monotypy). **Syn. nov.**

Diagnosis. Species of medium size, clypeus wide, emarginate anteriorly. Frontal suture with or without tubercles, sometimes the tubercles present in only one sex. Base of pronotum always bordered. Scutellum triangular. Structure of elytra variable; elytral intervals ranging from flat to cariniform, grooves usually with very transverse punctures which usually distinctly, sometimes coarsely, render the margins of the intervals crenate. Intervals sometimes “doubled”, sometimes more or less raised in the middle, shelving down laterally. Anterior tibiae with 3 outer teeth. The apical setae of the middle and posterior tibiae usually short and tough, more or less equal in length, exceptionally distinctly unequal in length.

Distribution. China, Korea, Russian far east, Nepal, India (Meghalaya).

***Aphodius* (*Carinaulus*) *meghalayensis* sp.nov. (Figs 1a, b)**

Type locality. NE INDIA, W Meghalaya prov., Garo Hills, Nokrek Nat. Park, 1,150 m, 25°40'N, 91°04'E.

Type material. Holotype (male), allotype (female) and 5 paratypes (Nos 1–5, 12–19): NE INDIA, W Meghalaya, Garo Hills, Nokrek Nat. Park, 1,150 m, 25°40'N, 91°04'E, 13.–22.vii.1997; 6 Paratypes (Nos 6–11): INDIA, Shillong, xii.1967. Holotype in RCCP.

Description. Length: 4.6–5.9 mm, combined length of elytra and pronotum 4.0–5.0 mm. Meanly convex, glabrous, head and pronotum almost mat, elytra feebly glossy. Body yellowish brown, disc of pronotum brown, elytra with irregular black-brown marking. Anterior legs light brown, middle and posterior ones darker brown. Elytra feebly widened towards the apex.

Male. Head transverse, feebly convex, with three distinct tubercles, the lateral ones smaller, transverse, situated at frontal suture, the middle tubercle distinctly separated, round, large, situated just in front of frontal suture which is fine but distinct, not elevated, curved forwards. Clypeus feebly and widely emarginate anteriorly, clypeal angles indicated. Sides of clypeus straight, genae practically not separated viewed directly from above, separated in lateral view. Genae rectangular, distinctly exceeding eyes, their tips

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rounded, with several short hairs. Punctuation of clypeus rather fine, quite dense and almost regular. Punctuation of vertex similar to that of clypeus.

Anterior margin of pronotum without border, posterior one distinctly bordered, the border separated from disc of pronotum by a fine groove. Punctuation of pronotum double, fine punctures intermixed with medium-sized ones, their size ratio 1:2 to 1:2.5. On the disc the fine punctures prevail, the larger ones being rare; punctures separated by approximately 2–6 diameters. Punctuation becoming denser laterally, with medium punctures more abundant than on disc, with punctures separated by approximately 0.5–3 diameters. Sides of pronotum rounded, pronotum widest in the middle. Anterior angles rounded, posterior ones obtuse, indicated. Base of pronotum as wide as base of elytra.

Scutellum triangular, shagreened, with several punctures. Elytra feebly glossy, glabrous. Elytral grooves rather fine, with transverse punctures rendering margins of intervals finely crenate only in anterior portion of discal intervals. Intervals convex, in apical portion roof-shaped, shagreened in a way that is especially noticeable laterally. Punctures of intervals almost indistinct, concentrated along lateral margins. Median portion of intervals without punctures. Sutural interval in apical declivity depressed, fine punctures situated in one row on each side of the elytral suture. Elytra with small humeral teeth.

Apical spur of anterior tibia rounded at the tip, reaching the midlength of the second tarsal segment. Lower terminal spur of middle tibiae normal, not reduced, approximately twice as short as the upper one. Apical setae of middle and posterior tibiae short, equal in length. Metatarsus distinctly longer than the upper tibial spur of posterior tibiae and as long as the three following tarsal segments combined.

Female. Whole body including pronotum widened towards the apex, pronotum widest at posterior angles. Head without tubercles, more convex than in the male, punctures coarser than in male. Middle-sized punctures also more abundant on disc of pronotum, punctures coarser.

Bionomy. The specimens of the new species captured in Garo Hills were collected at temperatures of + 5°C to + 9°C.

Distribution. India (Meghalaya).

Name derivation. The species is named after Meghalaya, an Indian state.

Differential diagnosis. The new species differs from all other species of the subgenus *Carinaulus* in elytra bearing markings and punctures of elytral grooves not rendering margins of intervals crenate.

Aphodius (*Carinaulus*) *zhanglaensis* sp.nov.

(Figs 2a, b)

Type locality. C CHINA, W Sichuan prov., Songpan.

Type material. Holotype (male) and 1 paratype (No. 1): CHINA, Sichuan, Songpan; allotype (female) and 10 paratypes (Nos 2–11): CHINA, Sichuan, Zhangla. Holotype in RCCP.

Description. Length: 5.6–6.5 mm, length of elytra and pronotum: 4.6–5.4 mm; convex, head and pronotum black, clypeus with narrow red-brown border, sides of pronotum (or

sometimes only anterior angles) widely red-brown, elytra red-brown. Vertex and pronotum (except for coarse punctures of pronotum which are mat) glossy, clypeus almost mat, elytra in apical third completely mat, elevated median portion of intervals in basal two thirds of elytra glossy. Forebody glabrous, only discal intervals and apex of elytra with fine but distinct grey hairs. Shape of body subparallel, especially noticeable in female. Elytra of male feebly widened towards the apex. Legs brown.

Male. Head transverse, convex, without tubercles. Frontal suture distinct, straight, not elevated. Sides of clypeus rounded. Clypeus shallowly emarginate anteriorly, clypeal angles widely rounded, punctation fine, almost regular, not very dense. Sides of clypeus distinctly separated from genae. These ear-shaped, widely rounded, protruding, distinctly exceeding eyes. Tips of genae with several fine hairs. Punctation of vertex equal in size to that of clypeus, but a little bit denser.

Anterior margin of pronotum without border, posterior margin bordered. The border separated from the rest of pronotum by a groove, in which a row of dense and coarse punctures is present. Punctation of pronotum very irregular, double. Very fine punctures on disc intermixed with very coarse ones, their diameter ratio approximately 1:5 to 1:6. Near basal margin the coarse punctures are denser to confluent at several spots. Towards lateral margins the coarse punctures become smaller than on disc, but confluent, the fine punctures very rare. Sides with narrow, rimmed margin, in anterior half rounded, in basal half straight. Pronotum widest near posterior angles, which are deeply cut, angles rounded. Anterior angles rounded. Base of pronotum approximately as wide as base of elytra.

Elytra in lateral and apical portions shagreened, deeply mat, on disc of elytra elevated discal portions of intervals shining. Borders of intervals also shining. Cross-section of intervals bell-shaped, their median portions rounded, elevated, glossy, with fine punctures while lateral part deeply mat, strongly shagreened, punctation invisible. In apical portion of elytra intervals flat, completely mat, disc without elevation, which is replaced by a row of very fine but distinct hairs. Striae glossy, 2.5 times narrower than intervals, on disc of elytra with rounded dense punctures which render the margins of intervals distinctly crenate; towards apex punctures disappearing. Sutural intervals elevated from base to apex, in basal half glossy, with fine punctures, in apical half shagreened, punctures disappearing, on apical declivity without traces of punctation. In humeral portion punctation of elytra dense to confluent. Epipleura visible in apical half of elytra viewed directly from above. Scutellum triangular, sides slightly rounded, apex shining, near base shagreened, with several, usually confluent, punctures. Elytra without humeral teeth.

Apical spur of anterior tibiae thick, curved outwards, reaching midlength of the second tarsal segment, its tip rounded. Lower apical spur of middle tibiae very short, reduced, approximately five times shorter than the upper one. Apical setae of middle and posterior tibiae approximately equal in length (on long side of the apex of tibia). Metatarsus almost 1.5 times longer than the upper terminal spur of posterior tibiae and longer than the three following tarsal segments combined.

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Female. Lower apical spur of middle tibiae longer than in the male, approximately 2.5 times as short as the upper one. Head and pronotum smaller and elytra relatively more robust than in the male.

Distribution. China (Sichuan).

Name derivation. The name of the species is a noun in the nominative, named after Zhangla village, Sichuan province, China.

Differential diagnosis. The new species is provisionally classified in the subgenus *Carinaulus*. It differs from all other species of the subgenus *Carinaulus* in the posterior angles being cut (which puts this species close to subgenus *Phaeaphodius* REITTER, 1892); in punctuation of the pronotum, which is very irregular and coarse and in the elytra having a different colour than the head and pronotum.

Aphodius (*Carinaulus*) *milaninikodymi* sp.nov. (Figs 3a, b)

Type locality. W CHINA, Qinghai prov., valley 40 km S of Huangyuan, 2,500 m.

Type material. Holotype (male) and 1 paratype (No. 1): CHINA, Qinghai reg., valley 40 km S of Huangyuan, 2,500 m, 6.–8.vii.1990. Holotype in RCCP.

Description. Length: 6.4–6.8 mm, length of elytra and pronotum 3.7–3.8 mm. Feebly convex, forebody glossy, elytra near base, striae and discal portion of intervals glossy, the rest of elytra shagreened, mat, especially noticeable on apical declivity. Glabrous, colour of body red-brown, shape of body elongate oval. Legs brown.

Male. Head relatively robust, as long as wide, convex, with one small central tubercle situated just on frontal suture, which is distinct only in the middle and laterally near genal margins. Clypeus anteriorly widely emarginate, laterally with indicated angles. Sides of clypeus nearly straight, passing fluently into genal edge. Punctuation of clypeus fine and not too dense on disc, more distinct and denser near anterior and lateral margins. Genae small, roundly obtuse-angulate, a little exceeding eyes, with several short hairs at the tip. Punctuation of vertex approximately the same as that near anterior and side margins of clypeus.

Anterior margin of pronotum without border, base bordered, twice emarginate. Border of the sides rimmed. Punctuation of pronotum triple, on disc fine punctures intermixed with medium ones, the coarse ones being very rare there. The coarse punctures dominate near lateral margins and base of pronotum. Pronotum in discal portion with a narrow, impunctate, smooth longitudinal area. Sides of pronotum slightly rounded, in basal half subparallel. Maximum width of pronotum before midlength. Anterior angles widely rounded, posterior ones indicated. Base of pronotum a little wider than base of elytra.

Elytra glabrous, shagreened, mat, only basal area distinctly and striae feebly shining. Scutellum triangular, sides slightly rounded. Surface of scutellum finely punctate. Striae shallow on disc, deeper near apex, rather narrow, approximately three to four times narrower than intervals. Punctures of striae transverse, rendering margins of intervals distinctly crenate near base, more rounded and more feebly crenated margins of intervals

on disc but disappearing towards apex. Intervals roof-shaped, their median portions only moderately elevated, glossy, punctation visible near base, disappearing towards apex. Lateral portions of intervals strongly shagreened, mat, without punctures. Sutural intervals elevated from base to apex, shagreened, with punctures situated in one row in basal third and disappearing towards apex punctures. Epipleura visible approximately in apical two thirds of elytra in dorsal view. Elytra with indication of humeral teeth.

Apical spur of anterior tibia reaching the beginning of the second tarsal segment, slightly curved outwards, sharp at the tip. The base of the spur is situated just opposite to the central outer tooth of the anterior tibiae. Lower terminal spur of middle tibiae not reduced, longer than half length of the upper one. Apical setae of middle and posterior tibiae distinctly unequal in length. Metatarsus as long as the upper terminal spur of posterior tibiae and as long as the three following tarsal segments combined.

Female unknown.

Distribution. China (Qinghai).

Name derivation. The species is dedicated to my friend Milan Nikodým (Prague, Czech Republic), a specialist in the Glaphyridae (Coleoptera, Scarabaeoidea).

Differential diagnosis. The new species differs from the related species *Aphodius vseteckai* TESAŘ and *Aphodius pucholti* BALTHASAR in the features stated in the key.

***Aphodius (Carinaulus) tryznai* sp.nov.**

(Figs 4a, b)

Type locality. W CHINA, SE Tibet, Chola Shan pass, Yanjing – Markam road, cca 4,400 m, 29°16'N, 98°38'E, alpine meadow.

Type material. Holotype (male), allotype (female) and 5 paratypes (Nos 1–5): CHINA, SE Tibet, Chola Shan pass, Yanjing – Markam road, ca 4,400 m, 29°16'N, 98°38'E, alpine meadow, 24.–27.vi.1997; 2 paratypes (Nos 6–7): CHINA, E Tibet, Lao Shan pass, Markam – Zogang road, 10 km W of Markam, ca 4,300 m, 29°42'N, 98°32'E, alpine meadow, 27.–28.vi.1997; 2 paratypes (Nos 8–9): CHINA, W-Sichuan, Chola Shan, Maniganggo – SW env. mts, 31°50'N, 99°07'E, 4,000–4,600 m, 12.vi.1992; 1 paratype (No. 10): CHINA, W Sichuan, Litang – Yajiang road, pass 20 km W Yajiang, 3,500 m, alpine region, 23.–24.vii.1994; 4 paratypes (Nos 11–14): CHINA, SE Tibet, “Chola Shan” pass, Yanjing – Markam road, 50 km S of Markam, ca 4,200 m, 29°16'N, 98°38'E, alpine meadow, 26.–29.vii.1998; 20 paratypes (Nos 15–34): CHINA, SE Tibet, “Zhong La Shan” pass, 5 km E of Markam, alpine meadow, ca 4,100 m, 3.–6.viii.1998. Holotype in RCCP.

Description. Length: 5.8–6.9 mm, length of elytra and pronotum 3.1–3.8 mm. Body elongate-oval, moderately convex, grey-black, mat, only transverse punctures of elytral striae glossy. Elytral intervals setaceous. Legs black-brown.

Male. Head convex, trapezoid, without tubercles. Frontal suture very fine, twice emarginate. Sides of clypeus almost straight, anterior margin rimmed, faintly emarginate, sides rounded. Punctures of clypeus rounded, regular, not very dense, punctures of vertex coarser.

Anterior margin of pronotum not bordered, sides and base bordered. Lateral margins rimmed. Border of base separated from pronotum by a row of punctures. Punctation of pronotum irregular, treble, oculate, dense but not confluent, distance between punctures less than their diameter. Fine punctures abundant mainly on disc, medium-sized ones occurring on whole surface of pronotum, the largest ones concentrating near base and

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posterior angles. Sides of pronotum rounded in anterior half, subparallel to slightly diverging in basal half. Maximum width of pronotum near posterior angles, these obtuse, their tips blunt. Anterior angles indicated, approximately rectangular. Base of pronotum slightly wider than base of elytra.

Elytra shagreened, mat. Scutellum narrow, triangular, its sides and tip rounded, surface shagreened, with several punctures in basal portion. Elytral striae wide, approximately 1.5 times as narrow as intervals, with transverse punctures which strongly and sharply render the margins of intervals crenate, making them serrated. Elytral intervals completely flat, with 2 to 3 round punctures on the width of the intervals. Each puncture bears a seta. Median portions of sutural intervals distinctly elevated in discal portion of elytra, feebly so on apical declivity, lateral portions of these intervals slope down onto the level of remaining intervals. Disc of sutural intervals punctate, punctures disappearing towards apex. Humeral portion of elytra with coarse punctures. Epipleura not visible viewed from above. Elytra with indicated to very small humeral teeth.

Apical spur of anterior tibiae slightly curved outwards, reaching nearly the midlength of the second tarsal segment, its tip rounded. Lower apical spur of middle tibiae not reduced, twice as short as the upper one. Apical setae of middle and posterior tibiae short, more or less equal in length. Posterior tibiae only normally widened apically, apical width of tibia / length of tibia ratio approximately 1:3.13, i.e. posterior tibia more than 3 times longer than apical width of the tibia. Metatarsus one third shorter than the upper terminal spur of posterior tibiae and as long as the two following tarsal segments combined.

Female. Punctures of the disc of pronotum deeper and the medium-sized ones much more abundant there than in the male. Apical spur of anterior tibiae narrower than in the male.

Distribution. China (Tibet, Sichuan).

Name derivation. The species is dedicated to my friend Miloš Trýzna (Děčín, Czech Republic), a specialist in the Anthribidae (Coleoptera).

Differential diagnosis. The species differs from the related species *Aphodius wrzecionkoi* sp.nov. in the features stated in the key.

Aphodius (*Carinaulus*) *imitabilis* sp.nov.

(Figs 5a, b)

Type locality. SW CHINA, NW Yunnan prov., Baimaxueshan pass, 4,900 m.

Type material. Holotype and 2 paratypes (Nos 1–2): CHINA, NW Yunnan, Baimaxueshan pass, 4,900 m, 8.–10.vi.1993. Holotype in RCCP.

Description. Length: 4.8–6.2 mm, length of elytra and pronotum 4.3–5.5 mm. Meanly convex, forebody black, sides of pronotum with brown border, elytra dark black-brown to black. Body with silky gloss, punctures of pronotum, striae and sutural intervals of elytra distinctly glossy. Elytral intervals and surface of pronotum with fine, grey, microscopic hairs. Shape of body elongate oval. Legs black-brown, anterior ones lighter than middle and posterior ones.

Male. Head transverse, convex in the middle, without tubercles. Frontal suture fine but distinct, in one paratype more distinct at the sides than in the middle, feebly curved towards the apex. Sides of clypeus rimmed, regularly rounded, almost fluently passing into genal edge (viewed directly from above). Anterior margin of clypeus not too deeply emarginate, laterally widely rounded. Punctuation of clypeus and vertex regular, punctures rather large, their spacing approximately equal to their diameter. Genae widely rounded, protruding, strongly exceeding eyes, their tips with several hairs.

Pronotum at anterior margin without border, base and sides bordered. Sides straight, diverging towards the apex. Pronotum widest at posterior angles. Anterior angles widely rounded, posterior ones indicated, obtuse-angulate. Base of pronotum slightly wider than base of elytra. Punctuation irregular, triple, rather dense, near lateral margins very dense. On disc the fine punctures intermixed with coarse ones, the distance between punctures equal to 1–2 their diameters, near anterior margin only medium-sized punctures present (as large as those of the head), their spacing approximately 0.5–1.5 times their diameters, near lateral margins coarse punctures prevail, fine punctures rare, spacing of punctures less than their diameter.

Elytra shagreened, with silky gloss, elytral grooves, elevated portion of sutural intervals and apical declivity distinctly glossy. Each interval with two rows of light microscopic hairs (x 35). Scutellum narrow, triangular, shagreened, with several punctures near base, sides arcuate. Elytral striae less than twice as narrow as intervals, with regular, deep, transverse punctures which render margins of intervals crenate. Intervals flat or almost flat, with feebly elevated, smooth, less shagreened narrow median portion, visible at least near apical declivity of elytra, in holotype from base to the beginning of apical declivity of elytra. Punctuation of intervals arranged in two rows, punctures not dense, rounded. Median portion of sutural intervals elevated from scutellum to the beginning of apical declivity, elevated portion slopes down on both sides to the level of remaining intervals. Punctures concentrate in one row near both margins of elevated portion, punctures elongated, their spacing uneven. Epipleura visible in apical half of elytra viewed directly from above. Elytra with distinct humeral teeth.

Apical spur of anterior tibiae slightly curved outwards, reaching over the midlength of the second tarsal segment. Lower terminal spur of mesotibiae not reduced, approximately twice as short as the upper one. Apical setae of middle and posterior tibiae short, more or less equal in length. Metatarsus approximately equal in length to the upper terminal spur of posterior tibiae and as long as the two following tarsal segments combined.

Female unknown.

Distribution. China (Yunnan).

Name derivation. *Imitabilis* is a Latin adjective meaning 'imitating'. It is chosen because of the similarities with other *Carinaulus* species in the structure of the head and pronotum.

Differential diagnosis. The new species differs from the closely related *Aphodius sikkimensis* BALTHASAR in the features stated in the key.

Aphodius (*Carinaulus*) *krali* sp.nov.

(Figs 6a, b)

Type locality. SW CHINA, N Yunnan prov., 27°49'N, 99°34'E, 3,800–4,200 m, mts 15 km W of Zhongdian.

Type material. Holotype, allotype and 10 paratypes (Nos 1–10): CHINA, N Yunnan, 27°49'N, 99°34'E, 3,800–4,200 m, mts 15 km W of Zhongdian, 22.–24.vi.1994. Holotype in DKCP.

Description. Length: 5.4–6.3 mm, length of elytra and pronotum 4.9–5.3 mm. Meanly convex, deeply mat, grey-black, elytra and pronotum with short light hairs. Body elongate oval, widened towards the apex. Legs brown-black to black, glossy.

Male. Head convex in the middle, without tubercles. Frontal suture fine but distinct, twice emarginate. Anterior margin of clypeus shallowly emarginate, clypeal angles widely rounded. Clypeal margin narrow, slightly rimmed. Sides of clypeus slightly arcuate, fluently passing into genae. Punctuation of clypeus and vertex regular, quite dense, the spacing of punctures approximately one or little bit more their diameters. Punctures of medium size. Genae rounded, distinctly exceeding eyes, their tips with several grey hairs.

Anterior margin of pronotum without border, base very narrowly bordered. Border of pronotal sides wider, rimmed. Sides of pronotum rounded, pronotum widest behind midlength (towards base). Anterior angles rectangular, indicated, posterior ones rounded (viewed laterally). Base of pronotum wider than base of elytra. Punctuation of pronotum dense, triple, spacing of punctures less than their diameter on whole surface; on disc abundant coarse punctures, which are oculate and medium-sized, and intermixed with sparse small punctures, near anterior margin the medium-sized punctures prevail, near base and especially at posterior angles only the coarse punctures present.

Elytra deeply mat including striae and strial punctures. Intervals with short yellowish grey hairs. Scutellum narrow, triangular, sides slightly arcuate, tip sharp. Surface of scutellum shagreened, mat, with several punctures. Striae deep, wide, almost twice as wide as the intervals, not distinctly separated from intervals. Punctures of grooves transverse, dense, spaces between punctures keel-shaped. Intervals convex, from elevated portion sloping down and fluently passing into the transverse keels of grooves. Intervals punctate, with two to three punctures on the width of interval, each puncture bearing a hair. Sutural intervals high, elevated, discal portion of both sutural intervals keel-shaped, sloping down towards elytral suture. Keel-shaped portion of sutural intervals less shagreened, with elongate punctures, which form an irregular row. Epipleura visible in apical half viewed directly from above. Elytra with very small humeral teeth.

Apical spur of anterior tibia slightly curved outwards, sharp at the tip, reaching the midlength of the second tarsal segment. Lower terminal spur of mesotibia not reduced, approximately twice as short as the upper one. Apical setae of meso- and metatibiae short, more or less equal in length. Metatarsus a little bit longer than the upper terminal spur of metatibia and slightly longer than the two following tarsal segments combined.

Female. Punctures of the elytral grooves coarser and deeper, intervals between them narrower than in the male. Punctures on the head larger than in the male. Body plumper, larger oval.

Distribution. China (Yunnan).

Name derivation. The species is dedicated to my friend David Král (Prague, Czech Republic), a specialist in the Aphodiidae (Coleoptera, Scarabaeoidea).

Differential diagnosis. The new species differs from all other species of the subgenus in having elytral intervals not distinctly separated from grooves.

Aphodius (Carinaulus) jakli sp.nov.

(Figs 7a, b)

Type locality. N CHINA, S Gansu, env. Langmusi, 4,000 m.

Type material. Holotype (male): CHINA, S Gansu prov., env. Langmusi, 4,000 m, 12.–16.v.1997. Holotype in RCCP.

Description. Length: 5.8 mm, length of elytra and pronotum: 5.0 mm. Male. Meanly convex, deeply mat, glabrous, grey-black, legs black-brown, tarsi lighter. Body subparallel.

Head trapezoidal, with convexity in the middle, without tubercles. Frontal suture fine but visible, curved backwards, not elevated. Clypeus shallowly emarginate anteriorly, laterally widely rounded, sides of clypeus nearly straight towards genae, which are not separated from the sides of clypeus viewed from above. Punctures of clypeus fine, rounded, sparse, those of vertex denser and larger. Genae obtuse-angulate, their tips indicated, with several yellowish hairs.

Anterior margin of pronotum without border, base and sides distinctly bordered. Sides of pronotum rounded, pronotum widest at the midlength. Anterior angles obtuse, their tips rounded (dorsal view), posterior ones obtuse, indicated (lateral view). Punctuation of pronotum triple, on disc the largest, distinctly oculate punctures intermixed with very fine ones, and punctuation here not very dense, the distance between punctures being usually larger than their diameter. Near sides the largest punctures smaller than on disc, punctuation denser. The medium-sized punctures occur only near anterior margin. Base of pronotum as wide as the base of elytra.

Elytra glabrous, shagreened, mat, except elevated, feebly but distinctly glossy, median portion of elytral intervals. Scutellum triangular, rather narrow, sides arcuate. Surface of scutellum strongly shagreened, with several punctures in basal half. Elytral striae rather wide but not deep, less than twice as narrow as intervals. Strial punctures transverse, narrow, rendering margins of intervals only finely crenate. Narrow median portion of the intervals elevated, glossy, while lateral portions strongly shagreened, mat, impunctate. Sutural intervals of the same shape as the other ones but on apical declivity of elytra flattened, glossy near suture. Epipleura visible in apical half viewed directly from above. Elytra in humeral portion rounded, without humeral teeth.

Apical spur of anterior tibia narrow, regularly curved outwards, reaching over the midlength of the second tarsal segment, its tip sharp. Lower terminal spur of middle tibia normal, not reduced, less than twice as short as the upper one. Apical setae of middle and

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posterior tibiae not equal in length. Metatarsus slightly shorter than the upper terminal spur of posterior tibia and shorter than the three following tarsal segments combined.

Female unknown.

Distribution. China (Gansu).

Name derivation. The species is dedicated to my friend Stanislav Jákl (Prague, Czech Republic), a specialist in the Cetoniidae (Coleoptera, Scarabeoidea).

Differential diagnosis. The new species differs from the closely related *Aphodius duNDARUM* sp.nov. in the features stated in the key.

Aphodius (*Carinaulus*) *wrzecionkoi* sp.nov.

(Figs 8a, b)

Type locality. W CHINA, E Tibet, Serkyimla, 4,900 m, 25 km E of Nyingtri [= ?Nyingchi]

Type material. Holotype (male): CHINA, E Tibet, Serkyimla, 4,900 m, 25 km E of Nyingtri [= ?Nyingchi], 11.vi.1997; in RCCP.

Description. Length: 6.9 mm, length of elytra and pronotum 6.2 mm. Meanly convex, mat, elytral intervals with fine setae, colour of the body grey-black, legs black. Body ovate.

Male. Head transverse, trapezoid, with central convexity. Frontal suture fine, straight, with distinct central tubercle. Clypeus slightly emarginate anteriorly, clypeal angles widely, regularly rounded. Sides of clypeus regularly arcuate towards genae. These not separated in dorsal view, distinctly separated in lateral view, narrowly angulate, rounded, exceeding eyes, their tips with several yellowish grey hairs. Punctures of clypeus fine, rounded, regular, not too dense, Punctures of vertex larger and denser.

Pronotum on anterior margin without border, base and sides finely bordered. Sides arcuate in anterior half, straight in basal half, diverging towards the apex, maximum width of pronotum thus near posterior angles. Anterior angles widely rounded, posterior ones obtuse-angulate in dorsal view, while in lateral view both anterior and posterior angles obtuse-angulate with indicated tips. Punctuation of pronotum triple, irregular, dense. On disc coarse punctures are intermixed with medium-sized ones, with the former prevailing; the distance between punctures usually less than their diameter. Near sides punctuation denser, in which the medium-sized punctures dominate, the distance between punctures always less than their diameter. Narrow strip near anterior margin is composed of fine punctures, similar to those of clypeus. Base of pronotum wider than the base of elytra.

Elytra mat, finely shagreened, elytral intervals with fine greyish setae. Scutellum narrow, triangular, shagreened, its sides slightly arcuate. Elytral striae rather deep, twice or more as narrow as intervals. Punctures in striae transverse, deeper than their intervals, rendering margins of intervals distinctly crenate, separated by one diameter or more. Elytral intervals flat (lateral intervals) to feebly convex (discal intervals), finely punctate to impunctate. Sutural intervals elevated, especially their sutural portions, which form a flat surface and slope laterally down from both edges to the level of other intervals.

Epipleura visible in apical half of elytra viewed directly from above. Elytra with indicated humeral teeth.

Apical spur of anterior tibia slightly arcuate, slender, reaching over the midlength of the second tarsal segment, tip of the spur rounded. Lower terminal spur of posterior tibia normal, not reduced, less than twice as short as the upper one. Apical setae of middle and posterior tibiae short, more or less equal in length. Posterior tibiae conspicuously widened apically, apical width of tibia : length of tibia ratio approximately 1:2.36, i. e. apical width of the tibia less than 2.5 times the length of the tibia. Upper terminal spur of posterior tibia distinctly longer than metatarsus, reaching midlength of the second tarsal segment. Metatarsus slightly longer than the two following tarsal segments combined.

Female unknown.

Distribution. China (Tibet).

Name derivation. The species is dedicated to my friend Antonín Wrzeczionko (Haviřov, Czech Republic), a specialist in the Coleoptera (Carabidae).

Differential diagnosis. The species is closely related to *Aphodius tryznai* sp.nov., from which it differs in the male in the presence of central tubercle on frontal suture, punctuation of pronotum is generally coarser and denser, elytral intervals are very finely punctate to impunctate and posterior tibiae are much more widened apically.

Aphodius (Carinaulus) dunderum sp.nov.

(Figs 9a, b)

Type locality. C CHINA, Sichuan prov., Gongga Shan, Hailuogou, above Camp 2, 29°35'N, 102°00'E, 2,600–2,750 m.

Type material. Holotype (male) and 7 paratypes (Nos 1–7): CHINA, Sichuan, Gongga Shan, Hailuogou, above Camp 2, 29°35'N, 102°00'E, 2,600–2,750 m, 3–6.vii.1998; allotype (female): CHINA, Sichuan, Kangding distr., Hailuogou Glacier Park, 21.–24.vii.1992; 1 paratype (No. 8): CHINA, Sichuan, Daxue Shan, Gongga Shan mt., Hailuogou Glacier Park, 102°04'E, 29°36'N, river valley ca 1 km above Camp I, 2,100 m, 28.–31.v.1997; 1 paratype (No. 9): CHINA, Sichuan, Daxue Shan, Gongga Shan mt., Hailuogou Glacier Park, track from Camp II to Camp I, 2,620–1,940 m, 31.v.1997. Holotype in DKCP.

Description. Length: 6.7 mm, length of elytra and pronotum: 5.8 mm. Meanly convex, mat, glabrous. Body black, anterior tibiae brown, middle and posterior ones black. Tarsi light brown, only first segment of middle and posterior tarsi darker. Body, especially elytra, widened towards the apex.

Female. Head short, transverse, feebly convex in the middle, without trace of tubercles. Frontal suture also indistinct. Clypeus shallowly emarginate anteriorly, widely rounded laterally. Sides of clypeus slightly arcuate towards genae, which are not separated from sides of clypeus in dorsal view while in lateral view they are distinctly separated. Genae obtuse-angulate, their tips rounded, with several greyish hairs. Punctures of clypeus regular, very fine, scarce, vanishing on vertex.

Pronotum on anterior margin without border, base and sides bordered. Border of sides wider than that of base, slightly rimmed. Base in the middle protruding backwards. Sides of pronotum rounded, pronotum widened backwards, maximum width near posterior angles. Anterior angles rounded in dorsal view, obtuse with indicated tips in

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lateral view; posterior angles widely rounded both in dorsal and lateral view. Base of pronotum wider than base of elytra. Punctuation of pronotum triple, irregular, not dense. On disc the largest, oculate punctures dominate and are intermixed with very fine ones (the latter being similar to those of clypeus). On the disc, the distance between punctures is one their diameter or more. Near anterior margin only very fine punctures present, becoming intermixed with medium-sized ones towards disc. Near sides and base punctuation denser, distance between punctures always less than their diameter; almost exclusively medium-sized ones present here, near base the largest ones with several of the finest ones amongst them.

Elytra glabrous, shagreened, mat, only suture and elevated median portion of the intervals glossy. Scutellum shagreened but glossy, triangular, its sides slightly arcuate. Elytral striae wide, on disc almost as wide as the intervals, lateral striae of the same width as the intervals. Striae deep, their punctures transverse, not dense, deeper than intervals between them, rendering margins of intervals distinctly crenate. Narrow median portion of the intervals elevated, glossy, while lateral portions strongly shagreened, mat, impunctate. Sutural intervals of the same shape as the other ones, their cross-section V-shaped emarginate from base to apex. Epipleura visible in two apical thirds of elytra in dorsal view. Elytra in humeral portion rounded, without humeral teeth.

Apical spur of anterior tibia slightly arcuate, with indicated tip, reaching over the midlength of the second tarsal segment. Lower terminal spur of middle tibia not reduced, less than twice as short as the upper one. Apical setae of middle and posterior tibiae short, more or less equal in length. Metatarsus as long as the upper terminal spur of posterior tibia and almost as long as the three following tarsal segments combined.

Male unknown.

Distribution. China (Sichuan).

Name derivation. The species is dedicated to my friend Radek Dunda (Prague, Czech Republic) – a specialist in the Attelabidae (Coleoptera), and to his brother Tomáš.

Differential diagnosis. The new species is related to *Aphodius jakli* sp.nov., from which it differs as follows: It has deeper and wider elytral grooves, the punctures of the grooves render the margins of the intervals distinctly crenate, the elevation of the discal portion of the intervals is higher, the punctuation of the disc of the pronotum is less dense than in *Aphodius jakli* sp.nov..

Aphodius (*Carinaulus*) *armandidavidi* sp.nov. (Figs 10a, b)

Type locality. C CHINA, W Sichuan prov., 20 km N Sabde, 3,200 m, 29°35'N, 101°23'E.

Type material. Holotype (male), allotype (female) and 5 paratypes (Nos 1–5): CHINA, W Sichuan, 20 km N Sabde, 3,200 m, 29°35'N, 101°23'E, 10.–16.vii.1998; 1 paratype (No. 6): “Thibet, Chasseurs de Ta-Tsien-lou [now W Sichuan, Kangding] 1895” (Paris Museum, ex coll. R. Oberthür). Holotype in DKCP.

Description. Length: 6.5 mm; length of elytra and pronotum: 6.0 mm. Meanly convex, black, mat, only clypeus near anterior and lateral margins feebly glossy, head and pronotum glabrous, each elytral interval with two rows of more distinct setae. Elytra very slightly widened towards the apex. Legs black-brown, shining.

Male. Head transverse, almost flat, clypeus with convexity in the middle. Frontal suture straight, feeble, without tubercles. Clypeus very slightly emarginate anteriorly, sides widely rounded, fluently linking to genal margins. Genae obtusely rounded, with several short setae. Punctuation of head shallow, medium-sized, that of clypeus simple, quite fine but dense to confluent near lateral margins.

Anterior margin of pronotum without border, base and lateral margins bordered. Lateral borders distinctly rimmed. Pronotum widened towards the apex, widest at posterior angles. Anterior angles rectangular, their tips rounded, posterior ones obtuse, indicated. Base of pronotum slightly wider than base of elytra. Punctuation of pronotum very irregular, triple. The finest punctures simple, the medium and the largest ones oculate, dense.

Elytra shagreened, especially lateral parts of intervals. Striae glabrous, each interval with two rows of grey setae. Elytral striae as wide as intervals, deep, with transverse grooves instead of punctures (striae : intervals ratio 1:1), these render margins of intervals very strongly crenate. Intervals scarcely punctate, towards lateral margins punctuation denser. Intervals very feebly cariniform, rounded on upper side. Scutellum narrow, triangular, shagreened, with several rather strong punctures; its apex widely rounded. Elytra with very small humeral teeth.

Apical spur of anterior tibia long, reaching over the midlength of the second tarsal segment, fluently bent outwards, narrowed towards the tip, which is almost pointed. Lower apical spur of middle tibia normal, not reduced. Apical setae of middle and posterior tibiae not equal in length; the setae are quite long on middle tibiae and the differences in length are not very great. Metatarsus slightly longer than the two following tarsal segments combined but distinctly shorter than the upper tibial spur of posterior tibia. Middle and posterior tibiae distinctly widened apically.

Female: Sexual dimorphism practically indistinct. Frontal suture indistinct, in one paratype very feeble. Base of elytra less narrower than base of pronotum than in male.

Distribution. China (Sichuan).

Name derivation. The species is dedicated to Mr. Armand David (France).

Differential diagnosis. The new species differs from the related species *Aphodius gansuicus* sp.nov. in the features stated in the key.

Aphodius (Carinaulus) gansuicus sp.nov.

(Figs 11a, b)

Type locality. CHINA. N Sichuan prov., Songpan.

Type material. Holotype (male), allotype (female) and 1 paratype (No. 1): CHINA, Sichuan, Songpan, 17.–18.vi.1996; 1 Paratype (No. 2): CHINA, Gansu, Dogcanglhamo, 4,200 m, 12.–15.vii.1990. Holotype in RCCP.

Description. Length: 5.8–6.4 mm, length of elytra and pronotum: 5.2–5.9 mm. Meanly convex, pronotum, vertex, disc of clypeus and elytral grooves with slight, silky shine, lateral and anterior portions of clypeus and elytral intervals distinctly shining. Body black to brown-black, sides of clypeus and pronotum lighter, more or less reddish. Middle and

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posterior legs dark brown, anterior ones lighter; tarsi lighter than tibiae. Body oblong-oval, not too widened towards the apex.

Male. Head short, transverse, with convexity in the middle. Frontal suture indicated only in the middle and on both sides near genal margin, without any protuberances. Clypeus very slightly emarginate anteriorly, widely rounded laterally. Sides of clypeus straight towards genae, which are practically not separated from the sides of clypeus in dorsal view, while being distinctly separated in lateral view. Punctuation of clypeus regular, fine but quite dense near anterior and lateral margins, punctures confluent on small middle convexity, near posterior margin denser than in anterior portion. Genae large, protruding, exceeding eyes approximately by their diameter, with sharp angles, their tips indicated and with several very fine, short hairs. Punctuation of vertex similar to that of contiguous portion of clypeus.

Anterior margin of pronotum without border, base and sides bordered. Border of the sides wider, rimmed, border of base separated from surface of pronotum by a groove with a row of coarse punctures. Sides of pronotum slightly arcuate in anterior half, near base straight, pronotum widened towards the apex. Maximum width of pronotum near posterior angles. Anterior angles rectangular, their tips rounded, posterior ones obtuse, their tips indicated in dorsal view, in lateral view anterior angles rectangular with indicated tips, posterior ones obtuse-angulate with indicated tips. Punctuation of pronotum irregular, dense, triple distance between punctures on whole surface of pronotum less than their diameter. Base of pronotum slightly wider than base of elytra.

Elytral striae and lateral portion of elytral intervals shagreened, mat, median portions of intervals on disc of elytra smooth, glossy, lateral intervals completely glossy. Elytral intervals with microscopic setae. Scutellum narrow, triangular, slightly shagreened but glossy, with several punctures near base. Sides of scutellum slightly arcuate. Elytral striae quite deep, narrower than intervals, punctures of striae transverse, dense, rendering elytral intervals coarsely crenate, the intervals between punctures less than their diameter, the punctures deeper than their intervals. The intervals convex, their cross-section widely bell-shaped, median portion of each interval elevated, lateral portions flat, the punctures fine and scarce, placed between elevated and flat portions of each interval. Lateral intervals flat, glossy, without elevated median portion. Sutural intervals glossy, near scutellum flat, towards apex each interval sloping down towards suture; fine punctures here present in basal fifth and on apical elevation, while on disc of elytra practically imperceptible. Epipleura visible in apical half viewed directly from above. Elytra with indicated humeral teeth.

Apical spur of anterior tibia reaching midlength of the second tarsal segment, its tip rounded. Lower terminal spur of middle tibia normal, not reduced, twice as short as the upper one. Apical setae of middle and posterior tibiae unequal in length. Metatarsus distinctly shorter than the upper terminal spur of posterior tibia and shorter than the two following tarsal segments combined.

Female. Body plumper. Genae less protruding, their tips less indicated and more rounded than in the male. Punctuation of clypeus near sides denser to confluent. Apical spur of anterior tibia more slender than in the male.

Distribution. China (Sichuan, Gansu).

Name derivation. The species is named after the Gansu province of China.

Differential diagnosis. The species differs from the related *Aphodius armandidavidi* sp.nov. in the features stated in the key.

***Aphodius (Carinaulus) coreensis* KIM, 1986**

Aphodius (Carinaulus) coreensis KIM, 1986: 7–11.

Type locality. KOREA, Seucheun-ri.

Remarks. This species was not examined.

Distribution. Korea.

***Aphodius (Carinaulus) dierli* BALTHASAR, 1967**

Aphodius (Carinaulus) dierli BALTHASAR, 1967: 123–125.

Aphodius (Carinaulus) dierli: STEBNICKA, 1986: 8–9.

Aphodius (Carinaulus) dierli: STEBNICKA, 1989: 4 (note).

Material examined. Paratype (female): NEPAL, Prov. Nr. 3 East Khumjung, 3,800 m, 22.vi.1964, W. Dierl leg. (deposited in MNP).

Remarks. This species was described on the base of holotype and single paratype. Since description, no additional specimens have become known to the author.

Distribution. Nepal.

***Aphodius (Carinaulus) inexpectatus* BALTHASAR, 1935 comb.subgen.nov.**

Aphodius (Agrilinus) inexpectatus BALTHASAR, 1935: 121.

Aphodius (Carinaulus) nigrocarinatus NIKOLAJEV, 1979: 99–100.

Aphodius (Agrilinus) inexpectatus: STEBNICKA & GALANTE, 1991: 727.

Aphodius (Carinaulus) nigrocarinatus: STEBNICKA & GALANTE, 1991: 727.

Type material. *A. (A.) inexpectatus*: Holotypus: Wladiwostok, Ost-Asien, Hermann Frieb, 19.viii.[19]19 (in coll. MNP).

Further material examined. E ROSSIA, S Primorye, Barabash: 18.viii.1981, 2 ex.; 10.viii.1981, S. Murzin leg., 1 ex. [labels written in Cyrillic alphabet] (deposited in RCCP); KOREA: Onpho ad Chongjin, 24.viii.1959, B. Pisarski et J. Prószyński leg., 1 ex.; N KOREA, Prov. Hamgyong P. north of Unggi, 22.iv.1986, Hwan-Song-Rin leg., 1 ex (both deposited in MHNG).

Remarks. Tesař's subgenus *Carianulus* was described in 1945, which was later than the year of description for *Aphodius inexpectatus*. Balthasar therefore could not place this species into subgenus *Carinaulus*. In the author's opinion *A. inexpectatus* BALTHASAR belongs to subgenus *Carinaulus* because its cariniform elytral structure is very close to the elytral structure of some other *Carinaulus* species, even though this structure is reduced for the apical half of the elytra. On the other hand, in the subgenus *Agrilinus* such a structure is not known; in all species of this subgenus the elytral intervals are flat or

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more or less convex, but never cariniform. NIKOLAJEV (1979) described *A. nigrocarinatus* and placed the species to the subgenus *Carinaulus*. *A. nigrocarinatus* was synonymized in 1991 with *A. inexpectatus* by STEBNICKA & GALANTE (1991).

Distribution. Russia (Far East), China, Korea.

Aphodius (*Carinaulus*) *pucholti* BALTHASAR, 1961

Aphodius (*Carinaulus*) *pucholti* BALTHASAR, 1961: 362.

Material examined. Holotype (female): CHINA, Fujian, Kuatun, 2,300 m, 27°40'N, 117°40'E, 17.iv.1938, L. J. Klapperich leg. (deposited in MNP).

Remarks. No additional specimens known since description. The geographical position as well as the height above sea level given on the label must be an error because the spot (27°40'N, 117°40'E) does not lie in the high mountains of Fujian province but in lowland part of Jiangxi province. Besides that, the highest spot of the whole region is Mt. Huanggangshan (2,157 m) which lies on the border between Fujian and Jiangxi provinces.

Distribution. China (Fujian).

Aphodius (*Carinaulus*) *vseteckai* TESAŘ, 1945 (Figs 12a, b)

Aphodius (*Carinaulus*) *vseteckai* TESAŘ, 1945: 66.

Type material. Holotype (female): C CHINA, Sichuan, Chong Qing (deposited in collection MHK).

Further material examined. CHINA, S Sichuan, Daliang Shan mts, Zhaojue vill. env., pass Xichang – Meigu vill., 12.–14.vi.1998, 10 ex. (coll. RCCP); CHINA, Sichuan, Kangding distr., Hailougou Glacier Park, 21.–24.vii.1992, 1 ex. (male); CHINA, N Yunnan, Zhongdian env., 6.–8.viii.1995, 4 ex; CHINA, C Yunnan, Weishan mt., 25°10'N, 100°21'E, 1,800–2,500 m, 22–25.vi.1992, 1 ex. (female); CHINA, N Yunnan, Zhongdian env., 3,200–3,300 m, 27°50'N, 99°36'E, 21.–22.vi.1996, 1 ex. (male); CHINA, N Yunnan, Yulongshan mts, 2,500–2,800 m, Ganhaizi/Lijiang road, 24.–26.vii.1990, 3 ex. (2 males, 1 female); CHINA, N Yunnan, 3,800–4,600 m, 27°19'N, 100°08'E, Habashan mts, E slope, 15.vii.1992, 1 ex. (male) (all specimens coll. DKCP).

Description. Length: 4.4–5.7 mm, length of elytra and pronotum: 3.7–4.9 mm. The original description by Tesař was based on a single female specimen. The male description is given below:

Male. Meanly convex, forebody feebly glossy, gloss of elytra and anterior portion of clypeus more distinct. Elytra with very short, yellowish setae. Body oblong-oval, only a little widened towards the apex. Colour of elytra brown, pronotum dark brown, clypeus and sides of pronotum lighter, reddish brown. Legs light brown.

Head trapezoid, with convexity in the middle. Frontal suture very fine, straight with distinct central tubercle and with transverse elevation on each side. Clypeus anteriorly shallowly emarginate, clypeal angles indicated, rimmed. Sides of clypeus arcuate towards genae. These feebly but distinctly separated from sides of clypeus, obtuse-angulate, their tips rounded, with several yellowish hairs. Punctuation of clypeus near sides and anterior margin fine, not very dense, towards central convexity punctures larger and denser, to

confluent on it. Punctures of vertex larger and denser than those of contiguous portion of clypeus but not confluent.

Anterior margin of pronotum without border, base and sides distinctly bordered. Border of sides rimmed. Sides of pronotum rounded, pronotum widest in the midlength. Anterior angles rounded, posterior ones obtuse, their tips indicated in dorsal view, while in lateral view anterior angles rectangular and posterior angles obtuse, their tips pointed. Punctuation of pronotum double, irregular. On disc punctures of middle size intermixed with fine ones, the first being more abundant; here the spacing of punctures usually equal or subequal to their diameter. Near sides the smaller punctures almost exclusively present, here very dense. Near anterior margin almost exclusively fine punctures occur, not very dense. Base of pronotum approximately as wide as base of elytra.

Elytra glossy, each interval with two rows of grey setae. Scutellum triangular, sides arcuate, surface with rather coarse punctures in basal two thirds. Elytral grooves rather deep, narrow, more than twice as narrow as intervals. Punctures of grooves transverse, rendering margins of intervals distinctly crenate. Spacing of punctures twice or more than twice their width. Intervals in discal portion elevated, here without punctures, rounded, each side with a row of fine but distinct punctures, each puncture bearing a seta. Sutural intervals elevated separately, on elevation punctate, sloping down towards the suture, here without punctures. Near apex sutural intervals almost flat. Epipleura visible in basal half in dorsal view. Elytra with small but distinct, sharp humeral teeth.

Anterior tibiae with three outer teeth, outer margin from base of tibia to the basal teeth with several small teeth. Apical spur of anterior tibiae slender, regularly curved outwards, reaching midlength of the second tarsal segment. Base of the spur grows out opposite to the interval between apical and middle outer teeth. Lower terminal spur of mesotibiae normal, not reduced, twice as short as the upper one. Apical setae of middle and posterior tibiae unequal in length. Metatarsus shorter than the upper terminal spur of posterior tibiae and approximately as long as the two following tarsal segments combined.

Distribution. China (Sichuan, Yunnan).

***Aphodius (Carinaulus) sikkimensis* BALTHASAR, 1965 comb. n.**

Aphodius (Oxyaphodius) sikkimensis BALTHASAR, 1965: 314–315.

Aphodius sikkimensis: STEBNICKA, 1986: 4 (note).

Type material. Holotype: NE INDIA, Sikkim, Tumlong env., 3,200 m. (deposited in MNP).

Further material examined. NEPAL, Langtang Nat. Park, Shing Gompa, 3,000 m, 25.v.1986, 3 ex.; NEPAL, Manaslu, ix.1980, Th. Deuve leg., 1 ex. (deposited in Museum Paris collection); W BHUTAN 16.–27.vii.1990, Thimphu distr., 2,500 m, Motithang, C. Holzschuh leg., 1 ex. (deposited in coll. D. Král, Prague).

Remarks. The subgenus *Oxyaphodius* was described by BALTHASAR (1965). The study of a large sample of different species confirmed that a sharp difference between the structure of the elytra of the subgenera *Oxyaphodius* BALTHASAR and *Carinaulus* TESÁŘ does not exist and therefore the subgenus *Oxyaphodius* is considered as junior synonym

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of the subgenus *Carinaulus*. The specimen from Bhutan is very large (8 mm) while the length of the holotype is 6.5 mm and the length of other examined specimens 6.7–6.8 mm.

Distribution. India (Sikkim), Nepal, Bhutan.

Key to species of the subgenus *Carinaulus* TESÁŘ, 1945

(The key does not contain *Aphodius coreensis* KIM.)

- 1(2) Elytra bicoloured, yellow-brown with black-brown marking. (The marking is noticeable in defatted specimens only!). Punctures of elytral striae do not render margins of intervals crenate. India: Meghalaya.....
..... *A. meghalayensis* sp.nov.
- 2(1) Elytra unicoloured, black, grey-black, brown or red-brown. Punctures of elytral striae render margins of intervals more or less crenate. China, Tibet, Russian Far East, Korea.
- 3(4) Head and pronotum black with red-brown border, elytra unicoloured, red-brown. Pronotum with very irregular, double punctation, larger punctures conspicuously coarse, punctures size ratio 1:5 to 1:6. China, Sichuan province. *A. zhanglaensis* sp.nov.
- 4(3) Body unicoloured, red, red-brown, brown, grey-black or black. Punctuation of pronotum different.
- 5(10) Body or at least elytra glossy, colour red, red-brown or brown.
- 6(7) Elytral intervals on disc normally convex but not elevated in median portion of each interval, in apical portion of elytra intervals strongly convex, with elevated median portion. Elytral striae shallow and narrow, approximately four times as narrow as intervals, punctures of striae rounded, rendering margins of intervals only a little crenate. Russian Far East, Korea.
..... *A. inexpectatus* BALTHASAR
- 7(6) Elytral intervals in whole length of elytra strongly and narrowly elevated in median portion of each interval. Elytral striae wider (maximum 2.5 times as narrow as intervals) and deeper than in previous species, punctures transverse, rendering margins of intervals strongly crenate.
- 8(9) Length 4.7 mm. Body red-brown. Punctuation of clypeus and pronotum generally coarser and more irregular. Smaller punctures on disc of pronotum less abundant than in the following species, difference between large and fine punctures larger. Strial punctures of elytra less transverse, rendering margins of intervals less crenate. Anterior angles of clypeus more angulate. Male unknown. Eastern China: Fujian province. *A. pucholti* BALTHASAR
- 9(8) Length 4.4–5.7 mm. Body dark brown. Punctuation of clypeus and pronotum quite dense but finer and much less irregular than in the previous species. Smaller punctures on disc of pronotum more abundant than in the previous species, difference between large and fine punctures smaller. Strial punctures

- of elytra more transverse, rendering margins of intervals more crenate. Anterior angles of clypeus more rounded. Western China: Sichuan province. *A. vseteckai* TESAR
- 10(5) Whole body or, at least, the major part of elytra mat, red-brown or grey black to black.
- 11(12) Body somewhat convex, red-brown, head and pronotum with silky shine, elytra in major part mat, only elytral striae and narrow, feebly elevated median portion of each interval glossy. *A. milaninikodymi* sp.nov.
- 12(11) Body more convex, mat, grey-black or brown-black to black (only in *A. imitabilis* forebody with silky gloss and elytra sometimes brown; see also *A. gansuicus* sp.nov. – point 25), structure of elytra very variable.
- 13(14) Elytral intervals not sharply separated from striae, fluently flowing into them. Punctures in elytral striae strongly transverse, dense, their spacing twice as close as their width. Elytral striae wider than intervals. China: Yunnan province. *A. krali* sp.nov.
- 14(13) Elytral intervals sharply separated from striae. Punctures in elytral striae less dense, their spacing always at least equal to their width. Elytral striae as wide as, or narrower than, intervals.
- 15(30) Lateral and discal intervals of elytra have the same structure.
- 16(23) Elytral intervals flat.
- 17(18) Large and robust species. Frontal suture with distinct central tubercle. Punctures in elytral striae a little transverse, maximum 1.5 times longer than wide, their spacing slightly more than their width, but smaller than in the following species. Elytral striae more than twice as narrow as intervals. China: Tibet autonomous region. *A. wrzecionkoi* sp.nov.
- 18(17) Smaller and less robust species. Frontal suture without tubercles. Punctures in elytral striae distinctly transverse, their spacing at the minimum twice their width. Elytral striae less than twice as narrow as intervals.
- 19(20) Whole body mat, only the punctures in elytral striae occasionally give some indication of gloss. Elytra with indicated humeral teeth. Punctures of elytral striae render margins of intervals strongly crenate, and therefore serrate. China, Tibet autonomous region. *A. tryznai* sp.nov.
- 20(19) All elytral striae glossy. Elytra with or without humeral teeth. Punctures of elytral striae render margins of intervals almost imperceptibly crenate.
- 21(22) Elytra with sharp humeral teeth. Sides of pronotum straight. Elytral striae shallow, narrow, twice as narrow as intervals. Head and pronotum with silky gloss. Elytra sometimes brown. Female unknown. China: Yunnan province. *A. imitabilis* sp.nov.
- 22(21) Elytra in humeral portion rounded, without humeral teeth. Sides of pronotum rounded. Elytral striae deep and almost as wide as intervals. Head and pronotum mat. India: Sikkim, Bhutan, Nepal *A. sikkimensis* BALTHASAR
- 23(16) Elytral intervals with more narrowly or widely elevated median portion.
- 24(27) Elevated median portion of elytral intervals noticeably wider than lateral, not elevated portion. Cross-section of intervals bell-shaped.

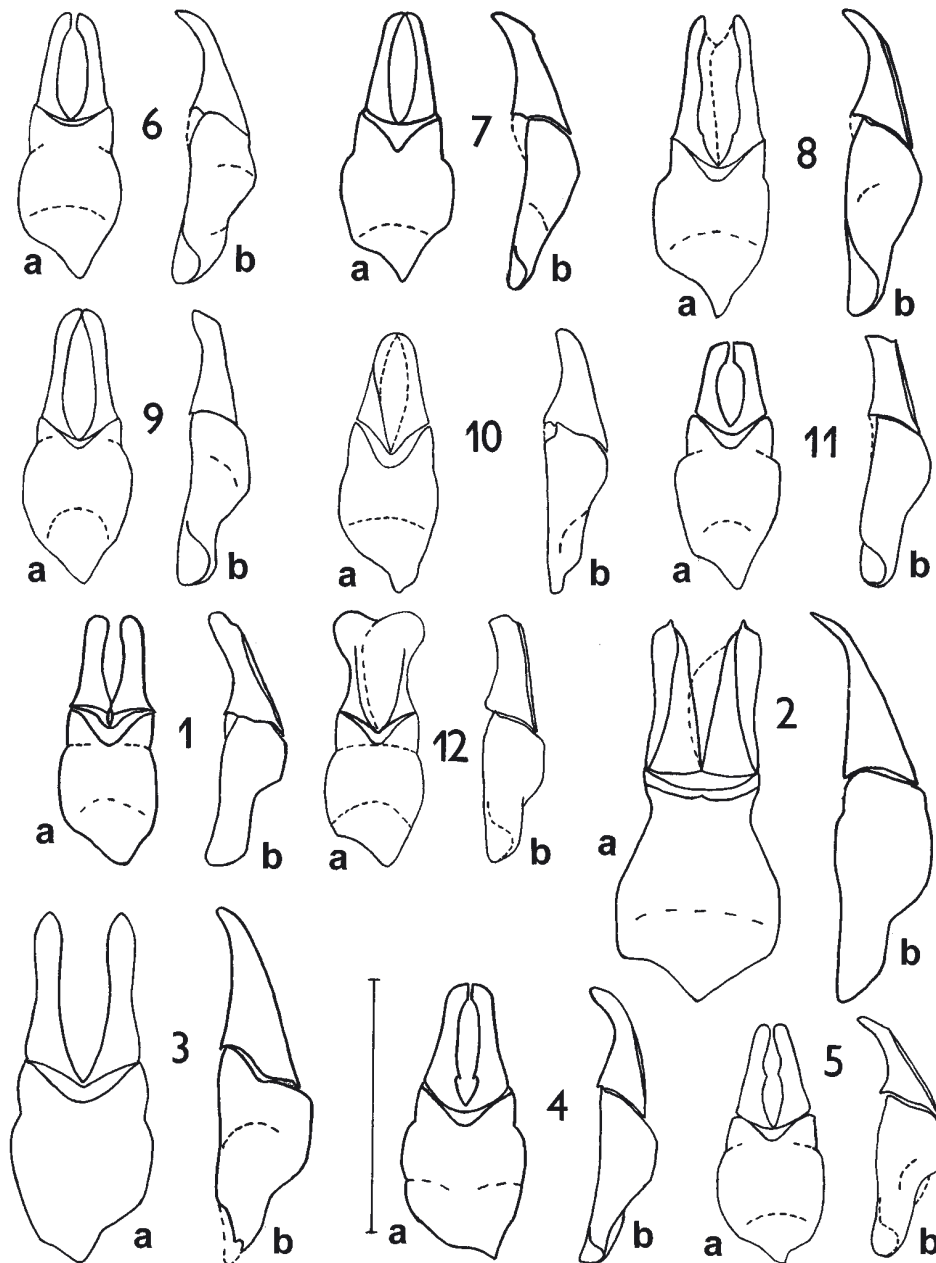
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- 25(26) Elevated median portion of elytral intervals smooth, glossy, without punctation or with only microscopic punctures. Elytral intervals narrower than striae. Pronotum in intervals between punctures distinctly glossy. Punctation of pronotum in general more uniform, on disc punctures shallower, their spacing closer than in the following species. Male: body less plump, genae sharp, more protruding. Punctation of clypeus near sides sparser, never confluent. Apical spur of anterior tibia wider than in female. China: Sichuan and Gansu provinces. *A. gansuicus* sp.nov.
- 26(25) Elevated median portion of elytral intervals with medium-sized, more or less elongated punctures which are arranged into two rows. Elytral intervals wider than in previous species, wider or as wide as striae. Pronotum in intervals between punctures mat, shagreened. Punctation of pronotum very coarse, punctures larger than in previous species, noticeable mainly near base. On disc of pronotum spacing of punctures wider than in previous species. Sexual dimorphism almost indistinct. China: Sichuan province *A. armandidavidi* sp.nov.
- 27(24) Elevated median portion of elytral intervals noticeably narrower than lateral, not elevated portion. Cross-section of the elevation has a shape of narrow keel.
- 28(29) Keel-shaped median portion of elytral intervals very low. Elytral striae very shallow and narrow, twice or only a little less as narrow as intervals. Punctures in elytral striae shallow, rendering margins of intervals only a little crenate. Elytral striae and not elevated portion of elytral intervals more finely shagreened. Female unknown. China: Gansu province. *A. jakli* sp.nov.
- 29(28) Keel-shaped median portion of elytral intervals high. Elytral striae deep, as wide or almost as wide as intervals. Punctures in elytral striae deeper, rendering margins of intervals strongly crenate, and therefore serrate. Elytral striae and not elevated portion of intervals more strongly shagreened. China, Sichuan province. *A. dundarum* sp.nov.
- 30(15) Lateral intervals of elytra on whole surface flat, shagreened and mat while sutural and two contiguous discal intervals with elevated median portion, which is smooth and glossy; elevated portion of discal intervals narrower than not elevated portion on each side. Elytral striae approximately twice as narrow as intervals. Nepal. *A. dierli* BALTHASAR

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Figs 1–12. Aedeagi: a, dorsal view, b, lateral view. (1) *Aphodius* (*Carinaulus*) *meghalayensis* sp.nov., (2) *A. (C.) zhanglaensis* sp.nov., (3) *A. (C.) milanikodymi* sp.nov., (4) *A. (C.) tryznai* sp.nov., (5) *A. (C.) imitabilis* sp.nov., (6) *A. (C.) krali* sp.nov., (7) *A. (C.) jakli* sp.nov., (8) *A. (C.) wrzecionkoi* sp.nov., (9) *A. (C.) dundarum* sp.nov., (10) *A. (C.) armandidavidi* sp.nov., (11) *A. (C.) gansuicus* sp.nov., (12) *A. (C.) vseteckai* TESAR.