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Notes on classification of the subfamily Patrobinae (Coleoptera, Carabidae) of the Palaearctic Region with description of new taxa

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As part of a general revision of the Palaearctic Patrobinae the genera *Ledouxius* n.gen. and *Archipatrobus* n.gen. are described, the taxonomic status of the genus *Patroboidea* VAN DYKE is resurrected, and the status of the subgenus *Chinapenetretus* KURN. is elevated to generic level; the genera *Parapenetretus* KURN. and *Apatrobus* HABU & BABA are redescribed (the latter in a new sense), the subgenera *Butanopenetretus* n.subgen. of *Parapenetretus* KURN. and *Parapatrobus* n.subgen. of *Apatrobus* HABU & BABA are established to include the newly described species *Parapenetretus wittmeri* n.sp. and *Apatrobus brancuccii* n.sp. (both from Bhutan). A new species *Archipatrobus deuvei* n.sp. and a new subspecies *Archipatrobus flavipes kantonensis* n.ssp. (both from China) are described; *Patrobus yunnanus* FAIRM. and *Patrobus microphthalmus* FAIRM. are transferred to the genus *Chinapenetretus* KURN., the status of *Patrobus davidis* FAIRM. is resurrected, this species is transferred to the genus *Diploous* MOTSCH., redescrptions of all these species are given. Several species are transferred to the newly described genera *Ledouxius* n.gen. and *Archipatrobus* n.gen. and to the genus *Apatrobus* HABU & BABA. An identification key is provided to the Palaearctic genera and subgenera of Patrobinae. Finally, the main groupings and the supposed dispersal centres of the Palaearctic "Deltomerini" (in the sense of KURNAKOV, 1963) are given and the evolutionary states of some characters are briefly discussed.

Keywords: Coleoptera Carabidae, Palaearctic Region, Patrobinae, taxonomy, description, new genera, subgenera and species.

INTRODUCTION

The subfamily Patrobinae is usually split into two tribes: Patrobini and Deltomerini. However, delimitation of them based on the traditional criteria is actually rather difficult (LEDOUX, 1984; ZAMOTAJLOV, 1992) and seems not to reflect the real relationships and phylogenetic status of the main groups. Some time ago KURNAKOV (1960, 1963) described several new taxa of the genus group from East Asia, which most likely occupy, according to some important characters, an intermediate position between both tribes. He placed them within Deltomerini, thus contributing to further confusion in classification of the patrobine species. Hence the status of the Palaearctic "Deltomerini" deserves close attention. On the other hand, the present-day knowledge of this subfamily seems to be quite insufficient, as a result a lot of new species have recently been described from the various mountainous systems of the Palaearctic Region (in the sense of SEMENOV-TIAN-SHANSKIJ, 1935). In spite of these important additions, no universal point of view on the systematics of this group has been elaborated till now. Moreover, obviously closely related species are often described or treated by different authors in different genera and even tribes, according to the traditions of the native carabidological schools. These problems can only be solved by the precise revision and analysis of the entire Patrobinae complex, that can establish the correct phylogenetical relations of the patrobine fauna. The first contribution

towards it is given below. However, until a complete revision of the subfamily, the limits of the tribe Deltomerini are accepted here conventionally according to KURNAKOV.

MATERIAL

The present paper is based on the materials kept mainly in the Natural History Museum Basel (NHMB), the Muséum Nationale d'Histoire Naturelle, Paris (MP), the Universitetets Zoologiske Museum, København (ZMK), and the Zoological Institute of the Russian Academy of Sciences, St. Petersburg (ZISP).

The materials treated herein have been returned to or shared with the collections of the above mentioned institutions and the author (AZ).

ON THE GENUS *LEDOUXIUS* N.GEN. AND ITS POSITION

During his trips to the Indian Cashmir Mr. G. LEDOUX (1984) collected and then described several species belonging to the tribe Deltomerini. He placed them within the genus *Penetretus* MOTSCH. Later, HEINZ & LEDOUX (1987) described two more species of the same group from the Pakistani Himalaya and NE Pakistan. Finally, these authors noted another species from the Gilgit Agency of Pakistan, related in some characters to other W Himalayan species, although possessing prominent pubescence of the upper tarsal surface (HEINZ & LEDOUX, 1989). It was placed within the genus *Deltomerus* MOTSCH. Habitually resembling some representatives of *Penetretus* MOTSCH., the mentioned species are different in several important characters. They form a well defined group, which is described below as a new genus. I dedicate it to my colleague, Mr. G. LEDOUX of Clamart.

Genus *Ledouxius* n.gen.

Type-species: *Penetretus umbilicatus* LEDOUX.

Penetretus MOTSCHULSKY; LEDOUX, 1984, *Ann. Soc. entomol. Fr.* 20:401-408 (partim). – HEINZ & LEDOUX, 1987, *Entomologiste* 43:30-34 (partim).

Deltomerus MOTSCHULSKY; HEINZ & LEDOUX, 1989, *Nouv. Revue Entomol.* 6:271-272 (partim).

Body pitchy black to dark brown, antennae, palpi, and legs black to brown; head and pronotum shiny, elytra shiny to dull. Head oblong-ovate to somewhat oblong-quadrate, eyes small, gently convex, seldom more or less strongly convex, protruding laterad (in *L. pakistanensis* HEINZ & LEDOUX) or very small (in *L. falciger* HEINZ & LEDOUX); temporae usually about twice as long as eyes, rarely shorter (in *L. pakistanensis* HEINZ & LEDOUX), but longer than eye diameter; neck-constriction shallow and indistinct, in *L. pakistanensis* HEINZ & LEDOUX somewhat more prominent; surface smooth, with 1 supraorbital seta and 1 seta on vertex on each side, the latter deposited closer to neck-constriction than to eyes, sometimes (in *L. oblongus pahalgamensis* LEDOUX and *L. falciger* HEINZ & LEDOUX) also developed posterior supraorbital setae; additional setae on vertex and genae absent; antennomere 1 with 2-5 setae, antennomere 2 pubescent only at apex; tooth of mentum bifid. Pronotum transverse, cordate to subcordate; median line indistinct at base, lateral margin before its middle with 2-4 setiferous pores, 1 seta situated also at basal angles. Elytra ovate to oblong-ovate, usually widest at the middle, roundly contracted to both base and apex, convex or somewhat flat (in *L. pakistanensis* HEINZ & LEDOUX and *L. falciger* HEINZ & LEDOUX), each elytron independently rounded at

apex (in *L. pakistanensis* HEINZ & LEDOUX they are confluent and rounded together); interspace 3 with 2-6 setiferous pores, interspace 5 with 0 to 2; marginal series composed of 15-20 pores not arranged into regular groups. In the bulk of species tarsal segments generally glabrous and smooth on dorsal surface, bearing only a few setae on the first segments of pro- and mesotarsi, in *L. falciger* HEINZ & LEDOUX more prominently pilose; segment 4 of pro- and mesotarsi usually larger than segment 3, deeply emarginate at apex and bilobed (Fig. 33); metatarsal segment 5 glabrous on ventral side. Apical lamellae of aedeagus simple, without distinct tubercles or horns; armature of endophallus consists of a large proximal copulatory piece, in *L. falciger* HEINZ & LEDOUX also of two subapical copulatory pieces.

Total length 10.5-13.5 mm.

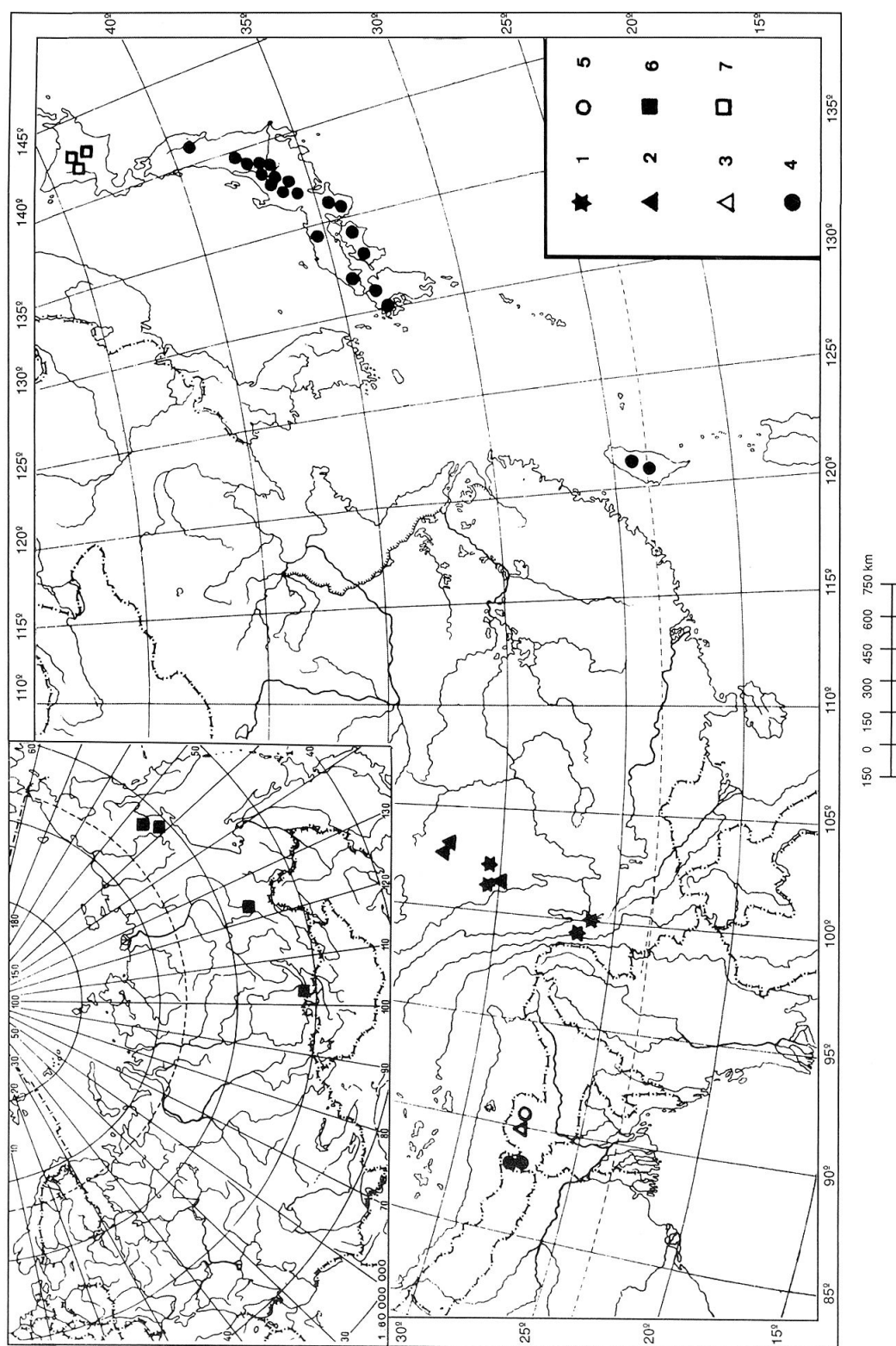
Composition: This genus comprises 8 hitherto known species, distinctly divided into three natural groups, (1) *L. longulus* (LEDoux) n.comb., *L. umbilicatus* (LEDoux) n.comb., *L. kaganensis* (HEINZ & LEDoux) n.comb., *L. oblongus* (LEDoux) n.comb., *L. microcephalus* (LEDoux) n.comb., and *L. meurguesae* (LEDoux) n.comb., (2) *L. pakistanensis* (HEINZ & LEDoux) n.comb., and (3) *L. falciger* (HEINZ & LEDoux) n.comb. Probably the latter could be separated into a different subgenus.

Affinities: This genus is distinguishable from both *Penetretus* MOTSCH. and *Deltomerus* MOTSCH. by the absence of the additional setae on vertex and genae. It habitually resembles some species of *Penetretus* MOTSCH., it differs from them however in the indistinct, widely rounded shoulders and not so prominent base of elytra, usually separately rounded apices of elytra, broader, bilobed segment 4 of pro- and mesotarsi (Figs 32, 33), and less distinct at base median line of pronotum in addition to the above character. From the other Palaearctic genera of the tribe Deltomerini it differs in the presence of several setae on antennomere 1.

Doubtless the genus *Ledouxius* n.gen. is closely related to the genera *Penetretus* MOTSCH. and *Deltomerus* MOTSCH. and represents a well-separated species-swarm within the Mediterranean group of the tribe Deltomerini, inhabiting the SE extremity of its range. As it is distributed far away from the W Mediterranean Realm, where true *Penetretus* species occur, there are no zoogeographical reasons for inserting it in this genus. Both groups are separated by the large range of *Deltomerus* MOTSCH. (ZAMOTAJLOV, 1992). Perhaps *L. falciger* (HEINZ & LEDoux) confirms closer relations of the Himalayan species to the latter. On the other hand, the first segments of meso- and metatarsi are pubescent on the upper surface also in some *Penetretus* species. Thus this character does not seem so evident for the delimitation of different genera of Deltomerini. Tarsal pubescence is present sometimes also within another patrobine group – *Apatrobus* HABU & BABA (see below). However, judging from both the morphological and distributional reasons, *Penetretus* in the close sense (ZAMOTAJLOV, 1990) could be considered to be a monophyletic taxon. Habitual similarity of the species, inhabiting the extreme west (i.e. those of the genus *Penetretus* MOTSCH.) and east (i.e. species from W Himalaya) of the Mediterranean deltomere complex range has probably resulted from the rather close phylogenetical levels and similar apomorphous features, convergently evolved within two different lineages. However, the Himalayan species are evidently higher evolved and probably represent the most derivative genus of this complex. Thus, Mediterranean Deltomerini have diverged into three genera: *Deltomerus* MOTSCH., *Penetretus* MOTSCH., and *Ledouxius* n.gen.

Distribution: West of Punjab Himalaya and adjoining mountain systems.

Habitat: All species occur at high altitude (2400-3900 m) at the borders of the snowfields and glaciers (LEDoux, 1984).



Map 1. Schematic distribution of the Oriental genera and subgenera of the tribe Deltomerini. 1, *Chinapenetretus* KURN. 2, *Parapenetretus* s.str. 3, *Butanopenetretus* n.subgen. 4, *Apatrobus* s.str. 5, *Parapatrobus* n.subgen. 6, *Platydiolus* CHAUD. 7, *Minypatrobus* UÉNO. Distribution of the Japanese taxa is given according to the map, kindly provided by Mr S. MORITA. Chinese localities unknown to the author, omitted.

ON THE GENUS *CHINAPENETRETUS* KURN. AND ITS POORLY KNOWN SPECIES

In 1963 KURNAKOV described the subgenus *Chinapenetretus* of *Apenetretus* KURN., based on two species, *Penetretus quadraticollis* BATES and *Chinapenetretus potanini* KURN. Earlier he erroneously placed *Penetretus quadraticollis* BATES within *Apenetretus* s.str. (KURNAKOV, 1960). However, this author did not pay attention to several important features, separating these species from other Oriental patrobine groups. Examination of further materials on species fitting to the description of the genus and evidently related to those mentioned above, proved that it must be treated as a genus.

Genus *Chinapenetretus* KURNAKOV, 1963, n.stat.

Type species: *Apenetretus potanini* KURN.

Apenetretus subgenus *Chinapenetretus* KURNAKOV, 1963, *Entomol. obozr.* 42:410.

Apenetretus subgenus *Chinapenetretus* KURNAKOV; ZAMOTAJLOV, 1990, *Zool. Zhurn.* 69:137.

Body black, shiny, antennae, palpi, and legs usually black, sometimes brown to reddish-brown. Head ovate, short and broad; eyes more or less convex, large, temporae shorter than eye diameter, tumid, neck-constriction deep and prominent; surface smooth to strongly rugous-punctate, 2 supraorbital setae present on each side, posterior ones located near the posterior margins of eyes, additional setiferous pores on vertex and genae absent; antennomere 1 bears single seta. Pronotum transverse, subcordate to cordate, often subquadrate, median line vanished at both extremities, basal foveae deep and broad, basal carinae sometimes absent, lateral margin with 3-5 setae, one pair of setae present in hind angles. Elytra ovate, base broad, shoulders distinct, overhung, denticulate, surface between shoulders almost plane or nearly concave; elytral interspace 3 with 3-4 setiferous pores, marginal series consists of 8-13 pores, in the middle distinctly rarefied. Tarsal upper surface glabrous, metatarsal segment 5 with 2 setae on each side (in *Ch. potanini* KURN., *Ch. quadraticollis* BATES, and *Ch. yunnanus* FAIRM.) or glabrous (in *Ch. microphthalmus* FAIRM.) ventrally. Apex of aedeagus simple, somewhat pointed (in *Ch. potanini* KURN.) to narrowly rounded (in *Ch. yunnanus* FAIRM.) or faintly lanceolate, with distinct protuberance on the right side (in *Ch. microphthalmus* FAIRM.); armature of endophallus usually consists of a single proximal copulatory piece, sometimes teeth-patch also developed.

Composition: This genus includes 4 species, *Ch. potanini* KURN., *Ch. quadraticollis* (BATES), *Ch. yunnanus* (FAIRM.) n.comb., and *Ch. microphthalmus* (FAIRM.) n.comb. The latter one is in many respects isolated among the congeners and probably could be put into a separate subgenus.

Affinities: In general appearance easily distinguishable from the other Chinese deltomere genera. In the pattern of chaetotaxy, this genus resembles *Parapenetretus* KURN., although it differs in the more robust body, more convex eyes, shorter and more tumid temporae, more constricted neck, broader elytral base, more prominent shoulders, and plane or somewhat concave elytral surface between shoulders. From the genus *Apatrobus* HABU & BABA it differs by the same characters. According to many features, this genus is disjunct within the Oriental Patrobinae. In some respects it seems also to occupy an intermediate position between the tribes Deltomerini and Patrobini. Apparently it is most closely related to the genera *Parapenetretus* KURN. and *Apatrobus* HABU & BABA.

Distribution: China (Szechwan and Yunnan) (Map 1).

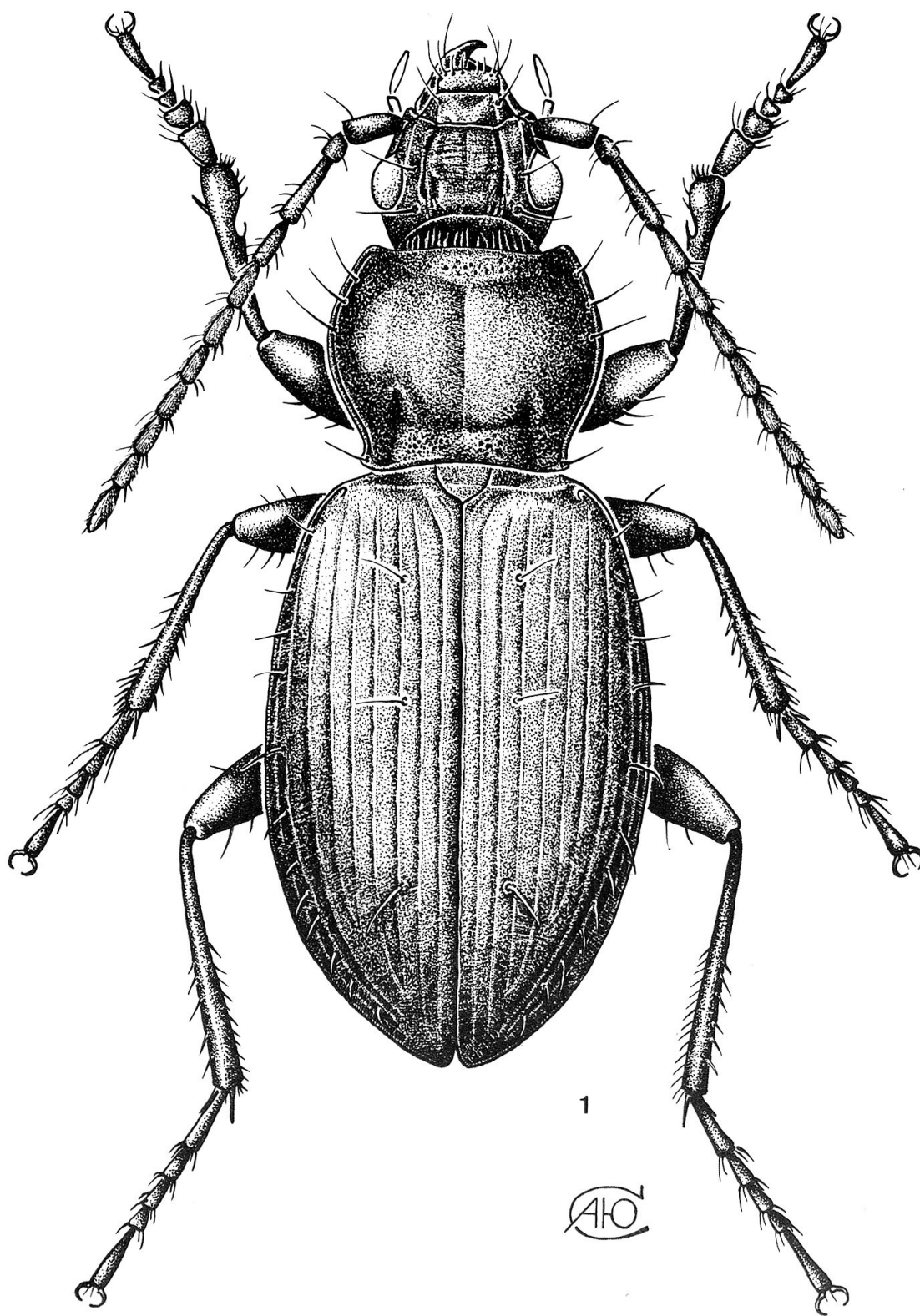


Fig. 1. *Chinapenetretus yunnanus* (FAIRM.), general view.

Habitat: There are no precise ecological data on the hitherto described species, although according to their localities they seem to inhabit mountainous landscapes.

Chinapenetretus yunnanus (FAIRMAIRE, 1886) n.comb. (Figs 1, 4-7)

Patrobus yunnanus FAIRMAIRE, 1886, *Ann. Soc. entomol. Fr.* 6:317. – JAKOBSON, 1906, *Zhuki Rossii* 4:304. – CSIKI, 1928, *Coleopt. Cat.* 2:341. – KÜHNELT (nec FAIRMAIRE), 1941, *Ann. Naturh. Mus. Wien* 51:164.

Body black to dark brown, shiny, antennae and legs dark brown, palpi brown to reddish brown. Head ovate, eyes more or less convex, temporae slightly tumid, shorter than eye diameter, neck-constriction deep; frontal furrows faintly divergent posteriad, almost parallel, long, nearly reaching neck-constriction; surface of vertex strongly rugous, 2 supraorbital setae present on each side, posterior supraorbital setiferous pores large. Pronotum transverse, cordate, 1.23-1.26 times as wide as long, front margin almost straight, sides moderately rounded in front, strongly sinuated behind, rather narrowly bordered, basal margin feebly emarginate, front angles faintly protruding, hind angles fairly extended laterad, acute, pointed, denticulate; anterior transverse impression very shallow, median line deep in the middle, vanished at both extremities, basal foveae deep, basal carina almost completely absent, basal area, apical and lateral sides of pronotum sparsely punctate; lateral margins before middle with 3-4 setae, posterior setae situated in hind angles. Elytra ovate, 1.43-1.50 times as long as wide, convex, shoulders prominent, overhung, denticulate, striae punctured, interspace 3 with 3-4 setiferous pores adjoining stria 3, marginal series composed of 11-13 pores; microreticulation forming transverse meshes. Metatarsal segment 5 on ventral surface with 2 setae on each side. Aedeagus (Figs 4, 5) bent step-like at base and fairly curved or almost straight ventrally, apical lamella rather strongly attenuating towards apex (viewed dorsally), the latter is rounded, with small protuberance on the right side; proximal copulatory piece bilobed, the lobes fused; left paramere (Fig. 6) somewhat larger than right one (Fig. 7), their apical projections tapering towards apices more or less regularly, left bearing 2 apical and 0-2 subapical setae, right 3-4 apical and 1 to 2 very small subapical setae.

Total length 10.6 mm.

Material: 1 ♂ (MP) with labels "Yunnan R.P.Delavay", "Ex Musaeo Arm. David 1900", "*Patrobus yunnanus* Fairm." (FAIRMAIRE's handwriting, designated here as lectotype). 1 ♂ (MP) with labels "Yunnan R.P.Delavay", "Ex Musaeo Arm. David 1900".

Affinities: This species resembles most nearly *Ch. quadraticollis* (BATES) and *Ch. potanini* KURN., but is distinguishable from them by more cordate pronotum without distinct basal carina, strongly rugous posterior area of vertex, and structure of the male genitalia. From the first species it differs also in larger body size and shorter temporae, from the second in more rounded shoulders and prominent punctuation of elytral striae.

Chinapenetretus microphthalmus (FAIRMAIRE, 1888) n.comb. (figs 2, 8-11, 36)

Patrobus microphthalmus FAIRMAIRE, 1888, *Ann. Soc. entomol. Belg.* 25:14. – JAKOBSON, 1906, *Zhuki Rossii* 4:305. – CSIKI, 1928, *Coleopt. Cat.* 2:340.

Body black, shiny, antennae, palpi, and legs sometimes (in juvenile specimens) dark brown to reddish brown. Head ovate, eyes small, more or less convex,

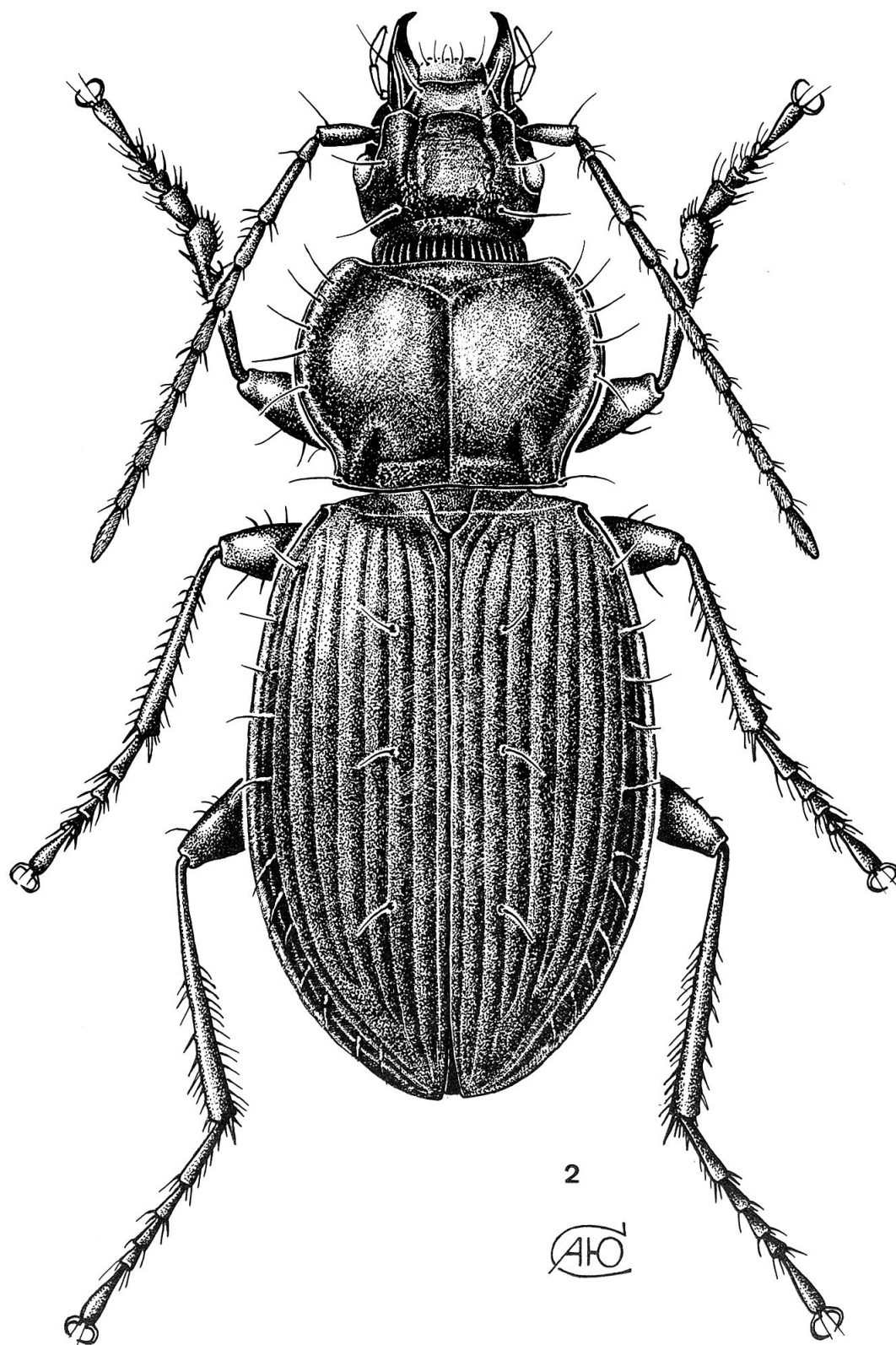


Fig. 2. *Chinapenetretus microphthalmus* (FAIRM.), general view.

temporae tumid, a little longer than eye diameter, neck-constriction deep; frontal furrows faintly divergent posteriad, sides and back of vertex strongly rugous-punctured, 2 supraorbital setae present on each side, posterior ones situated somewhat closer to neck-constriction than to eyes. Pronotum transverse, 1.23-1.42 times as wide as long, front margin slightly emarginate, lateral sides rounded almost to hind angles, widely explanate, with slight and very short sinuation just before hind angles, basal margin faintly arcuate, front angles almost not protruding, hind angles rectangular or somewhat acute, pointed; anterior transverse impression shallow, rugous-punctate, posterior one deep and strongly rugous-punctate, basal foveae small but rather deep, punctured, carina indistinct, disk faintly rugous, median line almost reaching apex, though less visible at base; lateral margins with 4 to 5 setae, 1 seta situated in hind angles. Elytra oblong-ovate, 1.42-1.50 times as long as wide, convex, sides somewhat rounded, distinctly contracted towards both base and apex, shoulders distinct, overhung, denticulate, lateral margins widely bordered in front, this explanate border gradually tapering behind; interspaces faintly convex, striae smooth, interspace 3 with 3 setiferous pores adjoining stria 3, marginal series composed of 10-13 pores; microreticulation very fine, forming isodiametric or transverse meshes. Metatarsal segment 5 on ventral surface glabrous. Aedeagus (Figs 8, 9) bent step-like at base, its apical lamella is turned ventrad (viewed laterally), evenly attenuating towards apex (viewed dorsally), left margin reflexed, forming large protuberance on right side of apex; armature of endophallus consists of bilobed, fused proximal copulatory piece and large teeth-patch of irregular shape; left paramere (Fig. 10) larger than right one (Fig. 11), both contracted towards apex more or less gradually, their apical projections with 2-3 long apical setae and 0-2 short subapical ones. Spermatheca (Fig. 36) with a somewhat oval chitinized ring ca. 0.6 mm in diameter.

Total length: 11.6-12.5 mm.

Material: I have studied 3 specimens completely fitting to the original description, 1 ♀ (MP) with labels "Yunnan R.P.Delavay", "*Patrobus microphthalmus* Fairm." (FAIRMAIRE's handwriting, designated here as lectotype). 1 ♂ (MP) with labels "Yunnan", "Ex Musaeo L. Fairmaire 1896", "*Patrobus microphthalmus* Fairm., Yunnan" (FAIRMAIRE's handwriting, designated here as paralectotype). 1 ♂ (MP) with labels "Yunnan R.P.Delavay", "Ex Musaeo Arm. David 1900".

Affinities: From the other congeners it differs in the more elongate body, not cordate pronotum, widely explanate border of pronotum and elytra, and glabrous ventral surface of tarsal segment 5.

ON THE GENUS *PARAPENETRETUS* KURN. AND ITS SUBDIVISION

In 1960 KURNAKOV described the subgenus *Parapenetretus* of *Penetretus* MOTSCH. from China. In the same paper he noted a resemblance of this group to other species from E Asia (i.e. genera *Chinapenetretus* KURN. and *Apatrobus* HABU & BABA). Based on the obviously closer relations of *Parapenetretus* KURN. to Oriental rather than to Mediterranean deltomere lineages, ZAMOTAJLOV (1990) proposed to separate it as a proper genus. Study of new materials from Bhutan revealed another species related to *Parapenetretus* KURN. A brief redescription of this group and a description of its new subgenus are given below.

Genus *Parapenetretus* KURNAKOV, 1960

Type-species: *Deltomerus szetschuanus* JEDL.

Penetretus subgenus *Parapenetretus* KURNAKOV, 1960, *Revue fr. Entomol.* 27:274.

Penetretus subgenus *Parapenetretus* KURNAKOV; KURNAKOV, 1963, *Entomol. Obozr.* 42:411-413.

Parapenetretus KURNAKOV; ZAMOTAJLOV, 1990, *Zool. zhurn.* 69:133.

Body black or blackish-brown, often with lacquer lustre, more or less slender; antennae, palpi, and legs black to reddish-brown. Head ovate, eyes small, faintly convex, temporae subequal in length to eye diameter, neck-constriction more or less shallow; surface smooth, 2-4 supraorbital setae and usually 2 setae on vertex (in *P. wittmeri* n.sp. a single seta) developed on each side, 1 pair of setiferous pores, which is situated near neck-constriction, is extremely large, temporae glabrous; antennomere 1 with a single subapical seta. Pronotum cordate, median line at base and apex smoothed out, basal foveae deep, lateral margin with 3-7 setae, one pair of setae developed in hind angles. Elytra ovate to oblong-ovate, flattened, shoulders rounded, humeral teeth faintly developed; interspace 3 with 3 to 4 setiferous pores, marginal series composed of 8-14 pores, rarefied in the middle; microreticulation often invisible. Tarsal upper surface glabrous, metatarsal segment 5 with 3 (in *P. caudicornis* KURN.), or 2 (in *P. szetschuanus* JEDL.), or 1 (in *P. reticulatus* ZAMOT. and *P. wittmeri* n.sp.) setae on each side or glabrous (in *P. berezovskii* KURN.) ventrally. Apical lamella of aedeagus nearly straight (in *P. szetschuanus* JEDL., *P. caudicornis* KURN., and *P. berezovskii* KURN.) or sharply bent ventrally (in *P. wittmeri* n.sp.), apex with more or less large horn-shaped or hook-shaped protuberance on the right side (in *P. szetschuanus* JEDL., *P. caudicornis* KURN., and *P. berezovskii* KURN.) or only with a small tooth-shaped prolongation (in *P. wittmeri* n.sp.); armature of endophallus composed of a large proximal copulatory piece and sometimes teeth-patch also.

Composition: This genus comprises 5 species, *P. szetschuanus* (JEDL.), *P. berezovskii* KURN., *P. caudicornis* KURN., *P. reticulatus* ZAMOT., and *P. wittmeri* n.sp. The last one is separated into a different subgenus, which is described below.

Affinities: Habitually resembles species of the genus *Apatrobus* HABU & BABA, although it is distinguishable by the more robust body and plurisetous lateral margins of pronotum. From the genus *Chinapenetretus* KURN. it differs, first of all, in longer temporae, less convex eyes, shallow neck-constriction, and the shape of elytra (see above). This genus seems to be closely related to *Apatrobus* HABU & BABA and differs from it mainly in several plesiomorphous characters. Probably the members of this group present not a separate phylogenetic branch within Chinese Patrobinae, but a complex of convergently similar species, i.e. a collective group.

Distribution: China (Szechwan) and Bhutan (Map 1).

Habitat: All hitherto known species occur in the mountains at altitudes of 3000-4000 m.

Subgenus *Butanopenetretus* n.subgen.

Type-species: *Parapenetretus wittmeri* n.sp.

Differs from the nominotypical subgenus by the presence of a single pair of additional setae on vertex, prominently more convex elytra and elytral interspaces, more rounded shoulders, not prominent humeral teeth, and structure of male genitalia: apical lamella of aedeagus bent ventrally, apex only with a small tooth-shaped prolongation on the right side, several groups of teeth-patches present in endophallus.

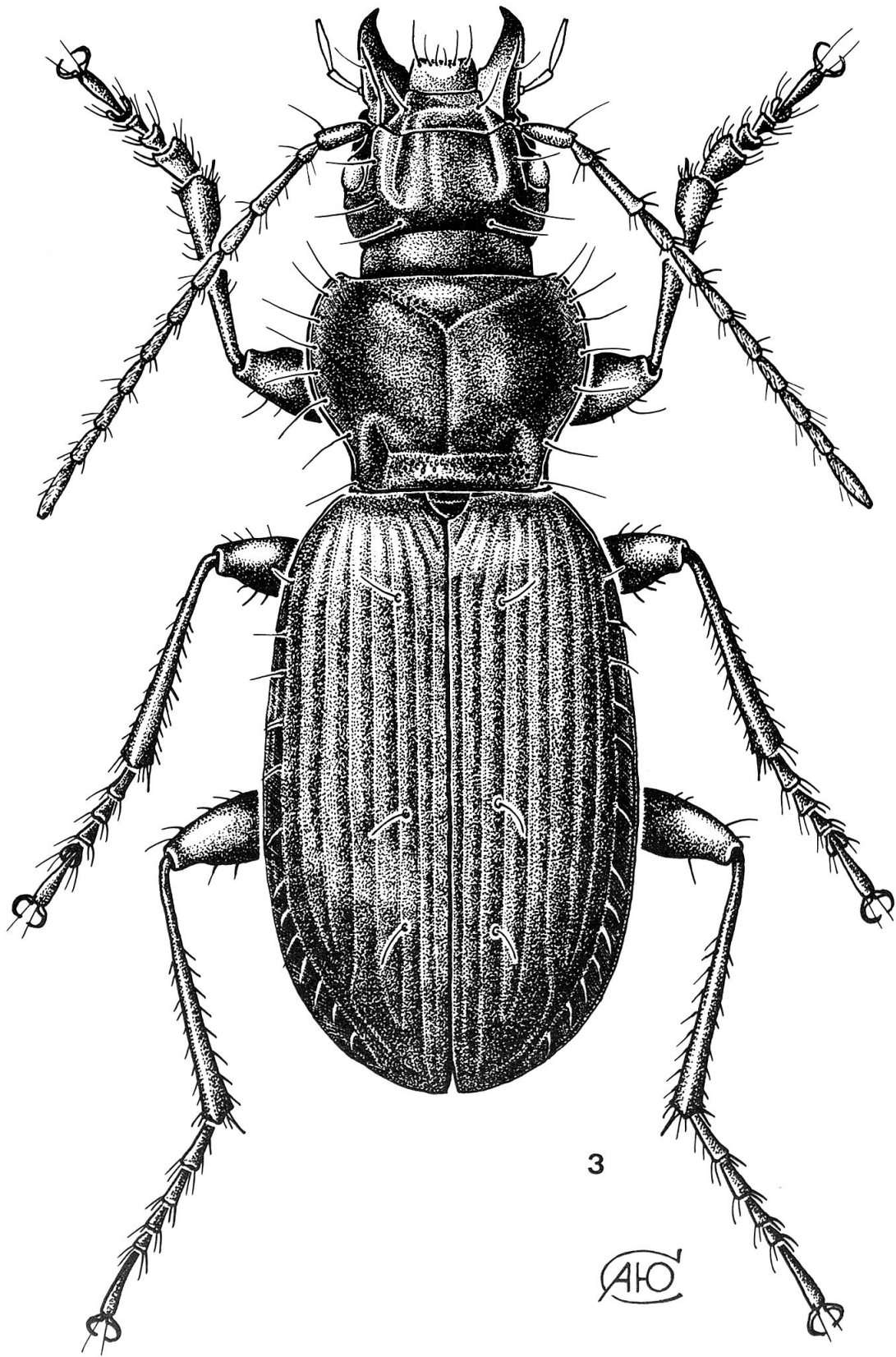
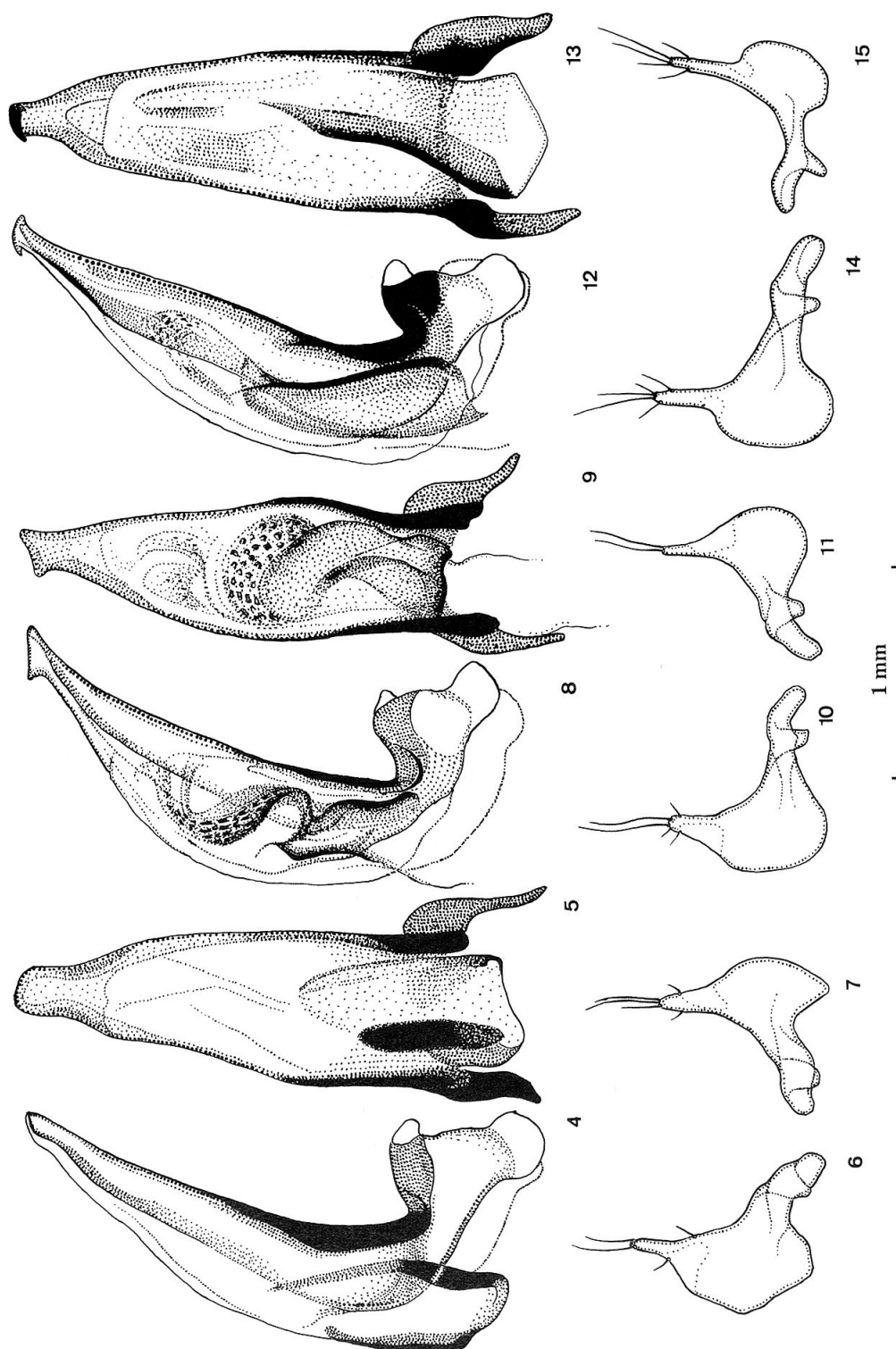


Fig. 3. *Parapenetretus wittmeri* n.sp., general view.



Figs 4-15. Male genitalia of: 4, *Chinapenetretus yunnanus* (FAIRM.), lectotype, aedeagus in left lateral view; 5, idem, aedeagus in dorsal view; 6, idem, left paramere; 7, idem, right paramere. 8, *Chinapenetretus microphthalmus* (FAIRM.), paralectotype from Yunnan, aedeagus in left lateral view; 9, idem, aedeagus in dorsal view; 10, idem, left paramere; 11, idem, right paramere; 12, *Parapenetretus wittmeri* n.sp., holotype, aedeagus in left lateral view; 13, idem, aedeagus in dorsal view; 14, idem, left paramere; 15, idem, right paramere.

Parapenetretus (Butanopenetretus) wittmeri n.sp. (Figs 3, 12-15)

Body dark brown, almost black, shiny, antennae and legs dark brown, palpi reddish-brown. Head ovate, eyes small, faintly convex, temporae tumid, longer than eye diameter, neck-constriction distinct, although rather shallow; frontal furrows fairly deep, divergent posteriad, surface smooth, 2 supraorbital setae, one near anterior margin and another near posterior margin of eye, and one large setiferous pore near neck-constriction present on each side of head. Tooth of mentum bifid. Pronotum cordate, 1.33 times as wide as long, convex, front margin almost even, lateral sides strongly rounded in front and sinuated just before hind angles, basal margin slightly emarginate, front angles dull, although distinct, hind angles rectangular, pointed; anterior transverse impression wide, punctate, basal foveae small, situated near lateral margins, disk sparsely rugous, median line shallow, smoothed out at both extremities, basal area densely punctate; lateral margins with 7 setae, 1 seta situated in hind angles. Elytra oblong-ovate, 1.62 times as long as wide, prominently convex, shoulders widely rounded, with indistinct and not prominent humeral teeth; interspaces somewhat convex, striae at base punctate, deep at all their length, interspace 3 with 3 setiferous pores adjoining stria 3, marginal series composed of 13 pores; microreticulation forming isodiametric or transverse meshes. Tarsal upper surface glabrous, metatarsal segment 5 with 1 seta on each side ventrally. Pro-, meso-, and metepisterna, mesosternum, and prosternum sparsely punctate, sternites very finely rugous at lateral areas. Aedeagus (Figs 12, 13) bent step-like at base, its apical lamella narrow, curved ventrally, apex with a small tooth-shaped protuberance on the right side; armature of endophallus consists of one long proximal copulatory piece and slightly chitinized or spinose fields in its apical part; left paramere (Fig. 14) larger than right one (Fig. 15), both with long and narrow apical projections bearing 2 long apical and 2-3 short subapical setae.

Total length 10.6 mm.

Material: Holotype ♂ (NHMB), Central Bhutan, Gogona, Mt. Muelhagang, 3650-4000 m, 10-12.VI.1972, W. Wittmer.

Derivatio nominis: This species is named after Dr W. WITTMER of the Natural History Museum in Basel.

Affinities: This new species is well separated in many characters from its Chinese congeners.

Distribution: C Bhutan.

Habitat: Occurs in Alpine zone.

ON THE GENUS *APATROBUS* HABU & BABA (IN THE NEW SENSE)

In 1883 BATES described two Japanese patrobine species in the genus *Penetretus* MOTSCH., namely *P. ambiguus* BATES and *P. dilatatus* BATES. Subsequently HABU (1953) described another species from Japan related to those by Bates, i.e. *P. hikosanus* HABU; he also placed it within *Penetretus* MOTSCH. However, all these species were different from the actual W Mediterranean *Penetretus* species in several important characters. Realizing this, HABU (1955) transferred his species to the genus *Patrobus* STEPH. HABU & BABA (1960) and KURNAKOV (1960) described almost simultaneously two taxa of the genus group, subgenus *Apatrobus* HABU & BABA (with a single species *A. hikosanus* HABU) and genus *Apenetretus* KURNAKOV (comprising the three Japanese species mentioned above and the Chinese *Penetretus quadraticollis* BATES). In the same paper, HABU & BABA referred all other known

Patrobus-like Japanese species to *Patrobus* s.str. Furthermore, several species from Japan and Formosa were described as *Apatrobus* or *Patrobus*. In 1985 *Apatrobus* HABU & BABA received generic rank (MORITA, 1985). Following HABU's logic, *Apenetretus* KURN. should be considered as a subjective synonym partly to *Patrobus* s.str., partly to *Apatrobus* HABU & BABA. Although, in 1989 MORITA used this name again for *Penetretus ambiguus* BATES and allied species. Finally, in 1990 ZAMOTAJLOV used the generic name *Apenetretus* KURN. for *Deltomerus stenomus* ANDREWES and *Patrobus sikkimensis* DEUVE & LEDOUX from Sikkim and described a new species of this genus from E Tibet. Thus there are now three different generic names for the Oriental patrobine group comprising species of very similar appearance.

HABU (1960) and then MORITA (1986) used for the delimitation of Japanese *Patrobus* and *Apatrobus* species the presence of setae on the ventral surface of tarsal segment 5. However, this character is rather variable in different genera of Patrobinae. Such setae are sometimes developed in *Penetretus* MOTSCH. (*P. andalusicus* REITT.), *Chinapenetretus* KURN. and *Parapenetretus* KURN. (see above), *Patrobus* STEPH. (*P. assimilis* CHAUD.), *Platypatrobus* DARL. (*P. lacustris* DARL.), and *Diplous* MOTSCH. (*D. depressus* GEBLER). This feature varies even within individual species, from population to population. On the other hand, separation of some species into the genus *Apenetretus* KURN. belonging to the dissimilar tribe Deltomerini, based solely on the position of the walls on the dorsal surface of aedeagus (MORITA, 1989) is also most likely to be incorrect. As LEDOUX (1984) has already shown, all members of Patrobinae possess an aedeagus, which looks like a semi-tube opened dorsally, although the degree of the approach of the sides to each other is variable. Moreover, the main groups separated by Japanese authors (i.e. three species-groups of *Apatrobus* HABU & BABA after MORITA (1987) and *Patrobus* s.str. or *Apenetretus* species) occur almost strictly allopatric, this fact gives more evidence of their common origin and close relations. Apparently they have to be treated as species-groups or, in some cases, as subgenera of a single large genus.

Hence, the above-mentioned species from Japan, Formosa, E Tibet, and E Himalaya represent a group different from both the Mediterranean deltomerine genera, and the actual Patrobini (i.e. genera *Patrobus* STEPH., *Platypatrobus* DARL., and *Diplous* MOTSCH.). According to the Principle of Priority, it must be named *Apatrobus* HABU & BABA. Its brief description is given below.

Genus *Apatrobus* HABU & BABA sensu novo

Patrobus subgenus *Apatrobus* HABU & BABA, July 1960, *Akitu* 9:6. Type-species: *Penetretus hikosanus* HABU.

Patrobus subgenus *Apatrobus* HABU & BABA; NAKANE, 1978, *Nature & Insects* 13:10.

Apatrobus HABU & BABA; MORITA, 1985, *Coleopt. Japan Col.* 2:102.

Patrobus s.str.; HABU & BABA, 1960, *Akitu* 9:5, 6 (partim). – NAKANE, 1978, *Nature & Insects* 13:9 (partim). – MORITA, 1985, *Coleopt. Japan Col.* 2:101 (partim).

Apenetretus KURNAKOV, December 1960, *Revue fr. Entomol.* 27:275. Type-species: *Penetretus ambiguus* BATES. – n.syn.

Apenetretus KURNAKOV; KURNAKOV, 1963, *Entomol. obozr.* 42:410 (partim). – MORITA, 1989, *Gifuken Hakubutsukan Chôsaikenkyûhôkoku* 10:29-32. – ZAMOTAJLOV, 1990: *Zool. zhurn.* 69:133.

Body slender to more or less robust. Head ovate, with rather deep neck-constriction, eyes small, temporae faintly tumid, rather long, almost as long or little longer than eye diameter; surface of vertex and temporae glabrous, with 1 or rarely 2 (in *A. nanhutanus* HABU) supraorbital setae near anterior margin of eye and 1 seta inserted usually somewhat apart from posterior margin of eye, closer to neck-constriction, on each side of head; antennomere 1 bears a single subapical seta,

antennomere 2 with a few small setae in apical part. Pronotum subcordate to cordate, rarely (in *A. brancuccii* n.sp.) not cordate, widest at or behind one-third, with a single anterior marginal seta; median line rather deep, but obliterated and inconspicuous near base (which is usually punctate), not broadened backwards. Elytra oblong-ovate, gently and gradually convex or rather flat, only in *A. brancuccii* n.sp. strongly convex; base more or less narrow, shoulders comparatively indistinct, humeral teeth very small or absent. Apterous or brachypterous. Tarsal segments glabrous on dorsal surface, very rarely, in *A. stenomus* (ANDREWES) only, pubescent; metatarsal segment 5 glabrous or bearing two or three setae on each side ventrally. Apical lamella of aedeagus simple or tuberculate at apex, almost straight or reflexed dorsally, pointed or bearing small protuberances, sometimes slightly produced dorsally and denticulate, but without large dorsal prolongation and never horned (only *A. brancuccii* n.sp. possesses a small horn-shaped apical prolongation of aedeagus); armature of endophallus consists of a single proximal copulatory piece or of both proximal and apical copulatory pieces, often supplied with teeth-patch.

Composition: This genus comprises 23 hitherto known species. Those originally described in or transferred to *Apatrobus* HABU & BABA are as follows: *A. hikosanus* (HABU), *A. kurosawai* MORITA, *A. ohdaisanus* (NAKANE), *A. jakuchiensis* HABU, *A. ishizuchiensis* HABU, *A. nishiawakurae* HABU, *A. tsurugiensis* HABU, *A. satoni* HABU, *A. hayachiensis* NAKANE, *A. echigonus* HABU & BABA, *A. iwasakii* MORITA, *A. narukawai* MORITA, and *A. hasemiya* MORITA. MORITA (1987) mentioned three groups of these species. Japanese and Formosan congeners considered earlier as *Patrobus* s.str. or *Apenetretus* KURN. are as follows, *A. ambiguus* (BATES) n.comb., *A. shoorengensis* (HABU & BABA) n.comb., *A. dilatatus* (BATES) n.comb., *A. shirahatai* (HABU & BABA) n.comb., *A. yushanensis* (HABU) n.comb., and *A. nanhutanus* (HABU) n.comb. Apparently they could also be split into several species-groups. A lineage comprising 3 species from the eastern periphery of the generic range, i.e. *A. stenomus* (ANDREWES) n.comb., *A. sikkimensis* (DEUVE & LEDOUX) n.comb., and *A. andrewesi* (ZAMOT.) n.comb. represents, probably another species-group. However, greatly specialized *A. stenomus* (ANDREWES), possessing, unlike other congeners, pubescent upper tarsal surface, could be separated into a different subgenus after further examination of the new materials from E Himalaya. The last species, *A. brancuccii* n.sp. from Bhutan, differs from the above mentioned species in many respects and it is described below within a new subgenus.

Affinities: In chaetotaxy of head and pronotum it resembles the genus *Patrobus* STEPH., however it differs in smaller and faintly convex eyes, longer, subequal in length to eye diameter and tumid temporae, obliterated near base, not broadened into gutter-shaped groove backwards median line, more narrow elytral base, more constricted elytra anteriorly, and more gradually rounded shoulders. From both *Chinapenetretus* KURN. and *Parapenetretus* KURN. easily distinguishable by the presence of a single seta on the lateral margin of pronotum.

Apatrobus HABU & BABA could be a polyphyletic taxon. Its distribution is rather indicative of it. Japanese and Formosan species on the one hand, and Tibetan and Himalayan species on the other, apparently represent two or three independent stocks. Their habitual resemblance could have resulted from convergently evolved apomorphic characters. However, there are no morphological reasons for splitting it into several subgenera now. Both distribution and morphology of *Apatrobus* HABU & BABA testify to its relation to the above mentioned Oriental deltomerine genera and its ancestor was probably much like species of the genus *Parapenetretus* KURN.

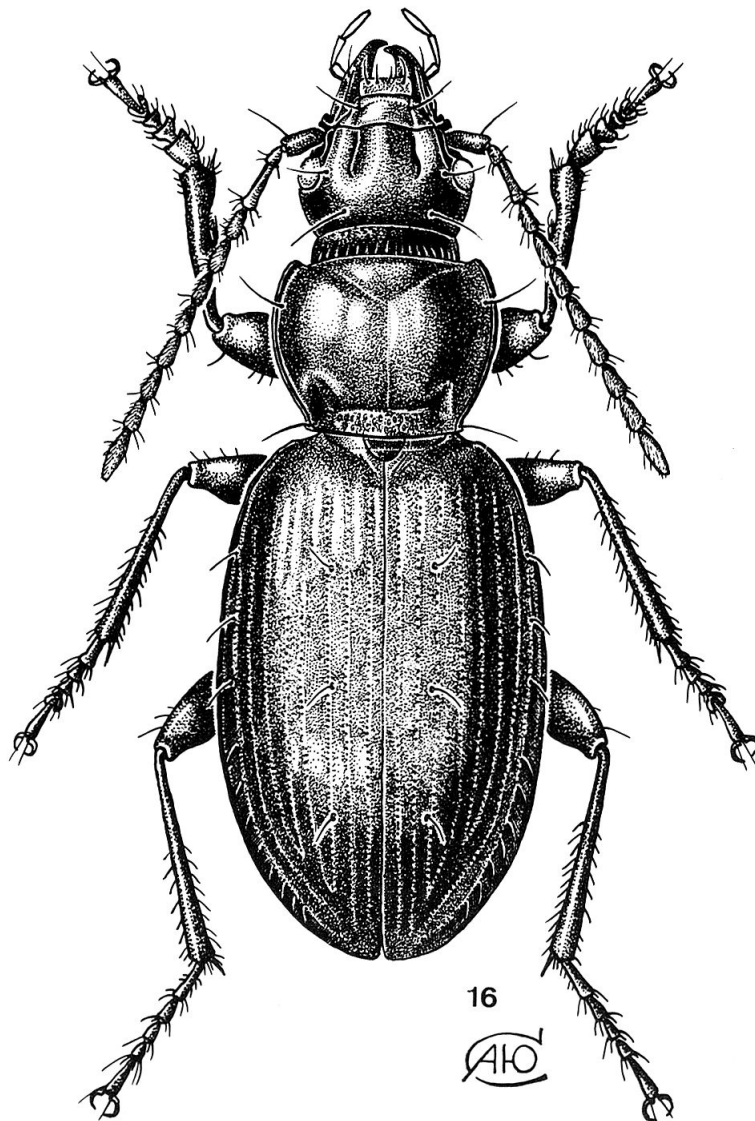


Fig. 16. *Apatrobus brancuccii* n.sp., general view.

Distribution: Mountainous systems of Japan (except for Isle Hokkaido), Formosa, E border of Tibet and E Himalaya (Bhutan, Sikkim) (Map 1).

Habitat: All *Apatrobus* species are true mountainous hygrophiles, inhabiting high- and midaltitude landscapes.

Subgenus *Parapatrobus* n.subgen.

Type-species: *Apatrobus brancuccii* n.sp.

Differs from the nominotypical subgenus in the more robust body, somewhat shorter appendages, stronger convex elytra, glabrous, shiny, not or almost not cordate pronotum with small but prominent basal teeth and narrow base, absence of punctation of pronotum (only a few punctures present in basal foveae), and shape of apical lamella of aedeagus, bearing a horn-shaped prolongation.

Apatrobus (Parapatrobus) brancuccii n.sp. (Figs 16, 20-23, 37)

Body dark brown, palpi, tibiae, and tarsi reddish-brown, dorsum with lacquer lustre. Head ovate, eyes very small, temporae faintly tumid, longer than eye diameter, neck-constriction deep; frontal furrows shallow, slightly divergent posteriad, surface smooth, 2 supraorbital setae, front one near anterior margin of eye and hind one near neck-constriction, developed on each side of head. Tooth of mentum bifid. Pronotum transverse, 1.22-1.38 times as wide as long, convex, front and hind margins slightly rounded, lateral sides arcuate almost from front to hind angles, front angles rounded though distinct, hind angles pointed, with little teeth, basal carina absent; anterior transverse impression situated apart from apex, basal foveae small, disk smooth, median line shallow, obliterated at both extremities, base sparsely punctate; lateral margins with a single seta, one seta deposited in hind angles. Elytra oblong-ovate, 1.55-1.87 times as long as wide, strongly convex, shoulders rounded, humeral teeth indistinct; striae shallow, at base punctured, almost disappearing near apex, interspaces faintly convex, interspace 3 with 3 setiferous pores adjoining stria 3, marginal series composed of 10-11 pores; microreticulation forming isodiametric or transverse meshes, but almost invisible. Tarsal upper surface glabrous, pro- and mesotarsal segment 4 strongly emarginate at apex, bilobed, metatarsal segment 5 ventrally glabrous. Pro- meso-, and metepisterna, mesosternum, and lateral areas of prosternum punctate, sternites very finely rugous at lateral areas. Aedeagus (Figs 20, 21) bent step-like at base, its apical lamella strongly curved ventrally, twisted leftwards, apex with tooth-shaped protuberance on the right side; armature of endophallus consists of a poorly chitinized proximal copulatory piece. Left paramere (Fig. 22) larger than right one (Fig. 23), their apical projections long and narrow, bearing 3-5 long apical or subapical setae and 0-2 short ones. Spermatheca (Fig. 37) with the rather thick, somewhat elongate chitinized ring of irregular shape ca. 0.5 mm in diameter and small teeth-shaped chitinized spot.

Total length 8.2-10.1 mm.

Material: Holotype ♂ (NHMB), Bhutan, Kidiphu Forest, 3900 m, 9.VII. 1980, W. Roder. Paratypes, 8 ♂♂, 4 ♀♀ (NHMB); 1 ♂, 1 ♀ (ZISP); 3 ♂♂, 2 ♀♀ (AZ), same locality and date as holotype. 3 ♂♂, 1 ♀ (NHMB); 1 ♂ (AZ), same locality, 8.VII.1980, W. Roder.

Derivatio nominis: This species is named after Dr M. BRANCUCCI of the Natural History Museum in Basel.

Affinities: This species is well separated by some important characters from its congeners.

Distribution: Bhutan.

Habitat: Occurs in Alpine zone.

ON THE GENERA *PLATYDIOLUS* CHAUD. AND *MINYPATROBUS* UÉNO

Besides the deltomerine genera mentioned above, there are two more Palaearctic ones, Siberian *Platydiolus* CHAUD. and Japanese *Minypatrobus* UÉNO. They are very similar to each other in extremely small body size, within the tribe Deltomerini, and easily distinguishable general appearance, and in the structure of male genitalia (possessing horned or hooked apices of aedeagus). Species of these genera also resemble an American species, originally described in the separate genus *Patroboidea* (VAN DYKE, 1926). Later it was synonymized by KURNAKOV (1960) with *Platydiolus* CHAUD. Both genera were monotypical and KURNAKOV based his

conclusions on the two constituent species, *Platydiolus rufus* CHAUD. and *Patroboidea rufa* VAN DYKE (the latter renamed as *Platydiolus vandykei* KURN.); KURNAKOV, however, ignored the already described *Minypatrobus darlingtoni* UÉNO. On the contrary, UÉNO (1955), describing his genus *Minypatrobus*, compared it with the single species *Patroboidea rufa* VAN DYKE and did not pay attention to *Platydiolus rufus* CHAUD. Thus species of all these three very similar groups have never been analysed simultaneously. Although, such analysis reveals, that *Minypatrobus darlingtoni* UÉNO (and apparently *M. uenoi* HABU) resemble in some characters the Siberian species rather than the American one. Both Asian groups differ from *Patroboidea* VAN DYKE in more robust body, more convex elytra, not globular, ordinary shape of antennomere 2, and in some other characters. As phylogenetical relations of these three groups are not absolutely clear now, it seems reasonable to treat them as different genera, thus resurrecting status of genus *Patroboidea* VAN DYKE and specific name *Patroboidea rufa* VAN DYKE nom.resurr. *Platydiolus* CHAUD. and *Patroboidea* VAN DYKE could be distinguished by the following main features:

Platydiolus CHAUD.: Body more robust and convex, appendages robust; eyes larger, temporae oblique, gently tumid, a little longer than eye diameter, neck-constriction prominent only on the upper surface of head, antennomere 2 short, but longer than wide, of normal shape (Fig. 38); elytra somewhat convex, their lateral sides divergent posteriad, widest in the apical one-third; upper tarsal surface distinctly pubescent.

Patroboidea VAN DYKE resurr.stat.: Body more slender and flat, appendages slender; eyes small, temporae strongly tumid, about twice as long as eye diameter, neck-constriction prominent on both dorsal and ventral surfaces of head, antennomere 2 wider than long, globular (Fig. 39); elytra flat, their lateral sides nearly parallel, widest in the middle; upper tarsal surface somewhat faintly pubescent.

Following the description by DARLINGTON (1938), UÉNO (1955) pointed out that *Patroboidea* VAN DYKE possesses plurisetous antennomere 1. Examination of one specimen (1 ♀, Canada, Lillooet, B.C., 4.VI.1958, Lindroth) has shown that this segment actually bears a single long seta, while others are very short and indistinct, as in *Platydiolus* CHAUD. So, such an important character within the tribe Deltomnerini, as chaetotaxy of antennomere 1, has the same state in all mentioned genera. Similar appearance of these species could be interpreted as a result of convergent evolution in different stocks, or of diversification of a single evolutionary lineage. The last hypothesis seems to be more probable.

The Palaearctic genera of this group are distributed in E Siberia (CHAUDOIR, 1878; BUDARIN & MATIS, 1981; BUDARIN, 1985; LAFER, 1989) and on Isle Hokkaido (UÉNO, 1955; HABU, 1972) (Map.1).

ON ARCHIPATROBUS N.GEN.

Both hitherto known species of the genus proposed below were originally described and then treated within the genus *Patrobus* STEPH. The third member was mentioned by KÜHNELT (1941) under the wrong name *Patrobus yunnanus* FAIRM. He separated species belonging to the new genus into "1. Gruppe" and noted their morphological and geographical isolation. HABU & BABA (1960) gave a very precise description of this taxon (based on *Patrobus flavipes* MOTSCH.) and its differences from other Japanese patrobine species, though proposed neither a name nor a species-group for it. In fact, all these authors ignored several, important characters of this group which most likely confirm its generic rank.

Genus *Archipatrobus* n.gen.

Type-species: *Archipatrobus deuvei* n.sp.

Patrobus STEPHENS; CHAUDOIR, 1870-1871, *Ann. Soc. entomol. Belg.* 14:40 (partim). – JAKOBSON, 1906, *Zhuki Rossii* 4:304 (partim). – KÜHNELT, 1941, *Ann. Naturh. Mus. Wien* 51:164, 165 (partim).

Patrobus (s.str.), HABU & BABA, 1960, *Akitsu* 9:4, 5 (partim). – NAKANE, 1978, *Nature & Insects* 13:9 (partim). – MORITA, 1985, *Coleopt. Japan Col.* 2:101 (partim). – ZAMOTAJLOV & KRYZHANOVSKIJ, 1990, *Proc. Zool. Inst. Leningrad* 211:9-13 (partim).

Body black, shiny, antennae, palpi, and legs reddish-brown. Head ovate, sometimes broad, eyes strongly convex, about 1.5 times as long as temporae, the latter almost oblique to nearly tumid, neck-constriction rather deep and distinct; surface smooth, with 2 supraorbital setae on each side, hind one situated near posterior margin of eye; antennomere 1 with a single subapical seta, antennomere 2 bearing few setae only at apex; tooth of mentum bifid. Pronotum transverse, subcordate, widest at about one third from apex or in the middle, hind angles protruding, rounded, lateral margins gently arcuate in front, slightly sinuated before hind angles, they are rectangular or dull, pointed; marginal explanate border wide in front, contracted posteriorly; surface with distinct punctures at apical and basal areas and along lateral grooves, where they form almost regular series, median line on disk deep, obliterated near apical margin, but almost reaching basal one, not broadened and depressed gutter-like near base; lateral margin before its middle with a single setiferous pore, 1 seta situated at hind angles. Elytra oblong-ovate, gently convex, base broad, shoulders comparatively distinct though rounded; interspace 3 with 3 setiferous pores, marginal series composed of 11-17 pores not arranged in regular groups, but the most densely located in humeral areas. Usually alate, sometimes probably apterous (in *A. flavipes kantienensis* n.ssp.). Tarsal segments glabrous on dorsal surface; segment 4 of pro- and mesotarsi emarginate at apex, in *A. suenisoni* (ZAMOT. & KRYZH.) almost bilobed (Fig. 35); metatarsal segment 5 glabrous on ventral side. Apical lamella of aedeagus simple, pointed, not tuberculate; armature of endophallus always consists of proximal and apical copulatory pieces, teeth-patch present in *A. flavipes* (MOTSCH.) and *A. deuvei* n.sp., absent in *A. suenisoni* (ZAMOT. & KRYZH.).

Total length 9.3-16.0 mm.

Composition: The new genus is composed of 3 well-defined species, *A. suenisoni* (ZAMOT. & KRYZH.) n.comb., *A. deuvei* n.sp., and *A. flavipes* (MOTSCH.) n.comb. The latter species stands in some respects apart from the others.

Affinities: From both genera *Patrobus* STEPH. (including subgenera *Neopatrobus* DARL. and *Geopatrobus* DARL.) and *Platypatrobus* DARL. it differs in less transverse, not trapeziform and almost not cordate pronotum widest nearly in the middle, with strongly extended forwards front angles and somewhat smoothed out near base, not broadened gutter-like backwards median line, in presence of a row of punctures along lateral grooves and well developed punctation of pronotum, and in somewhat longer temporae (Figs 40, 41). In the shape and sculpture of pronotum resembles the genus *Diplous* MOTSCH., especially North American species, although it is easily distinguishable by more convex body, less broad tarsal segments with less emarginate at apex pro- and mesotarsal segment 4 (Figs 34, 35). From the genus *Apatrobus* HABU & BABA it differs first of all in more convex eyes, shorter temporae, shape of pronotum (see above, Figs 40, 42), almost not constricted towards base of elytra and usually developed wings. The characters of this genus confirm that it represents an independent evolutionary lineage within Patrobini, which has most likely diverged earlier than isolation of both *Patrobus* STEPH. and *Platypatrobus*

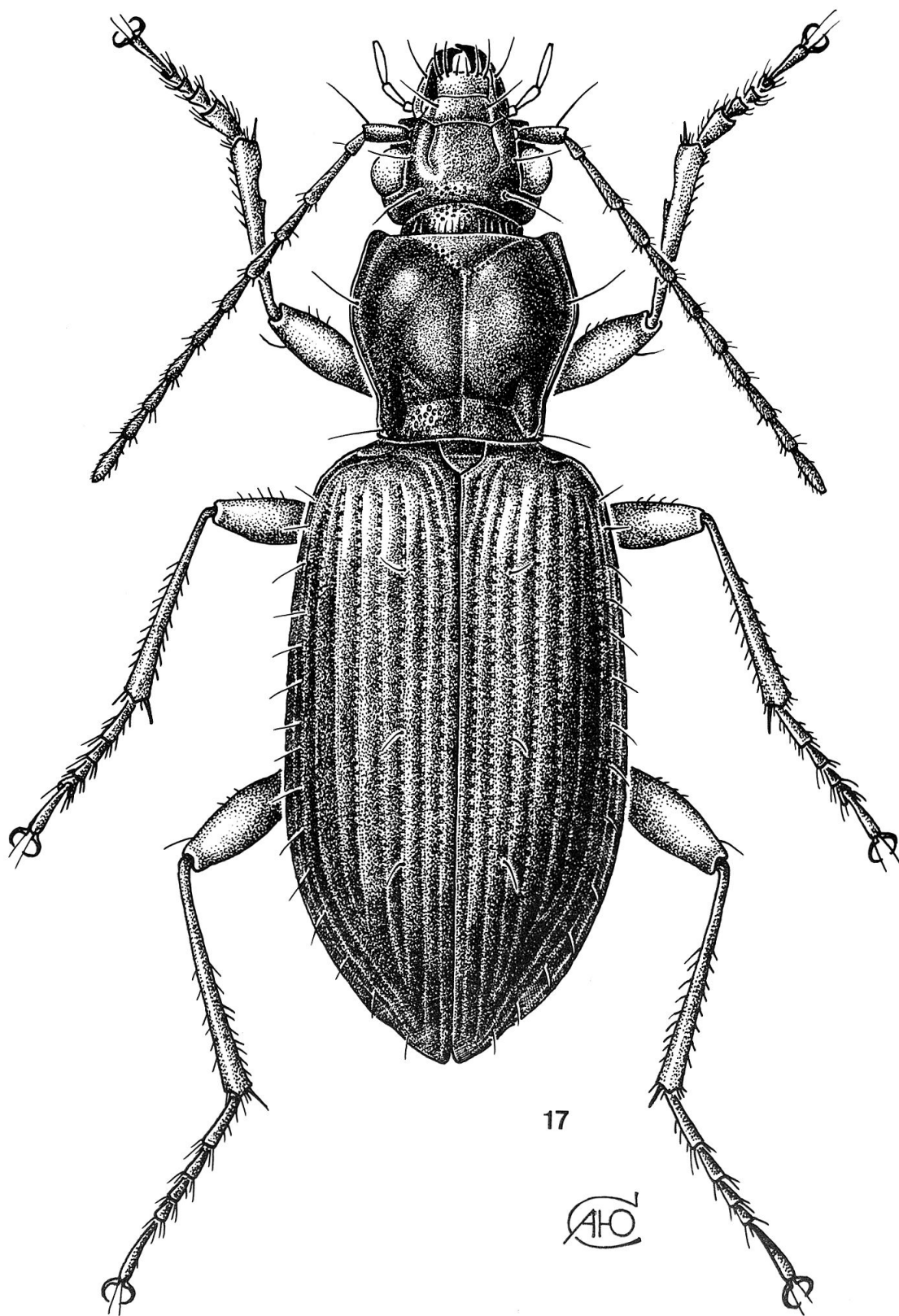


Fig. 17. *Archipatrobus deuvei* n.sp., general view.

DARL. on the one hand, and *Diplous* s.str. and *Platydius* CHAUD. on the other took place. Hence it must be treated as genus.

Distribution: China, Korea, Japan.

Habitat: In Japan one representative of this genus, *A. flavipes* (MOTSCH.), «is common at least on plains» (MORITA, 1990). In China the species occur also in the mountains, in the valleys around Kangting (formerly Ta-Tsien-lou) and at Tien-Mu-Shan Mt. Range (ZAMOTAJLOV & KRYZHANOVSKIJ, 1990).

Archipatrobus devei n.sp. (figs 17, 24-27)

Patrobus yunnanus FAIRMAIRE; KÜHNELT, 1941, *Ann. Naturh. Mus. Wien* 51:164,165. – ZAMOTAJLOV & KRYZHANOVSKIJ, 1990, *Proc. Zool. Inst. Leningrad* 211:10.

Body black, antennae, palpi, and legs reddish-brown, juvenile specimens brown, appendages pale. Head broad, ovate, eyes large, strongly convex, temporae short, distinctly shorter than eye diameter, tumid, neck-constriction rather shallow, frontal furrows deep, divergent posteriorly, surface smooth, neck-constriction punctured, 2 supraorbital setae present on each side of head, hind one situated nearly equidistant from both posterior margin of eye and neck-constriction. Tooth of mentum bifid. Pronotum subcordate, 1.12-1.19 times as wide as long, convex, widest at about one third from apex, front margin almost level, lateral sides rather straightly divergent from the front angles towards middle, at the widest point somewhat obtusely angular and then sinuated towards hind angles, they are widely explanate in front and rather narrowly explanate behind, hind margin faintly rounded, front angles protruding, hind ones rectangular, pointed, with teeth and faint carina; anterior transverse impression rather deep, densely and strongly punctate, basal foveae longitudinal, prominent, strongly punctate, disk near lateral margins strongly, in the middle faintly and sparsely rugous, lateral grooves with somewhat regular row of punctures, median line reaches base, although indistinct within basal punctuation; lateral margins with a single seta before middle and with one seta in hind angles. Elytra oblong-ovate, 1.74-1.83 times as long as wide, convex, shoulders widely rounded although prominent; striae punctate, at apex smoothed out, interspaces almost flat, interspace 3 with 3 setiferous pores adjoining stria 3, marginal series composed of 11-12 pores; microreticulation very fine, consists of isodiametric meshes. Alate. Tarsal upper surface glabrous, pro- and mesotarsal segment 4 slightly emarginate at apex, metatarsal segment 5 ventrally glabrous. Pro-, meso- and metepisterna, lateral areas of pro-, meso-, and metasternum coarsely and densely punctate, lateral part of sternites rugous. Aedeagus (Figs 24, 25) bent step-like at base, its apical lamella bent ventrally and twisted rightwards; proximal copulatory piece rather small, teeth-patch large, apical copulatory piece represents short and broad tooth. Left paramere (Fig. 26) larger than right one (Fig. 27), their apical projections elongated, evenly contracted towards apex, bearing 2 long apical and 1-3 small subapical setae.

Total length 10.4-12.1 mm.

Material: Holotype ♂ (AZ), China, Chekiang prov. ca. 29° N 120° E, 19.IV. 1919, Eigin Suenson. Paratypes: 2 ♂♂, (MP) with label "Chine, Foo Kien, M. de la Touche, 1899". 5 ♂♂, 3 ♀♀ (MP) with label "Yun., Han., Donckier, 1906". 1 ♂ (MP) with label "Yunnan-Sen, M.T.Excoffier, 1898". 1 ♂, 1 ♀ (ZMK), with the same locality as holotype, 23.IV.1925, Eigin Suenson. 1 ♂, 1 ♀ (ZMK), same locality, 27.IV.1925, Eigin Suenson. 1 ♂ (ZMK), China, Tien Mu Shan, 30° 23' N 119° 37' E, 17.V.1937, Eigin Suenson.

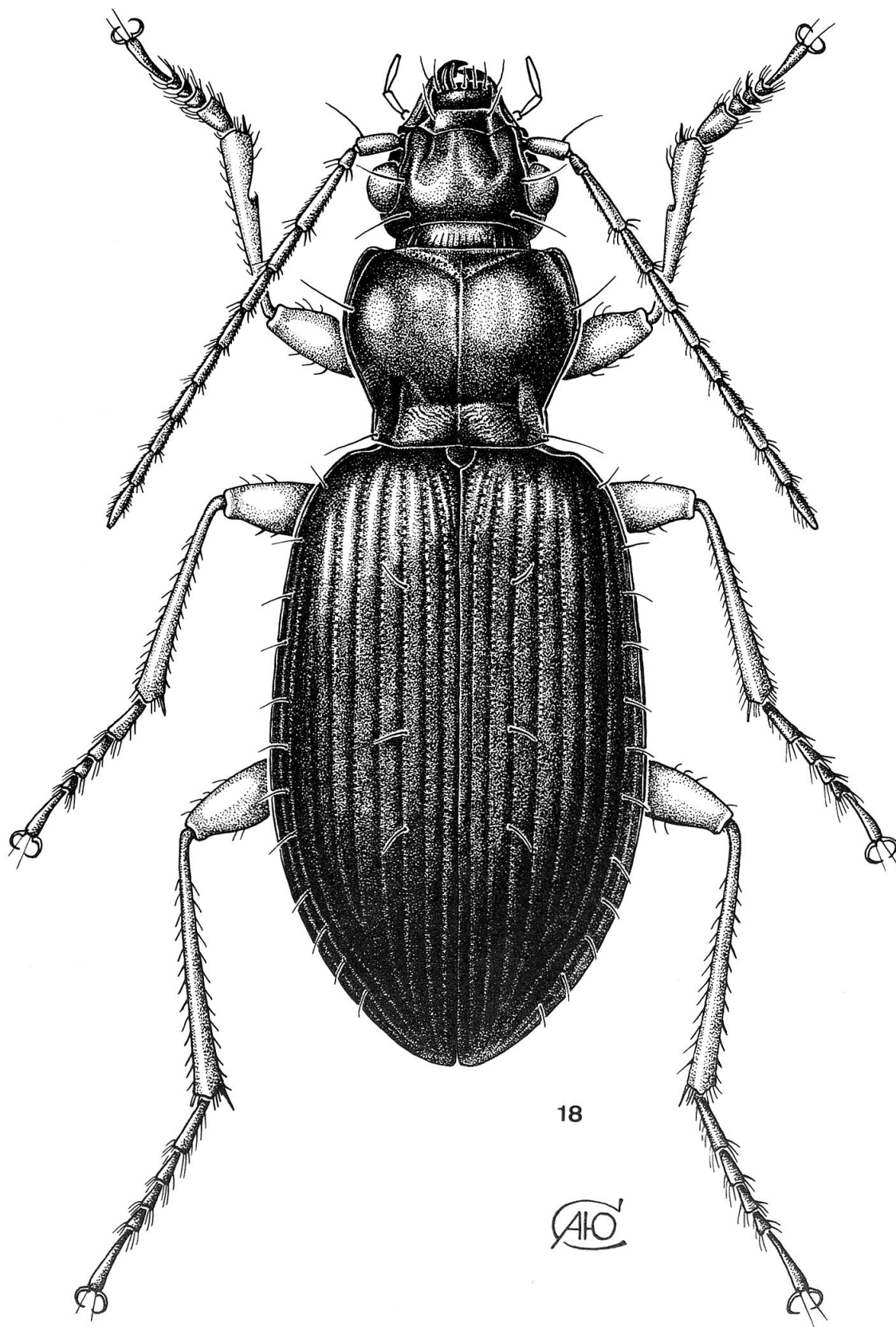


Fig. 18. *Archipatrobus flavipes kandinensis* n.ssp., general view.

Derivatio nominis: This species is named after Dr Th. DEUVE of the Muséum National d'Histoire Naturelle in Paris.

Affinities: From *A. flavipes* (MOTSCH.) it differs, first of all, in smaller body size, shorter and tumid temporae, less cordate and stronger constricted towards base pronotum. From *A. suenisoni* (ZAMOT. & KRYZH.) this species is distinguishable by somewhat smaller body size, more slender body, more broad and cordate pronotum with stronger projected front angles. From both species it differs clearly in the structure of male genitalia. According to its main characters, this species is probably more closely related to *A. suenisoni* (ZAMOT. & KRYZH.), than to *A. flavipes* (MOTSCH.).

Distribution: South of C and S China. In the addition to the above-mentioned type localities, Pingshiang and Kiangsi, mentioned by KÜHNELT (1941), must be noted.

Habitat: Occurs, probably, on plains and in middle highlands.

Archipatrobus flavipes kantonensis n.ssp. (Fig. 18)

Patrobus flavipes MOTSCHULSKY; ZAMOTAJLOV & KRYZHANOVSKIJ, 1990, *Proc. Zool. Inst. Leningrad* 211:10 (partim).

This subspecies differs from the nominotypical one in more gradually divergent posteriad frontal furrows, more robust and distinctly cordate pronotum with more sharp, hardly projecting beyond level of apex front angles and not denticulate or carinate hind angles, in stronger contracted towards base elytra, more rounded shoulders, and pattern of elytral microreticulation, consisting of isodiametric meshes (in nominotypical subspecies meshes are transverse).

Total length 12.2 mm.

Material: Holotype ♀ (ZISP), "Betw. Yun-Gzhing-Sian and Ching-Chi-Sian [W Szechwan, district of Kangting], 9.IV.1893, Potanin".

Derivatio nominis: This form is known from the district of Kangting.

Affinities: The new subspecies apparently represents a local brachypterous form of *A. flavipes* (MOTSCH.). However, further investigation could reveal its specific rank.

Diploous davidis (FAIRMAIRE, 1891) n.comb., resurr.stat. (Figs 19, 28-31)

Patrobus davidis FAIRMAIRE, 1891, *Compt. Rend. Soc. entomol. Belg.* 35:CLXXXIX.

Patrobus yunnanus FAIRMAIRE; KÜHNELT (nec FAIRMAIRE), 1941, *Ann. Naturh. Mus. Wien* 51:164, 165.

Body black to dark brown, shiny, antennae and palpi dark brown to brown, legs black to brown. Head somewhat rhombic, eyes large, strongly convex, temporae only a little shorter than eye diameter, faintly tumid, neck-constriction distinct, rather deep; surface punctured only in neck-constriction, 2 supraorbital setae present on each side, posterior one situated closer to neck-constriction than to posterior margin of eye; palpi more or less slender, at tip truncate. Pronotum cordate, 1.25-1.34 times as wide as long, front margin almost straight, sides rounded in front and prominently sinuated behind, widely bordered, basal margin faintly emarginate in the middle; anterior transverse impression more or less deep, coarsely punctate, basal foveae large but shallow, coarsely punctate, lateral sides rugous-punctate, median line sharp, reaching base although obliterated at hind extremity, disk feebly rugous or smooth; lateral margins with one seta before middle and one seta in hind angles. Elytra subquadrate, 1.68-1.78 times as long as wide, shoulders distinct, fairly obtuse,

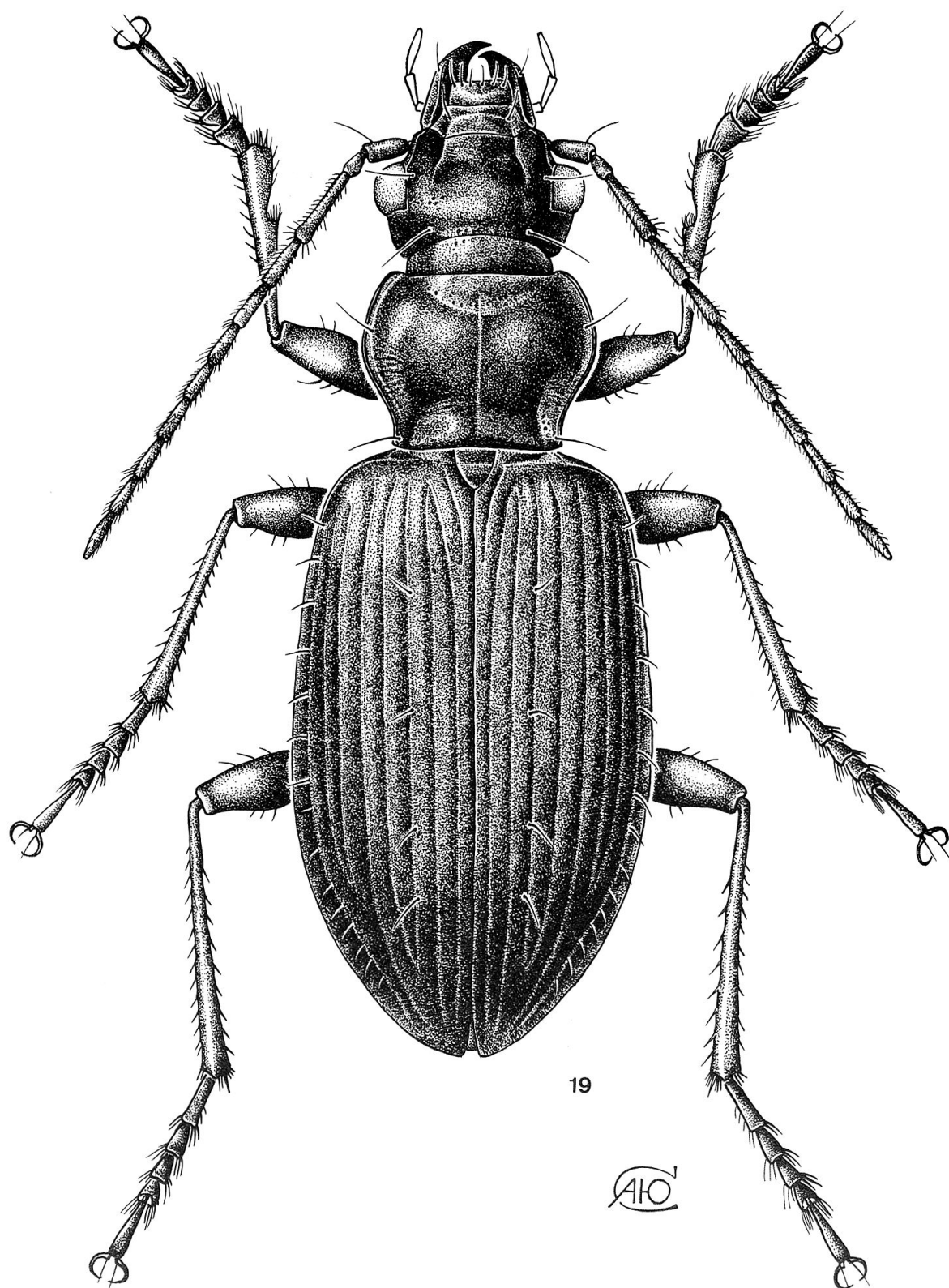
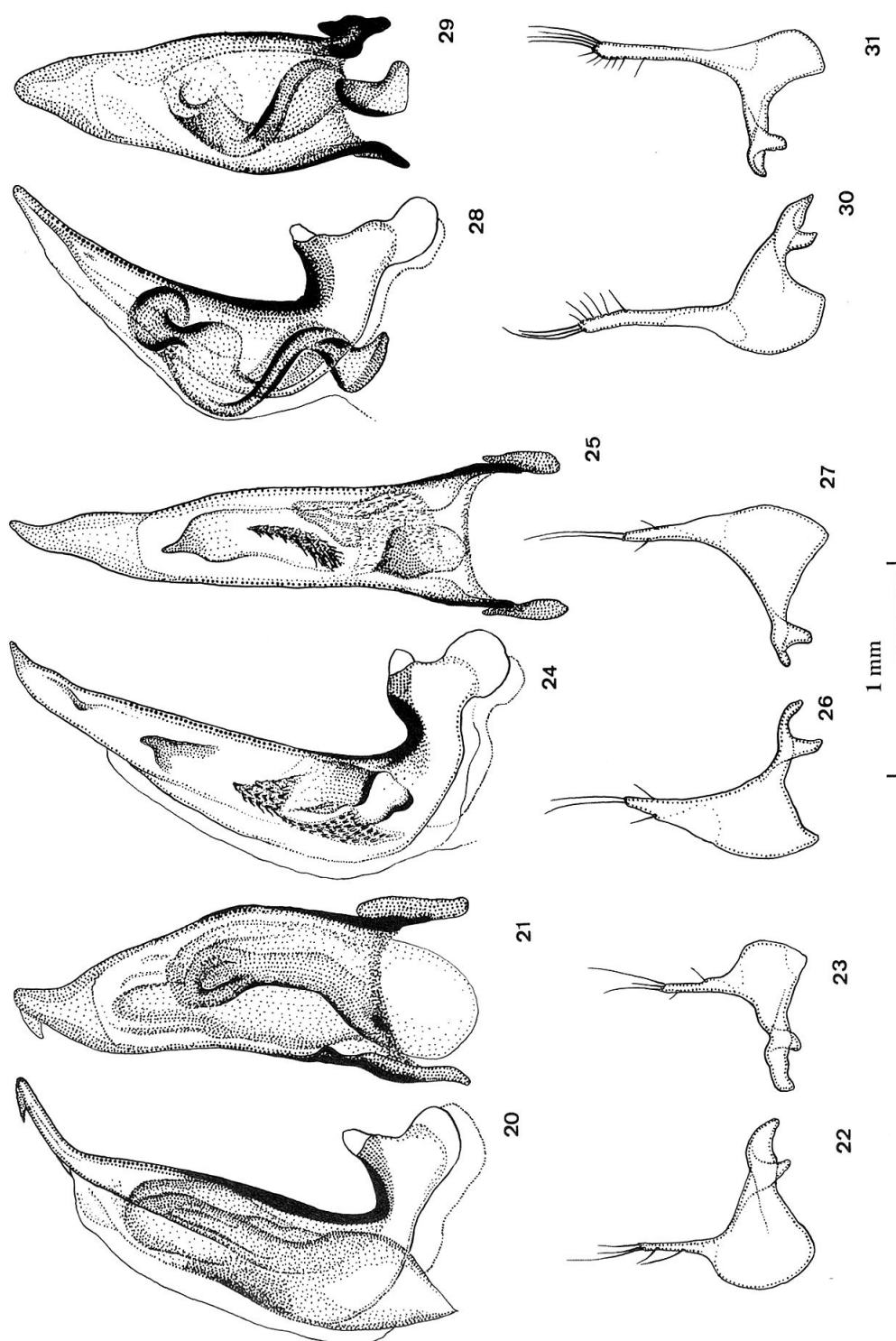


Fig. 19. *Diplous davidis* (FAIRM.), general view.



Figs 20-31. Male genitalia of: 20, *Apatrobis brancuccii* n.sp., paratype, aedeagus in left lateral view; 21, idem, aedeagus in dorsal view; 22, idem, left paramere; 23, idem, right paramere. 24, *Archipatrobis deuvei* n.sp., paratype from Chekiang, aedeagus in left lateral view; 25, idem, aedeagus in dorsal view; 26, idem, left paramere; 27, idem, right paramere. 28, *Diplous davidis* (FAIRM.), from Mou-Pin, aedeagus in left lateral view; 29, idem, aedeagus in dorsal view; 30, idem, left paramere; 31, idem, right paramere.

all striae distinct, not punctate, interspaces somewhat convex, interspace 3 with 4 setiferous pores adjoining stria 3, marginal series composed of 15 pores, rarefied in the middle; microreticulation forming isodiametric meshes. Pro- and mesotarsal segment 4 strongly bilobed. Aedeagus (Figs 28, 29) bent step-like at base, ventral side gradually arcuate, apical lamella curved ventrally, evenly attenuating towards apex (viewed laterally); armature of endophallus consists of single twisted spirally (with 1-1.5 coils) proximal copulatory piece; left paramere (Fig. 30) larger than right one (Fig. 31), apical projections long and narrow, bearing 3-4 long apical and several short subapical setae.

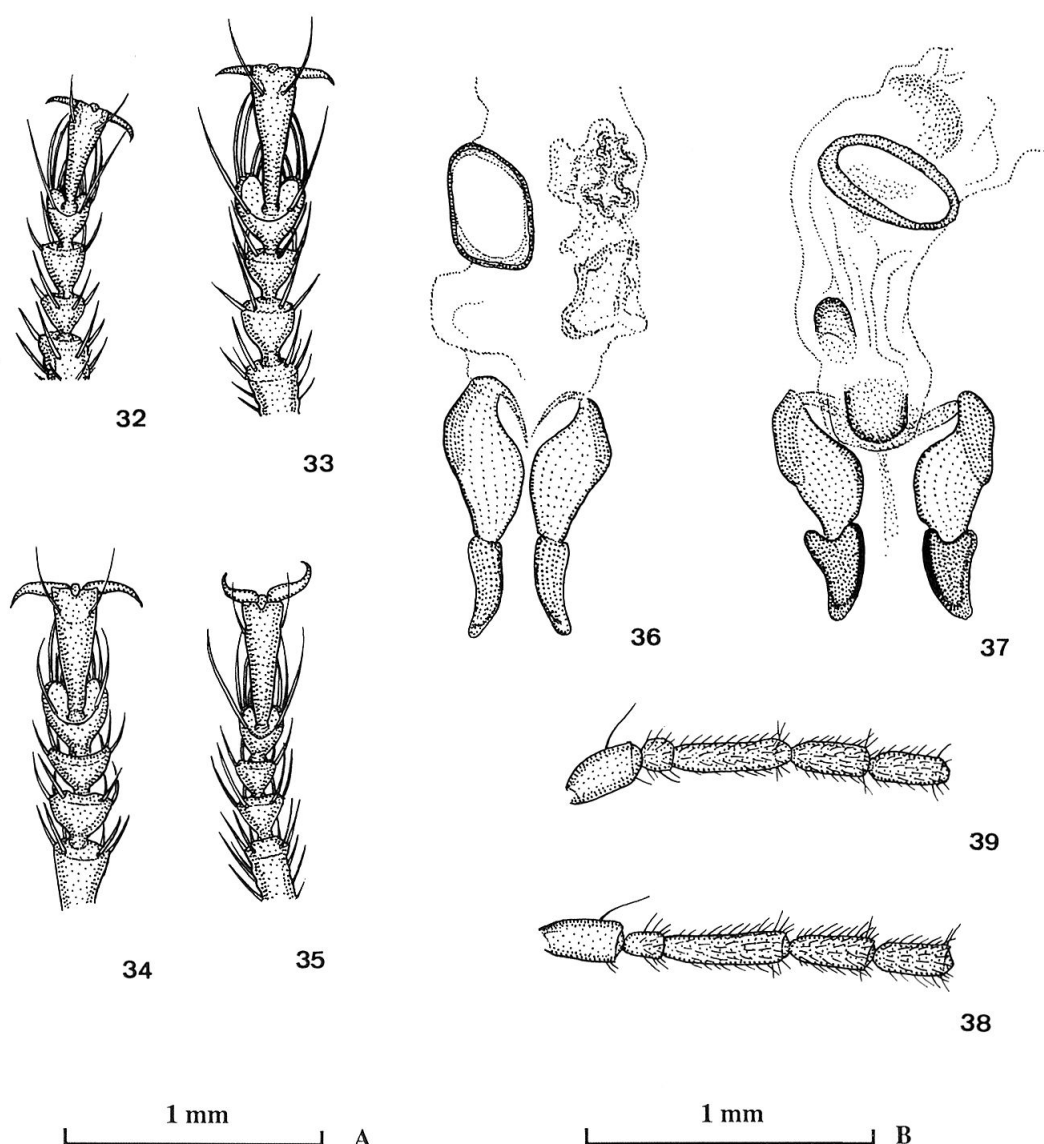
Total length 12.5-12.9 mm.

Material: I have found 2 specimens fitting to the original description, 1 ♂, juvenile (MP) with labels "Museum Paris Mou-Pin A.Davis 1870", "J 22", "*Patrobus Davidis* Fairm." (FAIRMAIRE's handwriting), "Type", and a yellow circle with number 717 70 (designated here as lectotype, in spite of FAIRMAIRE's indication, apparently erroneous, that the studied specimen was a female). 1 ♂ (MP) with label "Museum Paris Mou-Pin A David 1870" and yellow circle with number 1092 70.

Affinities: According to its main characters, this species belongs to "1. Gruppe" of *Diplous* MOTSCH. after KÜHNELT (1941), comprising two species, *D. caligatus* BATES and *D. sibiricus* MOTSCH. (or a single polytypical species *D. sibiricus* MOTSCH., with subspecies *D. sibiricus sibiricus* MOTSCH., *D. sibiricus caligatus* BATES, and *D. sibiricus atratus* HABU, after LAFER, 1989). However, in its robust body, rhombic head with the prominent and deep neck-constriction, broad in its middle aedeagus, and slightly spiralized proximal copulatory piece, *D. davidis* (FAIRM.) resembles *D. grummi* ZAMOT. & KRYZH., thus occupying a position intermediate between "1. Gruppe" and "2. Gruppe" after KÜHNELT (1941).

KEY TO THE PALAEARCTIC GENERA AND SUBGENERA OF THE SUBFAMILY PATROBINAE

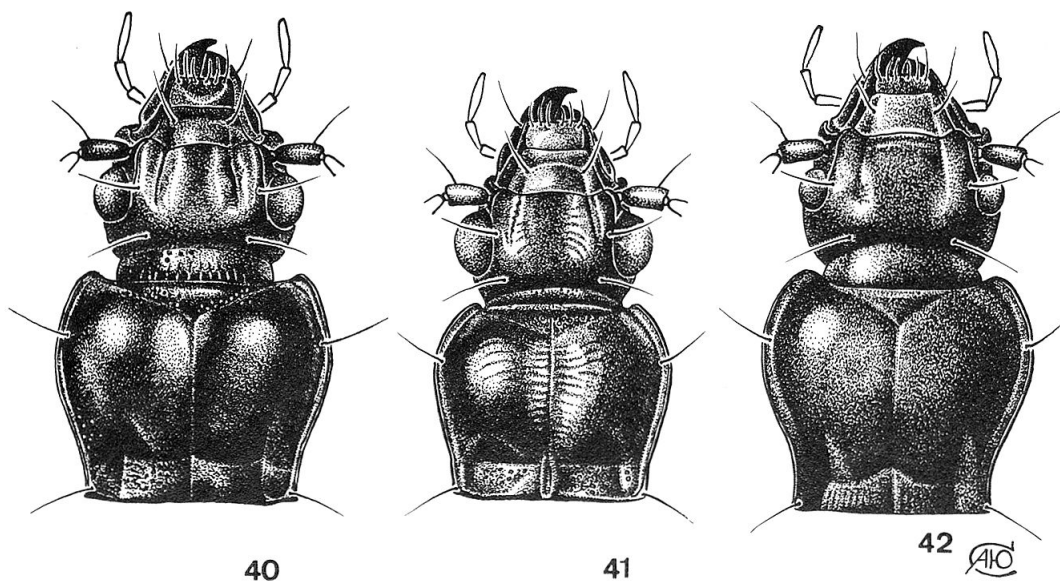
1. Antennomere 1 bears 2 or several long setae, neck-constriction shallow (Tribe Deltomerini, partly) 2
- Antennomere 1 with a single long seta, neck-constriction deeper 5
2. Vertex and temporae glabrous, with 1-2 supraorbital setae and 1 seta between eye and neck-constriction Genus *Ledouxius* n.gen.
- Vertex and temporae, seldom only vertex, with numerous setae 3
3. Tarsal upper surface glabrous, sometimes with a few small setae on the first segment Genus *Penetretus* MOTSCH.
- Tarsal upper surface ciliate (Genus *Deltomerus* Motsch.) 4
4. Shoulders prominent, elytra faintly contracted towards base, unicolorous ...
- Subgenus *Deltomerus* s.str.
- Shoulders indistinct, elytra strongly contracted towards base, bicolourous ..
- Subgenus *Paradeltomerus* APF.
5. Lateral margin of pronotum with several setae before its middle 6
- Lateral margin of pronotum with a single seta before its middle 8
6. More robust species, eyes large, strongly convex, temporae shorter than eye diameter, neck-constriction more prominent, surface of head with 2 supraorbital setae only, hind one usually situated closer to eye than to neck-



Figs 32-39. 32-35: Protarsi of ♀ of: 32, *Penetretus rufipennis* DEJ. from Licq.; 33, *Ledouxius umbilicatus* (LEDOUX), paratype from Gulmarg; 34, *Diplous caligatus* BATES from Odawara; 35, *Archipatrobus suensoni* (ZAMOT. & KRYZH.), paratype from Tien Mu Shan. 36-37: Female reproductive tract in dorsal view of: 36, *Chinapenetretus microphthalmus* (FAIRM.), lectotype; 37, *Apatrobus brancuccii* n.sp., paratype. 38-39: Basal antennomeres of: 38, *Platydiolus rufus* CHAUD. from Aldan; 39, *Patroboidea rufa* VAN DYKE from Lillooet. Scales: A for figs 32-37; b for figs 38-39.

- constriction and never beside neck-constriction, shoulders overhung, surface between them plane or nearly concave ... Subgenus *Chinapenetretus* KURN.
- More slender species, eyes small, faintly convex, temporae subequal in length to eye diameter, neck-constriction less prominent, surface of head with 2-4 supraorbital setae and 1-2 setae on the sides of vertex, one pair of them situated beside neck-constriction, elytra evenly flattened, without overhung shoulders (Genus *Parapenetretus* KURN.) 7
7. Body more flat, vertex with 2 or more pairs of setae Subgenus *Parapenetretus* s.str.

- Body more convex, vertex with a single pair of setae Subgenus *Butanopenetretus* n.subgen.
- 8. Eyes small, faintly convex, temporae subequal in length to eye diameter, median line of pronotum not broadened and deepened backwards (Tribe Deltomerini, partly) 9
- Eyes larger, strongly convex, temporae usually shorter than eye diameter (Tribe Patrobini) 12
- 9. Antennomere 2 entirely ciliate; tarsal upper surface ciliate; body length not more than 6.5 mm Genus *Platydiolus* CHAUD.
- Antennomere 2 ciliate only at apex; larger species, if small, tarsal upper surface glabrous 10
- 10. Total length not more than 6 mm; aedeagus with large, produced dorsally, horn-shaped protuberance at apex Genus *Minypatrobis* UÉNO
- Larger species, aedeagus sometimes with small tooth- or horn-shaped protuberance, but never with large horn-shaped one at apex (Genus *Apatrobis* HABU & BABA) 11
- 11. More slender species, pronotum subcordate to cordate, elytra more or less flattened Subgenus *Apatrobis* s.str.
- More robust species, pronotum not or almost not cordate, elytra strongly convex Subgenus *Parapatrobis* n.subgen.
- 12. Median line of pronotum near base broadened into gutter-shaped groove, lateral margins of pronotum usually without prominent and coarse punctation, temporae shorter Genus *Patrobis* STEPH.
- Median line of pronotum usually obliterated near base, never broadened, lateral margins of pronotum strongly punctured, temporae longer 13
- 13. Body somewhat flattened, tarsal segments broader, segment 4 of pro- and mesotarsi wider than long, often bilobed Genus *Diplous* MOTSCH.
- Body convex, tarsal segments more narrow, segment 4 of pro- and mesotarsi not wider than long Genus *Archipatrobis* n.gen.



Figs 40-42. Head and pronotum of: 40, *Archipatrobis suenisoni* (ZAMOT. & KRYZH.), paratype from Tien Mu Shan; 41, *Patrobis septentrionis* DEJ. from Isle Onokotan; 42, *Apatrobis hikosanus* (HABU) from Mt Hiko.

DISCUSSION

The present-day knowledge of the subfamily Patrobinae does not seem to be thorough, especially as regards its Oriental representatives, so the precise establishing of the real phylogenetical relations of the main taxa is difficult. However, study on morphology and distribution of hitherto known species reveals that the tribe Deltomerini (in the sense of KURNAKOV, 1960) comprises two clear-cut groups, the first being distributed mainly in the Mediterranean Realm and the second in East Asia. Each group seems to be monophyletic and certain phylogenetical trends can be observed within them. Prior to the definition of their composition and probable genesis, however, the current knowledge with regard to evolutionary states of some characters should be outlined. Thus following JEANNEL (1926), KURNAKOV (1960) considered that dense and irregular elytral punctation within the tribe most likely represents a plesiomorphous character, on the contrary, if the punctation is sparse and arranged in discal series, it confirms the apomorphous status. In the first group intensive elytral punctation is often accompanied by well-developed pilosity of head and sides of pronotum. Thus intensive pubescence of body in general can most likely be considered as plesiomorphous character within Deltomerini. This corresponds to the opinion of KRYZHANOVSKIY (1953) concerning the primitive features of the genus *Carabus* L. and that of KURNAKOV (1958) of the subgenus *Myosodus* FISCH.-W. of *Pterostichus* BON.

The first group comprises the genera *Penetretus* MOTSCH., *Deltomerus* MOTSCH., and *Ledouxius* n.gen. Based on the above speculations, it is possible to conclude that the genus *Deltomerus* MOTSCH. probably represents the most primitive genus within it. However, this genus includes groups quite diverse both in morphology and distribution, and in their phylogenetical position. One of them (*D. paradoxus paradoxus* APF. and *D. paradoxus korakensis* MÜLLER) is so sharply separated in its appearance from the other congeners, that it has been regarded as different subgenus *Paradeltomerus* APF. *Penetretus* MOTSCH. comprises both rather primitive, and highly derivative forms, and probably represents a special evolutionary lineage within Mediterranean Deltomerini. *Ledouxius* n.gen. seems to be the most derivative genus of the group. Ranges of the most primitive *Deltomerus* species from the *punctatissimus*-group (Atlas Mts), the *corax*-group (Atlas Mts). and the *sterbae*-group (Balkan Peninsula) probably indicate the historical dispersal centre of the first group.

The second group includes the genera *Chinapenetretus* KURN., *Parapenetretus* KURN., and *Apatrobus* HABU & BABA. The first two genera possess more pronounced plesiomorphous characters in the chaetotaxy of head and pronotum. They both occur in W Szechwan and Yunnan (except for the most advanced species *Parapenetretus wittmeri* n.sp.), regions already known to house the most primitive taxa of beetles (SEMENOV-TIAN-SHANSKIY, 1935), and most likely represents the dispersal centre of the second group. The most derivative genus *Apatrobus* HABU & BABA seems to have originated from at least three presumably independent stocks. One of them has been subjected to a considerable radiation in Japan and Formosa. The second comprises three hitherto known species, *A. stenomus* (ANDR.), *A. sikkimensis* (DEUVE & LEDOUX), and *A. andrewesi* (ZAMOT.), from E Tibet and Sikkim. The last stock is formed by a single species, *A. brancuccii* n.sp.

Probable relatives, the genera *Platydiolus* CHAUD. and *Minypatrobus* UÉNO, seem to be related to the second group, their ranges composing the northern periphery of its range, they could also represent, however, an independent lineage within Patrobinae.

In the main groups species distributed at the extremities or peripheries of their ranges possess an appearance similar to each other, this fact probably reflects similar regularities of their evolution and their high phylogenetical status.

The tribe Patrobini most likely comprises three independent evolutionary lineages, i.e. the genus *Archipatrobus* n.gen. (1), the genera *Patrobus* STEPH., and *Platypatrobus* DARL. (2), and the genus *Diplous* MOTSCH. (3). This tribe seems to be related to the Oriental group of Deltomerini.

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