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Further contribution to the systematics of the carabid tribe Patrobini (Coleoptera: Carabidae)

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Дополнения к систематике жужелиц трибы Patrobini (Coleoptera: Carabidae)

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Abstract. The precise systematic position of two species belonging to the tribe Patrobini, namely *Dimorphopatrobus businskyi* Casale & Sciaky (SE Tibet, Tsema La Pass) and *Ledouxius kaganensis* (Heinz & Ledoux) (Pakistan, vicinity of Naran) is ascertained and substantiated by the means of the external morphology studies, cladistic analysis and similarity measurements. A new genus *Prodiplous* gen. n., close to *Diplous* Motschulsky and its allies, is erected for *D. businskyi*. *L. kaganensis* possesses several important distinctions from *Ledouxius* s. str. and resembles in some respects another genus of the subtribe Deltomerina – *Himalopenetretus* Zamotajlov. *Hasarotretus* subgen. n. is erected in *Ledouxius* Zamotajlov for *L. kaganensis*. Two species of the genus *Parapenetretus* Kurnakov are also described from China: *P. medvedevi* sp. n. (N Sichuan, vicinity of Nanping) and *P. wenxianensis* sp. n. (S Gansu, vicinity of Wenxian).

Key words. Coleoptera, Carabidae, Patrobini, systematics, new taxa.

Резюме. На основании детального изучения внешнего строения, реконструкции филогенеза и расчета показателей сходства уточнено систематическое положение двух видов жужелиц трибы Patrobini – *Dimorphopatrobus businskyi* Casale & Sciaky из юго-восточного Тибета (перевал Цземала) и *Ledouxius kaganensis* (Heinz & Ledoux) из Пакистана (окрестности Нарана). Для *D. businskyi* установлен новый род *Prodiplous* gen. n., близкий к *Diplous* Motschulsky и родственным ему таксонам. *L. kaganensis* имеет ряд серьезных отличий от видов подрода *Ledouxius* s. str. и по некоторым признакам напоминает близкий род подтрибы Deltomerina – *Himalopenetretus* Zamotajlov; для него описывается новый подрод *Hasarotretus* subgen. n. Описываются также два новых вида рода *Parapenetretus* Kurnakov из Китая: *P. medvedevi* sp. n. из северной Сычуани (окрестности Наньпина) и *P. wenxianensis* sp. n. из южной Ганьсу (окрестности Вэньцяни).

Ключевые слова. Coleoptera, Carabidae, Patrobini, систематика, новые таксоны.

Introduction

An analysis of the World Patrobinae, recently conducted by the first author of this paper (Zamotajlov, 2002, 2003b, 2005), left several uncertainnesses as to the taxonomic status of a number of species of the tribe Patrobini, caused mainly by the lack or insufficiency of the comparative material. Also, some taxa described later the above-mentioned publications have not been adequately analyzed till now. Casale and Sciaky (2003), in particular, stressed the necessity of a more accurate definition of the taxonomic position of *Dimorphopatrobus businskyi* Casale & Sciaky, basing on the characters used by Zamotajlov (2002) for elaboration of the classification of the entire tribe Patrobini. The present work meets a demand of such a kind basing on the newly acquired or restudied material, deriving mainly from the collection of the second author. We use this opportunity to describe also two outstanding species of the genus *Parapenetretus*, considerably expanding our knowledge of the morphology of its subgenera and species-groups, thus contributing to the systematics of the tribe in question too.

We follow below a taxonomic approach, minutely described in the above-mentioned papers and monographs and called the "taxonomic pattern" after Shatalkin (1988). Summarily, we understand it as a combination of the phylogenetic reconstruction, phenetic similarity measurements, approaches of cladistic zoogeography, and some other numerical methods of analysis for definition of the taxonomic position of the analyzed taxa. Both the phylogenetic study and similarity measurements implemented below are based on the same minimally updated dataset, which was used earlier (see Zamotajlov, 2002) and includes 75 morphological characters. Only one character has been added [Character 75: "apical tooth of retinaculum" with 2 states: present (0) and absent (1)]. Although some morphological features of the female tergite 8 of "*Penetretus" kaganensis* Heinz & Ledoux were unavailable for study (since we possess only a male), we managed to reconstruct them basing on the analogous male structures, such a reconstruction being done on the observation that these structures are strongly correlative in both sexes. Although they are still formally unknown, some obvious character states of the female reproductive tract were also entered in the updated matrix substituting missing data in the matrix by Zamotajlov (2002). 50 of 76 characters appeared to be parsimony informative in the cladistic analysis and are used in a newly constructed detruncated matrix, processed in WinClada (version 1.00.08) (Nixon, 2002). Heuristic analysis with the search strategy "multiple tree bisection-reconnection branch-swapping" was applied. To estimate the consistency of the clades found, Majority Rule Consensus tree has been obtained, basing on the entire set of calculated trees. Similarity measurements and cluster analysis were conducted with the aid of Biodiv (version 4.1) (Baev, Penev, 1995), using Czekanowski–Dice–Sørensen index, single linkage and unweighted arithmetic average (UPGMA) clustering methods.

Abbreviations used below for depositories are as follows: AZ – collection of Alexandr Zamotajlov, Krasnodar (Russia); BL – collection of Bernard Lassalle, Boissy lés Perche (France); RS – collection of Riccardo Sciaky, Milan (Italy).

Genus *Prodiplous* Zamotajlov & Sciaky, gen. n.

Type species *Dimorphopatrobus businskyi* Casale & Sciaky, 2003. – *Dimorphopatrobus* Casale & Sciaky, 2003: 79 (partim); Zamotajlov, 2005: 193 (partim).

Detailed morphological and phylogenetic study of *Dimorphopatrobus businskyi* revealed a position well separate from that of *D. ludmilae* Casale & Sciaky and therefore made it necessary to describe a new genus to house it only.

Diagnosis. The genus possesses all key features of the tribe Patrobini. In habitus, it resembles other Asian micropterous species of the subtribe Deltomerina (see the key by Zamotajlov, 2002), but is easily distinguishable from all of them by extremely long metatrochanters. In addition, it differs from *Caelopenetretus* in the absence of supernumerary setae on the head and on the lateral margin of the pronotum; longer and narrower metepisternum; triangular, not transverse, protarsomere 3; absence of discal pores on elytral intervals 5 and 7, and some features of the female tergite 8 (Fig. 7). From *Qiangopatrobus*, the new genus may be distinguished, first of all, by the shape of the suture, separating

the mesepisternum and mesosternum (Fig. 4); valliculiform anterior margin of the metasternum near the middle coxal cavities, and triangular (not transverse) protarsomere 3.

Prodiplous seems to be closest morphologically to the genus *Diplous* (in general, including all species-groups, both Asian and Nearctic) and cannot be reliably discriminated from the "fused" *Diplous*-term on the basis of characters previously used by Zamotajlov (2002) (although *Prodiplous* possesses stable and more numerous differences from each group of *Diplous* separately). However, it constantly differs in a number of morphometric (apparently adaptive) features, first of all, fairly convex, less depressed body with less elongate, prominently ovate (not parallel-sided) elytra, possessing narrow, indistinct humeri; relatively larger, somewhat macrocephalic head with smaller eyes and much longer, tumid temples, and strongly cordate and less transverse pronotum; it is distinguishable also by the shape of the metepisterna (Fig. 4), male and female genitalia (the latter being indeed quite variable in *Diplous*); the only species is always micropterous.

Distinctions from *Dimorphopatrobus ludmilae* Casale & Sciaky are discussed below (see "Remarks" section).

Description. Body of medium size. Integument fully pigmented, dark, nearly one-coloured, without metallic lustre. Fairly sex-dimorphic (head and metatrochanters larger in male).

Head slightly hypertrophied; temples well-developed, longer than eye-diameter; mandibles normal, retinaculum with prominent teeth; antennomere 1 with single anterodorsal seta, antennomere 2 with a corona of setae apically; apical maxillary palpomere broadest in the middle; tooth of mentum with two setae subapically; submentum with two setiferous pores on each side; only two supraorbital setae present, hind one situated apart from neck-constriction; temples glabrous.

Disc of pronotum glabrous; lateral margin with one seta before its middle; median line simple; prothorax glabrous; suture separating mesepisternum and mesosternum (Fig. 4) joins lateral margin of metasternum; mesepimeron narrow, slightly broadened laterally, without median process penetrating between meso- and metathorax, disjointed from middle coxal cavity by rather broad area of meso- and metasternum; metepisternum rather long and narrow (Character 33, state 1, after Zamotajlov, 2002); anterior margin of metasternum near middle coxal cavities valliculiform; inner side of fore femur without tubercle; metatrochanter long, exceeding lateral margin of body in male and nearly reaching it in female; male protarsomere 2 hardly larger than protarsomere 3, latter nearly triangular, protarsomere 4 strongly emarginate apically, bilobed; tarsi glabrous on upper surface; tarsomere 5 glabrous ventrally.

Elytra oblong-ovate, faintly convex; scutellar pore present; elytral striae well-developed, only lateral ones somewhat less distinct; setae arranged in discal series present only on interval 3.

Anterolateral apophysis of female tergite 8 short but distinct (Fig. 7), base of tergite moderately exceeding epitergite, longitudinal keels absent, transverse ones long, median sclerotization absent, both basal and apical longitudinal depigmentation absent; abdominal sternites glabrous.

Apical lamella of aedeagus long, gutter-shaped, open dorsally; membranous folders, bounding endophallus dorsally, far not reaching aedeagal apex; both proximal and apical sclerotization of endophallus present, apical one composed of one body; basal flagellum absent; parameres fully developed, apical projections long.

Distal sclerite of female reproductive tract absent; bursal sclerite well-developed, ovate; stylus with one or two microsetae subapically.

Remarks. *D. businskyi* was attributed to the genus *Dimorphopatrobus* on the basis of two morphological features: elongate metatrochanters and sexual dimorphism. As it has already been shown (Zamotajlov, 2002), strongly developed elongate (usually sex-dimorphic) metatrochanters are present in the three phylogenetically distant patrobine lineages, namely genus *Dimorphopatrobus*, subgenus *Platidius* of *Diplous* [being most pronounced in *D. californicus* (Motschulsky), see Marek, Kavanaugh, 2005, etc.], and the *lodosi* group of the genus *Deltomerus*. Thus, this character state must be considered as homoplastic and cannot be used to outline a monophyletic group. The second feature mentioned by Casale and Sciaky (in its various forms) seems to be highly (but not absolutely) correlative with the first one. Again, it is extremely strongly developed only in *Dimorphopatrobus ludmilae* (thus being considered by Zamotajlov, 2002 as an autapomorphy of this species), but in a much less developed state it occurs in some other taxa, particularly *Diplous californicus*. In *D. businskyi*, the sexual dimorphism is hardly pronounced; furthermore, the head hypertrophy is rather poor even in the male, at least it is less pronounced than in *Deltomerus lodosi* Ledoux.

There are several serious morphological differences between *Dimorphopatrobus ludmilae* and *D. businskyi*, which seem to have higher phylogenetic importance. First of all, the mandibles in the latter species are of a usual shape, not hypertrophied, with fully developed premolar tooth; the labrum is nearly straight apically, without deep emargination; the hind supraorbital seta is situated apart from the neck-

constriction; only two supraorbital setae are present; the lateral margin of the pronotum has one seta before middle; the prothorax is not constricted (viewed laterally, Character 27 after Zamotajlov, 2002); the metepisternum is longer and more narrow (Fig. 4); anterior margin of the metasternum near the middle coxal cavities is valliculiform; the inner side of the fore femur lacks tubercle (or tooth in male); the male and female genitalia are of different structure: the apical lamella of the aedeagus is long, gutter-shaped; the apical sclerite of the endophallus is present; the apical projections of the parameres are shorter, without numerous ventral setae; the female reproductive tract is more heavily sclerotized, of different type. In details of both the male and female genitalia, mainly not reflected in our numerical dataset, *D. businskyi* strikingly resembles *Caelopenetretus crinalis* Zamotajlov & Ito.

Cladistic analysis reveals a monophyletic group of patrobine genera, comprising *Caelopenetretus*, "*Dimorphopatrobus*" *businskyi*, *Qiangopatrobus*, and different species-groups of *Diplous* (the former constituting a common clade) (simplified tree see in Fig. 21). It is observed in 85 % of all resulting equally parsimonious trees. On the cladogram most similar to the "preferred cladogram" by Zamotajlov (2002) (Fig. 24), "*Dimorphopatrobus*" *businskyi* appears to be an adelphotaxon to the complex (*Qiangopatrobus* + *Diplous*). *Caelopenetretus* occupies a more basal position to the other taxa of this complex. If so, enlarged metatrochaters of some *Platidius* could be interpreted as a reversionary character state, arisen probably in some primitive ancestral taxa of this complex. The genus *Dimorphopatrobus* s. str. is obviously distant from it.

Simplified similarity dendrograms obtained by both the single linkage and UPGMA methods possess congregations comprising different species-groups of *Diplous*, genus *Qiangopatrobus* and "*Dimorphopatrobus*" *businskyi* (Figs 22, 23). Thus, from both the "phylogenetic" and the "phenetic" points of view, "*Dimorphopatrobus*" *businskyi* requires separation from *Dimorphopatrobus* in a distinct genus, which can be regarded as a close relative of *Qiangopatrobus* and *Diplous*. Noteworthy, it manifests probable way of the origin of the complex (*Qiangopatrobus* + *Diplous*) and its particular adaptations on the basis of the *Caelopenetretus*-like ancestor. More detailed relationships of *Prodiplous* and *Diplous* remain, however, obscure and require further study. Like *Qiangopatrobus*, *Prodiplous* could possess serious molecular differences from *Diplous* (see Marek, Kavanaugh, 2005).

Etymology. The generic epithet reflects the taxonomic position of the new genus close to *Diplous*.

Genus *Ledouxius* Zamotajlov

Zamotajlov, 1992: 252. Type species *Penetretus umbilicatus* Ledoux, 1984. Zamotajlov, 2002: 120; 2003a: 284; 2005: 197.

Subgenus *Hasarotretus* Zamotajlov & Sciaky, subgen. n.

Type species *Penetretus kaganensis* Heinz & Ledoux, 1987.

Penetretus kaganensis Heinz & Ledoux was described from a single female collected in the vicinity of Naran, this specimen being unavailable for detailed study earlier. We failed to ascertain the phylogenetic position of this species basing on available characters, however, taking into consideration the general appearance of the beetle, *P. kaganensis* was provisionally attributed (Zamotajlov, 2002) to the *Ledouxius longulus* group. Recently we obtained another specimen, a male, from the same locality, which fits the main features of "*Penetretus*" *kaganensis* and seems to belong to the same species. In habitus, it actually resembles very closely the *L. longulus* group, but some other features requiring a special study place it between the genera *Ledouxius* and *Himalopenetretus*. This urges us to erect a separate subgenus for this species. A brief description of some features of "*Penetretus*" *kaganensis* is given below as well.

Diagnosis. In habitus, the single member of the new subgenus resembles species of *Ledouxius* s. str., but differs in the absence of the apical tooth of the mandibles (Fig. 8), faintly concave just behind the middle coxal cavities metasternum (Fig. 5), shape of the suture separating the mesepisternum and mesosternum, which joins the anterior margin of the mesepimeron, faintly emarginate apically protarsomere 4, and missing median sclerotization of female tergite 8. The apical lamella of the aedeagus is

extremely narrow, masking its gutter-shaped structure, unlike all known *Ledouxius* species, proximal copulatory piece could be interpreted as possessing the basal flagellum (even implicit or rudimentary).

In the absence of the apical tooth of the mandibles and somewhat concave metasternum, *Hasarotretus* resembles the genus *Himalopenetretus*, but the latter possesses much longer mandibles and much more strongly concave metasternum. Furthermore, *Hasarotretus* differs in the presence of only two supraorbital pores, shorter metepisternum, simple, even anterior margin of the metepisternum, faintly emarginate apically protarsomere 4, short but prominent anterolateral apophysis of female tergite 8, the presence of the basal depigmentation of female tergite 8, indistinct basal flagellum of the endophallus, missing apical copulatory pieces and the above mentioned shape of the apical lamella of the aedeagus.

Description. Body of medium size. Integument fully pigmented, dark, nearly unicolorous, without metallic lustre.

Head of usual proportions; temples well-developed, much longer than eye-diameter; eyes faintly convex; mandibles not strongly elongate, lacking apical tooth (Fig. 8); antennomere 1 multisetose, with rather prominent anterodorsal macroseta; antennomere 2 with a corona of setae apically; apical palpomere of maxillary palpus broadest in the middle; tooth of mentum with two setae subapically; submentum with two setiferous pores on each side; only two supraorbital setae present, hind one situated apart from neck-constriction; temples glabrous.

Disc of pronotum glabrous; lateral margin with two setae before middle; median line simple; prothorax glabrous; suture separating mesepisternum and mesosternum (Fig. 5) joins lateral margin of metasternum; mesepimeron narrow, slightly widened laterally, without median process penetrating between meso- and metathorax, separated from middle coxal cavity by rather broad area of meso- and metasternum; metepisternum rather long and narrow; anterior margin of metepisterna even; metasternum faintly concave just behind middle coxal cavities, anterior margin near middle coxal cavities simple, without swelling; inner side of fore femur without tubercle; metatrochanter without peculiar modification, male protarsomere 2 distinctly larger than protarsomere 3, latter nearly triangular; protarsomere 4 faintly emarginate apically; tarsi faintly and sparsely pilose on upper surface; tarsomere 5 glabrous ventrally.

Elytra elongate, faintly convex; scutellar pore present; all elytral striae well-developed; setae arranged into discal series present only on interval 3.

Anterolateral apophysis of female tergite 8 short, base of tergite moderately exceeding epitergite, longitudinal keels absent, transverse ones long, median sclerotization absent, both basal and apical longitudinal depigmentation present; abdominal sternites glabrous.

Apical lamella of aedeagus long and very narrow (Figs 9, 10), indistinctly gutter-shaped and open dorsally, membranous folders, bounding endophallus dorsally, far not reaching aedeagal apex; proximal copulatory piece present, apical one and basal flagellum absent; parameres fully developed, apical projections tapering apically, pointed (Figs 11, 12).

Remarks. Judging from the bulk of characters, *Hasarotretus* should be placed close to *Ledouxius* and *Himalopenetretus* and could be a sister group of either the first or the second genus (Figs 21, 22). However, basing on the entire set of the morphological characters, it is most similar to *Ledouxius* (Figs 23, 24). Hence, at present we incline to treat it as a subgenus of the latter.

The distributional range of the new subgenus is very close to that of the *Ledouxius longulus* group, which inhabits Pir Panjal Range. However, the nearest representative of the genus *Himalopenetretus*, *H. falciger* (Heinz & Ledoux), is also distributed rather near (Gilgit Agency, Naltar; see Heinz, Ledoux, 1989). Probably, *Hasarotretus* manifests an evolutionary stage close to the initial divergence of both genera, nowadays inhabiting vast territories of Himalayas up to Uttar Pradesh in the East (Ledoux, 1984; Heinz, Ledoux, 1987; Zamotajlov, Sciaky, 1998).

Etymology. The subgeneric epithet is derived from Hasara District in the North-West Frontier Province of Pakistan, where Naran [type locality of *H. kaganensis* (Heinz & Ledoux)] is situated.

***Ledouxius* (*Hasarotretus*) *kaganensis* (Heinz & Ledoux)** (Figs 1, 5, 8–12)

Heinz, Ledoux, 1987: 32 (*Penetretus*). Zamotajlov, 1992: 253; 2002: 120; 2003a: 284; 2005: 197 (*Ledouxius*).

Description. Habitus as in Fig. 1. Body dark brown, almost black, shiny; antennae, mandibles, tibiae, tarsi, and palpi brown. Head ovate, 0.86 times as wide as pronotum; eyes small but prominent, faintly convex; temples long, nearly oblique, neck-constriction rather shallow; frontal furrows rather deep and long, slightly divergent posteriad; surface smooth, rather coarsely punctate only in frontal furrows and at neck-constriction. Pronotum subcordate, transverse, rather strongly constricted posteriad, 1.12 times as wide as long, with anterior angles more or less distinct, lateral margins rounded, sinuate just before posterior angles; latter nearly rectangular, pointed, slightly projecting laterally; anterior transverse impression very shallow; basal foveae shallow, indistinct; median line rather deep and broad; anterior margin, sides and base rather sparsely and coarsely punctate. Elytra oblong-ovate, 1.69 times as long as wide and 1.68 times as wide as pronotum, almost flat; humeri rounded, indistinct, humeral tooth very small; intervals slightly convex; striae deep, coarsely punctate basally; inter-

val 3 with three setiferous pores, marginal series of 19 setae. Hind wings reduced. Aedeagus (Figs 9, 10) markedly bent at base, apical lamella nearly straight (viewed laterally), very long and narrow, somewhat broadened near rounded apex (viewed dorsally); endophallus with rather large, bilobed proximal copulatory piece, its distal faintly sclerotized ending being finely spinulate; left paramere (Fig. 11) larger than right one (Fig. 12), both with short projections, left bearing two seate and right, one seta apically. Total length 11.2 mm.

Material. 1 ♂ (RS), N P a k i s t a n , NW Frontier Prov., Kaghan Valley, 2500–3500 m, Naran SE env., 26–27 VII 1998, J. Kaláb.

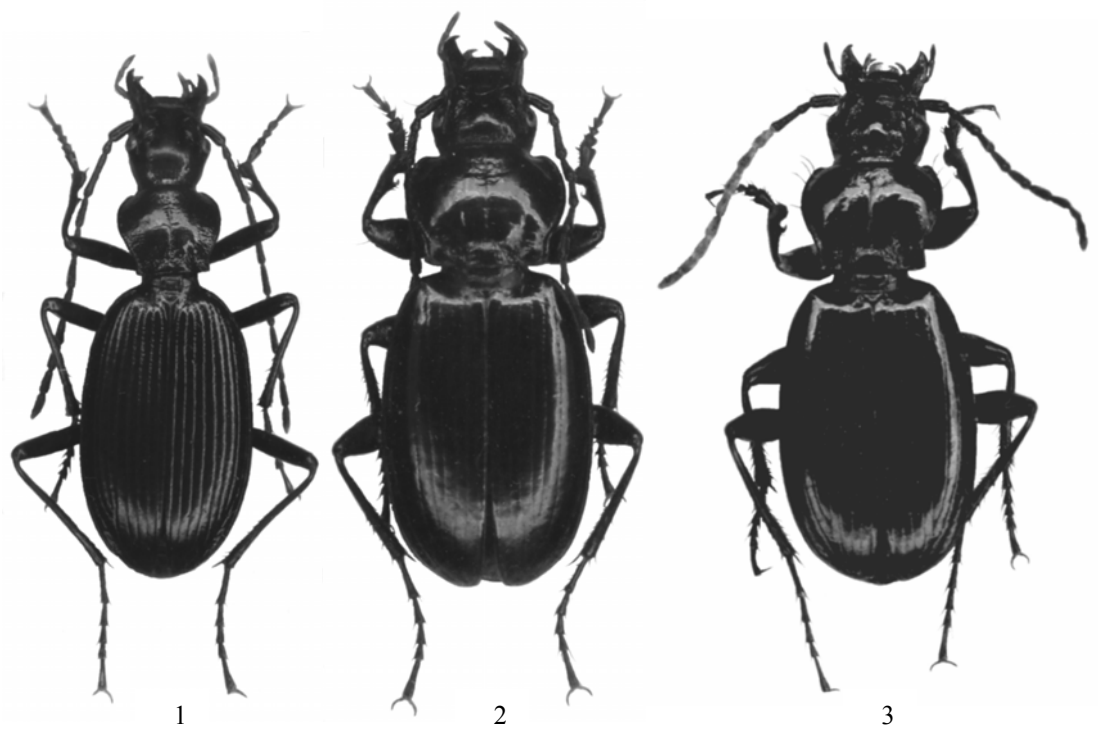
Remarks. The upper side of the tarsal segments of *L. kaganensis* (Heinz & Ledoux) is rather sparsely covered with small setae. Despite our previous assertions, this pattern of the setation is also characteristic of some other species of the genus *Ledouxius* and of *Himalopenetretus franzi* (Zamotajlov & Sciaky), so it cannot be used for their discrimination. Probably this hardly diagnosable feature was not also correctly interpreted by Heinz and Ledoux (1987); according to their description of the female, "les tarses sont bombés et glabres sur leur face dorsale". Another distinction concerns the chaetotaxy of the elytra: the female possesses four discal pores. However, this and some other minor differences do not seem relevant to us.

Some other significant male characters (including shape of ventrite 9) remain unknown because of inaccurate dissection of the specimen available.

Genus *Parapenetretus* Kurnakov

***Parapenetretus* (*Parapenetretus*) *medvedevi* Zamotajlov & Sciaky, sp. n.** (Figs 2, 6, 13–16)

Diagnosis. *P. medvedevi* sp. n. agrees with the nominotypical subgenus of *Parapenetretus* in the bulk of features, however, it differs in the presence of only three setiferous pores between the eye and neck-constriction [resembling in this respect *P.* (?) *reticulatus* Zamotajlov] and proportions of the male

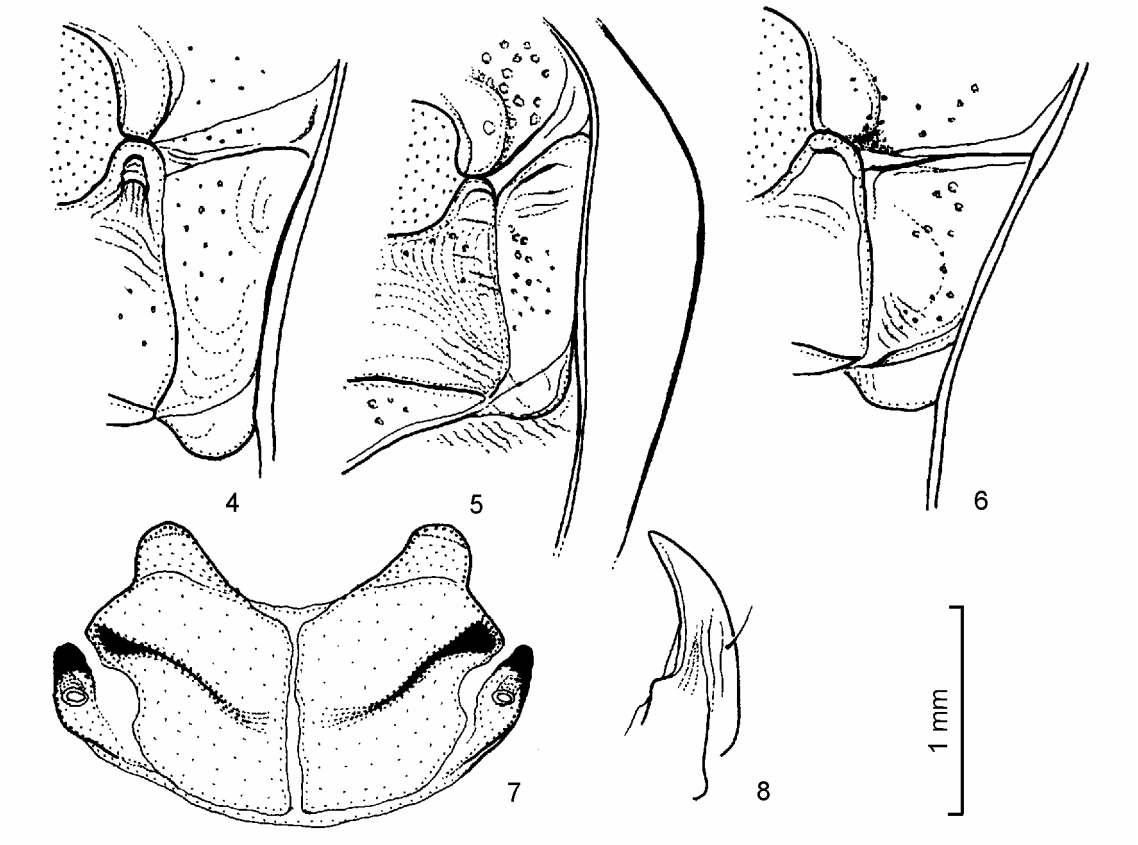


1 2 3

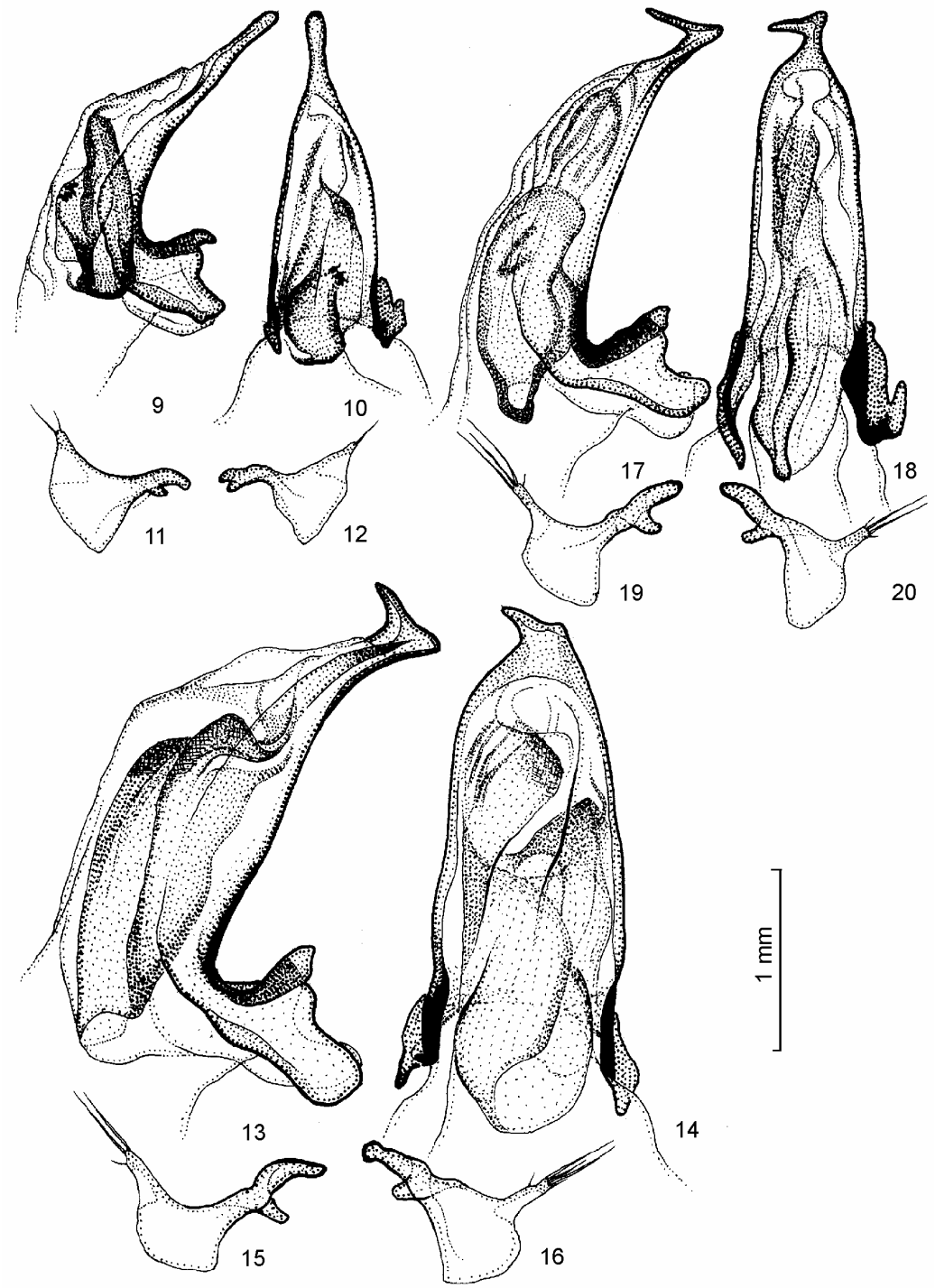
Figs 1–3. Patrobini, general view. 1 – *Ledouxius kaganensis* (Heinz & Ledoux), ♂; 2 – *Parapenetretus medvedevi* sp. n., holotype, ♂; 3 – *P. wenxianensis* sp. n., holotype, ♂.

protarsomeres 2 and 3 (resembling the subgenera *Ambigopenetretus* and *Robustopenetretus*). The state of Character 29 (after Zamotajlov, 2002) (Fig. 6) "inner angle of mesepisterna" is not absolutely clear and is assumed as "1", i. e. the suture joins the lateral margin of the metasternum (similar to other *Parapenetretus* species); anterior margin of the metasternum possesses only rather faint swelling, in contrast to the congeners; the aedeagus extremely large, larger than in the other known species. *P. medvedevi* sp. n. possesses also the most robust body of all known *Parapenetretus*. All these differences do not seem to have strong phylogenetic importance and reflect ecological adaptations rather than evolutionary position. So we place this species in *Parapenetretus* (s. str.), extending the diagnosis of this subgenus. Female genitalia characters (unknown at the moment) could help later to verify (and possibly change) this preliminary attribution.

Description. Habitus as in Fig. 2. Body dark brown to black, shiny; antennae and mandibles brown, legs and palpi brown to reddish brown. Head ovate, 0.66 times as wide as pronotum; eyes rather small, faintly convex; temples a little longer than eye-diameter, nearly oblique; neck-constriction deep; frontal furrows deep, markedly divergent posteriad; surface mostly smooth, rather sparsely and coarsely wrinkled-punctate in frontal furrows, neck-constriction coarsely punctate; three setiferous pores present on each side, anterior pore situated in supraorbital groove, middle one closer to neck-constriction than to posterior margin of eye, and posterior one about neck-constriction; tooth of mentum without peculiarities, submentum with two setae on each side. Pronotum broad, cordate, 1.37 times as wide as long, fairly convex; anterior margin almost straight; sides widely rounded, fairly sinuate before posterior angles, with rather broad explanate margin; basal margin nearly straight; anterior angles hardly projecting anteriad, somewhat angularly rounded; posterior angles obtuse,



Figs 4–8. Patrobini, lateral part of thorax (4–6), female tergite 8 (7), right mandible (8). 4, 7 – *Prodiplous businskyi* Casale & Sciaky, ♀; 5, 8 – *Ledouxius kaganensis* (Heinz & Ledoux), ♂; 6 – *Parapenetretus medvedevi* sp. n., holotype, ♂.



Figs 9–20. Patrobini, aedeagus, dorsal (9, 10, 13, 14, 18) and left lateral views (17); left paramere, left lateral view (11, 15, 19), and right paramere, right lateral view (12, 16, 20). 9–12 – *Ledouxius kaganensis* (Heinz & Ledoux); 13–16 – *Parapenetretus medvedevi* sp. n., holotype; 17–20 – *Parapenetretus wenxianensis* sp. n., holotype.

pointed; anterior transverse impression shallow, sparsely rugose; basal foveae rather broad, deep, sparsely and coarsely punctate; disc almost smooth, coarsely punctate in basal area; median line obliterated at both extremities; marginal setae 6–7 in number, basal seta present in posterior corner. Anterior margin of metasternum with rather faint swelling (Fig. 6); pro-, mesepisterna, and mesosternum densely and rather finely punctate, lateral portions of prosternum shallowly punctate, metepisterna and mesosternum almost smooth, shiny; lateral areas of sternite 1 finely wrinkled and indistinctly punctate; male protarsomere 2 markedly larger than protarsomere 3, metatarsomere 5 with three setae beneath. Elytra oblong-ovate, rather wide and short, 1.53 times as long as wide and 1.30 times as wide as pronotum, widest in the middle, fairly convex; sides somewhat rounded, narrowly bordered, with margin gradually tapering posteriorly; humeri rather broad and prominent, obliquely angulate and markedly denticulate; striae smooth, very finely punctate only at base; intervals faintly convex, interval 3 with three setiferous pores adjoining stria 3, humeral area of interval 7 with one seta adjoining stria 6; marginal series composed of 16 pores, rarefied in the middle; microsculpture made up by fine transverse meshes and wrinkles. Hind wings reduced. Aedeagus (Figs 13, 14) very large, markedly but gradually bent at base; apical lamella strongly curved ventrally (viewed laterally), sharply attenuating towards pointed apex (visible in ventral view only), with rather large tooth-shaped protuberance on right side dorsally; armature of endophallus composed of large bilobed, poorly sclerotized proximal copulatory piece without prominent subdivisions, its distal ending at least partly spinulate; left paramere (Fig. 15) larger than right one (Fig. 16), their apical projections short but distinct, bearing 2–3 long apical and 1–2 minute subapical setae. Total length 11.7 mm.

Material. H o l o t y p e : ♂ (RS), C h i n a , N Sichuan, Nanping env., 3500 m, 15 VI 1997, S. Murzin.

Etymology. We are pleased to dedicate this remarkable species to our colleague, outstanding Russian coleopterist Gleb S. Medvedev, Head of the Laboratory of Insect Systematics, Zoological Institute, St. Petersburg, President of Russian Entomological Society, in commemoration of his 75th birthday.

***Parapenetretus* (*Parapenetretus*) *wenxianensis* Zamotajlov & Sciaky, sp. n.** (Figs 3, 17–20)

Diagnosis. The main features of *P. wenxianensis* sp. n. fit the *Parapenetretus* (s. str.) *caudicornis* group (after Zamotajlov, Sciaky, 1996), though it differs in the absence of discal pores on elytral interval 7. From other members of the group it can be distinguished also by the more robust body and shape of the aedeagus, possessing extremely narrow apical lamella (viewed dorsally) with very large horn-shaped apical protuberance (viewed laterally).

Description. Habitus as in Fig. 3. Body dark brown to black, shiny, dorsum with intense lacquer lustre; antennae and mandibles brown, legs and palpi brown to reddish brown. Head ovate, 0.72–0.74 times as wide as pronotum; eyes rather large, fairly convex; temples about as long as eye-diameter, nearly oblique; neck-constriction deep; frontal furrows deep, faintly divergent posteriad; surface mostly smooth, densely and coarsely wrinkled-punctate in frontal furrows, coarse punctation prominently spread to neck-constriction, latter also coarsely and completely punctate; 4–5 setiferous pores present on each side, 2 anterior ones situated in supraorbital groove, middle (1–2 in number) between posterior margin of eye and neck-constriction, and posterior, represented as very large setiferous foveole, near neck-constriction; tooth of mentum without peculiarities, submentum with two setae on each side. Pronotum transverse, cordate, 1.22–1.27 times as wide as long, faintly convex; anterior margin almost straight; sides widely rounded, fairly sinuate before posterior angles, with rather broad explanate margin; basal margin nearly straight; anterior angles distinct, hardly projecting anteriad, angulate; posterior angles rectangular to obtuse, pointed, indistinctly carinate; anterior transverse impression rather deep, coarsely punctate; basal foveae rather broad, deep, densely and coarsely punctate; disc faintly wrinkled to smooth, coarsely punctate in basal area and lateral gutters, median line obliterated at both extremities; marginal setae five in number, basal seta present in posterior angles. Anteriort margin of metasternum with rather narrow swelling; pro-, mesepisterna, and mesosternum densely and rather coarsely punctate, lateral portions of prosternum finely punctate, metepisterna and metasternum somewhat more sparsely punctate, lateral areas of sternite 1 finely wrinkled and indistinctly punctate; male protarsomere 2 considerably larger than protarsomere 3, metatarsomere 5 with four setae beneath. Elytra oblong-ovate, 1.56–1.61 times as long as wide and 1.36–1.38 times as wide as pronotum, widest in the middle, faintly convex; sides somewhat rounded, narrowly bordered, margin gradually tapering posteriorly; humeri rather broad and prominent, obliquely angulate and markedly denticulate; striae distinct, basally rather coarsely punctate; intervals faintly convex, interval 3 with three setiferous pores adjoining stria 3; marginal series composed of 12–14 pores, rarefied in the middle; microsculpture composed of fine transverse meshes and wrinkles. Hind wings reduced. Aedeagus (Figs 17, 18) sharply bent at base; apical lamella fairly curved ventrally (viewed laterally), very narrow (viewed dorsally), abruptly attenuating towards somewhat rounded apex, with very long horn-shaped protuberance on right side dorsally; armature of endophallus composed of large, poorly sclerotized, bilobed proximal copulatory piece, its distal ending gradually transforming to membranous folded structures; left paramere (Fig. 19) larger than right one (Fig. 20), their apical projections short but distinct, bearing 2–3 long apical and 1–2 minute subapical setae. Total length 11.0–12.2 mm.

Material. H o l o t y p e : ♂ (RS), C h i n a , S Gansu, 20 km N of Wenxian, 3000 m, 25 V 1998. P a r a t y p e s . 1 ♂ (AZ), as holotype; 1 ♂ (BL), same locality, but Wenxian env., VI 1997, S. Murzin.

Etymology. The specific epithet refers to the name of the locality, where this species was collected, Wenxian.

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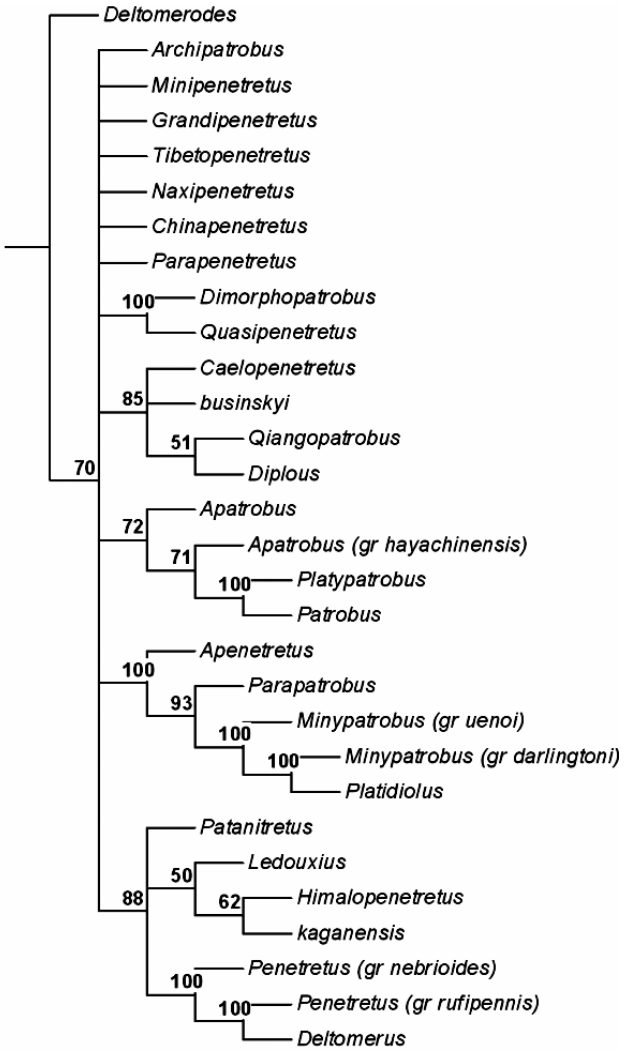

Fig. 21. Simplified majority rule consensus cladogram of the tribe Patrobini. Length = 312, CI = 0.21, RI = 0.67; numbers are the percentage of coincidence.

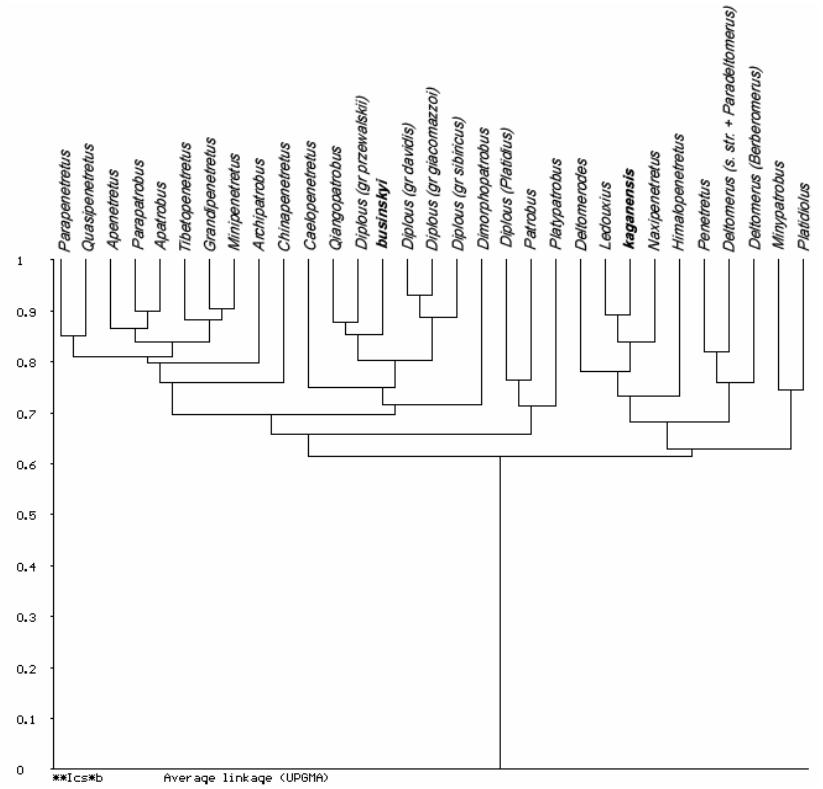

Fig. 22. Simplified similarity dendrogram of the tribe Patrobini constructed using UPGMA method. Scale indicates similarity indices.

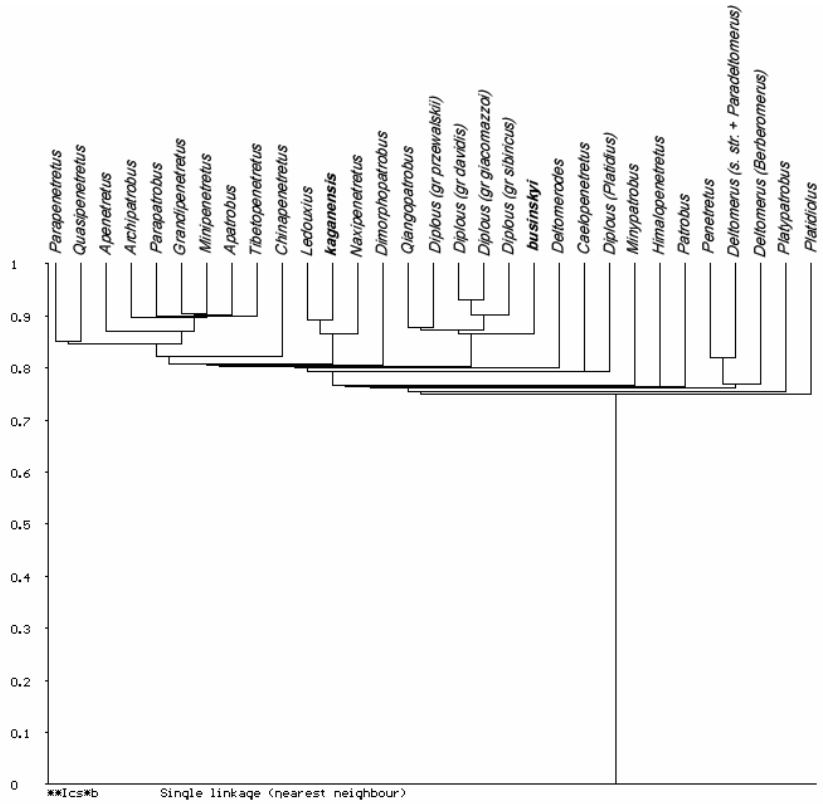

Fig. 23. Simplified similarity dendrogram of the tribe Patrobini constructed using single linkage method. Scale indicates similarity indices.

Fig. 24. Simplified preferred cladogram of the tribe Patrobini. Length = 275, CI = 0.24, RI = 0.72; empty circles indicate homoplasies, black circles indicate aut- or synapomorphies, character numbers indicated above lines, character states below lines (numbers expansion see Zamotajlov, 2002).

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