CONTRIBUTION TO THE BULGARIAN GROUND BEETLE FAUNA (COLEOPTERA: CARABIDAE). IV. TWO NEW SPECIES OF DUVALIUS (PARADUVALIUS) AND NOTES ON THE OTHER SPECIES OF THE SUBGENUS

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Abstract - Two new Duvalius-species of the subgenus Paraduvalius are described: D. (P.) petrovi sp. n. from the Eastern Rhodopes and D. (P.) pirinensis sp. n. from the Pirin Mountain. The taxonomic status of all Paraduvalius-species has been considered. Special attention is devoted to the taxa of the species group “stankovitchi”. In result of that D. delsthevi is synonymized with D. zivkovi and D. papasofoi is shifted from the “winkleri” group to the one “stankovitchi”. For the first time, illustrations of female genitalia of Paraduvalius species are presented. The copulatory piece of D. huresti is illustrated too.

Key words: Coleoptera, Carabidae, Duvalius (Paraduvalius); taxonomy, new species, synonymy; Palaearctic Region, Bulgaria.


Parole chiave: Coleoptera, Carabidae, Duvalius (Paraduvalius); tassonomia, nuove specie, sinonimia; Regione Palaearctica, Bulgaria.

1. Introduction

Sixteen species of the subgenus Paraduvalius Knirsch, 1924 of genus Duvalius Delarouzée, 1859 occur in Bulgaria (GUÉORGUIEV, 1971; CASALE, LANÉRY, 1983; GENEST, 1983; GENEST, JUBERTHE, 1983; FARKÁC, 1990; HURKA, 1990; CASALE, GENEST, 1991). At present, the relationships and systematic positions of the most species are unclear. Despite it has followed in present work the only classification of the group proposed (GUÉORGUIEV, 1971) includes characters of little importance and seems long time unnatural. On the other hand the morphological differentiation of the genital structures in the various lineages of Paraduvalius is result of long time autonomous evolution and their exceptional variation cannot facilitate the phyletic classification (CASALE, VIGNA TAGLIANTI, 1990: 328). The phenomenon of such variation is not unusual for group as Trechina Bonelli, 1810 and it could be explained with the peculiarities and trends of morphoeological evolution of the last taxon
(JEANNEL, 1928). Similar variation I ascertained in the present study (see item "Remarks" under D. pirinensis sp. n.).

The aims of the present study are to describe two new species (i), to outline or discuss the status of the Bulgarian taxa (ii) and to fill a gap in the genital morphology of some species (iii).

2. - Material and methods

The only species group classification proposed is followed (GUÉORGUIEV, 1971). The species within each group are arranged in alphabetical order. All the materials studied are kept in the National Museum of Natural History, Sofia (NMNH) and therefore it is cited further in the text without mention of that depository. Abbreviations used: m. - male/s; f. - female/s; CP - copulatory piece; HT - holotype; ML - median lobe; PA - length of pronotum apex; PB - length of pronotum base; PT - paratype/s; PW - maximal width of pronotum; SP - setiferous pore/s; TL - type locality; TS - taxonomic status. Overall distribution of the Bulgarian Paraduvalius - species is shown on Fig. 1.

![Map of Bulgaria and distribution of the species of Duvalius (Paraduvalius).](image)

Fig. 1. Map of Bulgaria and distribution of the species of Duvalius (Paraduvalius).


The designations of four unnamed taxa correspond to those from the text.

3. - List of the Bulgarian species of Duvalius (Paraduvalius)

"balcanicus" species group

Duvalius (Paraduvalius) balcanicus (Fridvaldszky, 1879)

TL: the exact site remains still unspecified, but most likely it is localized in the western part of the Shipchenska Planina Mt. ML: JEANNEL, 1928: 434; CP: JEANNEL, 1928: 434; FARKAČ, 1990: 353. TS: valid species.

Duvalius (Paraduvalius) bulgaricus (Knirsch, 1924)


Duvalius (Paraduvalius) garevi Casale & Genest, 1991


Duvalius (Paraduvalius) hanoe Hürka, 1990


Duvalius (Paraduvalius) karellturai Farkač, 1990

TL: northeastern part of the Western Rhodopes, Dobrostan Mt. The CP is illustrated (FARKAČ, 1990: 353) but the shape of the ML remains unknown. TS: valid species.

Duvalius (Paraduvalius) kotelensis Genest, 1978

TL: Kotlenksa Planina Mt., place "Zelenich". TS: valid species. Despite the male sex remains unknown I believe that the study of the ML and CP will support the status of this taxon.

Duvalius (Paraduvalius) legrandi (Genest, 1983)


Duvalius (Paraduvalius) petrovi sp. n. (Figg. 1-7)


Diagnosis: The new species differs from all the other Paraduvalius-species in the forms of the ML and the CP (Figg. 3-4). Externally it is distinct in the presence of 4-6 very long hairs on the disc of pronotum. These hairs are obviously distinct from the
short and dense pilosity on both surfaces on pronotum and elytra. For additional data see item “Remarks”.

Description: Total length of body with mandibles 4.1-4.5 mm (4.2 in HT); maximum width 1.4-1.45 mm (1.4 in HT). Colour of tegument rusty red on head and pronotum and somewhat lighter on elytra. Microsculpture indistinct. Head 1.2-1.31 (1.21 in HT) times longer than wide, frontal furrows completed, pilosity on vertex and temporal short; antennae not exceeding first fourth of elytra; eyes fully reduced; labrum concave in front. Pronotum (Fig. 2) 1.08-1.15 (1.15 in HT) times wider than head and 1.24-1.31 (1.25 in HT) times wider than long, widest in anterior third; disc with 4 (6) very long hairs (not longer than lateral and baso-lateral SP of pronotum) situated one behind another in two rows on each side of midline; surface outside disc with ordinary dense and shorter pilosity; anterior margin longer than posterior; posterior angles acute and sharply prominent outside. Legs long and slender; protibia with hardly visible furrow from outside; Ist and IInd male protarsi dilated, former article quite broader than latter one. Elytra elongate, parallel-sided; shoulders forming obtuse angles. Inner two striae distinct, IIIrd stria somewhat reduced, remaining striae highly reduced. Body underneath smooth and glabrous; abdomen with four visible sterna.

Male genitalia: Apical part of ML (Fig. 3) long, slender and slightly convex toward acute apex, distal part curved, forming pear-shaped basal bulb. Inner sac situated dorsally in apical part of ML. CP (Fig. 4) thin and long, forward with two lobes at tip, backward somewhat wider and profoundly bilobed. Parameres long and narrower to apex, each one with four long setae distally.

Female genitalia (Fig. 5-7): tergum VIII with two weakly chitinized and not closed areas. Ovipositor (terga IX + X): stylus (basal + apical styleremes) smaller than valvifer; styleremes almost equally large, apical article somewhat triangular, basal one subrounded with sharp tooth distally. Sternum VIII with differing chitinized areas (two midmost closed and slightest chitinized) and some SP along distal margin, from which only 6 bear setae.

Chetotaxy: Head with 1+1 SP on lateral border of each mandible; 3+3 anterior SP on labrum; 2+2 marginal SP on clypeus; two pairs of supraorbital SP; submentum with 6 SP. Pronotum with 1+1 lateral and 1+1 baso-lateral SP situated before tip. Elytra with pair of scutellar SP; IIIrd interstria with 3+3 dorsal SP, first one situated little after level of IIIrd humeral umbilicate SP; 1+1 apical SP of IInd striae; umbilicate series like to other consubgenera. Abdominal sterna with pair of SP, only last sternum of females with 2 pairs.

Etymology: The new species is named after one of its collectors, the young Bulgarian energetic cave researcher - Boyan Petrov, specialist in studies about Pseudoscorpionida.

Remarks: In the presence of long hairs on the pronotum and the shapes of the ML and CP this species belongs to the group “balticus”. Its ML and CP resembles those of bulgaricus (JENNEL, 1928, Fig. 1810), garevi (CASALE, GENEST, 1991, Fig. 3), and kalehkurkai Farkaš, 1990 (FARKAŠ, 1990, Fig. 5). However, the ML of the new species is more constricted before the bulb, and CP
is more elongated, forward with lobes scarcely prominent outside, backward with sides not convergent. Further, it differs from karelhrukai in the longer setae on the pronotum. D. petrovi sp. n. is allopatric to the mentioned above three species. It lives in Paleogene limestone area not marked by POPOV (1982, Fig. 46). Even though the ML of karelhrukai is unknown, I consider that it is adelphaxon of the new taxon. The presence of characters not peculiar with regard to the typical troglrobions (pigmentation of the tegument, not very prolonged mandibles and antennae, occurring in epigene habitats) shows that petrovi sp. n. is hypogeont than a true cave-dwelling form.

The specimens from the type series, dated on 21.IV.1996, were caught together with 2 m., 3 f. of Trechus (Trechus) crucifer La Brullerie, 1875, and 3 f. of Bureschiana cf. drenski V.B. Guéorguiev, 1963. The females of D. petrovi sp. n., dated on 8.II.1998, were collected with 1 f. of Bureschiana cf. drenski V.B. Guéorguiev. PETROV, (2004) described a third blind beetle from the same cave – Otiozythus (Padonobissus) angeloii (B. Guéorguiev).

Duvalius (Paraduvalius) cf. petrovi sp. n.  
Locality: Eastern Rhodopes, Kardzhali District, vil. Gorna Snezhinka, Hasaraska Peshtera Cave, 3.VIII.1999, 1 f., under stones in clay and guano, B. Petrov & V. Beshkov leg. This specimen seems not specifically distinct from petrovi sp. n. The only difference is the presence of 4 long hairs on the left half of pronotum and of 3 ones on the right half. The Hasaraska Peshtera Cave is remote on 32-33 kilometers (in airline) west of Zandana Cave and belongs to the Ardino karstic region (N° 411, POPOV, 1982). Thus, more material is necessary until the right status of this population can be settled.

Duvalius (Paraduvalius) sp. 1  
Locality: Eastern Rhodopes, Kardzhali District, vil. Podkova, 12.X.1995, 1 f., B. Petrov & P. Stoep leg., Quercus spp. leaf litter. This specimen is distinct from petrovi sp. n. in the absence of long hairs above the pronotum. The calcareous spot east of Podkova belongs to the Krumovgrad karstic area (N° 413, POPOV, 1982) and is remote on ca. 35 kilometers (in airline) southwest of Zandana Cave. Based on the character just mentioned and on possible allopatry I suppose that this female is specifically distinct from petrovi sp. n.

Duvalius (Paraduvalius) regisborisi (Buresh, 1926)  
TL: south part of the Central Predbalkan, Vasilovska Planina Mt., caves near vil. Golyama Zhelezna. ML: JEANNEL, 1928: 436. CP: JEANNEL, 1928: 436; FARKAC, 1990: 353. TS: valid species. P. Moravec reasonably assumed that the findings of this species at the pass Troyanski Prohod (HIEKE, WRASE, 1988: 40) could be referred to new taxon. Bearing in mind the close proximity of this pass to the Stenote Reserve, I also suppose that the populations from both localities belong rather to an unnamed form than to regisborisi.

Duvalius (Paraduvalius) sp. 2  

Duvalius (Paraduvalius) sp.3  
Locality: Preslavka Planina Mt., cave near vil. Prolaz, 1 f., B. Petrov leg.

“stankovitchi” species group  
Of particular interest are the TS of the species from the Vrachanska Planina Mt. and the Iskar Gorge (karstic region N° 203, POPOV, 1982). The concentration of five taxa from two species groups (GUEROUGUEV, 1971) in this limited area, only HT specimens known for two species, and using of characters of secondary importance for the species’ and species group’ differentiations are the reasons for this interest.

Duvalius (Paraduvalius) beroni V.B. Guéorguiev, 1971  
Remarks: So far, this taxon is known only after the HT. One of the two diagnostic marks used to splits beroni from zivkovi and pretneri is the lack of furrow on the anterior surface of the protibia. However, I ascertained the presence of shallow furrows on both protibiae in the HT as they extend more than half of the length of each tibia. The ratio PB/PA is 0.93. CP has not been illustrated, but, like papasoffi, it has single round at tip lobe (GUEROUGUEV, 1971: 161). Description and illustration of the ML have not been made. The genital preparation of HT was not found in the funds of the MNHS, TS: judging from the diagnostic features, I think that beroni is synonymy or mostly subspecies of zivkovi. However, only careful study of male specimens of both species will specify the right TS of beroni.

Duvalius (Paraduvalius) deltshevi V.B. Guéorguiev, 1965  
Remarks: GUEROUGUEV (1965: 150) described zivkovi deltshevi by single female from a precipice situated not farther than some hundred meters from the noted Ledenika Cave (TL of typical zivkovi). Here I give English translation of the original diagnosis: “Duvalius (Paraduvalius) zivkovi deltshevi n. sp. female: length 5 mm. At first sight it looks like Duvalius (P.) zivkovi, but differs in the following characters: 1. Posterior part of pronotum appreciably narrower. 2. PB rectangular (in nominotypical form bent near to angles and concave in middle). 3. Posterior angles of pronotum right, slightly pointed at tip and prominent (in nominate form obtuse). 4. Ist discal SP on elytra situated quite close behind the level of IIrd humeral umbilicate SP (in the nominotypical form situated far behind the level of IIrd humeral umbilicate SP and almost near level of IVth SP).” Later on, took into account only the fact that the 1st discal SP of elytra lies at the level of the IVth humeral umbilicate SP, and not behind the IIIrd one, GUEROUGUEV (1971: 160) gave of
deltishevi' higher status. Such an observation is opposed to item 4 of the original description. I think that this single feature splitting deltishevi from zivkovi is not of such taxonomic importance, moreover, the male genitalia of both taxa were not examined. Despite the TS already changed, CASALE, LANERYE (1983: 190), BERON (1994: 46) and Laneyrie (in lit.) continued to treat deltishevi as subspecies.

I studied the same two specimens examined by V. Guérin-Guéorguiev and have to do the next observations on items 1-4 of the original description. 1. The ratio PW / PB is 1.59 in zivkovi and 1.54 in deltishevi so that the pronotum of the latter taxon is not appreciably restricted backward. 2. / 3. The PB is rectangular in deltishevi while in zivkovi it is slightly bent near to the angles and is hardly concave in mid. The posterior angles are pointed and prominent at tip in deltishevi. Those are also prominent in zivkovi as the left one is slightly obtuse (cfr. KNIRSH, 1925: 87) and the right one is slightly pointed. I assume that characters 2 and 3 vary and the specimens studied represent some of their extreme variations. 4. Ist discal SP of left elytron in zivkovi is situated just over against the IIInd humeral umbilicate SP, while that of the right elytron is little behind of the IIInd humeral umbilicate SP. The first discal SP of left elytron in deltishevi is situated almost over against the IVth SP of the humeral umbilicate group, and that of the right elytron is closer to the level of the IIIrd SP. The circumstances that in the original description GUÉORGUIEV (1965) discussed the chetotaxy on the right elytron, and later, he argued for the chetotaxy on the left elytron (GUÉORGUIEV, 1971), explain this discrepancy. Probably the importance of this character as criterion for discrimination of the species and, the species groups of Paraduvalius is overestimated. The same character can vary among the specimens of one and same species and even among the two half of the elytra in one and same specimen. PB/PA in deltishevi is 0.94, and 0.91 in zivkovi. Although the ML and CP of these taxa are unknown, in result of the arguments above, I believe that no serious morphological feature for their distinction and propose to treat these as single species: Duvalius (Paraduvalius) deltishevi V. Guérin-Guéorguiev, 1965. Bull. Inst. Zool. Mus., 18: 150 - syn. n. of Duvalius (Paraduvalius) zivkovi Knirsch, 1925. Casopis Čsl. Společnosti Entomologické, 21 (5-6): 87.

Duvalius (Paraduvalius) papasofii (Mandl, 1942)
TL: left slope of the Iskar Gorge, region of Lakatnik.
Material examined: 1 m. (genitalia missing), Zidanka Cave, Lakatnik Region, 2.XII.1961, P. Beron leg.
Remarks: Contrary to the other Paraduvalius-taxa from the Vrachanska Planina Mt. and Iskar Gorge, belonging to the "stankovitchi" group, this species was placed in the "winkleri" group. Only reason for its separation in the latter group was the location of the Ist discal SP of elytra (GUÉORGUIEV, 1971: 156). As was noted above this feature only, besides its variations, is inadequate to define the systematic place of separate species. Therefore I put papasofii among the other representatives of the group "stankovitchi". The ML and CP of the species are described (GUÉORGUIEV, 1965: 152, Figg. 3-4). PB/PA in the specimen studied is 0.87. TS: unspecified, either valid species or subspecies of zivkovi.

Duvalius (Paraduvalius) cf. papasofii ssp.

3 m., 3 f., P. Stoev leg. According to Dr. R. Monguzzi (in lit.) the population from Kunino is almost identical with that of papasofii. Despite the male specimens available illustrations of the ML and CP have been not made because of the unspecified TS of the typical papasofii. TS: presumably subspecies of zivkovi or papasofii.

Duvalius (Paraduvalius) pretneri V.B. Guérin-Guéorguiev, 1971
Remarks: This is the only species of the "stankovitchi" group known from the right side of the Iskar Valley. GUÉORGUIEV (1971: 160) described pretneri on single female specimen. However, after study of the HT, I ascertained that it is actually male specimen without last abdominal sternum and genitalia. PB/PA is 0.85 in the HT and 0.83 in another specimen, being slightly different than the datum of the original description (0.8). This proportion is the closest to that of papasofii. In 1988 the late Dr L. Genest (in lit.), after examination of single male from the TL, expressed the next opinion: "je pense que l' insepte est tres proche de P. papasofii". TS: unspecified until the status of papasofii not be fixed.

Duvalius (Paraduvalius) zivkovi (Knirsch, 1925)
TL: eastern part of the Vrachanska Planina Mt., Ledenika Cave.
Remarks: This is the oldest species described from the Vrachanska Planina Mt. and the Iskar Gorge. Its ML and CP are still unknown and this fact is crucial for clarifying of the right TS of the triad beroni, papasofii and pretneri. The ratio PB/PA in the specimen studied is 0.91, while GUÉORGUIEV (1971: 161) indicated 0.8 for the same one. TS: obviously valid species.

"winkleri" species group

Duvalius (Paraduvalius) bureschi Jeanne1, 1928 (Figg. 1, 8-9)
Material examined: 1 m., 1 f., Western Rhodopes, the valley of Lepenita River, Lepenita Cave, 1000 m, 25.XI.1995, B. Petrov & P. Stoev leg.; 1 m. (genitalia examined), same locality, 28.VI.2000, B. Petrov & P. Nikolov leg., rotten log and clay; 2 m., same valley, Dupcheto Cave, 9.VIII., B. Petrov leg., under stones.
TL: Western Rhodopes, the valley of Lepenita River, Lepenita Cave. The male sex and the ML were described and portrayed by GUÉORGUIEV (1965: 150-151, Fig. 2). However, the position of the inner sac and the shape of the CP have not been illustrated although there is a short description of the last structure (op. cit.), translated here as follows: "The copulatory piece occupies somewhat more than 1/3 of the ML length. It is narrower in the posterior half, while in forward it broadens, bifurcates and terminates with two symmetrical and pointed at tip lobes." The preparation was found in the funds of NMNH, but the making of new figure from it was proved to be impossible. In result of study of other males
from the two caves mentioned above, I have to make the next notes. The shapes of the ML and CP and the position of the internal sac are stable features which distinctly differentiated buresci from the other congeners. The internal sac is situated dorsally in the ML (Fig. 8). CP is trough-shaped and nearly equally wide along its whole length (Fig. 9). Forward, it terminates with slightly convex border in the middle and backward - with two lateral lobes elevated over the underlying plain. It seems that in the original description this structure was turned over to 180° (GUÉORGUIEV, 1965: 151) and it is the reason for the difference between the former and present descriptions of the CP.

**Duvalius (Paraduvalius) maroni** (Knirsch, 1930)

**Duvalius (Paraduvalius) pirinensis** sp. n. (Figg. 1, 10-14)


Diagnosis: The new species could be distinct from all the other Paraduvalius-species in the shapes of both the ML and the CP (Figg. 10-11).

Description: Total length of body (with mandibles) 4.0-4.5 mm (4.2 mm in HT), maximum width 1.3-1.5 mm (1.35 mm in HT). Colour of head and pronotum rusty red, elytra lighter. Microsculpture distinct (above 60 x magnification) at least on posterior third of elytra. Vertex and temporae with shorter pilosity than that both on disc of pronotum and on elytra. Head 1.44-1.49 times (1.47 in HT) longer than wide, frontal furrows deeper in anterior half; antennae not exceeding first fourth of elytra; eyes marked from two very small and hardly visible spots, each of them four times shorter than length of tempora, facets of ommatium completely degenerate; labrum uniformly concave anteriorly. Pronotum 1.09-1.16

(1.1 in HT) times wider than head and 1.3-1.35 (1.33 in HT) times wider than long, widest in first third; anterior border 1.14-1.3 (1.15 in HT) times longer than posterior one; sides concave before acute and prominent posterior angles. Legs long and slender; protibia outside with very fine furrow; I-IInd male protarsi dilated, Ist article much broader than next one. Elytra sub-parallel, widest after middle; shoulders with obtuse angles; inner four striae more or less reduced and remaining striae fully reduced; apex broadly round. Body underneath smooth and glabrous; abdomen with four visible sterna.

Male genitalia: ML (Fig. 10) with apical part long and slender, tip fine and bent upward, distal part forming pear-shaped basal bulb. Inner sac situated proximally in apical part of ML. CP (Fig. 11) thin and long, forward narrower and round at tip, backward wider and profoundly bilobed. Parameres long and narrower at apex, each with four long setae distally.

Female genitalia (Figg. 12-14): Tergum VIII uniformly chitinized. Ovipositor:
stilus (basal and apical stylomeres) smaller than valvifer; stylomeres subtriangular, apical article somewhat smaller than basal one. Sternum VIII with differing chitinized areas, distal margin with some SP as 20 of them bear short setae.

Chetotaxie. Head with 1+1 SP on lateral edge of each mandible; labrum with 3+3 anterior SP; clypeus with 2+2 marginal SP; two pairs of supraorbital SP; submentum with 6 SP. Pronotum with 1+1 lateral and 1+1 baso-lateral SP situated before tip. Elytra with two stellatell SP; IIIrd interstria with 3+3 dorsal SP, first situated before level of III humeral umbilicate SP, closer to IIId than to IIIrd one; 1+1 small apical SP of IIId striae; umbilicate series similar to other conspecifics. Abdominal sterna with a pair of SP, only last one in females with 2 pairs.

Etymology: The new species was named after the mount where it was collected.

Remarks: This species is close to the other taxa of the "winkleri" group in the following characteristics. Lack of long hairs on the head and/or pronotum, protibia with fine furrow outside, 1st dorsal SP on the disc of elytra situated at the level or before the level of the IIIrd humeral umbilicate SP (GUÉORGUÉV, 1971: 156). The ML of the new species is very similar to that of germanae Casale & Vigna Taglianti, 1990 (CASALE, VIGNA TAGLIANTI, 1990, Fig. 2). There is also certain resemblance between the ML of pirinensis sp. n. and winkleri (JEANNEL, 1928: 443, Fig. 1818). On the other hand, resemblance exists between the ML of pirinensis sp. n. and D. balcanicus (JEANNEL, 1928: 434, Fig. 1802), the last species being representative of the "balcanicus" group. The CP of pirinensis sp. n. looks like those of bulgaricus (JEANNEL, 1928: 438, Fig. 1811), papassoif (GUÉORGUÉV, 1965: 152, Fig. 4) and bureschii (present study, Fig. 9), three species from two different species groups. Most likely, the similarities of the male genital structures between the new species and the species above mentioned (excluding germanae only) are convergent. Having in mind the probable long autonomous evolution of the separate lineages of Paraduvalius (cfr. CASALE, VIGNA TAGLIANTI, 1990: 328), for the present, the adelphotaxon of the new species cannot be specified. As a whole, the morphotype and some characters of ecological specialization show not ancient geological hypogean adaptation. TS: valid species.

Duvalius (Paraduvalius) rajachewi (Genest & Juberthie, 1983)

Duvalius (Paraduvalius) sp.4
Locality: southeastern slope of the Pirin Mt., a precipice close to vil. Mousomishta. Only single female specimen is known (ex. coll. Dr. L. Genest). ML and CP remain unknown. TS: probably valid species.

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