FOLIA ENTOMOLOGICA HUNGARICA
ROVARTANI KÖZLEMÉNYEK
Volume 68 2007 pp. 61–70.

A new species of Diplocolenus (Auchenorrhyncha: Cicadellidae) from the Eastern Carpathians

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Abstract – *Diplocolenus* (*Erdianus*) *beresi* sp. n. (Auchenorrhyncha, Cicadellidae: Deltocephalinae) is described based on males and females from Rodna and Maramureş Mountains, Romania. The new species is closely related to *D. penthopitta* (WALKER, 1851). Differentiating characters of *D. beresi* sp. n., *D. penthopitta* and *D. quadrivirgatus* (HORVÁTH, 1884) are presented. With 15 figures.

Key words – Auchenorrhyncha, Membracoidea, Cicadellidae, Deltocephalinae, *Diplocolenus*, new species, Romania, Carpathians.

INTRODUCTION

The zoological exploration of the Carpathian Basin got a new impulse in the last few years. The faunistic investigation of the mountains neighbouring Hungary from the east, first of all the Maramureş and Rodna Mountains, became a main centre of interest. After preliminary investigations and collecting trips, extensive collectings were carried out in the area within the frame of a joint project of the Vasile Goldiş University, Arad (Romania) and the Hungarian Natural History Museum, Budapest (Hungary) in the years 2005 and 2006.

The first results on various invertebrate groups were recently published in a thematic issue of *Studia Universitatis "Vasile Goldiş", Arad.* In this publication, a checklist of the Auchenorrhyncha known from Maramureş county was presented (OROSZ 2006). Several specimens of a species of *Diplocolenus* RIBAUT, 1946 (included as "*Verdanus* sp." in the above paper), collected in the last few years and three different localities in the Rodna Mountains, was found to differ from all known species of the genus. The species is described as new in this paper.

MATERIAL AND METHODS

Specimens were collected in Romania, County Maramureş, Rodna Mountains (Munţii Rodnei) and Maramureş Mountains (Munţii Maramureşului). Male genitalia were studied after short boiling in 10% KOH solution. Abdominal sternite VII were figured by slide mounts, depressed under coverglass.

For comparing the new species to its closest relatives, the following specimens, all deposited in the Hungarian Natural History Museum, Budapest, were used:

Diplocolenus penthopitta (WALKER, 1851): "sudeticus", "Silesia austr.", "1900.VI.11.", [leg.] "Kertész", "Deltocephalus penthopittus Am. Fieb." [HORVÁTH's handwriting] (1 male).

Diplocolenus quadrivirgatus (HORVÁTH, 1884): Lectotype, "Mármaros, Pop Iván, 20.7.1883" (male). Other materials examined: "Górhavas, Gyulafalva, 1902, Aigner" (1 female); "TRANSYLVANIA, Mt. Rodnei, Statiunea Borsa, top of the Vf. Gargalau, 2100 m, 01.08.2002. leg. A. Orosz", 1 male, 2 females; "TRANSYLVANIA, Mt. Rodnei, Statiunea Borsa, between of the Vf. Stiol and Vf. Gargalau, 1500–1800 m, 31.07.02. leg. A. Orosz", 3 females; "ROMANIA, Mt. Rodnei, Borsa, between Stiol and Prislop, about 1500 m, 29.06.2005. leg. K. Orci, J. Kontschán, D. Murányi", 1 female; "ROMANIA, County Brasov, Mt. Ciucas, 1600–1850 m, 28.07.2006. leg. A. Orosz", 1 male, 1 female; "ROMANIA, County Prahova, Muntele Rosu, over Cheia, 1500–1600 m, 27.07.2006. leg. A. Orosz", 4 males, 5 females.

THE SUBDIVISION OF *DIPLOCOLENUS*

Diplocolenus RIBAUT, 1946 (type species by original designation: *Deltocephalus calceolatus* BOHEMAN, 1845) is one of the most speciose genera within the tribe Jassargini, subfamily Deltocephalinae. The genus is widely distributed in the Palaearctic Region, two species also occur in the Neotropical Region.

The genus was described by RIBAUT (1946), who later subdivided the genus into three subgenera, *Diplocolenus* s. str., *Erdianus* and *Verdanus* (RIBAUT 1952). In a subsequent paper (RIBAUT 1959), he established a further subgenus, *Sabelanus*. On the basis of the structure of the subgenital plate, EMELJANOV (1966) recognized six subgenera, and erected *Calidanus*, *Gelidanus* and *Verdanulus* in addition to those described by RIBAUT. DLABOLA (1980) added a further new subgenus, *Ribautanus* for the accommodation of *D. convenarum* RIBAUT, 1946.

In a revision of the genus, KNIGHT (1974) attempted to present a reasonable subdivision of the genus based on phylogenetic analysis. As a basis, characters of the male genitalia, first of all anal tube and pygophore, subgenital plates, connective, genital styles, furthermore the basal apodeme, shaft and apex of the aedeagus were thoroughly examined. As a result, with detailed arguments, he subdivided the genus into three subgenera, corresponding with

the opinion of RIBAUT (1952). However, two of the subgenera, namely *Diplocolenus* s. str. and *Erdianus* are apparently of not monophyletic origin according to his phylogenetic tree.

Since there was much confusion about the identity of several species of *Diplocolenus* (*Erdianus*) until recently, it seems useful to summarize the taxonomical history of two species closely related to the new species.

Diplocolenus penthopitta (WALKER, 1851) (Figs 1–3)

"*Bythoscopus ?*" *penthopitta* WALKER, 1851: 864. Type(s) female, "France", lost?, depository unknown.

Acocephalus sudeticus KOLENATI, 1860: 390. Neotype male, "Moravia, Hr. Jesenik-Praded", Moravian Museum, Brno (KNIGHT 1974). Synonymized by KNIGHT (1974: 386).

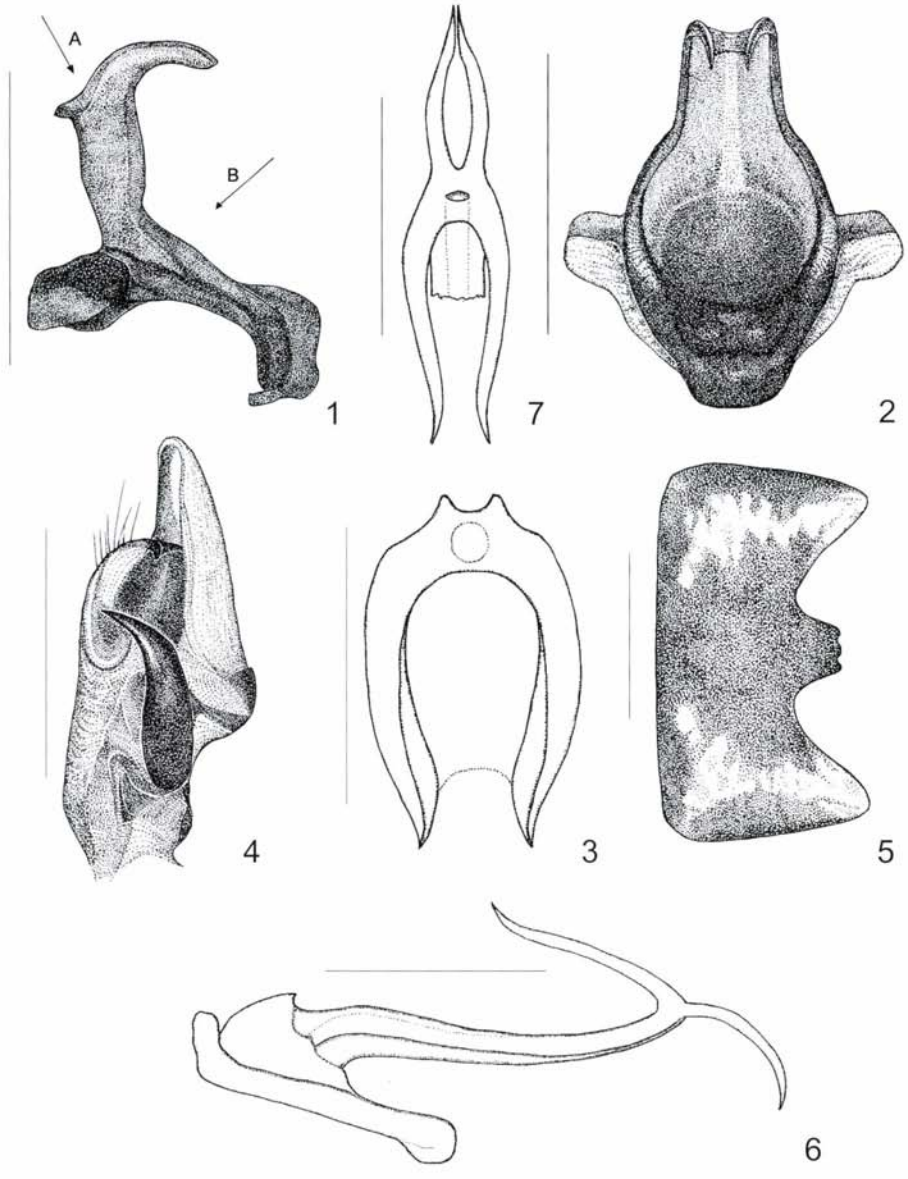
Remarks – The type series of *D. penthopitta*, described from France, is most probably lost. Unfortunately, also the type series of *D. sudeticus* was almost certainly destroyed (KNIGHT 1974). Consequently, KNIGHT (1974) designated a neotype of *D. sudeticus* from specimens collected at the typical locality and considered this species as junior synonym of *D. penthopitta*, however, without examined authentic specimens of the latter species. In his work on *Diplocolenus*, DLABOLA (1980) accepted *sudeticus* as valid species and regarded *penthopitta* as of doubtful identity. Later, GIUSTINA (1989) presented figures of the male genitalia of *D. penthopitta* based on specimens collected in Southern France and verified the synonymy presented by KNIGHT (1974).

Distribution – Only sporadical records of the species are known. It was recorded from the Czech Republic (neotype of *Acocephalus sudeticus*), Austria (one female specimen: KNIGHT 1974) and France ("Hautes-Alpes", two localities: GIUSTINA 1989). The species seems to occur only in montane biotopes (1500–2100 m a.s.l.).

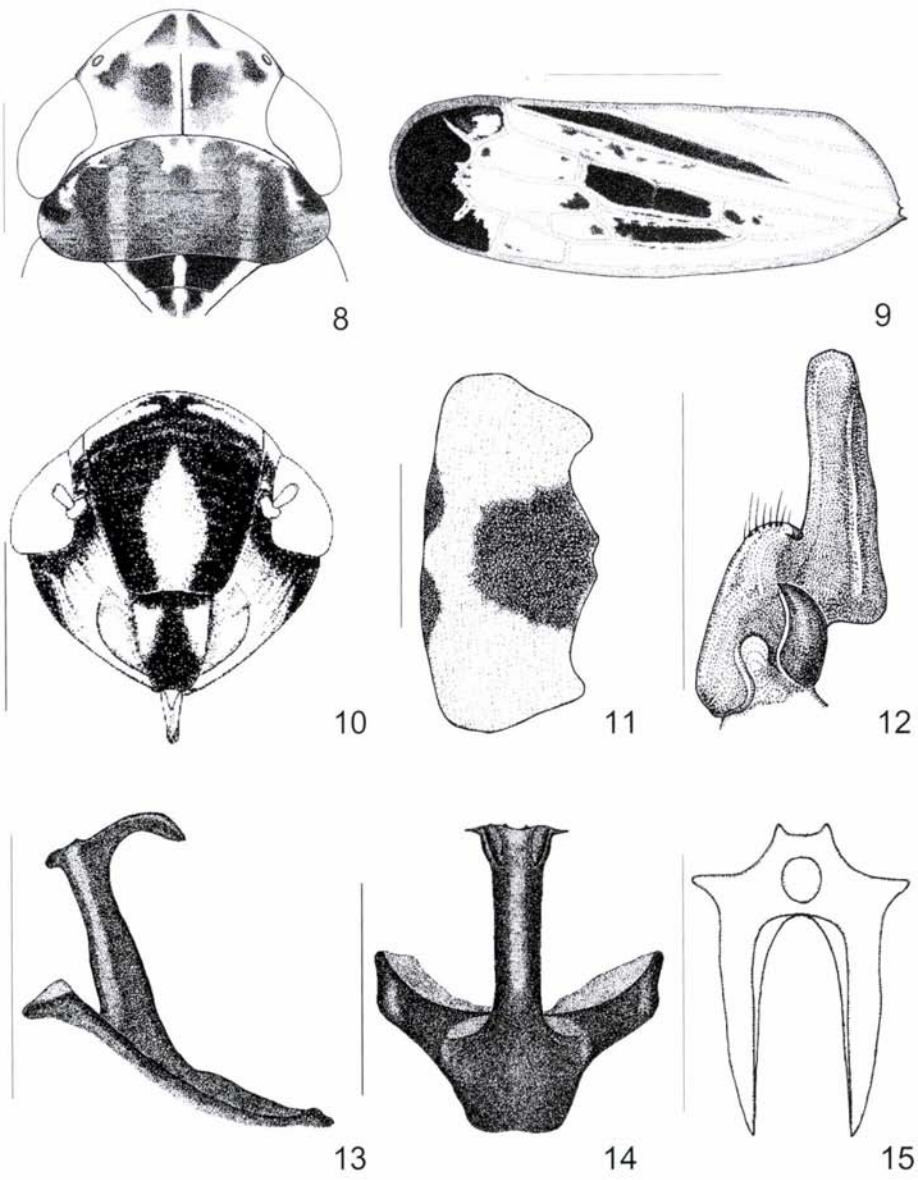
Diplocolenus quadrivirgatus (HORVÁTH, 1884) (Figs 4–7)

Deltocephalus quadrivirgatus HORVÁTH, 1884: 319. Lectotype (KNIGHT 1974: 384) male, "Pop-Iván" [now Romania] (Hungarian Natural History Museum).

Deltocephalus nasti WAGNER, 1939: 168. Syntypes 1 male, 8 females, "Ostkarpathen", destroyed (KNIGHT 1974). Synonymized by KNIGHT (1974: 384).



Figs 1–3. *Diplocolenus* (*Erdianus*) *penthopitta* (WALKER, 1851): 1 = aedeagus, lateral view, 2 = aedeagus, posterior view, 3 = apex of aedeagus, ventral view. – **Figs 4–7.** *Diplocolenus* (*Erdianus*) *quadrivirgatus* (HORVÁTH, 1884): 4 = subgenital plate and stylus of male, dorsal view, 5 = sternite VII of female, ventral view, 6 = aedeagus, lateral view, 7 = apex of aedeagus, dorsal view. Arrows in Fig. 1 indicate the aspects of Figs. 2 and 3, respectively. Scale: = 0.1 mm for Fig 3, 0.2 mm for Figs 1–2 and Figs 6–7, 0.5 mm for Figs 4–5



Figs 8–15. *Diplocolenus* (*Erdianus*) *beresi* sp. n.: 8 = head, dorsal view, 9 = forewing, 10 = head, ventral view, 11 = sternite VII of female, ventral view; 12 = subgenital plate and stylus of male, dorsal view, 13 = aedeagus, lateral view, 14 = aedeagus, posterior view, 15 = apex of aedeagus, dorsal view. Scale = 0.1 mm for Fig. 15, 0.2 mm for Figs 13–14, 0.5 mm for Fig. 8 and Figs 10–12, 1.0 mm for Fig. 9

Remarks – Since the male genitalia were not figured in the original description (HORVÁTH 1884), there was considerable confusion about the identity of *D. quadrivirgatus* for a long time. First, HAUPT (1935) erroneously synonymized *D. quadrivirgatus* with *D. sudeticus*. Later, NAST (1938) misidentified specimens of *D. quadrivirgatus* from the Eastern Beskids ("Ostkarpaten") as *D. nigricans*, and figured the male genitalia. WAGNER (1939) recognized NAST's (1938) misidentification, but recognized the specimens as an undescribed species and named them as *D. nasti*. Together with *D. penthopitta*, LANG (1947) and DLABOLA (1954) recognized *D. quadrivirgatus* as junior synonym of *D. sudeticus*. The same opinion was expressed by RIBAUT (1952), and repeated in his world catalogue by METCALF (1967). Finally, based on the re-examination of the adequate type material, NAST (1972) recognized *D. quadrivirgatus* as a valid species. KNIGHT (1974) accepted this opinion and designated a lectotype of the species.

Distribution – Bulgaria, Romania, Ukraine.

Diplocolenus (Erdianus) beresi sp. n.
(Figs 8–15)

Type material – Holotype, male: "TRANSYLVANIA, Mt. Rodnei, Statiunea Borsa, top of the Vf. Gargalau, 2100 m, 01.08.2002., leg. A. Orosz". – Paratypes (males, females): "TRANSYLVANIA, Mt. Rodnei, Statiunea Borsa, under the Vf, Gargalau, 1900–2100 m, 31. 07. 2002., leg. A. Orosz" (1 male, 2 females); "TRANSYLVANIA, Mt. Rodnei, Statiunea Borsa, top of the Vf. Gargalau, 2100 m, 1.08.2002., leg. A. Orosz" (4 males, 9 females); "ROMANIA, Mt. Rodnei (Mt. Maramures), Borsa, between Stiol and Prislop, about 1500 m, 29.06.2005., leg. K. Orci, J. Kontschán & D. Murányi" (28 males, 3 females). Holotype and paratypes are deposited in the Hungarian Natural History Museum, Budapest.

Description – Colour. General colour light yellowish green, with more or less developed but distinct brown spots on vertex, pronotum, scutellum (Fig. 8) and forewings; dorsal colouration varying from almost uniformly light yellowish green to almost uniformly chocolate brown. Frontoclypeus dark brown with distinct median light spot of variable shape; postclypeus with a pair of distinct triangular light spots; genae and lorum uniformly light yellow (Fig. 10). Cells of forewings transparent; clavus, anteapical and apical cells with distinct brown pattern; veins of forewings yellowish (Fig. 9). Tibiae of fore and mid legs light yellow, posterior legs dark brown. Ventral surface of body largely dark brown; abdominal sternites black, posteriorly bordered with red. Lateral parts of male anogenital complex dark, anal tube dorsally light yellow, pygophore with light yellow dorsal lobe and almost black posterior process.

Structure of male genitalia. Anal tube dorsoventrally slightly flattened, lateral margins converging posteriad in dorsal aspect, apex not reaching apex of pygophore. Pygophore narrowing

posteriad in lateral aspect, with a narrow dorsal lobe bordered with a series of long, strong, posteriorly directed setae. Apex of posterior process of pygophore abruptly narrowed, beak-shaped, strongly declivent posteriorly. Subgenital plate (Fig. 12) strongly incised at middle; apical half narrow, finger-like, apex rounded, slightly surpassing posterior process of pygophore; basal half rounded near incision, with long, strong, posteriorly directed setae. Stylus (Fig. 12) stout, apex strongly curved laterally, not surpassing apex of connective. Connective simple, connected with styli in its basal third, with two parallel arms fusing before apex of body. Aedeagus (Figs 13–15): caudal part of basal apodeme relatively narrow in dorsal aspect, lateral angles elongated, dorsolaterally elevated; shaft of aedeagus arising from middle of basal apodeme, with a pair of long, narrow, posteriorly directed processes, a pair of short lateral projections and a pair of short, anteriorly directed tubercles (Fig. 15).

Structure of female genitalia. Ovipositor well developed. Posterior margin of abdominal sternite VII with three short projections, the medial one excised at its apex (Fig. 11).

Measurements (in mm). Body length: male 3.70–4.05, female 4.09–5.05, length of vertex along meson: male 0.492–0.538, female 0.554–0.585, interocular distance: male 0.631–0.662, female 0.738–0.754, length of forewing: male 2.80–3.15, female 2.95–3.13, greatest width of forewing: male 1.00–1.13, female 1.05–1.15

Etymology – The new species is dedicated to Dr. JÓZSEF BÉRES, zoologist at Muzeul Maramureşului (Sighetu Marmaţiei, Romania), in appreciation of his devoted and assiduous activity in promoting the zoological exploration in Maramureş.

Comparison with related species – According to the external morphology and male genitalia, the new species belongs to *Diplocolenus*, subgenus *Erdianus*. It is most similar to *Diplocolenus penthopitta*, and the two species are apparently closely related taxonomically. The characters suitable for differentiating these species as well as *D. quadrivirgatus*, usually occurring together with the above two species, are given in Table 1.

Evolutionary notes – The geographic isolation of montane habitats led to speciation in several groups of Auchenorrhyncha and therefore is causal for considerable diversity in the European fauna. KNIGHT (1974) recognized *D. quadrivirgatus*, *D. quadricornis* RIBAUT, 1959 (France), *D. nigricans* (KIRSCHBAUM, 1868) (Italy and Switzerland) and *D. penthopitta* as a monophyletic evolutionary lineage within the (apparently not monophyletic) subgenus *Erdianus*. Very probably all of the above species, together with *D. beresi* sp. n., are result of relatively recent speciation events facilitated by isolation of montane biotopes in the Carpathians and Alps.

KNIGHT (1974) noted that within the above monophyletic group, the number of apomorphic characters show an increase in the direction *quadrivirgatus — quadricornis — nigricans — penthopitta*. If accepting this opinion, *D. beresi* sp. n. should be placed between *D. nigricans* and *D. penthopitta*.

Table 1. Diagnostic characters of *Diplocolenus beresi* sp. n., *D. penthopitta* (WALKER, 1851) and *D. quadrivirgatus* (HORVÁTH, 1884)

beresi sp. n.	*penthopitta* (WALKER)	*quadrivirgatus* HORVÁTH
Frontoclypeus dark brown with distinct median light spot (Fig. 10)		Frontoclypeus uniformly dark brown
Postclypeus with a pair of distinct triangular light spots (Fig. 10)		Postclypeus uniformly coloured or with obscure light spots
Apical part of subgenital plate narrow, finger-like, apex rounded, half as long as total length of plate (Fig. 12)		Apical part of subgenital plate short, narrowing apicad, about 0.25 times as long as total length of plate (Fig. 4)
Apex of stylus strongly curved laterally, short, not surpassing apex of connective (Fig. 12)		Apex of stylus slightly curved laterally, long, narrow, far surpassing apex of connective (Fig. 4)
Shaft of aedeagus long and narrow, columnar (Figs 13–14)	Shaft of aedeagus short and stout, posteriorly opened, concave (Figs 1–2)	Shaft of aedeagus very long and narrow, columnar, distinctly curved apically (Fig. 6)
Apex of aedeagus with a pair of long, narrow, posteriorly directed processes, a pair of short lateral projections and a pair of short, anteriorly directed tubercles (Fig. 15)	Apex of aedeagus with a pair of long, narrow, posteriorly directed processes and a pair of short, anteriorly directed tubercles (Fig. 3)	Apex of aedeagus with two pairs of very long and narrow processes, directed anteriorly and posteriorly (Fig. 7)
Posterior margin of abdominal sternite VII with three short projections, the medial one very wide, excised at its apex, slightly surpassing apices of lateral processes (Fig. 11)		Posterior margin of abdominal sternite VII with three short projections, the medial one narrow, with small apical tubercles, not reaching apices of lateral processes (Fig. 5)

D. beresi sp. n. and *D. penthopitta* are most probably two sister species derived from a common ancestor.

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Acknowledgements – Exploration of the invertebrate fauna of Maramureş (Romania) carried out by the Hungarian Natural History Museum is supported by a Hungarian National R&D Programme (The origin and genesis of the fauna of the Carpathian Basin: diversity, biogeographical hotspots and nature conservation significance; project no: 3B023-0-4) and by the Hungarian Scientific Research Fund (OTKA grant No. T-034207).

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