

RESEARCH PAPER

A new species of ant-attended *Balcanocerus* from Bulgaria (Hemiptera: Cicadellidae: Eurymelinae)

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Accepted:
12th June 2024

Published online:
18th August 2024

Abstract. A new ant-attended species, *Balcanocerus agapetomyrmices* sp. nov. (Hemiptera: Cicadellidae: Eurymelinae), is described from Bulgaria. The only known host plant is *Pyrus amygdaliformis* Villars, 1807 (Rosaceae). Both the adults and the nymphs often form small aggregations of 4–6 individuals that are frequently visited by *Lasius bombycina* Seifert & Galkowski, 2016 (Hymenoptera: Formicidae) that feed on the excreted honeydew. The new species is close to *B. balcanicus* (Horváth, 1903), but differs in colouration, and male and female genitalia. A short overview of all *Balcanocerus* species with comments on their distribution and host plants and a key to the European species are provided.

Key words. Hemiptera, Auchenorrhyncha, Cicadomorpha, Membracoidea, Cicadellidae, Idiocerini, ant-attendance, distribution, host plant, identification key, leafhopper, taxonomy, trophobiosis, Bulgaria, Palaearctic Region

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Introduction

The leafhopper genus *Balcanocerus* Maldonado-Capriles, 1971 (Hemiptera: Auchenorrhyncha: Cicadellidae: Eurymelinae: Idiocerini) comprises 22 species worldwide (DMITRIEV et al. 2022 onward). Within the tribe Idiocerini, the genus can be easily distinguished by its predominantly rusty-brown colour, finely punctured clavus, whitish ornaments on the forewing and lack of processes or filaments on the aedeagus (MALDONADO-CAPRILES 1971, GNEZDILOV & ÖZGEN 2021). However, there are considerable differences in the species-specific light-coloured spots on the wings (GNEZDILOV & ÖZGEN 2021). The type species of the genus, *Idiocerus balcanicus* Horváth, 1903, was described from Serbia and later redescribed and drawn by ZAKHVATKIN (1946, as *Chunrocerus balcanicus*). Many *Balcanocerus* species are associated with various woody species of Rosaceae, and for most others the host plants are unknown. The available data on the host plants and the distribution of the genus are summarised in Table 1.

To date, three species of *Balcanocerus* are known in Europe – *B. balcanicus* (Horváth, 1903), *B. larvatus* (Herrich-Schäffer, 1835) and *B. pruni* (Ribaut, 1952). While *B. larvatus* and *B. pruni* are widely distributed,

B. balcanicus, after its original description from Serbia (HORVÁTH 1903), has only been recorded in Bulgaria (OSHANIN 1910) and Romania (NAST 1972). Outside Europe, *B. balcanicus* is also present in Turkey (ZAKHVATKIN 1946) and Lebanon (ABDUL-NOUR 2003).

Some other *Balcanocerus* species are found in western Asia. *Balcanocerus amygdalinus* Dlabola, 1974, *B. amygdalicolus* Dlabola, 1994 and *B. chalusicus* Dlabola, 1994 have only been recorded for Iran (MOZAFFARIAN & WILSON 2016). Two species, *B. claudiae* Abdul-Nour, 2003 and *B. libanoticus* Abdul-Nour, 2003, are only known from Lebanon (ABDUL-NOUR 2003). *Balcanocerus ramallahicus* (Dlabola, 1965) was described from the vicinity of Ramallah (Palestine) and then recorded in Turkey (LODOS & KALKANDELEN 1982) and Lebanon (ABDUL-NOUR 2003). *Balcanocerus stellatus* Gnezdilov & Özgen, 2021 was recently described from Turkey and subsequently recorded for Armenia (GNEZDILOV et al. 2024).

A further five species occur in Central and East Asia. *Balcanocerus amygdali* (Korolevskaya, 1968) was described from Tajikistan as *Idiocerus amygdali* and recently



placed in *Balcanocerus* and recorded by GNEZDILOV & ÖZGEN (2021) from Turkmenistan. *Balcanocerus amaurus* (Emeljanov, 1972) is only known from Mongolia. Three species – *B. mali* (Matsumura, 1905), *B. myroxyli* (Ishihara, 1955) and *B. sasakii* (Ishihara, 1955) – occur only in Japan. *Balcanocerus mali*, described as *Bythoscopus mali* and then treated as *Oncopsis mali* for a long time (ESAKI 1932, NAST 1972), was moved to *Balcanocerus* by HAYASHI & HIGASHIKAWA (1997).

Seven species of *Balcanocerus* were described from North America in *Idiocerus* and then placed in *Balcanocerus* by HAMILTON (1980) – *B. chisosus* (DeLong & Caldwell, 1937), *B. crataegi* (Van Duzee, 1890), *B. dolosus* (Ball, 1902), *B. fitchi* (Van Duzee, 1909), *B. mexicanus* (Osborn & Ball, 1898), *B. provancheri* (Van Duzee, 1890) and *B. spinosus* (Freytag, 1962).

All observations of *B. balcanicus* in Bulgaria and Turkey show that it forms obligate trophobiotic relationships with different ant species on its host plant, where it lives in aggregations of nymphs and adults (GJONOV 2002, GJONOV & LAPEVA-GJONOVA 2013).

The aim of the present study is to describe a new species of *Balcanocerus* from south-eastern Bulgaria, for which the host plant and also the trophobiotic relationships with ants have been established. A brief analysis of the feeding specialisation of the species of the genus is also presented.

Material and methods

The study material of the new species was collected over a period of four years, from 2020 to 2023, in the Strandzha Mountains in south-eastern Bulgaria using a sweep net and directly from the host plants with an aspirator. The type material of *B. balcanicus* from the Hungarian Natural History Museum in Budapest and other specimens from the Zoological Collection of Sofia University were used for comparison. Images of live specimens *in-situ* and of forewings were taken with a Canon 70D camera with a Canon MP-E 65 mm lens and a Yongnuo YN-24EX twin flash. Images of dry-mounted specimens were taken with a Nikon DS-Ri2 camera through a Nikon SMZ 1270i stereomicroscope and then aligned and stacked using CombineZP software. SEM images were taken on gold coated specimens using a JEOL JSM-5510 scanning electron microscope.

The examined material is dry-mounted, glued on cardboard labels (unless otherwise stated) and deposited in the following collections:

BFUS	Zoological Collection of Sofia University, Sofia, Bulgaria;
DEBU	Ontario Insect Collection, University of Guelph, Canada;
HNHM	Hungarian Natural History Museum (Természettudományi Múzeum), Budapest, Hungary;
MMBC	Moravian Museum, Brno, Czech Republic;
NMPC	National Museum of the Czech Republic, Prague, Czech Republic

The description of the species adheres to the morphological terminology established by DIETRICH (2005). The nomenclature of the plants follows POWO (2024).

Taxonomy

Balcanocerus agapetomyrmices sp. nov.

(Figs 2–5, 10–13, 18, 20, 22–26, 32, 34, 36)

Type material. HOLOTYPE: ♂, BULGARIA: Strandzha Mt., Mal-ko Tarnovo, Sarnekovo, 41°59'05.3"N 27°33'42.9"E, 478 m a. s. l., 19.viii.2022, leg. Gjonov (BFUS: BFUS-I-IG028511). PARATYPES: BULGARIA: 10 ♂♂ 8 ♀♀, same collecting data as holotype (BFUS: 7 ♂♂ 5 ♀♀, BFUS-I-IG028507–BFUS-I-IG028510, BFUS-I-IG028512, BFUS-I-IG028515, BFUS-I-IG028516, BFUS-I-IG028519–BFUS-I-IG028523; MMBC: 1 ♂ 1 ♀; NMPC: 1 ♂ 1 ♀; DEBU: 1 ♂ 1 ♀, preserved in ethanol); 3 ♂♂, 12 ♀♀, same collecting site as holotype, 27.viii.2020, leg. Lapeva-Gjonova & Gjonov (BFUS-I-IG003810–BFUS-I-IG003812, BFUS-I-IG003814–BFUS-I-IG003821, BFUS-I-IG009553, BFUS-I-IG020607–BFUS-I-IG020610); 1 ♂ 3 ♀♀, Strandzha Mt., Brashljan villiage, Kalenik, 42°02'17.5"N 27°26'45.4"E, 386 m a. s. l., 29.viii.2020, leg. Lapeva-Gjonova & Gjonov (BFUS-I-IG012675, BFUS-I-IG003835–BFUS-I-IG003837); 3 ♀♀, Strandzha Mt., near Kalovo village, 42°07'01.0"N 27°31'09.4"E, 262 m a. s. l., 6.vi.2021, leg. Lapeva-Gjonova & Gjonov (BFUS-I-IG020197, BFUS-I-IG020611, BFUS-I-IG020612); 16 ♂♂ 37 ♀♀, Strandzha Mt., near Pismenovo village, 42°13'33.7"N 27°41'10.0"E, 91 m a. s. l., 12.viii.2021, leg. Gjonov (BFUS-I-IG017011, BFUS-I-IG017013, BFUS-I-IG017015, BFUS-I-IG017017, BFUS-I-IG017021, BFUS-I-IG017023, BFUS-I-IG017027, BFUS-I-IG017029, BFUS-I-IG017032, BFUS-I-IG017033, BFUS-I-IG017035, BFUS-I-IG017037–BFUS-I-IG017055, BFUS-I-IG017057–BFUS-I-IG017060, BFUS-I-IG017062–BFUS-I-IG017075, BFUS-I-IG017085–BFUS-I-IG017089); 1 ♂ 2 ♀♀, same as preceding but 13.vii.2022 (BFUS-I-IG028504–BFUS-I-IG028506); 1 ♀, same as preceding but 13.vii.2023 (BFUS-I-IG028503); 35 ♂♂, same as preceding but 9.viii.2023 (BFUS-I-IG028468–BFUS-I-IG028502); 11 ♂♂ 10 ♀♀, same as preceding but 9.x.2023 (BFUS-I-IG028464–BFUS-I-IG028467, BFUS-I-IG028524–BFUS-I-IG028540). All paratypes deposited in BFUS, unless otherwise specified.

Other material examined. BULGARIA: 1 ♂ 1 ♀ 14 nymphs, same collecting site as holotype, 27.viii.2020, leg. Lapeva-Gjonova & Gjonov (BFUS: 1 ♂ 1 ♀, gold-coated for SEM, BFUS-I-IG003813, BFUS-I-IG003821, 13 nymphs, BFUS-I-IG003822–BFUS-I-IG003834; NMPC: 1 nymph); 9 nymphs, Strandzha Mt., near Pismenovo village, 42°13'33.7"N 27°41'10.0"E, 91 m a. s. l., 9.x.2023, leg. Gjonov (BFUS: 8 nymphs, BFUS-I-IG028541–BFUS-I-IG028548; MMBC: 1 nymph).

Description. Adult. Body length (in mm). Males 4.0, females 4.0–4.2.

Colouration. Body and forewings mainly dark rusty brown (Figs 2–5, 10–13). Crown and thorax dorsally dark brown, with light spots. Rostrum black (Figs 4, 12). Scutellum at both lateral margins, in centre of anterior margin and sometimes also at posterior apex with light spots (Figs 2, 10). Forewings (Fig. 18) submedially with two oblong, transverse white spots – one on clavus, touching posterior edge of wing, but not reaching claval suture, and second one between cubital and median veins, touching both; apical portion of forewing with two transparent spots, one small on cubital vein and one larger on distal end of subapical cell and apical cells I and II. Legs light brown, arolium black (Figs 3, 4, 11, 12). Hind legs darkened at base of spines, spines light (Figs 4, 12). Abdomen brown (Figs 4, 12).

Male. Vertex dark rusty brown (Fig. 2). Frons coloured as vertex, lateral parts light (Fig. 5). Dark colouration from basal part of frons continuing on upper median part of postclypeus and gradually lightening towards its lower part and anteclypeus. Lateral parts of postclypeus and genae light except dark spots on genae below eyes. Lora light, with darkened margin. Antennae light brown, middle

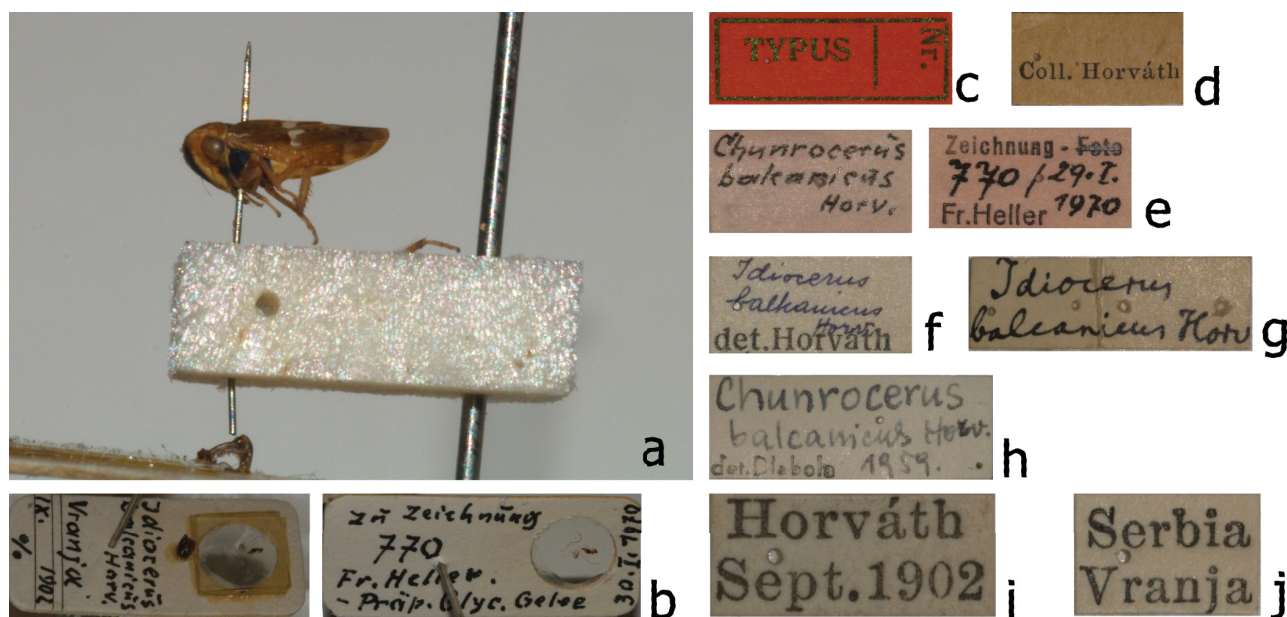


Fig. 1. *Balcanocerus balcanicus* (Horváth, 1903), holotype, lateral view, with labels (HNHM).

parts of leaf-like thickening of flagellum dark distally (Figs 4, 5). Pro- and mesonotum and scutellum dark rusty brown (Fig. 2). Anterior halves of abdominal sternites III–VI brown, their posterior halves whitish (Fig. 4).

Female. Head uniformly dark rusty brown with light spots (Figs 10–13). Postclypeus with 5–12 lighter round spots. Anteclypeus uniformly brown. Genae black below eyes, lighter near lora. Lora dark brown with lightened margins. Antennae light. Abdomen dark, pygofer ventrally lighter (Fig. 12).

External morphology. Head with crown short, evenly convex anteriorly, finely punctate (Figs 2, 3, 10, 11). Frontoclypeus weakly convex, about as wide as long. Anteclypeus with parallel sides, approximately twice as long as wide. Lora elongated-elliptical. Rostrum reaching posterior margin of thorax. Eyes convex, only in ventrolateral part slightly concave, situated on dorsolateral margins of head, their maximum diameter is along vertical axis of head. Antennae in males with apical leaf-like thickening (Figs 4, 5). Pronotum about same width as head, five times longer than head in dorsal view, strongly convex and finely punctate. Mesonotum together with scutellum roughly of same length as pronotum and also finely punctate (Figs 2, 10). Fore and mid tibiae with row of fine setae, hind tibiae with longitudinal rows of robust spines (Figs 4, 12). Forewings overlapping widely at rear because of broad appendix (Figs 2, 10).

Male genitalia. Subgenital plates uniformly wide along almost their entire length and curved in middle at about 45° (Fig. 22). Styli elongate, pointed at distal ends, bearing row of setae directed proximally (Fig. 24). Aedeagus curved, sickle-shaped; basal part large, laterally flattened (Figs 20, 26).

Female genitalia. Abdominal sternite VII elongate and pentagonal. Pygofer short and robust; ovipositor short (Figs 12, 32). Gonapophyses IX (second valvulae) relatively narrow and with small teeth (Fig. 25).

Fifth instar nymph. Body length. 3.5 mm.

Colouration. Head, antennae, legs, pronotum, mesonotum and wing pads brown. Abdomen darker (Fig. 34).

Structure. Head broadly rounded, fore margin with row of large spines medially. Head, pronotum, mesonotum and wing pads densely covered with setae. Pronotum narrower than head. Abdomen conical, gastral tergites on posterior margin with rows of setae 3–4 times longer than setae on head, pronotum, mesonotum and wing pads.

Host plant. All specimens were collected on *Pyrus amygdaliformis* Villars, 1807 (Rosaceae). They were observed feeding and laying eggs on this plant species.

Biology. Both the adults and the nymphs are living on small twigs of the host plant near the base of the leaf stalk. They often form small aggregations of 4–6 individuals, which are frequently visited by *Lasius bombycina* Seifert & Galkowski, 2016 (Fig. 36). The ants antennated the leafhopper specimens and consumed the honeydew excreted in response.

Distribution. The species is currently only known from south-eastern Bulgaria.

Etymology. The name is derived from the ancient Greek words “αγαπητός” (beloved) and “μυρμηγκίων” (ants), to indicate that this species is trophobiotic. The species name should be used as a noun in apposition.

Diagnosis. *Balcanocerus agapetomyrmices* sp. nov. is similar to *B. balcanicus*, but it is darker in colour and slightly smaller (Figs 2–17). The shape of the white spots on the forewings is different. In *B. agapetomyrmices*, the white spot on the clavus is twice as long as wide and it does not touch the claval suture (Fig. 18), whereas in *B. balcanicus*, it is about the same length as width and touches the claval suture (Fig. 19). In *B. agapetomyrmices*, the second white spot, which extends across the medial cell, is of equal length on both sides (on the cubital and median veins, Fig. 18), whereas in *B. balcanicus*



Figs 2–9. *Balcanocerus* spp., males. 2–5 – *B. agapetomyrmices* sp. nov., paratypes. 6–9 – *B. balcanicus* (Horváth, 1903), specimen from Bulgaria. 2, 6 – dorsal view. 3, 7 – lateral view. 4, 8 – ventral view. 5, 9 – frontal view.

it is twice as long on the cubital vein as on the median vein (Fig. 19). *Balcanocerus agapetomyrmices* and *B. balcanicus* differ from the other two species in Europe, *B. larvatus* and *B. pruni*, in that apart from the clavus, they have white spots located across the medial cell.

In *B. agapetomyrmices*, the basal part of the aedeagus is dorsoventrally less extended (Figs 20, 26) than in *B. balcanicus* (Figs 21, 31). The gonopore in *B. agapetomyrmices* is further away from the apex of the aedeagus (Figs 20, 26) than in *B. balcanicus* (Figs 21, 31). The subgenital plates in *B. agapetomyrmices* are shorter, evenly wide over almost their entire length and bent by about 45° in the middle (Fig. 22), whereas in *B. balcanicus* they are longer, wider in their central and distal parts and bent by

about 60° (Fig. 27). The connective in *B. agapetomyrmices* has apically pointed branches (Fig. 23), whereas in *B. balcanicus* the branches are truncate (Fig. 28).

The female pygofer and ovipositor in *B. agapetomyrmices* (Fig. 32) are shorter than in *B. balcanicus* (Fig. 33). The female abdominal sternite VII in *B. agapetomyrmices* is elongated and pentagonal (Fig. 32), whereas it is shorter and triangular in *B. balcanicus* (Fig. 33). Gonapophyses IX in *B. agapetomyrmices* are relatively narrower and with smaller teeth (Fig. 25) than in *B. balcanicus* (Fig. 30).

The nymphs of *B. agapetomyrmices* (Fig. 34) are darker than the nymphs of *B. balcanicus* (Fig. 35). Lastly, the only known host plant of *B. agapetomyrmices* is *Pyrus*



Figs 10–17. *Balcanocerus* spp., females. 10–17 – *B. agapetomyrmices* sp. nov., paratypes. 14–17 – *B. balcanicus* (Horváth, 1903), specimen from Bulgaria. 10, 14 – dorsal view. 11, 15 – lateral view. 12, 16 – ventral view. 13, 17 – frontal view.

amygdaliformis, whereas *B. balcanicus* occurs on various species of *Crataegus*, and *B. pruni* and *B. larvatus* are monophagous on *Prunus spinosa*.

A summary of the diagnostic characters that distinguish the newly described species from the similar and probably closely related *B. balcanicus* can be found in Table 2.

***Balcanocerus balcanicus* (Horváth, 1903)**

(Figs 1, 6–9, 14–17, 19, 21, 27–31, 33, 35, 37)

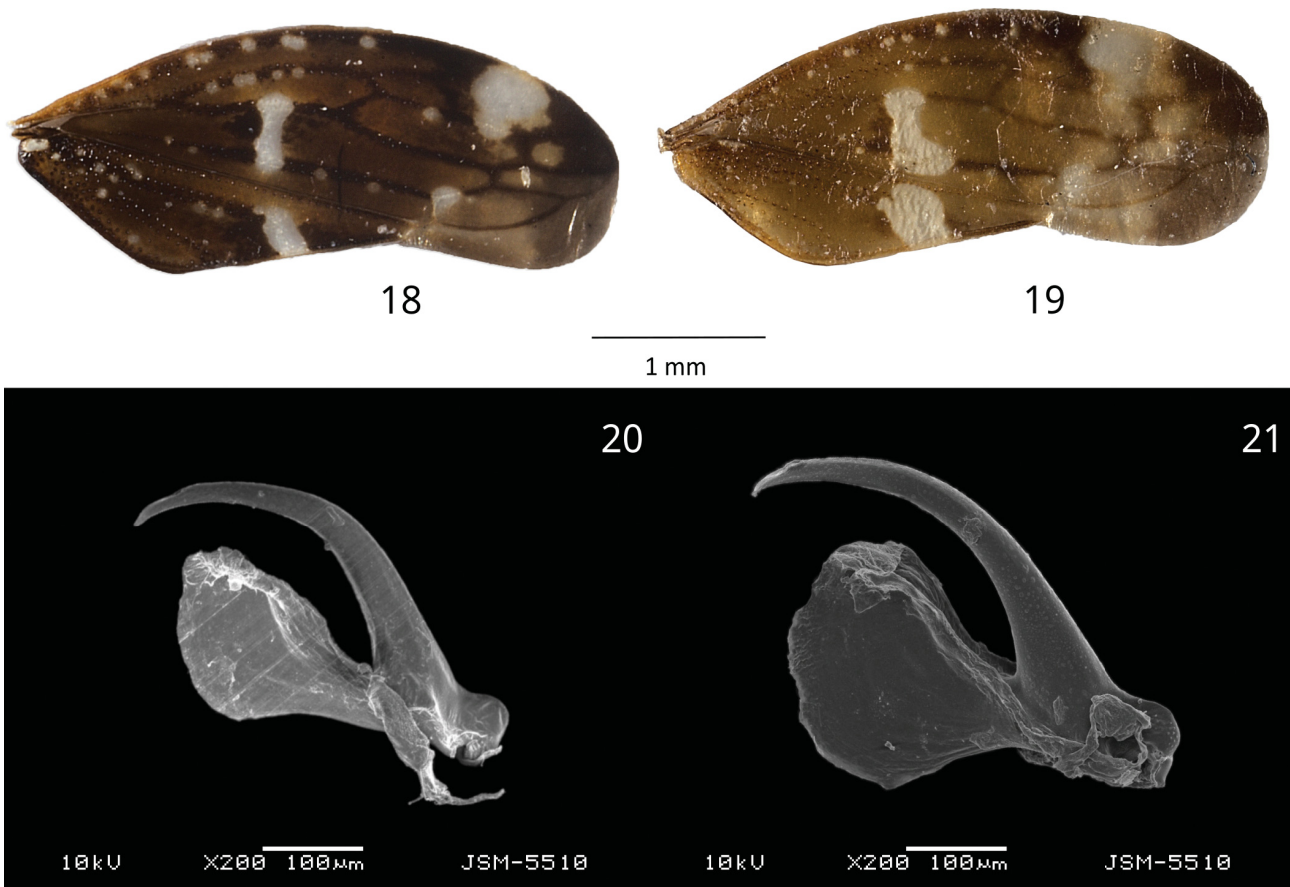
Idiocerus balcanicus Horváth, 1903: 24.

Chunrocerus balcanicus (Horváth, 1903): ZAKHVATKIN (1946: 154); NAST (1972: 226).

Balcanocerus balcanicus (Horváth, 1903): MALDONADO-CAPRILES (1971: 187).

Type material examined. HOLOTYPE: ♂, SERBIA: Vranja, ix.1902 (HNHM, dry-mounted on a minuten pin, with genitalia enclosed between two cover glasses placed on a separate cardboard label, with inscriptions as follows “*Idiocerus | balcanicus* | Horv. | Vranja | ix.1902” and on the bottom “Zeichnug | 770 | Fr. Heller | - Präp. Glyc. Gelee | 30.I.1970”, and with 8 additional labels attached to the same pin: “TYPUS | Nr.” (without number, red label); “Coll. | Horváth”; “*Chunrocerus | balcanicus* | Horv. ” on the upper side and „Zeichnug – Foto | 770/29.I. | 1970 | Fr. Heller” on the bottom side (pale pink label); “*Idiocerus | balkanicus* | Horv. | det. Horváth”; “*Idiocerus | balcanicus* Horv.”; “*Chunrocerus | balcanicus* Horv. | det. Dlabola 1959.”; “Horváth | Sept. 1902”; “Serbia | Vranja” (Fig. 1).

Other material examined. BULGARIA: 1 ♂ 1 ♀, Eastern Danubian Plain, Popovo-Provadia, Nova Varbovka village, 43°21'14.0"N 25°54'53.0"E, 310 a.s.l., 11.viii.2000, leg. I. Gjonov, IG110b/9700 (BFUS: BFUS-I-IG000833, BFUS-I-IG000834).



Figs 18–21. Forewings and aedeagi of *Balcanocerus* spp. 18, 20 – *B. agapetomyrmices* sp. nov. 19, 21 – *B. balcanicus* (Horváth, 1903). 18, 19 – forewings, 20, 21 – aedeagus, lateral view, SEM micrographs.

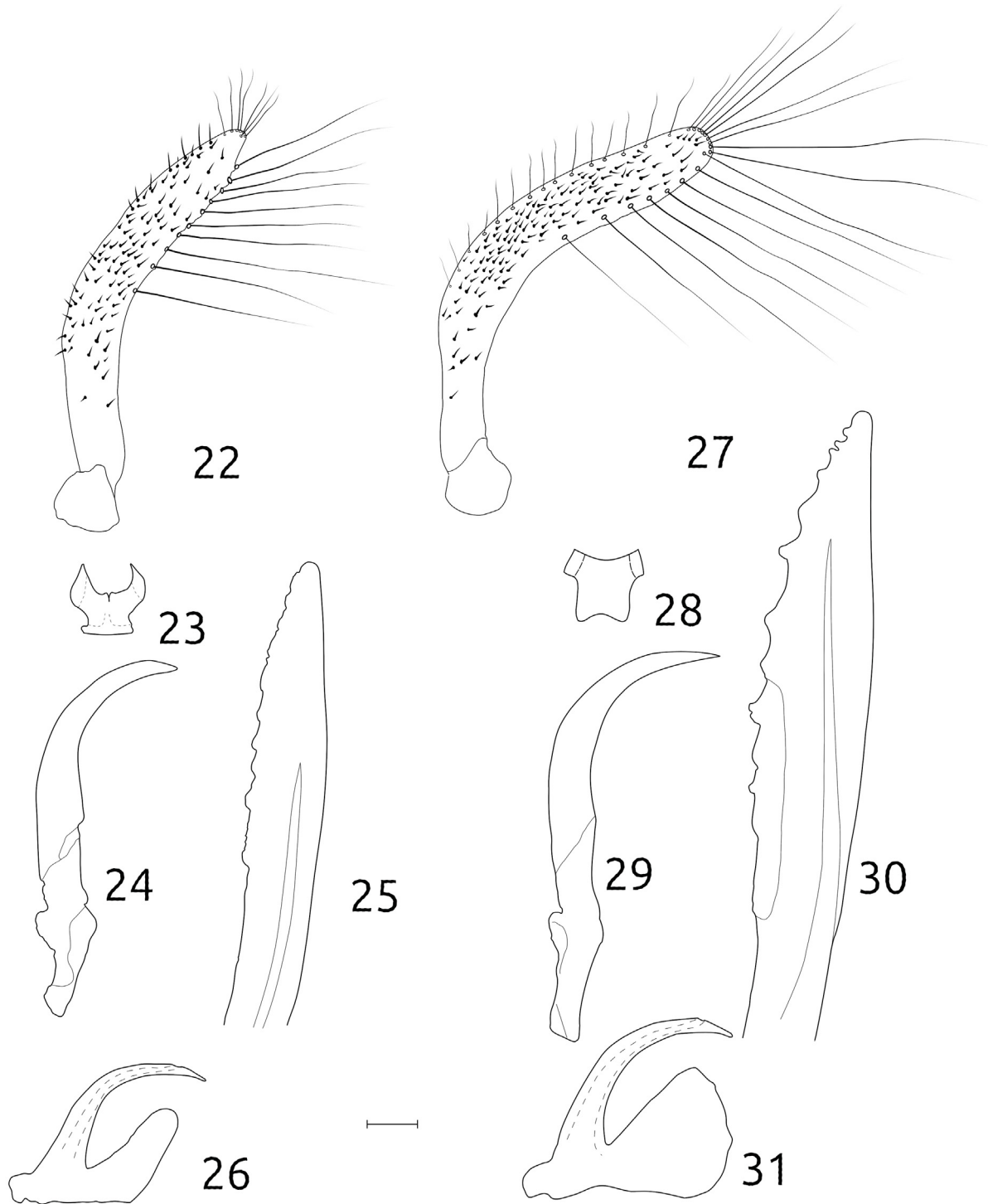
Key to the European species of *Balcanocerus* based on the males

- 1 Forewing with white spots on clavus and between median and cubital veins. On *Crataegus* or *Pyrus*. 2
- Forewing with white spots only on clavus; on *Prunus spinosa*. 3
- 2 The white spot on clavus twice as long as wide and not touching claval suture. The second white spot, which extends across medial cell, is equally long on both sides (Fig. 18). Aedeagus with basal part less extended dorsoventrally (Figs 20, 26). Subgenital plates shorter, evenly wide over almost their entire length and bent at 45° angle (Fig. 22). On *Pyrus amygdaliformis*. ***B. agapetomyrmices* sp. nov.**
- The white spot on clavus approximately as long as wide and touching claval suture. The second white spot on cubital vein twice as long as on median vein (Fig. 19). Aedeagus with basal part more extended dorsoventrally (Figs 21, 31). Subgenital plates more elongate, broader in their central and distal part and bent in the middle at about 60° angle (Fig. 27). On *Crataegus* spp. ***B. balcanicus*** (Horváth, 1903)
- 3 Forewing with three separate white spots on clavus; outer apical cell with distinct black triangle. Aedeagus with base slender, shorter than shaft. ***B. larvatus*** (Herrich-Schäffer, 1835)
- Forewing with confluent white spots on clavus; outer apical cell without distinct black markings. Aedeagus with base strongly extended, longer than shaft. ***B. pruni*** (Ribaut, 1952)

Discussion

Both *B. balcanicus* and *B. agapetomyrmices* sp. nov. are similar and probably closely related and can also be sympatric, although on different host plants. Many records of *Balcanocerus balcanicus* from Turkey and Lebanon should be reviewed to determine the distribution of the two species, as it is possible that some part of the records in these regions may relate to the newly described species.

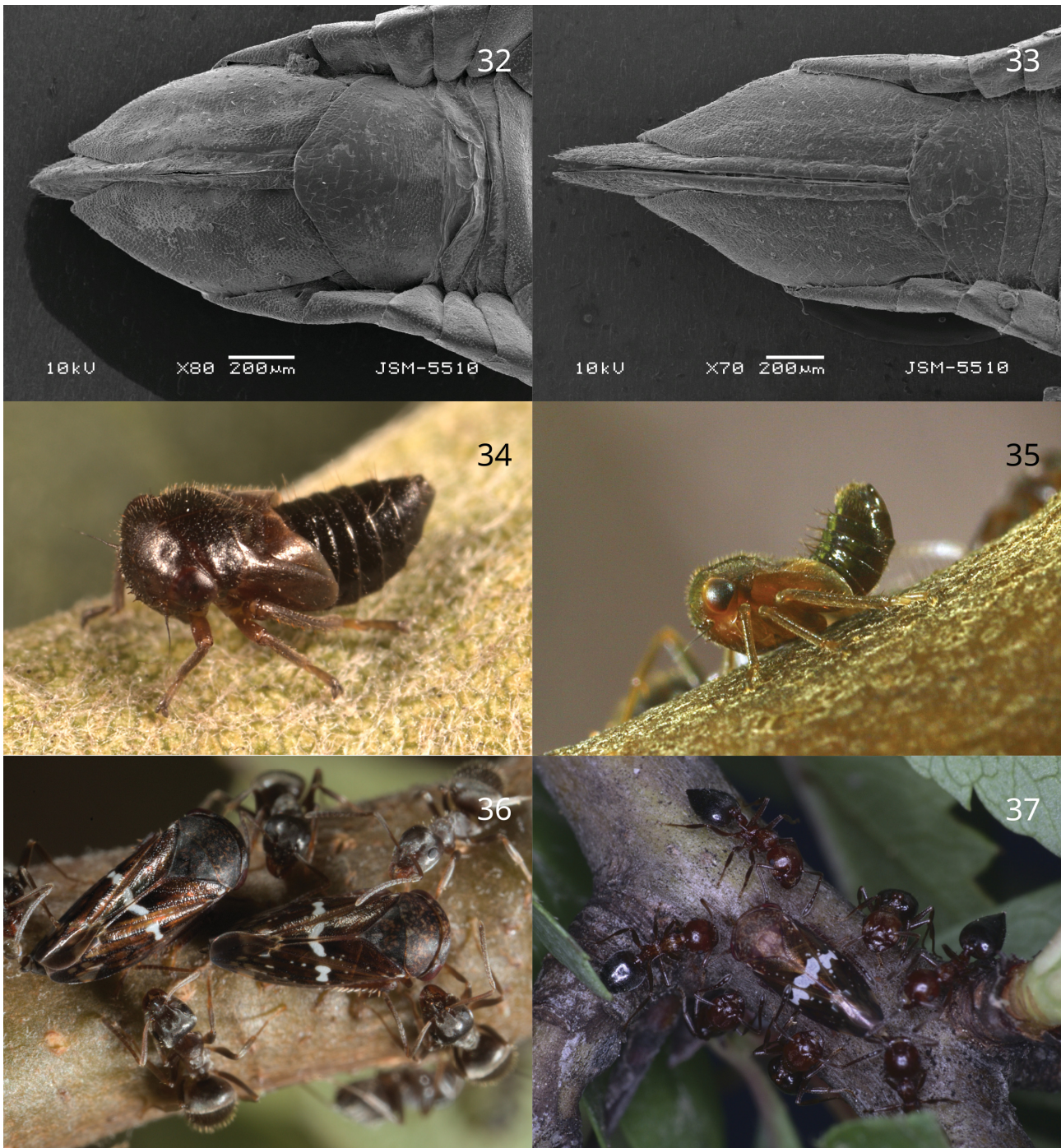
Balcanocerus agapetomyrmices sp. nov. is the second species of the genus, after *B. balcanicus* (Fig. 35), for which trophobiotic relationships with ants have been demonstrated. The latter species is known to live in trophobiosis with many ant species on *Crataegus* spp. in



Figs 22–31. Male and female genitalia of *Balcanocerus* spp. 22–26 – *B. agapetomyrmices* sp. nov. 27–31 – *Balcanocerus balcanicus* (Horváth, 1903). 22, 27 – subgenital plate, lateral view. 23, 28 – connective, ventral view. 24, 29 – stylus, lateral view. 25, 30 – gonapophysis IX, lateral view. 26, 31 – aedeagus, lateral view.

Table 1. List of currently known species of *Balcanocerus* and their host plants and distribution with references.

Species	Host plant (family)	Distribution
<i>B. amaurus</i> Emeljanov, 1972	unknown	Mongolia (EMELJANOV 1972)
<i>B. amygdali</i> (Korolevskaya, 1968)	<i>Prunus (Amygdalus)</i> sp. (Rosaceae): GNEZDILOV & ÖZGEN (2021)	Tajikistan, Turkmenistan (GNEZDILOV & ÖZGEN 2021)
<i>B. amygdalicolus</i> Dlabola, 1994	<i>Prunus (Amygdalus)</i> sp. (Rosaceae): DLABOLA (1994), MOZAFFARIAN & WILSON (2016)	Iran (DLABOLA 1994, MOZAFFARIAN & WILSON 2016)
<i>B. amygdalinus</i> Dlabola, 1974	<i>Prunus (Amygdalus)</i> sp. (Rosaceae): DLABOLA (1974), MOZAFFARIAN & WILSON (2016)	Iran (DLABOLA 1974, MOZAFFARIAN & WILSON 2016)
<i>B. balcanicus</i> (Horváth, 1903)	<i>Crataegus monogyna</i> (Rosaceae): GJONOV (2002), ÖZGEN et al. (2012), GJONOV & LAPEVA-GJONOVA (2013)	Bulgaria, Italy, Lebanon, Romania, Serbia, Turkey (Elazig, Mersin), Ukraine (DMITRIEV et al. 2022 onward)
	<i>Crataegus laevigata</i> (Rosaceae): GNEZDILOV & ÖZGEN (2021)	
	<i>Malus domestica</i> , <i>Pyrus communis</i> (Rosaceae): LODOS & KALKANDELEN (1982) <i>Quercus</i> sp. (Fagaceae), <i>Prunus</i> sp. (Rosaceae): ABDUL-NOUR (2003)	
<i>B. chalusicus</i> Dlabola, 1994	unknown	Iran (DLABOLA 1994)
<i>B. chisosus</i> (DeLong & Caldwell, 1937)	unknown	USA (Texas) (DELONG & CALDWELL 1937)
<i>B. claudiae</i> Abdul-Nour, 2003	unknown	Lebanon (ABDUL-NOUR 2003)
<i>B. crataegi</i> (Van Duzee, 1890)	<i>Crataegus</i> sp. (Rosaceae): HAMILTON (1985)	Canada (Manitoba, Ontario, Saskatchewan) (DMITRIEV et al. 2022 onward)
<i>B. dolosus</i> (Ball, 1902)	<i>Rhus aromatica</i> L. (Anacardiaceae): BALL (1903)	Canada, USA (Arizona, California, Colorado, New Mexico, Utah) (HAMILTON 1980)
	<i>Crataegus</i> sp., occasionally on <i>Malus</i> sp., <i>Pyrus</i> sp. (Rosaceae) and <i>Ulmus</i> sp. (Ulmaceae): FREYTAG (1965, 1976), HAMILTON (1985), CHANDLER & HAMILTON (2017)	Canada (New Brunswick, Nova Scotia, Ontario, Québec, Saskatchewan), United States (New Hampshire) (DMITRIEV et al. 2022 onward)
<i>B. larvatus</i> (Herrich-Schäffer, 1835)	<i>Prunus spinosa</i> (Rosaceae): RIBAUT (1952), NICKEL (2003)	Austria, Belgium, Czech Republic, Denmark, France Germany, Greece (Ionioi Nisoi), Hungary, Israel, Italy (incl. Sicily), Moldova, Norway, Poland, Romania, Russia (Krasnodar), Slovakia, Slovenia, Sweden, Switzerland, Turkey, Ukraine (Crimea, Transcarpathia) (DMITRIEV et al. 2022 onward)
	<i>Prunus amygdalinus</i> [sic!] (Rosaceae): LINNAVUORI (1962)	
	<i>Origanum</i> sp. (Lamiaceae): TEZCAN et al. (2003)	
<i>B. libanoticus</i> Abdul-Nour, 2003	unknown	Lebanon (ABDUL-NOUR 2003)
<i>B. mali</i> (Matsumura, 1905)	<i>Malus</i> spp. (Rosaceae): Hayashi (pers. comm., 2021)	Japan (HAYASHI & HIGASHIKAWA 1997)
<i>B. mexicanus</i> (Osborn & Ball, 1898)	unknown	Mexico (HAMILTON 1980)
<i>B. myroxylis</i> (Ishihara, 1955)	<i>Xylosma congesta</i> (Salicaceae): ISHIHARA (1955), Hayashi (pers. comm., 2021)	Japan (ISHIHARA 1955)
<i>B. provancheri</i> Van Duzee, 1890	<i>Aronia</i> sp., occasionally on <i>Crataegus</i> sp. and <i>Malus</i> sp. (Rosaceae): HAMILTON (1985)	Canada (Alberta, British Columbia, Manitoba, New Brunswick, Nova Scotia, Ontario, Québec, Saskatchewan), United States (New Hampshire, South Dakota) (DMITRIEV et al. 2022 onward)
	<i>Prunus spinosa</i> (Rosaceae): RIBAUT (1952), NICKEL (2003)	
<i>B. pruni</i> (Ribaut, 1952)	<i>Prunus amygdalinus</i> [sic!] (Rosaceae), <i>Pistacia vera</i> (Anacardiaceae): LODOS & KALKANDELEN (1982)	Austria, Bulgaria, France, Germany, Greece, Italy, Netherlands, Russia (Dagestan), Slovenia (DMITRIEV et al. 2022 onward)
<i>B. ramallahicus</i> (Dlabola, 1965)	<i>Prunus amygdalinus</i> [sic!] (Rosaceae), <i>Pistacia vera</i> (Anacardiaceae): LODOS & KALKANDELEN (1982)	Jordan, Lebanon, Palestine, Turkey (DMITRIEV et al. 2022 onward)
<i>B. sasakii</i> (Ishihara, 1955)	unknown	Japan (ISHIHARA 1955)
<i>B. spinosus</i> (Freytag, 1962)	<i>Aronia arbutifolia</i> , <i>Malus</i> spp., <i>Crataegus phaenopyrum</i> , <i>Amelanchier arborea</i> (Rosaceae): FREYTAG (1965, 1976), HAMILTON (1985)	USA (Arizona, California) (DMITRIEV et al. 2022 onward)
	<i>Prunus (Amygdalus) dulcis</i> (Rosaceae): GNEZDILOV & ÖZGEN (2021)	
<i>B. stellatus</i> Gnezdilov & Özgen, 2021	<i>Prunus (Amygdalus) dulcis</i> (Rosaceae): GNEZDILOV & ÖZGEN (2021)	Turkey (GNEZDILOV & ÖZGEN 2021)



Figs 32–37. *Balcanocerus* spp. 32, 34, 36 – *B. agapetomyrmices* sp. nov. 33, 35, 37 – *B. balcanicus* (Horváth, 1903). 32, 33 – female terminalia, ventral view. 34–35 – nymphs. 36–37 – trophobiosis: 36 – *B. agapetomyrmices* sp. nov. in association with *Lasius bombycina* Seifert & Galkowski, 2016; 37 – *B. balcanicus* (Horváth, 1903) in association with *Crematogaster schmidti* (Mayr, 1853).

Bulgaria and Turkey (GJONOV 2002, ÖZGEN et al. 2012, GJONOV & LAPEVA-GJONOVA 2013, GNEZDILOV & ÖZGEN 2023). It is possible that other *Balcanocerus* species also exhibit trophobiotic behaviour.

Regarding the host plants of *Balcanocerus* species, 14 of the species are associated with various Rosaceae plants (Table 1); the only known species with non-Rosaceae host plants are *B. myroxylis* and *B. dolosus*; for the remaining seven species (*B. amaurus*, *B. chalusicus*, *B. chisosus*, *B. claudiae*, *B. libanoticus*, *B. mexicanus* and *B. sasakii*),

the host plant is unknown. Some data suggest that some of these species also live on other plants. For example, ABDUL-NOUR (2003) stated that one male of *B. claudiae* was collected on *Quercus calliprinos* and another male on sticky traps in a pine forest. However, it should be borne in mind that the number of specimens was not sufficient to determine the host plant and that sticky traps are not very selective. As for the records of ABDUL-NOUR (1985, 2003) of *B. balcanicus* on three different *Quercus* species and the other record of TEZCAN et al. (2003) of *B. larvatus* on

Table 2. Summary of diagnostic characters distinguishing *B. agapetomyrmices* sp. nov. and *B. balcanicus* (Horváth, 1903).

Character	<i>B. agapetomyrmices</i> sp. nov.	<i>B. balcanicus</i> (Horváth, 1903)
Main colouration	darker	lighter
White spot on clavus	twice as long as wide and not touching claval suture	as long as wide and touching claval suture
White spot across medial cell	equally long on both sides	twice longer on cubital vein than on median vein
Basal part of aedeagus	less extended dorsoventrally	more extended dorsoventrally
Gonopore	more distant from apex of aedeagus	less distant from apex of aedeagus
Subgenital plates	shorter, bent by about 45°	longer, bent by about 60°
Connective	with pointed branches	with truncated branches
Ovipositor	shorter	longer
Abdominal sternite VII	elongate, pentagonal	shorter, triangular
Female pygofer	shorter	longer
Host plant	<i>Pyrus amygdaliformis</i>	<i>Crataegus</i> spp.

Origanum sp., it can be assumed that the collected specimens remained only occasionally on these plants, as they are strictly associated, at least in Europe, with *Crataegus monogyna* and *Prunus spinosa*, respectively. From this it can be concluded that most *Balcanocerus* species live on Rosaceae. Considering all this, further research should focus on species with unknown host plants in their natural habitats, especially targeting different Rosaceae species. In addition, the observation of ants on small branches as well as colonies of aggregated *Balcanocerus* specimens could be an interesting goal.

Acknowledgements

Firstly, I would like to thank Albena Lapeva-Gjonova (Sofia University, Bulgaria), who was the first to observe the colonies of the new species on the host plants and identified the ant species. I thank Masami Hayashi (Kyushu University Museum, Fukuoka; Ryukyu University Museum, Okinawa, Japan) for valuable information on the Japanese species of *Balcanocerus*. I also thank Hristina Shtereva and Alexander Androv (Sofia, Bulgaria) for linguistic advice on the naming of the new taxon. My special thanks go to Igor Malenovský (Masaryk University, Brno, Czech Republic), Adalgisa Guglielmino (University of Tuscia, Viterbo, Italy), Christoph Bückle (Tübingen, Germany) and an anonymous reviewer for their useful suggestions to improve the manuscript. The material was collected as part of the project no. KII-06-M31/4 of 13 December 2019, funded by the Bulgarian National Science Fund.

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