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SHORT COMMUNICATION

A new species of the genus *Brachycoleus* (Hemiptera: Miridae), with a revised identification key to the species found in Iran

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Abstract. A new species, *Brachycoleus medes* sp. nov. (Miridae: Mirinae: Mirini), is described from Kurdistan province, Iran. A revised taxonomic key to the Iranian species of *Brachycoleus* Fieber, 1858, illustrations of male genitalia, male and female habitus photographs of this new taxon and other reported species from Iran are provided. Diagnosis of the new species is based on a comparison with other congeners found in Iran. Presence of *Brachycoleus decolor* Reuter, 1887 in the fauna of Iran still remains doubtful.

Key words. Hemiptera, Heteroptera, Miridae, Mirinae, Mirini, key, new species, taxonomy, Kurdistan, Iran

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Introduction

In the *Closterotomus* Fieber, 1858 complex, species of the genus *Brachycoleus* Fieber, 1858, are recognized by erect and semi-erect yellowish pubescence. They are large and relatively broad, with head short and wide, frons markedly projecting over clypeus, corium with two distinct veins. Coloration with prevailing red, orange and yellow tinges, black pattern more or less developed. Labium reaching the middle of mesosternum or in *B. pilicornis* (Poppius, 1912) and *B. caucasicus* (Poppius, 1912) mesocoxae (Rosenzweig 1997). Nine species of *Brachycoleus* are known from the Palaearctic Region (Kerzhner & Josifov 1999). The Iranian species of this genus were revised by Hosseini (2016). Until now four species were reported from Iran (Linnavuori 2007, Hosseini 2016, Mohammadi et al. 2018) including *B. caucasicus*, *B. lineellus* Jakovlev, 1884, *B. steini* Reuter, 1877, and *B. thoracicus* Puton, 1892. Occurrence of *B. decolor* Reuter, 1887 in Iran (see Aukema et al. 2013, Hosseini 2016) remains doubtful and should be verified in the future.

In the present study, a new species of *Brachycoleus* is described based on male and female specimens collected by sweep net in Kurdistan province, western Iran. Habitus photographs of male and female and other diagnostic characters of this new taxon are provided.

Materials and methods

Examined specimens were collected using sweep net. Twenty dry mounted specimens were examined in this study using a GX stereomicroscope (GT Vision Ltd, Australia). For the study of genitalia, specimens were softened in 70% ethanol, the male pygophore was removed and kept in 10% KOH solution for a few minutes in a warm hot plate. After the KOH treatment, the pygophore was washed in distilled water and dissected in a drop of glycerol under the stereomicroscope. Lactic acid was used for expansion of endosoma (Scudder & Schwartz 2012). The dissected parameres and endosoma were studied and illustrated using a drawing tube attached to an Olympus microscope. Measurements of specimens were made using a stereomicroscope equipped with an ocular micrometer lens. The following dimensions were measured: body length (head to end of hemelytra from dorsal view), body width, head width across the eyes in dorsal view, height and length of head in lateral view, width of eyes, interocular distance, length of each antennal segment, collar length and width, pronotum length and width, scutellum length (medially from anterior margin to apex) and width (maximum width at anterior margin), length from costal fracture to apex of cuneus.

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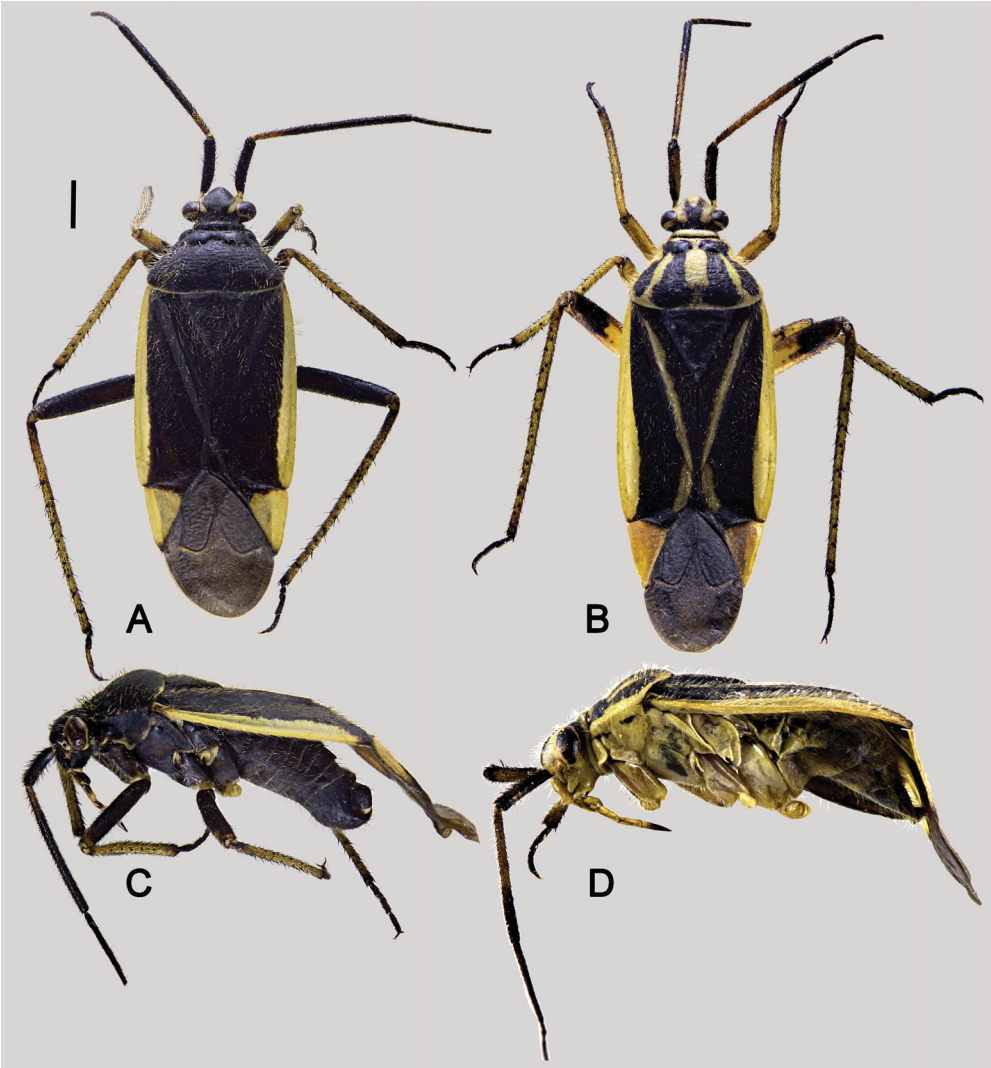

Fig. 1. Habitus photographs of *Brachycoleus medes* sp. nov. A, C – male; B, D – female. A, B – dorsal view; C, D – lateral view. Scale = 1 mm.

Habitus photographs were taken using a handmade automated imaging system including a Canon EOS 70D DSLR camera equipped with a Canon EF 100 mm f/2.8 USM Macro lens attached to a 65 mm Meike macro extension tube. Partially focused images were combined using Helicon Focus software (http://www.heliconsoft.com). Images were edited using Adobe Photoshop CS3. The nomenclature and terminology of the male genitalia follow those described in Kerzhner & Josifov (1999) and Konstantinov (2003), respectively.

Taxonomy

Brachycoleus medes sp. nov.

(Figs 1–3, Table 1)

Type material. Holotype: ♂, **IRAN: Kurdistan Province:** Sarvabad, Dezli (35°21′N 46°10′E, 1806 m), 15.v.2017; S. Mohammadi lgt. Paratypes (7 ♂♂ 12 ♀♀): 4 ♂♂ 5 ♀♀, same data as holotype; 3 ♂♂ 7 ♀♀, **IRAN: Kurdistan Province:** Sarvabad, Daraki (35°17′N, 46°11′E. 1876 m). 3.vi.2018, S. Mohammadi lgt.. The holotype and most paratypes are deposited in the Natural History Museum of the University of Guilan, Rasht, Iran; two paratypes will be deposited at the Hayk-Mirzayans Insect Museum (HMIM) in Iranian Research Institute of Plant Protection (IRIPP), Tehran, Iran.

Diagnosis. *Brachycoleus medes* sp. nov. is recognized by the following combination of characters: body elongate-ovoid, mostly black (Fig. 1), pronotum and scutellum uniformly black in males, with orange to stramineous stripe along embolium in both sexes, extending to cuneus, interrupted by a narrow black mark at the cuneus anterior margin. In males, antennomere I black, antennomere II black with proximal quarter indistinctly stramineous (Fig. 1); antennomere I incrassate (Fig. 1), 0.77–0.84× (♂♂) / 0.71–0.86× (♀♀) as long as head width, 1.74–1.84× (♂♂) / 1.43–1.66× (♀♀) longer than interocular distance; antennomere II 1.65–2.2× (♂♂) / 2× (♀♀) longer than head width; ocular index 1.56–1.80 in males, 1.87–2.10 in females; femora black in males.

Description. Male. ***Coloration.*** Body mostly black (Fig. 1A). *Head*: frons, vertex, posterior margin, maxillary plates and clypeus black (Fig. 1C); mandibular plates, margin of eyes on vertex and genae stramineous. *Eyes* mostly black, marginally stramineous (Figs 1A, C). *Antennae*: antennomere I uniformly black (Fig. 1A); antennomere II black with proximal quarter indistinctly dark stramineous (Fig. 1A); antennomeres III and IV black. *Labium* mostly

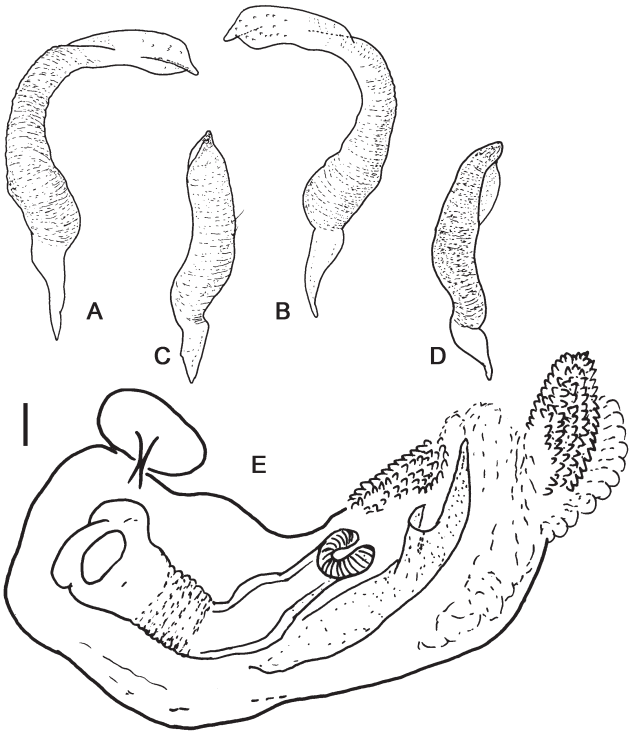

Fig. 2. Genitalia of *Brachycoleus medes* sp. nov. A, B – left paramere, different views; C, D – right paramere, different views; E – endosoma, lateral view. Scale = 0.1 mm.

stramineous, last segment black (Fig. 1C). *Pronotum* uniformly black, collar black (Fig. 1A). *Mesoscutum* and *scutellum* uniformly black (Fig. 1A). *Hemelytra* mostly black; embolium uniformly stramineous, narrow black mark between embolium and cuneus, cuneus stramineous, sometimes orangish, apical margin of cuneus internally black, membrane fumose (Fig. 1A). *Thoracic pleura* mostly black, outer margin of propleura stramineous, metathoracic scent gland evaporative area and peritreme stramineous (Fig. 1C). *Legs*: femora (except apices) and tarsomeres black, apices of femora and tibiae stramineous, in meso- and metatibiae base of spines with black dots (Fig. 1C). *Abdomen* black, including pygophore (Fig. 1C).

Vestiture. Dorsum covered with erect to semierect hair-like golden setae (Figs. 1A). *Antennae* covered mostly with semierect hair-like setae, on antennomere I long, on antennomeres II to IV shorter. *Thoracic pleura* covered with a few semierect hair-like golden setae. *Abdomen* covered with hair-like setae.

Texture. Body impunctate.

Structure. Body length 8.40–8.72 mm, width 2.84–2.90 mm, robust, elongate-ovoid (Fig. 1A). *Head*: width of head across eyes 1.28–1.33 mm; interocular distance 0.57–0.60 mm; ocular index 1.56–1.80. *Eyes*: width 0.35 mm. *Antennae*: antennomere I incrassate, thicker than other segments, 1.0–1.10 mm long, 0.77–0.84× as long as head width, 1.74–1.84× longer than interocular distance; antennomere II slender, antennomeres III and IV narrow and gracile; antennomere II length 2.2–2.93 mm,

Fig. 3. Natural habitats (A–B) and host plants (C–D) of *Brachycoleus medes* sp. nov. A – Sarvabad, Dezli (35°21′N 46°10′E, 1806 m); B – Sarvabad, Daraki (35°17′N, 46°11′E, 1876 m); C *Prangus ferulacea* (L.); D – *Eryngium caucasium* Trautv.

Fig. 4. Dorsal habitus photographs. A – *Brachycoleus thoracicus* Puton, 1892; B – *B. steini* Reuter, 1877; C – *B. caucasicus* (Poppius, 1912); D – *B. lineellus* Jakovlev, 1884; A, B, D – male; C – female. BM – black mark. (A and D after Mohammadi et al. 2018). Scale = 1 mm.

1.17–1.65× longer than head width, 0.90–1.20× as long as posterior width of pronotum; antennomere III 1.12–1.49 mm long, antennomere IV 0.90 mm long. *Labium* thick and short, reaching middle of mesosternum. *Pronotum*: callose region distinct, length of pronotum 1.23–1.28 mm, 1.80–1.90× as long as posterior width of pronotum, anterior width 0.77–0.90 mm, posterior width 2.30–2.45 mm; collar length 0.17–0.20 mm. *Scutellum*: length 0.98–1.07 mm, anterior width 1.16–1.26 mm, flat, mesoscutum narrowly exposed (Fig. 1A).

Male genitalia. Similar to other species of the genus. Apex of endosoma with well-developed dentate plate. Spiculum present, with reduced process (Fig. 2).

Female. Vestiture, texture and structure mostly as in males, with some exceptions given below.

Colouration. *Head*: vertex more or less with V-shaped black mark, posterior margin of vertex black, rest of head stramineous (Fig. 1B). *Antennae*: antennomere I internally brownish stramineous, externally black (Fig. 1B); antennomere II brownish stramineous, distal quarter black (Fig. 1B). Collar mostly stramineous (reddish orange in two paratypes), pronotum with four black longitudinal strips. Calli black, separated from each other, each callus attached to two longitudinal stripes extending almost to posterior margin of pronotum. *Scutellum* either uniformly black or apically with stramineous mark (Fig. 3). *Hemelytra* mostly black; embolium uniformly stramineous (reddish orange in two paratypes), clavus with narrow stramineous band along claval suture except basally, cuneus stramineous (reddish orange in two paratypes), sometimes orangish, basal margin black (Fig. 1B). *Thoracic pleura* mostly stramineous (reddish orange in two paratypes), including evaporative area and peritreme (Fig. 1D) (reddish orange in two paratypes). *Legs* stramineous, apical quarter of me-

Table 1. Diagnostic taxonomical characters of *Brachycoleus* spp. known in Iran. Numbers are ratios or size in mm.

	***B. medes* sp.nov** male (n = 8) / female (n = 12)	***B. thoracicus*** male (n = 4) / female (n = 2)	***B. steini*** male (n = 2) / female (n = 1)	***B. lineellus*** male (n = 1) / female (n = 1)	***B. caucasicus*** female (n = 1)
Body length	8.40–8.72 / 8.51–9.13	10.03–10.86 / 9.17–10.06	9.90–10.24 / 8.58	9.44 / 8.0	7.43
Body width	2.84–2.90 / 3.09–3.44	3.21–3.66 / 3.40–3.46	3.18–3.55 / 3.30	3.20 / 2.98	2.98
Antennomere I	1.0–1.1 / 0.98–1.20	1.05–1.17 / ?	0.96–1.0 / 0.87	0.94 / 0.84	0.71
Antennomere II	2.20–2.93 / 2.61–2.86	?	2.7–3.1 / 2.38	2.98 / 2.50	2.31
Antennomere III	1.12–1.49 / 1.23–1.49	?	1.35–1.67 / 1.28	1.37 / 1.19	0.94
Antennomere IV	0.90 / 0.88	?	0.89–0.96 / 0.90	0.80 / 0.96	0.59
Width of head across the eyes in dorsal view	1.28–1.33 / 1.37–1.42	1.28–1.37 / 1.40	1.26–1.37 / 1.35	1.26 / 1.28	1.19
Interocular distance	0.57–0.60 / 0.68–0.73	0.52–0.57 / 0.71	0.55–0.66 / 0.68	0.57 / 0.64	0.64
Width of eye	0.35 / 0.34–0.36	0.36–0.38 / 0.35	0.36–0.40 / 0.32	0.34 / 0.32	0.27
Collar (anterior width of pronotum)	0.77–0.90 / 0.96–1.05	0.82–0.91 / 0.98–1.03	0.77–0.86 / 0.94	0.87 / 0.91	0.82
Collar length (in the middle)	0.17–0.20 / 0.18–0.20	0.11–0.16 / 0.20	0.11–0.13 / 0.13	0.16 / 0.14	0.12
Length of pronotum (from collar to prosterior margin of pronotum)	1.23–1.28 / 1.26–1.49	1.26–1.37 / 1.46	1.23–1.26 / 1.16	1.23 / 1.14	1.23
Posterior width of pronotum	2.30–2.45 / 2.54–2.77	2.60–2.75 / 2.80–2.88	2.60–2.75 / 2.77	2.68 / 2.52	2.54
Ocular index	1.56–1.80 / 1.87–2.13	1.43–1.51 / 2.0	1.50–1.65 / 2.14	1.66 / 2.0	2.33
Antennomere I / interocular distance	1.74–1.84 / 1.43–1.66	1.84–2.22 / ?	1.50–1.75 / 1.26	1.64 / 1.32	1.1
Ratio antennomere I length / head width	0.77–0.84 / 0.70–0.86	0.77–0.91 / ?	0.73–0.76 / 0.64	0.74 / 0.66	0.59
Ratio antennomere II length / head width	1.17–1.65 / 1.90–2.04	2.39–2.61 / ?	2.14–2.26 / 1.76	2.36 / 1.96	1.94
Ratio antennomere II / posterior width of pronotum	0.90–1.20 / 1.0–1.04	1.22–1.35 / ?	1.0–1.10 / 0.85	1.1 / 1.0	0.90
pronotum width / length	1.87–1.94 / 1.84–2.14	1.93–2.12 / 1.90–1.96	2.11–2.18 / 2.37	2.16 / 2.20	2.05
Anterior width of scutellum	1.16–1.26 / 1.30-1.49	1.26–1.33 / 1.40–1.43	1.23–1.42 / 1.42	1.33 / 1.19	1.26
Scutellum length	0.98–1.07 / 1.05–1.20	1.14–1.28 / 1.23–1.26	1.14–1.26 / 1.14	1.16 / 1.03	1.0
Length of head in lateral view	0.59–0.68 / 0.73–0.77	0.57–0.68 / 0.68–0.70	0.50 / 0.64	0.57 / 0.61	0.82
Height of head in lateral view	1.0–1.12 / 1.10–1.26	1.0–1.07 / 1.12–1.20	0.96–1.0 / 1.12	1.0 / 1.05	0.80
Ratio of antennomere I /II lenghts	2.0–2.79 / 2.35–2.65	2.78–3.34	2.8–3.1 / 2.73	3.17 / 2.97	3.25

tafemora black (femora reddish orange in two paratypes). *Abdomen* stramineous (reddish orange in two paratypes), each abdominal segment dorsolaterally with black marks.

Structure. Body length 8.51–9.13 mm. *Head*: width across eyes 1.37–1.42 mm; interocular distance 0.68–0.73 mm. *Eyes*: width 0.34–0.36 mm; ocular index 1.87–2.13. *Antennae*: antennomere I 0.98–1.20 mm long, 0.71–0.86× as long as head width, 1.43–1.66× longer than interocular distance; antennomere II 2.61–2.86 mm long, 1.90–2.04× longer than head width, 1.0–1.04× posterior width of pronotum; antennomere III 1.23–1.49 mm long; antennomere IV 0.88 mm long. *Pronotum*: length 1.26–1.49 mm, 1.84–2.14× as long as posterior width; posterior width 2.54–2.77 mm; collar length 0.18–0.20 mm; anterior width 0.96–1.05 mm. *Scutellum*: length 1.05–1.2 mm, anterior width 1.3–1.49 mm. Female genitalia were not dissected in this study due to the poor condition of the female specimens.

Differential diagnosis. *Brachycoleus medes* sp. nov., compared to other species of *Brachycoleus* recorded in Iran,

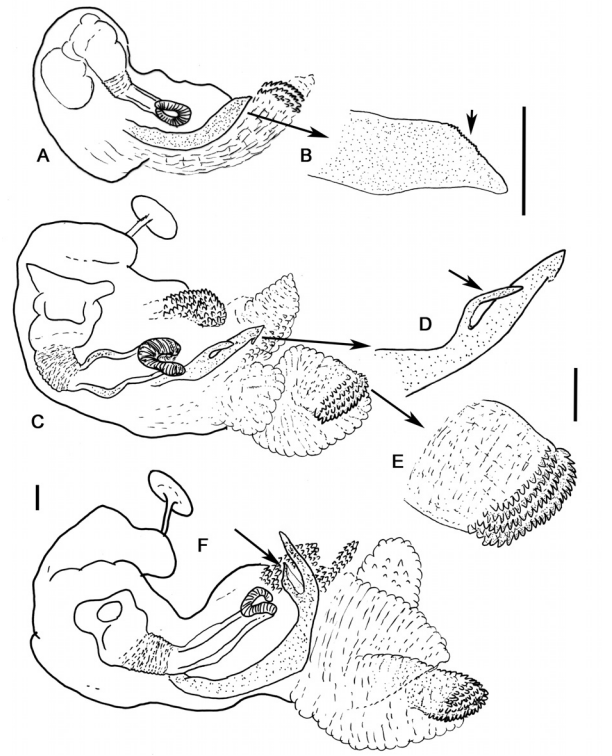

Fig. 5. Male genitalia. A – *Brachycoleus lineellus* Jakovlev, 1884; B – spiculum; C – *B. steini* Reuter, 1877; D – spiculum; E – dentate plate; F – *B. thoracicus* Puton, 1892. Scale = 0.1 mm.

is darker (Fig. 4). Its males are easily recognized by their unique coloration, with pronotum and scutellum uniformly black, except for an orange to stramineous stripe along embolium, extending to cuneus (Fig. 1). Similarities can be noticed between females of *B. medes* and *B. steini* in colour pattern, although in *B. steini* there is a continuous transverse black mark on callose region, both stramineous bands of clavus along claval suture and black mark between embolium and cuneus are wider.

Male genitalia exhibit only minor differences compared to other species of the genus. Endosoma in *B. lineellus* is smaller than in other species of the genus, process in spiculum absent, basal half of its apex serrate (Figs 5A, B), in *B. steini* with a narrow process in spiculum, apex of spiculum almost hook-shaped (Figs 5C–E), in *B. thoracicus* process of spiculum is more developed and spiculum apically simple (Fig. 5F), in *B. medes* process of spiculum is reduced and far from the apex (Fig. 2E).

The dorsal pattern of *B. decolor* Reuter, 1887 is relatively variable (Stichel 1930 inferred from Schuh 2013); however, according to Rosenzweig's (1997) and Wagner's (1974) figures of endosoma, *B. decolor* has an additional sclerite in the lateral lobe or on the other hand two spicula. Male genitalia of *B. pilicornis* (Panzer, 1805) and *B. decolor* Reuter, 1887 are depicted in Fig. 6. (Rosenzweig 1997).

Brachycoleus medes sp. nov. can be separated from other Iranian *Brachycoleus* species using the key below.

Etymology. The species is named after "the Medes", an ancient Iranian people who lived in north-western Iran known as Media region; noun in apposition.

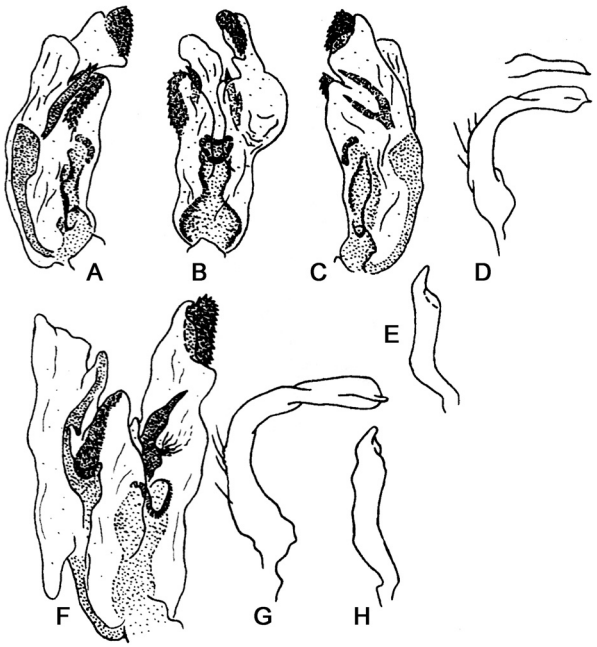

Fig. 6. Male genitalia. A–E – *Brachycoleus pilicornis* (Panzer, 1805); F–H – *B. decolor* Reuter, 1887; A, B, C, F – endosome different views; D, G – left paramere; E, H – right paramere (after Rosenzweig 1997).

Collection circumstances. The species was collected by sweep net on *Prangus ferulacea* (L.) (Fig. 3C) and *Eryngium caucasium* Trautv. (Fig. 3D) (Apiaceae) in hilly slopes (Figs 3 A, B).

Distribution. Iran (Kurdistan province).

Key to males of the Iranian species of *Brachycoleus*

(modified from Hosseini 2016).

1 Body color in dorsal view mostly black, pronotum and scutellum uniformly black, length from costal fracture to apex of cuneus 1.42 mm, ocular index 1.56–1.80 in ♂ (1.48 mm and 1.87–2.13 respectively in ♀). ..... ***B. medes* sp. nov.**

– Body color in dorsal view variable, other characters different. 2

2 Body color in dorsal view red or orange, pronotum red, calli and scutellum black, sometimes posteriorly red or orange. Antennomere II > 2.5× as long as width of head, length from costal fracture to apex of cuneus 2.0 mm in male, 1.66 mm in female, ocular index 1.43–1.51 in male, 2.0 in female. ..... ***B. thoracicus*** Puton, 1892

– Body color in dorsal view greenish or stramineous. Scutellum not black like in previous species. Antennomere II < 2× width of head. 3

3 Pronotum and hemelytra without distinct black marks. Ocular index 0.80–0.82 in ♂ (2.33 in ♀). Antennomere I 0.65–0.69× as long as width of head, antennomere II 1.5× as long as posterior width of pronotum. Length from costal fracture to apex of cuneus 1.22 mm in ♀. ..... ***B. caucasicus*** (Poppius, 1912)

– Pronotum and hemelytra with distinct black marks. ... 4

4 Pronotum bright, with 1 to 3 small and narrow dark longitudinal stripes. Corium pale, each with only narrow dark longitudinal stripes on commissure and medial flexion line, length from costal fracture to apex of cuneus 1.71 mm, ocular index 1.66 in ♂ (1.26 mm and 2 respectively in ♀). ..... ***B. lineellus*** Jakovlev, 1884
– Pronotum with broad dark longitudinal stripes. Corium dark. Other characters variable. 5
5 A wide black stripe on corium produced laterad along embolium / cuneus boundary and touching lateral margin of hemelytron (Fig. 4B: BM), hairs of metatibiae almost as long as the spines, apex of cuneus usually black, 2nd antennal segment about 2.1–2.2× width of head, length from costal fracture to apex of cuneus 1.82 mm, ocular index 1.5–1.65 in ♂ (1.42 mm and 2.14 respectively in ♀). ..... ***B. steini*** Reuter, 1877
– A wide black stripe on corium not produced laterad, outer margin of hemelytron completely yellow, hairs of metatibiae shorter than spines, apex of cuneus not black, ocular index approximately 2, endosome with two spicula (Wagner 1974). ..... [***B. decolor*** Reuter, 1887]
(Known from Europe and Central Asia)

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