

RESEARCH PAPER

# Three new species and new records of cuckoo bees of the genus *Epeolus* in Turkey (Hymenoptera: Apidae: Nomadinae)

Petr BOGUSCH

Department of Biology, Faculty of Science, University of Hradec Králové, Rokytanského 62, CZ-500 03 Hradec Králové, Czech Republic;  
e-mail: bogusch.petr@gmail.com

Accepted:  
1st April 2018

Published online:  
29<sup>th</sup> April 2018

**Abstract.** Three new species of cuckoo bees of the genus *Epeolus* Latreille, 1802 are described: *E. turcicus* sp. nov., *E. warncke*i sp. nov., and *E. productuloides* sp. nov., all from the Eastern Anatolia Region of Turkey. Descriptions of *E. turcicus* and *E. warncke*i are based on both sexes whereas the description of *E. productuloides* is based on males only (females of this species are presently unknown). Additional records based on vouchered pinned material are reported for eight species, of which *Epeolus alpinus* Friese, 1893 was until now not known to occur in Turkey. Altogether, 14 species of *Epeolus* have been recorded from Turkey, of which *E. cruciger* (Panzer, 1799), *E. productulus* Bischoff, 1930, *E. schummeli* Schilling, 1849, *E. transitorius* Eversmann, 1852 and *E. variegatus* (Linnaeus, 1758) are widespread and common. *Triepeolus tristis* (Smith, 1854) is the only other member of the tribe Epeolini recorded from Turkey.

**Key words.** Hymenoptera, Apoidea, Apidae, Epeolini, *Epeolus*, cuckoo bees, distribution, taxonomy, Turkey, Palaearctic Region

**Zoobank:** <http://zoobank.org/urn:lsid:zoobank.org:pub:CE408319-E62B-4005-94E3-E80F6734EB94>

© 2018 The Authors. This work is licensed under the Creative Commons Attribution-NonCommercial-NoDerivs 3.0 Licence.

## Introduction

Cuckoo bees form an ecological group with representatives in three families, Halictidae, Megachilidae, and Apidae, characterized by their cleptoparasitic lifestyle. Female cuckoo bees do not forage or build their own nests but instead lay eggs into the nests of host foraging bee species (Batra 1984, Westrich 1989, Michener 2007). Most species of cuckoo bees belong to the family Apidae, in which the subfamily Nomadinae forms the most species-rich group in most parts of the world (Michener 2007). *Epeolus* Latreille, 1802 represents one of the more speciose genera of cleptoparasitic Nomadinae in the old world (Bogusch & Hadrava, in press). The species and sexes in this genus are very uniform in general appearance, smaller or middle sized (4–9 mm in total body length), and robust with a slightly conical metasoma. Their integument colouration is largely black, although in some species parts of the body are largely red or reddish brown, and all species typically possess bands and spots of white or yellowish tomentum on their body (Westrich

1989, Onuferko 2017). Bees of the genus *Colletes* Latreille, 1802 are the only known hosts of *Epeolus*, and most species of *Epeolus* are specialized on only one species of *Colletes*; only some usually common and widespread species intrude nests of more *Colletes* hosts (Westrich 1989, Amiet et al. 2007, Bogusch & Hadrava, in press).

Bees of the genus *Epeolus* are poorly studied. As is true for many cleptoparasitic bees, they are quite difficult to identify to species, and many species are very rare and localized, so finding them in the field is difficult. Although Warncke (1982, 1983) revised all other genera of Palaearctic Nomadinae except *Nomada* Scopoli, 1770, he did not finish his studies on *Epeolus* of the Palaearctic Region. Recently, Onuferko (2017) published a revision of Canadian *Epeolus* species, and a revision of the European species of this genus by Bogusch & Hadrava (in press) is expected to be published in the near future. To date, however, no comprehensive study on the bees of this genus from Turkey has been published, and occurrence data for *Epeolus* from



Turkey have been published only in several old faunistic surveys (POPOV 1967, PESENKO 1974). Before the present study, it was not known how many species and which species of *Epeolus* occur in Turkey, and how numerous and common they are in the country, which is very rich in bee diversity (see ÖZBEK et al. 2015).

This study is a compilation of *Epeolus* records based on specimens collected in Turkey and recently deposited in museum collections in Europe and Turkey. Warncke's notes on the distribution of bees of the genus *Epeolus* are also included herein. This is the first overview of bees in this genus from Turkey, with descriptions of three new species from the eastern part of the country in the Anatolian peninsula.

### Materials and methods

The records are based on personally examined dry, pinned specimens housed in the following collections:

BMNH Natural History Museum, London, United Kingdom;  
 JSPC Jakub Straka private collection, Prague, Czech Republic;  
 HOET Hikmet Özbek private collection, Eskisehir, Turkey;  
 MSAA Maximilian Schwarz private collection, Ansfelden, Austria;  
 OLML Oberösterreichisches Landesmuseum, Linz, Austria;  
 PBHC Petr Bogusch private collection, Hradec Králové, Czech Republic.

I have also examined specimens of all species of *Epeolus* known from continental Europe from many collections in Europe and the USA, for which records will be made available upon the publication of the revision of European species (BOGUSCH & HADRAVA, in press). All material was compared to type material of European and Middle-Eastern species.

All localities were visually checked on a map and are presented alphabetically according to province. Descriptions of new species are based on type material. Morphological terms were adopted from MICHENER (2007) and RIGHTMYER (2008), and I use the abbreviations T for tergum, S for sternum, and F for flagellomere, with corresponding numbers (with 1 being the most basal subdivision and the maximum number being the most apical). Morphology was studied using standard dissecting microscopes and measurement techniques (measuring oculars). Most photos were taken using the camera Canon EOS 550d with macro-objective and LED-light, and focus-stacked in Zerene Stacker. Photos of smaller body parts (the labrum, pygidial plate, and some others) were taken using the Hirox digital microscope. Only type specimens of all species were imaged.

### Descriptions of new species

#### *Epeolus turcicus* sp. nov.

**Type material.** HOLOTYPE: TURKEY: BITLIS: ♀, Bitlis env., Süphan Dağı, 2500 m a. s. l., 17.viii.1991, K. Warncke lgt. (OLML). ALLOTYPE: TURKEY: BITLIS: Bitlis env., Süphan Dağı, 2500 m a. s. l., 17.viii.1991, 1 ♂, K. Warncke lgt. (OLML). PARATYPES: TURKEY: BITLIS: Bitlis env., Nemrut Dağı, 2300 m a. s. l., 15.viii.1991, 2 ♂♂, K. Warncke lgt. (OLML); Bitlis env., Süphan Dağı, 2500 m a. s. l., 17.viii.1991, 1 ♀, 2 ♂♂, K. Warncke lgt. (OLML). KONYA: Konya env., 6.viii.1991, 1 ♂, K. Warncke lgt. (OLML).

**Description. Female.** Size: Body length: 5.1 mm.

**Head.** Length to width ratio = 1.2. Mandible reddish, mandibular apex and preapical tooth darker than rest of

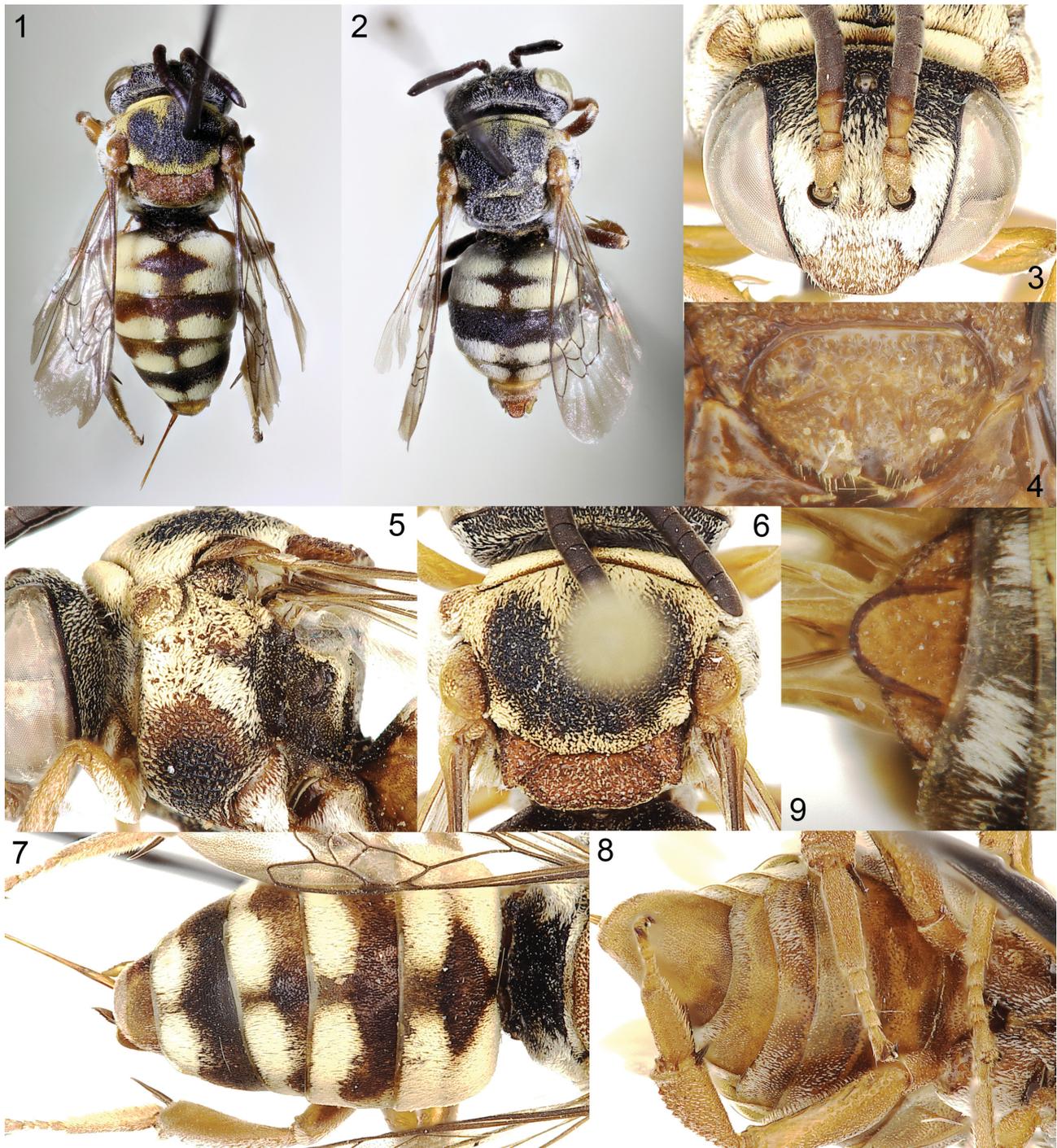
mandible. Labrum reddish and sides convex, coarsely and densely punctate, with pair of prominent teeth medially, apex with prominent hair, with pair of lobes separated by medial shallow emargination. Clypeus reddish, not very shiny and with very fine punctation throughout. Frons to interorbital tubercle reddish, with sparse whitish hair around antennal socket, and with well-developed frontal keel. Vertex with fine and sparse punctures, interspaces shiny and greater than puncture diameters. Antenna dark, only scape, pedicel and F1 completely reddish, F2 reddish basally. Flagellomeres slightly longer than wide (L:W ratio = 1.1), F2 a little longer than other flagellomeres (L:W ratio = 1.15–1.2).

**Mesosoma.** Pronotum reddish and entirely obscured by yellowish tomentum. Mesoscutum black in the middle with dense coarse wax-like punctation, interspaces much narrower than puncture diameters. Mesoscutum along anterior and posterior margins with yellowish tomentum, well-developed paramedian band and similar band also on each side of mesoscutum. Mesoscutellum reddish, round, densely and very coarsely punctate, punctures bigger than on the mesoscutum, axillar tooth (free portion of axilla) short and acute. Mesoscutellum with posterior margin extending over propodeum. Propodeum very finely sculptured, dull, lower part shiny, and laterally with yellowish tomentum. Mesopleuron in upper half black with dense yellowish tomentum, in lower half reddish, sparsely hairy and very coarsely and densely punctate, shiny interspaces narrower than puncture diameters. Wings slightly brownish with dark brown venation. Legs reddish, only basal part of front coxa dark, tibial spur on middle and hind legs black.

**Metasoma.** Metasoma partly reddish (usually basal and lateral parts of sterna and terga). T1 finely and densely punctate, interspaces matt and narrower than puncture diameters. T1 with bands of tomentum connected laterally and separated medially, forming a C-shape on each side. T1 with apical fascia of pale tomentum separated medially by patch of light brown to reddish-brown tomentum. T2–T4 densely but more coarsely punctate with shiny interspaces and ill-developed depressions. T2–T4 with apical bands of yellowish tomentum interrupted medially and narrowed laterally, apical impressed areas semitransparent. T5 shiny with very fine and dense punctation, black apex and whitish tomentum on sides, pseudopygidial area short, with silver-like pubescence. T6 reddish with slightly curved apex, bearing brownish pygidial plate, which is not very wide, with sparse short yellowish hair. S2 coarsely and sparsely punctate, interspaces much bigger than puncture diameters, especially medially, where punctures are bigger, shallow, and very sparse. Other sterna more finely and densely punctate. S5 curved (see from side) and narrow. Processes on sides of S6 normal, with short projections.

**Male.** Size: Body length: 5.1 mm.

**Head.** Length to width ratio = 1.2. Mandible reddish with mandibular apex and preapical tooth darker than rest of mandible. Labrum reddish and sides convex, coarsely and densely punctate, with pair of prominent teeth medially, apex with prominent hair, with pair of lobes separated by medial shallow emargination. Clypeus black with



Figs 1–9. *Epeolus turcicus* sp. nov. 1 – holotype, ♀, dorsal view; 2 – allotype, ♂, dorsal view; 3–8 – holotype: 3 – head, frontal view; 4 – labrum; 5 – mesopleuron, lateral view; 6 – mesosoma; 7 – terga; 8 – sterna. 9 – allotype, pygidial plate.

reddish narrow apical band, not very shiny and with very fine punctation throughout, most of clypeus with whitish tomentum. Frons with dense whitish hair around antennal socket, with well-developed frontal keel. Vertex with fine and sparse punctures, interspaces shiny and greater than puncture diameters. Antenna dark, only scape, pedicel and F1–F2 partly reddish. Flagellomeres slightly shorter than wide (L:W ratio = 0.9–0.95), F2–F3 a little longer than other flagellomeres (L:W ratio = 1.15).

*Mesosoma.* Pronotum black, entirely obscured by yellowish tomentum. Mesoscutum black with dense

coarse wax-like punctation, interspaces much narrower than puncture diameters. Mesoscutum along anterior and posterior margins with yellowish tomentum, well-developed paramedian band and similar band also on sides of mesoscutum. Mesoscutellum black, round, densely and very coarsely punctate, punctures bigger than on mesoscutum, axillar tooth short and acute. Mesoscutellum with posterior margin extending over propodeum. Propodeum very finely sculptured, dull, lower part shiny, and laterally with yellowish tomentum. Mesopleuron in upper half with dense yellowish tomentum, in lower half very coarsely and

densely punctate, shiny interspaces smaller than puncture diameters. Wings slightly brownish with dark brown venation. Legs reddish, only basal parts of front coxa and middle parts of femora dark, tibial spurs on middle and hind legs black.

**Metasoma.** Metasomal sterna and terga dark brown or black. T1 finely and densely punctate, interspaces shiny and similar in width to puncture diameters, with yellowish tomentum on whole surface (except basal part). T2–T5 more coarsely punctate than T1, shiny, with interspaces bigger than puncture diameters, and with complete, wide, yellowish apical bands. Depressions of T2–T5 well-developed, semitransparent. T6 with spots of whitish or yellowish tomentum medially. Pygidial plate elongate and reddish, shiny with sparse punctures and dark brown margin. S2 coarsely and sparsely punctate, interspaces much bigger than puncture diameters, especially medially, where punctures are bigger and sparse. Other sterna more finely and densely punctate. S2–S3 with white tomentum on apex, S4–S5 with prominent thick brownish hair on apex.

**Differential diagnosis.** This species is in the *E. variegatus* group (with *E. compar*, *E. eriwanensis*, *E. intermedius*, *E. productulus* and *E. variegatus*), characterized by the presence of labral tubercles positioned in the middle of labrum and curved shape of last metasomal sternum of female (most easily seen in lateral view). It is similar to *E. aureovestitus* in general appearance, but in *E. aureovestitus* the female S5 is straight and flagellomeres of both sexes are shorter (female *E. aureovestitus* L:W ratio = 0.85, female of *E. turcicus* L:W ratio = 1.15; male *E. aureovestitus* L:W ratio = 0.6, male *E. turcicus* L:W ratio = 0.85). In female *E. turcicus* the labrum, apex of clypeus, mesoscutellum, legs and most of the metasoma are reddish. Apex of labrum has two lobes, but they are less conspicuous than in *E. variegatus*. The scape, pedicel, and F1 are completely red in the female and partly red in the male. Tomentum on whole body is creamy-whitish or pale yellow, T2–T4 with bands of tomentum slightly interrupted in the middle. Legs reddish, in males with several parts darker. Punctuation very fine, especially on S2 much finer than in *E. variegatus*. Pygidial plate of male reddish.

**Etymology.** The species is known only from localities in Turkey so it was named after this country using the adjective *turcicus* (-a, -um).

**Ecology.** Host and floral associations are unknown.

**Distribution.** Recently known only from three localities in east Anatolia, Bitlis province, near Lake Van, and one specimen was collected near Konya quite far away westwards. It is likely to be more widely distributed in Turkey and probably also in other Middle-Eastern countries.

#### *Epeolus warnckeii* sp. nov.

**Type material.** HOLOTYPE: TURKEY: VAN: ♀, Van env., Erçek, 10.viii.1979, K. Warncke lgt. (OLML). ALLOTYPE: TURKEY: VAN: Van env., Erçek, 10.viii.1979, 1 ♂, K. Warncke lgt. (OLML).

**Description. Female.** Size: Body length: 5.9 mm.

**Head.** Length to width ratio = 1.25. Mandible reddish, mandibular apex and preapical tooth darker than rest of mandible. Labrum slightly concave, reddish, coarsely and

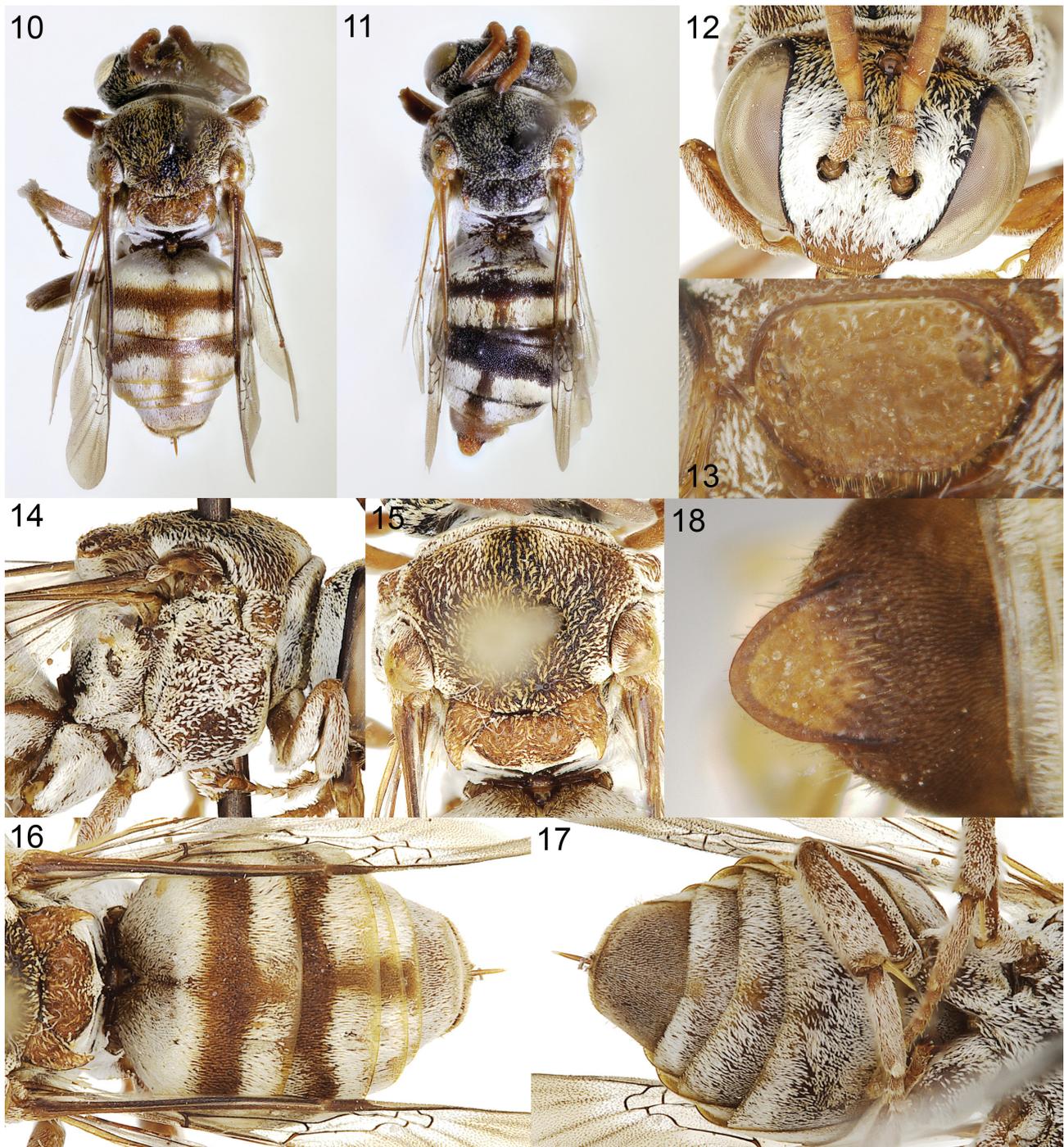
densely punctate, with two small teeth near apex, apex with prominent hair, only slightly curved. Clypeus reddish, not very shiny and with very fine punctures throughout, basal part of clypeus with white tomentum. Frons with whitish tomentum around antennal socket, and with well-developed frontal keel. Vertex with fine and sparse punctures, interspaces shiny and bigger than puncture diameters, all is hardly visible under sparse yellowish tomentum. Antenna reddish, flagellomeres slightly longer than wide (L:W ratio = 1.05–1.1), F2–F3 longer than other flagellomeres (L:W ratio = 1.15–1.2).

**Mesosoma.** Pronotum reddish and entirely obscured by creamy whitish tomentum. Mesoscutum black with marginal parts reddish, and with dense coarse punctation, interspaces usually narrower than puncture diameters, in front and central part of similar size to puncture diameters. Mesoscutum around anterior and posterior margins with creamy whitish tomentum, well-developed paramedian band and similar band also on side of mesoscutum. Mesoscutellum reddish, round, densely and very coarsely punctate, punctures bigger than on mesoscutum. Axillar tooth (free portion of axilla) longer than mesoscutellum and acute. Mesoscutellum with posterior margin extending over propodeum. Propodeum very finely sculptured, dull, lower part shiny with creamy whitish tomentum laterally. Mesopleuron on whole surface with dense whitish tomentum, in lower half reddish and very coarsely and quite densely punctate, shiny interspaces narrower than puncture diameters, small upper part of mesopleuron black. Wings slightly brownish with dark brown venation. Legs reddish, only basal part of front coxa darker, tibial spurs on middle and hind legs yellow.

**Metasoma.** Whole metasoma reddish. T1 finely and densely punctate, interspaces shiny and narrower than puncture diameters. T1–T2 with band of tomentum connected together and forming C-shaped mark on each side. T1–T2 medially with apical impressed area with light brown or reddish-brown tomentum. T3–T4 densely punctate with shiny interspaces and ill-developed depressions. T3–T4 with apical band of yellowish tomentum interrupted medially, ends of terga semitransparent. T5 shiny with very fine and dense punctation, with sparse whitish tomentum on whole surface, pseudopygidial area short with silver-like pubescence. T6 reddish with slightly curved apex, bearing reddish and wide pygidial plate with dense short yellowish hair. S2 coarsely and densely punctate, interspaces similar in width to puncture diameters. Other sterna more finely and densely punctate. S5 straight and wide. Processes on sides of S6 normal, with short projections. All sterna with creamy whitish tomentum.

**Male.** Size. Body length: 5.3 mm.

**Head.** Length to width ratio = 1.2. Mandible reddish, mandibular apex and preapical tooth darker than rest of mandible. Labrum concave, reddish, coarsely and densely punctate, with two small teeth near the apex, apex with prominent hair, only slightly curved. Clypeus black with reddish apex, not very shiny and with very fine punctures throughout, basal part with white tomentum. Frons with whitish tomentum around antennal socket, and with



Figs 10–18. *Epeolus warnckei* sp. nov. 10 – holotype, ♀, dorsal view; 11 – allotype, ♂, dorsal view. 12–17 – holotype: 12 – head, frontal view; 13 – labrum; 14 – mesopleuron, lateral view; 15 – mesosoma; 16 – terga; 17 – sterna. 18 – allotype, pygidial plate.

well-developed frontal keel. Vertex with fine and sparse punctures, interspaces shiny and wider than puncture diameters, all is hardly visible under sparse whitish tomentum. Antenna reddish, scape brown on base. Flagellomeres shorter than wide (L:W ratio = 0.85), F2–F3 longer than other flagellomeres (L:W ratio = 1.1).

*Mesosoma.* Pronotum entirely obscured by creamy whitish tomentum. Mesoscutum black with sparse and coarse punctation, interspaces usually wider than puncture size, in front and central part similar width to puncture diameters. Mesoscutum black, along anterior and posterior margins with creamy whitish tomentum, well-developed but short

paramedian band and similar band also on sides. Mesoscutellum black, round, sparsely and very coarsely punctate, punctures wider than on mesoscutum, axillar tooth (free portion of axilla) longer than mesoscutellum and acute, reddish on apex. Mesoscutellum with posterior margin extending over propodeum. Propodeum very finely sculptured, dull, lower part shiny and laterally with yellowish tomentum. Mesopleuron on whole surface with dense whitish tomentum, in lower half coarsely and densely punctate, shiny interspaces narrower than puncture diameters. Wings slightly brownish with dark brown venation. Legs brownish, only tibiae and tarsi reddish, tibial spurs on middle and hind legs yellow.

*Metasoma*. T1 finely and densely punctate, interspaces shiny and of similar width to puncture diameters. T1–T2 with band of tomentum connected together and forming C-shaped mark on each side. T1–T2 medially with apical impressed area with light brown or reddish-brown tomentum. T3–T5 densely punctate with shiny interspaces and ill-developed depression. T3–T5 with apical band of yellowish tomentum interrupted medially, ends of terga semitransparent. T6 shiny with very fine and dense punctation, with sparse whitish tomentum on the whole surface. T7 short and broad, round, reddish, with matt surface with ill-developed fine punctures. S2 quite coarsely and densely punctate, interspaces similar to width of puncture diameters. Other sterna more finely and densely punctate. S1–S3 with white tomentum on apex, S4–S5 with prominent thick brownish hair on apex.

**Differential diagnosis.** This species is very similar to *E. flavociliatus*, and both species can be distinguished from all other *Epeolini* in Turkey by the elongate and distinctly hooked axillae. Unlike *E. flavociliatus*, in which the labrum does not have tubercles, *E. warnckei* has well-developed labral tubercles near the apex of the labrum. Punctuation on whole body is much denser and coarser than in *E. flavociliatus*. Most of the body is red in females and with whitish tomentum. Male is black with red legs, scape, pedicel and F1 partly red. Similar is also *E. subrufescens*, but it differs by typical darkened and sc-

lerotized apical tubercles in the middle of mesoscutellum.

**Etymology.** Both specimens of this species were collected on the same day and at one locality by German specialist Klaus Warncke to whom I dedicate the species.

**Ecology.** Host and floral associations are unknown.

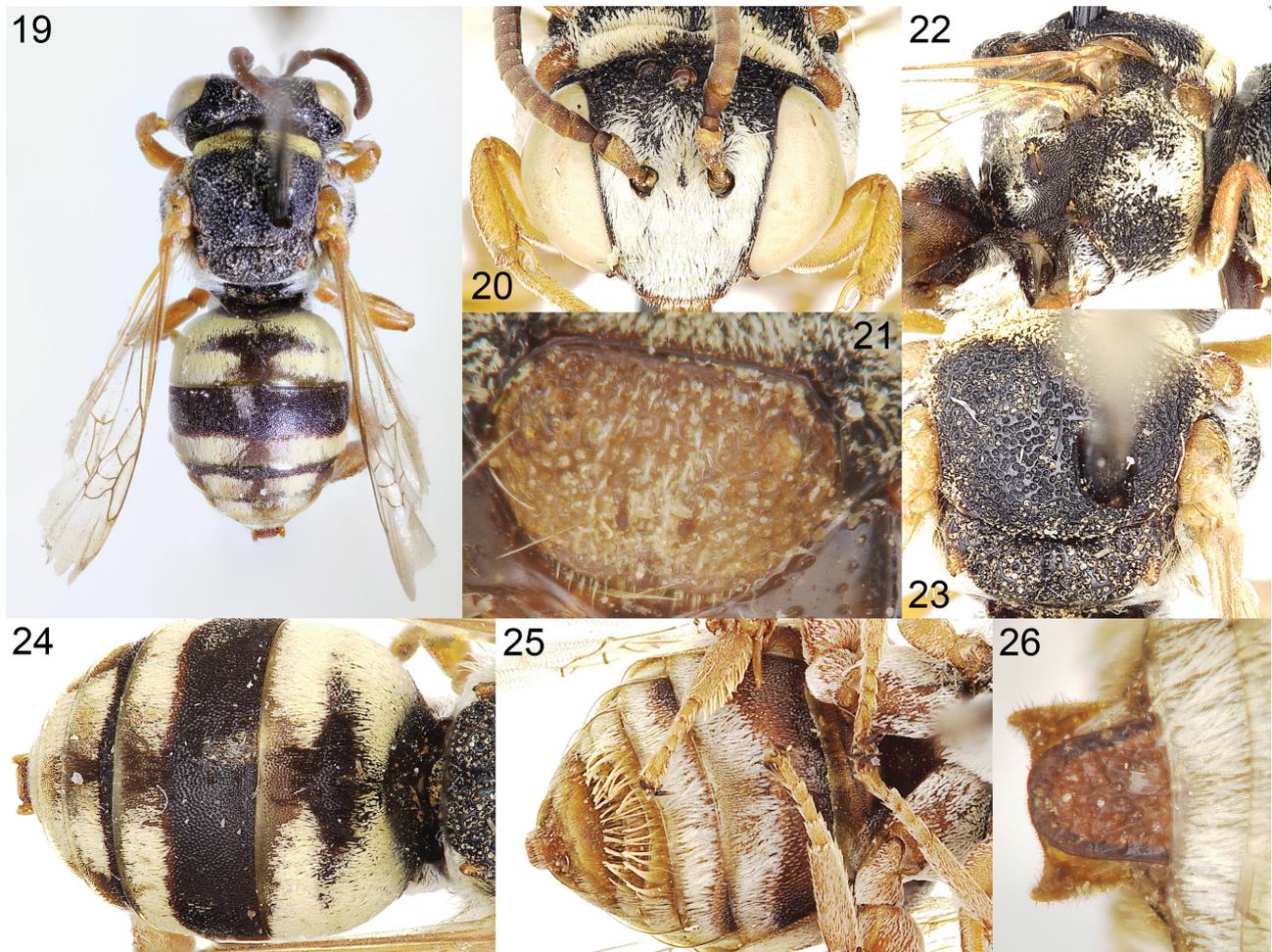
**Distribution.** Known from only one male and one female recorded at one locality near Lake Van, east Turkey. This species is probably rare and it is not possible to write anything more about its distribution and occurrence at this time.

*Epeolus productuloides* sp. nov.

**Type material.** HOLOTYPE: TURKEY: HAKKARI: ♂, Beytüşşebap, 1250 m a. s. l., 10.viii.1983, K. Warncke lgt. (OLML). PARATYPES: TURKEY: BITLIS: Bitlis env., Nemrut Dağı, 2300 m a. s. l., 15.viii.1991, 2 ♂♂, K. Warncke lgt. (OLML). HAKKARI: Beytüşşebap, 1250 m a. s. l., 10.viii.1983, 1 ♂, K. Warncke lgt. (OLML).

**Description. Male.** Size: Body length: 6.3 mm.

Head: Length to width ratio = 1.24. Mandible reddish, mandibular apex and preapical tooth darker than rest of mandible. Labrum reddish and flat, coarsely and densely punctate, with two prominent teeth not in the middle but positioned in 2/3 of the length of clypeus from the base, apex straight with short whitish hair. Clypeus black, not very shiny and with very fine punctation throughout, with whitish tomentum on whole surface. Frons with dense whitish hair around antennal socket, with well-developed



Figs 19–26. *Epeolus productuloides* sp. nov., holotype, ♂: 19 – whole specimen, dorsal view; 20 – head frontal view; 21 – labrum; 22 – mesopleuron, lateral view; 23 – mesosoma; 24 – terga; 25 – sterna; 26 – pygidial plate.

frontal keel. Vertex finely and sparsely punctate, interspaces shiny and wider than puncture diameters, punctation behind ocelli denser. Antenna light brownish, only scape reddish. Flagellomeres slightly shorter than wide (L:W ratio = 0.9–0.95), F2–F3 equal in length to width.

**Mesosoma.** Pronotum entirely obscured by yellowish tomentum. Mesoscutum black with dense coarse punctation, interspaces of similar width as puncture diameters. Basal part of mesoscutum with yellowish tomentum and very short maculae-like paramedian band. Mesoscutellum black, round, densely and very coarsely punctate, punctures greater than on mesoscutum, axillar tooth (free portion of axilla) short and acute, reddish at the end. Mesoscutellum with posterior margin extending over propodeum. Propodeum very finely sculptured, dull, lower part of propodeum shiny with yellowish tomentum laterally. Mesopleuron in upper half with dense yellowish tomentum, in lower half coarsely and densely punctate, shiny interspaces narrower than puncture diameters. Wings slightly brownish with dark brown venation. Legs reddish, only basal parts of front coxae dark, tibial spurs on middle and hind legs reddish.

**Metasoma.** T1 finely and densely punctate, interspaces matt and narrower than puncture diameters. T1 with band of tomentum connected together and forming C-shaped mark on each side. T1–T2 medially with apical impressed area with light brown or reddish-brown tomentum. T2–T5 densely punctate with shiny interspaces with ill-developed depressions. T2–T4 with two spots of yellowish tomentum laterally and T5 with one spot of yellowish tomentum laterally, depressions well-developed and semitransparent. T6 shiny with very fine and dense punctation, with sparse whitish tomentum on whole surface. T7 elongate, round, reddish, with matt surface, ill-developed fine punctures and narrow brownish margin. S2 quite coarsely and densely punctate, interspaces similar to width of puncture diameters. Other sterna more finely and densely punctate. S1–S3 with white tomentum on apex, S4–S5 with prominent thick yellowish hair on apex.

**Differential diagnosis.** This species is in the *E. variegatus* group, and is most similar to *E. productulus* because of the tubercles on the labrum positioned not in the middle but nearer to the apex, straight labral apex, shiny mesoscutum and dense punctures on T2. Males of *E. productuloides* differ in that they have very fine and sparse punctation on the metasoma contrasting with rough punctation on the mesosoma, uninterrupted apical bands of tomentum on T2–T5 and a red pygidial plate. All specimens have a red labrum, antenna and legs (all these structures are completely or partly black or brownish in most specimens of *E. productulus*).

**Etymology.** The species is very similar in morphology and certainly closely related to *E. productulus*. The species epithet is derived using the Greek suffix *-oides*, meaning ‘resembling’.

**Ecology.** Host and floral associations are unknown.

**Distribution.** Only four males were recorded at two localities in east Turkey. The localities are not far away from each other. However, it is not possible to write anything more about its distribution and occurrence.

## Occurrence records of other *Epeolus* species in Turkey

### *Epeolus alpinus* Friese, 1893

**Material examined.** TURKEY: BOLU: Seben, 17.vi.1998, 1 ♂, J. Halada lgt., P. Bogusch det. (OLML).

**Distribution.** Most of North Europe, in Central and Southern Europe known from the biggest mountain ranges: Alps, Pyrenees, and Carpathians (SCHEUCHL 2000, AMIET et al. 2007). This species is probably not endemic to Europe but likely occurs also in Siberia (BISCHOFF 1930). Several records are known also from North Africa (BOGUSCH & HADRAVA, in press). **New record for Turkey.**

### *Epeolus cruciger* (Panzer, 1799)

**Material examined.** TURKEY: AKSARAY: Belişirma env., Ihlara Vadisi, 10.viii.2006, 1 ♀, J. Růžička lgt., P. Bogusch det. (JSPC). BITLIS: Nemrut Dağı, 8.viii.1986, 15 ♂♂ 14 ♀♀; 15.viii.1991, 2 ♂♂ 7 ♀♀, K. Warncke lgt., P. Bogusch det. (OLML); Genç, 16.viii.1985, 1 ♀, R. Hensen lgt., P. Bogusch det. (OLML); Tatvan, 13.viii.1985, 1 ♂ 1 ♀, R. Hensen lgt., P. Bogusch det. (OLML). ERZINCAN: Erzincan env., Refahiye, 13.vii.1985, 1 ♂, W. Schacht lgt., P. Bogusch det. (OLML). ERZURUM: Oltu env., Başaklı, 9.viii.2000, 1 ♀, H. Özbek lgt., P. Bogusch det. (HOET); Tortum env., Esendurak, 1400 m a.s.l., 11.vii.2004, 1 ♀, O. Kaya lgt., P. Bogusch det. (HOET). GÜMÜŞHANE: Gümüşhane, 22.viii.1991, 1 ♀, K. Warncke lgt., P. Bogusch det. (OLML). HAKKARI: Beytuşşebap, 10.viii.1983, 2 ♀♀, Yüksekova, 12.viii.1979, 3 ♂♂ 3 ♀♀, both K. Warncke lgt., P. Bogusch det. (OLML). HATAY: Antakya, 4.vi.1965, 1 ♀, M. Schwarz lgt., P. Bogusch det. (MSAA). IĞDIR: Tuzluca, 17.viii.1972, 1 ♂, K. Warncke lgt., P. Bogusch det. (OLML). IZMİR: Ephesus (= Efes), 15.-21.v.1986, 1 ♂, Witzgall lgt., P. Bogusch det. (OLML). KAYSERİ: Kayseri, 1.vi.1964, 1 ♂, J. Gusenleitner lgt., P. Bogusch det. (OLML). KONYA: Konya, 23.vii.1971, 1 ♀, K. Warncke lgt., P. Bogusch det. (OLML). MANİSA: Salihi, 2.vii.2006, 1 ♂, J. Halada lgt., P. Bogusch det. (OLML). VAN: Van env., 5.vii.1997, 1 ♂, J. Halada lgt.; Muradiye, 5.vii.2000, 3 ♀♀, M. Halada lgt., both P. Bogusch det. (OLML).

**Distribution.** Most of Europe, recent records suggest it is more common in Southern Europe. It also occurs in the Middle East – Turkey, Iran, Caucasus and Siberia (BOGUSCH & HADRAVA, in press). According to these records, this species is distributed throughout most of Turkey and is not rare there.

### *Epeolus erivanensis* Bischoff, 1930

**Material examined.** TURKEY: AĞRI: Suluçan, Zor Dağı, 25.vi.1993, 1 ♂ 1 ♀, M. Halada lgt., P. Bogusch det. (OLML). AKSARAY: Güzeyurt env., Sivrihisar Köyü, 3.vi.1984, 1 ♀, A. W. Ebmer lgt., P. Bogusch det. (OLML). BITLIS: Tatvan, 1.vii.2000, 1 ♀, M. Halada lgt., P. Bogusch det. (OLML). BOLU: Seben, 17.vi.1998, 1 ♀, J. Halada lgt., P. Bogusch det. (OLML).

**Distribution.** Rare species occurring in the Middle East, known from Egypt, Turkey, Syria, Armenia, and Iran (BOGUSCH & HADRAVA, in press). Only several records are known from Turkey, where it is not common.

### *Epeolus fasciatus* Friese, 1895

**Material examined.** TURKEY: KÜTAHYA: Kütahya env., 28.vii.1962, 3 ♀♀, K. M. Guichard lgt., P. Bogusch det. (BMNH).

**Distribution.** Most of Southern and Central Europe and Russia – Rostov Province (PESENKO 1974). Additional recent records are known from Turkey and the Middle

East (BOGUSCH & HADRAVA, in press). This species has recently become very rare and has disappeared from most of Europe, with recent records coming only from France (BOGUSCH & HADRAVA, in press).

### *Epeolus productulus* Bischoff, 1930

**Material examined.** TURKEY: AGRI: Suluçan, Zor Dağı, 25.vi.1993, 1 ♂, M. Halada lgt., P. Bogusch det. (OLML). BITLIS: Tatvan, 30.vi.1993, 1 ♀, K. Deneş lgt., P. Bogusch det. (OLML). HAKKARI: Şemdinli, 20.7.1988, 1 ♂, C. Schmid-Egger lgt., P. Bogusch det. (OLML). KARS: Karakurt, 31.v.1988, 1 ♂, K. Warncke lgt., P. Bogusch det. (OLML). KONYA: Konya env., 28.vi.1969, 1 ♀, W. Linsenmaier lgt.; Sille env., 25.vi.2000, 1 ♀, M. Snížek lgt., both P. Bogusch det. (OLML). MALATYA: Erkenek, 9.vii.1997, 1 ♂, J. Halada lgt., P. Bogusch det. (OLML). VAN: Erciş, 27.v.1987, 3 ♂♂ 6 ♀♀, K. Warncke lgt.; 25.vi.1997, 1 ♂, J. Halada lgt.; Muradiye, 27.vi.1997, 1 ♀, 3.–5.vii.2000, 4 ♀♀, M. Halada lgt., all P. Bogusch det. (all OLML).

**Distribution.** Most of Southern Europe, reaching Switzerland in the north, but it has recently become extinct there (AMIET et al. 2007). It also occurs in the Middle East (BOGUSCH & HADRAVA, in press). Known from Turkey and probably is not rare there.

### *Epeolus schummeli* Schilling, 1849

**Material examined.** TURKEY: BITLIS: Ahlat, 24.vi.1997, 1 ♀, M. Halada lgt., P. Bogusch det. (OLML). ELÄZİĞ: Elâziğ, 13.–27.vi.1990, 1 ♀, K. Guichard lgt., P. Bogusch det. (BMNH). ERZURUM: Tortum env., Esendurak, 1400 m a. s. l., 11.vii.2004, 1 ♂, O. Kaya lgt., P. Bogusch det. (HOET). HAKKARI: Oraman, 29.vi.1997, 1 ♂, M. Schwarz lgt., P. Bogusch det. (MSAA). KARS: Paslı, 1.vii.1997, 1 ♂, M. Halada lgt., P. Bogusch det. (OLML). KAYSERİ: Develi, 23.vii.2003, 1 ♀, J. Straka lgt. & det. (JSPC). KIZILCAHAMAM: Kızılcahamam, 22.vi.1965, 1 ♂, C. Holzschuh lgt., P. Bogusch det. (OLML). KONYA: Konya, 23.vii.1971, 1 ♂ 2 ♀♀, K. Warncke lgt., P. Bogusch det. (OLML). MALATYA: Malatya, 23.vii.1988, 1 ♀, K. Guichard lgt., P. Bogusch det. (BMNH). MUĞLA: Maraş, 2.vi.1983, 1 ♀, 10.vi.1984, 2 ♂♂, K. Warncke lgt., P. Bogusch det. (OLML). NEVŞEHİR: Ürgüp, 21.vii.1971, 1 ♀, K. Warncke lgt., P. Bogusch det. (OLML). VAN: Erciş, 25.vi.1997, 1 ♂ 4 ♀♀, J. and M. Halada lgt., P. Bogusch det. (OLML).

**Distribution.** Most of Pannonian province and several sites in Southern Europe, recorded also from Russia – Rostov Province (PESENKO 1974). This species occurs in Southern and Central Europe and also occurs in Turkey and the Middle East (BOGUSCH & HADRAVA, in press). It is not rare in Turkey compared to Europe.

### *Epeolus transitorius* Eversmann, 1852

**Material examined.** TURKEY: AYDIN: Didim, 26.v.1986, 1 ♂ 6 ♀♀, K. Guichard lgt., P. Bogusch det. (BMNH). BITLIS: Nemrut, 15.viii.1991, 1 ♂; Tatvan, 16.viii.1991, 1 ♂, both K. Warncke lgt., P. Bogusch det. (OLML). BURSA: Çağlıyan, 20.–23.vii.1998, 1 ♀, M. Řiha lgt., P. Bogusch det. (PBHC). ERZINCAN: Tanyeri, 19.viii.1973, 1 ♂, K. Warncke lgt., P. Bogusch det. (OLML). KONYA: Konya, 23.vii.1971, 1 ♀, K. Warncke lgt., P. Bogusch det. (OLML). MERSİN: Mersin, 21.v.1961, 1 ♂, A. Giordani Soika lgt.; Silifke env., Ekşiler, 27.v.1998, 1 ♂, M. Halada lgt.; Göksu River, 19.vii.1998, 2 ♂♂, C. Schmid-Egger lgt., all P. Bogusch det. (OLML). NEVŞEHİR: Cappadocia (= Kapadokya), Sarahs, no date, 1 ♀, collector unknown; Zelve Yolu, 25.viii.1991, 1 ♀, K. Warncke lgt., both P. Bogusch det. (OLML). ŞANLIURFA: Şanlıurfa, 31.v.1968, 1 ♀, J. Gusenleitner lgt., P. Bogusch det. (OLML). VAN: Van, 5.vii.1997, 2 ♂♂ 4 ♀♀, M. Halada lgt., P. Bogusch det. (OLML).

**Distribution.** This species occurs across Southern Europe, reaching North to Central Europe (Hungary,

Slovakia) and also in the Middle East and North Africa (known from Cyprus, Turkey, Egypt, Jordan, Syria, and Morocco), Iran (POPOV 1967), Turkmenistan (BISCHOFF 1930), Uzbekistan (MORAWITZ 1874), and Kazakhstan (BOGUSCH & HADRAVA, in press). It is in some parts of its range quite common and being repeatedly collected, especially in all parts of Southern Europe. In Turkey, it is widespread and locally common.

### *Epeolus variegatus* (Linnaeus, 1758)

**Material examined.** TURKEY: BITLIS: Nemrut, 15.viii.1991, 3 ♂♂, K. Warncke lgt., P. Bogusch det. (OLML). BURDUR: Burdur, 8.vii.2006, 1 ♂ 1 ♀, J. Halada lgt., P. Bogusch det. (OLML). ERZINCAN: Erzincan, 10.viii.1979, 1 ♀, K. Warncke lgt., P. Bogusch det. (OLML). HAKKARI: Oraman, 29.vi.1985, 1 ♀, M. Schwarz lgt., P. Bogusch det. (MSAA). IZMİR: Ödemiş, 3.vii.2006, 5 ♂♂, J. Halada lgt., P. Bogusch det. (OLML). KAHRAMANMARAŞ: Findik, 28.vi.1991, 1 ♀, K. Guichard lgt., P. Bogusch det. (BMNH). KARAMAN: Karaman, 11.vi.1978, 1 ♂, M. Schwarz lgt., P. Bogusch det. (MSAA). KONYA: Sille, 29.vi.1976, 1 ♀, J. Heinrich lgt., P. Bogusch det. (OLML). NEVŞEHİR: Ürgüp, 11.vi.1970, 1 ♂, Schmidt lgt.; Avanos, 8.viii.1972, 1 ♂, K. Warncke lgt., both P. Bogusch det. (OLML). VAN: Muradiye, 27.vi.1997, 2 ♂♂ 1 ♀, K. Warncke lgt., P. Bogusch det. (OLML).

**Distribution.** This species is widely distributed across Europe (SCHEUCHL 2000, AMIET et al. 2007). Its distribution extends to the Middle East and North Africa, and probably further into Asia. It is the only common and widespread species of this genus across Europe. It is more common in Northern and Central Europe, while in Southern Europe and the Middle East (as well as in Turkey) other species (*E. transitorius*, *E. cruciger*, or local endemics) are usually more common.

## Discussion

This study presents three species new to science, all recorded from the eastern parts of Turkey. Two of them, *Epeolus turcicus* sp. nov. and *Epeolus warnckeii* sp. nov., have been recorded only from the vicinity of Lake Van, near the border with Azerbaijan, Syria, Iraq, and Iran. The third species, *Epeolus productuloides* sp. nov., is also from this region but another locality about 150 km south. All descriptions are based on specimens collected between 1979 and 1991, so these species are presumed to be extant. They are probably local endemics in the Eastern Anatolia Region, but surveys in neighbouring Azerbaijan, Syria, Iraq, and Iran could confirm or reject this hypothesis.

*Epeolus* in Turkey is poorly known, and this study is the most comprehensive review of bees of this genus in Turkey to date. Records of occurrence are confirmed and presented for eight species, of which *Epeolus alpinus* has not been previously recorded from the country. Of these species, *Epeolus cruciger*, *E. productulus*, *E. schummeli*, *E. transitorius* and *E. variegatus* seem to be common and widespread in Turkey. All these species also occur in Europe, where they are more numerous in the Mediterranean Region. Only *Epeolus schummeli* has recently become very rare in Europe but not Turkey. Three species are newly described. Besides these 11 species, three additional species have been recorded from Turkey in past: *Epeolus flavociliatus* Friese, 1889, *E. laevifrons* Bischoff, 1930 and *E. subrufescens*

Saunders, 1908 (BISCHOFF 1930, POPOV 1967, BOGUSCH & HADRAVA, in press). All these species are quite rare within their whole area of occurrence, and I have been unable to find and re-examine material to confirm their presence in Turkey. *Epeolus bischoffi* (Mavromoustakis, 1954) was described in the genus *Oxybiastes* Mavromoustakis, 1954, which has since been synonymized under *Epeolus* (ROIG-ALSINA & SCHWARZ 1992). It is known from several countries near Turkey including Cyprus, Jordan, Syria, Lebanon, and Israel (BOGUSCH & HADRAVA, in press), so it is possible that this species occurs in the southern parts of Turkey. However, it has not been collected anywhere recently; this species is known only from several mostly older finds. *Triepeolus tristis* (Smith, 1854) is the only other species of Epeolini in the Western Palaearctic Region. This genus is closely related to *Epeolus* and also very similar in appearance. *Triepeolus tristis* is very uncommonly observed or collected in Southern Europe and the Middle East (BOGUSCH & HADRAVA, in press).

In summary, in Turkey *Epeolus* is represented by 14 species, an additional species (*E. bischoffi*) is very likely to occur in Turkey, and one species of the related genus *Triepeolus* is also known from Turkey. Additional research done by specialists from Turkey could help to improve our knowledge of these interesting cuckoo bees.

### Acknowledgements

I would like to thank to all of the museum curators and owners of private collections listed in the methods for making their material available to me for study. Additional thanks to Jiří Skuhrovec (Prague) for giving me access to his photography instrument and Radek Blatný (Prague) for help with the English language. This study was supported by Specific Research Projects of University of Hradec Králové Nr. 2101/2016 and 2105/2017.

### References

- AMIET F., HERRMANN M., MÜLLER A. & NEUMEYER R. 2007: *Apidae* 5. *Ammobates*, *Ammobatooides*, *Anthophora*, *Biastes*, *Ceratina*, *Dasygoda*, *Epeoloides*, *Epeolus*, *Eucera*, *Macropis*, *Melecta*, *Melitta*, *Nomada*, *Pasites*, *Tetralonia*, *Thyreus*, *Xylocopa*. *Fauna Helvetica* 20. Centre suisse de cartographie de la faune (CSCF), Neuchâtel, 356 pp.
- BISCHOFF H. 1930: Beitrag zur Kenntnis paläarktischer Arten der Gattung *Epeolus*. *Deutsche Entomologische Zeitschrift* **1930**: 1–15.
- BOGUSCH P. & HADRAVA J. in press: The bees of the genera *Epeolus* Latreille, 1802 and *Triepeolus* Robertson, 1901 (Hymenoptera: Apidae: Nomadinae: Epeolini) of Europe: taxonomy, identification key, distribution, and ecology. *Zootaxa*.
- MAVROMOUSTAKIS G. A. 1954: New and interesting bees (Hymenoptera: Apoidea). *Annals and Magazine of Natural History, Series 12* **13**: 297–298.
- MICHENER C. D. 2007: *The Bees of the World. Second Edition*. Johns Hopkins University Press, London, xvi + 992 pp + 20 pls.
- MORAWITZ F. 1874: Die Bienen Daghestans. *Horae Societatis Entomologicae Rossicae* **10**: 129–189.
- ONUFERKO T. M. 2017: Cleptoparasitic bees of the genus *Epeolus* Latreille (Hymenoptera: Apidae) in Canada. *Canadian Journal of Arthropod Identification* **30**: 1–62 [doi:10.3752/cjai.2017.30].
- ÖZBEK H., BOGUSCH P. & STRAKA J. 2015: A contribution to the kleptoparasitic bees of Turkey: Part I., the genus *Sphecodes* Latreille (Hymenoptera: Halictidae). *Turkish Journal of Zoology* **39**: 1095–1109.
- PESENKO YU. A. 1974: Materiali po faune i ekologii pchelinih (Hymenoptera, Apoidea) Nizhnego Dona. Soobshchenie IV. Semeystvo Anthophoridae. [Contributions to the fauna and ecology of bees (Hymenoptera, Apoidea) in the Lower Don basin]. Report IV. The family Anthophoridae. *Entomologicheskoe Obozrenie* **53**: 324–333 (in Russian).
- POPOV V. B. 1967: Pcheliniye Sredney Azii i ikh raspredelenie po tsvetkovim rasteniyam. [The bees (Hymenoptera, Apoidea) of Middle Asia and their associations with angiosperm plants]. *Trudy Zoologicheskogo Instituta Akademii Nauk SSSR* **38**: 11–329 (in Russian).
- RIGHTMYER M. G. 2008: A review of the cleptoparasitic bee genus *Triepeolus* (Hymenoptera: Apidae). Part I. *Zootaxa* **1710**: 1–170.
- ROIG-ALSINA A. & SCHWARZ M. 1992: The identity of the cleptoparasitic bee *Oxybiastes bischoffi* Mavromoustakis, 1954 (Hymenoptera, Apoidea, Epeolini). *Entomofauna* **13**: 557–564.
- SCHEUCHL E. 2000: *Illustrierte Bestimmungstabellen der Wildbienen Deutschlands und Österreichs. Band I: Anthophoridae. – 2. erweiterte Auflage*. Erwin Scheuchl, Velden, 158 pp.
- WARNCKE K. 1982: Zur Systematik der Bienen – Die Unterfamilie Nomadinae (Hymenoptera, Apidae). *Entomofauna* **3**: 97–128.
- WARNCKE K. 1983: Zur Kenntnis der Bienengattung *Pasites* Jurine, 1807, in der Westpaläarkt (Hymenoptera, Apidae, Nomadinae). *Entomofauna* **4**: 261–347.
- WESTRICH P. 1989: *Die Wildbienen Baden-Württembergs. Band 1 und 2*. Stuttgart, Germany, Eugen Ulmer Verlag, 984 pp.

