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Discovery of a new *Cubiandrena* species in Turkey (Hymenoptera: Andrenidae)

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The genus *Andrena* is one of the most speciose groups of bees, and because of its large degree of morphological variability it has continued to defy subgeneric classification. Recent advances have identified the species-poor group *Cubiandrena* Warncke, 1968 as both sister to all *Andrena* and deserving of recognition as a good genus. Previously thought to contain just two species, examination of undetermined material from Turkey has revealed the existence of a third *Cubiandrena* species, *Cubiandrena nigripilosa* **sp. n.**, indicating that this country is the centre of diversity for the genus.

<http://www.zoobank.org/urn:urn:lsid:zoobank.org:pub:50EBDBDC-6EE2-429F-886D-0995E99FADE6>

Keywords: *Andrena*; basal diversity; endemic species; solitary bees; taxonomy

Introduction

The genus *Andrena* is hugely diverse, exceeding 1,500 species globally (Gusenleitner & Schwarz, 2002; Dubitzky, Plant, & Schönitzer, 2010), with many new species continuing to be described each year (e.g. Pisanty, Scheuchl, & Dorchin, 2018; Sheffield 2020; Wood, 2020; Wood, Boustani, & Rasmont, 2020a; Wood, Michez, Cejas, Lhomme, & Rasmont, 2020b). Because of the huge size of this genus and its large degree of morphological variability, *Andrena* has been highly resistant to efforts to create a uniform system of subgeneric classification, with many polyphyletic lineages lumped together (Pisanty, Richter, Martin, Dettman, & Cardinal, 2020, see also Dubitzky et al., 2010). Some groups of *Andrena* have been highlighted as having possible generic status due to their strongly divergent morphology, particularly the subgenus *Cubiandrena* Warncke, 1968 (Dubitzky et al., 2010; Pisanty et al., 2020).

The first *Andrena* (*Cubiandrena*) species was described by Friese (1914) from south-central Turkey (locus typicus: Gülek in the Taurus Mountains north of Adana), the Near East, and Azerbaijan (Murut, now Üçbulaq) as *Andrena cubiceps*. In the female sex, he noted its large cuboidal head (Figures 1A, C, D) and short squamous hairs on the scutum (Figures 1A, B). In the male sex Friese also drew attention to the large head (Figures 2A, B, wider than the thorax), and with hairbands (Figure 2C) or with thick golden hairs throughout (Figure 2D). This latter variety was called var. *fulvopilosa* Friese, 1914 (not Friese, 1922 as in Gusenleitner & Schwarz, 2002). Structurally, the two forms show no differences.

Warncke (1968) described the subgenus *Cubiandrena* including the single species *Andrena cubiceps*, highlighting the large head, the absence of a dorsal area of the propodeum with the propodeum instead being abruptly sloped and immediately falling away from the metanotum (Figure 1B), the short, wide, and drop-shaped fovea (Figure

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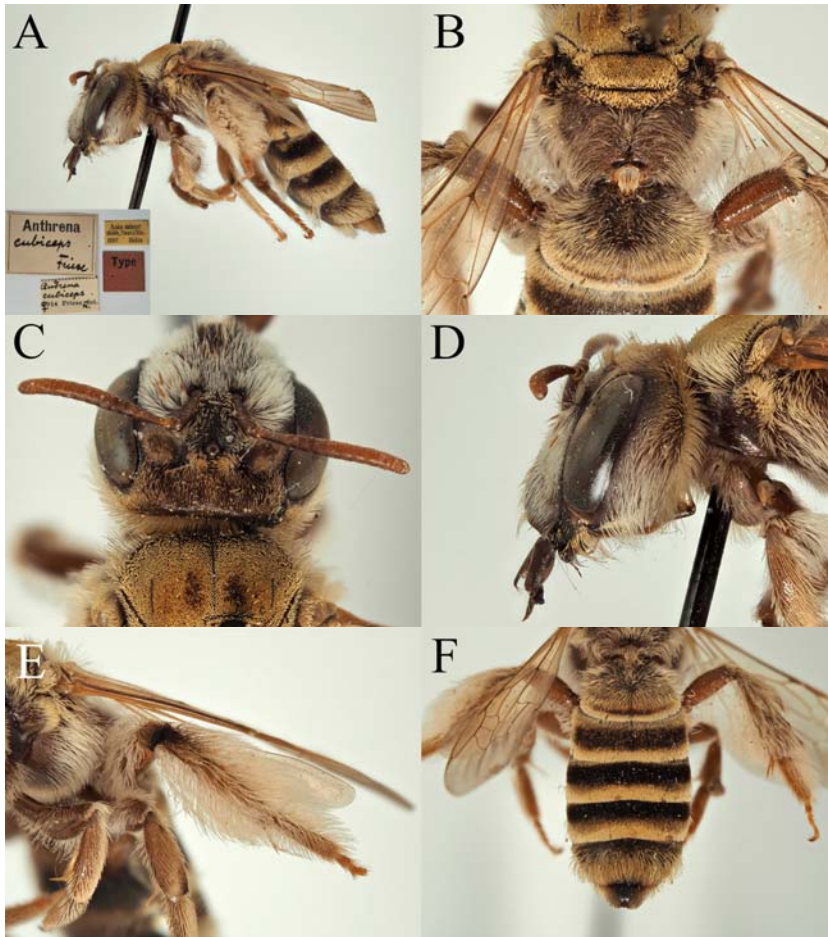


Figure 1. *Cubiandrena cubiceps* (Friese, 1914) female holotype. A. profile; B. propodeum; C. vertex; D. head in profile; E. hind leg; F. tergites.

1C), and the hind tibiae and basitarsi with feathered pollen-collecting hairs (Figure 1E). He later went on to describe a second species *Andrena cubicepsella* Warncke, 1975, also from south-central Turkey (locus typicus: Konya, Madenşehir). This species is very similar, but is smaller and can be distinguished by the less dense scutal punctures (Warncke, 1975).

More recently, it has been proposed that *Cubiandrena* should be raised to full generic status, as morphological cladistics suggest that it is the basal sister to all remaining *Andrena* species (Dubitzky et al., 2010). This position has recently been confirmed using a phylogeny derived from Ultra Conserved Element sequencing (Pisanty et al., 2020), and based on the principles of monophyly, clade stability, and phenotypic diagnosability (Vences, Guayasamin, Miralles, & De La Riva, 2013), it is justified that *Cubiandrena* is treated as a valid genus. With a current distribution focused on Turkey (Table 1), the phylogenetic placement of *Cubiandrena* has greatly changed our understanding of the evolution of the genus *Andrena*, with an Old World origin the most likely possibility (Dubitzky et al., 2010; Pisanty et al., 2020). Why *Cubiandrena* is so



Figure 2. *Cubiandrena cubiceps* (Friese, 1914) male paratype. A. head in profile; C. tergites. *Cubiandrena cubiceps* var. *fulvipilosa* (Friese, 1914) male holotype. B. head in profile; D. tergites.

species-poor and restricted in global distribution compared to the huge diversity found in *Andrena* remains an as yet unanswered question.

Against this context, examination of undetermined Turkish *Andrena* material in the Oberösterreichs Landesmuseum in Austria as part of an ongoing revision of West Palaearctic *Andrena* has revealed the presence of a third *Cubiandrena* species that is clearly morphologically distinct from the two known species. This find is described herein.

Methods

Morphological terminology follows Michener (2007). Specimens were measured from the vertical plane of the front of the head to the tip of the metasoma. Photographs were taken using an Olympus E-M1 Mark II with a 60 mm macro lens and were stacked using Zerene Stacker 1.04 (Zerene Systems, USA) and plates were prepared in GNU Image Manipulation Program (GIMP) 2.10.

Abbreviations: A = Antennal segment(s); T = Tergite(s); OÖLM = Oberösterreichs Landesmuseum, Linz, Austria; ZMHB = Museum für Naturkunde, Berlin, Germany.

Results

Cubiandrena nigripilosa sp. n. (Figures 3A-F, 4E-F)

Material. Holotype: Male, Niğde prov.: Çamardı [37.83°N, 34.98°E], 13.vii.1997, Ma. Halada leg. (OÖLM).

Comparative material examined: *Cubiandrena cubiceps*: IRAN: 1♀, 1♂, Chuzistan [Khuzestan] prov, Dezful, Vahdat env, 960 m, 9.v.2016, leg. M. Kafka (OÖLM). –



Figure 3. *Cubiandrena nigripilosa* sp. n. male holotype. A. profile; B. head and mesosoma, dorsal view; C. propodeum; D. tergites; E. apical view of abdomen and genitalia; F. genital capsule in profile.

JORDAN: 1♂, 30 km NW Aljun, 600 m, 29.iv.2006, K. Deneš leg. (OÖLM). – PAL-ESTINE: 1♀, Wadi el Kelt [Wadi Qelt], 10.iii.1952, Houska leg. (OÖLM). – TURKEY: 1♀, 1♂, Gülek, Taur. Cilic, 1897 (ZMHB) (Holotype, illustrated in Figures 1A-F); 1♂, Adana (no other information) (ZMHB) (paratype, illustrated in Figures 2A, C); 1♂, 30 km N Kutahya [Kütahya], 13.vi.2000, M. Halada leg. (OÖLM); 4♀, 1♂, Niğde [Niğde], Camardi [Çamardı], 13.vii.1997, Ma. Halada leg. (OÖLM); 1♀, Eskişehir, Sakari İlica, near Gümele, 6.vii.1997, P. Průdek & M. Riha leg. (OÖLM); 1♂, Bursa, Çağlıyan env [Çağlıyan], 10-14.vii.1997, M. Řiha leg. (OÖLM); 1♀, 2♂, 20 km N Mardin, 21.vi.1997, Ma. Halada leg. (OÖLM).

Cubiandrena cubicepsella: TURKEY: 1♀, Madensehir [Madensehri], Konya, 24.vii.1971, K. Warncke leg. (OÖLM) (Holotype); 1♂, Nevschehirs [Nevşehir], Ürgüp, 21.vii.1971, K. Warncke leg. (OÖLM) (paratype, illustrated Figures 4C, D); 1♂, Avanos, 8.viii.1972, K. Warncke leg. (OÖLM) (paratype).



Figure 4. *Cubiandrena cubiceps* (Friese, 1914) male. A. head in profile; B. genital capsule. *Cubiandrena cubicepsella* (Warncke, 1975) male paratype. C. head in profile; D. genital capsule. *Cubiandrena nigripilosa* sp. n. holotype male. E. head in profile; F. genital capsule.

Description: Female: Unknown.

Male: Body length 12 mm (Figure 3A). *Head:* Dark brown to black, slightly wider than long. Clypeus broader than long, basally flat, apically slightly bulging, fore margin forming a wide, even semi-circle. Clypeal surface weakly shining, densely punctured, punctures separated by one puncture diameter, punctures becoming sparser and larger apically, separated by 2-3 puncture diameters. Process of labrum trapezoidal, twice as wide as long, apical margin weakly emarginate. Mandibles dark brown, bidentate with small tooth on inner margin. Gena broad, slightly wider than width of a compound eye, vertex very wide, exceeding width of compound eye (Figure 3B), ocelloccipital distance six times width of lateral ocellus. Face, gena, and vertex with thick dark brown hair that does not obscure underlying surface, length not exceeding length of scape (Figures 3A, 4E). Antenna uniformly dark, A3 exceeding A4+5 but shorter than A4+5+6. *Mesosoma:* Scutum subtly shagreened, weakly shining, densely and evenly punctured, punctures

Table 1. Distribution of extant *Cubiandrena* species.

Species	Distribution	Reference
<i>Cubiandrena cubiceps</i> (Friese, 1914)	Armenia, Azerbaijan, Bulgaria, Greece, Iran, Israel, Jordan, North Macedonia, Palestine, Turkey	Friese (1914); Warncke (1969); Gusenleitner & Schwarz (2002); Roberts & de Meulemeester (2015); current publication
<i>Cubiandrena cubicepsella</i> (Warncke, 1975)	Turkey	Warncke (1975)
<i>Cubiandrena nigripilosa</i> sp. n.	Turkey	Current publication

separated by 1–1.5 puncture diameters (Figure 3B). Scutellum strongly shagreened, dull, with weak, shallow, and difficult to see punctures laterally. Propodeum lacking dorsal horizontal part, entirely declivous, dorsally microreticulate and dull, this becoming weaker and shinier towards junction with metasoma (Figure 3C). Scutum and scutellum with moderately long light to dark brownish hair, this not exceeding length of scape (Figure 3A). Episternum with longer dark brown hair, propodeum laterally with longer light brown hair, sparser centrally (Figure 3C). Legs dark brown, pubescence from dark brown (front legs) to light brown (hind legs). Wings weakly infusate, venation and stigma pale brown, nervulus interstitial. *Metasoma*: Tergites dark brown, apical margins of T1 narrowly and T2-5 more broadly hyaline (Figure 3D). T1 basally and laterally with long light brown hairs (Figure 3C), T1-5 apically with whitish hairbands, T6 with dark brown fringe (Figure 3D). Tergites finely shagreened, weakly shining, weakly punctured with tiny punctures, separated by 3-4 puncture diameters on T1, becoming denser apically, separated by one puncture diameter on T5. T7 with pygidial plate present, forming broad triangle with rounded apex, densely tessellate, margins raised (Figure 3E). Genitalia with long, simple gonocoxites with rounded obtuse angle at transition to gonostyli (Figure 4F), gonostyli narrow and pointed (Figures 3E, F), penis valve inflated apically to twice basal width, narrowing abruptly to pointed tip (Figure 3E). Sternite 8 widened medially, with dense lateral brown hair tufts.

Diagnosis. *Cubiandrena nigripilosa* can swiftly be recognised as a *Cubiandrena* because of its enlarged head (particularly the wide vertex) in combination with the entirely declivous propodeum. Within the *Cubiandrena*, its dark pubescence and apically widened penis valve allow for unambiguous differentiation from *C. cubiceps* and *C. cubicepsella*.

Etymology. The name *nigri* (dark) + *pilosa* (hairy, therefore haired) comes from the conspicuous dark pubescence on the vertex of the male which allows easy separation from the two other *Cubiandrena* species.

Identification key for *Cubiandrena* males

- 1 Vertex extensively dark haired (Figures 3A, 4E). Penis valve clearly laterally inflated apically, narrowing abruptly just before its apex (Figures 3E, 4F) *Cubiandrena nigripilosa* sp. n.
- Vertex with pale hairs, never dark haired (Figures 2A, B, 4A, C). Penis valve at most slightly inflated, never abruptly narrowing apically 2

- 2 Larger (12–13 mm). Scutum more densely punctured, punctures separated by one puncture diameter. Genitalia with a comparatively more pronounced angle on the inner margin of the gonocoxites (Figure 4B) *Cubiandrena cubiceps* (Friese, 1914)
- Smaller (8–9 mm). Scutum less densely punctured, punctures separated by 2–3 puncture diameters. Genitalia with a comparatively less pronounced angle on the inner margin of the gonocoxites (Figure 4D) *Cubiandrena cubicepsella* (Warncke, 1975)

Discussion

Turkey has one of the largest *Andrena* faunas in the world, with around 300 species recorded (Hazir, Keskin, & Scheuchl, 2014), including 183 taxa described at least in part from this country (Scheuchl & Gusenleitner, 2009; Scheuchl & Hazir, 2012), and new *Andrena* species continue to be described from Turkey (e.g. Scheuchl & Gusenleitner, 2009; Scheuchl & Hazir, 2012).

The discovery of more undescribed andrenine material from this region should therefore not be surprising, but the description of this new *Cubiandrena* species is unusual for several reasons. What is remarkable is that all three known *Cubiandrena* species have now been described from within a small area of south-central Turkey covering approximately 10,000 km² from three neighbouring provinces, Karaman [Madensehri], Mersin [Gulek], and Niğde [Çamardı], indicating this as the centre of diversity for this genus. What is even more extraordinary is that this area is comparatively well sampled, with material from the Taurus mountains the subject of study by Friese (1914) and later by Warncke. Indeed, Warncke collected a great deal of the material he described from Turkey himself, spending many springs and summers collecting extensively in the region of south-central Turkey; indeed, he was collecting just 100 km from Çamardı in the province of Nevşehir during July 1971 (Warncke, 1975). Quite why he did not come across *C. nigripilosa* is unclear, but it can be hypothesised that it must have a highly restricted range.

With regards to distributional ranges, *C. cubiceps* is clearly the most widespread of the species, being found from the southern Balkans to the Caucasus, and south to Israel and Palestine (Table 1). It is here reported as new from western Iran and northern Jordan, and it remains to be seen how much further its range will extend to the east and the south into the arid parts of the Middle East and Arabian Peninsula. There is evidence to suggest that it is an oligolege of Dipsacaceae (summarised in Roberts and de Meulemeester, 2015), and it is always caught in association with this family in Israel (G. Pisanty, pers. comm.). The presence of sparse, feathered scopal hairs does strongly suggest that this assessment is correct, as can be seen in unrelated *A. (Avandrena)*, *A. (Charitandrena)*, and *A. (Pallandrena)* species that are strongly associated with large pollen grains from Dipsacaceae and Geraniaceae (Wood et al., 2020a; b). Nothing is known about or can be hypothesised about the floral preferences of *C. cubicepsella* or *C. nigripilosa*.

Disclosure Statement

No potential conflict of interest was reported by the author.

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