

Research articleSubmitted: May 29th, 2021 – Accepted: August 10th, 2021 – Published: November 30th, 2021

DOI: 10.13133/2284-4880/525

The bee genus *Pseudoanthidium*: revision of the subgenus *Exanthidium* with the description of a new species (Apoidea: Megachilidae)

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Abstract

Exanthidium Pasteels, 1969 is today recognised as a subgenus of the genus *Pseudoanthidium* which comprises a small number of little-known species distributed in the Palaearctic between the Atlantic coast and Central Asia. The taxonomic status is reviewed and the members of the subgenus are here presented for the first time with photographs and line drawings illustrating the specific distinguishing characters. An identification key and distribution maps are given. A new species, *Pseudoanthidium (Exanthidium) deserticum* sp. n. is described from Saudi Arabia. It is close to *P. (E.) wahrmanicum* which is found in the Middle East and the Algerian Sahara.

Key words: Apoidea, Megachilidae, *Exanthidium*, new species, Saudi Arabia.<http://zoobank.org/urn:lsid:zoobank.org:pub:230E3A6B-A580-400B-B8E3-3811E030B906>**Introduction**

Anthidiini is a large tribe of bees found in all continents, containing more than 700 species in approximately 38 genera (Michener 2007). *Exanthidium* was erected as a genus of the Anthidiini by Pasteels (1969), but Warncke (1980) regarded it as a subgenus of *Anthidium* Fabricius, 1804, and today it is mostly recognised as subgenus of *Pseudoanthidium* Friese, 1898 (Michener 2007; Litman et al. 2016). *Exanthidium* comprises only a few species, found from the eastern Atlantic coast to Central Asia. As a little-known group, they are reviewed here and most species are presented for the first time with photographs and illustrations of the characteristic features. A new species from the Arabian Peninsula is described.

Methods and Approach

Photography. Photographs were taken with a Canon MP-E65/2.8 lens mounted on a Canon EOS 6D camera. A Canon Twin Lite MT24EX Macro Flash was used. The camera was moved between the shots with a Cognisys StackShot Rail and usually between 20 and 30 photographs were taken at different focal distances to give a resulting image with a greater depth of field than any of the individual source images. Subsequently, the pictures were processed

with Helicon Focus (version 6.7.1) software to combine the pictures and to create one completely focused image from several partially focused images (image stacking). The resulting images were further processed with Adobe Photoshop Elements 15.

Terminology follows Michener (2007). Postocular refers to the area of vertex directly behind the eye. Lower paraocular area is the paraocular area below the antennal socket and upper paraocular area is the area above the antennal socket.

Abbreviations

CMK	Collection Max Kasperek, Heidelberg (Germany)
DEI	Senckenberg Deutsches Entomologisches Institut Müncheberg (Germany)
MS	Maximilian Schwarz, Ansfelden (Austria)
NHMUK	Natural History Museum United Kingdom, London (United Kingdom)
OLL	Oberösterreichisches Landesmuseum Linz, Biologiezentrum
ZISP	Zoological Institute, Russian Academy of Sciences, St. Petersburg
ZMB	Museum für Naturkunde, Berlin (Germany)

S1, S2, ... = Sternum 1, sternum 2, ...; **T1, ... T2, ...** = Tergum 1, tergum 2, ...

***Pseudoanthidium* Subgenus *Exanthidium* (Pasteels, 1969)**

Exanthidium was erected by Pasteels (1969) with *eximium* Giraud, 1863 (= *excisum* Mocsáry, 1884) as type species. Additionally to the type species, he included two species, *E. enslini* Alfken, 1928 and *E. wahrmanicum* Mavromoustakis, 1953. Later, he described *E. guichardi* Pasteels, 1980 which he also included in this genus (Pasteels 1980). Warncke (1980) treated *Exanthidium* as subgenus of *Anthidium* and listed additionally *Anthidium pictipes* Morawitz, 1894, but without including this taxon in his key and without integrating it into his consecutive numbering. Michener & Griswold (1994) and Michener (2007) proposed recognising *Pseudoanthidium* Friese, 1898 on the genus level, and *Exanthidium* herewith as one of its subgenera.

The characterisation of *Exanthidium* by coherent traits valid for all taxa remains challenging. According to Michener (2007), the character traits of the female of *Exanthidium* include a small, midapical, marginal lobe on the apical margin of T5. Such a lobe, however, was observed only in *P. wahrmanicum*, not in *P. enslini* and *P. eximium* (the females of the other species are unknown). A broadly rounded or truncate, somewhat denticulate apex with a pair of small, shining, depressed median lobes on either side of a notch of T6 was mentioned as another character trait by Michener (2007). These lobes were, however, observed only in *P. enslini* and *P. eximium*, not in *P. wahrmanicum* (the females of the other species are unknown). Litman et al. (2016) additionally mentioned a lateral spine on T6 as a trait characterising *Exanthidium*, but such a spine was observed only in *P. enslini* and *P. eximium*, not in *P. wahrmanicum* and *P. deserticum* sp. n. The morphological features common to all members of the genus *Exanthidium* thus seem to be less than hitherto assumed.

Exanthidium is understood here as a group of anthidiine bees whose females are clearly distinct from all other Palaearctic members of *Pseudoanthidium* by an excavated, strongly concave T6. The clypeus is almost flat, the apex slightly curved inward and covered with hair (not protruding and fully exposed as e.g. in *Royanthidium*). The male can be characterised by its long (significantly longer than T6), protruding and deeply bilobed T7, and the absence of combs on the sterna.

The distribution of *Exanthidium* extends from the East Atlantic coast (Portugal) to Central Asia (Tajikistan). Michener (2007) also mentions Sudan. It is not known on what basis this statement was made. *Anthidium brevithorace* Warncke, 1982 shares in the male with *Exanthidium* the long, protruding T7, but has been assigned to the subgenus *Turkanthidium* by Warncke (1982) and is not treated here.

***Pseudoanthidium deserticum* sp. n.**

Material. Holotype. Male, Saudi Arabia, Riyadh area, 16-20 Apr 1980, K.M. Guichard leg., *Exanthidium wahrmanicum* Mav., J. Pasteels det. 1981 (ms3840, CMK).

Diagnosis. External structures are most similar to *P. wahrmanicum* from which it can easily be distinguished by a more extensive and brighter yellow colouration (character traits of *P. wahrmanicum* given in the following in brackets). Colour of all light parts of the integument bright yellow (pale whitish-yellow in *P. wahrmanicum*); yellow occipital band reaching mandibular base and covering the entire gena (only a longitudinal stripe in upper gena); scutum with broad anterolateral yellow band (scutum black or black with pale yellow stripe on each side of the middle); fore and mid femora orange above and yellow beneath (yellowish red above and pale yellow beneath); fore and mid tibiae entirely yellow (pale yellow above and with a black stripe beneath);

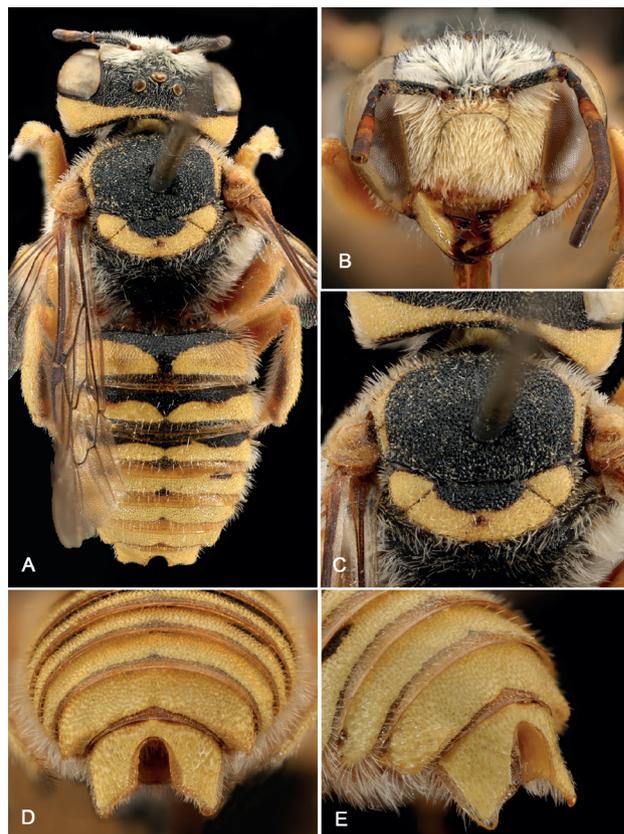


Fig. 1 – *Pseudoanthidium deserticum* sp. n., male holotype. **A**, Habitus dorsal; **B**, Face; **C**, Scutum and scutellum; **D-E**, Apical terga.

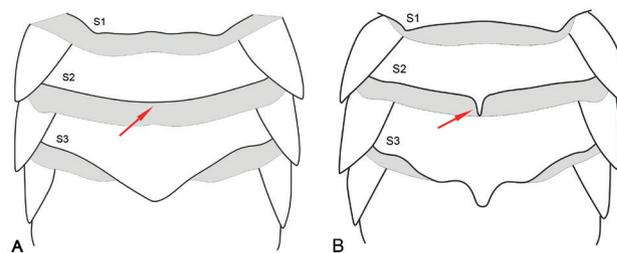


Fig. 2 – Comparison of sterna 1-3 of *Pseudoanthidium wahrmanicum* (A) and *P. deserticum* sp. n. (B). The light grey areas show the hyaline apical marginal zones. The apical margin of S3 is covered with dense, long, specialised hairs and mostly not clearly visible.

T2-T3 with broad yellow bands attenuated in the middle (lateral creamy yellow bands conspicuously separated from each other); apical margin of S2 with median protrusion bearing a tuft of hairs (apical margin of S2 truncated).

Derivatio nominis. Derived from Latin *desertum* (“desert”) + *colo* (“to inhabit”), i.e. “desert-dwelling” (adjective).

Male (Fig. 1). *Head.* Mandible yellow, sparsely punctate, with three strong, dark brown teeth; subantennal suture distinctly arcuate outward; clypeus yellow, apical margin smooth, shallowly emarginate; supraclypeal area and paracocular area (extended to upper third of the eye) yellow; yellow preoccipital band, including entire gena up to base of mandible; entire face with dense white hair;

scape of antenna black with a small yellow spot near apex; pedicel and flagellum 1 dark brown, flagellum 2-3 light reddish-brown, subsequent flagella dark reddish-brown.

Mesosoma. Scutellum black with dense punctation; broad anterolateral yellow band; outer side of scutellum yellow, inner part black; axilla yellow; pronotal lobe with high lamella; small yellow maculation on mesepisternum.

Metasoma. T1-T6 with broad yellow bands, broken on T1 and contiguous on T2; bands on T2-T4 attenuated anteriorly; punctation of terga shallow, punctures scattered especially on proximal terga with punctures up to several puncture diameters apart; denser on distal terga; apical margin light brown, semi-transparent; broader in

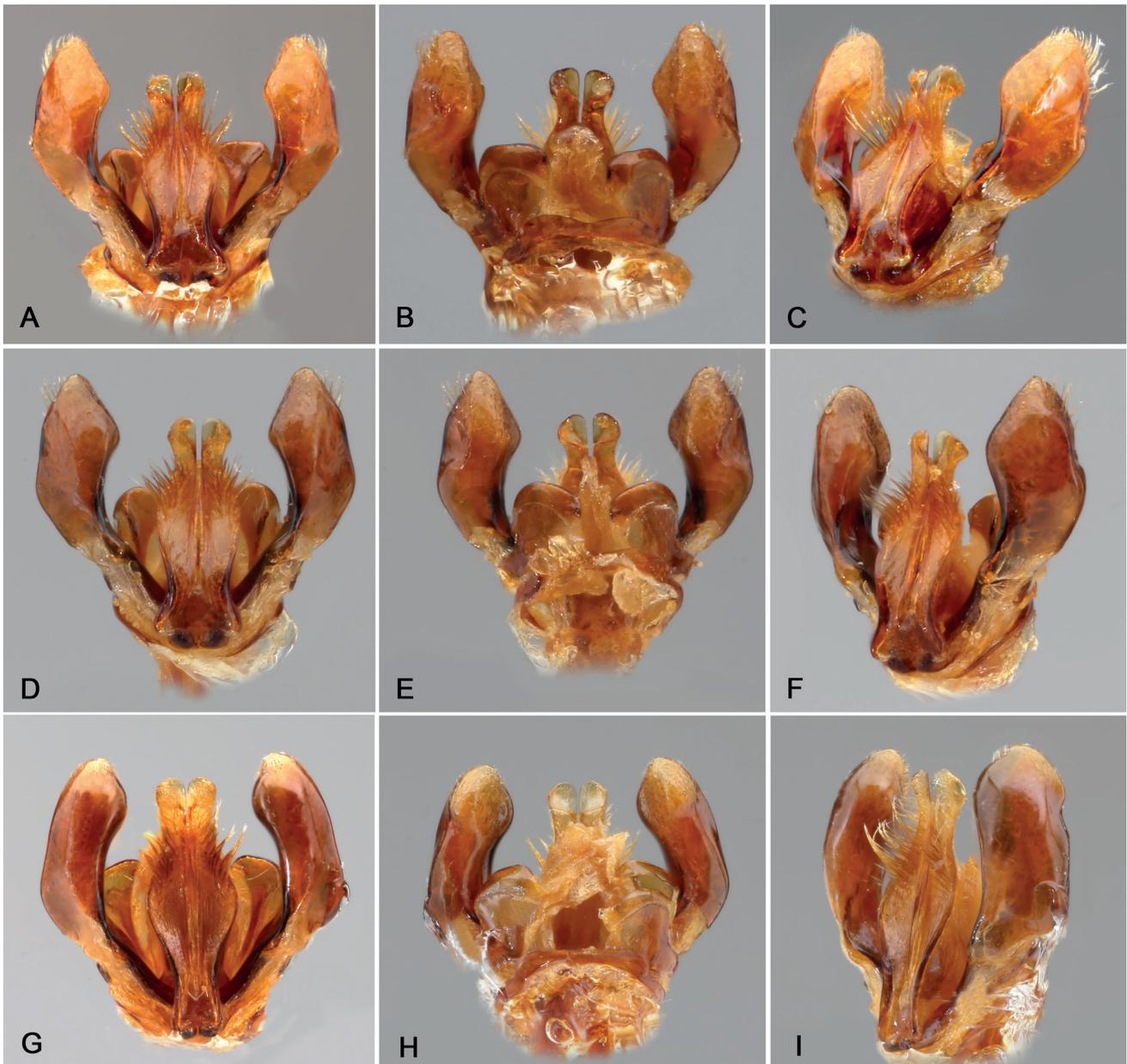


Fig. 3 – Male genitalia of *P. deserticum* sp. n. (upper row, A-C), *P. wahrmanicum* (middle row, D-F), and *P. eximium* (lower row, G-I). A/D/G: dorsal view, B/E/H: ventral view, C/F/I: lateral view.

the middle than laterally (T1-T3); T6 laterally bulging; visible part of T7 almost twice as long as visible part of T6; bilobed with deep median incision; inner part of incision U-shaped, but widened apically; T7 with transparent margin; small tooth on ventral side of T7; apical margin of S1 truncate to shallowly emarginate, S2 with median protrusion bearing a tuft of hairs (Fig. 2), S3 strongly convex, bearing a comb of long specialised hairs: hairs with curved apex at the base, followed by hairs with hooked apex, and hairs with waved apex in the middle; S4 and S5 mostly covered by S3 and hardly visible; apical margin of S4 truncate, hairy; apical margin of S5 smooth and shallowly emarginate; S6 widely rounded as seen from ventrad; S7 bilobed, S8 with triangular apex and rounded tip.

Genitalia: As in Fig. 3. Some structural and colour differences between *P. deserticum* and *P. wahrmanicum* were not regarded as significant enough to allow distinguishing these two species. Also *P. eximium* has very similar genitalia (Fig. 3).

Legs: Yellow, inner side of femora light reddish-brown; fore metatarsus slightly curved, with long (1-2 tarsus widths) hairs on inner side; mid-metatarsus straight, hairs on inner and outer face as long as tarsus width; hind femur at base with a tooth-like protrusion.

Distribution. Only known from the type locality, Riyadh in Saudi Arabia (Fig. 15).

Pseudoanthidium enslini (Alfken, 1928)

Anthidium enslini Alfken, 1928 (female, male, Egypt)

Type material (examined). 1 ♀, 1 ♂, **EGYPT:** 01-05 May 1927, E. Enslin leg., TYPUS / “Smlg. Alfken” / „*Anthidium enslini* Alfken det. J.D. Alfken 1927“ (collection site not on label, but it is Luxor according to Alfken’s original description)

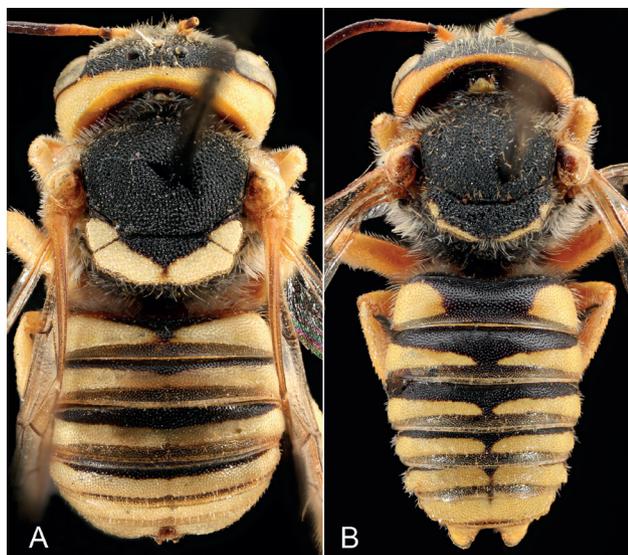


Fig. 4 – *Pseudoanthidium enslini*, dorsal habitus. A, Female, Egypt (CMK); B, Male, Egypt (holotype) (ZMB).

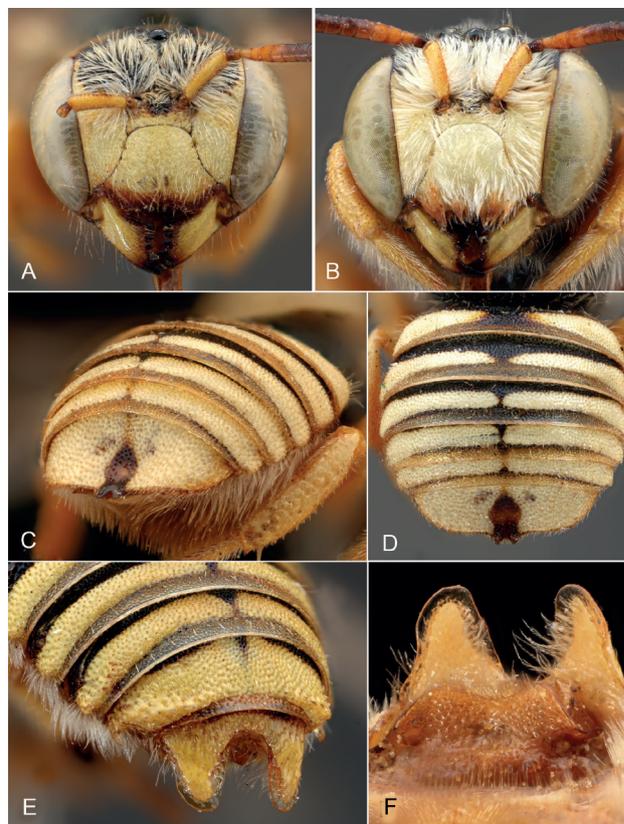


Fig. 5 – *Pseudoanthidium enslini*. Male holotype and female paratype. A, Female face; B, Male face; C-D, Apical terga female; E, Apical terga male; F, Apical sterna (ventral view).

(ZMB). Both specimens are labelled as “TYPUS”. The male is designated as lectotype (**lectotype designated here**). 1 ♀, **EGYPT:** Luxor, 01.-05 May 1927, Dr. Enslin, “*Anthidium enslini* Alfken, det. J. D. Alfken 1927“, Paratype.

Other material examined. 1 ♀, **EGYPT:** Fayoum, H. Priesner leg. (ms3617, CMK). Collection date not available. H. Priesner was active in Egypt from 1928 to 1957 (www.zobodat.at).

Material not examined. Warncke (1980) mentions Kom Ombo and Fayoum. The record from Fayoum probably refers to Priesner’s material mentioned above. **ALGERIA:** 1 ♂, Amsel, 30 km S Tamanrasset, 01 Apr 1989 (leg. M. Schwarz) (Aguib 2014; Aguib et al. 2010). This material could not be located in the collection of M. Schwarz. See also material listed under *A. guichardi*.

The species is structurally very similar to *A. guichardi*, from which it differs by its reduced areas of yellow maculation. Both sexes have e.g. a black scutum and a yellow band on T1 interrupted in the middle, while in *A. guichardi* the scutum has an anterior and lateral yellow maculation and the disc of T1 is entirely yellow.

Female (Figs 4-5). 6-7 mm. **Head** yellow except for the upper face being black from between antennal sockets to behind the posterior ocelli; black maculation with ochreous transition zone to yellow; clypeus flat, apical fourth

slightly turned inward; apical margin emarginate, covered by dense pubescence; mandible yellow with one large apical and four almost equally-sized black teeth; subantennal suture slightly arcuate outwards; preoccipital ridge angulate; scape ochreous, pedicel and flagella 1-4 light reddish-brown, remaining flagella dark reddish-brown.

Mesosoma: Black with strong lateral gutter; pronotal lobe yellow with strong lamella; mesepisternum with small to medium-sized yellow macula; scutellum whitish-yellow with black base, posterolaterally angulate with thin transparent lamella; posteromedially slightly depressed. Axilla whitish-yellow, triangular.

Metasoma: T1-T6 with whitish-yellow bands broadly interrupted on T1 and contiguous or subcontiguous on T2-T4; marginal zones semitransparent, light brown, turned upwards; T6 strongly depressed in the centre; apical margin with narrow dark brown margin and a small brown protrusion with a V-shaped incision in the middle; large dark brown maculation medially. Scopa dark brown; legs yellow, hind tibia and basitarsus rounded (carina absent).

Male (Figs 4-5). 8.5 mm. Head black with yellow maculation. Yellow are clypeus, lower paraocular area, upper paraocular area not reaching top of eye, supra-clypeal area and preoccipital band reaching middle of eye; antenna as in female.

Mesosoma: As in female, but mesepisternum entirely black.

Metasoma: T1-T5 black with lateral yellow bands, not reaching the centre on T1, subcontiguous on T2-T4, medially wedged on T5; apical margins semitransparent; T3-T4 laterally bulging, T5 with a short lateral tooth, T6 laterally bulging with a long, transparent, curved lateral tooth; T7 produced to two longish lobes with transparent margins and a deep U-shaped emargination in between; S3 bearing long hairs with hooked tips; S6 laterally carinate and turned upwards, bearing a wide median emargination.

Biology. Recorded in Egypt in early May. No further information available.

Distribution (Fig. 15). Found in Egypt at Fayoum (al-Fayyum) and Luxor (al-Uqsur). Warncke (1980) also mentioned Kom Ombo in Upper Egypt and Aguib et al. (2010) and Aguib (2014) reported the species from the Hoggar Mountains in Algeria. A report from the United Arab Emirates likely refers to *P. guichardi* (see there).

Pseudoanthidium eximium (Giraud, 1863)

Anthidium eximium Giraud, 1863 (Italy, Piedmont)

Anthidium excisum Mocsáry, 1884 (Spain)

Material examined. **SPAIN:** from the 1890s, coll. A. Weis (SMF). 1♀ Cutamilla (41°00'N, 02°43'W?), 16 July 1919, J. M. Dusmet leg. (OLL). **BULGARIA:** 2♀, 3♂ Locenec/Mičurin [Tsarevo], 24 June 1988, B. & O. Tkalčú leg. (OLL); 1♀, 1♂ Sozopol [Sosopol], 3 July 1979, A. Hoffer leg. (OLL); 1♀ 2♂ Ploski [Sandanski Municipality], 6 July

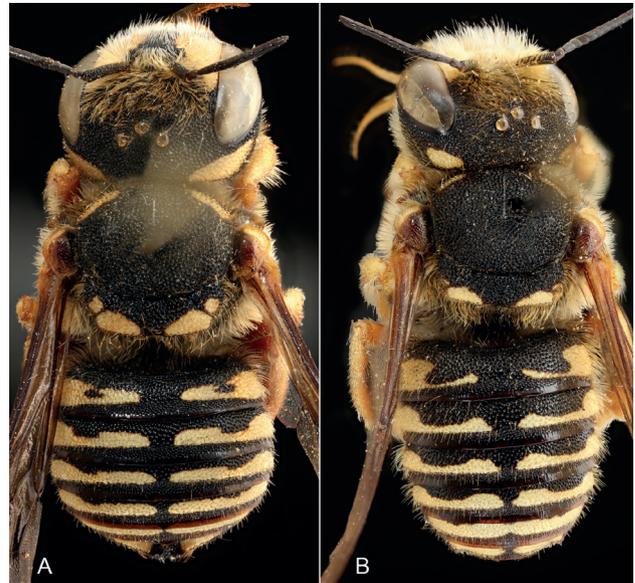


Fig. 6 – *Pseudoanthidium eximium*. A, Female; B, Male, both from Bulgaria (CMK).



Fig. 7 – *Pseudoanthidium eximium* from Bulgaria. A, female face; B, male face; C, female apical terga; D, male apical terga.

1990, B. & O. Tkalčú leg. (OLL); 2♀ 2♂ Arkutino, July 1988, B. & O. Tkalčú leg. (OLL); 8♀, 10♂, Sandanski, Apr 1969, A. Kocourek leg. (CMK); 1♀ Arkutino, vii.1968, A. Görtler leg. (CMK). **RUSSIA:** 1♀, Ingushetia, Terskaya Province (Terek Oblast), Egochkal nr. DzheyraKh, 9 Aug 1927, Kiritschenko leg. (OLL, also Mavromoustakis 1948). **TURKEY:** 1♀ Ankara: Beynam 15 km S Ankara, 22 July 1987, K. Warncke leg. (OLL); 1♂, Isparta prov.: Karakuş Dağı centr. (N38°15' E30°39'), 1460 m, 11 July 2006, J. Halada leg. (CMK); 1♂ Kars: 20 km W Sarikamiş, 2150 m, 7 Aug. 1979, K. Warncke leg. (OLL; Warncke 1980); 1♀, 1♂ Konya-Taşkent, 1800 m, 6 Aug 1991, K. Warncke leg. (OLL); 2♀ Erzincan: pass W of Erzincan, 2000 m, 22 Aug 1991, K. Warncke leg. (OLL); 1♂ Erzurum, 17 Sept



Fig. 8 – Distribution of *Pseudoanthidium eximium*.

1977, H. Özbek leg. (OLL); 1♀, 1♂, Gümüşhane, 1200 m, 12 July 1985, M. Schwarz leg. (CMK); 1♀, Hakkari: Omar 10 km NE, 1700 m, 29 June 1985, M. Schwarz leg. (CMK); 1♀ Van: Muradiye, 1750 m, 16 July 1988, Ch. Schmid-Egger leg. (OLL); 1♂ Van: Tatvan-Bitlis, 1770 m, 16 Aug 1991, K. Warncke leg. (OLL). **IRAN**: 1♂ Az Zanak-Ski, 11 km N Ab Ali (Elburs), 2300 m, 14 July 1965, A. Giordani Soika leg. (OLL; Warncke 1982).

The female is characterised by a deeply depressed T6 (in lateral view almost rectangularly concave) with a small wing ventrad on each side of the apex. The male is characterised by a regular V-shaped emargination of T7 (not U-shaped, no indentions or extensions) and a postocular yellow maculation and a yellow stripe at the anterior margin of the scutum.

Female (Figs 6-7). 8-9 mm. **Head**: Clypeus bell-shaped, yellow with broad black longitudinal band and black apical margin; longitudinal band sometimes reduced to a few remnants; apical margin emarginate, crenulate, covered by dense white apical pubescence; mandible yellow with a large apical and four almost equally-sized blunt, triangular teeth; lower paraocular area and lower half of upper paraocular area yellow; large yellow triangular postocular maculation; subantennal suture arcuate outwards; dense, honeycomb punctation on head; preoccipital ridge angular to rounded.

Mesosoma: Scutellum black with dense honeycomb-like punctation; yellow anterior marginal band; pronotal lobe with high lamella; scutellum black, posteriorly yellow; posteromedially slightly depressed; posterior margin straight, almost rectangular laterally.

Metasoma: Lateral yellow stripes attenuated inwards or interrupted; stripes not reaching the middle on T1-T4, but mostly contiguous on T5; punctation of discs coarse, finer on depressions; smooth impunctate marginal zone turned upwards; T6 deeply depressed (concave in lateral view);

apical margin irregularly rugged with small wing directed ventrad; tibiae and tarsi reddish-brown; scopa dark brown.

Male (Figs 6-7). (7-) 9-11 mm. **Head**: Clypeus, supra-clypeal area, lower paraocular area, lower part of upper paraocular area, and postocular triangle yellow; mandible yellow with three large black teeth; antenna black.

Mesosoma: As in female.

Metasoma: Lateral yellow bands on T1-T6 attenuated inwards and often reduced to remnants especially proximally; T3 laterally bulging; T4 laterally bulging or with blunt tooth; T5 and T6 with flat lateral tooth; T7 with lateral lobes and deep median V-shaped emargination (i.e. emargination broadening towards distal end); S3 with long hairs with hooked apex; S5 with a row of long, straight hairs at posterior margin; S6 semitrapezoid with laterally thickened margins and truncate apex; (hidden) S8 with triangular apex. Genitalia as in Fig. 3. Yellow tergal pattern more extensive in specimens from Turkey than those from the Balkans and Western Mediterranean.

Biology. Oligolectic on Asteraceae with strong preference for Asteroideae (Müller, 1969) but also recorded on Carduoideae (*Centaurea*, *Onopordon*) (Grace 2010; Özbek & van der Zanden 1993). Özbek & van der Zanden (1993) reported also Fabaceae (*Onobrychis*) and Grace (2010) Lythraceae (*Lythrum*). Females were reported to gather pollen by “seesawing” the scopa directly against anthers (Müller 1996). High summer species collected mostly in June and July. In eastern Anatolian highlands still in August and September (Özbek & van der Zanden 1993).

Distribution. Widely distributed from Portugal in the west over the Mediterranean, Turkey and the Caucasus to the Iranian Elburz Mountains (Fig. 8). **PORTUGAL**: North Portugal, Trás-os-Montes, Moimenta (Baldock et al. 2018). **SPAIN**: Granada (Mocsáry, 1884); Villalba, El Escorial, and Los Molino (Madrid), Baños de Montemayor (Cáceres) (Dusmet y Alonso 1908); Puerto Ragua (Sierra Nevada)

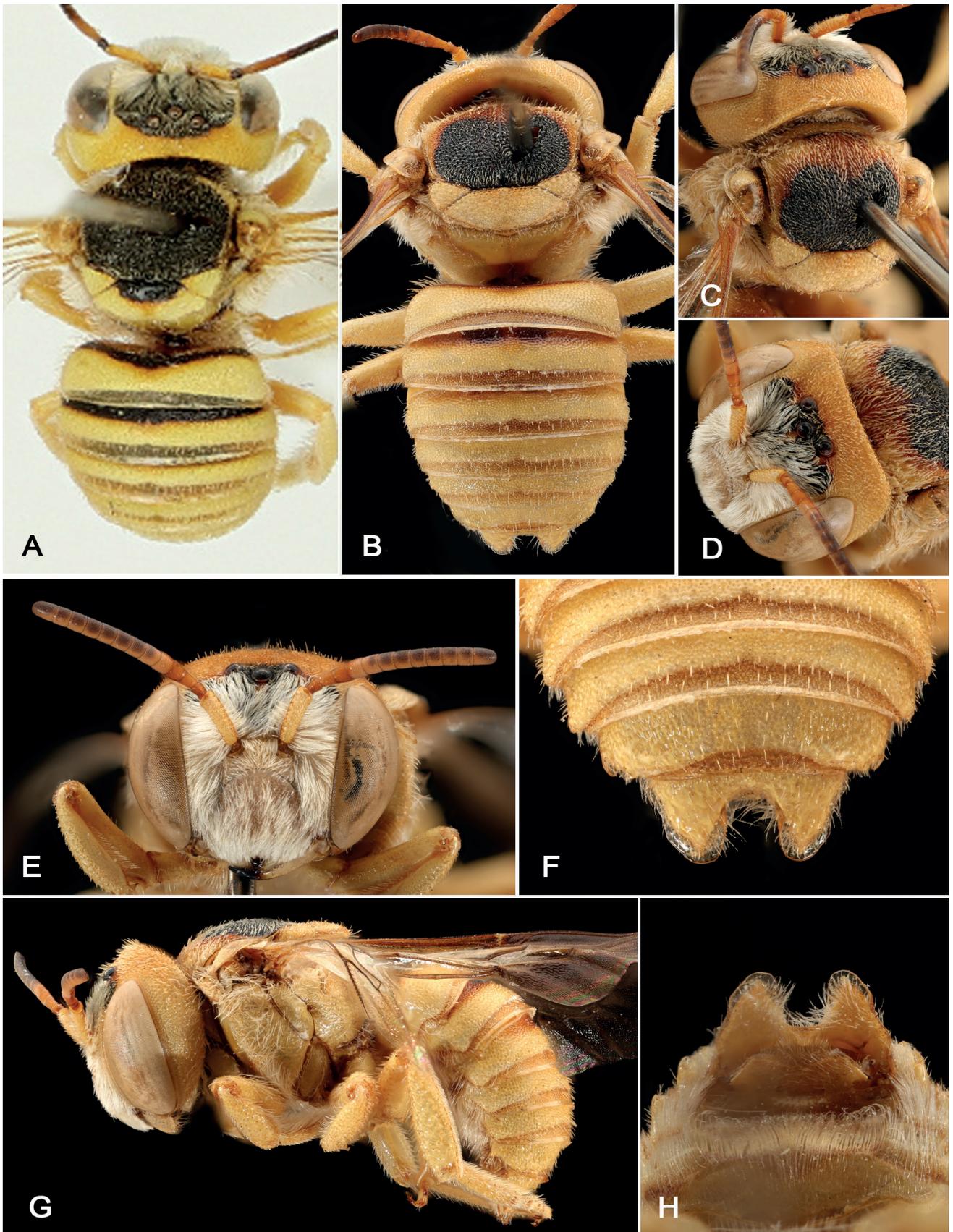


Fig. 9 – *Pseudoanthidium guichardi* Pasteels, 1980. Male. A, Holotype from Oman (NHMUK); B-H, Male from United Arab Emirates (DEI); A-B, Habitus ventral; C-D, Head and mesosoma in dorsal view; E, Head in frontal view; F, Apical terga; G, Habitus lateral; H, Apex of metasoma in ventral view.

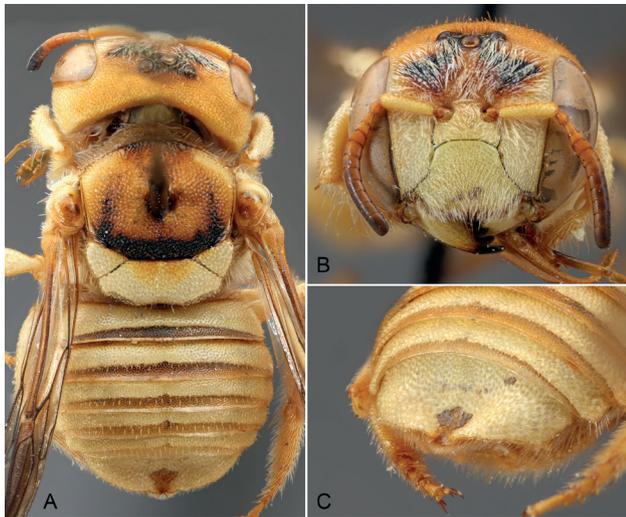


Fig. 10 – *Pseudoanthidium guichardi* Pasteels, 1980. Female from Oman (OLL).

(Almeria) and Río Nechite (Valor, Sierra Nevada) (Granada) (Ortiz y Sánchez 1990); See also material. **FRANCE**: South France (Warncke 1980). **ITALY**: Susa and Oulx, Piedmont (Giraud 1863; Litman et al. 2016); Aosta Valley (Steinmann 2002; Amiet et al. 2004). **BULGARIA**: Trigrad (Warncke 1980). See material. **TURKEY**: Erzurum city; Oltu (Erzurum prov.); Köprüköy (Erzurum prov.) (Özbek & van der Zanden 1993). **ARMENIA**: Chedar River 7 km E of Yerevan (Warncke 1980). **AZERBAIJAN (NAKHCHIVAN AUTONOMOUS REPUBLIC)**: Sharur, Akhura (39°33'N, 45°13'E) (Fatoryga et al. 2020).

Pseudoanthidium guichardi (Pasteels, 1980)

Exanthidium guichardi Pasteels, 1980

Holotype. Male, Oman: Wadi Ouryat, Ag. St., 5.iii.1976 (ad-Dachiliyya governorate, approx. 22°55'N, 57°09'E), K. M. Guichard leg.; <https://data.nhm.ac.uk/dataset/collection-specimens/resource/05ff2255-c38a-40c9-b657-4ccb55ab2feb/record/9096058>; photograph (Fig. 9A) examined.

Other material examined. **UNITED ARAB EMIRATES**: 1 ♂, al-Ain al-Fayda (24°05'N, 55°40'E), 8 Apr 2005 (listed by Dathe 2009 under *P. enslini*). Deposited in the A. van Harten collection in the DEI (DEI130) (Fig. 9). **OMAN**: 1 ♀, NW of Ibri, S of Dank, 9 March 2015, M. Snižek leg. (Fig. 10) (OLL).

Material not examined. **UNITED ARAB EMIRATES**: 1 ♀, Fagsha, Fujairah, 21 Apr 1988, I. Hamer leg., D. Baker det. (Snow Entomological Collection, Ohio), www.gbif.org/occurrence/785011857 (also listed by Dathe 2009). This material is listed under *P. enslini* and is tentatively assigned here to *P. guichardi*.

Structurally similar to *P. enslini*, but entire integument light yellow except for scutellum and face (dominant ground colour in *P. enslini* black). Yellow tergal bands interrupted in the middle in *P. enslini*, uninterrupted in *P. guichardi*. In *P. guichardi*, the tergal discs have an almost

step-like elevation over the depressions with a clear, albeit somewhat jagged border line (best seen medially on T2–T4). By contrast, the transition from the disc to the depression is inconspicuous and smooth in *A. enslini*.

Male (Fig. 9). 7 mm. **Head**: Light yellow except for black in the upper face from above antennal sockets to hind ocelli; yellow spot below anterior ocellus (present in DEI specimen, absent in holotype); clypeus bell-shaped; head densely punctate throughout except for marginal areas of clypeus which are smooth; dense, long, silvery, adpressed hair covering face; vertex and gena almost hairless; mandible pale yellow, sparsely punctate, with three black teeth; scape yellow; flagella reddish-brown, upper side of distal flagella grey-brown; preoccipital ridge angulate.

Mesosoma: Light yellow; scutum black with anterolateral yellow stripe in holotype, but in DEI specimen, anterior third entirely reddish brown and laterally yellow; pronotal lobe with high lamella; scutellum black anteromedially (holotype) and yellow posteriorly (entirely yellow with only some inconspicuous reddish tone anteromedially in DEI specimen); posteromedially slightly depressed; posterior margin transparent, jagged; widely rounded in dorsal view; sharp-edged in lateral view; axilla triangular, yellow.

Metasoma: Yellow except for the declivous anterior part of T1 which is black in the holotype and light brown in the DEI specimen; tergal bands on discs unbroken; depressions yellowish-brown; marginal areas smooth, transparent and slightly turned upwards; discs conspicuously elevated over depressions, the two areas separated by a distinct jagged line; punctuation on discs dense and coarse, on depressions dense and fine; T4 bulging laterally, T5 with blunt tooth laterally, T6 with flat, transparent hook-like tooth laterally; T6 bulging mediolaterally; T7 long with deep median emargination; margins broadly transparent; S6 laterally with strongly sclerotised wings; apex thin and transparent, bilobed; apex of (hidden) S8 truncate.

Female (Fig. 10). Structurally very similar to the female of *P. enslini*, but distinguished by colouration: almost entirely yellow and light reddish-brown except for black maculation around ocelli and between ocelli and antennal sockets, and some black remnants at anterior and posterior margin of scutum. Face and vertex light reddish-brown, lower face including clypeus, and gena yellow; T1–T5 with broad yellow bands and light brown depressions.

Remarks. The species is distinguished from *P. enslini* according to Pasteels (1980) by a bilobed S6, a relatively broad gena and a relatively long distance of the hind ocellus from the preoccipital ridge. However, both species have a bilobed S6, only slightly less emarginate in *P. enslini*. Also the difference of the width of the gena as compared to the width of the eye is moderate and the difference in the postocelli-preoccipital distance could not be confirmed when compared with *P. enslini* holotype. These traits may thus fall into individual variation and do not have diagnostic value. Also additional morphological differences such

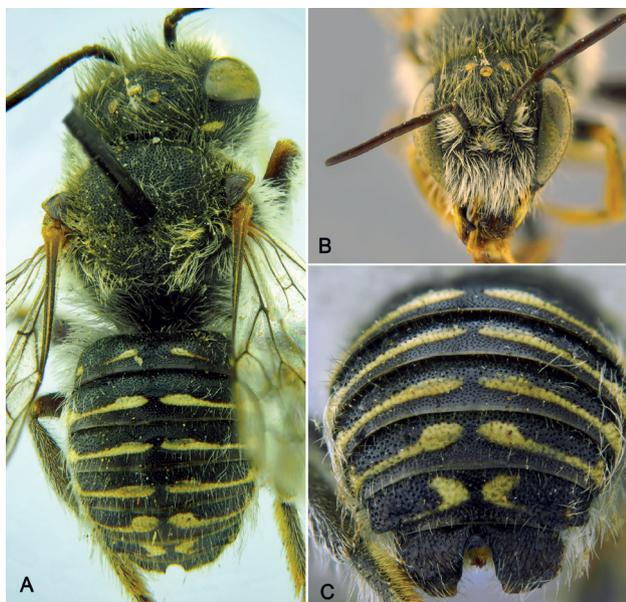


Fig. 11 – *Pseudoanthidium pictipes*. Male holotype (ZISP). A, Habitus dorsal; B, Head in frontal view; C, Apical terga. Photographs: Y. Astafurova.

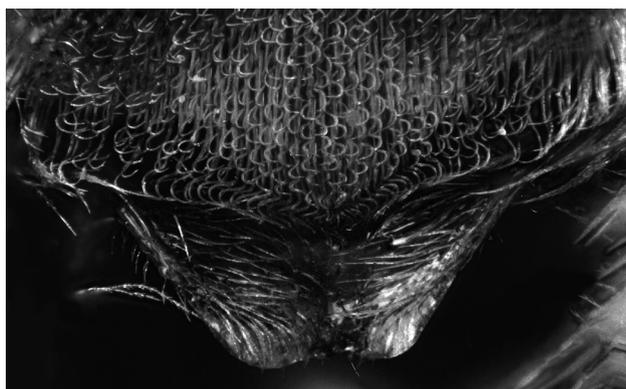


Fig. 12 – *Pseudoanthidium pictipes*. Specialised hairs with hooked apices on S3 of the male. Photograph: Y. Astafurova (ZISP).

as the presence of a lateral bulge on T6 vs. a blunt lateral tooth in *P. enslini* cannot be used as specific characters until the full variation is known.

Attempts to retrieve DNA from the UAE specimen for a genetic barcoding were not successful.

Distribution. Eastern Arabian Peninsula around the Gulf of Oman (Oman and United Arab Emirates) (Fig. 15).

Pseudoanthidium pictipes (Morawitz, 1894)

Material. Holotype male, Darch, Tajikistan, 11 Aug 1898 (?) [date not clearly readable on label]. D. K. Glasunow leg. (fide Morawitz 1894) (ZISP). Drawing of the apical tergum in Mavromoustakis (1954b). Examined by photographs.

The male is characterised by a long T7 with a deep, U-shaped emargination which is widened distally shortly before the apex. Lateral hook on T6 absent.

Male (Fig. 11). 7 mm. **Head:** Head black with small postocular yellow spot; clypeus black; mandible yellow

with three black teeth (transition zone reddish brown); face with long silvery hairs.

Mesosoma: Black with dense, long pubescence.

Metasoma: T1-T6 with yellow lateral bands nearly reaching the middle (according to Morawitz 1894, T1 with lateral bands, T2-T5 with continuous band attenuated in the middle); yellow bands attenuated inwards; T6 with crescent-shaped yellow maculation on both sides of the middle, bulging mediolaterally; T7 black, with deep V-shaped incision; incision with a shallow, step-like broadening in the outer third; S3 with a set of long hairs with curved, hooked and waved apices (as in other species of the genus) (Fig. 12); S6 (not S4 as in Morawitz 1894) convex and bilobed; legs black, femora with yellow apices and inner faces of tibiae and metatarsi yellow.

Popov (1950) mentioned that the male genitalia of this species are „aberrant” whereby he apparently meant that they are different from those of congeners, but without describing the differences. The holotype is dissected, but the male genitalia are not available for examination.

Female: Not known.

Distribution. Tajikistan (Fig. 15). The only known locality “Darch” seems to be situated in Zeravshan (Serafschan) Valley in Panjakent District close to the border with Uzbekistan.

Remark: The species is erroneously assigned to *Pseudoanthidium* (*Pseudoanthidium*) in Discover Life (Ascher & Pickering 2019).

Pseudoanthidium wahrmanicum (Mavromoustakis, 1953)

Anthidium wahrmanicum Mavromoustakis, 1953 (male, female, Israel) [often misspelt as *A. wahrmannicum*]

Type material (not examined). Israel, Wadi Fukra, Negev (S Be'er Sheva) and Ein Gedi (Dead Sea) (Mavromoustakis 1953).

Material examined. **ALGERIA:** 1 ♀, 2 ♂, Amsel, 30 km S Tamanrasset (22°37'N, 05°27'E), 01 Apr 1969, M. Schwarz leg. (CMK); 1 ♀ Tamanrasset, 52 km NE (Guelta), Hoggar (23°06'N, 05°53'E), 26 March 1989, leg. M. Schwarz (CMK); 1 ♀, 1 ♂ Tamanrasset, 60 km E, Hoggar (22°47'N, 06°07'E), 1500 m, 26 March 1989, leg. M. Schwarz (CMK); 1 ♀ Tamanrasset, 16 km NE (Guelta), Hoggar (22°53'N, 05°38'E), 25 March 1989, leg. M. Schwarz (CMK); 14 ♀, 5 ♂ same location, 01 Apr 1989, leg. M. Schwarz (CMK). All material also listed in Aguib et al. (2010). 1 ♀ 1 ♂ Hoggar: Guelta nr. Ilamane, 1900 m, 29 March 1989, K. Warncke leg. (OLL); 3 ♀ 4 ♂, Tamanrasset: Guelta 16 km NE, 25 March and 1 April 1989, K. Warncke leg. (OLL); 4 ♀ 3 ♂ Amsel, 30 km S Tamanrasset, 29 March and 1 April 1989, K. Warncke leg. (OLL); 1 ♂ Hoggar: Idjef Méléne Guelta, 15.-30. April 1950, G. Giodani Soika leg. (OLL; Mavromoustakis 1954a). **ISRAEL:** 2 ♂ Eilat, 10 April 1988, M. Kraus leg. (OLL); 4 ♀ 3 ♂ 2 km E Samar (33 km N Eilat), 15 April 1990, K. Warncke leg. (OLL). 2 ♀ Wadi Segur, 40km NW Eilat, 17



Fig. 13 – *Pseudoanthidium wahrmanicum* from Algeria. A, Habitus dorsal female; B, Habitus dorsal male; C, Face female; D, Face male.

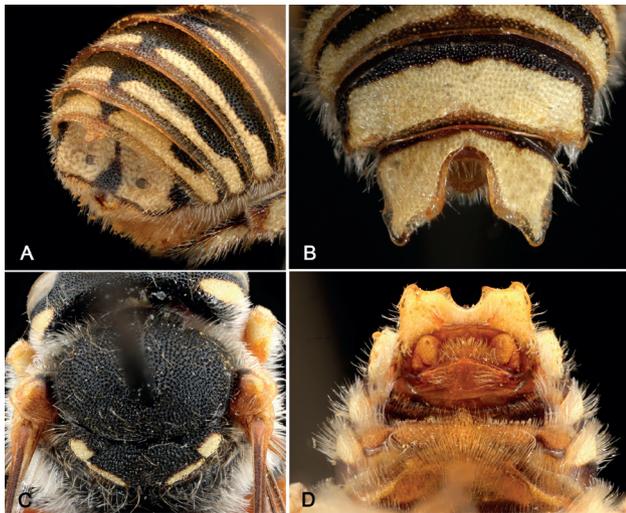


Fig. 14 – *Pseudoanthidium wahrmanicum* from Algeria. A, Apical terga female; B, Apical terga male; C, Scutum male; D, Apical sterna male.

April 1990, K. Warncke leg. (OLL); 1♀ Gerofit (46 km N Eilat), 16 April 1990, K. Warncke leg. (OLL); 1♂ 100 km N Eilat, Menuha Junction, R 90, N30°18', E35°08', 200 m, M. Halada leg. (OLL); 1♀ Solom (?), 12 April 1972, H. Bytinski-Salz leg. (OLL); 1♂ 50 km SE Mitspe Ramon, 30.280N, 35.001E, 3 May 2019, M. Halada leg. (OLL); 1♀ Ein Gedi, 5 April 1952, J. Wahrman, Hebrew

University leg. (OLL). SAUDI ARABIA: 1♀ Thumana, 70 km NW Er Riad, 10 March 1987, Voith leg. (OLL).

The female is distinguished from its congeners by an appendage on the apical margin of T5 which overhangs the cavity of T6. The male is characterised by a step-like broadening of the deep emargination of T7. It shares this trait with *P. deserticum* sp.n., which is distinguished by several colour traits such as a yellow pre-occipital band (lateral maculations in *P. wahrmanicum*) or L-shaped anterolateral yellow band on scutum (black in *P. wahrmanicum*).

Female (Figs 13-14). 4-6 mm. **Head:** Clypeus creamy white, bell-shaped, broader than long (1.5-1.6 as long as broad at the broadest point); shining and with large punctures at base, matt and with smaller punctures towards apex; clypeus somewhat retracted apically; posterior margin emarginate with dense white pubescence; broad black longitudinal band in the centre (this band not reported by Mavromoustakis from Negev material); mandible light yellow with five dark brown teeth; supraclypeal area with large punctures and shining interstices (as base of clypeus); lower paraocular area and lower half of upper paraocular area creamy white; creamy white genal stripe almost reaching mandible and upper end of eye; margins of the macula sometimes tinged with red-brown; preoccipital ridge rounded, little concave in dorsal view; antenna black, reddish-brown underneath.

Mesosoma: Scutum black, densely punctate, shining; pronotal lobe black at base, creamy white distally; high lamella; scutellum widely rounded in dorsal view, angulate in lateral view; black with creamy white posterior side; axilla black anteriorly, creamy white posteriorly.

Metasoma: Metasoma barrel-shaped to rotundiform; terga shining; discs with scattered punctures, often separated by up to three puncture diameters; depression with finer and denser punctation; marginal zone impunctate and curled upwards (best seen in lateral view); marginal zone broader in the middle than laterally; T2 longer than neighbouring terga; T1-T5 each with a creamy-yellow strip nearly reaching the middle; the stripes attenuated in the middle; depressions red-brown, sometimes tinged with yellowish-brown; marginal zone brownish semi-transparent; T5 with a produced narrow and short appendage in the middle; T6 broad, creamy white with black margins, strongly depressed; apical margin truncate with a small emargination in the middle; T5 with its appendage overhanging the cavity of T6.

Male (Figs 13-14). 6-8 mm. **Head:** Clypeus, supraclypeal area, lower paraocular area and lower part of upper paraocular area pale yellow; gena with yellow stripe not reaching mandible; apical margin of clypeus truncate; mandible pale yellow with scattered punctation, tridentate with dark brown teeth; entire face with long silvery-white pubescence nearly reaching anterior ocellus; antenna as in female.

Mesosoma: Scutum with pale yellow stripe on each side of the middle above (Mavromoustakis 1953). This

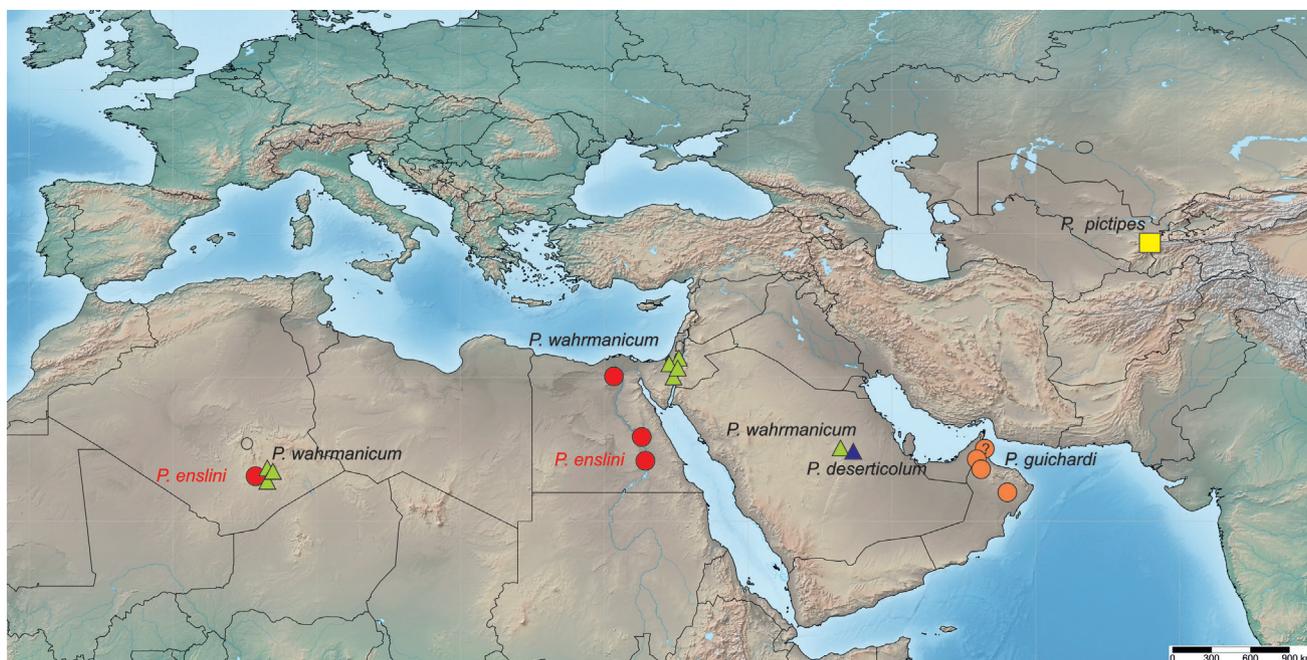


Fig. 15 – Distribution of *Pseudoanthidium deserticum* sp.n., *P. enslini*, *P. pictipes*, and *P. wahrmanicum*.

stripe is absent in material from Algeria. Yellow stripe on scutellum sometimes broken in the middle. Mesosoma otherwise as in female.

Metasoma: T1-T5 similar to female; T6 laterally bulging; T7 yellow, long with deep median emargination; anterior part of emargination U-shaped, but step-like widening of opening (see also drawing in Mavromoustakis 1954a); transparent marginal area; punctation of T7 sparse; S3 with specialised hairs with hooked apices; apical margin of S6 wide-angled triangular; genitalia as in Fig. 3.

Biology. All material was collected in March and April.

Distribution (Fig. 15). Hoggar Mountains in Algeria (details see under Material), Negev in Israel (Ein Gedi, 31°27'N 35°23'E, and Wadi Fukra, c. 30°57'N 35°03'E) (Mavromoustakis 1953), and central SAudi Arabia (Riyadh region).

Key for the species of *Pseudoanthidium* (*Exanthidium*)

Females

The females of *P. deserticum* sp. n. and *P. pictipes* are unknown.

1. Apical margin of T5 with small median protrusion; apical margin of scutellum and axillae widely rounded in dorsal view. *P. wahrmanicum*
- Apical margin of T5 straight without median protrusion; scutellum angular posterolaterally in dorsal view 2
2. Apical margin of T6 with small median protrusion, deeply V-shaped incised; posterior margin of axilla and posterolateral margin of scutellum forming straight line; posterior margin of scutellum rounded in dorsal view 3
- Apical margin of T6 with small ventrad protrusion; posterior margin of axilla and posterolateral margin of scutellum not forming straight line; posterior margin of

scutellum straight in dorsal view. *P. eximium*

3. Scutum black, terga black with pale yellow bands. *P. enslini*

- Scutum yellow and reddish-brown with some black remnants; terga yellow. *P. guichardi*

Males

1. T6 with hooked or spiniform lateral protrusion 2
- T6 laterally bulging; hooked or spiniform protrusion absent 4

2. Base of emargination of T7 pointed (emargination V-shaped); posterior margin of scutellum straight in dorsal view. *P. eximium*

- Base of emargination straight (emargination U-shaped); posterior margin of scutellum rounded in dorsal view 3

3. Scutum black, terga black with pale yellow bands. *P. enslini*

- Scutum yellow and reddish-brown with some black remnants; terga yellow. *P. guichardi*

4. Emargination of T7 little widening in apical third; T7 without transparent margin; outer faces of femora and tibiae black. *P. pictipes*

- Emargination of T7 strongly widening in apical third; T7 with transparent margin; outer faces of femora and tibiae yellow 5

5. Yellow preoccipital band reaching mandibular base; scutum with yellow anterolateral boomerang-shaped band; apical margin of S2 with median protrusion. *P. deserticum* sp. n.

- Yellow stripe on upper gena not reaching mandibular base and not extending onto vertex; anterolateral marking on scutum absent; apical margin of S2 truncated. *P. wahrmanicum*

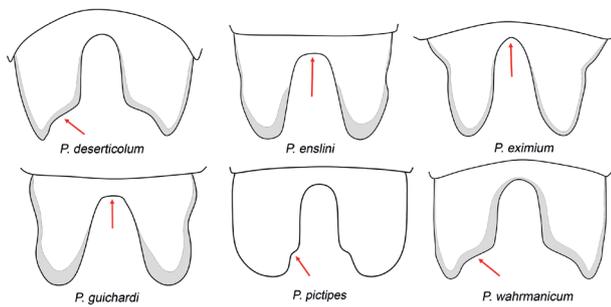


Fig. 16 – Tergum 7 of the male in the six species of *Pseudoanthidium* (*Eximium*).

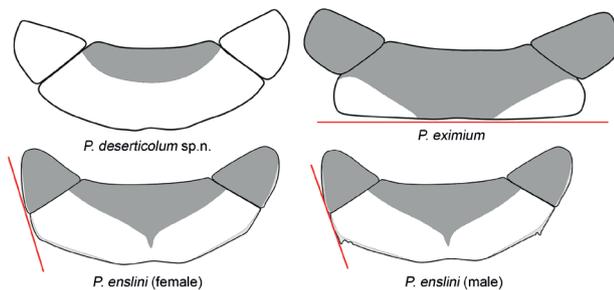


Fig. 17 – Scutellum and axillae of *Pseudoanthidium deserticolum* sp. n., *P. enslini* and *P. eximium*.

Acknowledgements – My sincerest thanks are due to Maximilian Schwarz, Ansfelden (Austria), who put his extensive collection of anthidiine bees at my disposal. Yulia V. Astafurova, Zoological Institute of the Russian Academy of Sciences, St. Petersburg (Russia) took photographs of type specimens for me. I thank Holger Dathe and Andrew Liston, Senckenberg Deutsches Entomologisches Institut, Münchenberg (Germany), Esther Ocker-müller and Martin Schwarz, Oberösterreichisches Landesmuseum Linz (Biologiezentrum), Linz (Austria), and Stefanie Krause and Michael Ohl, Museum für Naturkunde, Berlin (Germany) for the loan of material held in their collections, and Andrew Grace, St. Leonards, Sussex (United Kingdom) for reading and improving the manuscript.

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