

A revision of *Anthophora* (*Caranthophora*) Brooks with a remarkable new species from the Afrotropical region (Hymenoptera, Apidae)

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Abstract

The subgenus *Anthophora* (*Caranthophora*) Brooks, 1988 is a small lineage of *Anthophora* Latreille, 1803 bees, but despite its small size several problems and a lack of clarity exist. Based on revision of type and non-type material, several advances in understanding can be made, producing a final total of six species. *Anthophora* (*Caranthophora*) *iole* Bingham, 1898 (described from northern India) is found to have a range extending through southern Iran into Oman and the United Arab Emirates, and the mysterious taxon *Anthophora albopicta* Cockerell, 1917, **syn. nov.** is synonymised under it. A neotype is designated for *Anthophora* (*Caranthophora*) *tarsalis* Priesner, 1957 which is recognised as a member of subgenus *Caranthophora* and not subgenus *Heliophila* Klug, 1807, and *Anthophora spinacoxa* Brooks, 1988, **syn. nov.** is synonymised under it. *Anthophora* (*Caranthophora*) *calcarispina* **sp. nov.** is described from the Ethiopian highlands. This extends the range of this subgenus into the Afrotropical region from its previous strictly Palaearctic distribution, again highlighting Ethiopia as hosting a unique bee fauna containing elements from both biogeographical regions.

Key Words

Anthophorinae, Eastern Africa, identification key, solitary bees, synonymy

Introduction

Bees of the subfamily Anthophorinae Dahlbom, 1835 are present globally with more than 700 species known and with the highest diversity seen in xeric and Mediterranean regions (Brooks 1988; Michener 2007; Orr et al. 2022; Ascher and Pickering 2026). Whilst the generic classification of anthophorine bees is now largely stable (Popov 1950; Lieftinck 1966, 1974; Brooks 1988), there is a shortage of modern revisions at the species level, both for subgenera (e.g. Orr et al. 2018) and for regional faunas (e.g. see Rasmont et al. 2026).

The present work aims to revise the small but morphologically distinctive subgenus *Anthophora* (*Caranthophora*) Brooks, 1988 that is currently thought to be distributed across the Palaearctic from the Mediterranean basin east to central China (Brooks 1988). Despite the clear morphological characters that allow recognition at a subgeneric level, no species-level identification key ex-

ists. Through examination of unidentified material combined with type revision, several novelties are discovered and clarifications made, illustrating the challenges faced in dealing even with distinctive and species-poor lineages of anthophorine bees.

Methods

In the description of the subgenus, Brooks (1988: 470) gave primarily male diagnostic characters. These are i) mid leg with strongly defined hair brushes on the basitarsus and apical tarsomere (e.g. Figs 7D, 8B, 10A); ii) hind basitarsus with a longitudinal cavity running along its upper margin (e.g. Fig. 5A, B, 7E); iii) hind femur and tibia thickened or inflated (e.g. Fig. 10A); iv) disc of S7 about as long as broad, apodeme short (e.g. Figs 5C, D, 8F, 10F); v) S8 short and broad, forming a slight lobe laterally (e.g. Figs 5E, F, 8G, 10G); vi) pygidial plate absent; and

vii) T7 with two small and widely separated lateral teeth. This subgeneric concept is followed here. In the female sex, the only character given in the diagnosis is that the clypeus carries an inverted T-shaped pale mark “except [in] the Chinese *A. hedini*” (see section below). This lack of a strong female character is unfortunately characteristic of the challenges faced in recognising and classifying female anthophorine bees in isolation without confidently associated males. Indeed, many female *Anthophora* cannot be confidently placed into a subgenus following the subgeneric key of Brooks (1988).

Morphological terminology follows Michener (2007), with the exception of the marginal “zones” of the terga, which are referred to as marginal “areas”, “antennal segments” which are numbered A1–12(13) (rather than scape, pedicel, and antennomeres 1–10(11)), and “nervulus” rather than vein cu-v in the forewing. Specimens were measured from the centre of the clypeus at the front of the head to the apical tip of the metasoma to the nearest 0.5 mm. Photographs were taken using an Olympus E-M1 Mark II with a 60 mm macro lens. Additional close-ups were taken with the addition of a Mitutoyo M Plan Apo 5× infinity corrected objective lens. Photographs were stacked using Helicon Focus B (HeliconSoft, Ukraine) and plates were prepared in GNU Image Manipulation Program (GIMP) 2.10. Post-processing of some images was made in Photoshop Elements (Adobe Systems, USA) in order to improve lighting to highlight specific characters.

Unless otherwise stated, all specimens were identified by myself. New country records are indicated with an asterisk. Species are presented in chronological order of description.

Abbreviations

CSE	Personal collection of Christian Schmid-Egger, Berlin, Germany;
ETHZ	Eidgenössische Technische Hochschule Zürich collection, Zürich, Switzerland;
IZCAS	Institute of Zoology, Chinese Academy of Sciences, Beijing, China;
MNHN	Muséum national d'Histoire naturelle, Paris, France;
MSVI	Personal collection of Marco Selis, Viterbo, Italy;
NHMD	Natural History Museum of Denmark, Copenhagen, Denmark;
NHMUK	Natural History Museum, London, United Kingdom;
NHRS	Naturhistoriska Riksmuseet, Stockholm, Sweden;
OUMNH	Oxford University Museum of Natural History, Oxford, United Kingdom;
RMNH	Naturalis Biodiversity Center, Leiden, the Netherlands;
SDEI	Senckenberg Deutsches Entomologisches Institut, Eberswalde, Germany;

SHPC	Personal collection of Sebastian Hopfenmüller, Obergünzburg, Germany;
SMNHTAU	Steinhardt Museum of Natural History, Tel-Aviv University, Tel-Aviv, Israel;
SMNS	State Museum of Natural History, Stuttgart, Germany;
TJWC	Personal collection of T.J. Wood, Leiden, the Netherlands;
USNM	Smithsonian National Museum of Natural History, Washington D.C., USA;
ZMHB	Museum für Naturkunde, Berlin, Germany.

Results

1. *Anthophora* (*Caranthophora*) *pubescens* (Fabricius, 1781)

Apis pubescens Fabricius, 1781: 484, sex not specified but ♀ [Italy, NHMD, examined by photograph].

?*Apis liturata* Gmelin, 1790: 2789, sex not specified [Europe, ?type lost].

Anthophora flabellifera Lepeletier, 1841: 40, ♂ [Algeria, MNHN, not examined].

Material examined. ITALY • 1♀; NHMD, 1787637 (**holotype**); GREECE • 1♂; Kreta, Paleochora, 130 km WSW Heraklion; 3 Apr. 1979; Hohmann leg.; P. Westrich det. 1992; SMNS. See Suppl. material 1.

Notes. *Anthophora pubescens* was described from Italy (collection D. Allioni). Zimsen (1964: 421) indicated a single specimen in Fabricius' collection, with the bees now stored in the NHMD; a single female specimen bearing a Fabrician label remains there today (Fig. 1). This specimen was treated as the holotype by Baker and Brooks in 1978 and 1983, respectively (Fig. 1A), and it conforms to the classical concept of the species.

The synonymy for two names given in the chresonymy of Brooks is not clear, these being *Apis grisea* Christ, 1791 and *Anthophora flabellipes* Lichenstein, 1871 [sic]. Brooks (1988: 571) listed *Apis grisea* Christ as a junior synonym of *A. pubescens*, but Warncke (1986: 100) instead listed *Apis grisea* Christ as i) preoccupied by *Apis grisea* Gmelin, 1790 (Gmelin 1790: 2785) and ii) as a junior synonym of *Bombus subterraneus* (Linnaeus, 1758). Warncke's position is more strongly justified, as Christ (1791: 130) described this taxon in the trinomial *A.[pis] bomb.[us] grisea*, clearly linking the taxon with a bumble bee.

Brooks also listed *Anthophora flabellipes* Lichenstein *recte* Lichtenstein as a junior synonym. This however is incorrect, and derives from Dalla Torre (1896: 283) who listed *Anthophora flabellipes* Lichtenstein, 1871 under *Podalirius pubescens* (Fabricius). This relates to a communication by Jules Lichtenstein (1871) in the entomological bulletin between pages LXXVI and LXXIX. In this, Lichtenstein notes: “... sont ceux d'une grosse espèce d'*Anthophora*. Elle est espagnole et se rapproche beaucoup de l'*A. flabellipes* de Lepeletier” [... there is a large species of Spanish *Anthophora* that closely resembles



Figure 1. *Apis pubescens* Fabricius, 1781 holotype female (NHMD). **A.** Label information; **B.** Habitus, lateral view; **C.** Head, frontal view; **D.** Metasoma, dorsal view.

Lepeletier's *A. flabellipes*]. In this context, it is clear that this is simply an incorrect subsequent spelling, and no new name was created; the listing by Dalla Torre entered the European literature as if it were a specific name (e.g. Friese 1897: 142), but no-one seems to have actually checked the original work to see if the name was validly created.

Distribution. North-western Africa (Morocco, Algeria, Tunisia), Europe east to Ukraine, Russia (European part), Bulgaria, and is newly reported for Greece* (Fig. 2; Fabricius 1781; Lepeletier de Saint-Fargeau 1841; Friese 1897; Levchenko et al. 2017; Reverté et al. 2023). Not yet recorded from Turkey, though based on southern Bulgarian records it should be present at least in European Turkey.

2. *Anthophora (Caranthophora) dufourii* Lepeletier, 1841

Anthophora dufourii Lepeletier, 1841: 75, ♀♂ [probably France, MNHN/OUMNH, examined].

Anthophora tecta Smith, 1854: 342, ♀ [type locality unclear, NHMUK, examined by photograph].

Anthophora dives Dours, 1869: 143, ♂ [Dalmatia, type lost].

Anthophora dufouri [sic] ssp. *nigropyga* Strand, 1921: 297, ♀ [Iran, SDEI, examined].

Anthophora fasciculipes Alfken, 1935: 184, ♀ [West Bank, ZMHB, not examined].

Material examined. **ALBANIA** • 1♂; Konispol; 23 May 2017; M. Jacobs leg.; TJWC; **IRAN** • 1♀; Persien, 1908, Asterabad [=Gorgan]; 1 Apr. – 30 Jun. 1908; O. Leonhard leg.; SDEI (**holotype** of *Anthophora dufourii* ssp. *nigropyga*); **IRAQ** • 1♂; Kurdistan, Duhok gov., 5 km E of Ashewa, Mt. Gara; 1750–1950 m a.s.l.; 3 Jun. 2023; H.R. Ismael leg.; MSVI; **NORTH MACEDONIA** • 4♂, 1♀; Katlanovska Banja; 5 Jun. 1965; W. Vervoort & C. v. Heijningen leg.; RMNH, RMNH.INS.1660689; **UNKNOWN** • 1♂; OUMNH (**syntype**) • 1♀; MNHN (**syntype**). For additional examined material, see Suppl. material 1.

Notes. Lepeletier described this species as coming from “Du midi de la France ou du nord de l’Espagne. Envoyée par M. Léon Dufour. Femelle de mon cabinet; mâle du musée de M. le général Dejean” [From central France or northern Spain. Sent by Mr. Léon Dufour. Female in my collection, male in the collection of General Dejean]. Baker (1994: 1196) located the degraded male syntype in Dejean material in the OUMNH collection, but declined to designate it as the lectotype until material in the MNHN collection (Lepeletier collection) could be examined. The female specimen in the MNHN is also in poor condition,

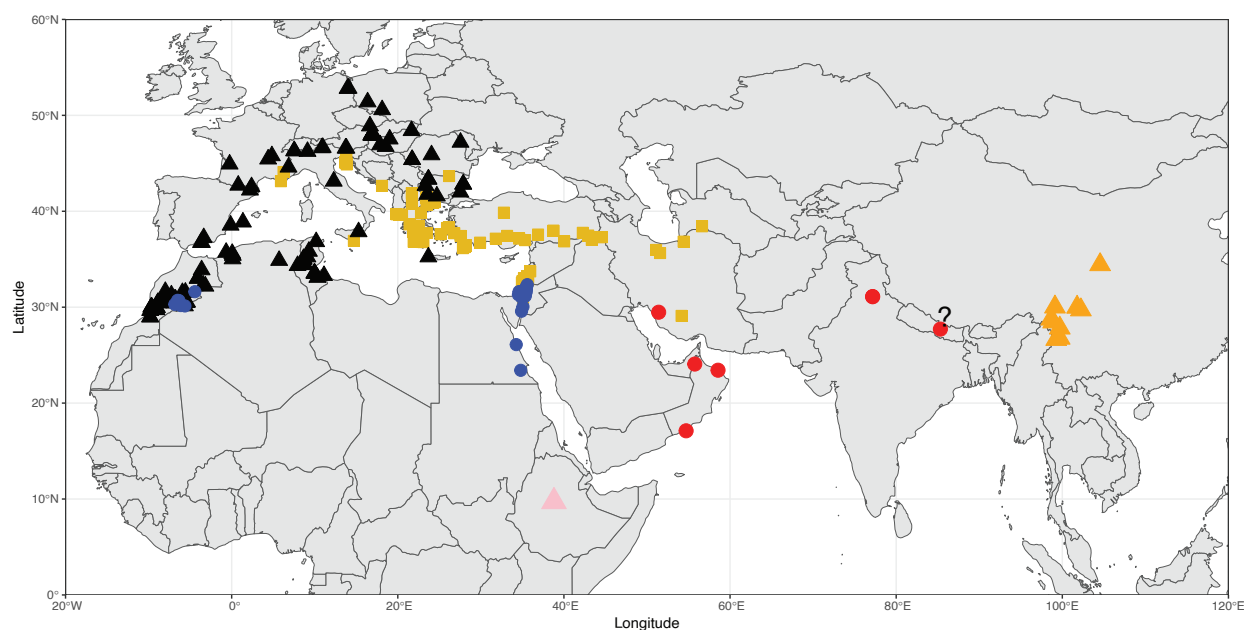


Figure 2. Distribution map of *Anthophora* (*Caranthophora*) species. *Anthophora pubescens* (Fabricius, 1781) (black triangles); *Anthophora dufourii* Lepeletier, 1841 (yellow squares); *Anthophora iole* Bingham, 1898 (red circles); *Anthophora hedini* Alfken, 1936 (orange triangles); *Anthophora tarsalis* Priesner, 1957 (blue circles); *Anthophora calcarispina* sp. nov. (pink triangle). A black ? indicates the *locus typicus* of *Anthophora* (*Caranthophora*) *unispina* (Wu, 1982) which is of uncertain specific placement. Distributional data are not comprehensive.

with only the head and mesosoma remaining (pers. obs.), but this is enough to clearly recognise its identity which is in line with the modern interpretation. As Baker noted, the identity of this distinctive species has been clear with correct sex association since the work of Lepeletier, and consequently I did not photograph either specimen. The “terra typica” is not clearly specified in the work of Lepeletier, but since the species is either absent from Spain or has a very marginal occurrence there, with no specimens examined to date (Fig. 2), it is best to consider it as having been described from France. Currently, no specimens have been observed from west of the “departements” of Gard and Bouches-du-Rhône, suggesting that the species has never occurred in Spain.

The remaining synonymies are relatively clear, although it was not possible to examine the type of *A. fasciculipes* as it is still on loan to Chris O’Toole who passed away in 2021. The specimen should be somewhere in the OUMNH collection which currently houses O’Toole’s unintegrated personal collection (pers. obs.).

Distribution. Europe from France eastwards to Albania*, North Macedonia*, Bulgaria, Greece, Russia (European part), Turkey, the Levant (Syria, Lebanon, Israel & West Bank), the Caucasus, Iraq*, Iran, and Turkmenistan (Kopet Dag) (Fig. 2; Lepeletier de Saint-Fargeau 1841; Friese 1897; Atanassov 1964; Baker 1994; Levchenko et al. 2017; Boustani et al. 2021; Reverté et al. 2023; Ascher and Pickering 2026). It was not possible to examine any material from the European part of Russia; Friese (1897: 211) mentioned a record from Sarepta (=Volgograd), but no such specimen could be found in the ZMHB collection.

3. *Anthophora* (*Caranthophora*) *iole* Bingham, 1898

Anthophora iole Bingham, 1898: 128, ♂ [India: Himachal Pradesh, NHMUK, examined] (Fig. 3).

Anthophora albopicta Cockerell, 1917: 288, ♀ [Iran, USNM, examined] (Fig. 4) syn. nov.

?*Heliophila unispina* Wu, 1982: 417, ♂ [China: Xizang, ?IZCAS, not examined].

Material examined. **INDIA** • 1♂; Simla [Shimla]; 1–31 May 1897; C.G. Nurse leg.; NHMUK (**holotype**) • 2♂; Simla [Shimla]; 1–31 Aug. 1898; C.G. Nurse leg.; D.B. Baker det. 1988; NHMUK; **IRAN** • 1♀; Kotal Malul, So. Persia [Kotal-e Malu, Fars province, 29.4751°N, 51.4068°E]; 1–28 Feb. 1906; F. Benton leg.; USNM, Type No. 23147 (**holotype** of *Anthophora albopicta*); **NEPAL** • 3♂; Kathmandu; 15 Apr. 1980; Hohmann leg.; SMNS; **OMAN** • 1♀; Dhofar, 13 km N Mirbat, Jb. Samhan [Jabal Samhan]; 4 Sep. 2019; C. Schmid-Egger leg.; CSE • 1♂, 1♀; Maskat, Al Hajar, Wadi Al Maih; 150 m a.s.l.; 9 Jan. 2025; S. Hopfenmüller leg.; SHPC; **UNITED ARAB EMIRATES** • 1♂; Jebel Hafit/S El Ain; 13 Jan. 2011; C. Schmid-Egger leg.; CSE.

Notes. *Anthophora iole* was described from the Western Himalayas, and nothing seems to have been published on it since that point, other than very brief identification characters and subgeneric classification in Brooks (1988: 470). Examination of *Anthophora* (*Caranthophora*) specimens from the eastern Arabian Peninsula, an area from which *Caranthophora* have never previously been reported, shows that they are surprisingly identical to *A. iole*.



Figure 3. *Anthophora iole* Bingham, 1898 holotype male (NHMUK). **A.** Label information; **B.** Habitus, lateral view; **C.** Head, frontal view; **D.** Hind tarsi, lateral view.



Figure 4. *Anthophora albopicta* Cockerell, 1917 holotype female (USNM). **A.** Label information; **B.** Habitus, lateral view; **C.** Head, frontal view; **D.** Mesosoma, posterior view.

Remarkably, there is no difference in the genital capsule and internal sterna of specimens from the United Arab Emirates and Oman (Fig. 5A, C, E, G) and specimens from Nepal and India (Fig. 5B, D, F, H). Whilst the holotype of *A. iole* lacks its metasoma, one of the key male characters can be seen in the shape of the hind basitarsus which is distinctly flattened medially, almost concave and spoon-like (Fig. 3D). For characters requiring dissection, most important are the disc of S7 with the apodeme distinctly elevated and with the anterior margin wavy (almost fish-tailed; Fig. 5C, D) and the genital capsule with the apical part of the gonocoxa displaying a distinct semi-circular emargination in its outer margin and with the gonocoxa produced into a rounded apex (Fig. 5E, F).

With the unambiguous male characters, populations in Arabia and the Western Himalayas can be considered to be conspecific. But, are specimens known from intermediate locations in Iran and Pakistan? The key to this lies in understanding the morphology of the female of *A. iole* which displays extensive pale markings on the face; specimens from southern Oman (Fig. 6A) and northern Oman (Fig. 6B) show a mixture of yellow and brown markings, but in both cases the pale marking occupied over half the visible surface of the clypeus. This marking was obliquely referred to as “brown” by Brooks (1988: 470). There is a slight sculptural difference in that the female from southern Oman (Fig. 6A) has a longitudinal impunctate strip basomedially, whereas the female from northern Oman lacks such a strip, with the basomedial surface evenly punctate. Since the specimen from northern Oman was captured with a male, and the other male record comes from the nearby United Arab Emirates, the female from northern Oman is considered to be most representative of *A. iole*. Should male material from southern Oman become available, differences between the northern and southern populations could be investigated further.

With the characterisation of the female of *A. iole*, the identity of a very poorly understood taxon can be clarified, specifically *Anthophora albopicta* which was described from southern Iran based on a single female specimen (Fig. 4). Cockerell placed it into the subgenus *Micranthophora* Cockerell, 1906, and highlighted the pale clypeus marking on a “light ferruginous field” (Fig. 4C). He also described the metasoma which is missing from the specimen in its current form:

Abdomen broad, hind margins of segments whitish hyaline; whole surface of dorsal segments rather thinly covered with appressed pale hair; not forming bands; apex with a patch of black hair; apical plate very long and narrow.

This is clearly consistent with female *A. iole*, and when combined with the facial marking which matches that seen in the specimen from Oman, *A. albopicta* can be recognised as a junior synonym of *A. iole* syn. nov. Brooks (1988: 491) placed *A. albopicta* into the subgenus *Heliophila* Klug, 1807, probably because he simply fol-

lowed Cockerell’s placement and treated *Micranthophora* as part of *Heliophila* when it is actually quite distinct (Orr et al. 2018, 2022); it is unclear if he ever examined the holotype specimen of *A. albopicta* directly.

It is challenging to understand precisely where “Kotal Malul” is within Iran. Frank Benton (1852–1919) was an American entomologist focusing on honeybees. In early 1906, he travelled from Turkestan (modern Uzbekistan) through Iran to the north-western part of British India (today Pakistan). It is possible to trace some of his stops through catalogues; Galloway (1907) listed plant specimens collected and sent by Benton with the date of receipt, allowing some of his itinerary to be reconstructed:

- Erivan, Russia [Yerevan, Armenia]; received 26 Jan. 1906.
- Samarkand [Uzbekistan]; received 22 Jan. – 9 Feb. 1906.
- Isfahan, Persia [Isfahan, Isfahan Province, Iran]; received 14 Feb. – 2 Apr. 1906.
- Shiraz, Persia [Shiraz, Fars Province, Iran]; received 2 Apr. 1906.
- Nizamabad, central Persia [Nezamshahr, Kerman Province, Iran]; received 2 Apr. 1906.
- Karachi, province of Sind, India [Karachi, Pakistan]; received 16 Apr. 1906.
- Quetta, Baluchistan [Quetta, Pakistan]; received 16 Apr. 1906.

On the basis of the collecting labels of Benton (e.g. Cockerell 1917, with many specimens collected around Quetta in March 1906), the receipt of plant material would seem to trail collection by around 4–6 weeks, which would line up with collection in the province of Fars in February 1906. Searches in Persian texts (Arash Roudbar, pers. comm.) indicates that the original name was Kotal-e Mal’un referring to a steep mountain pass (literally meaning “cursed pass” in Persian). This mountain pass (located at 29.4751°N, 51.4068°E) is on what was the main route to the Persian Gulf, and it is likely that Benton visited here in February 1906. On the basis of this Iranian record, *A. iole* should be present somewhere in Pakistan, but all that can be currently said is that none of the species described by Nurse (1904) match it, and further sampling is required.

Finally, it is necessary to discuss the action of Brooks (1988: 566) who synonymised *Heliophila unispina* under *A. iole* without providing any additional information or justification. *Heliophila unispina* was described based on two males from “Xizang: Gyirong, 2800 m. 20. VII. 1975, Chang Xuezhong”, this referring to Gyirong around 28.39°N, 85.32°E. Whilst this is extremely close to the border with Nepal and lies around 75 km from Kathmandu, the synonymy of Brooks is questionable. Wu (1982: 417–418) provided a description which, due to the general inaccessibility of this publication, is reproduced here after machine translation from Chinese, with minor stylistic edits:

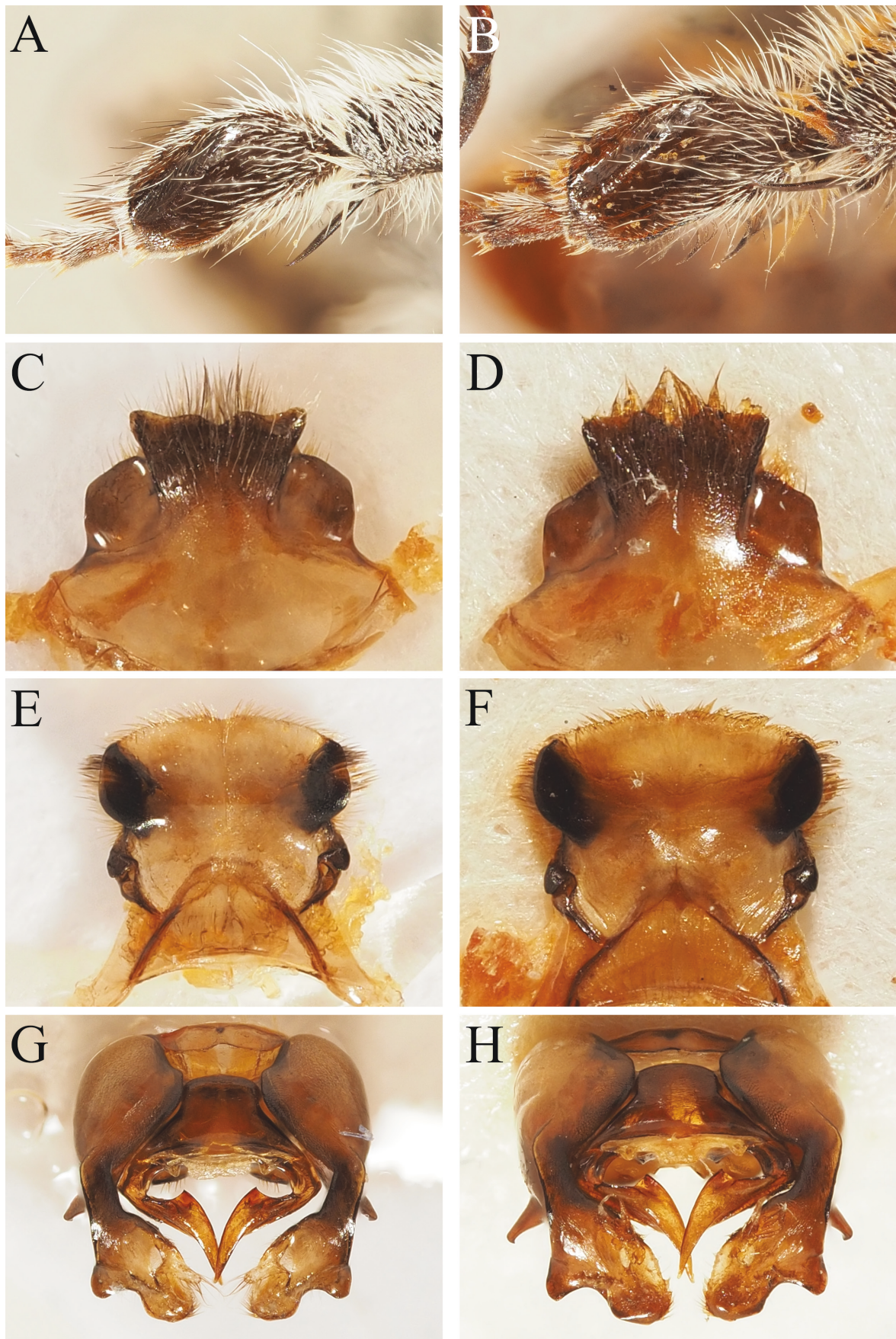


Figure 5. *Anthophora iole* Bingham, 1898 male from northern Oman (SHPC). **A.** Hind basitarsus, lateral view; **C.** S7, ventral view; **E.** S8, ventral view; **G.** Genital capsule, dorsal view. *Anthophora iole* Bingham, 1898 male from Nepal (SMNS); **B.** Hind basitarsus, lateral view; **D.** S7, ventral view; **F.** S8, ventral view; **H.** Genital capsule, dorsal view.



Figure 6. *Anthophora iole* Bingham, 1898 female from southern Oman (CSE). **A.** Face, frontal view. *Anthophora iole* Bingham, 1898 female from northern Oman (SHPC); **B.** Face, frontal view. *Anthophora pubescens* (Fabricius, 1781) female from Morocco (TJWC); **C.** Face, frontal view. *Anthophora tarsalis* Priesner, 1957 female from Morocco (TJWC); **D.** Face, frontal view.

(92) *Heliophila unispina*, new species (fig. 40). Body length: 10 mm. Mandibles with two teeth; labrum with coarse, shallow punctures; labial base smooth with fine punctures; antennal segment 3 equal to the sum of the following two segments; thorax densely punctured; hind tibiae extended medially into a spiny structure, located between the two spurs, its length being one-quarter to one-fifth of the spur length (fig. 40b); hind tarsi broad and flattened; T7 with a tooth-like projection on each side of the distal margin; S7–8 and genital capsule shown in fig. 40d, e. Body black, labial base (black on both sides), labrum (with black circular spots on both sides of the base), the base of the mandibles, the sides of the face, the transverse stripe at the base of the maxillae, and the anterior surface of the scape are all light yellow; the apex of the mandibles is reddish-brown; the basal plates and veins of the wings are dark brown; the legs are dark brown; the tarsi are lighter in colour. The body is covered with long white hairs; the sides of the face and around the ocelli are covered with black hairs, mixed with yellowish-white long hairs; the thorax is covered with greyish-white mixed with brown long hairs; the first tergite of the abdomen is covered with sparse greyish-yellow long

hairs, the distal margins of tergites 2–5 are banded with white hairs, and T2–6 are covered with sparse short black hairs; the mid-leg basal tarsus is slender, with black brush-like hairs on the inner side, long hairs on both sides, and long black hairs on the last tarsus (fig. 40a); the inner hairs of the hind leg basal tarsus are black; the spur is dark brown.

This species is similar to *Heliophila tibialis* (Mor.), but differs in the following ways: (1) antennae extend to the metathorax; (2) the mid-leg basal tarsus is slender with black brush-like hairs on the inner side, and the last tarsus has long black hairs; the hind leg basal tarsus has black hairs on the inner side; the spur is dark brown.

Based on the illustrations provided (Wu 1982: 418, fig. 40), it is extremely clear that *Heliophila unispina* is indeed an *Anthophora* (Caranthophora) species due to the characteristic morphology of S7–8 and the genital capsule. However, it is also not possible for *A. unispina* to be conspecific with *A. iole* because whilst the apodeme of S7 is very similar, the genital capsule (fig. 40 f) lacks a semicircular emargination in the outer margin of the apical part of the gonocoxa (e.g. Fig. 5G, H). The description more closely fits with *Anthophora hedini* Alfken, 1936

(see next section) due to the colouration of the face and the presence of a spine at the apex of the hind tibia. Specifically, Wu indicates yellow markings on the labrum, lower paraocular areas, and antennal scape, but not the clypeus itself. This is broadly consistent with *A. hedini* which has the clypeus predominantly dark (Fig. 7C) compared to *A. iole* which has the clypeus predominantly pale-marked (Fig. 3C). Wu indicates that the apex of the hind tibia is produced into a pointed spine (illustrating this in fig. 40b); a spine matching this description is present in *A. hedini* (Fig. 7E). In *A. iole*, the apex of the hind

tibia is produced into a rounded and flattened lamellate tooth; this can vaguely resemble a spine when viewed posteriorly (i.e. with the flattened surface not visible), but it is difficult to describe as “extended medially into a spiny structure”. However, a comparison of genital morphologies has not been possible, since only undissected specimens of *A. hedini* have been available.

A direct observation of Wu’s type material has also not been possible, and although Wu (1982: 421) indicates that all type material is preserved in the IZCAS, material of *Heliophila unispina* was not presented by Niu et al.



Figure 7. *Anthophora hedini* Alfken, 1936 paratype male (ZMHB). **A.** Label information; **B.** Habitus, lateral view; **C.** Head, frontal view; **D.** Mid tarsus, lateral view; **E.** Hind basitarsus, lateral view; **F.** Metasoma, dorsal view.

(2025) in a recent photographic catalogue of Anthophorinae type specimens in this institution. It may have been accidentally overlooked, as the taxon is not mentioned even as a species for which material could not be found. Specimens may remain in the general collection without having been incorporated into the type collection which was the focus of the efforts of Niu et al. (M. Orr, pers. comm.). Consequently, the synonymy of Brooks is maintained with the need to understand if *A. unispina* is in fact more closely allied with *A. hedini* or instead represents a further distinct *Anthophora* (*Caranthophora*) species.

Distribution. United Arab Emirates*, Oman*, Iran (Fars), India (Himachal Pradesh), Nepal* (Fig. 2; Bingham 1898; Cockerell 1917, as *A. albopicta*; Brooks 1988). Ascher and Pickering (2026) list a specimen from Nepal (KSEM1309303) from the Snow Entomological Museum Collection (University of Kansas Natural History Museum) identified by Brooks, but the record presented here is considered to be the first formally published from this country.

4. *Anthophora* (*Caranthophora*) *hedini* Alfken, 1936

Anthophora hedini Alfken, 1936: 19, ♀♂ [China: Gansu, NHRS, not examined].

Material examined. CHINA • 2♂; Kina, S. Kansu [Gansu province, precise location unclear]; Dr. Hummel leg.; ZMHB (paratypes).

Notes. Alfken described the species based on a single female which he explicitly designated as holotype (hence the paralectotype label in Fig. 7A is unnecessary), as well as seven male paratypes. He retained two paratypes in his collection which are now present in the ZMHB (Fig. 7); these specimens are undated, but from the publication they were collected between 9 May – 15 Jun. 1930. Whilst it has not yet been possible to examine the holotype female, the male is clearly distinct based from all other *Anthophora* (*Caranthophora*) species due to the shape of the hind basitarsus (Fig. 7E) which has a more strongly produced depression and carina present on the outer face than *A. iole*, as well as a distinctly produced hyaline tooth on the apex of the hind tibia (Fig. 7E), and the distinctive pale facial maculations which are greatly reduced on the clypeus compared to all other species (Fig. 7C). As noted in the previous section, *A. unispina* appears to be more closely allied to *A. hedini*, but examination of dissected material is necessary to clarify this situation. Additional unpublished specimen records from the IZCAS (M. Orr, pers. comm.) are presented in Fig. 2, expanding the distributional range to Yunnan.

Distribution. China (Gansu, Sichuan, Yunnan) (Fig. 2; Alfken 1936).

5. *Anthophora* (*Caranthophora*) *tarsalis* Priesner, 1957

Anthophora tarsalis Priesner, 1957: 109, ♀♂ [West Bank, ZMHB, neotype by present designation] (Fig. 8).

Anthophora spinacoxa Brooks, 1988: 540, ♂ [West Bank, ZMHB, examined] syn. nov. (Fig. 8).

Material examined. ISRAEL • 2♂; [label illegible] 4 Apr. 1986; R. Dukas leg.; D.B. Baker det. 1986; OUMNH • 1♂; Ein Gedi; 15 May 1958; Lewinsohn leg.; OUMNH • 1♀; En Gedi [Ein Gedi]; 20 Feb. 1985; R. Dukas leg.; C. O'Toole det. 1996; OUMNH • 1♀; En Gedi [Ein Gedi]; 20 Mar. 1985; R. Dukas leg.; C. O'Toole det. 1986; OUMNH • 1♂; Mezaad Zohar; 2 Apr. 2001; L. Freidman leg.; SMNHTAU • 1♀; South Distr., Elat Mountain NR, Negev, malaise trap; 297 m a.s.l.; 9 Apr. 1995; M. Irvin leg.; CSE • 1♂; Southern D., 3 km E Ne'ot Smadar; 23 Apr. 2010; Sedivy & Praz leg.; ETHZ • 1♀; W. Ugja [Ge'a]; 28 Apr. 1976; D. Simon leg.; OUMNH • 1♀; W. Umrani [Urim]; 14 Apr. 1955; L. Fishelsohn leg.; OUMNH • 1♂; Yeroham [Yeruham]; 17 Apr. 1972; J. Kugler leg.; OUMNH; JORDAN • 1♂; Jordan Valley, 10 km S Tabaqat Fahl [Tabqet Fahel]; 24 Apr. 2007; Praz, Sedivy, Müller leg.; ETHZ; MOROCCO • 1♂; 10 km e Agdz; 1000 m a.s.l.; 20 Apr. 2008; Sedivy & Müller leg.; ETHZ • 1♂; 35 km S of Er Rachidia; 11 Apr. 1993; S.P.M. Roberts leg.; D. Baker det. 1994; SMNS • 1♂; Drâa-Tafilalet, Agdz, 6 km NW Agdz; 1050 m a.s.l.; 5 Apr. 2025; T.J. Wood leg.; TJWC • 1♀; Drâa-Tafilalet, Zagora, 33.8 km SW Zagora; 800 m a.s.l.; 9 Apr. 2025; T.J. Wood leg.; TJWC • 3♂, 2♀; Drâa-Tafilalet, Zagora, 8.8 km S of Tinfou (Foum Anagame); 770 m a.s.l.; 6 Apr. 2025; T.J. Wood leg.; TJWC • 1♀; Souss-Massa, 3 km N Centre Commune Allougoum; 800 m a.s.l.; 9 Apr. 2025; T.J. Wood leg.; TJWC; WEST BANK • 1♂; Jericho; 13 Apr. 1909; [F. Morice leg.]; ZMHB (neotype of *Anthophora tarsalis*; holotype of *Anthophora spinacoxa*) • 2♂, 5♀; Jericho; 5 Feb. 1971; Bytinski-Salz leg.; OUMNH • 1♀; Mizpe Shalem; 24 Mar. 1986; I. Susman leg.; OUMNH • 1♀; Mizpe Shalem; 25 Feb. 2015; T. Jumah leg.; SMNHTAU • 1♀; Wadi Ahmer; 8 Apr. 1986; I. Susman leg.; OUMNH • 1♀; Avenat Rt. 90 [Avnat]; 17 Mar. 2004; I. Zonstein leg.; SMNHTAU.

Notes. Priesner (1957: 110) described the species from “Wadi Ambaga near Kosseir (male and female; types)” which refers to Quseir on the Red Sea coast as well as “Bir Abrag (South Eastern Desert)”, presumably implying that the latter specimens were not part of the type series. Priesner indicated that the type material of *A. tarsalis* was in the collection of the Egyptian Ministry of Agriculture; this collection appears to have been passed to the Entomological Society of Egypt but was unfortunately destroyed during the Arab Spring in 2010/2011 (P. Rasmont, pers. comm.).

Whilst the type material seems to be lost, Priesner provided an unusually clear diagnosis, describing in detail the structure of the male legs and concluding with: “*The species is unmistakable by the characteristically formed and extremely long middle and hind legs of the male, and obviously belongs near A. gracilipes F. Mor., but differs from it in details of the structure of the legs*”. It is beneficial to reproduce the description of the male legs here, with references to modern images inserted directly:

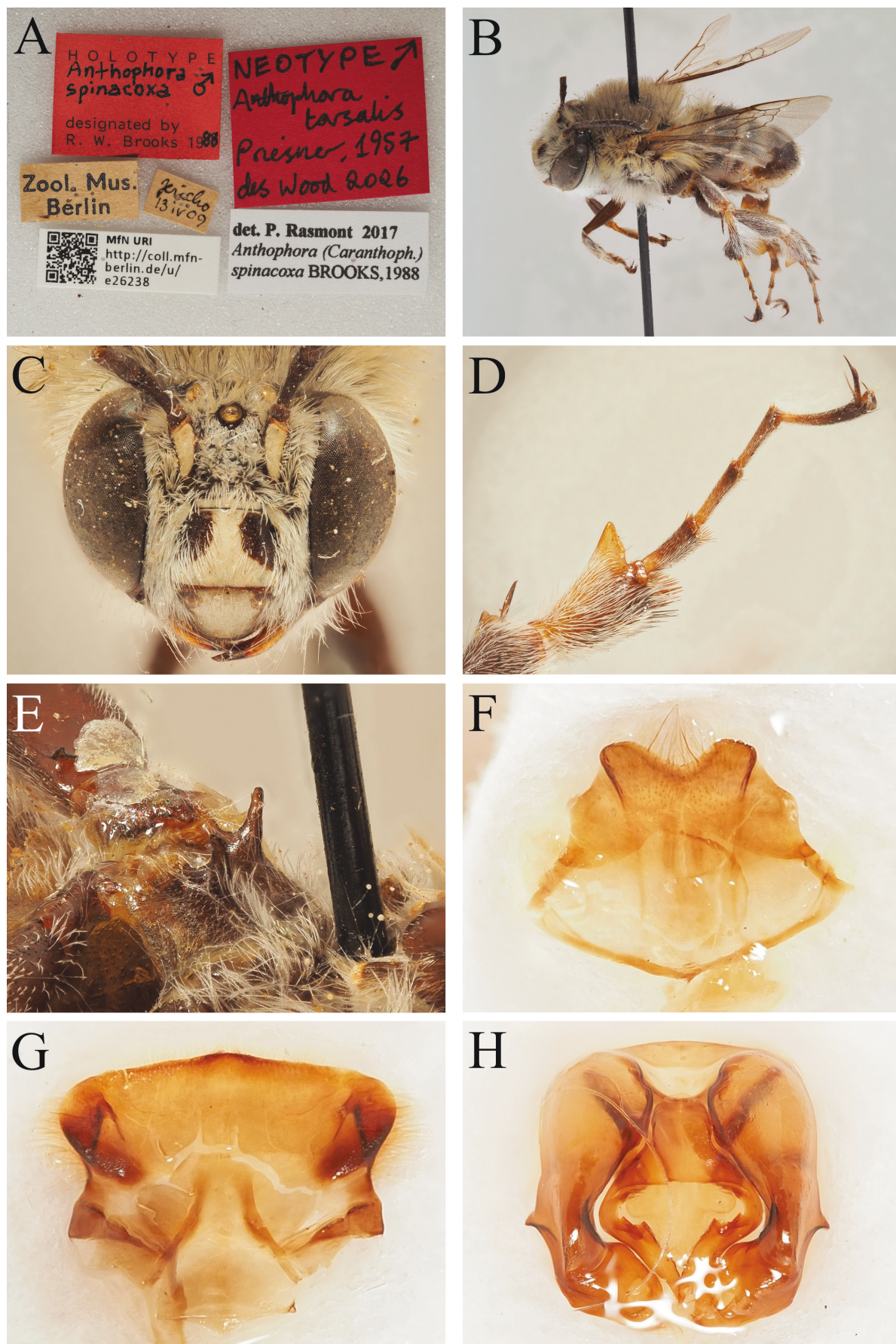


Figure 8. *Anthophora tarsalis* Priesner, 1957 neotype male (ZMHB) and *Anthophora spinacoxa* Brooks, 1988 holotype male. **A.** Label information; **B.** Habitus, lateral view; **C.** Head, frontal view; **D.** Hind tarsus, lateral view; **E.** Hind coxae, lateral view; **F.** S7, ventral view; **G.** S8, ventral view; **H.** Genital capsule, dorsal view.

Hind legs quite peculiar: hind coxae with long, fine tooth [Figs 8E, 9F], *trochanters with hump; femora simple, posterior face smooth and shining; hind tibiae much widened towards apex, at the end with a blunt interior hump; metatarsus broad, widened towards apex and with triangular tooth* [Figs 8D, 9D], *exterior margin of metatarsus convex towards apex and set with bristles* [Fig. 9B]; *joints 2–5 of the hind tarsi very long, joints 2–4 of about equal length, 2 somewhat thicker than the following joints, joint 5 about 1.5 times as long as each of the preceding three* [Figs 8D, 9B, D]; *the whole tarsus almost three times as long as the tibia (apical tergite damaged).*

There can only be one species that this description applies to, which is the species later described by Brooks as *A. spinacoxa* (Fig. 8); the presence of a long tooth on the ventral surface of the hind coxae is clearly mentioned by Priesner. This was observed by Baker, and his determinations of *A. tarsalis* can be seen in the OUMNH and SMNS collections (see Material examined). It was not stated by Brooks, but his type specimen of *A. spinacoxa* was collected by Francis Morice (1849–1926); the label (Fig. 8A) is typical of his handwriting (e.g. see Wood 2025a: 158; Wood 2026: 272). The majority of his collection is held in the OUMNH, but he also shared material with Friese. Most famously, he visited Jericho in April 1899 along with Otto Schmiedeknecht (1847–1936) with many of the specimens being described by Friese (e.g. Friese 1899a, 1899b). As Friese never specified holotypes (Rasmussen and Ascher 2008), syntypic series of several species are split across multiple institutions such as the ZMHB and OUMNH, see Wood (2026: 272–273) for an example from the 1899 Jericho collecting event. The ZMHB specimen of *Anthophora spinacoxa* must have remained untreated in Friese's collection until it was bequeathed to the museum. The placement of *A. tarsalis* into the subgenus *Heliophila* by Brooks (1988: 492) is considered to have been the root cause of this confusion.

Given the loss of Priesner's original type material, it is beneficial to create a neotype given the extremely clear description and the unique morphology of this taxon. Under Article 75.3 (ICZN 1999), this neotype is designated with the express purpose of clarifying the taxonomic status of *Anthophora tarsalis*. The key characters facilitating recognition are present in Priesner (1957), as well as reproduced here verbatim as well as in a synthesised form in the identification key below. The specimen selected to act as neotype is the holotype of *Anthophora spinacoxa* (Fig. 8); the creation of this neotype means that *Anthophora spinacoxa* becomes an objective junior synonym of *Anthophora tarsalis* syn. nov., providing absolute clarity for this taxon and providing nomenclatural stability. The neotype is consistent with Priesner's original description, represents the male (with the species originally described from both sexes), and comes from relatively close to the original type locality (around 650 km away), with it being clear that there is a shared fauna between arid parts of the Jordan Valley and the Red Sea coast of Egypt. The neotype is part of the ZMHB collection, and is available for scientific study.

Distribution. Morocco, Egypt, Israel & West Bank, Jordan* (Fig. 2; Priesner 1957; Brooks 1988, as *A. spinacoxa*; Lhomme et al. 2020, as *A. (Heliophila) tarsalis*). Ascher and Pickering (2026, under subgenus *Heliophila*) give also Algeria which is plausible given the presence of the species in southern Morocco close to the Algerian border, but no direct evidence is provided.

6. *Anthophora* (*Caranthophora*) *calcarispina* sp. nov.

<https://zoobank.org/EF5EF52C-8C4F-4210-9A89-5B25E782A4F8>

Material examined. ETHIOPIA • 1♂; Shewa, Debre Libanos; 9.7333°N, 38.8000°E; 2550 m a.s.l.; 28 Sep. 2005; L. Friedman leg.; SMNHTAU (Fig. 10).

Diagnosis. *Anthophora calcarispina* can be immediately and indisputably recognised as a *Caranthophora* as it displays i) mid leg with strongly defined hair brushes on the basitarsus and apical tarsomere (Fig. 10A); ii) hind basitarsus with a longitudinal cavity running along its upper margin; iii) hind femur and tibia thickened (Fig. 10D); iv) disc of S7 about as long as broad, apodeme well-defined (Fig. 10F); v) S8 short and broad, forming a slight lobe laterally (Fig. 10G); vi) pygidial plate absent; and vii) T7 with two small and widely separated lateral teeth (Fig. 10C).

At a specific level, *A. calcarispina* displays numerous unique characters within the subgenus. These are 1) hind basitarsus with a strongly developed tooth that is placed medially (Fig. 10D), 2) hind tibia with its inner margin ventrally produced into a long spine, this spine bearing the outer hind tibial spur so that it is now strongly displaced and far from the inner tibial spur (Fig. 10D); and 3) hind trochanter with a strongly produced and flattened latitudinal carina (Fig. 10E). Moreover, the apical tarsomere of the hind leg is strongly elongate and when including the tarsal claws exceeds the length of the basitarsus (Fig. 10A); this character is shared with *A. tarsalis* (Fig. 9B, D), but separation is straightforward based on the three aforementioned characters. With its distribution in the Ethiopian highlands, *A. calcarispina* is instantly recognisable when compared to either the Palearctic or Afrotropical *Anthophora* faunas.

Description. Female. Unknown.

Male. Body length: 10 mm (Fig. 10A). **Head:** Dark and broad, 1.5 times wider than long (Fig. 10B). Pale ivory maculations present on labrum with exception of apical margin narrowly and basolateral tubercles, basal portion of mandibles, clypeus along apical margin and narrow longitudinal midline, paraocular areas to upper margin of clypeus, and antennal scape. Labrum approximately as long as wide, apical corners rounded, surface finely shagreened and weakly shining. Clypeus distinctly domed, in lateral view projecting by distance equal to diameter of compound eye, surface finely and densely punctate with punctures separated by 0.5–1 puncture diameters, underlying surface polished and shining. Face and vertex covered with mixture of long white, grey, and black hairs, with shorter decumbent white hairs on frons around anterior ocellus; gena with pure white hairs, increasing in length in ventral portion and onto base of mandibles. Antennae dark, A3 subequal to A4+5.

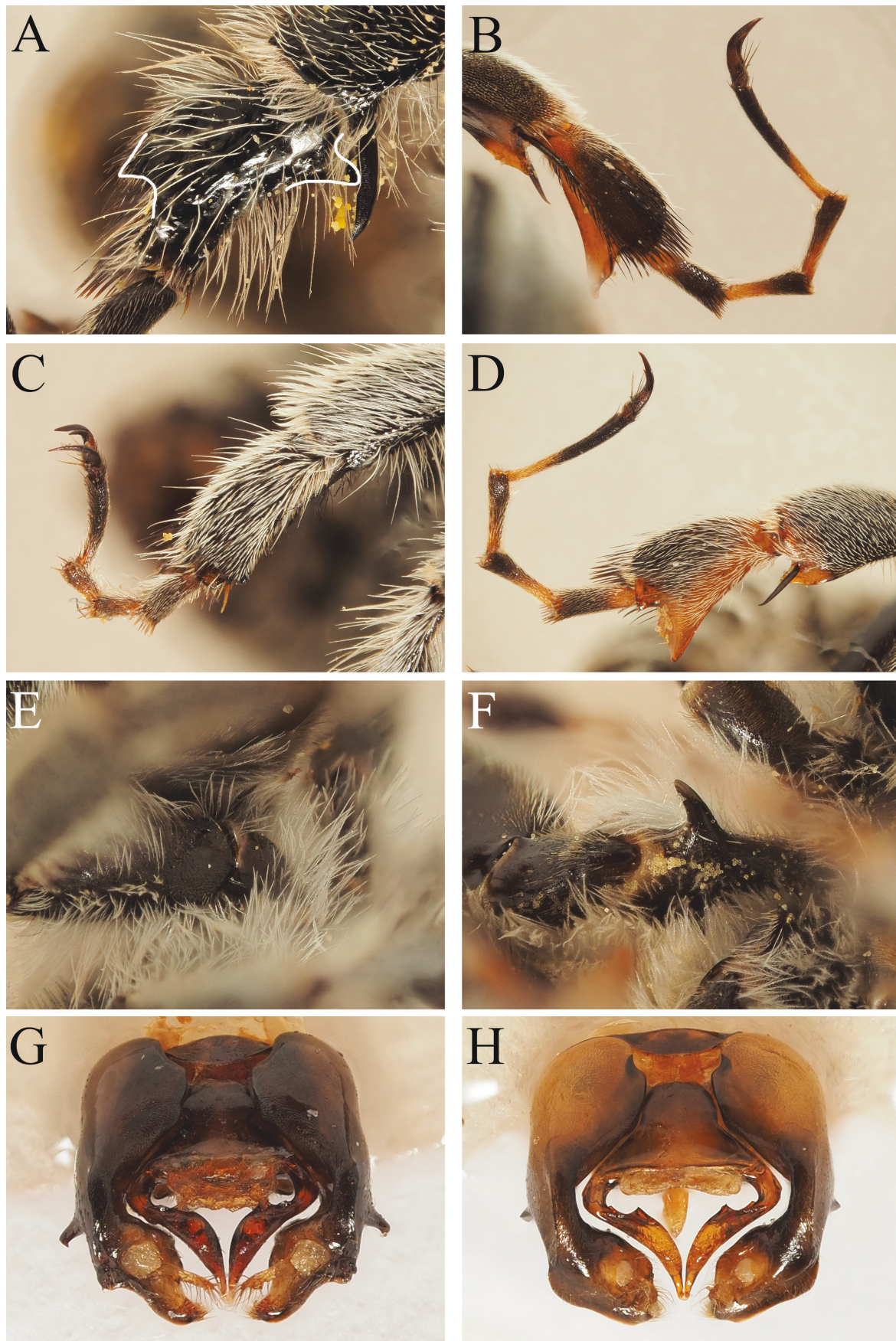


Figure 9. *Anthophora dufourii* Lepeletier, 1841 male from Bulgaria (TJWC). **A.** Hind basitarsus, lateral view (posterior and anterior teeth indicated). *Anthophora tarsalis* Priesner, 1957 male from Morocco (TJWC); **B.** Hind tarsi, posterior view; **D.** Hind tarsi, lateral view; **F.** Hind femur and coxa, frontal view; **H.** Genital capsule, dorsal view. *Anthophora pubescens* (Fabricius, 1781) male from Romania (TJWC); **C.** Hind tarsi, lateral view; **E.** Hind femur and coxa, frontal view; **G.** Genital capsule, dorsal view.

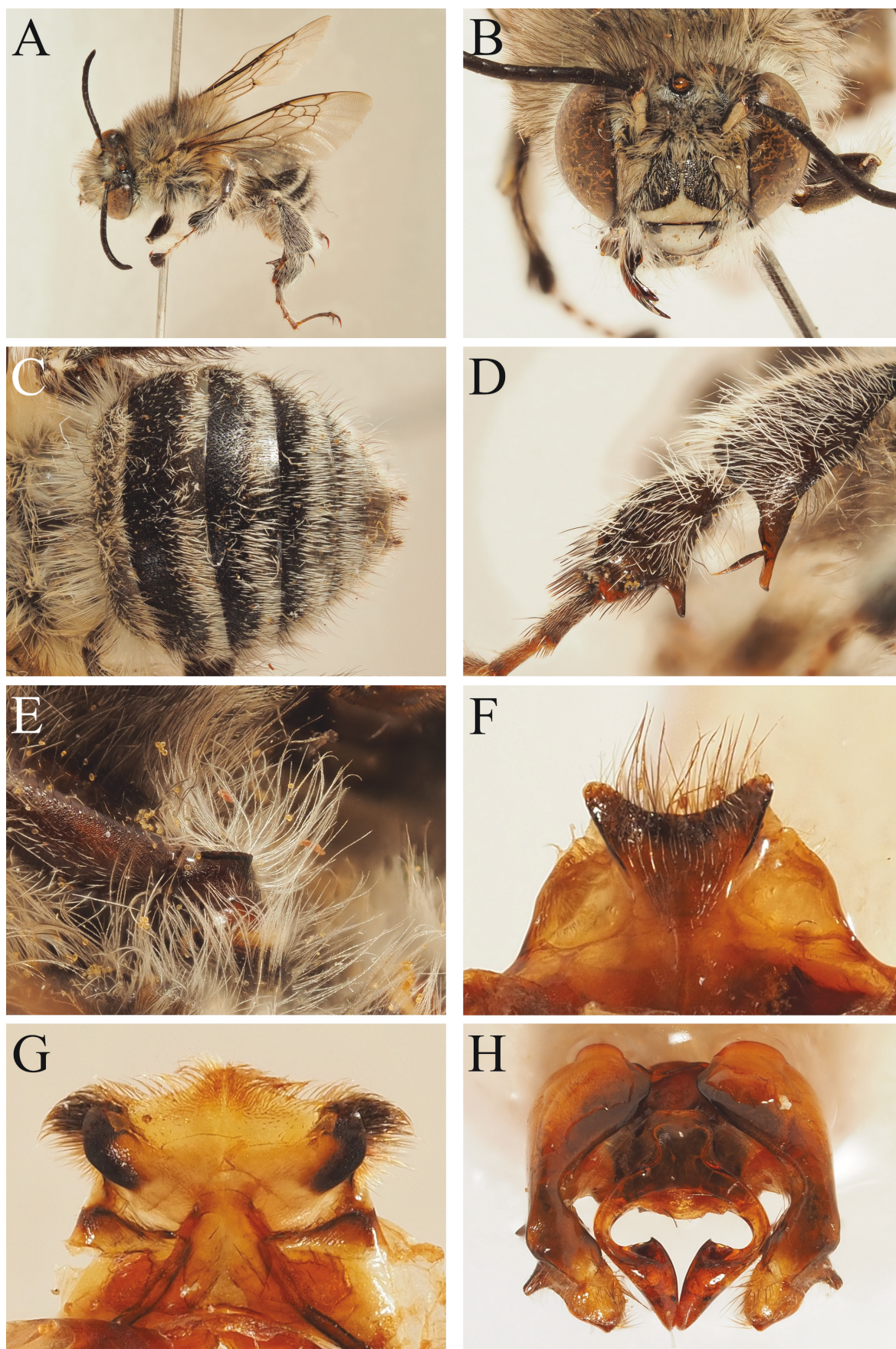


Figure 10. *Anthophora calcarispina* sp. nov. holotype male (SMNHTAU). **A.** Habitus, lateral view; **B.** Head, frontal view; **C.** Metasoma, dorsal view; **D.** Hind leg, lateral view; **E.** Hind femur and coxa, frontal view; **F.** S7, ventral view; **G.** S8, ventral view; **H.** Genital capsule, dorsal view.

Mesosoma: Scutum densely but very shallowly punctate, punctures confluent, surface dull. Mesepisternum with punctures slightly sparser, separated by 0.5–1 puncture diameters, interspaces with granular microreticulation, dull. Propodeal triangle basally impunctate, finely shagreened and weakly shining, poorly defined and becoming shallowly punctate apicolaterally. Scutum and scutellum covered with mixture of long whitish, light brownish, and black hairs, hairs becoming more uniformly whitish on mesepisternum. Legs predominantly dark, tarsal segments becoming reddish-orange. Mid leg with strongly defined black hair brushes on basitarsus and apical tarsomere, hairs on basitarsus concentrated on anterior margin (Fig. 10A). Hind leg with femur slightly thickened, tibia strongly broadened and inner margin ventrally produced into long blunt spine, inner margin bearing displaced hind tibial spur (Fig. 10D). Hind basitarsus with inner margin bearing long spine medially and second small spine subapically; hind margin viewed dorsally with distinct longitudinal concavity filled with black bristles. Apical tarsomere strongly elongate, combined with tarsal claws exceeding length of hind basitarsus (Fig. 10A). Hind trochanter with strongly produced and flattened latitudinal carina (Fig. 10C). Wings hyaline, venation dark brown, nervulus antefurcal.

Metasoma: Tergal discs dark, marginal areas broadly lightened hyaline (Fig. 10C). Disc of T1 with mixture of long greyish and black hairs, discs of T2–5 with predominantly long black hairs; marginal areas of T2–5 with decumbent white hairs, not obscuring underlying surface. T7 with widely separated small lateral teeth. Disc of S7 slightly broader than long, apodeme broadly crescent shaped, anterior margin distinctly concave (Fig. 10F). Disc of S8 twice as broad as long, laterally with blackened round-

ed lobes bearing laterally-projecting black hairs, anterior margin with golden hairs (Fig. 10G). Genital capsule with penis valves broadly Ω -shaped, apexes narrow and acutely pointed (Fig. 10H). Gonocoxae with strong ventrally-projecting tooth on outer margin medially, subapically with smaller laterally-projecting subapical tooth. Apex of gonocoxa with produced into blunt tooth; gonostylus small but distinct, short with long sparse hairs equalling own length.

Etymology. From the Latin nouns *calcar* (spur) and *spina* (spine), meaning “spurred-spine” in reference to the presence of the inner hind tibial spur which has been displaced and is present medially on the inner margin of the spine-like projection at the apex of the hind tibia (Fig. 10D). It is a compound noun in apposition.

Distribution. Ethiopia (Shewa) (Fig. 2).

Species excluded from *Anthophora* (*Caranthophora*)

Anthophora (*Petalosternon*) *kneuckeri* Alfken, 1938

Anthophora kneuckeri Alfken, 1938: 427, ♀ [Egypt, ZMHB, examined] (Fig. 11).

Material examined. EGYPT • 1♀; Sinai, W. Gesgir – Da’albi und Chaschibi; 22–24 Apr. 1904; Kneucker leg.; ZMHB (**holotype**).

Notes. Brooks placed *A. kneuckeri* into the subgenus *Caranthophora* despite the fact that it is known only from the female holotype and the clypeus is entirely black (Fig. 11C). Given that the only female character listed in the diagnosis is that the clypeus has an “inverted T-shaped



Figure 11. *Anthophora kneuckeri* Alfken, 1935 holotype female (ZMHB). A. Label information; B. Habitus, lateral view; C. Head, frontal view; D. Metasoma, dorsal view.

pale mark” (Brooks 1988: 470), this perplexing choice is difficult to understand. It fits more naturally into subgenus *Petalosternon* Brooks, 1988 and resembles an unusually small and abraded *Anthophora rivolleti* Pérez, 1895 or *Anthophora wegelini* Friese, 1914 (one that is lacking pale tomentum on the tergal discs). Without an associated male confident placement species-level identification is

currently not possible. Our understanding of the subgenus *Petalosternon* is extremely poor, both in terms of definition, recognition, included species, and the status of the numerous names currently placed within it (e.g. Brooks 1988). It is likely that many existing names will be synonyms, but this requires a focused subgeneric revision.

Distribution. Egypt (Sinai).

Identification key to *Anthophora* (*Caranthophora*) species

- 1 Twelve antennal segments and six visible metasomal segments; females 2
- Thirteen antennal segments and seven visible metasomal segments; males 6
- 2 Metasoma with long, yellowish, and erect hairs on T1, subsequent terga with shorter yellowish hairs which do not obscure the underlying integument. Integument with weak but distinct metallic blue-green reflections, most clearly visible on the metasoma. Large species, 12–14 mm in length *A. dufourii* Lepeletier
- Metasoma more-or-less homogeneously covered with short whitish to greyish hairs, with a mixture of longer and shorter hairs on T1 but without a strong contrast with those on subsequent terga (Fig. 1D); short whitish hairs almost obscuring the underlying integument in fresh specimens. Integument black, without metallic reflections. Smaller species, not typically exceeding 10 mm in length 3
- 3 Clypeus with a small distinct yellowish-white spot before the anterior margin. Found in central China (Gansu, Sichuan) (Fig. 2) *A. hedini* Alfken
- Clypeus partly to extensively pale-marked (Figs 2C, 4C, 6A–D). Found from the Mediterranean basin eastwards to south-western China (Xizang) (Fig. 2) 4
- 4 Clypeus with a large pale marking, clearly covering over half of the visible surface with orange-yellow colour (Figs 4C, 6A, B). Distributed from eastern Arabia through Iran to northern India and Nepal (Fig. 2) *A. iole* Bingham
- Clypeus with pale markings small, typically forming a narrow longitudinal line, clearly occupying much less than half the visible surface (Figs 2C, 6C, D). Distributed around the Mediterranean basin and north into Europe but not reaching further east than the southern Levant (Fig. 2) 5
- 5 Clypeus in its apical half with puncture interspaces distinctly polished and shining. Clypeus typically with a uniformly pale unbroken longitudinal midline reaching from the base to the apex (Fig. 6C). Broadly distributed in north-western Africa and Europe (Fig. 2) *A. pubescens* (Fabricius)*
- Clypeus in its apical half with puncture interspaces distinctly microreticulate and dull. Clypeus typically with an incomplete longitudinal pale to orange-red midline, never reaching from base to apex (Fig. 6D). Found in southern Morocco, eastern Egypt, and the southern Levant (Fig. 2) *A. tarsalis* Priesner
- 6 Hind leg with first tarsal segment with a conspicuous tooth situated basally on the inner margin AND a second tooth situated medially on the outer margin (Fig. 9A). Disc of T1 with abundant long yellowish hair, marginal areas of T2–3 without pale apical hairbands, essentially completely hairless. Large species, 12–13 mm in length *A. dufourii* Lepeletier
- Hind leg with the first tarsal segment either unmodified, without a conspicuous tooth on either the outer or inner margins (Fig. 9C), or with a single conspicuous tooth located on the inner margin (Figs 9D, 10D). Disc of T1 with sparse whitish hair, marginal areas of T2–5 with moderate coverage of pale hairs which resemble apical hairbands. Smaller species, never exceeding 10 mm in length 7
- 7 Hind leg with apical tarsal segment enormously elongate, length including tarsal claws exceeding that of the first tarsal segment (Figs 8D, 9B–D, 10A). Hind basitarsus with a conspicuous tooth situated apically (Figs 8D, 9D) or medially (Fig. 10D). Hind coxa or trochanter modified, either with a long ventrally-projecting spine (Figs 8E, 9F) or with a raised and flattened latitudinal carina (Fig. 10E), respectively 8
- Hind leg with apical tarsal segment not noticeably elongate, length including tarsal claws subequal to or shorter than first tarsal segment (Figs 3D, 9C). Hind basitarsus without a conspicuous tooth. Hind coxa and trochanter unmodified (Fig. 9E) 9
- 8 Inner margin of the hind tibia produced into a long ventrally-projecting spine, this spine carrying the outer hind tibial spur which is therefore widely separated from the inner hind tibial spur (Fig. 10D). Hind basitarsus with its inner margin medially produced into an acutely pointed tooth. Hind trochanter modified with a raised and flattened latitudinal carina (Fig. 10E). Genital capsule with a clear subapical tooth on the outer margin of the gonocoxa (Fig. 10H). Found in Ethiopia (Fig. 2) *A. calcarispina* sp. nov.
- Inner margin of the hind tibia produced into a short acute point, inner and outer hind tibial spurs located close together (Fig. 9D). Hind basitarsus with its inner margin apically produced into a long acutely pointed tooth (Figs 8D, 9D). Hind coxa modified with a long ventrally-projecting spine (Figs 8D; 9F). Genital capsule without a subapical tooth on the outer

* The following two species are tricky to separate based only on females in their area of overlap in southern Morocco; association with concurrently active males is beneficial. Otherwise, separation is straightforward outside of this region.

- margin of the gonocoxa (Figs 8H, 9H). Found in southern Morocco, eastern Egypt, and the southern Levant (Fig. 2)..... *A. tarsalis* Priesner
- 9 Clypeus predominantly dark, with a small triangular mark medioapically and small patches laterally, majority of the clypeal surface therefore contrasting the pale-marked paraocular areas (Fig. 7C). Supraclypeal area with only a tiny pale marking. Hind basitarsus depressed medially with a clear carina formed posteriorly and with a weak but distinctly bulbous projection on its ventral margin (Fig. 7E), and hyaline tooth produced at the apex of the hind tibia (Fig. 7E). Found in central and southern China (Gansu, Sichuan, Yunnan) (Fig. 2)..... *A. hedini* Alfken
- Clypeus predominantly pale, with dark markings restricted to the lateral margins, majority of the clypeus therefore con-colourous with the pale-marked paraocular areas (Fig. 3C). Supraclypeal area extensively yellow-marked (Fig. 3C). Hind basitarsus either flat (Fig. 9C), or depressed medially BUT without a distinctly bulbous projection on its ventral margin (Figs 3D, 5A, B). Found from the Mediterranean basin eastwards to south-western China (Xizang) (Fig. 2)..... 10
- 10 Hind basitarsus distinctly depressed medially, almost concave and spoon-like, surface sparsely and irregularly covered with thin white hairs that do not obscure the underlying surface, and without a distinct hyaline tooth at the apex of the hind tibia (Figs 3D, 5A, B). Genital capsule with the apical part of the gonocoxa displaying a distinct semi-circular emargination in its outer margin and with the gonocoxa produced into a rounded apex (Fig. 5G, H). Distributed from eastern Arabia through Iran to northern India and Nepal..... *A. iole* Bingham
- Hind basitarsus completely flat, outer face evenly covered with white pubescence that obscures the underlying surface (Fig. 9C). Genital capsule with the apical part of the gonocoxa displaying only a weak emargination in its outer margin and with the gonocoxa produced into an acute but blunt apex (Fig. 9G). Broadly distributed in north-western Africa and Europe..... *A. pubescens* (Fabricius)

Discussion

The bee fauna of Ethiopia is unusual in that whilst the country is clearly located in the Afrotropical biogeographical region, it contains many species from genera that are more typical of the Palaearctic, such as species of *Andrena* Fabricius, 1775 (Friese 1915), *Dasypoda* Latreille, 1802 (Michez and Pauly 2012), *Haetosmia* Popov, 1952 (Müller and Griswold 2017), and *Nomada* Scopoli, 1770 (Eardley and Schwarz 1991). The description of *A. calcarispina* adds to this emerging picture, representing the first Afrotropical record of what was thought to be a strictly Palaearctic lineage of anthophorine bees, though the new records of *A. iole* from the United Arab Emirates and Oman could also be argued to contribute to this pattern given the challenge in placing these countries decisively within either biogeographical realm. Understanding the true range limits of what appear to be Palaearctic lineages in the Horn of Africa remains a challenge, not only due to the presence of genuinely unexpected faunal elements such as *A. calcarispina* but also due to incorrect historical reports of Palaearctic taxa which are far outside their known range (e.g. Magretti 1906; Wood and Bossert 2026). Substantial revisionary efforts in this region remain necessary.

Despite its still limited baseline of historical study (e.g. Friese 1915; around 210 species listed by Ascher and Pickering 2026), Ethiopian bee diversity is expected to be high; the expected faunal richness was recently estimated to be between 310–333 species (Dorey et al. 2026). Whilst it is very unlikely to approach the levels of bee diversity seen in southern Africa, the geographical and climatic diversity present in the country will certainly host many currently unrecognised and likely endemic bee species (Michez and Pauly 2012; Kuhlmann and Pauly 2013). New species described from Ethiopia including bees from lineages restricted to the Afrotropics often display remarkably distinct morphological characters (e.g. Wood 2025b),

indicating that the fauna is substantially underworked and understudied rather than hosting a subtly distinct fauna that requires detailed and focused study per se.

Michez and Pauly (2012) suggested that the presence of more typically Palaearctic faunal elements in Ethiopia probably represents more recent newcomers to the country due to the proximity of the Palaearctic region. In the case of *A. calcarispina*, our lack of a modern dated phylogeny for *Anthophora* (see Orr et al. 2022) severely limits our ability to investigate biogeographical hypotheses. Recent taxon-dense phylogenetic sampling in Nomiine bees allowed for strong confidence in an Old World and probably Afrotropical origin (Bossert et al. 2024), providing clarity in an uncertain group with ambiguous lines of evidence as to their evolutionary history. The limited data available for *Anthophora* (*Caranthophora*) suggests that it may be relatively basal within Old World *Anthophora* (Orr et al. 2022), and renewed sampling is essential for an equivalent understanding of this species-rich bee lineage.

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Additional information

Conflict of interest

The author has declared that no competing interests exist.

Ethical statement

No ethical statement was reported.

Artificial Intelligence (AI) use

The author accepts full responsibility for the content of the manuscript, including the disclosure of any use of AI.

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Author contributions

The author solely contributed to this work.

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Data availability

All of the data that support the findings of this study are available in the main text or Supplementary Information.

Supplementary material 1

Full records for all *Anthophora* (*Caranthophora*) specimens examined for this work

Author: Thomas J. Wood

Data type: xlsx

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