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New records of bee flies (Bombyliidae, Diptera) from the United Arab Emirates

Huw Roberts¹ and Magdi S. A. El-Hawagry^{2*}

Abstract

Background Bombyliidae, a large Dipteran family, includes over 5380 species globally. Adults are frequently the primary pollinators of a wide variety of flowering plants, and larvae are predators of other holometabolous insects' immature stages. While 50 species of the family have been recorded in the UAE, a comparison with recent studies in neighboring countries suggests that this number underestimates the true diversity of Bombyliid fauna in the UAE.

Results In the present study, eleven species, classified in nine genera, five tribes, and three subfamilies are added to the UAE's bombyliid fauna for the first time. These species are *Geron* (*Geron*) *gibbosus* (Olivier, 1789) [subfamily Toxophorinae], *Heterotropus aegyptiacus* Paramonov, 1929, *H. bisglaucus* Bezzi, 1925 [subfamily Heterotropinae], *Anthrax dentatus* (Becker, 1906), *A. zohrayensis* El-Hawagry, 2002, *Satyramoeba bipunctata* (Fabricius, 1805), *Spogostylum incisurale* (Macquart, 1840), *Heteralonia (Zygodipla) submucoea* Greathead, 1980, *Exhyalanthrax triangularis* (Bezzi, 1924), *Petrorossia letho* (Wiedemann, 1828), and *Xeramoeba* near *salvae* El Hawagry, 2001 [subfamily Anthracinae]. Three of the genera, *Geron*, *Heterotropus* and *Satyramoeba*, and two of the subfamilies, Toxophorinae and Heterotropinae, are recorded for the first time in the UAE. Distributions, diagnoses, remarks on feeding habits and photographs of recorded species are provided.

Conclusion The present study adds eleven species to the UAE's bombyliid fauna, classified in nine genera, five tribes, and three subfamilies. This boosts the overall recorded number of bombyliid species in the UAE to 61 species.

Keywords United Arab Emirates, Fauna, Bee flies, Diagnosis, Distribution, New records, Hosts, Parasitoids

Background

Bee flies (Bombyliidae) constitute one of the largest lower brachycerous families in the order Diptera, with more than 5380 described species. These flies are well represented almost in all continents, making up a significant component of the fly diversity in arid and semiarid regions (Pape et al. 2011).

Adult bee flies are frequently the primary pollinators of a wide variety of flowering plants, particularly in arid

environments. They are often observed feeding on nectar, and females consume pollen as the primary food source, which is essential for the developing ova's nourishment (Evenhuis and Greathead 1999). However, most larvae of bee flies are either endo- or ectoparasitoids of other holometabolous insects' immature stages (Kits et al. 2008). Some bee fly species are known as predators, preying on the egg pods of orthopterans (Evenhuis and Greathead 1999) or the larvae of other small insects (Yeates and Greathead 1997). Therefore, these flies might be used as biological control agents.

No extensive faunistic or systematic studies on the family Bombyliidae have been previously carried out in the United Arab Emirates (UAE), and no comprehensive surveys have been carried out in the country before the present study. Greathead (1980b, 1988) published two papers that reviewed the family Bombyliidae in the

*Correspondence:

Magdi S. A. El-Hawagry
elhawagry@cu.edu.eg

¹ College of Humanities and Social Sciences, UAE University, PO Box 15551, Al Ain, United Arab Emirates

² Entomology Department, Faculty of Science, Cairo University, PO Box 12613, Giza, Egypt

Arabian Peninsula, focusing primarily on Saudi Arabia. These papers were based mainly on collections made by entomologists involved in locust surveys. Both reviews documented some records of bee fly species from the UAE. These records were supplemented with records from Evenhuis and Greathead (1999) and assembled into a country list in Van Harten (2005) and later Howarth and Gillett (2008).

The present study adds records of bee flies from montane habitats in the UAE. This country is situated at the intersection between the Afrotropical and Palaearctic zoogeographic regions (Mohamadzade Namin and Roberts 2020), although the country's fauna often holds significant elements originating in the Oriental or Indo-Malayan Region (Hölzel 1998).

Regarding individual southern Arabian countries' biogeographical affinities, there appears to be little consensus about the northern boundary or extent of the Afrotropical Region (El-Hawagry et al. 2020). Crosskey (1980) deemed only Yemen from the Arabian Peninsula as belonging to the Afro-tropical Region, and assigned all other countries in the peninsula including the UAE to the Palaearctic Region. However, many other researchers (Kirk-Spriggs and Sinclair 2017; El-Hawagry and Al Dhafer 2019) considered the UAE, Yemen, and Oman as Afrotropical countries.

Methods

Material for the present study was collected using a standard sweeping net at Ain Al Waal, Al Ain, Abu Dhabi, UAE, the main site of the study (Fig. 1). Collections were carried out by the first author, from 2014 to 2024. Exceptionally, two species, *Geron gibbosus* (Olivier, 1789) and *Satyramoeba bipunctata* (Fabricius, 1805) were collected from Al Hayl, Fujairah, and Al Ghail Walking Trail Summit, Sharjah, UAE, respectively.

Species were identified by the second author using relevant keys and original descriptions. Photographs of *Satyramoeba bipunctata* (Fabricius, 1805) were also checked by Dr. Neal Evenhuis (personal communication).

Collected specimens were preserved in Huw Roberts' personal collection (HRCA) in Al Ain, the UAE and in Magdi El-Hawagry's personal collection (MSHC) in Faculty of Science, Cairo University, Egypt.

Terminology used in diagnoses follows Cumming and Wood (2017).

The concept that the UAE, Yemen, and Oman are all parts of the Afrotropical Region, as regarded in the Manual of Afrotropical Diptera (Kirk-Spriggs & Sinclair 2017), is considered in the present study.

Specimens were pinned and stack photos were taken by the first author using Nikon D850 body, using Laowa 25mm f/2.8 2.5-5X ultra-macro lens and Laowa 60mm f/2.8 2X ultra-macro lens.



Fig. 1 Map of UAE showing the study areas

Results

Subfamily TOXOPHORINAE

TRIBE GERONTINI

Genus *Geron* Meigen

Geron (*Geron*) *gibbosus* (Olivier, 1789)

Bombylius gibbosus Olivier, 1789: 329. Type locality: France.

Distribution: AF: UAE (first record). PA: France, Greece, Israel, Spain, Turkey.

Material examined: 1 male, Wadi Al Hayl, Fujairah, UAE (25.082N, 56.225E) Roberts leg.; 1 female, Ain Al Waal, Abu Dhabi, UAE (24.067N, 55.748E) 21.iii.2023 Roberts leg.

Diagnosis:

Male (Fig. 2): About 5 mm in length; dorsal half of occiput, thorax and abdomen black; lower half of occiput and genae covered with gray tomentum; body covered with whitish long fine hairs and scattered scales; frons almost entirely bare, with gray tomentum at sides; antennae black, with apices of scape and pedicel brownish, with whitish hairs on scape and pedicel; face black and

bare at middle, with pure white scales and long scaly hairs at margins; proboscis black, elongate, longer than head; thorax notably humped; wings hyaline; origin of vein R_4 distal to apex cross-vein $m-m$; cross-vein $r-m$ situated well after the middle of discal medial cell (dm); legs mainly black, brownish in tibiae and metatarsi, covered with white scales; tibiae with black spicules. Female (Fig. 3): About 4.5 mm in length; body color as in male, however, with gray tomentum on frons, pleurae, anterior sides of scutum, and on the middle anterior part of scutum forming a gray median stripe; frons covered with whitish scales which become dense at sides and slightly yellowish at middle.

Remarks This is the first time to record the genus *Geron*, the tribe Gerontini and the Subfamily Toxophorinae in the UAE. *Geron* spp. are known as endoparasitoids in larvae or pupae of lepidopteran families Noctuidae, Psychidae, Pyralidae and Tortricidae, also as hyperparasitoids in cocoons and puparia of ichneumonid wasps and tachinid flies (Du Merle 1975; Yeates and Greathead 1997).

Subfamily HETEROTROPINAE

Genus *Heterotropus* Loew

Heterotropus aegyptiacus Paramonov, 1929

Heterotropus aegyptiacus Paramonov, 1929: 131(70).

Type locality: Egypt.

Distribution: AF: Egypt [as "Gebel Elba"], Saudi Arabia [as "South western part"], Sudan, UAE (first record). PA: Egypt.

Material examined: 1 male, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 17.iv.2020 Roberts leg.

Diagnosis:

Male (Fig. 4): About 5 mm in length; body yellowish-white in general, almost blackish dorsally, rather bare, lacking bristles and scales, and mostly covered with whitish pubescence; proboscis dark brown to black, as long as or slightly longer than head; antennae with scape and pedicel yellowish-white, often dark brownish dorsally, and the flagellomere yellowish-brown, blackish apically, elongate and narrow; mesonotum with three conspicuous broad blackish longitudinal stripes, with the median one separated from the lateral ones along its entire length by a narrow yellowish-white stripe on either side; scutellum yellowish-white, with grayish tinge; all legs yellowish-white except at least three blackish apical tarsomeres; tibiae spurless; apical tarsomere slightly broader than the preceding tarsomeres; discal medial cell (dm) very wide opposite $r-m$ cross-vein; posterior cubital cell (cup) closed; almost all abdominal tergites black, yellowish-white at sides and narrow posterior margins.

Remarks This is the first time to record the genus *Heterotropus* and the subfamily Heterotropinae in the UAE.

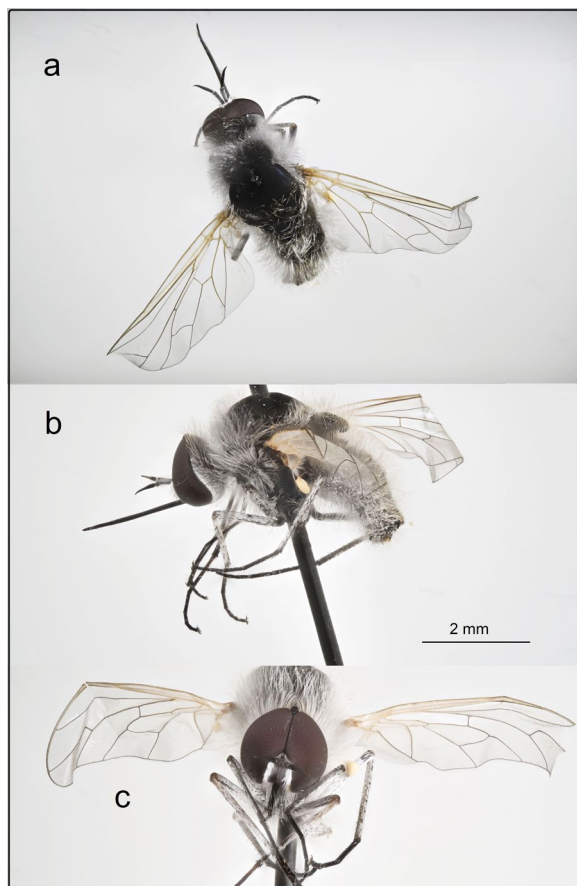


Fig. 2 Male *Geron gibbosus* (Olivier, 1789). **a** habitus, dorsal view. **b** habitus, lateral view. **c** frontal view. Photographs: H. Roberts

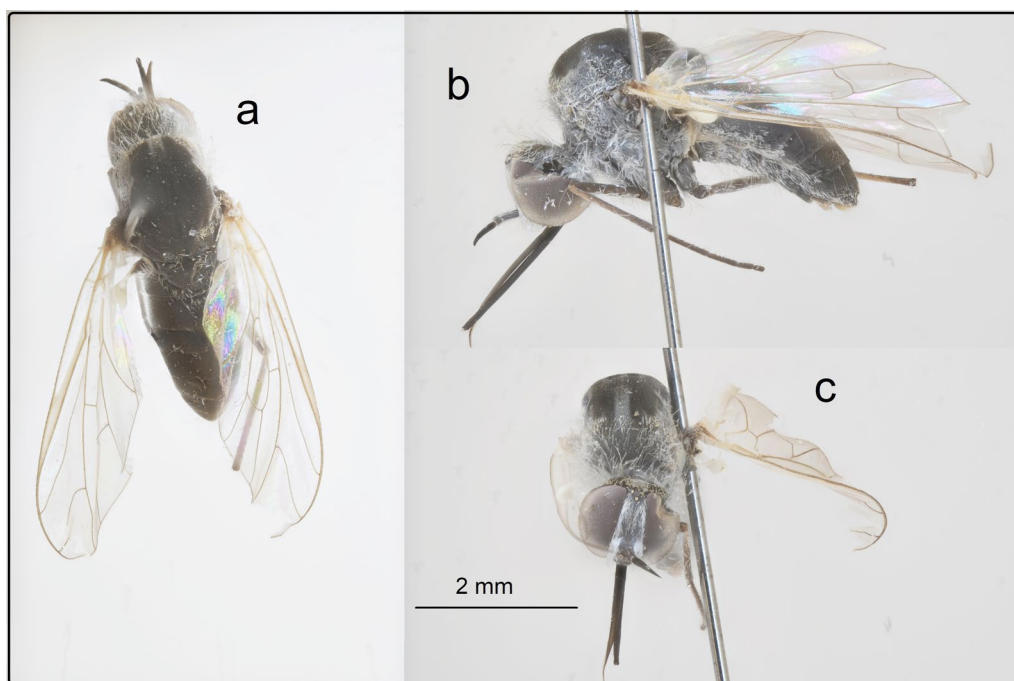


Fig. 3 Female *Geron gibbosus* (Olivier, 1789). **a** habitus, dorsal view. **b** habitus, lateral view. **c** frontal view. Photographs: H. Roberts

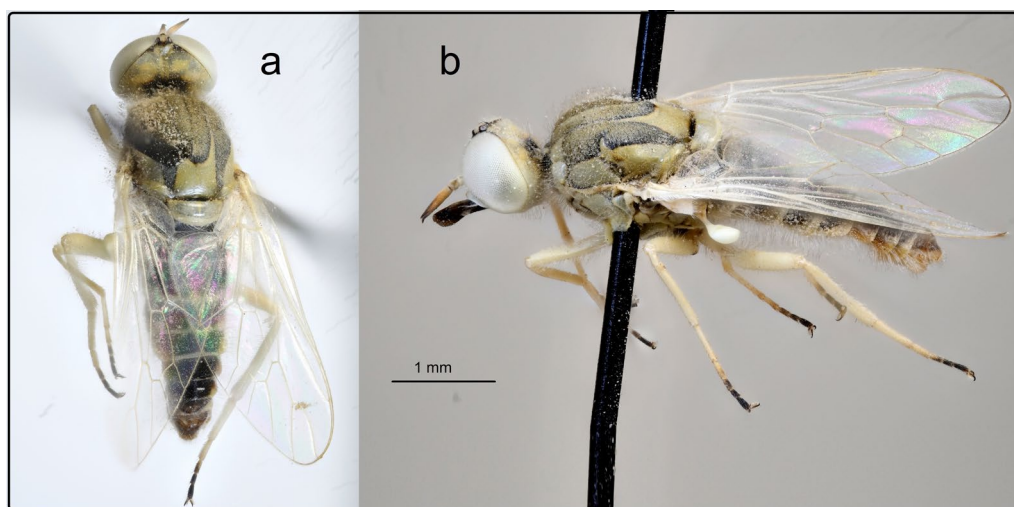


Fig. 4 Male *Heterotropus aegyptiacus* Paramonov, 1929. **a** habitus, dorsal view. **b** habitus, lateral view. Photographs: H. Roberts

This species, like all species of the genus *Heterotropus*, is a predator (Yeates and Irwin 1992; Yeates and Greathead 1997).

***Heterotropus bisglaucus* Bezzi, 1925**

Heterotropus bisglaucus Bezzi, 1925: 184. Type locality: Egypt.

Distribution: AF: UAE (first record). PA: Egypt, Saudi Arabia.

Material examined: 1 male, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 5.iii.2022 Roberts leg.

Diagnosis:

Male (Fig. 5): This species can be easily distinguished by the short yellowish-brown proboscis, and by the broad blackish longitudinal stripes on scutum which are obscured by pubescence, with the median stripe obviously separated from the lateral ones only on the posterior third of the scutum; all legs yellowish except two

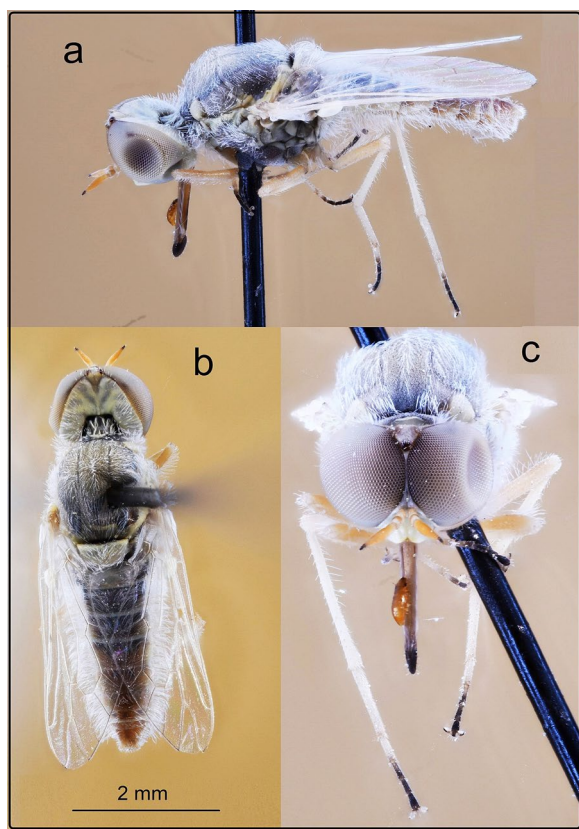


Fig. 5 Male *Heterotropus bisglaucus* Bezzi, 1925. **a** habitus, lateral view. **b** habitus, dorsal view. **c** frontal view. Photographs: H. Roberts

or three blackish apical tarsomeres; abdomen yellowish, with a very broad transverse blackish spot on each of 2nd to 6th tergites, lower borders of these spots don't touch the lower margins of tergites.

Remarks This species, like all species of the genus *Heterotropus*, is a predator (Yeates and Irwin 1992; Yeates and Greathead 1997).

Subfamily ANTHRACINAE

Tribe ANTHRACINI

Genus *Anthrax* Scopoli

Anthrax dentatus (Becker, 1906)

Argyromoeba dentata Becker, 1906: 148. Type locality: Tunisia.

Distribution: AF: Chad, Eritrea, Kenya, Saudi Arabia [as "South western part"], Seychelles, Tanzania, UAE (first record), Yemen. PA: Algeria, Andorra, Egypt, Hungary, Israel, Italy (incl. Sicily), Libya, Malta, Morocco, Palestine (West Bank), Spain, Tunisia and Vietnam.

Material examined: 1 female, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 16.ix.2020 Roberts leg.

Diagnosis:

Female (Fig. 6): About 7.5 mm in length. This species can be easily distinguished by the solid dark-brown basicoastal infuscation, with the spot on cross-vein *r-m* usually continuous with this infuscation, and infuscation of cell *cup* exceeds cross-vein *bm-cu*. For more diagnostic characters, see El-Hawagry (2021).

Remarks All *Anthrax* spp. are known as ectoparasitoids or endoparasitoids of larvae and pupae of antlions, wasps, bees and cicindelid beetles (Yeates and Greathead 1997).

Anthrax zohrayensis El-Hawagry, 2002

Anthrax zohrayensis El-Hawagry, 2002: 4. Type locality: Egypt.

Distribution: AF: UAE (first record). PA: Egypt.

Material examined: 2 males, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 8.ii.2019 & 21.i.2021 Roberts leg.

Diagnosis:

Male (Fig. 7): About 11 mm in length. This species can be easily distinguished by the wing which is feebly smoky, without a brown spot on cross-vein *m-m*, and hair tufts at sides of 2nd to 4th tergites bi-colored consisting of black hairs above and white below. For more diagnostic characters, see El-Hawagry (2021).

Remarks All *Anthrax* spp. are known as ectoparasitoids or endoparasitoids of larvae and pupae of antlions, wasps, bees and cicindelid beetles (Yeates and Greathead 1997).

Genus *Satyramoeba* Sack

Satyramoeba bipunctata (Fabricius, 1805)

Anthrax bipunctata Fabricius, 1805: 118. Type locality: India.

Distribution: AF: UAE (first record). OR: Bangladesh, India, Pakistan.

Material examined: 2 females, Al Ghail Walking Trail Summit, Sharjah, UAE (25.006N, 56.310E) 25.3.2023 & 21.4.2023 Roberts leg.

Diagnosis:

Female (Fig. 8): Large species, about 15–16 mm in length, predominantly black; scape short and cylindrical; pedicel globular, half the length of scape, not molded to flagellum as in the genus *Anthrax*; however, flagellum, not as in *Anthrax* spp., conical, and large, almost two times as long as scape and pedicel combined; pleura, posterior calli and central area of scutellum dark brown; wing completely infuscated brownish, with infuscation more darker at base, extending to end of vein R_1 and middles of cells r_1 , r_{2+3} and r_5 ; fading at wing margin; costal cell and squama extremely dark brown; abdomen

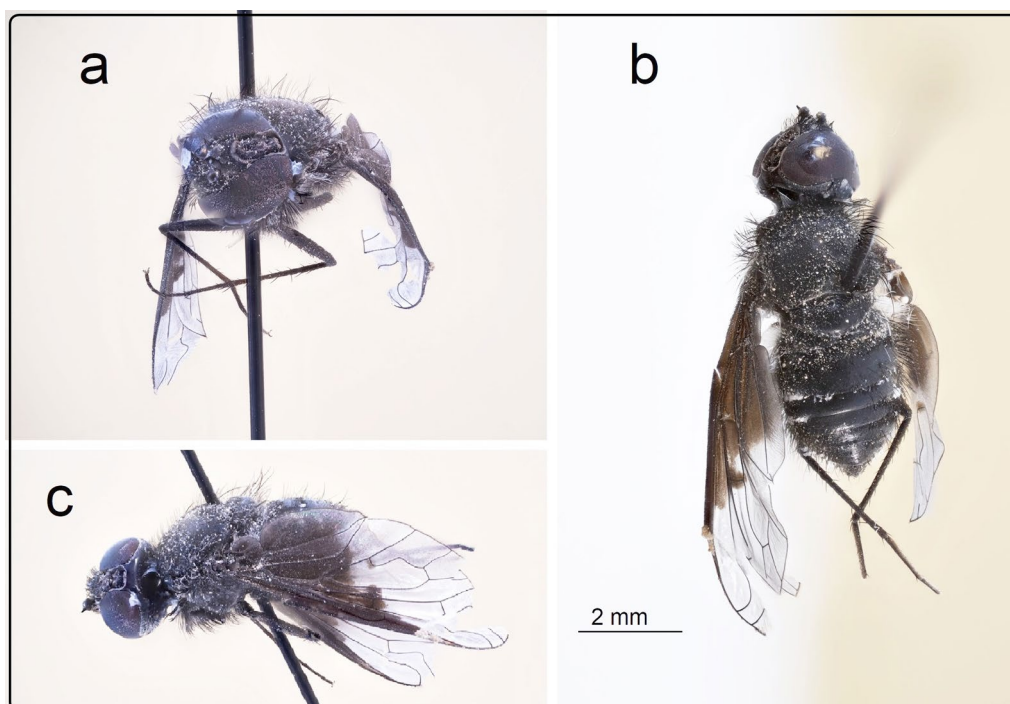


Fig. 6 Female *Anthrax dentatus* (Becker, 1906). **a** frontal view. **b** habitus, dorsal view. **c** habitus, lateral view. Photographs: H. Roberts

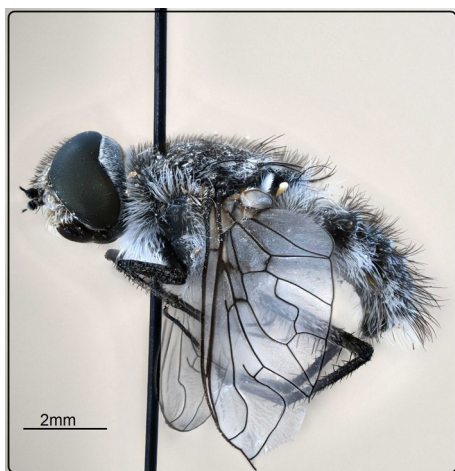


Fig. 7 Male *Anthrax zohrayensis* El-Hawagry, 2002, habitus, lateral view. Photograph: H. Roberts

triangular, black, with two patches of pure white scales on posterior sides of 1st tergite.

Remarks This is the second record of the species outside the Oriental or Indo-Malayan Region, having once been recorded in southern Iran (Havaskary et al. 2011). It is also the first time to record the genus *Satyramoeba* in UAE. This species is probably a parasitoid of *Xylocopa*

bees (Yeates and Greathead 1997) of which one, *Xylocopa sulcatipes* (Maa) has been observed near the site.

Genus *Spogostylum* Macquart

***Spogostylum incisurale* (Macquart, 1840)**

Anthrax incisuralis Macquart, 1840: 57. Type locality: South Africa.

Distribution: AF: Botswana, Egypt [as "Gebel Elba"], Lesotho, Malawi, Mozambique, Namibia, South Africa, Tanzania, UAE (first record), Uganda, Zambia, Zimbabwe. PA: Egypt.

Material examined: 1 female, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 18.i.2019 Roberts leg.

Diagnosis:

Female: Medium-sized, about 8 mm; frons and face grayish-white dusted; frons with yellowish-white scaly hairs mixed with black hairs; lower part of face with yellowish-white hairs, mixed with some broad scales; occiput covered with dense white scaly hairs; thoracic dorsum including scutellum covered with whitish-yellow scaly hairs, that become paler at posterior margin of scutellum, almost become white; legs with black femora, brownish tibiae and brownish-black tarsi; scaly coating of legs white; wing hyaline with some indistinct spots especially on *r-m* cross-vein and origin of vein R_{2+3} ; sides of 1st abdominal tergite and anterior corners of 2nd one with protruded white hairs; posterior angles of

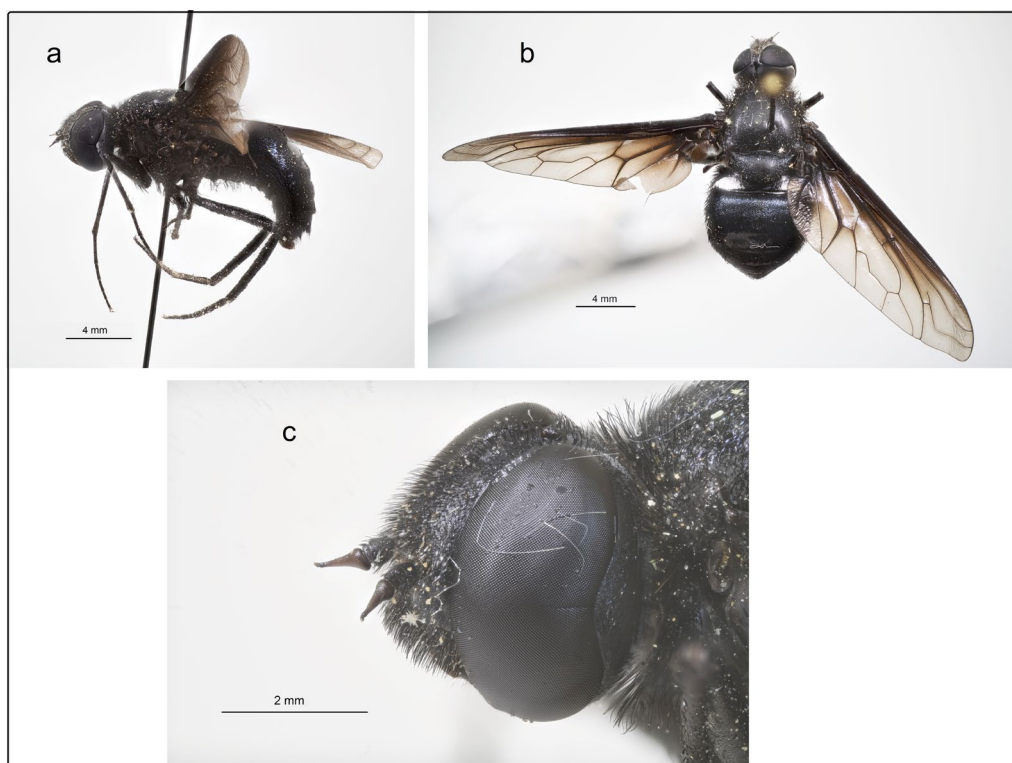


Fig. 8 Female *Satyramoeba bipunctata* (Fabricius, 1805). **a** habitus, lateral view. **b** habitus, dorsal view. **c** head, lateral view. Photographs: H. Roberts.

2nd tergite and sides of 4th one with tufts of brownish-black hairs or long scaly hairs, while sides of all other tergites covered with yellowish white hairs and white scales, intermixed with many black bristles especially on posterior margins; posterior margins of 1st and 2nd tergites with narrow bands of white and yellowish scales, that also may form more or less distinct transverse bands, or dense spots on following tergites.

Remarks The larvae of this species are known as hyperparasitoids in cocoons of braconid wasps, and ectoparasitoids on larvae and pupae of pyralid moths (Yeates and Greathead 1997).

Tribe Exoprosopini Becker

Genus *Heteralonia* Rondani

Heteralonia (*Zygodipla*) *submucorea* Greathead, 1980

Heteralonia submucorea Greathead, 1980a: 245. Type locality: Oman.

Distribution: AF: Oman, UAE (first record).

Material examined: 1 female, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 25.iv.2020 Roberts leg.

Diagnosis:

Female (Fig. 9): Large species, about 16 mm in length; head black, with face and genae brown; frons, face and

occiput densely covered with white to yellowish-white narrow scales; antennae black, with scape and terminal style reddish; proboscis black; wing infuscated grayish, yellowish-brown at base and fore border, dark brown to blackish-brown at center and on cross veins; cell r_5 closed just before wing margin forming a stalk about quarter cross-vein $m-m$; halter orange-brown, with yellowish-white knob; abdomen densely covered with scales, which are predominantly ochreous on dorsal surface, whitish at sides, posterior margins of tergites and on sternites; second abdominal tergite with a distinct transverse band of white scales on basal half, and with ochreous scales on the apical half.

Remarks Host of this species is unknown; however, one unidentified *Heteralonia* sp. has been recorded from the cocoon of a spider wasp (family: Pompilidae) (Yeates and Greathead 1997). Another doubtful record from a locust has been recorded by Du Merle (1975).

Tribe VILLINI

Genus *Exhyalanthrax* Becker

Exhyalanthrax triangularis (Bezzi, 1924)

Thyridanthrax triangularis Bezzi, 1924: 195. Type locality: Yemen.

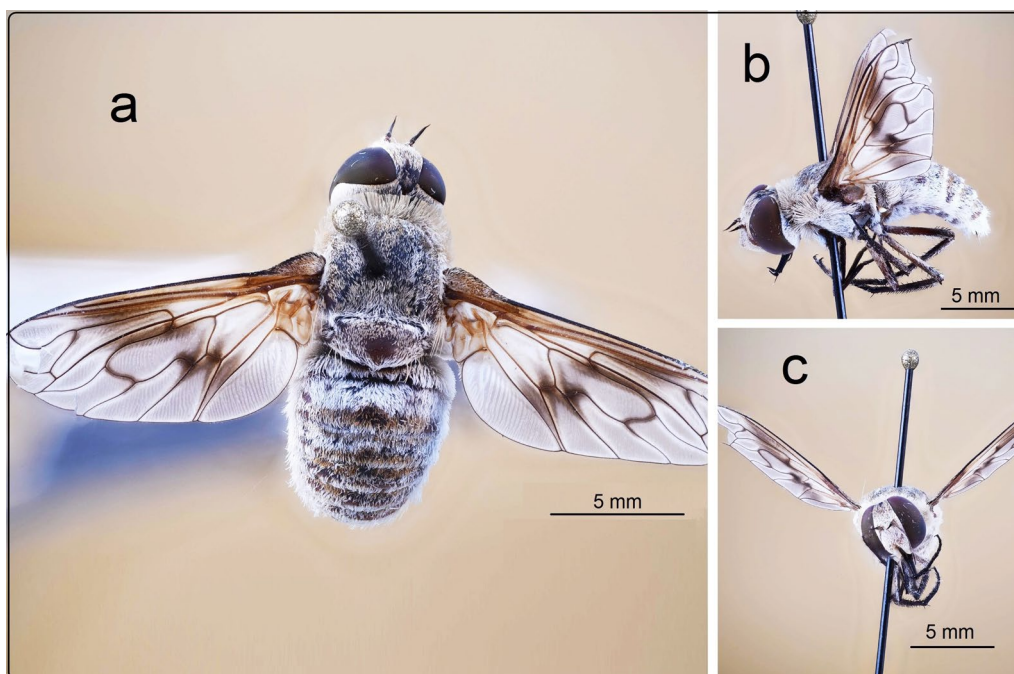


Fig. 9 Female *Heteralonia submucoorea* Greathead, 1980. **a** habitus, dorsal view. **b** habitus, lateral view. **c** frontal view. Photographs: H. Roberts.

Distribution: AF: Saudi Arabia [as “South western part”], UAE (first record), Yemen.

Material examined: 1 female, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 1.x.2014 Roberts leg.

Diagnosis:

Female: Medium-sized, 9 mm in length; frons narrow above, about two times as broad as ocellar tubercle, with erect black hairs, and with sparse yellowish scales become more dense above antennae; face with sparse yellowish scales; occiput at upper and lateral margins of eyes with white scales; antennae dark brown to black; scutum and scutellum black, covered with sparse yellowish scales, become more abundant anteriorly and at posterior border of scutum before scutellum and at anterior border of scutellum; scutum with fore margin (collar) fringed with long yellowish hairs, and lateral margins with white scales and scaly hairs forming two lateral stripes; bristles black; pleura with long pale-yellow hairs especially on upper anterior half; wings entirely hyaline, with faint pale-yellowish infuscation at base and fore border; alula with white fringe; cross-vein *r-m* placed at basal third of discal medial cell (*dm*); cell *r*₅ opened, slightly narrowed at wing margin; cross-vein *m-m* parallel to wing margin; legs entirely brownish-black to black; abdomen black; tergites with basal half clothed with white scales forming white transverse bands especially in first three tergites, and apical half with sparse black scales; 4th tergite with

yellowish scales especially at sides; scales and hairs on abdominal sternites pale-yellow to white.

Remarks Most *Exhyalanthrax* spp. are parasitoids in puparia of Diptera including tsetse flies and fruit flies. Some species were also recorded on cocoons of Ichneumonidae as well as on lepidopteran and diprionid hosts (Yeates and Greathead 1997).

Tribe XERAMOEBINI

Genus *Petrorossia* Bezzi

***Petrorossia letho* (Wiedemann, 1828)**

Anthrax letho Wiedemann, 1828: 566. Type locality: Nubien (Egypt or Sudan).

Distribution: AF: Benin, Chad, Egypt [as “Gebel Elba”], Eritrea, Ethiopia, Kenya, Saudi Arabia [as “South western part”], Somalia, Sudan, UAE (first record). PA: Afghanistan, Algeria, Austria, Bosnia-Herzegovina, Bulgaria, Croatia, Egypt, France, Iran, Italy, Libya, Macedonia, Russia, Saudi Arabia, Slovenia, Spain, Tajikistan, Turkey, Turkmenistan, Uzbekistan, former Yugoslavia.

Material examined: 1 female, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 12.xi.2014 Roberts leg.

Diagnosis:

Female: About 5 mm in length; body generally dark brown to black, with head and sides of mesonotum gray dusted; body covered with yellowish-white fine tomentum; frons with white hairs; antennae black, with white

hairs on scape; legs including femora entirely yellow, except at least three blackish apical tarsomeres, and fore femora may be slightly darkened at upper half; wings hyaline, infuscated yellowish at base and fore border; cross-vein *r-m* situated slightly after basal third of discal medial cell (*dm*); abdomen yellow to reddish at sides, without transverse bands on tergites.

Remarks *Petrorossia* spp. are known as predators of spider eggs and ectoparasitoids of solitary bees and wasps and puparia of tsetse flies (*Glossina* spp.) (Yeates and Greathead 1997).

Genus *Xeramoeba* Hesse

Xeramoeba near *salwae* El Hawagry, 2001

Xeramoeba salwae El Hawagry, 2001: 156. Type locality: Egypt.

Distribution of *X. salwae*: PA: Egypt.

Material examined: 1 female, Ain Al Waal, Al Ain, Abu Dhabi, UAE (24.067N, 55.748E) 11.iii.2022 Roberts leg.

Diagnosis:

Female (Fig. 10): A robust *Xeramoeba* species, about 8 mm in length; frons 3 times as wide as ocellar tubercle, dusted gray and covered with white hairs; hairs on scape and face long, coarse and white or slightly yellowish; all hairs and scaly hairs on thorax yellowish-white to white;

legs yellowish-brown except at least four blackish apical tarsomeres; wings hyaline, slightly yellowish at base; squama white, fringed with white hairs; abdomen entirely black, with posterior borders of tergites yellowish-brown; abdominal hairs and scales yellowish-white to white.

Remarks Femora in *X. salwae* are blackish; however, they are wholly yellowish-brown in the present species. Unfortunately, we have only one female, and dissection of male genitalia is required to confirm the identification.

Xeramoeba spp. are known to predate eggs of Acrididae (Orthoptera), Bombyliidae (Diptera) and Meloidae (Coleoptera). Some are known as ectoparasitoids of pupae of Noctuidae (Lepidoptera) (Yeates and Greathead 1997).

Discussion

The present 11 species are treated herein only because this is the first time to be recorded in the UAE fauna. However, these species were collected among other bee fly species that have been previously recorded in the UAE, and which are not listed in this paper. Almost all were collected as part of a comprehensive study of a small and restricted area in the country, Ain Al Waal, a mountainside area along the west flank of Jebel Hafeet,

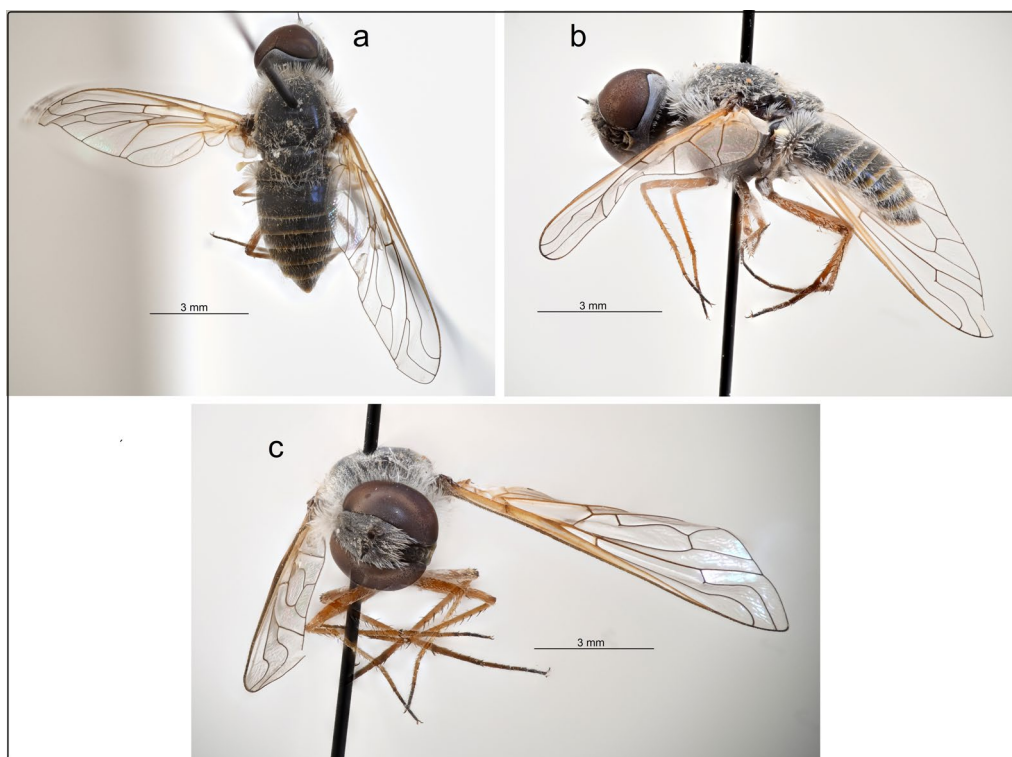


Fig. 10 Female *Xeramoeba* near *salwae* El Hawagry, 2001. **a** habitus, dorsal view. **b** habitus, lateral view. **c** frontal view. Photographs: H. Roberts.

a massif just south of Al Ain. The number of species collected during the present study, including the newly recorded ones, along with the 50 species documented by Greathead (1980b, 1988) and Evenhuis and Greathead (1999), reflects the high diversity of the family Bombyliidae in the UAE. This high diversity can be deduced in the UAE when compared to a larger neighboring country such as Saudi Arabia, where only 116 bee fly species have been recorded after more extensive collections for many years (El-Hawagry and Al Dhafer 2019). Further dedicated studies across various habitats in the UAE could potentially reveal a significantly higher number of species in the future.

The geographical affinities of the current bee fly species support the assertion that the UAE is situated at a transitional zone between the Palaearctic and Afrotropical regions, as 3 species are affiliated to both regions. Of the remaining species, 4 were more closely affiliated to the Afrotropical Region, while 3 were more associated with the Palaearctic Region. The Oriental or Indo-Malayan Region (Hölzel 1998) is represented in the present study by *Satyramoeba bipunctata* (Fabricius, 1805) which is predominantly an Oriental species, known from Bangladesh, India and Pakistan, with only one Palaearctic record from Iran.

Conclusions

The present study adds eleven species to the UAE's bombyliid fauna, classified in nine genera, five tribes, and three subfamilies. This boosts the overall number of recorded bombyliid species in the UAE to 61 species. These species are *Geron* (*Geron*) *gibbosus* (Olivier, 1789) [subfamily Toxophorinae], *Heterotropus aegyptiacus* Paramonov, 1929, *H. bisglaucus* Bezzi, 1925 [subfamily Heterotropinae], *Anthrax dentatus* (Becker, 1906), *A. zohrayensis* El-Hawagry, 2002, *Satyramoeba bipunctata* (Fabricius, 1805), *Spogostylum incisurale* (Macquart, 1840), *Heteralonia* (*Zygodipla*) *submucorea* Greathead 1980, *Exhyalanthrax triangularis* (Bezzi, 1924), *Petrorossia letho* (Wiedemann, 1828), and *Xeramoeba* near *salwae* El Hawagry, 2001 [subfamily Anthracinae]. Three of the genera, *Geron*, *Heterotropus* and *Satyramoeba*, and two of the subfamilies, Toxophorinae and Heterotropinae, are recorded for the first time in the.

Abbreviations

AF	Afrotropical
HRCAs	Huw Roberts' personal collection in Al Ain, the UAE
MSHC	Magdi El-Hawagry's personal collection in Faculty of Science, Cairo University, Egypt
OR	Oriental Region
PA	Palaearctic Region

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Author contributions

HR collected, pinned, photographed flies, participated in drafting the manuscript. MS identified flies, drafted the manuscript. Both authors participated in the study design and coordination, interpreted the data, and have read and approved the manuscript.

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Declarations

Ethics approval and consent to participate

Not applicable.

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