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Research article

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Some Afrotropical species of *Atherigona* Rondani (Diptera: Muscidae) revisited and a new species described

John C. DEEMING

Honorary Research Fellow, National Museum of Wales, Cardiff, CF10 3NP, United Kingdom.

Email: john.deeming@honorary.museumwales.ac.uk

urn:lsid:zoobank.org:author:B8B9E727-C28B-458A-B48C-40D14A95999C

Abstract. New taxonomic data on some species of *Atherigona* Rondani are provided. This is partly based on recently discovered types of *A. laevigata* (Loew), *A. maculipennis* Stein, *A. magnipalpis* Stein, *A. nigrithorax* Stein and *A. subnigripes* (Karsch), and partly on new material that has become available. Among this new material is a new species here described: *Atherigona zongoi* sp. nov. The newly discovered types of *Atherigona nigrithorax* Stein and *A. subnigripes* (Karsch) are redescribed. The status of a specimen of *Coenosia humeralis* found among material in the Smithsonian Institution and incorrectly labelled as the type of *Atherigona humeralis* is clarified. The puparium of *A. varia* (Meigen) is partially described for the first time. New records are given for several species and distribution is updated.

Keywords. *Atherigona*, new species, female descriptions, re-descriptions, new records, distribution, Afrotropical.

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Introduction

Atherigona Rondani, 1856 is a large genus of muscid flies of the Old World. About 260 species have been described. All are distributed across most temperate and tropical areas where the host plants (Poaceae) grow even though species of the subgenus *Acritochaeta* Grimshaw, 1901 are predatory on soft bodied insects in a variety of organic material, including infested fruits. The genus is absent from the colder regions and it is most species-rich in the tropics and subtropics of the Old World and the few species present in the New World are the result of inadvertent human introduction. Some species are of significant agricultural importance through damage both in cultivated cereals and in grassland pasture. As a result, this genus has long attracted taxonomic interest but some old type material was presumed lost.

Deeming (1971: 183) in reporting on *Atherigona* spp. of which the types were not to be found in their institutions of deposition, listed *A. subnigripes* (Karsch, 1888). Since then a box of *Atherigona* which included some types among all the specimens borrowed from the Museum für Naturkunde Berlin has been found in the Smithsonian Institution, Washington, probably following the death of the borrower.

Through the kind agreement of the Museum für Naturkunde Berlin I have been able to examine them. From these and other collections, comments on structural and colour variation are given, the undescribed females of certain species described, a new species described and further distributional data of known species recorded.

The most diagnostic character of species of *Atherigona* s. str. is found in the males. All males have a ‘trifoliate process’, which is a long-stemmed structure usually bearing three apical lobes, but rarely of a more complicated structure and is derived from the cercal plate (which is of simple structure in the subgenus *Acritochaeta*). In addition to this most species have a dorsally-situated pre-epandrial knob of structure varying according to species, which is termed the ‘hypopygial prominence’. The trifoliate process varies greatly between species in its structure, colouration and setation, all of which present useful diagnostic features. Being an emblem of identity it is used in an elaborate courtship dance described of *Atherigona laevigata* (Loew, 1852) by Deeming (1971: 148). There often being a large number of species occupying a habitat in which there is a great diversity of grass species, this serves to prevent cross-mating between species. When a courtship dance was first observed in *Atherigona*, it was apparent that the trifoliate process was integral to this (Ramachandra Rao 1924). He presented photographs of the then undescribed *Atherigona naqvii* Steyskal, 1966 (Ramachandra Rao 1924: 332, pl. 33). Although the species was not described at that time it was known as the ‘Sind wheat-stem fly’. Since then many authors have striven to figure trifoliate processes and hypopygial prominences of all known species of which males are known.

Whereas the larvae of *Atherigona* s. str. are exclusively phytophagous, feeding within the shoots of cereal crops and grasses, those of the subgenus *Acritochaeta* are not, being predaceous on other soft-bodied larvae and, in addition to poaceous shoots and stems, occupying a variety of habitats, including tomatoes and other fruits infested by fruit flies. Larvae and pupae may be identified as belonging to a subgenus by the structure of the mandibular sclerites of the cephaloskeleton, the simple robust form indicating phytophagy and the pincer-like form indicating a predator.

There is no comprehensive revision of the world species and no single key that covers all the described species. The most comprehensive keys are those dealing with the Afrotropical fauna. Deeming (1971) keys all species known at the time, Dike (1989a), Muller (2015) and Muller & Mostovski (2018) give updated keys to parts of the Afrotropical region from where new species were described. Deeming (2019) provides the most updated key to fauna of the Malagasy Region. The most comprehensive key to species of the Oriental Region is that of the fauna of the Philippines (Pont & Magpayo 1995).

Material and methods

All material here listed is dry-mounted, though much of it has been air-dried from alcohol. Terminology follows Cumming & Wood (2017).

Abbreviations and codens for institutions

BMSAE	=	British Museum Southern Africa Expedition, London, UK
MNB	=	Museum für Naturkunde Berlin, Germany
MNHN	=	Muséum national d’histoire naturelle, Paris, France
NHMUK	=	Natural History Museum, London, UK
NMNW	=	National Museum of Namibia, Windhoek, Namibia
NMSA	=	Kwa-Zulu Natal Museum, Pietermaritzburg, South Africa
NMWC	=	National Museum of Wales, Cardiff, UK
OUMNH	=	Oxford University Museum of Natural History, Oxford, UK

Results

Class Insecta Linnaeus, 1758
Order Diptera Linnaeus, 1758
Suborder Brachycera Schiner, 1862
Superfamily Muscoidea Coquillett, 1901
Family Muscidae Latreille, 1802
Subfamily Atherigoninae Fan, 1965

Genus *Atherigona* Rondani, 1856

Type species

Anthomyia varia Meigen, 1826.

Atherigona (s. str.) *africana* Deeming, 1971

Material examined

BURKINA FASO • 2 ♂♂; Bobo Dioulasso, Farako Bâ; Jul.–Nov. 1989; J. Zongo leg.; fish meal bait in sorghum plot; NMWC.

MALI • 1 ♂; Yanfolila; 19 Sep.–7 Oct. 1986; J. Durham leg.; NMWC.

Remarks

Described from both sexes and illustrated from the male. The species was collected in Nigeria (Deeming, 1971: 149–151, figs 24–25).

Distribution

Burkina Faso, Mali, Nigeria.

Atherigona (s. str.) *angustiloba* van Emden, 1956

Material examined

ETHIOPIA • 2 ♂♂; Alemaya; Sep. 1992; S. Gudeta leg.; NMWC.

GUINEA • 1 ♂; Nimba; Jul.–Dec. 1951; Lamotte and Roy leg.; NMWC.

SOUTH AFRICA • 1 ♂; E of Cape Province, Hogsback N of Alice; 2–3 Nov. 1964; B. and P. Stuckenberg leg.; NMSA • 1 ♂; Natal, Richmond; 22 Nov. 1973; F. Zumpt leg.; NMWC.

Remarks

Described (van Emden 1956: 521) from Burundi and further recorded from South Africa (Muller 2015: 859). The Ethiopian material is unusual in that the fore tibia is yellow throughout its length rather than being infuscated on its apical half.

Distribution

Burundi, Ethiopia, Guinea, South Africa.

Atherigona (s. str.) *bifida* Deeming, 1971

Fig. 1a

Material examined

GUINEA • 5 ♂♂, 12 ♀♀; Nimba, “Fôrét du Zié” [Zié Forest]; 1500 m a.s.l.; 6 Jan. 1984; C. Girard leg.; MNHN • 2 ♂♂, 2 ♀♀; same collection data as for preceding; NMWC.

Remarks

Described from a single male from the Mambilla Plateau, Nigeria (Deeming 1971: 173).

Female: apart from sexual characters differing from the male in the following respects: palpus black; scutellum black throughout; pleura black in ground colour with exception of propleuron and anterior one third of anepisternum; all tarsi infuscate; fore femur black on all but extreme base and apex; fore tibia black on apical two thirds of its length; a pair of brownish black spots on tergites 4 and 5, those on 4 longer and more triangular in shape, those on 5 oblong; tergite 8 (Fig. 1a).

Distribution

Guinea, Nigeria.

Atherigona (s. str.) *contrastiloba* Deeming, 1987

Fig. 1b

Material examined

MADAGASCAR • 2 ♂♂, 1 ♀; Toliara (Tulear) Distr., Betioky, Beamalo; 24°08' S, 45°15' E; 21 Feb. 1993; C.C.D. Tingle leg.; NMWC • 6 ♂♂, 8 ♀♀; same collection data as for preceding; 14 Feb. 1993; NMWC.

Remarks

Described from the male sex from Madagascar (Deeming 1987: 23) and additional material (males only) also from several localities in Madagascar was reported by Deeming (2019).

Female: apart from sexual differences differing from the male in the following respects: all tarsi more or less infuscate; fore femur black on all but basal one fifth of its length and on extreme apex; fore tibia black on all but basal one fifth of its length; tergite 1+2 with a dark median vitta, which is connected to a broad transverse band occupying two thirds of the width of dorsum of tergite 2 and its apical half; tergite 3 with an equally broad trapezoid dark marking having rounded shoulders, which is wider at apex than at base and occupies the entire exposed length of the tergite (in some specimens this marking divided by a pair of longitudinal yellow vittae, but whether divided or not a pair of grey dusted vittae giving it the appearance of being so); tergite 4 with a little narrower but similar marking to that of tergite 3, but this always divided by yellow vittae into a dark median vitta bounded on either side by a triangular spot; tergite 5 with a dark median vitta on basal half and a pair of oblong dark spots level with its apex; tergite 8 (Fig. 1b).

Distribution

Madagascar.

Atherigona (s. str.) *corrugata* Deeming, 1979

Material examined

NAMIBIA • 2 ♀♀; Katima Mulilo Distr., Salambala pan; 17°50'00" S, 24°35'58" E; 23–27 Dec. 2002; A.H. and M.K. Kirk-Spriggs leg.; Malaise trap; NMWN.

NIGERIA • 1 ♀; Zaria, Samaru; 29 Jan. 1969; J.C. Deeming leg.; m.v. trap; NMWC.

Remarks

Described from the male sex from Nigeria (Deeming 1979: 34).

Distribution

Namibia, Nigeria.

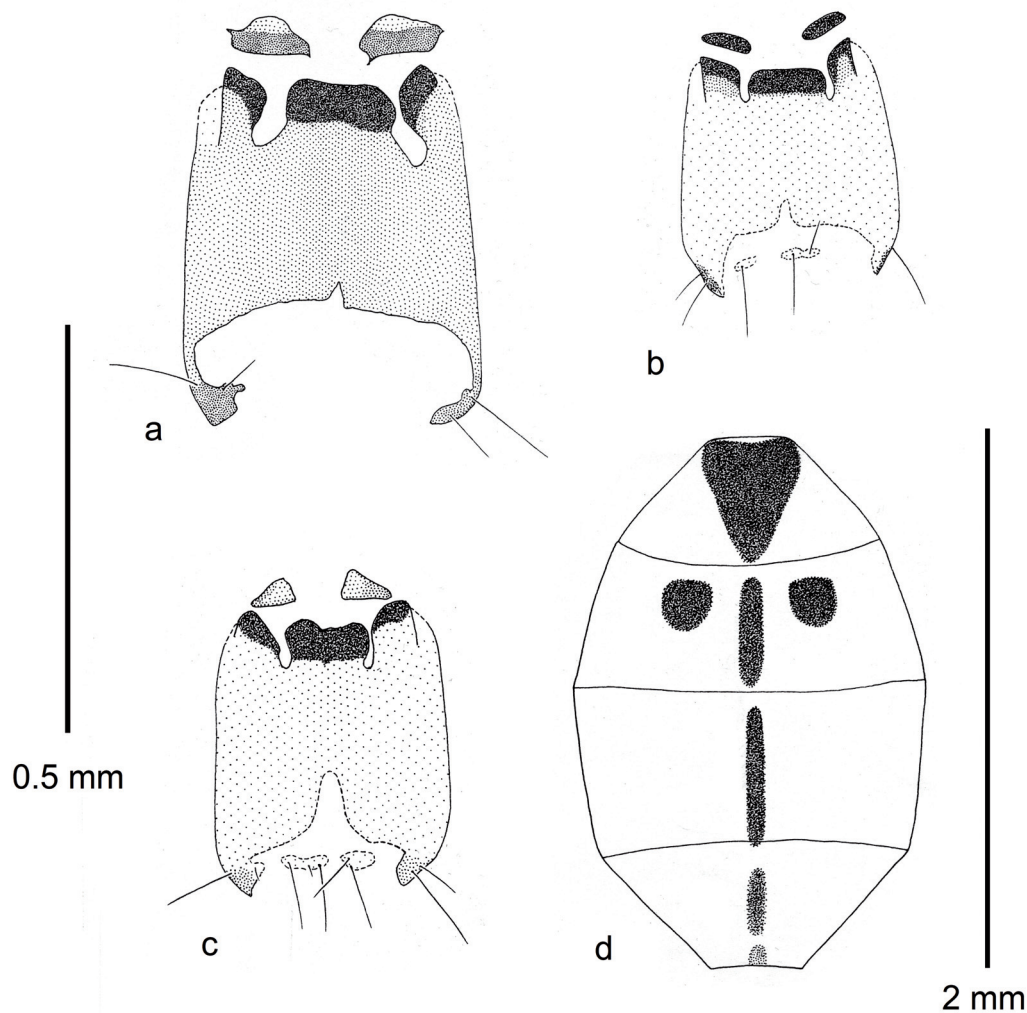


Fig. 1. a–c. Female eighth tergite, dorsal. a. *Atherigona bifida* Deeming, 1971. b. *Atherigona contrastiloba* Deeming, 1987. c. *Atherigona nigrithorax* Stein, 1906. d. *Atherigona nigrithorax*, preabdomen, dorsal.

Atherigona (s. str.) *falcata* (Thomson, 1869)

Coenosia falcata Thomson, 1869: 560. China (Hong Kong).

Atherigona nudiseta Malloch, 1923: 186. India.

Atherigona nudiseta ssp. *megaloba* Fan, 1965: 69. China.

Material examined

ETHIOPIA • 2 ♂♂; Oromo Prov., Debre Zeit; 1800 m a.s.l.; 23 Feb. 2005; M.R. Wilson leg.; Malaise trap in *Pennisetum purpureum* Schumach.; NMWC.

NAMIBIA • 1 ♂; West Caprivi Park, Kwando River Susuwe; 17°45'37" S, 23°20'55" E; 28 Sep.–2 Oct. 1998; A.H. Kirk-Spriggs leg.; Malaise trap, dry woodland; NMNW • 4 ♂♂; Katima Mulilo Distr., Salambala pan; 17°50'00" S, 24°35'58" E; 23–27 Dec. 2002; A.H. and M.K. Kirk-Spriggs leg.; Malaise trap; NMNW • 1 ♂, 3 ♀♀; Caprivi Park, Kwando Meander, Kwando River; 17°50'49" S, 3°18'53" E; 5 Dec. 1999; D.J. Mann leg.; swept from floating vegetation, mainly grasses; OUMNH • 3 ♂♂, 3 ♀♀; same collection data as for preceding; NMWC.

Remarks

Described into the genus *Coenosia* Meigen, 1826 (Thomson 1869: 560), this species has a wide oriental and australasian distribution. A single male was recorded (Deeming 1975: 2) from Ongeama, Namibia. Pont & Magpayo (1995: 43–44) list 22 known hostplants.

The puparium is described by Skidmore (1985: 305, fig. 92g–i).

Distribution

Ethiopia, Namibia, South Africa and widespread Oriental and Australasian Regions.

Atherigona (s. str.) *fililoba* Deeming, 1979

Material examined

BURKINA FASO • 2 ♂♂; Bobo Dioulasso, Farako Bâ; Jul.–Nov. 1989; J. Zongo leg.; fish meal bait in sorghum plot; NMWC.

MALI • 1 ♂; Yanfolila; 19 Sep.–7 Oct. 1986; J. Durham leg.; NMWC.

NIGERIA • 1 ♂; “M.W.” [Mid. West] State, Uhonmora; Nov. 1974; J.T. Medler leg.; NMWC.

Remarks

Described from Nigeria, Cameroun and Ivory Coast (Deeming 1979: 45).

Distribution

Burkina Faso, Cameroun, Ivory Coast, Mali, Nigeria.

Atherigona (s. str.) *humeralis* (Wiedemann, 1830)

Coenosia humeralis Wiedemann, 1830: 441.

Atherigona ferruginea van Emden, 1940: 116. Sudan.

Remarks

Described (Wiedemann 1830: 441) from the Sudan as a species of *Coenosia*, much confusion has arisen in nomenclature between this and related species. The junior synonym *Atherigona* (s. str.) *ferruginea* was also described from the Sudan (van Emden 1940: 116).

At present the synonymy of the two species that have appeared under this name is thus:

- 1) *humeralis* (Wiedemann) (Pont 1986, 1997) (Skidmore 1985, non Hennig 1964, nec auctt.), syn. *ferruginea* van Emden (Pont 1986).
- 2) *bedfordi* van Emden, syn. *humeralis* (Wiedemann) sensu Hennig 1964, et auctt., non Skidmore, 1985, nec Pont, 1986.

Amongst the material discovered in the Smithsonian Institution is a specimen labelled as being the type of *Coenosia humeralis*. This specimen is an *Atherigona* and it is in quite good condition, but teneral, lacking both middle legs and having the one remaining hind leg heavily damaged. It is pinned onto a card mount on a 'continental' pin and bears the following labels:

- 1) blue rectangular "Tete Peters" in copperplate of an unknown hand.
- 2) white rectangular "6618" [or possibly 8199] machine-printed.
- 3) red rectangular "Type" machine-printed.
- 4) blue rectangular "*humeralis* Wied. Loew*" in copperplate as 1 above.
- 5) grey rectangular "*Atherigona varia* Meig. ♂" in Stein's handwriting [this is a simple misidentification, fortunately not introduced into the literature].
- 6) white rectangular "Mus. Berol." [this refers to Museo Regio Berolinensi, the Royal Museum of Berlin, of which Museo academico Berolinensi and Royal Prussian Museum are alternative names for the Museum für Naturkunde Berlin, formerly the Museum für Naturkunde der Humboldt-Universität zu Berlin].

Wiedemann only described a single species of Muscidae under the specific name of *humeralis*, which is this species, and the types of it from Senckenberg Museum (Frankfurt am Main) have been clearly identified by Pont (1997: 98). Pont (1995) further gives much information on the collectors with whom Wiedemann cooperated and the nature of the collections upon which he worked and was able to identify the type with certainty. Clearly, this specimen is falsely labelled as being the type. Upon dissection it was found on the structure, colouration and chaetotaxy of the trifoliate process to be undoubtedly *A. hyalinipennis* van Emden, 1959. A further label has been added to the specimen to that effect and the abdomen pinned beneath the specimen in a van Doesburg vial of glycerine.

Distribution

The species is further known from the Canary Islands, Cape Verde Islands, Chad, Egypt, Ethiopia, the Gambia, Jordan, Libya, Madagascar, Nigeria, Oman, Rwanda, Palestine, Saudi Arabia, South Africa, Uganda and United Arab Emirates.

Atherigona (s. str.) *laevigata* (Loew, 1852)

Coenosia laevigata Loew, 1852: 660.

Atherigona scutellaris Stein in Becker, 1903: 110. Egypt.

Atherigona laeta – authors nec Wiedemann (misidentifications).

Described as a species of *Coenosia* from Mozambique (Loew 1852: 660), this species ranges from Cape Province to Egypt and Yemen and from Nigeria to the Seychelles, Comoros and Madagascar. The holotype female is amongst the material recently discovered in the Smithsonian Institution. It is in poor condition, lacking both wings and having only one mid and one hind leg complete. Nevertheless, the frontal vitta can be seen to be yellow on anterior half, becoming abruptly black, and the palpus yellow. These characters, along with the tergal markings, leave one in no doubt that the concept of authors of this species is correct. The specimen is mounted on a ‘continental’ (39 mm long) pin and bears the following labels:

- 1) blue long rectangular “Inhamb. Pet.” in a copperplate hand.
- 2) red rectangular “Type” machine-printed.
- 3) as (1) above “*laevigata* Loew”.
- 4) grey rectangular “*Atherigona laevigata* Lw.” in Stein’s handwriting.

This specimen is accompanied by a ♂ micropinned on pith on a black ‘continental’ pin and bearing the following labels, all of which are white rectangular:

- 1) “Africa or., Katona 904” machine-printed.
- 2) “Mto-ja-Kifaru” machine-printed.
- 3) “*Atherigona laeta* (Wied.) ♂ det. Stein” [a misidentification, *laeta* being an oriental species with a superficial resemblance to *laevigata*].
- 4) “*Atherigona laevigata* Lw. det. J.R. Malloch”.

This specimen undoubtedly originates from the Hungarian National Museum, where the East African collection of K. Katona is deposited (Horn & Kahle 1935: 131).

Material examined

CYPRUS • 1 ♀; Kyrenia, SE of New Harbour; 550 m a.s.l.; 23 Oct. 1995; C.E. Dyte leg.; plants near stream; NMWC.

ISRAEL • 1 ♂, 1 ♀; Jordan Valley, N of Tiberias; 27 Apr. 1984; K.A. Spencer leg.; det. A.C. Pont; NMWC.

KENYA • 2 ♂♂; Rift Valley, Ol Arabe Gorge; 18 Nov. 1988; R.K. Butlin leg.; NMWC • 5 ♂♂, 6 ♀♀; Kasarani; 10–11 Aug. 1989; J.W. Ismay leg.; swept, savannah; NMWC • 1 ♂; Limuru P.O.; 12 Apr. 1983; K.A. Spencer leg.; NMWC.

MAURITIUS • 1 ♂, 3 ♀♀; 1–2 km S of Wolmar; 21 May 2000; coast roadside; J.W. Ismay leg.; NMWC.

NAMIBIA • 2 ♂♂; Noachabeb, 27 miles NNE of Grunau; 10–12 Jan. 1972; BMSAE expedition; NHMUK • 1 ♀; Skeleton Coast, Kunene Mouth; 17°16' S, 11°47' E; 20–22 Apr. 1994; E. Marais leg.; NMNW • 2 ♀♀; Rundu Distr., Rundu, Kavango Lodge; 17°54'43" S, 19°45'33" E; 27–29 Mar. 2003; A.H. Kirk-Spriggs and W. Mey leg.; light trap; NMNW • 1 ♀; Opuwa Distr., Ekuju village, Kunene River; 17°19'30" S, 13°48'56" E; 11–12 Oct. 1999; Kirk-Spriggs leg.; Malaise trap in riverine forest; NMNW.

DEMOCRATIC REPUBLIC OF THE CONGO • 6 specs (with puparia unassociated with individual specimens); P.K. 45, “route du Nord, Ferme laitière” [North road, dairy farm]; 28 Nov. 1985; A. Delobel leg.; reared from *Cynodon dactylon* (L.) Pers.; NMWC.

UGANDA • 2 ♀♀; Kawanda; 30 Sep. 1962; J. Bowden leg.; NMWC.

UNITED ARAB EMIRATES • 1 ♀; Al-Ajban; 26 Mar.–4 Apr. 2006; A. van Harten leg.; Malaise trap; NMWC.

YEMEN • 1 ♂; Medina Al Shirq; 20 Feb. 1991; A. van Harten, H. Mahdi and M. Mahyoub leg.; NMWC • 3 ♂♂, 2 ♀♀; Ta'izz; 5 Jan.–2 Feb. 1998; A. van Harten and M. Mahyoub leg.; light trap; NMWC • 5 ♀♀; Ta'izz; Nov.–Dec. 1999; A. van Harten and A. Awad leg.; light trap; NMWC • 1 ♂, 1 ♀; Sana'a; Jan. 1991; A. van Harten leg.; NMWC • 1 ♂; same collection data as for preceding; Mar. 1991; NMWC • 1 ♂; same collection data as for preceding; Mar. 1992; NMWC • 6 ♂♂, same collection data as for preceding; Apr. 1992; NMWC.

Remarks

Females of the Kasarani material show a tendency to large size, being 5–5.4 mm in length, as against 3 mm in males, have the scutum and tergites more extensively darkened and a more accentuated frontofacial angle, whereas the material from Yemen is diminutive, being hardly more than half the length of the largest Kasarani female, is extensively pale and has a frontofacial angle of little less than a right angle. The Kawanda females resemble those from Kasarani. It is apparent that large species of this genus tend towards a more acute frontofacial angle (see Skidmore's 1985: 301, fig. 89g, figure of the head in profile of *A. mitrata* Séguy, 1955), and it would appear that large individuals of *A. laevigata* do the same. The darker colouration of the Kasarani material points to melanism associated with lower temperatures at high altitude. Extreme variation in colour pattern of Kenyan female material was figured (Clearwater 1981: 309, figs 9, 10a–d.)

Distribution

Angola, Comoros, Cyprus, D.R. Congo, Egypt, Ethiopia, Jordan, Kenya, Madagascar, Mauritius, Mozambique, Namibia, Nigeria, 'Palestine', Rwanda, Seychelles, Saudi Arabia, South Africa, Tanzania, Uganda, Yemen, Zambia, Zimbabwe.

Atherigona (s. str.) *maliensis* Dike, 1989

Material examined

MALI • 1 ♂; Mourdiah; 13–25 Aug. 1986; M. Matthews leg.; NMWC.

Remarks

Described from the male sex from Mali (Dike 1989b: 73). The holotype of this species was described, correctly, as having "Legs brownish black, but coxae, trochanters and knee of middle leg darkish yellow". With its strap-like palpus and unique abdominal structure and colouration, no doubt exists as to the identity of this second specimen. However, its legs, unlike those of the holotype, are yellow with the fore leg brownish black on all but coxa, trochanter, basal one third of femur and narrowly on knee, and the mid and hind tarsi somewhat infuscate, less so on the apical two segments. I suspect that the type is discoloured. Much other material received from the same collection as the type has exhibited unnatural discolouration, sometimes even halteres appearing infuscate.

These are the only two specimens so far known.

Distribution

Mali.

Atherigona (s. str.) *medleri* Deeming, 1979

Material examined

BURKINA FASO • 1 ♂; Matourkou; Jul.–Aug. 1987; J. Zongo leg.; on sorghum shoot; NMWC.

“R.P.” [Democratic Republic] CONGO • 1 ♂ (both fore legs missing); Matane, Boko, Songo; 19 May 1984; A. Delobel leg.; NMWC.

UGANDA • 1 ♂; Serere; 24 Oct. 1972; J.L. Overman leg.; NMWC.

Remarks

Described only from the male sex from Nigeria (Deeming 1979: 50). The Congo male is unusual in having the median lobe of the trifoliate process shorter and tergite 7 immaculate.

Distribution

Burkina Faso, D.R. Congo, Nigeria, Uganda.

Atherigona (s. str.) *nigrithorax* Stein, 1906

Fig. 1c–d

Described from a female from Togo (Stein 1906: 66) and not since reported. The holotype appears in the material discovered in the Smithsonian Institution and has been returned to MNB. The type is in good condition and mounted on a black steel pin with the following labels:

- 1) rectangular grey label “Togo, Bismarckburg, 17-23.XII.92, L. Conradt S.”
- 2) rectangular red label “Type”.
- 3) rectangular white label “Mus. Berol.”
- 4) rectangular grey label “*Atherigona nigrithorax* sp. n. Stein ♀”.

The first three labels are machine-printed and the fourth is in the handwriting of Stein.

Redescription

MEASUREMENTS. Body length, female 4.0 mm; wing 3.0 mm.

Female

HEAD. Frontal vitta deep velvety black; frontal plate undusted from base of second inferior orbital seta to level of posterior ocellus; parafacialia, facialia and gena white dusted, this most strongly developed on frontofacial angle; occiput and ocellar prominence dark grey dusted, the postorbital strip paler grey; width of parafacialia at narrowest part equal to diameter of an ocellus; antenna black, somewhat brownish on extreme apex of pedicel and on arista; palpus black.

THORAX. Scutum and scutellum black in ground colour and weakly grey dusted, the former without apparent darker dusted longitudinal vittae; postpronotal lobe infuscate dorsally; pleura ranging from yellow on propleuron to yellowish brown elsewhere, more heavily and yellowish dusted than scutum; propleuron with one long and one moderate and one fine seta; one moderate prostigmatal and a fine seta; lower katepisternal seta equidistant from the two upper setae (these lacking on both sides, but the scars of their attachment visible).

WING. Hyaline with brown veins; anterior crossvein at 0.4 of length of discal cell.

LEGS. All tarsi more or less infuscate; fore tibia black, but obscurely yellowish on basal one third of its length; fore femur somewhat infuscate on apical two fifths of its length and hind tibia somewhat infuscate on apical two thirds.

ABDOMEN (Fig. 1d). Yellow with black markings and tergites very weakly yellowish dusted; 8th tergite (Fig. 1c). The abdomen is contained in a van Doesburg vial of glycerine pinned under the specimen.

Male

Unknown.

Remarks

In the structure of the head and thorax this species is almost identical to *A. bimaculata* Stein, 1910 but the area of infuscation of the fore femur is much more restricted than in that species, the abdominal pattern is quite different and the eighth tergite has more heavily sclerotised basal lobes and their pair of separated sclerites triangular, rather than slug-shaped.

Distribution

Togo.

Atherigona (s. str.) *parviclivis* Muller, 2015

Fig. 2

Material examined

BOTSWANA • 5 ♂♂; Goodhope; 28 Feb. 1990; J.M. Mashonja leg.; NMWC.

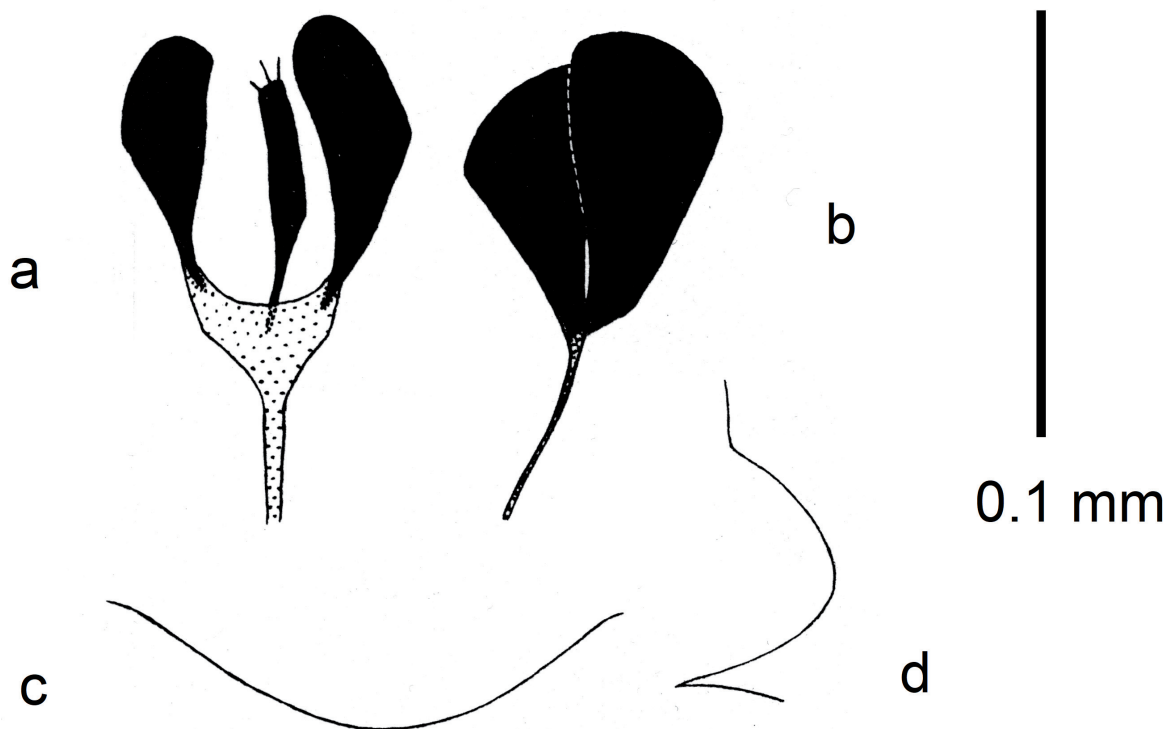


Fig. 2. *Atherigona parviclivis* Muller, 2015. **a.** Trifoliate process, ventral. **b.** Same, lateral. **c.** Hypopygial prominence, dorsal. **d.** Same, lateral.

Remarks

Described (Muller 2015: 891) from males from South Africa with illustrations of the hypopygial prominence and trifoliate process of the holotype (Muller 2015: 910, fig. 3a–d). In the Botswanan material listed here, the hypopygial prominence in dorsal view is much more weakly developed.

Distribution

Botswana, South Africa.

Atherigona (s. str.) *subnigripes* (Karsch, 1888)

Fig. 3a

Described into the genus *Cleigastra* Macquart, 1835 and from Bondei in what is now Tanzania, this species is only known from the female holotype (Karsch 1888: 380). This type, previously recorded by me (Deeming 1971: 183) as being lost, appears in the material discovered in the Smithsonian Institution and has been returned to MNB. The specimen is mounted on a white steel 39 mm long ‘continental’ pin and is in good condition. It bears the following labels:

- 1) blue rectangular “Bondei, C.W. Schmidt, Jan. 86” machine-printed.
- 2) white rectangular “13848” machine-printed.
- 3) red rectangular “Type” machine-printed.
- 4) white rectangular “*Cleigastra subnigripes* Karsch” handwritten in an unknown hand.
- 5) grey rectangular “*Atherigona* [illegible short word]” in Stein’s hand.

Redescription

MEASUREMENTS: Body length female 4.5 mm; wing 3.5 mm.

Female

HEAD. Black dorsally and on upper four fifths of occiput; yellow elsewhere, yellow parts whitish to yellow dusted, postorbital stripe pale grey dusted, occiput darker dusted, especially medially, where it is as dark as ocellar prominence; frontal plate undusted from level of posterior ocellus to base of the posterior of the two inferior orbital setae; frontal vitta black throughout; parafacialia at narrowest part as wide as two thirds of width of anterior ocellus; antenna dark brown, ferruginous on the basoventral angle of postpedicel; palpus yellow, slightly infuscate on basal one third of its length.

THORAX. Scutum and scutellum black and very lightly yellowish dusted, the former with indications of three darker longitudinal vittae and becoming yellowish in ground colour on lateral declivities; pleura yellow in ground colour and heavily golden yellow dusted; one long and one moderate propleural seta and a fine setula; one moderate prostigmatal and a fine setula; lower katapisternal seta situated closer to the more posterior of the two upper setae.

WING. Hyaline with yellowish veins; anterior crossvein situated at 0.38 of length of discal cell.

LEGS. Yellow with tarsi more or less infuscate, fore femur black on apical two fifths, fore tibia black but obscurely yellowish at extreme base and hind tibia brown.

ABDOMEN. Yellow, shining through weak yellowish dust; tergite 4 with a pair of round dark spots which are one quarter of the exposed length of the tergite and are separated from its apex by their own diameter; tergite 5 with a pair of long oval black spots occupying the apical half of its exposed length; tergite 8 (Fig. 7). The abdomen is contained in a van Doesburg vial of glycerine pinned under the specimen.

Male

Unknown.

Remarks

This species may well be conspecific with one known only from males. There are several African species whose females bear a superficial resemblance to this one, but none of those that I have been able to inspect has a similar structure to the eighth tergite.

Distribution

Tanzania.

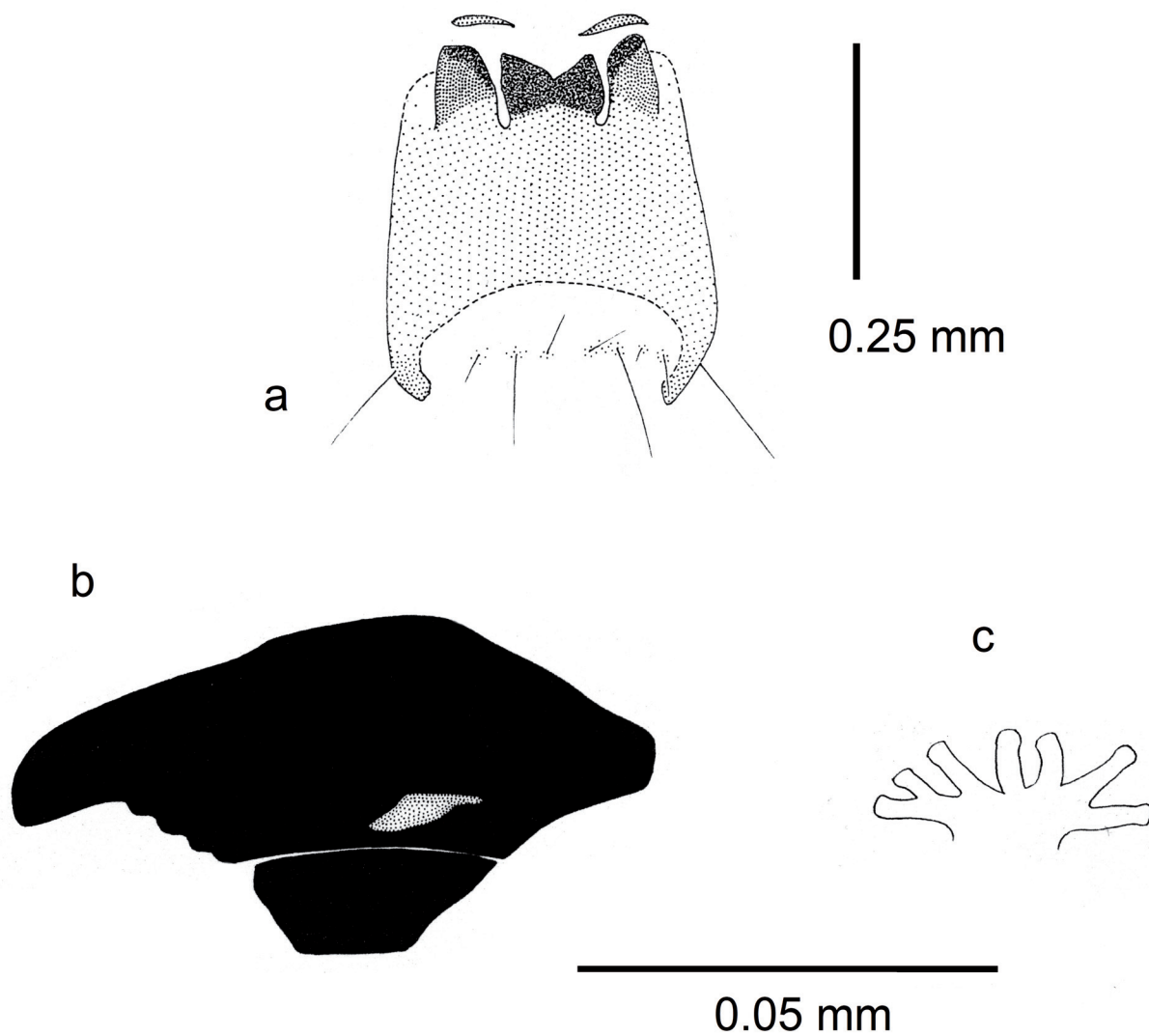


Fig. 3. a. *Atherigona subnigripes* (Karsch, 1888), holotype, ♀ (MNB), eighth tergite, dorsal. b–c. *Atherigona varia* (Meigen, 1826). b. Larval mandibular sclerite, lateral. c. Anterior spiracle of puparium.

Atherigona (s. str.) *tetrastigma* Paterson, 1956

Material examined

ETHIOPIA • 1 ♂, 1 ♀; Alemaya; 29 Jul. 1993; S. Gudeta leg.; NMWC • 1 ♂; Debre Zeit; 28–30 Sep. 2005; M.R. Wilson leg.; Malaise trap; NMWC.

KENYA • 1 ♂ (very teneral, with incomplete puparium); Nairobi; emerged 14 Dec. 1981; A. Delobel leg.; from shoot of *Cynodon nlemfuensis* Vanderyst; NMWC.

Remarks

Described from both sexes from Tanzania (Paterson 1956: 169).

Distribution

D.R. Congo, Ethiopia, Kenya, South Africa, Tanzania.

Atherigona (s. str.) *varia* (Meigen, 1826)

Fig. 3b–c

Described into the genus *Anthomyia* Meigen, 1803 (Meigen 1826: 187), this species is found around the Mediterranean and in Europe north to southern England, France and Hungary. It is further recorded from U.A.E., Oman and China and is the type species of *Atherigona*. On 28 Aug. 1996, I found an isolated deadheart shoot of an unidentified grass in mixed forest at Vallombrosa in the mountains of eastern Tuscany. From this a female *Atherigona* emerged in the laboratory, which on structure generally and especially that of the eighth tergite agrees with *A. varia*. The grass shoot was distinctive in having the ligule bearing long hairs and was kindly examined by Dr G. Hutchinson, NMWC, who believed it might be *Danthonia decumbens* (L.). To the best of my knowledge this species has never been reared, so a brief description of the puparium is given and the larval mandibular sclerite figured.

Description

MEASUREMENTS. Length 3.5 mm and 1.1 mm in greatest width.

PUPARIUM. Yellowish brown, subshiny, with cephaloskeleton and posterior spiracles black, which latter are projecting to a distance equal to one half of their individual width and with their apical surfaces separated from one another by their individual width. Mandibular sclerite (Fig. 3b) robust, black, with no indication of a separate dorsal tooth-like projection. Anterior spiracle (Fig. 3c) a rosette of 7 digitations.

Distribution

Widespread in southern Europe, Middle East and China.

Atherigona (s. str.) *zongoi* sp. nov.

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Figs 4–7

Diagnosis

This species is very similar to *A. kenierobaensis* Muller & Mostovski, 2018 from Mali, differing from it in having the occiput grey dusted throughout, the frontal plate with only a slight indication of shine between the upper three orbital setae, the fore leg yellow throughout, the fore tarsus with specialised chaetotaxy on anterior surface. The hypopygial prominence and trifoliate process of the two species show strong similarities to one another, but in *A. zongoi* sp. nov. the hypopygial prominence is deeper

than wide, rather than wider than deep, the trifoliate process has only traces of infuscation and its median lobe, though bearing a very similar chaetotaxy, very strongly bent when viewed in profile rather than almost straight (Fig. 4b). In the most recent key to Nigerian *Atherigona* (Dike 1990) it would trace to *A. africana* Deeming, 1971 but that species has an entirely black trifoliate process, the median lobe of which bears only minute apical setae. The new species is also very similar to *A. piscatoris* Muller, 2015 in the shape of the hypopygial prominence, as well as in the shape of the median lobe when viewed laterally, but looks quite different when viewed ventrally, although the dark colour in Fig. 7a is an optical artefact.

Etymology

The species epithet refers to the collector's name (J.O. Zongo) in whose honour the species is named.

Material examined

Holotype

BURKINA FASO • ♂; Bobo Dioulasso, Farako Bâ; Aug. 1988; J.O. Zongo leg.; on fishmeal bait in sorghum field; NMWC.

Paratypes

BURKINA FASO • 8 ♂♂; same collection data as for holotype; NMWC • 3 ♂♂ (on same mount, 1 fragmented); same collection data as for holotype; Aug.–Oct. 1978; R.T. Gahuhar leg.; NMWC.

GUINÉE [GUINEA] • 1 ♂; Nimba; Jul.–Dec. 51 [1951]; Lamotte and Roy leg.; MNHN.

Description

MEASUREMENTS. Body length, male 3.7 mm; wing, 2.3 mm.

Male

HEAD (Fig. 6a). Black, with black setae; frontal vitta black and with heavy grey dusting, which is less dense on superior orbits and becomes brownish on occiput; 2 long and 1 short inferior orbital seta; frontofacial angle 93°, parafacialia at this point broad and prominent, becoming as broad as base of arista at narrowest part, just above base of vibrissa; genal setae weak and short; antenna and palpus black, but basal half of arista brownish; setae on truncate apex of male palpus pale.

THORAX (Fig. 5a–b). Scutum and scutellum dark in ground colour, grey dusted, former with an indication of a darker median vitta presuturally; postpronotal lobe yellow and pleura dirty yellow, but somewhat infuscate on parts of anepisternum, anepimeron and katepisternum, pleural dusting more yellow; anepisternum with a strong seta at the lower posterior corner and 2 shorter setae above it; katepisternum with 3 setae in an isosceles triangle; all setae and setulae black.

WING. Hyaline with yellowish brown veins and anterior crossvein situated at 0.4 of length of discal cell; haltere creamy white.

LEGS. Yellow, apical 3 segments of fore tarsus (Figs 4e, 6b) with a comb of curved setae anteriorly, longest seta over twice as long as tarsus is wide.

ABDOMEN. Yellow and yellowish grey dusted; tergite 3 with a pair of long oval black spots occupying quite two thirds of its length; tergite 4 with a pair of short oval black spots on apical half; remaining tergites immaculate.

POSTABDOMEN. Trifoliate process (Figs 4a–b, 7a–b) yellow, with apices of lobes becoming white, stem somewhat infuscate, as also is a line extending to the shoulders of the lateral lobes; the pair of long setae on apex of median lobe of trifoliate process pale.

HYPOPYGIAL PROMINENCE (Fig. 4c–d).

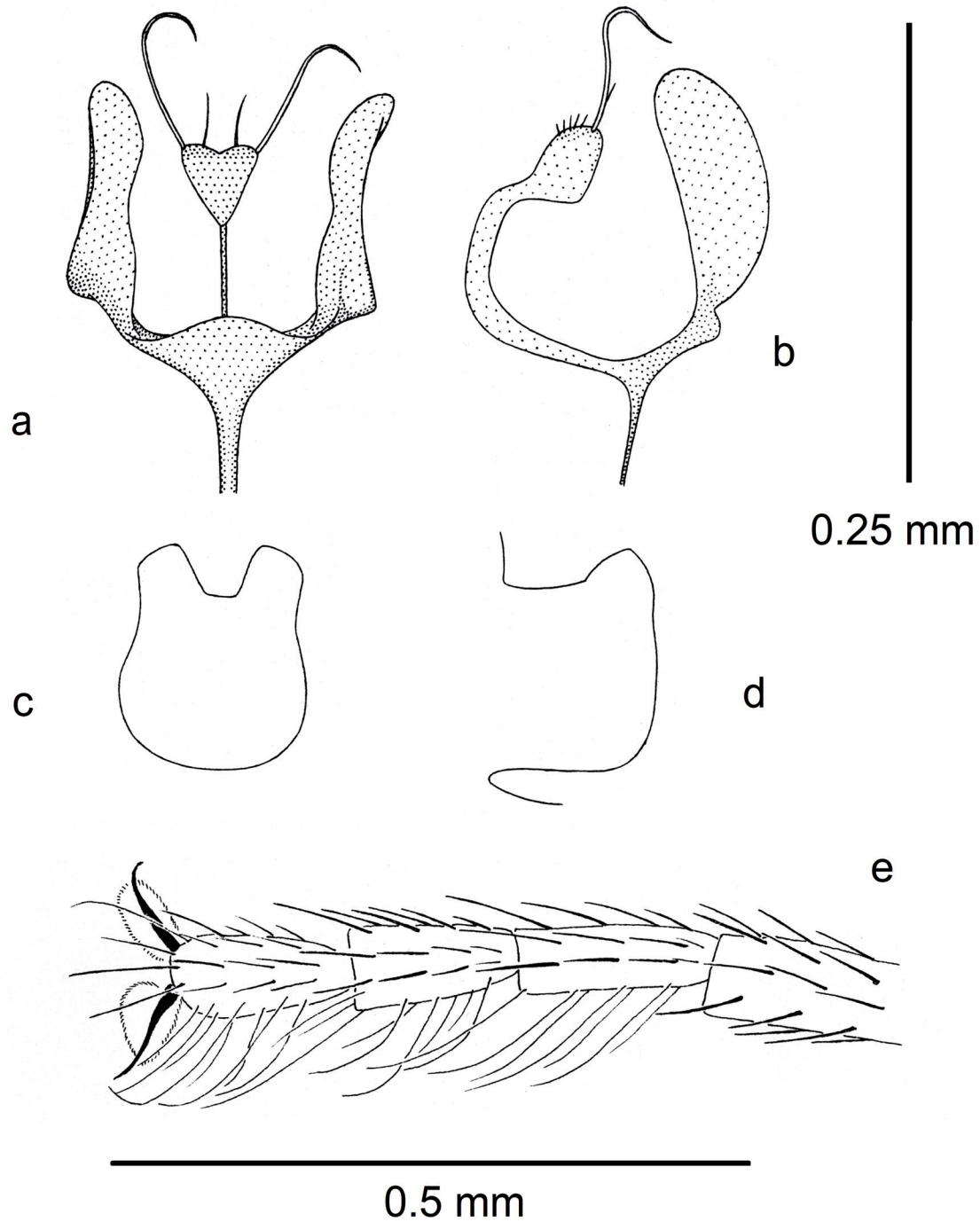


Fig. 4. *Atherigona zongoi* sp. nov., holotype, ♂ (NMWC). **a.** Trifoliate process, ventral. **b.** Same, lateral. **c.** Hypopygial prominence, posterior. **d.** Same, lateral. **e.** Fore tarsus.



a



b

Fig. 5. *Atherigona zongoi* sp. nov., holotype, ♂ (NMWC), habitus. **a.** Lateral view. **b.** Dorsal view.

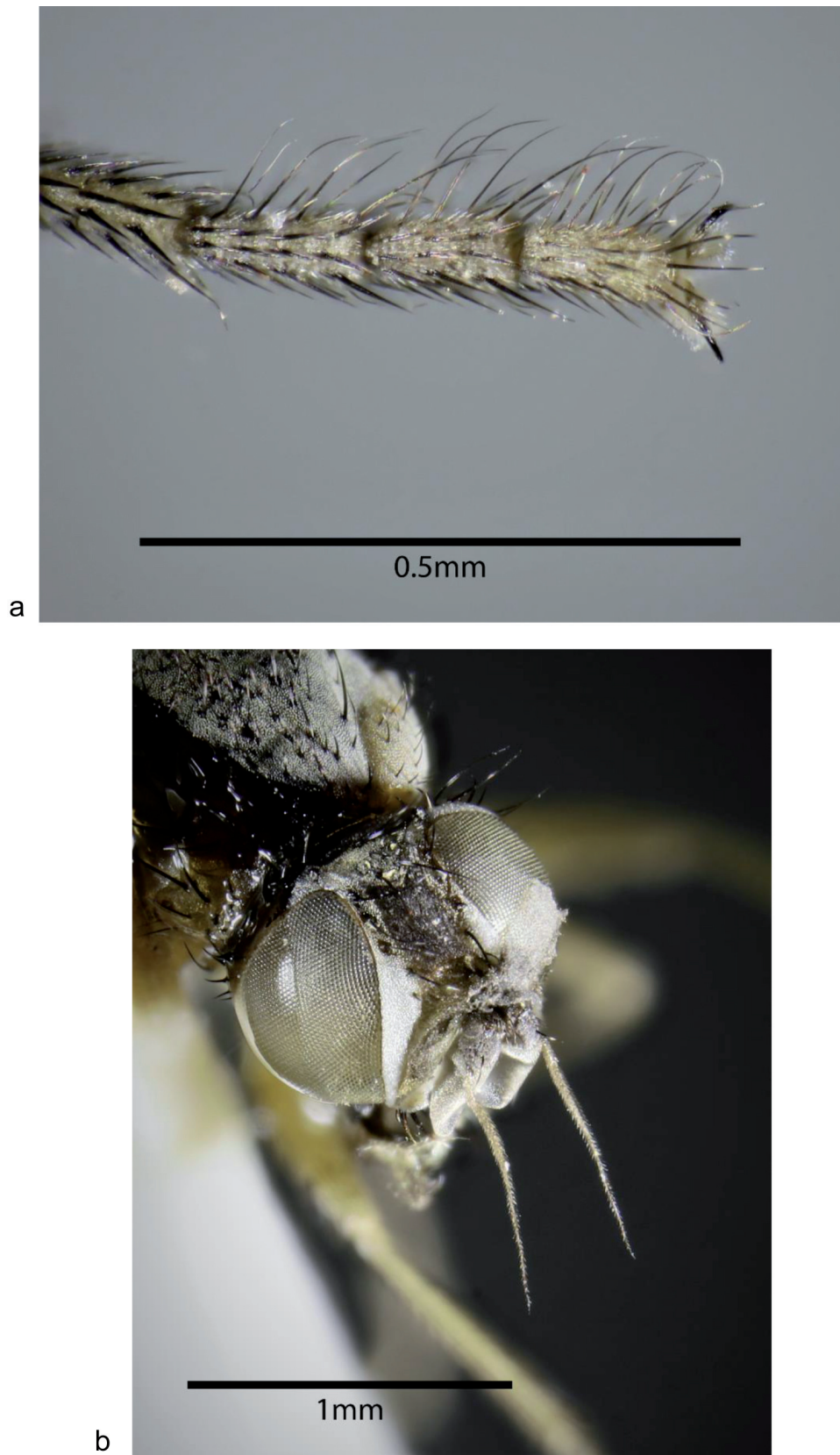


Fig. 6. *Atherigona zongoi* sp. nov., paratype, ♂ (NMWC). **a.** Head, anterior oblique view. **b.** Fore tarsus, dorsal view.

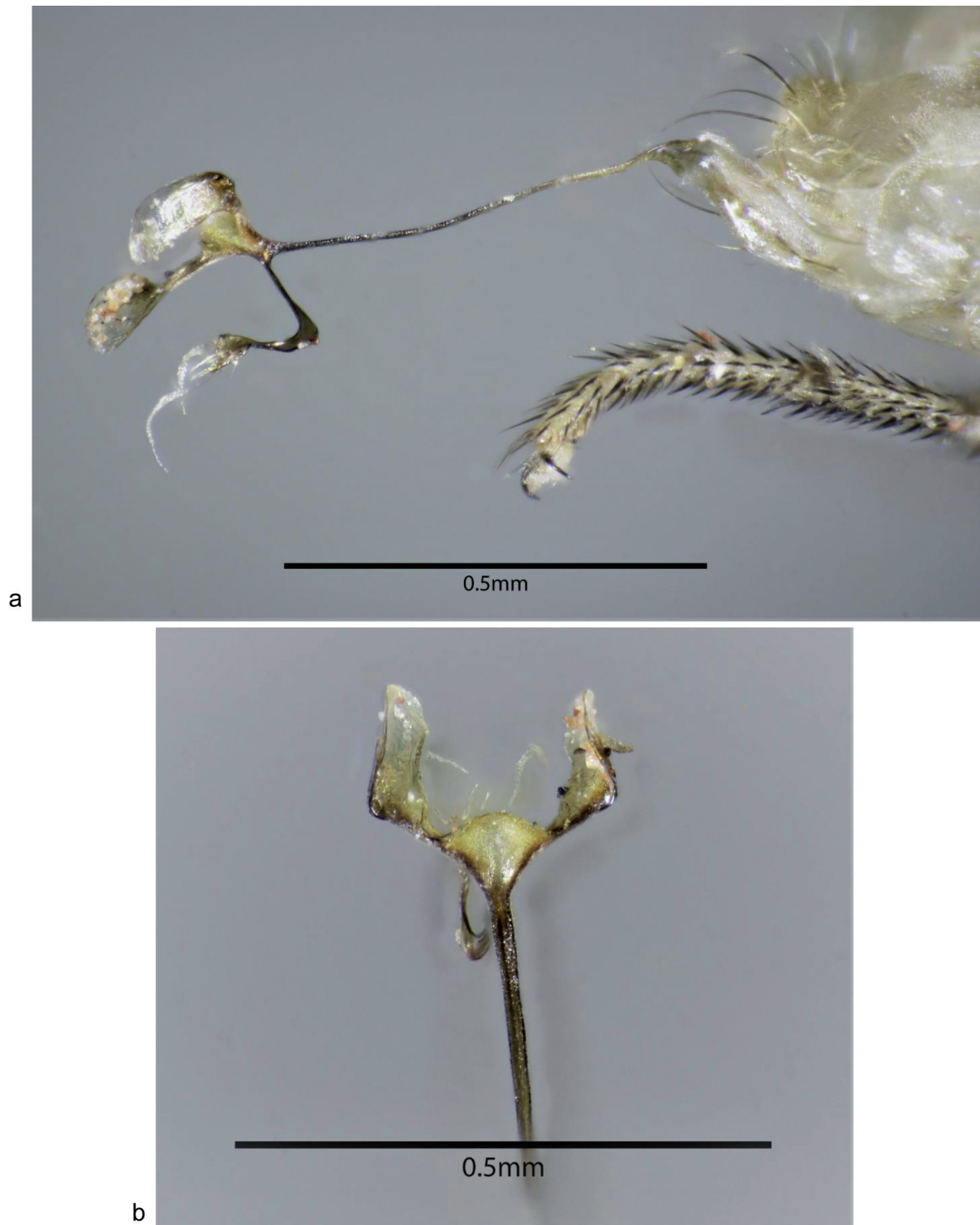


Fig. 7. *Atherigona zongoi* sp. nov., paratype, ♂ (NMWC). **a.** Trifoliate process, lateral oblique view. **b.** Same, ventral view.

Female

Unknown.

Distribution

Burkina Faso, Guinea.

Atherigona (Acritochaeta) maculipennis Stein, 1910

Described from both sexes from the Seychelles (Stein 1910: 158), the types appear in the material discovered in the Smithsonian Institution. These, a male and female, are in excellent condition, are micropinned onto pith mounts on ‘continental’ pins and are identically labelled, thus:

- 1) white rectangular “Seychelles [short illegible word]” handwritten.
- 2) red rectangular “Type” machine-printed.
- 3) white rectangular “*Atherigona maculipennis* Type (Stein) det. Stein”, and with respective sex symbol.

Remarks

The diagnosis of this species as given by van Emden (1940: 105), correct in every other detail, cites the frontal vitta as being orange-red. This is certainly true of the female, but in the male it is much darker, being black and only slightly paler anteriorly. The palpus of the male, on its apical one third, bears an area of erect wavy fine pale hairs on its ventral surface.

Distribution

Seychelles.

Atherigona (Acritochaeta) orientalis Schiner, 1868

Atherigona orientalis Schiner, 1868: 295.

Coenosia excisa Thomson, 1869: 560. Ross Island.

Atherigona trilineata Stein, 1900: 157. New Guinea.

Acritochaeta pulvinata Grimshaw, 1901: 42. Hawaii.

Atherigona magnipalpis Stein, 1906: 66. Cameroon.

Described from the Nicobar Islands (Schiner 1868: 295) and widespread throughout the tropics of the World, this is the only species of its subgenus to have become established in the Americas. This species has a very varied larval biology, the larvae being predaceous but also probably ingesting the decaying organic matter in which they develop. In the case of the recent record of this species being reared from turtle eggs in Cyprus (McGowan *et al.* 2001) the larvae of other Diptera present might be the primary source of nutrition.

The mislaid types of *Atherigona magnipalpis* Stein, 1906: 66, which is listed as a junior synonym of *orientalis*, are in the box of material discovered in the Smithsonian Institution and have been returned to MNB. These, a male and a female, are in very good condition, micropinned on card mounts on ‘continental’ pins and bear the following labels:

Male

- 1) grey rectangular “N. Kamerun, Johann-Alberechtshöhe, L. Conradt S6, 17.6.96” machine-printed with date added.
- 2) red rectangular “Type” machine-printed.
- 3) grey rectangular “*Atherigona magnipalpis* sp. n. ♂♀ Stein” in Stein’s handwriting.
- 4) white rectangular “*Atherigona excisa* Thom. Det. J.R. Malloch” in Malloch’s hand.

Female

- 1) white rectangular “17/6.96” in red ink.
- 2) as 1 above for male, but without date.
- 3) as 2 above for male.

Distribution

Cyprus, pan-tropical, southern Nearctic.

Discussion

Atherigona is a species rich genus of agriculturally important shoot-flies that received a lot of attention from taxonomists. Notwithstanding this, some species were inadequately described in older literature before Ramachandra Rao recognized the development and importance of the male trifoliate process and its value in taxonomy. Several species have significant sexual dimorphism and many species appear very similar on external characters. Thus, there is value in both sexes being adequately described.

Some types of Afrotropical species were thought to be lost and reliance of their identity was based on rather limited descriptions. The recent chance discovery of some of these types has clarified the species' identities enabling supplementary notes on their taxonomic characters. In some cases, the female is redescribed with attention paid to the eighth tergite since this bears taxonomically useful characters, which had not been recognised at the time of their description.

Many new species continue to be discovered in the Afrotropics. Within the last seven years Muller (2015) described 25 new species from South Africa. Muller & Mostovski (2018) described a species (*A. kenierobaensis*) from Mali that appears to be closest to the new species *A. zongoi* sp. nov. described from Burkina Faso in this article. In addition to the species described from Madagascar (Couri, Pont & Penny 2006), three more species were recently described from that country (Deeming 2019). This would suggest that more species can be expected in Africa especially for poorly investigated areas and so detailed descriptions of both sexes with adequate illustrations have become particularly necessary.

The distribution of species has been updated in this article because of the importance this bears on pest species. Furthermore, several species have expanded their range within Africa. It is also significant that outside Africa species have also expanded their range. *Atherigona reversura* Villeneuve, 1936 described from China reached Hawaii in 1974 (Hardy 1976) and Arabia in 1987 (Pont 1991). Later, it was reported from the New World wherein it further spread to several North American states (Grzywacz *et al.* 2013) and in the Neotropics (Patitucci *et al.* 2016).

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