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Modified fore femora in a new species of *Afrocamilla* Barraclough: a morphological innovation in the Camillidae (Diptera)

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ABSTRACT

A new species of *Afrocamilla* is described from a series of females from the Bale Mountains in south-eastern Ethiopia. The new species is unique within the Camillidae in having markedly swollen fore femora with a posteroventral protrusion of cuticle bearing a dagger-like spine on each femur. The ornamentation of the fore femora of other Camillidae is reviewed. Their possible functions in *A. femorata* sp. n. are evaluated, and based on the position of the spines it is suggested that they may be used to assist with movement over uneven substrates or for breaking open dung pellets for egg deposition.

KEY WORDS: Diptera, Ephydroidea, Camillidae, *Afrocamilla*, new species, Afrotropics, morphological modification.

INTRODUCTION

The Camillidae is a small family of schizophoran Diptera that includes four genera and 37 described species. It is distributed mainly in the Afrotropical and Palearctic regions, although there are a few species recorded from the Nearctic and northern Neotropical Regions (Barraclough & Fitzgerald 2001). The biology of Camillidae is now relatively well documented in Africa, with most species being coprophagous and largely associated with the droppings of small mammals and birds (Kirk-Spriggs *et al.* 2002). Kirk-Spriggs *et al.* (2002) described the immature stages of the cavernicolous species *Katacamilla cavernicola* Papp, 1978 from Namibia. The widespread genus *Afrocamilla* dominates the African fauna, comprising 14 of the 22 described species, and has been reared from the droppings of the rock hyrax *Procavia capensis* (Pallas) (see Barraclough 1992, 1997).

TAXONOMY

Genus *Afrocamilla* Barraclough, 1992

Type species: *Afrocamilla stuckenbergi* Barraclough, 1992 (Afrotropical), by original designation.

***Afrocamilla femorata* sp. n.**

Figs 1, 2

Etymology: The species name refers to the modified fore femora.

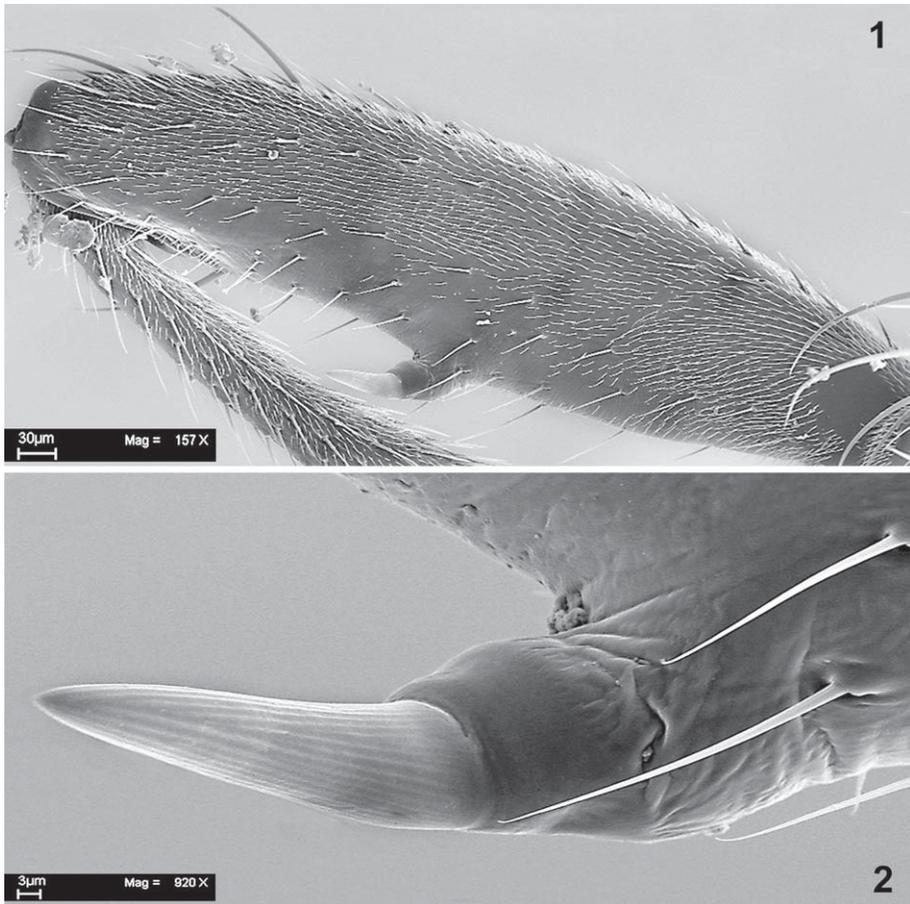
Description:

Female.

Colour/Pollinosity: Head mainly brown to black, but anterior half of occiput (sometimes only slightly so), antenna (arista excepted) and part of gena yellow to yellow-brown; pollinosity silver to brown, relatively dense and mainly restricted to occiput. Thorax

mainly dark brown, but humeral callus and adjacent cuticle (dorsally and ventrally) yellow-brown; pollinosity dense and brown on scutellum, more difficult to discern but visible along posteroventral margin of sternopleuron (silver) and between hypopleuron and scutellum (ranging from silver below to pale brown above). Legs entirely pale yellow. Wing membrane hyaline; transverse basal fascia not evident. Abdomen black with indistinct purple metallic reflections; T2 with brown pollinosity.

Head: Eye margin smoothly rounded anterodorsally in profile. Frons moderately short and broad in dorsal view, length at midline about $3/4$ maximum width. Width of face and parafacials together, at mid-height, $0.8-1.3\times$ length of antenna. Antenna with short ventral rays along apical $1/2$ to $3/4$ of arista, longest dorsal rays $0.8-1.0\times$ length of third antennal segment. Upper orbital plate obviously developed anteriorly (ending coincident with anterior reclinate bristle), here falling short of ptilinal suture by about $1.5\times$ length of ocellar triangle, maximum width (near vertex) $0.7-0.8\times$ width of ocellar triangle. Postocellar bristles moderately developed, length about $0.9-1.2\times$ that of ocellar triangle.



Figs 1, 2. Detail of fore femur in *Afrocamilla femorata* sp. n.: (1) Anterior face showing position of cuticular protrusion with spine; (2) Slender, cone-like protrusion with stout dagger-like spine (same leg).

Ocellar triangle moderately raised above upper eye margin in profile, distance 0.7–0.8× length of third antennal segment. Proclinate fronto-orbital bristle absent, anterior reclinate fronto-orbital present, being 1/8 to 1/10 length of posterior bristle. Two vibrissae present. Gena height in profile 0.4–0.7× length of third antennal segment.

Thorax: Apical scutellar marginal bristles well developed, 0.9–1.1× length of basal marginals. Fore femur markedly swollen relative to other femora (most prominently so along posterior face), maximum width and depth about twice that of other femora; slender, ventrally directed cone-like protrusion of tubercle evident posteroventrally at about mid-length or just beyond, protrusion 1/4 to 1/3 femur depth in length; apex of protrusion bearing a stout dagger-like spine (length 1/2 to 3/4 depth of femur), which is anterolaterally directed beneath and well beyond ventral margin of femur such that it is obvious beyond anterior femoral face in dorsal view (Figs 1, 2). Mid tibia without dorsal pre-apical bristle; apicoventral bristle present. Wing not markedly slender.

Abdomen: T2 median marginal bristles moderately developed, 1.2–1.5× length of T1+T2.

Measurements (in mm): Body length 2.7–3.8, wing length 2.5–3.8.

Holotype: ETHIOPIA: ♀ “Bale / Bale Mountains / Harena [= Harena] Forest / 2800m 2.ii.2000 / A. FRIEDBERG / & I. YAROM” (Tel Aviv University Museum).

Note: The Harena Forest is an Afromontane ecosystem on the southern slopes of the Bale Mtns in south-eastern Ethiopia.

Paratypes: 10♀ same data as holotype, except one in Natal Museum, South Africa.

Comparison: *A. femorata* is immediately distinguished from all other congeners, and indeed all Camillidae, by the swollen fore femora and the armature thereon. Head profile and wing shape are unremarkable and are consequently not figured; reference should be made to the morphological detail presented in Barraclough (1997).

The absence of the transverse basal fascia on the wing is a noteworthy character state. In the well-studied South African fauna it is absent in only one of the nine described species (*A. confusa* Barraclough, 1997), although *A. femorata* and *A. confusa* are not closely related. *A. confusa* differs in having a proclinate fronto-orbital bristle and largely pallid thoracic colouration.

DISCUSSION

A recent personal review of the Natal Museum’s extensive camillid collection, revealed that in terms of morphology, the femora of Camillidae are unremarkable and differ between species largely in terms of the development of small bristles on the fore femora, which are otherwise similar in form and size to the mid and hind femora. The fore femora bear a small apical anteroventral spine in *Afrocamilla* species, *Teratocamilla* Barraclough and some species of *Camilla* Haliday (the spine is absent in some species of *Camilla*). The spine is absent in *Katacamilla* Papp, although some species have an apical posteroventral ctenidium of short spines (Barraclough 1998, 2005). The discovery of a new Ethiopian species of *Afrocamilla* with obviously modified fore femora was therefore surprising, and a discussion of the morphology of the femora and their possible function was considered warranted.

The swollen fore femora with armature in *A. femorata* are unique within the Camillidae. The femoral modification is likely present in both sexes, suggesting that it cannot have a clasping function associated with copulation, as in males of many sepsid species (e.g. Eberhard 2001). Camillid adults are not known to be predatory, and *A. femorata*

does not have modified mouthparts, which eliminates the possibility of the femora having a raptorial function as in some species of Ephydriidae (present for example in *Ochthera* Latreille (Zhang & Yang 2006; Minakawa *et al.* 2007)). Unlike both these examples the fore tibiae are unmodified in *A. femorata*, suggesting that the femora and tibiae are not opposed and thus do not have a grasping or clasping function. As the femora of *A. femorata* are swollen and unwieldy with the spine concealed beneath the ventral margin, a grooming function is also unlikely. Sivinski (1997) considers that legs may be platforms for signals in Diptera because of their mobility. I believe that this is unlikely in *A. femorata*, as extensive observation of the South African type species *A. stuckenbergi* Barraclough, 1992, for example, showed that there was regular, marked up-and-down movement of the abdomen and folded wings in both sexes, and that this was considered to be a possible signalling repertoire (Barraclough 1992: 48).

Behavioural observations of living flies in their microhabitats are certainly required to reveal the function of the remarkable fore femora in *A. femorata*. Although their function is currently unknown, the position and downward inclination of the spines suggests that they may possibly be used to assist with movement over uneven surfaces, for example mounds of small dung pellets. The fore femora and spines could also be used to cling or dig into nesting material in the microhabitat, or in females to break open dung pellets for oviposition.

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