

***MOLLERIELLA KAPUTU* N. SP. FROM THE WEST USAMBARA MOUNTAINS, NE TANZANIA (DIPTERA: CHIRONOMIDAE)**

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Abstract

The male and female imago of *MollerIELLA kaputu* n. sp. are described and figured based on specimens collected in NE Tanzania in 1990. The new species can be separated from *M. calcarella* Sæther and Ekrem by having a slightly narrower, parallel sided anal point and weaker setae on the inferior volsella, longer C extension and distinctly shorter tibiae. The specimens were caught in Malaise traps at about 1500 m altitude in the Mazumbai Forest Reserve in the West Usambara Mountains.

Introduction

The West Usambara Mountains belong to the Eastern Arch, a chain of isolated mountains stretching from the Taita Hills in southern Kenya and the East and West Usambara and Pare mountains in north-eastern Tanzania to the Uluguru and Udzungwa mountains in southern Tanzania. These mountains resulted from uplifting and faulting of the main East African plateau and are much older than the East African volcanoes like Mt. Kilimanjaro and Mt. Meru. They are situated close to the Indian Ocean and warm, wet sea air and easterly winds set up a favorable climate. The mountains are covered with forests of different types depending on altitude and rainfall and contain at least 800 endemic plant species. A thorough description of the vegetation was given by Iversen (1991). There are also many endemic animals, thus the mountains are regarded as an important biodiversity hotspot, i.e. an area with a significant reservoir of biodiversity that is under threat from humans.

In the autumn of 1990 the University Museum of Bergen undertook an expedition to the West Usambara Mountains in Tanzania. The fieldwork, which included extensive use of Malaise traps and sweep nets, was mainly conducted in the Mazumbai Forest Reserve in the eastern part of the mountains. Some of the Malaise traps along the Kaputu Stream were run again in the spring and autumn of 1991.

A number of the taxa found in the material were new to science or previously unrecorded from the African continent (see e.g. Andersen and Sæther

1993, 1994a, 1994b; Andersen and Schnell 2000; Sæther and Andersen 1993, 1995; Sæther and Wang 1993a; Stur and Ekrem 2000). Below I describe one of these and place it in the genus *MollerIELLA* Sæther and Ekrem. This monotypic genus is based on *M. calcarella* Sæther and Ekrem, a terrestrial species only known to occur in the Netherlands (Sæther and Ekrem 1999).

Material and methods

The specimens examined were all collected in Malaise traps along the Kaputu Stream and preserved in alcohol. They were later mounted on slides in Canada balsam following the procedure outlined by Sæther (1969). Morphological terminology follows Sæther (1980). Measurements are given as ranges, followed by the mean when four or more specimens have been measured. Coloration descriptions are based on slide mounted specimens.

The holotype and most paratypes are deposited in the Department of Natural History, University Museum of Bergen, Bergen, Norway (ZMBN); some paratypes will be donated to the Zoologische Staatssammlung München, Germany (ZSM).

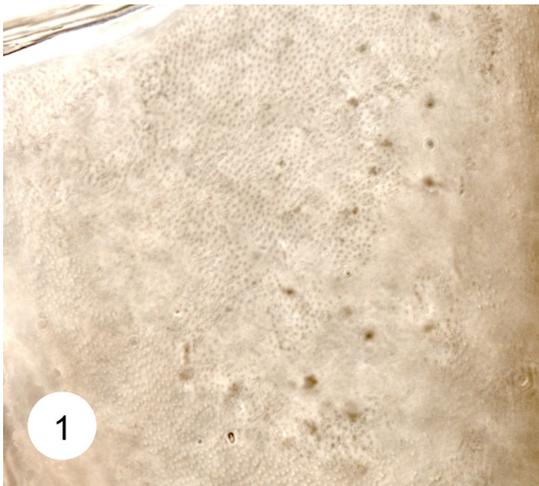
***MollerIELLA* Sæther and Ekrem**

MollerIELLA Sæther and Ekrem, 1999: 162.

Type species: *MollerIELLA calcarella* Sæther and Ekrem, 1999: 164.

Other included species: *MollerIELLA kaputu* n. sp.

The genus is figured and described in detail based on a few specimens of *MollerIELLA calcarella* from the Netherlands (Sæther and Ekrem 1999). They stated that the species has tiny preepisternals. However, on closer examination of the type material no preepisternals could be discerned. But the specimens have a number of distinct, small pits on preepisternum (Figs 1–2). In *M. kaputu* n. sp. preepisternum also has a few similar pits and thus, these pits probably do not result from damage. Most probably they have a sensory function or represent the opening of glands. However, examination of fresh material is necessary to establish the true nature of these pits.



Figures 1–2. *Molleriella calcarella* Sæther and Ekrem, 1999, holotype. Details of preepisternum showing the distinct, small pits.

The tibial spurs are described as strongly reduced, thin and weak, with at most a couple of basal hair-like denticles on longer spurs. Examination of the types, however, revealed that all tibiae have a spinose apical scale. In *M. kaputu* n. sp. each leg has a single, long spur and in addition mid and hind tibiae have a single, strong seta at the base of the spur. In *M. calcarella* there appears to be an additional, shorter spur on all legs.

Sæther and Ekrem (1999) suggested two alternative systematic placements for *Molleriella*, a relative isolated position either in the *Heterotrissocladus* group or near *Heterotanytarsus* Spärck. The spinose scales on all tibiae appear to be unique among Orthocladiinae and most closely resemble the scales found in *Xiaomyia* Sæther and Wang and *Shangomyia* Sæther and Wang described from Oriental China (Sæther and Wang 1993b). Sæther and Wang (1993b) placed *Xiaomyia* and *Shangomyia* in Chironominae and postulated that they might form the sister group of the tribe Chironomini. However, in a dated molecular phylogeny Cran-

ston et al. (2012) suggested a deeper position as the sister to all other Chironominae, thus justifying tribal or possibly subfamily status.

As there can be no doubt of a placement of *Molleriella* within the subfamily Orthocladiinae, the tibial scales and spurs appear to be an autapomorphy in the genus, representing yet another case of convergent rather than phylogenetically informative evolution in Chironomidae. However, a more detailed interpretation and placement must wait until the larvae and pupae are known and/or fresh material for DNA analyses is collected.

Molleriella kaputu new species

(Figs 3–17)

Type material: Holotype ♂, Tanzania, Tanga Region, West Usambara Mountains, Mazumbai, Kaputu Stream, loc. 10, 1420 m a.s.l., November 1990, Malaise trap, leg. T. Andersen (ZMB's Tanzania Expedition), (ZMBN). Paratypes: 11 ♂♂ as holotype; 1 ♀, as holotype except loc. 4, 1680 m a.s.l.; 2 ♂♂ as holotype except loc. 7, 1535 m a.s.l., 4–10 February 1991; 3 ♂♂ as previous except 1–8 August 1991 (ZMBN, ZSM).

Diagnostic characters. The new species is very similar to *M. calcarella* Sæther and Ekrem in morphological features, but can be distinguished by having slightly more narrow, nearly parallel sided anal point while *M. calcarella* has a wider, slightly spatulate anal point. The new species also has less setae on inferior volsella, the C extension is longer and the tibiae are distinctly shorter.

Etymology. Named after the type locality, Kaputu Stream. The species epithet is a noun in apposition without any Latin or Latinized elements.

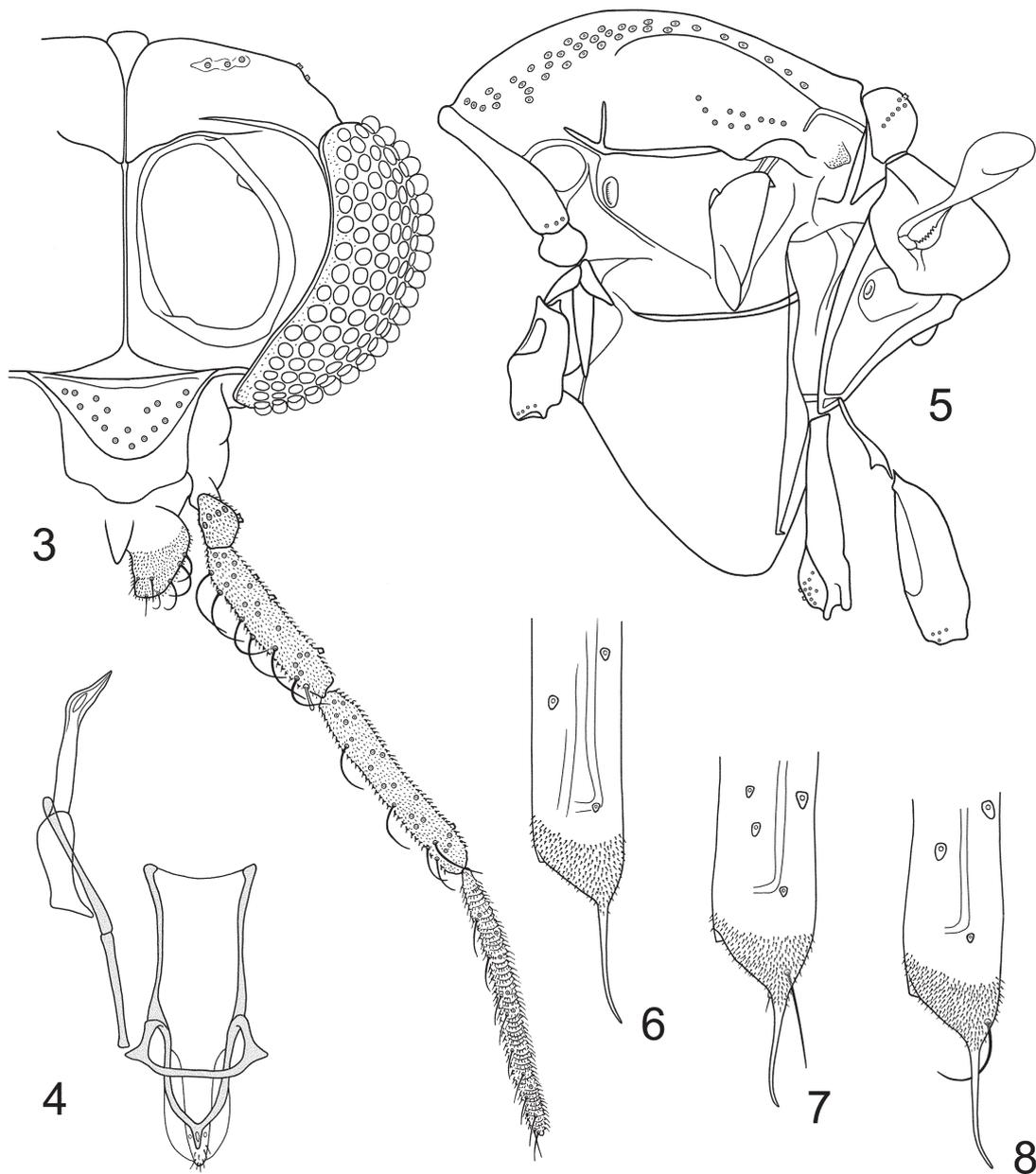
Description

Male (n = 10, unless stated differently).

Total length 1.70–2.18, 1.90 mm. Wing length 1.01–1.39, 1.15 mm. Total length / wing length 1.57–1.79, 1.65. Wing length / length of fore femur 2.05–2.41, 2.24.

Coloration. Head, thorax and abdomen brown; femur and tibiae lighter brown; wings translucent.

Head (Fig. 3). AR 0.48 (1). Terminal flagellomere 162–205 (2) µm long. Temporal setae 7–12, 9; consisting of 3–6, 4 inner verticals; 1–3, 2 outer verticals and 2–4, 3 postorbitals. Clypeus with 13–23, 17 setae. Tentorium, stipes and cibarial pump as in Figure 4. Tentorium 98–117, 105 µm long; 18–22, 19 µm wide. Stipes 101–116, 108 µm long. Palpomere lengths (in µm): 22–26, 23; 30–36, 33; 92–104, 98; 108–123, 116 (8); 159 (1). Third



Figures 3–8. *Mollerietta kaputu* n. sp., male. 3, head; 4, tentorium, stipes and cibarial pump; 5, thorax; 6, apex of fore tibia; 7, apex of mid tibia; 8, apex of hind tibia.

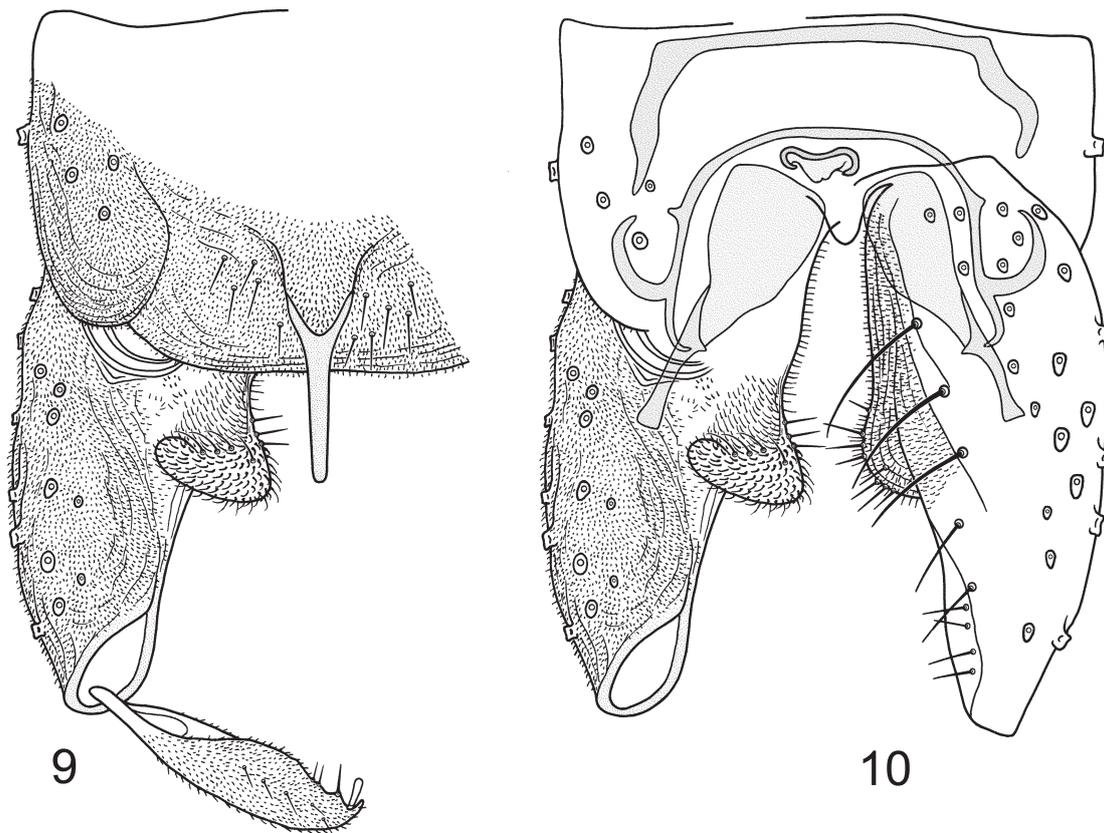
palpomere with 1–2 sensilla clavata subapically, longest 11–13 μm long.

Thorax (Fig. 5). Anteprenotum with 2–4, 3 ventrolateral setae. Dorsocentrals 29–45, 35 starting close to anteprenotum; prealars 7–11, 10. Scutellum with 12–16, 14 setae. Preepisternum apparently without minute setae.

Wing (Fig. 11). VR 1.27–1.50, 1.37. C extension 104–128, 116 μm long. Brachiolum with 2–3, 3 setae; C extension with about 47–54, 49 non-marginal setae; Sc with about 52–75, 66; R with about

31–42, 36; R_1 with about 22–35, 29; R_{4+5} with about 33–51, 43; RM with 1–3, 2; M with about 2–5, 3; M_{1+2} with about 66–85, 74; M_{3+4} with about 45–56, 48; Cu with about 36–47, 41; Cu_1 with about 25–34, 29; PCu with about 74–97, 85; and An with about 47–54, 49 setae. Wing membrane with about 110 setae in cell m; about 600 in r_{4+5} ; about 550 in m_{1+2} ; about 250 in m_{3+4} ; and about 350 in cu and an combined. Squama with 4–8, 6 setae.

Legs. Fore femur 472–568, 508 μm long; fore tibia 268–336, 304 μm long; mid femur 492–589, 528 μm long; mid tibia 376–452, 404 μm long; hind



Figures 9–10. *Mollerietta kaputu* n. sp., male. 9, hypopygium, dorsal view; 10, hypopygium with anal point and tergite IX removed, dorsal aspect to the left and ventral aspect to the right.

femur 452–516, 484 μm long; hind tibia 436–508, 464 μm long; all tarsi lost. Scale of fore tibia (Fig. 6) 42–54, 45 μm long including 28–35, 30 μm long spur; scale of mid tibia (Fig. 7) 47–56, 50 μm long including 29–36, 33 μm long spur; scale of hind tibia (Fig. 8) 50–55, 52 μm long including 28–36, 32 μm long spur. Width at apex of fore tibia 23–28, 25 μm ; of mid tibia 29–32, 30 μm ; of hind tibia 28–32, 30 μm .

Hypopygium (Figs 9–10). Anal point 33–37, 35 μm long; 6–8, 7 μm wide at base; 4–6, 5 μm wide at apex. Tergite IX with altogether 5–11, 8 setae; laterosternite IX with 6–9, 7 setae. Phallapodeme 58–63, 61 μm long; transverse sternapodeme 54–67, 60 μm long. Virga 10–14, 12 μm long; 14–18, 16 μm wide. Gonocoxite 121–144, 130 μm long. Superior volsella absent. Inferior volsella 29–35, 31 μm long; 22–25, 24 μm wide at its widest point. Gonostylus 66–76, 68 μm long; megaseta 8–10, 9 μm long. HR 1.76–1.98, 1.87. HV 2.64–2.96, 2.78.

Female (n = 1).

Total length 1.25 mm. Wing length 0.96 mm. Total length / wing length 1.30. Wing length / length of

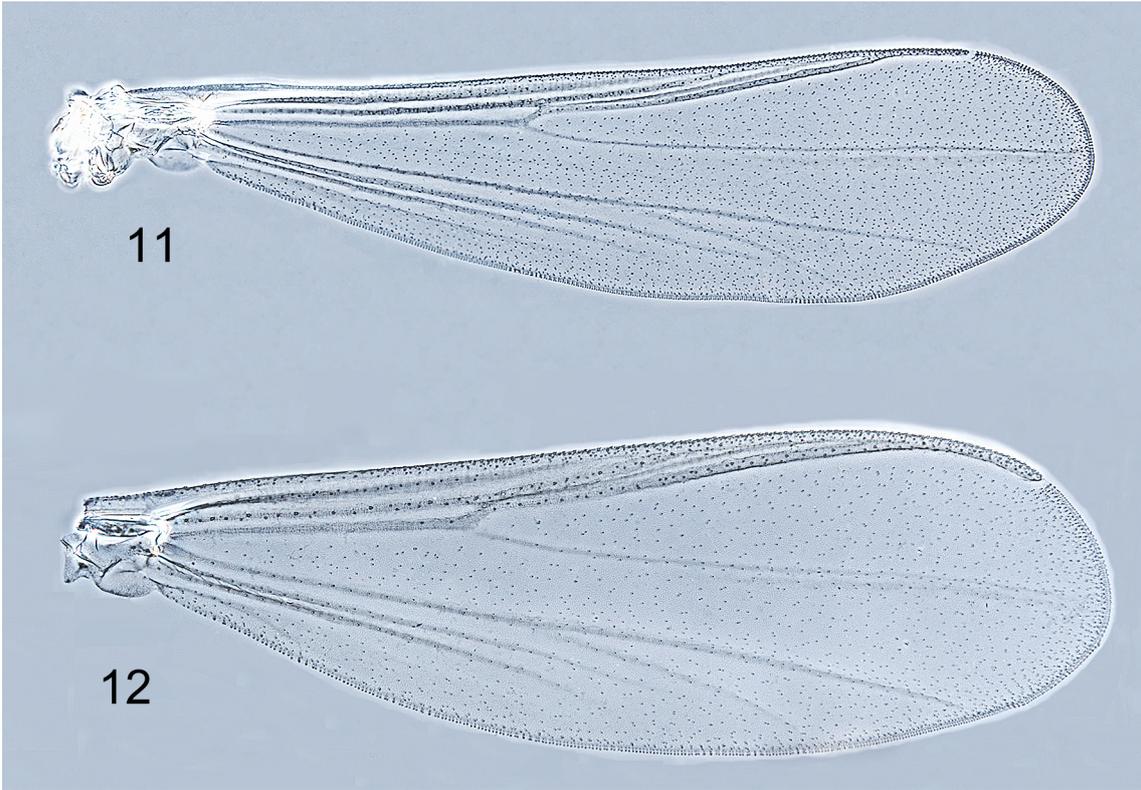
fore femur 2.85.

Coloration. Head, thorax and abdomen brown; femur and tibiae lighter brown; wings translucent.

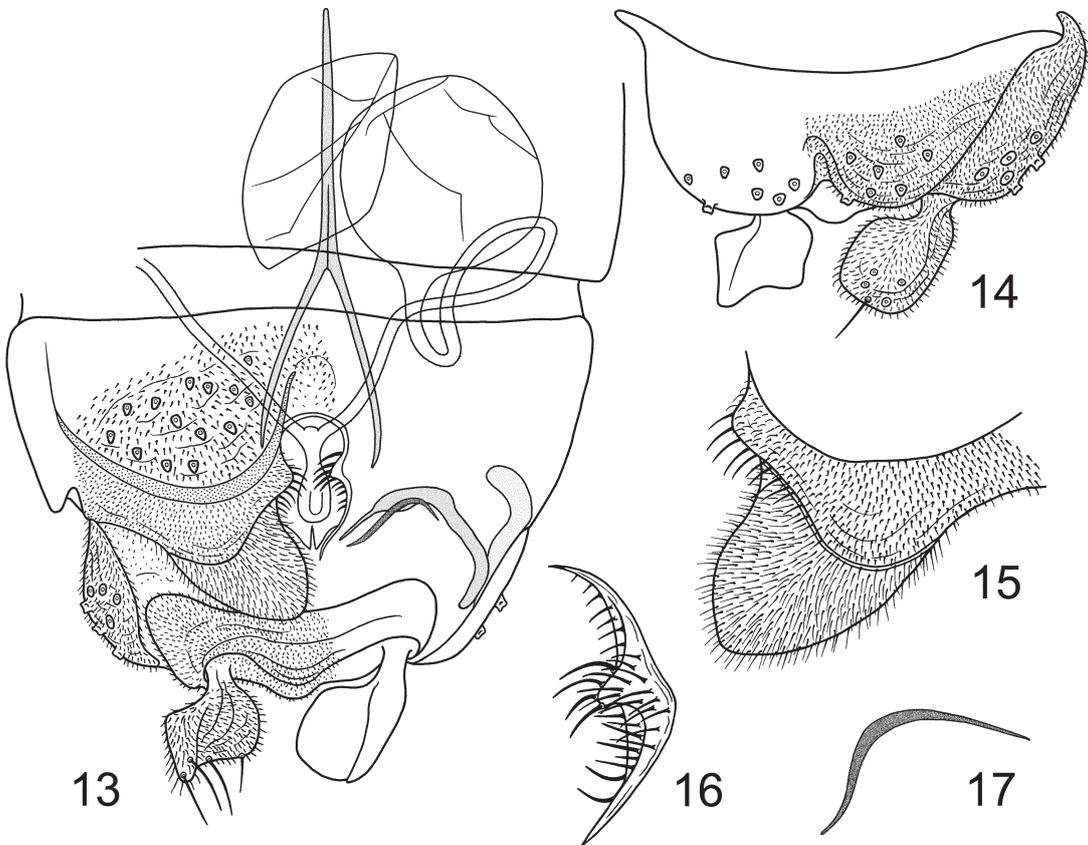
Head. Antenna missing. Temporal setae 11, consisting of 5 inner verticals; 2 outer verticals and 4 postorbitals. Clypeus with 21 setae. Tentorium 72 μm long, 8 μm wide. Stipes 90 μm long. Palp segment lengths (in μm): 22, 26, 75, 95, fifth palpomere missing. Third palpomere with 2 sensilla clavata subapically, longest 19 μm long.

Thorax. Anteprepronotum with 3 ventrolateral setae. Dorsocentrals 47 starting close to anteprepronotum; prealars 9. Scutellum with 14 setae.

Wing (Fig. 12). VR 1.37. C extension 173 μm long. Brachiolum with 2 setae; C extension with about 86 non-marginal setae; Sc with about 27; R with about 24; R_1 with about 22; R_{4+5} with about 41; RM with 2; M with 2; M_{1+2} with about 56; M_{3+4} with about 45; Cu with about 25; Cu_1 with about 23; PCu with about 49; and An with about 29 setae. Wing membrane with about 60 setae in cell m; about 325 in r_{4+5} ; about 475 in m_{1+2} ; about 150 in



Figures 11–12. *Mollerietta kaputu* n. sp., 11, wing, male; 12, wing, female.



Figures 13–17. *Mollerietta kaputu* n. sp., female. 13, genitalia, ventral view; 14, genitalia, dorsal view; 15, ventrolateral lobe; 16, dorsomesal lobe; 17, apodeme lobe.

m_{3+4} ; and about 250 in cu and an combined. Squama with 5 setae.

Legs. Fore femur 380 μm long; fore tibia 284 μm long; mid femur 420 μm long; mid tibia 344 μm long; hind femur 404 μm long; hind tibia 396 μm long; all tarsi lost. Scale of fore tibia 39 μm long including 26 μm long spur; scale of mid tibia 40 μm long including 26 μm long spur; scale of hind tibia 48 μm long including 30 μm long spur. Width at apex of fore tibia 28 μm ; of mid tibia 30 μm ; of hind tibia 31 μm .

Genitalia (Figs 13–17). Gonocoxite IX with 6 setae. Tergite IX with posteromedial deep incision, each side with 7–8 setae. Cercus 47 μm long. Seminal capsules distorted in the single specimen, about 76 μm long, 62 μm wide, with 11 μm long neck. Notum 72 μm long. Ventrolateral lobe bluntly triangular, 52 μm long, 48 μm wide at its widest point, covered with microtrichia. Dorsomesal lobe narrow, 46 μm long, 8 μm wide.

Pupa and larva. Unknown.

Remarks

The new species is very similar to *Molleriella calcarella* in most morphological features, and the two species also overlap in most measurements. However, the male *M. calcarella* has a spatulate anal point, while the anal point in *M. kaputu* is slightly narrower and nearly parallel sided. *M.*

calcarella apparently also has more and stronger setae on the inferior volsella than *M. kaputu*. In *M. calcarella* the C extension is 79–83 μm long in the male and on average 121 μm long in the female, while in *M. kaputu* it is on average 116 μm long in the male and 173 μm long in the female. The most distinct difference seems however, to be in the length of the tibiae; in *M. calcarella* fore tibia is 430–435 μm long in the male and on average 361 μm in the female, while in *M. kaputu* it is on average 304 μm long in the male, 284 μm long in the female. Using an unconventional leg ratio, length of tibia / length of femur, the fore leg ratio is 0.81 in male *M. calcarella* and 0.54–0.62, 0.58 in male *M. kaputu*, 0.85–0.88, 0.87 in female *M. calcarella* and 0.75 in female *M. kaputu*.

Habitat

Two main vegetation types are found in the Mazumbai Forest Reserve: intermediate forest and mountain rainforest. At higher elevations outside the forest reserve dry montane forest occurs. The trees in the intermediate forest can reach a height of 50 m, while those at higher altitudes are reduced in height with increasing altitude.

During our stay at Mazumbai in late autumn 1990 daily maximum temperatures ranged from 17.5 to 23.0°C and the minima from 15.0 to 20.5°C. In the Usambara mountains there are two main rainy seasons, a heavier one from the beginning of March



Figure 18. Kaputu Stream at locality 7 at 1535 m altitude. The Malaise trap was placed across the stream.

to the end of May, and a lighter one in September and October. Mean annual rainfall at Mazumbai (1945–1975) was 1138 mm.

The Kaputu Stream is located on the eastern side of Kwagoroto Hill and is surrounded by nearly undisturbed rainforest. It originates at about 1860 m altitude and runs down to a marshy area at about 1400 m altitude. Four relatively large waterfalls are located along the stream, but in most stretches the water speed is moderate. The water temperatures measured varied between 14.6 and 17.6°C and the pH was 5.9.

The specimens of *M. kaputu* were collected at three of the Malaise trap localities along the Kaputu Stream described in Andersen and Johanson (1993). At locality 4, at 1680 m altitude, the stream was 1–3 m wide and 3–15 cm deep and the current was moderate; the substrate was mostly sand, gravel and stones densely covered with moss. At locality 7 (Fig. 18), at 1535 m altitude, the stream was 2–3 m wide and 5–15 cm deep and the current was rather slow; the substrate was mostly gravel and stones densely covered with moss, with some mud in the backwaters. At locality 10, at 1420 m altitude, the stream was 0.5–2 m wide and 10–20 cm deep and the current was moderate; the substrate was mostly fine sand, mud and some larger stones densely covered with moss.

According to Sæther and Ekrem (1999) *M. cal-carella* is terrestrial; it was caught in “mini-traps” placed on the banks of a small lake about one meter from the water edge. As the material of *M. kaputu* was collected in Malaise traps, this species too might well be terrestrial, having originated in the moss or wet soil along the Kaputu Stream.

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