



How strange: *Coenosia curiosa* sp. nov. (Diptera: Muscidae), the first recorded Tiger fly from Lesotho, with revision of the *Coenosia globuliseta*-group

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Abstract

A new species of tiger fly, *Coenosia curiosa* sp. nov., is described from the Kingdom of Lesotho. It is also the first record of the genus for Lesotho. An identification key is provided for the *C. globuliseta*-group, which now includes four species with aberrant males that have enlarged apically globular frontal setae, thus far known only from southern Africa. Diagnoses, material examined and terminalia illustrations for all known species of the *C. globuliseta*-group are also provided.

Key words: Afrotropical Region, southern Africa, new species, taxonomy, identification key, *globuliseta*-group

Introduction

The Kingdom of Lesotho is a landlocked African country, encompassed entirely by the Republic of South Africa. Its eastern borders are formed by the Drakensberg Mountains, which are also the most eastern part of the Great Escarpment.

Lesotho shares the vegetation and habitat types of similar sites in South Africa, and it is to be expected that there should be some overlap in species occurring on the eastern side of the Drakensberg in the KwaZulu-Natal province, South Africa. However, the average altitude of Lesotho is ~900 m higher than that of South Africa suggesting that differences from South Africa will occur.

Coenosia Meigen, 1826 is one of the most species-rich genera of Muscidae in the Afrotropical Region with over 120 known species described (Couri & Pont 2016) from the Afrotropical Region. To date no species of *Coenosia* has been recorded from Lesotho, but as there have been very few expeditions to Lesotho (Kirk-Spriggs 2017: 21) to sample Diptera, much less Muscidae, this is not surprising.

Species groups within *Coenosia* were first suggested by Van Emden (1940) and given the number of species in the genus, these groups have been treated in isolation in the past. A new species of the *C. globuliseta*-group, first defined in Muller (2019), is described, including its female, expanding on the knowledge of this curious group. An identification key to the *C. globuliseta*-group is provided with a redefinition of the group. In addition, diagnoses, material examined and illustrations for all known species of the *C. globuliseta*-group are also given.

Material and methods

Specimens were collected using sweep nets at Afriski Mountain Lodge and Resort (Fig. 1) in December 2021. The resort falls within the Alpine zone at 3032 m, consisting of Drakensberg Afroalpine Heathland (Gd10) vegetation, which is typically dominated by fynbos shrubs and also grass (Mucina & Rutherford 2006).

Specimen terminalia were dissected and macerated in 10% heated Potassium Hydroxide (KOH) for 20 minutes. A Novel Compound Light Microscope with attached Canon 400D camera was used to photograph the terminalia,

and subsequent photos were used to create illustrations in Illustrator CC 2022. Habitus photos of specimens were taken using a Canon 400D with a reversed 35mm lens and stacked in Helicon Focus Pro 7. Drawings and photos of other species are reused or modified from Muller (2019) under Creative Commons Attribution License (CC BY 4.0). The distribution map (Fig. 2) was generated using QGIS 3.10. Specimen measurements were made using ImageJ 1.53k.



FIGURE 1. Study site: Afriski Mountain Lodge and Resort, type locality of *Coenosia curiosa* sp. nov., typical Drakensberg Afroalpine Heathland vegetation.

Type material and other material examined cites the labels directly, with any additional author-interpreted information provided in brackets. Original label layout is cited with “/” indicating a label; “/” indicating a line break.

Morphological terminology follows that of Cumming & Wood (2017), with the exception of the term cercal plate, which is the typical term used to refer to the cercus of the male terminalia in Muscidae.

Abbreviations and codens. ar—arista; cerc plt—cercal plate; dist ph—distiphallus; ej apod—ejaculatory apodeme; epand—epandrium; epiprct—epiproct; fr s—frontal seta; hypd—hypandrium; hypret—hypoproct; int s—interstitial seta; ivt s—inner-vertical seta; oc s—ocellar seta; orb s—orbital seta; palp—palpus; ped s—pedicel seta; pgt—postgonite; phapod—phalopodeme; pregt—pregonite; spmth—spermathaeca; st—sternite; sur—surstylus; t—tergite; vb s—vibrissal seta. BMSA—National Museum, Bloemfontein, South Africa; NMSA—KwaZulu-Natal Museum, Pietermaritzburg, South Africa.

Results

Couri & Pont (2000) lists the slender paired plates of tergite 6 in females as a synapomorphy of *Coenosia*. *Coenosia flagelliseta* however, has its tergite as a single, broad plate, which led to Muller (2019) speculating that the “*globuliseta*-group should be treated as aberrant and an exception to the *Coenosia* ground plan”. With the description of *C. curiosa* sp. nov. and a large series of females, a redefinition of the group is provided below to make it more inclusive of females of species that are less aberrant.

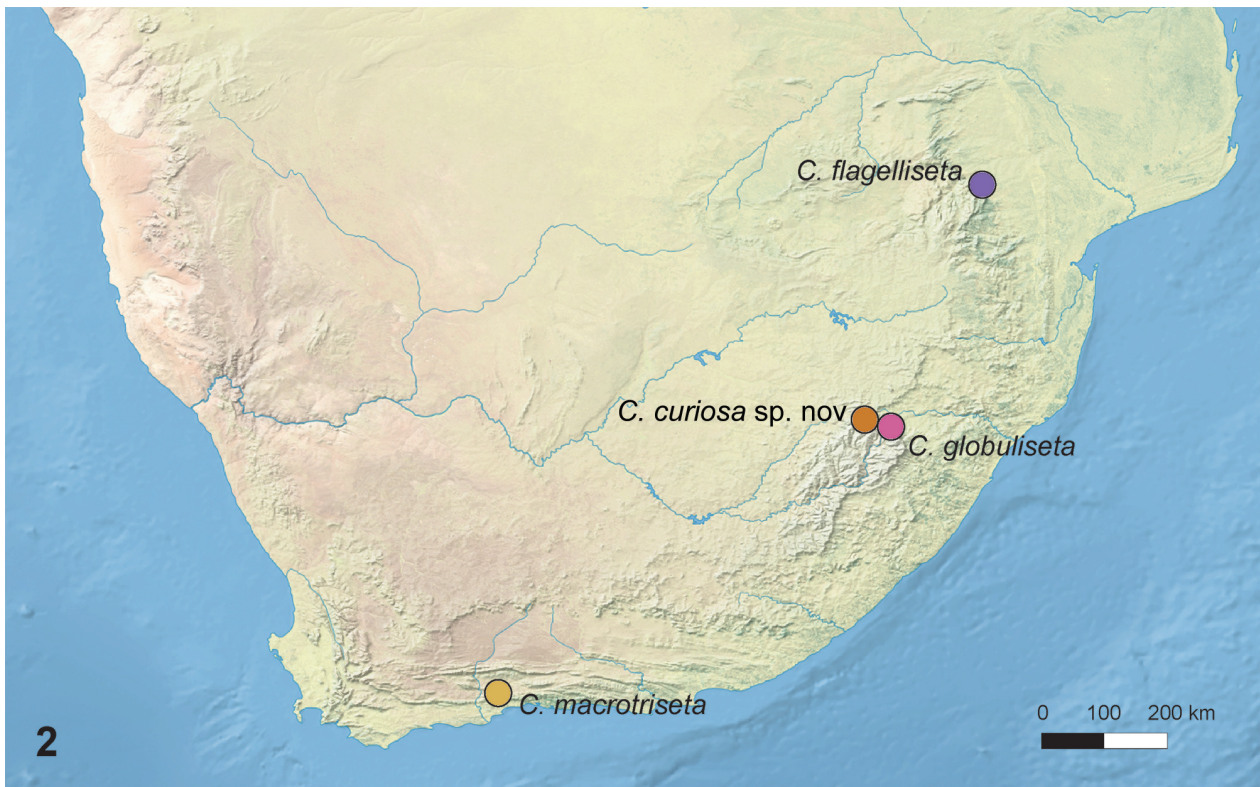


FIGURE 2. Distribution map of known species belonging to the *C. globuliseta*-group.

Species in the *Coenosia globuliseta* group key to *C. semifumosa* group in Van Emden (1940), but can be separated from the latter by the combination of an inclinate pair (apically globular in males) of upper frontal setae and reclinate pair of orbital setae, presence of weakly developed interstitial setulae between each of the frontal and orbital setae (Fig. 7), and hind tibia without a median anterior seta. The face is also conspicuously projecting compared to other groups.

It should be noted that Muller (2013) misinterpreted the interstitial frontal setulae as setae and Muller (2019) misinterpreted the apically globular upper frontal seta of all species as an inclinate orbital seta.

The species group has a disjunct distribution throughout South Africa and Lesotho (Fig. 2), apparently associated with vegetation that includes fynbos or shrubland (see Discussion).

Key to species of the *Coenosia globuliseta*-group:

- 1 Male with first two pairs of frontal setae normally developed, one pair of upper inclinate apically globular frontal setae; female unknown *globuliseta* Pont
- Male with all three pairs of frontal setae apically globular; known females with frontal setae normally developed 2
- 2 Male with a well-developed apically globular seta on the pedicel; scutum with easily distinguishable and well-developed dorsocentral and acrostichal setae; female with tergite 6 two relatively slender paired plates *curiosa* sp. nov.
- Male with a short setulae on pedicel; dorsocentral and acrostichal setae difficult to distinguish from surrounding setulae, at most with posterior pair of dorsocentral setae strongly developed and distinguishable. 3
- 3 Male with mostly whip-like setae and setulae on thorax and legs; female with normally developed setation, tergite 6 a broad, fused plate with basal emargination *flagelliseta* Muller
- Male with normally developed setae and setulae on the thorax and legs; female unknown *macrotrisetata* Muller & Miller

Taxonomy

Muscidae Latreille, 1802
Coenosiinae Verrall, 1888
Coenosiini Verrall, 1890
Coenosia Meigen, 1826

Coenosia curiosa sp. nov.

(Figs 3–10, 20, 24, 25)

Zoobank LSID:urn:lsid:zoobank.org:act:E68BD71E-7513-4CFD-B14F-E5F52024E6D8

Type material examined. Holotype ♂ “//LESOTHO: Butha-Buthe: / Afriski Mountain Resort / 28°49'22.2”S, 28°43'41.0”E / 3–7.xii.2021, 3032 m a.s.l. / Midgley, J.M. & Muller, B.S.” // “Sweepnet / Drakensberg Afro- / alpine Heathland” // “NMSA-Dip. 212862”; NMSA type no. 3237. 1♂7♀ Paratypes: same data as holotype (♂: BMSA(D)129185; ♀: BMSA(D)130304, BMSA(D)130322, BMSA(D)129186, NMSA-Dip. 212863, NMSA-Dip. 212864, NMSA-Dip. 212865, NMSA-Dip. 212866); NMSA type no. 3237

Diagnosis. Males can easily be distinguished from other species within the *globuliseta*-group, and other non-globular species by the seemingly unique apically globular seta on the antennal pedicel (Fig. 7) in combination with well-developed and normally appearing thoracic and leg setae and setulae. Females have the supramedian posterior seta on the mid tibia absent, and tergite 6 as two relatively slender plates (Fig. 24), compared with females of *C. flagelliseta* (the only other known female in the group) that have the seta present, and tergite 6 as a broad, fused plate (Fig. 26). Males and females with preapical dorsal and anterodorsal setae on hind tibia, unlike the other species in the group.

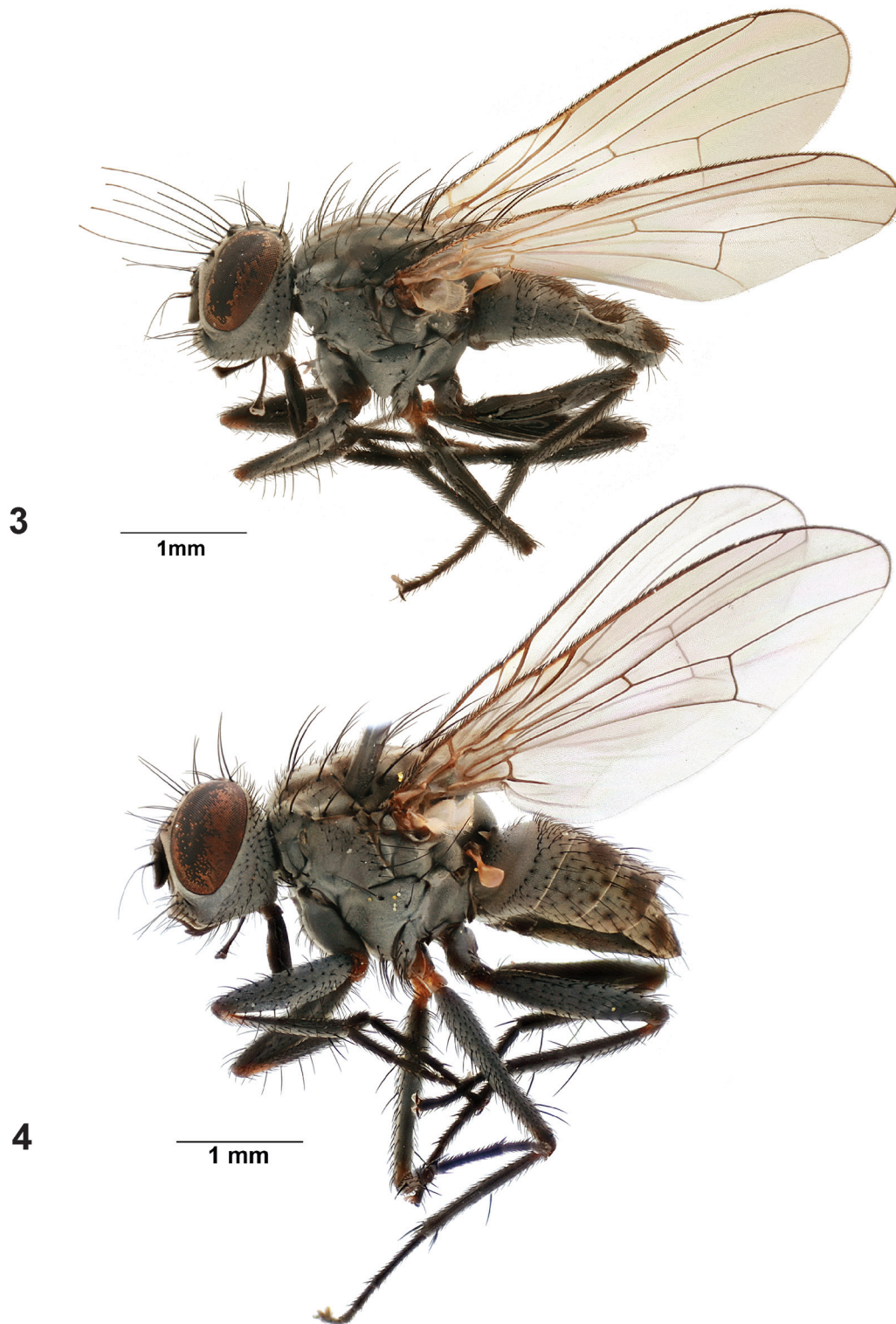
Description.

Male. Measurements. Body length: 3.4–3.7 mm; wing length: 3.5–4.0 mm.

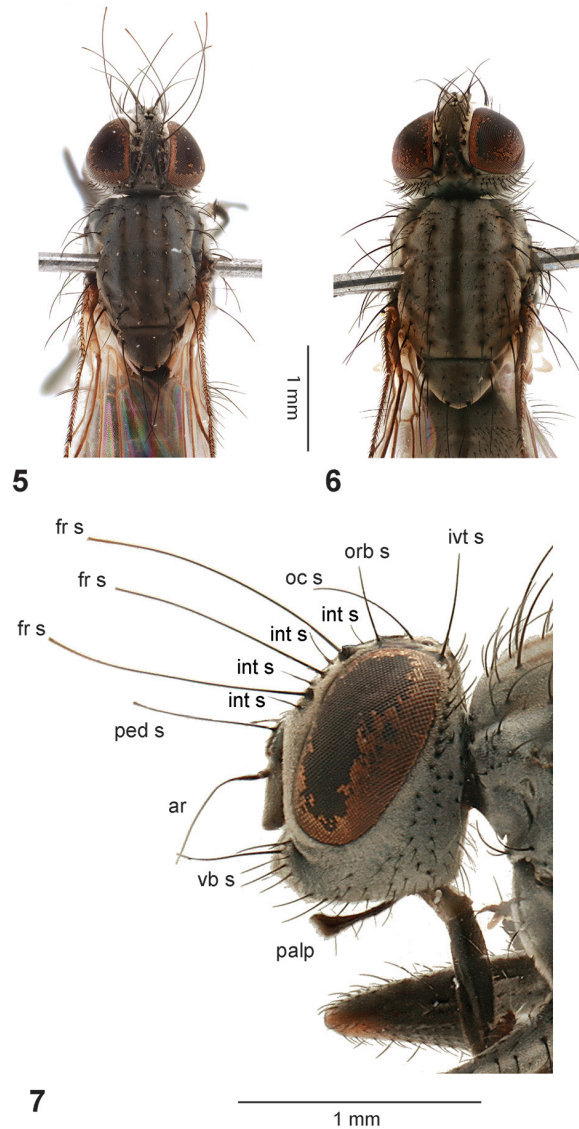
Head (Fig. 7). Dichoptic; eyes bare and somewhat reduced taking up 48% of lateral head surface; antennal scape with two minute proclinate dorsal setulae; pedicel with dorsal suture along its length, with one strong globular seta, ca 0.69 × as long as apical frontal seta and one weak setula on the dorsal inner surface; postpedicel not reaching past bottom third of head, ca 2 × length of pedicel; arista inserted dorsally on postpedicel, bare, apart from minute basal setulae, never wider than width of arista base; palpus apically dilated, with glossy dark-brown appearance, apically with silver-white hairs; gena wide, darker apically than surroundings, face projecting forwards; apical edge of face and gena with a silver-grey fringe; mentum dark brown, glossy; head grey-dusted throughout, with exception of frontal plate (appears darker when viewed from posterior), parafacials and fronto-orbital plates that are silver-grey dusted in appearance, orbitals glossy up to vertex; one pair of ocellar setae, ca 2 × length of ♀ ocellar setae; one pair of reclinate orbital setae, similar length as ocellar setae; three pairs of inclinate, apically globular frontal setae, with three pairs of interstitial setulae; the upper and lower pairs of frontal setae similar, situated on a glossy, raised tubercle; one pair of divergent post-ocellar setae, less than ¼ the length of ocellar setae; one pair each of inner vertical and paraverticilar setae, outer vertical setae appearing absent, not distinguishable from postocular setae; inner vertical seta well-developed, somewhat longer than reclinate orbital seta, ca 4 × longer than paraverticilar seta; two pairs of supravibrissal setulae, one pair of vibrissae, four pairs of subvibrissal setulae.

Thorax (Fig. 5). Grey dusted throughout, with five dark brown vittae, running along the dorsocentral, acrostichal and intra-alar setae; most lateral pair lighter in appearance, acrostichal vitta running to the apex of scutellum; postpronotum with 2 setae and 3–5 short setulae; prosternum bare; two notopleural setae of equal length; two postalar setae, posterior postalar seta 2 × length of anterior postalar seta; one pair of supra-alar setae; two pairs presutural, and two pairs postsutural intra-alar setae; dorsocentral setae 1+3; scutum with interstitial acrostichal, dorsocentral and inter-alar setulae; scutellum: one pair of apical setae, one pair of strongly developed sub-basal setae, ¾ the length of apical setae; one pair of weak basal setulae (½ the length of sub-basal setae), no subapical setae and discal setal area restricted to 4–5 weak setulae; subscutellum bare; proepisternum with one seta, one setula, seta ca 3 × the length of

the setula; proepimeron with one strong upcurved seta and one much smaller downcurved lower seta; katepisternal setae forming an equilateral triangle (1:1:1), with 2 weak setulae inside the triangle, posterior katepisternal much stronger than anterior and lower katepisternal setae; anepisternum with row of 4 setae on posterior margin, and 10 scattered setulae on surface; anepimeron, meron and katepimeron bare; katatergite with fine hyaline hairs, anatergite bare.



FIGURES 3, 4. Habitus of *Coenosia curiosa* sp. nov.: (3) Holotype ♂, lateral view, (NMSA-Dip. 212862); (4) Paratype ♀, lateral view, NMSA-Dip. 212863).



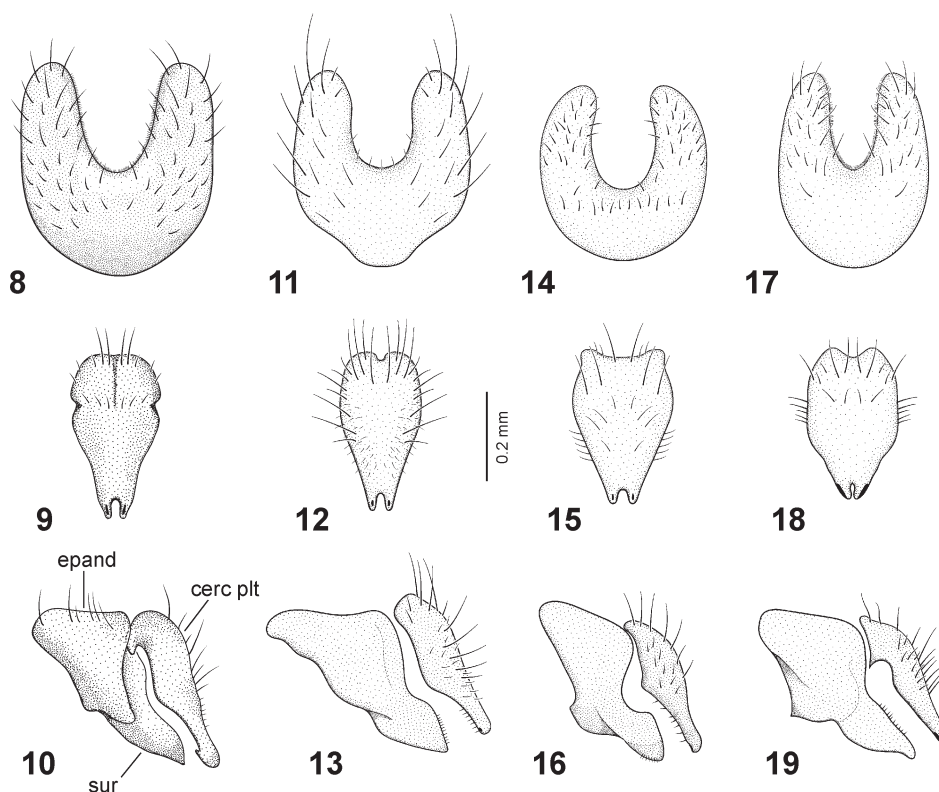
FIGURES 5, 6. Dorsal view of *Coenosia curiosa* sp. nov. head and scutum: (5) Holotype ♂ (6) Paratype ♀. **FIGURES 7.** Head setation of ♂ *Coenosia curiosa* sp. nov.

Wing. Hyaline and bare, with no conspicuous setation or suffusions; haltere yellow.

Legs. Coxae grey with dusted appearance. All coxae with glossy black posteriors, fore and hind trochanters glossy amber-black, adjoining areas and joints amber, mid trochanters entirely amber in colour; mid coxae posterolaterally amber with amber coloured posterolateral protuberance; fore femur with posterodorsal surface grey dusted and anterodorsal surface glossy black, anteroventral and posteroventral surface silver grey dusted, creating a visible transverse contrast between the top and bottom half of anterior and posterior surfaces; mid femur with anterodorsal and almost entire posterior surface glossy black (except on apical surface), anterodorsal surface dark-grey, creating a visible contrast between the top and bottom half of anterior surface; hind femur entirely glossy black except for anterior apical surface; fore, mid and hind tibia dark grey; fore, mid and hind tarsi infuscate, terminal segments with an apically protruding setulae.

Leg setation. Fore femur with one row each of posterodorsal and posteroventral setae; fore tibia with one median posterior seta, one preapical dorsal seta; fore tarsus with one sub-basal ventral seta on basal segment; mid femur with two short supramedian anterior seta, one short sub-basal ventral seta, anterior and posterior preapical setae absent; mid tibia with one median posterior seta, two preapical anterior setae, one preapical posterodorsal seta, one apical ventral seta; hind femur with one sub-basal dorsal seta, one preapical ventral seta, two preapical dorsal setae barely longer than surrounding setulae; hind tibia with reduced median and preapical anterodorsal setae, one

preapical dorsal seta, one apical ventral seta, one apical anteroventral seta; fore, mid and hind basal and 2nd tarsal segments with ventral setulae appearing somewhat erect.



FIGURES 8–19. *Coenosia* spp. ♂, terminalia: *C. curiosa* sp. nov.: (8) sternite 5; (9) cercal plate; (10) surstylus and cercal plate, lateral view. *C. flagelliset*a: (11) sternite 5; (12) cercal plate; (13) surstylus and cercal plate, lateral view. *C. macrotriseta*: (14) sternite 5; (15) cercal plate; (16) surstylus and cercal plate, lateral view. *C. globuliseta*: (17) sternite 5; (18) cercal plate; (19) surstylus and cercal plate, lateral view. Figs 11–19 modified from Muller (2019), figs 17–25 under Creative Commons Attribution License (CC BY 4.0).

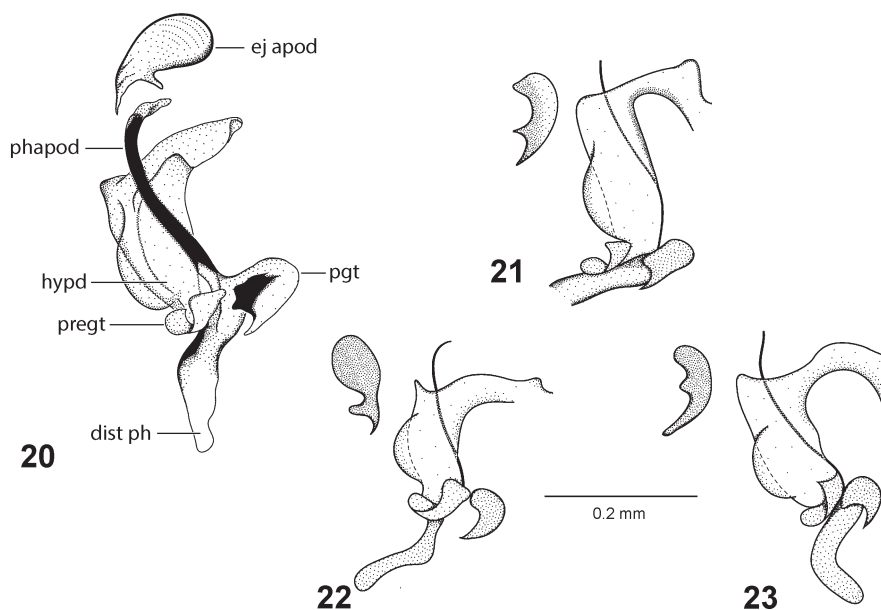
Abdomen and terminalia. All tergites with dark, shiny, paired markings taking up at least $\frac{2}{3}$ of lower dorsal surface area. Median dark narrow vitta running from tergites 1+2 to tergite 5 merging with paired markings; sternite 1 bare; sternite 5 as in Fig. 8, with setulae covering the majority of surface of lobes, except for basal margins; cercal plate as in Fig. 9, with clear apical emargination and pair of dark markings apically, basal margin with only a slight emargination, lateral margins with clear emarginations on basal $\frac{1}{3}$; cercal plate with long basal setulae and shorter row of setulae transverse-medialy; surstylus partly fused with epandrium, with separation by a hyaline membranous area; phallic complex as in Fig. 20. hypandrium tubular, with two flap-like structures on either side; phallopodeme rodlike, hyaline basally, otherwise infuscate; distiphallus appearing somewhat straightened, with infuscated basal-ventral margins; pregonite as in Fig. 20; postgonite infuscate ventrally, and a well-developed apical tooth; ejaculatory apodeme as in Fig. 20.

Female. Measurements. Body length: 3.8–4.2 mm; wing length: 3.6–4.3 mm

Similar to male except as noted below:

Head. Eyes taking up 50% of lateral head surface. Antennal scape with a singular minute setulae; palpus apically with golden-white hairs. Apical edge of face and gena with a slight golden-white coloured fringe. Head grey-dusted throughout, with exception of frontal plate (black ground colour) with silver-grey pruinosity and fronto-orbital plates with a slight infuscate grey appearance up to vertex. One pair of ocellar setae, 0.5× length ♂ ocellar setae, one pair of well-developed reclinate orbital setae; three pairs of well-developed normal inclinate frontal setae, non on raised tubercles, with three pairs of interstitial setulae; one pair of divergent post-ocellar setae, similar in length

to ocellar setae. One pair each of inner vertical, outer vertical and paraverticilar setae; inner vertical seta ca 2× outer vertical seta length, the latter similar to paraverticilar length.



FIGURES 20–23. *Coenosia* spp. ♂, phallic complex: (20) *C. curiosa* sp. nov.; (21) *C. flagellisetia*; (22) *C. globulisetia*; (23) *C. macrotrisetia*. Figs 21–23 modified from Muller (2019), figs 26–28 under Creative Commons Attribution License (CC BY 4.0).

Thorax (Fig. 6). Grey dusted throughout, dark brown vittae running along the acrostichal, dorsocentral and intra-alar setae; dorsocentral vittae lighter in colour and appearing fragmented and reduced to dark brown markings around dorsocentral setae in some specimens; postpronotum with 2 setae and 3–5 short setulae; two notopleural setae similar to ♂, but more strongly developed; dorsocentral and acrostichal setae more strongly developed compared to male, but same relative length; scutellum with one pair of basal setulae ($\frac{1}{4}$ the length of sub-basal setae), discal setal area restricted to 4–7 weak setulae; proepisternum with one seta, one setula, seta ca 2× the length of the setula; anterior and posterior katapisternal setae more strongly developed than lower.

Legs. Mid coxae with glossy upper posterior; hind coxae grey with amber posterior and thin, transverse glossy upper posterior area; all trochanters amber coloured, except hind trochanter with infuscate posterior; all legs grey without contrasting transverse colour separation.

Leg setation. Fore femur with a row of posterodorsal and posteroventral setae and several additional posterior and ventral setae towards base; fore tibia in addition to one median posterior seta, and one preapical dorsal seta (as in male) also with one preapical posteroventral seta, one preapical posterior seta, and one apical posterodorsal seta, fore tarsus with one sub-basal ventral seta on basal segment; mid femur with one supramedian anterior seta, one median anterior seta and one submedian anterior seta, one row of four ventral setae, one preapical posterodorsal seta, one preapical posterior seta, one supramedian ventral seta, one row of anteroventral setae; mid tibia with one preapical dorsal seta, one apical anterior seta, one median anterodorsal seta, one median posterodorsal seta, one apical ventral seta, one posteroventral preapical; hind femur with one row of anterodorsal and anteroventral setae, one median and one supramedian posteroventral seta, one preapical posterodorsal seta; hind tibia with one preapical dorsal seta and one preapical anterodorsal seta, one reduced preapical posterodorsal seta, one median anterodorsal seta, one submedian anteroventral seta, one apical ventral or apical anteroventral seta.

Abdomen and terminalia. Abdomen similar to male, but with tergite 5 paired markings not merged with median vitta. Setae on tergites 3–5 with bases surrounded by dark markings that are absent in male. Ovipositor as in (Figs 24, 25). Sternites 6, 7, and tergites 6, 7, 8 slender plates, but edges not well-defined; sternite 8 reduced to two small apical plates; tergite 6 plates appearing wider due to fading into middle of tergite in some specimens; three spermathecae, somewhat pear shaped; hypoproct and epiproct rounded apically.

Etymology. From the Latin *curiosus* meaning odd or strange, referring to the curious globular setae that characterises the species.

Distribution. Lesotho (Butha-Buthe).

***Coenosia globuliseta* Pont, 1980**

(Figs 17–19, 22)

Coenosia globuliseta Pont, 1980: 755 [replacement name]; Muller 2013: 599, figs 1B, 2B, 3B, 6B, 7B, 8B, 9B; Muller 2019: 250, figs 6, 10, 14, 23–25, 28.

Coenosia longiseta Zielke, 1971: 301 [junior primary homonym of *C. longiseta* Stein, 1906].

Material Examined. *Holotype* ♂ South Africa: KwaZulu-Natal: Cathedral Peak area [28.9502S 29.2053E, max. uncertainty 2.5 km], Natal Drakensberg; alt. 7700 ft [ca 2350 m a.s.l.]; 20 Mar. 1955 [20.iii.1955]; B. Stuckenberg; [red label] *Holotype*, *Coenosia longiseta* sp. nov., det. E. Zielke 1969; NMSA-Dip. 37487, NMSA type no. 1750. Micro-pinned specimen, genitalia dissected, stored together with abdomen in vial under specimen. Specimen deposited in the KwaZulu-Natal Museum, Pietermaritzburg, South Africa.

Diagnosis. Males with only one pair of apically globular upper frontal setae, the others developed normally. The scutum with well-developed, prominent dorsocentral and acrostichal setae. Hind tibia without preapical dorsal setae and preapical anterodorsal setae.

Distribution. South Africa (KwaZulu-Natal).

***Coenosia flagelliseta* Muller, 2019**

(Figs 11–13, 21, 26, 27)

Coenosia flagelliseta Muller, 2019: 241, figs 3, 4, 7, 8, 11, 12, 15–19, 26, 29, 30.

Material Examined. *Holotype* ♂ South Africa: Mpumalanga: Mariepskop State Forest, Radar station road at: 24.5466°S, 30.8646°E, 26–28.i.2017, 1 885 m [a.s.l.], Kirk-Spriggs & Muller, Malaise trap over ravine, Northern Escarpment Afromontane Fynbos; *Holotype* ♂ *Coenosia flagelliseta* sp. nov., B.S. Muller 2019; BMSA(D)02271; BMSA type no. 317. Micro-pinned specimen. Specimen deposited in the National Museum, Bloemfontein, South Africa. *Paratype* ♀ Same data as for *Holotype*. *Paratype* ♀ *Coenosia flagelliseta* sp. nov.; B.S. Muller 2019; BMSA(D)02273; BMSA type no. 318. Micro-pinned specimen, genitalia dissected, stored together with abdomen in vial under specimen. Specimen deposited in the National Museum, Bloemfontein, South Africa.

Diagnosis. Males can easily be distinguished from other known species of *Coenosia* by the whip-like setae and setulae on the thorax and legs. The females have a supramedian posterior seta on the mid tibia, which is absent in the female of *C. curiosa*, the only other known *globuliseta*-group species with the female described.

Correction. The original BMSA type numbers 306 and 307 assigned to the holotype (BMSA(D)02271, and female paratype (BMSA(D)02273) respectively in Muller (2019) were incorrectly assigned due to an administrative error and were already preoccupied by other specimens in the National Museum, Bloemfontein collection. The new correct numbers are included in the material examined citation above for future reference. Also, the female paratype is also incorrectly referred to as an Allotype under the measurement section in Muller (2019).

Distribution. South Africa (Mpumalanga).

***Coenosia macrotriseta* Muller & Miller, 2013**

(Figs 14–16, 23)

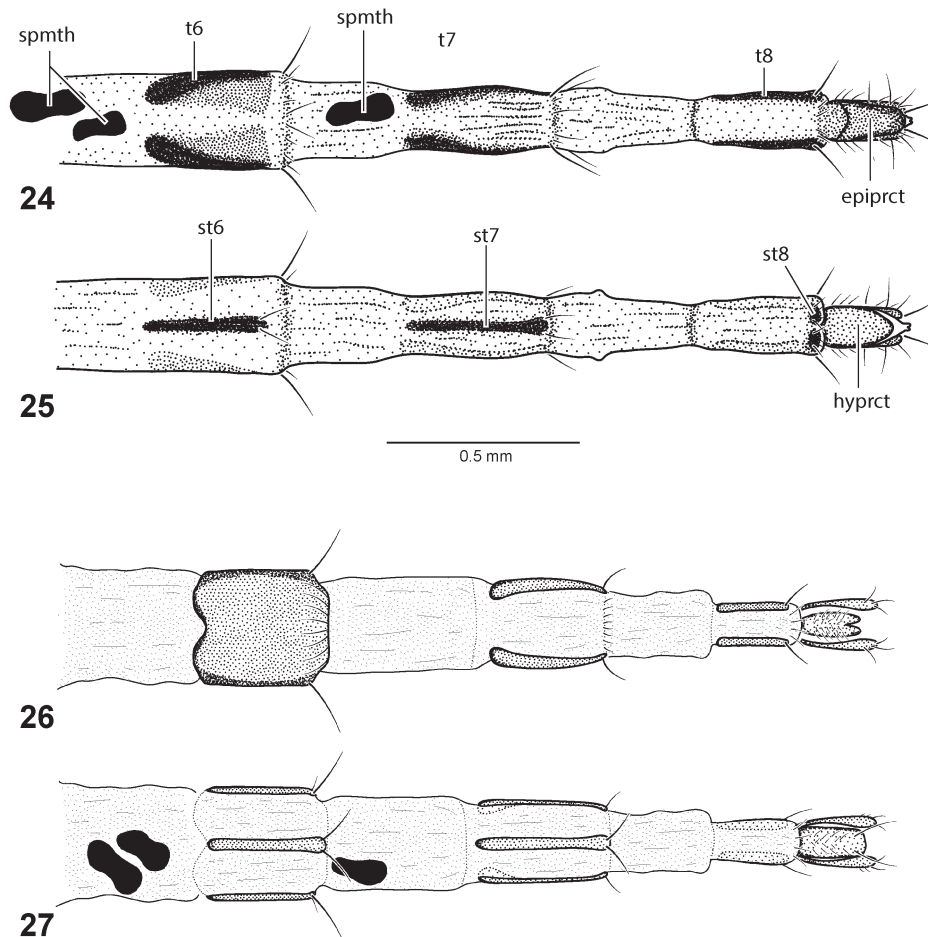
Coenosia macrotriseta Muller & Miller, 2013: 596, figs 1A, 2A, 3A, 4, 5, 6A, 7A, 8A, 9A; Muller 2019: 249, figs 5, 9, 13, 20–22, 27.

Material Examined. *Holotype* ♂ South Africa: Western Cape: Oudtshoorn district, Moeras-River Farm (209); 33°48'S, 22°03'E; 525 m [a.s.l.]; Early September 2007 [ix.2007]; G.P.B. Davies; Dry Karoo scrub with flowers;

Holotype ♂ 1806; *Coenosia macrotriseta* sp. nov., det. B. Muller 2013; NMSA-Dip. 70333; NMSA type no. 1806. Micro-pinned specimen, genitalia dissected, stored together with abdomen in vial under specimen. Specimen deposited in the KwaZulu-Natal Museum Pietermaritzburg, South Africa.

Diagnosis. Male with three pairs of frontal setae that have apically globular apices in combination with undifferentiated dorsocentral and acrostichal setae on the scutum, except for the most posterior dorsocentral setae that are well-developed.

Distribution. South Africa (Western Cape).



FIGURES 24–27. *Coenosia* spp. ♀, ovipositor: *C. curiosa* sp. nov. (24) dorsal view; (25) ventral view. *C. flagelliseta* (26) dorsal view; (27) ventral view. Figs 26, 27 modified from Muller (2019), figs 29, 30 under Creative Commons Attribution License (CC BY 4.0).

Discussion

The vegetation types in which the three known species were collected were discussed by Muller (2019). While not true fynbos, Drakensberg Afroalpine Heathland is dominated by shrubs and is not a typical grassland (Mucina & Rutherford 2006). *Coenosia curiosa* is also associated with the fynbos, occurring in a mixed vegetation type. It is so far the only species within the group that occurs within the Alpine Zone, at 3032 m. While occurring in close direct proximity (~45 km) to *C. globuliseta* (Fig. 2), the difference in altitude between these sites is ~700 m, suggesting that overlap is limited.

Future sampling efforts should ideally be focussed on similar high elevation fynbos vegetation as it would help clarify the relationship of *Coenosia* s.l. with this curious group.

Acknowledgements

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Conflict Of Interest

The authors declare that there is no conflict of interest.

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