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FIRST RECORD OF THE MICRO BEE FLY GENUS *GLABELLULA*
BEZZI IN MADAGASCAR (DIPTERA: MYTHICOMYIIDAE)

NEAL L. EVENHUIS



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HONOLULU

Cover photo: *Glabella vibex* Evenhuis, new species, male from Madagascar.

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First record of the micro bee fly genus *Glabellula* Bezzi in Madagascar (Diptera: Mythicomyiidae)

NEAL L. EVENHUIS 

J. Linsley Gressitt Center for Research in Entomology, Bishop Museum, 1525 Bernice Street, Honolulu, Hawai'i 96817-2704, USA; email: NealE@bishopmuseum.org

Abstract. Three new Malagasy species of the microbombyliid genus *Glabellula* Bezzi: *Glabellula hospes*, **n. sp.** *G. madagascarensis*, **n. sp.** and *G. vibex*, **n. sp.** are described and illustrated. This marks the first record of the genus from Madagascar and increases the Afrotropical *Glabellula* from one to four species. A key to species found in the Afrotropical Region is given.

INTRODUCTION

Little study has taken place with regard to Mythicomyiidae found in Madagascar. Evenhuis (2007) described the first record of the family (*Empidideicus rhinoclypeatus* Evenhuis) and Evenhuis & Gharali (in press) added five more species of *Empidideicus* Becker (all in the subgenus *Anomaloptilus* Hesse). Collecting during surveys conducted as part of the NSF-funded “Terrestrial Arthropods of Madagascar” project resulted in numerous new mythicomyiids available for study. From these extensive collections, I report here the first records of the genus *Glabellula* Bezzi in Madagascar, which includes three new species: *Glabellula hospes*, **n. sp.**; *G. madagascarensis*, **n. sp.** and *G. vibex*, **n. sp.** Previous to this study, only one southern African species of the genus [*Glabellula natalensis* (Hesse 1967)] was known from the Afrotropical Region. This paper increases the total to four in the region. A key is presented to distinguish species of the genus in the Afrotropical Region.

MATERIAL AND METHODS

Material has been examined from or will be deposited in the following institutions: BPBM (Bishop Museum, Honolulu, Hawai'i, USA) and CAS (California Academy of Sciences, San Francisco, California, USA). Genitalic preparations were made by macerating parts in either hot lactic acid (a few minutes) or overnight in an enzymatic solution used for cleaning contact lenses (see Yau & Marshall 2015), washing in distilled water, and dissecting and examining in concave slides in a medium of Purell® Hand sanitizer mixed with a drop of 95% ethanol. Male genitalia are preserved in a microvial pinned below the specimen; female genitalia are mounted on slides. Images of various morphological structures were accomplished by using a Leica M165C stereo dissecting scope via the Leica Microsystems LASX Multifocus software (v. 3.0.14.23224) and using Zerene Stacker® software (v. 1.04) (Zerene Systems, LLC, Richmond, Washington, USA) to align and stack-focus each final image. Morphological terminology follows Cumming & Wood (2017) with some genitalic terminology from Evenhuis (2019).

 TAXONOMY

 Genus *Glabellula* Bezzi

Platygaster Zetterstedt, 1837: 54. *Nomen nudum*.

Platygaster Zetterstedt, 1838: 574. Type species: *Platygaster arcticus* Zetterstedt, 1838, by monotypy. [Preoccupied by *Platygaster* Latreille, 1809.]

Sphaerogaster Zetterstedt, 1842: 22 (new replacement name for *Platygaster* Zetterstedt). Type species: *Platygaster arctica* Zetterstedt, 1838, automatic. [Preoccupied by *Sphaerogaster* Sturm, 1826.]

Glabellula Bezzi, 1902: 191 (new replacement name for “*Platygaster* . . . und *Sphaerogaster* . . . und *Glabella*”). Type species: *Platygaster arcticus* Zetterstedt, 1838, by subsequent designation of I.C.Z.N. (1989: 148 [Opinion 1545]).

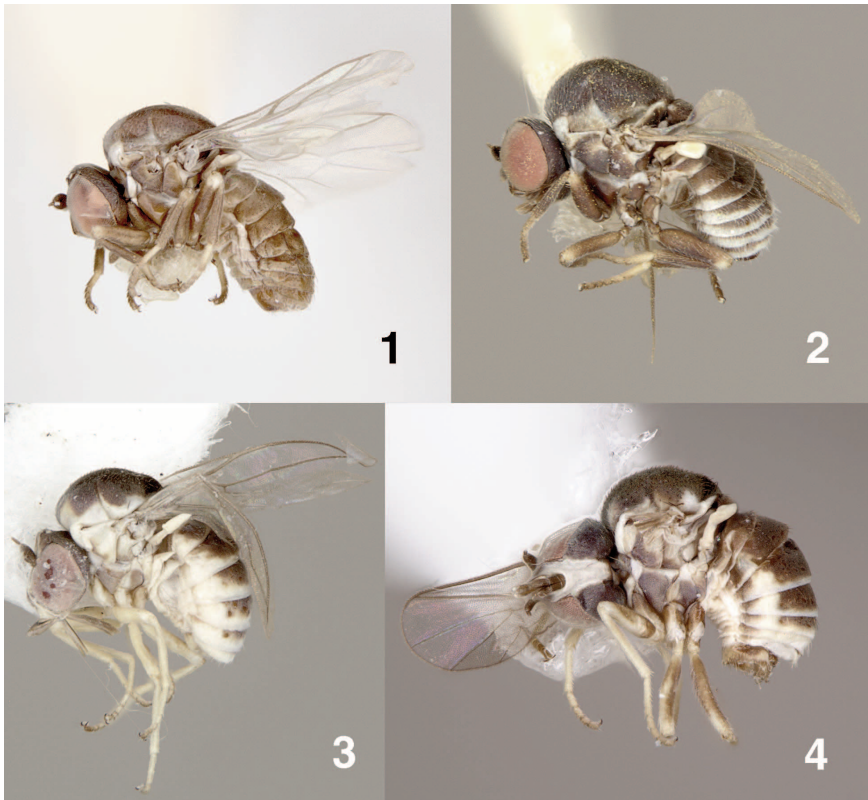
Pachyneres Greene, 1924: 62. Type species: *Pachyneres crassicornis* Greene, 1924, by monotypy.

Proglabellula Hennig, 1966: 15. Type species: *Proglabellula electrica* Hennig, 1966, by monotypy.

The genus *Glabellula* is distinguished from all other mythicomyiids based on the medial interruption of sclerotization on abdominal tergite II and in the wing by the tiny marginal cell of the wing formed by vein R_{2+3} joining R_1 well before the costa combined with the cell *bm* united with cell *dm* (e.g. Fig. 11; cell *bm-dm*). Within this generic definition, species worldwide still have a wide array of shapes and sizes of head, thorax, and antennal flagellomeres; as well as patterning on the thorax and abdomen, all allowing for a high degree of species diversity. Recent work by Mendes *et al.* (2022) on new species of *Glabellula* from Brazil has shown that the shape of sternite 7 in the female may be of diagnostic value in separating species based on females and has been examined here and illustrated for the species found in Madagascar.

 KEY TO SPECIES OF *GLABELLULA* BEZZI OCCURRING IN THE AFROTROPICAL REGION

1. Mesonotum dark grayish brown with predominant gray tomentose admedian vittae dorsally (Figs. 25, 26) ... (South Africa) *G. natalensis* Hesse
- . Mesonotum brown to black, without distinct grayish tomentose admedian vittae (Figs. 21–24, 27–28) (faint vittae may be seen in some males of *G. vibex*, n. sp., cf. Fig. 28) ... (Madagascar) **2**
2. Scutellum predominantly yellow (Figs. 27, 28); mesonotum with distinct white notopleural stripe in males and females (Figs. 7, 8) *G. vibex* Evenhuis, **n. sp.**
- . Scutellum predominantly brown to black, notopleural stripe, if present, faint between postpronotal lobe and transverse suture (e.g., Figs. 1, 2, 4, 5, 6) (except broad in females of *G. madagascarensis*, n. sp.) **3**
3. Large, distinct interhumeral marks in males and females (Figs. 15, 16); male genitalia with gonostyli apically placed and aedeagal bulb ovoid, longer than wide (Fig. 30); female thorax black *G. madagascarensis* Evenhuis, **n. sp.**
- . Interhumeral marks faint in females, or absent in males; male genitalia gonostyli subapically placed, and aedeagal bulb spheroid, as wide as long (Fig. 29); female thorax brown *G. hospes* Evenhuis, **n. sp.**



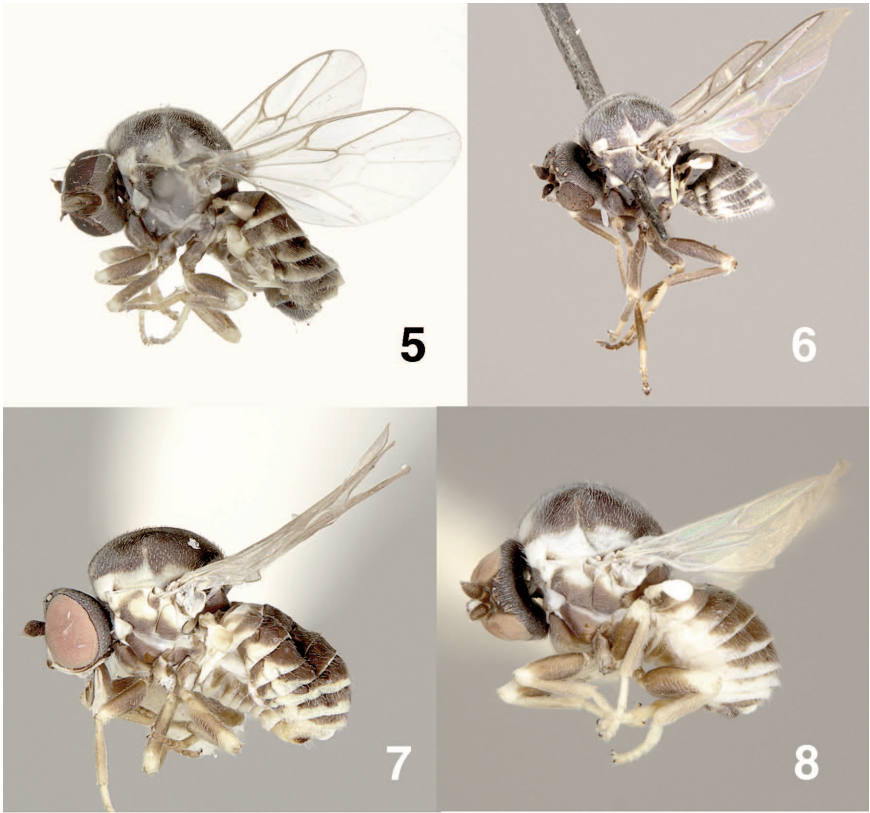
Figures 1–4. *Glabellula* habitus, lateral view. 1, *G. hospes*, n. sp., female; 2, *G. hospes*, n. sp., male; 3, *G. madagascarensis*, n. sp., female; 4, *G. madagascarensis*, n. sp., male;

***Glabellula (Glabellula) hospes* Evenhuis, new species**

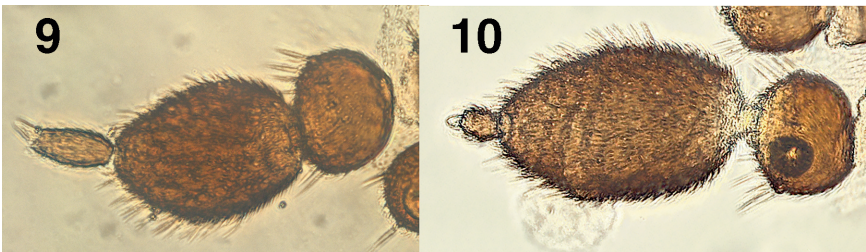
(Figs. 1, 2, 13, 14, 21, 22, 29, 32)

Types. *Holotype* ♂ from MADAGASCAR: **Tulear Prov:** Andohahela National Park, Tsimelahy, Parcelle II, 180 m, 24°56.21'S, 46°37.60'E, 12–23 Feb 2004, M. Irwin, F. Parker, R. Harin'Hala, Malaise in transitional forest. *Paratypes:* MADAGASCAR: **Tulear Prov:** 1♀, same data except, 175 m, 10–21 Oct 2003; 1♂, Zombitse National Park, near national road, 825 m, 22°50.43'S, 44°43.87'E, 13–20 Nov 2002, R. Harin'Hala (CASLOT 019825). Holotype and paratypes in CAS.

Diagnosis. Similar to *Glabellula madagascarensis* in having a black scutellum, but can be separated from it by the brown mesonotum (black in *G. madagascarensis*) and the brown dorsally on the halter knob (halter knob all white in *G. madagascarensis*). Males can be additionally separated by the larger, apically placed gonostyli (subapically and very small in *G. madagascarensis*). Females can be additionally separated by the large, somewhat trapezoidal-shaped sternite 7 with shallow depression posteriorly (sternite 7 thin, U-shaped, with deep depression posteriorly in *G. madagascarensis*).



Figures 5–8. *Glabellula* habitus, lateral view. 5, *G. natalensis* Hesse, female; 6, *G. natalensis* Hesse, male; 7, *G. vibex*, n. sp., female; 8, *G. vibex*, n. sp., male.



Figures 9–10. *Glabellula* antenna. 9, *G. madagascarensis*, n. sp.; 10, *G. vibex*, n. sp.

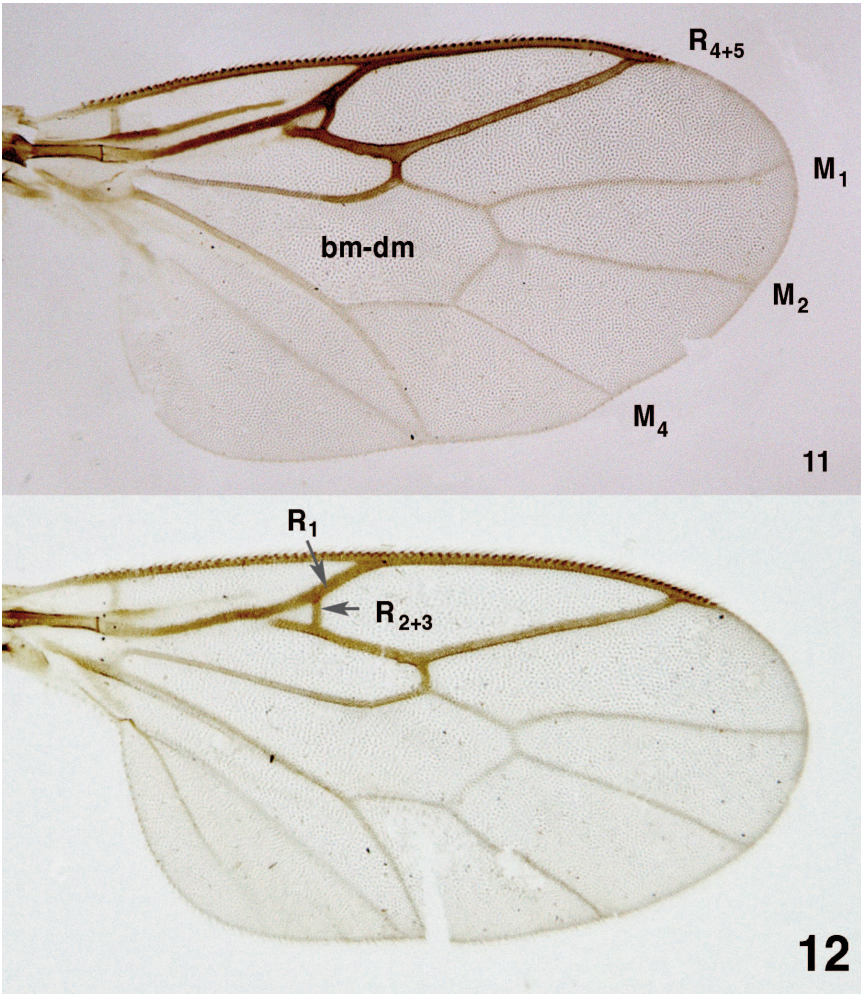
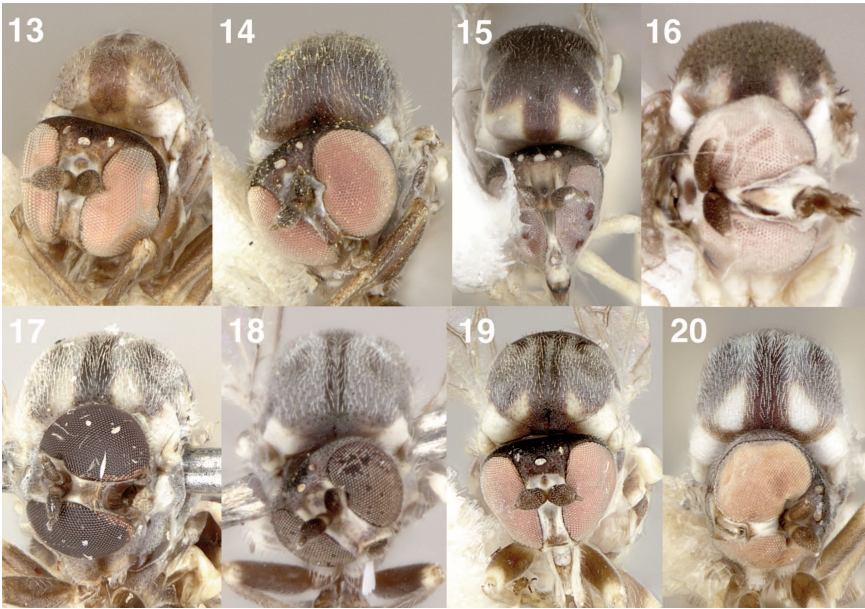


Figure 11–12. *Glabellula* wings. 11, *G. madagascarensis*, n. sp.; 12, *G. vibex*, n. sp., wing.

Description

Male (Fig. 2). Length: 1.1–1.3 mm. *Head*. Black; eyes dichoptic, separated at vertex by 1.5× distance between lateral ocelli; frons depressed medially, black just below median ocellus; face black, thin white along eye margin, tip of oral margin black; antennae black; scape minute; pedicel slightly wider than long; first flagellomere ovoid, length about 1.5× greatest width; stylus about 1/4 length of first flagellomere, with apical sensillum; mentum dark brown; proboscis white, thick, short, length slightly shorter than oral margin; palpus not evident.



Figures 13–20. *Glabellula* head and thorax, frontal view. **13**, *G. hospes*, n. sp., female; **14**, *G. hospes*, n. sp., male; **15**, *G. madagascarensis*, n. sp., female; **16**, *G. madagascarensis*, n. sp., male; **17**, *G. natalensis* Hesse, female; **18**, *G. natalensis* Hesse, male; **19**, *G. vibex*, n. sp., male; **20**, *G. vibex*, n. sp., female.

Thorax (Figs. 14, 22). Mesonotum and scutellum dull black, with scattered white hairs; postpronotal lobe white, notopleural marking faint grayish brown or absent, thin white marking laterally only at transverse suture and postalar callus; propleuron white, otherwise pleura brown with thin white on membrane between sclerites.

Legs. coxae and legs dark brown, only apex of femur and mid and hind basitarsi yellow; halter stem yellow, knob white with brown dorsally.

Wing. Hyaline; veins pale yellow to white; costa ends slightly less 1/4 way beyond end of R_{4+5} ; vein Sc incomplete, ending at level about halfway between origin of Rs and end of vein R_{2+3} ; Rs evanescent at connection with R_1 ; R_{4+5} straight to wing margin, not curved; vein M_1 slightly curved toward wing margin; M_2 fairly straight to wing margin; A_1 straight to wing margin, not curved or sinuous.

Abdomen. Dorsum brown, with scattered white hairs; thin white band posteriorly, broader white laterally, especially so on apical tergites; sternites paler brown than dorsum, with yellow on posterior portion of segments.

Genitalia (Fig. 29). Hypopygium shining dark brown; epandrium in lateral view long, thin, subrectangular, with long, thin posterodorsal process, in dorsal view thin with prominent posterodorsal process, processes rounded apically; cerci small, rounded, slightly exerted; gonocoxa subrhomboid in ventral view, long rounded triangular in lateral view; gonostylus small, with apically rounded process; lateral arms of parameral sheath



Figures 21–28. *Glabellula* thorax, dorsal view. **21**, *G. hospes*, n. sp., female; **22**, *G. hospes*, n. sp., male; **23**, *G. madagascarensis*, n. sp., female; **24**, *G. madagascarensis*, n. sp., male; **25**, *G. natalensis* Hesse, female; **26**, *G. natalensis* Hesse, female; **27**, *G. vibex*, n. sp., female; **28**, *G. vibex*, n. sp., male.

fused to gonocoxa, longer than aedeagal apodeme, slightly flared apically; apical portion of parameral sheath with two pointed lateral processes and truncate medial process; aedeagal bulb spheroid, with shoe-shaped aedeagal apodeme and foliate lateral rami.

Female (Fig. 1). Same as male except thorax brown (Fig. 21), anteriorly with faint yellowish interhumeral marks (Fig. 13). Genitalia not dissected; sternite 7 (Fig. 32) thin with pointed posterolateral darkly sclerotized processes, with curved medial depression posteriorly.

Glabellula (Glabellula) madagascarensis Evenhuis, new species

(Figs. 3, 4, 9, 11, 15, 16, 23, 24, 30, 33, 35)

Types. *Holotype* ♂ and *paratype* ♀ from MADAGASCAR: **Tulear Prov:** Zombitse National Park, near national road, 825 m, 22°50.43'S, 44°43.87'E, 13–20 Nov 2002, R. Harin'Hala (CASLOT 019825); *Other paratypes:* MADAGASCAR: **Tulear Prov:** 1♀, topotypic, same data except 1–14 Aug 2002 (CASLOT 019843); 1♂, 1 km N. entrance Zombitse National Park, 822 m, 22°50.43'S, 44°38.87'E, 16–31 Oct 2002, M. Irwin, R. Harin'Hala, Malaise in transitional forest (CAS); 1♀, 4 km NW Manombo, Mikea forest, 30 m, 22°54.22'S, 48°28.53'E, R. Harin'Hala, M. Irwin, Malaise in dry deciduous forest (CASLOT 014441); **Fianarantsoa Prov:** 1♀, Isalo National Park, 825 m, 22°37.60'S, 45°21.49'E, 25–31 Oct 2002, R. Harin'Hala, M. Irwin, Malaise in dry wash in savanna (CAS); **Majunga Prov:** 1♀, Ampijoroa (Andranofasika) National Park, 46 m, 16°19.16'S, 46°48.80'E, 19/26 Oct 2003, M. Irwin, R. Harin'Hala, hand netted in deciduous forest (CAS); 1♀, same data except 9/20 Nov 2003 (CASLOT 014437). *Holotype* in CAS; *paratypes* in CAS and BPBM.

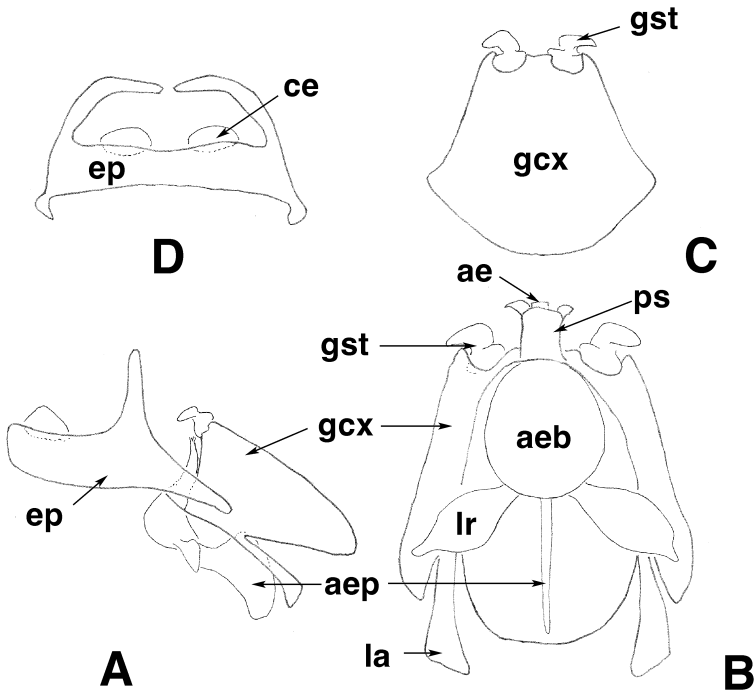


Figure 29. *Glabellula hospes*, n. sp., male genitalia. **A**, lateral view; **B**, phallic complex with gonocoxa, ventral view; **C**, gonocoxa, dorsal view; **D**, epandrium dorsal view. Abbreviations: ae = aedeagus; aeb = aedeagal bulb; aep = aedeagal apodeme; ce = cercus; ep = epandrium; gcx = gonocoxa; gst = gonostylus; la = lateral arm of parameral sheath; lr = lateral ramus; ps = parameral sheath.

Diagnosis. Easily separated from the congeners in Madagascar by the brown to black scutellum combined with a distinct notopleural stripe. Males can additionally be separated from the congeners in Madagascar by the trident-shaped apex of the parameral sheath. Females can be separated from the congeners in Madagascar by the thin sternite 7 with a deep medial depression posteriorly.

Description

Male (Fig. 4). Length: 0.95–1.20 mm. *Head.* Black; eyes dichoptic, separated at vertex by 1.5× distance between lateral ocelli; frons grayish white, depressed medially with dark brown spot medially; face gray, white laterally, tip of oral margin black; antennae (Fig. 9) black; scape minute; pedicel cylindrical, slightly wider than long; first flagellomere ovoid, length about 1.5× greatest width; stylus about 1/3 length of first flagellomere, with apical sensillum; mentum white; proboscis black, thick, short, length subequal to oral margin; labrum sclerotized, stiff, pointed apically; palpus not evident.

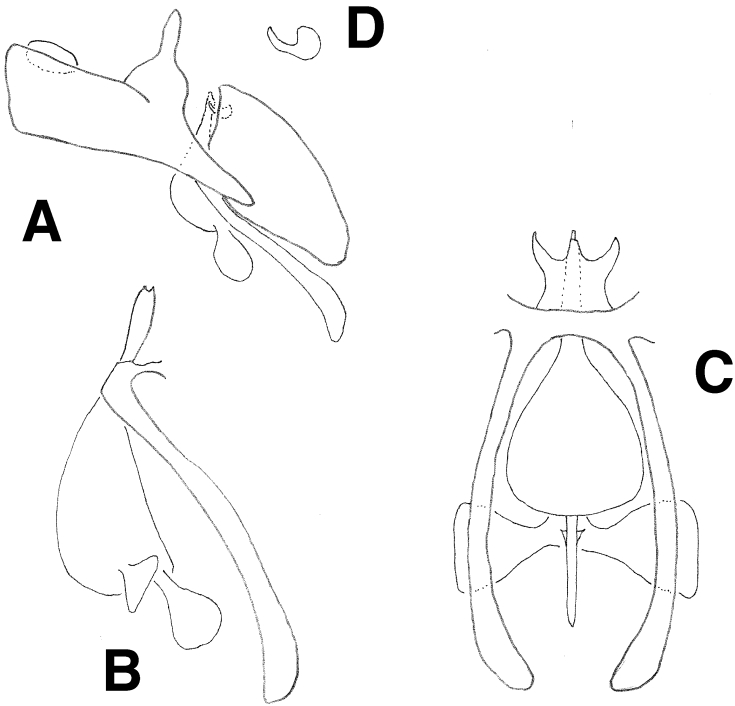


Figure 30. *Glabellula madagascarensis*, n. sp., male genitalia. **A**, lateral view; **B**, phallic complex, lateral view; **C**, phallic complex, ventral view; **D**, gonostylus, detail.

Thorax (Figs. 16, 24). Mesonotum matte black, scutellum matte dark brown to black, with scattered dark hairs and tomentum (hairs absent on anterior portion of mesonotum—best seen in frontal view); postpronotal lobe, small interhumeral marks, thin line to wing base, thin ridge along postalar callus white; propleuron white, rest of pleura predominantly dark brown, white on posterior half of anepisternum; upper rim of katepisternum, most of anepimeron, and upper half of metepisternum.

Legs. Coxae and legs brown to yellowish brown; halter stem and knob white.

Wing (Fig. 11). Hyaline; veins pale yellow to white; costa ends slightly less 1/4 way beyond end of R_{4+5} ; vein Sc incomplete, ending at level about halfway between origin of R_s and end of vein R_{2+3} ; R_s evanescent at connection with R_1 ; R_{4+5} straight to wing margin, not curved; vein M_1 slightly curved toward wing margin; M_2 fairly straight to wing margin; A_1 straight to wing margin, not curved or sinuous.

Abdomen. Dorsum brown, with scattered white hairs; thin white band posteriorly, broader white laterally, especially so on apical tergites; sternites paler brown than dorsum, with yellow on posterior portion of segments.

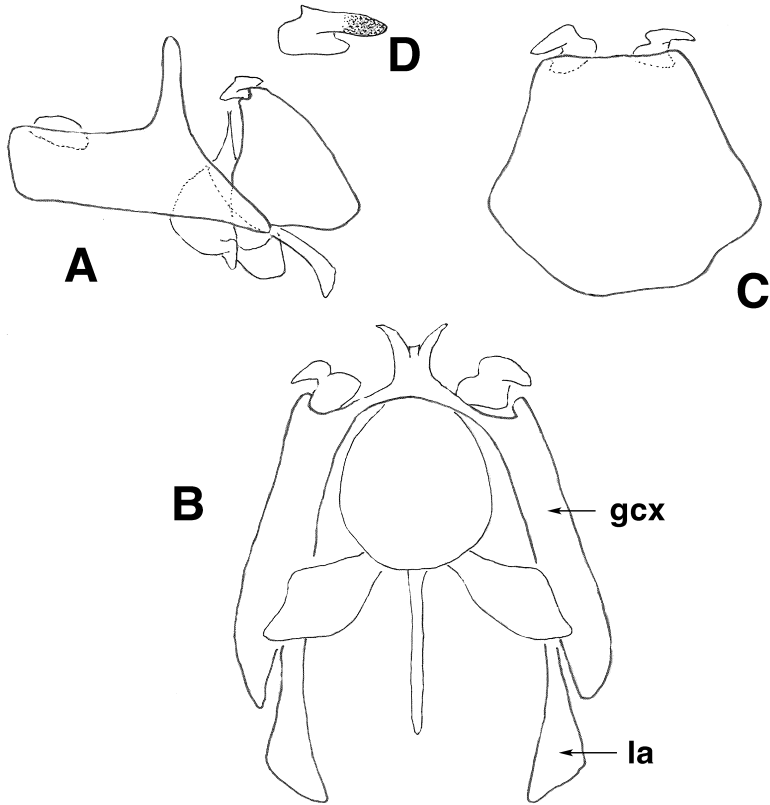


Figure 31. *Glabellula vibex*, n. sp., male genitalia. **A**, lateral view, **B**, phallic complex, ventral view; **C**, gonocoxa, dorsal view; **D**, gonostylus, detail. Abbreviations: gcx = gonocoxa; la = lateral arm of parameral sheath.

Genitalia (Fig. 30). Epandrium in lateral view thin subrectangular, with broadly tapering posterodorsal process, rounded apically; gonocoxa subtriangular in lateral view, with very small gonostylus placed subapically; gonostylus semi-crescent-shaped; laterally parameral arms fused basally to gonocoxa, much longer than aedeagal apodeme, rounded apically, not distinctly flared; aedeagal bulb ovate, longer than in *G. hospes*, n. sp.; aedeagal apodeme paddle-shaped; lateral rami large, foliate, broad in dorsal view; apex of parameral sheath trident-shaped, with three points.

Female. Same as male except as follows: hairs present on anterior portion of mesonotum (best seen in frontal view); notopleural stripe very broad, uninterrupted from postpronotal lobe to postalar callus; pleura predominantly white with brown on most of katapisternum

and posterior half of meron; legs predominantly yellow, brown only on apical tarsomeres; white bands on tergites broader laterally than in male. Genitalia (Figs. 33, 35). Sternite 7 (Fig. 33) thin, wide V-shaped with pointed lateral processes that are darkly sclerotized apicolaterally; spermatheca (Fig. 35) long, linear-ellipsoid with numerous glandular trichomes at apex, spermatheca sclerotized dark brown except extreme apex, sclerotized base of spermatheca thin, strongly curved, leading to transparent apical duct, which is also strongly curved, curved portion as long as spermatheca; apical duct short, uncurved length slightly longer than spermatheca, with slightly bulging portion possessing numerous glandular trichomes; sperm pump ca. $1.5\times$ length of spermatheca, with transparent wide sac-like feature; sac-like feature crimped at basal one-third, basal portion swollen but one-third width of apical sac-like feature; basal duct very short, transparent; all three basal duct connected basally, with no apparent common duct; genital fork U-shaped, thin, undifferentiated.

***Glabellula (Glabellula) vibex* Evenhuis, new species**

(Figs. 7, 8, 10, 12, 19, 20, 27, 28, 31, 34, 36)

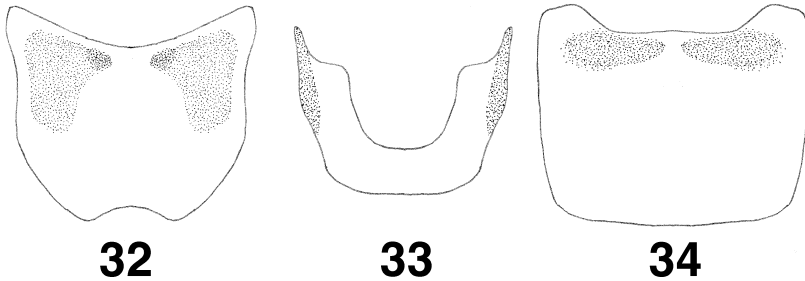
Types. *Holotype* ♀ and 1♂, 4♀ *paratypes* from MADAGASCAR: **Tulear Province:** Zombitse National Park, near ANGAP office, 840 m, 22°50.13'S, 44°43.87'E, 825 m, 27 Mar–3 Apr 2002, Malaise in spiny forest, M.E. Irwin, F. Parker, R. Harin'Hala (CASLOT 019845). *Other paratypes:* MADAGASCAR: **Tulear Prov:** 1♂, 1♀ 1 km N. entrance Zombitse National Park, 822 m, 22°50.43'S, 44°38.87'E, 16–31 Oct 2002, M. Irwin, R. Harin'Hala, Malaise in transitional forest (CAS); 3♂, Cape Ste. Marie Special Reserve, 37 m, 74 km S. of Tsihombe, 25°35.26'S, 45°09.78'E, 18–23 Dec 2002, M. Irwin, F. Parker, Malaise trap, spiny bush (CASLOT 024735); 1♂, Andohahela National Park, Parcelle II, Tsimelahy, 175 m, 22°36.21'S, 46°37.60'E, 16–17 Dec 2002, M. Irwin, F. Parker, R. Harin'Hala (CAS); 1♂, same data except, 12–13 Feb 2004, R. Harin'Hala (CASLOT 18540). *Holotype* in CAS; *paratypes* in CAS and BPBM.

Diagnosis. Easily separated from the congeners in Madagascar by the yellow scutellum; females are similar to *G. madagascarensis* in both having a distinct notopleural stripe but *G. vibex* can be separated from it by (in addition to the yellow scutellum) the brown legs (legs yellow in *G. madagascarensis*), the brown on the extreme lateral margins of the abdominal tergites (these tergites predominantly white laterally in *G. madagascarensis*), the brown color on the upper pleural sclerites (these sclerites predominantly white in *G. madagascarensis*), and the halter knob with brown dorsally (halter knob all white in *G. madagascarensis*).

Description

Female (holotype) (Fig. 7). Length: 0.98–1.06 mm. Black; eyes dichoptic, separated at vertex by $1.5\times$ distance between lateral ocelli; frons white, depressed medially with brown spot medially; face white with brown medial stripe, tip of oral margin black; antennae black; scape minute; pedicel cylindrical, slightly wider than long; first flagellomere (Fig. 10) ovoid, length about $1.5\times$ greatest width; stylus about $1/3$ length of first flagellomere, with apical sensillum; mentum white; proboscis black, thick, short, length subequal to oral margin; labrum sclerotized, stiff, pointed apically; palpus not evident.

Thorax. Mesonotum (Fig. 27) matte black, scutellum yellow, with basomedial spot of dark brown to black, dorsum of mesonotum and scutellum with scattered dark hairs; postpronotal lobe, small interhumeral marks (not coalesced with postpronotal lobe mark), thin line to wing base, thin ridge along postalar callus white; propleuron white, rest of



Figures 32–34. *Glabellula*, female sternite 7, ventral view. 32, *G. hospes*, n. sp.; 33, *G. madagascarensis*, n. sp.; 34, *G. vibex*, n. sp.

pleura predominantly dark brown, white on posterior half of anepisternum; upper rim of katepisternum, most of anepimeron, and upper half of metepisternum; halter with stem and knob white, knob with brown on dorsal surface.

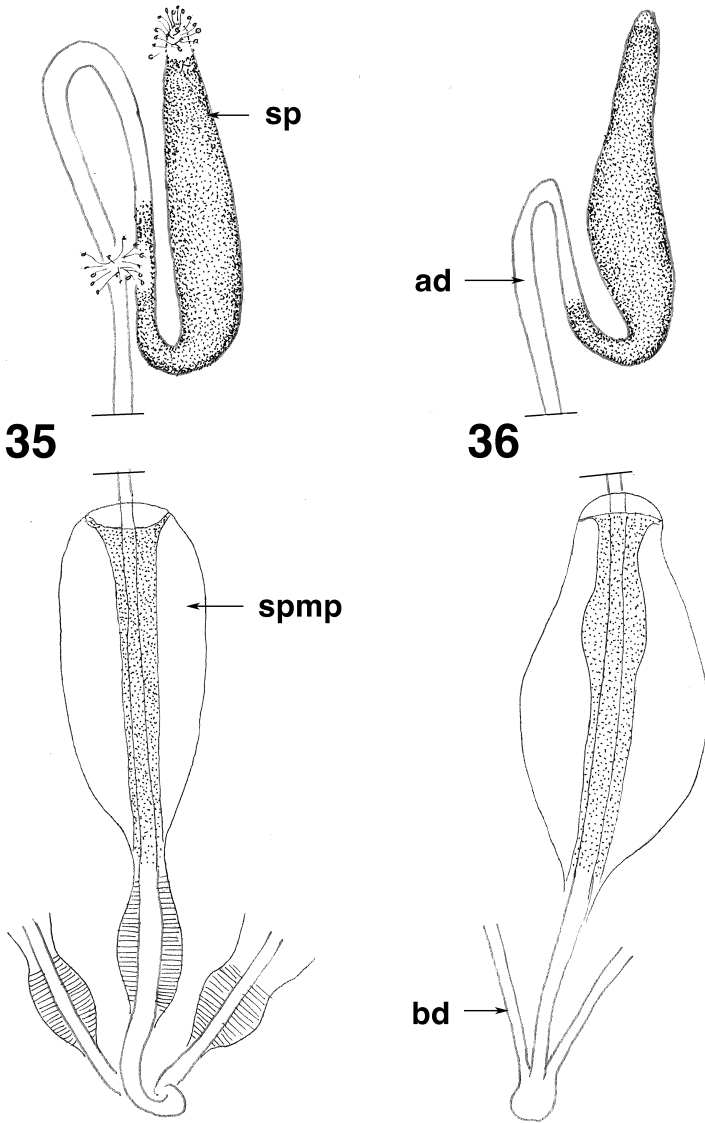
Legs. Brown, yellow on apex of femur and basitarsus.

Wing (Fig. 12). Hyaline; veins pale yellow to white; costa ends slightly less 1/4 way beyond end of R_{4+5} ; vein Sc incomplete, ending at level about halfway between origin of R_s and end of vein R_{2+3} ; R_s evanescent at connection with R_1 ; R_{4+5} straight to wing margin, not curved; vein M_1 slightly curved toward wing margin; M_2 fairly straight to wing margin; A_1 straight to wing margin, not curved or sinuous.

Abdomen. Dorsum dark brown, with scattered dark hairs; white posteriorly on tergites III–VI, white color more broad laterally, extreme lateral margin brown; sternites brown with yellow posteriorly.

Genitalia (Figs. 34, 36). Sternite 7 (Fig. 34) subrectangular with shallow medial depression, sclerotized subapicolaterally; spermatheca (Fig. 36) long, linear-ellipsoid without glandular trichomes at apex, spermatheca sclerotized dark brown except extreme apex, sclerotized base of spermatheca thin, strongly curved, leading to transparent apical duct, which is also strongly curved, curved portion half length of spermatheca; apical duct short, uncurved length as long as spermatheca; sperm pump ca. $1.5\times$ length of spermatheca, with transparent wide sac-like feature; sac-like feature slightly wider than sperm pump apically, then widening at apical 1/4, widest at middle, tapering to thin base leading to basal duct; apical and basal valves absent; basal duct very short, transparent; all three basal duct connected basally, with no apparent common duct; genital fork U-shaped, thin, undifferentiated.

Male (Fig. 8). Same as female except as follows: brown medial band on face thin; halter knob brilliant white, without brown dorsally; interhumeral marks more distinct and larger, not coalesced with humeral mark; propleuron with some brown on anterior portion; scutellum with pale brown medially in some specimens; abdominal tergites all white laterally, no brown at extreme lateral margin. Genitalia (Fig. 31) with epandrium long, subrectangular in lateral view, with long thin posterodorsal process, apex of process pointed,



Figures 35–36 *Glabellula*, female genitalia. **35**, *G. madagascarensis*, n. sp.; **36**, *G. vibex*, n. sp.
Abbreviations: ad = apical duct; bd = basal duct; sp = spermatheca; smp = sperm pump.

cercus small, rounded, slightly exerted; gonocoxa in ventral view subrhomboid, rounded, with gonostyli placed apically, in lateral view subtriangular as wide as high; gonostylus small, base broad, apical portion subcylindrical with rounded sclerotized apex; lateral parameral arms fused to gonocoxa, relatively short, but longer than aedeagal apodeme; aedeagal bulb spheroid, with aedeagal apodeme axe-shaped, almost same length as aedeagal bulb in dorsal view, lateral rami large, foliate; apex of parameral sheath bifid, pointed, with aedeagus exerted from middle of parameral sheath apex when viewed dorsally.

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