

## Research article

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# ***Capalictus*, a new subgenus of *Lasioglossum* Curtis, 1833 from South Africa, with description of three new species (Hymenoptera, Apoidea, Halictidae)**

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**Abstract.** *Capalictus*, a new subgenus of *Lasioglossum* Curtis, 1833 (Hymenoptera, Apoidea, Halictidae), endemic to the South African Cape Province, is described. The type species is *Halictus mosselinus* Cockerell, 1945. *Evyllaesus* (*Sellalictus*) *fynbosensis* (Pauly *et al.*, 2008) is a new junior synonym of *L. (C.) mosselinus*. Three new species are described: *Lasioglossum (Capalictus) hantamense* sp. nov., *L. (C.) tigrinum* sp. nov. and *L. (C.) timmermanni* sp. nov. DNA sequence data from three nuclear genes support morphologically-determined species limits. *Capalictus* is a basal clade of the *Hemihalictus* series of *Lasioglossum*.

**Key words.** taxonomy, Anthophila, new species.

Pauly A., Gibbs J. & Kuhlmann M. 2012. *Capalictus*, a new subgenus of *Lasioglossum* Curtis, 1833 from South Africa, with description of three new species (Hymenoptera, Apoidea, Halictidae). *European Journal of Taxonomy* 28: 1-28. <http://dx.doi.org/10.5852/ejt.2012.28>

## Introduction

We describe a new subgenus of *Lasioglossum*, endemic to the Cape Province of South Africa. This new subgenus was first described as a new species-group of *Sellalictus* Pauly, 1980 by Pauly *et al.* (2008), based on a single new species, “*Evyllaesus (Sellalictus) fynbosensis* Pauly, Timmermann & Kuhlmann, 2008”. Discovery of at least three new species belonging to the same species-group as *L. fynbosense* (comb. nov.) in combination with recent molecular phylogenetic results (Gibbs *et al.* 2012) incline us to describe this group rather as a distinct subgenus. A recent molecular phylogeny of halictid bees demonstrated with strong support, that this group composes a basal clade of the *Hemihalictus* series

(Gibbs *et al.* 2012). This position on the phylogenetic tree strongly supports subgeneric status for these species.

## Material and method

### Terminology

Terminology for morphological characters follows Engel (2001) and Michener (2007). Terminology for the ‘propodeum’ and ‘metapostnotum’ follows Gibbs (2011). We used the glossary of Harris (1979) for description of the surface sculpture (except “shagreened” used here in the sense of “dull due to the presence of microsculpture”). Puncture density is given in terms of relationship between puncture diameter (d) and the spaces between them (i), such as  $i > d$ . Hair length is given in relative units based on the median ocellar diameter (OD). Metasomal sterna and terga, and flagellomeres are abbreviated S, T, and F, respectively, followed by the appropriate number. The following abbreviations are used throughout: upper interocular distance (UOD), lower interocular distance (LOD), ratio of mesoscutellum and metapostnotum lengths (MMR).

### Measurements

Measurements were taken on enlarged pictures or directly using an ocular micrometer.

### Collections

Material is preserved in the following collections:

- BMNH = The Natural History Museum, London, United Kingdom
- CUIC = Cornell University Insect Collection, Ithaca, USA
- RBINS = Royal Belgian Institute of Natural Sciences, Brussels, Belgium
- SANC = South African National Collection of Insects, Pretoria, South Africa

No collection numbers are allocated to specimens.

### DNA analysis

DNA was extracted and amplified following protocols explained elsewhere (Danforth 1999; Danforth *et al.* 2003, 2004) from five specimens belonging to the new subgenus described below as part of ongoing studies of the phylogenetic relationships of halictid bees (Gibbs *et al.* 2012; Gibbs unpublished data.). Fragments of three nuclear genes were sequenced in both directions (elongation factor-1 alpha: ef-1 $\alpha$ , wingless: wnt-1, and long-wavelength rhodopsin: opsin) using Big Dye Terminator for the sequencing reaction. Sequencing was performed at the Cornell University Life Sciences Core Laboratories Center using Applied Biosystems Automated 3730 DNA analyzers. Sequences were assembled using Sequencher (GeneCodes).

## Results

Classis Hexapoda Blainville, 1816  
Ordo Hymenoptera Linnaeus, 1758  
Superfamilia Apoidea Latreille, 1802  
Epifamilia Anthophila Latreille, 1804  
Familia Halictidae Thomson, 1869  
Subfamilia Halictinae Thomson, 1869  
Tribus Halictini Thomson, 1869  
Genus *Lasioglossum* Curtis, 1833

*Lasioglossum (Capalictus)* subgen. nov.

[urn:lsid:zoobank.org:act:D6B54F16-5465-4163-BCCE-C89B76E04C3C](http://urn:lsid:zoobank.org:act:D6B54F16-5465-4163-BCCE-C89B76E04C3C)

**Type species**

*Halictus mosselinus* Cockerell, 1945.

**Description**

*Capalictus* is distinct from other African subgenera of the *Hemihalictus* series by the combination of following characters: small size (length 6-7.5 mm). Body black, non-metallic, metasoma red in some species (this red colouration is unique in African subgenera of the *Hemihalictus* series, with the exception of the kleptoparasitic *L. ereptor*). Metasomal terga without patches of tomentum. Mesoscutum smooth-shiny, without tessellate surface. Lower paraocular area shiny and sparsely punctate. Propodeum posterior surface weakly carinate in females, not carinate in males. The carina in females not extending medially across upper margin (Fig. 1F). Clypeus and mandibles of males black. Inner metatibial spur in females with about five short teeth, the one in males without teeth. Gonocoxite of males without retrorse lobe, gonostyli pointed, half as long as gonocoxite (Fig. 15). Apex of marginal cell pointed, ending on wing margin (Fig. 1C, E).

**Differential diagnosis**

The new South-African subgenus *Capalictus* belongs to the *Hemihalictus* series (*sensu* Michener 2007) of the genus *Lasioglossum* Curtis, 1833, which is characterized by weak cross-submarginal veins 1rs-m and 2rs-m of forewing (Fig. 1C-E). *Capalictus* is morphologically close to the Holarctic subgenera *Evylaeus* Robertson, 1902 and *Dialictus* Robertson, 1902, and to the African subgenera *Sellalictus* Pauly, 1980 and *Afrodialictus* Pauly, 1984 (see classification of Pauly 1999). From *Sellalictus* it differs by the absence of a patch of tomentum on the metasomal terga (males of *Sellalictus* bear a very characteristic large patch of tomentum on base of tergum 2 while females have small baso-lateral spots of tomentum on T2-T4). *Capalictus* also differs by the apex of the marginal cell close to wing margin (Fig. 1C-E) (in *Sellalictus* the apex of the marginal cell is minutely separated from the wing margin and minutely appendiculate as in Fig. 1D). From *Afrodialictus*, the new subgenus differs by the lack of microtessellate texture on the body (microtessellate surface sculpture is characteristic on head, mesoscutum and propodeum of *Afrodialictus*; in *Capalictus*, mesoscutum is polished and shiny), lower part of paraocular area shiny and with some punctation (Fig. 1A) (with *Afrodialictus* the lower parts of the paraocular area has a different dull, frosted-like and completely impunctate surface as in Fig. 1B) and posterior face of propodeum with a very weak carina in the female (Fig. 1F) (carina entirely lacking in *Afrodialictus*). *Capalictus* can be separated from the African subgenus *Mediocralictus* Pauly, 1984 by the inner metatibial spur of the males without teeth (pectinate in males of *Mediocralictus*). Females of *Mediocralictus* can be separated by the peculiar shape of the propodeal carina (Pauly *et al.* 2001: 121, fig. 36). *Capalictus* can be separated from most Palaearctic species of the *Hemihalictus* series by the gonocoxites of males without retrorse lobe. Palaearctic *Evylaeus* lacking a retrorse lobe can be easily distinguished from *Capalictus* by the carinate propodeum (male *Capalictus* lack distinct propodeal carinae) and metasomal sterna with very sparse, and short setae ( $\leq$ OD) (sternal hairs sometimes long (2–2.5 OD) and plumose in *Capalictus*).

*Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945)

Figs 2, 3, 10A-B, 12A, 13A, 14A-B, 15A, 16A, E, 17A

*Halictus mosselinus* Cockerell, 1945: 280-281.

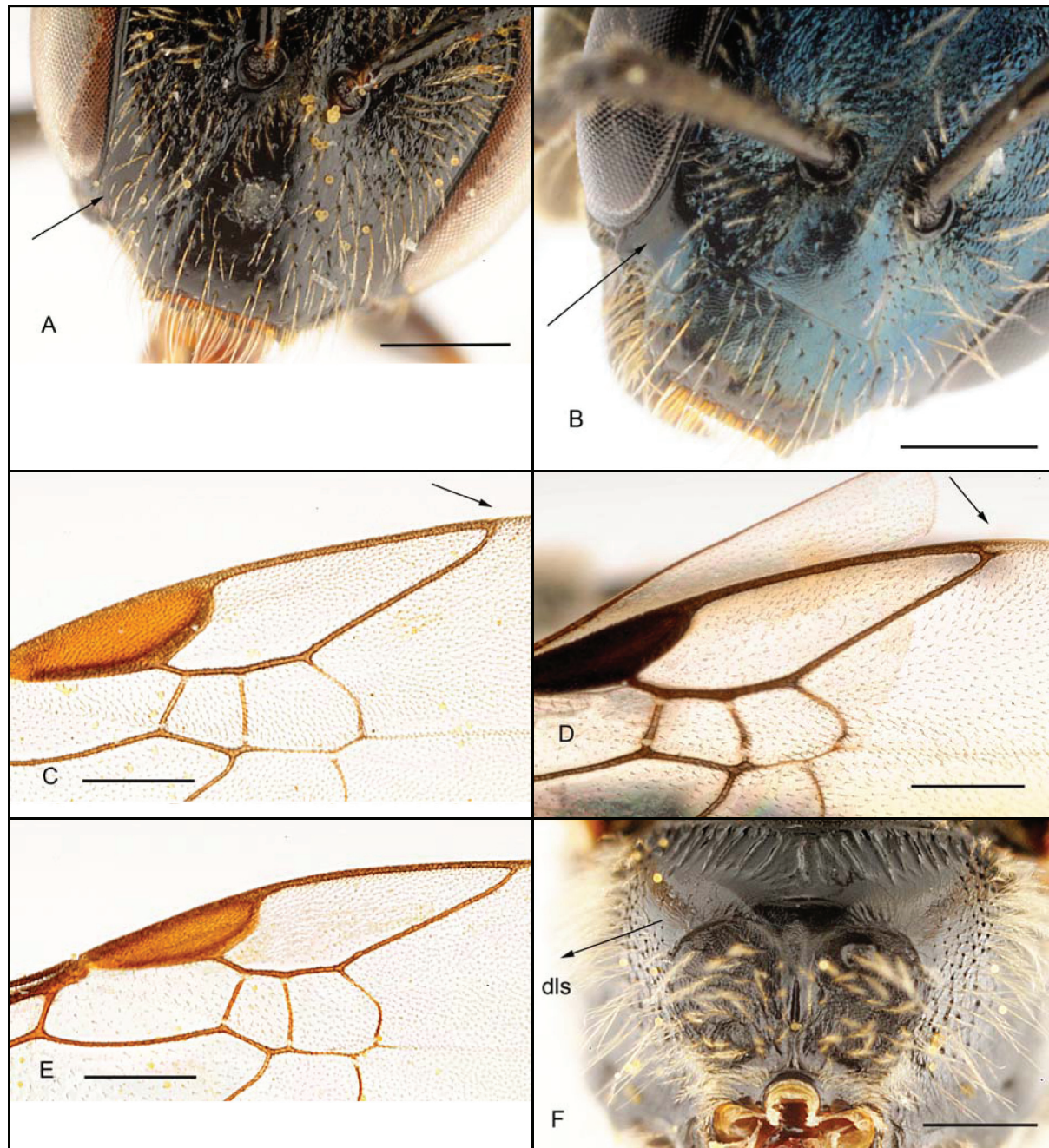
*Patellapis (Chaetalictus) mosselina* Pauly, 1999: 150, 174.

*Evylaeus (Sellalictus) fynbosensis* Pauly, Timmermann & Kuhlmann, 2008: 85-91. **Syn. nov.**

*Lasioglossum mosselinum* – Timmermann & Kuhlmann 2009: 180.

**Type material**

*Halictus mosselinum*: Holotype ♀, SOUTH AFRICA, Cape Province, Mossel Bay, Sep. 1933 (white label), S. Africa, R.E. Turner, Brit. Mus. 1933-552 (white label), Type (red-white label), B.M. TYPE HYM. 17a.1109 (white label), *Halictus mosselinus* Ckll Type (handwritten white label) (BMNH), examined in January 2012 .

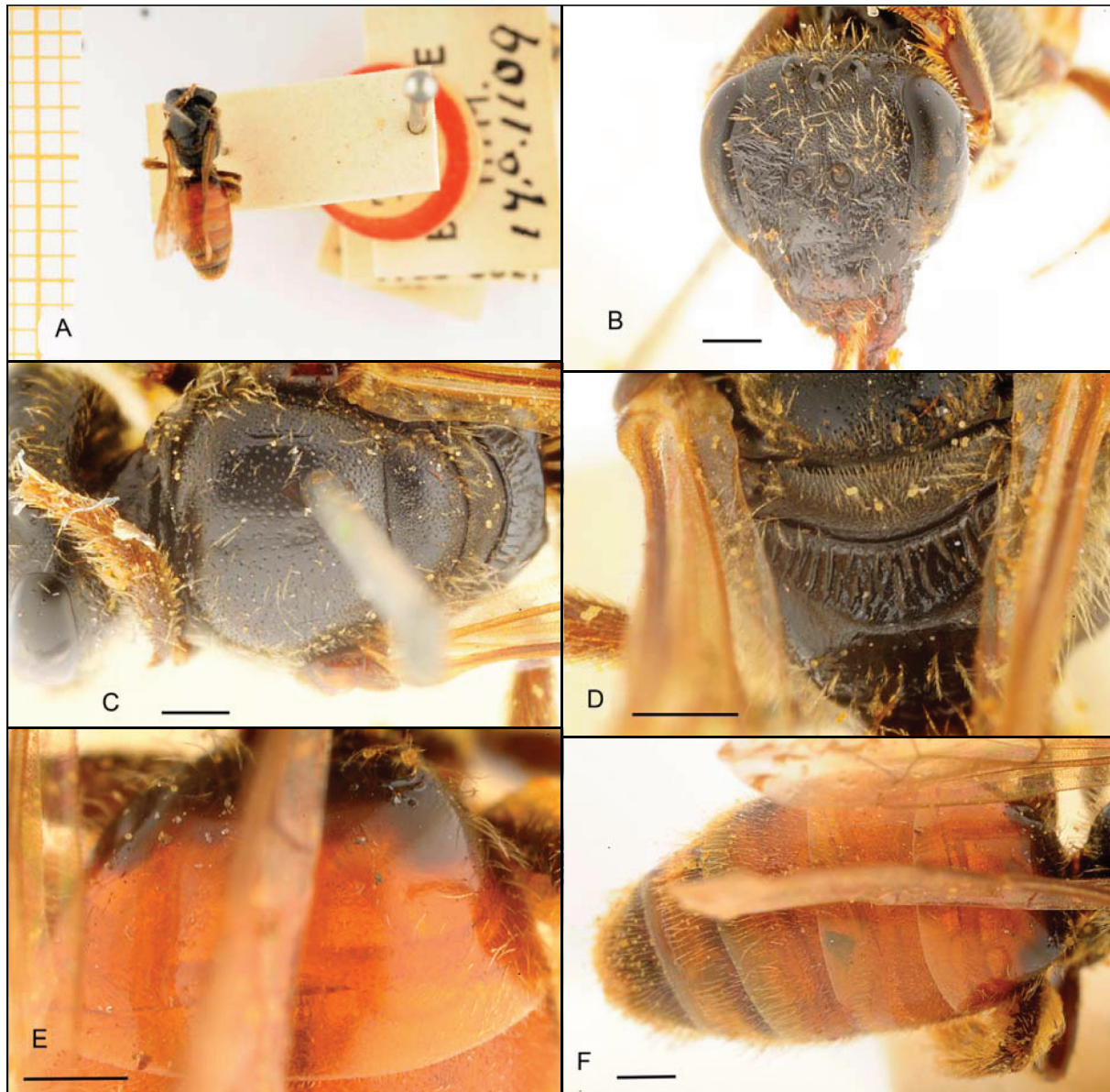


**Fig. 1.** — *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). **A.** Head showing lower paraocular area. **C, E.** Wing venation showing apex of marginal cell and weak veins of submarginal cells. **C.** ♀. **E.** ♂. **F.** ♀, propodeum and metapostnotum (dls = dorso-lateral slopes). — *Lasioglossum (Afrodialictus)* sp. **B.** Head showing lower paraocular area. — *Lasioglossum (Sellalictus)* sp. **D.** ♀, wing venation showing apex of marginal cell and weak veins of submarginal cells. Scale line = 0,5 mm.

*Evyllaeus (Sellalictus) fynbosensis*: Holotype ♀, SOUTH AFRICA, 15 km NW Nieuwoudtville, Farm Engelsepunt, Fynbos, Pf E1, 31°14'31" S - 18°59'08" E, 830 m, 28 Aug. 2003, leg. K. Timmermann (SANC). Paratypes: 31 ♀♀, 34 ♂♂, together with holotype, different dates at same locality (BMNH, SANC, RBINS).

**Additional material**

17 ♂♂, 1 ♀, SOUTH AFRICA, WCP, 16 km E. Clanwilliam, Pakhuis Pass, 700 m, 32°08.1'S - 18°59.7'E, 8 Sep. 2001, coll. CUIC.



**Fig. 2.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945), ♀ holotype. **A.** Total view. **B.** Head. **C.** Mesosoma. **D.** Propodeum. **E.** First tergum. **F.** Metasoma. Scale line = 0,5 mm.

## Diagnosis

### Male

Body length 7.5 mm. Wing length 6 mm. Legs very long, especially tarsi (length of posterior tarsi equal to length of mesosoma), totally black to blackish brown except foretarsi yellowish brown (Figs 12A, 13A, 14A-B) (all tarsi yellowish in *L. hantamense* and *L. tigrinum*). Metapostnotum with longitudinal ridges. Dorsolateral slopes of propodeum shining, punctate. Punctuation of mesoscutum sparse between



**Fig. 3.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945), ♂. **A.** Head. **B.** Mesoscutum and vertex. **C.** Propodeum. **D.** First tergum. **E.** Metasoma, dorsal view. **F.** Metasoma, ventral view. Scale line = 0,5 mm.

parapsidal lines (i = 3–4d) (Fig. 2C) (denser in *L. timmermanni*). Metasoma blackish, sometimes partly orange red (Fig. 3E). Gonostylus with long apical setae (longer than basal width of gonostylus).

#### **Female**

Body length 7 mm. Wing length 6 mm. Metasoma red, base of T1 and T5-T6 blackish (Figs 2E-F, 16E) (metasoma largely black in *L. hantamense* and *L. tigrinum*; T5 red in *L. timmermanni*). Metapostnotum with longitudinal ridges, dorsolateral slopes of propodeum shining (Fig. 2D) (slopes shagreened in *L. timmermanni*). Punctuation of mesoscutum sparse between parapsidal lines (i = 2d) (Fig. 2C).

#### *Lasioglossum (Capalictus) hantamense* sp. nov.

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Figs 4, 5, 11A-B, 12C, 13C, 14E-F, 15C, 16C, 17B

#### **Diagnosis**

##### **Male**

Close to *L. mosselinum* but all tarsi pale yellow and not so long (Fig. 12C) (mid and hind tarsi brown in *L. mosselinum* and *L. timmermanni*). Metapostnotum with rugae extending 2/3 distance to posterior margin (extending 4/5 distance in *L. tigrinum*).

##### **Female**

Differs from *L. mosselinum* and *L. timmermanni* by black metasoma (Figs 5E, 11A) and dull shagreened dorso-lateral slopes of propodeum (Fig. 5C). T1 nearly impunctate, punctures very fine, indistinct (numerous distinct punctures in *L. tigrinum*).

#### **Etymology**

The specific epithet refers to the Hantam Mountains near Calvinia where the species was first discovered.

#### **Type material**

##### **Holotype**

♂, 7 Sep. 2010, leg. M. Kuhlmann (SANC).

##### **Paratypes**

4 ♂♂ and 6 ♀♀, idem, 30 Aug. 2011, 28 ♂♂ and 10 ♀♀ (Coll. Kuhlmann, BMNH, RBINS, SANC, CUIC).

#### **Type locality**

SOUTH AFRICA, Plateau Hantam Mts., near antenna, 9 km N Calvinia, 31°22'29''S 19°47'03''E, 1570 m.

#### **Description**

##### **Male**

BODY LENGTH. 6.5-7 mm.

FOREWING LENGTH. 5.5 mm.

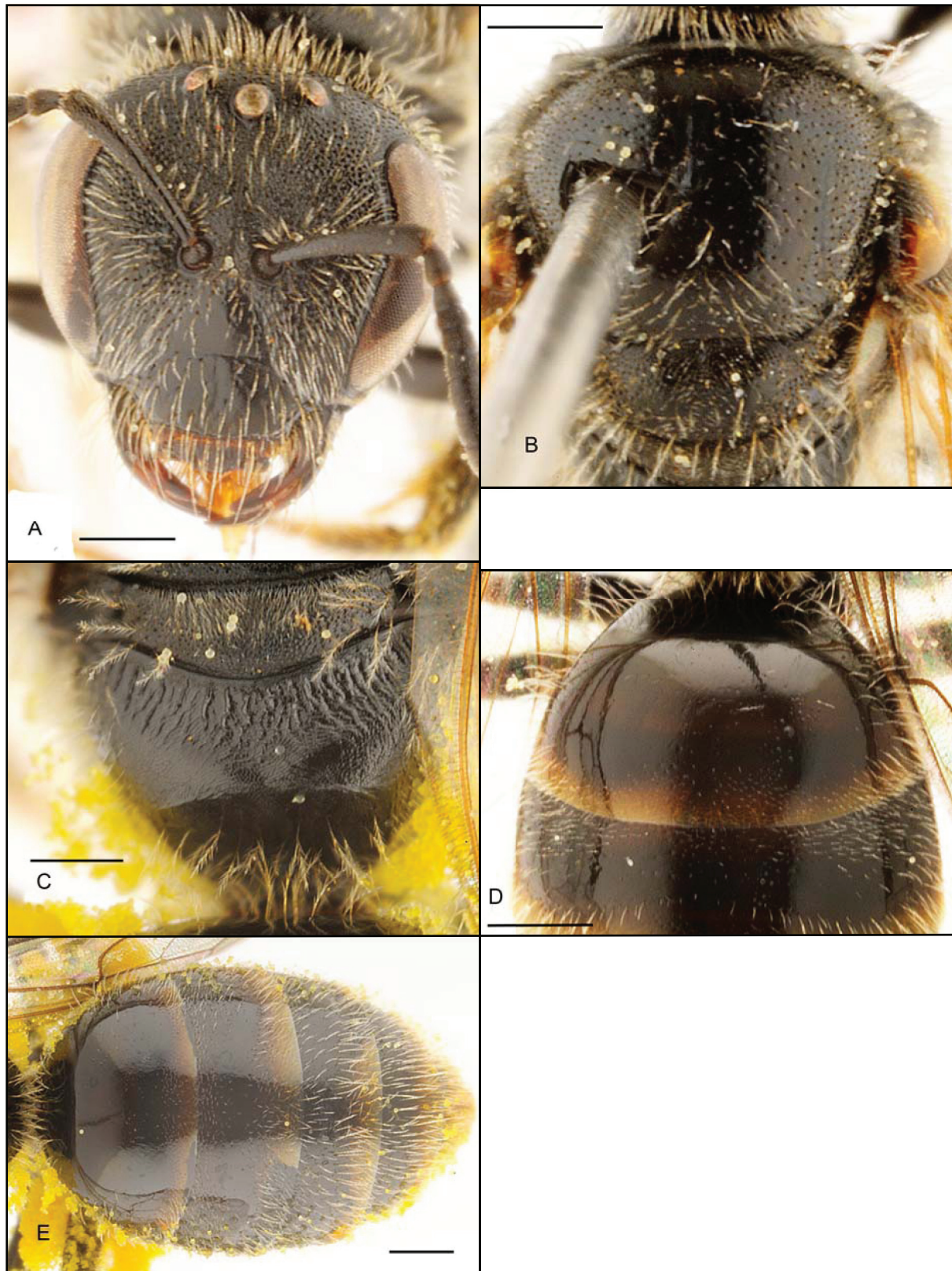
COLOURATION. Head and mesosoma black. Metasomal terga black with apical rim translucent straw-coloured. Clypeus and mandibles completely black. Flagellum with ventral surface black. Wing membrane subhyaline, venation, pterostigma and tegula brown. Legs black except femoral apices and tibial bases brown and all tarsi pale yellow.

PUBESCENCE. Face below antennal sockets with dense appressed greyish white setae. Long erect setae on scape, vertex and gena (2-2.5 OD). Metanotum, side of mesosoma, propodeum on lateral and posterior surfaces with sparse, short, greyish white and plumose setae (2-2.5 OD). Metasomal terga without patches of tomentum but with sparse and short setae on lateral parts of terga. Metasomal sterna nearly glabrous except some long setae laterally.



**Fig. 4.** *Lasioglossum (Capalictus) hantamense* sp. nov., ♂. **A.** Head. **B.** Mesoscutum and scutellum. **C.** Propodeum and metanotum. **D.** First tergum. **E.** Metasoma, dorsal view. **F.** Metasoma, ventral view. Scale line = 0,5 mm.





**Fig. 5.** *Lasioglossum (Capalictus) hantamense* sp. nov., ♀. **A.** Head. **B.** Mesoscutum and scutellum. **C.** Propodeum and metanotum. **D.** First tergum. **E.** Metasoma. Scale line = 0,5 mm.

**SURFACE SCULPTURE.** Clypeus and supraclypeal area finely and densely punctate. Frons with minute contiguous punctures ( $i < d$ ) of velvet-like appearance. Upper paraocular area shagreened and irregularly micropunctate. Vertex rugulose to shagreened. Gena dull and ruguloso-striate. Mesoscutum smooth with punctures separated by puncture width ( $i = 1-1.5d$ ), punctures denser laterally of parapsidal lines ( $i = 0.5d$ ). Mesoscutellum and metanotum more finely punctate ( $i = 0.5-1d$ ). Preepisternum, hypoepimeral area and metepisternum with minute contiguous punctures. Mesepisternum with larger and more widely spaced punctures, spaces between punctures shining ( $i = 0.5d$ ). Metapostnotum rugae relatively weak, extending no more than  $2/3$  distance to posterior margin. Dorso-lateral slopes of propodeum dull shagreened. Lateral surface of propodeum dull and minutely roughened, indistinctly punctate. T1 moderately punctate ( $i = 1-1.5d$ ), impressed apical margin with few with punctation similar to T1, disc of T4 and T5 with sparse piliferous punctures.

**STRUCTURE.** Head nearly as long as wide (length/width ratio = 0.94). Eyes converging below (UOD/LOD ratio = 1.62). Flagellomeres long (F2-F10 length/diameter ratio 1.8-1.5). Vertex short. Gena narrower than eye. Propodeum without carina, dorsal surface relatively long (MMR = 1.8). Legs moderately long (length of posterior tarsus equal to 0,7 length of mesosoma) (Figs 13C, 14E-F).

**TERMINALIA.** Gonostylus pointed apically, laterally covered with short setae (less than  $1/4$  basal width of gonostylus) (Fig. 15C).

### **Female**

**BODY LENGTH.** 6-6.5 mm.

**FOREWING LENGTH.** 5 mm.

**COLOURATION.** Head, mesosoma, metasoma and legs black. Metasomal terga black with apical rim translucent straw-coloured. Wing membranes subhyaline, venation, pterostigma and tegula brown.

**PUBESCENCE.** Greyish white and sparse. Metasomal terga without patches of tomentum, apical rim of T2-T4 with sparse fringes.

**SURFACE SCULPTURE.** Clypeus shiny with large and sparse punctures. Supraclypeal area shiny with fine punctures. Frons dull and finely rugulose, with velvet-like appearance. Paraocular area and ocellocular area finely and densely punctate, semi-dull. Lower paraocular area shining and sparsely punctate. Vertex shagreened. Gena finely and densely strigose-punctate. Mesoscutum smooth and shining with sparse punctures ( $i = 1-2d$ ), punctures denser anteriorly and laterally of parapsidal lines ( $i = d$ ). Mesoscutellum more finely and densely punctate, shiny medially. Metanotum dull matt with minute contiguous punctures. Preepisternum, mesepisternum and metepisternum dull matt, minutely roughened. Hypoepimeral area minutely and densely punctate.

**METAPOSTNOTUM.** It is with weak anastomosing rugae extending no more than  $2/3$  distance to posterior margin. Lateral surface of propodeum minutely roughened and shagreened. T1 smooth and nearly impunctate on disc, apical margin finely punctate ( $i = 1.5d$ ). T2 punctate on basal and apical margins, impunctate in middle of disc. T3-T4 with very sparse punctation.

**STRUCTURE.** Head nearly as long as wide (length/width ratio = 0.91). Eyes slightly convergent below (UOD/LOD ratio = 1.09). Vertex short. Gena as wide as eye. Inner metatibial spur with five short teeth. Metapostnotum moderately long (MMR = 1.25). Propodeum with very weak lateral and oblique carinae curved to the middle of the posterior surface.

*Lasioglossum (Capalictus) tigrinum* sp. nov.

[urn:lsid:zoobank.org:act:6924FBAB-4F53-4C34-95BA-306F59D2328F](https://doi.org/10.3897/zoobank.org/act:6924FBAB-4F53-4C34-95BA-306F59D2328F)

Figs 6, 7, 11C-D, 12D, 13D, G-H, 15D, 17C

**Diagnosis**

♂. Close to *L. hantamense* but all tibiae (except a dark central maculation on tibiae II and III), tarsi, apical margins of terga and sterna yellowish orange (Fig. 12D). Mid and hind tarsi black in *L. mosselinum* and *L. timmermanni* punctate in middle of disc as on apical margin (Fig. 7D), punctation of mesoscutum denser (Fig. 7B). Differs from *L. mosselinum* and *L. timmermanni* by the largely black metasoma.

**Etymology**

The name refers to the distinctive yellow-orange banding of the male metasoma which is striped like a tiger.

**Type material**

**Holotype**

♂, 30 Aug. 2011, leg. M. Kuhlmann (SANC).

**Paratypes**

1 ♂, 1 ♀ (Coll. M. Kuhlmann).

**Type locality**

SOUTH AFRICA, Plateau Hantam Mts., near antenna, 9 km N Calvinia, 31°22'29''S 19°47'03''E, 1570 m.

**Description**

**Male**

BODY LENGTH. 7.5 mm.

FOREWING LENGTH. 6 mm.

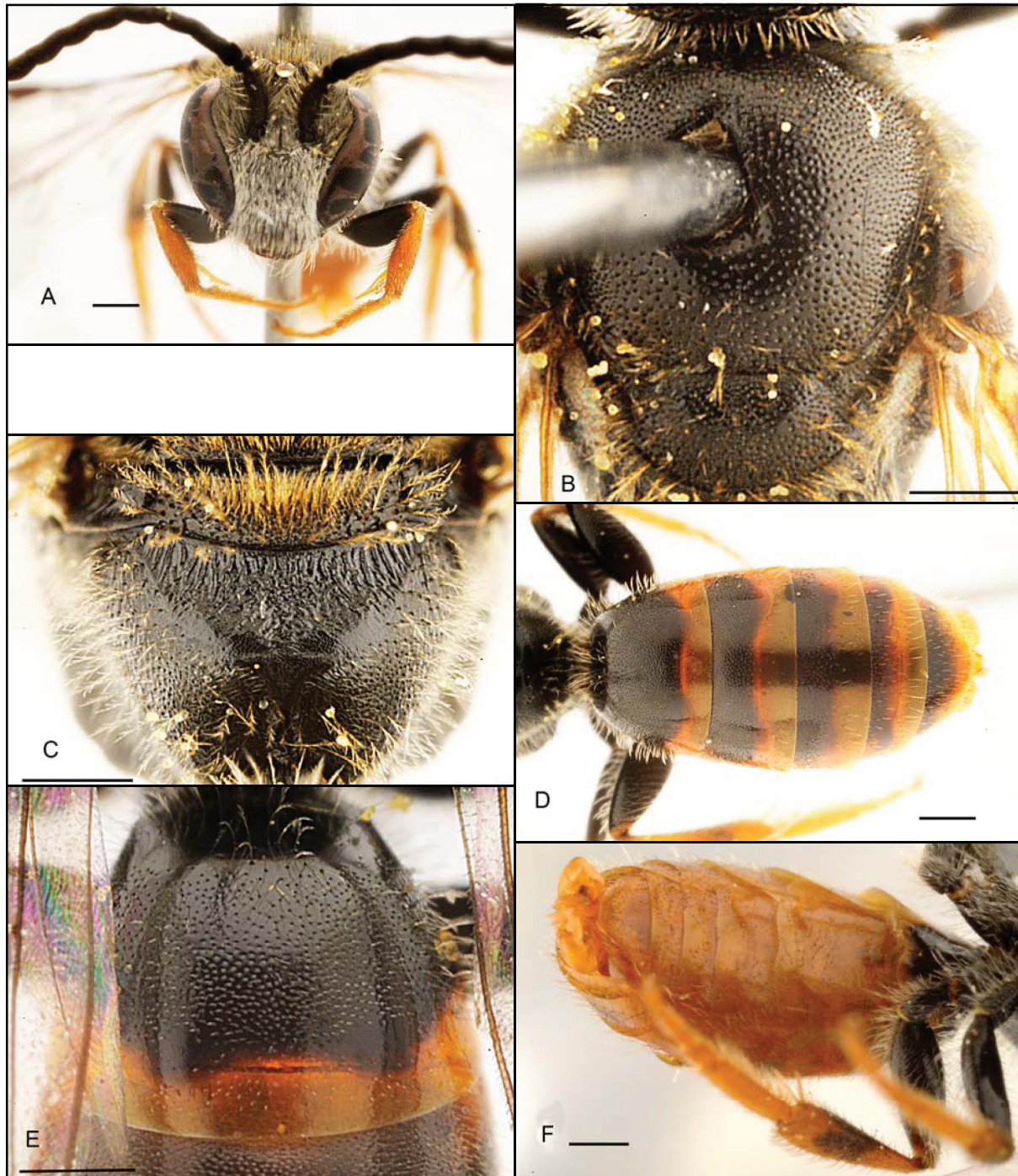
COLOURATION. Head and mesosoma black. Terga black with the whole apical impressed margin amber translucent. Metasomal sterna yellowish orange. All tarsi and tibiae (except a central dark maculation on tibiae II and III) yellowish orange. Clypeus, mandible and ventral surface of flagellum black. Wing membrane subhyaline, venation, pterostigma and tegula dark brown

PUBESCENCE. Face below antennal sockets with dense appressed greyish white setae. Long erect setae on scape, vertex and gena (2-2.5 OD). Metanotum, sides of mesosoma, propodeum on lateral and posterior surface with sparse, short, greyish white and plumose setae (2-2.5 OD). Metasomal terga with sparse and short setae on lateral parts of terga. Metasomal sterna nearly glabrous except some short and sparse setae.

SURFACE SCULPTURE. Clypeus and supraclypeal area finely and densely punctate. Frons with minute contiguous punctures ( $i < d$ ) of velvet-like appearance. Upper paraocular area shagreened and irregularly micropunctate. Vertex rugulose to shagreened. Gena dull and ruguloso-striate. Mesoscutum smooth with punctures separated by one puncture width ( $i = d$ ), punctures denser anteriorly and laterally of parapsidal line ( $i = 0.5d$ ) (Fig. 8b). Preepisternum, hypoepimeral area, metepisternum as well as mesepisternum with minute, contiguous punctures. Metapostnotum rugae relatively weak, extending 4/5 distance to posterior margin. Dorso-lateral slope of propodeum dull shagreened. Lateral surface of propodeum dull and minutely roughened, indistinctly punctate. T1 moderately-densely punctate ( $i = 0.5-1d$ ), impressed

apical margin with few minute punctures. T1 anterior surface smooth, without striations. Discs of T2 and T3 with punctuation similar to T1, discs of T4 and T5 with sparser punctures.

STRUCTURE. Head nearly as long as wide (length/width ratio = 0.97). Eyes converging below (UOD/LOD ratio = 1.70). Flagellomeres long (F2-F10 length/diameter ratio 1.6–1.4). Vertex short. Gena narrower



**Fig. 6.** *Lasioglossum (Capalictus) tigrinum* sp. nov., ♂. **A.** Head and forelegs. **B.** Mesoscutum and scutellum. **C.** Propodeum and metanotum. **D.** Metasoma, dorsal view. **E.** First tergum. **F.** Metasoma ventral view. Scale line = 0,5 mm.

than eye. Propodeum without carina, dorsal surface relatively long (MMR = 1.66). Legs moderately long (length of posterior tarsi equal to 0,85 length of mesosoma) (Figs 13D, 14G-H).

TERMINALIA. Gonostylus pointed apically, laterally with some long setae (longer or subequal to basal width of gonostylus) (Fig. 15D).



**Fig. 7.** *Lasioglossum (Capalictus) tigrinum* sp. nov., ♀. **A.** Head. **B.** Mesoscutum and scutellum. **C.** Propodeum and metanotum. **D.** First tergum. **E.** Metasoma. Scale line = 0,5 mm.

### Female

BODY LENGTH. 7 mm.

FOREWING LENGTH. 5 mm.

COLOURATION. Head, mesosoma and metasoma black. Metasomal terga black with apical rim translucent straw-coloured. Wing membrane subhyaline, venation and pterostigma brown, tegula blackish brown.

PUBESCENCE. Greyish white and sparse. Apical rim of T2-T4 with sparse fringes.

SURFACE SCULPTURE. Clypeus shiny with large and sparse punctures. Supraclypeal area shiny with fine punctures. Frons dull and finely rugulose, with velvet-like appearance. Upper paraocular area and ocellular area finely and densely punctate, semi-dull. Lower paraocular area shining and sparsely punctate. Vertex shagreened. Gena finely and densely strigose-punctate. Mesoscutum smooth and shining with sparse punctures ( $i = 1-2d$ ), punctures denser anteriorly and laterally of parapsidal line ( $i = d$ ) with minute contiguous punctures. Preepisternum, and mesepisternum dull matt, minutely and densely roughened. Hypoepimeral area and metepisternum minutely and densely punctate. Metapostnotum with weak anastomosing rugae extending no more than  $2/3$  distance to posterior margin. Lateral surface of propodeum minutely roughened and shagreened. T1 smooth and distinctly punctate in middle of disc as well as on apical margin ( $i = 1.5d$ ), smooth and impunctate anteriorly and laterally. T2 punctate in middle of disc as on apical margin. T3-T4 with sparse punctures.

STRUCTURE. Head nearly as long as wide (length/width ratio = 0.90). Eyes slightly convergent below (UOD/LOD ratio = 1.13). Vertex short. Gena as wide as eye. Inner metatibial spur with five short teeth. Metapostnotum moderately long (MMR = 1.56). Propodeum with very weak lateral and oblique carinae curved to the middle of the posterior surface.

*Lasioglossum (Capalictus) timmermanni* sp. nov.

[urn:lsid:zoobank.org:act:BD39F9EB-D335-4B6F-BC5E-096313677B1F](http://urn:lsid:zoobank.org:act:BD39F9EB-D335-4B6F-BC5E-096313677B1F)

Figs 8, 9, 10C-D, 12B, 13B, 14C-D, 15B, 16B, 17D

### Diagnosis

#### Male

Close to *L. mosselinum* but punctation of mesoscutum much denser between parapsidal lines ( $i = 1-1.5d$ ) (Fig. 8B) (sparse in *L. mosselinum*,  $i = 3-4d$ ). Legs completely black, tarsi shorter than those of *L. mosselinum* (Figs 12B, 13B, 14C-D) (all tarsi pale yellow to yellow-orange in *L. hantamense* and *L. tigrinum*, fore tarsus yellow in *L. mosselinum*).

#### Female

Close to *L. mosselinum* but metasoma with more extensive red colouration on last tergum (Fig. 16F), base of first tergum often black (metasomal terga black with pale apical margins in *L. hantamense* and *L. tigrinum*). Rugae of metapostnotum are finer and shorter than in *L. mosselinum*, dorso-lateral slopes of propodeum with microtessellate dull surface, not shiny as in *L. mosselinum* (Fig. 9C-D).

### Etymology

The species is named for Kim Timmermann, formerly Münster (Germany), who collected many of the specimens.

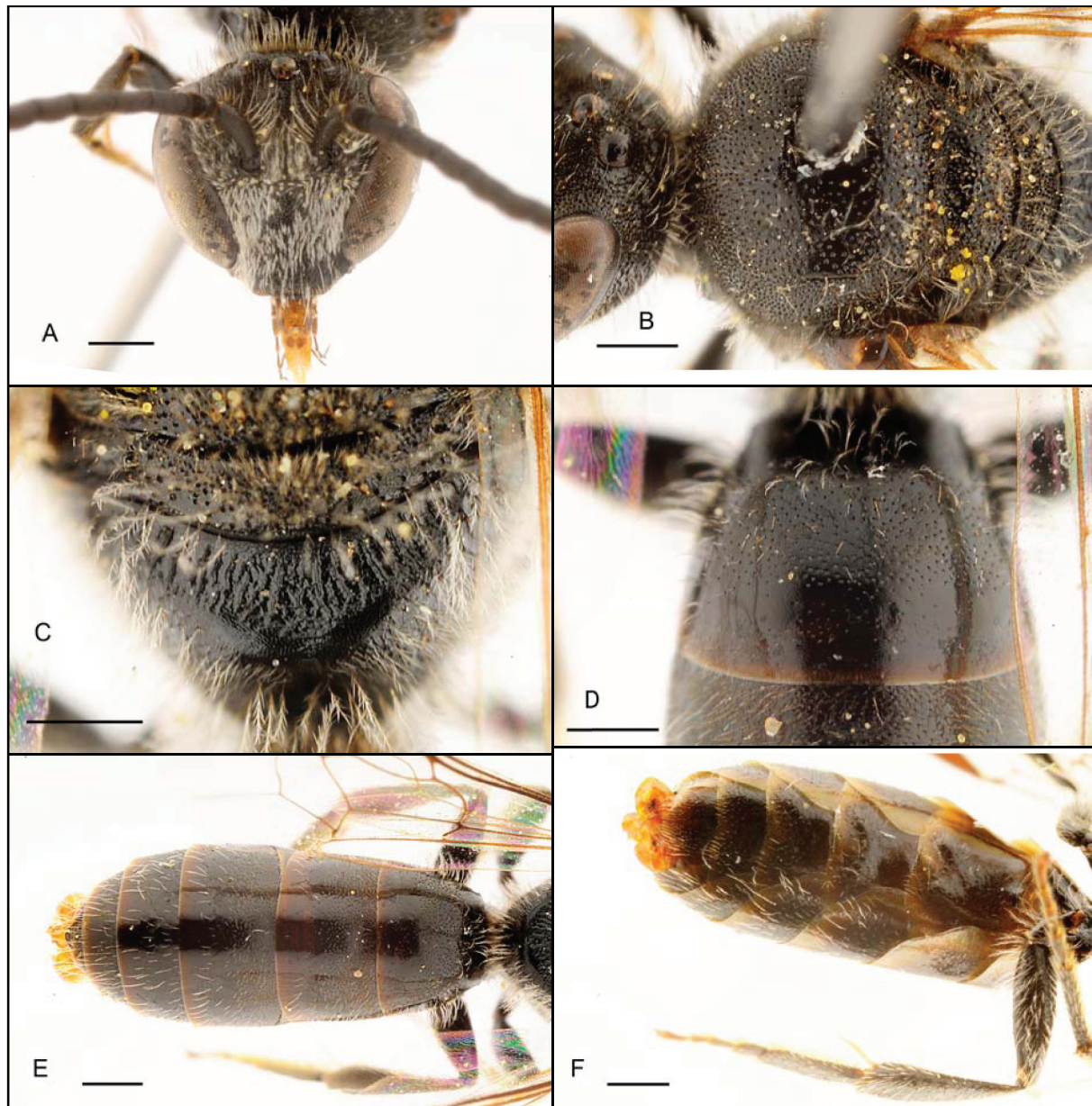
**Type material**

**Holotype**

♂, 4 Sep. 2011, leg. Erhardt (SANC).

**Paratypes**

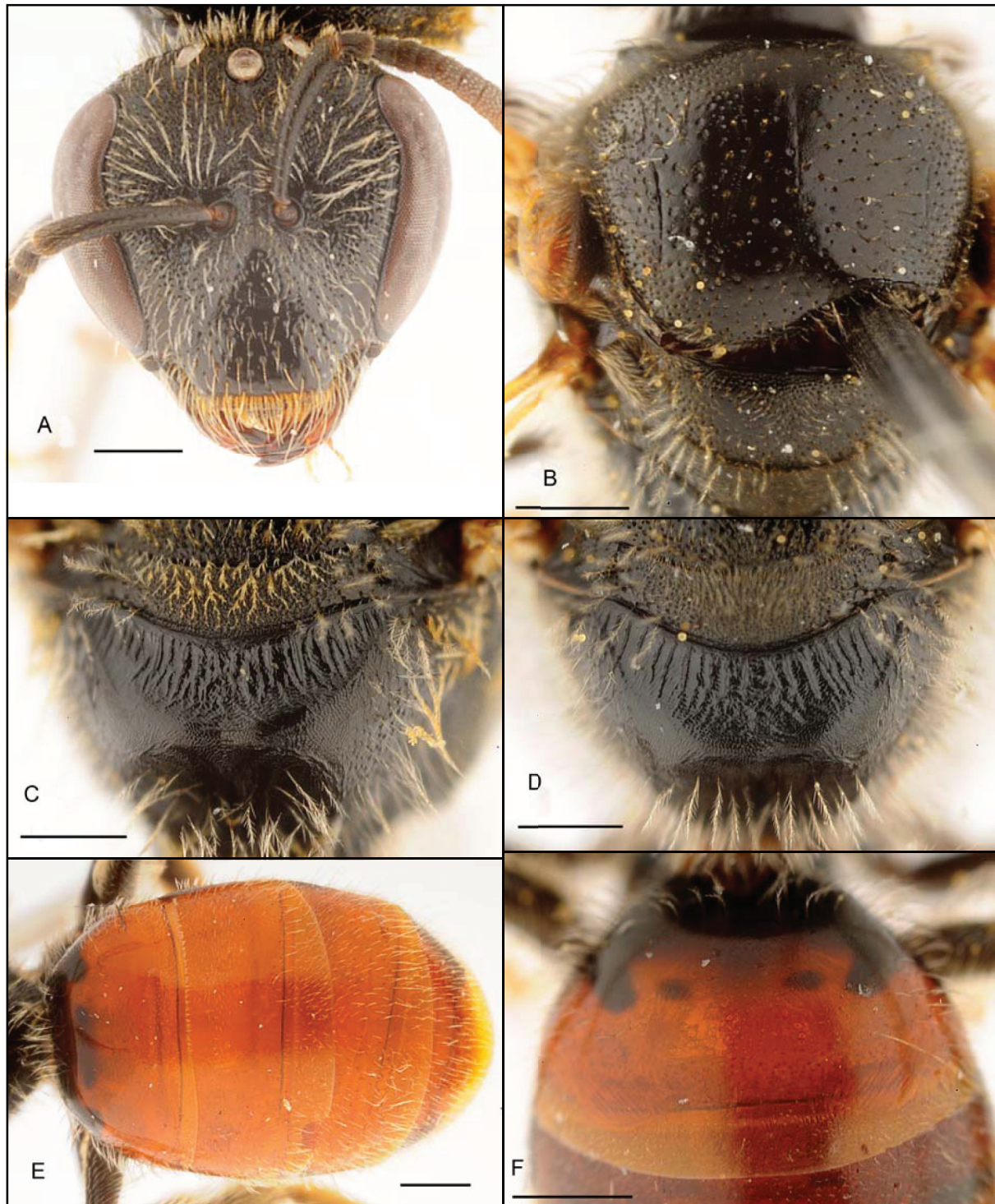
1 ♂, 25 Aug. 2010, leg. M. Kuhlmann (BMNH). 4 ♀♀, 17 Aug. 2011, coll. BMNH, RBINS. 10 ♀♀ collected at Farm Engelsepunt, 16 km NW Nieuwoudtville, Fynbos, Pfe1, 31°14'31''S 18°59'08''E, 830 m, leg. K. Timmermann (BMNH, RBINS): 1 ♀, 2-26 Jul. 2003; 1 ♀, 6 Aug. 2003; 2 ♀♀, 27 Aug. 2003; 6 ♀♀, 28 Aug. 2003, Pfe1.



**Fig. 8.** *Lasioglossum (Capalictus) timmermanni* sp. nov., ♂. **A.** Head. **B.** Mesosoma and vertex. **C.** Propodeum and metanotum. **D.** First tergum. **E.** Metasoma, dorsal view. **F.** Metasoma, ventral view. Scale line = 0,5 mm.

**Type locality**

SOUTH AFRICA, Farm Avontuur, Fynbos, 12 km NW Nieuwoudtville, 31°16'18''S 19°02'55''E, 770 m.



**Fig. 9.** *Lasioglossum (Capalictus) timmermanni* sp. nov., ♀. **A.** Head. **B.** Mesoscutum and scutellum. **C.** Propodeum. **D.** Metanotum. **E.** Metasoma. **F.** First tergum. Scale line = 0,5 mm.



## Description

### Male

BODY LENGTH. 7.5 mm.

FOREWING LENGTH. 6 mm.

COLOURATION. Head, mesosoma, terga, sterna, clypeus, mandible, antenna and legs black. Wing membrane subhyaline, venation, pterostigma and tegula black.

PUBESCENCE. Face below antennal sockets with dense appressed greyish white setae. Long erect setae on scape, vertex and gena (2-2.5 OD). Metanotum, pleuron, propodeum on lateral and posterior surface with sparse, short, greyish white and plumose setae (2-2,5 OD). Metasomal terga without patches of tomentum but with sparse and short setae on lateral. Metasomal sterna nearly glabrous except some long and sparse setae on lateral sides.

SURFACE SCULPTURE. Clypeus and supraclypeal area finely and densely punctate. Frons with minute contiguous punctures ( $i < d$ ) of velvet-like appearance. Upper paraocular area shagreened and irregularly micropunctate. Vertex and ocellular area rugulose to shagreened. Gena dull and ruguloso-striate. Mesoscutum smooth with punctures separated by more than a puncture width ( $i = 1-1.5d$ ), punctures denser laterally of parapsidal lines ( $i = 0.5d$ ) and anteriorly. Mesoscutellum more finely punctate ( $i = 0.5-1d$ ). Metanotum with contiguous fine punctures. Preepisternum, hypoepimeral area and metepisternum with contiguous minute punctures. Mesepisternum with larger alveolate and contiguous punctures. Metapostnotum rugae relatively weak and anastomosing, extending more than 4/5 distance to posterior margin. Dorsolateral slopes of propodeum dull shagreened. Lateral surface of propodeum dull with distinct dense punctures. T1 moderately punctate ( $i = 1-1.5d$ ), impressed apical margin without punctures. T1 anterior surface smooth and without striations. Disc of T2 and T3 with punctation similar to T1, disc of T4 and T5 with sparse piliferous punctures.

STRUCTURE. Head rounded, nearly as long as wide (length/width ratio = 0.91). Eyes converging below (UOD/LOD ratio = 1.69). Flagellomeres long (F2-F10 length/diameter ratio 1.5-1.7). Vertex short. Gena narrower than eye. Propodeum without carina, metapostnotum relatively long (MMR = 1.42). Legs moderately long (length of posterior tarsi equal to 0,8 length of mesosoma) (Figs 13B, 14C-D).

TERMINALIA. Gonostylus pointed apically, with relatively long apical setae (subequal to basal width of gonostylus) (Fig. 15B).

### Female

BODY LENGTH. 7 mm.

FOREWING LENGTH. 6 mm.

COLOURATION. Head, mesosoma and legs black, metasoma red orange except T1 anterior surface black and lateral parts of T2-T4 blackish. Wing membranes subhyaline, venation, pterostigma and tegula brown.

PUBESCENCE. Greyish white and sparse. Metasomal terga without patches of tomentum.

SURFACE SCULPTURE. Clypeus shiny with large and sparse punctures. Supraclypeal area shiny with fine punctures. Frons dull and finely rugulose, with velvet-like appearance. Paraocular area and ocellular area finely and densely punctate, semi-dull. Lower paraocular area shining and sparsely punctate. Vertex shagreened. Gena finely and densely strigose-punctate. Mesoscutum smooth and shining with sparse punctures ( $i = 2-3d$ ), punctures denser anteriorly and laterally to parapsidal line ( $i = d$ ). Mesoscutellum

more finely and densely punctate, shiny medially Metanotum dull matt with minute contiguous punctures. Preepisternum, and mesepisternum dull matt, minutely and densely roughened. Hypoepimeral area and metepisternum minutely and densely punctate. Metapostnotum with weak anastomosing rugae extending no more than 2/3 distance to posterior margin. Lateral surface of propodeum minutely roughened and shagreened. T1 smooth and nearly impunctate on disc, apical margin finely punctate ( $i = 1.5d$ ). T2 punctate on basis and apical margin, not in the middle. T3-T4 with very sparse punctures.

SCULPTURE. Head nearly as long as wide (length/width ratio = 0.89). Eyes slightly convergent below (UOD/LOD ratio = 1.09). Vertex short. Gena as wide as eye. Inner metatibial spur with five short teeth. Metapostnotum moderately long (MMR = 1.48).

PROPODEUM. It is with very weak lateral and oblique carina curved to the middle of the posterior surface.

### Additional material

The following specimens are identified as *Capalictus*, but not described as new because only a single sex is known. They differ slightly from the species above by the punctation of mesoscutum and metasomal terga. The information is provided to encourage and facilitate future study of the subgenus.

#### *Lasioglossum (Capalictus) sp. 1*

### Material

1 ♂, Farm Papkuilsfontein, 20 km S Nieuwoudtville, Fynbos, 31°33'16''S 19°08'31''E, 680m, 15 Aug. 2010, leg. M. Kuhlmann

This male specimen is close to *L. timmermanni* sp. nov., but differs by foretibia orange on inner side and impressed apical margin of T1 punctate. The female is unknown.

#### *Lasioglossum (Capalictus) sp. 2*

### Material

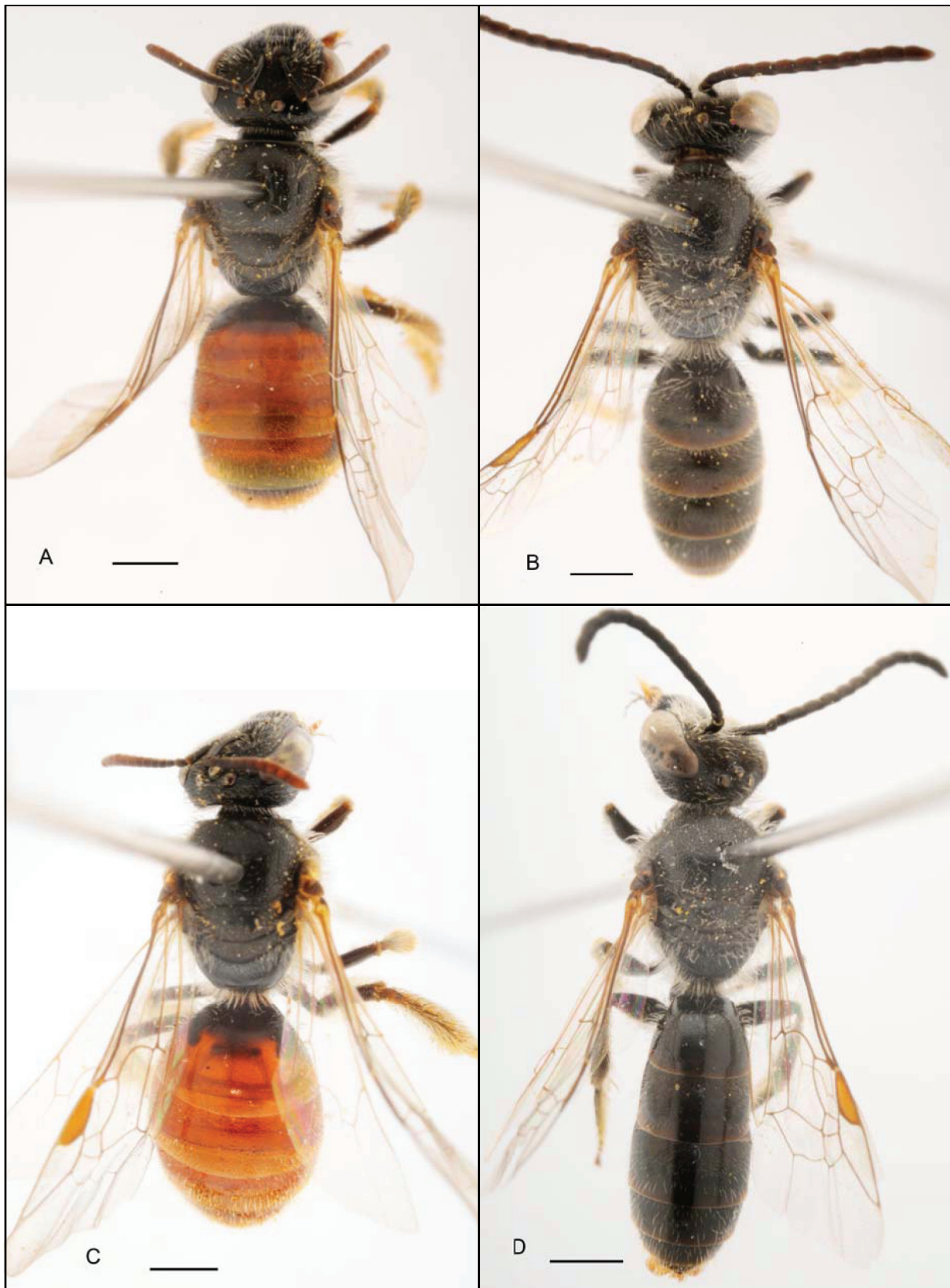
All ♀♀: 2 ♀♀ (CUIC) (metasoma black), SOUTH AFRICA, Western Cape Province (WCP), Kunje Farm, 760 m, 28 km SSE Citrusdal, 32°40.35'S 19°12.67'E, 23-25 Sep. 2001; 2 ♀♀ (CUIC) (metasoma red), WCP, Kunje Farm, 760 m, 28 km SSE Citrusdal, 32°40.35'S 19°12.67'E, 23-25 Sep. 2001; 4 ♀♀ (CUIC) (2 females Voucher 01-54) (metasoma black), WCP, 21 km N Hermanus, 157 m, 34°17.82'S 19°07.71'E, 28 Sep. 2001; 1 ♀ (Voucher 01-45) (CUIC) (metasoma red), WCP, Cape Agulhas, 34°49.92'S 20°00.14'E, 27 Sep. 2001; 1 ♀ (CUIC) (metasoma black), WCP, Betty's Bay, botanical garden, 27 m, 34°21.14'S 18°55.62'E, 28 Sep. 2001.

Specimens from Hermanus (4 ♀♀ including Voucher 01-54) are similar in size and colour to *L. tigrinum* sp. nov., but their tergum 1 is nearly impunctate on the disc, punctures of the mesoscutum are larger and sparser, punctures on the face are stronger.

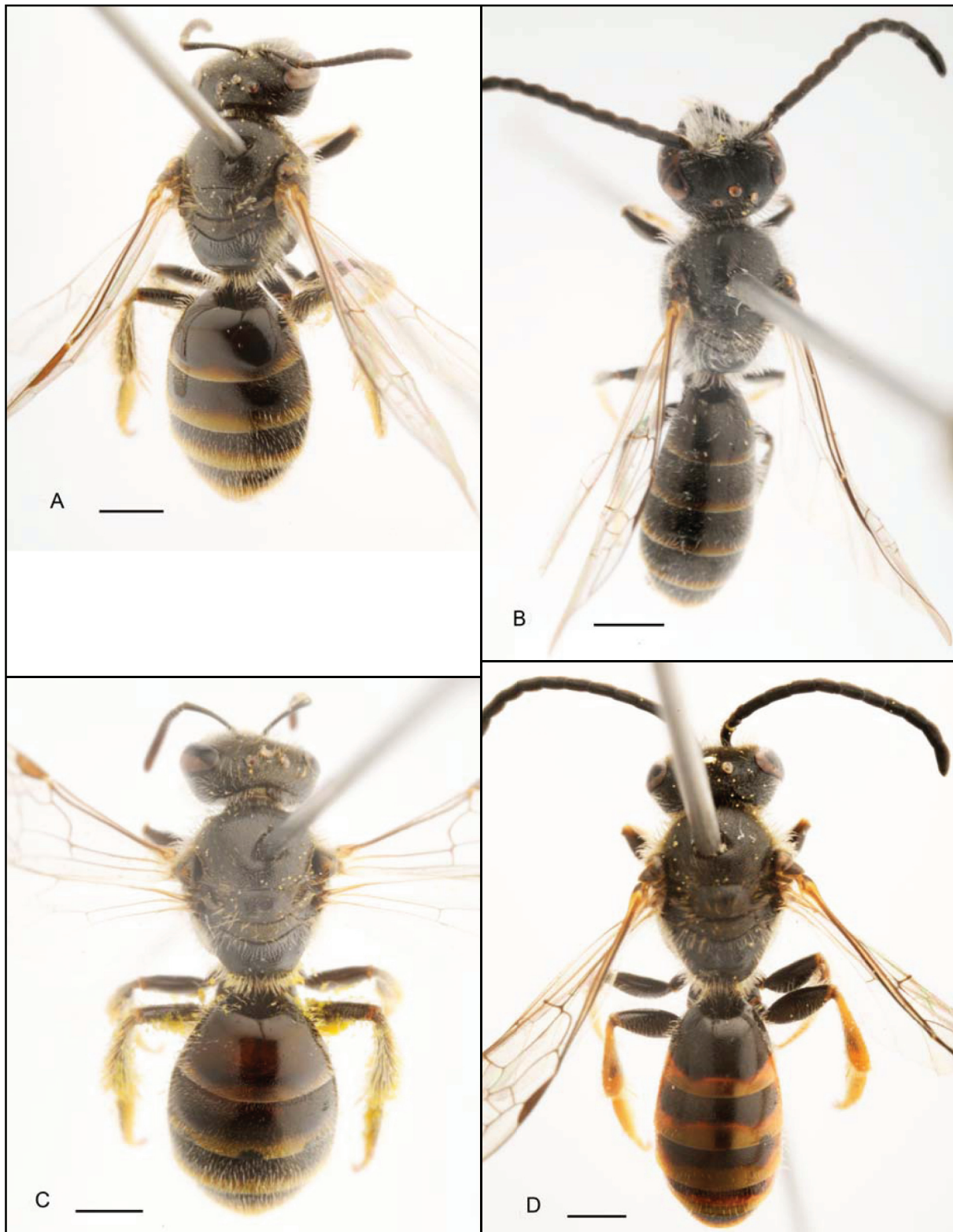
Specimens with black metasoma from Kunje Farm (2 ♀♀) and Betty's Bay (1 ♀) are similar in size and colour to *L. hantamense* sp. nov. but punctures of the mesoscutum are stronger.

The specimen from Cape Agulhas (1 ♀, Voucher 01-45) is similar to *L. timmermanni* sp. nov. by its colouration (metasoma red, including last terga) and shagreened propodeum.

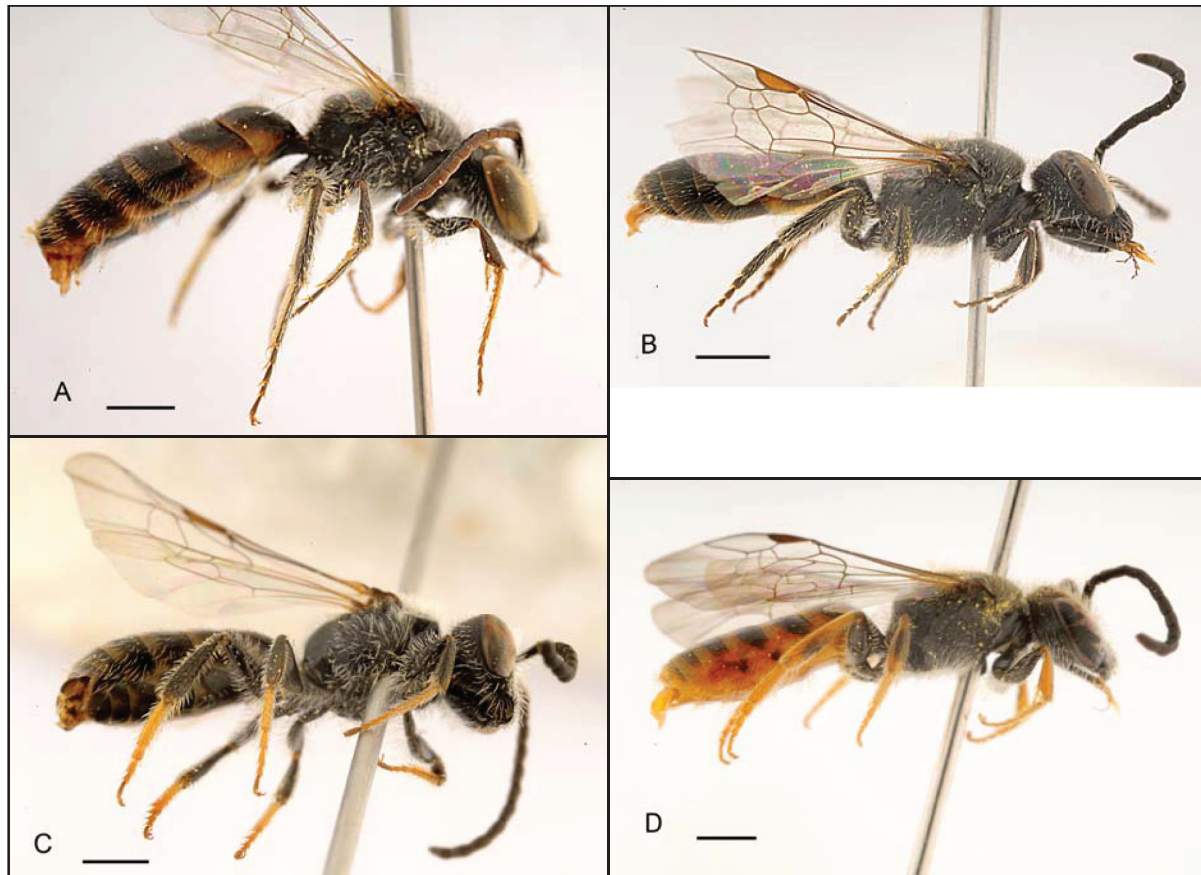
Specimens from Kunje Farm with red metasoma (2 ♀♀) are similar to *L. timmermanni* sp. nov. by red metasoma and shagreened propodeum, but differs by black last terga. They are smaller in size than the specimen from Cape Agulhas.



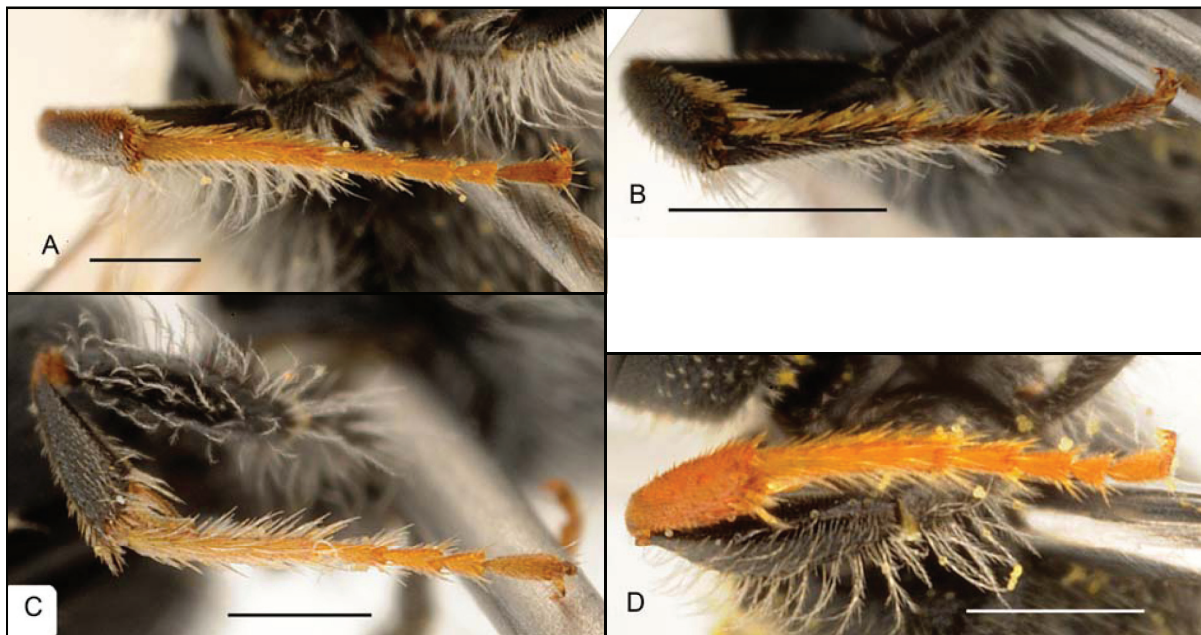
**Fig. 10.** Dorsal habitus. — **A-B.** *Lasioglossum mosselinum* (Cockerell, 1945). A. ♀. B. ♂. — **C-D.** *Lasioglossum timmermanni* sp. nov. C. ♀. D. ♂. Scale line = 1 mm.



**Fig. 11.** Dorsal habitus. — **A-B.** *Lasioglossum (Capalictus) hantamense* sp. nov.. A. ♀. B. ♂. — **C-D.** *Lasioglossum (Capalictus) tigrinum* sp. nov. C. ♀. D. ♂. Scale line = 1 mm.



**Fig. 12.** Lateral habitus, ♂. — **A.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **B.** *Lasioglossum (Capalictus) timmermanni* sp. nov. — **C.** *Lasioglossum (Capalictus) hantamense* sp. nov.. — **D.** *Lasioglossum (Capalictus) tigrinum* sp. nov. Scale line = 1 mm.

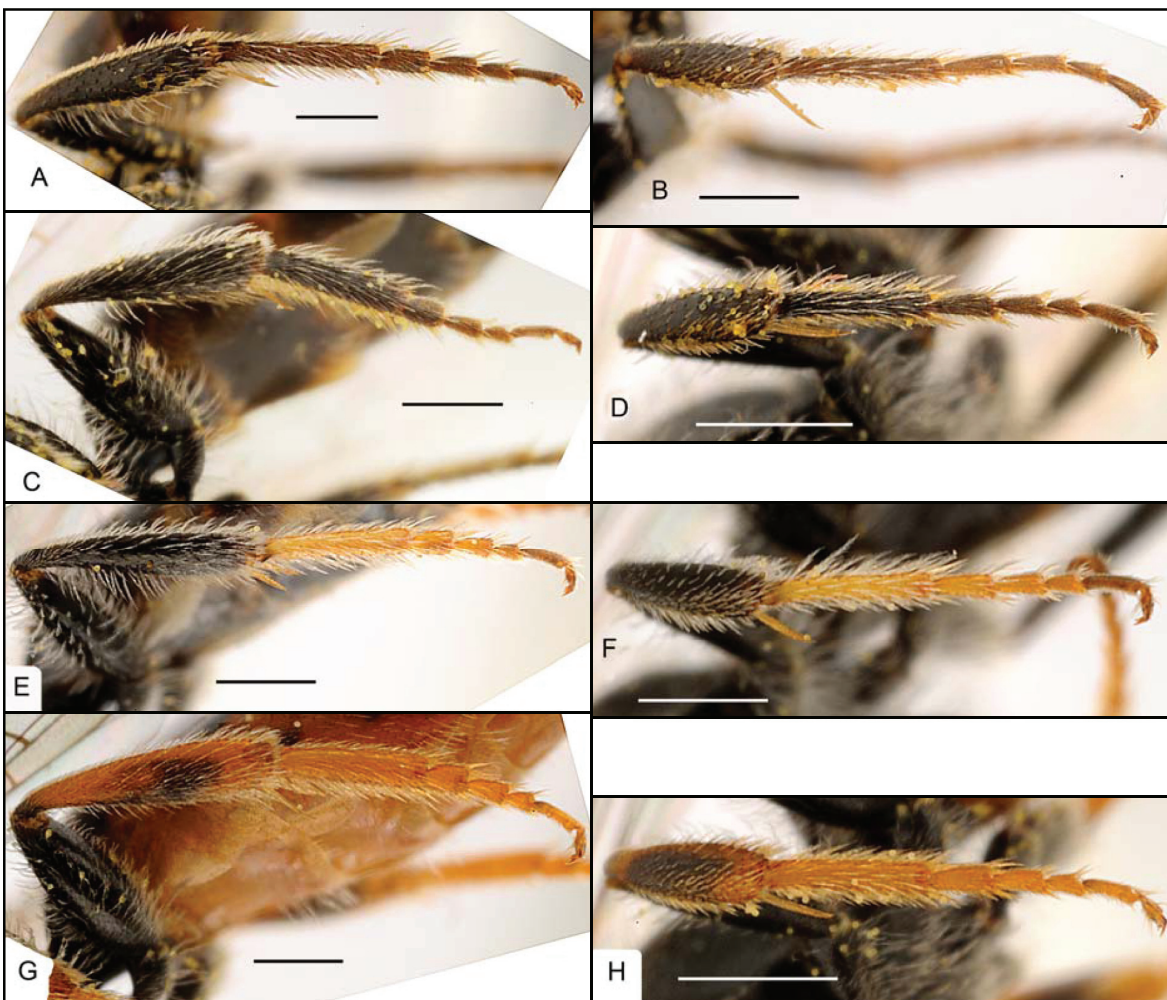


**Fig. 13.** ♂ foretarsi. — **A.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **B.** *Lasioglossum (Capalictus) timmermanni* sp. nov. — **C.** *Lasioglossum (Capalictus) hantamense* sp. nov. — **D.** *Lasioglossum (Capalictus) tigrinum* sp. nov. Scale line = 0,5 mm.

**Key to species**

**Males**

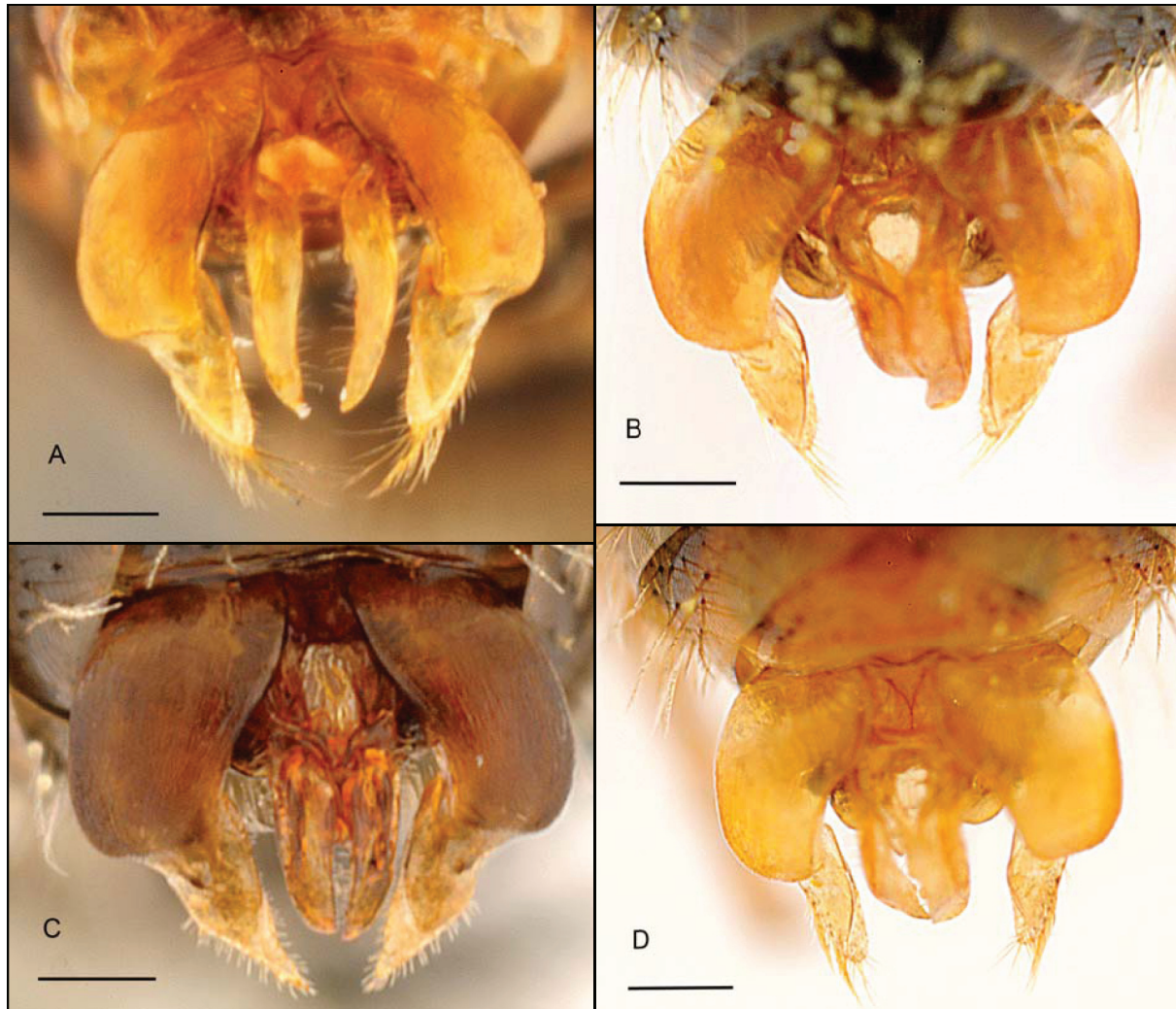
1. Tibiae of middle and posterior legs yellowish orange (except for a central dark maculation) (Figs 12D, 13D, 14G-H); apical impressed area of terga largely amber translucent (Fig. 6D) ..... *L. (Capalictus) tigrinum* sp. nov.
- Tibiae of middle and posterior legs dark; apical impressed area of terga black, rarely amber, apical rim slightly straw-coloured ..... (2)
2. All tarsi pale yellow (Figs 12C, 13C, 14E-F); gonostylus with short setae, length less than  $\frac{1}{4}$  basal gonostylus width (Fig. 15C) ..... *L. (Capalictus) hantamense* sp. nov.
- Tarsi of middle and posterior legs dark (Fig. 14A-D); gonostylus with long setae, length subequal to or longer than basal gonostylus width (Fig. 15A-B) ..... (3)
3. Foretarsi black (Fig. 13B); punctation of mesoscutum denser ( $i = 1-1.5d$ ) (Fig. 8B); dorso-lateral slope of propodeum with microtesselate dull surface (Fig. 8c) ..... *L. (Capalictus) timmermanni* sp. nov.
- Foretarsi yellowish (Fig. 13A); punctation of mesoscutum sparser ( $i = 3-4d$ ) (Fig. 3B); dorso-lateral slope of propodeum shining (Fig. 3C) ..... *L. (Capalictus) mosselinum* (Cockerell, 1945)



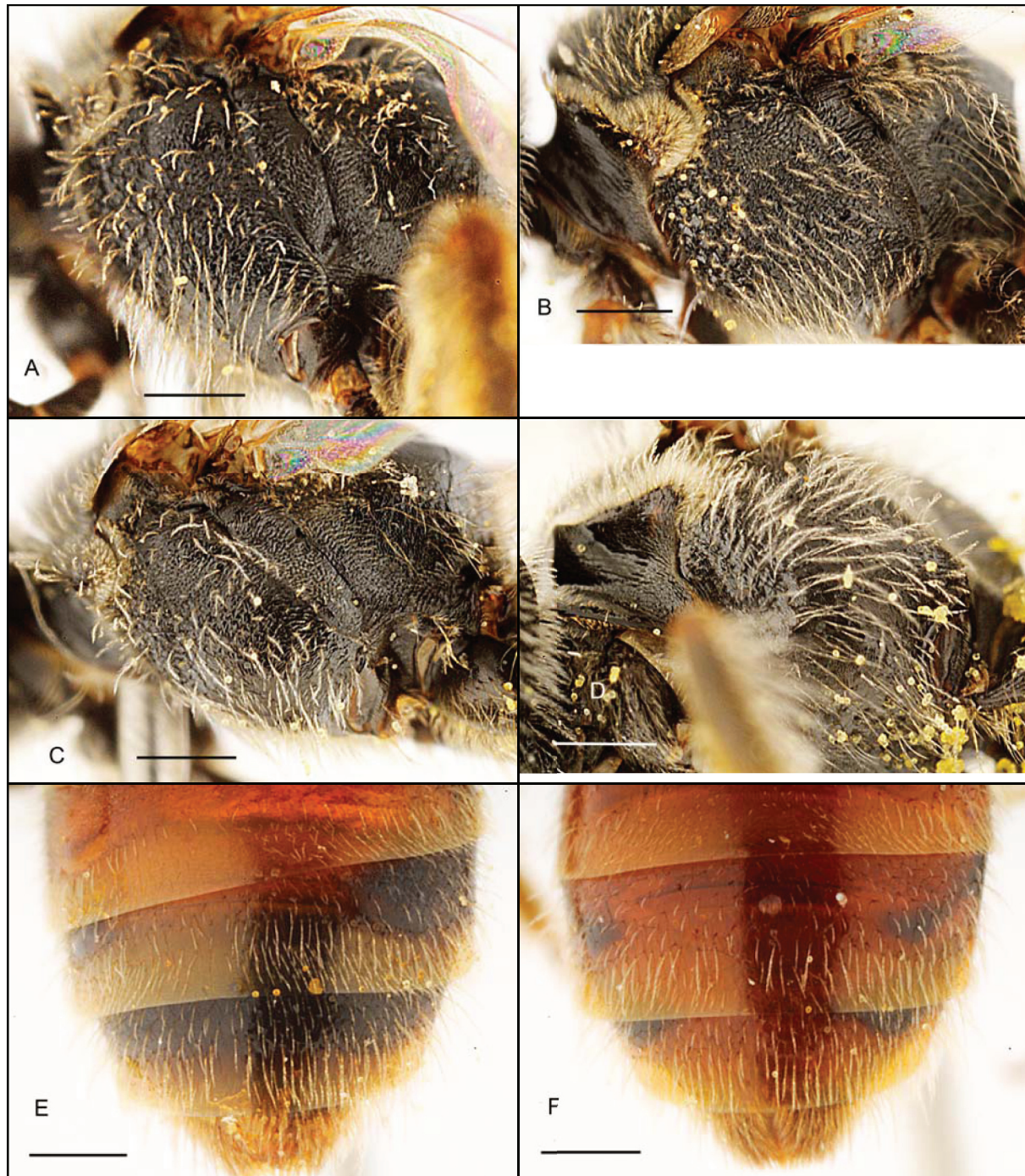
**Fig. 14.** ♂ hind legs (left) and mid legs (right). — **A-B.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **C-D.** *Lasioglossum (Capalictus) timmermanni* sp. nov. — **E-F.** *Lasioglossum (Capalictus) hantamense* sp. nov. — **G-H.** *Lasioglossum (Capalictus) tigrinum* sp. nov. Scale line = 0,5 mm.

**Females**

1. Metasoma largely red (Fig. 10A, C) ..... (2)
- Metasoma black, apical margins pale (Fig. 11A, C) ..... (3)
  
2. Terga 5–6 largely red (Fig. 16F); dorso-lateral slopes of propodeum shagreened (Fig. 9C, D); ridges of metapostnotum short and anastomosing (Fig. 9C, D; also Fig. 7 in Pauly *et al.* 2008) ..... *L. (Capalictus) timmermanni* sp. nov.
- Terga 5–6 blackish (Fig. 16E); dorso-lateral slopes of propodeum shining (Fig. 2D); ridges of metapostnotum more linear (Fig. 2D, also Fig. 6 in Pauly *et al.* 2008)..... *L. (Capalictus) mosselinum* (Cockerell, 1945)
  
3. Smaller body size (length 6-6.5 mm); T1 nearly impunctate on disc, punctures very weak and superficial, apical margin with fine punctures (Fig. 5D, E)..... *L. (Capalictus) hantamense* sp. nov.
- Larger body size (length 7 mm); T1 with distinct punctuation on disc as well as on apical margin (Fig. 7D, E) ..... *L. (Capalictus) tigrinum* sp. nov.

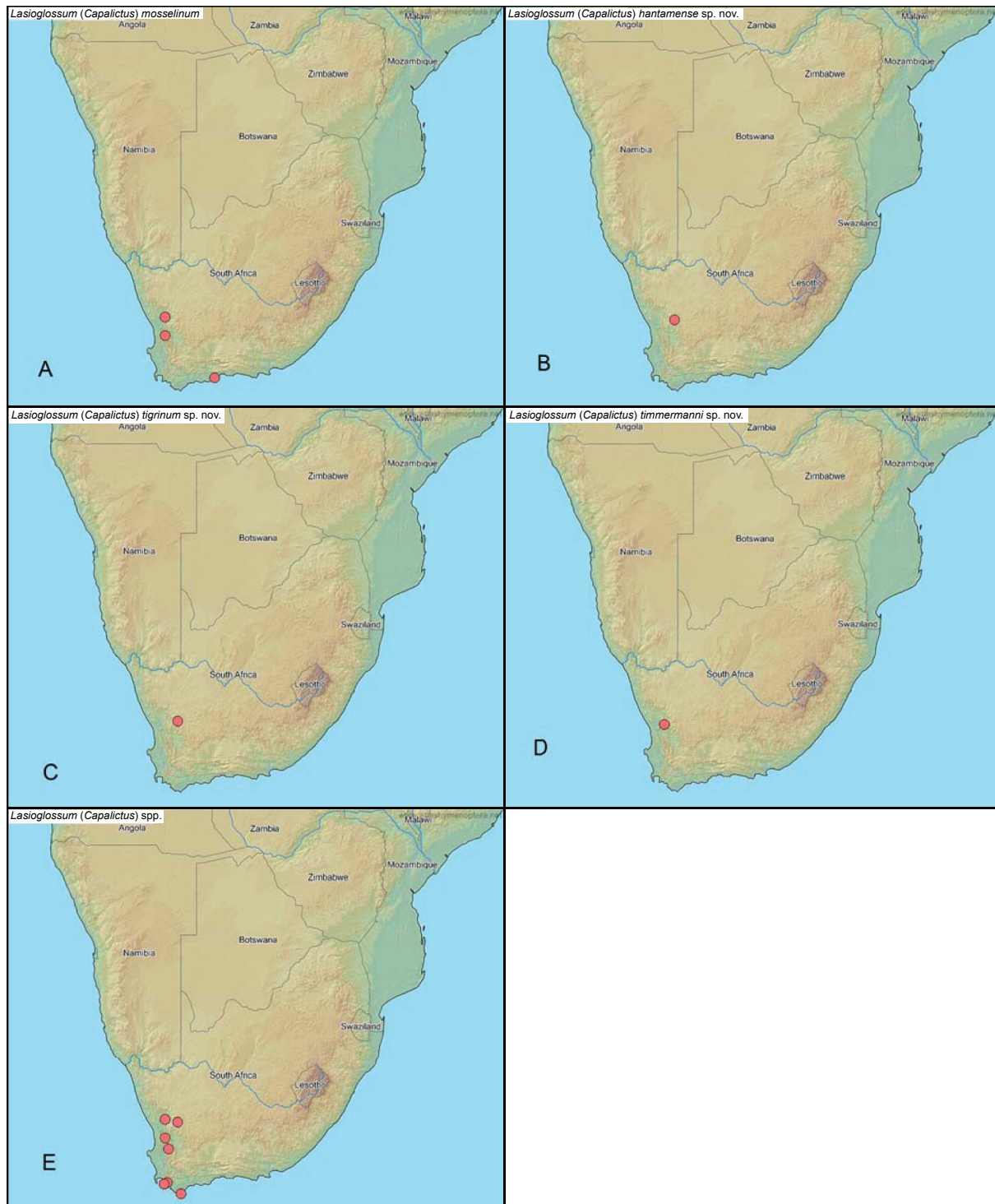


**Fig. 15.** ♂ genitalia, dorsal view. — **A.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **B.** *Lasioglossum (Capalictus) timmermanni* sp. nov. — **C.** *Lasioglossum (Capalictus) hantamense* sp. nov. — **D.** *Lasioglossum (Capalictus) tigrinum* sp. nov. Scale line = 0,25 mm.



**Fig. 16.** A-D. Lateral view of mesosoma. E-F. Last terga. ♀♀. — **A.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **B.** *Lasioglossum (Capalictus) timmermanni* sp. nov. — **C.** *Lasioglossum (Capalictus) hantamense* sp. nov. — **D.** *Lasioglossum (Capalictus) tigrinum* sp. nov. — **E.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **F.** *Lasioglossum (Capalictus) timmermanni* sp. nov. Scale line = 0,5 mm.





**Fig. 17.** Distribution maps of *Lasioglossum (Capalictus)* spp. in southern Africa. — **A.** *Lasioglossum (Capalictus) mosselinum* (Cockerell, 1945). — **B.** *Lasioglossum (Capalictus) hantamense* sp. nov. — **C.** *Lasioglossum (Capalictus) tigrinum* sp. nov. — **D.** *Lasioglossum (Capalictus) timmermanni* sp. nov. — **E.** Unidentified specimens of *Lasioglossum (Capalictus)*, ♀♀.

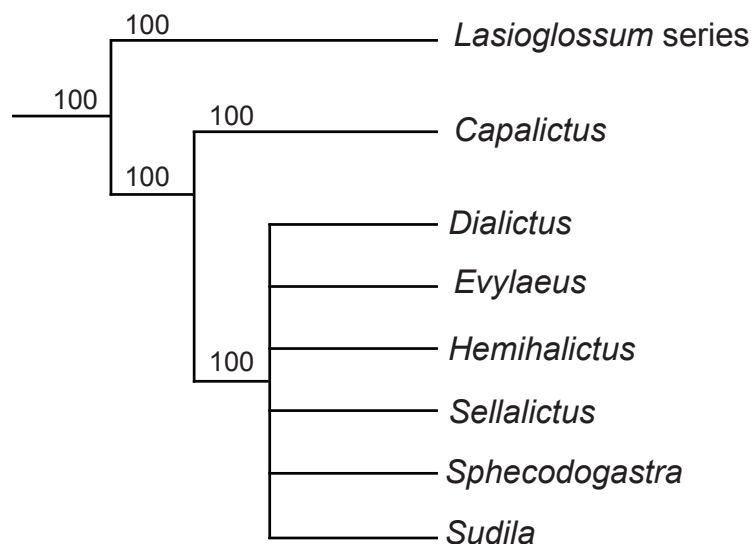
## Molecular results

DNA sequence data from five specimens of *Lasioglossum* (*Capalictus*) (1 specimen of *L. hantamense* sp. nov., 2 of *L. tigrinum* sp. nov., and 2 of *L. aff. tigrinum* (n°01-54) includes putatively fixed characters suggestive of species-level differentiation. A total of 1934 bp was sequenced for all five specimens (EF1- $\alpha$ : 951 bp, wnt-1: 457 bp, and opsin: 525 bp). *Lasioglossum hantamense* sp. nov. differed from *L. tigrinum* sp. nov. by 7 nucleotide substitutions (3 in EF-1 $\alpha$ , 1 in wnt-1, and 3 in opsin) and from *L. aff. tigrinum* by 9 nucleotide substitutions (5 in EF-1 $\alpha$  and 4 in opsin). *Lasioglossum tigrinum* sp. nov. differed from *L. aff. tigrinum* by 10 nucleotide substitutions (4 in EF-1 $\alpha$ , 1 in wnt-1, and 5 in opsin). Only one variable nucleotide position was found within *L. aff. tigrinum* (in EF-1 $\alpha$ ) and 2 were found in *L. tigrinum* sp. nov. (1 each in EF-1 $\alpha$  and opsin). The levels of genetic differentiation in EF-1 $\alpha$  are consistent with those discovered between other closely related bee species (Danforth *et al.* 1999; Kuhlmann *et al.* 2007).

## Discussion

Phylogenetic studies of *Lasioglossum* are ongoing, but recent molecular study clearly supports the position of *Capalictus* as a basal lineage of the weak-veined *Lasioglossum* (*Hemihalictus* series) (Gibbs *et al.* 2012) (Fig. 18). Nodal support values for the relevant nodes of the topology are very high (100) when the data are analysed with either Bayesian methods (measured in posterior probabilities) (Gibbs *et al.* 2012) or parsimony (measured in GC values; Goloboff *et al.* 2003) (J. Gibbs unpublished results).

The subgenus *Capalictus* seems to be largely restricted to the winter-rainfall region of South Africa that is known as a centre of bee endemism and species diversity of global importance (Kuhlmann 2009). In this region some other bee genera are known that represent basal lineages within their families, subfamilies or tribes. These are *Fidelia*, *Fideliopsis*, *Afroheriades*, *Aspidosmia* (Megachilidae) (Litman *et al.* 2011), and *Haplomelitta* (Melittidae) (Michez *et al.* 2009). Additional research in this centre of bee and floral diversity is of special interest for the understanding of bee phylogeny and evolution (Kuhlmann 2009).



**Fig. 18.** Summary of phylogenetic relationships of *Capalictus* relative to remaining *Lasioglossum*, based on Gibbs *et al.* 2012. Numbers represent posterior probability support values.

## Acknowledgements

MK is much indebted to Onno Huyser, Manager of the Table Mountain Fund, and Noel Oettle, Managing Director of Avontuur Sustainable Agriculture, for giving him access to the farm Avontuur and their permission to study the bees on the property. Northern Cape Nature Conservation Service is gratefully acknowledged for giving their permission to collect bees. Basie Nel of the farm Renosterhoek has kindly given MK access to the plateau of the Hantam Mountain and Hergen Erhardt, Edeweicht (Germany), supported MK by collecting bees in the wider Nieuwoudtville area at various occasions.

Molecular sequencing was supported by NSF grants in systematic biology (DEB-0814544, DEB-0742998) to Bryan Danforth (Cornell University).

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