

## Research article

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## New species and species group in the bee genus *Scapter* Lepeletier & Serville, 1828 (Hymenoptera: Colletidae) oligolectic on *Oxalis* flowers in western South Africa

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**Abstract.** Six new species of the novel *carysopus* species group in the genus *Scapter* Lepeletier & Serville, 1828 are described: *Scapter oxalensis* sp. nov. ♀♂, *S. oxalicus* sp. nov. ♀♂, *S. oxaliphilus* sp. nov. ♀♂, *S. oxalis* sp. nov. ♀♂, *S. oxalissimus* sp. nov. ♀♂ and *S. oxaloides* sp. nov. ♀. The female of *S. carysopus* Davies, 2005 is described here for the first time. A key to all species of this species group is provided. The *Scapter carysopus* species group is endemic to western South Africa and females collect pollen exclusively on yellow flowers of the genus *Oxalis* L. (Oxalidaceae).

**Keywords.** *Scapter*, bees, South Africa, new species, taxonomy, *Oxalis*.

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### Introduction

The bee genus *Scapter* Lepeletier & Serville, 1828 currently comprises 92 described species (Eardley 1996; Davies *et al.* 2005; Davies & Brothers 2006; Kuhlmann 2014, 2021; Kuhlmann & Friehs 2020; Bossert & van Noort 2022; Mack & Kuhlmann 2023) and is largely endemic to southern Africa with its center of diversity in the Greater Cape Floristic Region (GCFR) (Kuhlmann 2005, 2009). In sub-Saharan Africa *Scapter* can be readily recognized because it is the only abundantly hairy colletid bee genus with two submarginal cells in the forewing (Michener 2007; Eardley *et al.* 2010). Many of the species are specialized visitors of flowers with a short seasonal activity and often they can only be found by targeted sampling at their specific host plants (Kuhlmann & Eardley 2012).

In the GCFR, flower visiting insects have been mainly collected in spring and early summer (September to December), which is the main flower season in Namaqualand (Kuhlmann & Eardley 2012). Other seasons are underrepresented and far less explored, so collections are strongly biased towards spring (Kuhlmann & Eardley 2012). This particularly applies to autumn and winter with its spectacular floral mass displays of *Oxalis* L. (Oxalidaceae R.Br.) in years with good rainfall (Dreyer *et al.* 2006) (Fig. 1A). *Oxalis* has a centre of diversity in the GCFR (Oberlander *et al.* 2002) and it is the seventh largest genus within the Cape Flora (Goldblatt & Manning 2000), with about 270 taxa recorded from South Africa

(Dreyer *et al.* 2006). The vast majority of species of *Oxalis* are insect pollinated (Dreyer *et al.* 2006) and some of them are visited by a group of almost completely unknown, closely related, and highly specialized species of *Scrapper*. Interestingly, these bees seem to exclusively visit yellow flowers and ignore white or pink forms in colour polymorphic species of *Oxalis* (Fig. 1B).



**Fig. 1.** Habitat and foodplants of solitary bees of the *Scrapper carysomus* group. **A.** Landscape with mass-flowering species of *Oxalis* L. in the Knersvlakte (Succulent Karoo biome) east of Vanrhynsdorp, Western Cape Province (photo: 10 Jun. 2013). **B.** Mixed population of *Oxalis argillacea* F.Bolus (yellow and white morphs on the left) and *O. purpurea* L. (yellow morph on the right). Only yellow flowers are visited for pollen collecting by female bees even if it is the same species of *Oxalis* (photo: 10 Jun. 2013).

Of the seven species of *Scapter* known to date that specialize in *Oxalis*, six are new to science. All of them belong to a single, as yet undescribed species group and have only been discovered in recent years. Females of this group are immediately recognizable by the protruding and polished supraclypeal area and clypeus that define the species group (Fig. 2). However, the first species that was discovered in this group, *S. carysomensis* Davies, 2005, was described based on five male specimens (Davies *et al.* 2005). In spite of its characteristic squarish shape of the head in combination with the conspicuous polished supraclypeal area (Fig. 3) initially it was not recognized as a member of an unknown species group. Only after more material of this species group has become available, both of additional taxa and the female of *S. carysomensis*, could its status be clarified. Species of the *S. carysomensis* species group are generally rare and they usually seem to have small and localized populations, even when their host plants are abundant, which makes further studies challenging. However, targeted collecting at yellow *Oxalis* flowers revealed that some of these specialists of *Oxalis* apparently have an unusually long period of adult activity of about half a year from autumn (May, possibly earlier) throughout winter into spring (October) which is exceptional for small solitary bees.

The goal of this paper is to describe six new species of the *S. carysomensis* species group that is first defined here, as well as the hitherto unknown female of *S. carysomensis*. Further distributional records for the latter species are provided and a key to the species of this group is presented.

## Material and methods

For morphology the terminology of Michener (2007) was used. Puncture density is expressed as the relationship between puncture diameter (d) and the space between them (i), such as  $i = 1.5d$  or  $i < d$ . Body length was measured from the vertex to the apex of the body.

Images were taken with a Dino-Lite Edge Digital Microscope AM7515MZT and stacked for extended depth-of-field by using Helicon Focus ver. 8.2.2 (Helicon Soft Ltd., Kharkiv, Ukraine). Image processing and assemblage of figure plates was done with Adobe Photoshop Elements 2021 (Adobe Systems Software Ireland Limited, Republic of Ireland).

Permits for fieldwork and wild bee collecting in South Africa were granted by Cape Nature for Western Cape Province (permit numbers 202/1999, 250/2000, 368/2001, AAA004-00212-0035, AAA004-00446-0035, AAA004-01055-0035, 0056-AAA008-00076, CN44-87-21440) and by Northern Cape Department of Environment and Nature Conservation for Northern Cape Province (025/2002, 056/2003, 0055/04, 0332/05, 0648/06, 0317/07, FAUNA 074/2008, FAUNA 1299/2008, FAUNA 082/2010, FAUNA 557/2011, FAUNA 638/2012, FAUNA 155/2013, FAUNA 1213/2014, FAUNA 0529/2016, FAUNA 0345/2017, FAUNA 0461/2022).

## Abbreviations for morphological structures

S = metasomal sternum

T = metasomal tergum

## Institutional abbreviations

NHML = Natural History Museum, London, UK

RCMK = research collection of Michael Kuhlmann, Zoological Museum of Kiel University, Germany

SANC = South African National Collection of Insects, Pretoria, South Africa

## Results

### *Taxonomy*

Class Insecta Linnaeus, 1758  
Order Hymenoptera Linnaeus, 1758  
Superfamily Apoidea Latreille, 1802  
Epifamily Anthophila Latreille, 1804  
Family Colletidae Lepeletier, 1841  
Subfamily Scaptrinae Ascher & Engel, 2005  
  
Genus *Scapter* Lepeletier & Serville, 1828

### **Description of the *Scapter carysomus* species group**

Species of this group are medium-sized (6.5–8.5 mm body length) bees, characterized by a ± squarish face, usually with inner eye margins parallel or slightly diverging ventrally, malar area medially narrow, almost linear and in particular a distinctly protruding, polished and shiny clypeus and supraclypeal area (Figs 2–3). The latter is very conspicuous and unique in *Scapter*, especially in females. Males are characterized by a large, apically broad and emarginate S7 with long and dense hair fringes on both sides of the emargination (e.g., Fig. 6C). In the closest related species that belong to a group around *S. capensis* (Friese, 1909), *S. leonis* Cockerell, 1934 and *S. eremanthedon* Davies, 2005 (sister-group relationship supported by preliminary unpublished molecular-phylogenetic data) the clypeus and supraclypeal area are also protuberant, but to a much lesser extent and surfaces are more or less clearly and densely sculptured. Furthermore, their faces tend to be more transversely oval and the eyes usually converge ventrally.

#### *Scapter carysomus* group

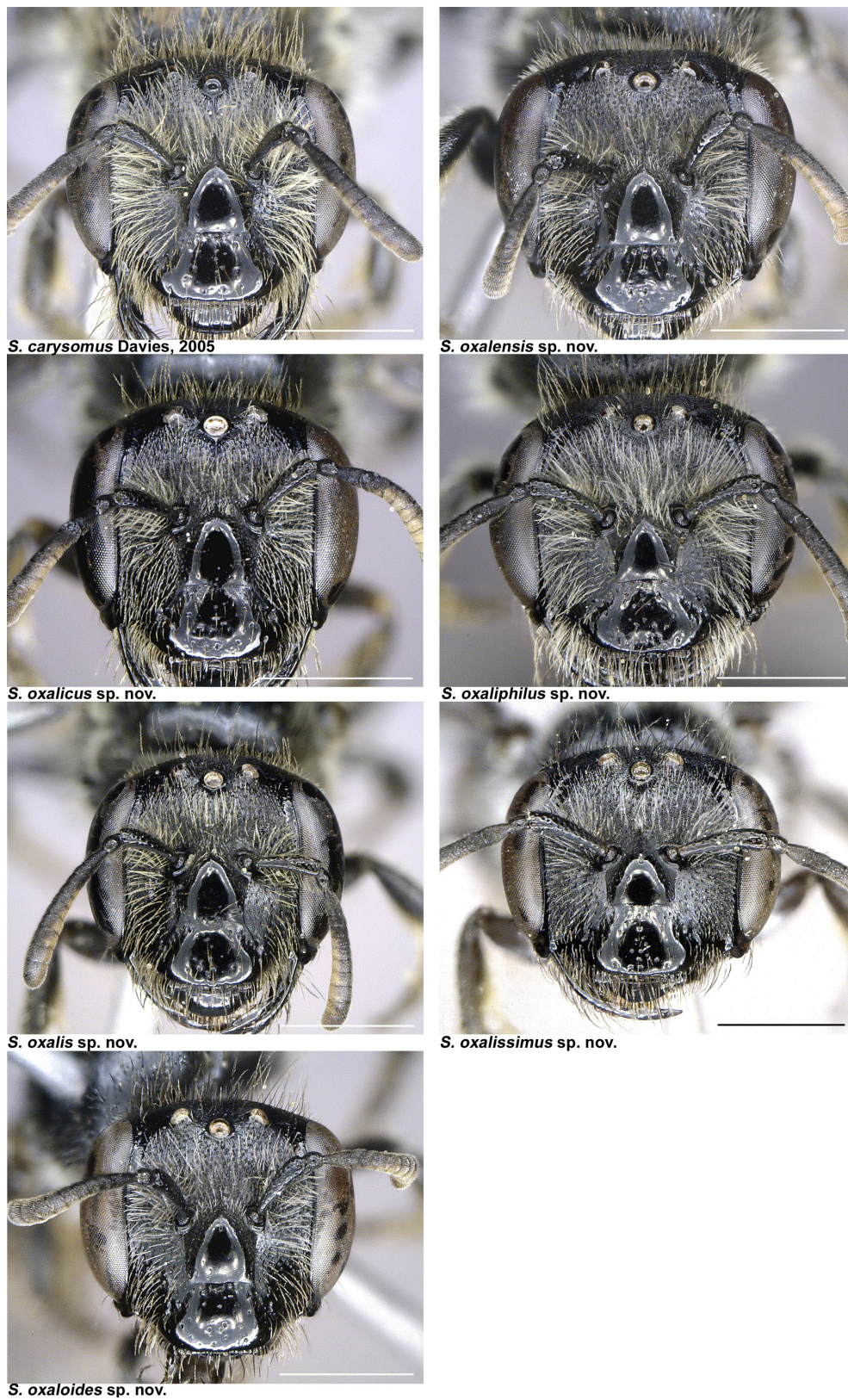
*Scapter carysomus* Davies, 2005  
Figs 2–6, 23–26

*Scapter carysomus* Davies in Davies *et al.*, 2005: 149 (in key), 155–158, figs 9–12, holotype ♂ (type locality: Farm Glen Lyon, Nieuwoudtville, South Africa) (SANC), examined.

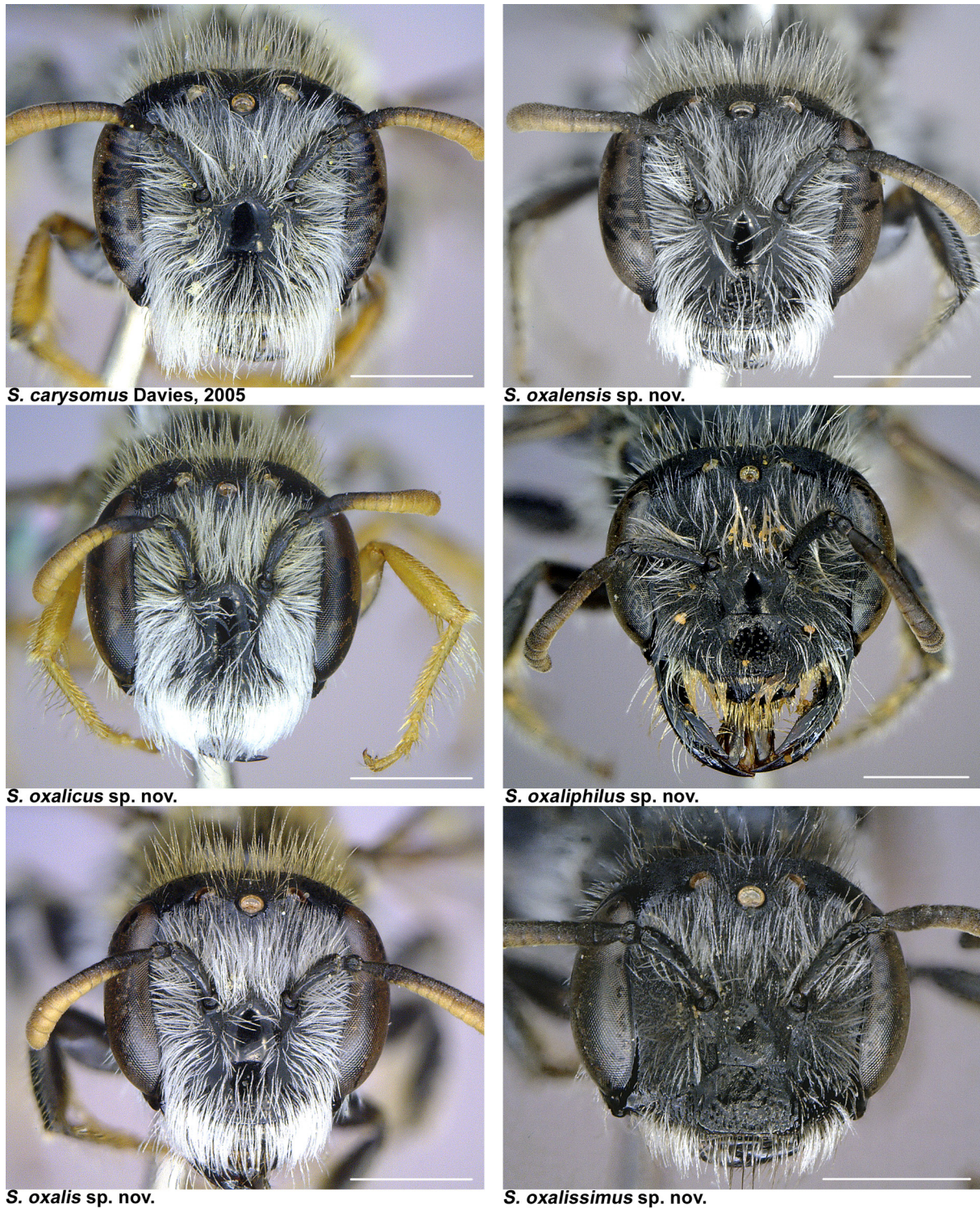
### **Diagnosis**

The female of *S. carysomus* is described here for the first time. It can be separated from that of all other species in this group by the following character combination: propodeum dorsolaterally (lateral to the matt propodeal triangle) very finely shagreened and matt (Fig. 4D), foreleg blackish-brown, sometimes femur apically slightly dark yellowish-brown, disc of T2 finely and sparsely punctate or without punctation, apical tergal depressions broad, yellowish translucent with the adjacent apical area of the disc crescent-shaped dark reddish (Fig. 4B).

The male is characterized by foreleg with medio- and distitarsi completely bright yellow, basitarsus and tibia predominantly yellow (Figs 3, 5A), mid and hind leg with tarsi predominantly dark yellowish-brown to blackish (Fig. 5A); hind tibia apically on inner side with hairs relatively short (Fig. 6A), genitalia as in Fig. 6B. The male was described in detail by Davies *et al.* (2005), so the description is not repeated here but images (Figs 3, 5–6) are provided to facilitate its identification.



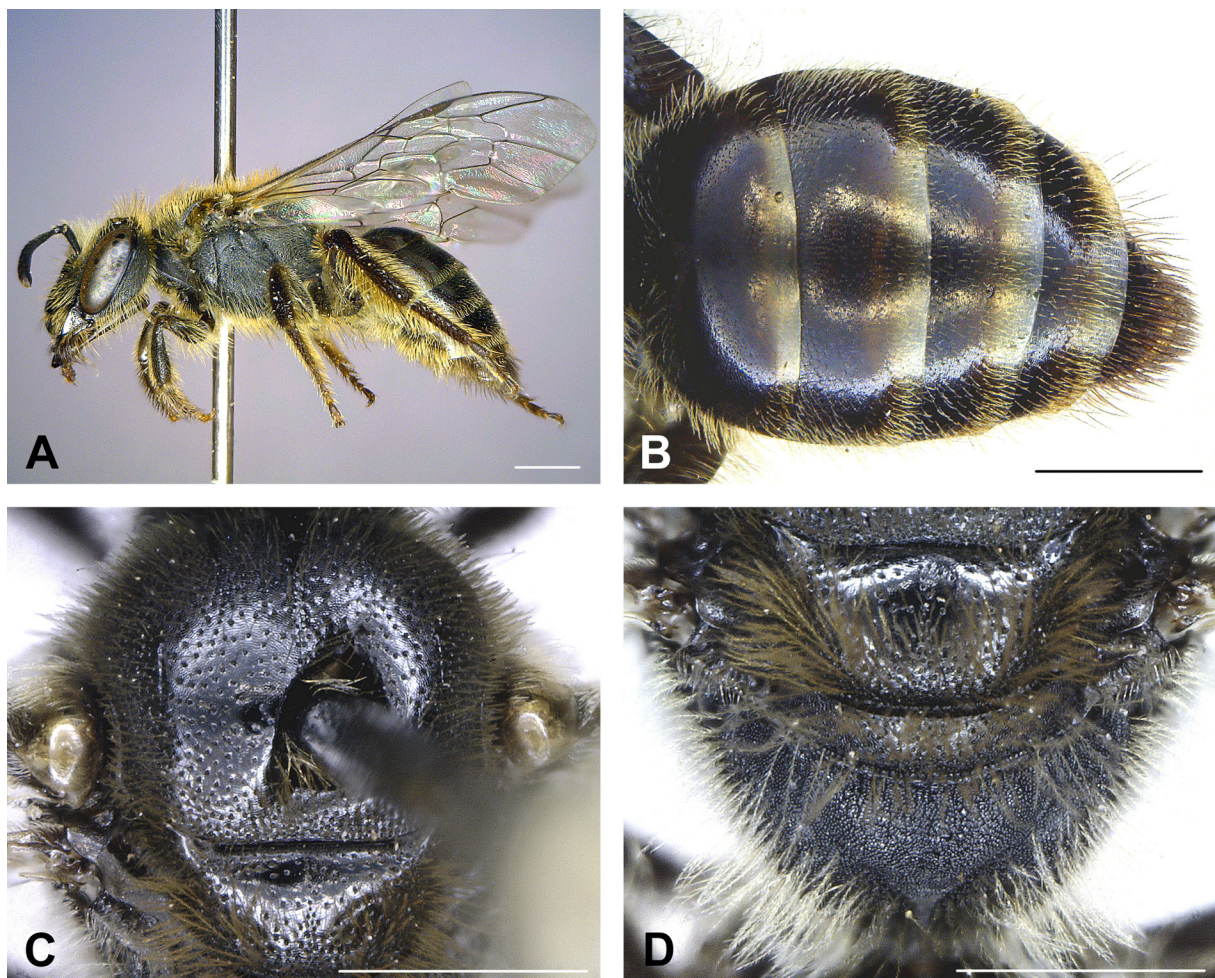
**Fig. 2.** Females of the species of the *Scapter carysomens* group. Heads in frontal view showing protruding and polished supraclipeal area and clypeus that are defining characters of this species group. Scale bars = 1.0 mm.



**Fig. 3.** Males of the species of the *Scapter carysomens* group (male of *S. oxaloides* sp. nov. unknown). Heads in frontal view. Scale bars = 1.0 mm.

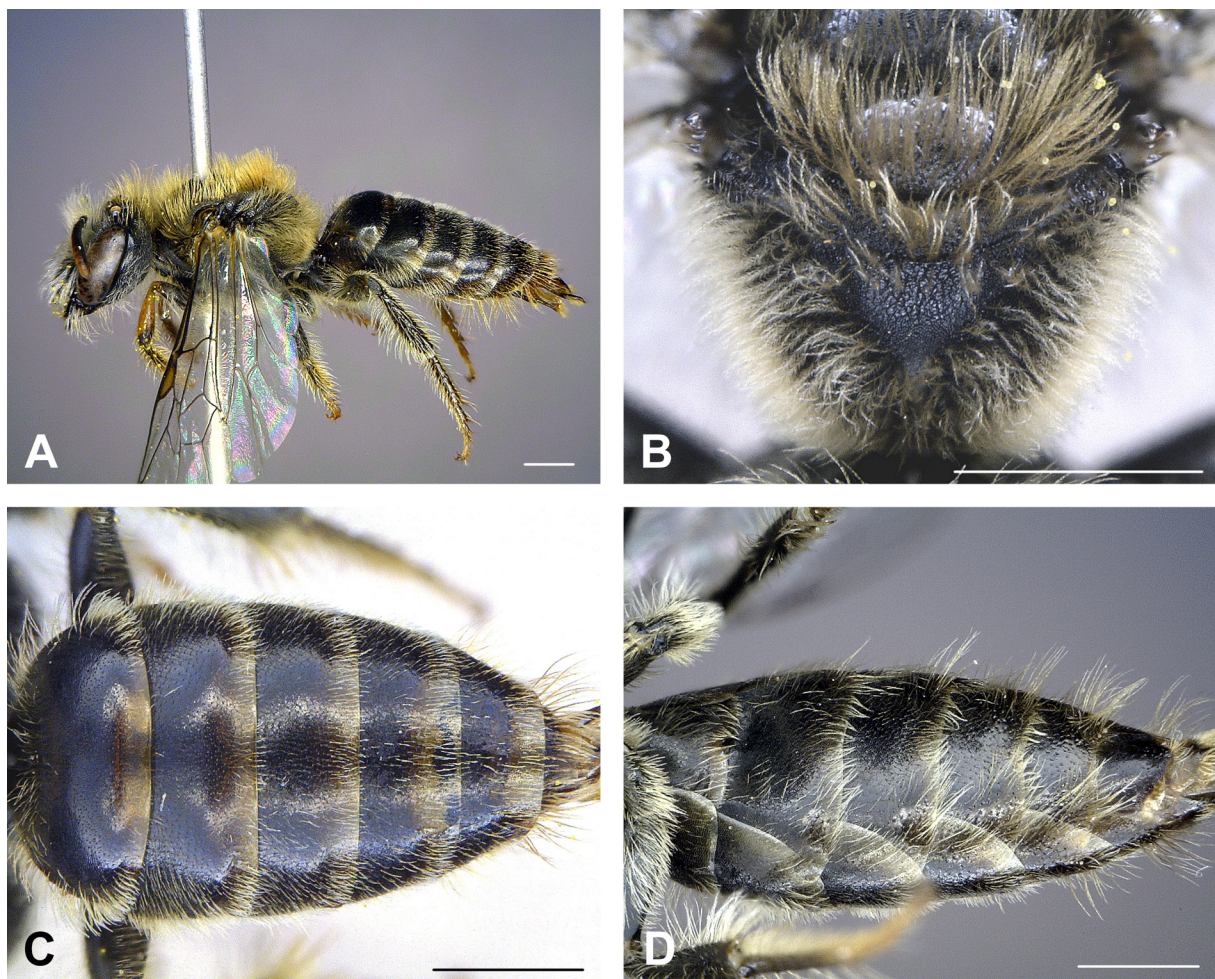
**Material examined (101 specimens)**

SOUTH AFRICA • 1 ♀; Keiski Mts, 3 km E of Farm M’Vera, shale; 1190 m a.s.l.; 31°45’29” S, 19°54’13” E; 26 Aug. 2017; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; 27 Aug. 2017; M. Kuhlmann leg.; RCMK • 1 ♂; Keiski Mts, 5 km S of Farm Nooiensrivier, dolerite hill; 1270 m a.s.l.; 31°45’54” S, 19°50’17” E; 12 Jun. 2013; M. Kuhlmann leg.; RCMK • 4 ♀♀; Leliefontein, plain; 30.23391° S, 18.16476° E; 7 Sep. 2003; C. Mayer leg.; RCMK • 1 ♂; same data as for preceding; 16 Aug. 2003; C. Mayer leg.; RCMK • 1 ♂; same data as for preceding; NHML • 1 ♂; same data as for preceding; 31 Aug. 2003; C. Mayer leg.; RCMK • 1 ♀, 6 ♂♂; same data as for preceding; NHML • 1 ♀; same data as for preceding; 30.23169° S, 18.16260° E; 31 Aug. 2003; C. Mayer leg.; RCMK • 2 ♂♂; same data as for preceding; NHML • 1 ♂; same data as for preceding; 5 Sep. 2003; C. Mayer leg.; NHML • 2 ♀♀, 2 ♂♂; same data as for preceding; 7 Sep. 2003; C. Mayer leg.; RCMK • 3 ♀♀, 1 ♂; same data as for preceding; NHML • 1 ♀; same data as for preceding; 30.22452° S, 18.14052° E; 25 Sep. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 30.23169° S, 18.16260° E; 16 Aug. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 30.23391° S, 18.16476° E; 5 Sep. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 11 Sep. 2003; C. Mayer leg.; NHML • 3 ♀♀; same data as for preceding; 30.23169° S, 18.16260° E; 11 Sep. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 25 Sep. 2003; C. Mayer leg.; NHML • 1 ♀, 4 ♂♂; Leliefontein, slope; 30.23288° S, 18.16458° E; 31 Aug.



**Fig. 4.** *Scrapper carysomus* Davies, 2005, non-type specimen, ♀ (RCMK), Nieuwoudtville, 3 Sep. 2003. **A.** Lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

2003; C. Mayer leg.; NHML • 2 ♂♂; same data as for preceding; 5 Sep. 2003; C. Mayer leg.; RCMK • 1 ♀, 5 ♂♂; same data as for preceding; NHML • 2 ♀♀, 3 ♂♂; same data as for preceding; 16 Aug. 2003; C. Mayer leg.; NHML • 2 ♀♀, 2 ♂♂; same data as for preceding; 11 Sep. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 25 Sep. 2003; C. Mayer leg.; NHML • 4 ♀♀, 4 ♂♂; same data as for preceding; 7 Sep. 2003; C. Mayer leg.; NHML • 1 ♀, 2 ♂♂; Nieuwoudtville, Flower Reserve East; 735 m a.s.l.; 31°21'56" S, 19°08'52" E; 3 Sep. 2003; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; 4 Sep. 2003; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; 7 Sep. 2003; M. Kuhlmann leg.; RCMK • 1 ♂; Nieuwoudtville, Glen Lyon, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 27 Aug. 2003; M. Kuhlmann leg.; RCMK • 1 ♂; same data as for preceding; 30 Aug. 2003; M. Kuhlmann leg.; RCMK • 1 ♂; same data as for preceding; 7 Sep. 2003; M. Kuhlmann leg.; RCMK • 1 ♀; Nieuwoudtville, Farm Glen Lyon, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 7 Aug. 2004; M. Kuhlmann leg.; RCMK • 1 ♀; Nieuwoudtville, Flower Reserve East; 735 m a.s.l.; 31°21'56" S, 19°08'52" E; 10 Aug. 2004; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; 13 Aug. 2004; M. Kuhlmann leg.; RCMK • 2 ♂♂; same data as for preceding; 6 Jun. 2013; M. Kuhlmann leg.; RCMK • 2 ♀♀; Remhoogte, plain; 30.23530° S, 18.16568° E; 5 Sep. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 7 Sep. 2003; C. Mayer leg.; RCMK • 1 ♀, 1 ♂; same data as for preceding; NHML • 1 ♀, 1 ♂; Remhoogte, plain; 30.23453° S, 18.16499° E; 7 Sep. 2003; C. Mayer leg.; RCMK • 2 ♂♂;



**Fig. 5.** *Scapter carysomus* Davies, 2005, non-type specimen, ♂ (RCMK), Nieuwoudtville, 6 Jun. 2013. **A.** Lateral view. **B.** Scutellum, metanotum and propodeum, dorsal view. **C.** Metasoma, dorsal view. **D.** Metasoma, ventral view. Scale bars = 1.0 mm.

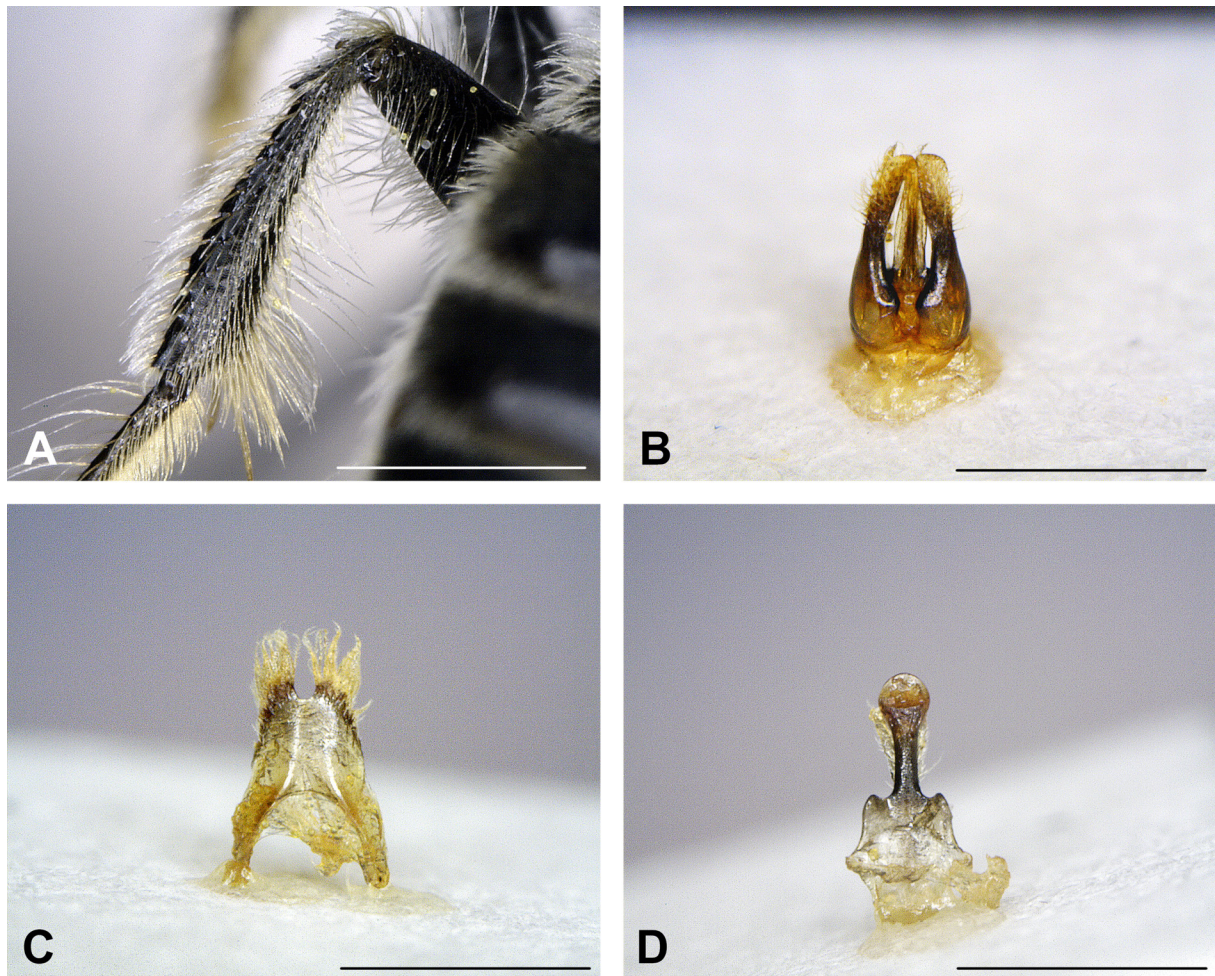
same data as for preceding; NHML • 1 ♂; same data as for preceding; 11 Sep. 2003; C. Mayer leg.; RCMK • 1 ♀; same data as for preceding; 31 Aug. 2003; C. Mayer leg.; NHML • 2 ♀♀; same data as for preceding; 7 Sep. 2003; C. Mayer leg.; NHML • 1 ♀; same data as for preceding; 25 Sep. 2003; C. Mayer leg.; RCMK • 1 ♀, 2 ♂♂; Remhoogte, slope; 30.24110° S, 18.17063° E; 31 Aug. 2003; C. Mayer leg.; RCMK • 1 ♀, 1 ♂; same data as for preceding; 7 Sep. 2003; C. Mayer leg.; RCMK • 2 ♀♀, 1 ♂; same data as for preceding; 11 Sep. 2003; C. Mayer leg.; NHML.

## Description

### Female

BODY LENGTH. 7–8 mm.

HEAD. Head wider than long. Integument black to very dark reddish-brown. Face covered with relatively long, yellowish to greyish, erect hair (Fig. 2). Clypeus strongly convex; finely and very sparsely ( $i=2-5d$ ) punctate; surface between punctures smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally dark yellow.



**Fig. 6.** *Scapter carysomus* Davies, 2005, non-type specimen, ♂ (RCMK), Nieuwoudtville, 6 Jun. 2013. **A.** Hind tibia. **B.** Genitalia, dorsal view. **C.** Metasomal sternum S7, dorsal view. **D.** Metasomal sternum S8, dorsal view. Scale bars = 1.0 mm.

**MESOSOMA.** Integument black, tegulae yellowish-brown. Mesoscutal disc between punctures strongly reticulate and slightly matt; disc relatively densely ( $i=1-2d$ ) and distinctly but relatively shallowly punctate (Fig. 4C). Metanotum slightly shorter than basal area of propodeum, apically with broad and distinct carinate depression (Fig. 4D). Propodeum on basal half relatively indistinctly and finely carinate (Fig. 4D). Mesoscutum covered with relatively short, scutellum and metanotum with long, yellowish-brown, erect hair; mesepisternum and propodeum covered with long, yellowish-grey, erect hair (Fig. 4A).

**WINGS.** Yellowish-brown; wing venation light brown; stigma yellowish-brown.

**LEGS.** Integument black to reddish-brown; fore tibia sometimes anteriorly on basal half with relatively small yellowish spot; all tarsi brownish to yellowish. Vestiture and scopa yellowish-grey.

**METASOMA.** Integument black to reddish-brown, apical margins of terga broadly translucent yellow (Fig. 4B). Disc of T1 glabrous; following terga with very few and very short but increasingly more and longer, greyish, erect hair; apical tergal hair bands missing on all terga (Fig. 4B). Prepygidial and pygidial fimbriae yellowish-brown. Punctuation on all terga very fine and sparse ( $i=2d$ ), on T1 extremely fine and almost impunctate, on following terga increasingly distinct; between punctures finely shagreened and slightly matt; apical tergal depressions finely shagreened and slightly matt (Fig. 4B).

### **Distribution**

Presumably the most widespread species of this group recorded from mountainous regions of the Kamiesberg Mountains, Roggeveld Mountains and the Bokkeveld Plateau (Northern Cape Province).

### **Floral hosts**

Oxalidaceae: yellow flowering *Oxalis* spec., *O. pes-caprae* L.

### **Seasonal activity**

June–September.

*Scapter oxalensis* sp. nov.

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Figs 2–3, 7–9, 23–28

### **Diagnosis**

The female of *S. oxalensis* sp. nov. can be separated from that of all other species in this group by the following character combination: scutellum relatively large (slightly longer and broader), flat and dull (Fig. 7D), propodeum dorsolaterally (lateral to the matt propodeal triangle) very finely shagreened and matt (Fig. 7D), hair on posterior surface of propodeum longer than length of basal area of propodeum (Fig. 7D), foreleg blackish-brown, disc of T2 finely and sparsely punctate, apical tergal depressions narrow, brownish translucent without reddish discoloration of the adjacent apical area of the disc (Fig. 7B). Females of *S. oxalensis* and *S. oxaloides* sp. nov. are very similar but the former has slightly broader apical tergal depressions (Fig. 7B) and the basal area of propodeum shows slightly sparser and coarser reticulation (Fig. 7D).

The male is characterized by propodeum densely covered with thick, plumose hair of  $\pm$  equal length (Fig. 8B), foreleg completely dark brown to blackish, sometimes to a small extent distitarsus and apical parts of mediotarsi orange-brown (Fig. 8A), hind tibia apicomediaally moderately swollen, hairs apically on inner side long (Fig. 9A), S3–S5 with sparse apical hair fringes (Fig. 8D), genitalia as in Fig. 9B.

### Etymology

The specific epithet refers to the specific host plants of the genus *Oxalis* (Oxalidaceae) of this bee species.

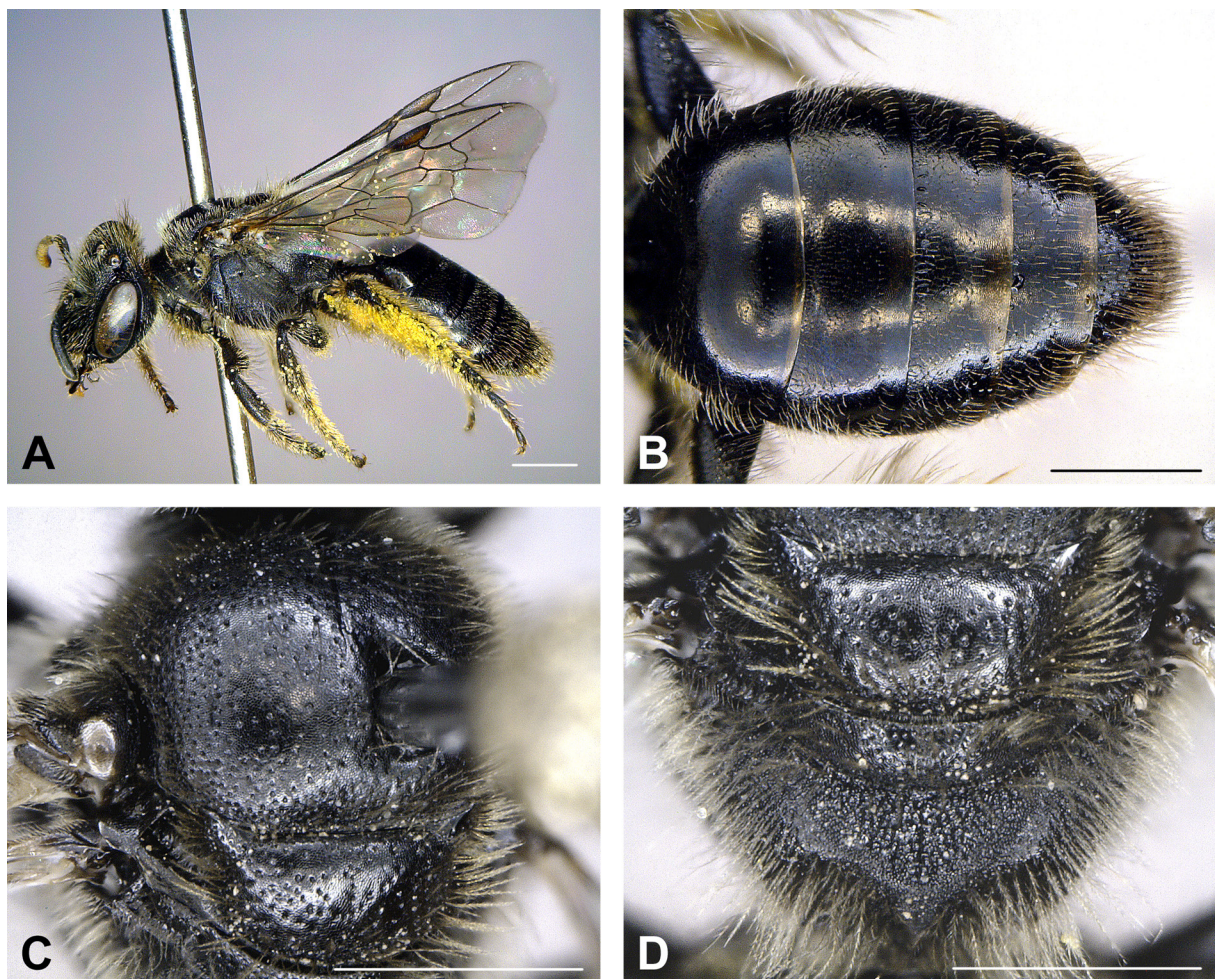
### Type material (137 specimens)

#### Holotype

SOUTH AFRICA • ♂; Nieuwoudtville, Hantam Botanical Garden, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 15 May 2013; M. Kuhlmann leg.; SANC.

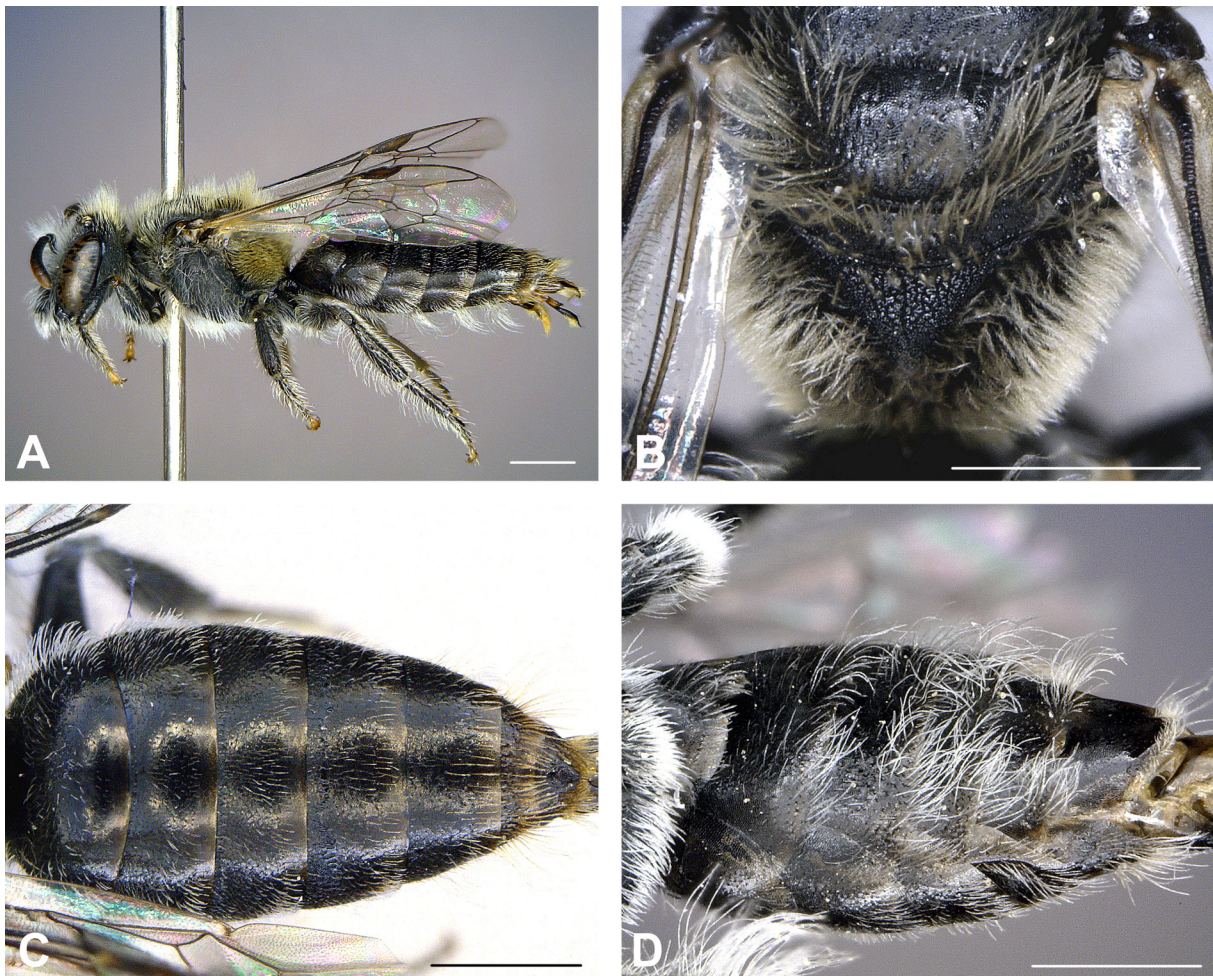
#### Paratypes

SOUTH AFRICA • 6 ♂♂; 12 km NW of Nieuwoudtville, Farm Avontuur, Renosterveld along Pad; 770 m a.s.l.; 31°15'27" S, 19°03'38" E; 17 May 2013; M. Kuhlmann leg.; NHML • 1 ♂; same data as for preceding; 31 May 2013; M. Kuhlmann leg.; RCMK • 4 ♀♀, 3 ♂♂; same data as for preceding; 31 May 2013; M. Kuhlmann leg.; NHML • 1 ♀; same data as for preceding; 11 Jun. 2013; M. Kuhlmann leg.; RCMK • 17 ♀♀, 2 ♂♂; same data as for preceding; NHML • 1 ♀; Farm Glen Lyon, Renosterveld; 700 m a.s.l.; 31°24'42" S, 19°09'00" E; 25 Aug. 2006; K. Timmermann leg.; RCMK • 1 ♀; Nieuwoudtville, Glen Lyon, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 11 Sep. 2003; M. Kuhlmann leg.;



**Fig. 7.** *Scrapper oxalensis* sp. nov., paratype, ♀ (RCMK), Nieuwoudtville, 7 Aug. 2004. **A.** Lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

NHML • 2 ♀♀, 1 ♂; same data as for preceding; 30 May 2004; M. Kuhlmann leg.; RCMK • 2 ♀♀; same data as for preceding; SANC • 5 ♀♀, 26 ♂♂; same data as for preceding; NHML • 1 ♀, 12 ♂♂; same data as for preceding; 31 May 2004; M. Kuhlmann leg.; RCMK • 4 ♂♂; same data as for preceding; SANC • 7 ♀♀, 14 ♂♂; same data as for preceding; NHML • 2 ♀♀; same data as for preceding; 11 Aug. 2004; M. Kuhlmann leg.; RCMK • 6 ♀♀; Nieuwoudtville, Farm Glen Lyon, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 7 Aug. 2004; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; NHML • 1 ♀; same data as for preceding; 18 Aug. 2004; M. Kuhlmann leg.; SANC • 1 ♀; Nieuwoudtville, Flower Reserve East; 735 m a.s.l.; 31°21'55" S, 19°08'52" E; 10 Aug. 2004; M. Kuhlmann leg.; NHML • 1 ♀; same data as for preceding; 1 Sep. 2002; M. Kuhlmann leg.; RCMK • 2 ♀♀, 1 ♂; Nieuwoudtville, Hantam Botanical Garden, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 15 May 2013; M. Kuhlmann leg.; RCMK • 2 ♀♀; same data as for preceding; SANC • 6 ♀♀; same data as for preceding; NHML • 1 ♀; same data as for preceding; 23 May 2013; M. Kuhlmann leg.; RCMK • 3 ♀♀; same data as for preceding; NHML.



**Fig. 8.** *Scapter oxalensis* sp. nov., paratype, ♂ (RCMK), Nieuwoudtville, 15 May 2013. **A.** Lateral view. **B.** Scutellum, metanotum and propodeum, dorsal view. **C.** Metasoma, dorsal view. **D.** Metasoma, ventral view. Scale bars=1.0 mm.

## **Description**

### **Female**

**BODY LENGTH.** 7–8 mm.

**HEAD.** Head wider than long. Integument black, except part of mandibles dark reddish-brown. Face sparsely covered with relatively long, greyish, erect hair (Fig. 2). Clypeus strongly convex with fine and very sparse ( $i=2-5$  d) punctation; surface between punctures smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally dark yellow.

**MESOSOMA.** Integument black, tegulae brownish. Mesoscutal disc between punctures reticulate and slightly matt to shiny; disc very densely ( $i=0.5-1$  d), sometimes sparser ( $i=2-3$  d), and relatively coarsely punctate (Fig. 7C). Metanotum slightly shorter than basal area of propodeum, apically with narrow carinate depression (Fig. 7D). Propodeum on basal half medially finely but distinctly carinate (Fig. 7D). Propodeum with relatively dense, apically long and laterally short; mesoscutum with short and sparse; scutellum, metanotum and mesepisternum with sparse, greyish to yellowish, erect hair (Fig. 7A).

**WINGS.** Slightly yellowish-brown; wing venation and stigma brown.

**LEGS.** Integument black; fore and mid tarsi sometimes reddish-brown, especially distally. Vestiture and scopula greyish to brown.

**METASOMA.** Integument black to dark reddish-brown; apical margins of terga broadly yellowish translucent (Fig. 7B). Disc of T1 with very few, very short, greyish-white, erect hairs; following terga with increasingly more and longer, but still short and few, greyish-white, erect hairs; apical tergal hair bands missing on all terga (Fig. 7B). Prepygidial and pygidial fimbriae greyish to slightly brownish. T1 and T2 very shallowly, indistinctly, sparsely and finely punctate; T3 and T4 very finely but relatively densely ( $I=1-2$  d) punctate; between punctures shagreened and slightly matt to shiny; apical tergal depressions finely sculptured and slightly matt to shiny (Fig. 7B).

### **Male**

**BODY LENGTH.** 7–8 mm.

**HEAD.** Head as long as wide. Integument black, except mandible partly dark reddish-brown. Face covered with long, silvery-white, erect hair. Malar area medially narrow, almost linear. Antenna dorsally brown, ventrally dark yellow (Fig. 3).

**MESOSOMA.** Integument black. Mesoscutal disc between punctures reticulate, slightly matt; disc finely and relatively densely ( $i=1-1.5$  d) punctate. Basal area of propodeum  $\pm$  triangular, distinctly covered with carinae that cover the majority of its surface (Fig. 8B). Mesoscutum and mesepisternum sparsely covered with long, greyish, erect hair; scutellum, metanotum and propodeum covered with long, greyish to yellowish, erect hair (Fig. 8A).

**WINGS.** Slightly yellowish-brown; wing venation brown; stigma light yellowish-brown.

**LEGS.** Integument black; fore femora apically dark yellowish-brown, fore tibia anteriorly dominantly yellowish-brown; all tarsi successively more yellowish brown distally. Hind tibia inside subapically broadened with a tuft of long hair (Fig. 9A). Vestiture greyish-white.

**METASOMA.** Integument black to dark reddish-brown, apical margins of terga broadly translucent yellow to slightly yellowish-brown (Fig. 8C). Discs of T1–T4 covered with short, greyish, erect hair; following terga with increasingly longer hair; apical tergal hair bands missing on all terga (Fig. 8C). Terga finely

shagreened and slightly matt to shiny (Fig. 8C). T1 impunctate or almost impunctate, following terga very finely and relatively densely ( $i=1-1.5d$ ) punctate (Fig. 8C). Apical tergal depressions broad, very finely shagreened and slightly matt. S2-S5 especially laterally with sparse but very long apical hair tufts (Fig. 8D).

TERMINALIA. Genitalia (Fig. 9B), S7 (Fig. 9C) and terminal plate of S8 (Fig. 9D) as illustrated.

### Distribution

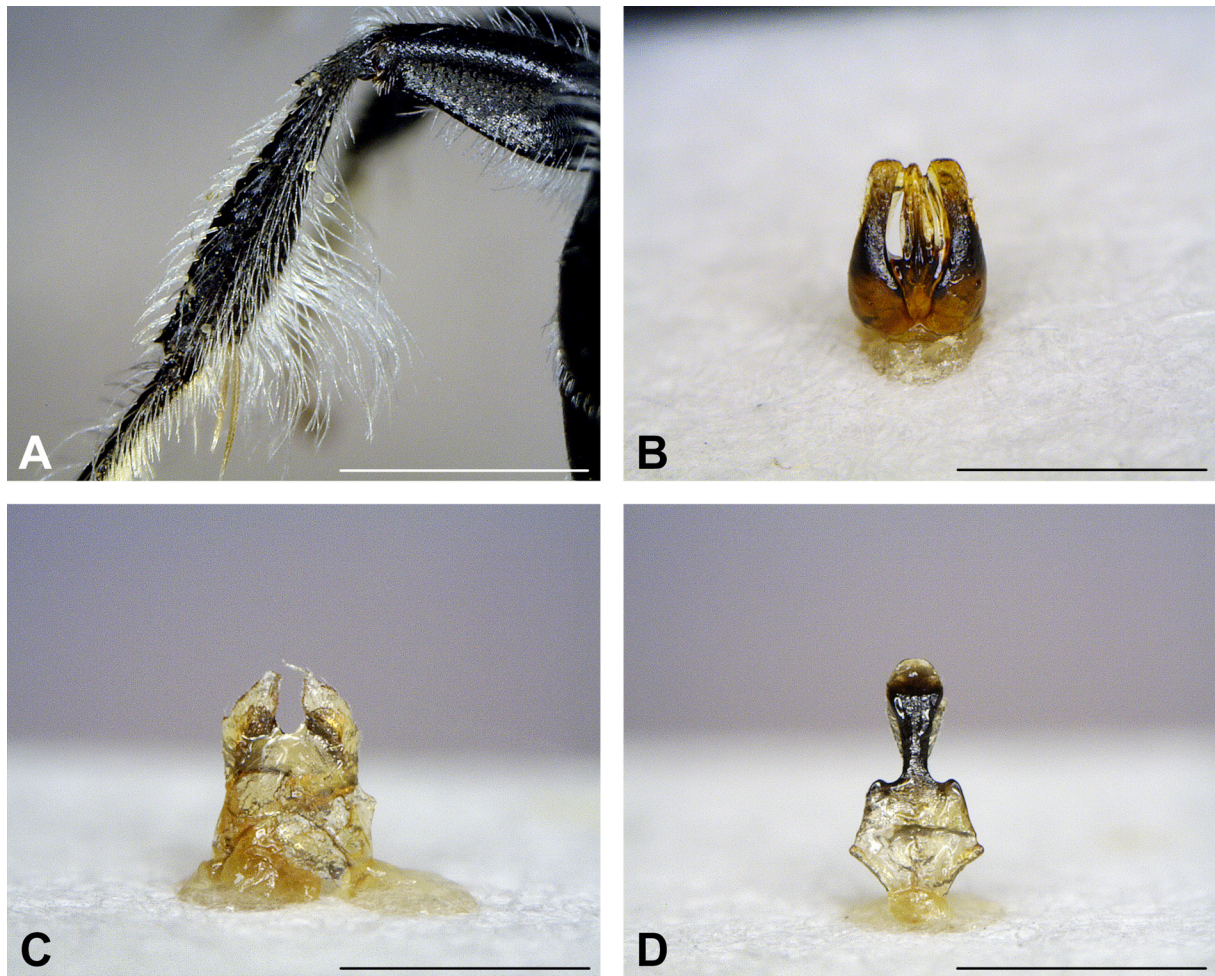
Only recorded from the Bokkeveld Plateau (Northern Cape Province) and potentially endemic to this region.

### Floral hosts

Oxalidaceae: yellow flowering *Oxalis* spec., *O. pes-caprae*, *O. massoniana* T.M.Salter var. *flavescens*.

### Seasonal activity

May–September.



**Fig. 9.** *Scapter oxalensis* sp. nov., paratype, ♂ (RCMK), Nieuwoudtville, 15 May 2013. **A.** Hind tibia. **B.** Genitalia, dorsal view. **C.** Metasomal sternum S7, dorsal view. **D.** Metasomal sternum S8, dorsal view. Scale bars = 1.0 mm.

*Scapter oxalicus* sp. nov.

[urn:lsid:zoobank.org:act:D062502A-CBE8-4039-9358-9045067A187C](https://zoobank.org/urn:lsid:zoobank.org:act:D062502A-CBE8-4039-9358-9045067A187C)

Figs 2–3, 10–12, 25–26

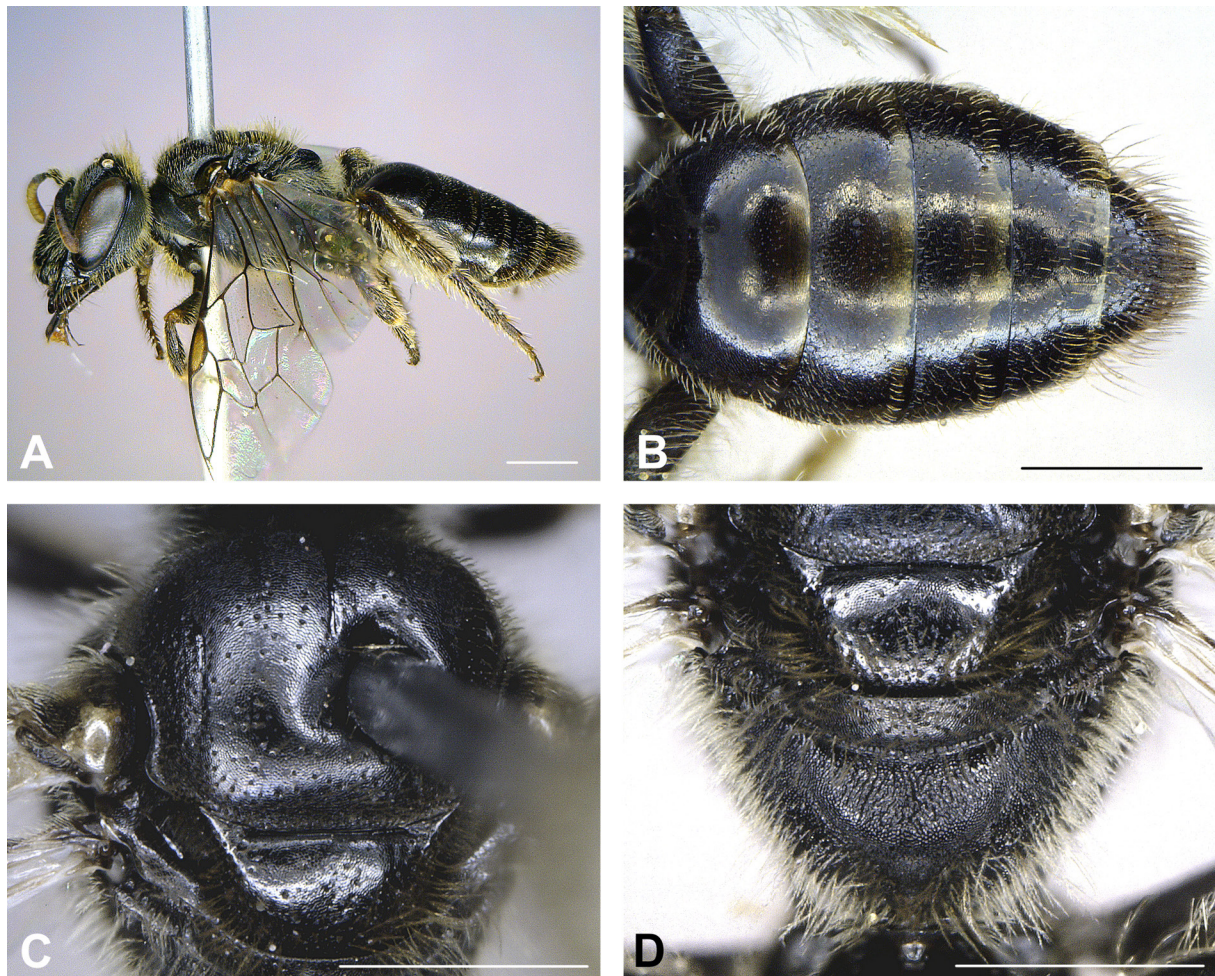
**Diagnosis**

The female of *S. oxalicus* sp. nov. is unique in this species group due to the fore tibiae each having on the inside medially, on the outside apically and fore femur on the outside apically a dull yellow spot of variable size.

The male is unique in this species group due to completely bright yellow tarsi (Figs 3, 11A), hind tibia apically on inner side with long hairs (Fig. 12A) and genitalia as in Fig. 12B.

**Etymology**

The specific epithet refers to the specific host plants of the genus *Oxalis* (Oxalidaceae) of this bee species.



**Fig. 10.** *Scapter oxalicus* sp. nov., paratype, ♀ (RCMK), Gemsbokrivier-Pad, 10 Jun. 2013. **A.** Lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

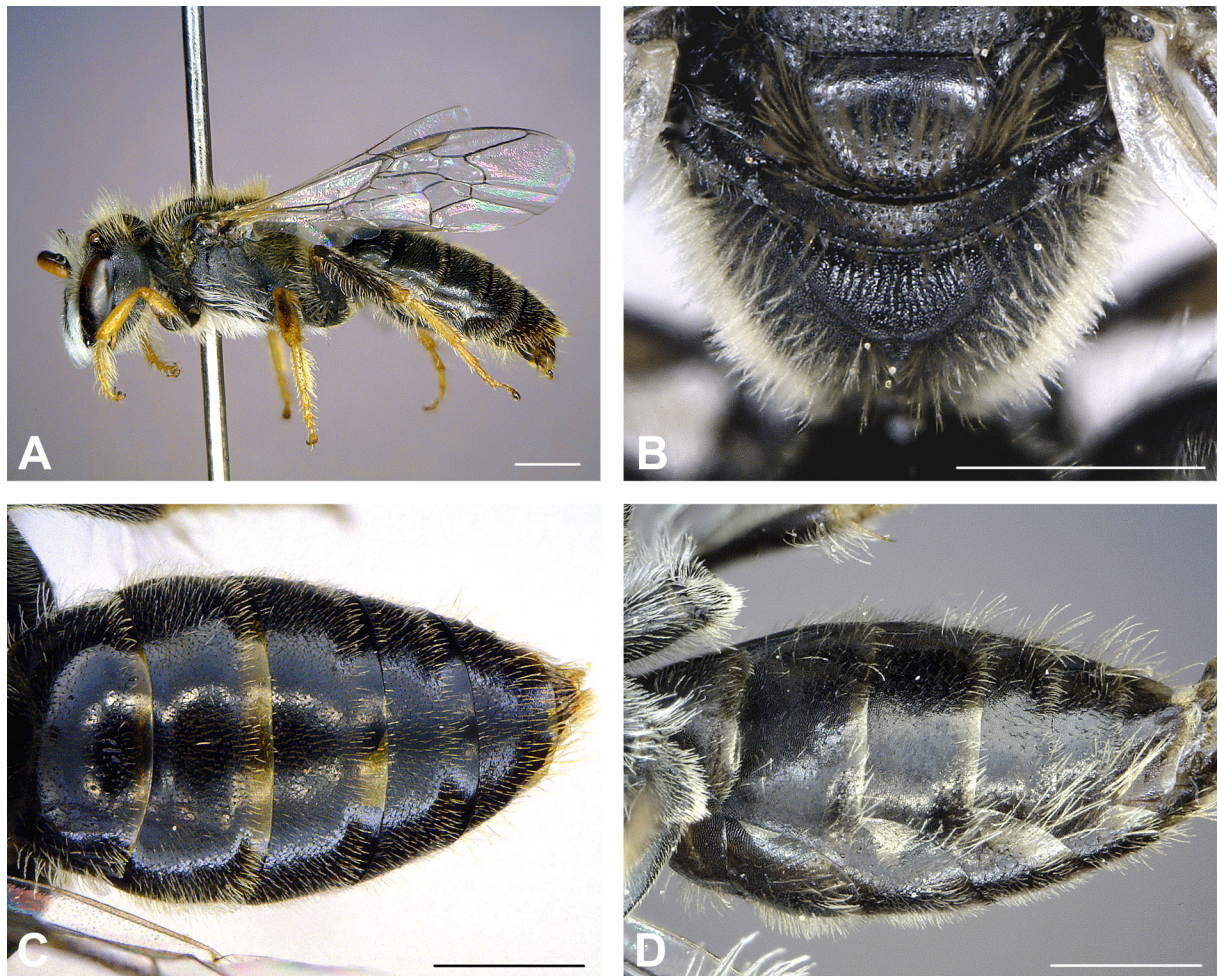
**Type material** (76 specimens)

**Holotype**

SOUTH AFRICA • ♂; Gembokrivier-Pad, 4.5 km NE of Grootdrif, Road Side; 170 m; 31°25'54" S, 18°55'16" E; 5 Jun. 2013; M. Kuhlmann leg.; SANC.

**Paratypes**

SOUTH AFRICA • 1 ♀; Gembokrivier-Pad, 4.5 km NE of Grootdrif, Road Side; 170 m; 31°25'54" S, 18°55'16" E; 15 Aug. 2011; M. Kuhlmann leg.; RCMK • 12 ♂♂; same data as for preceding; 28 May 2013; M. Kuhlmann leg.; RCMK • 9 ♂♂; same data as for preceding; NHML • 3 ♂♂; same data as for preceding; 5 Jun. 2013; M. Kuhlmann leg.; RCMK • 4 ♂♂; same data as for preceding; NHML • 14 ♀♀; same data as for preceding; 10 Jun. 2013; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; SANC • 9 ♀♀, 17 ♂♂; same data as for preceding; NHML • 1 ♀; Knersvlakte, along Gembokrivier-Pad; 120–195 m a.s.l.; 31°23'57" S, 18°54'11" E; 14 Sep. 2007; M. Kuhlmann leg.; RCMK • 1 ♀; Knersvlakte, Gembokrivier-Pad, rivier; 195 m a.s.l.; 31°26'40" S, 18°56'23" E; 24 Aug. 2008; M. Kuhlmann leg.; NHML • 1 ♀; Knersvlakte, Sukkulent Karoo, 30 km N of Vanrhynsdorp; 146 m a.s.l.; 31°22'23" S, 18°42'37" E; 22 Aug. 2003; K. Timmermann leg.; NHML • 1 ♂; same data



**Fig. 11.** *Scapter oxalicus* sp. nov., paratype, ♂ (RCMK), Gembokrivier-Pad, 5 Jun. 2013. **A.** Lateral view. **B.** Scutellum, metanotum and propodeum, dorsal view. **C.** Metasoma, dorsal view. **D.** Metasoma, ventral view. Scale bars=1.0 mm.

as for preceding; 26 Aug. 2003; K. Timmermann leg.; NHML • 1 ♀; Witwater, slope; 30.23050° S, 18.13458° E; 25 Sep. 2003; C. Mayer leg.; NHML.

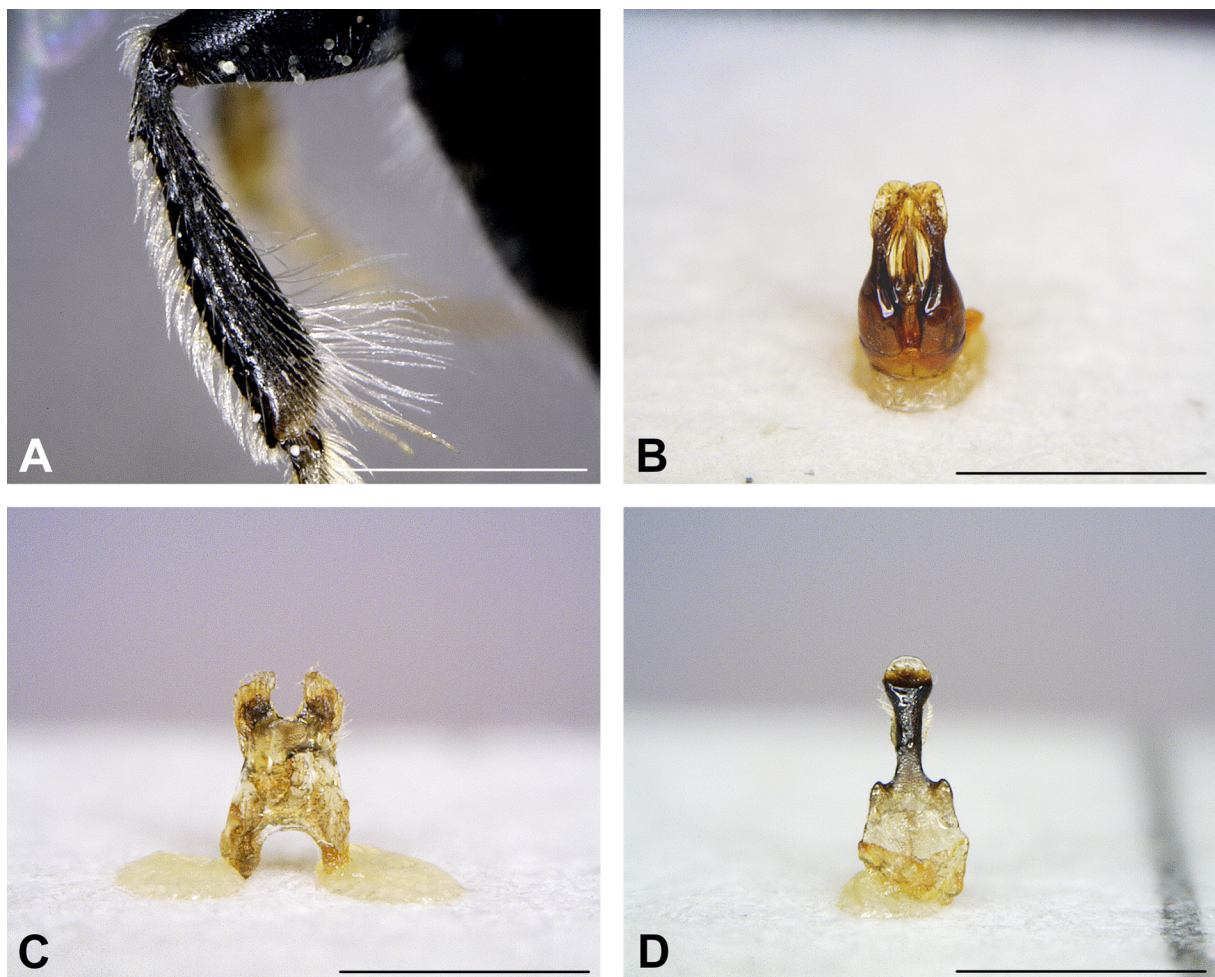
## Description

### Female

BODY LENGTH. 8 mm.

HEAD. Head slightly wider than long. Integument black to dark reddish-brown. Face covered with relatively short, greyish to yellowish, erect hair (Fig. 2). Clypeus strongly convex with fine and very sparse ( $i=2-5$  d) punctation; surface between punctures smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally basally dark brown to apically light brown, ventrally bright yellow.

MESOSOMA. Integument black, tegulae dark yellowish. Mesoscutal disc between punctures reticulate and matt; disc sparsely ( $i=1.5-3$  d) and finely to slightly coarsely but shallowly punctate (Fig. 10C). Metanotum about  $\frac{2}{3}$  as long as basal area of propodeum, apically with narrow carinate depression (Fig. 10D). Propodeum basally finely and distinctly carinate (Fig. 10D). Mesoscutum with short, erect



**Fig. 12.** *Scapter oxalicus* sp. nov., paratype, ♂ (RCMK), Gemsbokrivier-Pad, 5 Jun. 2013. **A.** Hind tibia. **B.** Genitalia, dorsal view. **C.** Metasomal sternum S7, dorsal view. **D.** Metasomal sternum S8, dorsal view. Scale bars = 1.0 mm.

hair; propodeum laterally with relatively short, apically with long, erect hair; scutellum, metanotum and mesepisternum with sparse, long, greyish to yellowish, erect hair (Fig. 10A).

WINGS. Slightly yellowish-brown; wing venation light brown; stigma yellow.

LEGS. Integument black to dark yellowish-brown; fore anteriorly on basal half with large yellow spot, posteriorly with indistinct yellowish spot. Vestiture and scopa greyish-white.

METASOMA. Integument black to dark reddish-brown; apical margins of terga broadly translucent yellowish to brown (Fig. 10B). Disc of T1 with very few, very short, greyish-white, erect hairs; following terga with successively more and longer, greyish-white, erect hairs; apical tergal hair bands missing on all terga (Fig. 10B). Prepygidial and pygidial fimbriae greyish to slightly brownish. T1–T4 with very fine shallow and dispersed punctation, looking almost impunctate; between punctures shagreened and slightly matt to shiny; apical tergal depressions finely shagreened and slightly matt to shiny (Fig. 10B).

### Male

BODY LENGTH. 7–7.5 mm.

HEAD. Head slightly longer than wide. Integument black, except mandible partly dark reddish-brown. Face densely covered with long, silvery-white, erect hair. Malar area medially narrow, almost linear. Antenna dorsally brown, ventrally bright yellow (Fig. 3).

MESOSOMA. Integument black. Mesoscutal disc between punctures reticulate, matt; disc finely and relatively densely ( $i=1-1.5d$ ) punctate. Basal area of propodeum  $\pm$  narrowly crescent, distinctly covered with carinae that cover the majority of its surface (Fig. 11B). Mesoscutum sparsely, scutellum, metanotum with long, greyish to slightly yellowish, erect hair (Fig. 11A); propodeum covered laterally with short, apically with long, dense greyish to slightly yellowish, erect hair (Fig. 11B); mesepisternum sparsely covered with long, greyish, erect hair.

WINGS. Slightly yellowish-brown; wing venation yellowish-brown; stigma yellow.

LEGS. Integument black to dark reddish-brown; fore femora apically, fore tibia and fore tarsi completely bright yellow; mid femora and tibia anteriorly and apically, mid tarsi completely bright yellow; hind tarsi bright yellow. Hind tibia yellowish-brown at the very apical end; apically broadened inside with a tuft of very long but sparse, greyish-white hair (Fig. 12A).

METASOMA. Integument black to very dark reddish-brown, apical margins of terga broadly translucent yellowish-brown (Fig. 11C). Discs of T1–T4 covered with short, greyish, erect hair, following terga with successively longer hair; apical tergal hair bands missing on all terga (Fig. 11C). All terga extremely finely punctate, looking impunctate, superficially shagreened and slightly matt to shiny; apical tergal depression relatively broad, superficially shagreened and slightly shiny (Fig. 11C). S2–S5 laterally with sparse, long apical hair fringes or tufts (Fig. 11D).

TERMINALIA. Genitalia (Fig. 11B), S7 (Fig. 11C) and terminal plate of S8 (Fig. 11D) as illustrated.

### Distribution

Found in the Knersvlakte (Western Cape Province) and the Kamiesberg Mountains (Northern Cape Province).

### Floral hosts

Oxalidaceae: yellow flowering *Oxalis* spec., *O. argillacea* F.Bolus, *O. purpurea* L.

**Seasonal activity**

May–September.

*Scapter oxaliphilus* sp. nov.

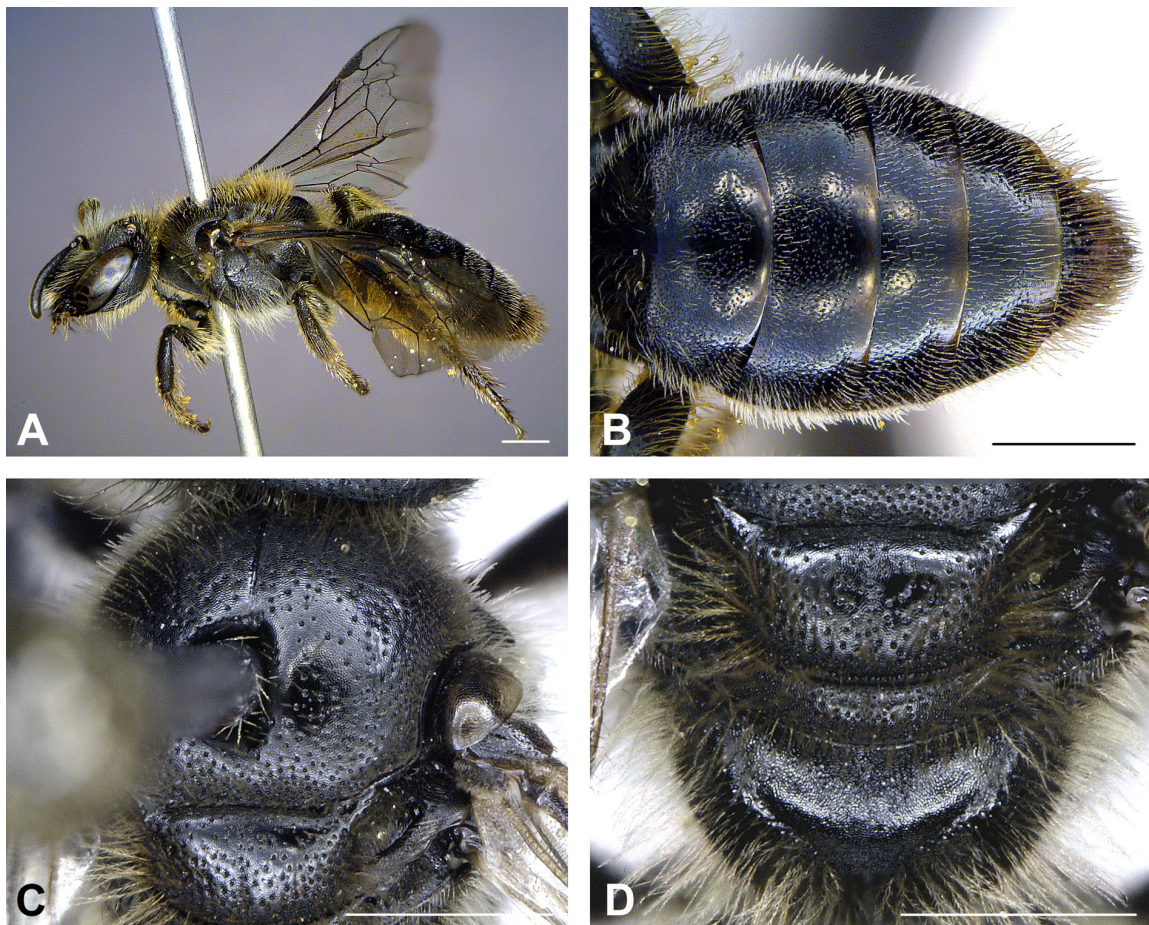
[urn:lsid:zoobank.org:act:F67CFAE1-9B81-4C56-B72C-4BECC5E081EB](https://zoobank.org/urn:lsid:zoobank.org:act:F67CFAE1-9B81-4C56-B72C-4BECC5E081EB)

Figs 2–3, 13–15, 23–27

**Diagnosis**

The female of *S. oxaliphilus* sp. nov. can be separated from that of all other species in this group by the following character combination: clypeus, vertex and dorsal side of mesosoma with white to light brown hair, at most a few single black hairs intermixed (Fig. 13A), propodeum dorsolaterally (lateral to the matt propodeal triangle) partly smooth and shiny, basal area without carination (Fig. 13D), foreleg blackish-brown, sometimes femur apically slightly dark yellowish-brown (Fig. 13A), T2 distinctly and densely ( $i=0.5-1$  d) punctate (Fig. 13B).

The male is characterized by clypeus medially finely and sparsely punctate, shiny (Fig. 3), propodeum sparsely covered with thin hair of variable length, basal area without or anteriorly only with very short, indistinct longitudinal carinae (Fig. 14B), foreleg completely dark brown to blackish, sometimes to a



**Fig. 13.** *Scapter oxaliphilus* sp. nov., paratype, ♀ (RCMK), Plateau Hantam Mts, 2 Oct. 2014, RCMK. **A.** Lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

small extent distitarsus and apical parts of mediotarsi orange-brown (Fig. 14A), hind tibia apicomediaally not conspicuously swollen (Fig. 15A), genitalia as in Fig. 15B.

### Etymology

The specific epithet refers to the specific host plants of the genus *Oxalis* (Oxalidaceae) of this bee species.

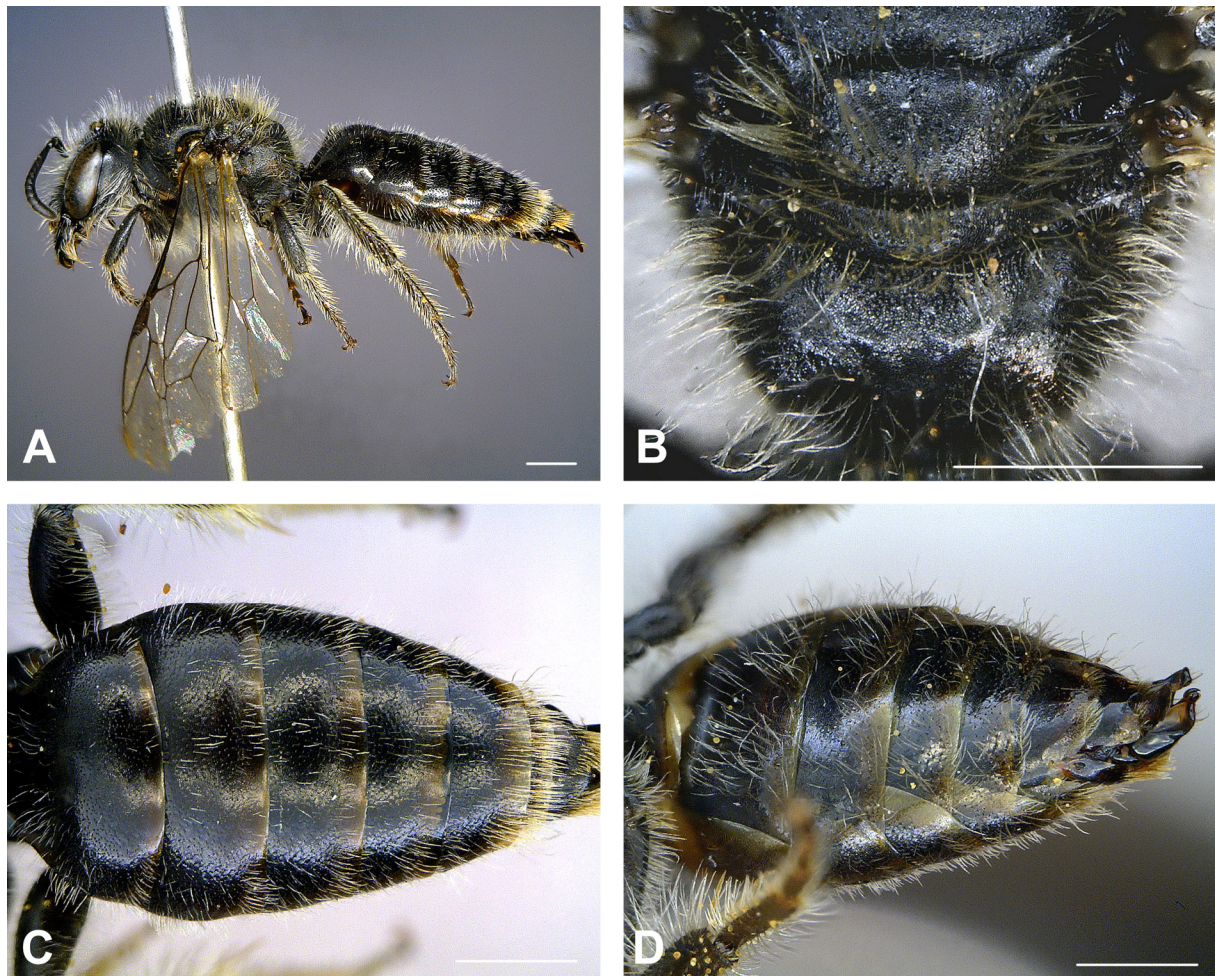
### Type material (21 specimens)

#### Holotype

SOUTH AFRICA • ♀; Plateau Hantam Mts, near antenna, 9 km N of Calvinia; 1570 m a.s.l.; 31°22'29" S, 19°47'03" E; 2 Oct. 2014; M. Kuhlmann leg.; SANC.

#### Paratypes

SOUTH AFRICA • 2 ♀♀; Plateau Hantam Mts, near antenna, 9 km N of Calvinia; 1570 m a.s.l.; 31°22'29" S, 19°47'03" E; 7 Sep. 2010; M. Kuhlmann leg.; NHML • 1 ♂; same data as for preceding; RCMK • 3 ♀♀, 5 ♂♂; same data as for preceding; 30 Aug. 2011; M. Kuhlmann leg.; RCMK • 1 ♀; same data as for preceding; NHML • 5 ♀♀; same data as for preceding; 2 Oct. 2014; M. Kuhlmann leg.;



**Fig. 14.** *Scapter oxaliphilus* sp. nov., paratype, ♂ (RCMK), Plateau Hantam Mts, 30 Aug. 2011. A. Lateral view. B. Scutellum, metanotum and propodeum, dorsal view. C. Metasoma, dorsal view. D. Metasoma, ventral view. Scale bars = 1.0 mm.

RCMK • 1 ♀; same data as for preceding; SANC • 1 ♀; Plateau Hantam Mts, weather stn., 12 km N of Calvinia; 1580 m a.s.l.; 31°21'13" S, 19°47'53" E; 11 Sep. 2010; M. Kuhlmann leg.; RCMK • 1 ♂; Farm Kanolfontein, 20 km W of Sutherland, Road Side; 1385 m a.s.l.; 32°24'43" S, 20°27'28" E; 7 Sep. 2012; M. Kuhlmann leg.; RCMK.

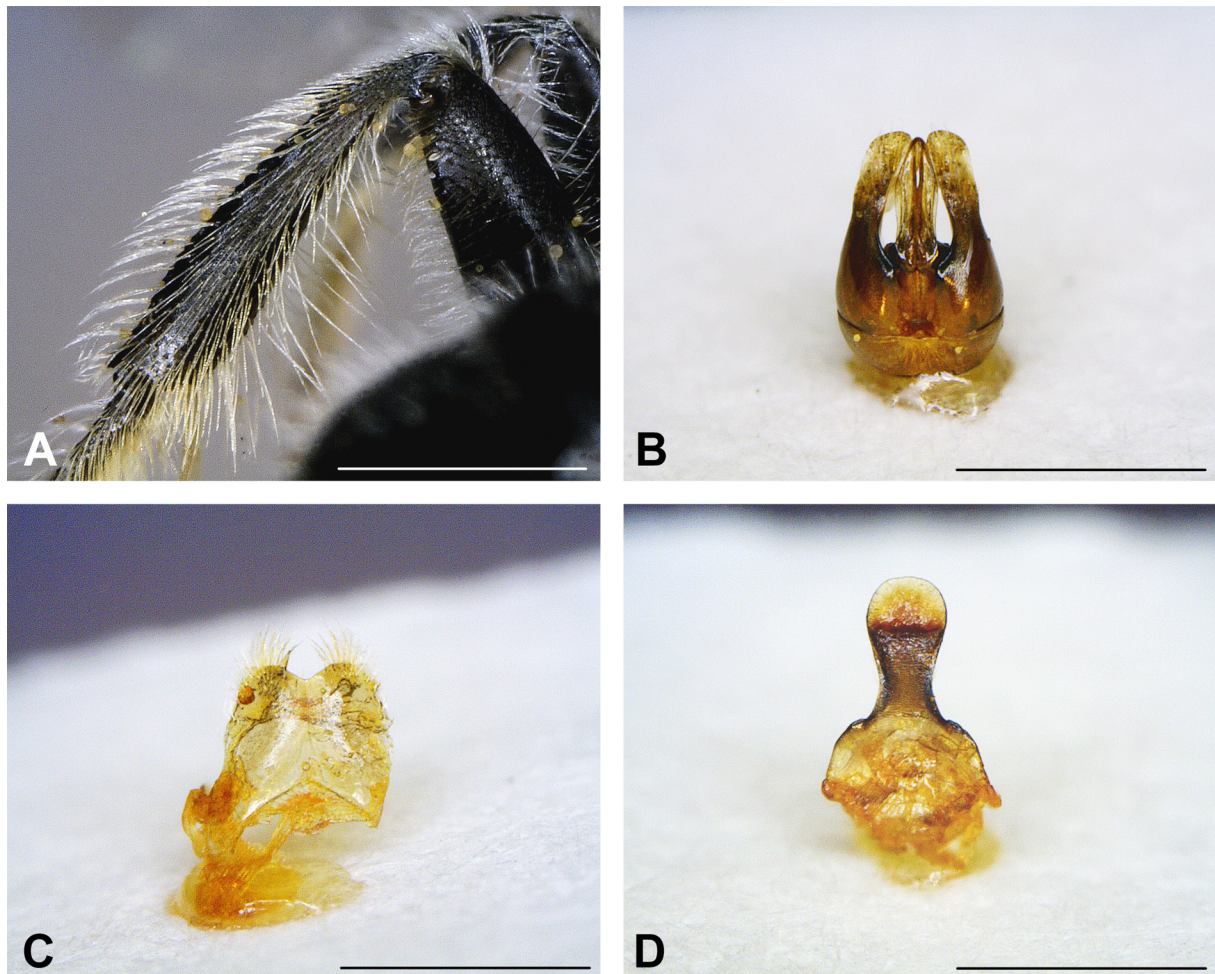
## Description

### Female

BODY LENGTH. 7–7.5 mm.

HEAD. Head wider than long. Integument black, except part of mandibles dark reddish-brown. Face sparsely covered with relatively long, greyish, erect hair (Fig. 2). Clypeus strongly convex with fine and very sparse ( $i=2d$ ) punctation; surface between punctures smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally brown.

MESOSOMA. Integument black, tegulae dark brown. Mesoscutal disc between punctures reticulate and matt; disc sparsely ( $i=1-3d$ ) and relatively shallowly punctate (Fig. 13C). Metanotum as long as basal area of propodeum, apically with broad and distinct carinate depression (Fig. 13D). Propodeum basally



**Fig. 15.** *Scrapper oxaliphilus* sp. nov., paratype, ♂ (RCMK), Plateau Hantam Mts, 30 Aug. 2011. **A.** Hind tibia. **B.** Genitalia, dorsal view. **C.** Metasomal sternum S7, dorsal view. **D.** Metasomal sternum S8, dorsal view. Scale bars = 1.0 mm.

without carination (Fig. 13D). Propodeum laterally with relatively short, apically with long, greyish to slightly yellowish hair; mesoscutum with short erect hair; scutellum, metanotum and mesepisternum with sparse, long, greyish-white, erect hair (Fig. 13A).

WINGS. Yellowish-brown; wing venation and stigma dark brown.

LEGS. Integument black; tarsi dark reddish-brown. Vestiture greyish to slightly brownish; scopa greyish-white.

METASOMA. Integument black to dark reddish-brown; apical margins of terga on T1 narrowly, on other terga broadly translucent yellowish to brownish (Fig. 13B). Disc of T1 sparsely covered with relatively long, greyish-white, erect hair; following terga with successively more and longer, greyish-white, erect hair; apical tergal hair bands missing on all terga (Fig. 13B). Prepygidial and pygidial fimbriae brownish-grey. T1 and T2 very finely, but distinctly and very densely ( $i=0.5-1d$ ) punctate, T3 finely and densely ( $i=1-1.5d$ ) punctate, on T4 slightly sparser; apical tergal depressions and between punctures terga smooth and shiny (Fig. 13B).

### Male

BODY LENGTH. 8–8.5 mm.

HEAD. Head wider than long. Integument black, except mandible partly dark reddish-brown. Face covered with long, silvery-white, erect hair (Fig. 3). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally dark yellowish-brown.

MESOSOMA. Integument black. Mesoscutal disc between punctures reticulate and matt; disc shallowly densely ( $i=d$ ) and very finely punctate. Basal area of propodeum in anterior half finely carinate (Fig. 14B). Mesoscutum, scutellum, metanotum, mesepisternum and propodeum sparsely covered with long, yellowish-grey, erect hair (Fig. 14A).

WINGS. Slightly yellowish-brown; wing venation and stigma brown.

LEGS. Integument black to reddish-brown, tarsi dark brown. Hind tibia apicomediaally slightly swollen, vestiture greyish-white, without conspicuous hair tuft (Fig. 15A).

METASOMA. Integument black to reddish-brown, apical margins of terga translucent dark reddish-brown (Fig. 14C). Discs of T1–T5 covered with short, greyish, erect hair; apical tergal hair bands missing on all terga (Fig. 14C). Terga shallowly and finely but densely ( $i=d$ ) punctate; between punctures and on apical tergal depressions superficially shagreened and slightly matt (Fig. 14C). Sterna without distinct apical hair fringes (Fig. 14D).

TERMINALIA. Genitalia (Fig. 15B), S7 (Fig. 15C) and terminal plate of S8 (Fig. 15D) as illustrated.

### Distribution

Only known from higher altitudes of the Hantam and Roggeveld Mountains (Northern Cape Province).

### Floral hosts

Oxalidaceae: yellow flowering *Oxalis* spec., *O. pes-caprae*.

### Seasonal activity

September–October.

*Scapter oxalis* sp. nov.

[urn:lsid:zoobank.org:act:ECBEF593-24AE-4B7C-B6CF-67A6C53A7302](https://doi.org/10.21203/rs.3.rs-5111111/v1)

Figs 2–3, 16–18, 23–28

**Diagnosis**

The female of *S. oxalis* sp. nov. can be separated from that of all other species in this group by the following character combination: scutellum relatively small, distinctly convex and shiny (Fig. 16D), propodeum dorsolaterally (lateral to the matt propodeal triangle) very finely shagreened and matt, hair on posterior surface shorter than length of basal area (Fig. 16D), foreleg blackish-brown, sometimes femur apically slightly dark yellowish-brown, apical tergal depressions narrow and brownish translucent without reddish discoloration of the adjacent apical area of the disc, disc of T2 finely and sparsely punctate (Fig. 16B).

The male is characterized by the propodeum densely covered with thick, plumose hair of  $\pm$  equal length (Fig. 17B), foreleg completely dark brown to blackish, sometimes to a small extent distitarsus and apical parts of mediotarsi orange-brown (Fig. 17A), hind tibia apicomediaally strongly swollen, hairs apically on inner side relatively short (Fig. 18A), S3-S5 with dense apical hair fringes (Fig. 17D), genitalia as in Fig. 18B.

**Etymology**

The specific epithet refers to the specific host plants of the genus *Oxalis* (Oxalidaceae) of this bee species.

**Type material** (17 specimens)

**Holotype**

SOUTH AFRICA • ♂; Knersvlakte, along Gemsbokrivier-Pad; 195 m a.s.l.; 31°26'40" S, 18°56'23" E; 5 Jun. 2013; M. Kuhlmann leg.; SANC.

**Paratypes**

SOUTH AFRICA • 1 ♂; Gemsbokrivier-Pad, 4.5 km NE of Grootdrif, Road Side; 170 m a.s.l.; 31°25'54" S, 18°55'16" E; 20 May 2013; M. Kuhlmann leg.; NHML • 2 ♂♂; same data as for preceding; 28 May 2013; M. Kuhlmann leg.; RCMK • 1 ♂; same data as for preceding; 5 Jun. 2013; M. Kuhlmann leg.; RCMK • 3 ♀♀, 4 ♂♂; same data as for preceding; 10 Jun. 2013; M. Kuhlmann leg.; RCMK • 3 ♂♂; same data as for preceding; NHML • 1 ♂; Knersvlakte, along Gemsbokrivier-Pad; 195 m a.s.l.; 31°26'40" S, 18°56'23" E; 5 Jun. 2013; M. Kuhlmann leg.; RCMK.

**Description**

**Female**

BODY LENGTH. 6.5–7.5 mm.

HEAD. Head as wide as long. Integument black, except part of mandibles dark reddish-brown. Face sparsely covered with relatively long, yellowish-grey, erect hair (Fig. 2). Clypeus strongly convex with fine and very sparse ( $i=2-5$  d) punctation; surface between punctures smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally dark yellow.

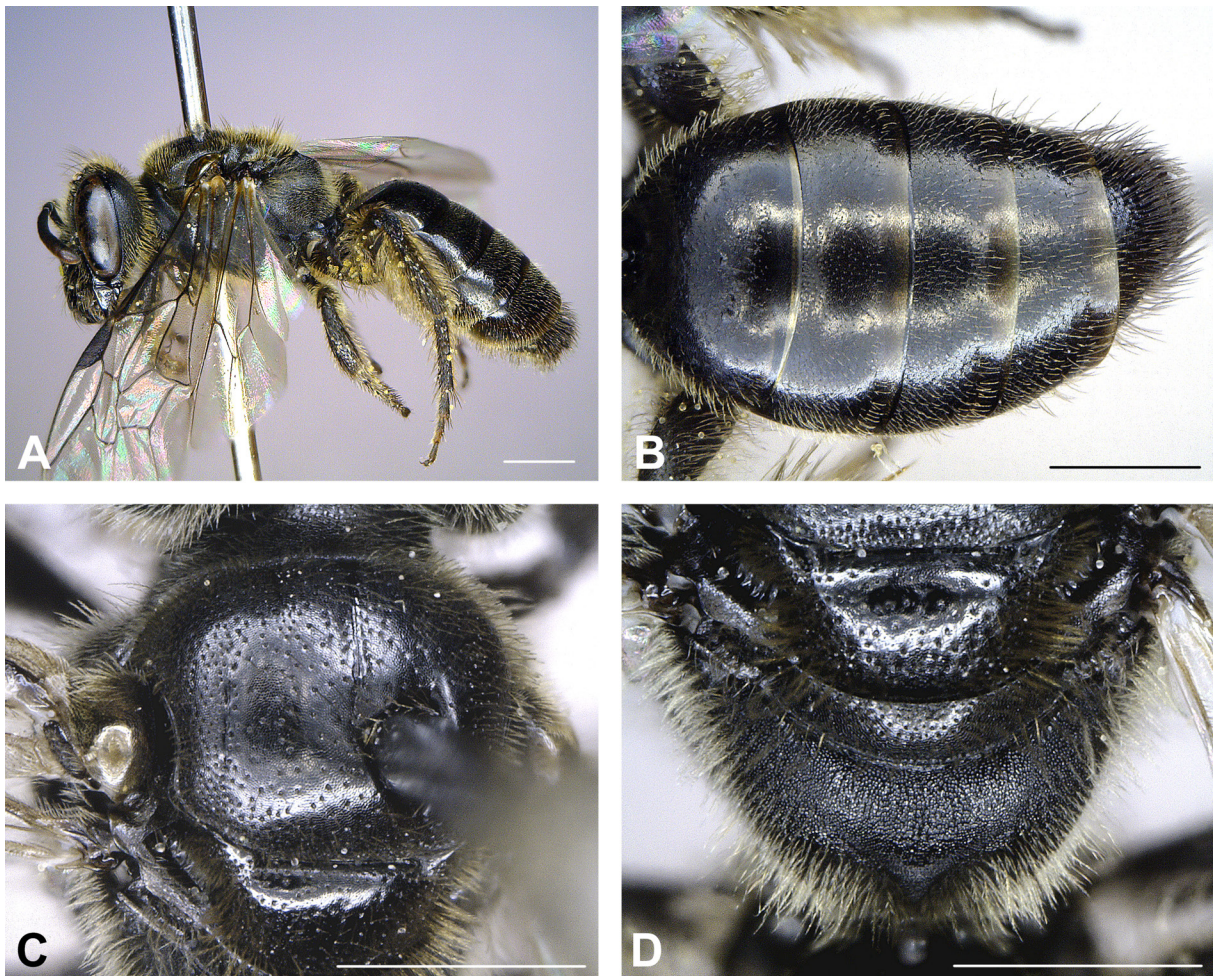
MESOSOMA. Integument black, tegulae dark brown. Mesoscutal disc between punctures finely reticulate and partly matt; disc finely, relatively shallowly and sparsely ( $i=2$  d) punctate (Fig. 16C). Metanotum slightly shorter than basal area of propodeum, apically with narrow and indistinctly carinate depression (Fig. 16D). Propodeum basally very indistinctly and finely carinate (Fig. 16D). Mesoscutum with short;

scutellum, metanotum, mesepisternum and propodeum with long, sparse, greyish to yellowish, erect hair (Fig. 16A).

WINGS. Slightly yellowish-brown; wing venation and stigma brown.

LEGS. Integument black to dark reddish-brown. Vestiture yellowish to brownish-grey. Scopa yellowish-grey.

METASOMA. Integument black to dark reddish-brown; apical margins of terga broadly translucent yellowish to brownish (Fig. 16B). Disc of T1 and T2 very sparsely covered with very short, greyish-white, erect hair; following terga with successively more and longer, greyish-white, erect hair; apical tergal hair bands missing on all terga (Fig. 16B). Prepygidial and pygidial fimbriae dark brown. T1 and T2 impunctate, T3 and T4 with indistinct shallow punctation, looking almost impunctate; between punctures shagreened and slightly matt to shiny; apical tergal depressions very finely shagreened and slightly matt (Fig. 16B).



**Fig. 16.** *Scapter oxalis* sp. nov., paratype, ♀ (RCMK), Gemsbokrivier-Pad, 10 Jun. 2013. **A.** Lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

**Male**

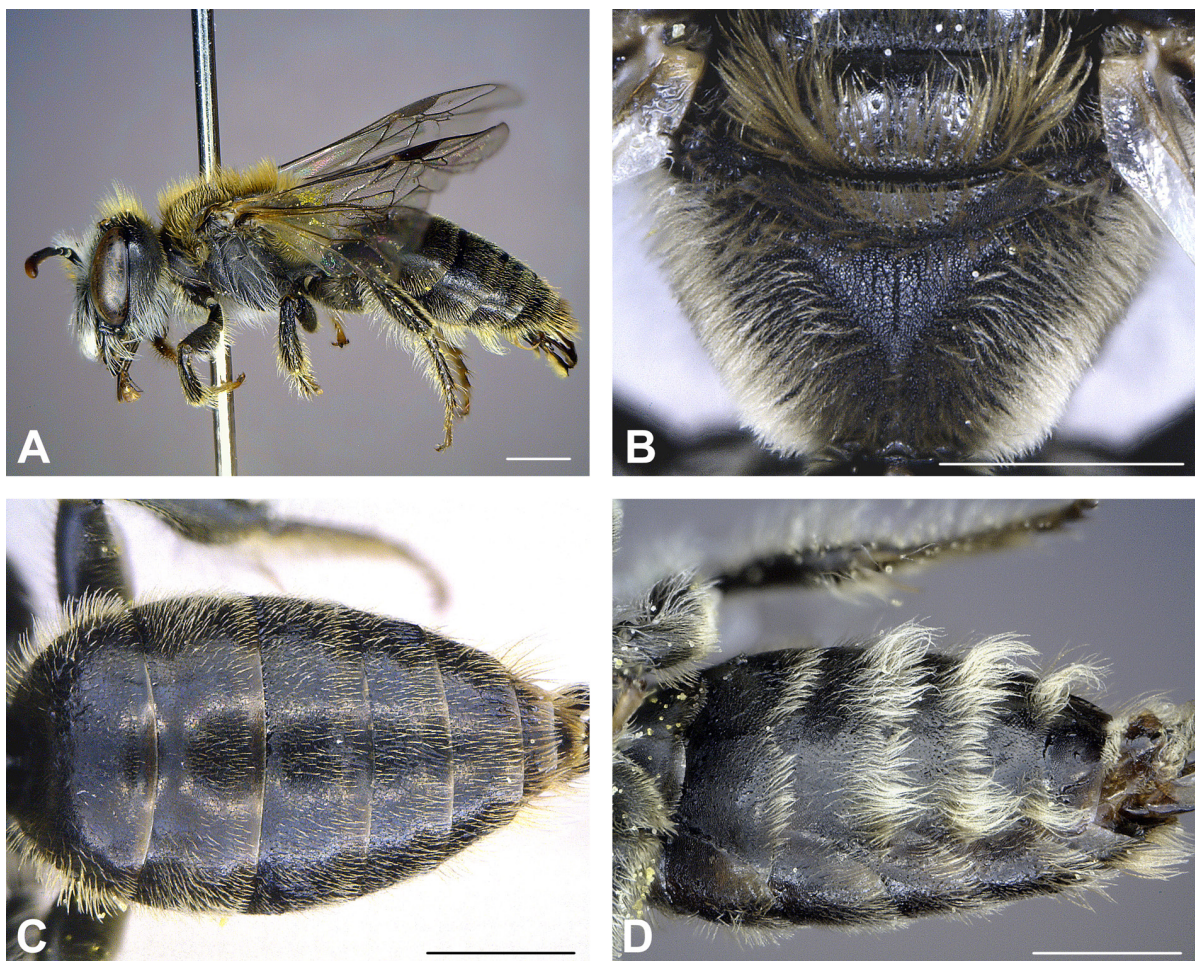
BODY LENGTH. 8.5 mm.

HEAD. Head slightly longer than wide. Integument black, except mandible partly dark reddish-brown. Face densely covered with long, silvery-white, erect hair (Fig. 3). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally yellowish-brown.

MESOSOMA. Integument black. Mesoscutal disc between punctures reticulate and slightly matt; disc shallowly but densely ( $i=d$ ) and relatively finely punctate. Basal area of propodeum  $\pm$  triangular and distinctly carinate (Fig. 17B). Mesoscutum sparsely, scutellum and metanotum densely covered with long, yellowish, erect hair; propodeum laterally with short, apically with long, dense, yellowish, erect hair (Fig. 17B); mesepisternum sparsely covered with long, greyish, erect hair (Fig. 17A).

WINGS. Slightly yellowish-brown; wing venation and stigma brown.

LEGS. Integument black to reddish-brown, tarsi distally successively more yellowish-brown. Hind tibia apicomediaally strongly swollen and curved, without distinct hair tuft (Fig. 18A). Vestiture greyish-white, on tarsi slightly yellowish.



**Fig. 17.** *Scrapper oxalis* sp. nov., paratype, ♂ (RCMK), Gemsbokrivier-Pad, 5 Jun. 2013. **A.** Lateral view. **B.** Scutellum, metanotum and propodeum, dorsal view. **C.** Metasoma, dorsal view. **D.** Metasoma, ventral view. Scale bars=1.0 mm.

**METASOMA.** Integument black to reddish-brown, apical margins of terga partly narrowly translucent dark reddish-brown (Fig. 17C). Discs of T1–T4 covered with short, greyish, erect hair, following terga with successively longer hair; apical tergal hair bands missing on all terga (Fig. 17C). Terga very finely and densely (i=d) punctate, appearing almost impunctate; between punctures and on apical tergal depressions superficially shagreened and slightly matt (Fig. 17C). S3 and S4 with dense, long apical hair fringes (laterally longer), S5 only laterally (Fig. 17D).

**TERMINALIA.** Genitalia (Fig. 18B), S7 (Fig. 18C) and terminal plate of S8 (Fig. 18D) as illustrated.

### Distribution

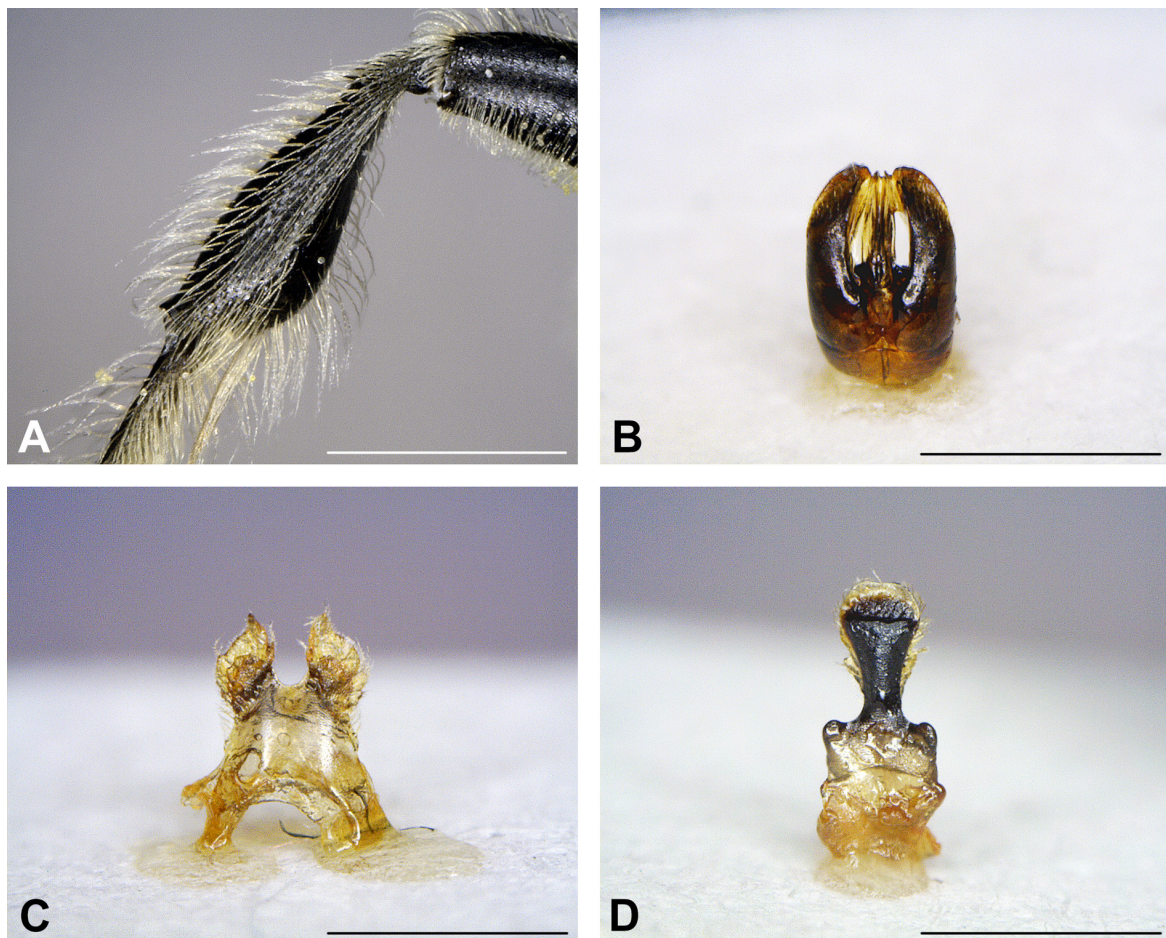
Only known from the Knersvlakte (Western Cape Province) and possibly endemic to this southern-most part of the Succulent Karoo biome.

### Floral hosts

Oxalidaceae: yellow flowering *Oxalis* spec., *O. argillacea*, *O. purpurea*.

### Seasonal activity

May–June.



**Fig. 18.** *Scapter oxalis* sp. nov., paratype, ♂ (RCMK), Gemsbokrivier-Pad, 5 Jun. 2013. **A.** Hind tibia. **B.** Genitalia, dorsal view. **C.** Metasomal sternum S7, dorsal view. **D.** Metasomal sternum S8, dorsal view. Scale bars = 1.0 mm.

*Scapter oxalissimus* sp. nov.

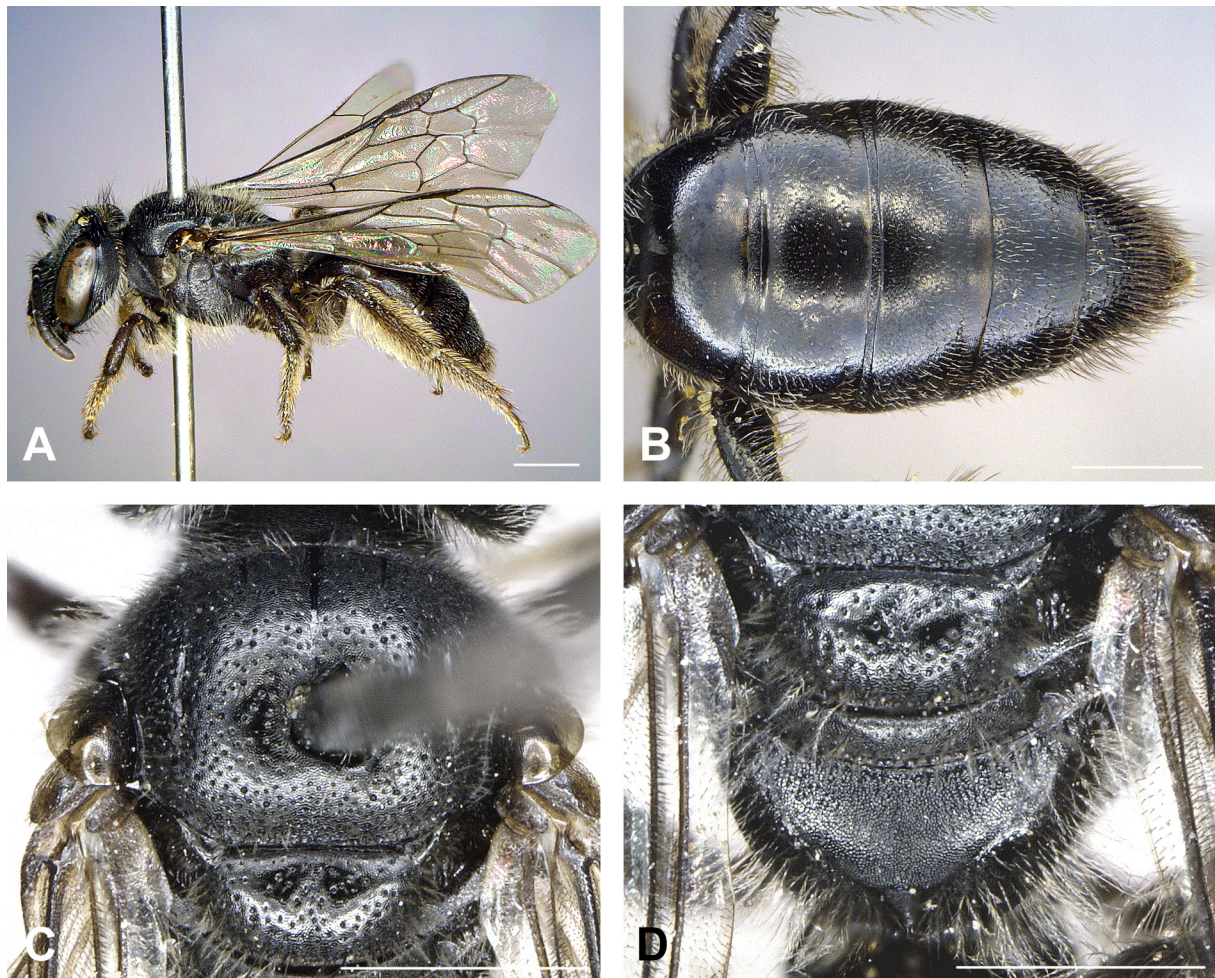
[urn:lsid:zoobank.org:act:86E63A08-A616-440B-9693-E1FB82CE1101](https://zoobank.org/act:86E63A08-A616-440B-9693-E1FB82CE1101)

Figs 2–3, 19–21, 23–27

**Diagnosis**

The female of *S. oxalissimus* sp. nov. can be separated from that of all other species in this group by the following character combination: clypeus, vertex and dorsal side of mesosoma with abundant dark brown to blackish hairs intermixed with lighter hair (Fig. 19A), basal area of propodeum on anterior half with fine longitudinal carination, propodeum dorsolaterally (lateral to the matt propodeal triangle) partly smooth and shiny (Fig. 19D), foreleg blackish-brown, sometimes femur apically slightly dark yellowish-brown, disc of T2 shallowly and sparsely ( $i=2$  d) punctate (Fig. 19B),

The male is characterized by the clypeus medially coarsely and denser punctate, matt (Fig. 3), propodeum sparsely covered with thin hair of variable length, basal area with distinct longitudinal carinae (Fig. 20B), foreleg completely dark brown to blackish (Fig. 20A), hind tibia apicomediaally not conspicuously swollen (Fig. 21A), genitalia as in Fig. 21B.



**Fig. 19.** *Scapter oxalissimus* sp. nov., paratype, ♀ (RCMK), 10 km N of Nieuwoudtville, 12 Sep. 2009. **A.** Lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

### Etymology

The specific epithet refers to the specific host plants of the genus *Oxalis* (Oxalidaceae) of this bee species.

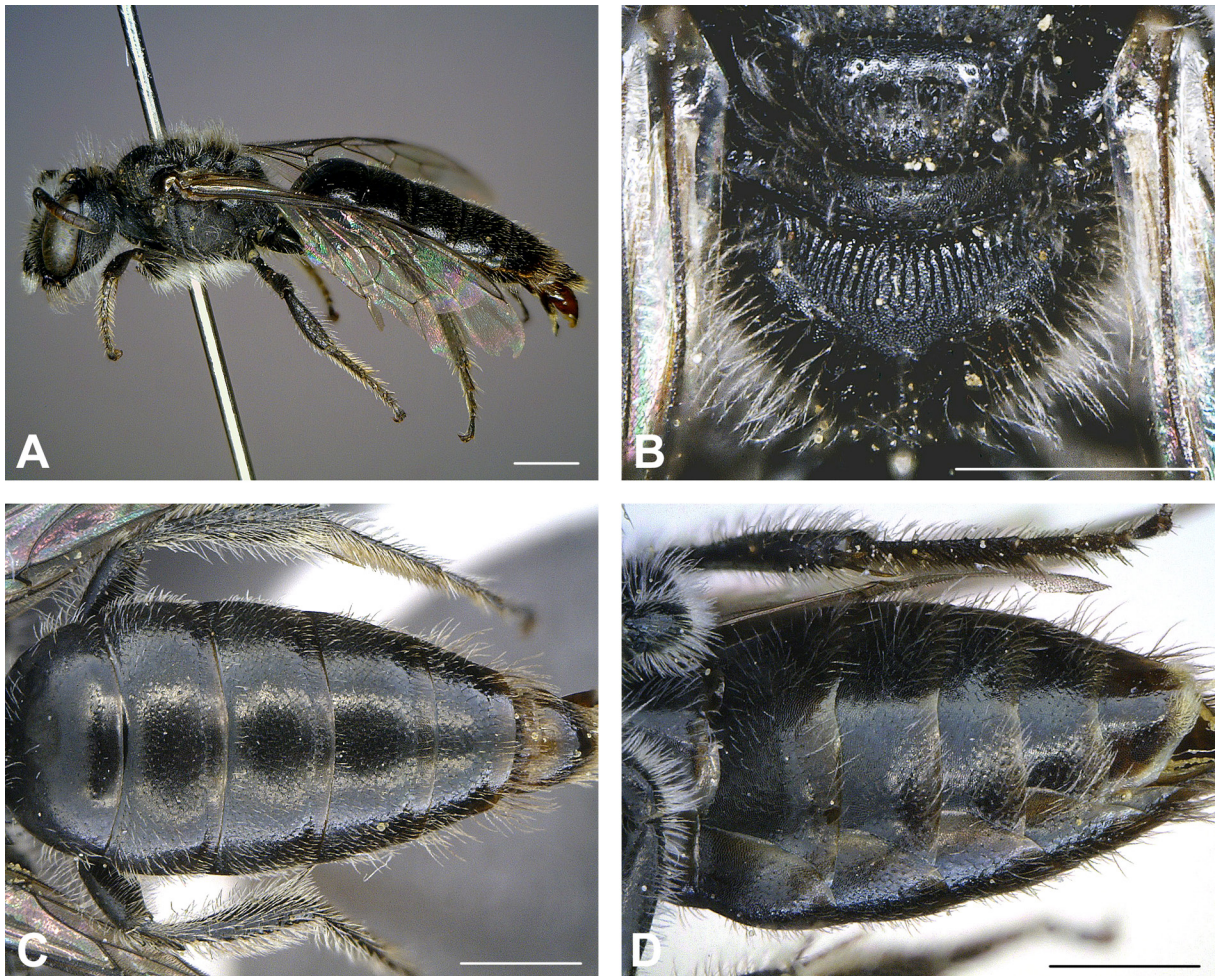
### Type material (15 specimens)

#### Holotype

SOUTH AFRICA • ♀; Nieuwoudtville, Glen Lyon, Renosterveld; 700 m a.s.l.; 31°24'03" S, 19°08'34" E; 7 Sep. 2003; M. Kuhlmann leg.; SANC.

#### Paratypes

SOUTH AFRICA • 1 ♀; 10 km N of Nieuwoudtville, Farm Grasberg, dolerite hill; 800 m a.s.l.; 31°18'01" S, 19°05'42" E; 12 Sep. 2009; M. Kuhlmann leg.; RCMK • 1 ♀; 12 km NW of Nieuwoudtville, Farm Avontuur, Fynbos; 770 m a.s.l.; 31°16'18" S, 19°02'55" E; 25 Aug. 2017; M. Kuhlmann leg.; RCMK • 1 ♂; Keiski Mts, 3 km E of Farm M'Veira, shale; 1190 m a.s.l.; 31°45'29" S, 19°54'13" E; 27 Aug. 2017; M. Kuhlmann leg.; RCMK • 1 ♀; Keiski Mts, 5 km S of Farm Nooiensrivier, burned area; 1275 m a.s.l.; 31°45'47" S, 19°50'17" E; 28 Sep. 2009; M. Kuhlmann leg.; RCMK • 2 ♀♀, 2 ♂♂; Keiskie Mts, 5 km S of Farm Nooiensrivier, dolerite hill; 1270 m a.s.l.; 31°45'54" S, 19°50'17" E; 19



**Fig. 20.** *Scapter oxalissimus* sp. nov., paratype, ♂ (RCMK), Roggeveld Mts, 24 Aug. 2018. **A.** Lateral view. **B.** Scutellum, metanotum and propodeum, dorsal view. **C.** Metasoma, dorsal view. **D.** Metasoma, ventral view. Scale bars = 1.0 mm.

Aug. 2017; M. Kuhlmann leg.; RCMK • 2 ♀♀; same data as for preceding; 26 Aug. 2017; M. Kuhlmann leg.; RCMK • 1 ♀, 2 ♂♂; Roggeveld Mts, 2 km SE of Farm Allemansdam, burnt area; 1290 m a.s.l.; 31°49'32" S, 19°59'55" E; 24 Aug. 2018; M. Kuhlmann leg.; RCMK) • 1 ♀; same data as for preceding; 29 Aug. 2018; M. Kuhlmann leg.; RCMK.

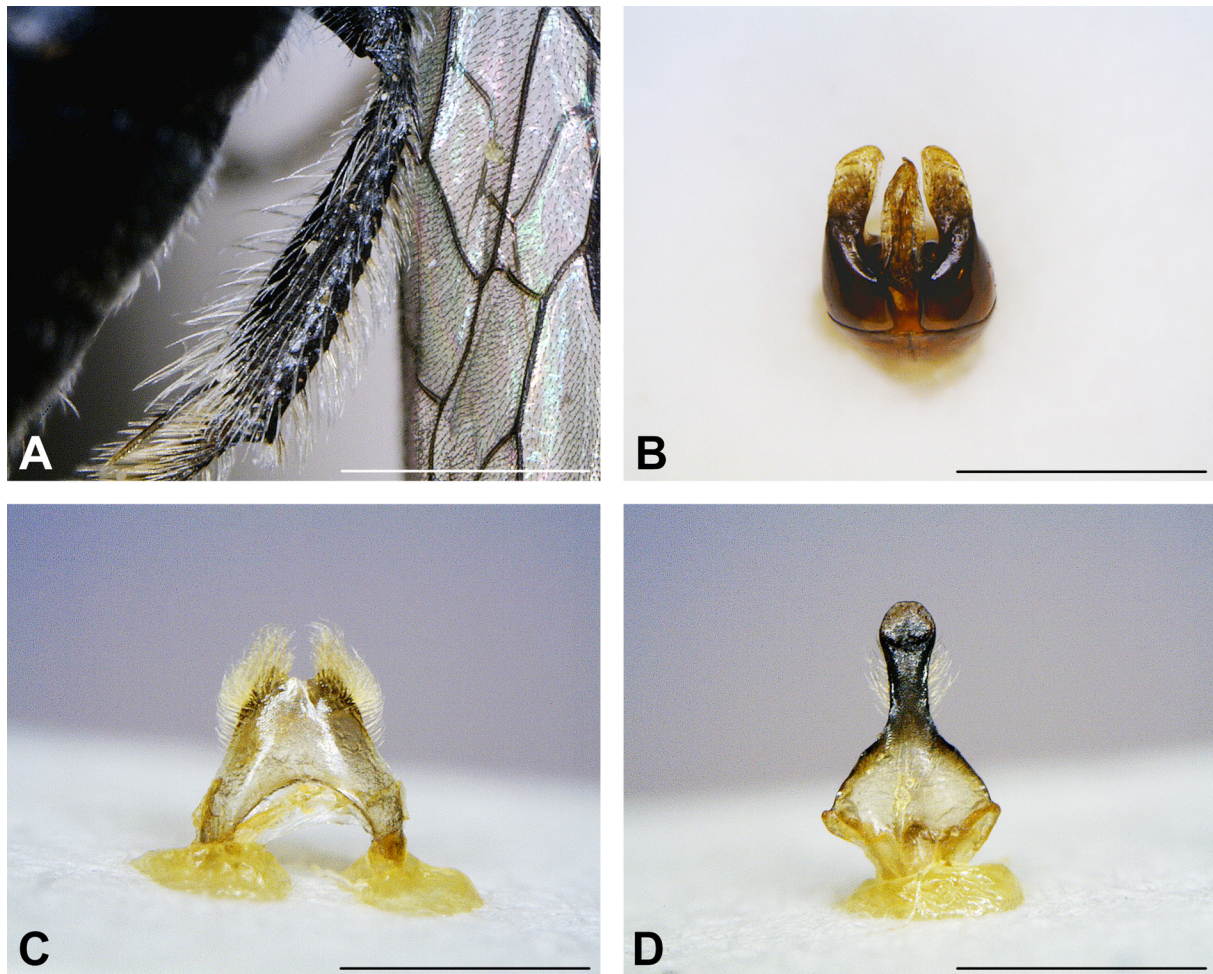
## Description

### Female

BODY LENGTH. 7.5–8 mm.

HEAD. Head wider than long. Integument black, except part of mandibles dark reddish-brown. Face sparsely covered with relatively short, blackish-grey, erect hair (Fig. 2). Clypeus strongly convex; medially relatively coarsely and very sparsely ( $i=2-5$  d) punctate, laterally almost impunctate; surface between punctures smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally very dark yellowish-brown to dark brown.

MESOSOMA. Integument and tegulae black. Mesoscutal disc between punctures reticulate and matt; disc relatively densely ( $i=1-2$  d) and coarsely punctate (Fig. 19C). Metanotum about  $\frac{2}{3}$  as long as basal area



**Fig. 21.** *Scapter oxalissimus* sp. nov., paratype, ♂ (RCMK), Roggeveld Mts, 24 Aug. 2018. **A.** Hind tibia. **B.** Genitalia, dorsal view. **C.** Metasomal sternum S7, dorsal view. **D.** Metasomal sternum S8, dorsal view. Scale bars = 1.0 mm.

of propodeum, apically with broad and distinct carinate depression (Fig. 19D). Propodeum on basal half laterally relatively finely linear carinate (Fig. 19D). Mesoscutum with short; scutellum, metanotum, mesepisternum and propodeum with relatively long, blackish and grey, erect hairs (Fig. 19A).

WINGS. Yellowish-brown; wing venation and stigma dark brown.

LEGS. Integument black. Vestiture and scopa brownish to blackish-grey.

METASOMA. Integument black to dark reddish-brown; apical margins of terga broadly translucent dark yellowish-brown to reddish-brown (Fig. 19B). Disc of T1 without hair; following terga with very short and few but successively more and longer, greyish, erect hair; apical tergal hair bands missing on all terga (Fig. 19B). Prepygidial and pygidial fimbriae dark brown. T1 very finely and indistinctly punctate, partly looking impunctate, T2 very finely and sparsely ( $i=2d$ ) punctate, T3 and T4 very shallowly and sparsely ( $i=2-3d$ ) punctate; between punctures apical tergal depressions superficially shagreened but shiny (Fig. 19B).

### Male

BODY LENGTH. 8 mm.

HEAD. Head wider than long. Integument black, except mandible partly dark reddish-brown. Face covered with long, silvery-white, erect hair (Fig. 3). Malar area medially narrow, almost linear. Antenna dorsally dark brown, flagellar segments 5–11 ventrally dark yellowish-brown.

MESOSOMA. Integument black. Mesoscutal disc between punctures strongly reticulate and matt; disc densely ( $i=d$ ) but shallowly and relatively finely punctate. Basal area of propodeum  $\pm$  wide crescent, distinctly and broadly linear carinate (Fig. 20B). Mesoscutum, propodeum and mesepisternum sparsely covered with long, greyish, erect hair; scutellum and metanotum covered with long, brownish-grey, erect hair (Fig. 20A).

WINGS. Slightly yellowish-brown; wing venation and stigma brown.

LEGS. Integument black to dark brown, hind tarsi successively slightly lighter brown distally. Hind tibia apically slightly broadened inside with a thin tuft of slightly longer greyish-white hair (Fig. 21A).

METASOMA. Integument black, apical margins of terga relatively broadly translucent dark yellowish-brown (Fig. 20C). Discs of T1 very sparsely covered with short, greyish, erect hair, following terga with successively more and longer hair; apical tergal hair bands missing on all terga (Fig. 20C). T1 sparsely ( $i=2d$ ) and very finely punctate, T2–T6 finely and relatively sparsely ( $i=1.5-2d$ ) punctate; terga and apical tergal depressions superficially shagreened and slightly matt to shiny (Fig. 20C). S3–S5 laterally with very sparse, long apical hair fringes or tufts (Fig. 20D).

TERMINALIA. Genitalia (Fig. 21B), S7 (Fig. 21C) and terminal plate of S8 (Fig. 21D) as illustrated.

### Distribution

Found only on the Bokkeveld Plateau and the northern extension of the Roggeveld Mountains (Northern Cape Province).

### Floral hosts

Oxalidaceae: yellow flowering *Oxalis* spec., *O. pes-caprae*,

### Seasonal activity

August–September.

### *Scapter oxaloides* sp. nov.

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Figs 2, 22–24

### Diagnosis

The female of *S. oxaloides* sp. nov. can be separated from that of all other species in this group by the following character combination: scutellum relatively large, flat and dull (Fig. 22D), propodeum dorsolaterally (lateral to the matt propodeal triangle) very finely shagreened and matt (Fig. 22D), hair on posterior surface of propodeum longer than length of basal area of propodeum (Fig. 22D), foreleg blackish-brown, disc of T2 finely and sparsely punctate, apical tergal depressions narrow, brownish translucent without reddish discoloration of the adjacent apical area of the disc (Fig. 22B). Females of *S. oxaloides* and *S. oxalensis* sp. nov. are very similar but the former has slightly narrower apical tergal depressions (Fig. 22B) and the basal area of propodeum shows slightly denser and finer reticulation (Fig. 22D). The male is unknown.

### Etymology

The specific epithet refers to the specific host plants of the genus *Oxalis* (Oxalidaceae) of this bee species.

### Type material (22 specimens)

#### Holotype

SOUTH AFRICA • ♀; 12 km NW of Nieuwoudtville, Farm Avontuur, Fynbos; 770 m a.s.l.; 31°16'18" S, 19°02'55" E; 18 Aug. 2012; M. Kuhlmann leg.; SANC.

#### Paratypes

SOUTH AFRICA • 1 ♀; 12 km NW of Nieuwoudtville, Farm Avontuur, Fynbos; 770 m a.s.l.; 31°16'18" S, 19°02'55" E; 16 Aug. 2011; M. Kuhlmann leg.; RCMK • 2 ♀♀; same data as for preceding; 23 Aug. 2017; M. Kuhlmann leg.; RCMK • 6 ♀♀; same data as for preceding; 27 Aug. 2017; M. Kuhlmann leg.; RCMK • 1 ♀; 20 km S of Nieuwoudtville, Farm Papkuilsfontein, Fynbos; 680 m a.s.l.; 31°33'16" S, 19°08'31" E; 27 Aug. 2010; M. Kuhlmann leg.; RCMK • 1 ♀; Fynbos, 15 km NW of Nieuwoudtville, Farm Engelsepunt; 830 m a.s.l.; 31.14.31 S, 18.59.08 E; 22 Jul. 2003; K. Timmermann leg.; NHML • 2 ♀♀; same data as for preceding; 23 Jul. 2003; K. Timmermann leg.; RCMK • 2 ♀♀; same data as for preceding; 26 Jul. 2003; K. Timmermann leg.; RCMK • 1 ♀; same data as for preceding; NHML • 1 ♀; same data as for preceding; 5 Aug. 2003; K. Timmermann leg.; RCMK • 1 ♀; same data as for preceding; 27 Aug. 2003; K. Timmermann leg.; NHML • 2 ♀♀; same data as for preceding; 23–26 Jul. 2003; K. Timmermann leg.; NHML • 1 ♀; Nieuwoudtville, garden; 700 m a.s.l.; 31°22' S, 19°07' E; K. Timmermann leg.; RCMK.

### Description

#### Female

BODY LENGTH. 7–7.5 mm.

HEAD. Head as wide as long. Integument black, except part of mandibles and sometimes part of clypeus dark reddish-brown. Face sparsely covered with relatively long, greyish, erect hair (Fig. 2). Clypeus strongly convex with relatively coarse but very sparse ( $i=2-5$  d) punctation; surface between punctures

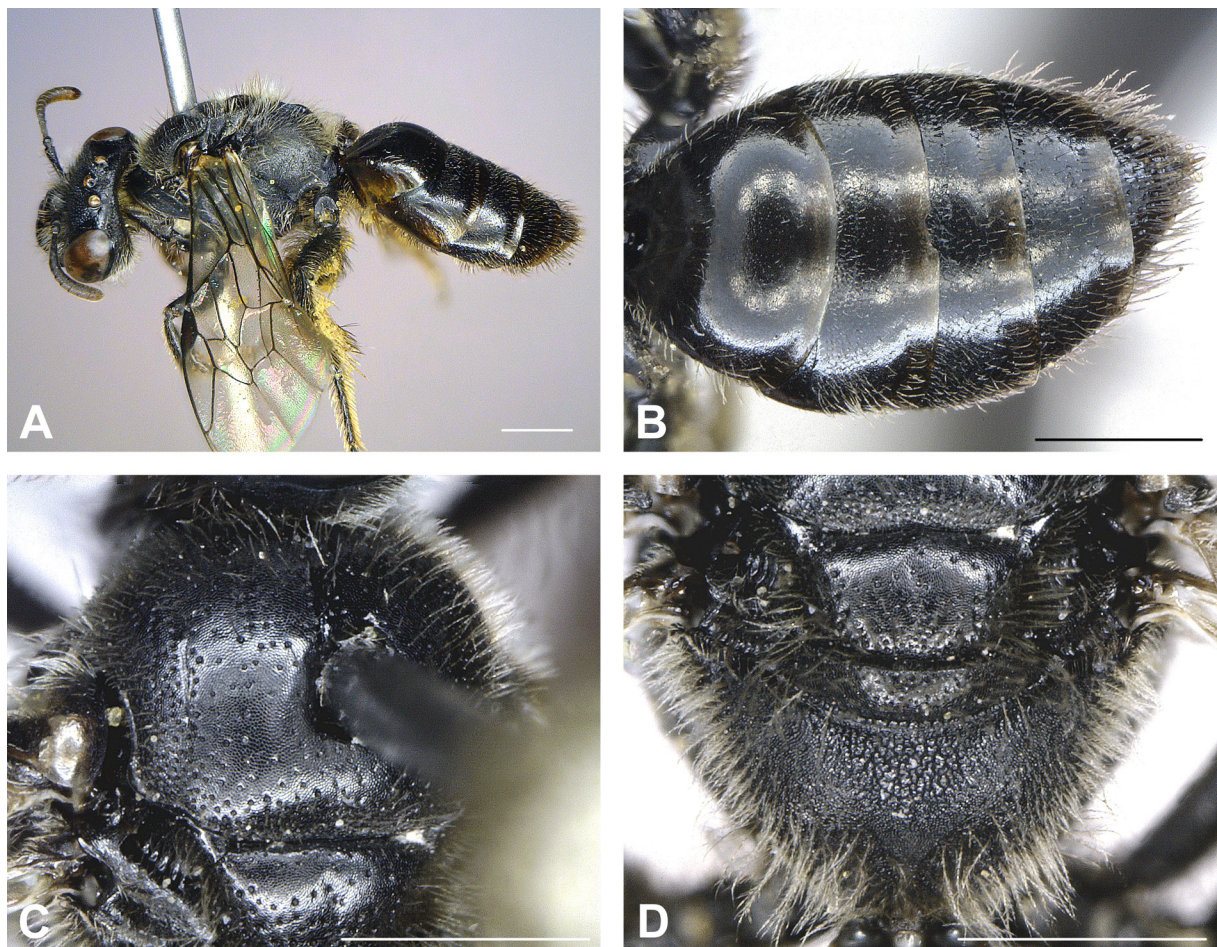
smooth and shiny (Fig. 2). Malar area medially narrow, almost linear. Antenna dorsally dark brown, ventrally dark yellow.

**MESOSOMA.** Integument black, tegulae dark brown. Mesoscutal disc between punctures reticulate and slightly matt, disc sparsely ( $i=1-3d$ ) and shallowly punctate (Fig. 22C). Metanotum slightly shorter than basal area of propodeum, apically with narrow carinate depression (Fig. 22D). Propodeum on basal half medially relatively coarsely and distinctly carinate (Fig. 22D). Propodeum apically with long, laterally with shorter, mesoscutum with short, scutellum, metanotum and mesepisternum with sparse, long, greyish to yellowish, erect hair (Fig. 22A).

**WINGS.** Slightly yellowish-brown; wing venation and stigma brown.

**LEGS.** Integument black to dark reddish-brown. Vestiture yellowish-grey to brownish. Scopa brownish to greyish-white.

**METASOMA.** Integument black to dark reddish-brown; apical margins of terga broadly translucent brown (Fig. 22B). Disc of T1 with very few, very short, greyish-white, erect hairs; following terga with increasingly more and longer, greyish-white, erect hairs; apical tergal hair bands missing on all terga



**Fig. 22.** *Scapter oxaloides* sp. nov., paratype, ♀ (RCMK), 12 km NW of Nieuwoudtville, 16 Aug. 2011. **A.** Specimen, lateral view. **B.** Metasoma, dorsal view. **C.** Scutum, dorsal view. **D.** Scutellum, metanotum and propodeum, dorsal view. Scale bars = 1.0 mm.

(Fig. 22B). Prepygidial and pygidial fimbriae greyish to slightly brownish. T1 and T2 very shallowly, indistinctly, finely and sparsely punctate, looking almost impunctate; T3 and T4 very finely but relatively densely ( $i=1-2$  d) punctate; between punctures finely shagreened and slightly matt to shiny (Fig. 22B).

#### Male

Unknown.

#### Distribution

Apparently endemic to the Bokkeveld Plateau (Northern Cape Province).

#### Floral hosts

Oxalidaceae: yellow flowering *Oxalis* spec., *O. pes-caprae*,

#### Seasonal activity

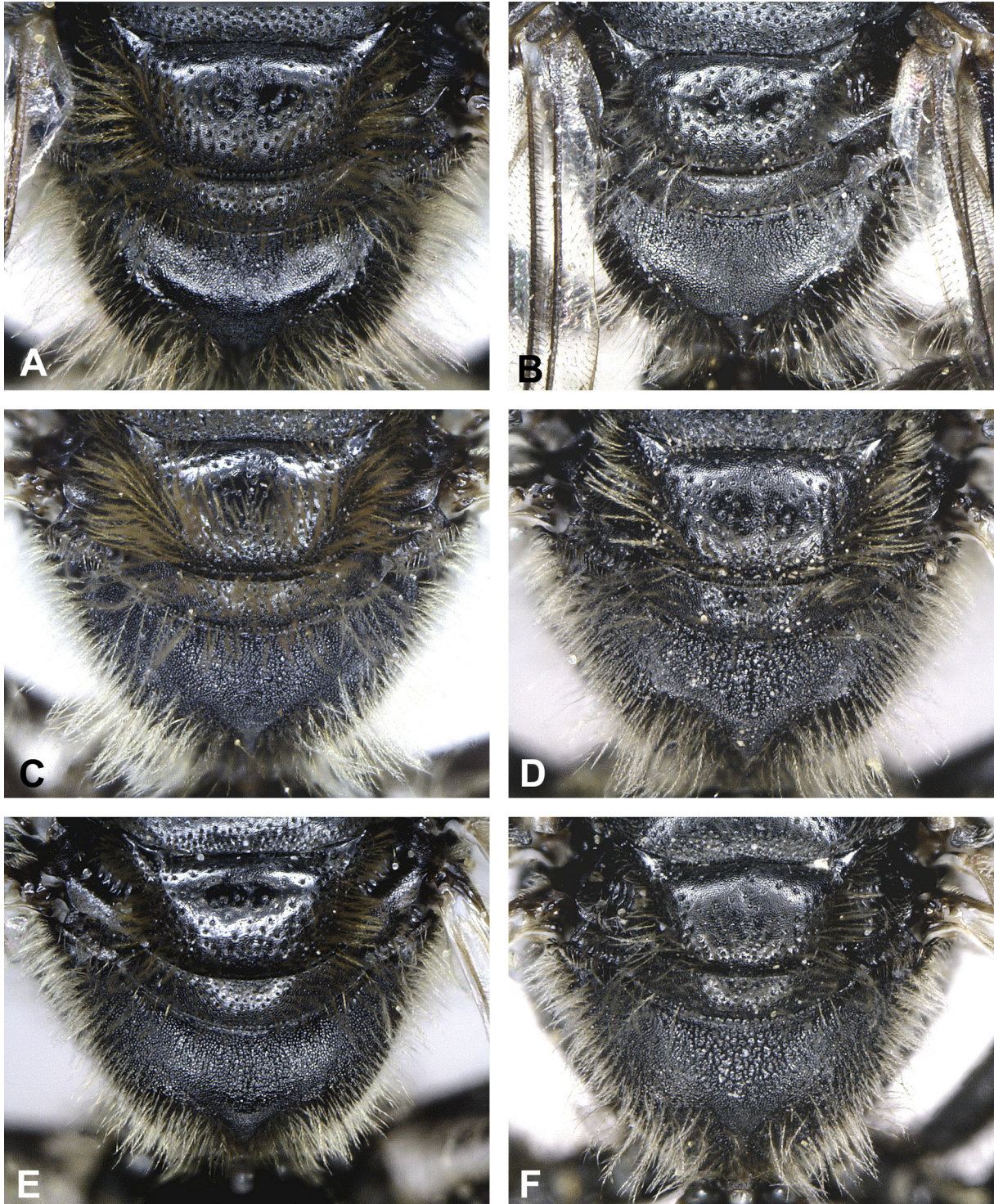
July–August.

#### Key to species of the *Scapter carysomus* group

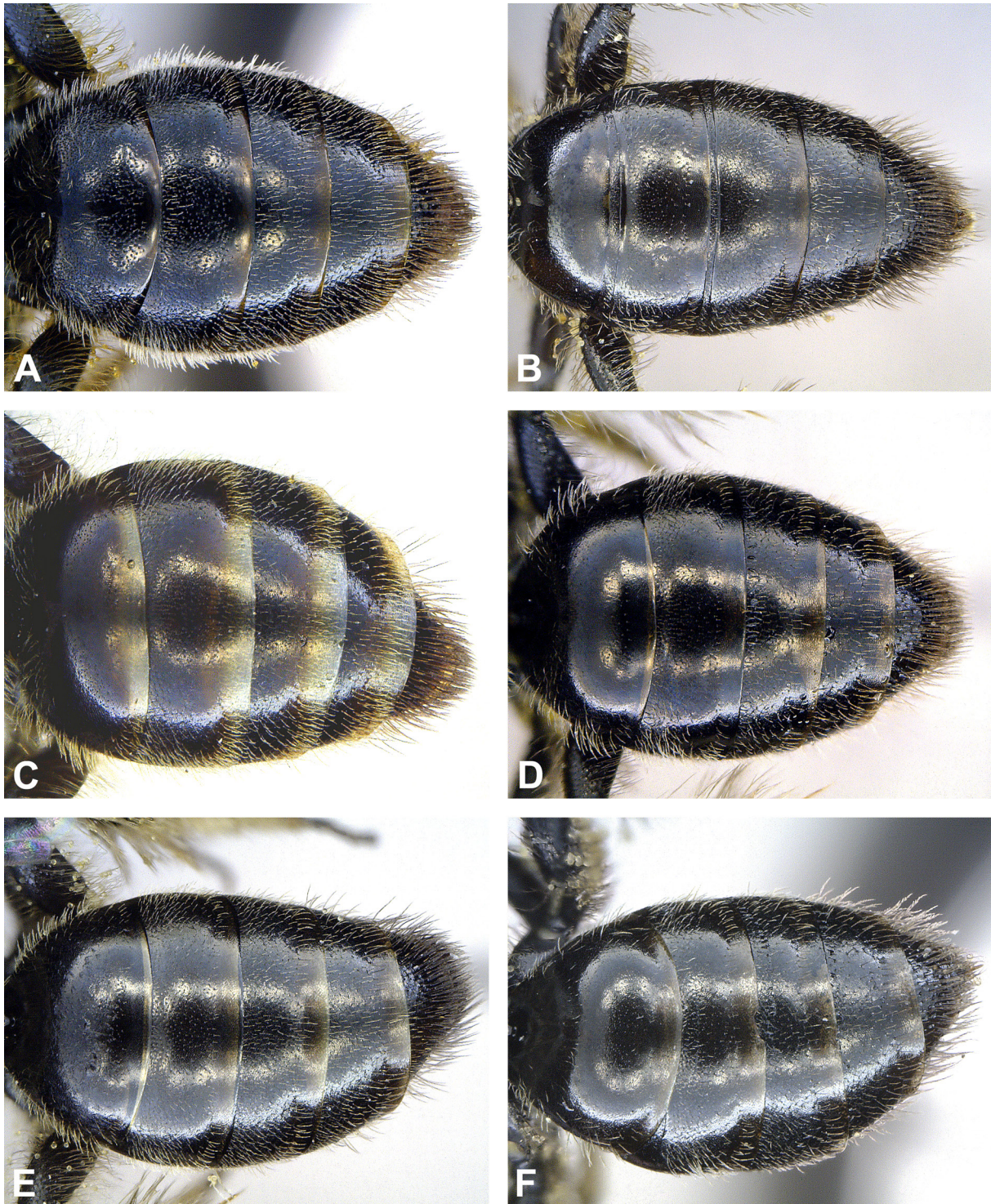
##### Females

Females of this species group are very similar to each other and identification can be difficult without reference material or associated males due to sometimes very subtle differences in the surface sculpture.

1. Fore tibia on inner face medially, on outer face apically, and fore femur on outer face apically with dull yellow spot of varying size ..... *S. oxalicus* sp. nov.  
– Foreleg blackish-brown, sometimes femur apically slightly dark yellowish-brown ..... 2
2. Propodeum dorsolaterally (lateral to the matt propodeal triangle) partly smooth and shiny (Figs 23A–B); disc of T2 relatively coarsely and densely punctate ( $i=0.5-2$  d) (Fig. 24A–B) ..... 3  
– Propodeum dorsolaterally (lateral to matt propodeal triangle) very finely shagreened and matt (e.g., Fig. 23C–D); disc of T2 finely, more dispersed punctate ( $i > 2$  d) or without punctation (e.g., Fig. 24C–D) ..... 4
3. Clypeus, vertex and dorsal side of mesosoma with white to light brown hair, at most few single black hairs intermixed; basal area of propodeum without rugae (Fig. 23A); T2 distinctly and densely ( $i=0.5-1$  d) punctate (Fig. 24A) ..... *S. oxaliphilus* sp. nov.  
– Clypeus, vertex and dorsal side of mesosoma with abundant dark brown to blackish hairs intermixed with lighter hair; basal area of propodeum on anterior half with fine longitudinal rugae (Fig. 23B); T2 comparatively more shallowly and sparsely ( $i=2$  d) punctate (Fig. 24B) .....  
..... *S. oxalissimus* sp. nov.
4. Apical tergal depressions relatively broad, yellowish translucent with the adjacent apical area of the disc crescent-shaped dark reddish (Fig. 24C) ..... *S. carysomus* Davies, 2005  
– Apical tergal depressions narrower and brownish translucent without reddish discoloration of the adjacent apical area of the disc (Fig. 24E–F), if apical tergal depressions yellowish translucent, then only very narrowly (Fig. 24D) ..... 5
5. Scutellum slightly smaller (shorter and narrower), more convex and shinier (Fig. 23E); hair on posterior surface of propodeum shorter than length of basal area of propodeum (Fig. 23E) .....  
..... *S. oxalis* sp. nov.  
– Scutellum slightly larger (longer and broader), flatter and duller (Fig. 23D–F); hair on posterior surface of propodeum longer than length of basal area of propodeum (Fig. 23D–F) ..... 6



**Fig. 23.** *Scapter* sp., ♀♀, scutellum, metanotum and propodeum, dorsal views. **A.** *S. oxaliphilus* sp. nov., paratype (RCMK), Plateau Hantam Mts, 2 Oct. 2014. **B.** *S. oxalissimus* sp. nov., paratype (RCMK), 10 km N of Nieuwoudtville, 12 Sep. 2009. **C.** *S. carysomus* Davies, 2005, non-type specimen (RCMK), Nieuwoudtville, 3 Sep. 2003. **D.** *S. oxalensis* sp. nov., paratype (RCMK), Nieuwoudtville, 7 Aug. 2004. **E.** *S. oxalis* sp. nov., paratype (RCMK), Gemsbokrivier-Pad, 10 Jun. 2013. **F.** *S. oxaloides* sp. nov., paratype (RCMK), 12 km NW of Nieuwoudtville, 16 Aug. 2011.



**Fig. 24.** *Scapter* sp., ♀♀, metasoma, dorsal views. **A.** *S. oxaliphilus* sp. nov., paratype (RCMK), Plateau Hantam Mts, 2 Oct. 2014. **B.** *S. oxalissimus* sp. nov., paratype (RCMK), 10 km N of Nieuwoudtville, 12 Sep. 2009. **C.** *S. carysomens* Davies, 2005, non-type specimen (RCMK), Nieuwoudtville, 3 Sep. 2003. **D.** *S. oxalensis* sp. nov., paratype (RCMK), Nieuwoudtville, 7 Aug. 2004. **E.** *S. oxalis* sp. nov., paratype (RCMK), Gemsbokrivier-Pad, 10 Jun. 2013. **F.** *S. oxaloides* sp. nov., paratype (RCMK), 12 km NW of Nieuwoudtville, 16 Aug. 2011.

Separation of the following two species is very difficult:

- 6. Apical tergal depressions slightly broader (Fig. 24D); basal area of propodeum with slightly sparser and coarser reticulation (Fig. 23D) ..... *S. oxalensis* sp. nov.
- Apical tergal depressions slightly narrower (Fig. 24F); basal area of propodeum with slightly denser and finer reticulation (Fig. 23F) ..... *S. oxaloides* sp. nov.

### Males

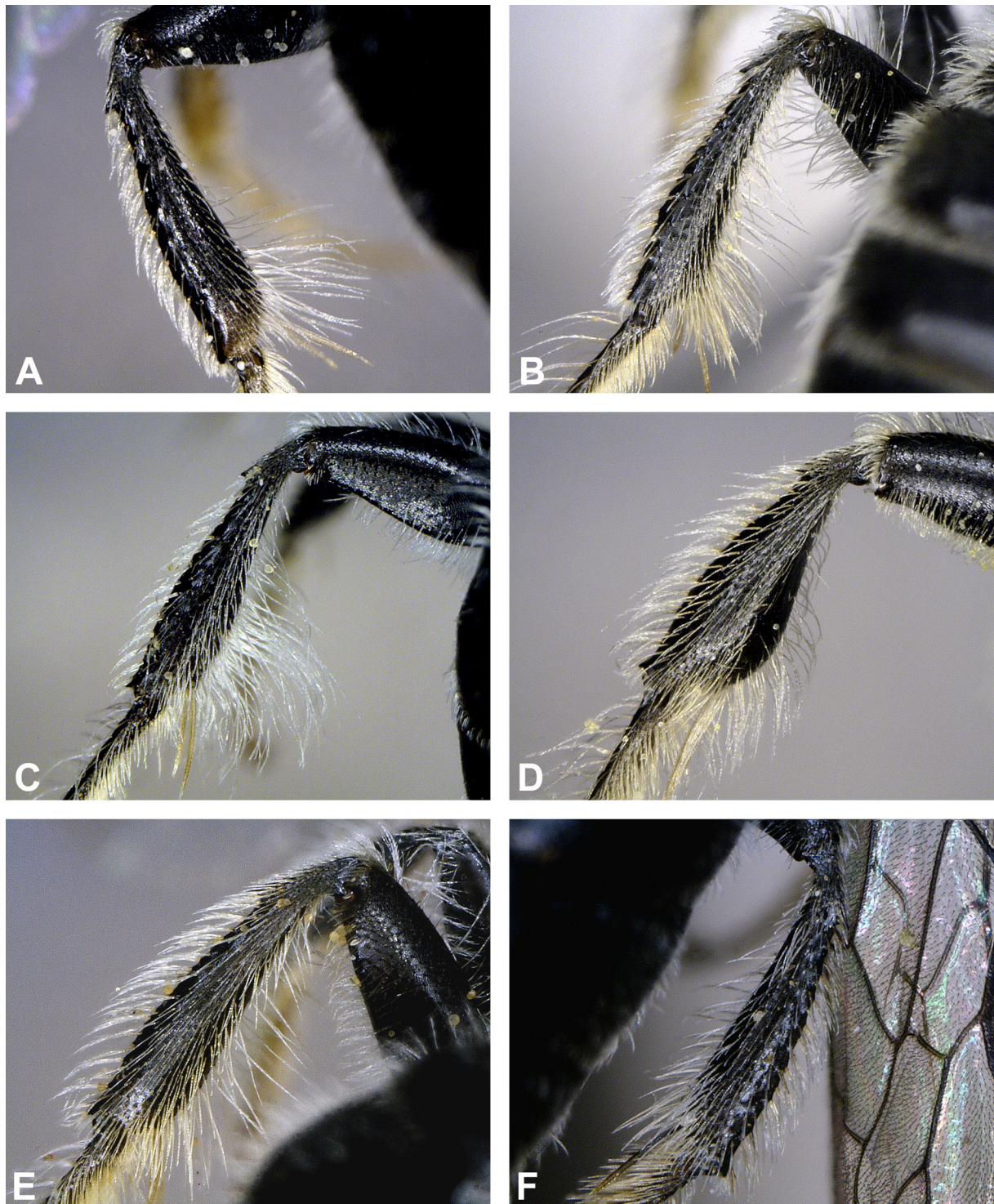
The male of *S. oxaloides* sp. nov. is unknown.

- 1. Foreleg with medio- and distitarsi completely bright yellow, basitarsus and tibia predominantly yellow ..... 2
- Foreleg completely dark brown to blackish, sometimes to small extent distitarsus and apical parts of mediotarsi orange-brown ..... 3
- 2. Tarsi of mid and hind leg completely bright yellow; hind tibia apically on inner side with hairs longer (Fig. 25A); genitalia as in Fig. 26A ..... *S. oxalicus* sp. nov.
- Tarsi of mid and hind leg predominantly dark yellowish-brown to blackish; hind tibia apically on inner side with hairs shorter (Fig. 25B); genitalia as in Fig. 26B ..... *S. carysomus* Davies, 2005
- 3. Hind tibia apicomediaally strongly swollen (Figs 9A, 18A); propodeum densely covered with thick, plumose hair of  $\pm$  equal length (Figs 27A–B, 28A, C) ..... 4
- Hind tibia apicomediaally not conspicuously swollen (Fig. 25E–F); propodeum sparsely covered with thin hair of variable length (Fig. 27C–D) ..... 5
- 4. S3–S5 with dense apical hair fringes (Fig. 28D); hind tibia apicomediaally more strongly swollen, hairs on inner side in apical half comparatively short (Fig. 25D); genitalia as in Fig. 26C ..... *S. oxalis* sp. nov.
- S3–S5 with sparse apical hair fringes (Fig. 28B); hind tibia apicomediaally less swollen, hairs on inner side in apical half comparatively long (Fig. 25C); genitalia as in Fig. 26D ..... *S. oxalensis* sp. nov.
- 5. Clypeus medially finely and sparsely punctate, shiny; basal area of propodeum without or anteriorly only with very short, indistinct longitudinal carinae (Fig. 27C); genitalia as in Fig. 26E ..... *S. oxaliphilus* sp. nov.
- Clypeus medially coarsely and denser punctate, matt; basal area of propodeum with distinct longitudinal carinae that extend over the majority of the length of the segment (Fig. 27D); genitalia as in Fig. 26F ..... *S. oxalissimus* sp. nov.

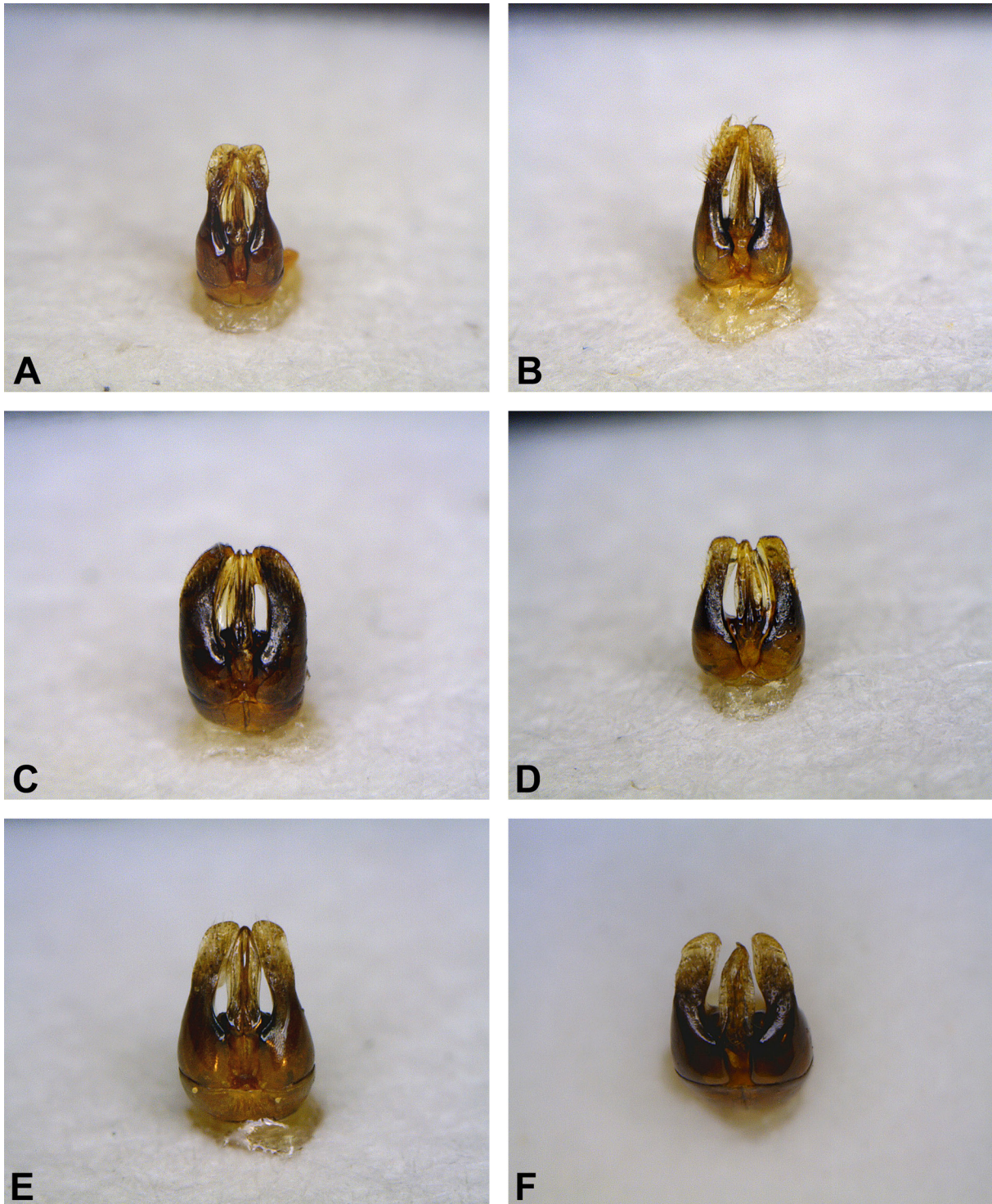
### Discussion

In the present study, six new species of the bee genus *Scapter* and the hitherto unknown female of *S. carysomus* are described, bringing the total number of taxa in the bee genus *Scapter* to 98. The *S. carysomus* species group is recognized as a new group within the genus and appears to be most closely related to the species *S. capensis*, *S. leonis* and *S. eremanthedon*, that share a protruding clypeus and supraclypeal area. However, a comprehensive phylogenetic analysis is required to confirm the systematic placement of the *S. carysomus* group.

Females of the *S. carysomus* group are highly specialized (oligolectic) flower visitors that exclusively collect pollen from yellow *Oxalis* species (Kuhlmann & Eardley 2012, pers. obs.). Oligolectic bees are not uncommon in the GCFR (Kuhlmann & Eardley 2012; for an extreme example of a monolectic species see Kuhlmann & Timmermann 2011) but the relationship with *Oxalis* might be special because it displays tristily. Tristily is highly specialized pollination syndrome with a plant species displaying

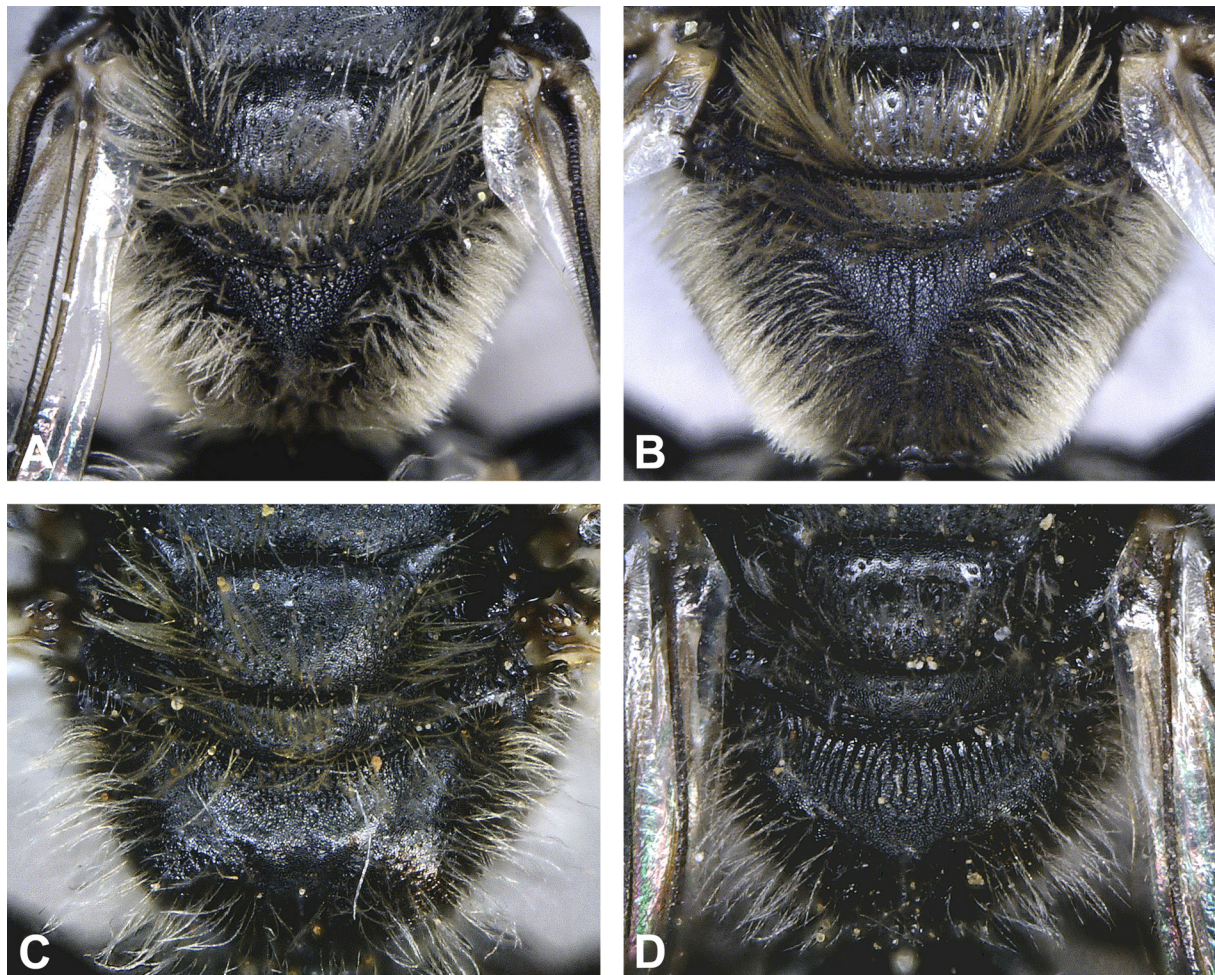


**Fig. 25.** *Scapter* sp., ♂♂, hind tibiae. **A.** *S. oxalicus* sp. nov., paratype (RCMK), Gembokrivier-Pad, 5 June. 2013. **B.** *S. carysomens* Davies, 2005, non-type specimen (RCMK), Nieuwoudtville, 6 Jun. 2013. **C.** *S. oxalensis* sp. nov., paratype (RCMK), Nieuwoudtville, 15 May 2013. **D.** *S. oxalis* sp. nov., paratype (RCMK), Gembokrivier-Pad, 5 Jun. 2013. **E.** *S. oxaliphilus* sp. nov., paratype (RCMK), Plateau Hantam Mts, 30 Aug. 2011. **F.** *S. oxalissimus* sp. nov., paratype (RCMK), Roggeveld Mts, 24 Aug. 2018.



**Fig. 26.** *Scapter* sp., ♂♂, genitalia, dorsal views. **A.** *S. oxalicus* sp. nov., paratype (RCMK), Gembokrivier-Pad, 5 June. 2013. **B.** *S. carysomus* Davies, 2005, non-type specimen (RCMK), Nieuwoudtville, 6 Jun. 2013. **C.** *S. oxalis* sp. nov., paratype (RCMK), Gembokrivier-Pad, 5 Jun. 2013. **D.** *S. oxalensis* sp. nov., paratype (RCMK), Nieuwoudtville, 15 May 2013. **E.** *S. oxaliphilus* sp. nov., paratype (RCMK), Plateau Hantam Mts, 30 Aug. 2011. **F.** *S. oxalissimus* sp. nov., paratype (RCMK), Roggeveld Mts, 24 Aug. 2018.

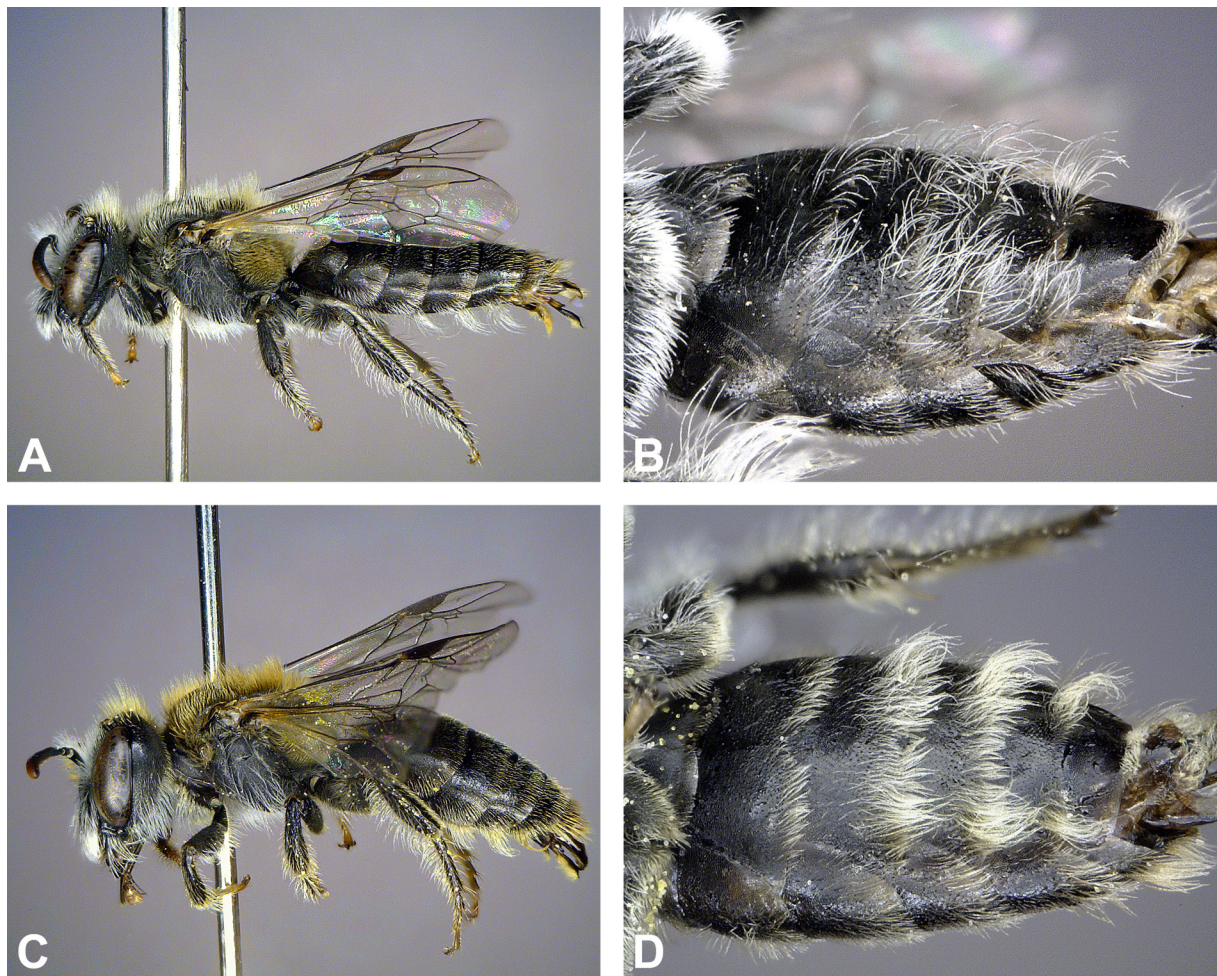
three different flower morphs (Proctor *et al.* 1996): 1) pistil short, stamens long and intermediate, 2) pistil intermediate, stamens short and long, 3) pistil long, stamens short and intermediate. For seed production this sexual system requires plants with different floral morphs (pollen transferred between flowers of the same morph result in no seed set) as well as effective pollinators that can handle these flowers. As tristily includes a significant component of self-incompatibility, out-crossing is essential for reproduction which is posing a high risk of extinction to the often small and highly localized populations of many species of *Oxalis* (Zietsman *et al.* 2008; Turketti *et al.* 2012). Thus, it is essential to get a better understanding of plant-pollinator interactions and the role the bees of the *S. carysomensis* group might play in the reproduction and diversification of *Oxalis* as one of the most prominent plant genera in the GCFR. This also applies to the unusually long period of adult activity of about half a year throughout winter of at least some of the species of this group, while others are apparently only active in autumn. Interestingly, species of *Oxalis* show a similar pattern, with some flowering continuously from autumn to spring (e.g., *O. pes-caprae*, *O. obtusa* Jacq.), while others flower exclusively in autumn (e.g. *O. luteola* Jacq., *O. flava* L.) (Manning & Goldblatt 2002). It is not known whether there is a relationship between the flowering period of species of *Oxalis* and visits by differently seasonally active species of the *S. carysomensis* group.



**Fig. 27.** *Scapter* sp., ♂♂, scutellum, metanotum and propodeum, dorsal views. **A.** *S. oxalensis* sp. nov., paratype (RCMK), Nieuwoudtville, 15 May 2013. **B.** *S. oxalis* sp. nov., paratype (RCMK), Gembokrivier-Pad, 5 Jun. 2013. **C.** *S. oxaliphilus* sp. nov., paratype (RCMK), Plateau Hantam Mts, 30 Aug. 2011. **D.** *S. oxalissimus* sp. nov., paratype (RCMK), Roggeveld Mts, 24 Aug. 2018.

Due to a lack of sufficient data, it is also unclear whether individual bees actually survive for many months. However, based on own observations there are indications that the individual lifespan might extend over a longer period of time due to the often unfavourable weather conditions in winter that limit the individual daily activity period for weeks to sometimes less than an hour per day (pers. obs.). In species like *C. oxalensis* and *S. oxalicus*, that were collected over many months (but in different years due to short annual collection stays on site), it is noticeable that males almost only occur in autumn/winter, while females are rare during this time, but dominate in spring. There is evidence of similar phenological patterns in other solitary bees, such as *C. carolinae* Zabel & Kuhlmann, 2023, *C. fuscitergus* Zabel & Kuhlmann, 2023 and *C. ruschia* Zabel & Kuhlmann, 2023 (Zabel & Kuhlmann 2023). Presumably, it is a widespread phenomenon.

The present example of a group of *Scapter* bees specialized on *Oxalis* flowers nicely illustrates that wild bees are generally underexplored in the GCFR, resulting in the repeated discovery of large numbers of new species (Kuhlmann 2009; Melin & Colville 2019). This can be attributed to a variety of reasons: most bee species are inconspicuous and many areas in the GCFR are large, remote and inhospitable, making the discovery of the often highly localized and small bee populations difficult and laborious. The infrequent rainfall particularly in Namaqualand, a hotspot of bee diversity (Kuhlmann 2009; Melin



**Fig. 28.** A–B. *Scapter oxalensis* sp. nov., paratype, ♂ (RCMK), Nieuwoudtville, 15 May 2013. C–D. *Scapter oxalis* sp. nov., paratype, ♂ (RCMK), Gemsbokrivier-Pad, 5 Jun. 2013. A, C. Lateral views. B, D. Metasoma, ventral views.

*et al.* 2024), leads to sporadic appearance and usually (but not always as shown by some of these species of *Scapter*) short flight periods that sometimes last only two weeks, particularly during warm weather in later active (spring to early summer, e.g., euryglossiform *Scapter*) floral specialist among wild bees (Kuhlmann & Eardley 2012). Given the frequent lack of data on host plant specialization of most wild bees and the unusually high levels of endemism in the GCFR (Kuhlmann 2005, 2009), it is reasonable to assume that many more species await discovery, particularly in neglected regions and seasons. This points to the urgent need for a better documentation of the unique and rich endemic bee fauna in the GCFR, which is particularly affected by climate change (Kuhlmann *et al.* 2012).

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