

Description of a New Solifuge *Melanoblossia ansie* sp. n. (Solifugae, Melanoblossiidae) with Notes on the Setiform Flagellar Complex of Melanoblossiinae Roewer, 1933

Authors: Bird, Tharina L., and Wharton, Robert A.

Source: African Invertebrates, 56(2) : 515-525

Published By: KwaZulu-Natal Museum

URL: <https://doi.org/10.5733/afin.056.0218>

BioOne Complete (complete.BioOne.org) is a full-text database of 200 subscribed and open-access titles in the biological, ecological, and environmental sciences published by nonprofit societies, associations, museums, institutions, and presses.

Your use of this PDF, the BioOne Complete website, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Complete content is strictly limited to personal, educational, and non - commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

Description of a new solifuge *Melanoblossia ansie* sp. n. (Solifugae, Melanoblossiidae) with notes on the setiform flagellar complex of Melanoblossiinae Roewer, 1933

Tharina L. Bird^{1*} and Robert A. Wharton²

¹National Museum of Namibia, P.O. Box 1203, Windhoek, Namibia; tharinab@gmail.com

²Department of Entomology, Texas A&M University, College Station, TX 77843 USA; rawbaw2@tamu.edu

*Corresponding author

ABSTRACT

Melanoblossiidae Roewer, 1933 is a small family of solifuges (Solifugae, Arachnida), comprising two subfamilies: Melanoblossiinae Roewer, 1933 and the monotypic Dinorhaxinae Roewer, 1933. The Melanoblossiinae consists of 15 currently recognised species, restricted to southern Africa. A new species, *Melanoblossia ansie* sp. n., placed in the Melanoblossiinae, is described from Namibia. This brings to five the number of species in *Melanoblossia* Purcell, 1903, and is the first record of *Melanoblossia* from Namibia. The flagellum and principal seta of the setiform flagellar complex characteristic of Melanoblossiinae are discussed.

KEY WORDS: Afrotropical Region, Namibia, *Melanoblossia*, solifuges, flagellum, new species, principal seta, setiform flagellar complex.

INTRODUCTION

The arachnid order Solifugae, commonly referred to as solifuges or sunspiders, currently comprises 12 extant families and 1105 described species (Bird *et al.* 2015). Melanoblossiidae Roewer, 1933 is a small family restricted to southern Africa, with the exception of the monotypic *Dinorhax* Simon, 1879 from Indonesia and Vietnam.

Melanoblossiinae Roewer, 1933 tend to be small in body size (Fig. 1A, B) and all species appear to be diurnal. They have a characteristic habitus with the prosoma of equal width from the broad posterior margin of the propeltidium (Figs 1C, 2A) to the abdomen. They are characterised by the anterolateral propeltidial lobe partially fused to the propeltidium (Fig. 3C), fleshy ctenidia on the post-genital sternite (third opisthosomal segment) of males (Figs 1D, E, 2B), absence of leg I tarsal claws, legs II–III telotarsi with one tarsomere (Fig. 5B), and leg IV with 1–2 tarsomeres. Except for *Microblossia* Roewer, 1941, described from a single specimen, the setiform flagellar complex (*sfc*) of melanoblossiines are unique (Fig. 4). It consists of several modified setae arranged in a compact cluster forming a well-defined unit, and situated on the prolateral side of the chelicera in a flagellar complex depression (Figs 3A, 4). The *sfc* is protected by a convex ventral enlargement of the fixed (dorsal) finger, the so-called medioventral excrescence (MVE) (Fig. 3B). The latter may be weak or pronounced. The general shape of the *sfc* formed by the position and directionality of the setae within the *sfc* has been used to distinguish between *Lawrencega* Roewer, 1933 and *Melanoblossia* Purcell, 1903 (e.g. Wharton 1981). For a better evaluation of the generic placement of species that seem to have *sfc* characteristics overlapping with both *Lawrencega* and *Melanoblossia*, a breakdown of the arrangement of individual setae within the complex is, however, necessary.

Melanoblossiinae currently comprises 15 species and five genera. Four species are described in *Melanoblossia*, namely *M. braunsi* Purcell, 1903, *M. globiceps* Purcell, 1903, *M. namaquensis* Lawrence, 1935, and *M. tridentata* Lawrence, 1935. The purpose of this paper is to describe an additional species of *Melanoblossia* with unique cheliceral morphology. Its *sfc*, which has characteristics of both *Lawrencega* and *Melanoblossia*, is discussed in the context of putative setal homologs within the *sfc* of the two genera.

MATERIAL AND METHODS

Material examined is deposited in the following collections: American Museum of Natural History, New York, USA (AMNH), Musée royal de l'Afrique centrale, Tervuren, Belgium (MRAC), National Collection of Arachnida, Plant Protection Research Institute, Pretoria, South Africa (NCA), National Museum of Namibia, Windhoek, Namibia (NMNW), Senckenberg Museum, Frankfurt, Germany (SMFD), and the Iziko South African Museum, Cape Town, South Africa (SAMC, collection code: SAM).

Specimens were examined using a Nikon SMZ 1500 stereoscope (AMNH) and a Leica EZ40 digital stereoscope. Images were taken with a Nikon D300 camera or a Zeiss digital-imaging system, and focal planes of single image stacks combined with either CombineZM software or Helicon focus 5.3. Adobe Photoshop CS6 or Jasc Paint Shop Pro were used for editing images. For scanning electron microscopy (SEM), specimens were critical-point dried and sputter coated with gold-palladium (40/60) prior to SEM with a JEOL 5600 at Lund University, Sweden.

All measurements are given in millimetres. Measurements were made using an ocular micrometer on a Wild microscope set on 6× magnification for total body length, and either on 25× or 50× magnification for all other measurements. Measurements of the propeltidium and body were done in dorsal view. Total body length was measured from the tip of the fixed (dorsal) finger to the posterior margin of the opisthosoma, propeltidium length from its anterior to posterior margin, and propeltidium width between the lateral sides of the propeltidium visible in dorsal view. Length of meso- and metapeltidia and ocular tubercle indicates anterior-posterior axis, and width indicates axis between lateral sides of body. Cheliceral length (CL; horizontal axis from the tip of the chelicera to the anterior margin of the anterolateral propeltidial lobe) and cheliceral height (CH; vertical axis across the widest part of the cheliceral manus) were measured in retrolateral view; cheliceral width (CW; horizontal axis over the widest part of the manus) was measured in dorsal view. Total leg and pedipalp measurements are the sum of all segments measured, and exclude claws, when present.

Cheliceral terminology follows Bird *et al.* (2015), including acronyms and their formatting, i.e. setal acronyms italicised and lower case, dentition and cuticular outgrowths upper case, and all other acronyms lower case. Leg segmentation interpretation and terminology follows Shultz (1989). Shultz (1989) did not discuss pedipalp segment homology, and historical interpretation of pedipalp segments (e.g. Roewer 1932: 63; Wharton 1981) are followed here, but exchanging basi- and telotarsus for metatarsus and tarsus respectively in line with leg terminology as used by Shultz (1989). Rostrum terminology follows Snodgrass (1948), as adapted by Dunlop (2000), prosomal terminology follows Wharton (1981), and palpal setation follows Cushing and Castro (2012). “Spiniform setae” refers to rigid, socketed macrosetae (historically often referred to as “spine” or “spine-like setae”; see also Lamoral 1973), and “setae”

refers to setiform, i.e. flexible, socketed macrosetae. Telotarsi spiniform setae on telotarsi II–IV recorded proximal to distal; dash (/) indicates separation between tarsomeres.

Abbreviations used in text: CH – cheliceral height; CL – cheliceral length; CW – cheliceral width; FD – fixed finger, distal tooth; FM – fixed finger, medial tooth; FP – fixed finger, proximal tooth; FSM – fixed finger, submedial tooth; MM – movable finger, medial tooth; MP – movable finger, proximal tooth; MSM – movable finger, submedial tooth/teeth; MVE – medioventral excrescence; PF – profundal teeth; PFM – profundal medial tooth; PFP – profundal proximal tooth; PFSP – profundal subproximal tooth; *pvd* – proventral distal setae; RF – retrofondal teeth; RFM – retrofondal medial tooth; RFP – retrofondal proximal tooth; RFSM – retrofondal submedial tooth; RFSP – retrofondal subproximal tooth; *sfc* – setiform flagellar complex; STF – subterminal flange.

TAXONOMY

Family Melanoblossiidae Roewer, 1933
Subfamily Melanoblossiinae Roewer, 1933
Genus *Melanoblossia* Purcell, 1903

Melanoblossia ansie sp. n.

Figs 1–5

Melanoblossia sp. Bird *et al.* 2015: 56, 81, 103, 122, 139, 188, figs 6B, 10B, 26, plates 36I, 154G, H, 157.

Etymology: The species is named in honour of distinguished South African arachnologist, Dr Ansie Dippenaar-Schoeman, for her contribution to arachnology in Africa, and mentor to various students in this field, including to the first author in the present study. Noun (name) in apposition.

Affinities: This species shows closest affinities with *Melanoblossia*. It is separated from *Daesiella* Hewitt, 1934, *Unguiblossia* Roewer, 1941, and most *Lawrencega* by the presence of two tarsomeres on leg IV. Males are distinguished from *Microblossia* by the presence of a distinct type C setiform flagellar complex (*type C sfc*) (Bird *et al.* 2015), and from *Lawrencega* by the presence of a prominent *sfc principal seta* (Fig. 4), i.e. the dorsalmost seta in the flagellar complex, which is long, strongly differentiated and dorsodistally directed, similar to other species of *Melanoblossia* (Fig. 4), compared to the short, weakly differentiated and more distally directed *sfc principal seta* in *Lawrencega*.

Diagnosis: Males differ from all other known melanoblossiine species by the elaborate modifications distally on the fixed (dorsal) finger, comprising a prominent, curved retrolateral flange and a strong ventral dip in the dorsal margin of the finger (Figs 3, 4A). The flagellar homolog (as defined by Bird *et al.* 2015) is distinct and clearly visible in prolateral view, similar to most *Lawrencega* species but different from other known *Melanoblossia* species, which have this modified seta more hidden behind the proximal row of setae in the *sfc*. Conversely, the *sfc principal seta* is prominent in this species, similar to other known *Melanoblossia* species but different from that of *Lawrencega* species (Fig. 4).

Description:

Male.

Habitus. Division between prosoma and opisthosoma broad; opisthosoma tapering posteriorly (Fig. 1A, B).

Coloration. Propeltidium and chelicerae dark yellowish brown. Ocular tubercle black. Opisthosomal tergites reddish brown with dark purplish bands on posterior margins, which are wider in anterior four segments that are visible in dorsal view. Lateral opisthosoma purple with whitish longitudinal folds in the intersegmental membrane. Opisthosomal sternites light cream brown, changing to purplish posteriorly. Anal segment completely reddish brown. Legs and pedipalps yellowish brown dorsally, similar to propeltidium, cream brown ventrally, similar to opisthosomal sternites; coxae, trochanters and genital sternite lighter cream brown (Fig. 1A, B).

Prosoma. Median longitudinal furrow of propeltidium incomplete (Figs 1C, 3D) and superficial (Fig. 2A); anterolateral propeltidial lobes partially fused to propeltidium; lateral eyespots long and narrow, hidden from lateral view on ventral side of anterolateral propeltidial lobe along margin of lobe (Fig. 3C, arrow indicates position); median plagula narrower than ocular tubercle (Fig. 1C); mesopeltidium and metapeltidium wider than long, mesopeltidium boatshaped, metapeltidium rectangular (Fig. 2A); coxae densely covered with bifid setae. Widely spaced reddish brown, long, bifid setae on propeltidium and retrodorsally on the chelicera, on propeltidium more numerous in anterior third (Fig. 3B, C), interspersed with shorter, less pigmented setae extending across the surface of chelicera and propeltidium.

Opisthosoma. Tergites and pleurites sparsely covered in relatively long, bifid, transparent setae. Similar setae on sternites, but slightly longer and slightly more dense. Fleishy ctenidia on first post-genital sternite (third opisthosomal segment), 3–4 largest ones on each side reddish brown, interspersed with 4–5 slightly smaller cream-coloured ctenidia. Dense patch of slightly thickened setae on fourth post-genital sternite (sixth opisthosomal segment); less distinct in some specimens.

Chelicera. Shape: Fixed finger sculptured distally (Fig. 3), with prominent retrolateral flange and strong ventral dip in dorsal margin of finger (Fig. 4A, arrow); fixed finger medioventral excrescence (MVE) pronounced (Fig. 3B); gnathal edge (=cutting edge) strongly retrolaterally compressed; subterminal flange (STF) present on fixed finger mucron, situated directly distal to fixed finger distal (FD) tooth, if present; STF is a prominent toothlike flange originating distally on the gnathal edge and proximally merging into the retrolateral side of the finger; movable finger gradually curving dorsally, mucron approximately one third length of finger. Dentition (Fig. 4A): Movable finger dentition with well developed proximal tooth (MP) and slightly larger medial tooth (MM; most distal tooth on finger) separated by one (Fig. 3B), sometimes two (Fig. 4A) secondary teeth (movable finger submedial teeth, MSM) increasing in size proximal to distal if two MSM. Fixed finger median series dentition reduced, with small but distinct proximal tooth (FP), and smaller than FP but distinct secondary tooth (fixed finger submedial tooth, FSM) directly distal to FP; other primary teeth (fixed finger medial, FM; fixed finger distal, FD) absent, to present in highly vestigial form; if present, barely visible as a slight, often darkened short (FM) or elongated (FD) protuberances. Fixed finger fonal teeth well developed in prolateral row with distinct, tall and narrow profondal medial (PFM) and profondal proximal (PFP) tooth, both larger than FP; not possible to examine PF row in holotype for risk of damage, but profondal subdistal (PFSD) tooth present in another specimen examined. Retrofodal (RF) row with four teeth, distalmost tooth in fixed finger retrofodal (RF) row (putative retrofodal medial tooth, RFM) distinct, approximately half the size of FP; rest of RF row teeth small and

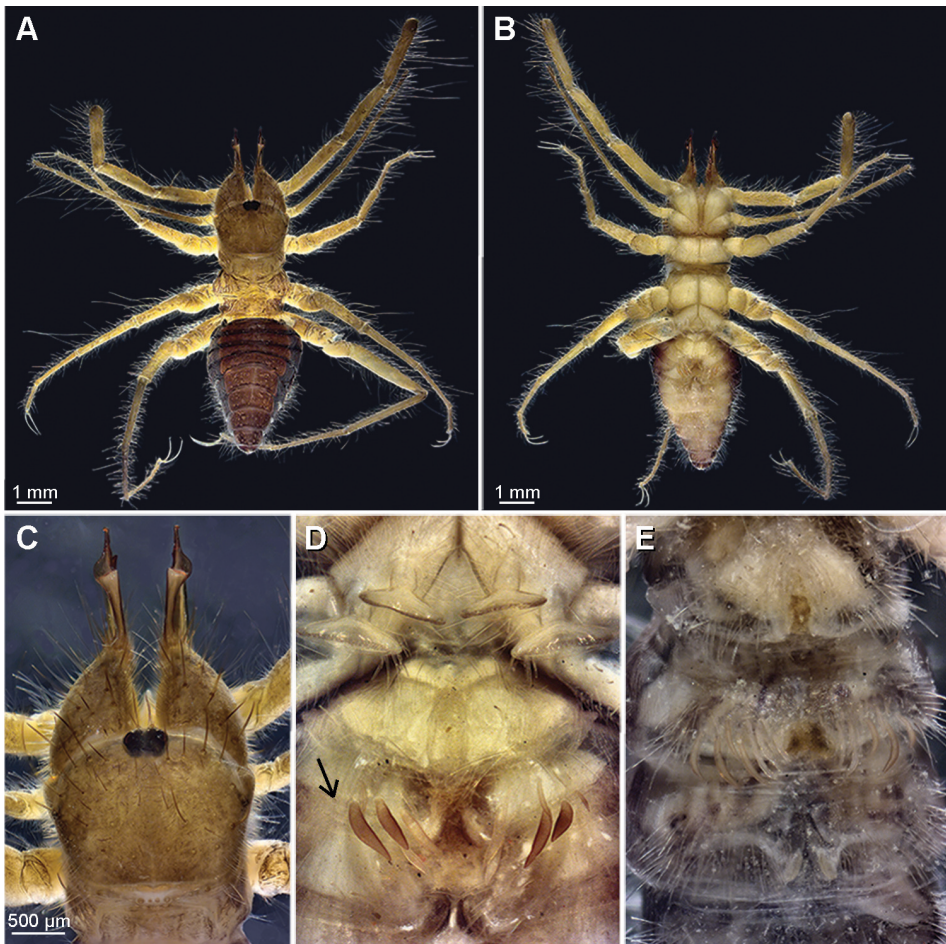


Fig. 1. *Melanoblossia ansie* sp. n., (A–D) ♂ holotype (NMNW 14227), (E) ♂ paratype (SAM-ENW-C006956): (A, B) habitus in (A) dorsal and (B) ventral view; (C) propeltidium and chelicerae in dorsal view; (D, E) anterior opisthosomal sternites in ventral view, indicating (D) malleoli and (D, E) ctenidia. Arrow indicates socket of ctenidium broken off.

insignificant, barely visible, with second most proximal tooth (retrofondal proximal tooth, RFP) slightly larger than the one distal (profondal submedial, PFSM) and proximal (profondal subproximal, PFSP) to it.

Flagellar complex. Setiform flagellar complex (*sfc*), type C (see Bird *et al.* 2015). Well defined cluster of modified *pvd* setae (Fig. 4). Two rows of setae emerge from slight linear elevation into a broad flagellar complex depression (Fig. 4C). Distal row comprises three setae with limited plumosity; distalmost seta in row is the hypothesised setiform flagellum homolog, which is laterally compressed and smooth with limited plumosity ventrally and distally. Second (proximal) row of setae in *sfc* uniformly and strongly plumose throughout, curve dorsally along margin of MVE, except for *sfc principal seta* (dorsalmost setae in the proximal row of *sfc*), which is strongly plumose, especially at base, resulting in a general triangular-shaped seta.

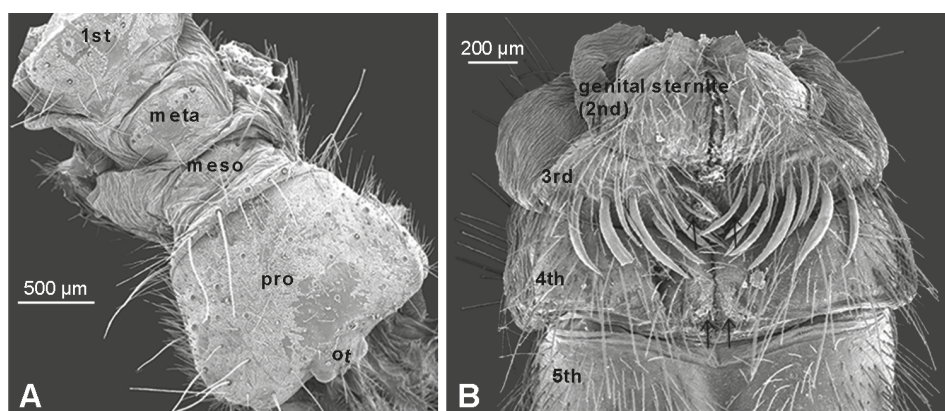


Fig. 2. *Melanoblossia ansie* sp. n., ♂ (NMNW 13396): (A) prosomal and first opisthosomal tergites in dorsal view; (B) anterior opisthosomal sternites in ventral view, indicating ctenidia on first post-genital sternite (third opisthosomal sternite). Arrows indicate paired tracheal spiracles on third and fourth opisthosomal sternites. Abbreviations: ot – ocular tubercle; meso – mesopeltidium; meta – metapeltidium; pro – propeltidium; 1st–5th – opisthosomal segment number.

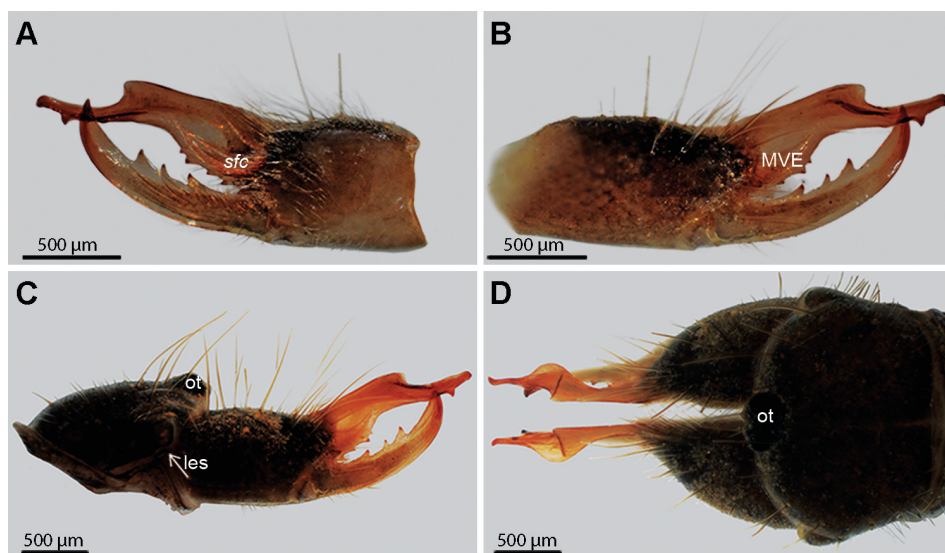


Fig. 3. *Melanoblossia ansie* sp. n., ♂ (AMNH [LP9857]), chelicera: (A, B) dextral chelicera in (A) prolateral and (B) retrolateral view; (C, D) chelicerae and propeltidium in (C) lateral and (D) dorsal view, indicating attachment of chelicera to propeltidium in the anterolateral propeltidial lobe. Abbreviations: les – lateral eyespot; MVE – medioventral excrescence; ot – ocular tubercle; sfc – setiform flagellar complex.

Rostrum. Approximately 1.5× longer than wide; dorsal margin of epistomo-labral plate weakly sinuous; interlocked anastomosed setae form rigid sieve; median setae in sieve shortest, and dorsal setae longer than ventral setae. Lateral lip flagella distinctly but not densely plumose, one situated on each lip dorsally at base of lip.

Pedipalp. Telotarsus immovably fixed to basitarsus, together uniformly cylindrical throughout (Fig. 5C); tibia curved proventrally; femur more or less cylindrical (Fig. 1A, B). Spiniform setae absent. Flexible apparent bifid setae of various lengths on all segments, those situated proventrally longer and more ridged; few very long hairlike setae, longest ones medially on dorsal side of tarsus (basitarsus + telotarsus) and tibia. Dorsal to retrolateral femur with dense cover of short, transparent setae. Clubbed seta medioventrally on telotarsus (Fig. 5E, F).

Leg I. Patella, tibia and basitarsus cylindrical throughout, telotarsus slightly broadening towards apex. Concentration of bifid setae at apex. Narrow prodorsal field of tarsal pores (Fig. 5A). Slit sensilla at least on telotarsus (Fig. 5A, arrow). Trochanter, femur and patella covered with short, transparent setae.

Walking legs. Claws long in all walking legs, longer than telotarsus in legs II and III. Second (distal) segment of claw approximately eighth the length of first (proximal) claw segment. Trochanter, femur and patella covered with short, transparent setae (Fig. 1A, B). Legs II and III: Telotarsus not divided into tarsomeres; spiniform pattern of telotarsus 2.2.2.1, with four setae on proventral and three on retroventral side (Fig. 5B). Leg IV: Telotarsus divided into two tarsomeres; spiniform pattern of tarsomeres 2.2/2.2.2.

Measurements (from holotype; in millimetres). Total length 9.27; propeltidium length 1.47, width 1.96; ocular tubercle length 0.20, width 0.39; eye (ocellus) diameter 0.14; CL 2.42; CH 0.75, CW 0.75. Appendages (segment length): Palp total length 5.84, femur 1.95, tibia 1.79, basitarsus + telotarsus 2.10; leg I total length 5.84, patella 1.75, tibia 1.60, basitarsus 1.00, telotarsus 0.74; leg II total length 4.92, patella 1.44, tibia 1.17, basitarsus 1.10, telotarsus 0.61, claw 0.73 (distal claw segment 0.10); leg IV total length 9.95, patella 2.73, tibia 2.38, basitarsus 2.06, telotarsus 1.39, claw 0.79 (distal claw segment 0.09).

Female. Unknown.

Variation: Twelve males (24 chelicerae) were examined for variation in dentition. On the movable finger MP and MM present in all specimens, single MSM present in 14 chelicerae, second MSM, smaller than and situated proximal to the first MSM, present in 10 chelicerae. Large variation in size in the second (proximal) MSM, from denticle-sized to only slightly smaller than distal MSM. The FP and FSM were present with little variation in size and shape, in all chelicerae, FM was absent in 14 chelicerae and present as a slight, generally darkened protuberance in all other specimens. Except for the FD, which was difficult to evaluate in chelicerae where the jaws were closed, bilateral asymmetry in absence/presence of teeth was found only in three specimens. In one a retrofendal tooth was absent on the left chelicera, and in the other two a second movable finger submedial (MSM) tooth was present on the left, but not on the right chelicera. One fixed finger was deformed towards the apex, resulting in the loss of the STF. Ctenidia variable in number, but difficult to evaluate as these seem to easily break off.

Holotype ♂: NAMIBIA: *Lüderitz District*: Diamond Area: Sperrgebiet National Park: Tsaukhaib Mountain, old transport route (26°42'58.0"S 15°40'02.6"E), 906 m, 24–30.viii.2006, EduVentures 9 Expedition. Deposited in the National Museum of Namibia, Windhoek (NMNW 14227).

Paratypes: Same collecting data as holotype: 1♂ (MRAC 244095); 1♂ (NCA 2015/3479); 1♂ (NMNW 13394); 1♂ (NMNW 13395); 3♂ (NMNW 13396); 3♂ (NMNW 14179); 1♂ (SAM-ENW-C006956); 1♂ (SMFD).

Other material examined: Same collecting data as types: 1♂ (AMNH [LP 9857]).

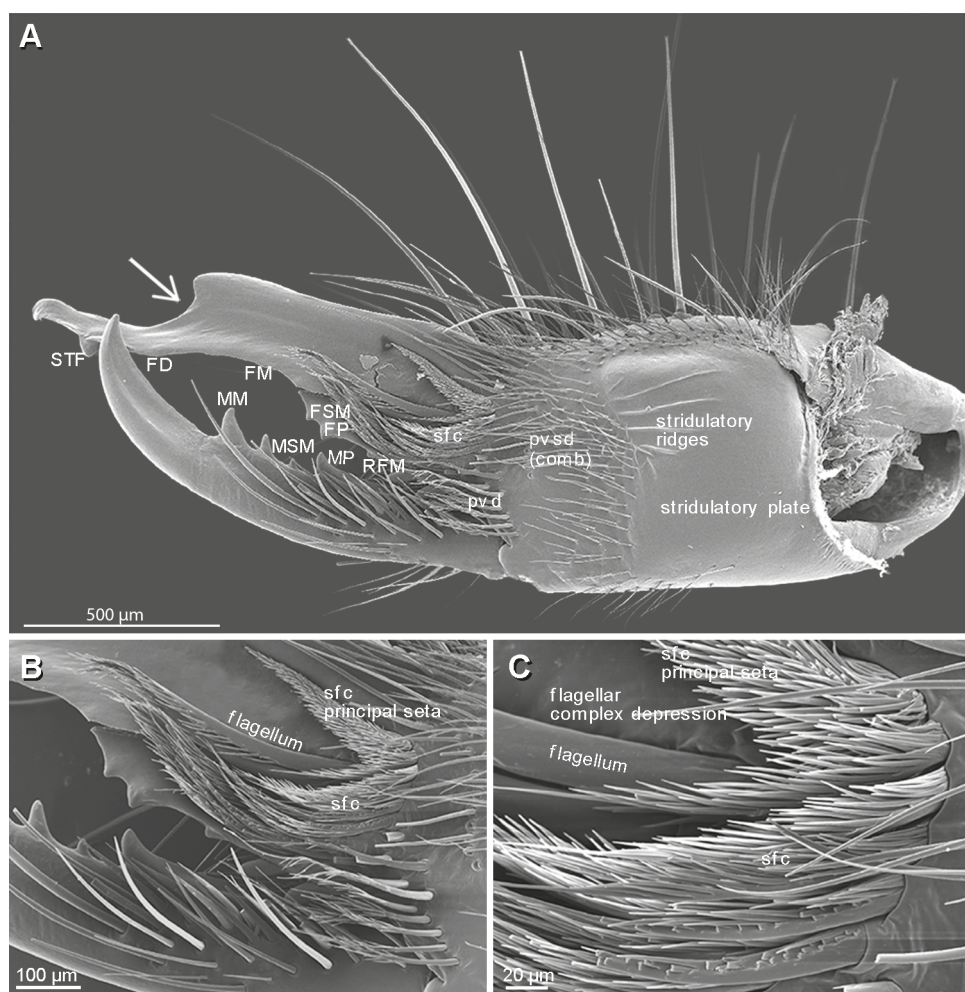


Fig. 4. *Melanoblossia ansie* sp. n., ♂ (NMNW 13396), dextral chelicera and setiform flagellar complex (*sfc*) in prolateral view, indicating (A) dentition and (B) setiform flagellar complex in full view and (C) close-up of origin of distal row of laterally compressed, weakly plumose, and proximal row of densely plumose setae, from Bird *et al.* (2015: 91, fig. 26). Arrow indicates ventral dip in dorsal margin of fixed (dorsal) finger. Abbreviations: FD – fixed finger, distal tooth; FM – fixed finger, medial tooth; FP – fixed finger, proximal tooth; FSM – fixed finger, submedial tooth; MM – movable finger, medial tooth; MP – movable finger, proximal tooth; MSM – movable finger, submedial tooth; *pvd* – proventral distal setae; *pvsd* – proventral subdistal setae; RFM – retrofendal medial tooth; *sfc* – setiform flagellar complex; STF – subterminal flange.

Distribution: Known only from the type locality at the foot of the Tsaukhaib Mountain in the Sperrgebiet National Park, situated in the southern Namib Desert in the southwestern corner of Namibia.

Biology: The type locality of *Melanoblossia ansie* sp. n. is classified as a succulent steppe vegetation zone, which falls within the Succulent Karoo biome (Irish 1994; Mendelsohn *et al.* 2002). *Melanoblossia ansie* sp. n. was only collected

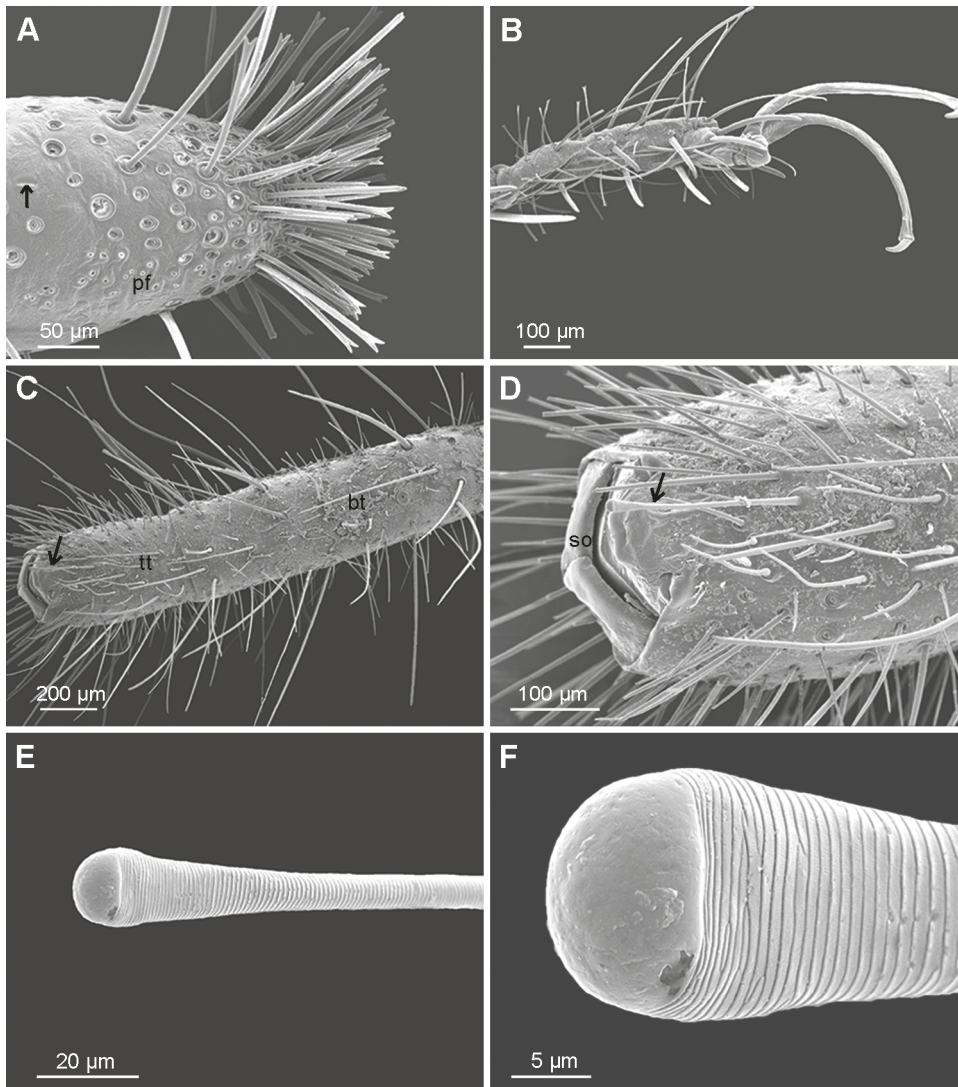


Fig. 5. *Melanoblossia ansie* sp. n., ♂ (NMNW 13396), appendages: (A) leg I telotarsus, indicating cluster of setae at apex and longitudinal pore field. Short arrow indicates slit sensillum; (B) leg II telotarsus in retroventral view, indicating paired ventral spiniform setae, four on proventral and three on retroventral side, and tarsal claws; (C–F) pedipalp, ventral view, indicating (C) tarsus (basitarsus plus telotarsus), (D) distal close-up of telotarsus with suctorial organ, and (E, F) close-up of clubbed seta ventrodiscal on palpal telotarsus. Arrows indicate clubbed seta ventrodiscal on palpal telotarsus. Abbreviations: bt – basitarsus; pf – pore field; so – suctorial organ; tt – telotarsus.

during one pittrap cycle at the beginning of a three-year long pittrap survey of the Sperrgebiet National Park, during a year of particularly high rainfall. Soon after this pittrap cycle, pittraps moved approximately 50 metres further, and *M. ansie* sp. n. was not collected again. Targeted collection attempts later for this species did not deliver any specimens. *Melanoblossia ansie* sp. n. seems to have a restricted range

of microhabitat and seasonal preference. These species are probably restricted to sandy habitats, as indicated by their long claws, and are likely diurnal, similar to other melanoblossiids, as indicated by their dark pigmentation.

DISCUSSION

The setiform flagellar complex (*sfc*) of Melanoblossiinae (Fig. 4) seems to be derived from the series of plumose setae, termed proventral distal (*pvd*) setae by Bird *et al.* (2015). The *pvd* setae are situated in two to three more or less parallel rows lining the ventral side of the fixed finger, and remain unmodified in females and juveniles, while one or more of the distally situated *pvd* setae, depending on the taxon, are modified into the flagellum and flagellar complex of males. In males, the proximal *pvd* setae (ventrally in the modified chelicera of male melanoblossiines) remain unmodified, usually plumose, while the distal *pvd* setae (dorsally in the modified chelicera of male melanoblossiines) are modified into a flagellar complex, which remains setiform (i.e. the setiform flagellar complex, or *sfc*) in melanoblossiines (Fig. 4).

Bird *et al.* (2015) defined what they termed the primary flagellum as a modified distalmost *pvd* seta. In *M. ansie* sp. n., a seta with limited plumosity that is slightly longer than the remainder of the *sfc* seta is the distalmost seta in a row of approximately three setae inserted below the strongly plumose setae that are situated proximally within the *sfc* (Fig. 4). This seta is hypothesised to be homologous to the primary flagellum of the order (see Bird *et al.* 2015). Although not as distinctly differentiated from the remainder of the setae in its row, it remains a prominent seta, and is thus termed the flagellum. In Melanoblossiinae the *pvd* setae seemed to have shifted significantly to form the *sfc*. This would explain the position of the flagellum in *M. ansie*, which is not positioned distally in the *sfc*, but nonetheless distally in the distalmost row of setae, i.e. what seems to be the most ventral row of *pvd* setae on the fixed finger of the unmodified chelicera of juveniles. In at least some *Lawrencega* investigated, e.g. *L. longitarsus* Lawrence, 1967 and *L. procera* Wharton, 1981, a seta similar in form and position but even more distinct, i.e. the flagellum, can be observed.

A second, pronounced plumose seta situated dorsally in the *sfc* (Fig. 4) is a homolog of the seta traditionally interpreted as the flagellum in *Melanoblossia* (Purcell 1903a: 6). This seta, termed the *sfc principal seta* (*seta principalis* of the flagellar complex of Roewer 1941; dorsal-most plumose seta of Wharton 1981), is weakly differentiated in all known *Lawrencega*, but distinctly differentiated within the *sfc* in all *Melanoblossia*, including *Melanoblossia ansie* sp. n.

The curved ventral setae of the *sfc* (see Wharton 1981, key to Melanoblossiinae genera) and, possibly, the relatively obvious setiform flagellum, seem to indicate affinities of *M. ansie* with *Lawrencega*. Two tarsomeres on leg IV, and a well differentiated, dorsodistally directed of the *sfc principal seta*, however, places *Melanoblossia ansie* sp. n. within *Melanoblossia*. *Melanoblossia ansie* sp. n. might be an intermediate form between *Lawrencega* and *Melanoblossia*.

ACKNOWLEDGEMENTS

We thank Lorenzo Prendini for access to the AMNH collection and use of AMNH facilities; Steve Thurston (AMNH), Igor Muratov, and Tessa Finger for assistance with figures; Namdeb and the Ministry of Environment and Tourism (MET) in Namibia for allowing extensive collecting in the Sperrgebiet National

Park, and providing logistical support; and Chris Bird, Telané Greyling, Constantin Harrer, Benson Muramba, Holger Vollbrecht and Ingrid Wiesel for assistance with servicing traps in the Sperrgebiet. We are greatly indebted to Eric Warrant, Thomas Nørgaard, and Ola Gustafsson of the Vision Study Group at Lund University for assistance with and use of their SEM facilities. We thank Lorenzo Prendini and Andrea González Reyes for valuable comments on the manuscript, and Charles Haddad for facilitating this publication. This research was supported in part by National Science Foundation grants DEB-0640245 to Paula Cushing and DEB-0640219 to Lorenzo Prendini for the “Global Survey and Inventory of Solifugae”, the Vision Study Group (Lund University), and the JRS Biodiversity Foundation. Specimens were collected as part of the Southern Namib Arachnid Project (SNAP) survey jointly conducted by the NMNW and EduVentures.

REFERENCES

- BIRD, T.L., WHARTON, R.A. & PRENDINI, L. 2015. Cheliceral morphology in Solifugae (Arachnida): primary homology, terminology, and character survey. *Bulletin of the American Museum of Natural History* **394**: 1–355.
- CUSHING, P.E. & CASTRO, P. 2012. Preliminary survey of the setal and sensory structures on the pedipalps of camel spiders (Arachnida: Solifugae). *Journal of Arachnology* **40**: 123–127.
- DUNLOP, J.A. 2000. The epistomo-labral plate and lateral lips in solifuges, pseudoscorpions and mites. *Ekológia (Bratislava)* **19**: 67–78.
- IRISH, J. 1994. The biomes of Namibia, as determined by objective categorization. *Navorsinge van die Nasionale Museum, Bloemfontein* **10**: 549–592.
- LAMORAL, B.H. 1973. The arachnid fauna of the Kalahari Gemsbok National Park. Part I. A revision of the species of “mole solifuges” of the genus *Chelypus* Purcell, 1901 (Family Hexisopodidae). *Koedoe* **16**: 83–102.
- LAWRENCE, R.F. 1967. Additions to the fauna of South West Africa: solifuges, scorpions and Pedipalpi. *Scientific Papers of the Namib Desert Research Station* **34**: 1–19.
- MENDELSON, J., JARVIS, A., ROBERTS, C. & ROBERTSON, T. 2002. *Atlas of Namibia. A portrait of the land and its people*. Cape Town: David Philip Publishers.
- PURCELL, W.F. 1903. Descriptions of new genera and species of South Africa. *Annals of the South African Museum* **3**: 1–12.
- ROEWER, C.F. 1932. Solifugae, Palpigradi. In: Bronn, E.G., ed., *Klassen und Ordnungen des Tierreichs. 5: Arthropoda. IV: Arachnoidea und kleinere ihnen nahestehende Arthropodengruppen*. Vol. 5 (IV) (4) (1). Leipzig: Akademische Verlagsgesellschaft M.B.H., pp. 1–160.
- 1933. Solifugae, Palpigradi. In: Bronn, E.G., ed., *Klassen und Ordnungen des Tierreichs. 5: Arthropoda. IV: Arachnoidea und kleinere ihnen nahestehende Arthropodengruppen*. Vol. 5 (IV) (4) (2–3). Leipzig: Akademische Verlagsgesellschaft M.B.H., 161–480.
- 1941. Solifugen 1934–1940. *Veröffentlichungen des Deutschen Kolonial- und Übersee-Museums, Bremen* **3**: 97–192.
- SHULTZ, J.W. 1989. Morphology of locomotor appendages in Arachnida: evolutionary trends and phylogenetic implications. *Zoological Journal of the Linnean Society* **7**: 1–56.
- SNODGRASS, R.E. 1948. The feeding organs of Arachnida, including mites and ticks. *Smithsonian Miscellaneous Collections* **110**, **10**: 1–93.
- WHARTON, R.A. 1981. Namibian (South Africa) Solifugae. *Cimbebasia Memoir* **5**: 3–87.

