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Establishment of *Oulenziella* gen. nov. for *Oulenzia bakeri* (Hughes, 1962) (Acari: Winterschmidtidae)

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Abstract

A new genus, *Oulenziella*, is proposed for *Oulenzia bakeri* (Hughes, 1962), a species originally collected on jute (*Corchorus* sp., Malvaceae) from India. *Oulenziella bakeri* (Hughes, 1962) comb. nov. is re-described. *Oulenzia gossypii* Meyer & Rodrigues, 1965 collected from *Gossypium* sp. in Mozambique is considered a junior synonym of *Oulenziella bakeri*. The new genus differs from *Oulenzia* in having *hT* present on tibiae I and II, *kT* on tibia IV, *la* and *ra* on tarsus II, *w* and *r* on tarsus III, *e* and *f* on tarsi I–III; and by seta *d* on tarsi III and IV positioned at level of apical 1/8 to 1/6 of the segments.

Key words: Sarcoptiformes, Astigmata, *Acalvolia*, *Procalvolia*, *Psylloglyphus*, India, Mozambique

Introduction

The genus *Oulenzia* was erected by Oudemans (1928) and currently includes three named species, *O. arboricola* Oudemans, 1928, *O. bakeri* (Hughes, 1962) (= *Calvolia bakeri* Hughes, 1962) and *O. gossypii* Meyer & Rodrigues, 1965, and an undescribed species (Fan *et al.* 2012). The type species, *Oulenzia arboricola* (Oudemans, 1928) (originally as *Lenzia arboricola* Oudemans, 1928), was collected from *Hevea* leaves, in Medan, Deli, Sumatra, Indonesia. The second species, *Calvolia bakeri* Hughes, 1962, was described based on the specimen misidentified as *Oulenzia arboricola* by Baker & Wharton (1952) collected from jute in Dacca, India and recently transferred to the genus *Oulenzia* by Fan *et al.* (2012). The third species *Oulenzia gossypii* Meyer & Rodrigues, 1965 was collected from cotton (*Gossypium* sp.) in Mozambique. It is unsatisfactory to keep *O. bakeri* and *O. gossypii* in *Oulenzia*, as indicated by Fan *et al.* (2012) in their redefinition of *Oulenzia*. In addition we have found that these two species could not be classified into any known genus in the subfamily Oulenziinae. There is thus a need to propose a new genus to accommodate them. The purpose of this paper is to erect a new genus *Oulenziella* based on *Oulenzia bakeri* (Hughes, 1962), designate a lectotype for *Oulenzia bakeri*, redescribe this species in detail to allow accurate identification, and synonymize *Oulenzia gossypii* Meyer & Rodrigues, 1965 with *O. bakeri*.

Methods

Specimens loaned from the United States National Mite Collection via Barry OConnor (University of Michigan, USA) and the Arachnida Collection of Plant Protection Research Institute, Pretoria, South Africa were examined and measured with an interference-phase contrast microscope (Fan *et al.* 2010). Illustrations were made using a drawing tube attached to a Nikon interference-phase contrast microscope. Images were taken using a Zeiss AxioCam HRc camera attached to a Zeiss interference-phase contrast microscope and edited with Auto-montage and Adobe Photoshop CS4 software. All measurements are given in micrometers (µm). Terminology used for idiosomal chaetotaxy follows Griffiths *et al.* (1990), that for palp and leg chaetotaxy follows Grandjean (1939) and Griffiths (1970).

Results

Oulenziella Fan & Zhang, gen. nov.

Type species: *Calvolia bakeri* Hughes, 1962: 59 (= *Oulenzia arboricola* sensu Baker & Warton, 1952, 342; misidentification).

Description. FEMALE. Ocelli present; prodorsal shield slightly widened posteriorly; setae *sce* about 3× to 5× as long as *sci*; supracoxal setae *scx* slender and barbed; hysterosomal setae e_2 about as long as e_1 ; each tarsus (excluding pretarsi) more than 4× as long as its basal width. Genu I with solenidion σ'' : $\sigma' = 3$ to 4.5; σ on genu III small; seta *d* on tarsi III and IV positioned at level of apical 1/8 to 1/6 of tarsi. Chaetotaxy and solenidiotaxy of legs I–IV: trochanter 1, 1, 1, 0; femora 1, 1, 0, 0; genua 2 + 2 σ , 2 + 1 σ , 1 σ , 0; tibiae 2 + 1 ϕ , 2 + 1 ϕ , 1 + 1 ϕ , 1 + 1 ϕ ; tarsi I with 4 long setae (*wa*, *ra*, *la* and *d*), 2 small apical setae (*f* and *e*) + 1 subterminal ventral spine (*s*) + 2 basally merged terminal ventral spines ($u + p$ and $v + q$) + $\omega_1 + \omega_2 + \omega_3 + 1\epsilon$; tarsus II similar to tarsus I but without ω_2 , ω_3 and ϵ ; tarsus III with 3 long seta (*w*, *r* and *d*), 2 small apical setae (*f* and *e*) + 1 subterminal ventral spine (*s*) + 2 basally merged terminal ventral spines ($u + p$ and $v + q$); tarsus IV with 3 long seta (*w*, *r* and *d*) + 1 subterminal ventral spine (*s*) + 2 basally merged terminal ventral spines ($u + p$ and $v + q$).

MALE. Similar to female but genital opening with an aedeagus situated between coxae IV; anterior rim of epigynal sclerite contiguous with medial part of apodemes IV; ventral setae *3a* and *4a* absent; tarsi I and II (excluding pretarsi) less than 3× as long as their basal width, their apicoventral portion modified into suckers; subterminal ventral spine (*s*) of tarsi I–II indiscernible; terminal ventral spines *p* and *q* of tarsi I and II blunt.

Etymology. The generic name is derived from *Oulenzia*; feminine in gender.

Remarks. This genus belongs to the subfamily Oulenziinae, which includes also four other genera: *Oulenzia* Radford, 1950, *Acalvolia* Fain, 1971, *Procalvolia* Fain, 1971 and *Psylloglyphus* Fain, 1966. Fan *et al.* (2012) showed clearly that *O. bakeri* does not belong to *Oulenzia*. The main characters of these five genera are compared in detail in Table 1. This new genus is similar to *Oulenzia*, but can be distinguished from the latter in having *hT* present on tibiae I and II, *kT* on tibia IV, *la* and *ra* on tarsus II, *w* and *r* on tarsus III, *e* and *f* on tarsi I–III, and seta *d* on tarsi III and IV positioned at level of apical 1/8 to 1/6 of the segments. However, the new genus is more closely related to *Procalvolia*, but differs from the latter in having an elongated solenidion σ'' on genu I, with σ'' : σ' ratio of 3 to 4 (versus σ'' : σ' ratio 1 to 2 in *Procalvolia*). We think the elongation of the solenidion σ'' is a very significant event in the evolution of these genera. This feature is also often used to separate genera in the family Acaridae.

TABLE 1. Comparison of morphological and ecological characters of the genera in the subfamily Oulenziinae.

	<i>Oulenzia</i> Radford, 1950	<i>Oulenziella</i> gen. n.	<i>Procalvolia</i> Fain, 1971	<i>Psylloglyphus</i> Fain, 1966	<i>Acalvolia</i> Fain, 1971
Ocelli	Present	Present	Present	Absent	Absent
Prodorsal setae <i>sce</i> : <i>sci</i>	> 6	3 to 5	3 to 4	3?	2 to 3
Idiosomal setae e_2	$\geq 2 \times e_1$	$\leq 1 \times e_1$	$1.5 \times$ to $2 \times e_1$	$\leq 1 \times e_1$	$\leq 1 \times e_1$
Spermathecal duct	moderate, not forming loops	moderate, not forming loops	Unknown	long, forming 5-6 loops	moderate, not forming loops
Genua solenidia σ'' : σ'	> 5	3 to 4.5	1 to 2	1?	< 2
Tibial setae <i>hT</i> I-II and <i>kT</i> IV	Absent	Present	Present	Present	Present
Tarsal setae <i>la</i> II, <i>ra</i> II and <i>w</i> III	Absent	Present	Present	Present	Present
Seta <i>d</i> on tarsi III and IV	At level of apical 1/3 of tarsi	At level of apical 1/8–1/6 of tarsi	At level of apical 1/8–1/6 of tarsi	At level of apical 1/8–1/6 of tarsi	At level of apical 1/8–1/6 of tarsi
Habitat	Plants	Plants	Stored products	Vertebrate nests	Plants and stored products

Key to genera of the subfamily Oulenziinae (adult females)

1. Prodorsal shield with a pair of ocelli on its anterolateral margins. 2
- Prodorsal shield without ocelli. 4
2. Tibiae I and II each with one seta (*gT*); tibia IV without ventral seta; tarsus II without setae *la* or *ra*, tarsus III without seta *w*. *Oulenzia* Radford, 1950
- Tibiae I and II each with 2 setae (*gT* and *hT*); tibia IV with a ventral seta (*kT*); tarsus II with setae *la* and *ra*, tarsus III with seta *w*. 3
3. Solenidia of genu I σ' : $\sigma'=3$ to 4.5; idiosomal setae e_2 nearly as long as e_1 *Oulenziella* gen. n.
- Solenidia of genu I σ' : $\sigma'=1$ to 2; idiosomal setae e_2 1.5 \times to 2 \times as long as e_1 *Procalvolia* Fain, 1971
4. Spermathecal duct long, forming 5–6 loops. *Psylloglyphus* Fain, 1966
- Spermathecal duct short, not forming loops. *Acalvolia* Fain, 1971

Redescription of *Oulenziella bakeri* (Hughes, 1962)

(Figs 1–6, Plates 1)

Oulenzia arboricola (non Oudemans, 1928): Baker & Warton, 1952, 342 (misidentification).

Calvolia bakeri Hughes, 1962: 59.

Oulenzia gossypii Meyer & Rodrigues, 1965: 216–217. **Syn. nov.**

Oulenzia bakeri: Fan *et al.*, 2012: 337.

Material examined

Lectotype female (designated here), labelled as *Lenzia arboricola* Oud., ♀, Lenziidae, remounted: VI-1946; on Jute, Dacca, India, Dr. G.M. Das, coll., Tube 6, #10,120; deposited in the United States National Mite Collection, United States National Museum, USA.

A paratype female (Acy 65/23) and a paratype male (Acy 65/24), labelled as *Oulenzia gossypii* Meyer & Rodrigues, on *Gossypium* sp., from Kaidundjua and R. Quetxoio of Mozambique, 17 Apr. 1964, by M.C. Rodriguez. Both slides are deposited in the Arachnida Collection of Plant Protection Research Institute, Pretoria, South Africa.

Other species examined. *Acalvolia americana* Fan, George & Kumarasinghe, 2010, holotype female and a paratype female, intercepted on orange (*Citrus sinensis*) from USA, 18 May 2006 (Accession No. 09/2006/2528), deposited in New Zealand Arthropod Collection (NZAC); a paratype male, intercepted on orange from USA, 7 Apr 2003 (Accession No. 09/2003/1734), deposited in Plant Health & Environment Laboratory, Auckland, New Zealand (PANZ).

Oulenzia arboricola (Oudemans, 1928), adult female, on *Hevea* leaves, from Medan, Deli, Sumatra, May 1918, Accession No.: RMNH Acari P7031, deposited in Nederlands Centrum voor Biodiversiteit Naturalis, Netherlands (NCBN).

FEMALE (Figs 1–3, Plate 1). Idiosoma oval, 313 (313–328) long and 195 (174–195) wide; idiosomal cuticle smooth, without striation. Chelicerae robustly chelate, cheliceral seta *cha* small, spiniform; subcapitulum bearing pair of setae (*m*); palpal supracoxal setae (*elcp*) absent; palptibia with dorsal and lateral setae, both filiform; palptarsus with filiform dorsal seta and tiny terminal solenidion.

Dorsum (Fig. 1; Plate 1A, B). Prodorsal shield nearly trapezoidal, faintly punctate and slightly reticulated at posterior marginal area, posterior margin slightly convex. Supracoxal sclerite elongate, duct of supracoxal gland faint; supracoxal setae *scx* (Fig. 1B) slender, tapering from base to tip, bearing about 4 pairs of tiny barbs; Grandjean's organ (Fig. 1C) finger-shaped, smooth and short. Ocelli crescent-shaped, positioned close to anterior corners of prodorsal shield; *vi* about 3/4 as long as prodorsal shield; alveoli of *ve* situated on mid-lateral margins of prodorsal shield; *sce* about 2.8–3 times as long as *vi* and 3.6–4.3 times as long as *sci*, distance *sci*–*sci* 2.2 times as wide as *sci*–*sce*. Opisthotal gland openings *gla* situated closer to e_2 than to d_2 . Opisthosomal tubercles not observed on the old specimens. Hysterosomal setae h_3 absent; c_1 slightly shorter than c_2 and d_1 ; c_p about 4.5 (3.9–4.5) times as long as c_1 ; e_2 slightly shorter than e_1 ; f_2 on ventral side of idiosoma. Setal lengths: *vi* 60 (60–61), *sci* 42 (42–47), *sce* 181 (170–181), *scx* 16 (16–18), c_1 35 (35–36), c_2 45, c_p 159 (141–159), c_3 49 (42–49), d_1 50 (50–51), d_2 47 (45–47), e_1 53 (48–53), e_2 37 (37–43), f_2 36 (36–38), h_1 49 (45–49), h_2 278 (250–280); distances: *sci*–*sci* 40 (39–40), *sci*–*sce* 18, c_1 – c_1 55 (55–62), c_1 – d_1 48 (39–48), d_1 – d_1 50 (50–54), d_1 – e_1 54 (54–62), e_1 – e_1 52 (52–53).

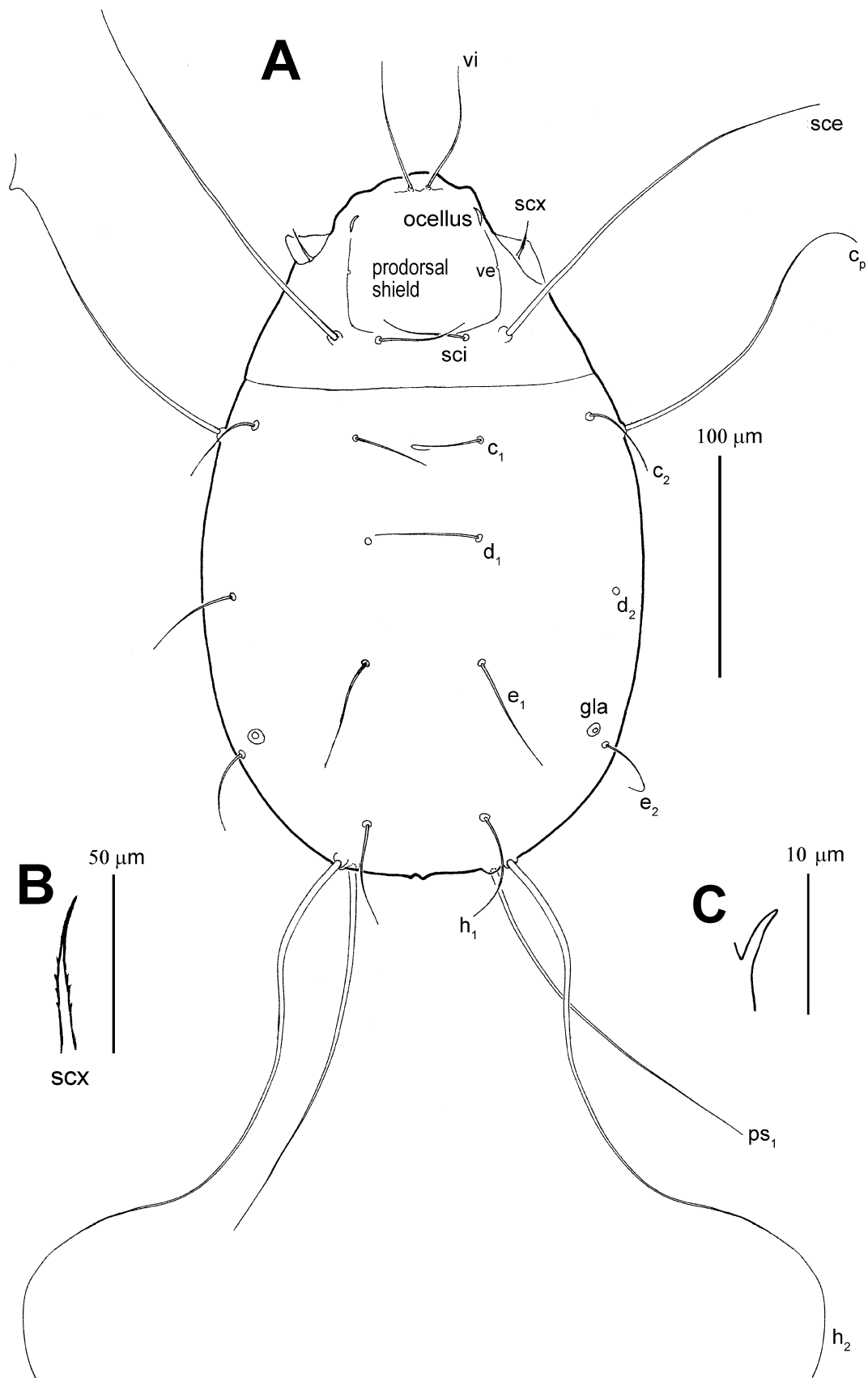


FIGURE 1. *Oulenziella bakeri* (Hughes, 1962) (female). A, dorsal view of idiosoma; B, supracoxal seta; C, Grandjean's organ.

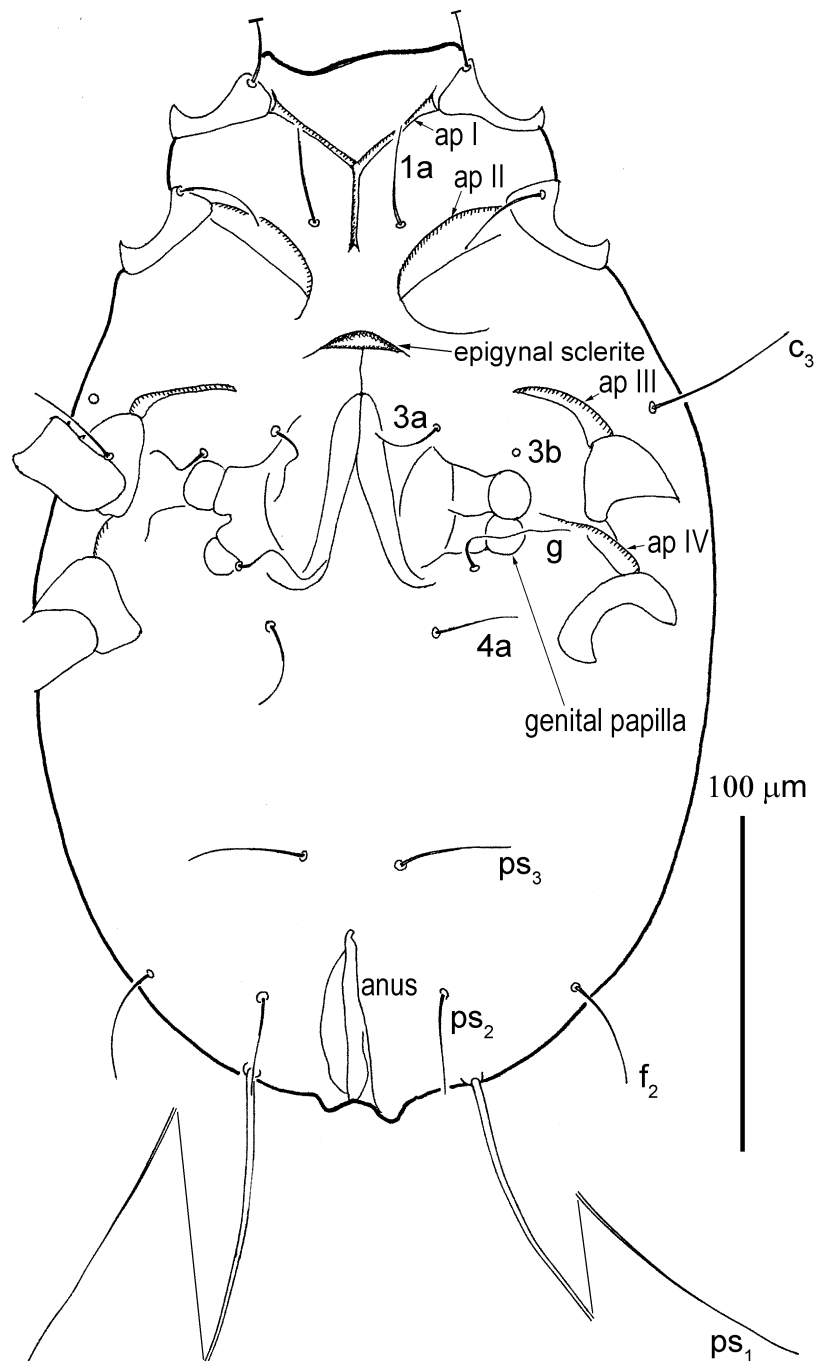


FIGURE 2. *Ouleenziella bakeri* (Hughes, 1962) (female). Ventral view of idiosoma; ap I, ap II, ap III and ap IV: apodeme of coxa I, II, III and IV, respectively.

Venter (Fig. 2; Plate 1C, D). Coxal apodemes I joined at midline, forming a prosternal apodeme directed posteromedially; coxal plate I posteriorly extending beyond apex of prosternal apodeme; coxal apodemes II directed posteromedially, plates large, extending far beyond apex of apodeme II, posterior margin concave in middle; sejugal apodeme very faint, a simple ridge; epigynal sclerite situated just anterior to genital opening, umbrella-shaped in middle, extending laterally beyond inner tips of apodemes III; apodemes III directed medially, apodemes IV directed anteromedially and joined with post-apodemes of coxae III. Ventral setae *1a* inserted posterolaterad of prosternal apodeme, *3a* laterad of genital opening, *g* posteriad of genital papillae, *4a* posteriad of genital opening. Genital opening in shape of an inverted V, situated centrally between coxae III–IV. Anal opening far posterior to genital opening, about as long as genital opening, surrounded by 3 pairs of pseudanal setae, *ps*₁ longest, about 7.9× as long as *ps*₃ and 7.0× as long as *ps*₂. Copulatory opening posterior to anus; spermathecal duct

a cylindrical tube; spermathecal sac not observed as the specimen condition was not ideal. Setal lengths: *1a* 30 (28–30), *3a* 27 (26–27), *3b* 38 (35–38), *g* 42 (38–42), *4a* 24 (24–25), *ps*₃ 31 (31–33), *ps*₂ 35 (35–38), *ps*₁ 245 (180–245).

Legs (Fig. 3; Plate 1E). Leg IV longer than others; lengths (I–IV): 155 (155–159), 168 (157–168), 165 (165–168), 195 (195–198); all setae on trochanters, femora, genua and tibiae smooth and attenuate.

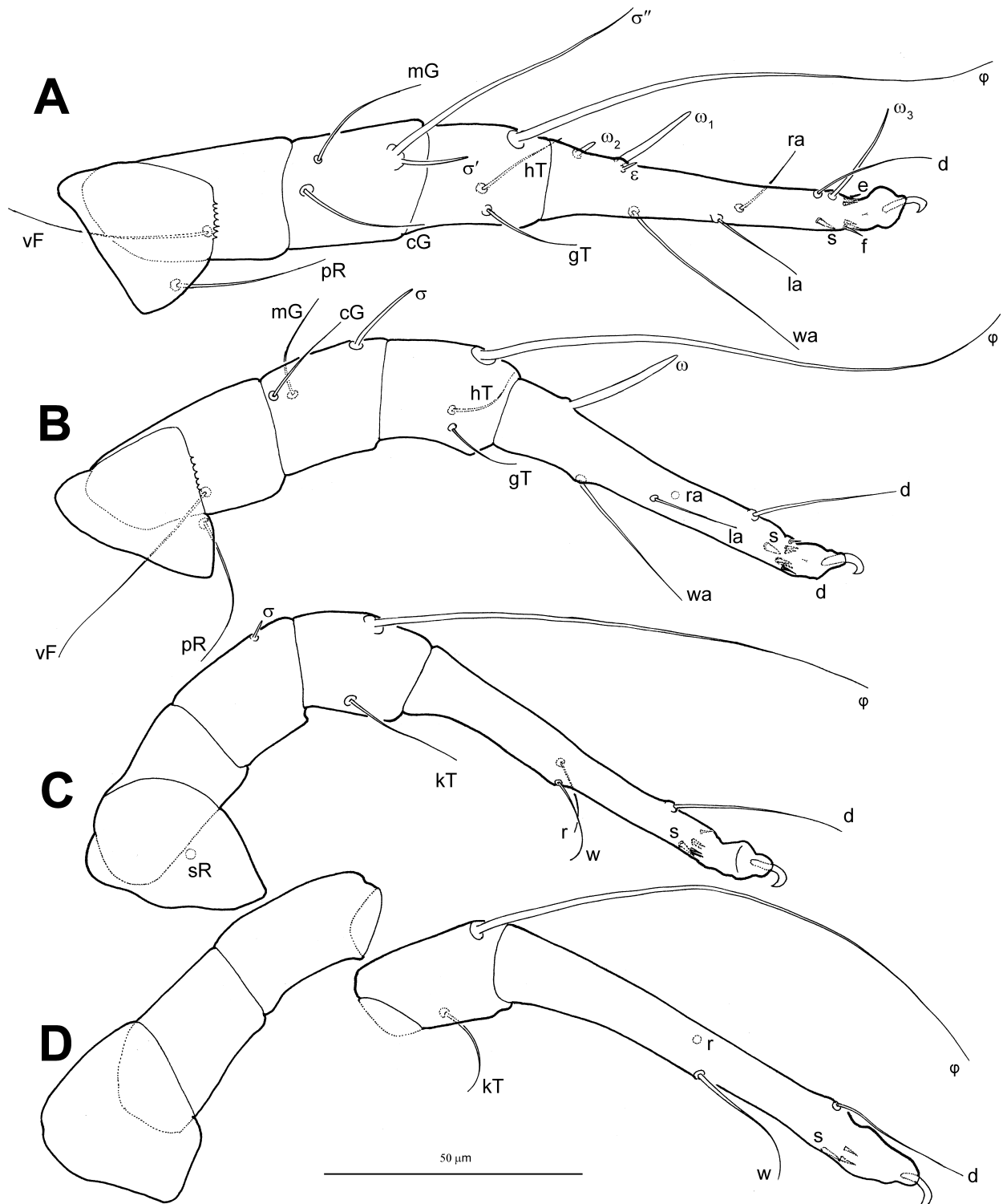


FIGURE 3. *Oulenziella bakeri* (Hughes, 1962) (female). A, leg I; B, leg II; C, leg III; D, leg IV.



FIGURE 4. *Oulezziella bakeri* (Hughes, 1962) (male). Dorsal view of idiosoma.

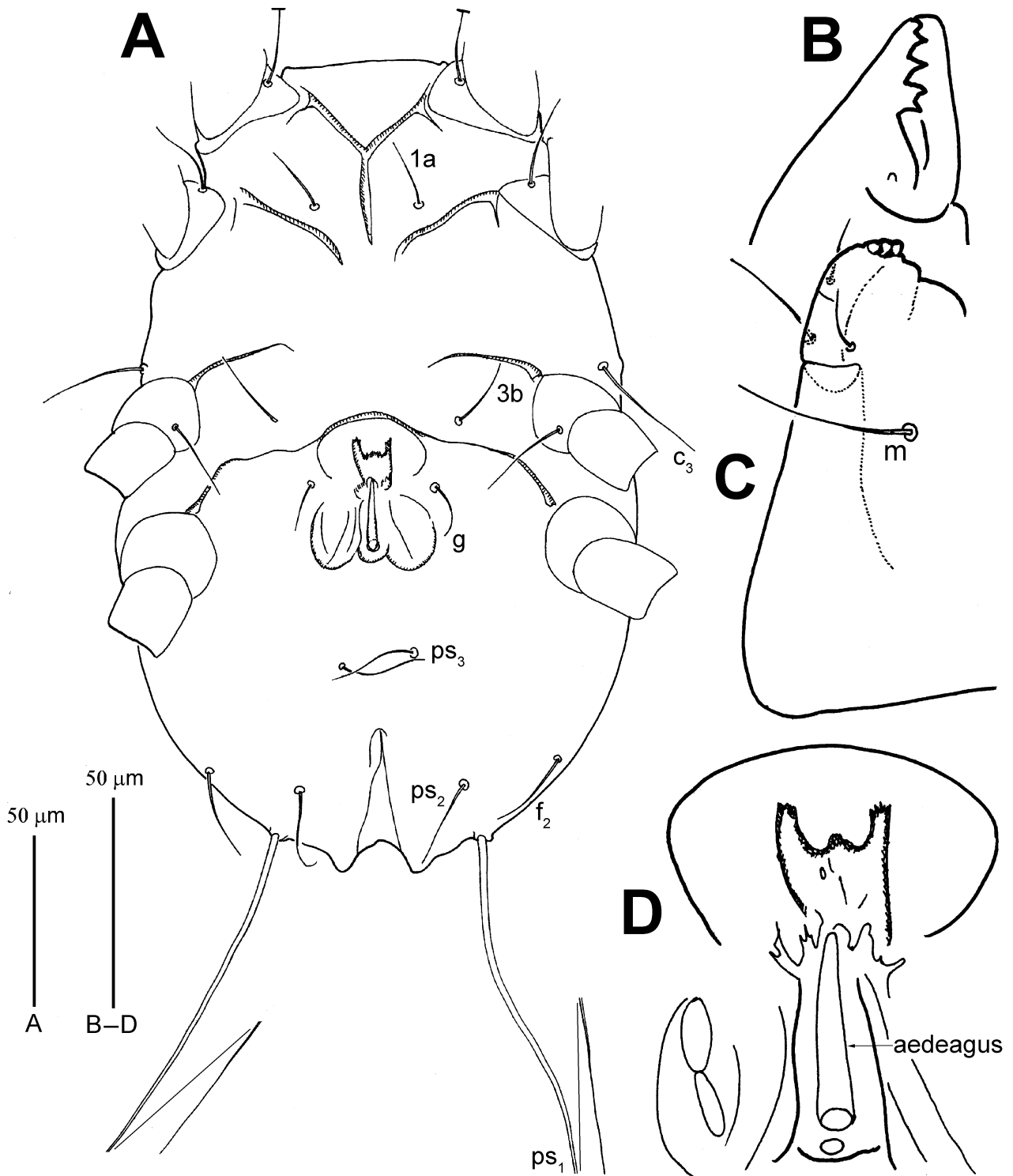


FIGURE 5. *Oulenziella bakeri* (Hughes, 1962) (male). **A**, ventral view of idiosoma; **B**, cheliceral digits; **C**, left side of subcapitulum; **D**, aedeagus.

Leg I (Fig. 3A; Plate 1E). Trochanter dorsally bearing about 8 tiny teeth on anteromedial edge; femoral seta *vF* reaching apical rim of genu, 38 (38–41); genual solenidia σ' : $\sigma' = 3.9$ (3.3–3.9), setae *cG* 26 (26–36), slightly longer than *mG* (25 (25–30)); tibial solenidion ϕ 89 (89–98), extending beyond tarsal tip, *gT* and *hT* subequal, 19 (19–22); tarsus (excluding pretarsus, same as below for other tarsi) about 4.2 \times as long as its basal width, solenidion ω_1 17 (16–17), parallel sided and tapered at its apex; ϵ 3 (3–4), slightly shorter than ω_2 (4 (4–5)); ω_3 19 (19–20), shorter than *d* (23 (23–25)); seta *wa* 41 (41–42), about twice as long as *la* (19 (19–20)) and *ra* (17), *e* (4) and *f* (5) very small; ventro-terminal spines: *s* (5) slightly larger than *p* and *q* (4.5); *p* and *q* larger than *u* and *v* (3).

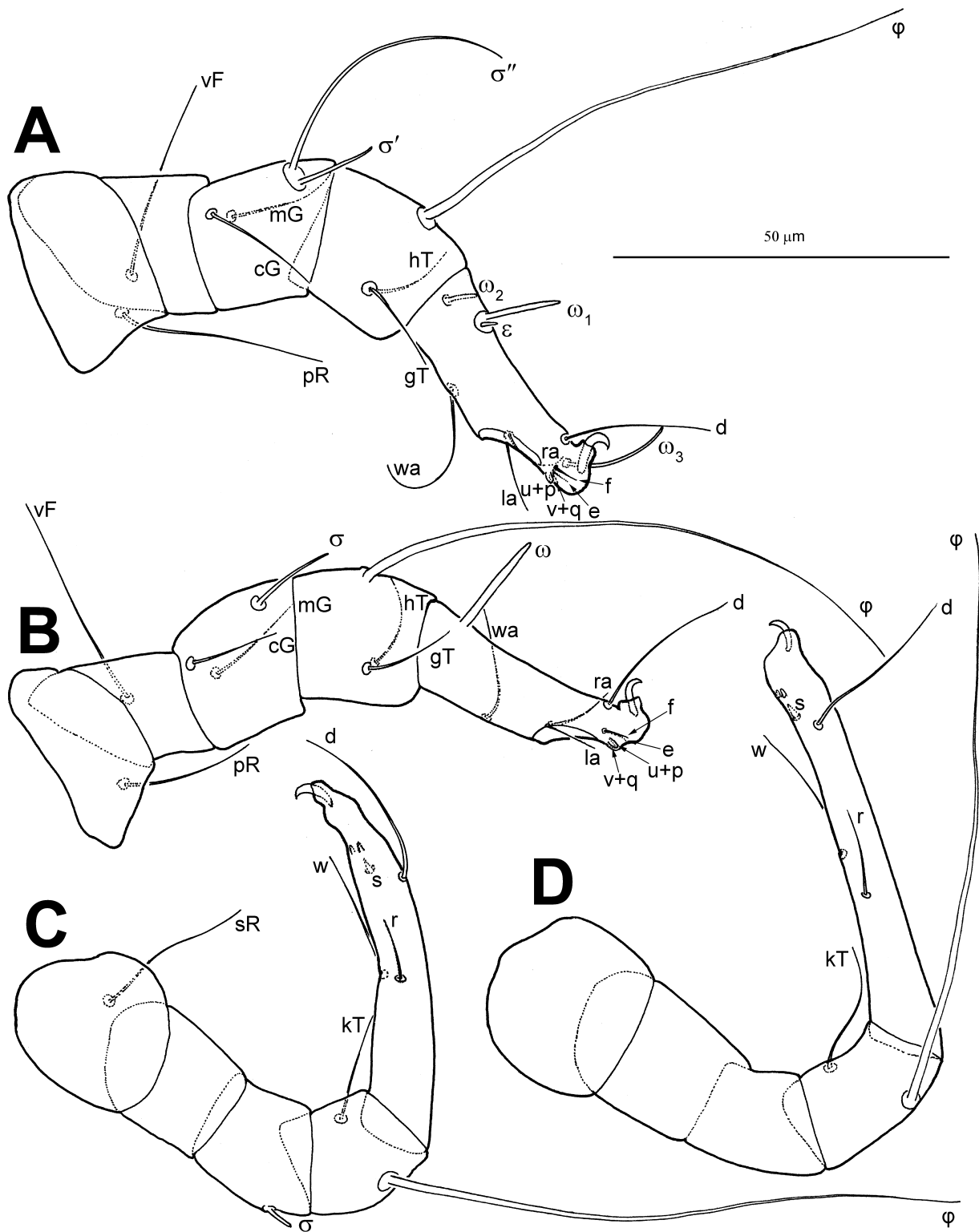


FIGURE 6. *Oulenziella bakeri* (Hughes, 1962) (male). **A**, leg I; **B**, leg II; **C**, leg III; **D**, leg IV.

Leg II (Fig. 3B). Trochanter also bearing about 8 tiny teeth on anteromedial edge; femoral *vF* (38 (38–49)) reaching apical rim of genu; genual solenidion σ reaching 1/4 to 1/3 of tibia, seta *cG* about as long as *mG*, 20 (20–25); tibial solenidion ϕ (103) extending beyond tarsal claw tip, *gT* and *hT* subequal, 16 (16–24); tarsus about 4.3× as long as its basal width, solenidion ω 23 (23–24), parallel sided and pointed at its apex, seta *wa* (39 (39–40)) more than 2× as long as *la* and *ra* (19 (19–24)), *e* (4) and *f* (5) very small; ventro-terminal spines: *s* (5) slightly larger than *p* and *q* (4.5); *p* and *q* larger than *u* and *v* (3).

Leg III (Fig. 3C). Genua solenidion σ very small (4), nearly reaching apical rim of genu; tibial solenidion ϕ extending beyond tarsal claw tip, 96 (96–109); kT 25 (25–34), slightly longer than w on tarsus; tarsus about $4.8\times$ as long as its basal width; r (16 (16–19)) and w (18 (18–28)) situated at about same level, d (31 (31–34)) extends beyond tarsal claw tip; e (3 (3–4)) and f (4 (4–5)) very small; ventro-terminal spines: s (5) slightly larger than p and q (4.5); p and q larger than u and v (3).

Leg IV (Fig. 3D). Tibial solenidion ϕ 92 (92–108), extending beyond tarsal claw tip; kT 18 (18–35), about as long as w on tarsus; tarsus about $5.9\times$ as long as its basal width; r 18 (18–19), situated proximal to w (27 (27–28)); d 31 (31–37), extending beyond tarsal claw tip; e and f absent; ventro-terminal spines: s (5) slightly larger than p and q (4.5); u and v absent.

MALE (Figs 4–6). Idiosoma (Fig. 4) as in female, cuticle smooth, without striation. Chelicerae (Fig. 5B) robust, cheliceral seta *cha* spiniform; subcapitulum (Fig. 5C) bearing a pair of setae (*m*); palpal supracoxal seta (*elcp*) absent; as in female, palptibia with dorsal and lateral seta, both filiform; palptarsus with filiform dorsal seta and tiny terminal solenidion.

Dorsum (Fig. 4). Prodorsal shield similar to that of female. Supracoxal sclerite elongate, duct of supracoxal gland perceptible; Grandjean's organ finger-shaped, smooth and short; supracoxal setae *scx* slender, faintly barbed, tapering from base to tip. Ocelli positioned close to anterior corners of prodorsal shield; alveoli of *ve* perceptible; *sce* about $3.0\times$ as long as *vi* and $3.7\times$ as long as *sci*; *sci–sci* $2.8\times$ as wide as *sci–sce*. Opisthonotal gland openings *gla* located closer to e_2 than to d_2 ; setae h_3 absent; c_1 slightly shorter than c_2 and d_1 ; c_p more than $4.3\times$ as long as c_1 ; e_2 shorter than e_1 ; f_2 on ventral side of idiosoma. Setal lengths: *vi* 47, *sci* 39, *sce* 143, *scx* 15, c_1 30, c_2 31, c_p 129, c_3 35, d_1 35, d_2 34, e_1 41, e_2 36, f_2 26, h_1 39, h_2 214; distances: *sci–sci* 33, *sci–sce* 12, $c_1–c_1$ 33, $c_1–d_1$ 25, $d_1–d_1$ 37, $d_1–e_1$ 35, $e_1–e_1$ 37.

Venter (Fig. 5A, D). Coxal apodemes I joined at midline as in female; coxal apodemes II directed posteromedially, plates large, extending far beyond apex of apodeme II, posterior margin concave in middle; sejugal apodeme very faint; genital opening situated between coxae IV; epigynal sclerite thickened, convex anteriorly, its lateral arms fused with medial part of apodemes IV; aedeagus (Fig. 5D) gradually tapering from base to tip. Ventral setae *3a* and *4a* absent, genital setae *g* anterior to genital papillae; *1a* and *3b* longer than *g*. Anal opening surrounded by 3 pairs of pseudanal setae, ps_1 $5.8\times$ as long as ps_2 and $8.5\times$ as long as ps_3 . Setal lengths: *1a* 18, *3b* 19, *g* 16, ps_3 17, ps_2 25, ps_1 145.

Leg (Fig. 6). Lengths (I–IV): 91, 90, 117 and 129; all setae on trochanters, femora, genua and tibiae smooth and attenuate.

Leg I (Fig. 6A). Trochanter I with 8 tiny teeth on anteromedial edge; seta *vF* 30; solenidia σ'' : $\sigma''=4.0$, setae *cG* 21, *mG* 22; ϕ 73, *gT* 15, *hT* 14; tarsus I (excluding pretarsus, same as below) 35 long, about $3\times$ as long as its basal width (12), ω_1 parallel sided and pointed at its apex, 12 long, ϵ 3.5, ω_2 5, ω_3 16, setae *wa* 20, *la* 11, *ra* 10, *d* 20, *e* 3, *f* 5; ventro-terminal sucker large, extending posteriorly to base of *wa*, spine *s* absent, *u* basally merged with *p*, *v* with *q*, about 4 (3.5–4).

Leg II (Fig. 6B). Trochanter II also with 8 tiny teeth on anteromedial edge; seta *vF* 33; σ 13, *cG* 16, *mG* 14; ϕ 74, *gT* 14, *hT* 15; tarsus II 35 long, about $2.7\times$ as long as its basal width (13); ω parallel sided and pointed at its apex, 16 long, *wa* 18, *la* 12, *ra* 10, *d* 20, *e* 3, *f* 5; ventro-terminal sucker large, extending to base of *wa*, spine *s* absent, *u* basally merged with *p*, *v* with *q*, about 4 (3.5–4).

Leg III (Fig. 6C). Solenidion σ tiny, 4, nearly reaching apical rim of genu III; ϕ 85, *kT* 26; tarsus III 49 long, 12 wide at base, ratio length: width = 4.1; *r* 15, *w* 20, *d* 28; *e* 3, *f* 4; ventro-terminal spines: *s* 4.5, *p* and *q* 4; *u* and *v* 3.

Leg IV (Fig. 6D). Solenidion ϕ 85, *kT* 21; tarsus IV 53 long, 13 wide at segment base, ratio length: width = 4.1; *r* 15, *w* 23, *d* 28; *e* and *f* absent; ventro-terminal spines: *s* 4.5, *p* and *q* 4, *u* and *v* absent.

Remarks

The designated lectotype female is from the same series of specimens described and illustrated by Hughes (1962), who failed to fix any primary type. After examination of the description and paratype female and male of *Oulenzia gossypii* Meyer & Rodrigues, 1965 we found no significant difference between *O. gossypii* and *O. bakeri* (Hughes, 1962). Therefore, *O. gossypii* is considered a junior synonym of *O. bakeri*.

The biology of *Oulenziella bakeri* is little known. This species has been frequently intercepted on bananas imported from Ecuador and Philippines at the border of New Zealand (Laboratory Information Management System (LIMS) database, Ministry for Primary Industries, New Zealand). It is a fungus feeder commonly found in warmer regions (OConnor 2009).

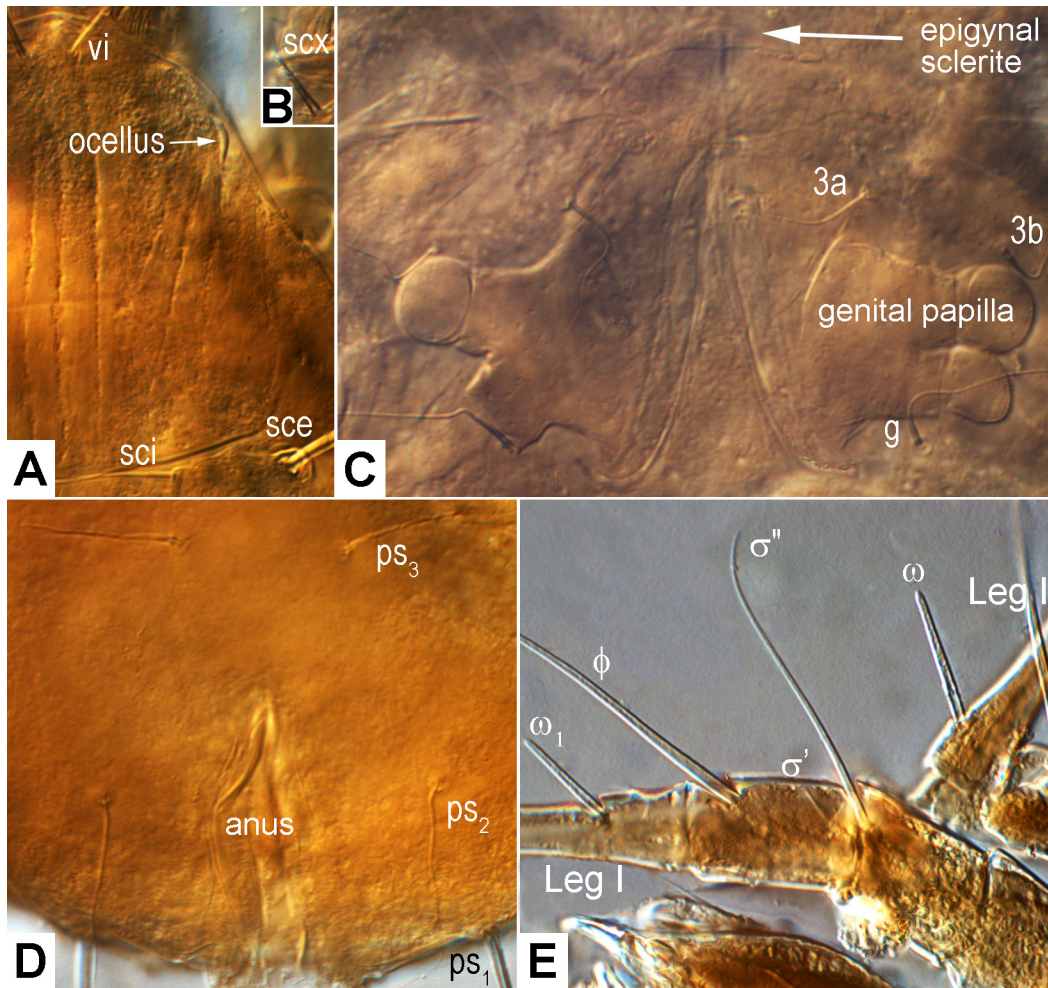


PLATE 1. *Oulenziella bakeri* (Hughes, 1962) (female). **A**, prodorsum; **B**, supracoxal seta; **C**, genital area; **D**, anal area; **E**, solenidia on tarsi I and II.

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