# A NEW GENUS AND TWO NEW SPECIES OF TENUIPALPIDAE (PROSTIGMATA: TETRANYCHOIDEA) FROM AN AUSTRALIAN SEDGE

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AFRONYCHUS
*AUSTRALIAN TETRANYCHOIDEA*
DOLICHOTETRANYCHUS
*FALSE SPIDER MITES*
*TENUIPALPIDAE*

SUMMARY: We describe 2 new species and a new genus, *Prolixus,* of unusually narrow, elongate Tenuipalpidae (Acari: Tetranychoidea) parasitic on an Australian sedge, *Gahnia aspera* sensu lato (Cyperaceae). Species of *Prolixus* have so far been collected only in southeast Queensland. Species of *Prolixus*, gen. nov. share characters with the genus *Afronychus* Meyer including presence of dorsal setae *e2* and nude genua IV, and with the genus *Dolichotetranychus* Sayed including nude genua III and IV.

RÉSUMÉ : Deux nouvelles espèce et un genre nouveau, *Prolixus* de Tenuipalpidae sont décrits sur le carex australien *Gahnia aspera* sensu lato (Cypéracées) et jusqu'ici récoltées du sud-est du Queensland. Les espèces du nouveau genre *Prolixus* partagent certains caractères du genre *Afronychus* Meyer dont la présence de la soie dorsale *e2* et le génual IV glabre, et du genre *Dolychotetranychus* Sayed dont les génuaux III et IV glabres.

## INTRODUCTION

Despite their agricultural importance as plant parasites and known vectors of plant viruses, the Tenuipalpidae or false spider mites, like other groups in the superfamily Tetranychoidea, are poorly known in Australia. Some information was published during the 1940's (WOMERSLEY 1940, 1941, 1942, 1943), but little appearing since. The most recent review of Australian Tenuipalpidae listed only 18 species (SMILEY & GERSON, 1995), less than 0.3% of the 600 + species recorded worldwide (SEPASGOSARIAN, 1990). Our recent collections, and those of SMILEY & GERSON (1995), and SMILEY, FROST & GERSON (1996) suggest that Australia contains a significant diversity of undescribed species and genera in the Tenuipalpidae. One such genus of extremely elongate parasites of Australian sedges (Cyperaceae) is described in this paper.

The new genus, *Prolixus*, is related to the genera *Dolichotetranychus* Sayed, *Afronychus* Meyer and *Tenuipalpus* DONNADIEU (TABLE 1). Opisthosomal setae *d1* can be used to separate these genera as it is present in *Tenuipalpus*, *Afronychus* and *Dolichotetranychus*, but absent in *Prolixus*. The presence of ventral setae *4a2* and elongate dorsal setae *h2* are characters that *Prolixus* shares with *Tenuipalpus*; nude genua IV are shared with both *Afronychus* and *Dolichotetranychus*; and nude genua III are shared with *Dolichotetranychus* only. The overall body shape of

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| **Character** | *Prolixus* | *Dolichotetranychus* | *Afronychus* | *Tenuipalpus* |
|---|---|---|---|---|
| Rostral shield present | – | – | – | + |
| Seta c1 present | + | + | + | + |
| Seta c2 present | – | + | + /– | + |
| Seta c3 present | + | + | + | + |
| Seta d1 present | – | + | + | + |
| Seta d2 present | + | + | + | + |
| Seta e1 present | + | + | + | + |
| Seta e2 present | + | – | + | + |
| Seta f1 present | + | + | + | + |
| Seta f2 present | + /– | – | + /– | + |
| Setae h1, h2 present | + | + | + | + |
| Genu IV nude | + | + | + | + |
| Genu III nude | + | + | – | + /– |
| Seta 4a2 present | + | – | – | + /– |
| Forked setae on tarsi | + | – | + | ? |
| Palp 3-segmented | + | + | + | + |
| Palp tarsus with 3 eupathidia | – | – | + | – |
| Monocot host plants | + | + | – | + /– |

TABLE 1. Characters shared between the related tenuipalpid genera *Prolixus* gen. nov., *Dolichotetranychus*, *Afronychus*, *Tenuipalpus*.

species of *Prolixus* is narrower and more elongate than that of the other genera, and the shape and arrangement of genital setae on both sexes of *Prolixus* is different to that of the other genera. Setae *g1* and *g2* are usually inserted along the posterior margin of the genital flap in a more or less transverse row, in the genera *Dolichotetranychus*, *Afronychus* and *Tenuipalpus*; whereas on *Prolixus* setae *g1* and *g2* are inserted as they are in the family Tetranychidae, i.e. *g1* far anterior to *g2*, in two more or less longitudinal rows. The arrangement present in *Prolixus* also occurs in some species of *Dolichotetranychus*.

*List of abbreviations.* QM: The Queensland Museum, Grey Street, PO Box 3300, South Brisbane, Queensland, 4101 UQIC: The University of Queensland Insect Collection, The University of Queensland, Brisbane, Queensland, Australia, 4072

## MATERIAL AND METHODS

Mites were colllected directly from field collected samples. All measurements are given in micrometers as a range. Setae were measured from centre of setal base to tip of seta; distances between setae were measured as the distance from the edge of one setal base to the other (i.e. the minimum distance between two setal bases). Leg setal numbers are written as the total number of setae followed by number of solenidia in parentheses.

## FAMILY TENUIPALPIDAE BERLESE

Type genus — *Tenuipalpus* Donnadieu, 1875

Diagnosis**.** Tarsi I-II with distal bulb-shaped to rod-like solenidia; palp tibial claw absent; palps with 1-5 free segments; stylophore surrounded by longitudinally ribbed collar of membranous cuticle; prodorsal shield with 3 pairs of setae (*v2*, *sc1*, *sc2*) and usually with two pairs of eyes; dorsal opisthosoma with maximum 13 pairs of setae; dorsal setae *f3*, *h3* always absent; distinct ventral and genital shield present or absent; adults and immatures usually dorsoventrally flattened.

Remarks. Members of the Tenuipalpidae are usually strongly dorsoventrally flattened plant parasites that share the characteristic ribbed collar and modified tibial solenidia with the Tuckerellidae and Linotetranidae. The most distinct synapomorphy for the family is the suppression of the palp-tibial thumb-claw complex. This character occurs convergently elsewhere in the superfamily only in one genus of Linotetranidae (BEARD & WALTER 2004). Within

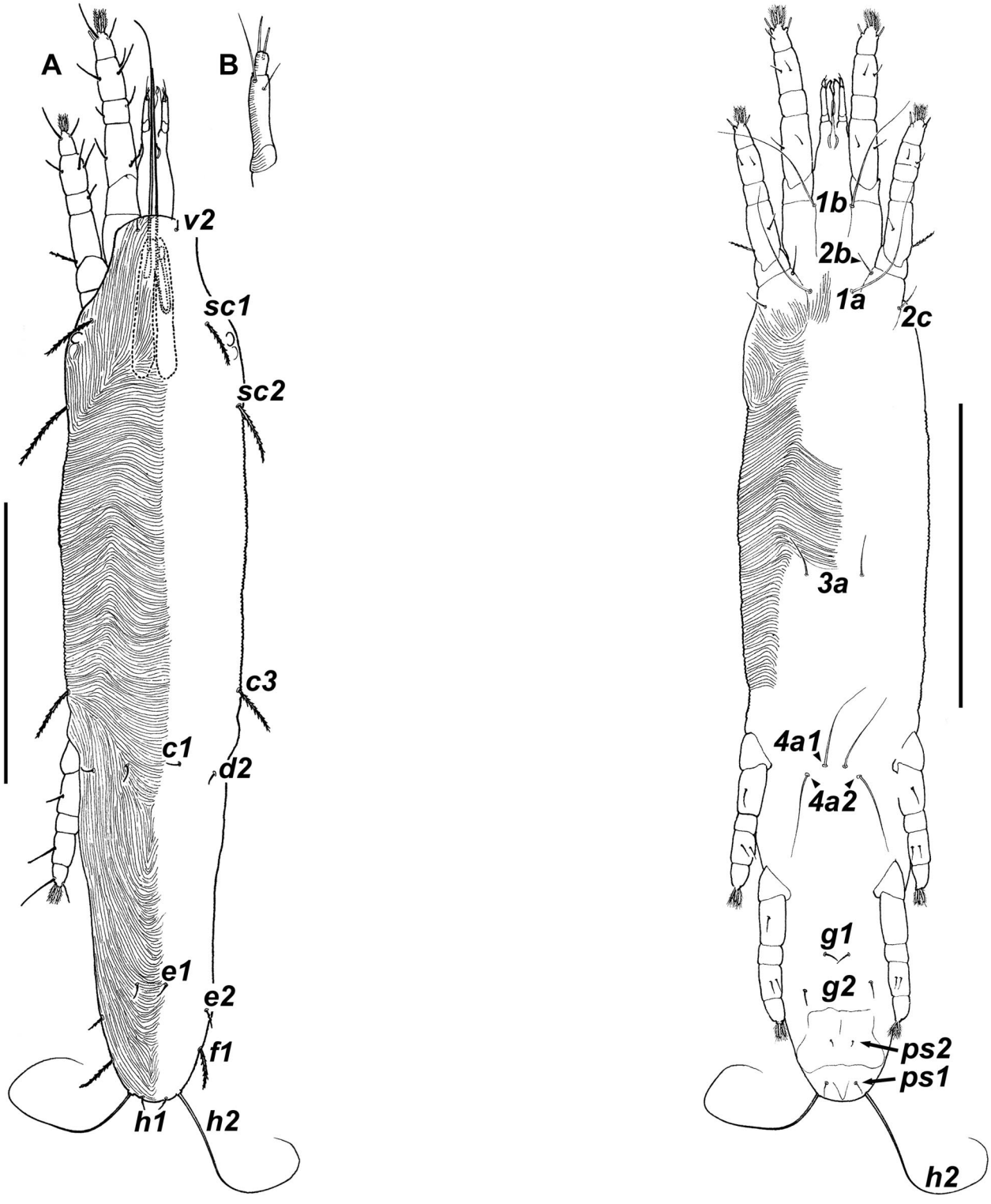



FIG 1. — *Prolixus corruginus* female A. dorsum; B. detail of palp. Scale bar A. = 100 μm, B. 40 μm
FIG 2. — *Prolixus corruginus* female venter. Scale bar = 100 μm

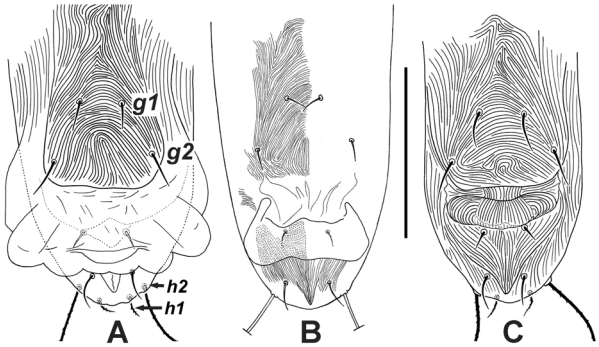



FIG 3. — *Prolixus corruginus* female. Detail of genitalia, A. genital opening fully expanded; B. genital opening partially expanded; C. genital opening normal. Scale bar = 100 μm

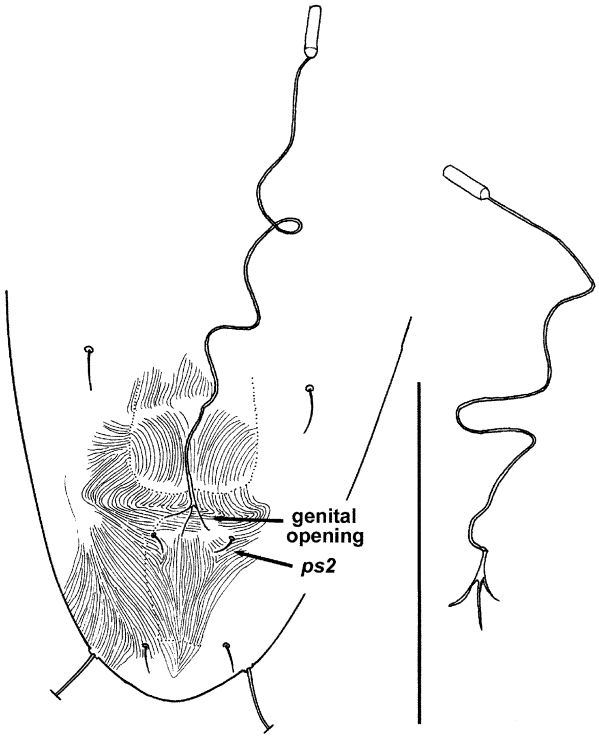



FIG 4. — *Prolixus corruginus* female, detail of spermathecal apparatus. Scale bar = 50 μm

the Tenuipalpidae, the number of free palpal segments is often reduced from the plesiotypic state characteristic of other families of Tetranychoidea (5) to 1-4.

*Prolixus* gen. nov. Beard, Fan & Walter
Type species — *Prolixus forsteri* Beard, Fan & Walter

Diagnosis (Adult). Body elongate (approx. 4 times longer than wide), dorsoventrally flattened, cuticle between dorsal setae *sc2* and *c3* finely to coarsely transversely plicate; prodorsum with or without area of smooth cuticle (when present, appears to be prodorsal shield); all dorsal setae barbed; dorsal setae *v2*, *sc1*, *sc2*, *c1*, *c3*, *d2*, *e1*, *e2*, *f1*, *h1*, *h2* present; setae *f2* present or absent; setae *h2* elongate, extremely fine distally; setae *sc1*, *sc2*, *c3*, *f1* thick, strongly barbed; setae *e1*, *e2*, *f2* sometimes thick and strongly barbed. Venter finely plicate; setae *1a*, *1b*, *2b*, *2c*, *3a*, *4a1*, *4a2*, *g1*, *g2*, *ps1*, *ps2* present; setae *3b*, *4b*, *ag1* present or absent. Setae *1a*, *1b*, *4a1* elongate, extremely fine distally; seta *4a2* elongate or not. Palps 3-segmented, with setal formula 0, 2, 0(2); palp tarsus with two eupathidia. Adult leg chaetotaxy variable; adult females with stable setal formula for the genua and tibiae of 2-1-0-0 and 5-5-3-3 respectively; all stages with 1-2 pairs forked setae on tarsi. Males with elongate aedeagus.

Diagnosis (Other). Larval leg chaetotaxy stable except genu II with 0/1 setae, with setal formula of 1-0-3-1-5-6(1), 0-0-3-**0/1-**5-6(1), 0-0-2-0-3-3.

Remarks. The duplication of seta *4a* on the podosomal venter is rare (LINDQUIST 1985). We have denoted the extra seta *4a2* as we feel that it is more likely to be the result of neotrichy rather than a displaced coxal seta. This genus shares several morphological characters with the genera *Dolichotetranychus* Sayed, *Afronychus* Meyer and *Tenuipalpus* Donnadieu (TABLE 1).

Etymology. The genus is masculine, and is named from the masculine Latin word *prolixus* meaning stretched out long.

*Prolixus corruginus* sp. nov. Beard, Fan & Walter
(FIGS. 1-16)

Types. *Queensland***.** Holotype ♀, Wondul Stock Route, Wondul Range, near Inglewood, 28°13′11″S, 151°00′10″E, 24 Feb. 2001, ex. native sedge *Gahnia aspera* sensu lato (Cyperaceae), J.J. BEARD (QM). Paratypes. Same data as holotype: 11♀, (on separate

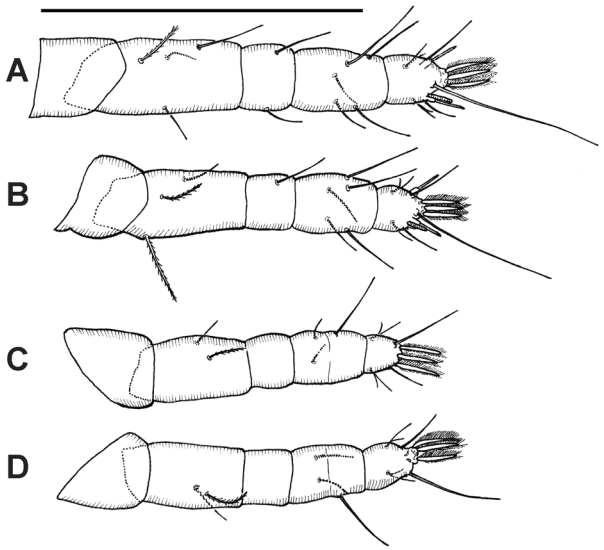



Fig 5. — *Prolixus corruginus* female legs showing trochanter, coxa, femur, genu, tibia, tarsus. A. leg I; B. leg II; C. leg III; D. leg IV. Scale bar = 50 μm

slides); 7 deutonymphs, same data as holotype (on separate slides); 3♀, ♂, 1 deutonymph (on same slide); ♀, 1 protonymph (on same slide); ♀, 1 deutonymph (on same slide); 3 deutonymphs (on same slide). Paratypes cont. Same data as holotype except 29 Nov. 2001: 2♂ (on same slide); 1 larva; 11♀ (on separate slides); 5♂ (on separate slides); protonymph, deutonymph (on separate slides); 3♀ (on same slide). Paratypes cont. Same data as holotype except 4 Mar. 2002: ♀, ♂ (on same slide); ♂, 2 deutonymphs (on same slide); 2 protonymphs (on same slide); 2 protonymphs (on same slide); 1 deutonymph. All paratype specimens in UQIC.

Diagnosis. Characters as for genus in addition to dorsal seta *f2* absent, entire dorsum including prodorsum plicate; adult female with ventral setae *3b*, *4b*, *ag1* absent; larva with 1 seta on genu II. All life stages are bright red to orange in colour when alive.

Female. *Dorsum*. (Fig. 1A) Cuticle completely plicate. Cuticular patterns: longitudinal on prodorsum, transverse (straight to wavy) between setae *sc2* and *c1*, posterad setae *c3* striae longitudinal laterally, becoming transverse mesally and creating v-shaped pattern in striae immediately posterad setae *c1* and another mesad setae *f1*. Body measurements: *v2-h1* 325-343, *sc2-sc2* 68-71, *c3-c3* 60-68, *f1-f1* 33-36. All dorsal setae barbed: *v2* 5-7, *sc1* 15-21, *sc2* 24-32, *c1*

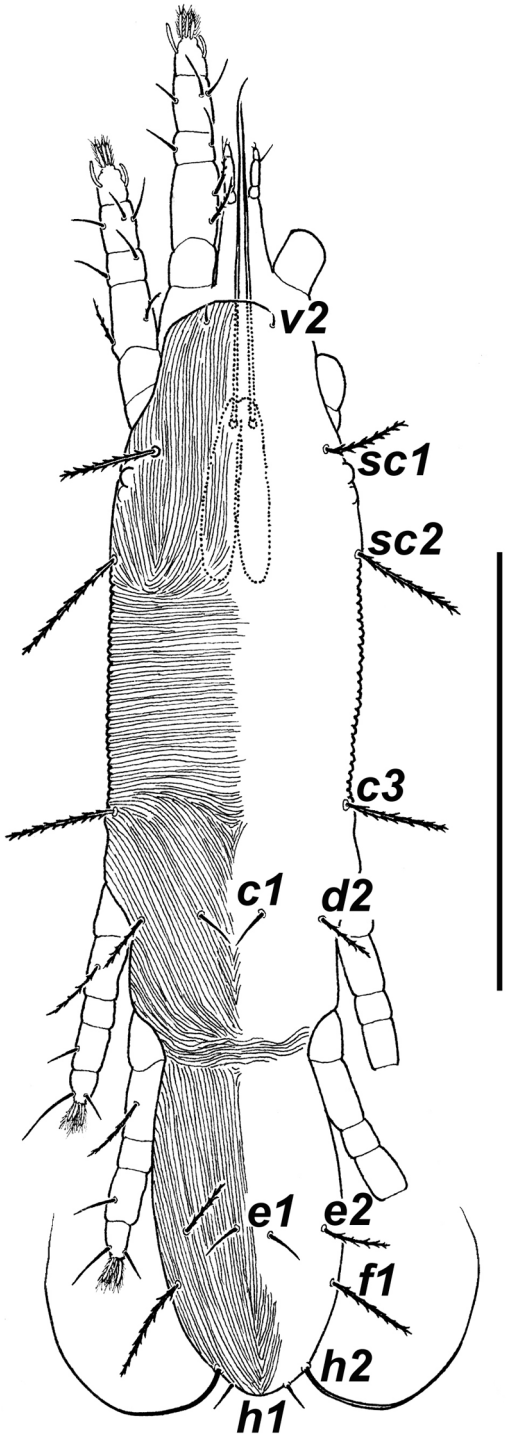



Fig 6. — *Prolixus corruginus* male dorsum. Scale bar = 100 μm

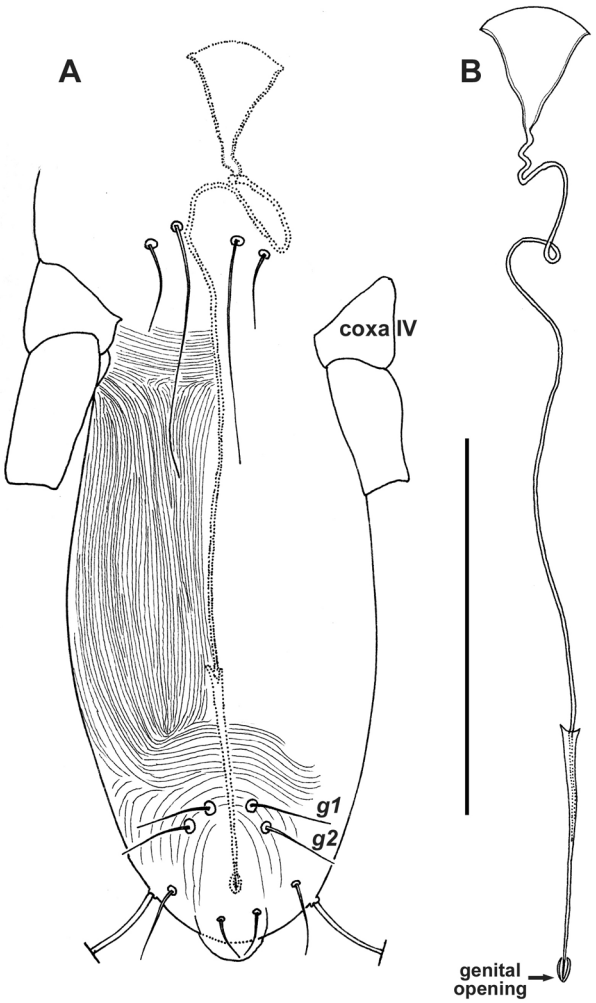



FIG 7. — *Prolixus corruginus* male, detail of A. venter; B. aedeagus. Scale bar = 50 μm

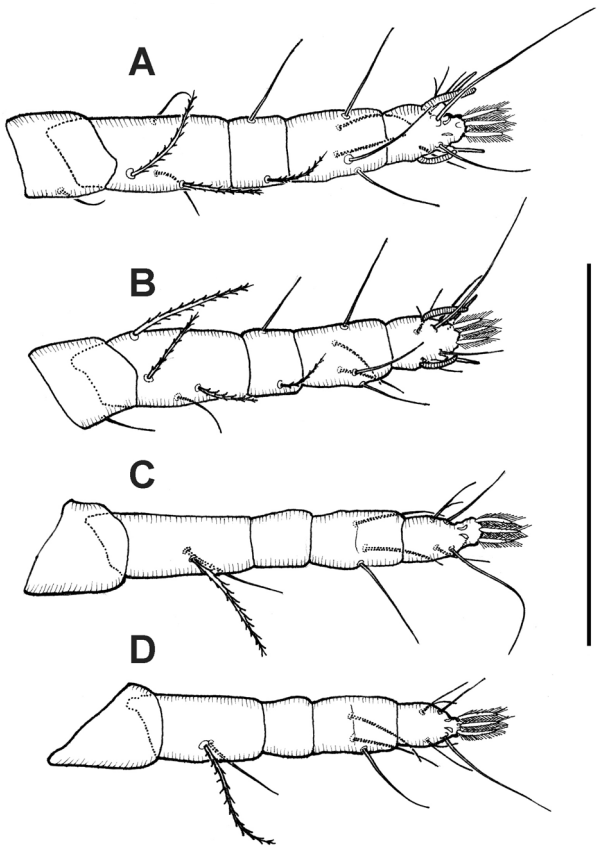



FIG 8. — *Prolixus corruginus* male legs showing trochanter, coxa, femur, genu, tibia, tarsus. A. leg I; B. leg II; C. leg III; D. leg IV. Scale bar = 50 μm

8-10, *c3* 17-23, *d2* 5-6, *e1* 8-9, *e2* 7-10, *f1* 13-17, *h1* 6-7, *h2* 72-93. Setae *sc1*, *sc2*, *c3*, *f1*, *h2* thick; other setae thin. Seta *f2* absent.

*Palps*. (FIG. 1B) Palps three segmented. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (5, 6-7).

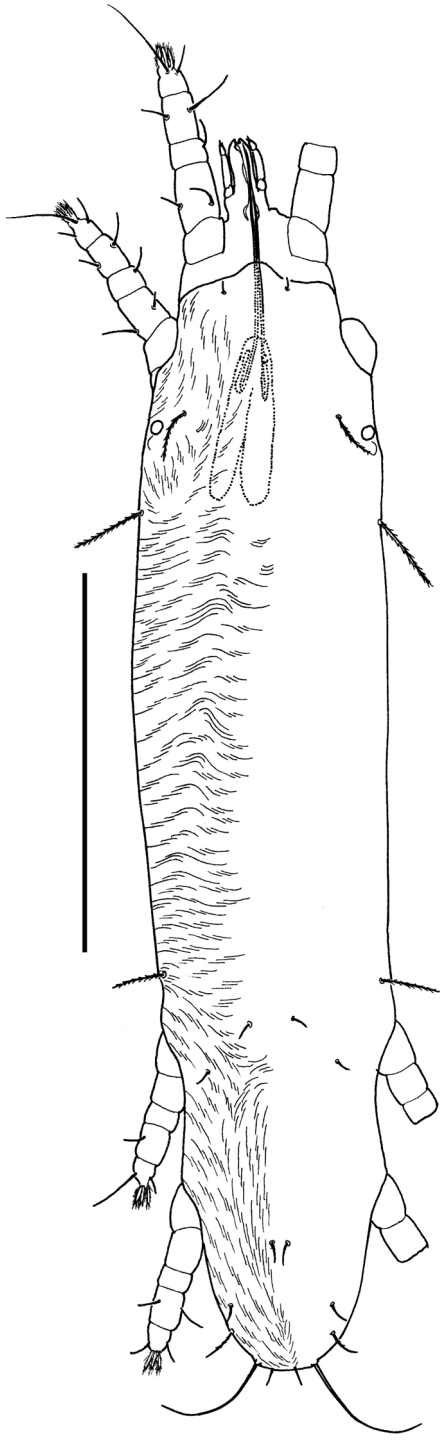
*Venter*. (FIG. 2) Cuticle completely plicate, covered with fine, mostly transverse, striae; striae longitudinal to oblique between setae *ps1* and *ps2* (FIG. 3B, C); striae mixed between setae *g1* and *g2* (FIG. 3B, C). Setae *g1* and *g2* on genital flap (FIG. 3A-C). Setal measurements: *1a* 80-112, *1b* 43-58, *2b* 12-18, *2c* 11-14, *3a* 20-27, *4a1* 53-81, *4a2* 30-47, *g1* 11-16, *g2* 10-16, *ps1* 8-11, *ps2* 5-6. Setae *1a*, *1b*, *4a1*, *4a2* elongate, fine (difficult to consistently determine full length). Setae *3b*, *4b*, *ag1* absent.

*Spermatheca*. (FIG. 4) A long narrow tube runs from the genital opening (anterad seta *ps2*) and ends in a cylinder-shaped vesicle (7-9).

*Legs*. (FIG. 5A-D) Setal formula for legs I-IV: 1-0-4-2-5-8(1), 2-0-3-1-5-8(1), 0-0-2-0-3-4, 0-0-2-0-3-4 respectively. Tarsus I-IV each with two ventral forked setae. Tarsus I and II each with one adjacent solenidion (4-6; 4-5 respectively).

*Colour*. This species is bright orange to red in life.

**Male.** *Dorsum*. (FIG. 6) Body elongate, with obvious constriction (waist) level with legs IV; cuticle



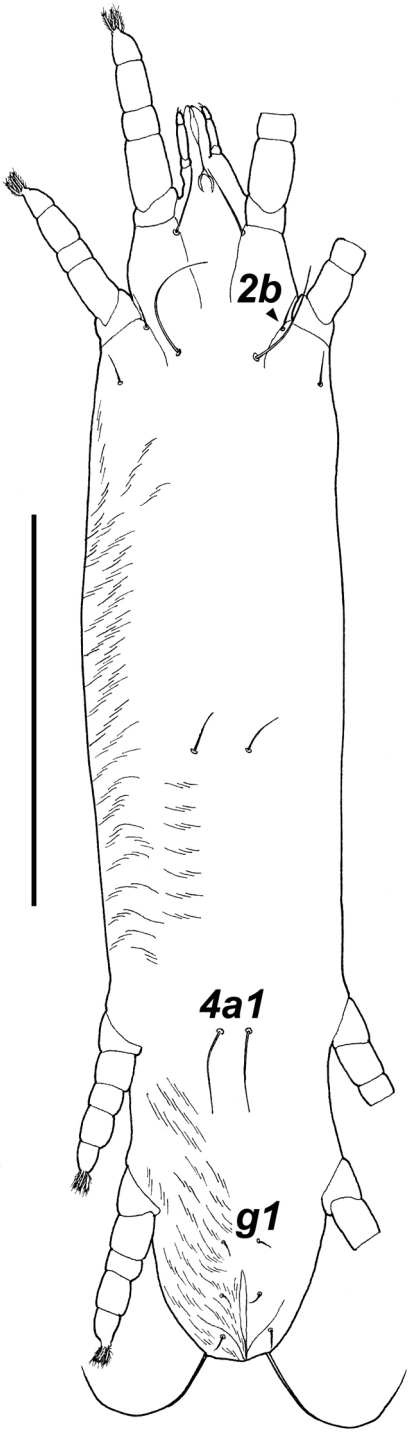



FIG.9. — *Prolixus corruginus* deutonymph dorsum. Scale bar = 100 μm
FIG 10. — *Prolixus corruginus* deutonymph venter. Scale bar = 100 μm

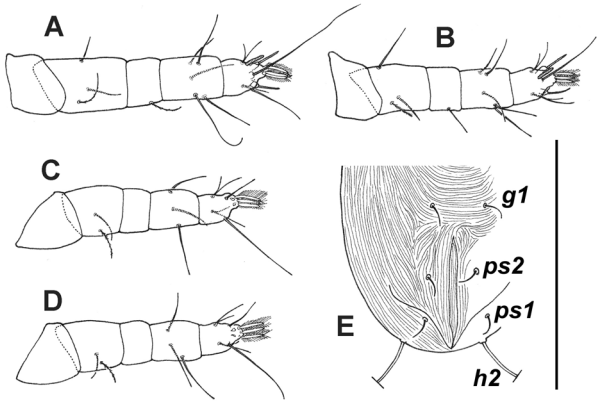



FIG 11. — *Prolixus corruginus* deutonymph, A. leg I; B. leg II; C. leg III; D. leg IV; E. detail of posterior dorsum. Scale bar = 50 μm

completely plicate, covered in mostly longitudinal to oblique striae. Cuticular patterns: longitudinal on prodorsum; band of transverse striae between setae *sc2* and *c3*; oblique between setae *c3* and level with coxae of leg IV (= waist); narrow band of transverse striae on waist; longitudinal posterad waist. Body measurements: *v2-h1* 268-286, *sc2-sc2* 66-77, *c3-c3* 60-64, *f1-f1* 35-37, waist 37-43. All setae barbed: *v2* 6-9, *sc1* 24-32, *sc2* 35-48, *c1* 7-11, *c3* 24-36, *d2* 12-18, *e1* 11-16, *e2* 21-26, *f1* 28-34, *h1* 7-10, *h2* 77-126. Setae *sc1*, *sc2*, *c3*, *e2*, *f1*, *h2* thick, other setae thin. Seta *f2* absent.

*Palps*. Palps three segmented. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (5, 5).

*Venter*. (FIG. 7A) Ventral cuticle completely plicate, covered in mostly longitudinal striae; narrow band of transverse striae: level with dorsal seta *sc2*, immediately posterad setae *3a*, along waist between coxae of leg IV, and immediately anterad setae *g1*. Setal measurements: *1a* 71-92, *1b* 35-66, *2b* 14-17, *2c* 14-18, *3a* 19-23, *4a1* 45-78, *4a2* 14-23, *g1* 10-11, *g2* 11-15, *ps1* 11-13, *ps2* 11-13.

*Aedeagus*. (FIG. 7B) Aedeagus (31-33) with sclerotised, elongate, narrow arrow-head shape, tapering to fine point posteriorly (at genital opening), attaching anteriorly to long narrow tube that ends in broad membranous cone-shaped vesicle (12-15 deep).

*Legs*. (FIG. 8A-D) Setal formula for legs I-IV: 1-1-4-2-5-9(2), 2-1-4-2-5-9(2), 0-0-2-0-3-4, 0-0-2-0-3-4 respectively. Tarsus I-IV each with two ventral forked setae. Tarsus I and II each with two solenidia (one adjacent, one proximal) (tar I 7-10, 7-9; tar II 7-8, 6-8 respectively).

*Colour*. As in female.

**Deutonymph.** *Dorsum*. (FIG. 9) Cuticle completely plicate, with transverse striae between setae *sc2* and setae *c1*; striae longitudinal anterad setae *sc2* and posterad setae *d2*. Body measurements: *v2-h1* 267-308, *sc2-sc2* 60-68, *c3-c3* 57-60, *f1-f1* 22-26. All setae barbed: *v2* 4-6, *sc1* 14-19, *sc2* 22-23, *c1* 7-9, *c3* 17-18, *d2* 6-8, *e1* 6-7, *e2* 6-8, *f1* 8-11, *h1* 5-6, *h2* 75-88. Setae *sc1*, *sc2*, *c3*, *h2* thick, all other setae thin.

*Palps*. Palp with three segments. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (4-5, 5-6).

*Venter*. (FIGS. 10, 11E) Cuticle completely plicate, covered mostly with transverse striae, with some longitudinal to oblique striae anterad setae *2c* and posterad setae *4a1*. Setal measurements: *1a* 60-97, *1b* 30-42, *2b* 8-15, *2c* 9-12, *3a* 19-23, *4a1* 32-56, *g1* 7-8, *ps1* 6-10, *ps2* 4-5. Setae *4a2*, *g2* absent.

*Legs*. (FIG. 11A-D) Leg setal formulae for legs I-IV: 1-0-3-1-5-8(1), 2-0-3-1-5-8(1), 0-0-2-0-3-4, 0-0-2-0-3-4, 0-0-2-0-3-4 respectively. Tarsus I-IV each with two ventral forked setae. Tarsus I and II each with one adjacent solenidion (3-5, 4 respectively).

**Protonymph.** *Dorsum*. (FIGS. 12, 14C) Cuticle completely plicate, covered in mostly transverse striae, with longitudinal striae anterad setae *sc2* and posterad setae *c1*. Body measurements: *v2-h1* 203-245, *sc2-sc2* 53-62, *c3-c3* 50-55, *f1-f1* 17-18. All setae barbed: *v2* 4-6, *sc1* 12-14, *sc2* 17-19, *c1* 6-8, *c3* 9-13, *d2* 5-6, *e1* 4-6, *e2* 4-5, *f1* 4-5, *h1* 4, *h2* 69-70. Seta *sc1*, *sc2*, *c3* thick, all other setae thin except seta *h2* thick at base, fine distally.

*Palps*. Palps with 3 segments. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (4, 6).

*Venter*. (FIG. 13) Cuticle completely plicate, mostly covered with transverse striae, with limited area of longitudinal to oblique striae anteriorly around setae *1a*, and posteriorly surrounding setae *ps1-2*. Setal measurements: *1a* 51-79, *1b* 28-41, *2c* 6-8, *3a* 16-23, *ps1* 5-6, *ps2* 3-4. Setae *2b*, *4a1*, *4a2*, *g1*, *g2* absent.

*Legs*. (FIG. 14A-C) Leg setal formulae for legs I-IV: 1-0-3-1-5-8(1), 1-0-2-1-5-8(1), 0-0-2-0-3-4, 0-0-2-0-

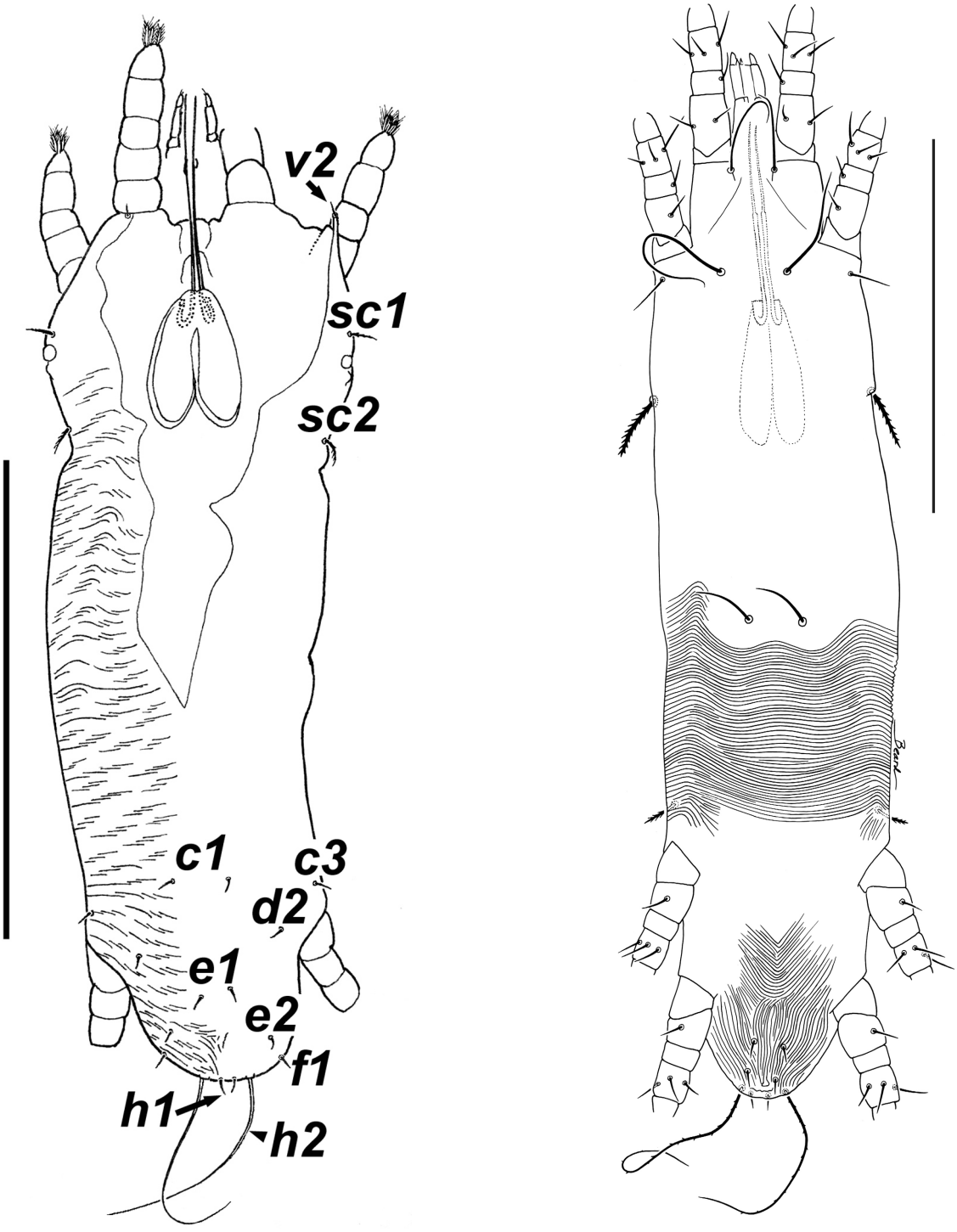



FIG 12. — *Prolixus corruginus* protonymph dorsum; leg detail omitted. Scale bar = 100 μm
FIG 13. — *Prolixus corruginus* protonymph venter. Scale bar = 100 μm

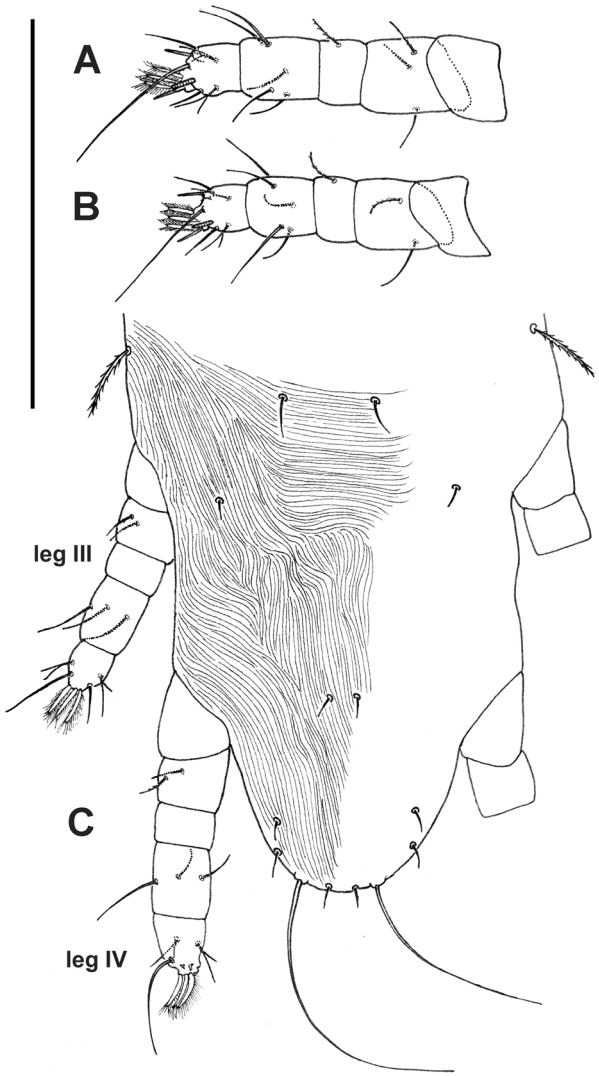



FIG 14. — *Prolixus corruginus* protonymph legs and dorsum. A. leg I; B. leg II; C. detail of posterior dorsum including legs III and IV. Scale bar = 50 μm

3-3 respectively. Tarsus I-IV each with two ventral forked setae. Tarsus I and II each with one adjacent solenidion (3-4, 3-4).

**Larva.** Dorsum. (FIG. 15) Cuticle completely plicate, with mostly transverse striae, with limited area of oblique striae posterad setae *e1*. Body measurements: *v2-h1* 180*, *sc2-sc2* 57, *c3-c3* 49, *f1-f1* 17 (* = approximate length). All setae thin, barbed: *v2* 3, *sc1* 8, *sc2* 9, *c1* 5, *c3* 6, *d2* 3, *e1* 5, *e2* 4, *f1* 4, *h1* 4, *h2* 66.

*Palps*. Palps with three segments. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (4, 5).

*Venter*. (FIG. 16) Cuticle completely plicate, with mostly transverse striae, with some oblique striae surrounding setae *ps1-2*. Setal measurements: *1a* 40*, *1b* 28*, *3a* 15*, *ps1* 4, *ps2* 3 (* = approximate length). Setae *2b*, *2c*, *4a1*, *4a2*, *g1*, *g2* absent.

*Legs*. Leg setal formulae for legs I-IV: 1-0-3-1-5-6(1), 0-0-3-1-5-6(1), 0-0-2-0-3-3 respectively. Tarsus I-IV each with two ventral forked setae.

**Host.** *Gahnia aspera* sensu lato (Cyperaceae).

**Distribution.** 30 km NE Inglewood, Southeast Queensland, Australia.

**Remarks.** All stages of *P. corruginus* can be separated from *P. forsteri* by the absence of dorsal seta *f2*. This seta is also absent in the genus *Dolichotetranychus*. Additionally, adult female *P. corruginus* lack ventral setae *3b*, *4b*, *ag1*, and lack a smooth area of cuticle on the prodorsum, all of which are present in adult female *P. forsteri*.

Individuals of *P. corruginus* were collected from deep inside the tight grooves that run longitudinally along the leaf blades of the host plant. The mites, bright red in colour, were almost completely concealed within the grooves.

**Etymology.** The masculine name *corruginus* is derived from the Latin word *corrugis* meaning wrinkled or ridged.

## *Prolixus forsteri* sp. nov. Beard, Fan & Walter (FIGS. 17-30)

Types**.** *Queensland.* Holotype ♀, State Forest 1294, 25°28′53″S, 152°17′29″E, 20 Dec. 2002, ex. sedge *Gahnia aspera* sensu lato (Cyperaceae), J.J. BEARD (QM). Paratypes 2♀, 2 pharate ♀, 2♂, 2 pharate ♂, 1 deutonymph, 2 protonymphs, 1 larva, same data as holotype (all on separate slides); ♀, 1 deutonymph, same data as holotype (on same slide). All paratype specimens in UQIC.

Diagnosis. As for genus, in addition to dorsal seta *f2* present, smooth cuticle on prodorsum present; adult female with ventral setae *3b*, *4b*, *ag1* present; larva without setae on genu II. All life stages are yellow-olive in colour with a series of small black food spots dorsolaterally.

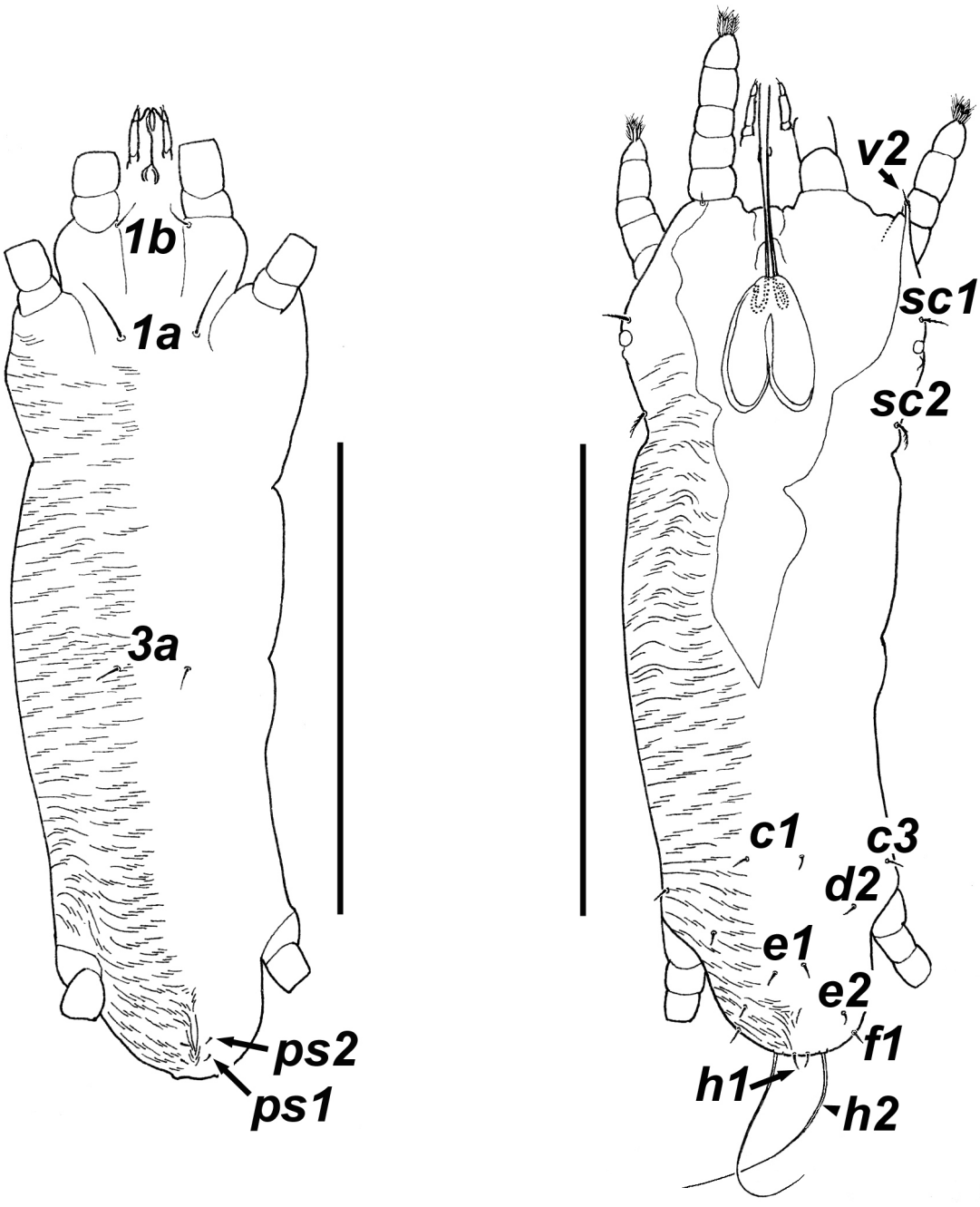
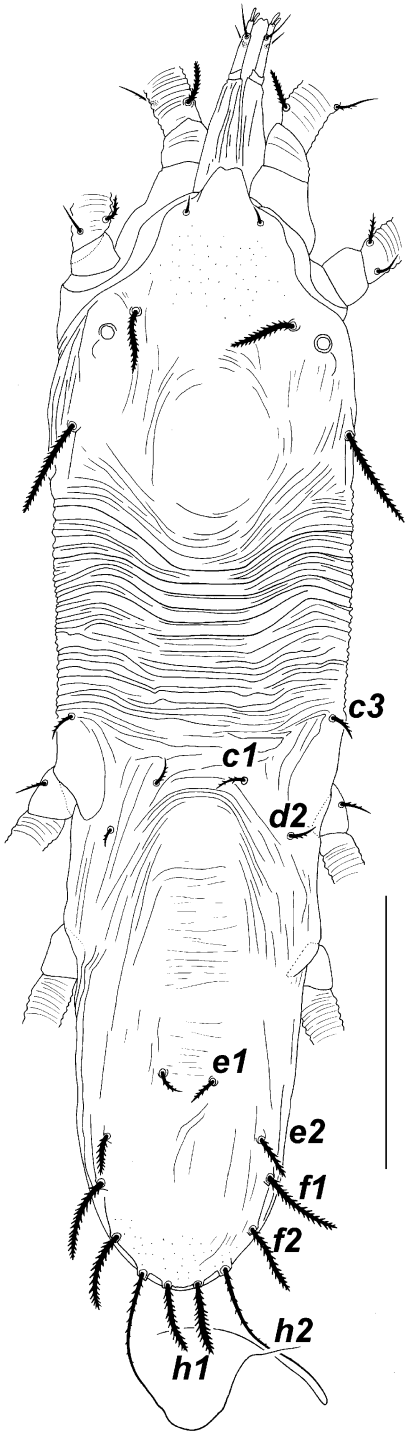



FIG 15. — *Prolixus corruginus* larva dorsum; leg detail omitted. Scale bar = 100 μm
FIG 16. — *Prolixus corruginus* larva venter; leg detail omitted. Scale bar = 100 μm



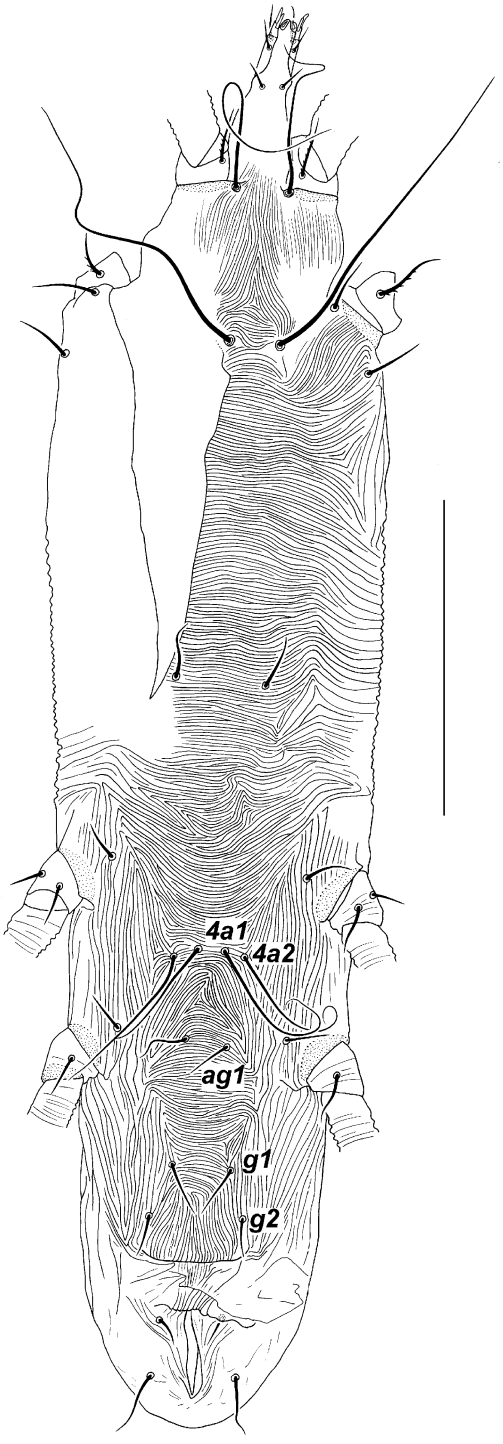




FIG 17. — *Prolixus forsteri* female dorsum. Scale bar = 100 μm
FIG 18. — *Prolixus forsteri* female venter. Scale bar = 100 μm

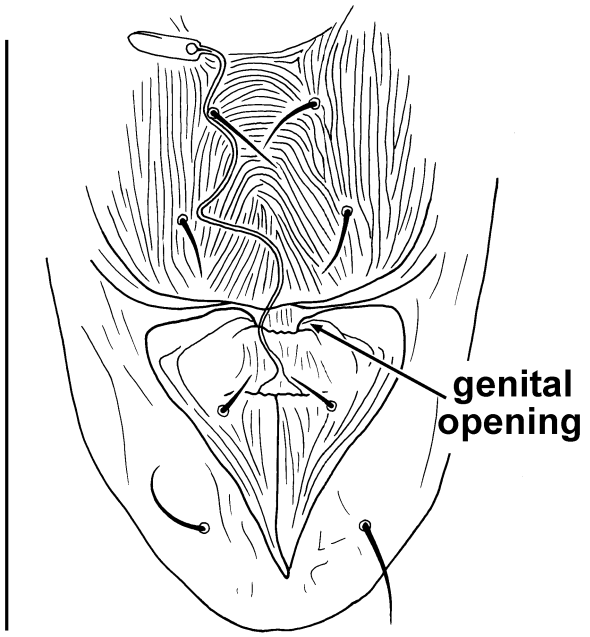



FIG 19. — *Prolixus forsteri* female, detail of spermatheca, even though an internal structure spermatheca is illustrated here in solid line. Scale bar = 100 μm

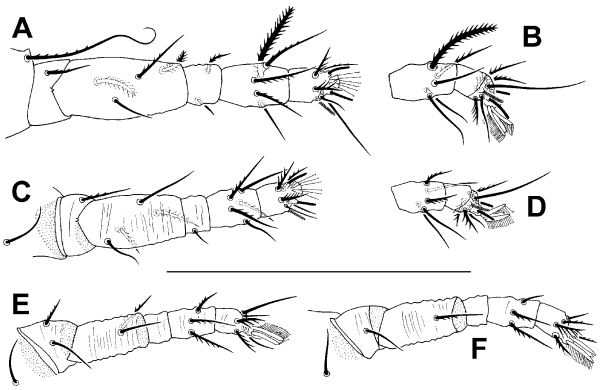



FIG 20. — *Prolixus forsteri* female legs A. leg I; B. detail tibia and tarsus I; C. leg II; D. detail of tibia and tarsus II; E. leg III; F. leg IV. Scale bar = 100 μm

**Female.** *Dorsum*. (FIG. 17) Cuticular patterns: cuticle corrugated with strong, deep, widely spaced plicae between smooth prodorsal area (level with *sc2*) and setae *c1*; posterad setae *c1* cuticle with faint transverse striate pattern becoming smooth posterad setae *e1*; faint pitting present around both anterior and posterior margins. Short rostral projection present. Body measurements: *v2-h1* 383-398, *sc2-sc2* 96-100, *c3-c3* 91-93, *f1-f1* 54-57. All dorsal setae barbed; setae *sc1*, *sc2*, *e2*, *f1*, *f2*, *h1* thick, subequal in length; setae *v2*, *c1*, *c3*, *d2*, *e1* short; seta *h2* elongate, thick and barbed at base, tapering, extremely fine distally; setal measurements: *v2* 5-7, *sc1* 21-23, *sc2* 31-37, *c1* 8-11, *c3* 9-13, *d2* 7-9, *e1* 9-11, *e2* 15-16, *f1* 28-30, *f2* 23-28, *h1* 24-25, *h2* 132-147.

*Palps*. (See FIG. 17) Palps three segmented. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (6, 6-7).

*Venter*. (FIG. 18) Cuticle completely plicate, with striae fine mesally becoming widely spaced laterally. Cuticular patterns: striae between setae *1a* and level with coxae of leg III transverse; between coxae III and genital opening mesal striae transverse or oblique, becoming longitudinal laterally; on genital flap (between setae *g1* and *g2*) striae longitudinal to oblique; posterad genital opening there is no clear pattern. Setal measurements: *1a* 117-133, *1b* 48-77, *2b* 17-23, *2c* 18-20, *3a* 18-21, *3b* 17-19, *4a1* 66-76, *4a2* 54-58, *4b* 17-18, *ag1* 14-17, *g1* 13-17, *g2* 13-17, *ps1* 18-20, *ps2* 9-12. Setae *3b*, *4b*, *ag1* present.

*Spermatheca*. (FIG. 19) A long narrow tube runs from the genital opening (anterad *ps2*) and ends in a cylinder-shaped vesicle (10-12).

*Legs*. (FIG. 20A-F) Setal formula for legs I-IV: 1-1-3-2-5-8(1), 2-1-4-1-5-8(1), 1-2-2-0-3-5, 1-1-1-0-3-5 respectively. Tarsi I-IV each with two ventral pectinate setae. Tarsus I and II each with one solenidion (8-9, 6-7 respectively) (FIG. 20 B, D). Large barbed dorsal seta on tibia I.

*Colour*. This species is pale yellowy-olive in life, with a series of small black food spots dorsally along either side of the body.

**Male.** *Dorsum*. (FIG. 21) Body elongate with obvious constriction level with leg IV (= waist). Cuticle almost completely smooth; smooth, plate-like area on prodorsum, with faint pitting; between prodorsal area and setae *c1* narrow band of strong deep widely spaced plicae; posterad *c1* with few longitudinal plicae; some faint pitting around posterior margin of dorsum. Body measurements: *v2-h1* 299-300, *sc2-sc2* 81-85, *c3-c3* 75-78, *f1-f1* 40-46, waist 48-50. All dorsal setae barbed; setae *sc1*, *sc2*, *e1*, *e2*, *f1*, *f2*, *h1* thick, barbed; setae *v2*, *c1*, *c3*, *d2* short; seta *h2* elongate, thick and barbed at base, tapering, extremely

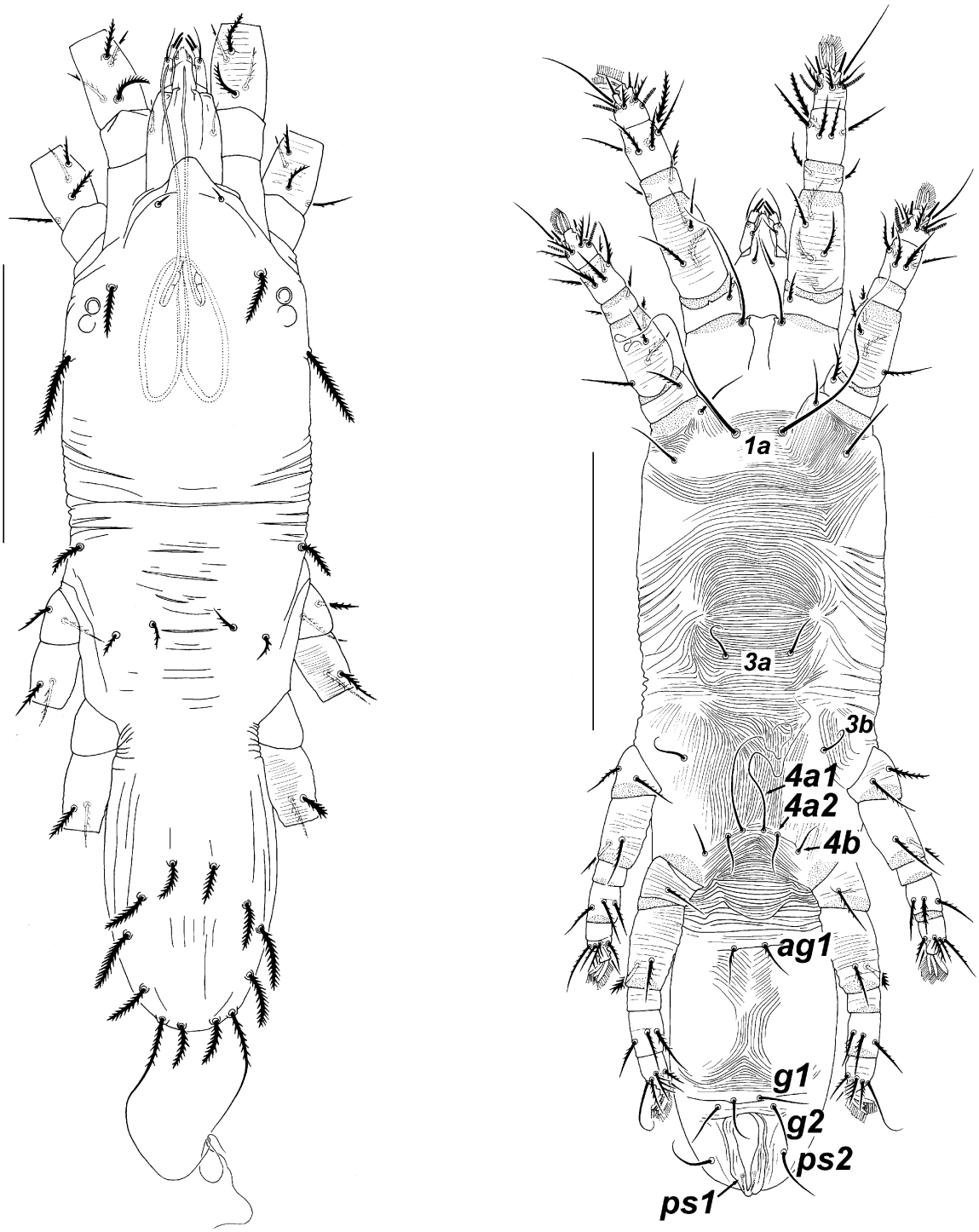



FIG 21. — *Prolixus forsteri* male dorsum. Scale bar = 100 μm
FIG 22. — *Prolixus forsteri* male venter. Scale bar = 100 μm

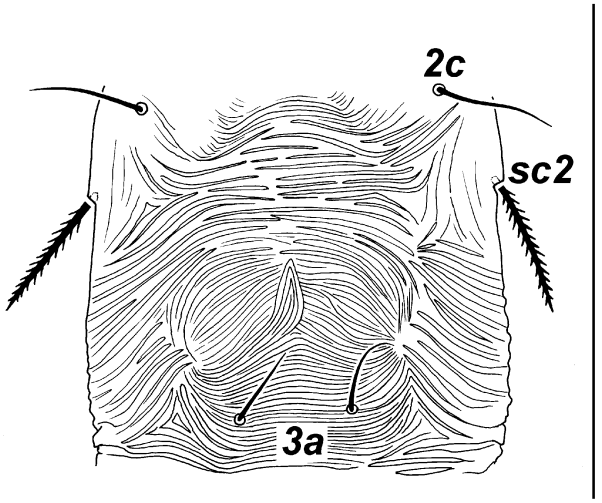



FIG 23. — *Prolixus forsteri* male, detail of cuticular pattern on anterior venter. Scale bar = 100 μm

fine distally; setal measurements: *v2* 5-7, *sc1* 20, *sc2* 30-31, *c1* 9-11, *c3* 13-15, *d2* 11-12, *e1* 3-161, *e2* 15-17, *f1* 22-24, *f2* 21, *h1* 16-17, *h2* 115-137.

*Palps*. Palps three segmented, with setal formula 0, 2, 0(2). Palp tarsus with two eupathidia (6, 5).

*Venter*. (FIGS. 22, 23) Cuticle almost entirely plicate. Cuticular patterns: cuticle with fine striae mesally, becoming widely spaced laterally; between setae *1a* and *3a* striae mostly transverse (FIG. 22) or with some variation (e.g. FIG. 23); between setae *3b* and *4a1*/*4a2* striae longitudinal; waist (level with coxae IV) with band of transverse, strongly corrugated striae and concertinaed folds of cuticle; posterad setae *ag1* striae oblique to longitudinal surrounding smooth areas laterally; narrow band transverse striae immediately anterior to setae *g1*. Setal measurements: *1a* 81-98, *1b* 48-54, *2b* 20-21, *2c* 19-22, *3a* 16-17, *3b* 13-14, *4a1* 83-106, *4a2* 15-16, *4b* 17-18, *ag1* 13-15, *g1* 17-18, *g2* 16-18, *ps1* 8-13, *ps2* 19-20.

*Aedeagus*. (FIG. 24) Sclerotised, elongate, narrow arrow-head shape, tapering to fine point distally (32-36), attached proximally to long narrow tube ending in membranous cone-shaped vesicle.

*Legs*. (See FIG. 22). Tarsus I and II each with one solenidion (8-9, 7-8 respectively). Setal formulae for legs I-IV respectively: 1-1-4-2-5-9(2), 2-1-4-0-5-9(2), 1-2-2-0-3-5, 1-1-2-0-3-5.

***Colour***. As in female.

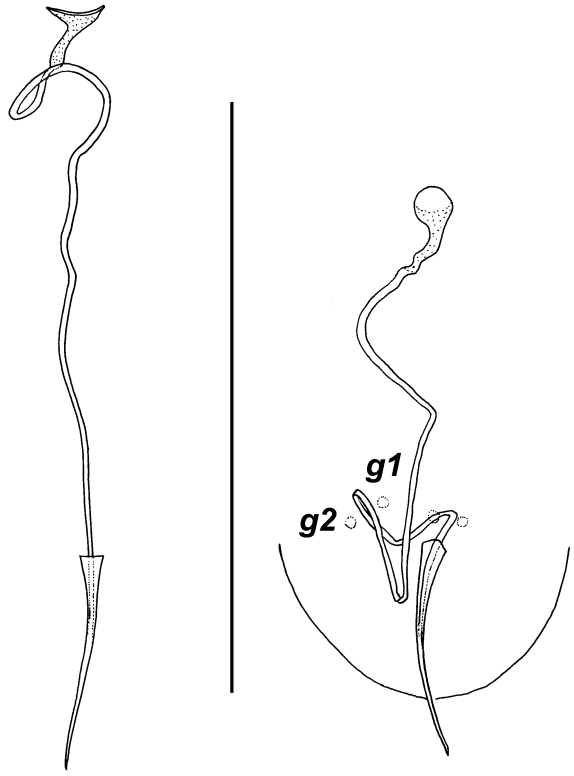
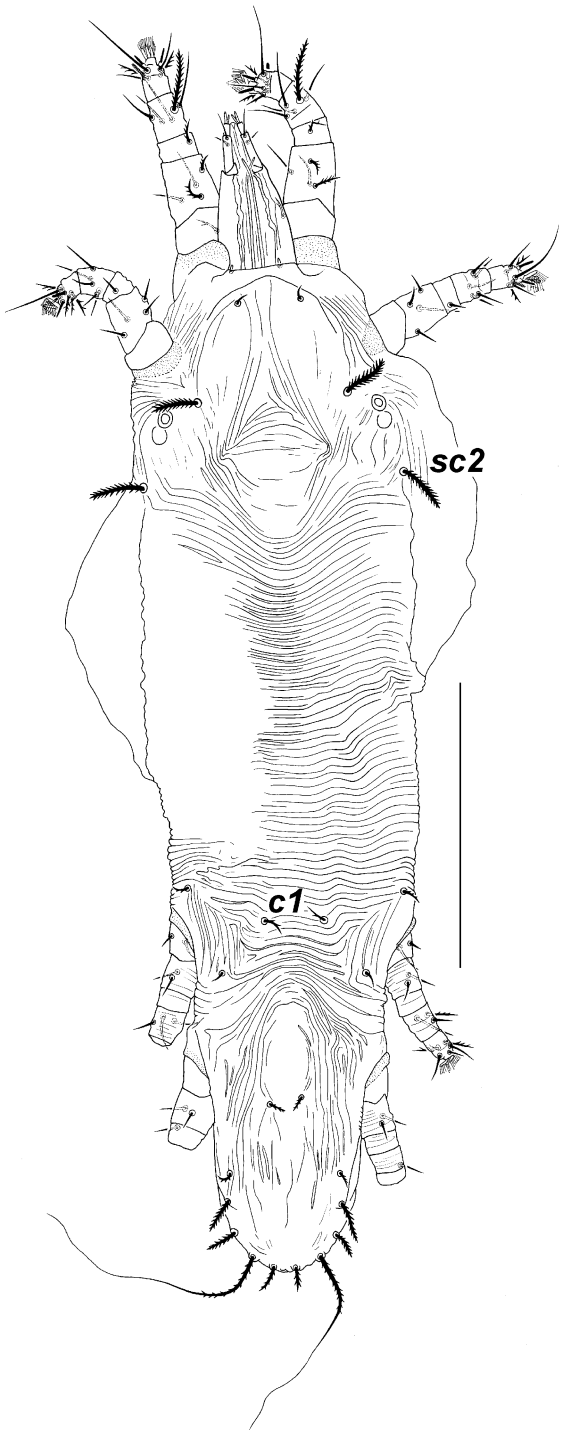



FIG 24. — *Prolixus forsteri* male, detail of aedeagus. Scale bar = 100 μm

**Deutonymph.** *Dorsum*. (FIG. 25) Cuticle mostly plicate; dorsum with smooth area between setae *v2* and *sc1*; with strong corrugated transverse striae between setae *sc2* and setae *c1*; striae weak around setae *e1*. Body measurements: *v2-h1* 307-346, *sc2-sc2* 74-89, *c3-c3* 71-74, *f1-f1* 35-38. All dorsal setae barbed; setae *sc1*, *sc2*, *f1*, *f2*, *h1* thick, barbed; setae *v2*, *c1*, *c3*, *d2, e1*, *e2*, short; seta *h2* elongate, thick and barbed at base, tapering, fine distally; setal measurements: *v2* 5, *sc1* 17-18, *sc2* 18-19, *c1* 6-7, *c3* 4-6, *d2* 5-6, *e1* 6-7, *e2* 4-5, *f1* 8-14, *f2* 8-11, *h1* 7-11, *h2* 80-84.

*Palps*. Palps three segmented, with setal formula 0, 2, 0(2). Palp tarsus with two eupathidia (4, 5).

*Venter*. (FIG. 26) Ventral cuticle completely plicate, with oblique striae anterad setae *1a*, transverse striae between setae *1a* and setae *ag1*, longitudinal striae posterad setae *ag1*. Setal measurements: *1a* 79-86, *1b* 33-57, *2b* 11-14, *2c* 15-16, *3a* 17-18, *3b* 12-13, *4a1* 67-92, *4b* 7-9, *ag1* 7, *g1* 8-9, *ps1* 9-11, *ps2* 6-10. Setae *4a2*, *g2* absent.



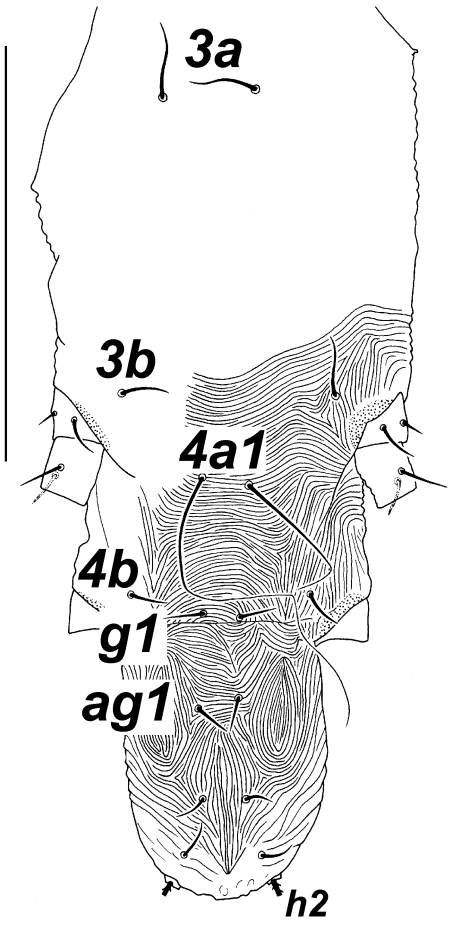




FIG 25. — *Prolixus forsteri* deutonymph dorsum. Scale bar = 100 μm
FIG 26. — *Prolixus forsteri* deutonymph venter. Scale bar = 100 μm

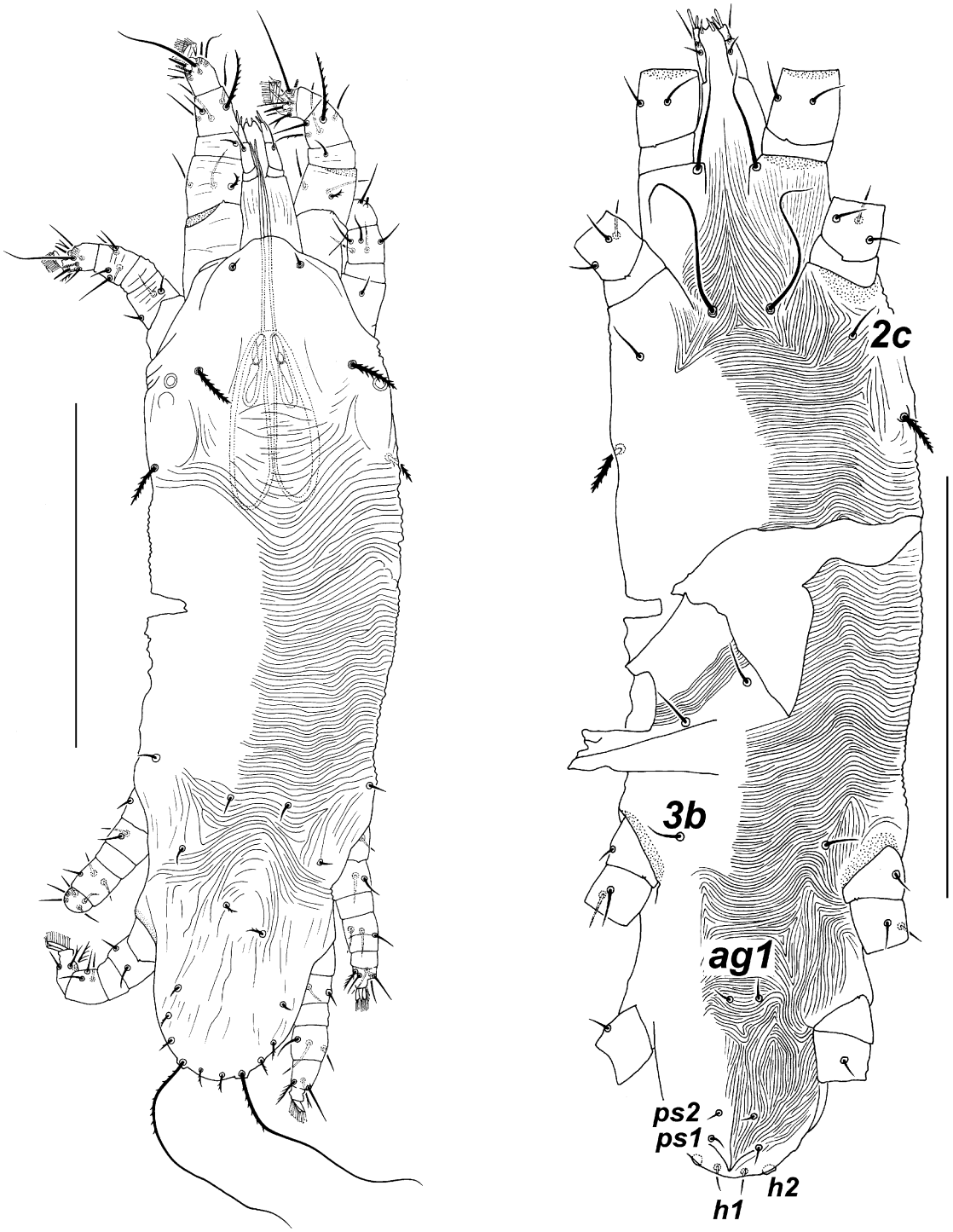



FIG 27. — *Prolixus forsteri* protonymph dorsum. Scale bar = 100 μm
FIG 28. — *Prolixus forsteri* protonymph venter. Scale bar = 100 μm

*Legs*. (see FIG. 25) Tarsus I and II each with one solenidion (5-6, 4-5 respectively). Setal formulae for legs I-IV respectively: 1-1-4-1-5-8(1), 2-0-4-1-5-8(1), 1-2-2-0-3-5, 1-0-1-0-3-5.

**Protonymph.** *Dorsum*. (FIG. 27) Cuticle mostly with strong, deep transverse plicae; dorsum with smooth cuticle anteriorly and posteriorly. Body measurements: *v2-h1* 234-239, *sc2-sc2* 71-72, *c3-c3* 60-63, *f1-f1* 29-30. All dorsal setae barbed; setae *sc1*, *sc2* thick, barbed; all other setae short (< 8), except seta *h2* elongate, thick and barbed at base, tapering distally; setal measurements: *v2* 3-4, *sc1* 14-16, *sc2* 10-12, *c1* 6, *c3* 4-5, *d2* 4, *e1* 5, *e2* 3-4, *f1* 3-5, *f2* 3-4, *h1* 4-6, *h2* 105-119.

*Palps*. Palp three segmented. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (4, 3).

*Venter*. (FIG. 28) Cuticle entirely plicate; with fine mostly transverse striae; limited area of longitudinal striae between setae *ag1* and *ps2*. Setal measurements: *1a* 54-64, *1b* 31-33, *2c* 8-16, *3a* 12-13, *3b* 11-12, *ag1* 5-7, *ps1* 5-7, *ps2* 4-6. Setae *2b*, *4a1*, *4a2*, *4b*, *g1*, *g2* absent. Setae *1a*, *1b* elongate, fine.

*Legs*. (See FIG. 27) Setal formula for legs I-IV: 1-0-3-1-5-8(1), 1-0-3-0-5-8(1), 0-1-2-0-3-5, 0-0-2-0-3-3 respectively. Tarsi I-IV each with two ventral pectinate setae. Tarsus I and II each with one solenidion (4-5, 3-4).

**Larva.** Dorsum. (FIG. 29) Cuticle entirely plicate; with mostly transverse striae; limited area of longitudinal striae anteriorly between setae *v2* and setae *sc1*, and mixed striae posterad setae *c1*. Rostral projection absent. Body measurements: *v2-h1* 215, *sc2-sc2* 65, *c3-c3* 58, *f1-f1* 26. All dorsal setae short (≤ 8), barbed, except setae *sc1* long (15), thick, barbed and setae *h2* elongate, thick and barbed at based, tapering distally; setal measurements: *v2* 4, *sc1* 15, *sc2* 8, *c1* 6, *c3* 5, *d2* 5, *e1* 4, *e2* 4, *f1* 4, *f2* 4, *h1* 5, *h2* 89-109.

*Palps*. Palps three segmented. Setal formula: 0, 2, 0(2). Palp tarsus with two eupathidia (5, 4).

*Venter*. (FIG. 30) Cuticle entirely plicate; with almost entirely transverse striae; limited area of longitudinal or oblique striae anterad setae *1a*, and surrounding setae *ps1-2*. Setal measurements: *1a* 46, *1b* 27, *3a* 9, *ps1* 7, *ps2* 7. Setae *2b*, *2c*, *3b*, *4a1*, *4a2*, *4b*, *ag1*, *g1*, *g2* absent.

*Legs*. (See FIG. 29) Setal formula for legs I-IV: 1-0-3-1-5-6(1), 0-0-3-0-5-6(1), 0-0-2-0-3-3 respectively. Tarsus I and II each with one solenidion (4, 3 respectively).

**Hosts.** *Gahnia aspera* sensu lato (Cyperaceae). The furrows in the blade of this particular form of *G. aspera* are shallow and not as deep as those of the *G. aspera* host of *P. corruginus*.

**Distribution.** Near Bundaberg, Southeast Queensland, Australia.

**Remarks.** All stages of *P. forsteri* sp. nov. can be separated from *P. corruginus* sp. nov. by the plesiomorphic retention of dorsal seta *f2*. Adult female *P. forsteri* possess ventral setae *3b*, *4b*, *ag1*, and a smooth area of cuticle on the prodorsum, all of which are absent in adult female *P. corruginus*.

Both *P. forsteri* and *P. corruginus* were collected in the grooves along the blade of their host plant. However, as the grooves on the host of *P. forsteri* were not as deep as those on the host of *P. corruginus*, individuals of *P. forsteri* were not completely concealed. In addition, individuals of *P. forsteri* were only collected from the younger central leaf blades of the host, that had not yet fully uncurled.

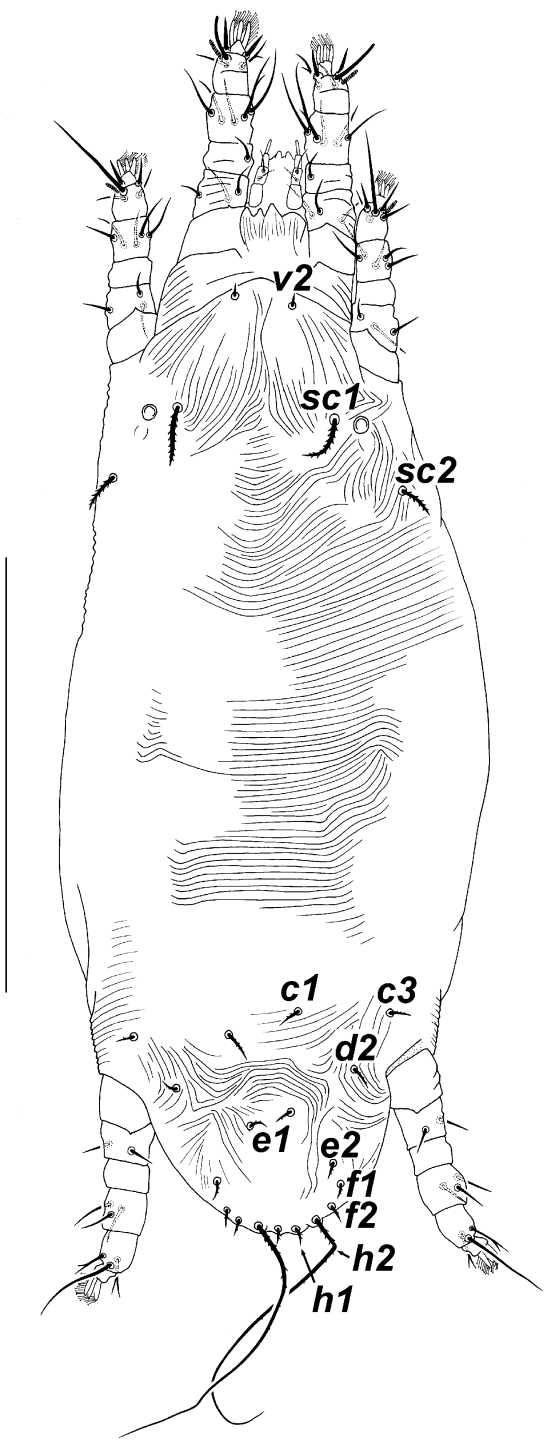
Setae *1a*, *1b*, *4a1* are elongate, and exceedingly fine distally making it difficult to determine the full length of these setae.

**Etymology.** This species is named for Paul I. Forster, who is actively helping to broaden my botanical horizons.

*Discussion*

Members of the genus *Prolixus* share many characters with those of the genera *Dolichotetranychus* and *Afronychus* (TABLE 1), but appear to be more closely related to the former than the latter. This relationship extends to host plant specificity, in that species of both *Dolichotetranychus* and *Prolixus* are found predominantly or entirely upon monocotyledonous plants.

The setal designations used here for both the dorsal and ventral setae of *Prolixus* were based on their relative positions and the sequence of their addition during ontogeny. For example, on the adult dorsum seta *c2* is inserted posterad *c3* and thus appears in the *d1* position; however, in the larva this seta is actually inserted level with seta *c3* (FIGS. 15, 29) and is thus



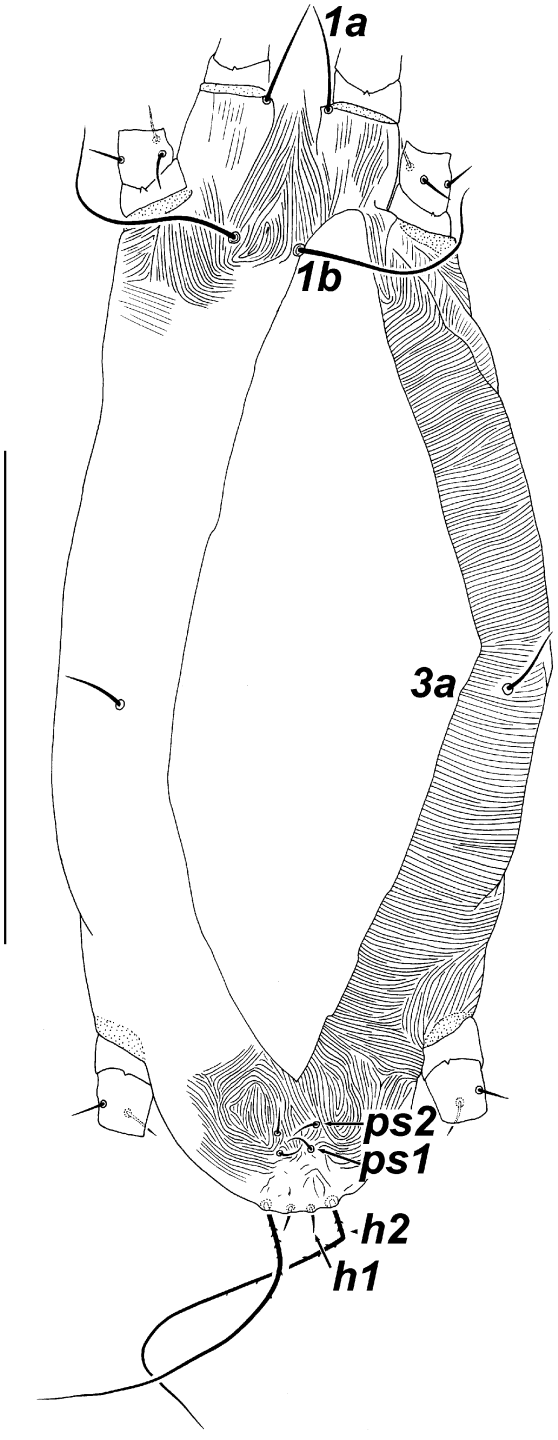




FIG 29. —*Prolixus forsteri* larva dorsum. Scale bar = 100 μm
FIG 30. — *Prolixus forsteri* larva venter. Scale bar = 100 μm

| Taxon | Stage | Seta* | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 1a | 1b | 1c | 2a | 2b | 2c | 3a | 3b | 4a | 4b | ag1 | ag2 | g1 | g2 | g3 | g4 | ps1-3 |
| *Tuckerella* | L | * | * | | – | | | * | | | | | | | | | | * |
| Tuckerellidae | PN | | | | – | | * | | * | | | * | | | | | | |
| | DN | | | * | – | * | | | | * | * | | * | | | | | |
| | TN | | | | – | | | | | | | | | * | * | | | |
| | F | | | | – | | | | | | | | | | | * | * | |
| | M | | | | – | | | | | | | | | | | | | |
| *Tetranychus* | L | * | * | | – | | | * | | | | | – | | | – | – | * |
| Tetranychidae | PN | | | * | – | | * | | * | | | * | – | | | – | – | |
| | DN | | | | – | * | | | | * | * | | – | * | | – | – | |
| | F/M | | | | – | | | | | | | | – | | * | – | – | |
| *Austrolinus* | L | * | * | | | | – | * | | | | | | | | | – | * |
| Linotetranidae | PN | | | | * | * | – | | * | | | * | | | | | – | |
| | DN | | | * | | | – | | | * | * | | * | * | | | – | |
| | F | | | | | | – | | | | | | | | * | * | – | |
| *Prolixus* | L | * | * | – | – | | | * | | | | – | – | | | – | – | *1-2 |
| Tenuipalpidae | PN | | | – | – | | * | | * | | | – | – | | | – | – | |
| | DN | | | – | – | * | | | | *1 | * | – | – | * | | – | – | |
| | F/M | | | – | – | | | | | *2 | | – | – | | * | – | – | |

TABLE 2. Developmental stages in which ventral setae are added, for examples of four families in the Tetranychoidea (* = note that setae *3c* and *4c* are not present in the entire superfamily).

designated *c2*. The naming of the ventral setae was based on a comparison of the sequence of additions in *Prolixus* with species from other families in the Tetranychoidea (Tuckerellidae, Tetranychidae, Linotetranidae) (TABLE 2). In general for these families, setae *2c* and *ag1* are added in the protonymph, *2b*, *4a*, *ag2* and *g1* in the deutonymph, and *g2* appears in the adult (except in *Tuckerella* where *g1* and *g2* are both added in deutonymph and *g3* and *g4* are added in the adult (BEARD, & WALTER, 2005).

The ventral podosomal seta *4a2* represents a rare addition to an otherwise chaetotactically stable area (LINDQUIST 1985). This addition also occurs in several species of the genus *Tenuipalpus*, including *T. keiensis* Meyer for which the presence of two pairs of *4a* setae is considered a diagnostic feature (MEYER 1979). Previously these setae were designated as the posterior medioventral setae, and although the extra seta (here *4a2*) has not previously been denoted in the literature under the naming system presented by LINDQUIST (1985), LINDQUIST himself feels this seta is a duplication of *4a* (pers. comm. 2003).

## ACKNOWLEDGEMENTS

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