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Larva and deutonymph of *Promegistus armstrongi* Womersley (Acari: Mesostigmata: Trigynaspida: Promegistidae)

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ABSTRACT

Larvae and deutonymphs of *Promegistus armstrongi* Womersley are described from new material collected from south-east Queensland. Leg chaetotaxy is provided. Unlike other known trigynaspid larvae, those of *P. armstrongi* are extremely hypotrichous, especially on the opisthosoma, and possess a long trochantal process. Likewise, the deutonymph is unique with poorly defined dorsal and ventral shields, small bare sternal shield, and forked trochantal process. The morphology of the immature stages of *P. armstrongi* is compared with other immature stages of trigynaspid mites, including the unplaced species *Derrickia setosa* Womersley (unplaced), which it resembles most. Diagnoses are provided for the immature life stages of Celaenopsoidea, Fedrizzioidea and Megisthanoidea.
❐ *Taxonomy, ontogeny, classification, Antennophorina, Parantennuloidea.*

Promegistus armstrongi Womersley is the sole member of the Promegistidae. Womersley (1958) originally placed this unusual mite in the Paramegistidae, which it resembles in the smooth dorsum fringed with setae, fragmented sternal shield and hypertrichous ventrianal shield. Later, the unique arrangement of sternal and genital shields coupled with unique leg chaetotaxy led Kethley (1977a) to form a new family to accommodate this species, within the Fedrizzioidea. Later, Kim (2004) moved the family from the Fedrizzioidea and into the Parantennuloidea, mostly on the basis of the pseudosternogynum: a bare pregenital shield present only in parantennuloid mites.

Like most trigynaspid mites, adult life stages of *P. armstrongi* are associated with insects (Hunter 1993; Seeman 2001). Womersley's (1958) original collections were from a carabid and a passalid beetle (plus several other specimens with poor collection data), suggesting both may serve as hosts. However an extensive survey of log inhabiting arthropods by Seeman (2001, 2002), in addition to further collection records presented here, indicate this species is almost exclusively associated with large carabid beetles. Records from passalid beetles represent accidental associations resulting from carabid and passalid beetles co-habiting beneath rotting logs.

Few immature life stages are described for trigynaspid mites (Seeman 2000), yet their morphology could help place problematic species such as *P. armstrongi*. The paucity of information on immature trigynaspids is probably due the obscurity of these mites and the dissociated juvenile and adult habitats. While most adult trigynaspid mites live on insects, with few exceptions the immature life stages are free living. In situations in which the host insect lives in a long-lasting habitat, the immature mites roam freely in the habitat, for example within the tunnels of passalid beetles (e.g., Butler & Hunter 1968; Seeman 2000) or

scolytid beetles (e.g. Kinn 1966, 1967). However when the host insect is not sedentary, such as many carabid beetles, the immature life stages are harder to find.

During the IBISCA (Investigating the Biodiversity of Soil and Canopy Arthropods) -Queensland Project (see Kitching *et al*. this volume), samples of soil revealed the hitherto unknown deutonymph of *P. armstrongi*. This spurred further attempts to rear the mites in an effort to obtain all life stages.

MATERIAL AND METHODS

Leaf litter was placed in a Tullgren funnel, extracted into 75% ethanol, and a single deutonymph of *P. armstrongi* removed. This specimen was cleared in Nesbitt's fluid, mounted in Hoyer's medium and the slide ringed with insulating varnish. All specimens were examined with a Nikon Eclipse 80i microscope equipped with DIC and a drawing tube. Illustrations were prepared by Michelle Baker. Leg chaetotaxy follows Evans (1963). Body chaetotaxy follows Lindquist & Evans (1965).

Previous attempts at rearing *P. armstrongi* involved removing adult mites from carabid beetles and placing them into containers with a moistened plaster of Paris – charcoal substrate, as in Seeman (2000), using nematodes as food. However, all attempts failed as the adult mites did not feed on nematodes.

The first successful attempt at obtaining larvae of *P. armstrongi* used the same method, with mites taken from a *Pamborus alternans* Latreille (Carabidae) collected from Mt Glorious. A small amount of woody debris was added to the container to provide habitat. As nematodes were not available, the adult mites received no food. From this, two dead larvae were found. These were mounted in Dimethyl Hydantoin Formaldehyde (Steedman 1958). This mounting medium has good optical properties and slides can be dried at room temperature and do not require ringing. However, these slides and another series mounted at the same time (Cheyletidae, Phytoseiidae, Tenuipalpidae, Tydeidae) demonstrated two limitations. First, this medium does not clear specimens after mounting, so incompletely cleared specimens are poor. Second, the cuticle of soft-bodied specimens crumpled. Consequently, the two damaged larval specimens could only be used for comparison with the larval specimens obtained later and mounted in Hoyer's medium.

The subsequent rearing attempt involved keeping a *Pa. alternans* beetle, infested with *P. armstrongi*, alive in a small plastic tub with woody debris. The container and beetle were examined every few days for the presence of immature mites, from which a larva was recovered. Two weeks after the death of the beetle, the contents of the tub were placed into 75% ethanol and searched. From this material two live deutonymphs were recovered. Both specimens were much smaller than the specimen captured from litter extraction, suggesting the rearing conditions were not ideal. These specimens were cleared in Nesbitt's Fluid, mounted in Hoyer's medium, and ringed with insulating varnish.

SYSTEMATICS

Promegistidae Kethley, 1977a

Diagnosis. *All life stages*: palp tibia and tarsus fused. *Adults:* Round mites with minute dorsal setae and marginal fringe of spine-like setae; palp genu with 6 setae; moveable digit of chelicerae with filamentous excrescence; fixed digit with membranous distal excrescence; both digits with fine fringes; membranous lobe between digits; gnathotectum with weak median keel. *Female*: Sternal shield fragmented: *st1-3* on sternal shield; st4 on metasternal shields that are fused to the endopodal shields; posteromedial pseudosternogynum present. Latigynal shields free, bearing nine or ten setae. Bare mesogynal shield fused to hypertrichous ventrianal shield. *Deutonymph*: Dorsum with reticulated prodorsal,

paired mesonotal and pygidial shield; palp trochanter with blunt forked process. *Larva*: Dorsum with six pairs of prodorsal setae on weak shield, one pair of opisthodorsal setae, one pair of opisthogastric setae, one pair of paranal setae and unpaired anal seta; anal shield placed terminally; anteriormost prodorsal setae elongate, the longest dorsal seta; palp trochanter with blunt process.

Type species. *Promegistus armstrongi* Womersley.

Promegistus armstrongi Womersley, 1958

Material. 1 deutonymph, Lamington National Park IBISCA, SE Qld, Australia, Plot # IQ-1100-C, 1106 m alt., 28.260 ºS 153.167ºE, 5-7 Oct 2006, rainforest, K. Staunton, ex litter extraction. Sampcode 20013 (a pitfall trap site where an opportunistic litter sample was taken). 2 deutonymphs, 1 larva, reared in captivity, original adult *P. armstrongi* record: 2♀♀, 3♂♂, Lamington National Park IBISCA, SE Qld, Australia, Plot# IQ-500-B, 514 m alt., 28.212ºS 153º141ºE, 23 Oct 2006, rainforest, C. Burwell, day hand collecting, 1210-1310 hrs, ex. *Pamborus alternans* (Coleoptera: Carabidae). 2 larvae, reared in captivity (collected dead), original adult *P. armstrongi* from Mt Glorious National Park, C. Burwell, hand collection, Aug. 2006, ex. *Pamborus alternans.* All slides in Queensland Museum.

Description. Larva (n = 1; Figs 1-7). *Dorsal idiosoma* (Fig. 1). Round, length 247, width 278, with incompletely formed prodorsal shield (folded medially in specimen) and setae *j1* on small weakly formed anterior plate. Prodorsum with six pairs of setae tentatively assigned as *j1, j3, j5, j6, z4* and *s4* (*j1* and *z4* off shield). Setae *j1* 225 long, barbed; other prodorsal setae short (9 – 20 long), smooth. One pair of pores laterad *s4*. Opisthodorsum with one pair of *J* setae 38 long. Soft cuticle striate.

Ventral idiosoma. (Fig. 2) Tritosternal base 16 wide, 31 long, laciniae separate, 53 long. Sternal setae barbed, *st1-3* 63-75. Sternal shield delineated by a poorly defined area of smooth cuticle between sternal setae. Opisthogaster with one pair of setae, barbed, 90 long, probably *JV1* or *JV2* based on its medial position. Anal valves with alveoli of paired euanal setae. Small terminal postanal shield bearing paranal setae 133 long, barbed, and postanal seta broken, at least 250 long, barbed. Two pairs of pores between anus and anal setae. Soft cuticle striate, weakly so between anus and postanal shield.

Gnathosoma. (Fig. 3) Hypostomal setae *h1* barbed, 83 long, *h2* barbed, 104 long. Deutosternum with four rows of denticles. Corniculi blunt, 25 long. Gnathotectum multi-tined, without keel. Palp trochanter with narrow non-setigerous process on adaxial margin, 50 long (homologous with forked process in deutonymph). Palp setal count (trochanter – tibiotarsus) 0-4-5-22; apotele two-tined; pre-apotele (tibia) with seven setae, post-apotele (tarsus) with 15 setae. Palp tarsal tip with two blunt setae.

Chelicerae. (Fig. 4) Large, moveable digit 125, fixed digit 178. Moveable digit with one row of five-six large and eight-nine small teeth and two seta-like cheliceral excrescences, 17 long. Fixed digit with blade-like cheliceral seta, 19 long, and two rows of teeth: five-six large and eight-nine small teeth in inner row, and 27 small teeth in outer row. Pilus dentilus not obvious, however a small cavity 22 from cheliceral tip may represent a rudimentary pilus dentilus.

Legs. (Figs 5-7) Coxae of all legs (I-III) and trochanters and femora II-III with rows of fine denticles. Tarsus I without claws, but with long thick terminal seta 206 long; six elongate setae with a wavy form. Tibia I with two elongate setae. Setal counts for coxa to tarsus: leg I 2-4-9-6-8-26; leg II 1-4-7-6-7-16; leg III 1-4-5-6-6-16. Leg chaetotaxy for trochanters to tibiae presented in figures 5-7.

Deutonymph. (n = 3; Figs 8-16) *Dorsal idiosoma* (Fig. 8). Oval, length 950-1550, width 810-1240, with small reticulate prodorsal shield with irregular margins, 350-370 long, 430-450 wide. Prodorsal setae tentatively designated as *j1-6, z3-6, s4-6* and two-three setae lateral to series *s*; series *r* hypertrichous. Setae *j1* 315 long, with few barbs. Prodorsal shield with setae *j5* (27-30 long, smooth) medially and setae *j4, j6, z3, z4* and *z5* captured on the shield's margin. Medial opisthodorsum mildly hypertrichous.

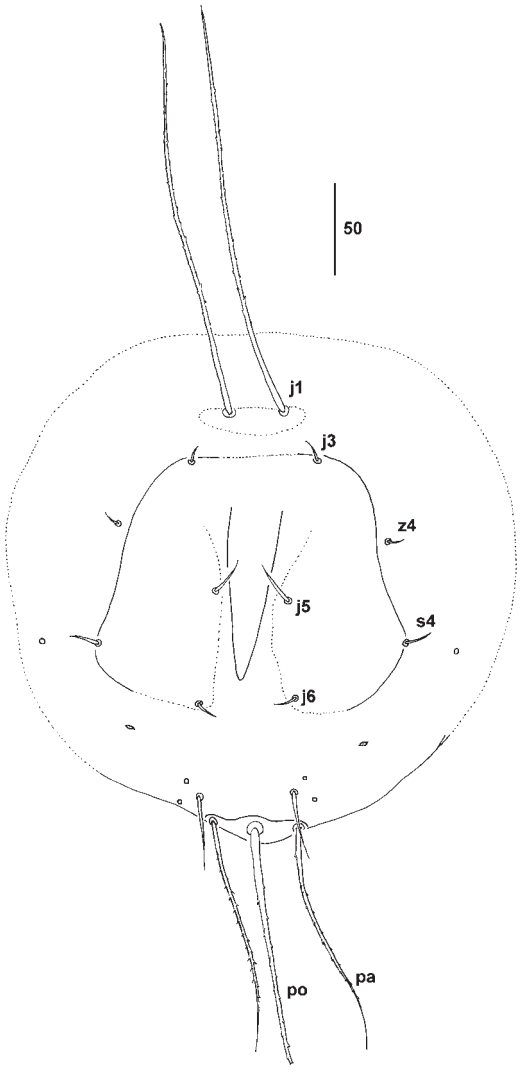


FIG. 1. Dorsum of the larva of *Promegistus armstrongi* Womersley with tentative setal designations.

All mediodorsal setae relatively short, smooth, 22-47 long. Paired mesonotal plates small, reticulate, with irregular margins, 100-105 long, 135-150 wide; without setae. Pygidial shield similar, 100 long, 200-213 wide, bearing seta tentatively named *J3* and an unpaired medial seta on anterior margin. Marginal setae smooth with few barbs anteriorly, ca. 150 long, becoming longer and barbed posteriorly. Many posterior marginal setae barbed for ca. 250, then attenuate for another 200-250 (truncated in illustration). Soft cuticle strongly striate.

Ventral idiosoma. (Fig. 9) Tritosternal base 42 wide, 124 long. Laciniae separate, 130 long. Sternal shield small, reticulate, with irregular margins, 175 long, 138 wide. Setae st1-5 barbed, 150-175 long. Opisthogastric setae tentatively designated as *JV1-5, ZV1-5, UR1-2* and paranal setae. Postanal seta absent. Five paired patches of reticulate cuticle posterior to st5: anterior-most associated with pair of pores (just posteromedad st5); two patches associated with *JV1* and *ZV1*; one patch laterad *JV3*; and with rudimentary endopodal plates around coxa IV. Peritreme very short, 26-30 long. Anus 45 long, bearing alveoli of paired euanal setae, surrounded by small ring of smooth cuticle, bearing one pair of pores posteriorly.

Gnathosoma. (Figs 10-11) Hypostomal setae *h1-4* barbed, 175-225 long. Deutosternum with four rows of small denticles. Corniculi strong, with blunt bifid tips, 51-55 long. Membranous gnathosomal collar with spiculate cuticle. Gnathotectum (Fig. 11) multi-tined, branched, without keel; with long broad medial tine (95-102 long) and paired multi-branched tines either side. Palp trochanter with forked non-setigerous process on adaxial margin. Palp setal count (trochanter – tibiotarsus) 2-5-6-31; apotele two-tined; pre-apotele (tibia) with eight setae; post-apotele (tarsus) with 23 setae. Palp tarsal tip with at least four blunt setae.

Chelicerae. (Fig. 12) Large, moveable digit 255-275 long, fixed digit 362-380 long. Moveable digit with single row of 21-27 teeth, large teeth interspersed with small teeth; with three seta-like cheliceral excrescences, 60-70 long; distal hook with numerous fine rasp-like teeth. Fixed digit with cheliceral seta (45-51 long) and 27-28 teeth in two rows: inner row with 12-14 large teeth

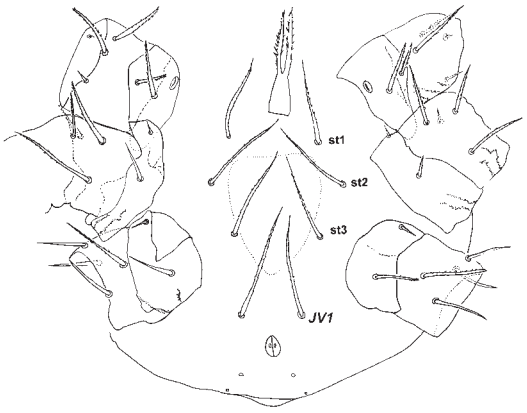


FIG. 2. Venter of the larva of *Promegistus armstrongi* Womersley.

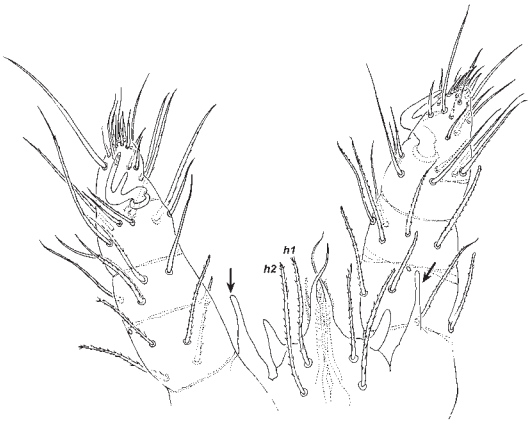


FIG. 3. Hypostome and palps of the larva of *Promegistus armstrongi* Womersley. The right palp is a ventral view. On the left palp, the trochanter has twisted clockwise and the femur to tarsus has twisted anticlockwise. Arrows indicate the trochantal process.

interspersed with small teeth; outer row with 24-26 tiny teeth, from pilus dentilus (eight long) to a cluster of teeth on distal hook.

Legs. (Figs 13-16) Coxae of legs I with 26-33 sclerotised pore-like structures. Denticles absent

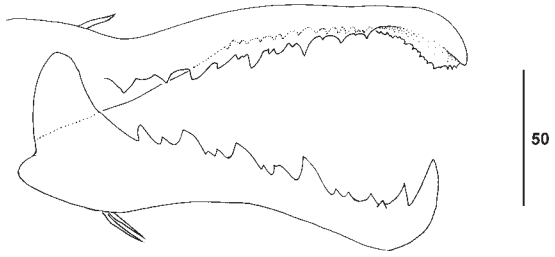


FIG. 4. Chelicera of the larva of *Promegistus armstrongi* Womersley.

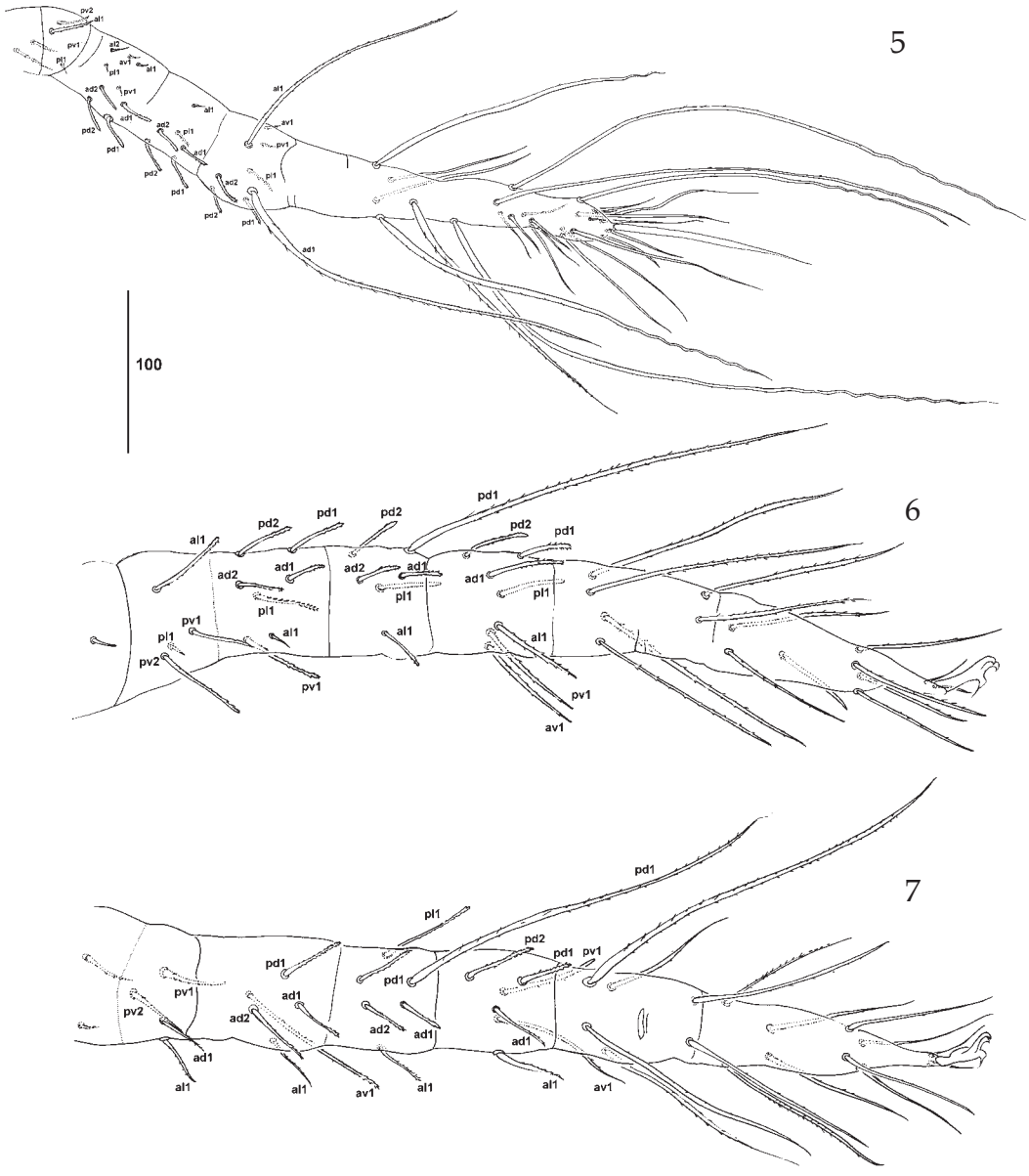
on all segments. Tarsus I without claws, wavy setae absent. Setal counts for coxa to tarsus: leg I 2-6-11-6-10-33 (min.); leg II 1-5-10-8-9-19; leg III 1-5-7-8-8-19; leg IV 1-5-8-7-8-21. Tarsus IV with av4 and pv4 small, placed on ventral intercalary sclerite between basitarsus and telotarsus. Leg chaetotaxy for trochanters to tibiae presented in figures 13 to 16.

Remarks. With the exception of fedrizziid and davacarid mites (Seeman 2000; Walter 2004), larvae of Trigynaspida lack the full setal complement of the Gamasina (Lindquist & Evans 1965; Seeman & Walter 1997). This hypotrichy is usually mild, but in *P. armstrongi* it is extreme. Gamasina larvae possess up to 20 pairs of dorsal setae and four pairs of opisthogastric setae. *Promegistus armstrongi* has just seven pairs of dorsal setae and one pair of opisthogastric setae.

Similar prodorsal hypotrichy occurs on the prodorsum of *Choriarchus reginus* Kinn, 1966, (Schizogyniidae) which also possesses just six pairs of prodorsal setae and their positions suggest these setae are homologous.

DISCUSSION

The Trigynaspida is currently split in two cohorts, Cercomegistina and Antennophorina, with one and seven superfamilies, respectively (Kim 2004). This follows Kethley's (1977a)



FIGS 5-7. Legs of the larva of *Promegistus armstrongi* Womersley with setal designations for trochanters to tibiae.

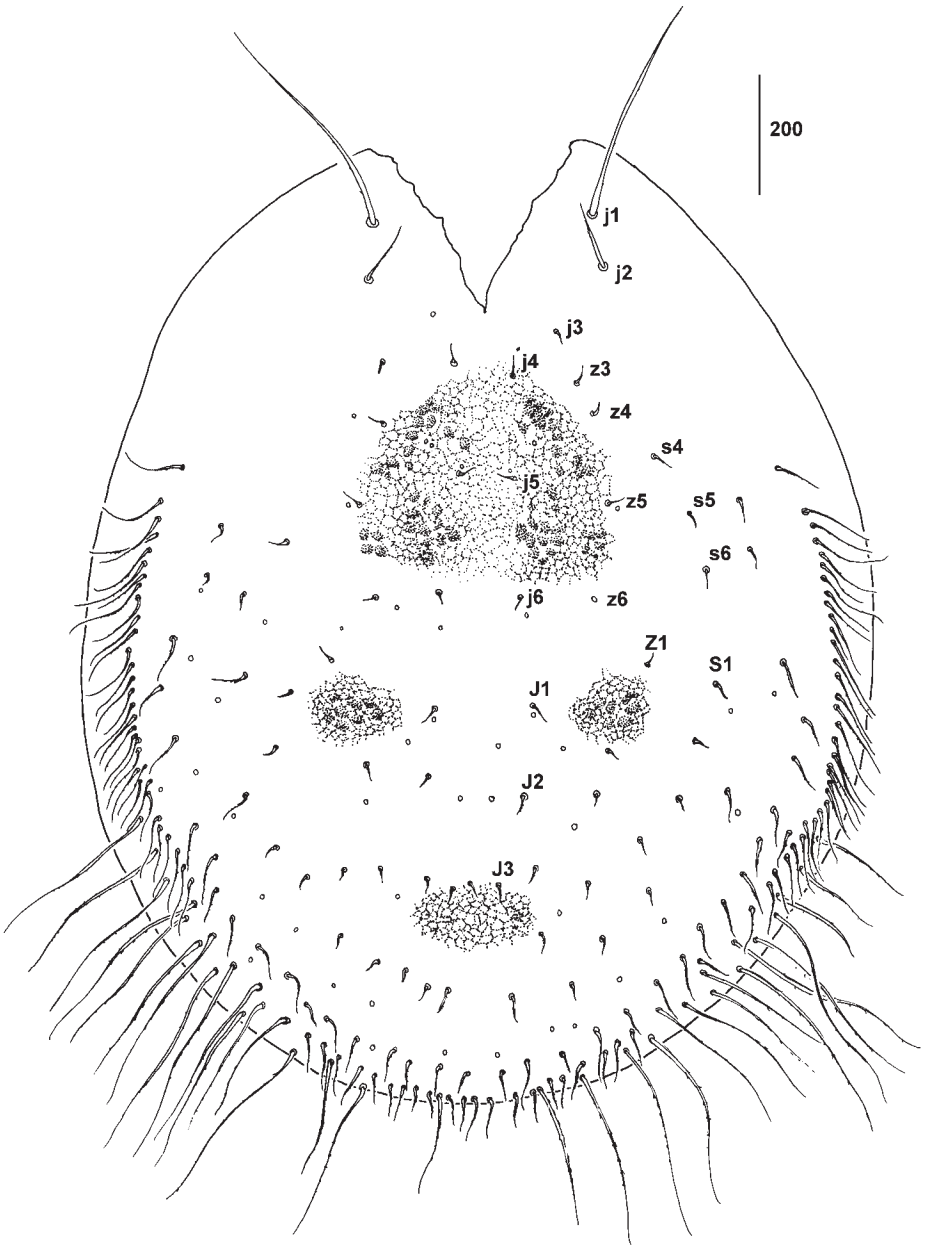


FIG. 8. Dorsum of the deutonymph of *Promegistus armstrongi* Womersley with tentative setal designations for some podosomal setae.

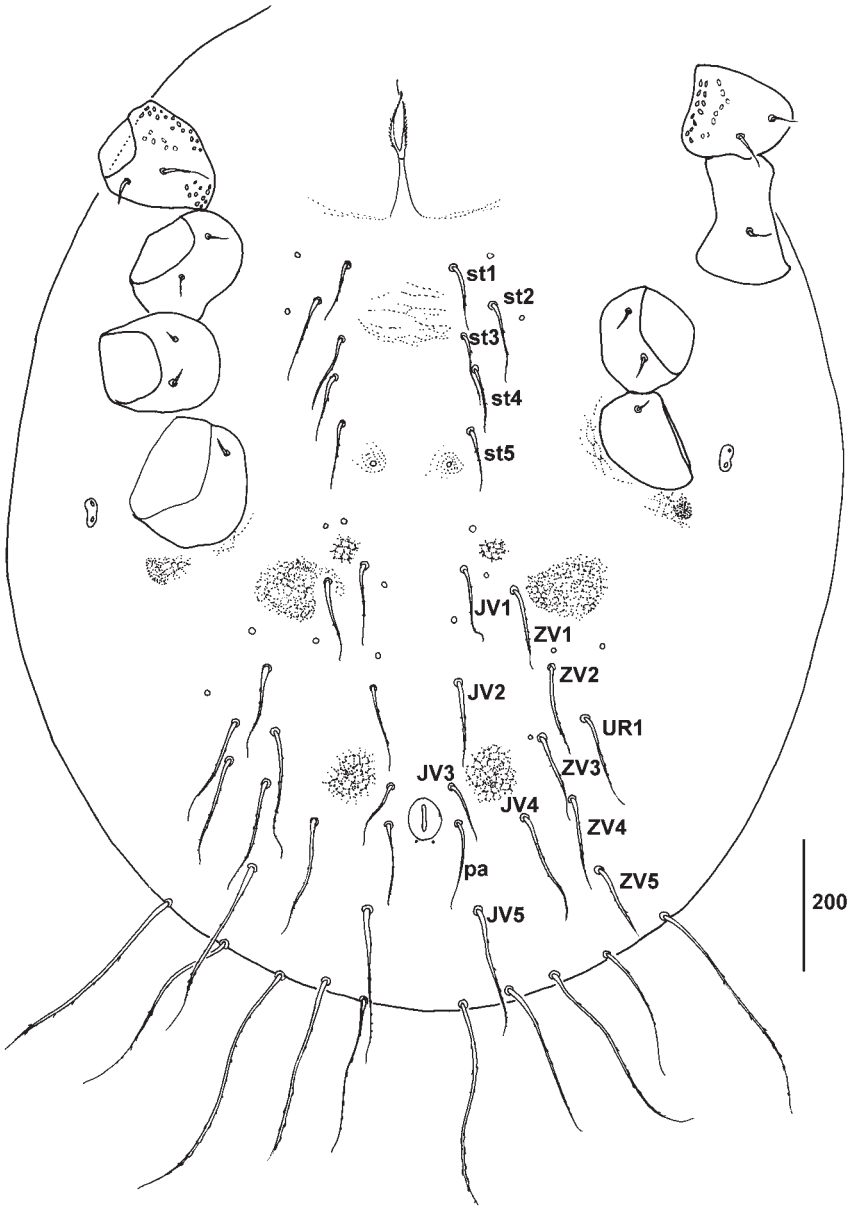


FIG. 9. Venter of the deutonymph of *Promegistus armstrongi* Womersley with tentative setal designations for opisthogastric setae.

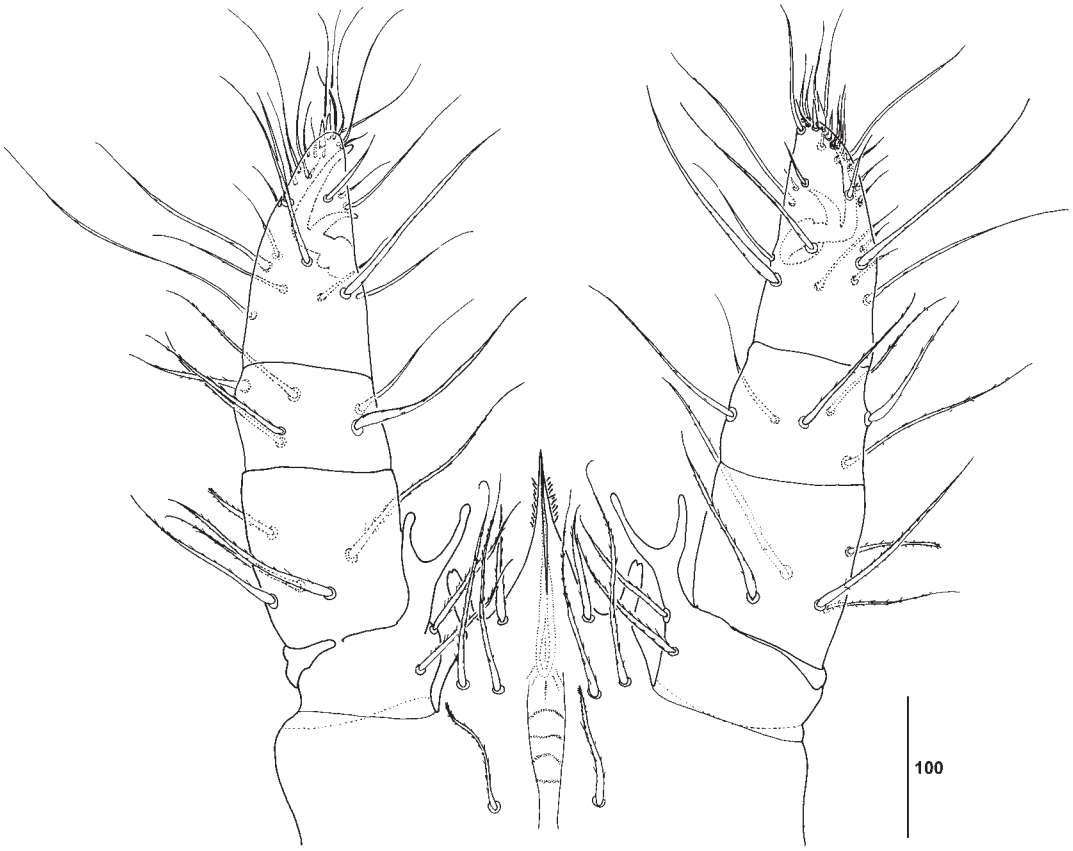


FIG. 10. Hypostome and palps the deutonymph of *Promegistus armstrongi* Womersley.

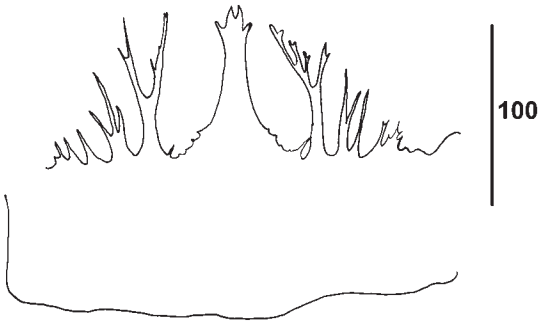


FIG. 11. Gnathotectum of the deutonymph of *Promegistus armstrongi* Womersley.

concept fairly closely, excepting the concept of the Fedrizzioidea. This superfamily was split, with the Promegistidae being moved to a different Superfamily, the Parantennuloidea. This change was supported by a phylogenetic analysis. Nevertheless, *P. armstrongi* does at least bear a superficial resemblance to members of the Paramegistidae. Both families have large rounded adult mites with bare dorsal shields fringed with blade-like setae, fragmented sternal and genital shields, and a large hypertrichous ventrianal shield. Furthermore, Kontschan & Seeman (2011) found a surprising number of leg setal differences between *P. armstrongi* and other members of the

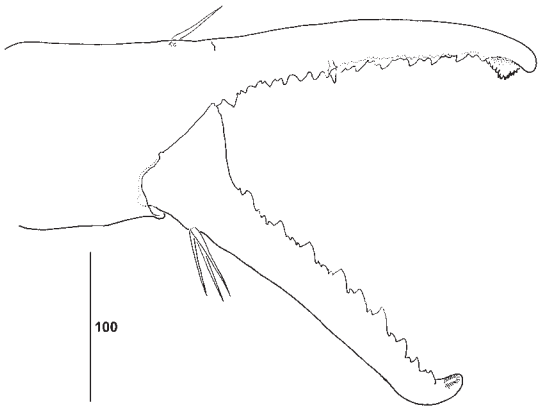


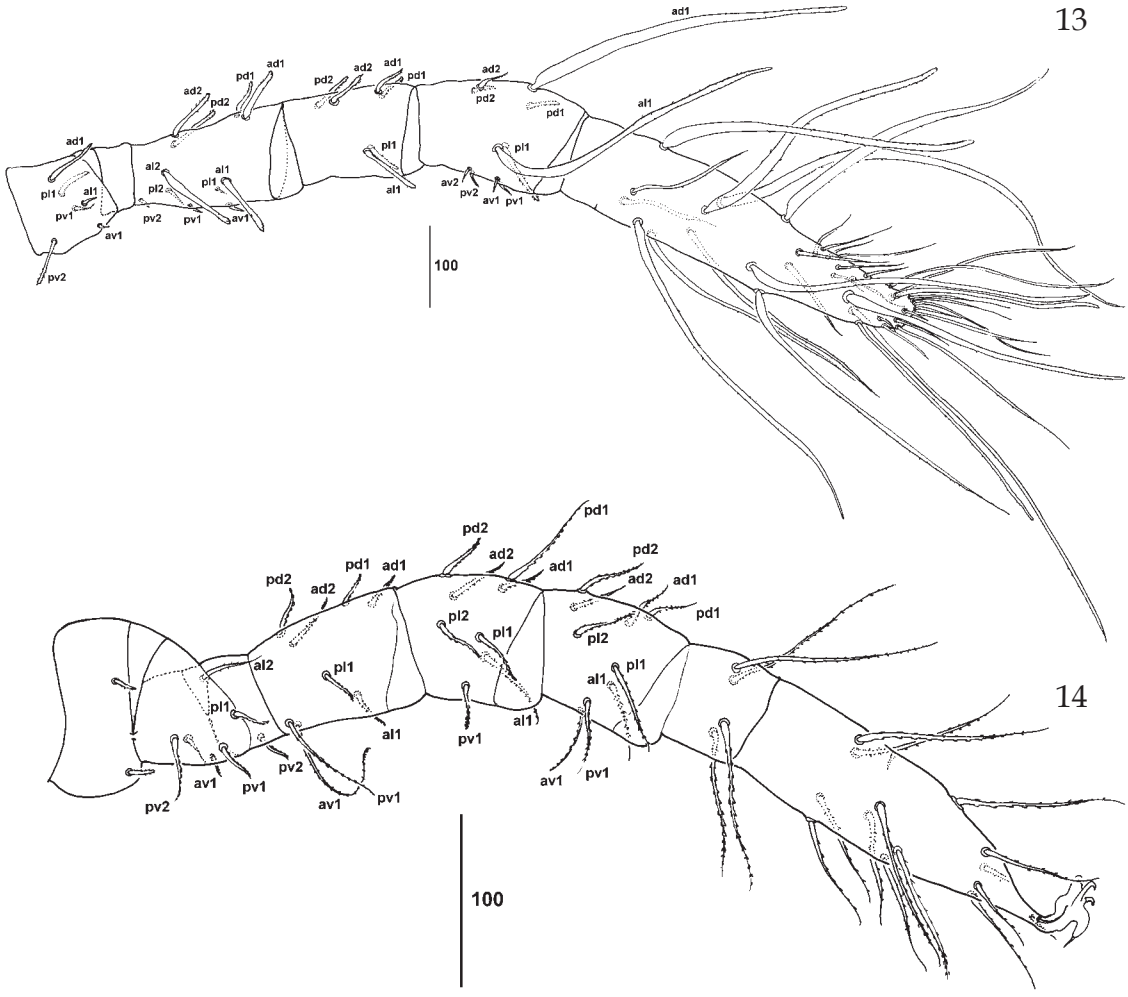
FIG. 12. Chelicera of the deutonymph of *Promegistus armstrongi* Womersley.

Parantennulidae. Thus, it seems this unusual species may yet be reclassified pending further data, including that of the immature life stages of other trigynaspid mites.

Unfortunately, meaningful comparisons of the immature stages of *P. armstrongi* with other trigynaspid taxa are hampered by lack of data. Immature life stages are known for 18 other species from 13 families of Trigynaspida. Though this sample is scant, some conclusions can be made. First, the protonymph and deutonymph, and generally the larvae, of the Celaenopsoidea seem similar to each other and a tentative diagnosis can be prepared for this group (Table 1). Further to this diagnosis, characters from the adult stage are also evident, such as the large basal cheliceral tooth and the reasonably consistent leg chaetotaxy (Kethley 1977a). Consequently, immature life stages of the Celaenopsoidea are readily identifiable, and *P. armstrongi* is certainly not a celaenopsoid mite.

TABLE 1. Diagnoses for the immature life stages of the Celaenopsoidea. Further characters of the adult body (Kim 2004) and possibly leg chaetotaxy (Kethley 1977a; Seeman 2007b) are complementary to this diagnosis.

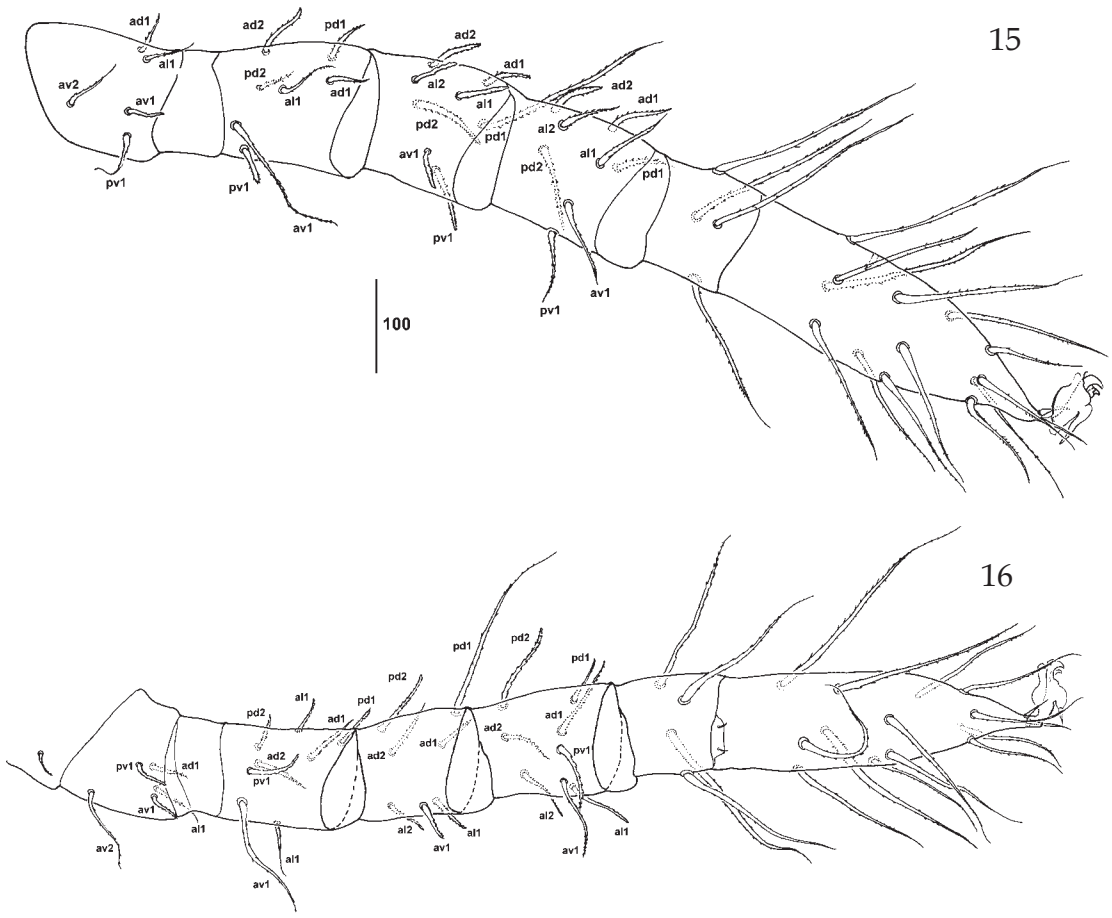
Superfamily Celaenopsoidea Taxa: *Choriarchus reginus* (Schizogyniidae; Kinn 1966), *Cryptometasternum derricki* (Diplogyniidae; pers. obs.), *Euzercon latus* (Euzerconidae; Hunter & Davis 1965), *Funkotriplogynium iagobadius* (Triplogyniidae; Seeman & Walter 1997), *Neotenogynium malkini* (Neotenogyniidae; Kethley 1974) and *Pleuronectocelano barbara* (Celaenopsidae; Kinn 1968). Remarks: Absences of features (see below) in the larval stage occur only in *P. barbara*, which needs to be re-examined to ensure shields are not present but difficult to see. *Neotenogynium malkini* is unusual in the Celaenopsoidea in having immature life stages associated with their host. Exceptions caused by this species are in italics.
Deutonymphs. Well defined podonotal, mesonotal and pygidial shields; large *anal* or ventrianal shield; two pairs of well defined metapodal shields, *or absent*; small platelet posterolateral to ventrianal shield present or absent. Sternal shield well developed, bearing st1-st3 *or at margins of shield*. Peritremes developed, reaching CxII-III boundary, *or very short*. If hypertrichous, then hypertrichy mostly restricted to margins and opisthodorsum. Tarsus I not tapering. Macrosetae absent on all leg segments.
Protonymphs. Well defined podonotal, paired mesonotal and pygidial shields; anal or small ventrianal shield present; sternal shield well developed, bearing st1-st3. Peritremes reaching at least to margin of CxIII-IV, *or very short*. If hypertrichous, then weakly so and only on opisthodorsal margins. Tarsus I not tapering. Macrosetae absent on all leg segments.
Larvae. Podonotal shield present or absent; pygidial shield present. Anal or ventrianal shield present. Euanal setae present, *or absent*. Sternal shield present or absent; if present then large and bearing st1-st3. Body hypotrichous, but prodorsum with at least six pairs of setae. Tarsus I not tapering. Macrosetae absent on all leg segments.



FIGS 13-14. Legs I-II of the deutonymph of *Promegistus armstrongi* Womersley with setal designations for trochanters to tibiae.

Diagnoses for the Fedrizzioidea (Table 2) and Megisthanoidea (Table 3) are tentative, being based on representatives from one of two families in each superfamily. However, the diagnosis for the Fedrizzioidea should be robust, as its two families (Fedrizziidae and Klinckowstroemiidae) are very similar (Seeman 2007a). Note also that the immature stages of *Fedrizzia grossipes* Canestrini described by Seeman (2000) are now considered to be *Fedrizzia sellnicki* Womersley (Seeman 2007a). The Megisthanidae and Holomegistidae also seem similar, so this diagnosis may also prove useful.

A diagnosis for the Antennophoroidea is premature as immature stages are known only for one species (Wiśniewski & Hirschmann 1992),



FIGS 15-16. Legs III-IV of the deutonymph of *Promegistus armstrongi* Womersley with setal designations for trochanters to tibiae.

and good diagnoses for the Parantennuloidea and Cercomegistoidea are impossible due to significant variation within known immature stages. For the Parantennuloidea, immature life stages of *Micromegistus* (Parantennulidae: *M. bakeri*, plus two undescribed species from Australia) are virtually identical to each other. *Micromegistus*, *Philodana johnstoni* Kethley (Philodanidae) and *P. armstrongi* share few or no features (Nickel & Elzinga 1970; Kethley 1977b; Table 4). Likewise, immature life stages of *Cercoleipus coelonotus* Kinn, *Cercomegistus evonicus* Kinn and *Holocercomegistus agelenophilus* Evans (Cercomegistidae; Evans 1958; Kinn 1967, 1970), *Pyrosejus prionotus* Lindquist & Moraza (Pyrosejidae; Lindquist & Moraza 1993), *Acanthodavacarus klompeni* Walter and *Davacarus gressetti* Hunter (Davacaridae; Hunter 1970; Walter 2004) and *Saltiseius hunteri* Walter (Saltiseiidae; Walter 2000) are too variable to make a meaningful diagnosis for the superfamily.

TABLE 2. Tentative diagnoses for the immature life stages of the Fedrizzioidea. Further characters of the adult body (Kim 2004) and leg chaetotaxy (Kethley 1977a; Seeman 2007a) are complementary to this diagnosis.

Superfamily Fedrizzioidea Taxa: *Neofedrizzia camini* (Fedrizziidae; Seeman 2000); *Fedrizzia sellnicki* (Fedrizziidae; Seeman 2000, 2007a)
Deutonymphs. Well defined podonotal, mesonotal and pygidial shields; large ventrianal shield; 1 pair of well defined metapodal shields; small platelet posterolateral to ventrianal shield present. Sternal shield well developed, bearing st1-st3. Peritremes developed, reaching CxII-III boundary. Hypertrichous, mostly restricted to margins and opisthodorsum. Tarsus I not tapering. Macrosetae absent on all leg segments.
Protonymphs. Well defined podonotal and pygidial shields; mesonotal shields absent; ventrianal shield present, fused with pygidial shield; sternal shield well developed, bearing st1-st3. Peritremes short, barely reaching margin of CxIII-IV. Mild hypertrichy only in J series. Tarsus I not tapering. Macrosetae absent on all leg segments.
Larvae. Well defined podonotal shield; pygidial shield present. Anal shield present, fused with pygidial shield. Euanal setae present. Sternal shield present, bearing only st1. Body hypotrichous, but prodorsum with at least six pairs of setae. Tarsus I not tapering. Macrosetae absent on all leg segments. Hypotrichy absent.

TABLE 3. Tentative diagnoses for the immature life stages of the Megisthanoidea. Further characters of the adult body (Kim 2004) and leg chaetotaxy (Kethley 1977a; Seeman 2007a) are complementary to this diagnosis.

Superfamily Megisthanoidea Taxa: *Megisthanus floridanus* (Megisthanidae; Hunter & Davis 1965); *Megisthanus* sp. (pers. obs.)
Deutonymphs. Well defined podonotal and small opisthonotal shields; small ventrianal shield; metapodal shields absent; small platelet posterolateral to ventrianal shield absent. Sternal shield well developed, bearing st1-st3. Peritremes developed, reaching CxII-III boundary. Hypertrichous dorsum and venter, excepting podonotal shield. Tarsus I slightly tapering. Macrosetae absent on all leg segments.
Protonymphs. Well defined small podonotal shields; mesonotal and pygidial shields absent; small ventrianal shield. Sternal shield well developed, bearing st1-st3. Peritremes developed, reaching CxII-III boundary. Mild hypertrichy restricted to opisthodorsum. Tarsus I slightly tapering. Macrosetae absent on all leg segments.
Larvae. Podonotal shield small, medial, bearing 1 pr setae; pygidial shield absent. Small ventrianal shield present. Euanal setae present. Sternal shield present, bearing only st1. Opisthodorsum hypotrichous, prodorsum with usual ten pairs of setae. Tarsus I not tapering. Macrosetae absent on all leg segments.

The immature life stages of *P. armstrongi* have some features found in few, or no other, trigynaspid taxa. In fact, the only trigynaspid mite that immature *P. armstrongi* resembles is *Derrickia setosa* Womersley, 1956 (unplaced family), a species known only from the protonymph and deutonymph collected from "Muminbah" (probably Numinbah) and Brookfield, Queensland (Womersley 1956a, b; Halliday 1990). The species was originally placed in the Podocinidae, but Halliday (1990) recognised this species as a trigynaspid mite, but was unable to further classify the species. This species is not an immature *Promegistus* as it bears some important differences, such as an elaborate brush-like excrescence on the movable digit (versus seta-like in *Promegistus*); an unpaired *j3* seta (paired in Trigynaspida, except Cercomegistidae); and spiculate soft cuticle on the dorsum (versus striate).

Some features of *D. setosa* allow further speculation on the classification of this mite (Table 4). The fused palp tibia-tarsus indicates that this mite could be a member of the Aenictequoidea (Aenictequidae, Messoracaridae, Physalo-

TABLE 4. Comparison of larvae and deutonymphs of *P. armstrongi* with other trigynaspid taxa.

Character	Taxa sharing character
Larvae	
One pair of opisthodorsal setae.	None
One pair of opisthogastric setae.	None
Setae j1 exceptionally long.	None
Palp trochanter with process.	None
Deutonymphs	
Prodorsal shield reticulate, poorly defined.	*Derrickia setosa*
Mesonotal shields reticulate, poorly defined.	None
Pygidial shield reticulate, poorly defined.	None
Sternal shield without setae.	None
Peritreme not developed.	None
Paired patches of reticulate cuticle near anus.	None, but metanotal plates in some taxa.
Palp trochanter with forked process.	None
Tarsus I with long (macro) setae. (also character of the larva)	*Derrickia setosa*, and possibly other taxa with long setae on tarsus I in adults (Messoracaridae, some Paramegistidae).
Palp tibia-tarsus fused. (also character of the larva)	*Derrickia setosa*, and presumably other taxa with fused palp tibia-tarsus in adults: Aenictequoidea, Paramegistoidea, Philodanidae.
Tarsus I tapering. (also character of the larva)	*Derrickia setosa*, and presumably other taxa with elongate tarsi in adults, such as the Aenictequoidea and Paramegistoidea.

zerconidae or Ptochacaridae), Paramegistidae (Paramegistoidea) or Philodanidae (Parantennuloidea). The latter family is unknown in Australia, and the known immature life stages of *Philodana johnstoni* are dissimilar to *D. setosa* (Kethley 1977b), leaving the Aenictequoidea or Paramegistoidea. Unfortunately immature life stages for these superfamilies are unknown. However, comparison of leg chaetotaxy of the deutonymph with adults of these superfamilies should allow a family designation – providing *D. setosa* belongs to a taxon with known adult stages.

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