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On some silverfish taxa from the Cape York region of northern Australia (Zygentoma: Lepismatidae: Ctenolepismatinae)

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Abstract. Silverfish (Zygentoma) are an ancient, but poorly studied group of primitively wingless insects. Species definition based on morphology alone is complicated by variations arising from the continuous moulting, even after reaching sexual maturity. In recent studies the use of molecular data has supported the identification of consistent morphological character traits, however only a small fraction of the species have been investigated. Eight species of the large silverfish genus *Acrotelsella*, collected by the first author from the Cape York Peninsula of northeastern Australia, are described and named as new species. Molecular data (COI and 28S) are presented that reinforces previous suggestions that the genus will eventually need to be split into two.

Introduction

Silverfish belong to an ancient group of primitively wingless insects believed to have emerged in the Devonian period, some 400 MY ago (Grimaldi & Engel, 2005; Misoff *et al*., 2014). Five families are currently recognised, three of which are considered to be ancient relics and which have not yet been collected in Australia. Each of the two larger, widespread families (Lepismatidae and Nicoletiidae) contain about 320 described species worldwide, of which about 80 are Australian endemic species. Smith (2017) reviewed the Australian fauna, summarising the known distribution and biology of these two families, noting the importance of integrating molecular and morphological studies. In general the order has been poorly sampled and many species remain undescribed within Australian museum collections. Unfortunately, material stored in 80% ethanol becomes unsuitable for the extraction of good quality DNA within 1–2 years. In recent years the authors have collected fresh material of Lepismatidae from many locations in the eastern half of Australia, sequenced DNA and integrated the results with morphological studies to progressively describe and define the fauna e.g. Smith *et al*. (2021). Here we extend the work of Smith & Mitchell (2022) on the largely Australian silverfish genus *Acrotelsella* Silvestri, 1935, concentrating on material collected on the Cape York Peninsula. This is a vast region of savannah woodland and tropical forests in the far north of Queensland with a tropical monsoonal climate of high rainfall in the summer months (November to April) and very little rainfall in the southern winter.

Keywords: Zygentoma, Silverfish, Thysanura, taxonomy, new species, barcode, *Acrotelsella*
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Materials and methods

The material was collected by the first author on three field trips to the Cape York region in 2011, 2013 and 2018. Specimens were collected into 80% ethanol, which was generally replaced a week or so after collection to prevent specimens from becoming soft. A leg was removed from selected specimens within a few months of collection and stored in 100% ethanol in a refrigerator at about 4°C until DNA sequencing was conducted some years later.

Holotype and some paratype specimens have been deposited in the entomological collection of the Queensland Museum (QM). The rest of the material has been deposited in the entomological collection of the Australian Museum in Sydney (AMS), where they have been allocated museum data base numbers starting with a "K" in the lists of material examined. Where a specimen has been dissected and mounted on more than one slide, the parent specimen is allocated a "K" number and the two slides receive the same number with suffixes ".001" and ".002"; only the parent number is listed against the specimens in this manuscript. All specimens also carry a unique specimen number from the first authors specimen data base, identifiable by the prefix "gbs" (e.g., gbs001836). A copy of this data base is held at the Australian Museum.

Locality co-ordinates for specimens were made using a hand-held Garmin eTrex®10 GPS with a claimed accuracy usually under five metres. Some of the whole specimens were soaked in DNA extraction buffer for 1–2 hours prior to dissection and slide mounting; a process which tends to degrade the integrity of the antennae and terminal filaments but generally leaves the specimen in reasonable condition for further descriptive work. All specimens are now stored in 75–80% ethanol unless noted as slide mounted.

Measurement data of whole specimens in alcohol and dissection methods used are as described in Smith (2013). Dissected specimens were each mounted onto two slides using Tendeiro medium, with the head and thorax mounted on one slide and the abdomen on a second slide. The position of the anterior trichobothrial areas of the pronotum were measured according to the method shown in Smith *et al.* (2021), the dimensions of the thoracic sterna, urotergite X and the processes of coxites IX were taken from illustrations using a drawing attachment with an Olympus CX31 stereomicroscope. Antennal sensilla are described using the terminology of Adel (1984). Roman numerals were used to indicate abdominal segment number. The combs of the nota are described using the terminology of Molero-Baltanás *et al*. (2010) where N = the comb associated with the posterior trichobothrium and N-1 is the next more anterior, etc. The number of lateral combs on the nota is counted from the posterior comb (N) which is always associated with a trichobothrium and counted forward. In many cases there can be a single macrochaeta in the most anterior position more or less on the margin, however this macrochaeta was not counted as a comb in this manuscript.

The following abbreviations are also used: HW: head width (in millimetres); H+B: head and body length (in millimetres); L/W: length to width (ratio); NP: National Park; NSW: New South Wales; QLD: Queensland; PI, PII, PIII: legs of pro-, meso- and metathorax respectively. The term *macrochaetae* refers to the larger stronger bristles, *setae* refers to smaller thinner bristles (usually simple), *setulae* to the very small, usually straight, setae and *cilia* to the curly thin hairs, often associated with the combs, setal collar or notal margins. Left and right refer to the animal when the dorsal surface is observed with the head forward. Measurement data, including the number of macrochaetae in the combs, represent a subsample of the non-juvenile specimens in the type series not just the holotype. The position of the major chaetotaxy is fairly accurate in illustrations, however this is not so much the case for the smaller setae where these are either omitted or drawn in a fashion to give the impression of their size and density only. The illustration of pectinations on the macrochaetae (other than the detailed illustrations of the macrochaetae) is also only indicative and in reality usually extends further along the shaft of the macrochaetae than illustrated in the figures.

Character variability was analysed using slide mounted adult material from a number of localities with the number of specimens of each species examined shown in the Table 1 below. The characters measured were the same as listed in Smith & Mitchell (2022) for *Acrotelsella* species from the Mildura region.

DNA extraction, PCR, DNA sequencing, DNA data set assembly were performed as previously described (Smith *et al*., 2021). DNA consensus sequences, sequence trace files and specimen collection data were uploaded to BOLD (http://www.boldsystems.org) where they are accessible as public dataset DS-ACROCPY (dx.doi.org/10.5883/DS-ACROCPY). Sequences newly derived for this study were also deposited in GenBank (accession numbers OR432856–OR432918).

Three data sets were analysed, COI only, 28S only and combined data. MEGA v. 11.0.13 (Tamura *et al*., 2021) was used to calculate DNA distances for the COI gene, and to determine the best model to use for phylogenetic analyses, which was the general time-reversible model with gamma-distributed rates and invariable sites (GTR + G + I). Phylogenetic analyses used both maximum likelihood (ML) and Bayesian Inference (BI) methods using the plugins available in Geneious for RAxML v. 8.2.11 (Stamatakis, 2006) and MrBayes v.3.2.7a (Ronquist *et al*., 2012). RAxML analyses used the hill climbing algorithm with 1,000 rapid bootstrap replicates. The BI analyses were set to run for 2 million generations, with a sample frequency of 1,000, using 2 runs, setting the number of chains to 4. The average standard deviation of split frequencies dropped below 0.01 before the analyses finished, suggesting convergence of the chains. The first 25% of sampled trees were discarded (burnin fraction equalled 0.25). All trees were rooted on the designated outgroup taxon, *Ctenolepisma longicaudatum*.

Results

Molecular

The final datasets included 43 28S sequences (30 newly derived for this study) and 47 COI sequences (33 newly derived for this study) (Table 2). There was very little variation in the 28S gene within *Acrotelsella* with only 13 of 435 sites being parsimony-informative. The trees derived from 28S data only were therefore quite unresolved, however there was strong support (93% bootstrap percentage (BP) under ML, and a posterior probability (PP) of 1 under BI)

Table 1. Specimens used in character variability study, in addition to those reported in Smith & Mitchell (2022)

Species	No. of males	No. of females	No. of locations	No. of sequenced specimens
A. petra sp. nov.	3	4	3	3
A. quattuor sp. nov.	2	8	4	4
A. lauraensis sp. nov.	2	1	1	2
A. marginata sp. nov.	1	4	2	4
A. aff. *marginata* F2	1	1	2	2
A. aff. *marginata* F3	2	3	4	5
A. arboricola sp. nov.	1	2	1	2
A. hethicola sp. nov.	1	0	1	1
A. septentrionalis sp. nov.	2	4	4	4
A. obscura sp. nov.	1	2	1	1

for the monophyly of *Hemitelsella*. The COI trees in contrast were highly resolved and almost identical to the trees derived from the combined data, so we focused on the trees resulting from the combined data analyses (Fig. 1). The combined data trees showed strong support (BP>70%, PP>0.9) for one and very strong support (BP > 90%, PP = 1) for five of the six species for which we had multiple samples. There was strong support for a clade comprising *Hemitelsella*, *Qantelsella* and some *Acrotelsella* species, and strong support for the separation of the remaining *Acrotelsella* species into two groups. One of these groups comprised four new species, *A. quattuor* sp. nov., *A. lauraensis* sp. nov., *A. arboricola* sp. nov., *A. marginata* sp. nov. and an allied group of specimens that we have called *A.* aff. *marginata*, discussed below. The other group comprised *A. auricoronata* Smith & Mitchell, 2022, *A. erniei* Smith, 2016, *A. tanni* Smith & Mitchell, 2022, *A. thommoi* Smith & Mitchell, 2022, *A. parlevar* Smith, 2016 and *A. petra* sp. nov. Within the latter group there was also strong support for relationships among species, while in the former group the only strongly supported relationship is that between *A. marginata* sp. nov. and *A.* aff. *marginata*.

Systematics

Family Lepismatidae Latreille, 1802

Subfamily Ctenolepismatinae Mendes, 1991: 11

Acrotelsella Silvestri, 1935

Acrotelsa Escherich, 1905: 105 pro parte.
Stylifera Stach, 1932: 333, 345 pro parte.
Acrotelsella Silvestri, 1935: 307.

Type species: *Acrotelsa producta* Escherich, 1905 by original designation.

Acrotelsella petra sp. nov.

urn:lsid:zoobank.org:act:E723F161-3F53-4BE9-B9C2-E3CDB289DBF0

Figs 2–29

Holotype ♀ (HW 1.31) QUEENSLAND: Chillagoe, Balancing Rock 17.1708°S 144.5132°E 387m asl, 23.iv.2011, Graeme Smith, under limestone stones on rocky surface, QMT259419 (on two slides). **Paratypes** (11 males, three females, two juveniles) 1♂ (HW 1.15) same data as holotype, QMT259426 (on two slides); 1♀ (HW 0.98) Undara 18.2018°S 144.5696°E 764m asl, 28.iv.2011, Graeme Smith, underside of stone, AMS K.541650 (on two slides); 1♂ (HW 1.25) QLD: east of Chillagoe 17.1849°S 144.5434°E 417m asl, 17.iv.2011, Graeme Smith, Joe Sydney, Dave Rothery, under clean limestone rock, AMS K.541651 (on two slides); 1♀ (HW 1.45) same data as previous, AMS K.541652 (on two slides); 1♂ (HW 1.09) Undara, rocks above camp 18.2013°S 144.5698°E 778m asl, 5.viii.2013, Graeme & Louise Smith, leaf litter, AMS K.541654 (on two slides); 1 juvenile (HW 0.58) same data as previous, AMS K.377994 (in alcohol); 1♀ (HW 1.00) Undara, rocks above camp 18.2048°S 144.5707°E 784m asl, 5.viii.2013, Graeme & Louise Smith, leaf litter, AMS K.378030 (in alcohol); 1♂ (HW 1.08) Undara, rocks above camp 18.2015°S 144.5696°E 768m asl, 6.viii.2013, Graeme Smith, leaf litter on granite, K.541653 (on two slides); 5♂♂ (HW 1.03, 1.01, 0.95, 0.85, 0.78) 1 juvenile ♀ (HW 0.78) same data as previous, AMS K.377995 (in alcohol); 2♂♂ (HW 0.96, 0.90) Undara 18.2018°S 144.5696°E 764m asl, 28.iv.2011, Graeme Smith, leaf litter on granite rocks above campsite, K.377993 (in alcohol). Localities are shown on the map in Figure 2.

Diagnosis. This species is closest to *A. parlevar*, sharing characters such as the three papilla of the labial palp and the parabolic shape of the thoracic sterna where some combs consist of macrochaetae in a quite irregular arrangement. It differs from *A. parlevar* by its broader form (width mesothorax/H+B of 0.21–0.25 versus 0.17–0.21), by the absence of combs on the inner processes of coxites IX in both sexes (sometimes seen on males of *A. parlevar*), by the longer inner processes of the ♀ (L/W > 5 versus < 4), by the longer ovipositor (L/HW about 2 or more, versus about 1.7) and with more divisions (24–26 versus < 20), by the more acute urotergite X in both sexes (36–47° versus 47–60°), furthermore the arrangement of the macrochaetae in the thoracic sternal combs is less erratic than that seen in *A. parlevar*.

Description

Appearance: Medium to large silverfish, thorax not much wider than the abdomen which only tapers slightly posteriorly (Fig. 3). Scale pattern when live overall dark grey or mottled when scales are lost, with lighter areas around the dorsal and lateral combs, with a distinct anterior fringe of brown macrochaetae in front of the head, legs with dark patches at apico-dorsally on femora and tibia, antennae

Table 2. Specimens used for molecular analysis. Museum accession numbers (*coll. no.)*, BOLD process ID, GenBank accession numbers for 28S and COI, and voucher type status are given.

Species	Sample ID	Mus. Access. No.	BOLD Process ID	GenBank Access. 28S	GenBank Access COI	Voucher Type
Ctenolepisma longicaudatum	gbs001836	K377675	ZYI065-18	MK185707	MT674899	—
Qantelsella louisae	gbs003917	T-228755	ZYI068-18	MK185709	MK185705	Holotype
Hemitelsella clarksonorum	gbs004625	K261105	ZYII241-21	MZ364336	MZ364329	Holotype
Hemitelsella hortorum	gbs006161	E109767	ZYII242-21	MZ364338	MZ364331	Holotype
Hemitelsella luismendesi	gbs005912	K377942	ZYII355-21	OL665124	OL521843	Paratype
Hemitelsella mutilloides	gbs006164	K377941	ZYII245-21	MZ364340	MZ364333	Paratype
Hemitelsella transpectinata	gbs006167	K261328	ZYII247-21	MZ364337	MZ364330	—
Acrotelsella albicaudata	gbs004042	K261327	ZYII330-21	OP028364	OP028320	Paratype
Acrotelsella auricoronata	gbs004044	gbs004044	ZYII097-18	OP028347	OP028304	—
Acrotelsella erniei	gbs001438	K377609	ZYI066-18	—	MK185701	Paratype
Acrotelsella mallee	gbs004336	K541633	ZYII337-21	OP028362	OP028318	Paratype
Acrotelsella parlevar	gbs004624	K261103	ZYI067-18	MK185706	MT674895	Holotype
Acrotelsella tanni	gbs005655	K377788	ZYII144-18	OP028328	OP028284	Paratype
Acrotelsella thommoi	gbs004035	gbs004035	ZYII159-18	OP028333	OP028289	—
Acrotelsella quattuor sp. nov.	gbs003673	K541656	ZYII089-18	OR432909	OR432879	Paratype
Acrotelsella quattuor sp. nov.	gbs003687	K541659	ZYII007-18	OR432907	OR432877	Paratype
Acrotelsella quattuor sp. nov.	gbs003780	T259420	ZYII188-18	OR432903	OR432872	Holotype
Acrotelsella quattuor sp. nov.	gbs003799	K541662	ZYII021-18	OR432908	OR432878	Paratype
Acrotelsella lauraensis sp. nov.	gbs003665	T259428	ZYII397-22	OR432912	OR432882	Paratype
Acrotelsella lauraensis sp. nov.	gbs003668	T259421	ZYII398-22	OR432898	OR432865	Holotype
Acrotelsella arboricola sp. nov.	gbs003815	T259424	ZYII414-23	OR432914	OR432884	Holotype
Acrotelsella arboricola sp. nov.	gbs003820	K541678	ZYII415-23	OR432913	OR432883	Paratype
Acrotelsella marginata sp. nov.	gbs003693	K541665	ZYII400-22	OR432890	OR432857	Paratype
Acrotelsella marginata sp. nov.	gbs003698	K541666	ZYII401-22	OR432905	OR432874	Paratype
Acrotelsella marginata sp. nov.	gbs003705	K378011	ZYII402-22	OR432893	OR432860	Paratype
Acrotelsella marginata sp. nov.	gbs003728	K541667	ZYII405-22	OR432902	OR432871	Paratype
Acrotelsella marginata sp. nov.	gbs003734	T259422	ZYII407-22	OR432910	OR432880	Holotype
Acrotelsella aff. *marginata* F2	gbs003738	K541668	ZYII408-22	OR432906	OR432876	—
Acrotelsella aff. *marginata* F2	gbs003753	K541669	ZYII410-22	OR432894	OR432861	—
Acrotelsella aff. *marginata* F2	gbs003757	K378013	ZYII411-22	OR432917	OR432887	—
Acrotelsella aff. *marginata* F3	gbs003711	K541670	ZYII403-22	OR432904	OR432873	—
Acrotelsella aff. *marginata* F3	gbs003717	K541671	ZYII404-22	OR432889	OR432856	—
Acrotelsella aff. *marginata* F3	gbs003758	K541672	ZYII416-23	OR432892	OR432859	—
Acrotelsella aff. *marginata* F3	gbs003764	K541673	ZYII412-22	OR432891	OR432858	—
Acrotelsella aff. *marginata* F3	gbs003765	K541675	ZYII106-18	OR432896	OR432863	—
Acrotelsella petra sp. nov.	gbs001272	K541651	ZYII259-21	—	OR432870	Paratype
Acrotelsella petra sp. nov.	gbs001279	K541652	ZYII260-21	—	OR432868	Paratype
Acrotelsella petra sp. nov.	gbs001316	K541650	ZYII262-21	—	OR432875	Paratype
Acrotelsella petra sp. nov.	gbs003813	K541654	ZYII418-23	OR432901	OR432869	Paratype
Acrotelsella petra sp. nov.	gbs003827	K378030	ZYII417-23	OR432918	OR432888	Paratype
Acrotelsella petra sp. nov.	gbs003830	K541653	ZYII419-23	OR432916	OR432886	Paratype
Acrotelsella obscura sp. nov.	gbs003810	T259423	ZYII029-18	OR432897	OR432864	Holotype
Acrotelsella hethicola sp. nov.	gbs003742	T259417	ZYII409-22	OR432911	OR432881	Holotype
Acrotelsella septentrionalis sp. nov.	gbs003689	K541647	ZYII399-22	OR432899	OR432866	Paratype
Acrotelsella septentrionalis sp. nov.	gbs003727	K541649	ZYII046-18	OR432915	OR432885	Paratype
Acrotelsella septentrionalis sp. nov.	gbs003733	K541648	ZYII406-22	OR432900	OR432867	Paratype
Acrotelsella septentrionalis sp. nov.	gbs003744	T259425	ZYII019-18	OR432895	OR432862	Paratype

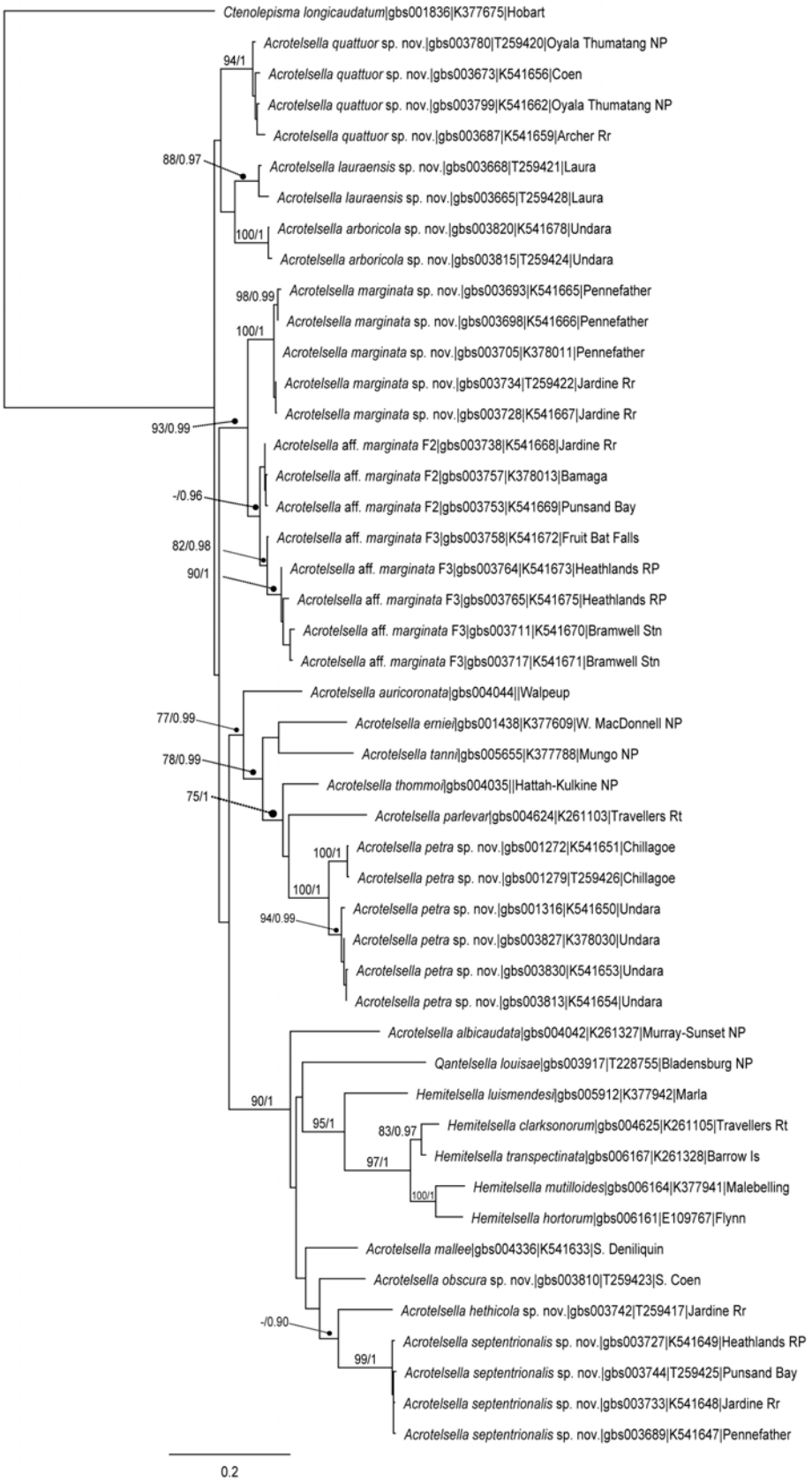


Figure 1. ML tree for concatenated COI and 28S sequences for 61 specimens. Asterisk indicates holotype. Numbers above branches are ML bootstrap values/Bayesian posterior probabilities, shown only if ≥ 70 and 0.9, respectively.

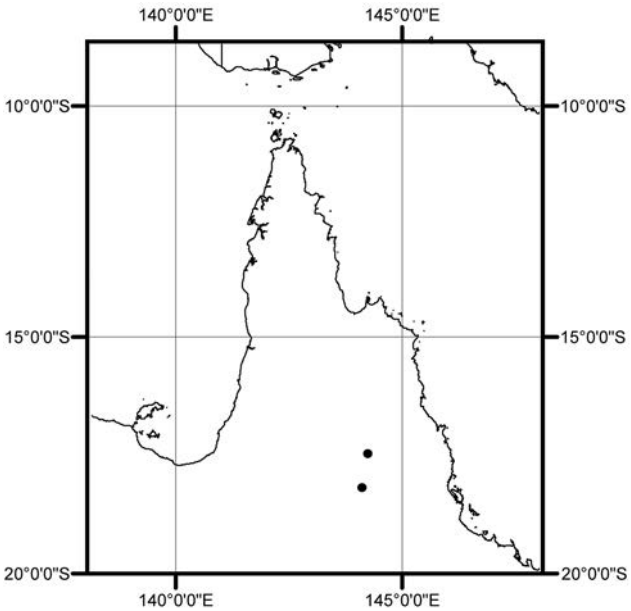


Figure 2. Known distribution of *Acrotelsella petra* sp. nov.

evenly brown, terminal filaments distinctly annulated with the lighter regions shorter than the darker regions especially distally. In alcohol mottled brown.

Body length: H+B up to 9.2 mm, HW up to 1.45 mm; thorax: length 3.1 mm or 0.29–0.34 H+B; width 2.3 mm with the pro and meta nota being slightly narrower than the mesonotum; maximum preserved antennal length 11.3 mm or 1.3 H+B; terminal filaments all broken, maximum preserved length of cercus 7.6 mm or >0.8 H+B; median dorsal appendage maximum length 6.3 mm (>0.8 H+B).

Pigmentation: Chestnut to brown in colour. Antennae evenly coloured brown; pigment absent from scape, pedicel with blotchy pigment which is darkest distally. Head and body dorsally almost without pigment, maxillary palp with some pigment in middle region of apical article and lighter at ends, penultimate article overall pigmented but darker distally, 3rd article with blotchy pinkish brown pigment which is more noticeable dorsally and distally; labial palp with a little pigment on edges of ultimate and penultimate articles. Nota and thoracic sterna without obvious pigment. Coxae and trochanter of legs without pigment. Femora of PI and PII with a little pigment dorsally on distal end which is much denser on PIII, all femora also with pigment on posterior margin distal of the bulge. Tibia not strongly pigmented, just a little more distally and dorsally. Tarsi with some pigment on the basal article, most obvious on PIII. Abdominal segments without obvious pigment. Styli with quite strong chestnut pigment except for each end. Ovipositor largely without pigment. Cerci and median filament distinctly banded with only the basal and distal annuli of each division lacking pigment.

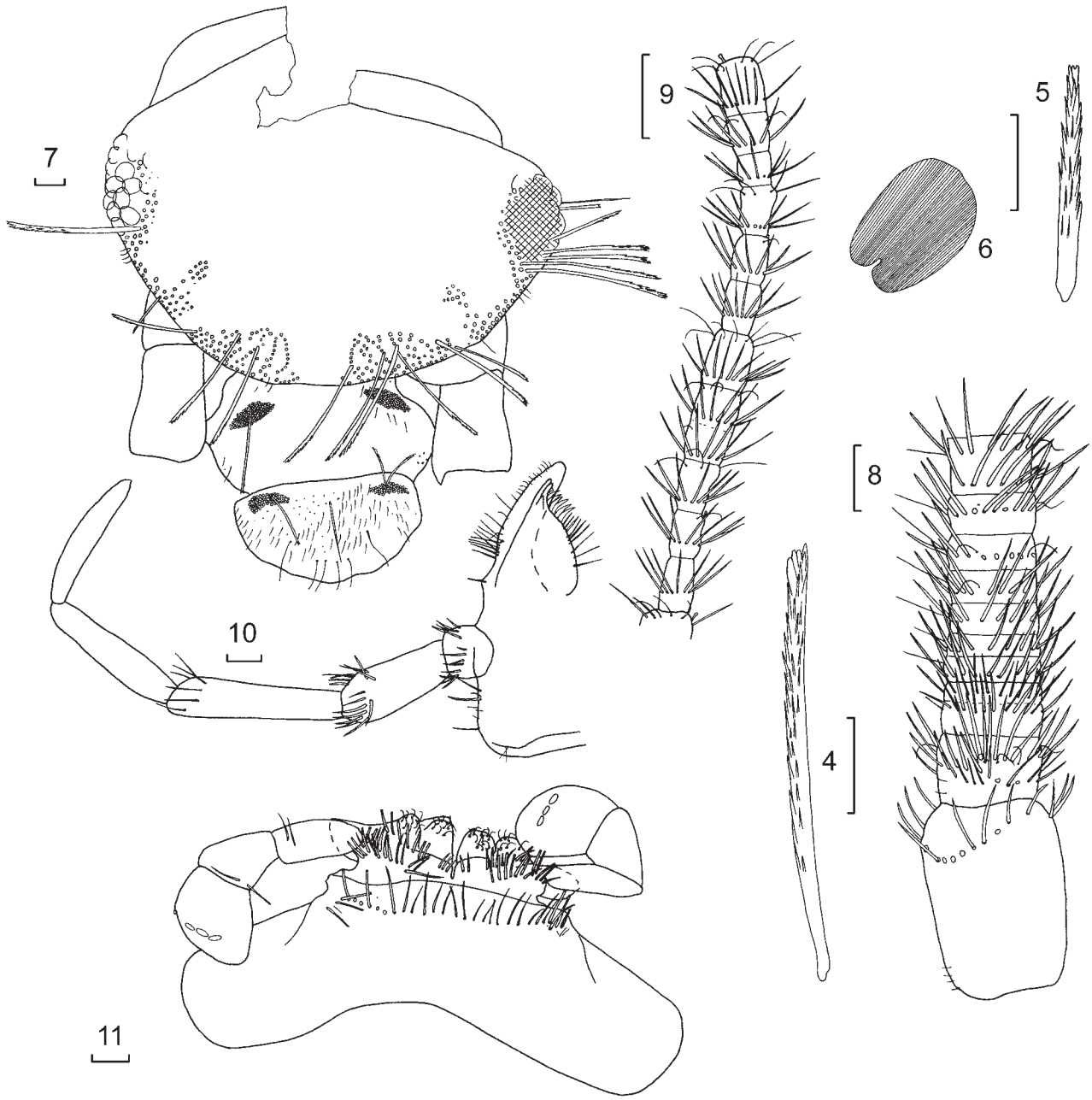
Macrochaetae: Hyaline to brown, variable, pectinate with stronger apical pectinations and numerous fine pectinations along most of the length of the shaft (Fig. 4); some macrochaetae short and carrot-shaped (Fig. 5) and others intermediate between these two forms.

Scales: With numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 6), ribs on dorsal scales are brown, those on the ventral scales are hyaline.

Figure 3. *Acrotelsella petra* sp. nov. from Balancing Rock, Chillagoe, Queensland.

Scales found on top of head, clypeus, on scape, on second and third articles of maxillary palp, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli IX, medial filament and cerci.

Head: (Fig. 7) wider than long, with 1+1 moderately dense bushes of macrochaetae aligned in subparallel rows on the antero-lateral corners. Eyes dark brown in alcohol preserved material. There is a small gap in the row of macrochaetae along the margin above the antennal bases after which there is another bush of pectinate macrochaetae almost merging with the obvious peri-antennal group, and the macrochaetae continue along the sides of the head to the eyes with the macrochaetae extending over the anterior half of the eyes in two subparallel rows. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as a few curved setae laterally anterior to the bushes; hyaline scales present between and anterior to the bushes. Labrum also with 1+1 distinct bushes of pectinate macrochaetae as well as a single long thin pectinate macrochaeta between



Figures 4–11. *Acrotelsella petra* sp. nov. holotype ♀ unless otherwise indicated by specimen number *(4)* pectinate peri-ocular macrochaeta; *(5)* pectinate macrochaeta of posterior margin of femora of PI; *(6)* darker scale of pronotum; *(7)* head (cross-hatched area obscured by eye pigment); *(8)* antenna, scape, pedicel and basal intervals of flagellum of QMT259426; *(9)* idem, most distal surviving complete interval; *(10)* maxilla; *(11)* labium, smaller chaetotaxy and papillae omitted from one palp (K.541651). Scale bars = 0.1 mm.

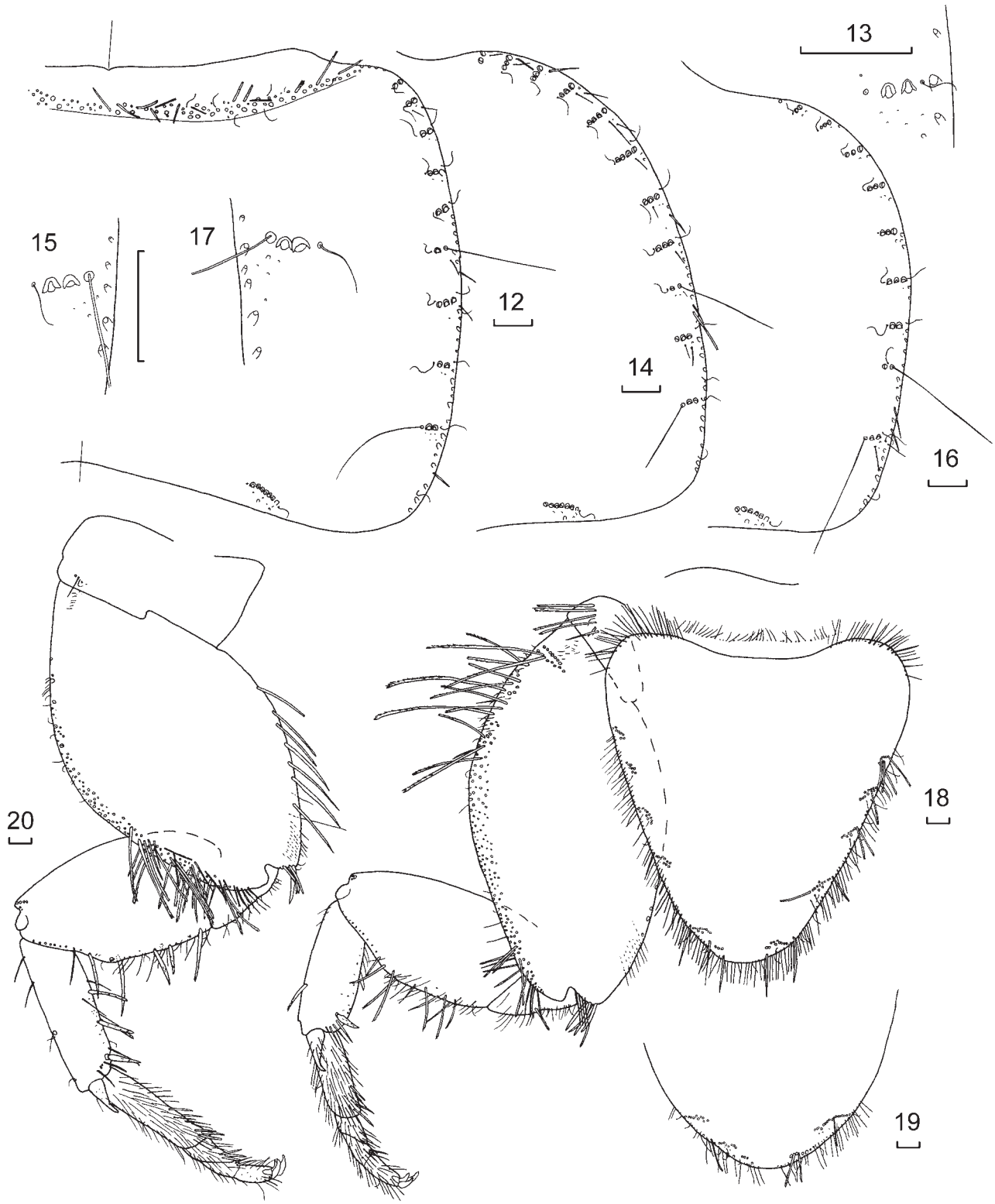
the bushes, remainder of surface with scattered setae. — Antennae fairly long, scape (Fig. 8) of average length with scales over surface and a preapical rosette of numerous setae; pedicel with preapical rosette of simple setae and cilia with two close rows of setae in places as well as setae scattered over face; annuli 1–5 of flagellum with a ring of simple setae and probably one or two short trichobothria; annuli 6–8 similar but also with some cilia. Articles subdivided into two annuli from the ninth article and into four annuli by the 13th with the trichobothrium restricted to the most distal annulus of each interval. Distally the articles are subdivided into repeating chains of six annuli (Fig. 9) each with a ring of simple setae, the third, 5th and most distal annuli of each chain also bearing a proximal ring of setae, basiconic sensilla (type B) seen on several annuli but no distinct pattern was observed, however these can be difficult to see unless they appear on the sides of the mounted flagellum. — Mandibles typical for *Acrotelsella* with well-developed molar and incisor areas; a group of about thirteen strong apically bifurcated but simple setae distally adjacent to the pectinate molar area and a bush of about 120 macrochaetae externally as well as scattered simple setae and pectinate macrochaetae. — Maxilla (Fig. 10) with some thick minutely apically bifurcated but otherwise smooth macrochaetae externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by about seven

lamellate processes and a row of nine thin simple setae, those nearest the lamellate processes shorter and conical in shape, galea slightly longer than lacinia with about nine strong smooth simple or apically bifurcate setae externally in its basal half and several cilia distally; maxillary palp long and thin, apical article 4.2–7.1 times longer than wide and 0.9–1.1 times as long as the penultimate article, the third is the longest article, last two articles of palp with fine setae only, basal article with oblique rosette of thicker setae, second article also with subapical rosette of slightly thicker setae. — Labium (Fig. 11) short and broad, prementum with transverse row of apically bifurcate setae, glossae and paraglossae with transverse and oblique rows of short strong apically bifurcated setae, apically with long curved setulae; labial palp short, apical article expanded slightly medially, usually a little longer than wide (0.95–1.35) with row of only three papillae of compact type arranged in a single row near the outer margin, with a single indeterminate basiconic sensillum and some rod-like basiconic sensilla on the outer margin, covered with numerous short and long fine setae.

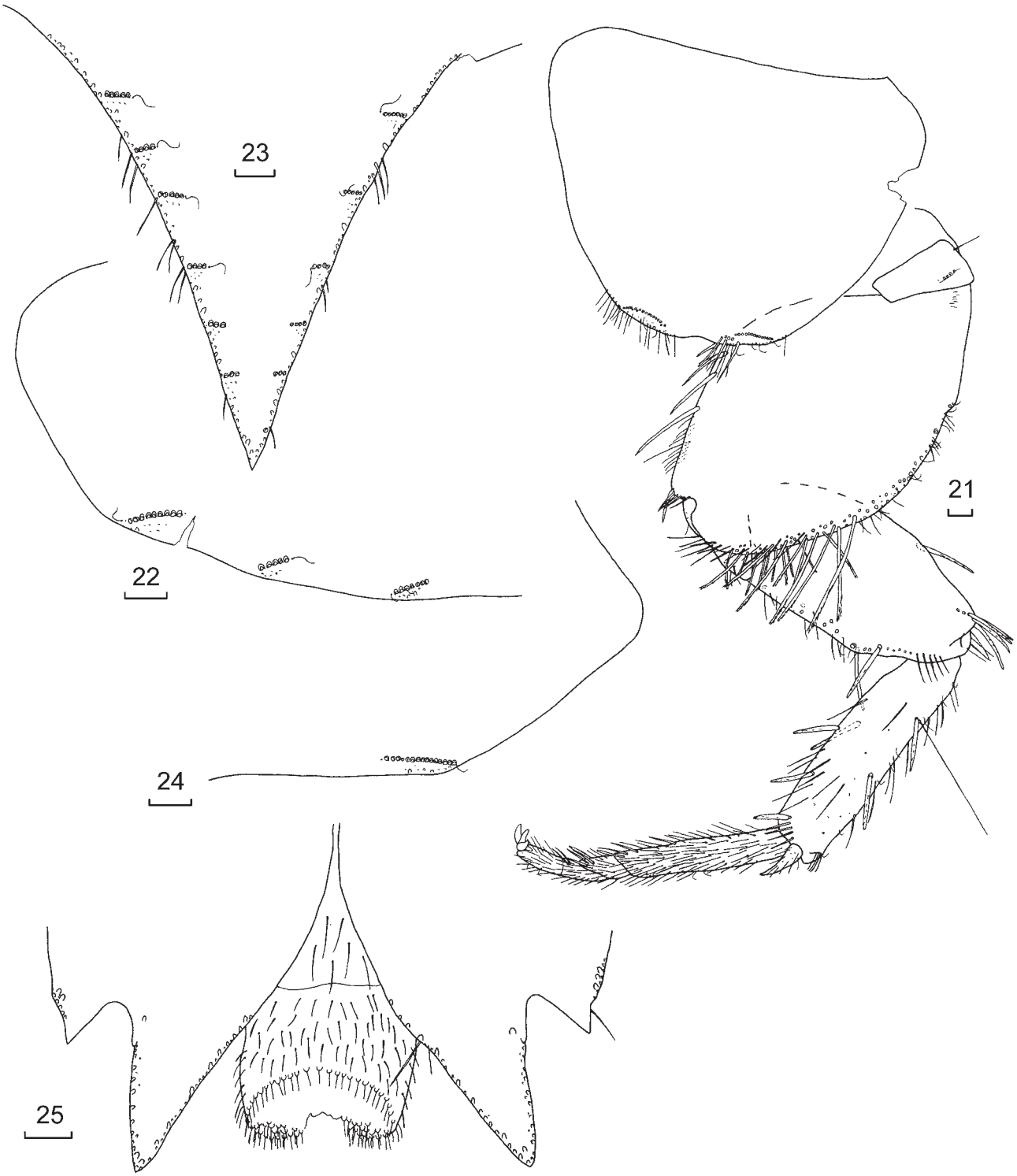
Thorax: Pronotum (Fig. 12) with dense setal collar about 2–3 macrochaetae wide, sometimes with very slight gap medially, macrochaetae stout and pectinate, also some cilia and many smaller stout setae; lateral margins with stout setae, marginal setae almost absent from the anterior third of the margin, becoming more frequent posteriorly, with 8–9 combs of 1–3 macrochaetae along each margin. Two open trichobothrial areas; the posterior trichobothrial area located about 0.74–0.79 along the margin and is associated with the last comb (N) this comb composed of two macrochaetae with the short trichobothrium at the mediad end and a cilium at the laterad end (the proximity of a large marginal setae close to the end of one comb on the holotype (Fig. 13) gives the impression of three macrochaeta but the location of a cilium between the true comb and the marginal seta as well as the shape of the insertion supports the view that the more external macrochaeta is in fact a marginal macrochaeta rather than part of the comb); anterior trichobothrial area located 0.33–0.38 along the margin and is associated with comb N-3, the comb composed of one or two macrochaetae with the trichobothrium between the comb and the margin and a cilium at the mediad end; all combs associated with a few setulae, sometimes quite long. Posterior margin of all nota with 1+1 combs of 6–7 insertions with several setulae between the comb and the margin and a cilium at the mediad end, the most lateral insertion almost certainly houses a long thin trichobothrium-like seta; the gap between the combs on the pronotum is 45–54% the width of the pronotum. — Mesonotum (Fig. 14) with lateral chaetotaxy similar to pronotum with 9–11 combs of 1–4 macrochaetae, the anterior trichobothrial area (Fig. 15) located 0.61–0.66 along the lateral margin associated with comb N-2 composed of 2–3 macrochaetae (rarely one on just one side as illustrated for holotype) with the trichobothrium located between the macrochaetae and the margin, with some setulae posterior to the comb. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.84–0.87), the trichobothrium located mediad of the comb of two macrochaetae and with 1–3 setulae posterior to the comb.— Metanotum (Fig. 16) similar to mesonotum with 8–10 combs of 1–3 macrochaetae, the anterior trichobothrial area (Fig. 17) associated with comb N-1 usually of two macrochaetae (rarely one) about 0.71–0.75 along the margin, the posterior trichobothrial area usually with two, sometimes only one macrochaeta.

Presternum narrow, with transverse row of small setae (Fig. 18). — Prothoracic sternum (Fig. 18) large, almost as long as the coxa, 0.93–1.12 times as long as wide at its base, parabolic, rounded apically, antero-lateral corners with fields of about 30–40 simple small setae, those on the margins finer than those submarginal, posterior three quarters of lateral margins with fringe of setae and some cilia as well as 5–9 short combs each composed of 1–13 macrochaetae mostly arranged in 2–3 overlapping rows. — Mesosternum (Fig. 19) a little longer than prosternum (1.1 times) and slightly less acute apically, not much longer than wide at its base (L/W 0.99–1.07), without fine setae in the anterolateral corners and with long, thin simple marginal setae along the posterior quarter of the margin and 2+2, 2+3 or 3+3 combs distally, the more anterior composed of 2–16 pectinate macrochaetae in irregular rows. — Metasternum (Fig. 21) much wider and shorter than mesonotum (L/W 0.76–0.83), apically rounded, the margins slightly concave adjacent to the posterior combs, with marginal setae and cilia along distal $^{1}/_{5}^{th}$ of lateral margins and 1+1, 1+2, 2+2 or 2+3 combs of 1–16 pectinate macrochaetae mostly arranged in single rows but with some macrochaetae offset from the rows plus some single smooth submarginal macrochaetae more distally.

Legs quite long, tibia L/W ratio of legs PI 2.4–3.7, PII 2.7–4.1, PIII 3.3–4.2; tarsi L/W ratio PI 5.1–7.0, PII 5.5–8.9, PIII 9.3–10.3. PI (Fig. 18) with a row of about five macrochaetae laterally on the distal margin of the precoxa. Coxa with scales and a group of about fifteen macrochaetae on the anterolateral corners arranged in two irregular rows, followed by a field of strong pectinate macrochaetae along the external margin; inner margin with a five macrochaetae and several smooth and pectinate setae of varying thickness distally over the articulation. Trochanter with many small setae and cilia as well as a single pectinate macrochaeta. Femur posteriorly with several long thin pectinate macrochaetae and smooth setae along the margin, most individuals without carrot-shaped macrochaetae (although these may have been lost during handling), considerable variation exists between individuals with some only having thinner macrochaetae, others of intermediate thickness and a couple of specimens show at least one distinctly carrot-shaped macrochaeta; dorsal margin with three macrochaetae towards the distal end. Tibia of PI with about four stout, carrot-shaped slightly pectinate macrochaetae along the posterior margin as well as some thinner smooth setae and a row of shorter setae near the distal margin; anterior margin with two pectinate macrochaetae as well as some subdistal setae over the articulation, dorsal surface with a subdistal row of setae; apex of tibia with the usual apical spur which is covered in numerous setae. Tarsi with four articles, the basal article of PI about half the total length of the tarsus, its join with the next article not particularly oblique, the surface of all tarsal articles with numerous simple setae. Pretarsus with two long curved lateral claws and a shorter curved medial claw. PII and PIII (Figs 20–21) similar to PI except lacking the antero-lateral groups of macrochaetae on the coxa; femora with more carrot-shaped macrochaetae on the posterior margins; legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer but only about 60% of the total length on PIII; tibia of PIII bearing a long thin trichobothrium-like seta adjacent to the more proximal macrochaeta near the



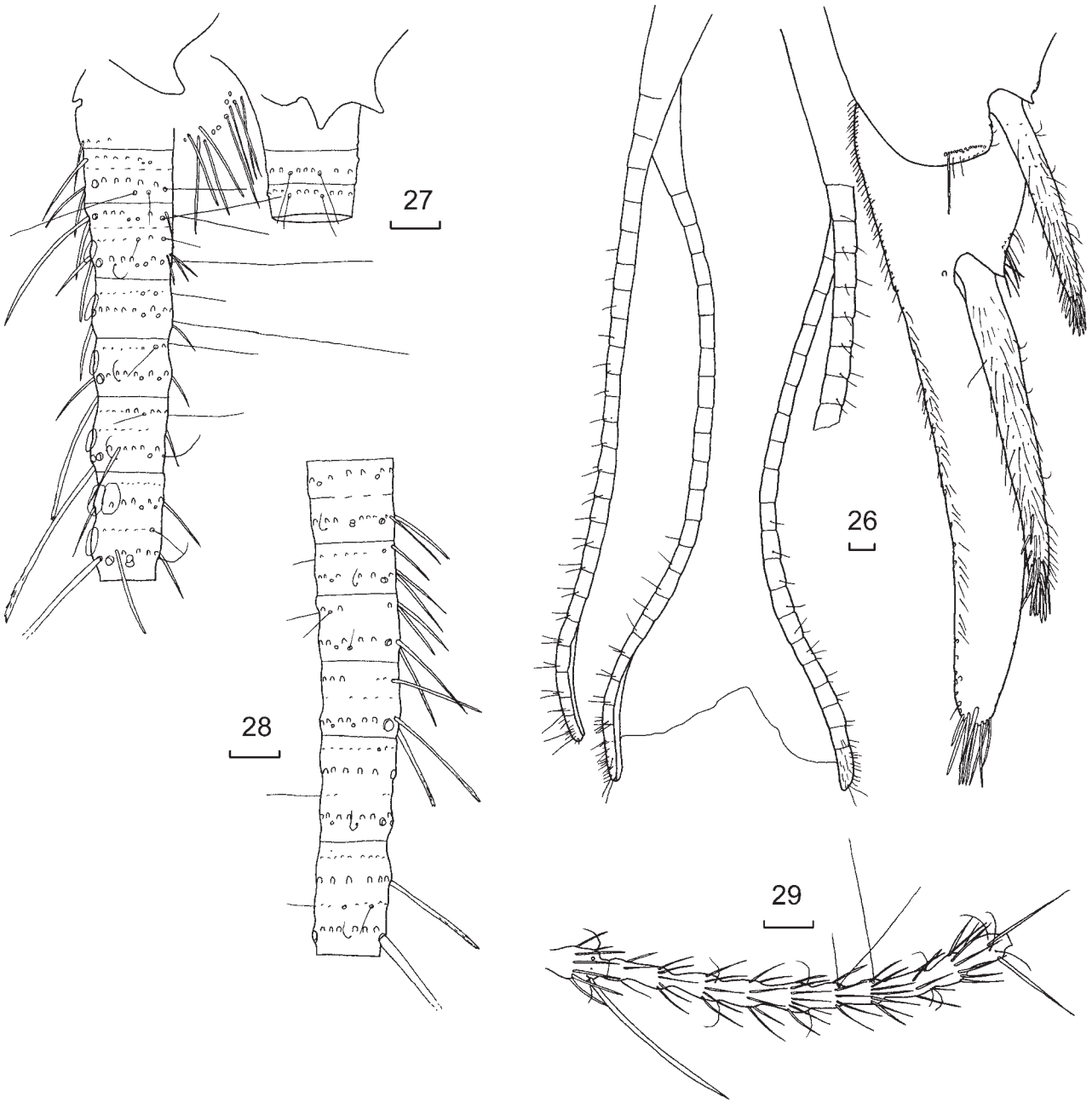
Figures 12–20. *Acrotelsella petra* sp. nov. holotype ♀ unless otherwise specified by specimen number *(12)* pronotum, right side (QMT259426); *(13)* pronotum, posterior trichobothrial area, right side with unusually aligned marginal macrochaeta; *(14)* mesonotum, right side (QMT259426); *(15)* mesonotum, anterior trichobothrial area, right side (QMT259419); *(16)* metanotum, right side (QMT259426); *(17)* metanotum, anterior trichobothrial area, right side (QMT259419); *(18)* prothoracic presternum, sternum and PI; *(19)* mesothoracic sternum; *(20)* PII. Scale bars = 0.1 mm.



Figures 21–25. *Acrotelsella petra* sp. nov. holotype ♀ unless otherwise indicated by specimen number *(21)* metathoracic sternum and PIII; *(22)* urotergite VI, left side; *(23)* urotergite X; *(24)* urosternite VI, left side; *(25)* coxites IX and penis (QMT259426). Scale bars = 0.1 mm.

dorsal margin.

Abdomen: Urotergite I with 1+1 lateral combs of 5–6 macrochaetae each associated with a cilium at either end and several setulae between the comb and the margin, urotergites II–VII (Fig. 22) with 3+3 combs of macrochaetae as in Table 3, the lateral combs with a cilium at either end, the sublateral comb with a cilium at either or both ends, the submedial with a cilium at the outer end and several setae or setulae between the comb and the margin. Urotergite VIII with 2+2 combs (lacking the sublateral), urotergite IX glabrous; urotergite X (Fig. 23) acutely triangular, slightly more acute in the female (36–45°) than in the male (42–47°), wider at base than long



Figures 26–29. *Acrotelsella petra* sp. nov. holotype ♀ unless otherwise indicated by specimen number *(26)* left coxites VIII and IX with ovipositor; *(27)* base of left cercus with epiproct and a paraproct (QMT259426); *(28)* base of median filament (QMT259426); *(29)* most distal surviving division of cercus (QMT259426). Scale bars = 0.1 mm.

(L/W 0.7–1.0) with many setae along entire margin both above and below (small, simple or slightly pectinate) and four to six combs of 1–6 macrochaetae per comb as well as several setulae posterior to each comb, most combs with a cilium at the mediad end.

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 9–18 pectinate macrochaetae (Fig. 24) each with several setulae or setae between the comb and the margin as well as a cilium at each end of every comb. The distance between the lateral combs 3.0–6.2 times the average width of the combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Figure 26. Two pairs of styli with very numerous stronger macrochaetae apically as well as quite numerous setae and some scales along the shaft. Coxites VIII with long combs of 11–15 macrochaetae and a similar number of setae and setulae between the comb and the margin, the coxites with rounded inner corners. Coxites IX with long rounded internal process about 5.9 times longer than wide at its base and thirteen times longer than the short pointed external process, the inner processes not reaching the apex of the ovipositor; outer process with several setae externally, inner process with several long smooth setae along the outer margins as well as finer setae,

Table 3. Number of macrochaetae per bristle comb—*Acrotelsella petra* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	5–6	—	—	—	—
II	6–9	4–6	5–8	—	—
III	7–8	5–6	5–8	10–16	4.2–6.2
IV	6–9	4–6	6–8	12–16	3.9–5.6
V	7–11	5–6	5–8	12–16	4.2–5.6
VI	8–10	5–6	6–7	12–16	3.4–5.4
VII	8–11	5	5–7	12–18	3.3–4.6
VIII	8–11	—	6–7	11–15	3.0–3.8
IX	—	—	—	—	—

inner margin of process with setae insertions (all setae lost) and many small setae or setulae, apically with several long smooth setae. — Ovipositor (Fig. 26) quite long (2.0–2.2 HW), surpassing the apex of the long internal processes of coxites IX, both pairs of gonapophyses consisting of longer basal articles becoming progressively shorter distally, about 24–26 articles in total; of primary type with rows of fine setae on each article.

Cerci (Fig. 27) first division with some small insertions laterally, divisions two to four with single rings of setae, trichobothria and a lateral pectinate macrochaeta, divisions five to seven with two rings, the basal of scales and trichobothria, division eight with three rings, the basal of setae, trichobothria and scales, division nine with four rings with scales on the basal and penultimate rings. Most distal surviving divisions with ten annuli each with a ring of setae, the most distal and one and a half of the most basal without strong pigment, macrochaetae restricted to the distal ring, rings 3, 5, 8 and 10 with cilia, rings six and seven with trichobothria (Fig. 29). — Median dorsal appendage (Figs 27–28) first article glabrous, articles two to five with single rings of setae, trichobothria and macrochaetae, divisions six and seven with two rings the basal probably also with scales, division eight with three rings, the middle one of scales, division nine with four rings, with scales found on the basal and penultimate rings. Most distal surviving divisions (mid length) similar to cerci but lighter region restricted to the distal annulus only, scales found on the basal part of annuli 3–6, trichobothria on annuli 2, 5 and 6.

Male. Similar to female except coxites VIII entire (Fig. 25) with 1+1 combs of macrochaetae. Coxites IX in ♂ separated, each side with a macrochaeta insertion mediad to the base of each stylus. External and internal margins of internal process with some moderately strong setae and macrochaetae; ventral surface of process with many long thin setae inserted parallel to the external margin. No short transverse combs found. Outer process small triangular with several stout setae along the outer margin. Penis typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Habitat. Collected from the underside of limestone rocks at Chillagoe and from dry leaf litter on granite rock slopes at Undara. Localities as in Figure 2.

Etymology. The species is named *petra* from the Latin word for rock, because it was collected on the underside of rocks and from dry leaf litter accumulated on large rocky exposures.

Acrotelsella quattuor sp. nov.

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Figs 30–54

Holotype ♀ (HW 1.23) QUEENSLAND: Oyala Thumatang NP, Mango Lagoon 13.6253°S 142.5758°E 82m asl, 30.vii.2013, Graeme & Louise Smith, bark spray to ironbark, QM T259420 (on two slides). **Paratypes** (14 males, 11 females, eight juveniles) 1♀ (HW 1.16) same data as holotype, AMS K.541655 (on two slides); 1♂ (HW 1.13) same data as holotype, QM T259427 (on two slides); 1♂ (HW 0.90) same data as holotype, AMS K.377996 (in alcohol); 1♀ (HW 1.38) Oyala Thumatang NP, Mango Lagoon 13.6264°S 142.5780°E 76m asl, 31.vii.2013, Graeme & Louise Smith, bark spray to soft bark eucalypt, AMS K.541660 (on two slides); 1♀ (HW 1.26) same data as previous, AMS K.541661 (on two slides); 2♂♂ (HW 1.21, 0.93) same data as previous, AMS K.378002 (in alcohol); 1♂ (HW 1.13) Coen River campsite 13.9248°S 143.1922°E 221m asl, 16.vii.2013, Graeme Smith, bark spray to square bark tree, AMS K.541656 (on two slides); 1♀ (HW 1.23) same data as previous, AMS K.541657 (on two slides); 1♂ (HW 0.95) 1♀ (HW 1.10) 4 juveniles (HW 0.80, 0.74, 0.68, 0.58) same data as previous, AMS K.377997 (in alcohol); 1♂ (HW 1.35) Coen River campsite 13.9249°S 143.1921°E 227m asl, 16.vii.2013, Graeme Smith, bark spray, AMS K.377974 (in alcohol, about to moult); 3♂♂ (HW 1.08, 1.08, 1.01) same data as previous, AMS K.377999 (in alcohol); 1♀ (HW 1.14) same data as previous, AMS K.541658 (on two slides); 1♀ (HW 1.15) Archer River 13.4382°S 142.9428°E 52m asl, 17.vii.2013, Graeme Smith, bark spray to tree with lumpy bark, K.541659 (on two slides); 1♀ (HW 0.95) same data as previous, AMS K.377998 (in alcohol); 1♂ (HW 1.20) Oyala Thumatang NP, Mango Lagoon 13.6254°S 142.5757°E 75m asl, 30.vii.2013, Graeme & Louise Smith, bark spray to soft bark eucalypt, K.378000 (in alcohol); 2♂♂ (HW 1.13, 1.13) 1♀ (HW 1.00) 3 juveniles (HW 0.63, 0.63, 0.55) same data as previous, AMS K.378001 (in alcohol); 1♀ (HW 1.19) Oyala Thumatang NP, Chongs Swamp 13.6122°S 142.5822°E 73m asl, 31.vii.2013, Graeme & Louise Smith, bark spray to semi-rough bark tree, AMS K.541662 (on two slides); 1♀ (HW 1.40) QLD: Oyala Thumatang NP, Governor's Waterhole 13.4385°S 142.3196°E 59m asl, 31.vii.2013, Graeme & Louise Smith, bark spray to soft bark eucalypt, AMS K.378003 (in alcohol); 1♀ (HW 1.20) 1♂ (HW 1.10) 1 juvenile (HW 0.68) same data as previous,

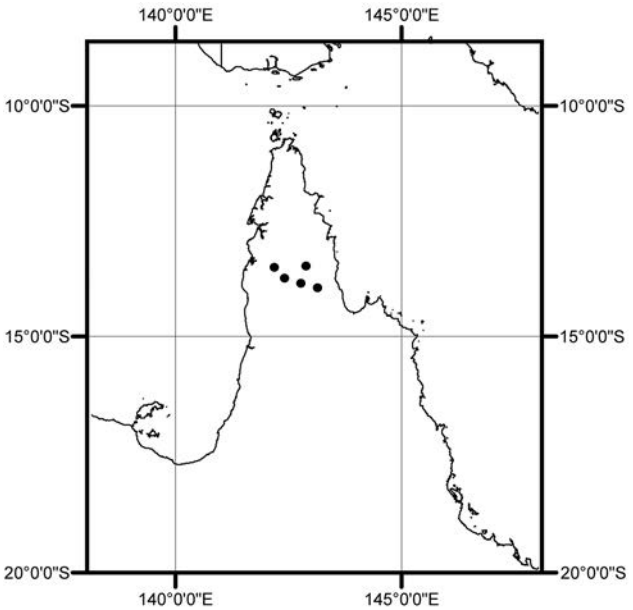


Figure 30. Known distribution of *Acrotelsella quattuor* sp. nov.

AMS K.378004 (in alcohol). Localities shown on the map in Figure. 30.

Not included in type series. 1♀ (HW 1.30) QUEENSLAND: Oyala Thumatang NP, Rockeby Rd ca 20km from Development Rd 13.6884°S 142.8996°E 192m asl, 1.viii.2013, Graeme Smith, bark spray to square barked eucalypt, AMS K.541663 (on two slides); 2 juveniles (HW 0.75, 0.58) same data as previous, AMS K.378005 (in alcohol).

Diagnosis. This species belongs to the group of species with trapezoidal thoracic sternites; it can be distinguished by the presence of only four papillae on the ultimate article of the labial palp (versus three in *A. auricoronata* and five in *A. marginata* sp. nov.) and from *Acrotelsella lauraensis* which lacks the strongly pigmented pedicel of the antennae and distinctly annulated terminal filaments.

Description

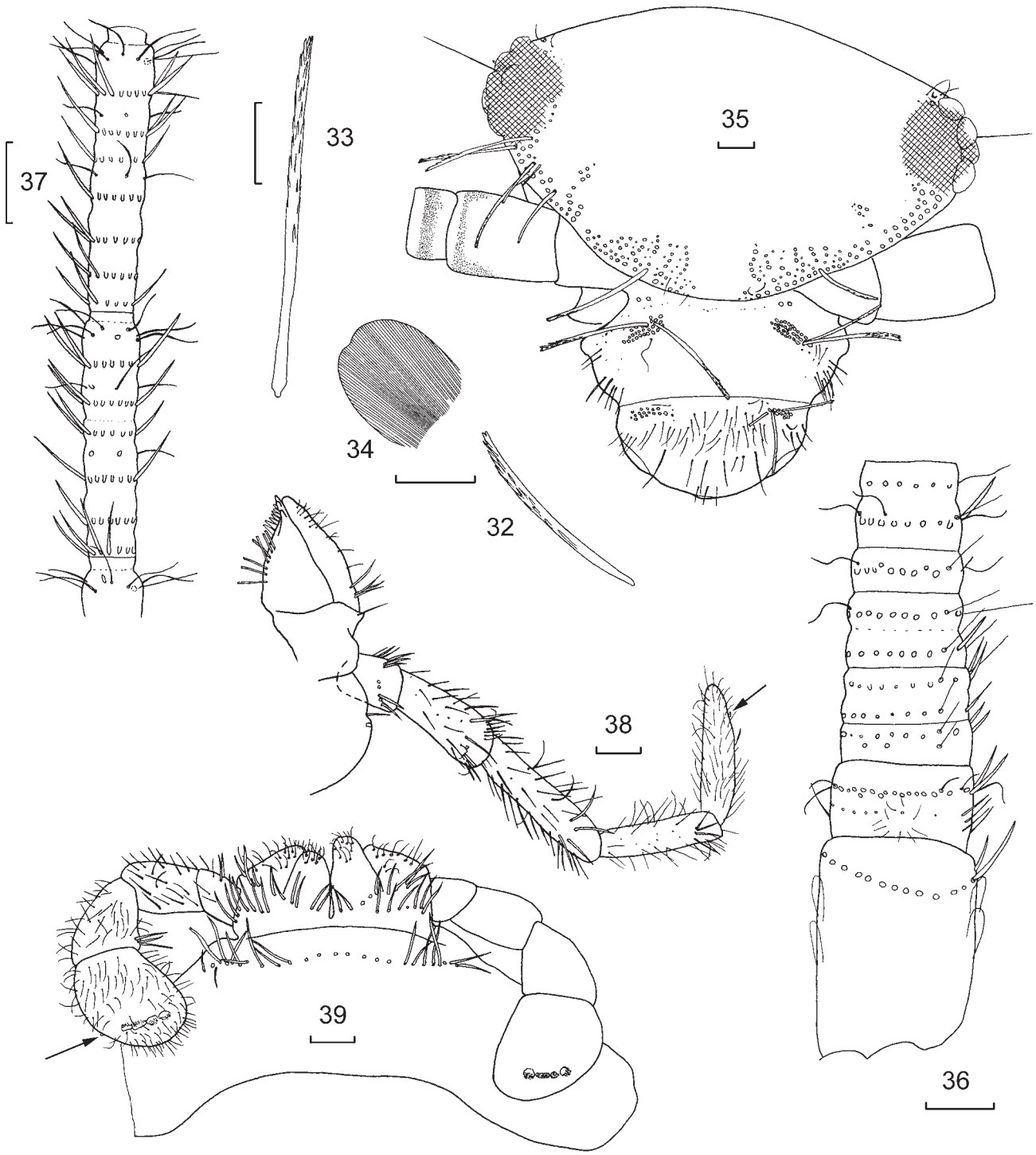
Appearance: Medium to large silverfish, with narrow body, thorax slightly wider than the abdomen which only tapers slightly posteriorly. Scale pattern when live mottled grey (Fig. 31), in alcohol mottled dark brown, almost black. Eyes dark chestnut, thorax and abdomen dorsally fairly evenly covered in brown scales. Terminal filaments distinctly annulated, the antennae also annulated but the lighter areas are small.

Body length: H+B up to 9.8 mm, HW 1.4 mm; thorax: length 3.0 mm or 0.26–0.34 H+B; width 2.3 mm with the mesonotum being slightly wider than the pronotum and metanotum, the metanotum being slightly shorter than the pro- and mesonota. Antennae incomplete, maximum preserved length 7.5 mm or >0.98 H+B; terminal filaments incomplete, maximum length of terminal filaments 7.6 mm or >0.99 H+B.

Pigmentation: Medium to dark brown. Flagellum of antennae with distinct annulations, the lighter areas small, restricted to the distal one or two annuli of each interval and not contrasting greatly with the darker annuli; pedicel with strong medial ring of darker pigment, scape with darker

Figure 31. *Acrotelsella quattuor* sp. nov. from Mango Lagoon in Oyala Thumatang NP, Queensland.

scales and pigment on ventral face. Frons with pigment around the eyes and among the macrochaetae anterior to the eyes, labrum, clypeus and mandibles without obvious pigment, distal two articles of maxillary palp with dark pigment in basal ⅔, antepenultimate article with patches of pigment along the sides; labial palp with strong pigment in basal half, penultimate article with pigment along the sides and the second article with some pigment distally. Pronotum with line of pigment along anterior edge of setal collar otherwise all nota and thoracic sterna without obvious pigment except for urotergite X which has distinct pigment either side at the base. Coxae of legs with distinct line of pigment along the external margin. Trochanter with darker pigment patch. Femora with pigment along posterior margin predominantly on the bulge and distal to it, with a little pigment on the dorsal distal margin. Tibia with patch of pigment in distal ⅓ but not extending to the apex; on PIII the pigment of the tibia extends along the whole dorsal margin. First tarsal article with pigment in medial ⅔, not extending to apices of the article, the remaining three tarsal articles with subtle pigmentation. Abdominal segments I–VIII without obvious pigment ventrally, coxites IX quite darkly pigmented (or sclerotised) especially around the stylus insertions. Ovipositor without pigment. Cerci and median filament distinctly annulated with the distal annulus in each division and the base of the first annulus lighter, the distal half of the first annulus with increasing pigment as is the penultimate article, all annuli between these quite darkly pigmented. Abdominal styli with pigment.



Figures 32–39. *Acrotelsella quattuor* sp. nov. holotype ♀ *(32)* pectinate macrochaeta of clypeus; *(33)* long pectinate macrochaeta of pronotum; *(34)* darker scale from pronotum; *(35)* head (cross-hatched area obscured by eye pigment); *(36)* antenna, scape, pedicel and basal intervals of flagellum; *(37)* idem, most distal surviving complete interval; *(38)* maxilla; *(39)* labium, smaller chaetotaxy and papillae omitted from one palp. Scale bars = 0.1 mm.

Macrochaetae: Variable, the majority of macrochaetae with quite slender delicate pectinations (Figs 32–33), straw coloured.

Scales: Variable in shape, with numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 34), those dorsal are brown, those ventral hyaline. Scales found on top of head, clypeus anterior to the bushes, on scape, on second and third articles of maxillary palp, on mentum of labium, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli IX, medial filament and cerci.

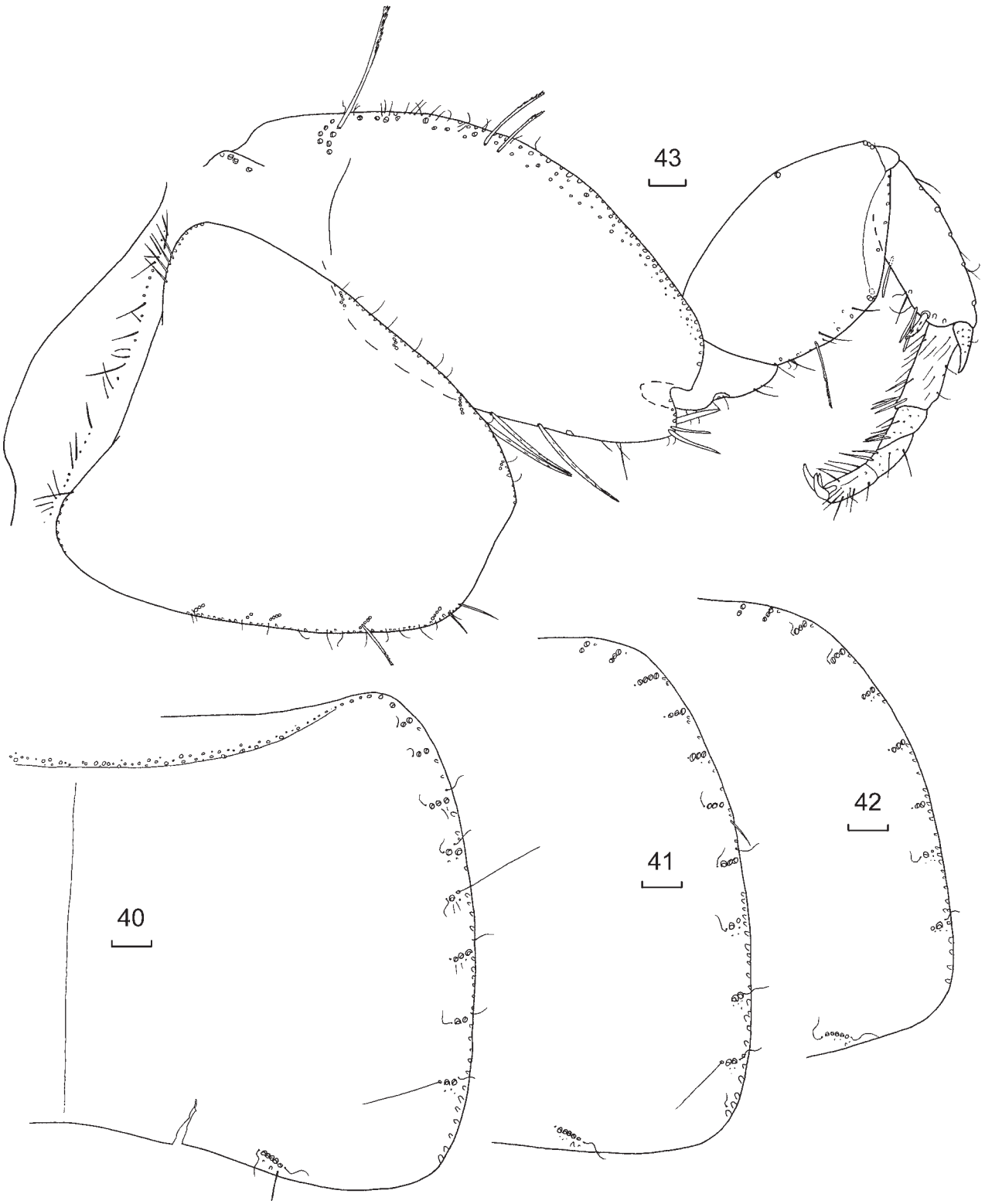
Head: (Fig. 35) wider than long, with 1+1 open bushes of macrochaetae aligned in several subparallel rows on the antero-lateral corners. Eyes dark brown in alcohol preserved material. The row of macrochaetae extends along the margin with a small gap above the antennal bases, beyond which is

another line of macrochaetae two macrochaetae wide which extends to and above the eyes; the peri-antennal group is almost connected with the lateral rows. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as 2+2 macrochaetae between these bushes and the frons plus a few setae laterally. Labrum also with 1+1 bushes of pectinate macrochaetae as well as many small simple setae, some longer than others. — Antennae fairly long, scape (Fig. 36) quite long with scales over surface and a preapical ring of numerous setae; pedicel with preapical ring of strong simple setae and cilia as well as smaller setae on the dorsal face as well as some small setulae scattered over face forming a circle; first annulus/interval of flagellum with two rings of setae and trichobothria, the sutures between the annuli/intervals very difficult to see in holotype; subsequent intervals with one or two rings of setae cilia and trichobothria. Based on the presence of trichobothria in the ultimate ring of each interval, the intervals clearly consist of two rings by the seventh interval and four by the tenth. In the most distal surviving intervals there are two very similar chains to each interval with a total of about eight rings of chaetotaxy per chain as in Figure 37. Type B basiconic sensilla present but not abundant and possibly type C basiconic sensilla or Silvestri-type sensilla. — Mandibles typical for *Acrotelsella* with prominent molar and large incisor areas; a group of about eleven strong apically bifurcated but simple setae distally adjacent to the pectinate molar area and a bush of about 100 pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 38) with one large and one smaller seta externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by seven lamellate processes and a row of seven smooth apically bifurcate setae; galea almost as long as the lacinia with several small setulae or cilia over the surface and four or five larger setae basally; maxillary palp long and thin, apical article 4.3–5.7 times longer than wide and 0.93–1.16 times as long as the penultimate article which is a little shorter than the third and longest article, the ultimate article with basiconic sensilla type B; last two articles of palp with fine setae only, second and third article with scales and thin setae, some of which are a little stronger near the distal end of the article, first article with an incomplete subapical ring of slightly thicker setae. — Labium (Fig. 39) short and broad, postmentum with transverse row of strong mostly simple setae, prementum with transverse and oblique rows of short strong mostly simple setae, apically with curved setulae; second article of labial palp with a few strong setae medially; apical article quite variable in shape, usually expanded medially, on average about as long as wide but large differences seen (L/W 0.89–1.33) with four papillae of compact type arranged in a single row, with a small stout basiconic sensillum near the outer margin at the level of the papillae, surface covered with numerous fine setae.

Thorax: Pronotum (Fig. 40) with setal collar about two macrochaetae wide; lateral margins with smaller but stout finely pectinate setae along the margin, with 7–9 combs of 1–3 strongly pectinate macrochaetae along each margin. Two open trichobothrial areas; the anterior trichobothrial area about 0.38–0.44 of the distance along the margin, associated with comb N-3, the trichobothrium being placed between the single macrochaeta of the comb and the margin on the holotype and a few other specimens but almost as many have the trichobothrium located between two macrochaetae; posterior trichobothrial area is located about 0.75–0.81 of the distance along the margin and is associated with the last comb which is composed of one or two macrochaetae with the short trichobothrium at the mediad end and a cilium at the laterad end, most combs with 1–3 setulae posterior to the comb. Posterior margin with 1+1 combs of 4–6 insertion points, each associated with a few small setae between the comb and the margin and a cilium at each end; the outermost insertion on the comb is occupied by a long thin trichobothrium-like seta. The distance between the lateral combs of the pronotum 43–48% the total width of the pronotum. — Mesonotum (Fig. 41) with lateral chaetotaxy similar to pronotum but with 9–11 combs each of 1–4 macrochaetae, the anterior trichobothrial area located 0.62–0.70 along the lateral margin associated with comb N-2 composed of one macrochaeta (rarely two) with the trichobothrium located between the macrochaeta and the margin, with a few setulae posterior to the comb and a cilium at the mediad end. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.84–0.89), the trichobothrium located mediad to the comb of 1–2 macrochaetae and with a few setulae posterior to the comb. Posterior margin with 1+1 combs of 4–6 macrochaetae insertions usually with a cilium at each end, the most lateral macrochaeta most likely a long, thin, trichobothrium-like, with a few setulae between the comb and the margin. — Metanotum (Fig. 42) similar to mesonotum with 8–10 combs of 1–4 macrochaetae, the anterior trichobothrial area associated with comb N-1 (rarely N-2 on one side only) of one macrochaeta (rarely two) about 0.67–0.77 along the margin, the posterior trichobothrial area associated with the most posterior comb (0.85–0.89 along margin) and the posterior 1+1 combs each of 4–6 macrochaetae the most lateral macrochaeta being a long thin, trichobothrium-like, with a few setulae between the comb and the margin.

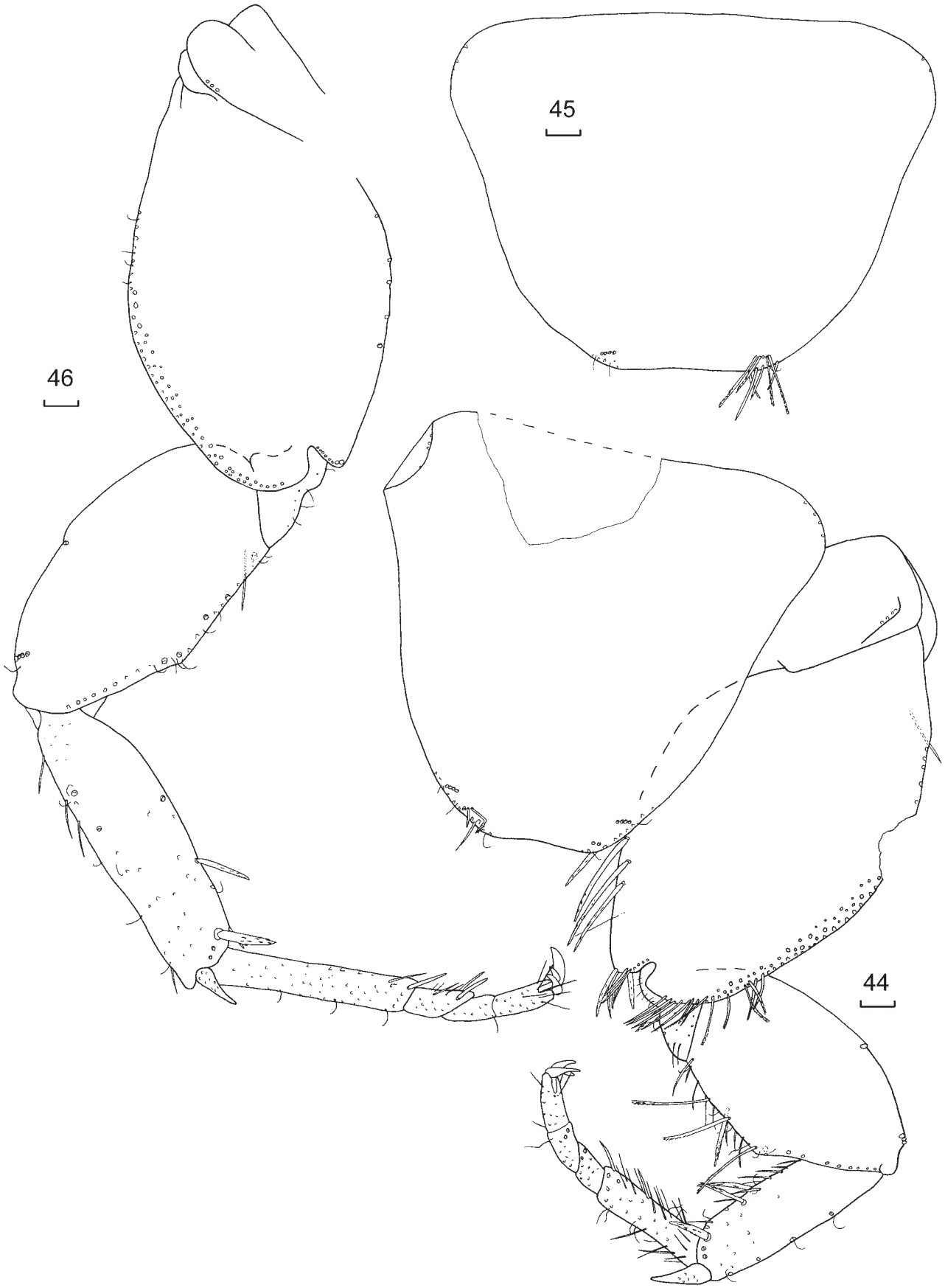
Presternum with transverse row of small setae and setulae (Fig. 43). — Prothoracic sternum (Fig. 43) large and trapezoidal, 0.91–1.08 times as long as wide at its base, antero-lateral corners with several simple setae all on the margin, posterior ⅔ of lateral margins with fringe of fine setae and some cilia as well as 4–8 combs each composed of 1–5 pectinate macrochaetae arranged in single straight or curved combs. — Mesosternum (Fig. 44) trapezoidal, a little larger than prosternum (1.11–1.19 times as long) but similar in shape, almost as long as wide at its base (L/W 0.90–0.98), with a few fine setae in the anterolateral corners, with long thin simple marginal setae and cilia at the posterior corners, not extending much beyond the combs and 2+2 combs (rarely 1+2) distally of 2–5 macrochaetae with additional slightly submarginal 1+1 strong setae nearer to the posterior end; all combs without associated setulae. — Metasternum (Fig. 45) trapezoidal, shorter and wider than the mesosternum (L/W 0.70–0.76) with a few fine setae in the anterolateral corners, with marginal setae and cilia only along margins adjacent to the combs; with 1+1 or more rarely 1+2 subdistal combs of 2–6 pectinate macrochaetae.

Legs of average dimensions, neither long and slender nor short and stout, tibia L/W ratio of PI 2.2–3.2, PII 2.4–3.4, PIII 3.2–4.2; tarsi L/W ratio PI 5.9–9.1, PII 7.2–9.6, PIII 7.5–10.1. PI (Fig. 43) with a row of about six macrochaetae laterally on the precoxa. Coxa with scales and a group of about eight macrochaetae on the anterolateral corners followed by a field of pectinate macrochaetae along the external margin about 2–3 macrochaetae wide; inner margin with four lightly

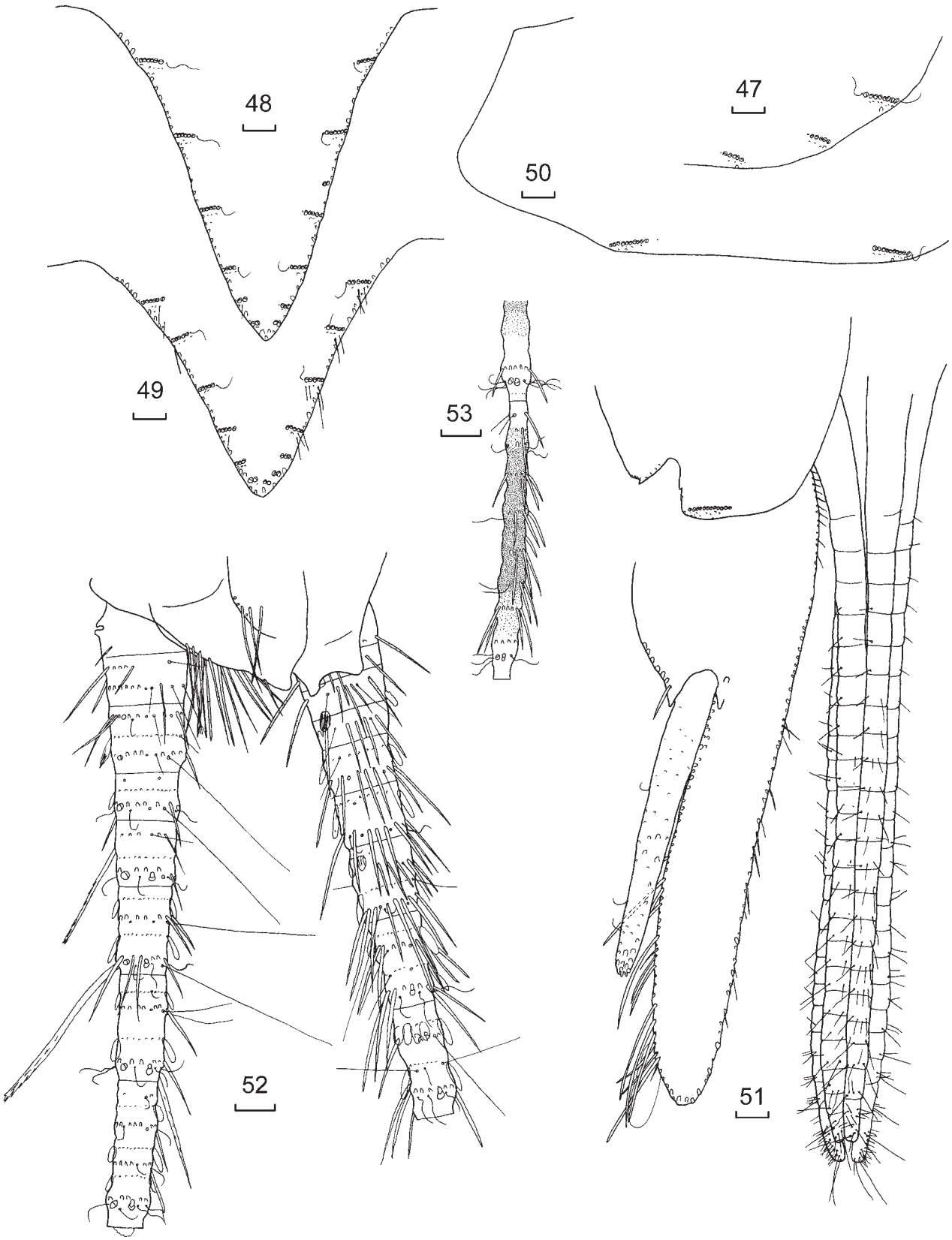


Figures 40–43. *Acrotelsella quattuor* sp. nov. holotype ♀ *(40)* pronotum, right side; *(41)* mesonotum, right side; *(42)* metanotum, right side; *(43)* prothoracic presternum, sternum and PI. Scale bars = 0.1 mm.

pectinate tapered macrochaetae and several shorter smooth and pectinate setae of varying thickness distally over the articulation; distal end with distinct cleft, with a row of small setae along the mediad margin. Trochanter with one small pectinate macrochaeta and a few fine setae. Femur posteriorly with some slender pectinate macrochaetae, in addition to some stronger tapered and carrot-shaped macrochaetae along the margin to the posterior bulge then a row of about seven setae along the margin to the articulation; anterior margin with a strong macrochaeta about ⅔ along the margin and



Figures 44–46. *Acrotelsella quattuor* sp. nov. holotype ♀ *(44)* mesothoracic sternum and PII; *(45)* metathoracic sternum; *(46)* PIII. Scale bars = 0.1 mm.



Figures 47–53. *Acrotelsella quattuor* sp. nov. holotype ♀ unless otherwise indicated by specimen number *(47)* urotergite IV, right side; *(48)* urotergite X; *(49)* urotergite X of ♂ (T259427); *(50)* urosternite VII; *(51)* coxites VIII and IX with ovipositor; *(52)* base of left cercus and median filament, with epiproct and a paraproct; *(53)* most distal surviving division of cercus with pigment density shown. Scale bars = 0.1 mm.

Table 4. Number of macrochaetae per bristle comb—*Acrotelsella quattuor* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	4–6	—	—	—	—
II	4–6	4–6	3–5	—	—
III	5–6	4–6	3–5	1–8	15.0–20.7
IV	5–8	4–6	3–6	5–9	10.9–16.5
V	6–10	4–6	2–6	5–10	9.8–13.3
VI	7–10	5–6	4–5	6–12	7.1–10.0
VII	7–10	4–7	4–6	8–14	4.4–8.1
VIII	7–11	—	4–6	9–14	4.6
IX	—	—	—	—	—

three strong insertions near the articulation. Tibia of PI with a very strong stout pectinate carrot-shaped macrochaeta near the distal end and some thin pectinate setae and smaller smooth setae along the posterior margin and just two small insertions distally mediad of the thick macrochaeta; dorsal margin with scales and five strong insertions; apex of tibia with the usual apical spur which is stout and covered in numerous setae. Tarsi with four articles, the basal article of PI a little less than half the total length of the tarsus, its join with the next article not oblique, whereas the distal margin of the second article is quite oblique, the surface of all tarsal articles with very numerous simple setae, those distally and below stronger than the others. Pretarsus with two long curved lateral claws and a shorter curved medial claw. PII (Fig. 44) and PIII (Fig. 46) similar to PI except the macrochaetae laterally on the coxae are somewhat reduced in the anterior half on PII and much reduced in the anterior half on PIII; the tibia of PIII has a long thin trichobothrium-like seta about ¼ the distance along the outer margin; legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer, being about 55% of the total length of the tarsus of PIII.

Abdomen: Urotergite I with 1+1 lateral combs of 4–6 macrochaetae, urotergites II–VII (Fig. 47) with 3+3 combs of 3–11 macrochaetae as in Table 4, urotergite VIII with 2+2 combs (lacking the sublateral), urotergite IX glabrous; the lateral and submedial combs with a cilium at each end and the sublateral with a cilium only at the mediad end; all combs with several small setae and setulae between the comb and the margin. — Urotergite X (Figs 48–49) of female narrow triangular (35–50° in both sexes) and acute but with the apex slightly withdrawn from the apex of a triangle in some specimens, slightly wider at base than long (L/W 0.87–0.97) with many delicately pectinate setae along entire margin inserted both above and below, 6–7 combs on each side, the combs composed of 2–6 macrochaetae per comb usually with a cilium at the mediad end of each comb, as well as a few setulae posterior to each comb.

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of up to 14 pectinate macrochaetae (Fig. 50) each with a smaller number of setulae between the comb and the margin as well as a cilium at the lateral end of every comb. The distance between the lateral combs 4.4–20.2 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Figure 51. Two pairs of styli, those on IX about one third longer than those on VIII, each with some robust setae apically. Coxites VIII with long combs of 9–14 macrochaetae and a smaller number of thin setae and setulae between the comb and the margin, the coxites with rounded inner corners, the straight section being about ⅓–½ the width of the distal margin. Coxites IX with a long rounded internal process about 4.7–6.3 times longer than wide at its base (longer in larger specimens) and 7.9–11.6 times longer than the short pointed external process, the inner processes surpassing the apex of styli IX including macrochaetae, almost reaching to the end of the ovipositor; outer process with several setae externally, inner process with strong smooth macrochaetae along the margins, being very dense on the outer margin where many large scales also exist. — Ovipositor of primary type with rows of fine setae on each article, quite long (1.65–2.33 HW) reaching to the apex of the long internal processes of coxites IX, both pairs of gonapophyses consisting of long basal division followed by smaller divisions that do not differ greatly in their length along the ovipositor, 24–27 divisions in total.

Cerci (Figs 52–53) with first division almost glabrous with just a couple of minute setae near the lateral margin, following three divisions wider than long with two or three rings of faintly pectinate setae macrochaetae and trichobothria, the middle ring composed mostly of scales, following divisions progressively longer with four rings per division by the sixth division, the basal and third rings mostly of scales and sometimes a cilium, the second ring of setae cilia and trichobothria, the most distal also with long distinctly pectinate macrochaetae; most distal surviving division in holotype (fourteenth) with eight rings of chaetotaxy but scales no longer visible.— Median dorsal appendage (Fig. 54) first four divisions short with only a single ring of setae although some isolated scales suggest scales may be present distal of the ring, fifth and sixth divisions with basal ring of scales and trichobothria and a subdistal ring of long, finely pectinate or smooth setae, divisions 7–9 with four rings, the basal and third of scales and trichobothria, the second of setae and trichobothria, the ultimate of macrochaetae and cilia. Epiproct and paraprocts quite darkly sclerotized or pigmented.

Urosternite VIII in ♂ entire with 1+1 combs of 9–14 macrochaetae as well as many thin marginal setae and setulae between the comb and the margin; posterior margin between the combs concave. Coxites IX in ♂ separated (Fig. 54) each side with a long smooth macrochaeta mediad to the base of the stylus. The internal process very acute apically, about 2.9–5.3 times longer than the external process and 1.3–1.6

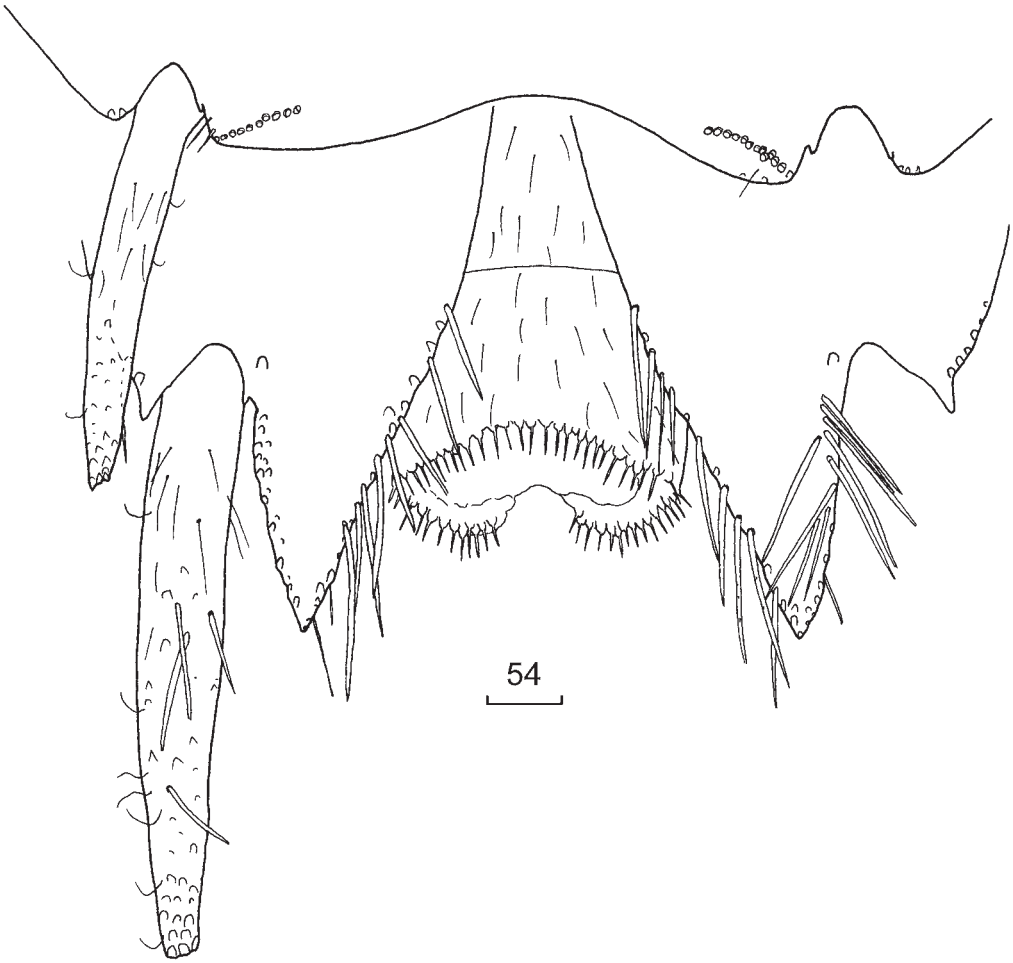


Figure 54. *Acrotelsella quattuor* sp. nov. paratype ♂ (T259427), posterior margin of urosternite VIII, coxites IX and penis. Scale bars = 0.1 mm.

times as long as broad at its base. External and internal margins of internal process and external margin of outer process with many smooth or perhaps very finely pectinate setae and macrochaetae. Outer process small triangular with several stout finely pectinate setae along the outer margin. Penis typical with numerous glandular setae apically each set on a protuberance. Parameres absent.

Habitat. This species was always collected from the bark of a variety of trees using the bark spray methodology. Localities as in Figure 30.

Etymology. This species is named *Acrotelsella quattuor* from the Latin number for four, referring to the number of papillae on the ultimate article of each labial palp.

Remarks. The specimens from Rockeby Road have not been included in the type series because we do not have supporting molecular data, the ovipositor is shorter with fewer divisions and the location of the anterior trichobothrial area of pronotum is at the anterior end of the range but otherwise these specimens conform with *Acrotelsella quattuor* sp. nov.

Acrotelsella lauraensis sp. nov.

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Figs 55–78

Holotype ♀ (HW 1.19) QUEENSLAND: Laura, opposite school 15.5568°S 144.4470°E 97m asl, 16.vii.2013, Graeme Smith, bark spray to paperbark tree, QMT259421 (on two slides). **Paratypes** (three males, two juveniles) 1♂ (HW 1.21) same data as holotype AMS K.541664 (on two slides, about to moult); 1♂ (HW 1.14) 2 juveniles (HW 0.91, 0.66) same data as holotype, AMS K.378006 (in alcohol); 1♂ (HW 1.08) Laura, opposite school 15.5568°S 144.4470°E 97m asl, 16.vii.2013, Graeme Smith, bark spray to ironbark tree, QMT259428 (on two slides); 2 juveniles (HW 0.63, 0.55) same data as previous, AMS K.378007 (in alcohol). Locality shown on the map in Figure 55.

Diagnosis. This species can be distinguished from other described *Acrotelsella* with a simple ovipositor and trapezoidal thoracic sterna by a combination of characters including the darker scales on the antero-lateral margins of the nota when live, the presence of four papillae on the labial palp and from *A. quattuor* sp. nov. by the almost complete absence of pigment on the pedicel (versus moderate to strong on *A. quattuor* sp. nov.), the less distinct annulations of the

terminal filaments (often absent) and the posterior margin of urosternite VIII in males is straight rather than slightly concave.

Description

Appearance: Medium silverfish with narrow body, thorax not much wider than the abdomen which only tapers slightly posteriorly. Scale pattern when live see Figure 56, in alcohol mottled brown.

Body length: H+B up to 8.9 mm, HW 1.2 mm; thorax: length 2.6 mm or 0.28–0.33 H+B; width 1.9 mm with the mesonotum being slightly wider than the pronotum and metanotum. Antennae incomplete, maximum preserved length 6.0 mm or >0.67 H+B; terminal filaments incomplete, maximum length of terminal filaments 2.6 mm or >0.33 H+B.

Pigmentation: Brown to dark brown or almost black. Flagellum of antennae with distinct colour bands, the light areas on the holotype variable in length with some only one annulus long and others several annuli long; pedicel without patch of pigment on anterior face, scape without pigment. Frons without pigment around the eyes and among the macrochaetae anterior to the eyes, labrum and clypeus without pigment, mandibles with dark pigment over much of outer face, ultimate three articles of maxillary palp with rich brown pigment in basal half, second article with slight pigment in basal half; labial palp ultimate article with brown pigment along basal half of inner margin, penultimate article with very little pigment, just a little on the inner and outer margins. Nota and thoracic sterna without obvious pigment. Coxae of legs with a small amount of pigment in antero-lateral "shoulders" only. Trochanter with rich brown pigment distally on margin. Femora with dark brown/black pigment on the posterior margin beyond the bulge. Tibia with dark brown pigment patch on the distal dorsal face. First tarsal article with dark patch of pigment in distal half, remaining tarsomeres with only faint pigment. Abdominal segments without obvious pigment except for light pigment on coxites IX. Ovipositor largely without pigment except for a light scattering of pigment distally. Both pairs of abdominal styli with even brown pigment in basal ¾. Cerci and median filament with moderate brown pigment overall but quite variable with some specimens having distinct but small lighter bands at the apex of each division, others with only a hint of lighter colour on the distal most annulus.

Macrochaetae: Variable, straw coloured, many macrochaetae with quite slender delicate pectinations (Figs 57–59) others with stronger pectinations especially distally.

Scales: Variable in shape with numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 60) those dorsal are brown, those ventral hyaline. Scales found on top of head, clypeus anterior to the bushes, on scape, on second and third articles of maxillary palp, on mentum of labium, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli IX, medial filament and cerci.

Head: (Fig. 61) wider than long, with 1+1 open bushes of macrochaetae aligned in several, often ill-defined, subparallel rows on the antero-lateral corners. Eyes dark brown in alcohol preserved material. The row of macrochaetae extends along the margin with a small gap above the antennal bases behind which is another row of macrochaetae three macrochaetae wide which extends to and above the eyes; the peri-antennal group is almost connected with the lateral rows. Clypeus with

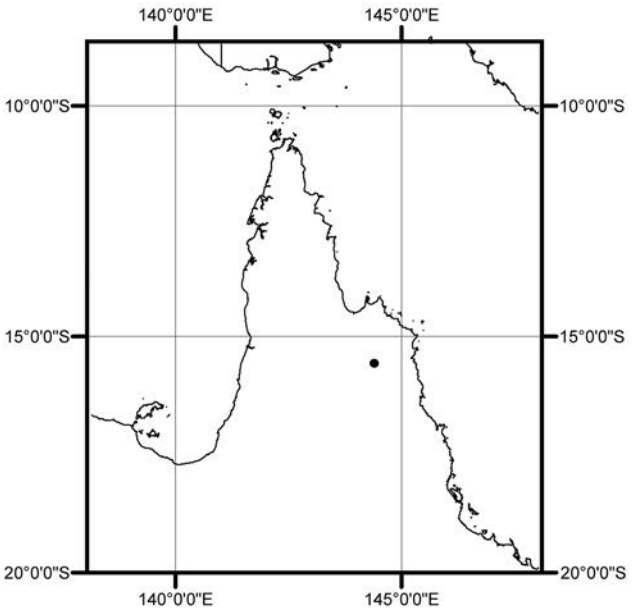
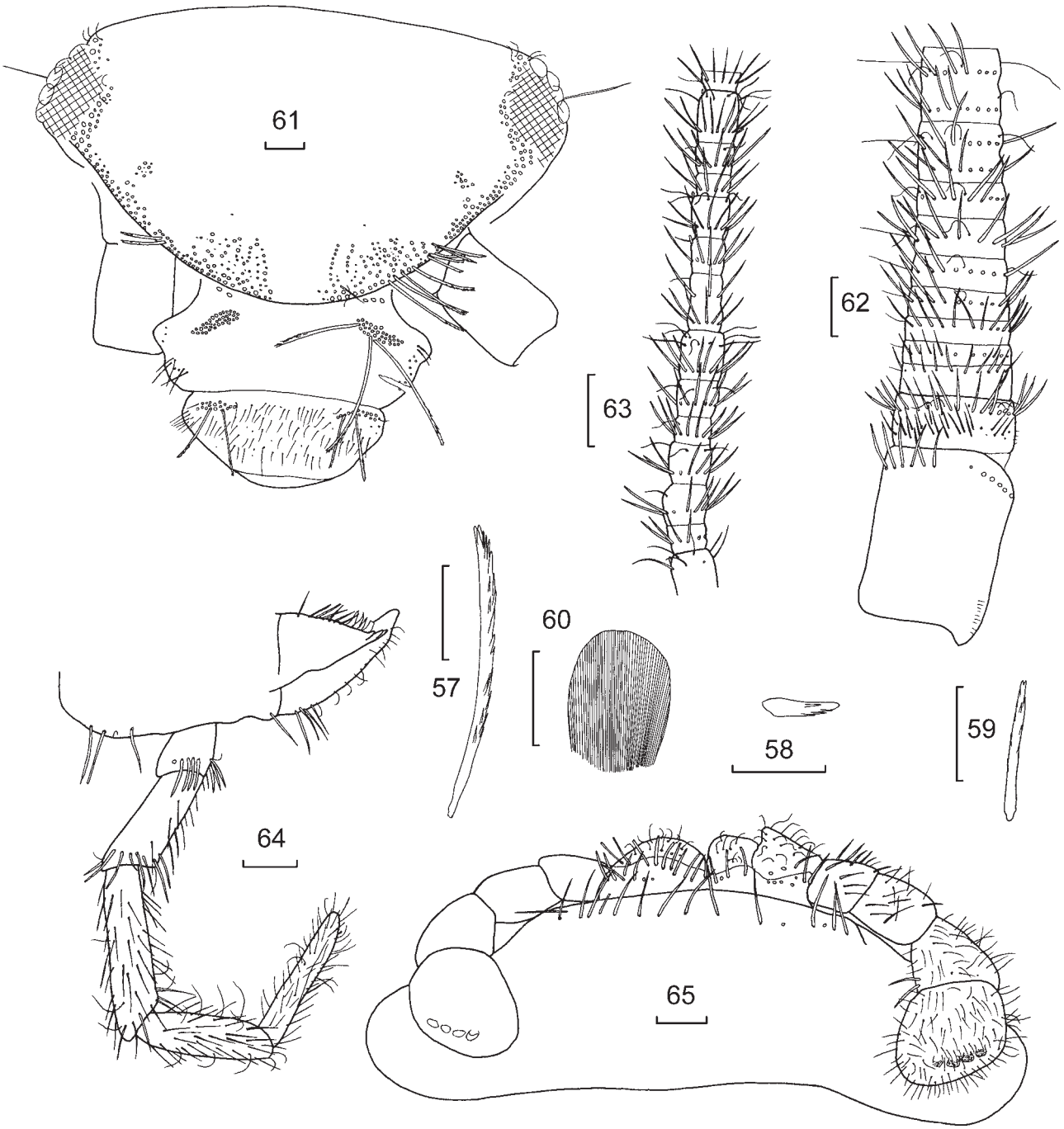


Figure 55. Known distribution of *Acrotelsella lauraensis* sp. nov.

Figure 56. *Acrotelsella lauraensis* sp. nov. from Laura, Queensland.

1+1 very dense bushes of strongly pectinate macrochaetae as well as 2+(2–3) macrochaetae between these bushes and the frons plus a few setae laterally. Labrum also with 1+1 bushes of pectinate macrochaetae as well as many small simple setae, some longer than others. — Antennae fairly long, scape (Fig. 62) quite long with scales over surface and a preapical ring of numerous setae; pedicel with preapical ring of strong simple setae and cilia as well as many smaller setae on the dorsal face; first annulus/interval of flagellum with a ring of setae and a short trichobothrium; next six intervals with one ring of setae cilia and trichobothria; interval eight divided into two annuli each with a ring of setae, the distal ring also with cilia and a trichobothrium. In the most distal surviving intervals there are two very similar chains to each interval with a total of about 20 rings of chaetotaxy per interval as in Figure 63. Type B and type C basiconic sensilla present. No circular sensilla observed. — Mandibles typical for *Acrotelsella* with prominent molar and large incisor areas; a group of about eleven strong apically bifurcated but simple setae distally adjacent to the pectinate



Figures 57–65. *Acrotelsella lauraensis* sp. nov. holotype ♀ *(57)* long pectinate macrochaeta of frons; *(58)* carrot-shaped macrochaeta of tibia of PI; *(59)* marginal macrochaeta of pronotum; *(60)* darker dorsal scale; *(61)* head (cross-hatched area obscured by eye pigment); *(62)* antenna, scape, pedicel and basal intervals of flagellum; *(63)* most distal surviving interval of flagellum; *(64)* maxilla; *(65)* labium. Scale bars = 0.1 mm.

molar area and a bush of about 100 pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 64) with 2–4 setae proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by seven lamellate processes and a row of 6–7 smooth apically bifurcate setae, galea a little longer than the lacinia with several small setulae or cilia over the surface and 4–5 larger setae basally; maxillary palp long and thin, apical article 4.2–4.5 times longer than wide and 1.0–1.1 times as long as the penultimate article which is distinctly shorter than the third and longest article, the ultimate article with a basiconic sensillum (type B); last two articles of palp with fine setae only, second and third article with scales and thin setae, some of these setae are a little stronger near the distal end of the article, first article with an incomplete subapical ring of slightly thicker setae. — Labium (Fig. 65) very short and broad, postmentum with transverse row of strong simple setae, prementum very short with transverse and oblique rows of short stout simple setae, apically with curved setulae; labial palp with mostly fine setae although

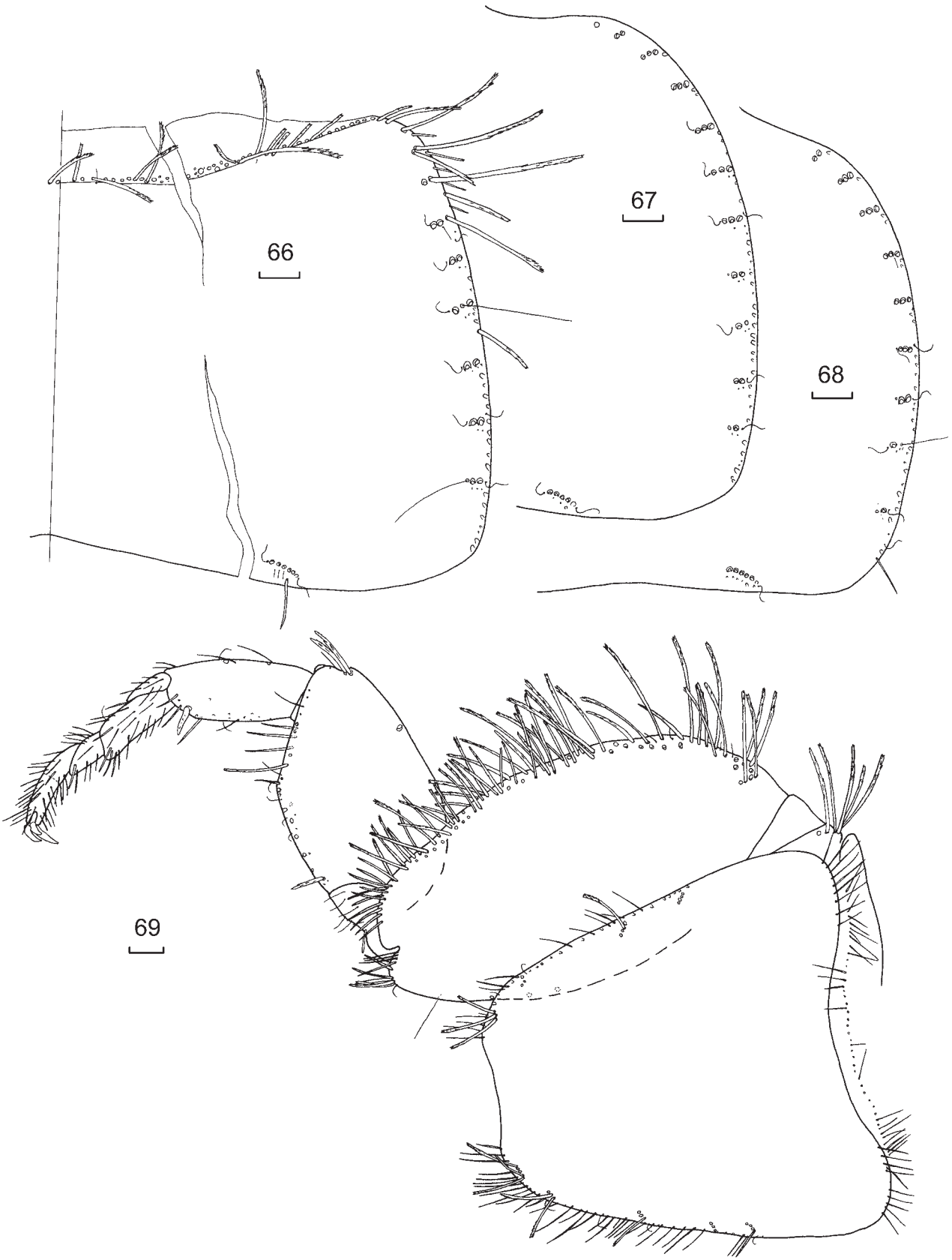
some stronger setae on second and third articles; apical article slightly expanded medio-distally, on average about as long as wide but large differences seen (L/W 0.9–1.3) with four papillae of compact type arranged in a single row (one side of QMT259428 with five papillae, the extra papilla appearing to be the result of a subdivision of the most laterad papilla), basiconic sensilla not seen on any of the three dissected specimens, surface covered with numerous fine setae.

Thorax: Pronotum (Fig. 66) with setal collar only one macrochaetae wide, many macrochaetae only short with small pectinations but some more than twice as long as the others with strong pectinations in apical half; lateral margins with smaller and also longer finely pectinate setae along the margin, with eight combs of 1–3 strongly pectinate macrochaetae along each margin. Two open trichobothrial areas; the anterior trichobothrial area about 0.37–0.41 of the distance along the margin associated with comb N-3, the trichobothrium being placed between the single macrochaeta of the comb and the margin or between two macrochaetae; posterior trichobothrial area is located about 0.70–0.77 of the distance along the margin and is associated with the last comb which is composed of 1–2 macrochaetae with the short trichobothrium at the mediad end and a cilium at the laterad end, most combs associated with 1–3 setulae posterior to the comb. Posterior margin with 1+1 combs of 4–6 insertion points each associated with a few small setae between the comb and the margin and a cilium at each end; the outermost insertion on the comb is occupied by a long thin trichobothrium-like seta. The distance between the lateral combs of the pronotum 48% the total width of the pronotum. — Mesonotum (Fig. 67) with lateral chaetotaxy similar to pronotum but with 10–11 combs each of 1–3 macrochaetae, the anterior trichobothrial area located 0.65–0.72 along the lateral margin associated with comb N-2 composed of one macrochaeta with the trichobothrium located between the macrochaeta and the margin, with a few setulae posterior to the comb and a cilium at the mediad end. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.86–0.89), the trichobothrium located mediad to the comb of a single macrochaeta and with a few setulae posterior to the comb. Posterior margin with 1+1 combs of 4–6 macrochaetae insertions usually with a cilium at each end, the most lateral macrochaeta most likely long thin trichobothrium-like, with a few setulae between the comb and the margin. — Metanotum (Fig. 68) similar to mesonotum with nine combs of 1–3 macrochaetae, the anterior trichobothrial area associated with comb N-1 of one macrochaeta about 0.73 along the margin, the posterior trichobothrial area associated with the most posterior comb (0.85–0.86 along margin) and the posterior 1+1 combs each of 4–6 macrochaetae the most lateral macrochaeta being long thin trichobothrium-like, with a few setulae between the comb and the margin.

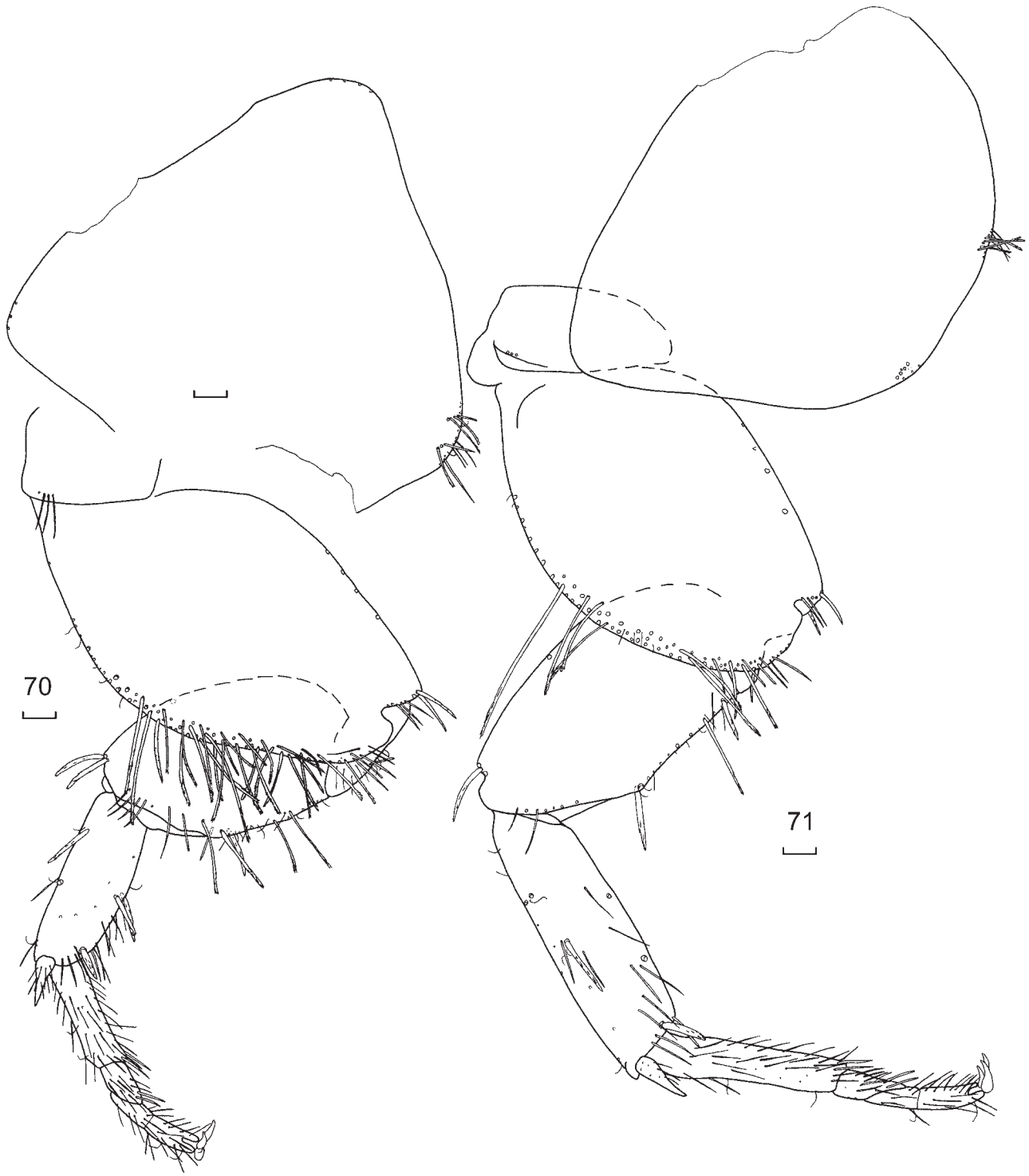
Presternum with transverse row of small setae and setulae (Fig. 69). — Prothoracic sternum (Fig. 69) large and trapezoidal, 0.87–0.91 times as long as wide at its base, antero-lateral corners with several simple setae all on the margin, posterior ¾ of lateral margins with fringe of fine setae and some cilia as well as 4–5 combs each composed of 2–5 pectinate macrochaetae arranged in single straight or curved combs. — Mesosternum (Fig. 70) trapezoidal, a little larger than prosternum (1.18–1.21 times as long) but similar in shape, about a long as wide at its base (L/W 0.90–0.94) with a few fine setae in the anterolateral corners, with long thin simple marginal setae and cilia at the posterior corners not extending much beyond the combs and 2+2 or 1+2 combs distally of 2–4 macrochaetae with additional slightly submarginal 1+1 strong setae nearer to the posterior end; all combs without associated setulae. — Metasternum (Fig. 71) trapezoidal, shorter and wider than the mesosternum (L/W 0.74–0.79) with about two fine setae in the anterolateral corners, with long marginal setae and cilia only along margins adjacent to the combs; 1+1 subdistal combs of 4–6 pectinate macrochaetae.

Legs of average dimensions, neither long and slender nor short and stout, tibia L/W ratio of PI 1.8–2.5, PII 2.5–3.7, PIII 3.5–3.6; tarsi L/W ratio PI 6.3–7.3, PII 7.0–8.9, PIII 11.0–11.1. PI (Fig. 69) with a row of about six macrochaetae laterally on the precoxa. Coxa with scales and a group of about nine macrochaetae on the anterolateral corners followed by a field of pectinate macrochaetae along the external margin about two macrochaetae wide; inner margin with four macrochaetae and several shorter smooth and pectinate setae of varying thickness distally over the articulation; distal end with distinct cleft, with a row of small setae along the mediad margin. Trochanter with one small pectinate macrochaeta and a few fine setae. Femur posteriorly with some slender pectinate macrochaetae in addition to some stronger tapered and occasionally carrot-shaped macrochaetae along the margin to the posterior bulge then a row of about seven setae along the margin to the articulation; anterior margin with a strong macrochaeta about ⅔ along the margin and three strong pectinate macrochaetae near the articulation. Tibia of PI with a very strong stout pectinate carrot-shaped macrochaeta near the distal end and some thin pectinate setae and smaller smooth setae along the posterior margin and two small setae distally mediad of the thick macrochaeta; dorsal margin with scales and two strong insertions; apex of tibia with a quite long apical spur which is strong (about half the length of the basal tarsal article) and covered in numerous setae. Tarsi with four articles, the basal article of PI a little less than half the total length of the tarsus, its join with the next article not oblique, whereas the distal margin of the second article is quite oblique, the surface of all tarsal articles with very numerous simple setae, those distally and below a little stronger than the others. Pretarsus with two long curved lateral claws and a shorter curved medial empodium. PII (Fig. 70) and PIII (Fig. 71) similar to PI except the macrochaetae laterally on the coxae are somewhat reduced in the anterior half; legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer being about 54% of the total length of the tarsus of PIII.

Abdomen: Urotergite I with 1+1 lateral combs of 5–6 macrochaetae, urotergites II–VII (Fig. 72) with 3+3 combs of 2–10 macrochaetae as in Table 5, urotergite VIII with 2+2 combs (lacking the sublateral), urotergite IX glabrous; the lateral and submedial combs with a cilium at each end and the sublateral with a cilium only at the mediad end; all combs with several small setae and setulae between the comb and the margin. — Urotergite X (Fig. 73) of female narrow triangular (39°) and acute but with the apex slightly withdrawn from the apex of a triangle, slightly wider at base than long (L/W 0.69) with many delicately pectinate setae along entire margin both above and below, 5–6 combs on each side each composed of 1–6 macrochaetae usually with



Figures 66–69. *Acrotelsella lauraensis* sp. nov. holotype ♀ *(66)* pronotum, right half; *(67)* mesonotum, right side; *(68)* metanotum, right side; *(69)* presternum, prothoracic sternum and PI. Scale bars = 0.1 mm.

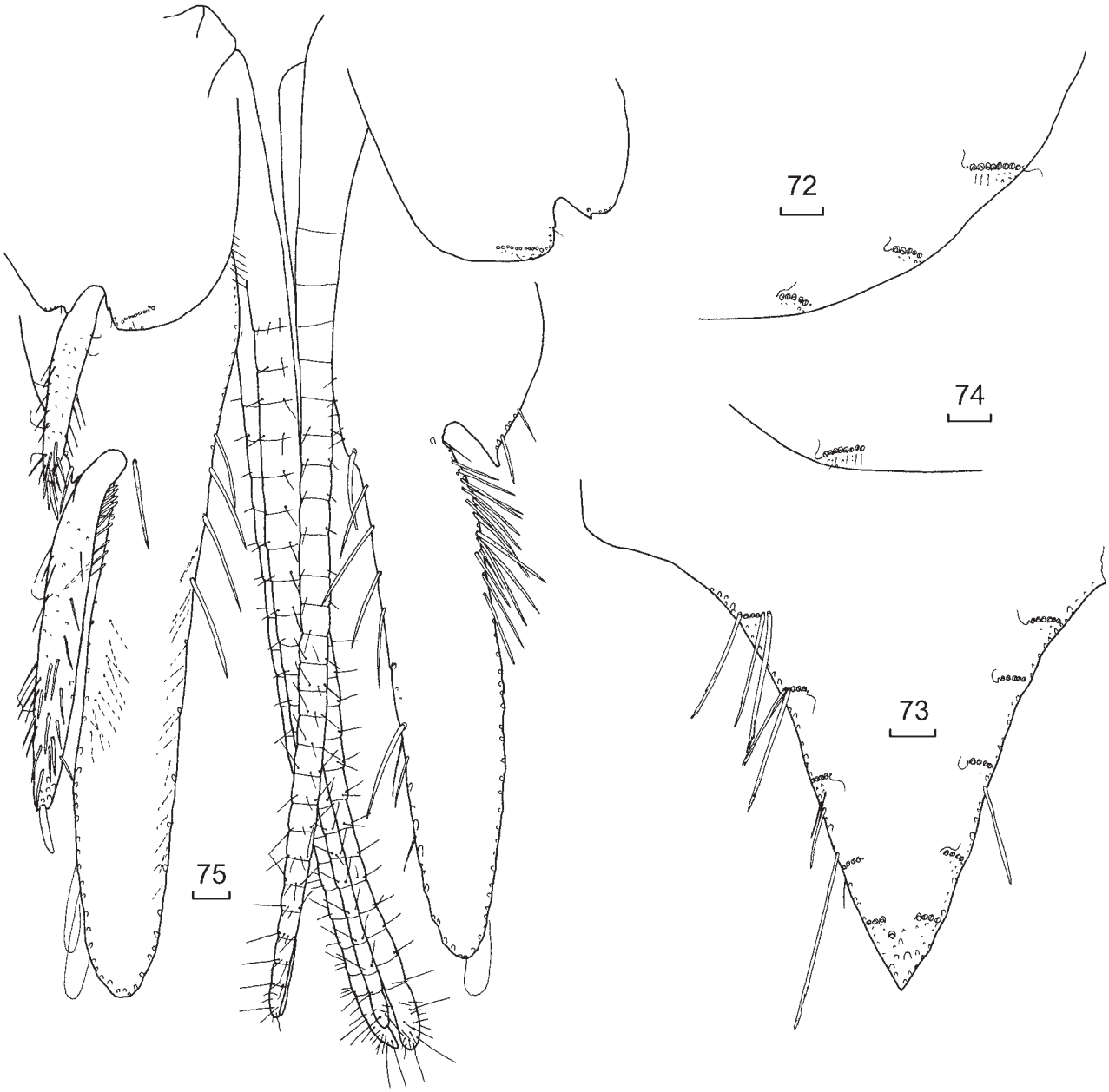


Figures 70–71. *Acrotelsella lauraensis* sp. nov. holotype ♀ *(70)* mesothoracic sternum and PII; *(71)* metathoracic sternum and PIII. Scale bars = 0.1 mm.

a cilium at the mediad end of each comb as well as a few setulae posterior to each comb. Urotergite X somewhat less acute in male (45–49°).

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 5–12 macrochaetae (Fig. 74) each with a similar number of setulae between the comb and the margin as well as a cilium at the lateral end of every comb. The distance between the lateral combs 5.5–20.5 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Figure 75. Two pairs of styli, those on IX about one half or more times longer than those on VIII, with some robust setae apically. Coxites VIII with long combs of 10–11 macrochaetae and a smaller number of thin setae and setulae between the comb and the margin, the coxites with rounded inner corners, the straight section being about ½ the width of the distal margin. Coxites IX with long rounded internal process about 4.6–4.8 times longer than

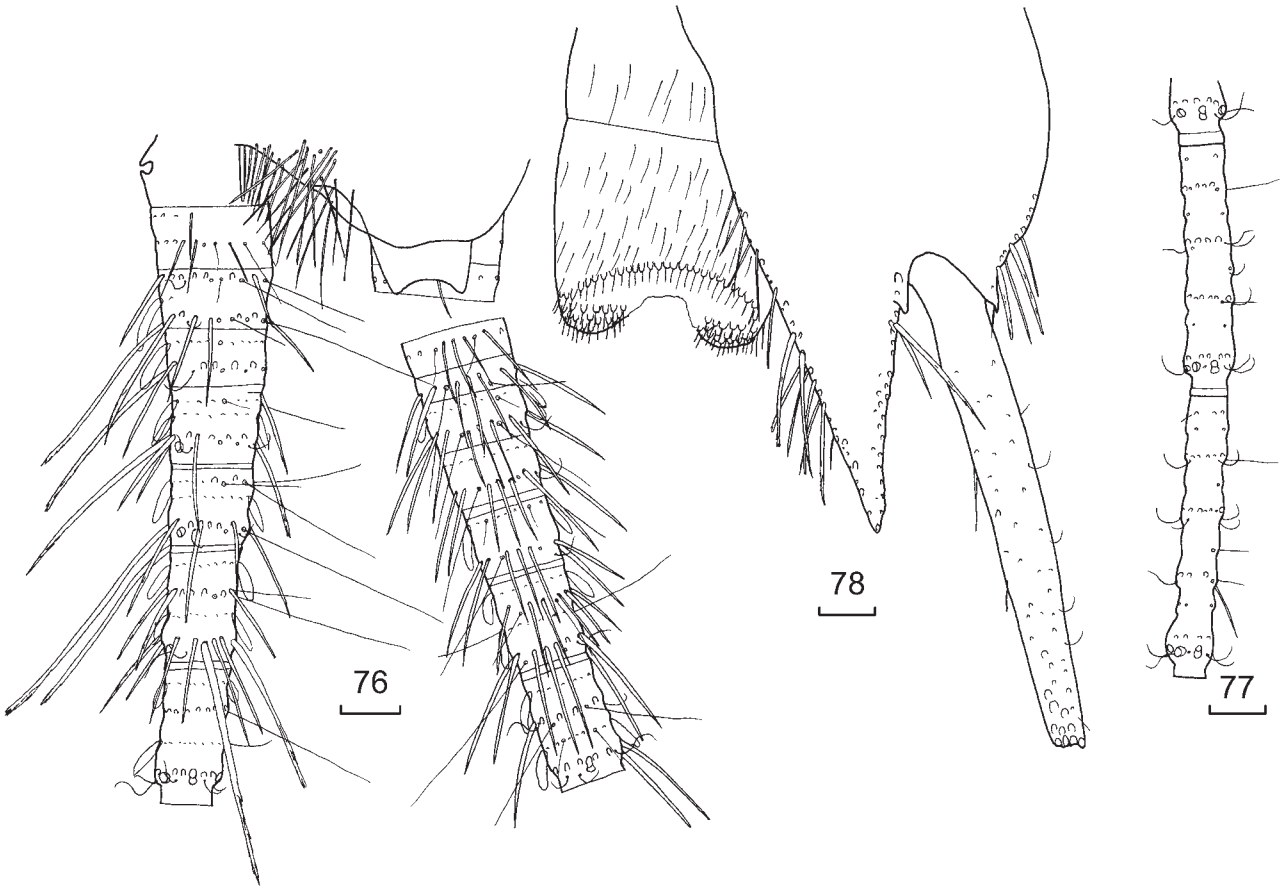


Figures 72–75. *Acrotelsella lauraensis* sp. nov. holotype ♀ *(72)* urotergite V, right side combs; *(73)* urotergite X; *(74)* right sublateral comb of urosternite VI; *(75)* coxites VIII and IX and ovipositor. Scale bars = 0.1 mm.

wide at its base and 10.8–14.8 times longer than the short pointed external process, the inner processes surpassing the apex of styli IX including macrochaetae almost reaching to the end of the ovipositor; outer process with a few setae externally, inner process with strong smooth macrochaetae along the inner margins and long pectinate macrochaetae along the outer margin being dense on the basal third, many large scales in the distal half. — Ovipositor of primary type, quite long (2.17 HW), reaching to the apex of the long internal processes of coxites IX, with rows of fine setae on each article, both pairs of gonapophyses consisting of long basal division followed by smaller divisions that do not differ greatly in their length along the ovipositor, about 26 divisions in total.

Cerci (Figs 76–77) with first division almost glabrous with just a couple of minute setae near the lateral margin, following three divisions wider than long with two rings of faintly pectinate setae, macrochaetae and trichobothria, following divisions progressively longer with two, then three, then four rings (eighth division) the basal and penultimate mostly just with trichobothria and scales; most distal surviving division (eleventh) of paratype K.541664 with eight rings of chaetotaxy but scales no longer visible.— Median dorsal appendage (Fig. 76) first four divisions short with only a single ring of setae and trichobothria, fifth, six and seventh divisions with basal ring of scales and trichobothria and a subdistal ring of long finely pectinate or smooth setae, divisions 7–8 with four rings, the basal and third of scales and trichobothria, the second of setae cilia and trichobothria, the ultimate of macrochaetae and cilia. Epiproct and paraprocts quite darkly sclerotized or pigmented.

Coxite VIII in ♂ entire with 1+1 combs of 9–12



Figures 76–78. *Acrotelsella lauraensis* sp. nov. holotype ♀ unless otherwise indicated with specimen number *(76)* base of cerci and medial filament (broken off); *(77)* cercus, most distal surviving divisions, mid-length (K.541664); *(78)* coxite IX and stylus, left side with penis (K.541664). Scale bars = 0.1 mm.

Table 5. Number of macrochaetae per bristle comb—*Acrotelsella lauraensis* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	5–6	—	—	—	—
II	5	4–5	5–6	—	—
III	5–7	4–5	5–6	5	19.2–20.5
IV	6–9	5–6	5	7–9	11.3–11.6
V	7–9	5–6	5–7	7–8	10.9–11.9
VI	6–10	5–6	5–6	7–10	8.6–11.4
VII	9	5	5–6	9–11	5.5–5.6
VIII	2–10	—	5–6	10–12	6.7
IX	—	—	—	—	—

macrochaetae as well as many thin marginal setae and setulae between the comb and the margin; posterior margin between the combs straight. Coxites IX in ♂ separated (Fig. 78) each side with a macrochaeta mediad of the base of the stylus. The internal process very acute apically about 3.2–3.9 times longer than the external process and 1.5–1.7 times as long as broad at its base. External and internal margins of internal process and external margin of outer process with many very finely pectinate setae and macrochaetae. Outer process small triangular with several stout finely pectinate setae along the outer margin. Penis typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Habitat. This species was collected by pyrethrum spray to the bark at the base of a paperbark tree and an ironbark tree.

Etymology. The species is named *lauraensis* referring to the only known locality in the town of Laura.

Acrotelsella marginata sp. nov.

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Figs 79–100

Holotype ♀ (HW 1.44) QUEENSLAND: Jardine River NP, Jardine River South campsite 11.1399°S 142.3637°E 16m asl, 22.vii.2013, Graeme Smith, leaf litter in river edge forest (eucalypt, plus *Acacia* or *Melaleuca*), QMT259422 (on two slides). **Paratypes** (four males, five females, five juveniles) 1♂ (HW 1.20) same data as holotype, QMT259429 (on two slides); 1♂ (HW 1.24) same data as holotype, AMS K.378008 (in alcohol); 1♀ (HW 1.50) Jardine River NP, Jardine River South campsite 11.1406°S 142.3626°E 15m asl, 21.vii.2013, Graeme Smith, leaf litter at base of tree, AMS K.541667 (on two slides); 1 subadult ♀ (HW 0.80) 1 juvenile ♂ (HW 0.73) same data as previous, AMS K.378009 (in alcohol); 1♀ (HW 1.25) Pennefather 12.2918°S 141.7033°E 7m asl, 19.vii.2013, Graeme Smith, paperbark leaf litter on sand, AMS K.541665 (two slides); 1♀ (HW 1.23) Pennefather 12.2916°S 141.7059°E 7m asl, 19.vii.2013, Graeme Smith, bark spray to soft bark eucalypt, AMS K.541666 (on two slides); 2♀♀ (HW 1.03, 1.00) 1♂ (HW 0.88) 3 juveniles (HW 0.73, 0.73, 0.60) same data as previous, AMS K.378010 (in alcohol); 1♂ (HW 1.18) Pennefather 12.2919°S 141.7076°E 10m asl, 19.vii.2013, Graeme Smith, abandoned termite galleries on ti tree, AMS K.378011 (in alcohol).

Not included in type series. 1♀ (HW 1.38) Wenlock River 13.1008°S 142.9406°E 133m asl, 27.vii.2013, Graeme Smith, bark spray to square bark tree, AMS K.541676 (on two slides); 1♂ (HW 1.29) ♀ (HW 1.05) 1 subadult ♂ (HW 0.90) same data as previous, K.378028 (in alcohol); 1 juvenile ♀ (HW 0.73) Wenlock River 13.1008°S 142.9409°E 128m asl, 27.vii.2013, Graeme Smith, bark spray to square bark tree, AMS K.378027 (in alcohol); 6 juveniles (HW 0.58, 0.55, 0.53, 0.48, 0.43, 0.43) same data as previous, AMS K.378025 (in alcohol). All localities shown on map in Figure. 79.

Diagnosis. This species can be distinguished from other described *Acrotelsella* with a simple ovipositor and trapezoidal thoracic sterna by a combination of characters including the lighter scales on the margins of the nota when live, very weak annulations of the antennae, the number of papillae on the apical article of the labial palp (five), the larger number of combs on the prothoracic sternum (5–8 versus 4–5) and the very weak or absent annulations on the terminal filaments.

Description

Appearance: Medium size silverfish with narrow body, thorax not much wider than the abdomen which only tapers slightly posteriorly. Scale pattern in alcohol mottled brown, when live recently moulted specimens have distinct lighter bands along sides of at least the pronotum (Fig. 80) but we do not have enough photos, especially of the clade to which the holotype belongs (see comments).

Body length: H+B up to 10.6 mm, HW 1.5 mm, thorax: length 3.1 mm or 0.28–0.37 H+B, width 2.4 mm with the mesonotum being slightly wider than the pronotum and metanotum. Antennae incomplete, maximum preserved length 8.8 mm or >0.84 H+B; terminal filaments all broken, maximum length of terminal filaments 6.1 mm or >0.58 H+B.

Pigmentation: Light to dark brown. Flagellum of antennae with weak annulations, the lighter areas restricted to the distal two annuli of each interval; pedicel with variable pigment, sometimes absent but when present usually only as patch on outer face but occasionally extending as medium brown pigment over much of dorsal face, scape usually without pigment but a small patch basally on some specimens. Frons without pigment around the eyes and among the macrochaetae anterior to the eyes, labrum without pigment, clypeus sometimes with pigment patches below bushes, mandibles with pigment among bushes of macrochaetae, last three articles of maxillary palp with light to medium pigment which is lighter at each end, second article without pigment; labial palp with pigment around inner and inner basal margin of ultimate article and inner and/or outer distal margin of penultimate article, slight pigment distally on the ante-penultimate article. Nota and thoracic sterna without obvious pigment. Coxae of legs with only slight pigment in the anterior outer corners. Trochanter with some pigment along outer margin especially distally. Femora with pigment on posterior margin predominantly in the area distad of the bulge and also distally on the dorsal margin. Tibia with some pigment in the distal third especially on the dorsal margin. First tarsal article with pigment, remaining articles without pigment or with a small amount medially. Abdominal segments without obvious pigment except for light pigment on anterior outer margins of urotergite X. Ovipositor with some light pigment distally. Cerci and median filament generally with evenly distributed medium density pigment overall however the most distal two annuli may have slightly less pigment than the rest. Abdominal styli with light pigment.

Macrochaetae: Variable, pectinate or smooth straw coloured, the pectinations are generally not strong and may be very delicate on many setae and tapered macrochaetae (Figs 81–82).

Scales: Variable in shape, with numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 83) those dorsal are brown in alcohol, those ventral hyaline. Scales found on top of head, on scape, on second and third articles of maxillary palp, on mentum of labium, all nota, all thoracic sterna, legs (except for trochanter and apical three articles of tarsi), all urotergites and urosternites, styli and terminal filaments.

Head: (Fig. 84) wider than long, with 1+1 open bushes of macrochaetae aligned in several subparallel rows on the antero-lateral corners. Eyes dark brown in alcohol preserved material. The row of macrochaetae extends along the lateral margin with a small gap above the antennal bases behind which is another row of macrochaetae two or three macrochaetae wide which extends to and in front of the eyes; the peri-antennal group is almost connected with the lateral rows. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as 2+2 macrochaetae between these bushes and the frons plus a few setae laterally. Labrum also with 1+1 bushes of pectinate macrochaetae as well as many small simple setae, some longer than others. — Antennae fairly long, scape (Fig. 85) quite long with scales over surface and a preapical ring of numerous setae; pedicel with preapical ring of strong simple setae and cilia as well as smaller setae on the dorsal face and some setulae scattered over face forming a circle; basal nine annuli/intervals of flagellum short, gradually increasing in length distally, each with a ring of setae cilia and trichobothria; tenth interval with two annuli, the trichobothria restricted to the distal

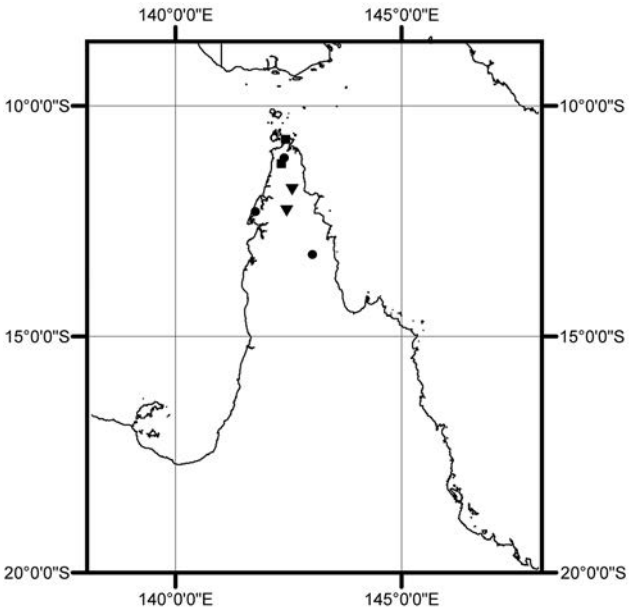


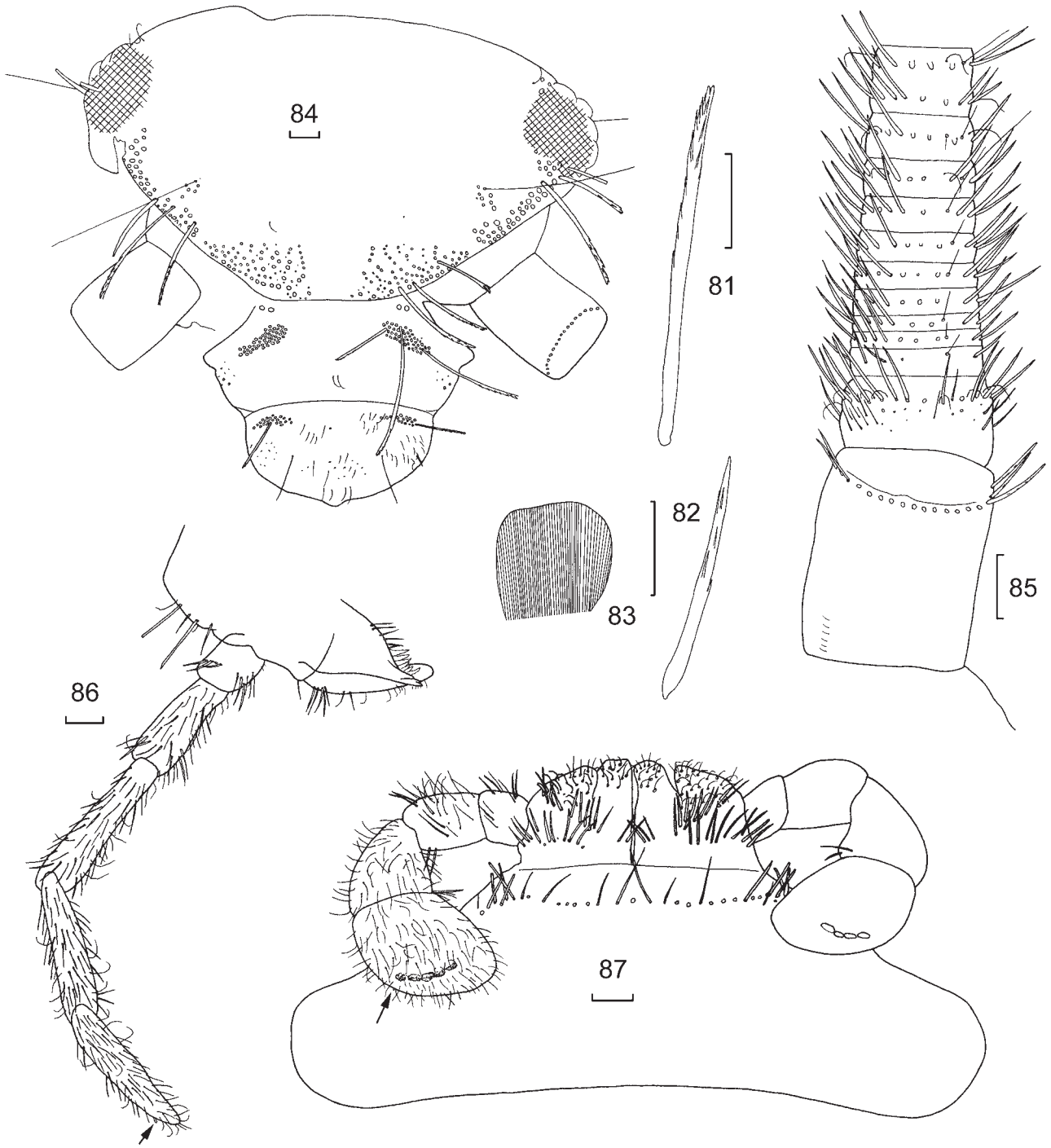
Figure 79. Known distribution of *Acrotelsella marginata* sp. nov. (circle) and two closely related taxa *A.* aff. *marginata* F2. (square) and *A.* aff. *marginata* F3. (inverted triangle).

annulus; thirteenth interval with three annuli, fourteenth with four annuli. In the most distal surviving intervals there are two very similar chains to each interval with a total of about 20 rings of chaetotaxy per chain; with type B basiconic sensilla present but not abundant. — Mandibles typical for *Acrotelsella* with prominent molar and large incisor areas; a group of about eleven strong apically bifurcated but simple setae distally adjacent to the pectinate molar area and a bush of about 100 pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 86) with two smooth or delicately pectinate macrochaetae, two setae and a cilium externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by seven lamellate processes and a row of six smooth apically bifurcate setae, galea a little longer than the lacinia with several small setulae or cilia over the surface and 4–5 larger setae basally; maxillary palp long and thin, apical article 4.6–6.8 times longer than wide and 0.97–1.14 times as long as the penultimate article which is a little shorter than the third and longest article, the ultimate article with basiconic sensilla (type B); last two articles of palp with fine setae only, second and third article with scales and thin setae, some of which are a little stronger near the distal end of the article, first article with an incomplete subapical ring of slightly thicker setae. — Labium (Fig. 87) short and broad, postmentum with transverse row of strong mostly simple setae, prementum with transverse and oblique rows of short strong simple or apically truncate setae, apically with curved setulae; second article of labial palp with two strong setae medially, apical article quite variable in shape, usually expanded medially about as long as wide and eccentric in shape (L/W 0.81–1.35) with single row of five papillae of compact type (only four on one side of the holotype) and a basiconic sensillum type B near the outer margin at the level of the papillae, surface covered with numerous fine setae.

Thorax: Pronotum (Fig. 88) with setal collar about two macrochaetae wide towards the mid region but only a single

Figure 80. *Acrotelsella marginata* sp. nov. from Pennefather, Queensland.

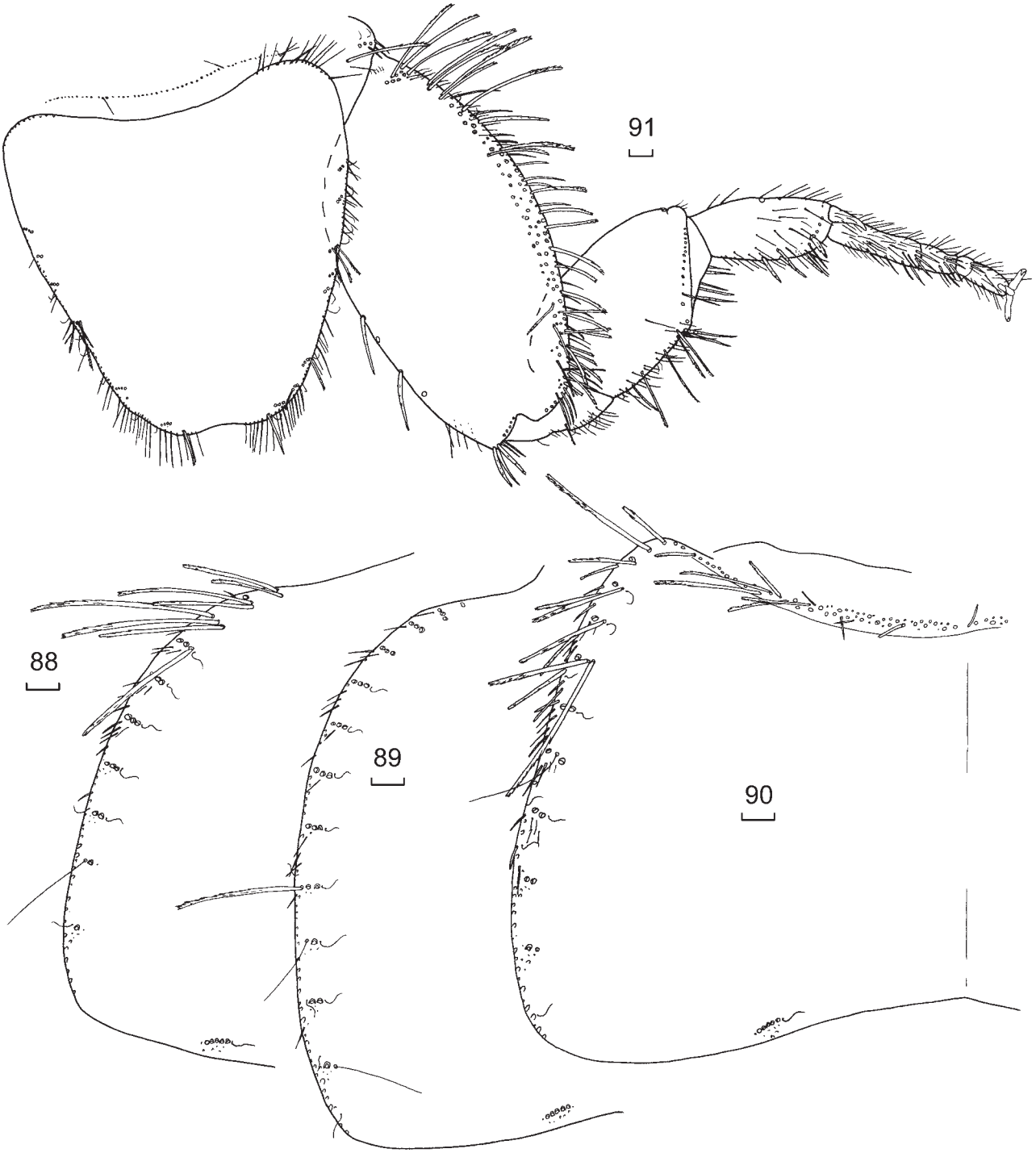
macrochaeta wide towards the margins; lateral margins with many reasonably strong pectinate setae along the margin and 8–9 combs of 1–3 strongly pectinate macrochaetae. Two open trichobothrial areas; the anterior trichobothrial area about 0.37–0.41 of the distance along the margin associated with comb N-3, the trichobothrium almost always being placed between the single macrochaeta of the comb and a larger slightly submarginal macrochaeta; posterior trichobothrial area is located about 0.75–0.77 along the margin and is associated with the last comb which is usually composed of a single macrochaeta (rarely two) with the trichobothrium at the mediad end and a cilium at the laterad end, most combs associated with 1–4 setulae posterior to the comb. Posterior margin of all nota with 1+1 combs of 5–7 insertion points each associated with a few small setae between the comb and the margin and a cilium at each end; the outermost insertion on the comb is occupied by a long thin trichobothrium-like seta. The distance between the lateral combs of the pronotum 38–44% the total width of the pronotum. — Mesonotum (Fig. 89) with lateral chaetotaxy similar to pronotum but with 10–12 combs each of 1–4 macrochaetae, the anterior trichobothrial area located 0.62–0.65 along the lateral margin associated with comb N-2 composed of a single macrochaeta with the trichobothrium



Figures 81–87. *Acrotelsella marginata* sp. nov. holotype ♀ *(81)* long pectinate macrochaeta of frons; *(82)* finely pectinate macrochaeta of coxa of PI; *(83)* darker dorsal scale of pronotum; *(84)* head, cross-hatched area obscured by eye pigment; *(85)* antenna, scape, pedicel and basal intervals of flagellum; *(86)* maxilla and palp, arrow showing location of basiconic sensillum; *(87)* labium, chaetotaxy omitted from left palp. Scale bars = 0.1 mm.

located between the macrochaeta and the margin with a few setulae posterior to the comb and a cilium at the mediad end. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.84–0.88), the trichobothrium located mediad to the comb of a single macrochaeta with a few setulae posterior to the comb. — Metanotum (Fig. 90) similar to mesonotum with 9–10 combs of 1–4 macrochaetae, the anterior trichobothrial area associated with comb N-1 of one macrochaeta about 0.73–0.75 along the margin, the posterior trichobothrial area associated with the most posterior comb (0.85–0.87 along margin).

Presternum with transverse row of small setae (Fig. 91). — Prothoracic sternum (Fig. 91) large and trapezoidal 0.94–1.05 times as long as wide at its base, antero-lateral corners with several simple setae all on the margin, posterior ¾ of lateral margins with fringe of fine setae and some cilia as well as 5–8 combs each composed of 1–7 pectinate macrochaetae arranged in single straight or curved combs,



Figures 88–91. *Acrotelsella marginata* sp. nov. holotype ♀ *(88)* pronotum, left half; *(89)* mesonotum, left side; *(90)* metanotum, left side; *(91)* part of presternum, prothoracic sternum and PI. Scale bars = 0.1 mm.

sometimes a bit complex with some macrochaetae offset from the main row, also with 1+1 larger submarginal setae distally. — Mesosternum (Fig. 92) trapezoidal a little larger than prosternum (1.11–1.25 times as long) but similar in shape, about as long as wide at its base (L/W 0.95–1.05) with a few fine setae in the anterolateral corners and with long thin simple marginal setae and cilia at the posterior corners not extending much beyond the combs and 2+2 combs (rarely 2+3) distally of 2–5 macrochaetae without additional slightly submarginal 1+1 strong setae nearer to the posterior end; all combs associated with 0–1 setulae. — Metasternum (Fig. 93) trapezoidal, shorter and wider than the mesosternum (L/W 0.72–0.81) with a few fine setae in the anterolateral corners, with marginal setae and cilia only along margins adjacent to the combs; with 1+1 (rarely 1+2) subdistal combs of 4–10 pectinate macrochaetae.

Legs of average dimensions, neither long and slender nor short and stout, tibia L/W ratio of PI 2.2–2.7, PII 2.2–3.2, PIII

Table 6. Number of macrochaetae per bristle comb—*Acrotelsella marginata* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	5–6	—	—	—	—
II	5–8	5	4–6	—	—
III	6–9	5–6	5–6	7–12	7.5–13.0
IV	7–10	5–6	4–6	7–12	8.2–11.3
V	9–11	5–6	4–6	9–12	6.8–10.9
VI	7–11	5–6	4–5	9–13	5.6–9.0
VII	7–10	5–6	0–5	11–14	3.8–5.1
VIII	8–11	—	0–5	11–13	4.6 (♂)
IX	—	—	—	—	—

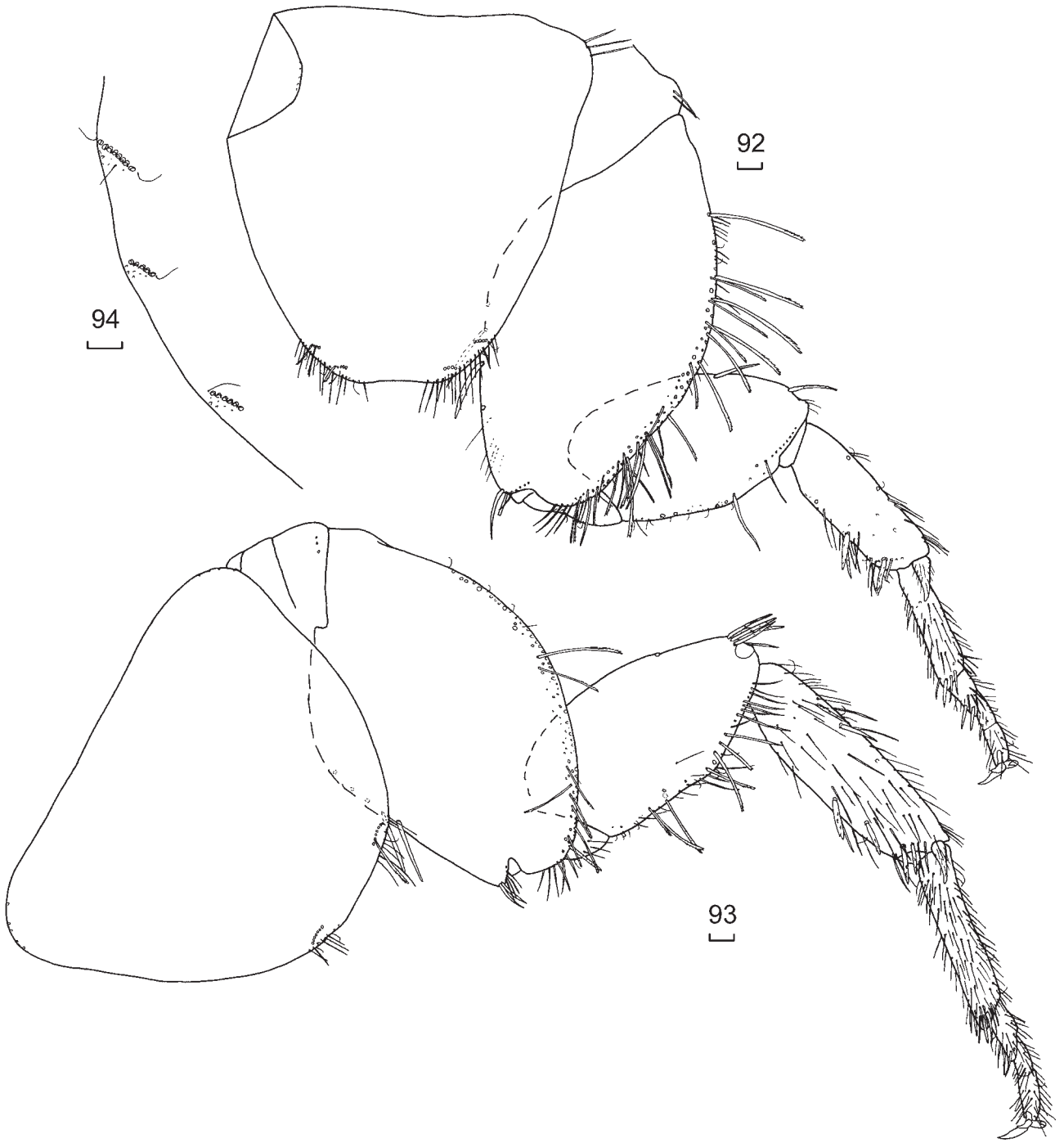
3.3–3.9; tarsi L/W ratio PI 6.0–7.5, PII 6.1–8.9, PIII 9.1–10.9. PI (Fig. 91) with a row of several macrochaetae laterally in pigmented region on the precoxa. Coxa with scales and a group of about nine macrochaetae on the anterolateral corners followed by a field of pectinate macrochaetae along the external margin about three macrochaetae wide; inner margin with four lightly pectinate macrochaetae and several smooth and pectinate setae of varying thickness distally over the articulation; distal end with distinct cleft, with a row of small setae insertions along the mediad margin. Trochanter with a few strong smooth setae and a thin pectinate macrochaeta. Femur posteriorly with several slender pectinate macrochaetae in addition to many robust smooth setae along the margin to the posterior bulge then a row of about 13 setae along the margin to the articulation; anterior edge without strong macrochaetae along the margin and at least two pectinate macrochaetae over the articulation. Tibia of PI with three stout carrot-shaped pectinate macrochaetae along the posterior margin as well as several longer thinner delicately pectinate or smooth setae and a row of shorter stout setae near the distal margin; anterior margin with one pectinate macrochaeta as well some subdistal setae over the articulation, dorsal surface with a subdistal row of setae; apex of tibia with the usual apical spur which is covered in numerous setae. Tarsi with four articles, the basal article of PI about half the total length of the tarsus, its join with the next article not particularly oblique, whereas the distal margin of the second article is quite oblique, the surface of all tarsal articles with very numerous simple setae, those ventrally near the apex distinctly stronger than the others. Setae of tibia and tarsi quite long and strong as well as numerous. Pretarsus with two long curved lateral claws and a shorter curved medial empodial claw. PII (Fig. 92) and PIII (Fig. 93) similar to PI except the macrochaetae laterally on the coxae are reduced in the anterior half; the tibia of PIII appears to have more pectinate carrot-shaped macrochaetae than the other legs, tibia of PIII with a long trichobothria-like seta about ⅓ the distance along the outer margin adjacent to a pectinate macrochaeta; legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer being about 60% of the total length of the tarsus of PIII.

Abdomen: Urotergite I with 1+1 lateral combs of 5–6 macrochaetae, urotergites II–VII (Fig. 94) with 3+3 combs of 0–11 macrochaetae as in Table 6, urotergite VIII with 2+2 combs (lacking the sublateral), urotergite IX glabrous; the lateral and submedial combs with a cilium at each end and the sublateral with a cilium only at the mediad end; all combs with several small setae and setulae between the comb and the margin. — Urotergite X (Fig. 95) of female narrow triangular (42–52°) but with the apex sometimes slightly withdrawn from the apex of a triangle, slightly wider at base than long (L/W 0.74–0.89) with many setae along entire margin and 5–6 combs on each side, the combs composed of 1–5 macrochaetae usually with a cilium at the mediad end as well as a few setulae posterior to each comb. Urotergite X in male less acute (57°) than in female.

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 7–14 pectinate macrochaetae (Fig. 96) each with a smaller number of setulae between the comb and the margin as well as a cilium at the lateral end of every comb. The distance between the lateral combs 3.8–13.0 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Figure 97. Two pairs of styli, those on IX about one third longer than those on VIII with some robust setae apically. Coxites VIII with long combs of 11–13 macrochaetae and a smaller number of thin setae and setulae between the comb and the margin, the coxites with rounded inner corners, the straight section being about ⅓–⅔ the width of the distal margin. Coxites IX with long rounded internal process about 4.2–5.6 times longer than wide at its base (longer in larger specimens) and 7.5–14.0 times longer than the short pointed external process, the inner processes surpassing the apex of styli IX including macrochaetae; outer process with several setae externally, inner process with strong smooth macrochaetae along the margins, being very dense on the outer margin where many large scales also exist. — Ovipositor of primary type with rows of fine setae subapically on each article, quite long 1.5–1.9 HW, reaching beyond the apex of the long internal processes of coxites IX, both pairs of gonapophyses consisting of long basal division followed by smaller divisions that do not differ greatly in their length along the ovipositor, 24–27 divisions in total.

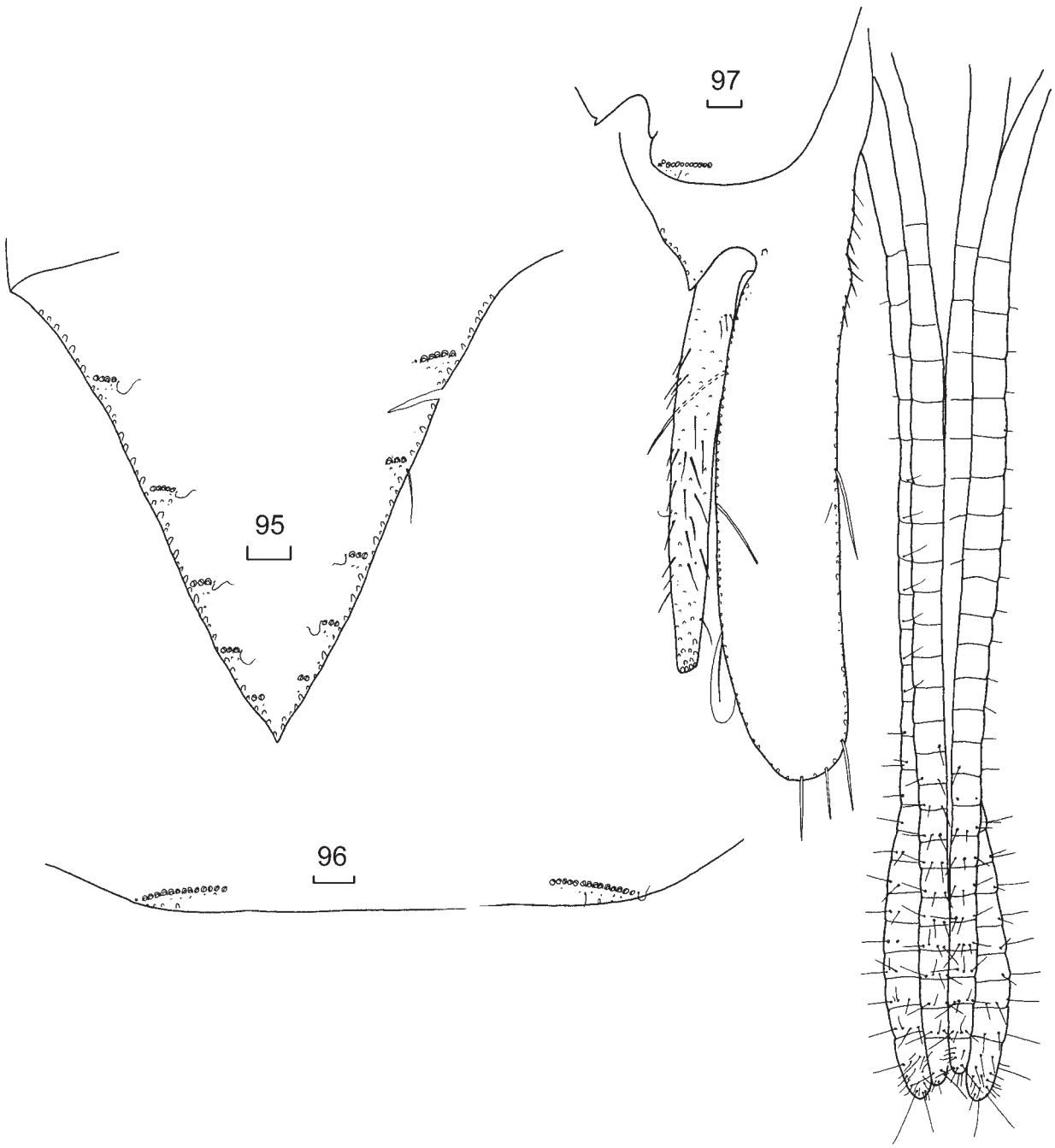
Cerci (Figs 99–100) first division almost glabrous with just a couple of minute setae near the lateral margin; following division with two rings of setae and trichobothria, the following division with five rings the basal, middle and distal with setae and trichobothria, the second and fourth with small trichobothria and scales; following division with only two rings, the basal of scales setae and trichobothria, pectinate macrochaetae and cilia appearing in the most distal ring; the fifth division with three rings, the basal two of scales and trichobothria; the next two divisions with four rings,



Figures 92–94. *Acrotelsella marginata* sp. nov. holotype ♀ *(92)* mesothoracic sternum and PII; *(93)* metathoracic sternum and PIII; *(94)* urotergite V, right side combs. Scale bars = 0.1 mm.

the basal and third of scales and trichobothria; following divisions with increasing number of rings. — Median dorsal appendage (Fig. 99) with similar arrangement of increasing length as well as number and structure of divisions. Most distal surviving division with 13 annuli, the sixth and seventh predominantly of trichobothria and cilia. Epiproct and paraprocts very darkly sclerotized.

Urosternite VIII in ♂ entire with 1+1 combs of 11–13 macrochaetae as well as some thin marginal setae and setulae, posterior margin between the styli slightly concave. Coxites IX in ♂ separated (Fig. 100) each side with a macrochaeta mediad to the base of the stylus. The internal process very acute apically about 3.7–4.0 times longer than the external process and 1.6–1.7 times as long as broad at its base. External and internal margins of internal process and external margin of outer process with many moderately strong setae and macrochaetae. Outer process small triangular with several stout pectinate setae along the outer margin. Penis typical with numerous glandular setae apically each set on a protuberance. Parameres absent.



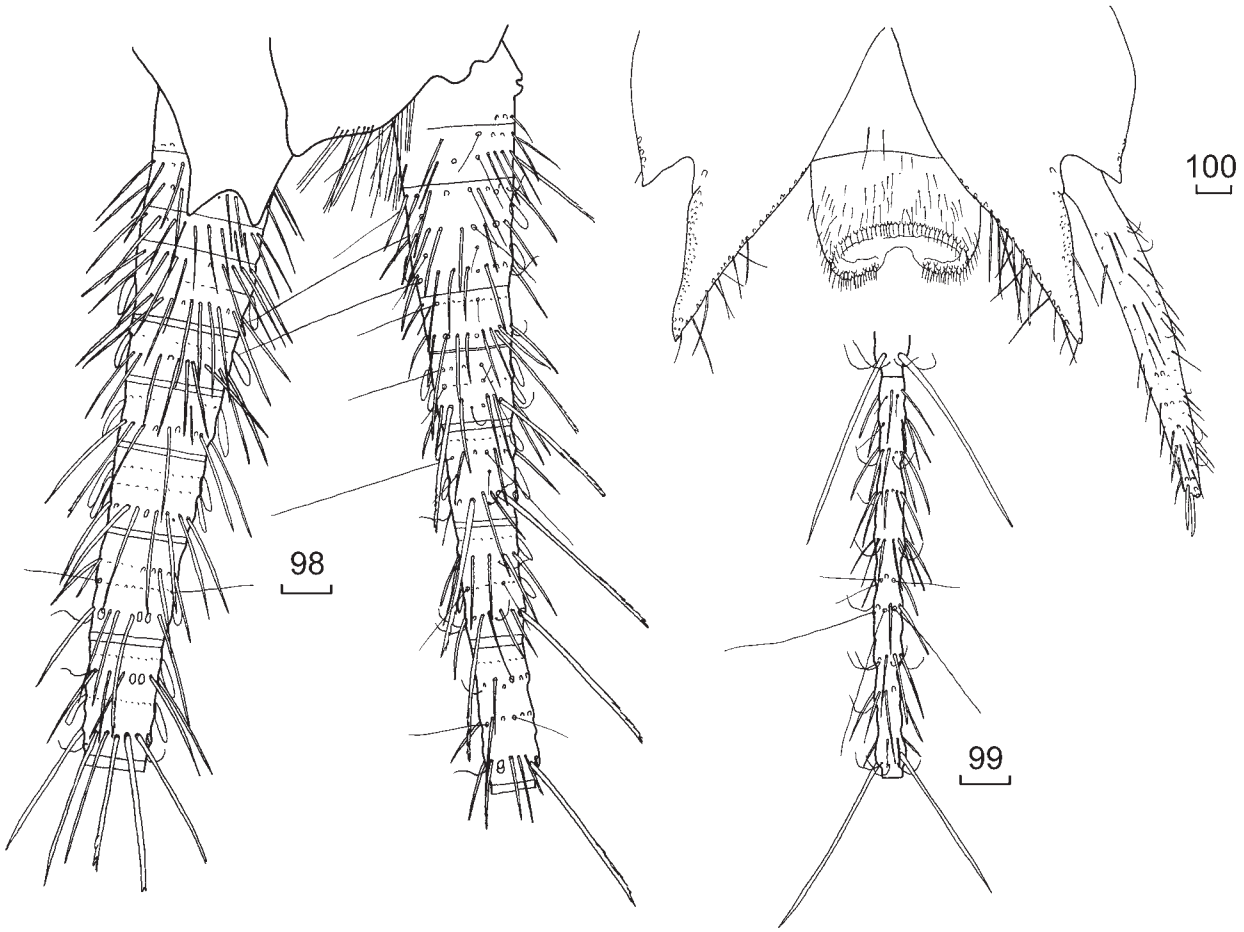
Figures 95–97. *Acrotelsella marginata* sp. nov. holotype ♀ *(95)* urotergite X; *(96)* urosternite VII, posterior margin; *(97)* right coxites VIII and IX with ovipositor. Scale bars = 0.1 mm.

Habitat. This species was collected by spraying the bark of various tree species, from leaf litter and from abandoned termite galleries.

Etymology. The species is named *marginata* from the Latin noun for margin, referring to the lighter margins of the pronotum.

Comment. The material collected at Wenlock River was excluded from the type series because of insufficient molecular data and its geographic distance from the remainder of the specimens, however the morphology conforms to *A. marginata* sp. nov.

Molecular data also suggested that there are two clades very close to *A. marginata* sp. nov. that differ from each other in COI by 1.8-5.1% and within group variation of up to 5.1%. It was more difficult to find morphological differences between these clades. All have light markings on the edge of the nota but in one clade this appears to be limited to the pronotum (Fig. 80), however we only have a photo of a single specimen from this clade, and its scale covering is not in good condition. The other two clades have distinct light margins along all nota as well as urotergite X (Figs 101–102). Specimens belonging to the first clade (which includes the type specimens of *A. marginata* sp. nov.) were mostly collected in leaf litter although twice while spraying the bark



Figures 98–100. *Acrotelsella marginata* sp. nov. holotype ♀ unless otherwise indicated by specimen number *(98)* base of cerci and medial filament; *(99)* most distal surviving division of cercus; *(100)* left coxite IX and penis of male (QMT259429). Scale bars = 0.1 mm.

of a tree, the other two clades were only collected by spraying bark. The first clade also has the urosternal combs closer together than on the other two clades with the gap between the combs relative to the average length of the comb being 3.8–13.0 (with the length of the gap greater for the anterior combs than the posterior combs) compared to 3.9–20.8 with the difference being most obvious on the anterior segments (compare Tables 6, 7 and 8). The combs of the prothoracic sternum of the first clade are sometimes irregular but in the other two clades all macrochaetae were arranged in simple rows. In the first clade, the anterior trichobothrium of the pronotum is almost always located between a macrochaeta on the margin and a macrochaeta mediad of the trichobothrium, whereas in the other two clades there was no incidence observed where a marginal macrochaeta is aligned with this comb and trichobothrium. Within the two latter clades *A*. aff. *marginata* F2 appears to have a smaller gap between the most posterior combs (segments VII and VIII) of 3.9–4.8 while *A*. aff. *marginata* F3 has a gap of >6.0. There is significant overlap in the geographic distribution of all three clades with two specimens from different clades being collected within a few hundred metres of each other but in different habitats. We are therefore uncertain about the significance of these differences and have chosen to describe only one of these clades as a species but record the other two clades as *A*. aff. *marginata* F2 and F3. However, we accept the possibility that these clades do represent distinct species

Figure 101. *Acrotelsella* aff. *marginata* F2 from Punsand Bay campground, Queensland.

Table 7. Number of macrochaetae per bristle comb—*Acrotelsella* aff. *marginata* F2

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	4–5	—	—	—	—
II	4–5	4–5	2–4	—	—
III	4–6	4–5	3–4	4–6	18.2–20.8
IV	5–6	4–5	3–4	7–11	13.0–14.7
V	6–9	4–5	0–4	9–10	10.3–10.4
VI	7–8	4–5	3–4	7–16	8.1–11.3
VII	8	4	4	8	3.9–8.4
VIII	7–8	—	3–4	9–12	4.8 (♂)
IX	—	—	—	—	—

and that more convincing morphological differences may eventually be found, perhaps by more detailed studies of scale morphology or the arrangement of various sensilla. It may even be possible to separate the clades solely on the basis of the scale pattern of living specimens, however more material in good condition would need to be photographed.

Acrotelsella aff. *marginata* F2

Figs 79, 101

Material examined. (two males, two females, two juveniles) 1♂ (HW 1.19) QUEENSLAND: Jardine River NP, Jardine River South campsite 11.1399°S 142.3638°E 19m asl, 22.vii.2013, Graeme Smith, bark spray to soft bark eucalypt, AMS K.541668 (on two slides); 1♂(HW 1.19) 1♀ (HW 1.10) 1 subadult ♀ (HW 0.90) same data as previous, AMS K.378012 (in alcohol); 1♀ (HW 1.30) Punsand Bay campground 10.7215°S 142.4598°E 1m asl, 23.vii.2013, Graeme Smith, bark spray to paperbark tree, AMS K.541669 (on two slides); 1 juvenile (HW 0.83) Bamaga near DC3 wreck 10.9175°S 142.4289°E 66m asl, 25.vii.2013, Graeme Smith, bark spray to eucalypt, AMS K.378013 (in alcohol). All localities shown on the map in Figure. 79.

Acrotelsella aff. *marginata* F3

Figs 79, 102

Material examined. (nine males, five females, four juveniles) 1♀ (HW 1.08) QLD: Bramwell Station 12.1389°S 142.6234°E 69m asl, 21.vii.2013, Graeme Smith, bark spray to square bark eucalypt, AMS K.541670 (on two slides); 3♂♂ (HW 1.00, 0.90, 0.88) 1 subadult ♀ (HW 0.85) 1 juvenile (HW 0.70) same data as previous, AMS K.378014 (in alcohol); 1♀ (HW 1.19) Bramwell Station 12.1387°S 142.6235°E 73m asl, 21.vii.2013, Graeme Smith, bark spray to soft bark eucalypt, AMS K.541671 (on two slides); 3♂♂ (HW 0.83, 0.80. 0.80) 2 juveniles (HW 0.55, 0.50) same data as previous, AMS K.378015 (in alcohol); 1♂ (HW 1.10) Heathlands Resources Reserve, 4km south of Fruit Bat Falls 11.4889°S 142.4328°E 92m asl, 25.vii.2013, Graeme Smith, bark spray to ironbark, AMS K.541672 (on two slides); 1♂ (HW 1.08) 1♀ (HW 1.18) same data as previous, K.378029 (in alcohol); 1♂ (HW 1.50) Heathlands Resources Reserve, ca 1km along Captain Billy Rd 11.6801°S 142.7121°E 111m asl, 26.vii.2013, Graeme Smith, under bark in rainforest/ vine forest, AMS K.541673 (on two slides); 1♀ (HW 1.28) QLD: Heathlands Resources Reserve, along Captain Billy Rd 11.6204°S 142.8441°E 36m asl, 27.vii.2013, Graeme

Figure 102. *Acrotelsella* aff. *marginata* F3 from Captain Billy Road, Queensland.

Table 8. Number of macrochaetae per bristle comb—*Acrotelsella* aff. *marginata* F3.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	4–6	—	—	—	—
II	4–6	3–5	3–4	—	—
III	4–7	4–5	3–4	5–6	14.2–20.3
IV	5–8	4–5	4	5–8	11.4–18.9
V	6–9	3–5	3–5	7–9	8.5–14.1
VI	6–10	3–5	2–5	7–11	8.1–12.8
VII	6–9	3–5	3–5	7–11	6.1–11.0
VIII	6–9	—	2–4	6–11	6.5–6.7 (♂)
IX	—	—	—	—	—

Smith, bark spray to eucalypt with long soft bark, AMS K.541675 (on two slides) [NB. two mites, of the Hyporder Raphignathina, removed from between nota and placed into a separate tube]; 1♀ (HW 1.15) same data as previous, AMS K.378016 (in alcohol). All localities shown on the map in Figure. 79.

Acrotelsella arboricola sp. nov.

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Figs 103–127

Holotype ♀ (HW 1.35) QUEENSLAND: Undara, rocks above camp 18.2049°S 144.5706°E 789m asl, 5.viii.2013, Graeme Smith & Louise Smith, pyrethrum bark spray to square pattern bark eucalypt or bloodwood, QM T259424 (on two slides). **Paratypes** (one male, three females, five juveniles) 1♂ (HW 1.30), same data as holotype, QM T259431 (on two slides); 2♀♀ (HW 1.09, 104) same data as holotype, AMS K.377989 (in alcohol); 1♀ (HW 1.45) Undara, rocks above camp 18.2049°S 144.5706°E 790m asl, 5.viii.2013, Graeme Smith & Louise Smith, pyrethrum spray to dead barkless tree, AMS K.541678 (on two slides); 5 juveniles (HW 0.80, 0.45, 0.45, 0.43, 0.43) same data as previous, AMS K.378026 (in alcohol). Localities shown on the map in Figure. 103.

Diagnosis. This species can be distinguished from other described *Acrotelsella* with a simple ovipositor and trapezoidal thoracic sterna by a combination of characters including the presence of five papillae on the labial palp (versus three or four) combined with the distinct annulations on the flagellum and terminal filaments. It also has fewer combs on each side of the prothoracic sternum (4–5 versus 5–8) and the presence of some irregularly aligned (not all simply linear) combs on the thoracic sterna. It also differs from the nearest species (*A. marginata* sp. nov.) by the smaller number of thick carrot-shaped macrochaetae on the tibia of PI (one versus three) with these macrochaetae being present but much thinner. When live this species lacks the lighter margins seen in *Acrotelsella marginata* sp. nov.

Description

Appearance: Medium size silverfish with narrow body, thorax not much wider than the abdomen which only tapers slightly posteriorly. Scale pattern in alcohol mottled brown, when live mottled dark grey or black with lighter areas around the posterior combs of the nota, without lighter bands along sides of nota (Fig. 104).

Body length: H+B up to 9.8 mm, HW 1.5 mm; thorax: length 3.0 mm or 0.28–0.33 H+B; width 2.4 mm with the mesonotum being slightly wider than the pronotum and metanotum, the metanotum being slightly shorter than the pro- and mesonota. Antennae incomplete, maximum preserved length 8.3 mm or >0.68 H+B; terminal filaments all broken, maximum length of terminal filaments 9.0 mm or about H+B length.

Pigmentation: Light to dark brown. Flagellum of antennae with distinct annulations, the lighter areas restricted to the distal two or three annuli of each interval; pedicel with some patches of strong dark pigment most prominent on the outer dorsal face, scape usually without obvious pigment. Frons with pigment around the eyes and among the macrochaetae anterior to the eyes, clypeus and labrum, mandibles with pigment among bushes of macrochaetae, last three articles of maxillary palp with medium pigment in the proximal half to two thirds, slightly lighter in third article; labial palp with rich brown pigment along the outer margins proximally, penultimate article with brown pigment along the entire outer margin. Nota and thoracic sterna without obvious pigment. Coxae of legs with only slight pigment in the anterior outer corners. Trochanter with a distinct patch on the distal posterior margin. Femora with very dark almost black pigment on most of the posterior margin predominantly in the area distad of the bulge and also distally on the dorsal margin. Tibia with dark patches on dorsal face, especially distally but also proximally. First tarsal article with pigment, remaining articles without pigment. Abdominal segments without obvious pigment except for moderate dark pigment on coxites IX and its inner processes. Urotergite X darker laterally at base only. Ovipositor with some pigment overall. Cerci and median filament generally with distinct annulations with the lighter region restricted to the last annulus of each division. Abdominal styli with moderate pigment evenly distributed over whole length.

Macrochaetae: Variable, pectinate or smooth brown to hyaline, the pectinations are quite strong distally but can be very subtle in other parts of the shaft (Figs 105–106).

Scales: Variable in shape, with numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 107), those dorsal are brown in alcohol, those ventral hyaline. Scales found on top of head and clypeus, on scape, on second and third articles of maxillary palp, on mentum of labium, all nota, all thoracic sterna, legs (except for trochanter and apical

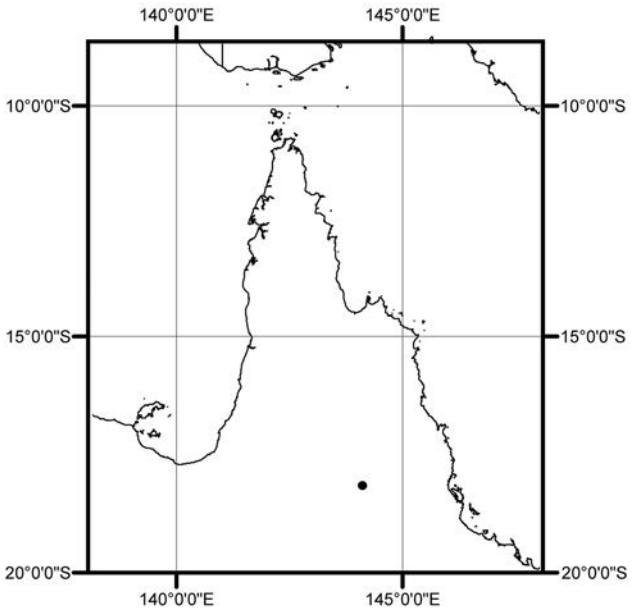


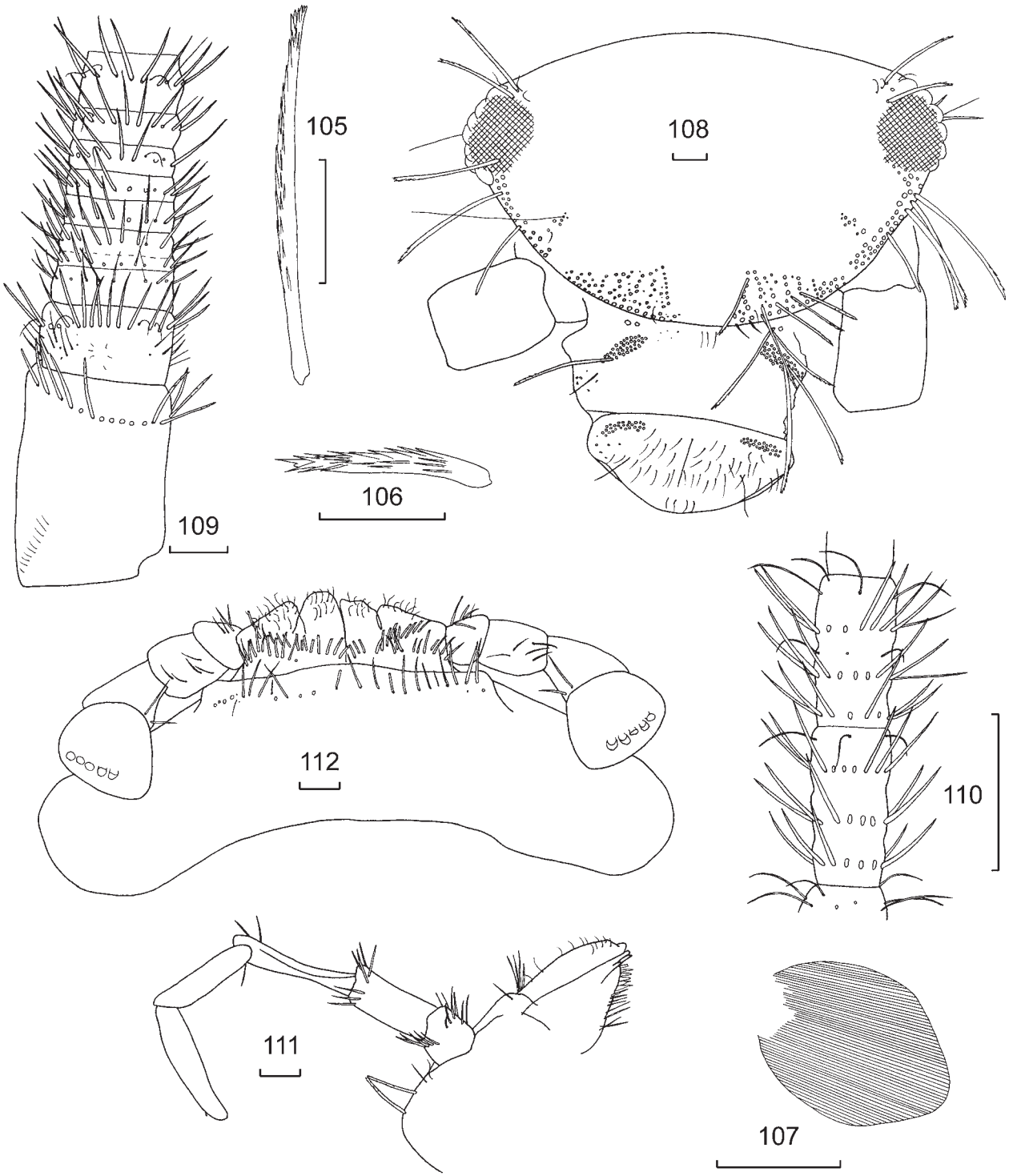
Figure 103. Known distribution of *Acrotelsella arboricola* sp. nov.

Figure 104. *Acrotelsella arboricola* from Undara, Queensland.

three articles of tarsi), all urotergites and urosternites, styli and terminal filaments.

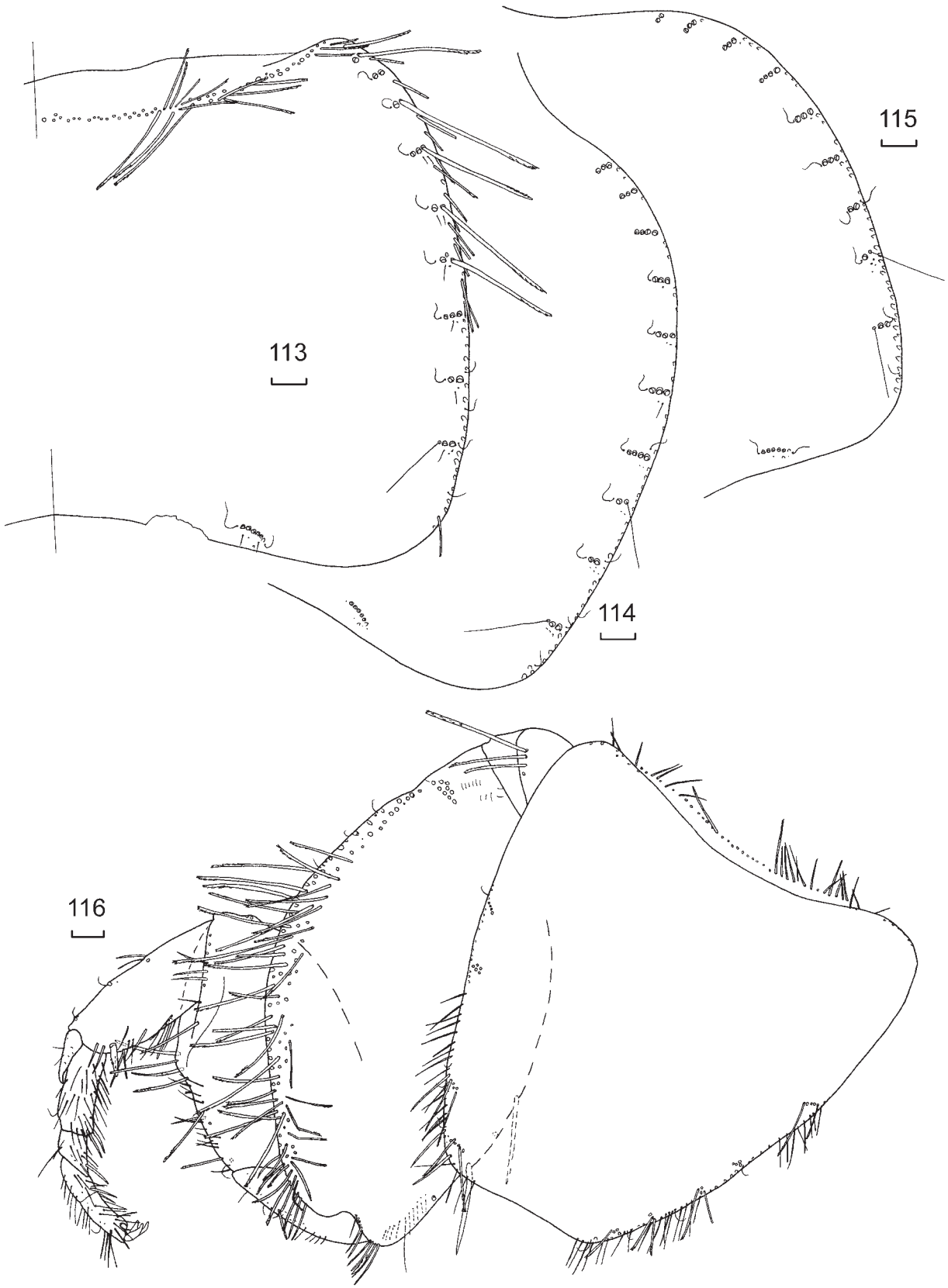
Head: (Fig. 108) wider than long, with 1+1 open bushes of macrochaetae aligned in several subparallel rows on the antero-lateral corners. Eyes dark brown in alcohol preserved material. The row of macrochaetae extends along the lateral margin with a small gap above the antennal bases behind which is another row of macrochaetae two or three macrochaetae wide which extends to and in front of the eyes; the peri-antennal group is strong with an isolated macrochaeta between the group and the marginal rows. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as 2+2 macrochaetae between these bushes and the frons plus a few setae laterally. Labrum also with 1+1 bushes of pectinate macrochaetae as well as many small simple setae, some longer than others. — Antennae fairly long, scape (Fig. 109) quite long with scales over surface and a preapical ring of numerous strong pectinate setae; pedicel with preapical ring of strong simple setae and cilia as well as smaller setae on the dorsal face as well as some small scattered setulae over face forming a circle; basal nine annuli/intervals of flagellum short, gradually increasing in length distally, each with a ring of setae, cilia and trichobothria; tenth interval with two annuli, the trichobothria restricted to the distal annulus; twelfth interval with three annuli, fourteenth with four annuli. In the most distal surviving intervals (about ¾ length) there are two very similar chains to each interval with three annuli each with rings of simple setae and cilia as illustrated in Figure 110, with type B basiconic sensilla present but not abundant. — Mandibles typical for *Acrotelsella* with prominent molar and large incisor areas; a group of about nine strong apically bifurcated but simple setae distally adjacent to the pectinate molar area and a bush of about 90 pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 111) with two delicately pectinate macrochaetae, a seta and a cilium externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by six lamellate processes and a row of eight smooth apically bifurcate setae, galea a little longer than the lacinia with several small setulae or cilia over the surface and 4–5 larger setae basally; maxillary palp of moderate to short length, apical article 5.0–6.0 times longer than wide and 1.1–1.2 times as long as the penultimate article which is a little shorter than the third and longest article, the ultimate article with probably with a basiconic sensillum (type B) however it appeared differently on other specimens and could even be a circular sensillum; last two articles of palp with fine setae only, second and third article with scales and thin setae, some of which are a little stronger near the distal end of the article, first article with an incomplete subapical ring of slightly thicker setae. — Labium (Fig. 112) short and broad, postmentum with transverse row of strong mostly simple setae, prementum with transverse and oblique rows of short strong simple or apically truncate setae, apically with curved setulae; penultimate article of labial palp with two strong setae medially; apical article subrectangular slightly expanded medially, about as long as wide, only a little eccentric in shape (L/W 0.85–0.91) with row of five papillae of compact type and a basiconic sensillum type B near the outer margin at the level of the papillae, surface covered with numerous fine setae.

Thorax: Pronotum (Fig. 113) with setal collar about one to two macrochaetae wide towards the mid region but only a single macrochaeta wide towards the margins; lateral margins with many reasonably strong pectinate setae along the margin, with 8–9 combs of 1–3 strongly pectinate macrochaetae along each margin. Two open trichobothrial areas, the anterior trichobothrial area about 0.41 of the distance along the margin associated with comb N-3, the trichobothrium being placed between the single macrochaeta of the comb and the margin (on specimen K.541678 there is a clear developmental anomaly on one side with two

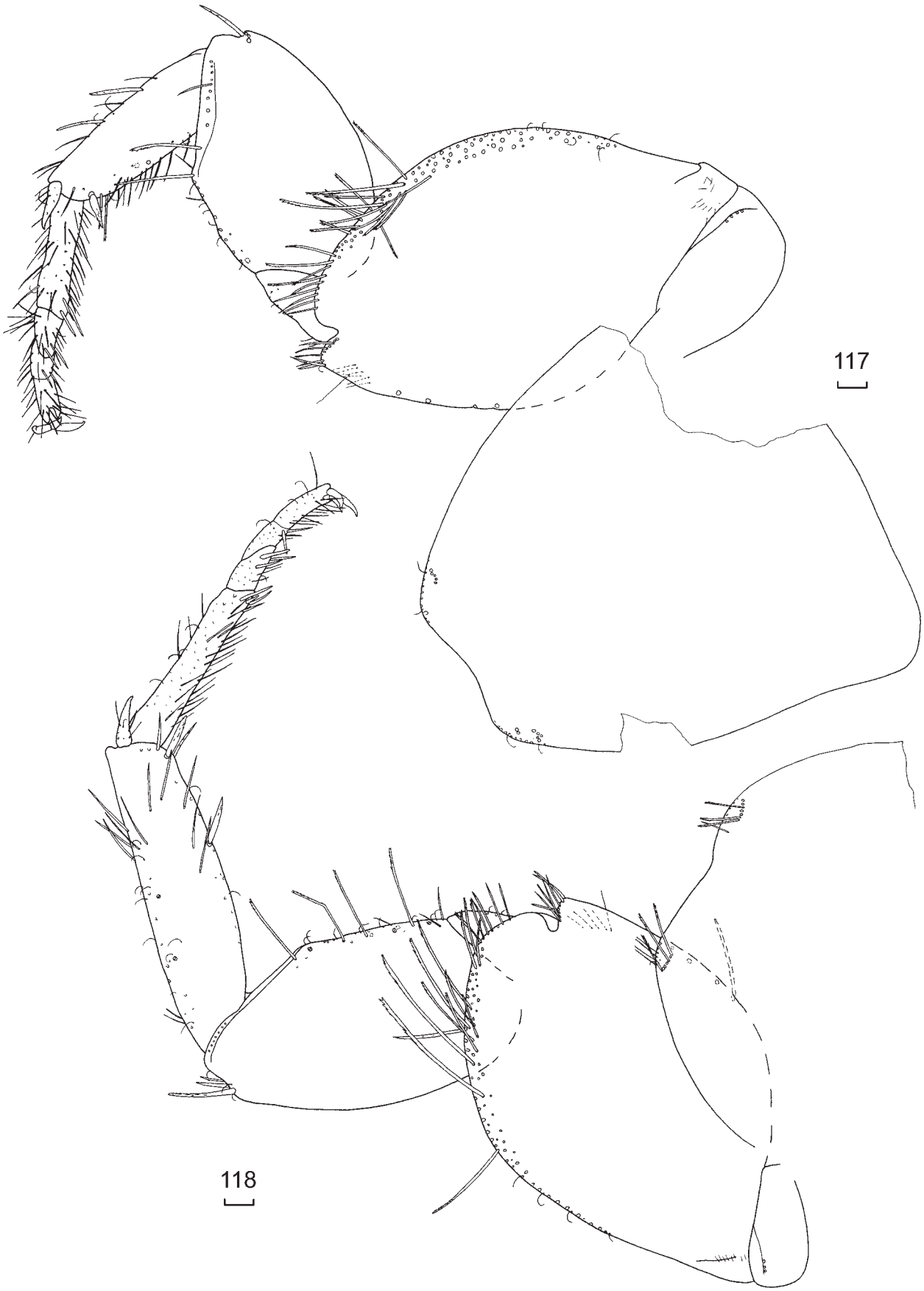


Figures 105–112. *Acrotelsella arboricola* sp. nov. holotype ♀ *(105)* long pectinate macrochaeta of frons; *(106)* highly pectinate, carrot-shaped macrochaeta of tibia of PII; *(107)* darker dorsal scale of metanotum; *(108)* head (cross-hatched area obscured by eye pigment); *(109)* antenna, scape, pedicel and basal intervals of flagellum; *(110)* idem, most distal surviving complete interval; *(111)* maxilla; *(112)* labium. Scale bars = 0.1 mm.

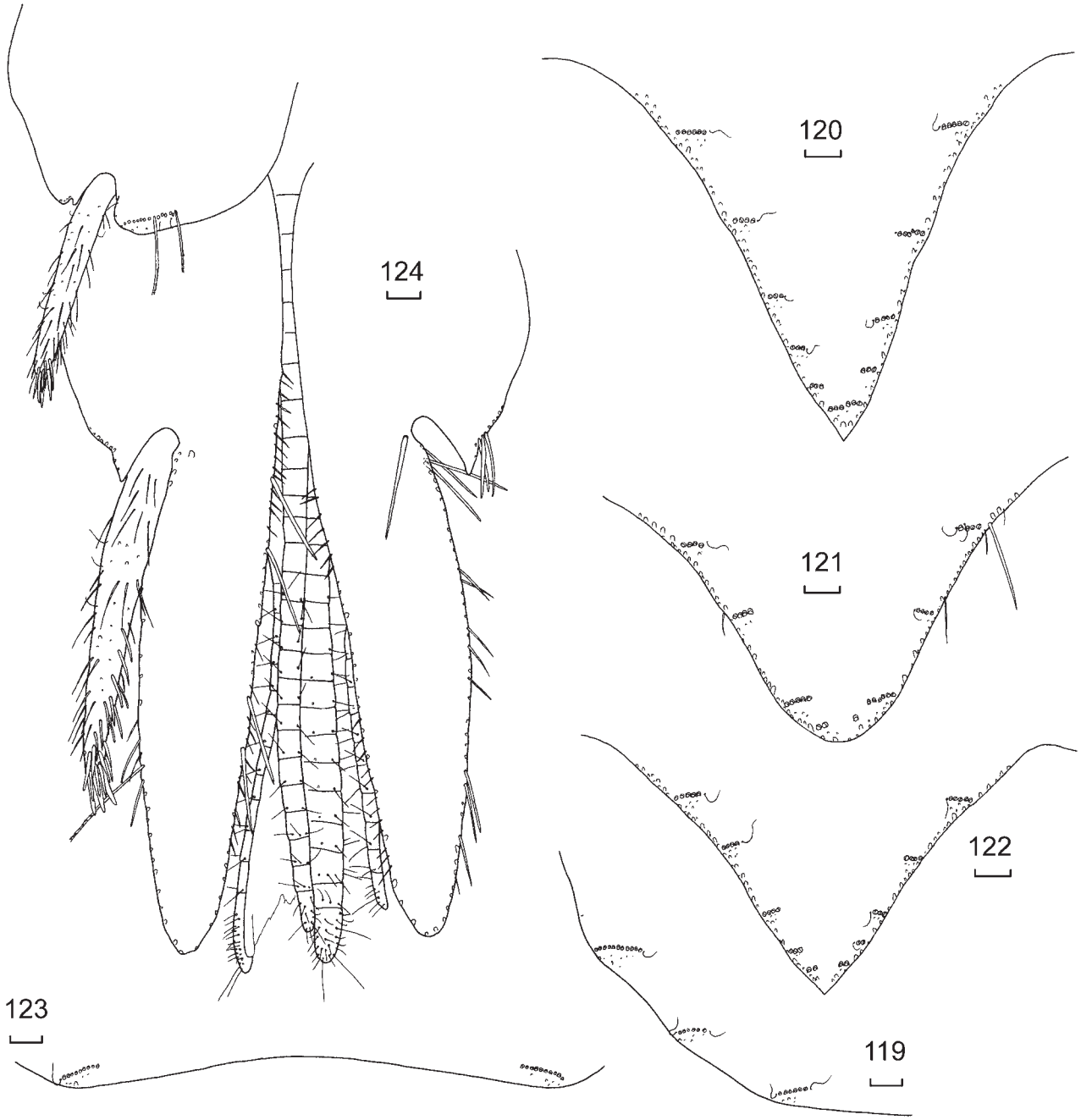
combs missing between anterior and posterior trichobothrial areas resulting in a more posterior position on this side and the appearance of being associated with N-1); posterior trichobothrial area is located about 0.76–0.77 of the distance along the margin (0.81 in the anomalous specimen) and is associated with the last comb which is usually composed of two macrochaetae (sometimes one) with the trichobothrium at the mediad end and a cilium at the laterad end, most combs associated with 1–3 setulae posterior to the comb. Posterior margin of all nota with 1+1 combs of 5–7 insertion points, each associated with a few small setae between the comb and the margin and a cilium at each end; the outermost insertion



Figures 113–116. *Acrotelsella arboricola* sp. nov. holotype ♀ *(113)* pronotum; *(114)* mesonotum; *(115)* metanotum; *(116)* presternum, prothoracic sternum and PI. Scale bars = 0.1 mm.



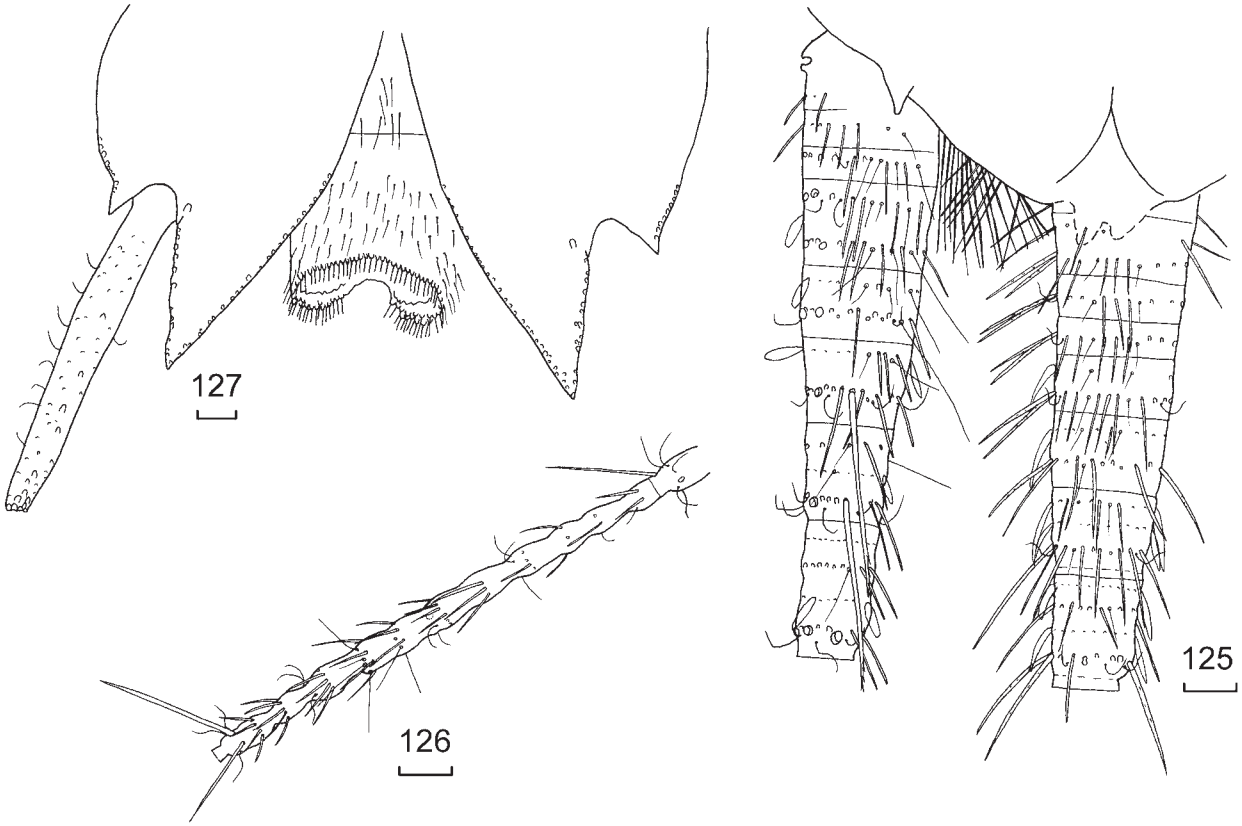
Figures 117–118. *Acrotelsella arboricola* sp. nov. holotype ♀ *(117)* mesothoracic sternum and PII; *(118)* metathoracic sternum and PIII. Scale bars = 0.1 mm.



Figures 119–124. *Acrotelsella arboricola sp. nov.* holotype ♀ unless otherwise indicated by specimen number; *(119)* combs of left side of urotergite V; *(120)* urotergite X; *(121)* aberrant urotergite X (K.541678); *(122)* urotergite X of ♂ (T259431); *(123)* urosternite V; *(124)* coxites VIII and IX with ovipositor. Scale bars = 0.1 mm.

on the comb is occupied by a long thin trichobothrium-like seta. The distance between the lateral combs of the pronotum 44% the total width of the pronotum. — Mesonotum (Fig. 114) with lateral chaetotaxy similar to pronotum but with ten combs each of 1–3 macrochaetae, the anterior trichobothrial area located 0.64–0.68 along the lateral margin associated with comb N-2 composed of a single macrochaeta with the trichobothrium located between the macrochaeta and the margin, with a few setulae posterior to the comb and a cilium at the mediad end. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.77–0.87) the trichobothrium located mediad to the comb of a single macrochaeta and with a few setulae posterior to the comb. — Metanotum (Fig. 115) similar to mesonotum with 8–9 combs of 1–4 macrochaetae, the anterior trichobothrial area associated with comb N-1 of one macrochaeta 0.77–0.80 along the margin, the posterior trichobothrial area associated with the most posterior comb (0.86–0.90 along margin).

Presternum with transverse row of mostly pectinate setae (Fig. 116). — Prothoracic sternum (Fig. 116) large and trapezoidal 0.93–0.96 times as long as wide at its base, antero-lateral corners with several setae on the margin, posterior ⅔ of lateral margins with fringe of setae and some cilia as well as 4–5 combs each composed of 1–6



Figures 125–127. *Acrotelsella arboricola sp. nov.* holotype ♀ unless otherwise indicated by specimen number *(125)* base of cerci and medial filament; *(126)* median dorsal filament, most distal surviving division (T259431); *(127)* coxites IX and penis of ♂ (T259431). Scale bars = 0.1 mm.

Table 9. Number of macrochaetae per bristle comb—*Acrotelsella arboricola* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	6–7	—	—	—	—
II	5–7	5–6	6–7	—	—
III	6–9	5–6	5–6	7–8	12.0–17.4
IV	9–10	5–7	5–7	8–11	8.7–11.9
V	10–11	5–6	4–6	9–10	7.5–10.6
VI	10–11	5–6	5–6	9–12	7.0–9.8
VII	9–10	5–6	6–7	9–13	4.7–7.6
VIII	9–11	—	6–7	9–14	4.5
IX	—	—	—	—	—

pectinate macrochaetae arranged in single straight or irregular combs, also with 1+1 larger submarginal setae distally. — Mesosternum (Fig. 117) trapezoidal, 1.1–1.2 times as long as the prosternum but similar in shape, about a long as wide at its base (L/W 0.89–0.92) with two setae in the anterolateral corners and long thin simple marginal setae and cilia at the posterior corners which do not extend much beyond the combs, 1+2 or 2+2 combs distally of 2–5 macrochaetae with additional slightly submarginal 1+1 setae nearer to the posterior end; all combs associated with 0–1 setulae. — Metasternum (Fig. 118) trapezoidal, shorter and wider than the mesosternum (L/W 0.71–0.75) with a few fine setae in the anterolateral corners, with marginal setae and cilia only along margins adjacent to the combs; with 1+1 or 1+2 subdistal combs of 2–7 pectinate macrochaetae.

Legs of average dimensions, tibia L/W ratio of PI 2.4–2.9, PII 3.2–3.6, PIII 3.5–4.7; tarsi L/W ratio PI 5.5–7.0, PII 7.6–8.2, PIII 9.6–10.5. PI (Fig. 116) with a row of four pectinate macrochaetae laterally in pigmented region on the precoxa. Coxa with scales and a group of about nine macrochaetae on the anterolateral corners followed by a field of pectinate macrochaetae along the external margin about three macrochaetae wide; inner margin with a four lightly pectinate macrochaetae and several smooth and pectinate setae of varying thickness distally over the articulation; distal end with distinct cleft, with a row of small setae

insertions along the mediad margin. Trochanter with a few strong smooth setae and a thin pectinate macrochaeta. Femur posteriorly with several slender pectinate macrochaetae, in addition to many smooth setae along the margin to the posterior bulge then a row of about ten setae in a well delineated darkly pigmented region along the margin to the articulation; anterior edge without strong macrochaeta along most of the margin except for two pectinate macrochaetae inserted well before the articulation. Tibia of PI with only one stout carrot-shaped pectinate macrochaetae near the end of the posterior margin and two more slender tapered pectinate macrochaetae along the posterior margin, as well as several longer thinner setae; anterior margin with two macrochaetae insertions as well some subdistal setae over the articulation; apex of tibia with the usual apical spur which is covered in several setae. Tarsi with four articles, the basal article of PI less than half the total length of the tarsus, its join with the next article not particularly oblique, whereas the distal margin of the second article is quite oblique, the surface of all tarsal articles with very numerous simple setae, those ventrally near the apex distinctly stronger than the others. Setae of tibia and tarsi quite long and strong as well as numerous. Pretarsus with two long curved lateral claws and a shorter curved medial empodial claw. PII (Fig. 117) and PIII (Fig. 118) similar to PI except the macrochaetae laterally on the coxae are absent from the anterior quarter; tibia of PII and PIII have more pectinate carrot-shaped macrochaetae, tibia of PIII probably with a long trichobothria-like seta about ⅓ the distance along the outer margin adjacent to a pectinate macrochaeta (two insertions seen but setae lost); legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer, being about 60% of the total length of the tarsus of PIII.

Abdomen: Urotergite I with 1+1 lateral combs of 6–7 macrochaetae, urotergites II–VII (Fig. 119) with 3+3 combs of 4–11 macrochaetae as in Table 9, urotergite VIII with 2+2 combs (lacking the sublateral), urotergite IX glabrous; all combs with a cilium at each end and with a few small setae and setulae between the comb and the margin. — Urotergite X (Fig. 120) of female narrow triangular (46° in female) but with the apex sometimes slightly withdrawn from the apex of a triangle (but on the anomalous K.541678 the apex is distinctly round as in Figure 121), slightly wider at base than long (L/W 0.78) with many setae along entire margin and 4–5 combs on each side, the combs composed of 1–6 macrochaetae per comb usually with a cilium at the mediad end of each comb, as well as a few setulae posterior to each comb. Urotergite X in male (Fig. 122) distinctly less acute (65°) than in female (L/W at base 0.57).

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 7–14 pectinate macrochaetae (Fig. 123) each with a smaller number of setulae between the comb and the margin as well as a cilium at the lateral end of every comb. The distance between the lateral combs 4.5–15.1 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Figure 124. Two pairs of styli, those on IX about one third longer than those on VIII, with some robust setae apically. Coxites VIII with long combs of 9–14 macrochaetae and a smaller number of thin setae and setulae between the comb and the margin, the coxites with rounded inner corners, the straight section being about ½–⅔ the width of the distal margin. Coxites IX with long rounded internal process about 4.5–5.2 times longer than wide at its base and 8.3–14.3 times longer than the short pointed external process, the inner processes greatly surpassing the apex of styli IX including macrochaetae; outer process with several setae externally, inner process with strong smooth macrochaetae along the inner margins and pectinate macrochaetae on the outer margin where many large scales also exist. — Ovipositor of primary type with rows of fine setae subapically on each article, quite long 2.0 HW, reaching beyond the apex of the long internal processes of coxites IX, both pairs of gonapophyses consisting of long basal division followed by smaller divisions that do not differ greatly in their length along the ovipositor, 25–29 divisions in total.

Cerci (Fig. 125) first division almost glabrous with just a couple of minute setae near the lateral margin, following two divisions each with a single rings of setae and trichobothria, the following division difficult to discern suture with next division, probably also a single ring of setae, cilia and trichobothria, the division merging with the following division which has two rings, the basal of trichobothria and scales, the distal with setae, cilia, trichobothria and macrochaetae, the following division similar with two rings, the next division with three rings, the basal of setae trichobothria and probably scales, the middle of scales and trichobothria, the distal as previous, the following division with four rings, the basal of scales, the second of setae and trichobothria, the third of scales and the distal as previous. — Median dorsal appendage (Figs 125–126) with similar arrangement of increasing length as well as number and structure of divisions. Most distal surviving divisions difficult to examine due to pigmentation, with about 11 annuli, the seventh and eighth also with several trichobothria and cilia; there appear to be some basiconic sensilla type B and possibly also a circular sensillum but this may be an artefact. Epiproct and paraprocts very darkly sclerotized.

Urosternite VIII in ♂ entire with 1+1 combs of nine macrochaetae as well as some thin marginal setae and setulae, posterior margin between the styli almost straight. Coxites IX in ♂ separated (Fig. 127) each side with a macrochaeta mediad to the base of the stylus. The internal process very acute apically about 3.0–3.3 times longer than the external process and 1.3–1.4 times as long as broad at its base. External and internal margins of internal process and external margin of outer process with many moderately strong setae and macrochaetae. Outer process small triangular with several stout setae along the outer margin. Penis typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Habitat. This species as collected from the bark of both living and dead trees.

Etymology. This species is named *arboricola*, from the Latin word for trees, referring to its habitat of living within and under the bark of trees

Acrotelsella hethicola sp. nov.

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Figs 128–149

Holotype ♂ (HW 1.08) QUEENSLAND: Jardine River NP, track to Jardine River South campsite 11.2167°S 142.3569°E 72m asl, 22.vii.2013, Graeme Smith, Eucalypt leaf litter,

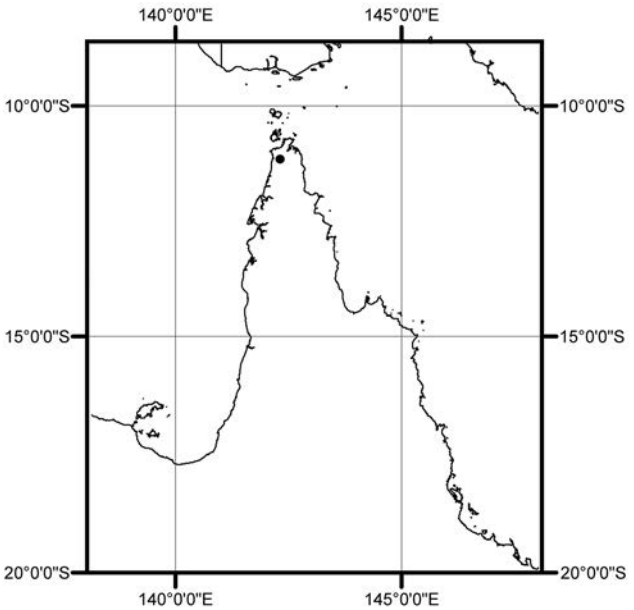


Figure 128. Known distribution of *Acrotelsella hethicola* sp. nov. from one palp. Scale bars = 0.1 mm. All arrows indicate circular sensilla.

Figure 129. *Acrotelsella hethicola* sp. nov. holotype from Jardine River, Queensland.

QMT259417 (on two slides). Locality shown on the map in Figure 128.

Diagnosis. This species, while only known from a single male, is genetically, morphologically and geographically close to *Acrotelsella septentrionalis* sp. nov. but is easily distinguishable from it by the smaller number of papillae on the labial palps (five versus 7–10), by the preponderance of circular sensilla rather than basiconic sensilla on the distal articles of the antennae and the distal article of the labial palp, by the concave posterior margins of all thoracic sterna, and by the rounded internal processes of coxites IX of the males.

Description

Appearance: Small to medium sized silverfish, somewhat stocky in form, thorax wider than the abdomen. Scale pattern when live see Figure 129, antennae evenly brown, terminal filaments annulated; distinct band of dark scales on back of head; upper surface of legs dark. The single specimen known was about to moult so it was often possible to see the sclerites and macrochaetae of the newly forming cuticle beneath the old, which sometimes made it difficult to interpret when drawing the illustrations.

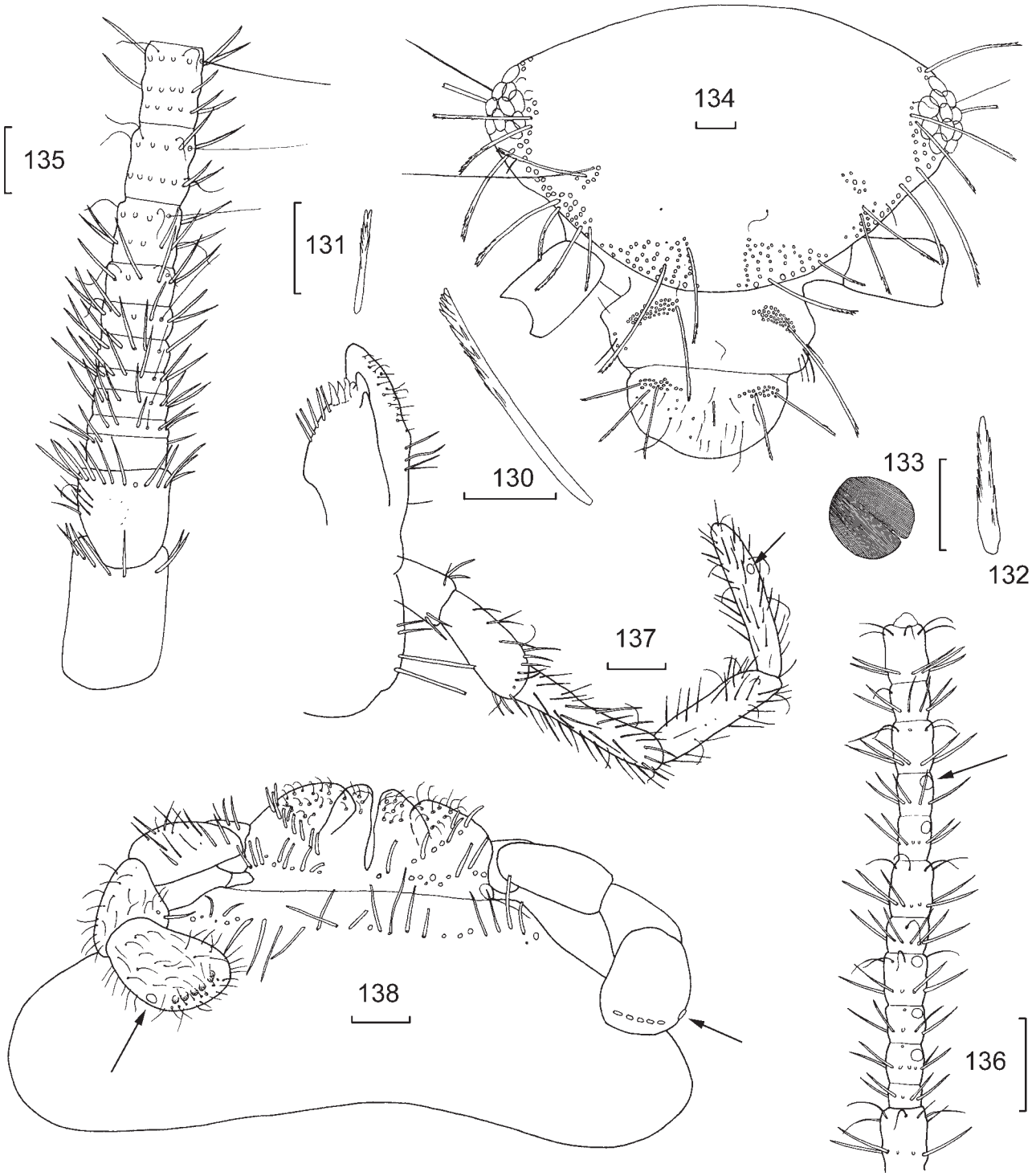
Body length: H+B up to 7.1 mm, HW 1.08 mm; thorax: length 2.4 mm or 0.33 H+B; width 1.88 mm with the mesonotum being slightly wider than the pronotum and not much wider than the metanotum. Antennae incomplete, maximum preserved length 5.5 mm or >0.77 H+B; terminal filaments all broken, maximum length of terminal filaments 2.5 mm or >0.35 H+B.

Pigmentation: Cuticle overall moderately dark when placed into alcohol. The intensity of darkness makes it a little difficult to observe macrochaetae insertions in some places. Flagellum of antennae without banding, moderate brown pigment evenly distributed; pedicel and scape not particularly strongly pigmented. Frons without darker regions, labrum and clypeus without pigment, mandibles and maxillae without pigment among bushes of macrochaetae, maxillary and labial palps with brown pigment, the ultimate and penultimate articles of the maxillary palp pigmented overall but a little darker distally, other articles with some pigment distally. Ultimate article of labial palp with pigment around margins, other articles with very little pigment. Nota and thoracic sterna without obvious pigment. Some pigment on "shoulder" of the coxa of PI but not along the outer margin nor on PII or PIII. Trochanter without distinct pigment. Femora fairly evenly pigmented or sclerotised, tending to darker at the posterior bulge and the anterior distal corners. Tibia of all legs a little darker distally. All tarsal articles without much pigment. Abdominal segments with little pigment but coxites IX have pigment around the insertion of the styli. Cerci and median filament annulated in photo when live but any annulation difficult to see in preserved material. Abdominal styli light basally with a little darker pigment distally.

Macrochaetae: Variable, strongly pectinate (Figs 130–132) elongate, tapered or carrot-shaped and strongly pectinate or more subtly pectinate, curved and tapered dark brown to hyaline.

Scales: Variable, some with numerous sub-parallel ribs that do not surpass the margin of the scale, others with ribs that appear to merge towards the mid-line (Fig. 132) some scales with ribs more widely spaced others closer together. Dorsal scales are brown to hyaline, those on ventral surface brown or hyaline. Scales found on frons and clypeus, on pedicel and scape, on second and third articles of maxillary palp, the submentum, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli, medial filament and cerci. Scales of palps, styli, terminal filaments of variable size, form not well understood due to orientation in slide material.

Head: (Fig. 134) wider than long with 1+1 not very dense bushes of macrochaetae aligned in subparallel rows on the



Figures 130–138. *Acrotelsella hethicola* sp. nov. holotype ♂ *(130)* periocular pectinate macrochaeta; *(131)* macrochaeta of prothoracic sternal comb; *(132)* carrot-shaped macrochaeta of tibia of PI; *(133)* darker scale from nota; *(134)* head; *(135)* antenna, scape, pedicel and basal intervals of flagellum; *(136)* idem, most distal surviving complete interval; *(137)* maxilla; *(138)* labium, chaetotaxy omitted from one palp. Scale bars = 0.1 mm. All arrows indicate circular sensilla.

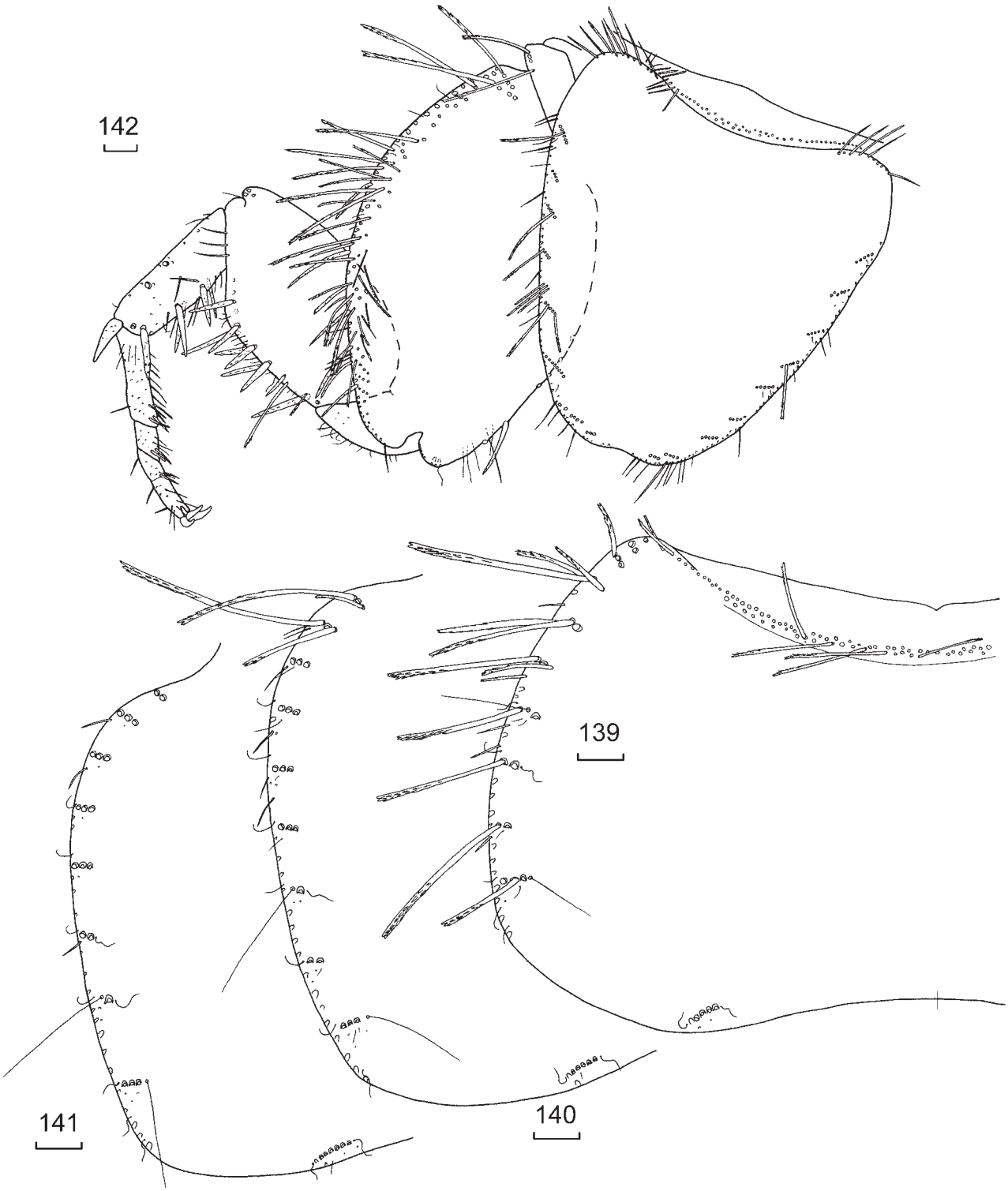
antero-lateral corners, with a distinct gap in chaetotaxy between these two bushes. Eyes dark brown in alcohol preserved material. There is a small gap behind each bush in the row of macrochaetae along the margin which extends inwards a little near a large but isolated peri-antennal group and its long thin trichobothrium-like seta; the marginal row continues back and up over the eyes about one to two macrochaetae wide. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as a few curved setae laterally, with only a single cilium on the face between the bushes. Labrum also with 1+1 bushes but these are less dense, as well as many simple setae and cilia scattered over the face and a single macrochaeta medially between the bushes. — Antennae fairly long, scape (Fig. 135) not long

with scales over much of its surface and a preapical ring of setae; pedicel with sacles and preapical ring of simple setae and cilia and setae scattered over internal face; first annulus/interval of flagellum with an incomplete subapical ring of simple setae; next four annuli each with a single ring of simple setae and a short trichobothrium; intervals six and seven similar but with additional long cilia; articles eight and nine with two rings, the basal only with setae and cilia, the distal similar but with a long trichobothrium; article ten with three rings the basal two of setae only or perhaps also a trichobothrium, the distal as in the previous interval. Most distal surviving intervals (Fig. 136) consisting of two very similar chains, the basal of four annuli, the distal of five; circular sensilla can be seen in the basal three annuli of the basal chain and the basal two or three annuli of the distal chain, most annuli with a sub-basal ring of setae and sometimes a subdistal ring of cilia; basiconic sensilla not observed. — Mandibles typical for *Acrotelsella* with well-developed molar and incisor areas; a group of about ten short apically bifurcated but simple setae distally adjacent to the pectinate molar area and large bushes of pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 137) with two thick minutely apically bifurcated and very subtly pectinate macrochaetae as well as two smaller setae externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by about five or six lamellate processes and a row of 5–6 short simple setae, galea longer than lacinia with about 3–4 strong smooth simple or apically bifurcate setae externally in its basal half and several cilia distally; maxillary palp not very elongate, apical article 5.4 times longer than wide and 1.13 times as long as the penultimate article which is the longest article, the ultimate article with a circular sensillum subapically, last two articles of palp with fine setae only, third article with some slightly stronger setae subapically, second and third articles also with scales, although these can be hard to find on the third article. — Labium (Fig. 138) short and broad, postmentum with transverse row of simple and apically truncate smooth setae, prementum with transverse and oblique rows of strong apically truncate setae, apically with long curved setulae; labial palp short, apical article only slightly not expanded medially, about as long as wide (L/W 1.07) with row of five papillae of compact type arranged in a single curved row, with a single circular sensillum on the outer margin, face covered with numerous fine setae as well as longer fine setae.

Thorax: Pronotum (Fig. 139) with dense setal collar of both longer and shorter pectinate macrochaetae, about three macrochaetae wide, without slight medial gap; lateral margins with strong shorter and longer curved slightly pectinate macrochaetae as well as a few cilia, with 8–9 combs of 1–3 macrochaetae along each margin. Two open trichobothrial areas; the posterior trichobothrial area located about 0.70 of the distance along the margin and is associated with the last comb (N), this comb composed of three macrochaetae with the short trichobothrium at the mediad end and a cilium at the laterad end, the anterior trichobothrial area is forward of the midpoint (0.36) and associated with comb N-3, the comb composed of only a single macrochaeta with the trichobothrium between the macrochaeta and the margin and a cilium laterad of the trichobothrium; all combs associated with a few setulae, never very numerous. Posterior margin of all nota with 1+1 combs of 5–7 macrochaetae insertions associated with a couple of setulae between the comb and the margin and a cilium at each end, the macrochaetae are all lost but the most laterad insertion is almost certainly occupied by a long thin trichobothrium-like macrochaeta based on the shape of the insertion hole; these combs not particularly widely spaced (gap between them 45% of total width of pronotum). — Mesonotum (Fig. 140) with lateral chaetotaxy similar to pronotum although fewer marginal setae and nine combs of 1–3 macrochaetae, the anterior trichobothrial area located 0.52 along the lateral margin, associated with comb N-2 composed of one macrochaeta with the trichobothrium located between the macrochaeta and the margin, with a few setulae posterior to the comb and a cilium between the trichobothrium and the margin. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.79) the trichobothrium located mediad to the comb usually of three macrochaetae and with 1–4 setulae or stronger setae posterior to the comb.— Metanotum (Fig. 141) similar to mesonotum with eight combs of 1–3 macrochaetae, the anterior trichobothrial area associated with comb N-1 of one macrochaeta about 0.67 the distance along the margin, the trichobothrium located between the margin and the macrochaeta, the posterior trichobothrial area associated with the most posterior comb (0.83 along the margin) of three macrochaetae.

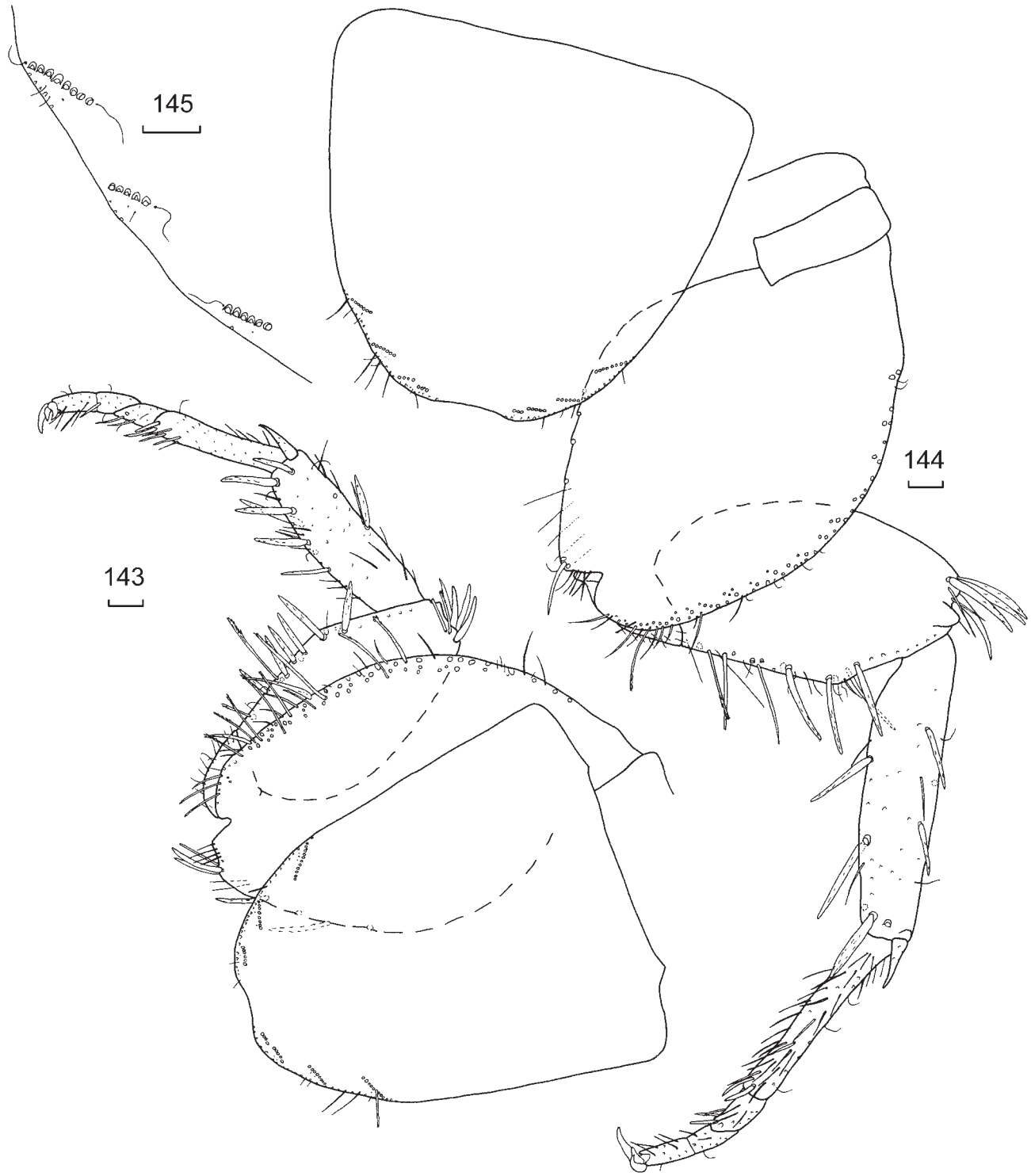
Presternum narrow with transverse row of short pectinate setae (Fig. 142) without scales or cilia between the row of setae and the prothoracic sternum. — Prothoracic sternum (Fig. 142) approaching trapezoidal with concave posterior margin (however the newly developing cuticle of the next stadium is visible beneath the surface and it does not show any concave region between the most posterior combs), a little wider than long (L/W 0.93) antero-lateral corners with about ten finely pectinate tapered marginal setae, posterior ⅘ of lateral margins with fringe of setae as well as 9–10 short combs on each side each composed of 1–8 pectinate macrochaetae. — Mesosternum (Fig. 143) only a little larger than prosternum (1.15 times as long) about as long as wide at its base (L/W 1.07) and of similar shape, anterolateral corners glabrous, posterior third of margins with many long thin setae and 3–4 combs on each side distally, teach composed of 4–11 pectinate macrochaetae in a single line; all combs with a few setulae behind them, larger smooth, tapered macrochaetae sometimes on the margin. — Metasternum (Fig. 144) of similar length to prosternum except wider (L/W 0.87) apically also with small concave margin, with marginal setae and occasional cilia along distal $^1/_4$ of lateral margins and 4+4 combs of 3–11 pectinate macrochaetae although the close proximity of the more posterior combs suggest these may merge in some individuals to give a 3+3 or 3+4 arrangement as seen on the mesosternum.

Legs quite long, difficult to measure in alcohol because of alignment of specimen, tibia L/W ratio of PII 4.1. PI (Fig. 142) with a comb of 4–5 pectinate macrochaetae laterally on the distal margin of the precoxa. Coxa with scales and a group of about 12 macrochaetae on the anterolateral corners usually arranged in two irregular rows, followed by a field of strong pectinate macrochaetae along the external margin about 3–4 macrochaetae wide; inner margin with 5–6 lightly pectinate tapering macrochaetae and several setae of varying thickness distally over the articulation. Trochanter with setae, setulae and cilia. Femur posteriorly with several long carrot-shaped pectinate macrochaetae as well as some



Figures 139–142. *Acrotelsella hethicola* sp. nov. holotype ♂ *(139)* pronotum, left half; *(140)* mesonotum, left side; *(141)* metanotum, left side; *(142)* prothoracic presternum, sternum and PI. Scale bars = 0.1 mm.

thinner pectinate macrochaetae, some cilia and small setae, dorsal margin with at least three strong curved pectinate macrochaetae over the articulation. Tibia of PI with about eight stout, pectinate mostly carrot-shaped macrochaetae along the ventral and distal margins as well as several smooth setae, dorsal margin with two short curved mildly pectinate macrochaetae spaced along the margin and a few smooth setae and long scales subdistally, with usual tibial spur bearing a few setae. Tarsi with four articles, the basal article of PI about half the total length of the tarsus, its join with the next article not particularly oblique, the surface of all tarsal articles with numerous simple setae, those ventral near the distal end of the basal three articles more robust and with more rounded tips, especially on the two basal



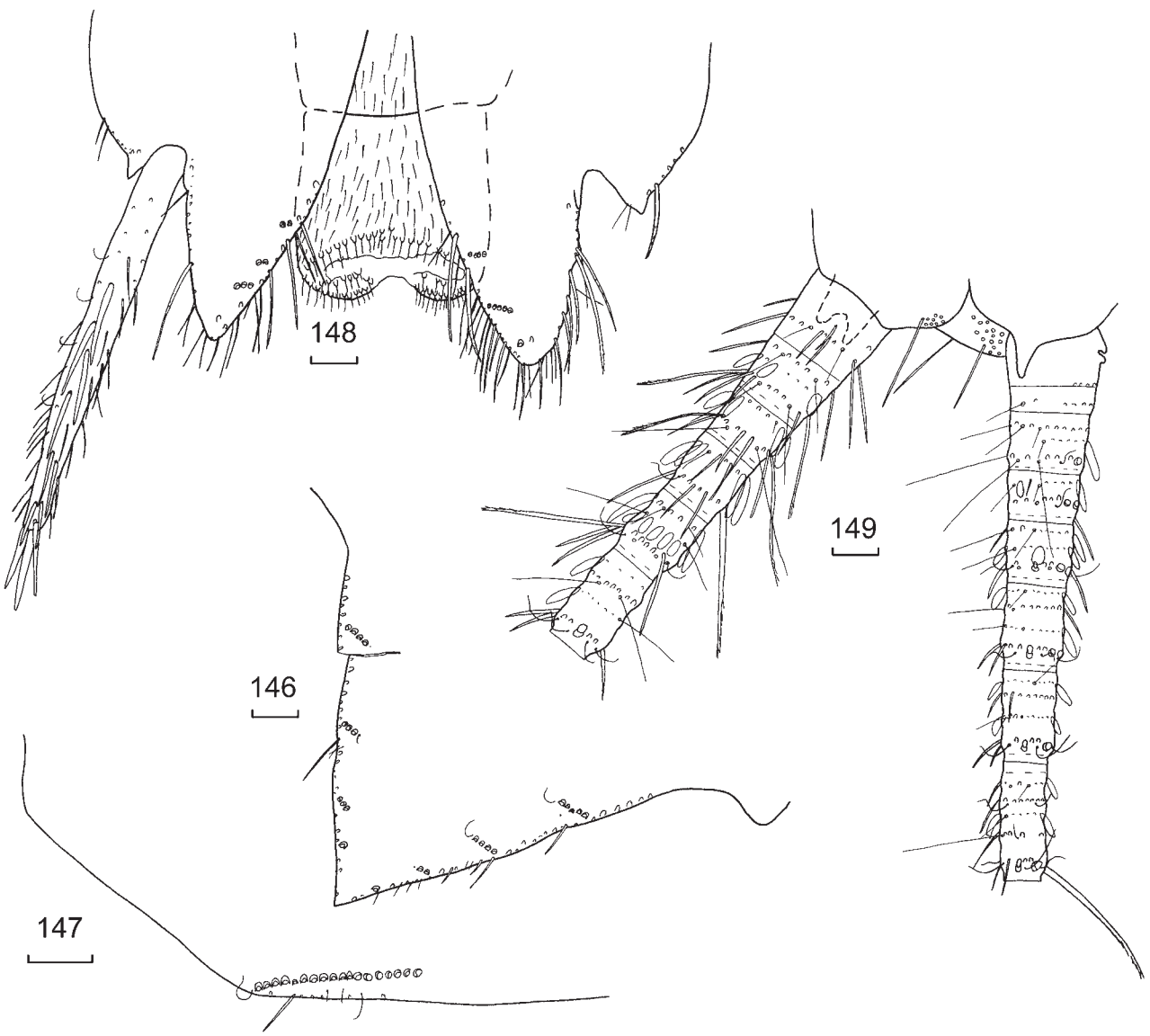
Figures 143–145. *Acrotelsella hethicola* sp. nov. holotype ♂ *(143)* mesothoracic sternum and PII; *(144)* metathoracic sternum and PIII; *(145)* combs of left side of urotergite VI. Scale bars = 0.1 mm.

articles. Pretarsus with two long curved lateral claws and a shorter curved medial empodial claw. PII (Fig. 143) and PIII (Fig. 144) similar to PI except the antero-lateral groups of macrochaetae on the coxa absent; legs progressively longer from PI to PIII and the relative length of the basal tarsal article is progressively longer being about 0.6 of the total length on PIII.

Abdomen: Urotergite I with 1+1 lateral combs of five macrochaetae each associated with a cilium at least at the external end and 2–4 small marginal setae and 1–2 setulae between the comb and the margin, urotergites II–VII (Fig. 145) with 3+3 combs of macrochaetae as in Table 10, the lateral combs with two cilia as well as 2–4 small marginal setae and 1–7 setulae, the sublateral combs with a cilium at

Table 10. Number of macrochaetae per bristle comb—*Acrotelsella hethicola* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	5	—	—	—	—
II	6	4	6	—	—
III	7	5	6–7	17–19	3.2
IV	7–8	4–5	5–6	19–20	2.9
V	9	5	5	18	2.8
VI	7–8	4–5	5–6	17–18	3
VII	8–9	4	5	18	2.1
VIII	8	—	5	16–17	2.1
IX	—	—	—	—	—



Figures 146–149. *Acrotelsella hethicola* sp. nov. holotype ♂ *(146)* urotergite X; *(147)* urosternite VI; *(148)* coxites IX, stylus and penis; *(149)* base of left cercus and median filament, with epiproct and a paraproct. Scale bars = 0.1 mm.

the mediad end as well as 2–3 small marginal setae and 2–4 setulae, the submedial combs with a cilium at the laterad end as well as 2–3 small marginal setae and 2–4 setulae; urotergite VIII with 2+2 combs (lacking the sublateral), also with a cilium at each end of both combs as well as 1–4 marginal setae and 5–6 setulae, urotergite IX glabrous. — Urotergite X (Fig. 146) almost equilateral triangle (72°), wider at base than long (L/W 0.64) with many long fine pectinate tapered setae and setulae along entire margin, and 4+4 combs of 1–5 macrochaetae per comb but very few setulae posterior to each comb, and most combs with a cilium at the mediad end.

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 17–20 pectinate macrochaetae (Fig. 147) each with several small marginal setae and several setulae between the comb and the margin as well as a cilium at the laterad end of every comb. The distance between the lateral combs 2.1–3.2 times the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♂ as in Figure 148. Two pairs of styli, those on IX long and slender with robust setae apically and along the length of the stylus, styli of VIII similar and not much smaller. Urosternite VIII entire with long combs of 16–17 macrochaetae and about half this number of marginal setae and a few setulae in between the two, the margin between the styli slightly concave. Coxites IX in ♂ separated with internal process not very broad and short being only 1.1–1.2 times longer than wide at its base and 3.4 times longer than the short pointed external process, the inner processes not quite reaching to half the length of the stylus; outer process with finely pectinate setae along the outer margin, inner process with setae and finely pectinate tapered macrochaetae along both margins, as well as three submarginal combs of 1–5 macrochaetae along the inner margin, and a macrochaeta inserted mediad of the base of the stylus. Penis typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Cerci (Fig. 149) first division almost glabrous except for a couple of small setae externally, second division with single ring of a few small setae and a trichobothrium, third division with a sub-basal ring of setae and trichobothria, a medial semi ring of scales and a trichobothrium and subdistally with a ring of setae, trichobothria and an external macrochaeta; fourth interval with sub-basal ring of a few setae, a trichobothrium and scales, the fifth division with three rings, the sub-basal with a seta, two trichobothria and scales, the middle ring with scales and trichobothria and the sub-distal ring with setae, macrochaetae and cilia; sixth division with four rings, the sub-basal with a seta, trichobothrium and scales, the next setae and trichobothria, the next with a trichobothrium and scales and the sub-distal with macrochaetae, cilia and setae. Subsequent divisions increase in length with eight rings visible in the most distal surviving division (eleventh).— Median dorsal appendage (Fig. 149) basal divisions difficult to discern, probably only a few small setae on the most basal division; second division with a single ring of trichobothria and setae; following division with three rings, the most basal of setae and trichobothria, the following of scales only and the subdistal of trichobothria, macrochaetae and setae, fourth and fifth divisions with only two rings, the sub-basal of setae, scales and trichobothria and the subdistal of macrochaetae, setae and trichobothria, sixth division with three rings, the sub-basal of trichobothria, setae and long scales, the middle of trichobothria and shorter scales and the subdistal of macrochaetae, setae and cilia, seventh division with four rings, the sub-basal of long scales only, the next of setae and trichobothria, the third of long scales and trichobothria and the subdistal as in previous and subsequent divisions.

Female: Unknown.

Habitat. This species was collected in dry *Eucalyptus* leaf litter among *Xanthorrhoea* grass trees. Localities as in Figure 129.

Etymology. The species is named *hethicola*, an artificial word referring to its habitat of heathland, using the old English word "heth" for heath and the Latin suffix "icola" in the sense that the species is from the heath.

Acrotelsella septentrionalis sp. nov.

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Figs 150–175

Holotype ♀ (HW 1.21) QUEENSLAND: Punsand Bay campground 10.7216°S 142.4599°E 5m asl, 23.vii.2013, Graeme Smith, eucalypt leaf litter, QMT259418 (on two slides). **Paratypes** (seven males, five females) 1♂ (HW 1.21) same data as holotype, QMT259425 (on two slides); 1♀ (HW 1.23) same data as previous, AMS K.541646 (on two slides); 2♀♀ (HW 1.28, 1.25) 1♂ (HW 1.16) same data as holotype, AMS K.377990 (in alcohol); 1♀ (HW 1.30) Pennefather campsite 12.2918°S 141.7033°E 7m asl, 19.vii.2013, Graeme Smith, paperbark leaf litter on sand, AMS K.541647 (two slides); 3♂♂ (HW 1.26, 1.20, 1.13) same data as previous, AMS K.377991 (in alcohol); 1♀ (HW 1.18) Heathlands Resources Reserve, along road to ranger station 11.7569°S 142.6709°E 152m asl, 21.vii.2013, Graeme Smith, leaf litter, AMS K.541649 (on two slides); 1♂ (HW 1.20) Jardine River NP, Jardine River South campsite 11.1399°S 142.3637°E 16m asl, 22.vii.2013, Graeme Smith, leaf litter in riverine forest (*Eucalyptus*, *Acacia* or *Melaleuca*), AMS K.541648 (on two slides); 1♂ (HW 1.15) same data as previous, AMS K.377992 (in alcohol). Localities shown on the map in Figure 150.

Diagnosis. Distinguished from other described species of the group with secondary ovipositors by a combination of characters such as the presence of 7–10 papillae on the labial palp, the 3+3 arrangement of combs on the metasternum, 3–4 macrochaetae associated with the posterior trichobothria of the nota (versus two or three), and the normal width processes of coxites IX. It differs from *A. mallee* in having the anterior trichobothrial area of the pronotum more anterior (0.35–0.40 versus 0.43–0.49) associated with the comb N-3 rather than N-2, the gap between the posterior combs of the pronotum is 0.42–0.48 versus 0.50–0.54 the total width of the pronotum, it has a presternum with scales rather than numerous cilia and a large number of long pectinate carrot-shaped macrochaetae on the femora and tibia. In the males the posterior angle of urotergite X is more acute and similar to that of the female (60–65° versus 72–81°) and much less acute in the females of *A. mallee*.

Description

Appearance: Broad medium-sized silverfish with brown antennae, darker distally and light brown terminal filaments

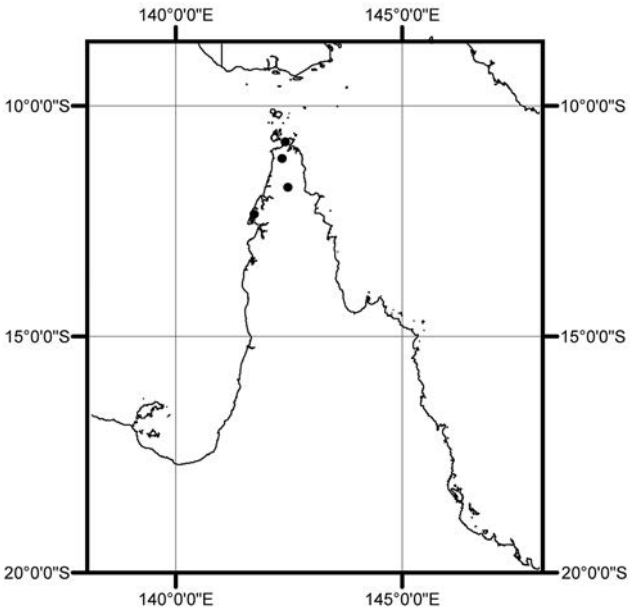


Figure 150. Known distribution of *Acrotelsella septentrionalis* sp. nov.

with rings of dark scales. When live (Fig. 151) overall grey in colour with line of dark scales along posterior margin of head, all appendages dark. In alcohol, scales brown.

Body length: H+B up to 9.1 mm, HW 1.3 mm; thorax: length 2.6 mm or 0.27–0.31 H+B, width 2.35 mm with the mesonotum being slightly wider than the pronotum and not much wider than the metanotum. Antennae incomplete, maximum preserved length 5.8 mm or >0.7 H+B; terminal filaments all broken, maximum length of terminal filaments 4.0 mm or >0.5 H+B.

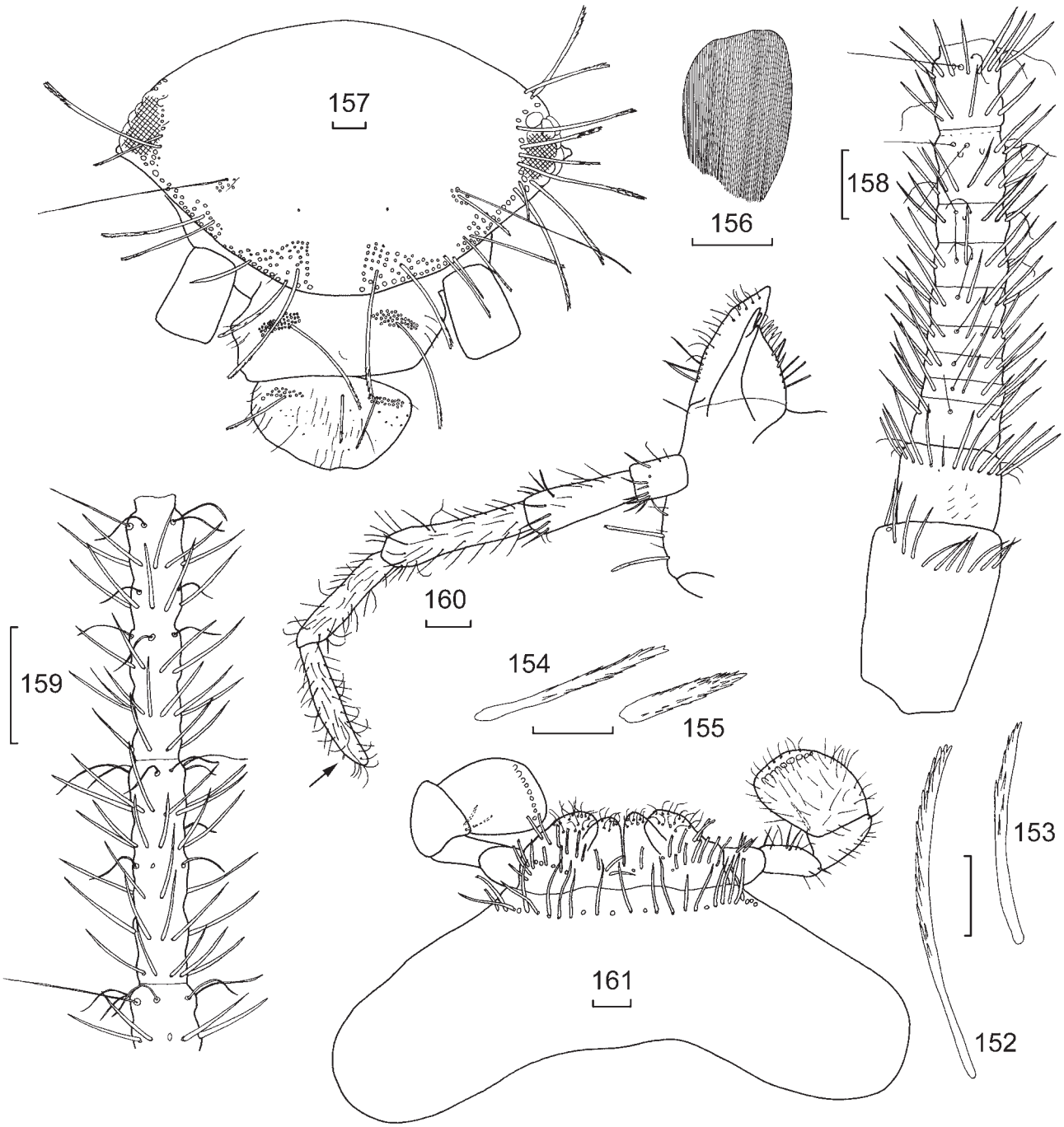
Pigmentation: Cuticle overall quite dark with specimens becoming very dark when they are placed into alcohol. The intensity of darkness makes it difficult to observe macrochaetae insertions in some places. Flagellum of antennae without banding, moderate brown pigment evenly distributed; pedicel and scape not particularly strongly pigmented. Frons without darker regions, labrum and clypeus without pigment, mandibles and maxillae without pigment among bushes of macrochaetae, maxillary and labial palps with brown pigment, the ultimate and penultimate articles of the maxillary palp moderately and evenly pigmented, other articles with some pigment distally. Ultimate article of labial palp with pigment around margins, other articles with very little pigment. Nota and thoracic sterna without obvious pigment. Some pigment on "shoulder" of the coxa of PI but not along the outer margin nor on PII or PIII. Trochanter sometimes with pigment along outer margin distally. Femora fairly evenly pigmented tending to darker distally and quite dark along the posterior margin distal of the posterior bulge. Tibia of all legs a little darker distally. First tarsal article with more pigment distally, remaining articles with some light pigment becoming stronger towards the claws. Outer margins of inner processes of coxites IX as well as outer process quite dark, penis moderately pigmented. Ovipositor evenly pigmented. Cerci and median filament evenly pigmented but appearing darkly annulated when live due to rings of dark scales. Abdominal styli light basally with a little darker pigment distally.

Figure 151. *Acrotelsella septentrionalis* sp. nov. from Jardine River, Queensland.

Macrochaetae: Variable strongly pectinate (Figs 152–155) carrot-shaped and strongly pectinate or more subtly pectinate curved and tapered dark brown to hyaline, the pectinations extending almost along the whole length of the macrochaetae.

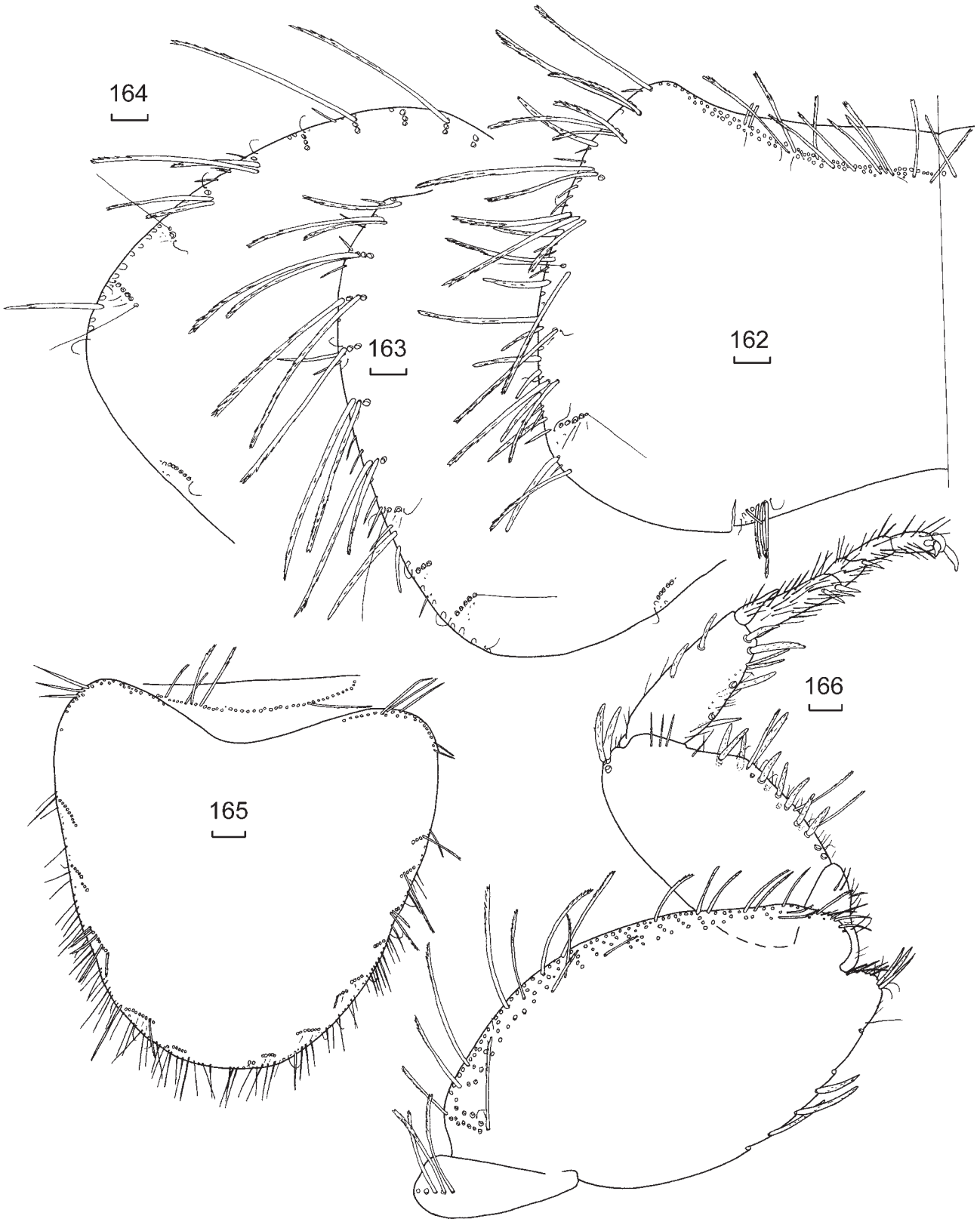
Scales: With numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 156), those dorsal are brown to hyaline, those ventral brown or hyaline; the ribs are slightly further spaced on some irregular shaped hyaline scales. Scales found on frons and clypeus, on pedicel and scape, on second and third articles of maxillary palp, the submentum, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli, medial filament and cerci. Scales of palps, styli, terminal filaments of variable shape, defined ribs clearly present on some scales but possibly not all.

Head: (Fig. 157) wider than long with 1+1 not very dense bushes of macrochaetae aligned in subparallel rows on the antero-lateral corners, with a distinct gap in chaetotaxy between these two bushes. Eyes dark chestnut in alcohol

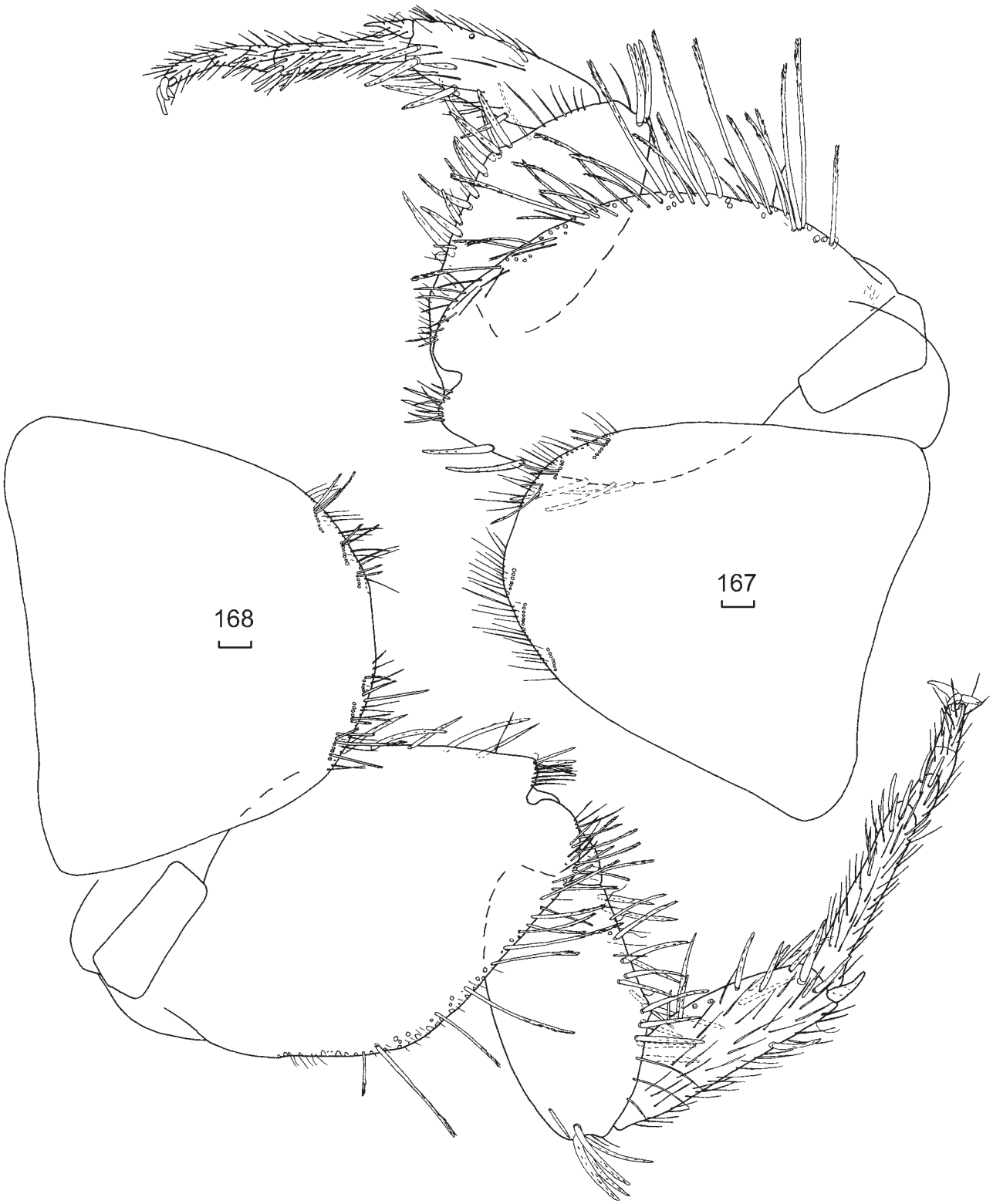


Figures 152–161. *Acrotelsella septentrionalis* sp. nov. holotype ♀ *(152)* pectinate macrochaeta of clypeus; *(153)* long pectinate macrochaeta of pronotum; *(154)* shorter pectinate macrochaeta of pronotum; *(155)* carrot-shaped pectinate macrochaeta of femur of PII; *(156)* darker scale from pronotum; *(157)* head (cross-hatched area obscured by eye pigment); *(158)* antenna, scape, pedicel and basal intervals of flagellum; *(159)* idem, most distal surviving complete interval; *(160)* maxilla, arrow indicates basiconic sensillum; *(161)* labium, smaller chaetotaxy and papillae omitted from one palp. Scale bars = 0.1 mm.

preserved material. There is a small gap behind each bush in the row of macrochaetae along the margin of the frons which then extends inwards a little near a large but isolated peri-antennal group and its long thin trichobothrium-like seta; the marginal row continues back and up over the eyes about one macrochaeta wide. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as a few curved setae laterally, with only a single cilium on the face between the bushes. Labrum also with 1+1 bushes but with fewer pectinate macrochaetae as well as many simple setae scattered over the face and a single macrochaeta medially between the bushes. — Antennae fairly long, scape (Fig. 158) not long with scales over much of its surface and a preapical ring of setae; pedicel with preapical ring of simple setae and cilia, with scales rather than setae over the face apart from an area with several tiny setulae; first annulus/interval of flagellum almost as long as the pedicel with a subapical ring of simple setae and trichobothria; next four annuli shorter but increasing in length each with ring of simple setae and one or two trichobothria; following two intervals similar but



Figures 162–166. *Acrotelsella septentrionalis* sp. nov. holotype ♀ *(162)* pronotum, left half; *(163)* mesonotum, left side; *(164)* metanotum, left side; *(165)* prothoracic presternum and sternum; *(166)* PI. Scale bars = 0.1 mm.



Figures 167–168. *Acrotelsella septentrionalis* sp. nov. holotype ♀ *(167)* mesothoracic sternum and PII; *(168)* metathoracic sternum and PIII. Scale bars = 0.1 mm.

also with some long cilia; interval eight and nine each with two rings of chaetotaxy, the more basal of setae and cilia, the more distal also with a trichobothrium; intervals ten and eleven with three rings of chaetotaxy, the basal and distal rings as in the previous intervals the middle ring of setae only; interval twelve with four rings, the most basal now of setae only. The most distal surviving intervals (Fig. 159) are divided into two chains each of five annuli with either a ring of setae only or a basal ring of setae only and a distal ring of cilia, the most distal ring of cilia in each interval also bears a trichobothrium. On most specimens examined as slide material both basiconic sensilla type B (rarely type

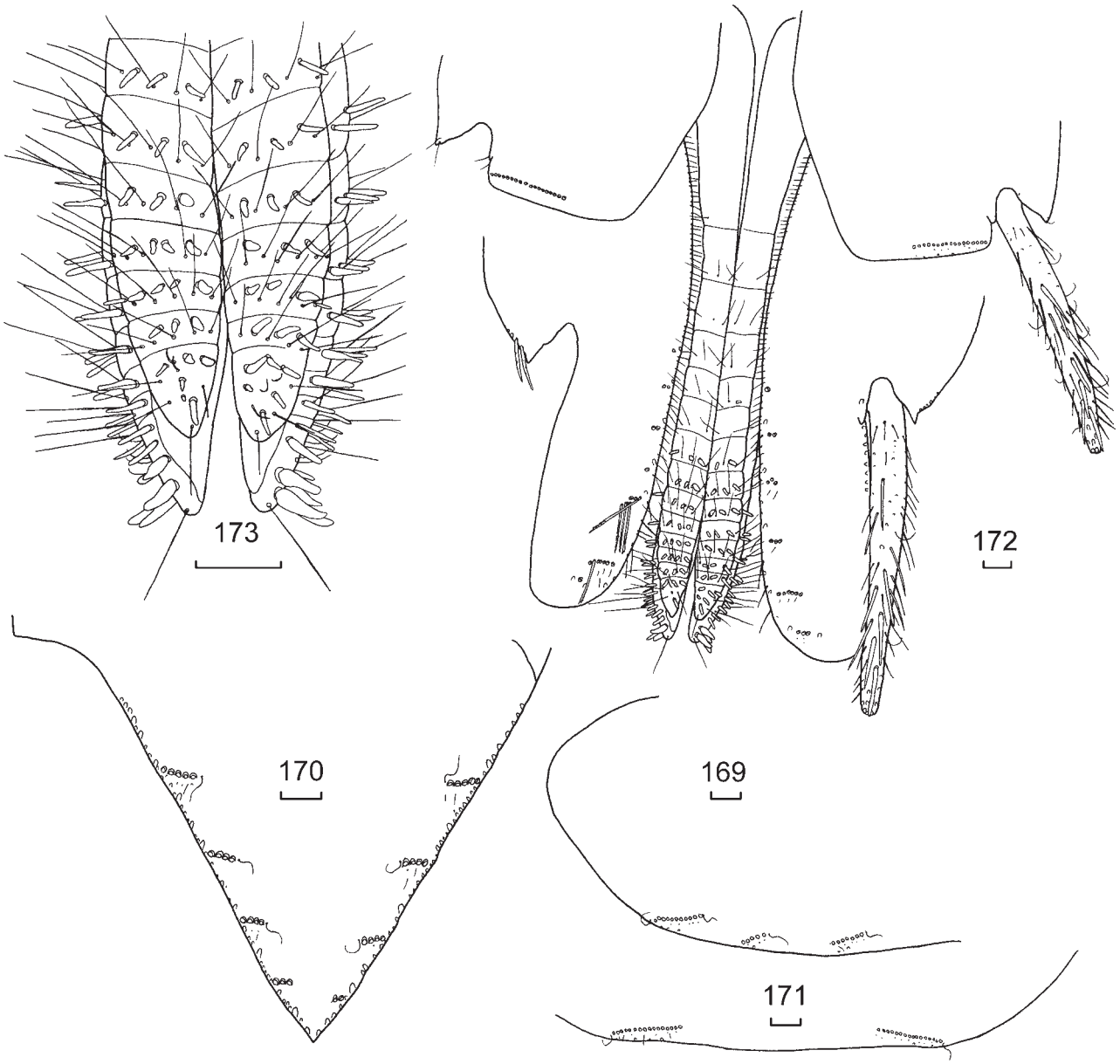
Table 11. Number of macrochaetae per bristle comb – *Acrotelsella septentrionalis* sp. nov.

	urotergite			urosternite	
segment	lateral	sublateral	submedial	sublateral	L gap/combs
I	4–6	—	—	—	—
II	6–7	3–6	5–7	—	—
III	4–9	4–6	4–7	16–23	3.3–4.6
IV	3–11	4–6	6–7	16–21	3.1–4.5
V	9–11	3–6	5–8	14–23	3.0–4.1
VI	8–10	4–6	4–8	16–21	2.8–3.6
VII	3–11	4–6	2–6	11–18	2.1–3.8
VIII	4–9	—	2–6	14–19	2.4–2.6
IX	—	—	—	—	—

C) and circular sensilla were seen. — Mandibles typical for *Acrotelsella* with well-developed molar and incisor areas; a group of about 12–15 strong apically bifurcated but simple setae distally adjacent to the pectinate molar area and a bush of around seventy strong, often dense pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 160) with two or three thick slightly pectinate macrochaetae as well as a few small setae externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by about 6–7 lamellate processes and a row of 5–8 setae, galea longer than lacinia with about 3–6 smooth, simple setae externally in its basal half and several setulae distally; maxillary palp long, apical article 4.8–6.0 times longer than wide and 1.0–1.2 times as long as the penultimate article which is a little shorter than the antepenultimate article, the ultimate article with a small basiconic sensillum type B, last two articles of palp with fine setae only, third article with stronger setae in a subapical ring some slightly stronger setae subapically, second and third articles also with scales although these can be hard to find on the third article. — Labium (Fig. 161) short and broad, postmentum with transverse row of mostly pointed setae, a couple laterally with blunt apices, prementum with transverse and oblique rows of strong apically truncate setae, apically with long curved setulae; labial palp short, apical article not expanded medially, about as long as wide (0.86–1.14) with row of 7–10 papillae of compact type arranged in a single curved row across most of the face margin, with a single very small rod-like basiconic sensillum (type B) on the outer margin, covered with numerous fine setae as well as longer fine setae.

Thorax: Pronotum (Fig. 162) with dense setal collar of quite long but also shorter pectinate macrochaetae, about 2–3 macrochaetae wide without any medial gap; lateral margins with many strong, shorter and longer curved slightly pectinate macrochaetae as well as a few cilia, with 8–9 combs of 1–4 macrochaetae along each margin. Two open trichobothrial areas; the posterior trichobothrial area located about 0.69–0.75 of the distance along the margin and is associated with the last comb (N), this comb composed of 3–4 macrochaetae with the trichobothrium at the mediad end and a cilium at the laterad end, the anterior trichobothrial area is forward of the midpoint (0.35–0.40) and associated with comb N-3, the comb composed of only a single macrochaeta with the trichobothrium between the macrochaeta and the margin and a cilium laterad of the trichobothrium (sometimes a large marginal macrochaetae is positioned close to this trichobothrium giving the appearance of a macrochaeta being present on either side of the trichobothrium); all combs associated with a few setulae, sometimes more numerous. Posterior margin of all nota with 1+1 combs of 4–7 mostly pectinate macrochaetae associated with a few setulae between the comb and the margin and a cilium at each end, the most laterad insertion is probably occupied by a long thin trichobothrium-like macrochaeta (deduced from its shape); these combs not particularly widely spaced, the gap between them 42–48% of total width of pronotum. — Mesonotum (Fig. 163) with lateral chaetotaxy similar to pronotum with 10–11 combs of 1–4 macrochaetae, the anterior trichobothrial area located 0.54–0.63 along the lateral margin, associated with comb N-2 (rarely N-3) composed of one macrochaeta with the trichobothrium located between the macrochaeta and the margin (occasionally a marginal macrochaeta laterad of trichobothrium) sometimes with a couple of setulae posterior to the comb and a cilium between the trichobothrium and the margin. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.78–0.83) the trichobothrium located mediad to the comb of three or four macrochaetae and with 1–3 setulae or stronger setae posterior to the comb.— Metanotum (Fig. 164) similar to mesonotum with 7–11 combs of 1–4 macrochaetae, the anterior trichobothrial area associated with comb N-1 of a single macrochaeta (or on one side of one specimen no macrochaeta) about 0.68–0.77 the distance along the margin, the trichobothrium located between the margin and the macrochaeta, the posterior trichobothrial area associated with the most posterior comb (0.83–0.88 along the margin) of 3–4 macrochaetae.

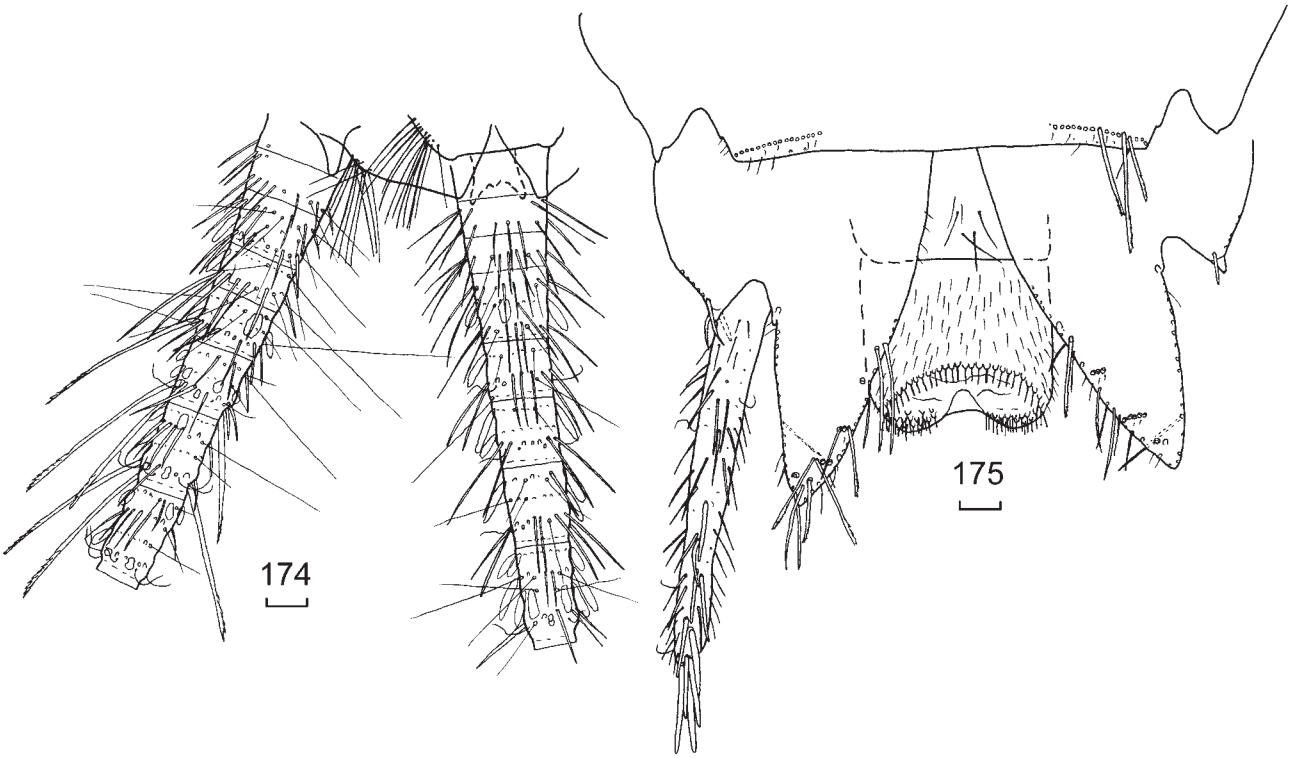
Presternum narrow, with transverse row of spaced pectinate macrochaetae (Fig. 165) with scales between the row of macrochaetae and the prothoracic sternum not cilia. — Prothoracic sternum (Fig. 165) parabolic, a little wider than long (L/W 0.85–0.96) antero-lateral corners with about 30 finely pectinate tapered marginal and submarginal setae, posterior three quarters of lateral margins with fringe of setae and some cilia as well as 5–9 short combs on each side each composed of 2–10 pectinate macrochaetae. — Mesosternum (Fig. 167) only a little larger than prosternum (1.1–1.2 times as long) about as long as wide at its base (L/W 0.95–1.03) anterolateral corners glabrous, posterior third of margins with many long thin setae and 2–4 combs on each side distally, the more anterior composed of 5–8 pectinate macrochaetae in a single row and the more posterior composed of 4–8 pectinate macrochaetae; all combs with a few setulae behind them, larger smooth, tapered macrochaetae sometimes on



Figures 169–173. *Acrotelsella septentrionalis* sp. nov. holotype ♀ *(169)* urotergite V, combs of left side; *(170)* urotergite X; *(171)* urosternite VI; *(172)* coxites VIII and IX with ovipositor; *(173)* apices of gonapophyses. Scale bars = 0.1 mm.

the margin at the end of some combs. — Metasternum (Fig. 168) of similar length to prosternum except wider (L/W 0.74–0.83) apically rounded with marginal setae and occasional cilia along distal $^1/_4$ of lateral margins and 3+3 (occasionally four) combs of 2–9 pectinate macrochaetae.

Legs quite long, tibia L/W ratio of PI 2.2–2.6, PII 2.6–3.8, PIII 4.1–4.9; tarsi L/W ratio PI 6.8–8.2, PII range 7.7–9.9, PIII 11.3–14.7. PI (Fig. 166) with a comb of 4–5 pectinate macrochaetae and one smooth macrochaeta laterally on the distal margin of the precoxa. Coxa with scales and a group of about 9–13 macrochaetae on the anterolateral corners usually arranged in two irregular rows followed by a field of strong pectinate macrochaetae along the external margin about three to four macrochaetae wide, the macrochaetae behind the margin pectinate and usually grouped into combs of 2–4; inner margin with six lightly pectinate tapering macrochaetae and several smooth and delicately pectinate setae of varying thickness distally over the articulation. Trochanter with setae only, some distally much stronger than those proximally as well as cilia and setulae. Femur posteriorly with some long thin pectinate macrochaetae as well as ten or more stout pectinate carrot-shaped macrochaetae along the posterior margin and a broken line of smooth setae posteriorly, dorsal margin with at least three strong curved pectinate macrochaetae over the articulation. Tibia of PI with about eight stout pectinate mostly carrot-shaped macrochaetae along the ventral margin as well as several longer thinner smooth setae, without row of shorter setae near the distal margin; dorsal margin with two short curved mildly pectinate macrochaetae spaced along the margin and a few smooth setae and long scales subdistally, with usual tibial spur bearing a few setae. Tarsi with four articles, the basal article of PI about half the total length of the tarsus, its join with the next article not oblique, the surface of all tarsal articles



Figures 174–175. *Acrotelsella septentrionalis* sp. nov. paratype ♀ (K.541646) *(174)* base of left cercus and median filament, with epiproct and a paraproct; paratype ♂ (T259425); *(175)* urosternite VIII, coxites IX and penis. Scale bars = 0.1 mm.

with numerous simple setae, those ventral near the distal end of the basal three articles more robust and with more rounded tips, especially on the two basal articles. Pretarsus with two long curved lateral claws and a shorter curved medial claw. PII (Fig. 167) and PIII (Fig. 168) similar to PI except the antero-lateral groups of macrochaetae on the coxa absent; legs progressively longer from PI to PIII (L tibia PI/PIII 0.43–0.55) and the relative length of the basal tarsal article is progressively longer, being about 0.6 of the total length on PIII.

Abdomen: Urotergite I with 1+1 lateral combs of 4–6 macrochaetae each associated with a cilium at both ends and 2–3 small marginal setae and several setulae between the comb and the margin, urotergites II–VII (Fig. 169) with 3+3 combs of macrochaetae as in Table 11, the lateral combs with two cilia as well as 2–4 small marginal setae and several tiny setulae, the sublateral combs with a cilium at the mediad end as well as 1–3 small marginal setae and a few setulae, the submedial combs with a cilium at each end as well as 2–5 small marginal setae and several setulae; urotergite VIII with 2+2 combs (lacking the sublateral), also with a cilium at each end of both combs as well as a few marginal setae and several tiny setulae, urotergite IX glabrous. — Urotergite X (Fig. 170) equilateral triangle (60–67°) in both sexes, wider at base than long (L/W 0.62–0.74) with many setae along entire margin and each side with 3–5 combs of 1–5 macrochaetae per comb (all lost) as well as a few setulae posterior to each comb, most combs with a cilium at the mediad end.

Urosternite I and II glabrous, urosternites III–VII with 1+1 lateral combs of 11–23 pectinate macrochaetae (Fig. 171) each with a few marginal setae and several setulae between the comb and the margin as well as a cilium at the laterad end of each comb (occasionally not present). The distance between the lateral combs 2.1–4.6 times the average width of these combs, the ratio being largest on urosternite III or IV and decreasing posteriorly.

Genital region of ♀ as in Figure 172. Two pairs of styli, those on IX with robust setae apically and along the length of the stylus, styli of VIII similar and not much smaller. Coxites VIII with long combs of 14–19 macrochaetae and a few small marginal setae and a few setulae in between the two, the coxites with straight truncate posterior margin and a slightly obtuse angle with the inner margin, the corner being moderately rounded with the curve occupying only ⅛ to ¼ the length of the posterior margin. Each coxite IX with long internal process which is quite broad about 2.3–2.6 times longer than wide at its base and 4.5–6.1 times longer than the short pointed external process, the inner processes reaching to about the apex of the ovipositor; outer process with stout setae along the outer margin, inner process with numerous, setae along the basal third of the outer margin adjacent to the stylus, a macrochaeta insertion mediad of the base of the stylus, the inner margin with 3–7 combs of 1–7 pectinate macrochaetae as well as some large marginal setae. — Ovipositor (Figs 172–173) not very long (1.1–1.4 HW) of secondary type, only reaching the apex of the long internal processes of coxites IX, both pairs of gonapophyses consisting of longer basal divisions becoming progressively shorter distally except for the last divisions which are about as long as the previous two or three together, 12–14 divisions in total; the apical eight divisions armed with modified spines or conules which become more numerous distally, the last division with 6–10 modified spines; all divisions also with long fine setae.

Cerci (Fig. 174) first division almost glabrous except for two small setae externally, second division with sub-basal

semi ring of a few small setae and a distal ring of setae and some trichobothria, third division with a basal ring of setae and trichobothria, a medial ring of small trichobothria and small scales and a subdistal ring of some small finely pectinate setae and trichobothria, fourth division with a basal ring of scales and trichobothria and a subdistal ring of setae, cilia, trichobothria and externally a pectinate macrochaeta, fifth division with three rings, the basal and middle rings of scales and trichobothria, the subdistal also of setae, cilia, trichobothria and externally a pectinate macrochaeta, sixth division also with three rings but the basal ring also has some setae and the subdistal with larger macrochaetae externally, seventh and eighth divisions with four rings, the basal of scales and sometimes setae, the next of setae and long trichobothria, the following of scales and trichobothria and the subdistal as in previous divisions. — Median dorsal appendage (Fig. 174), first division glabrous, the second with a basal ring of only a couple of long thin delicately pectinate setae near the outer margins and a subdistal ring of setae, following division with single subapical ring of setae, fourth division with three rings, the basal of setae and trichobothria, the next of setae trichobothria and scales, the subapical of setae and trichobothria, fifth division with only two rings the basal of scales and trichobothria, the subapical of setae, trichobothria and cilia, sixth and seventh divisions with three rings, the basal of setae trichobothria and scales, the middle of scales and trichobothria and the subapical as in the fifth division, eighth division with four rings, the basal of scales only, the second of scales setae and trichobothria, the third of scales and trichobothria and the subapical with setae, cilia and macrochaetae.

Male: Similar to female except urosternite VIII entire with posterior margin between the combs straight or very slightly concave. Coxites IX in ♂ separated (Fig. 175) with internal process not very broad being only 1.5 times longer than wide at its base and 3.3–4.3 times longer than the short pointed external process, the inner processes not quite reaching to half the length of the stylus; outer process with stout setae along the outer margin, inner process with setae along both margins, as well as 4–5 submarginal combs of 1–5 macrochaetae along the inner margin, as well as a macrochaetae inserted mediad of the base of the stylus. Penis typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Habitat. This species was always collected in dry leaf litter.

Etymology. The species is named *septentrionalis* from the Latin for northern, reflecting the current known distribution of the species at the northern most tip of the Cape York Peninsula.

Acrotelsella obscura sp. nov.

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Figs 176–199

Holotype ♀ (HW 1.25) QUEENSLAND: south of Coen 14.1442°S 143.2451°E 238m asl, 1.viii.2013, Graeme & Louise Smith, leaf litter, QM T259423 (on two slides). **Paratypes** (one male, one female) 1♀ (HW 1.13) same data as holotype, AMS K.541677 (on two slides); 1♂ (HW 1.30) same data as holotype, QM T259430 (on two slides) (Fig. 176).

Diagnosis. This species can be distinguished from

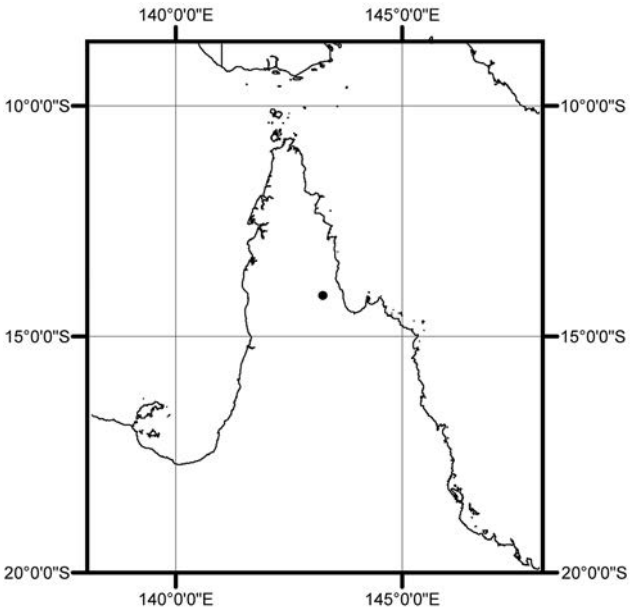


Figure 176. Known distribution of *Acrotelsella obscura* sp. nov.

Figure 177. *Acrotelsella obscura* sp. nov., 10 km south of Coen, Queensland.

other described species with secondary ovipositors by the expanded outer margins on the inner processes of coxites IX in the female being 1.5 times wider at their widest point than at their base (versus 0.9–1.2 in all other species of the group where this has been measured e.g., *A. obscura* sp. nov., *A septentrionalis* sp. nov., *A. mallee*, *A. albicaudata*), the presence of only two macrochaetae (rarely three) in the posterior trichobothrial areas of all nota and the presence of several exceptionally long finely pectinate macrochaetae along the shaft of styli IX.

Description

Appearance: Medium sized silverfish, somewhat stocky in form, thorax wider than the abdomen. Scale pattern when live see Figure 177, antennae evenly brown, terminal filaments annulated, slightly darker scales on back of head. In alcohol specimens become very dark almost as soon as they contact the alcohol.

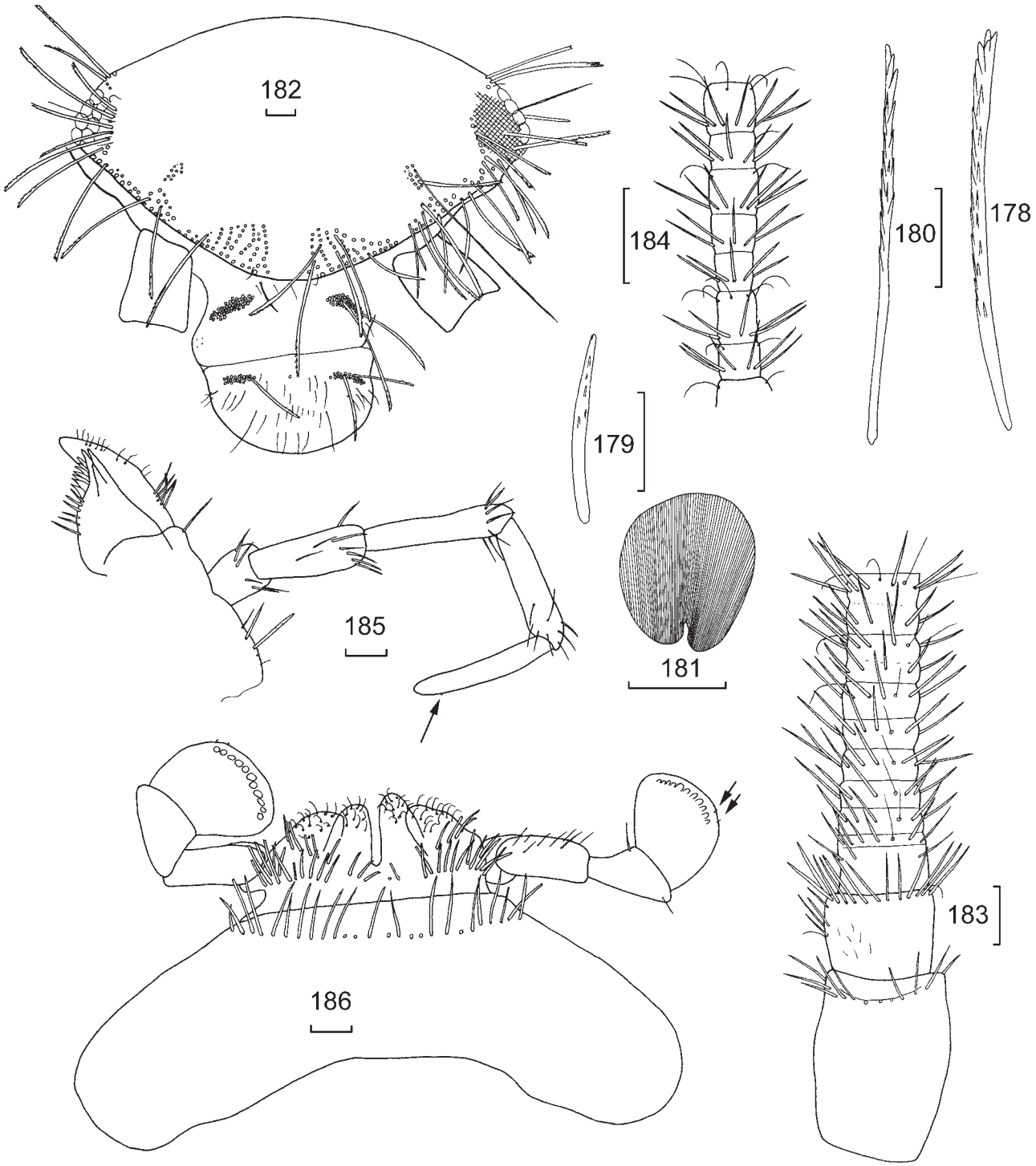
Body length: H+B up to 8.9 mm, HW 1.30 mm; thorax: length 2.4 mm or 0.27–0.31 H+B, width 2.3 mm with the mesonotum being slightly wider than the pronotum. Antennae incomplete, maximum preserved length 5.9 mm or >0.77 H+B; terminal filaments all broken, maximum length of terminal filaments 4.4 mm or >0.5 H+B.

Pigmentation: Cuticle overall quite dark with specimens becoming very dark when placed into alcohol. The intensity of darkness makes it difficult to observe macrochaetae insertions in some places. Some variability in darkness noted between specimens. Flagellum of antennae without banding, moderate orange-brown pigment evenly distributed; pedicel and scape with pigment distally. Frons overall slightly dark, labrum and clypeus without pigment, mandibles and maxillae overall slightly pigmented but without strong pigment among bushes of macrochaetae, maxillary and labial palps with stronger brown pigment, the distal article of the maxillary palp overall with medium brown pigment, penultimate and third articles with moderate pigment overall but darkest distally, second article also with moderate pigment but lighter at base. Labial palp ultimate and penultimate articles with quite dark pigment, especially around edges. Nota and thoracic sterna without obvious pigment. Shoulder of the coxa darker but not along the outer margin. Trochanter with pigment along outer margin more pronounced at each end. Femora fairly evenly well pigmented, darker at the anterior distal corners. Tibia darkly pigmented overall, except for apical spur. First tarsal article with more pigment distally, distal article with some light orange pigment apically. Abdominal segments progressively darker towards posterior end (sclerotised or pigment?); coxites VIII and IX quite dark. Ovipositor a little pigmented distally. Cerci and median filament annulated, mostly dark divisions except for first annulus which is light in colouring and apex of distal division distad of the ring of macrochaetae. Abdominal styli darker in distal half becoming more intense distally, styli VIII the same or sometimes with much less pigment.

Macrochaetae: Variable strongly pectinate (Figs 178–180) carrot-shaped and strongly pectinate or more subtly pectinate curved and tapered dark brown to straw coloured.

Scales: With numerous sub-parallel ribs that do not surpass the margin of the scale (Fig. 181), those dorsal are brown, those ventral brown or hyaline. Scales found on top of head, on pedicel and scape, mandible, on second and third articles of maxillary palp, all nota, all thoracic sterna, legs (except for trochanter and distal three articles of tarsi), all urotergites and urosternites, styli and terminal filaments.

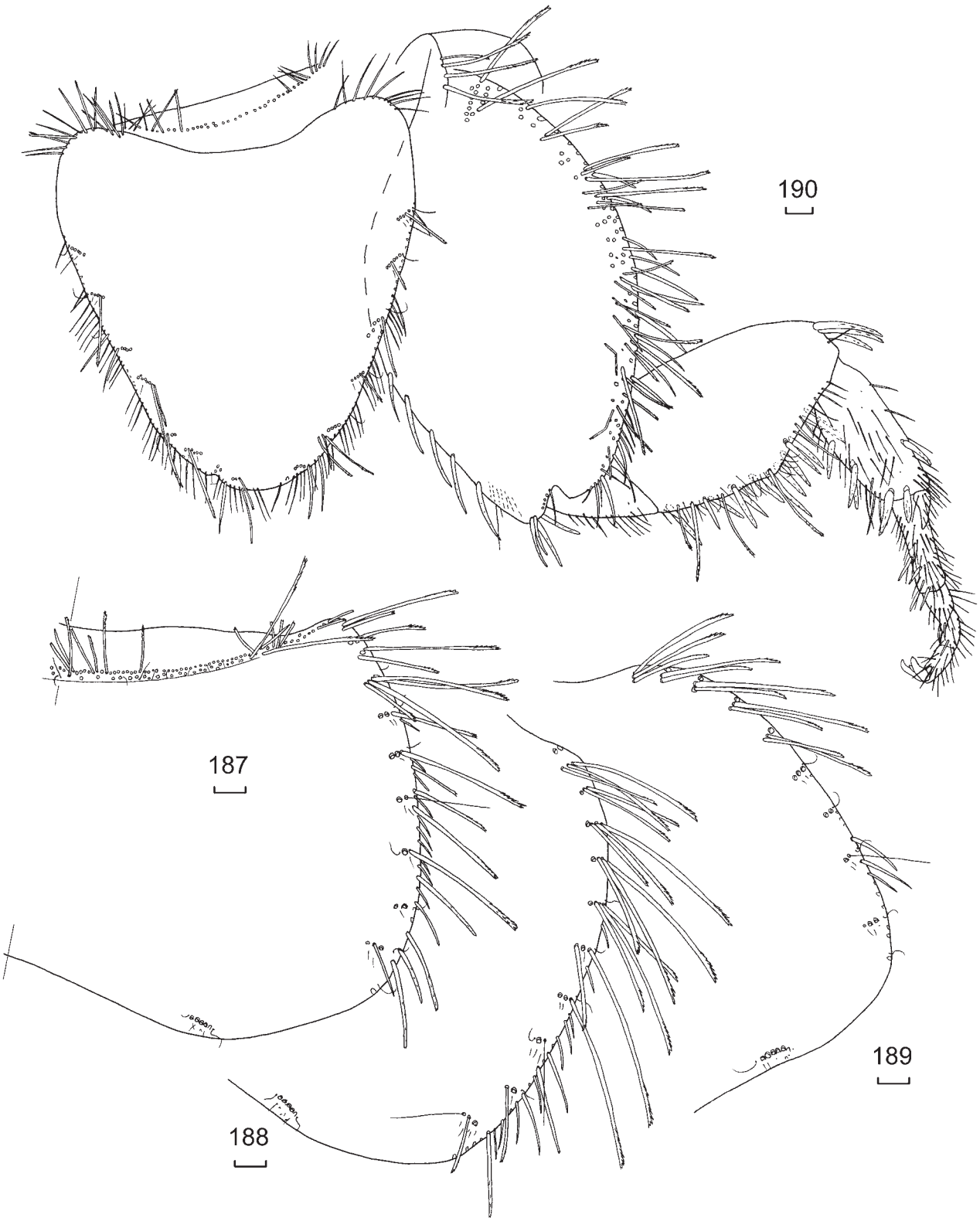
Head: (Fig. 182) wider than long with 1+1 not very dense bushes of macrochaetae aligned in subparallel rows on the antero-lateral corners, with a distinct gap in chaetotaxy between these two bushes. Eyes dark chestnut in alcohol preserved material. There is a small gap behind each bush in the row of macrochaetae along the margin which extends inwards towards but not quite reaching the peri-antennal group and its long thin trichobothrium-like seta; the marginal row continues back and up over the eyes about two macrochaetae wide. Clypeus with 1+1 very dense bushes of strongly pectinate macrochaetae as well as a few curved setae laterally. Labrum also with 1+1 dense bushes and a single macrochaeta and scattered cilia medially between the bushes as well as some simple setae scattered over the face. — Antennae fairly long, scape (Fig. 183) not long with scales over much of its surface and a preapical ring of setae; pedicel with preapical ring of simple setae and cilia as well as scales over face; first annulus/interval of flagellum with a weak subapical ring of simple setae; second to sixth annuli with ring of simple setae each and at least one trichobothrium; interval seven also with a cilium in the ring of setae and a trichobothrium; intervals eight and nine divided into two annuli, the basal of setae only the subdistal with two trichobothria and some cilia; interval ten divided into three annuli and interval eleven into four annuli with the trichobothrium restricted to the most distal annulus. At about half the length of the antennae the intervals are subdivided into about nine with the most distal annulus bearing a proximal ring of setae, a subapical ring of cilia and two trichobothria; rod-like basiconic sensilla (type B) rarely seen. Most distal surviving intervals difficult to define (Fig. 184) perhaps divided into seven annuli with trichobothria no longer observed, basiconic sensilla type B seen on ultimate annulus; circular sensilla were not seen but may be present as the darkness of the antennae makes observation very difficult. — Mandibles typical for *Acrotelsella* with well-developed molar and incisor areas; a group of about 10–15 strong apically bifurcated but simple setae distally adjacent to the pectinate molar area and a bush of around eighty strong, often dense, pectinate macrochaetae externally as well as scattered simple setae. — Maxilla (Fig. 185) with one or two stout smooth macrochaetae as well as 2–3 smaller setae externally proximal to the palp, the lacinia with three strong teeth, one set further back than the other two, followed by about seven lamellate processes and a row of 5–7 short simple setae, galea longer than lacinia with about 3–5 strong, smooth simple or apically bifurcate setae externally in its basal half and several cilia distally; maxillary palp very long and thin, apical article 6.0–6.2 times longer than wide and about the same length as the penultimate and third articles, the ultimate article with a small basiconic (type B) and fine setae, penultimate and third articles with some slightly thicker setae subdistally, second and third articles also with scales, first and second articles with more distal subdistal rings of stronger setae. — Labium (Fig. 186) short and broad, postmentum with transverse row of strong apically bifurcate and simple setae, prementum with transverse and oblique rows of stout apically bifurcated setae, apically with long curved setulae; labial palp short, apical article slightly expanded medially with a row of 10–11 papillae of compact type arranged in a single curved row,



Figures 178–186. *Acrotelsella obscura* sp. nov. holotype ♀ *(178)* long pectinate periocular macrochaeta; *(179)* curved slightly pectinate marginal macrochaeta of metanotum; *(180)* long strongly pectinate macrochaeta of PIII; *(181)* darker dorsal scale of mesonotum; *(182)* head (cross-hatched area obscured by eye pigment); *(183)* antenna, scape, pedicel and basal intervals of flagellum; *(184)* idem, most distal surviving complete interval; *(185)* maxilla; *(186)* labium. Arrows indicate the position of the basiconic sensilla. Scale bars = 0.1 mm.

with one or two very small rod-like basiconic sensilla (type B) on the outer margin, covered with numerous fine setae as well as longer fine setae.

Thorax: Pronotum (Fig. 187) with dense setal collar of both longer and shorter strongly pectinate macrochaetae about 2–3 macrochaetae wide, without slight medial gap; lateral margins with many strong shorter and longer curved slightly pectinate macrochaetae as well as a few cilia, with 9–10 combs of 1–4 macrochaetae along each margin. Two open trichobothrial areas; the posterior trichobothrial area located about 0.72–0.73 along the margin and is associated with the last comb (N), this comb composed of two (sometimes three) macrochaetae with the short trichobothrium at the mediad end and a cilium at



Figures 187–190. *Acrotelsella obscura* sp. nov. holotype ♀ *(187)* pronotum; *(188)* mesonotum; *(189)* metanotum; *(190)* presternum, prothoracic sternum and PI. Scale bars = 0.1 mm.

the laterad end, the anterior trichobothrial area forward of the midpoint (0.36–0.43) and associated with comb N-3, the comb composed of only a single macrochaeta with the trichobothrium between the macrochaeta and the margin and a cilium laterad of the trichobothrium; however on many specimens, a large lateral macrochaeta is aligned with this comb giving the impression of the trichobothrium being positioned between two macrochaetae, all combs associated with a few setulae, sometimes more numerous. Posterior margin of all nota with 1+1 combs of 5–7 macrochaetae insertions associated with several setulae between the comb

Table 12. Number of macrochaetae per bristle comb - *Acrotelsella obscura* sp. nov.

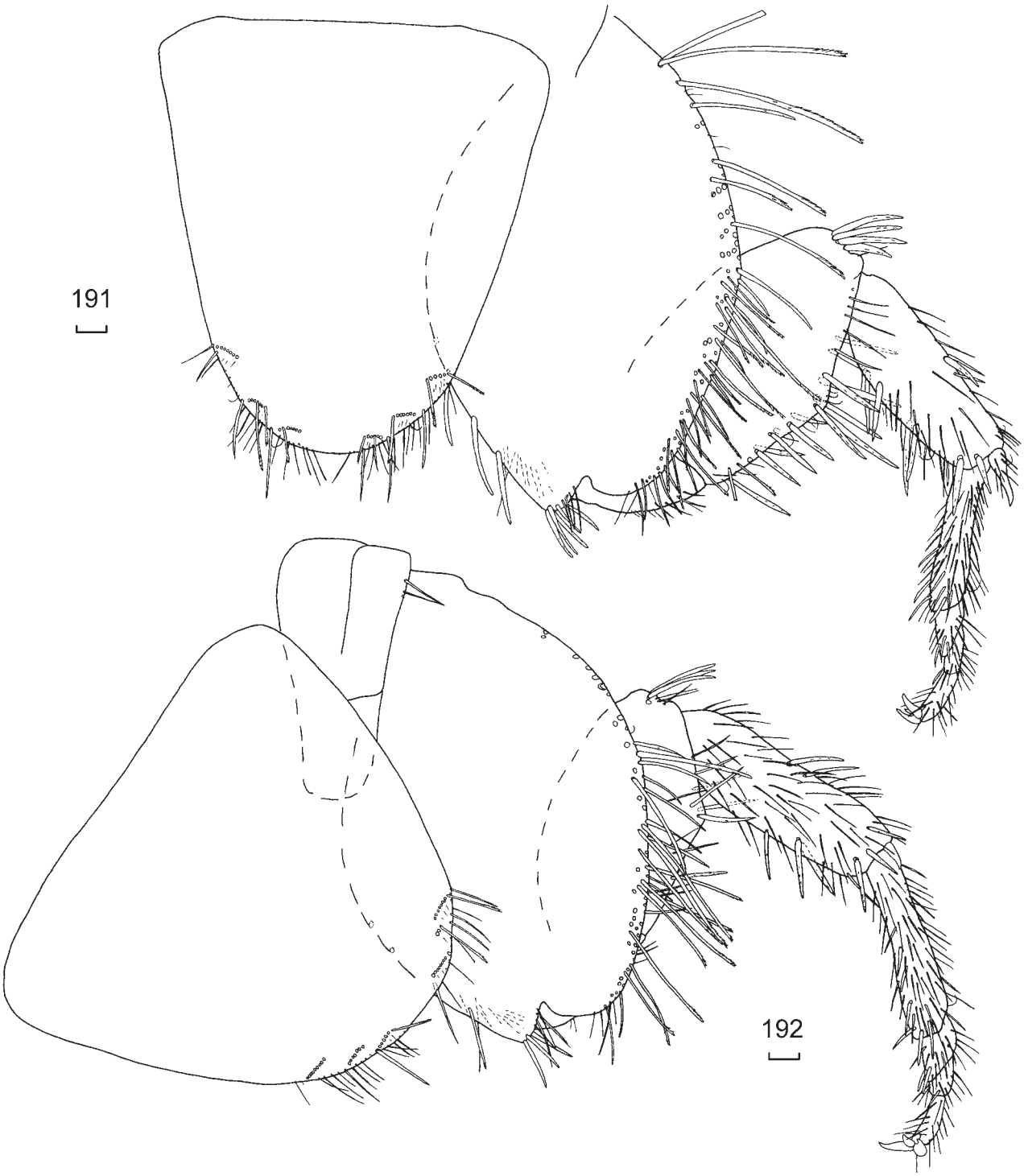
	urotergite			urosternite	
segment	lateral	sublateral	submedial	lateral	L gap/combs
I	5–6	—	—	—	—
II	6–7	4–5	5–7	—	—
III	7–8	4–5	6–7	19–22	2.9–3.1
IV	7–9	4–5	5–7	19–23	2.5–3.0
V	8–10	4–5	6–7	20–24	2.5–2.8
VI	9–10	4–5	5–7	19–22	2.2–2.6
VII	8–10	4–5	6–7	18–22	1.9–2.7
VIII	8–10	—	6–7	15–22	2.3
IX	—	—	—	—	—

and the margin and a cilium at each end, the macrochaetae are mostly lost but in several specimens (probably all) the most laterad or second most laterad is occupied by a long thin trichobothrium-like macrochaeta; these combs not widely spaced (gap between them 46–49% of total width of pronotum). — Mesonotum (Fig. 188) with lateral chaetotaxy similar to pronotum with ten combs of 1–4 macrochaetae, the anterior trichobothrial area located 0.57–0.61 along the lateral margin, associated with comb N-2 composed of one macrochaeta with the trichobothrium located between the macrochaeta and the margin, with a few setulae posterior to the comb and a cilium between the trichobothrium and the margin. Posterior trichobothrial area slightly more posterior than that on the pronotum (0.82–0.83) the trichobothrium located mediad to the comb usually of two macrochaetae and with 1–3 setulae or stronger setae posterior to the comb.— Metanotum (Fig. 189) similar to mesonotum with nine combs of 1–4 macrochaetae, the anterior trichobothrial area associated with comb N-1 of a single macrochaeta about 0.74 along the margin, the trichobothrium located between the margin and the macrochaeta, the posterior trichobothrial area associated with the most posterior comb (0.87–0.88 along the margin) of two macrochaetae.

Presternum narrow, with transverse row of spaced pectinate macrochaetae and setae, without numerous fine setulae below and between these macrochaetae (Fig. 190). — Prothoracic sternum (Fig. 190) parabolic, a little shorter than at its base (L/W 0.89–0.96) antero-lateral corners with about 10–15 simple marginal setae, posterior three quarters of lateral margins with fringe of setae and some cilia as well as 6–9 short combs on each side each composed of 2–9 pectinate macrochaetae, combs sometimes lying quite close to each other and lying in two overlapping rows, sometimes with a strong seta on the margin near the end of the comb but not counted in the number of macrochaetae per comb, these strong marginal or submarginal smooth macrochaetae also present distally and at irregular locations along the lateral margins. — Mesosternum (Fig. 191) only a little larger than prosternum (1.1–1.2 times as long) about as long as wide at its base (L/W 1.00–1.12) anterolateral corners glabrous, posterior third of margins with many long thin setae and 3+3 combs distally, each composed of 5–11 pectinate macrochaetae in a single row although sometimes the row is slightly irregular, all combs with several curved setulae beneath them, larger smooth tapered macrochaetae distally at or past the level of the two more distal combs. — Metasternum (Fig. 192) of similar length to prosternum except wider (L/W 0.81–0.87), apically rounded, with marginal setae and cilia along distal third of lateral margins and 3+3 (occasionally 2+3) combs of 3–10 pectinate macrochaetae.

Legs quite long, tibia L/W ratio of PI 2.6, PII 2.7–3.1, PIII 3.0–3.5; tarsi L/W ratio PI 7.6–7.7, PII range 8.0–8.4, PIII 10.6–11.0. PI (Fig. 190) with a comb of four pectinate and smooth macrochaetae laterally on the distal margin of the precoxa. Coxa with scales and a group of about 12–16 macrochaetae on the anterolateral corners usually arranged in 2–3 irregular rows, followed by a field of strong pectinate macrochaetae along the external margin about 2–4 macrochaetae wide, the margin with curved slightly pectinate macrochaetae, the macrochaetae behind the margin pectinate; inner margin with 4–6 lightly pectinate macrochaetae and several smooth and delicately pectinate setae of varying thickness distally over the articulation. Trochanter with several setae, some quite strong. Femur posteriorly with some long thin pectinate macrochaetae as well as ten carrot-shaped pectinate macrochaetae along the posterior margin and a line of smooth setae posteriorly, dorsal margin with at least three short curved pectinate macrochaetae over the articulation. Tibia of PI with five stout carrot-shaped strongly pectinate macrochaetae along the ventral margin as well as several longer thinner smooth setae and an additional carrot-shaped pectinate macrochaeta on the distal end rather than the normal strong setae; anterior margin with one pectinate macrochaeta and stronger setae near the distal margin, with usual tibial spur bearing a few setae. Tarsi with four articles, the basal article of PI about half the total length of the tarsus, its join with the next article not particularly oblique, the surface of all tarsal articles with numerous simple setae, those ventral near the distal end of the basal three articles more robust and with more rounded tips. Pretarsus with two long curved lateral claws and a shorter curved medial empodial claw. PII (Fig. 191) and PIII (Fig. 192) similar to PI except the antero-lateral groups of macrochaetae on the coxa absent; legs progressively longer from PI to PIII (L tibia PI/PIII 0.57–0.61, L tarsus PI/PIII 0.58–0.66 and the relative length of the basal tarsal article is progressively longer, being about 0.63 of the total length on PIII.

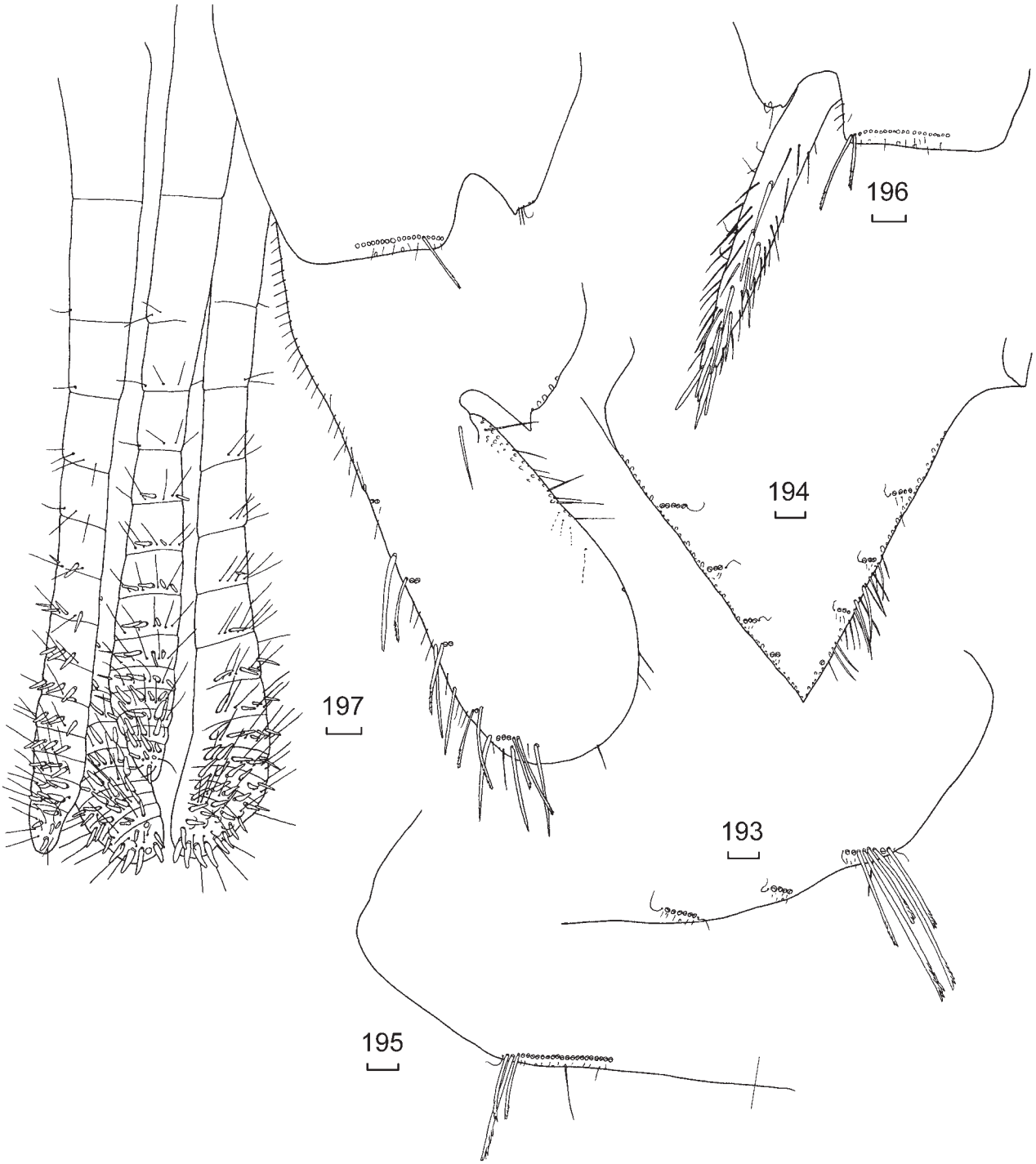
Abdomen: Urotergite I with 1+1 lateral combs of 5–6 macrochaetae each associated with a cilium at both ends, one marginal seta and some setulae between the comb and the margin, urotergites II–VII (Fig. 193) with 3+3 combs of macrochaetae as in Table 12; the lateral combs with two cilia as well as 1–3 small marginal setae and several



Figures 191–192. *Acrotelsella obscura* sp. nov. holotype ♀ *(191)* mesothoracic sternum and PII; *(192)* metathoracic sternum and PIII, NB spur of tibia not normally developed on this leg. Scale bars = 0.1 mm.

setulae, the sublateral combs with a cilium at the mediad end as well as 1–2 marginal setae and several setulae, the submedial combs with a cilium at the laterad end as well as 2–3 marginal setae and several setulae; urotergite VIII with 2+2 combs (lacking the sublateral) also with a cilium at each end of both combs with 1–3 marginal setae and some setulae; urotergite IX glabrous. — Urotergite X (Fig. 194) equilateral triangle (58–62°) in both sexes, wider at base than long (L/W 0.68–0.72) with many pectinate tapered setae along entire margin, and 4–5 combs of 1–5 macrochaetae per comb on each side as well as a few setulae posterior to each comb, most combs with a cilium at the mediad end.

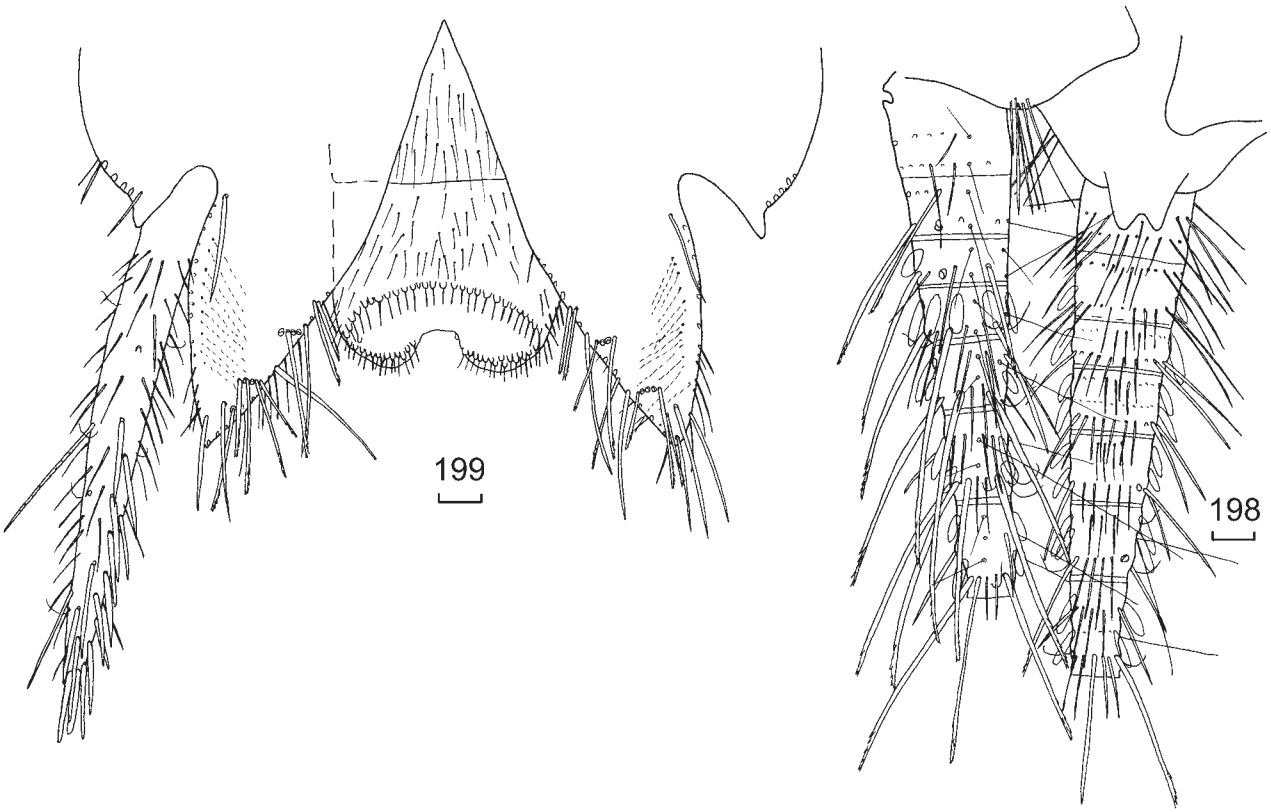
Urosternites I and II glabrous, urosternites III–VII with 1+1 lateral combs of 15–24 pectinate macrochaetae (Fig. 195) each with a few marginal setae and many setulae between the comb and the margin as well as a cilium at the laterad end. The distance between the lateral combs 1.9–3.1 times



Figures 193–197. *Acrotelsella obscura* sp. nov. holotype ♀ *(193)* right combs of urotergite VI; *(194)* urotergite X; *(195)* right side of urosternite V; *(196)* right coxite VIII; *(197)* left coxites VII and IX with ovipositor. Scale bars = 0.1 mm.

the average width of these combs, the ratio being largest on urosternite III and decreasing posteriorly.

Genital region of ♀ as in Figures 196 and 197. Two pairs of styli, those on IX long and slender with robust setae apically and along the length of the stylus, styli of VIII (Fig. 196) similar and not much smaller (0.8). Coxites VIII with long combs of 15–22 macrochaetae and just a few marginal setae and several setulae between the comb and the margin, the coxites with straight truncate posterior margin and a slightly obtuse angle (97–102°) with the inner margin, the corner being moderately rounded the curve occupying only ⅛ to ¼ the length of the posterior margin. Each coxite IX with long internal process which is very broad, being about 2.9–3.3 times longer than wide at its base and 5.3–6.4 times longer than the short pointed external process, however these inner processes are much wider along their length beyond the stylus insertion being 1.5 times wider at their widest point than at their base, the inner processes not quite



Figures 198–199. *Acrotelsella obscura* sp. nov. holotype ♀ unless otherwise indicated by specimen number *(198)* base of cerci and medial filament (K.541677); *(199)* coxites IX and penis of ♂ (T259430). Scale bars = 0.1 mm.

reaching the apex of the ovipositor and bearing 4–5 combs of 1–5 macrochaetae along the inner margin, outer process with a few stout setae along the outer margin; inner process with numerous, quite long, closely packed setae along the expanded outer margin adjacent to the stylus, a long smooth macrochaetae inserted mediad of the base of the stylus, the inner margin with 4–5 combs of 1–5 pectinate macrochaetae. Stylus IX with several long (half the length of the stylus) pectinate macrochaetae raised perpendicular to the style axis on the posterior face. — Ovipositor of secondary type 1.56 HW, only just surpassing the apex of the internal processes of coxites IX, both pairs of gonapophyses consisting of longer basal divisions becoming progressively shorter distally except for the last divisions which are about as long as the previous two together, 13–15 divisions in total; the apical ten divisions armed with modified spines or conules which become more numerous distally, the last divisions with 7–10 modified spines; all divisions also with short fine trichobothria-like setae.

Cerci (Fig. 198) first division with two incomplete rings of fine setae and trichobothria, second division with sub-basal semi ring of a few setae, those on the outside large, and a subapical ring of setae, trichobothrium and some pectinate macrochaeta externally; third and fourth divisions with two rings, the basal of trichobothria and scales the subapical of trichobothria, setae and macrochaetae; fifth and sixth intervals with sub-basal ring of setae, trichobothria and scales, a medial ring of scales and a small trichobothrium, the subapical ring of macrochaetae, setae, and cilia; seventh division with four rings, the basal and penultimate with trichobothria and scales, the second of setae and trichobothria and the ultimate as in the previous division. — Median dorsal appendage (Fig. 198), first division with three rings of fine setae, following division with a basal ring of fine setae a medial ring of scales and a subdistal ring of fine setae, those on the outer sides longer; third division with two rings the basal of small setae and scales, the subdistal similar to the previous; divisions 4–6 with three rings, the basal and penultimate of scales and trichobothria, the second of setae and smaller macrochaetae, the subapical as in the previous division.

Male: Similar to female except urosternite VIII entire with posterior margin between the combs very slightly concave, almost straight. Coxites IX in ♂ separated (Fig. 199) with internal process broad and shorter than that of the female being only 1.4–1.5 times longer than wide at its base and 2.4–3.3 times longer than the short pointed external process, the inner processes not quite reaching to half the length of the stylus; outer process with stout setae along the outer margin; inner process with setae along both margins, and four submarginal combs of 1–5 macrochaetae along the inner margin, as well as a long smooth macrochaetae inserted mediad of the base of the stylus. Penis typical with numerous glandular setae apically, each set on a protuberance. Parameres absent.

Habitat. This species was collected in dry leaf litter.

Etymology. The species is named *obscura* from a Latin word for dark to reflect the sudden darkening of the cuticle that occurs as soon as the specimens are dropped into alcohol.

Discussion

Smith *et al.* (2019) examined genetic variability for several populations of silverfish of the subfamily Heterolepismatinae, finding that differences in base pairs of 0.9–1.8% in the case of 28S and 7.2% for COI appear to be the lowest levels associated with consistent morphological differences considered indicative of species. However, in other work on silverfish of the subfamily Ctenolepismatinae (Smith & Mitchell, 2021, 2022), consistent morphological differences could be found between species with identical 28S sequences and only 5.2% difference in COI. Within species variation of COI ranged between 2.3 and 10.7%. In this work we faced similar challenges. Molecular data identified at least four distinct clades among species with trapezoidal thoracic sternites (*A. quattuor* sp. nov., *A. lauraensis* sp. nov., *A. arboricola* sp. nov. and *A. marginata* sp. nov.) which were separated from each other by 5.6–13.0% difference in COI and within species variation of 1.7–2.7%. They were collected from areas separated by 75 to 800 km. Morphological characters found to support these clades as distinct species included the presence of four versus five labial palp papillae, the presence of a strong pigment band on the pedicel and the presence of distinct annulations on the terminal filaments. Based on morphology alone, without the ability to reliably sort the specimens using molecular data, the first author would have treated such subtle characters as representing intraspecific variation. It is likely that the variability accepted by earlier workers as "usual" may in fact be indicative of species level differences that could be defined once molecular techniques become widely used.

Smith & Mitchell (2022) discussed the variability of various characters. We have not changed our opinion on these characters and have further developed the use of gap spacing on the urosternites to separate populations of species. We have also added an additional dimension to the definition of the inner processes of coxites IX, so that rather than just considering the ratio of length to width at the base where the width is measured at the level of the stylus insertion, the width halfway along the process relative to the width at the base should also be considered because in some species (e.g., *A. obscura* sp. nov.) the process is significantly expanded on the outer margin compared to other species where the sides are subparallel.

The molecular and morphological data continue to support the concept that *Acrotelsella* should be split into two genera with the type species *A. producta* (Escherich, 1905) being included in the genus having simple ovipositors and greatly elongated inner processes of coxites IX in the female which lack transverse combs (although these are occasionally seen in some males on *A. auricoronata*) and lacking scales on the pedicella of the antennae.

The second genus would include those species with secondary ovipositors, scaled pedicella, and shorter inner processes of coxites IX in the female which almost always have transverse combs. This clade would include all *Hemitelsella* species. This clear separation is, however, clouded by *Qantelsella* (see below) as well as *Acrotelsella escherichi* Womersley, 1939 which is described as having both elongated inner processes on coxites IX and a secondary type ovipositor. We are also aware of several Western Australian species with some quite striking morphology that should be further studied before this clade can be adequately defined. Additional molecular studies are underway using several genes, which should assist in making these fundamental decisions.

The genus *Qantelsella*, whose species only have 2+2 combs on urotergites III–VII (versus 3+3), does not currently fit well within either clade based on morphology. It possesses a simple primary type ovipositor but the inner processes of coxites IX are not elongated and lack transverse combs and only one of the three described species is reported to have scales on the pedicel. However, the molecular data on just a single specimen places *Qantelsella* within the second clade in conflict with the arrangement proposed by morphology. More molecular data, including additional *Qantelsella* species may help clarify the position of this genus.

We have again chosen not to split the genus *Acrotelsella* until further species have been described from a wider range of geographical areas, including species from outside Australia. A picture is emerging of the characters which can be used to separate Australian species of *Acrotelsella sensu stricto* which has *A. producta* (Escherich, 1905) as the type species but which is in need of redescription. These include a primary-type ovipositor, elongated inner processes of coxites IX in the female which lack transverse combs (although small combs have been seen on some males of *A. parlevar*), rounded posterior margins of coxites VIII in the females (versus mostly distinctly straight), the presence of five or fewer papillae on the labial palps (versus seven or more, rarely five), the absence of scales on the pedicel (but also absent in some *Hemitelsella* and *Qantelsella*), and metasternum usually with 1+1 combs (rarely 1+2, 2+2 or 2+3) versus mostly 3+3, 3+4 or 4+4 combs (rarely 2+2 combs). As mentioned in the introduction, the position of *A. escherichi* from the Yorke Peninsula in South Australia needs to be considered due to it being described as having both elongated inner processes on coxites IX but a secondary type ovipositor.

Among species of *Acrotelsella sensu stricto* a few distinct morphological clades can be identified, at least among the species studied from eastern Australia. The first clade contains species with distinctly trapezoidal sternal plates (*A. auricoronata*, *A. quattuor* sp. nov., *A. lauraensis* sp. nov., *A. marginata* sp. nov. and *A. arboricola* sp. nov.) and is generally, but not always, collected from the bark of trees, however the molecular data places *A. auricoronata* closer to the second clade. This second clade contains species collected from the bark of trees with parabolic thoracic sternal plates with simple linear combs and five labial palp papillae, (*A tanni*, *A. thommoi*). A further clade contains species that also have parabolic sternal plates but on which only some combs may be somewhat irregularly aligned, and with three labial palp papillae, generally collected in accumulations of leaf litter on the ground (*A. parlevar* Smith, 2016 and *A. petra* sp. nov.). *Acrotelsella erniei*, in spite of the unusual presence of medial urosternal combs, corresponds most closely with species in the *A. tanni*, *A. thommoi* group in both morphology and genetics.

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