

REDESCRIPTIONS OF *ASPHALIDESMUS* LEAE SILVESTRI, 1910 AND *A. PARVUS* (CHAMBERLIN, 1920) COMB. NOV. FROM TASMANIA, AUSTRALIA (DIPLOPODA: POLYDESMIDA: HAPLODESMIDAE)

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**Abstract**

Mesibov, R., 2002. Redescriptions of *Asphalidesmus leae* Silvestri, 1910 and *A. parvus* (Chamberlin, 1920) comb. nov. from Tasmania, Australia (Diplopoda: Polydesmida: Haplodesmidae). *Memoirs of Museum Victoria* 59(2): 531–540.

*Atopodesmus* Chamberlin, 1920 is synonymised with *Asphalidesmus* Silvestri, 1910. *Asphalidesmus leae* Silvestri, 1910 and *A. parvus* (Chamberlin, 1920) comb. nov. are redescribed from abundant, recently collected material. The two millipede species appear to be endemic to Tasmania but have widely separated ranges.

**Introduction**

Early last century, Filippo Silvestri and Ralph Chamberlin independently described small Tasmanian polydesmoid millipedes with dense metatergal tuberculation and laterally expanded paranota on the second tergites. Each man established a monotypic genus for the material he examined: *Asphalidesmus* Silvestri, 1910 for a male specimen and *Atopodesmus* Chamberlin, 1920 for two females. Neither Silvestri nor Chamberlin assigned his genus to a family and the correct taxonomic placement of *Asphalidesmus* and *Atopodesmus* has long been a myriapodological puzzle.

Attems (1926) and Verhoeff (1932) placed *Asphalidesmus* in Fontariidae Attems, 1926, but Attems (1940) later regarded *Asphalidesmus* as a genus of uncertain status within Vanhoeffeniidae Attems, 1914.

Verhoeff (1932) ignored *Atopodesmus* entirely because it had been described in a work (Chamberlin, 1920) which lacked illustrations and was therefore unscientific: ‘...diese Arbeit [kann] weder berücksichtigt werden noch überhaupt als wissenschaftlich gelten’ (Verhoeff, 1932: 1981). Attems (1926) at first placed *Atopodesmus* in Cryptodesmidae Karsch, 1879, but later considered it an uncertain genus within Oniscodesmidae de Saussure, 1860 (Attems, 1940).

Hoffman (1980) included *Atopodesmus* in his list of Polydesmidea of uncertain status and

family position. He placed *Asphalidesmus* in Dalodesmidae Cook, 1896, noting that the genus ‘certainly appears to be a senior synonym of *Tasmaniosoma* [a Tasmanian dalodesmid], but the probability should be confirmed by the study of actual material, to include type material of *Atopodesmus* and *Lissodesmus* [another Tasmanian dalodesmid], of which the gonopod structure is still unknown’ (Hoffman, 1980: 150).

Jeekel (1984) argued that neither *Asphalidesmus* nor *Atopodesmus* were likely to be dalodesmids. Silvestri’s description of an *Asphalidesmus* male lacked mention of the sphaerotrichomes characteristic of Dalodesmidae, and *Atopodesmus* seemed to be very similar to *Asphalidesmus* in nonsexual characters. Both genera seemed to Jeekel to resemble the South African *Phygoxerotes* Verhoeff, 1939 and *Vaalogonopus* Verhoeff, 1940, suggesting that the Tasmanian genera might be referable to Vaalogonopodidae Verhoeff, 1940. After further discussion of similar polydesmoids, including the monotypic *Atopogonus* Carl, 1926 from New Caledonia, Jeekel (1984) reduced Vaalogonopodidae to Vaalogonopodinae and Atopogonidae Verhoeff, 1941 to Atopogoninae. He placed the two new subfamilies in Haplodesmidae Cook, 1895, where they joined Haplodesminae, Helodesminae and Prosopodesminae, which had been established by Hoffman (1980) from Haplodesmidae, *Helodesmus* Cook, 1896 and *Prosopodesmus* Silvestri, 1910, respectively.

Jeekel (1984) concluded by accepting the two Tasmanian genera as haplodesmids, but without subfamily placement.

The following year, Jeekel (1985) published a key to families and non-paradoxosomatid genera of eastern Australian Polydesmida. According to the key, the non-sexual characters reported for *Asphalidesmus* and *Atopodesmus* would place these genera in Haplodesmidae. However, the only eastern Australian genus referred to this family in Jeekel's key is *Agathodesmus* Silvestri, 1910, based on *Agathodesmus steeli* Silvestri, 1910 from New South Wales. *Agathodesmus* had not been placed in a family by Attems (1940) and had been assigned to Dalodesmidae by Hoffman (1980).

In a later paper, Jeekel (1986) referred to his earlier discussions of Australian Haplodesmidae and noted that 'In the meantime, Dr P. M. Johns, Christchurch, New Zealand (pers. comm.) assured me that in his opinion *Asphalidesmus* Silvestri is a member of the family Dalodesmidae rather than a haplodesmid. This leaves only *Atopodesmus* Chamberlin and *Agathodesmus* Silvestri as potential Australian Haplodesmidae. Unfortunately, the male characters of these two genera are unknown, so that as yet no certainty can be obtained' (Jeekel, 1986: 46). Jeekel (1986: 35) went on to describe a new haplodesmid species from Queensland, *Atopogonus bucculentus*, characterising its collection in 1981 as 'the first unquestionable record of the group from Australia.'

In this paper I redescribe *Asphalidesmus leae* Silvestri, 1910 and *Atopodesmus parvus* Chamberlin, 1920. The two species have widely separated ranges in Tasmania but are locally abundant, and my descriptions are based on examination of more than 500 specimens deposited in the Queen Victoria Museum, Launceston, Australia. I do not consider that there are sufficient differences in gonopod structure and non-sexual details to maintain separate genera for these Tasmanian forms, and I therefore reduce *Atopodesmus* to a synonym of the older *Asphalidesmus*, which I redefine below.

Haplodesmidae seem to have become a 'temporary storage area' for genera of small polydesmoids with dense metatergal tuberculation and lateral expansion of the collum or the paranota of the second tergite. Until more information becomes available about species in this group, it seems wisest to accept Jeekel's 1984 placement of *Asphalidesmus* in Haplodesmidae without assignment to a subfamily.

Haplodesmids are widespread in Australia and probably species-diverse (Black, 1997). At least one other Tasmanian species is in the Queen Victoria Museum collection, known from two female specimens from King Island; this elusive species will be described when mature males are collected.

Specimens listed under *Material examined* were killed and preserved in 75–80% ethanol. Preliminary drawings on graph paper were made using material cleared in 60% lactic acid and viewed at 100 or 200 × magnification through an eyepiece graticule. A Philips Electroscan ESEM 2020 operated in high-vacuum mode was used to examine preserved material which had been air-dried before sputter-coating with gold. SEM images were acquired digitally.

*Note on spatial data.* Universal Transverse Mercator (UTM) grid references are the spatial locators used by most field workers to define collecting localities in Tasmania. Collecting sites for all but a few of the specimens listed under *Material examined* (online at [www.museum.vic.gov.au/memoirs/index.html](http://www.museum.vic.gov.au/memoirs/index.html)) were estimated in the field to be within particular 100 m UTM grid squares on 1:25000 scale maps published by the State of Tasmania. The maximum horizontal error in these estimates is likely to be less than 100 m. Latitude/longitude equivalents given were calculated using GeoCalc 4.20 (GeoComp Systems, Blackburn, Victoria) and are not as precise as the UTM grid references.

*Abbreviations.* MCZ, Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA; QVM, Queen Victoria Museum and Art Gallery, Launceston, Tasmania, Australia.

## Order Polydesmida Leach, 1815

### Suborder Polydesmidea Leach, 1815

#### Haplodesmidae Cook, 1895

##### *Asphalidesmus* Silvestri

*Asphalidesmus* Silvestri, 1910: 362.—Attems, 1926: 153.—Verhoeff, 1932: 1587.—Verhoeff, 1936: 2.—Attems, 1940: 205.—Jeekel, 1971: 313.—Hoffman, 1980: 150, 184.—Jeekel, 1984: 85.

*Atopodesmus* Chamberlin, 1920: 153.—Attems, 1926: 134.—Attems, 1940: 356.—Jeekel, 1971: 313.—Hoffman, 1980: 150, 186.—Jeekel, 1984: 85 (type species: *Atopodesmus parvus* Chamberlin, 1920 by original designation). (syn. nov.).

*Type species.* *Asphalidesmus leae* Silvestri, 1910, by original designation.

*Included species.* *A. leae*, *A. parvus* (Chamberlin, 1920) comb. nov.

*Description.* General appearance. Head plus 19 somites (fig. 1) in both sexes. Mature males 5–6 mm long, 0.7–0.9 mm in overall midbody width; mature females very slightly larger. Immature and some mature individuals completely unpigmented, appearing white to naked eye. Most mature (stadium VII) individuals pale yellow-brown on collum, metatergites and preanal ring, deepening to brown towards waist and bases of paranota, remainder of body very pale yellow, whole animal appearing yellow-brown to naked eye. Most mature individuals, but no immatures, encrusted with minute soil particles (see *Remarks*).

Head with granulated vertex to level of antennal sockets, otherwise smooth (fig 2), vertigial sulcus short and weakly impressed. Antennae short with stout antennomeres, sixth being longest and widest (fig. 2).

Collum almost entirely concealing head when extended animal is viewed from above, strongly convex and fitting head like a cap (fig. 2). Collum, metatergites and preanal ring with transverse rows of numerous, uniform tubercles (figs 4, 6, 8) on roughened cuticular surface, each tubercle bearing short, curved seta with a flared tip (fig. 4). Midbody tergites of mature individuals typically with 5–6 rows of tubercles.

Somites each with clearly defined prozonite and metazonite and with paranota based low on sides (fig. 3). Podous segments diminishing only slightly in width from anterior to posterior. Prozonite surface faintly reticulated, caudal margin of metazonite continuously fringed with minute teeth, each with tip bent away from body at a right angle (figs 3, 4, 6, 8).

Paranota of segment 2 expanded, extending forward to partly cover collum and backward to lie under the anterior edge of the paranota of segment 3, margin divided into 7–9 seta-bearing lobes (fig. 2). Remaining paranota (figs 6, 8) more or less uniform in size, those of segment 18 substantially smaller. Each paranotum flexed slightly downward (fig. 3), the posterior edge lower than the anterior edge. Anterolateral border of paranotum roughly arc-shaped with series of 3–4 indistinctly defined seta-bearing lobes, posterior border more or less at right angles to body with flat, round-bordered outgrowth, here called a *paranotal tag*, close to body (figs 6, 8). On most segments few seta-bearing tubercles similar to those on metatergite can be noted on inflated basal portion of paranotum.

Ozopores on segments 5, 7, 9, 10, 12, 13, 15–17, above and distal to centre of base of paranotum (figs 6, 8), each ozopore opening within short, column-like structure with well-defined, circular, upper rim (fig. 5).

Legs short (fig. 2), the tarsus being longest podomere. Setation normal (no sphaerotrichomes). Male leg podomeres somewhat inflated relative to those on female legs, male postfemur and tibia proportionally longer than those of female.

Telson with preanal ring completely covering anal valves as viewed from above, valves opening ventrally. Few macrosetae at apex of epiproct, 2+2 macrosetae at anal valves, 2 long macrosetae on hypoproct.

Male with ovoid gonopod aperture, posterior margin slightly raised (fig. 2). Gonopods in situ with coxae entirely contained within cavity, telopodites reaching to anterior leg-pair of segment 5 (fig. 2). Gonopod coxae short, tapering towards distal end, lightly joined (not fused) medially. Telopodite slender, setiferous on posterolateral surface from base to half to two-thirds of length, then splitting into 2 branches: anteriorly directed process which bends caudad, and posteriorly directed process bearing end of prostatic groove (figs 7, 9). Female with narrow, inconspicuous epigynal slit; cyphopods not examined. Juveniles very similar to adults in general appearance and details of tuberculation, but with less prominent paranota.

*Distribution and ecology.* *Asphalidesmus* spp. are so far known only from two widely separated areas in Tasmania (fig. 10). Within their respective ranges, *A. leae* and *A. parvus* occur on a variety of bedrocks and landforms in areas with annual rainfall from c. 650 to 2000 mm (winter maximum). Both species, however, are restricted to eucalypt forest and *Nothofagus* rainforest, within which they are found in and under wet rotting wood and in moist accumulations of leaf litter. *Asphalidesmus* spp. are gregarious and typically occur in multi-aged groups of 10–50 individuals spread over c. 0.1 m<sup>2</sup>. They are exceptionally slow-moving millipedes. When disturbed they neither enroll, curl, walk quickly away nor readily release their grip on the substrate. Mating pairs are found throughout the year, although so far only one sample (*A. parvus*, QVM 23:8360) contains a pair preserved in copula.

*Remarks.* The differences between the gonopods of the two known *Asphalidesmus* species are large in comparison to those within many

better-known polydesmoid genera. On the other hand, the two species are virtually identical in nonsexual morphology, share some striking synapomorphies and are both apparently endemic to Tasmania. Thus the gonopod differences are likely to have evolved within a single lineage. The Chamberlin name *Atopodesmus* remains available if molecular studies of *Asphalidesmus* and new studies of related Australian polydesmoids justify the (re)placement of the Tasmanian species in separate genera.

It is remarkable that body colouring and encrusting soil matter are invariably absent in immature stadia of *Asphalidesmus* and almost always present in mature individuals, despite the fact that matures and immatures live side by side in the same microhabitats. Is there a cuticular change in stadium VII which allows *Asphalidesmus* to adsorb coloring matter from soil and decorate itself with particles?

#### *Asphalidesmus leae* Silvestri

Figures 1–4, 6, 7, 10

*Asphalidesmus leae* Silvestri, 1910: 362, fig. 8.—Attems, 1940: 205.—Jeekel, 1971: 313.—Jeekel, 1984: 85.

*Holotype*. Mature male, ‘Hobart (Tasmania, A. Lea legit)’ (Silvestri, 1920: 362), possibly in the Silvestri type collection in Portici, not examined.

*Material examined*. 166 specimens in QVMAG from 80 unique localities (Fig. 10) in northern Tasmania: Alarm River, Allen Creek, Arthur River, Big Creek, Bishops Creek, Black River, Blackfish Creek, Bonneys Tier, Borradale Creek, Brampton Creek, Cam River, Camp Creek, Chasm Creek, Christmas Hills, Crayfish Creek, Detention Falls, Devils Gate, Dial Creek, Dynans Bridge, East Gawler River, East Ridgley, Flowerdale River, Frankland River, Gawler River, Gog Range, Harris Creek, Hebe River, Holwell Gorge, Inglis River, Julius River, Keddies Creek, Kelcey Tier, Kenzies Hill, Langford Creek, Lawson Plains, Lebrina, Library Creek, Little Claytons Rivulet, Little Donaldson River, Lobster Rivulet, Lone Star, Long Hill, Loyetea Peak, Lunta Tier, Meryanna, Meunna Hills, Montagu Swamp, Mt Arthur, Mt Riana, Palooa Dam, Peegra Road, Pioneer Link, Punched Terror, Retreat, Roger River West, Salmon River, Saxons Creek, Sideling Range, Sisters Creek, Somerset, The Clump, Trowutta Caves, Venns Creek, Wyena, York Town Rivulet. For full details of localities, dates, collectors, specimens and registration numbers, see the online list at [www.museum.vic.gov.au/memoirs/index.html](http://www.museum.vic.gov.au/memoirs/index.html), or contact the author.

*Diagnosis*. Differs from *A. parvus* as follows: (a) anterior process of gonopod telopodite slender, terminating at or below the level of the posterior process in a short, caudally directed hook; (b) paranotal tabs weakly produced or not apparent, no more prominent than lobes on anterolateral border of paranota (late stadium males and females).

*Description*. Paranotal tabs weakly produced (fig. 6) and not apparent on most paranota. Gonopod (figs 2, 7) with telopodite divided at about two-thirds its length into anterior and posterior processes. Basal portion of the telopodite fairly straight, tapering mesally, with short, stout setae on the posterior and posterolateral faces, the setiferous area terminating just proximal to the telopodite branching point. Posterior process directed slightly caudad and laterad, thinning to spatulate structure, concave mesally with coarsely toothed terminus, small uncus arising just proximal to concavity at about one-quarter length of branch. Prostatic groove running along anterior face of telopodite, curving caudad and mesad to terminate in flattened solenomerite arising within branch concavity, solenomerite bending laterad and cephalad and almost extending to level of branch terminus. Anterior process of telopodite slender, bending sharply caudad at about one-third its length, tapering and terminating in caudally pointed hook at about level of tip of solenomerite.

*Distribution*. *Asphalidesmus leae* occurs from near sea level to c. 750 m in northern and northwestern Tasmania (fig. 10). Within its range of c. 8000 km<sup>2</sup> *A. leae* seems to prefer wet forest habitats. (See also the discussion of *Asphalidesmus* distribution and ecology.)

*Remarks*. Remarkably little morphological variation has been noted in *A. leae*. Gonopods of males collected 200 km apart, at opposite ends of the *A. leae* range, appear identical.

My identification of the QVM material with *A. leae* is based on Silvestri’s text description and gonopod drawing (fig. 7A). However, Silvestri gives the type locality as Hobart, which is clearly wrong (fig. 10). The collector, Arthur Lea, was Government Entomologist of Tasmania beginning in 1899 (Marks, 1991: 207). Although Lea was based in Hobart, he was an active field naturalist and presumably collected *A. leae* on a trip to the north of the island sometime between 1899 and 1910. It is unclear how the confusion in type locality arose.

*Asphalidesmus parvus* (Chamberlin) comb. nov.

Figures 1, 2, 5, 8–10

*Atopodesmus parvus* Chamberlin, 1920: 154.—Attems, 1940: 357.—Jeekel, 1971: 313.—Jeekel, 1984: 85.

*Holotype.* mature female, 'Tasmania (G.H. Hardy)' (Chamberlin, 1920, p. 154), MCZ, no. 4648. Paratype: immature female, collection details as for holotype, MCZ, no. 4649.

*Other material examined:* 398 specimens in QVMAG from 83 unique localities in south-eastern Tasmania: Anglers Creek, Baldy Creek, Bellettes Creek, Big Sassy Creek, Black Hill, Blind Creek (Maria Island), Blue Gum Spur, Browns Creek, Chauncy Vale, Counsel Creek (Maria Island), Douglas Creek, Entrance Cave, Espies Craig, Flash Tier, Four Mile Creek (Maria Island), Huon River (Arve Road), Huon River (Edwards Road), Huon River (Manuka Road), Lake Sydney, Lenah Valley, Macgregor Peak, Maclaines Creek, Mitchelmores Creek, Mother Browns Bonnet, Mt Hobbs, Mt Maria (Maria Island), Mt Misery, Mt Ponsonby, Mt Rumney, Mt Tobin (Bruny Island), Mystery Creek Cave track, Ned Ryans Creek (Maria Island), Nugent, Old Farm Road, Organ Pipes (Mt Wellington), Paradise Gorge, Pendulum Palace (cave PB-12, Precipitous Bluff), Phipps Creek, Pine Hut Creek (Maria Island), Pirates Road, Ravens Hill, Robinsons Creek (Maria Island), Sand River, Sandspit River, Sassafras Hill, Silver Hill Road, Stormlea, Strathblane, Tahune Bridge, Three Thumbs, Tiger Creek, Tinderbox, Tobys Hill, Tooms White Gum Reserve, Waterfall Creek, Wilsons Ridge, Woodsdale, Yarlington Tier. For full details of localities, dates, collectors, specimens and registration numbers, see the online list at [www.museum.vic.gov.au/memoirs/index.html](http://www.museum.vic.gov.au/memoirs/index.html), or contact the author.

*Diagnosis.* Differs from *A. leae* as follows: (a) anterior process of gonopod telopodite robust, at least twice as long as posterior process, terminating in a long, flattened, caudally directed structure usually with 10–12 coarse teeth; (b) paranotal tabs strongly produced in late stadium males and females, clearly larger and more distinct than lobes on anterolateral border of paranota.

*Description.* Paranotal tabs large and apparent on most paranota (fig. 8). Gonopod (figs 2, 9) with telopodite divided at just over half its length into anterior and posterior processes. The basal portion of the telopodite fairly straight, slender, tapering mesally, with short, stout setae on posterior and posterolateral faces, setiferous area terminating just proximal to telopodite branching point. Posterior process directed slightly caudad and divided into lateral and mesal branches. Lateral subbranch in turn divided into distal solenomerite and proximal process which bends

laterad, bears minute teeth and reaches about half length of solenomerite. Mesal subbranch short, stout, erect, terminating at level of posterior process on lateral subbranch. Prostatic groove running near anteromesal face of telopodite, barely curved, terminating near tip of slightly flattened solenomerite. Anterior process of telopodite a large, anteroposteriorly flattened structure, bending sharply caudad at about two-thirds its length and tapering into laterally flattened comb bearing c. 10–12 coarse teeth pointed towards posterior process. From telopodite branch point, anterior process extending just over twice distance reached by the solenomerite.

*Distribution.* *A. parvus* ranges over c. 8000 km<sup>2</sup> in southern and south-eastern Tasmania, including Bruny and Maria Is (fig. 10). It is common in wet forest and in wet places (flowlines, south-facing slopes) in dry forest. On the Tasmanian mainland *A. parvus* occurs from near sea level to c. 950 m (on Mt Wellington, near Hobart). *A. parvus* has also been collected in limestone caves in far southern Tasmania, where it is likely to be a troglophile or accidental. (See also the discussion of *Asphalidesmus* distribution and ecology.)

*Remarks.* The original description of *A. parvus* includes the line 'Caudal margin of most keels with a single large conical tooth close to the base' (Chamberlin, 1920: 154). A large paranotal tab is apparent on segments 7–15 of the holotype and segments 5–15 of the paratype, distinguishing these specimens as *A. parvus* rather than *A. leae*.

Like *A. leae*, *A. parvus* varies very little across its range, but in males from three sites on Forestier Peninsula (QVM 23:41551, QVM 23:8324 and QVM 23:41528) and one on Tasman Peninsula (QVM 23:8325) the teeth on the anterior process of the gonopod are reduced or absent. The gonopodal teeth appear normal on a male from a nearby 'non-peninsular' site (QVM 23:8327). The two peninsulas are already recognised as a biogeographical subregion of Tasmania for the presence of a locally endemic snail and millipede, and the apparent absence of at least two other terrestrial invertebrates (Mesibov, 1996).

The type locality of *A. parvus* (Tasmania) unfortunately remains inexact. However, the collecting date can be roughly bracketed in time. G.H. Hardy worked in Western Australia before serving as Assistant Curator of the Tasmanian Museum in Hobart from 1913 to 1917, after which he studied at the University of Sydney (Marks, 1991: 216). The Annual Report of the

Director of the Museum of Comparative Zoology at Harvard College to the President and Fellows of Harvard College for 1914–1915 records (p. 31) that material had been received by the MCZ during the year from ‘E.H. Hardy’ (sic.). Ralph Chamberlin, who at the time was Curator of Arachnids, Myriopods (sic.) and Worms at the MCZ, described 14 Tasmanian myriapod species from Hardy collections (Chamberlin, 1920) and gives a collecting date ‘February 1915’ for one of these, the millipede *Notodesmus scotius*. Finally, a possibly original label with the *Lissodesmus modestus* type (no. 4644) says ‘Jan 1915 Russell Falls’. It thus seems likely that Hardy collected *A. parvus* in the period from 1913 to the austral summer of 1914–1915.

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I thank Dr David Steele, University of Tasmania, for taking SEMs of *Asphalidesmus* specimens. At the MCZ in October 2000, Dr Gonzalo Giribet generously provided working space for an examination of Chamberlin types, and Special Collections Librarian Dana Fisher kindly found documents for me from the Chamberlin era. For recent *A. parvus* collections I thank Kevin Bonham, a malacologist with a good eye for tiny millipedes. Finally, I am very grateful to Mark Harvey, Rowland Shelley and an anonymous referee for constructive comments on a draft of this paper.

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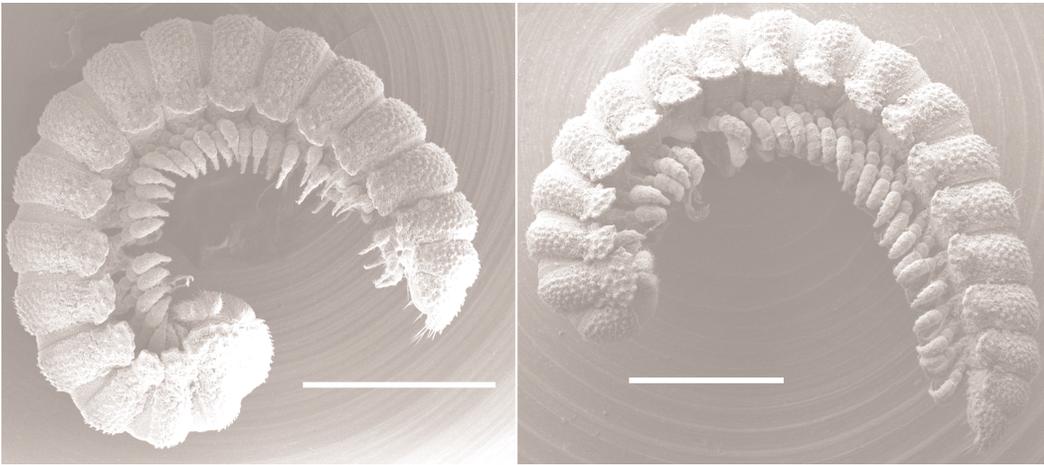


Figure 1. Whole-animal views of mature male *A. leae* (left; QVM 23:8371) and *A. parvus* (right; QVM 23:8389). Scale bars = 1 mm.

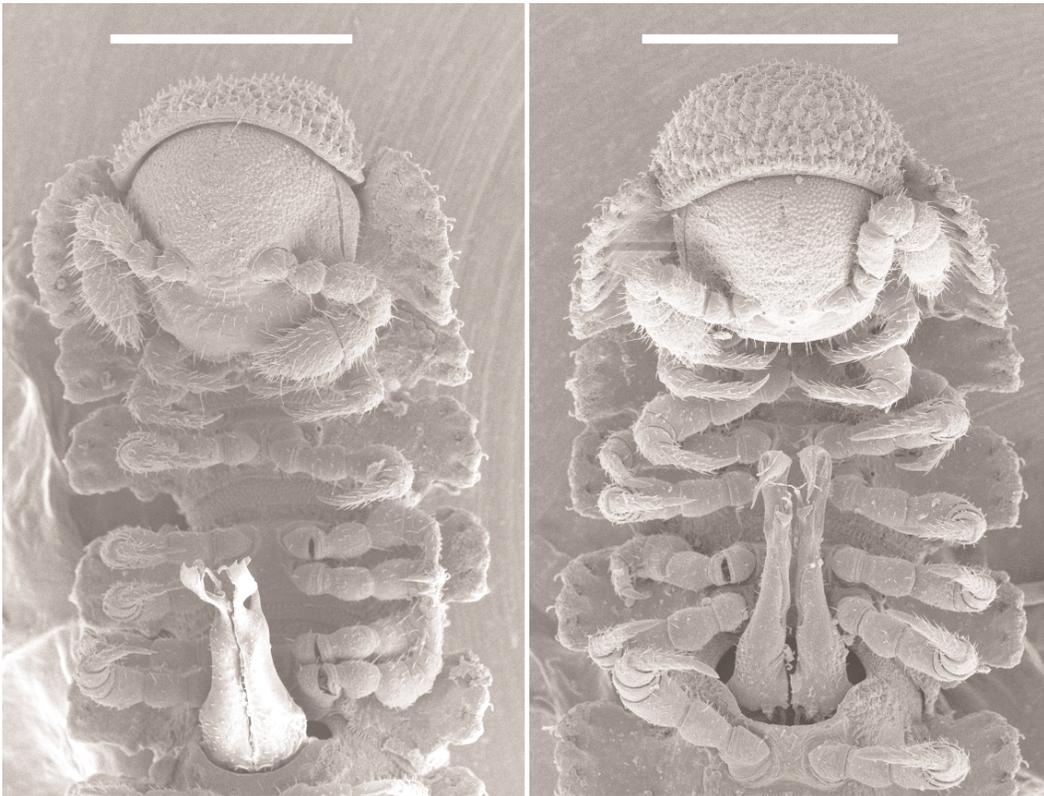


Figure 2. Ventral views of anterior segments of mature male *A. leae* (left; QVM 23:8322) and *A. parvus* (right; QVM 23:8360). Scale bars = 0.5 mm.

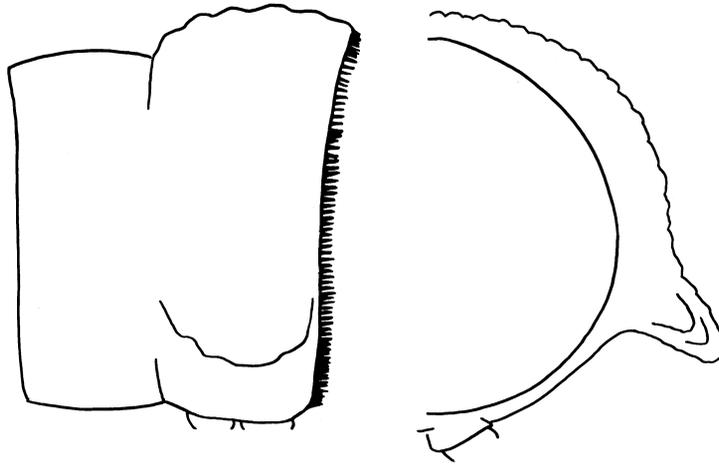


Figure 3. Outline drawings of left profile (left) and anterior half-section (right) of segment 8 of mature female *A. leae* (QVM 23:8381).

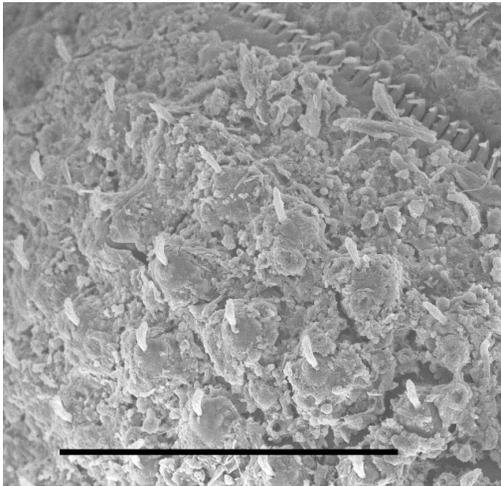


Figure 4. Rear portion of midbody tergite of mature male *A. leae* (QVM 23:8371); anterior is to lower left. Scale bar = 150  $\mu\text{m}$ .

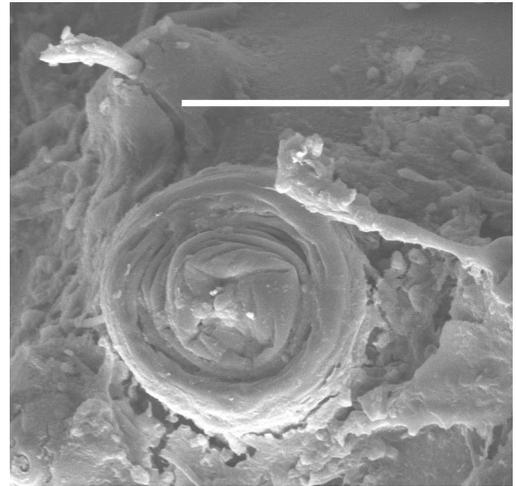


Figure 5. Ozopore on segment 9 of mature male *A. parvus* (QVM 23:8389). Scale bar = 50  $\mu\text{m}$ .

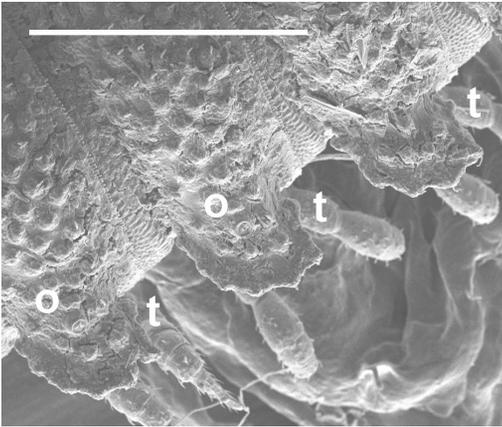


Figure 6. Paranota of segments 9–11 of mature female *A. leae* (QVM 23:41535) showing paranotal tabs (t) and ozopores (o). Scale bar = 0.5 mm.

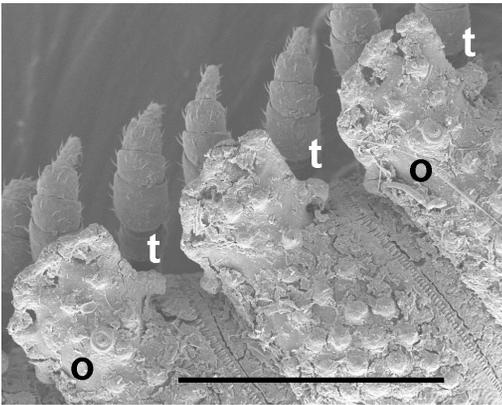


Figure 8. Paranota of segments 10–12 of mature female *A. parvus* (QVM 23:8389) showing paranotal tabs (t) and ozopores (o). Scale bar = 0.5 mm.

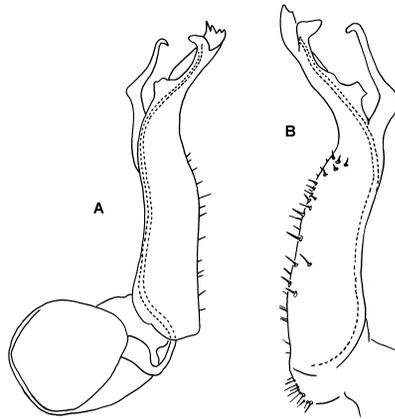


Figure 7. Gonopod of *A. leae*. (A) mesal view of left gonopod of holotype, redrawn from Silvestri (1910); (B) mesal view of right gonopod telopodite of male from northwest Tasmania (QVM 23:41717). Drawings not to same scale. For posterior view, see Fig. 2.

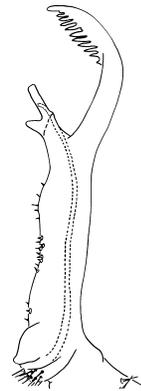


Figure 9. Gonopod of *A. parvus*. Mesal and slightly dorsal view of right gonopod telopodite of male from southeast Tasmania (QVM 23:24743). For posterior view, see fig. 2.

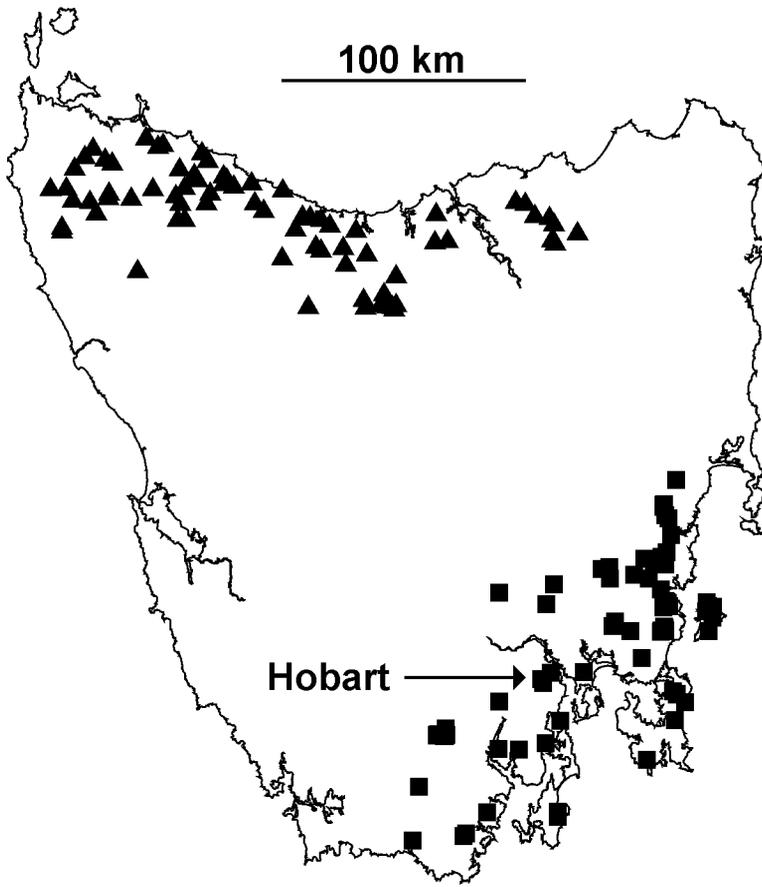


Figure 10. Tasmanian localities of *A. leae* (triangles) and *A. parvus* (squares).