

reduced or fused with frons. Apex of last article of maxillary palp usually with a single cylindrical sensillum. Apical article of labial palp with 3+2 papillae. Anterior margin of pronotum without setal collar. Thoracic sterna large and free. PIII of male sometimes modified (not in species found in Australia). Tarsi of three articles. Pretarsus with two lateral claws and a medial empodial claw. Parameres primitively with single glandular area, secondarily pseudoarticulated or with strong tendency for reduction and loss of chaetotaxy or vesiculiform and reduced. Ovipositor with simple setae apically. Scales absent from terminal filaments.

Lepisma Linnaeus, 1758

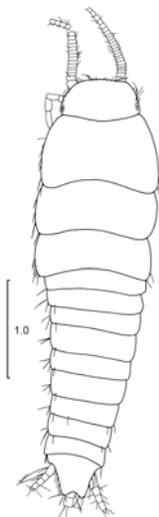
Lepisma Linnaeus, 1758: 602.

Type species: *Lepisma saccharina* Linnaeus, 1758 by subsequent designation of Latreille, 1810: 423, 113.

Diagnosis

Elongate with short or long antennae and terminal filaments. Antennae with basiconic and campaniform sensillae. Macrochaetae on head largely restricted to the margins, without strong bushes; clypeus and labrum with isolated setae only; clypeus of normal size. Pro- meso- and metanota with anterior trichobothrial areas trianguloid and open, posterior trichobothrial areas all subcircular and isolated from margins by scales; posterior margins glabrous. Thoracic sterna free, prosternum small, meso- and metasterna also somewhat reduced. Urotergite I with 1+1 small infralateral groups plus 1+1 lateral and 1+1 sublateral submarginal macrochaetae; urotergites II-VIII usually with 1+1 infralateral groups, 1+1 lateral, 1+1 sublateral and 1+1 submedian submarginal macrochaetae; urotergite IX with small infralateral

Figure 61. *Lepisma umbra* Smith, 2015, legs not illustrated.

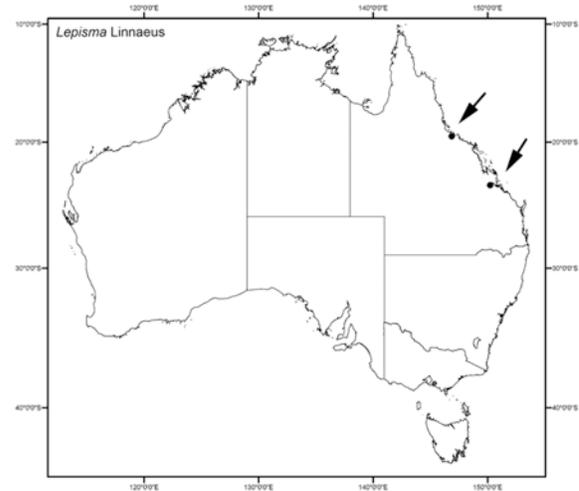


groups. Urotergite X trapezoidal, its posterior edge more or less straight, or slightly concave. Urosternites I and II with one medial comb, III-VII (in female) or III-VIII (in male) with 1+1+1 combs. Coxites IX of female not elongated. Ovipositor long and thin with thin simple setae only. Styli present on coxites VIII and IX or on IX only. Parameres well developed, sacciform, exceeding or equalling the posterior limit of the internal process of coxite.

Habitat, distribution and abundance

Lepisma saccharina is a cosmopolitan anthropophilic species. Smith (2015c) discusses the records of the species suggesting that it may no longer be found in Australia even though Womersley (1939) reported the species to be common in most “grain and similar

Figure 62. Locality records of autochthonous *Lepisma umbra*



stores in the Commonwealth”. Even in Europe this species seems to be becoming less common than *Ctenolepisma longicaudata* in homes. *Lepisma umbra* on the other hand, seems to be an endemic species, found with native termites in QLD. It has only been collected on two occasions (Figure 62).

Figure 63. World locality records of *Lepisma* spp. excluding the peridomestic *L. saccharina*



The single Australian native species is the only non-anthropophilic species of the genus yet described outside the Mediterranean and Caucasian area (Figure 63). It is considered a relic of a much more widely distributed ancient genus.

Xenolepisma Mendes, 1981

Asterolepisma (*Xenolepisma*) Mendes, 1981: 200.

Xenolepisma Mendes, 1988a: 12.

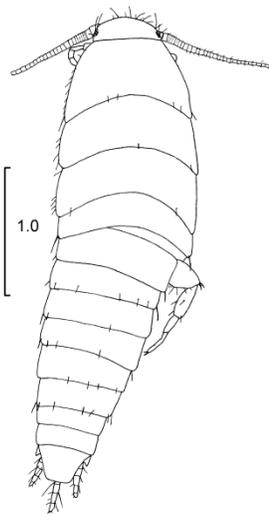
Xenolepisma Smith, 2015a: 74 [redefinition].

Type species: *Lepisma globosa* Escherich, 1905 by original designation.

Diagnosis

Compact with short antennae and very short terminal filaments. Antennae with basiconic and asteriform sensillae (Figure 19). Macrochaetae on head largely restricted to the anterior margin and around eyes, clypeus merged with frons; clypeus and labrum with isolated setae only. All trichobothrial areas of all nota closed (isolated from margins by scales); posterior margins glabrous (except for macrochaeta in posterolateral corner) or with isolated submarginal macrochaetae. Thoracic sterna free, prosternum smaller than also somewhat reduced meso- and metasterna. All urotergites with infralateral macrochaetae with remaining medial part of posterior

Figure 64. *Xenolepisma monteithi* Smith, 2015, most legs not illustrated.

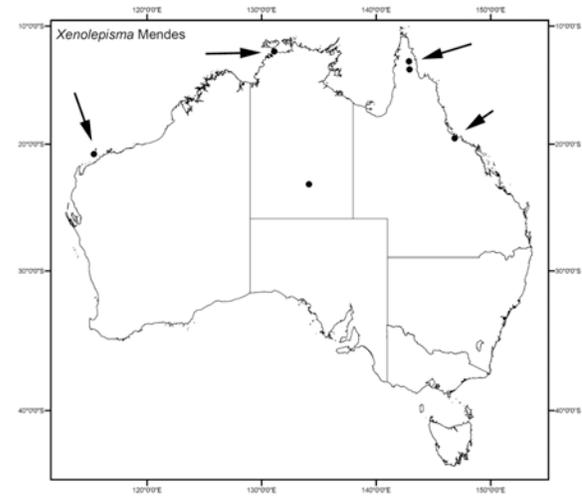


margin of urotergites II-IX glabrous or with up to six submarginal macrochaetae on each side. Urotergite X trapezoidal, its posterior edge more or less concave. Urosternite I glabrous, II with a medium comb, III-VII (in female) on III-VIII (in male) with 1+1+1 combs. Coxites IX of female not elongated. Ovipositor not long, but thin with thin simple setae only. Styli present on coxites VIII and IX in both sexes. Parameres sacciform, reduced.

Habitat, distribution and abundance

Xenolepisma species were collected on seven occasions (Figure 65), usually with ants. It has a body form typical of mymecophilic species (tapered form with short terminal filaments).

Figure 65. Australian locality records of *Xenolepisma* spp.



The genus is known from just a few widely scattered localities in Australia. It is also known from southern Africa, India and Malaysia (Figure 66). Two of the described Australian species appear to be endemic and one was originally described from Malaysia (Smith *et al.*, 2011).

Figure 66. World locality records of *Xenolepisma* spp.



Family Nicoletiidae (Lubbock, 1873)

Nicoletiidae Lubbock, 1873: 201.

Gymnodermata Joseph, 1882: 25.

Nicoletiinae Lubbock.—Escherich, 1905: 36.

Nicoletiidae Lubbock.—Remington, 1954: 284.

Nominotypical genus: *Nicoletia* Gervais, 1844.

Diagnosis

Body elongate to short and stout. Eyes and ocelli absent. Nearly always off-white or golden coloured. Scales, when present, multiradiate, the ribs usually originating from a single central base and often

surpassing the posterior margins of each scale (with the exception of a single Portuguese species of Coletiniinae where the ribs are subparallel); scales sometimes quite modified. Macrochaetae never pectinate, always smooth and often with bifurcated apices, never grouped into closely packed bushes or combs; sometimes modified into flattened abiesiform or lyriform bristles. Antennae long filiform or shorter with fewer intervals (usually <20), the pedicel often modified in adult males. Lacinia with pectinate (prostheca) and lamellate processes along the inner margin; galea often with apical conules; apical article of maxillary palp usually with one to several branched papillae. Ultimate article of labial palp with six papillae arranged in a 3+2+1 arrangement. Pronotum with or without macrochaetae along the anterior margin. Thoracic nota usually with macrochaetae along the lateral and posterior margins and sometimes also on the face; trichobothria absent from nota. All thoracic sterna hidden below coxae of the legs, never developed into a free plate covering the coxae, nor raised into a medial process bearing a tuft of macrochaetae. Tarsi of four articles. Pretarsus usually with 1+1 lateral claws and a medial empodial claw (rarely absent); pulvillae sometimes present. Urotergites usually with macrochaetae along the lateral and posterior margins and sometimes over the face. Abdominal sternites often bearing vesicles and/or styli, sometimes divided by a visible suture into a medial sternum and postero-lateral coxites. Urosternite VII with 1+1 pseudovesicles. Coxites IX in males either as separated plates or fused into a single sclerite; coxites VIII and IX always separate in females. Parameres always present, sometimes apically divided. Base of ovipositor always covered by subgenital plate. Ovipositor never bearing apical spines. Gonapophyses IX in female with an internal subdistal area of spinules.

Subfamily Atelurinae Remington, 1954

Atelurinae Remington, 1954: 284.

Nominotypical genus: *Atelura* Heyden, 1855 by original designation.

Diagnosis

Body short and either oval (onisciform) or tear-drop shaped (ateluriform), dorsally convex with short terminal filaments. Scales always present, often giving a golden appearance; scales sometimes quite modified; scales present or absent from head. Head rounded, not emarginate at the level of the antennae. Antennae approaching moniliform; apical interval bearing a distinctive three-pronged sensillum. Pedicel of mature males with or without secondary sexual modifications. Mandibles sometimes reduced with

molar region very small or absent. Galea often with apical conules. Pronotum mostly without macrochaetae along the anterior margin. Nota obviously wider and longer than abdominal tergites. Tibia of legs usually with apical lyriform macrochaetae. Pretarsus with or without pulvillae. Abdominal sternites never divided into a medial sternum and postero-lateral coxites; often bearing vesicles and/or styli. Coxites IX never fused into single plate. Urotergite X of mature males usually with pegs on the ventral surface as well as on the basal divisions of the cerci. Median dorsal appendage of mature males with or without pegs.

Tribe Atopatelurini Silvestri, 1908

Atopatelura Silvestri, 1908a: 369.

Atopatelurini Mendes, 2012: 22.

Nominotypical genus: *Atopatelura* Silvestri, 1908 by original designation.

Diagnosis

Head almost always exposed, setose, without scales. Body scales typical, rarely modified. Pedicel of mature males with fovea but without apophysis. Galea with or without a single apical conule. Legs with lyriform spines that are sometimes very abundant; pulvillae sometimes present. Urotergite X of males incised trapezoidal with 1+1 apical macrochaetae, often with pegs on the ventral surface. Cerci of mature males with pegs; rarely transformed. Abdominal vesicles VI present or lacking, when present always armed with setae. Parameres never apically divided. Male cerci with cylindrical pegs; male paracercus not modified.

Allatelura Silvestri, 1947

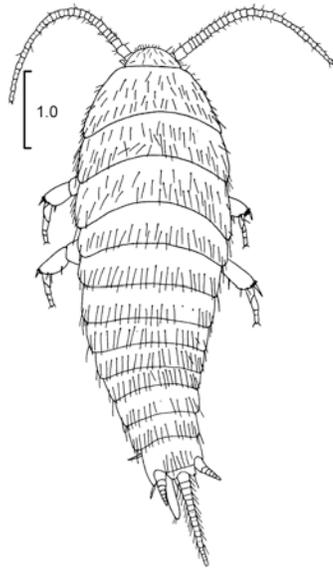
Allatelura Silvestri, 1947: 74.

Allatelura Silvestri.—Smith, 2016b: 23 [redefinition].

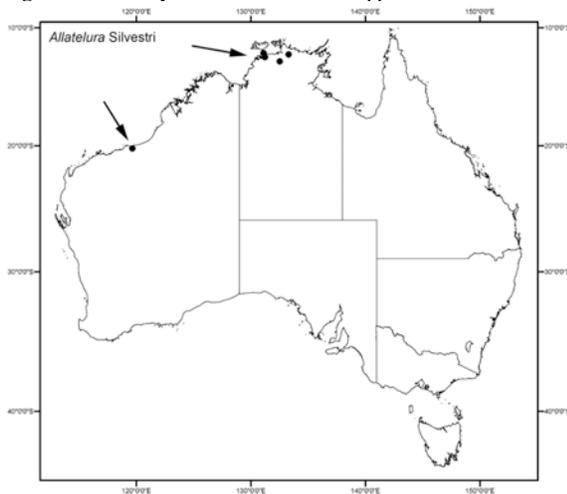
Type species: *Allatelura hilli* Silvestri, 1947 by original designation.

Diagnosis

Ateluriform with short antennae. Scales round or pointed with ribs of both dorsal and ventral scales surpassing the margins by about 10% of their length. Macrochaetae with delicately bifurcate apices; abiesiform macrochaetae absent. Head only slightly covered by pronotum along posterior margin, with long, strong setae in irregular rows. Mandibles comparatively small with a reduced or absent molar region. Galea without apical conules. Maxillary palp of mature males with wart-like process on penultimate article. Labium with distinct forward directing process on each of the postero-lateral corners of postmentum. Last article of labial palp very elongate oval. Thoracic nota with multiple

Figure 67. *Allatelura hilli* Silvestri, 1947.

irregular rows of long macrochaetae on the face. Tibia with long rows of lyriform macrochaetae distally. Pretarsus with large membranous pulvillae. Urotergites each with a single irregular row of long macrochaetae as well as a marginal macrochaeta in each postero-lateral corner. Urotergite X small with rounded posterior corners; ventral face with 1+1 fields of pegs in mature males. Urosternites I-V without vesicles or styli; urosternite VI without vesicles; urosternite VIII in male with concave posterior margin. Urosternites VI-IX with short styli. Parameres deeply set in urosternites IX, long and wide with large numbers of minute glandular rods clustered into large fields on the inner surface. Cerci

Figure 68. Locality records of *Allatelura* spp.

short, basal division in both sexes several times longer than remaining divisions, basal division in mature males with group of pegs. Median dorsal appendage curved downwards without pegs in both sexes.

Habitat, distribution and abundance

Endemic to Australia with just fourteen collection events, all in the north (Figure 68). Collected with termites of the genera *Mastotermes* [Mastotermitidae], *Amitermes* [Termitidae] and *Coptotermes* [Rhinotermitidae].

Ausallatelura Smith, 2007

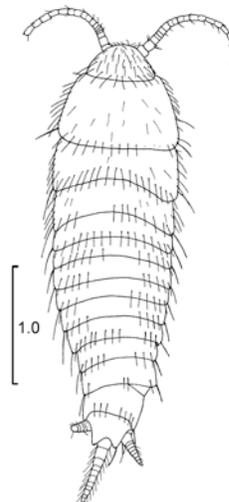
Ausallatelura Smith, 2007: 19.

Ausallatelura Smith.—Smith, 2016b: 32 [redefinition].

Type species: *Ausallatelura ordoarmata* Smith, 2007 by original designation.

Diagnosis

Ateluriform, elongate with short antennae. Scales round or pointed with ribs on both dorsal and ventral scales surpassing the margins by about 10-15% of their length. Macrochaetae simple or with delicately bifurcate apices; abiesiform macrochaetae absent. Head not or only slightly covered by pronotum along posterior margin, with long, strong setae in irregular rows. Mandibles comparatively small with a reduced molar region. Galea without apical conule or with single low flat conule. Labium with rounded postero-lateral corners of postmentum. Ultimate article of labial palp very elongate, oval. Thoracic nota with single submarginal row of macrochaetae as well as one or more irregular rows of long, fine setae on the face. Tibia with either just two to three lyriform macrochaetae distally or else two to three rows of

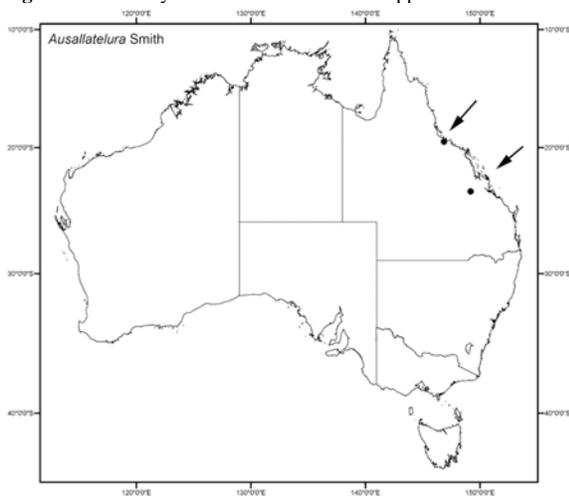
Figure 69. *Ausallatelura pauciarmata* Smith, 2016, legs not illustrated.

lyriform macrochaetae. Pretarsus simple, without pulvillae. Urotergites each with a single irregular row of long macrochaetae as well as a marginal macrochaeta in each postero-lateral corner. Urotergite X trapezoidal with deep or shallow medial notch. Urosternites I-V without vesicles, styli present on urosternites V-IX or VI-IX, urosternite VI with styli and large eversible vesicles bearing setae. Males unknown.

Habitat, distribution and abundance

Endemic to Australia with three collection events only, all in eastern QLD (Figure 70), all with termites of the genus *Amitermes* [Termitidae].

Figure 70. Locality records of *Ausallatelura* spp.



Australiatelura Mendes, 1995

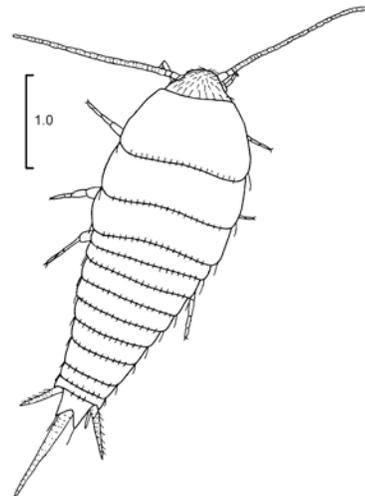
Australiatelura Mendes, 1995a: 98.

Type species: *Atopatelura kraepelini* Silvestri, 1908 by original designation.

Diagnosis

Ateluriform with short antennae. Scales round with ribs not or only slightly surpassing the margins of the scale dorsally but by about 10% on the ventral scales. Macrochaetae simple or apically bifurcate, abiesiform macrochaetae present on all nota and urotergites. Head not or only slightly covered by pronotum along posterior margin, with longer and shorter, strong setae in slightly irregular rows. Mandibles with well-developed incisor and molar regions. Galea with a single prominent apical conule. Labium with round postero-lateral corners. Ultimate article of labial palp oval. Thoracic nota with a submarginal row of abiesiform macrochaetae as well as a longer macrochaeta in each postero-lateral corner. Tibia with three lyriform macrochaetae distally. Pretarsus without obvious pulvillae. Abdominal tergites also

Figure 71. *Australiatelura tasmanica* Silvestri 1949.

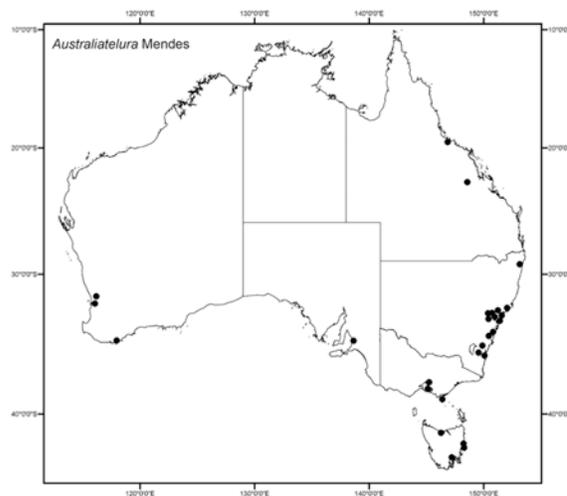


with single row of abiesiform macrochaetae. Urotergite X trapezoidal with acute apices and deep notch between. Underside of urotergite X in mature males with 1+1 fields of pegs. Urosternites I-V without vesicles; urosternite VI with large vesicles bearing setae; urosternite VII with pseudovesicles. Styli on segments III-IX, those on III located medially. Urosternite VIII in male with convex posterior margin. Parameres long and sometimes wide. Cerci short, basal division not longer than other divisions, the basal divisions in mature males with group of pegs. Median dorsal appendage without pegs in both sexes.

Habitat, distribution and abundance

Endemic to Australia and fairly abundant (62 collection events), predominantly in the south, including Tasmania (Figure 72). Generally collected

Figure 72. Locality records of *Australiatelura* spp.



under stones with ants including species of *Amblyopone* Erichson, 1842, *Camponotus* Mayr, 1861, *Colobopsis* Mayr, 1861, *Iridomyrmex* Mayr, 1862, *Myrmecia* Fabricius, 1804, *Pheidole* Westwood, 1839, *Rhytidoponera* Mayr, 1862, but occasionally it is also found with termites (e.g. *Coptotermes* Wasmann, 1896). Limited molecular data (COI) of several morphologically very similar forms, collected along the east coast of Australia, suggest much work is required to clarify the systematics of the genus.

Australotheus Smith, 2016

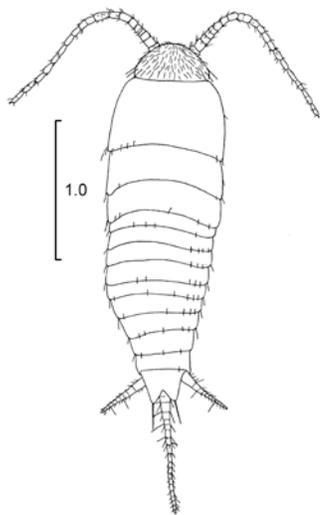
Australotheus Smith, 2016b: 38.

Type species: *Australotheus eberhardi* Smith, 2016 by original designation.

Diagnosis

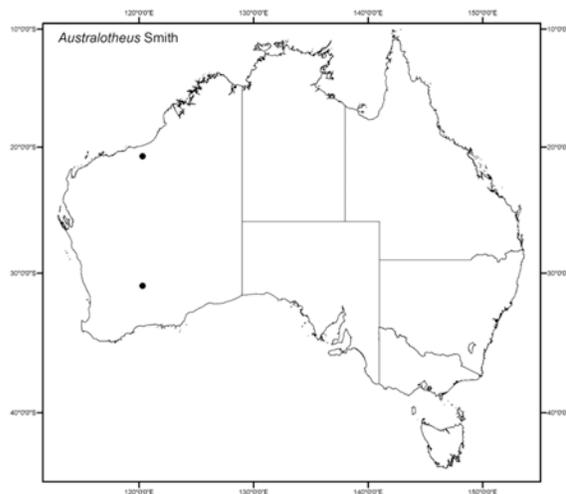
Ateluriform. Scales round with ribs not or only slightly surpassing the margins of the scales. Abiesiform macrochaetae present on all nota and urotergites. Head free, with numerous flattened macrochaetae in irregular rows. Mandibles with well-developed incisor and molar regions. Galea with single prominent apical conule. Labium with round postero-lateral corners. Ultimate article of labial palp

Figure 73. *Australotheus eberhardi* Smith, 2016, legs not illustrated.



oval. Nota with single submarginal row of abiesiform macrochaetae as well as a longer macrochaeta in each postero-lateral corner. Tibia with three lyriform macrochaetae distally. Pretarsus without obvious pulvillae. Urotergites with chaetotaxy similar to nota. Urotergite X trapezoidal with acute apices and deep notch between. Ventral face of urotergite X with 1+1 fields of pegs in mature males. Urosternites I-V without vesicles; urosternite VI with large vesicles

Figure 74. Locality records of *Australotheus* spp.



bearing setae; urosternite VII with pseudovesicles. Styli on segments V-IX. Parameres long. Basal division of cerci not longer than other divisions, bearing pegs in mature males. Median dorsal appendage without pegs.

Habitat, distribution and abundance

Endemic to Australia with one species from deep subterranean habitat, the other of unknown WA habitat but probably not subterranean (Figure 74). It may be more common than these limited records suggest due to limited sampling in the west of Australia.

Dodecastyla Paclt, 1974

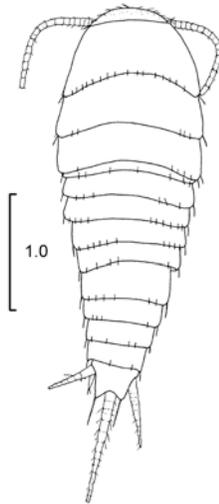
Dodecastyla Paclt, 1974: 545.

Type species: *Lepismima bifida* Schäffer, 1897 by original designation.

Diagnosis

Ateluriform. Scales round with ribs not or only slightly surpassing the margins of the scales. Abiesiform macrochaetae present on all nota and urotergites. Head more or less free, with numerous flattened macrochaetae in irregular rows. Mandibles with well-developed incisor and molar regions. Galea with a single prominent apical conule. Labium with round postero-lateral corners; last article of labial palp oval. Thoracic nota with submarginal row of abiesiform macrochaetae as well as longer macrochaetae in each postero-lateral corner. Tibia with three lyriform macrochaetae distally. Pretarsus without obvious pulvillae. Abdominal tergites with chaetotaxy similar to nota. Urotergite X trapezoidal with acute apices and deep notch between. Underside of urotergite X in mature males with 1+1 fields of pegs. Urosternites I-V without vesicles, urosternite VI

Figure 75. *Dodecastyla rima* Smith & McRae, 2015, legs not illustrated.

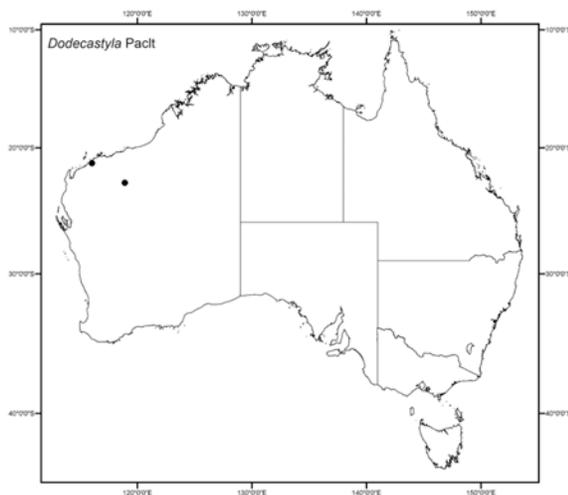


with large vesicles bearing setae, urosternite VII with pseudovesicles. Styli on segments IV-IX. Parameres long. Basal division of cerci not longer than other divisions, bearing pegs in mature males. Median dorsal appendage without pegs.

Habitat, distribution and abundance

With 36 collection events in Australia (Figure 76), all restricted to two very localised areas in the Pilbara, both described species appear to be locally common within very limited ranges. There does not appear to be any obvious host relationship although one species was occasionally collected with ants. The type species, *Dodecastyla bifida* Schäffer, 1897, was described from Chile. The two described Australian species are believed to be remnants of a more wide-

Figure 76. Australian locality records of *Dodecastyla*



spread Gondwanan genus which retreated into deep subterranean cavities as the continent dried out (Figure 77).

Figure 77. World locality records of *Dodecastyla*



***Galenatelura* Smith, 2009**

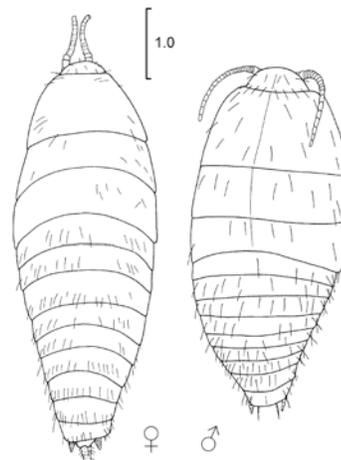
Galenatelura Smith, 2009: 15.

Type species: *Galenatelura deflexa* Smith, 2009 by original designation.

Diagnosis

Ateluriform. Scales subrectangular, the ribs extending by up to one third their length beyond the margin. Macrochaetae simple, thin, some a little apically bifurcate; abiesiform macrochaetae absent. Head partially covered by anterior edge of pronotum, with scattered long macrochaetae in irregular rows. Mandibles narrow with strong incisor but weak molar region. Galea without prominent apical conule. Labium with postero-lateral corners of postmentum angular. Ultimate article of labial palp elongate oval. Thoracic nota with multiple irregular rows of long thin macrochaetae about the same size and length as those on each postero-lateral corner. Tibia with apical row of several lyriform macrochaetae. Pretarsus with two lamellate pulvillae. Abdominal tergites also with long thin macrochaetae in one or more irregular rows.

Figure 78. *Galenatelura deflexa* Smith, 2007, legs not illustrated.

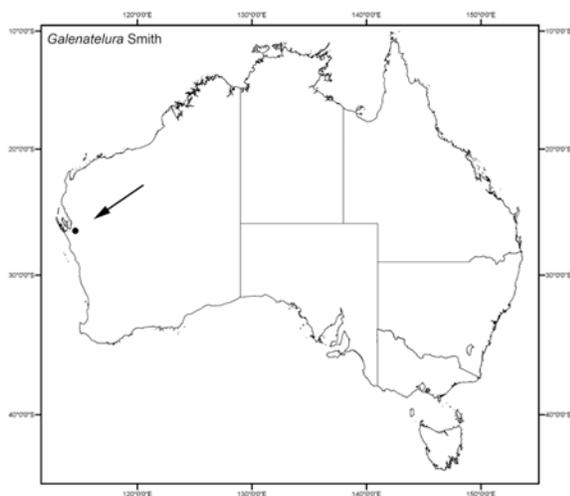


Sexually dimorphic. Urotergite X trapezoidal in female with acute apices and a shallow notch between; urotergite X strongly modified in mature males, largely hidden under urotergite IX with the lower surface pointing backwards exposing very large 1+1 fields of pegs. Urosternites I-VI without vesicles, urosternite VII with pseudovesicles. Styli on segments VI-IX. Posterior margin of urosternite VIII in male concave. Parameres large and rounded, curving around the large penis. Cerci in both sexes short and conical, those of mature male very widened internally, their basal divisions largely fused together, armed with numerous pegs and modified chaetotaxy. Median dorsal appendage in male deflected downwards between the cerci, without pegs.

Habitat, distribution and abundance

Endemic to Australia. It has been collected only once, from the nest of the termite *Coptotermes brunneus* (Gay, 1955) in WA (Figure 79). It appears to be closely related to *Allatelura* Silvestri, 1947 from northwestern Australia.

Figure 79. Locality records of *Galenatelura*.



Pseudogastrotheus Mendes, 2003

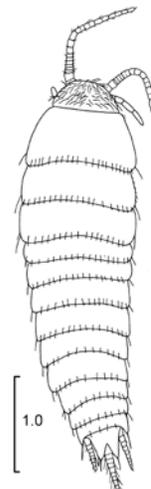
Pseudogastrotheus Mendes, 2003: 344.

Type species: *Grassitella pallens* Escherich, 1903 by original designation.

Diagnosis

Ateluriform. Scales round with ribs only slightly surpassing the margins on dorsal scales and surpassing by about 10% of their length on ventral scales. Abiesiform macrochaetae present on all nota and urotergites. Head more or less free, with numerous wider macrochaetae in irregular rows. Mandibles with well-developed incisor and molar regions. Galea with a single prominent apical conule.

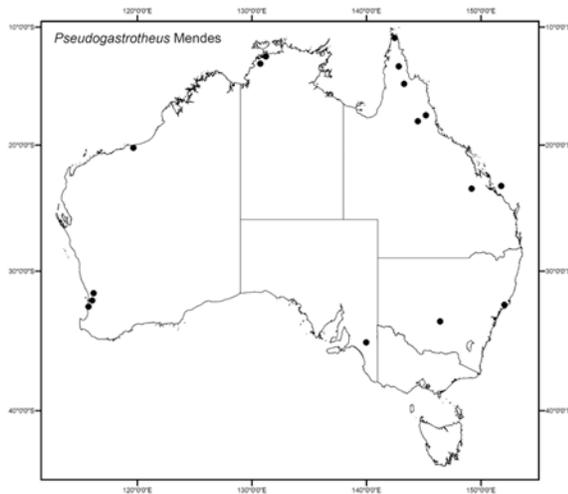
Figure 80. *Pseudogastrotheus undarae* Smith, 2016, legs not illustrated.



Postmentum of labium with round postero-lateral corners. Ultimate article of labial palp round. Thoracic nota with a submarginal row of abiesiform macrochaetae as well as longer macrochaetae in each postero-lateral corner. Tibia with three lyriform macrochaetae distally. Pretarsus without obvious pulvillae. Abdominal tergites with chaetotaxy similar to nota. Urotergite X trapezoidal with acute apices and deep notch between. Underside of urotergite X in mature males with 1+1 fields of pegs. Urosternites I-V without vesicles, urosternite VI with large vesicles bearing setae, urosternite VII with pseudovesicles. Styli on segments VI-IX. Parameres long. Basal division of cerci not longer than other divisions, bearing pegs in mature males. Median dorsal appendage without pegs.

Habitat, distribution and abundance

The genus *Pseudogastrotheus* is widespread with species described from the Afrotropical (Angola, Cape Verde Islands, Democratic Republic of Congo, Kenya, São Tomé, South Africa, Tanzania, Uganda, Yemen), Neotropical (Brazil), Indo-Malayan (India, Indonesia, Sri Lanka, Thailand) and Oceanic Regions (Papua New Guinea) (Figure 82). Twenty three collection events are recorded covering a wide area of Australia (Figure 81), mostly collected within termite nests, under stones and even within caves. The genus is likely to prove abundant given sufficient collection effort. The Australian fauna appears to form a clade distinct from the African fauna in that all(?) African species have two strong, deeply bifurcate macrochaetae mediad of the suture with the paratergites while the Australian species known so far have just one strong, and only slightly bifurcate macrochaeta plus a smaller seta in this position. The

Figure 81. Australian locality records of *Pseudogastrotheus* spp.

genera *Dodecastyla*, *Pseudogastrotheus* and *Australotheus* are very close to each other differing only in the number of pairs of styli, a character that can be variable in other genera. It may later prove to be an artificial construct but is useful at a practical morphological level.

Figure 82. World distribution of *Pseudogastrotheus* spp.

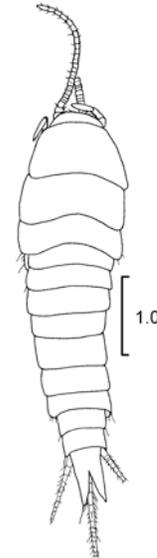
Troglotheus Smith & McRae, 2014

Troglotheus Smith & McRae, 2014: 119.

Type species: *Troglotheus bifurcus* Smith & McRae, 2014 by original designation.

Diagnosis

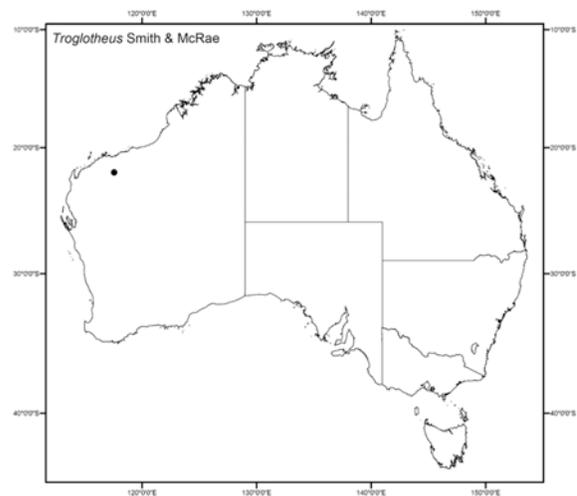
Very elongate ateluriform. Scales round with ribs only slightly surpassing the margins dorsally, extending slightly further on ventral scales. Macrochaetae mostly simple or apically bifurcate; abiesiform macrochaetae absent. Head more or less free, with numerous strong macrochaetae in irregular rows. Mandibles with well-developed incisor and molar regions. Galea with a single prominent apical conule. Postmentum of labium with round postero-lateral corners. Ultimate article of labial palp elongate oval. Thoracic nota glabrous except for a single strong macrochaeta in each postero-lateral corner.

Figure 83. *Troglotheus bifurcus* Smith & McRae, 2014, legs not illustrated.

Tibia with three lyriform macrochaetae distally. Pretarsus without obvious pulvillae. Chaetotaxy of abdominal tergites similar to nota. Urotergite X trapezoidal with extremely long acute apices and a very deep notch between. Underside of urotergite X in mature males with 1+1 fields of pegs. Urosternites I-V without vesicles, urosternite VI with large vesicles bearing setae, urosternite VII with pseudovesicles. Styli on segments IV-IX. Parameres long. Cerci with basal division not longer than other divisions, bearing pegs in mature males. Median dorsal appendage without pegs.

Habitat, distribution and abundance

Endemic to Australia with only four collection events from deep subterranean habitat within a very

Figure 84. Locality records of *Troglotheus* Smith & McRae, 2014

restricted area (Figure 84). The species displays troglomorphic characters.

Unplaced

Wooroonatelura Smith, 2016

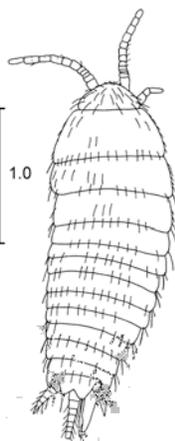
Wooroonatelura Smith, 2016b: 51.

Type species: *Wooroonatelura lenta* Smith, 2016 by original designation.

Diagnosis

Small, onisciform. Scales multiradiate, ribs on dorsal scales extending beyond margin by about half their length and by 10% on ventral scales. Macrochaetae long and thin with delicate apical bifurcations; abiesiform macrochaetae absent. Head exposed with scattered long macrochaetae. Mandibles with long incisor and shorter molar region. Galea without prominent apical conule. Ultimate article of labial palp elongate oval. Thoracic nota with multiple irregular rows of long thin macrochaetae about the same size and length as those in each postero-lateral corner. Tibia with two apical lyriform macrochaetae. Pretarsus without pulvilli, the outer claws with ventral keels, the medial empodial claw simple. Abdominal tergites each with a single row of long thin macrochaetae. Urotergite X trapezoidal with round apices and a deep notch between. Urosternites I-V without special features; urosternite IV with glabrous eversible vesicles, urosternite VII with pseudovesicles. Styli on segments VI-IX. Cerci and median appendage short, the basal divisions not elongated or fused. Males unknown.

Figure 85. *Wooroonatelura lenta* Smith, 2016, legs not illustrated.

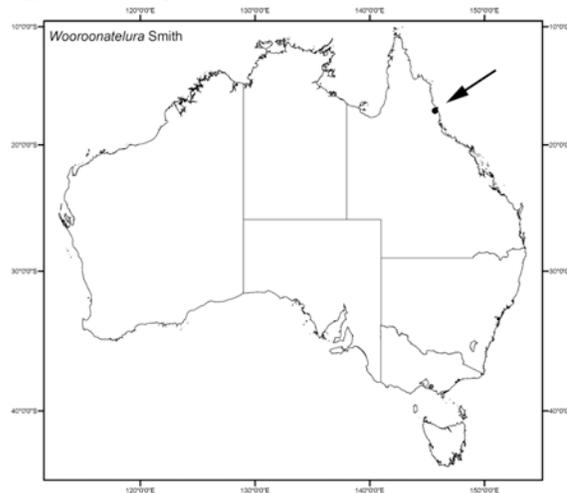


Habitat, distribution and abundance

Endemic, collected only once from a piece of rotting wood lying on the ground at the edge of rainforest with ants of the genus *Monomorium* Mayr, 1855 (Figure 86). In the absence of male specimens it is not

currently possible to place the genus within any of the currently recognised tribes.

Figure 86. Locality records of *Wooroonatelura* Smith



Subfamily Coletiniinae Mendes, 1988

Coletiniinae Mendes, 1988b: 768.

Nominotypical genus: *Coletinia* Wygodzinsky, 1980.

Diagnosis

Body elongate, sub-cylindrical. Scales present or absent (only absent in some genera not yet reported from Australia), sometimes quite modified; ribs not significantly protruding beyond the margin. Antennae filiform, pedicel of mature males with distal apophyses which lack distinct glandular area. Head emarginate at level of antennae, with or without scales. Mandibles with well-developed incisor and molar regions. Galea apically with two large conules. Pronotum with isolated macrochaetae along the anterior margin. Nota not obviously wider than urotergites. Tibia of legs without apical lyriform macrochaetae. Pretarsus with two lateral claws and a medial empodial claw; pulvillae absent. Urosternite I divided by sutures into a medial sternum and postero-lateral coxites; urosternites II-VII (VIII) entire; coxites IX of male as two free sclerites, never fused into single plate. Styli present on II-X or III-IX. Eversible vesicles on II-VI or III-VI, pseudovesicles on VII. Parameres entire, not apically divided. Urotergite X of males with pegs on the ventral surface. Both cerci and median dorsal appendage of mature males usually with pegs but sometimes absent from both.

Lepidospora Escherich, 1905

Lepidospora Escherich, 1905: 179.

Type species: *Lepidospora braueri* Escherich, 1905 by subsequent designation Paclt, 1963: 44.

Lepidospora (Brinckina) Wygodzinsky, 1955

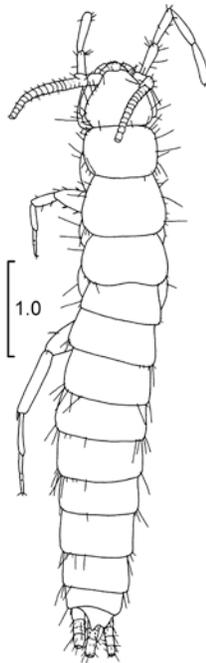
Lepidospora (Brinckina) Wygodzinsky, 1955: 179.

Type species: *Lepidospora (Brinckina) makapaan* Wygodzinsky, 1955 by original designation.

Diagnosis

Scales round. Head without scales. Urotergite X of male extended into longer downward directed processes, always bearing a longitudinal row of pegs on the underside. Styli present on II-IX, eversible vesicles on II-VI. Both cerci and median dorsal appendage of mature males usually but not always, with pegs.

Figure 87. *Lepidospora (Brinckina) relict*a Smith & McRae, 2016.

**Habitat, distribution and abundance**

Lepidospora (Brinckina) is known from the Democratic Republic of Congo, Kenya, South Africa, China and Afghanistan, Australia and probably also Papua New Guinea (Smith, 1998b) (Figure 89). With just nine collection events in Australia (Figure 88), all from deep subterranean habitat in the Pilbara, little is known of its biology. Outside Australia, species of the subgenus have been collected from soil in forest, sometimes at higher altitudes (ca 2100m asl), under stones, in caves or even with termites of the genus *Odontotermes* Holmgren, 1912 i.e. all soil related habitats typical of the non-Atelurinae Nicoletiids. At least three morphospecies are represented in the material examined, all probably short-range endemics. It is likely that more species of this genus will be found.

Figure 88. Australian locality records of *Lepidospora (Brinckina)* spp.

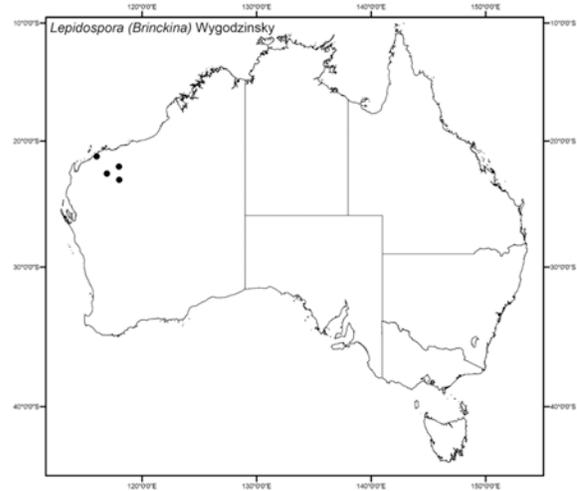


Figure 89. World locality records of *Lepidospora (Brinckina)* spp.

**Subfamily Subnicoletiinae Mendes, 1988**

Subnicoletiinae Mendes, 1988b: 769.

Nominotypical genus: *Subnicoletia* Silvestri, 1908.

Diagnosis

Body elongate, sub-cylindrical. Scales absent or quite modified (absent in all Australian species). Antennae filiform; pedicel of mature male with glandular area and no apophysis or with submedial inward directed process; scape of some species also with process. Head emarginate at level of antennae. Mandibles with well-developed incisor and molar regions. Galea apically with two large conules. Pronotum with or without isolated macrochaetae along the anterior margin. Notum not obviously wider than abdominal terga. Tibia of legs without apical lyriform macrochaetae. Pretarsus with two lateral claws and mostly with a medial empodial claw (absent in *Trinemurodes* from the Indo-Malayan region); pulvillae absent. Urosternites I-VII entire; coxites IX in males fused into single sclerite. Styli present on II-IX or less numerous. Eversible vesicles on II-VI or less numerous (even absent); pseudovesicles on VII. Parameres divided apically or, if entire, then with

modified apical region. Urotergite X of males without pegs on the ventral surface. Cerci of mature males usually with modified chaetotaxy; sometimes also with anemone-like structures. Median dorsal appendage sometimes with modified chaetotaxy in mature males.

Comment: Mendes (1988b) noted this subfamily is more heterogeneous than other subfamilies. Mendes (1994) found that four of the genera (*Hematelura*, *Trichotriura*, *Trichotriuroides* and *Trichatelura*) had a close relationship to each other, lying close to the remaining Subnicoletiinae but on a separate branch. The three Australian genera and *Trinemurodes* however seem to be reasonably homogeneous.

Metrinura Mendes, 1994

Metrinura Mendes, 1994: 99.

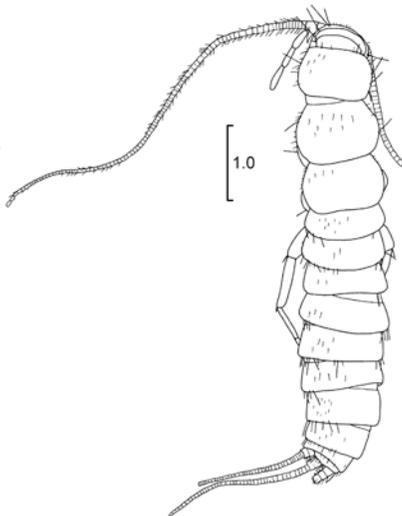
Metrinura Mendes.—Smith, 1998b: 162 [redefinition].

Type species: *Trinemura novaecaledoniae* Silvestri, 1915 by original designation.

Diagnosis

Male pedicel widened with glandular area and often an apophysis. Abdominal styli on segments III-IX. Eversible vesicles on II-VI. Cerci of mature male with modified spines and sometimes anemone-like structures. Median appendage rarely with modified chaetotaxy.

Figure 90. *Metrinura taurus* Smith & McRae, 2016, most legs not illustrated.



Habitat, distribution and abundance

The genus is known from the Indo-Malayan (Sulawesi), Neotropical (Colombia), Palaearctic (Afghanistan), Australian and Oceanian Regions (New Caledonia and probably Papua New Guinea)

(Figure 92). The nine Australian collection events (Figure 91) are from caves, in soil, under logs or rocks.

Figure 91. Australian locality records of *Metrinura* spp.

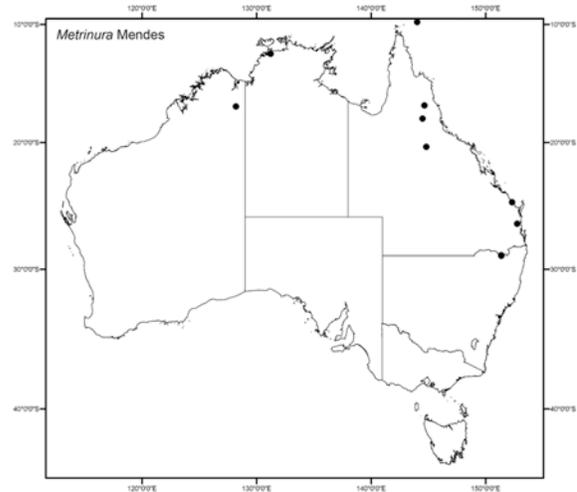


Figure 92. World locality records of *Metrinura* spp.



Subtrinemura Smith, 1998

Subtrinemura Smith, 1998b: 173.

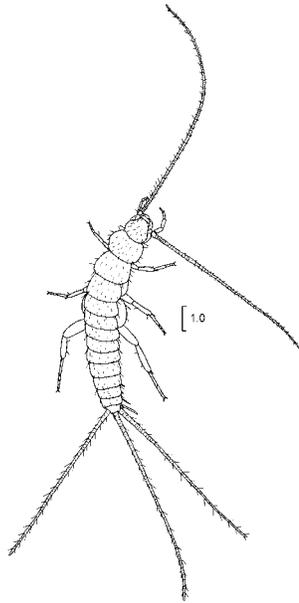
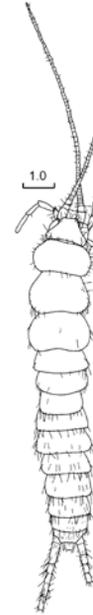
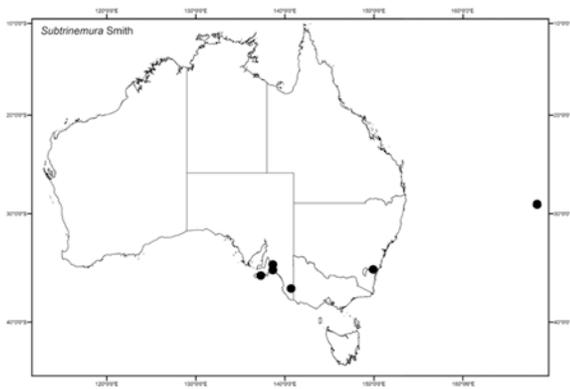
Type species: *Trinemura excelsa* Silvestri, 1920 by original designation.

Diagnosis

Male pedicel widened with process, process sometimes also on scape. Pretarsus simple and with three claws. Abdominal styli on segments III-IX, eversible vesicles on III-VI. Cerci and terminal filament of male with sensory pegs; cerci of males sometimes also with basal anemone-like structures.

Habitat, distribution and abundance

Endemic to south-eastern Australia with seventeen collection events (Figure 94). Of the four described species, two are only known from caves and other two from under logs and stones on soil.

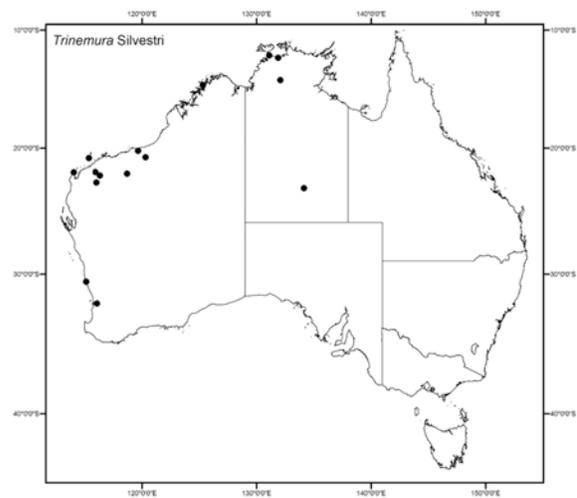
Figure 93. *Subtrinemura anemone* Smith, 1998**Figure 95.** *Trinemura callawae* Smith *et al.*, 2011, legs not illustrated.**Figure 94.** Locality records of *Subtrinemura* spp.***Trinemura* Silvestri, 1908**

Trinemura Silvestri, 1908b: 61.

Type species: *Trinemura novaehollandiae* Silvestri, 1908 by monotypy.

Diagnosis

Pedicel in mature male widened with glandular area and/or with medial processes. Scape of some males also with processes. Pretarsus with three claws. Abdominal styli on segments III-IX. Eversible vesicles absent. Cerci and terminal filament of mature males usually with sensory pegs and cerci sometimes with basal anemone-like structures.

Figure 96. Locality records of *Trinemura* spp.***Habitat, distribution and abundance***

Endemic to the western half of Australia with sixty-eight collection events, mostly from deep subterranean habitat in the Pilbara of WA (Figure 96), but also collected in caves and from under logs in forest, all typical soil related habitat. Many more undescribed species have been collected from deep subterranean habitats that appear to be short range endemic species.

EVOLUTION AND ZOOGEOGRAPHY

Dating and the fossil record

Zygentoma fossil evidence is rare, probably due to the poor preservation of these soft bodied animals.

The molecular clocks of Misof *et al.* (2014) suggest a radiation of the ectognathous hexapods in the Early Silurian (~441 Ma), with the *Zygentoma* diverging from the Archaeognatha at this time. They calculate *Tricholepidion* diverged from the other silverfish families in the late Triassic (~214 Ma), while the Nicoletiidae and Lepismatidae have existed as distinct families from the Jurassic (~160 Ma).

Mendes (in press) reviewed the limited fossil records of the silverfish-like orders (extinct Monura, Archaeognatha and *Zygentoma*). The earliest fossil attributed to Archaeognatha dates from the Devonian of Quebec (390-392 Ma) (Labandeira *et al.*, 1988). Mendes, however considers the position of this fossil as well as the Palaeozoic silverfish-like fossils of the genera *Bojophlebia*, *Carbotriplura* and *Ramsdelepidion* (all Kukalová-Peck, 1987) to be inconclusive. Bechly and Stockar (2011) described fossils of a Mid-Triassic Monuran *Dasyleptus* from limestone in Switzerland (225-242 Ma). Sturm (1998) described two specimens showing the typical habitus of the Lepismatidae from Lower Cretaceous sandstone of Araripe in Brazil (ca 110 Ma). Fossils considered as unambiguously zygentoman are more recent, mostly preserved in amber. Specimens described from 100-110 Ma Burmese amber, although assigned to *Allacrotelsa*, (Ross *et al.*, 2010) as well as four unidentified specimens (Grimaldi *et al.*, 2002), are considered doubtful by Mendes. However, Mendes & Poinar (2008) described *Burmalepisma* and Mendes & Wunderlich (2013) described *Cretalepisma* (both assigned with reasonable probability to the Lepismatinae) from the same Burmese amber deposits. Silvestri (1912b) redescribed a species of *Allacrotelsa* [Lepismatinae] (as *Lampropholis*) and a species of the extinct Lepidotrichidae from Eocene Baltic amber (38-50 Ma). Several species have been described from Dominican amber (20-30 Ma) including two species of Atelurinae assigned to the Grassiellini, a species of *Ctenolepisma* [Ctenolepismatinae], one of *Protolepisma* [Lepismatinae], two species of *Trinemurodes* and one belonging to *Hemitrinemura* [all Subnicoletiinae] (Mendes, 1997, 1998, Sturm and Mendes, 1998 and Mendes & Poinar, 2004). *Onycholepisma arizonae* and *Onychomachilis fischeri* were described from onyx marble of Arizona (12-50 Ma) (Pierce, 1951); the latter species is however

considered by Mendes to belong, almost certainly, to the Nicoletiidae.

Zoogeography

The *Zygentoma* are clearly an ancient group and, judging from the fossil forms, morphologically conservative. They are an interesting model to correlate with the movement of the continents over geological time. Molecular clocks suggest they were present, probably in forms similar to those living today, since the Triassic and hence before the breakup of the supercontinent Pangea in the Jurassic (~175 Ma). The families Nicoletiidae and Lepismatidae are believed to have been established before Africa split apart from South America, Antarctica and Australia (~124 Ma) and hence well before Australia finally split from Antarctica and South America (30-50 Ma). Furthermore, the emergence of termites at the end of the Jurassic (~145 Ma) and the social ants in the Cretaceous (~100 Ma) opened up opportunities for the inquiline species.

Being primitively wingless and generally ground-dwelling their ability to cross oceans is presumably limited. Nevertheless, endemic species are known from many oceanic islands. The most likely means is by rafting on storm debris. Heatwole & Levins (1972) collected flotsam over three years in the vicinity of Puerto Rico and examined the fauna still alive, identifying 19 families of insects as well as pseudoscorpions, snails, spiders, mites, millipedes, isopods and worms. No *Zygentoma* were found but as silverfish are long-lived, able to survive many months without food and can absorb moisture from the atmosphere they would appear to be reasonably well adapted to survive such journeys. Furthermore, many species (especially *Heterolepisma* and to a lesser extent *Acrotelsella* spp.) shelter within or under the bark of trees and hence would be carried along with a tree washed into a river following storms. Indeed, it is these two genera, especially *Heterolepisma*, that are found on islands throughout the Pacific and Indian oceans. Furthermore Wheeler (1916) reported ants (*Pheidole peregrina* Wheeler) being found in a log washed up on an island at least 2 km off the coast of Brazil and termites were among the insect fauna collected on flotsam by Heatwole and Levins. If colonies of ants and termites can be transported, it would explain the presence of various Atelurinae such as *Lasiotheus nanus* on islands. Nevertheless, in spite of the possibility of transport over oceans, quite distinct patterns in the fauna are apparent and many species are known from very restricted distributions.