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THE TAXONOMY AND BIOLOGY OF AUSTRALIAN BDELLIDAE (ACARI).  
I. SUBFAMILIES BDELLINAE, SPINIBDELLINAE AND CYTINAE  

BY  

M. M. H. WALLACE and J. A. MAHON *.

SUMMARY.

New information is given on the biology and distribution in Australia of the following described species: Bdella captiosa, Spinibdella cronini, S. corticis, S. depressa, S. tenuirostris, Biscirius thor and Cyta latirostris.

Six new species are described, viz., Bdella humida, Spinibdella ampulla, Biscirius arenarius, B. aquilonius, B. obliquus, and Cyta longiseta.

Spermatophore and egg deposition and web production are described in several species.

I. INTRODUCTION.

WOMERSLEY (1933) published the first account of the bdellid mites (Acari: Bdellidae) of Australia. Thirteen species were recognised, nine of European origin and five described as new. Following his 1960 revision of the family Bdellidae of North and Central America, ATYEO (1963) revised the Australian fauna on the limited material then available. He recognised 23 species, of which nine were described as new. Many of the identifications of European species made by WOMERSLEY were shown to be invalid.

As part of a project on the possible biological control of the lucerne flea, Sminthurus viridis (L.) (Collembola) by predatory mites an extensive survey of southern and north-western Australia was carried out in 1962 and 1966 respectively. Collections were obtained from over 1000 localities and included over 10,000 bdellid mites. This collection has been used to expand the work of ATYEO and provide a more complete revision of the family, including information on distribution within Australia. Details of biology and behaviour are also included where known.

The following abbreviations have been used throughout: Australian National Insect Collection, ANIC; South Australian Museum, SAM; British Museum (Natural History), BM; Western Australia, WA; South Australia, SA; Victoria, Vic.; New South Wales, NSW; Tasmania, Tas.; Queensland, Qld.; Northern Territory, NT; M. M. H. WALLACE, MMHW; J. A. MAHON, JAM; E. HOLM, EH; G. S. McCUTCHEON, GSM; K. D. WRIGHT, KDW; H. WOMERSLEY, HW; A. J. NICHOLSON, AJN; K. R. Norris, KRN.

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II. METHODS.

Collections were made with the aid of a 25 cm diam. enamel plate which was swept through the herbage near the ground or held under bushes, tufts of grass, pieces of wood, etc., which were knocked to dislodge the sheltering mites. The latter were then sucked directly into a small tube of absolute alcohol and stored for subsequent laboratory preparation and examination. More recently a power-operated sampler described by WALLACE (1972) has been used and found to be particularly suitable for sampling surface litter.

In the laboratory, specimens were cleared in hot lactophenol and then mounted in Hoyer's medium before being examined through the phase-contrast microscope.

Spermatophores and eggs were obtained by confining individual mites in small cages made up from 1-2 cm diam. plastic vials with the bottom cut off to form a short cylinder open at both ends. At one end, the original plastic cap was pressed into place after being filled with saturated tissue ("Kleenex") and covered with thin cellophane and a strip of tissue. This provided a moist substrate. At the other end, another cap was used with a hole punched in it and a piece of tissue or fine nylon gauze placed over it before pressing into place. This provided a dry zone and allowed aeration of the cage. The mites could then select a moist or a dry situation for oviposition or spermatophore deposition. Where possible photographs of spermatophores and eggs were taken with the scanning electron microscope.

The terminology used in the keys and descriptions is illustrated in Figures 1 and 2.

III. CLASSIFICATION.

In general the classification of subfamilies and genera follows that of ATYEO (1963). Four subfamilies are recognised and these can be separated with the aid of the following key:

1. Venter of hypostome with 6-7 pairs of strong setae and 2 pairs of small adornal setae; without well-developed genital tracheae. ......................................................... 2
   Venter of hypostome with only 2 pairs of strong setae and 2 pairs of small adornal setae; genital tracheae well developed. ......................................................... 3
2. Trichoboth present on tibia II. .................................................. Odontoscirinae
   Trichoboth absent on tibia II. ..................................................... Bdellinae

3. Trichoboth present on tarsus IV. ............................................. Spinibdellinae
   Trichoboth absent on tarsus IV. .............................................. Cytinae

Subfamily BDELLINAE Grandjean 1938.

Represented in Australia by the single genus *Bdella* containing two species, *B. captiosa* and *B. humida* sp. nov., which may be separated by the following key:

Striae of dorsal propodosoma longitudinal between both anterior sensilla and posterior sensilla. ......................................................... *B. captiosa* ATYEO ........ p.

Striae of dorsal propodosoma transverse between anterior sensilla and longitudinal between posterior sensilla. ..................................... *B. humida* sp. nov.... p.
Bdella captiosa Ateyo 1963.  
(Figure 4).

Described from a single female collected at Grovely, near Brisbane, Queensland. Similar to B. distincta Baker and Balock, 1944, in propodosomal pattern but distinguished by having the dorsal hysterosomal setae simple rather than coarsely branched distally. One female collected on the 1962 survey agreed well with ATEYEO’s description of the holotype *.

**Male:** Unknown.

**Habitat:** The specimen from NSW was collected in dense rain forest and the holotype locality - is a patchwork of rural development and rainforest. Probably B. captiosa is restricted to the rainforest habitat.

**Food:** Unknown.

**Spermatophore and egg:** Unknown.

**Ecdysis:** Not observed.


**Remarks:** B. captiosa appears to be a rare species but this may be because little collecting has been done in its preferred habitat.

**Bdella humida** sp. nov.

Closely related to B. tropica ATEYEO but distinguished by the shorter dorsal hysterosomal setae. The internal humeral setae are about 2/3 the length of those in B. tropica and just over half the first interspace compared with nearly 5/6 in B. tropica. In B. humida the external humeral setae are nearly 2x the internal humeral setae whereas in B. tropica the former is only 1.5x the latter **.

**Female** (holotype): Colour in life bright red with propodosomal area slightly darker than the remainder; body narrowly ovoid; mite walks rapidly and steadily; length (including gnathosoma), 740 μ; breadth, 330 μ.

**Gnathosoma:** Palp 175 μ, extending beyond hypostome by about half the length of the tibiotarsus; I, 10 μ; II + III, 110 μ; IV, 17 μ; V, 40 μ; des, 155 μ; ves, 120 μ; II with 6 setae; III with 1; IV with 4; V with 2 tactile setae, 1 curved sensory seta, 1 short almost terminal sensory

* ATEYEO (1963) states that the holotype is a male but examination by the authors has shown conclusively that it is a female.

**Note an error in the description of B. tropica in ATEYEO (1960) where the external humeral seta is said to be 238 μ in length. In reality its length is only half of this, 120 μ.*
seta, and 2 end setae. Chelicerae with weak longitudinal striations; length, 180 μ; breadth at widest point, 40 μ, and at narrowest point, 5 μ; chelae without teeth, the straight and pointed fixed digit extending slightly beyond the moveable digit; proximal seta, 45 μ in length, 60 μ from the distal seta, and 40 μ from the base; distal seta, 55 μ in length and 80 μ from the tip. Gnathosomal base, 95 μ in width with distinct longitudinal ridge in the mid-line; striations very weak. Hypostome 160 μ in length with weak longitudinal striations ventrally along the whole length; ventral setae 30-45 μ in length with vh1-vh5 almost in straight line; distances apart, vh1-vh2, 21 μ; vh2-vh3, 18 μ; vh3-vh4, 19 μ; vh4-vh5, 27 μ; vh5-vh6, 27 μ; vh6-tip, 65 μ; dorsal setae 30 μ in length, 50 μ apart on lateral margins of hypostome at level vh2.

Dorsal propodosoma: Striae finely broken, transverse between anterior sensilla, longitudinal centrally and between median propodosomal setae, then curving outward; lateral apodemes diffuse, commencing a short distance posterior to the posterior sensilla, curving lateral to the
anterior sensilla and then inwards and forwards to meet in front of a line joining the anterior sensilla. Anterior sensilla fine, 130 μ in length, 80 μ apart; posterior sensilla fine, 150 μ in length, 110 μ apart; median propodosomal setae 90 μ in length, 75 μ apart, and 15 μ from posterior sensilla; lateral propodosomal setae 40 μ in length, 110 μ apart, 40 μ from anterior sensilla, and 30 μ from posterior sensilla; eyes close together with 3-5 transverse or oblique striations between; anterior eye 15 μ in diameter; posterior eye 13 μ in diameter; 5 μ from anterior eye.

Dorsal hysterosoma: Striae finely broken; setae relatively short; internal humeral setae 50 μ in length; external humeral setae, 90 μ in length; first interspace 85 μ.

Ventral idiosoma: Striae finely broken except between coxae where they are almost continuous; genital plates 100 μ in length with 8-9 short setae in a single row; paragenital setae short; anal setae short ventrally, becoming longer dorsally; anal slit about 80 μ in length.

Legs: Length (excluding coxae), I-IV, 290 μ, 260 μ, 325 μ, 370 μ; basifemora I-IV, 60 μ, 55 μ, 65 μ, 65 μ; telofemora I-IV, 30 μ, 30 μ, 35 μ, 40 μ; genua I-IV, 35 μ, 30 μ, 40 μ, 55 μ; tibiae I-IV, 45 μ, 35 μ, 50 μ, 55 μ; tarsi I-IV, 75 μ, 65 μ, 75 μ, 80 μ; pre-tarsi, 16-20 μ; claws 15-20 μ with weak lateral rays.

Chaetotaxy: Coxae I-IV, 5, 5, 5, 3 short tactile setae; trochantera I-IV, 1, 1, 2, 1 short tactile setae; basifemora I-IV, 7, 8, 6, 4 short tactile setae; telofemora I-IV, 5, 5, 5, 5-6 short tactile, setae, one seta slightly longer than others on telofemora I and II, and much longer than others on telofemora III and IV; genu I, 6 tactile setae, 2 distal attenuate sensory setae, one of which is a duplex seta, and on one side an additional basal peg; genu II, 6 tactile setae, 1 distal duplex attenuate sensory seta; genu III, 5-6 tactile setae, 1 duplex attenuate sensory seta; genu IV, 6 tactile setae, 1 duplex attenuate sensory seta; tibia I, 8 tactile setae, 3 attenuate sensory setae in group distal to trichoboth, 1 attenuate sensory seta proximal to trichoboth, 1 trichoboth at 3/5; tibia II, 7 tactile setae, 1 distal attenuate sensory seta, 1 distal short blunt sensory seta; tibia III, 8 tactile setae; 1 attenuate sensory seta near 1/2; tibia IV, 10 tactile setae, 1 trichoboth at between 1/2 and 1/3; tarsus I, 9 plumose ventral, 6 lateral, and 1 dorsal tactile setae, the latter at about 1/2, 2 attenuate and 2 long blunt sensory setae, basal one with associated peg, other at between 1/3 and 1/2; tarsus II, 8 plumose ventral, 5 lateral, and 1 dorsal tactile setae, the latter near base, 2 long blunt sensory setae, one near base and one at 1/4; tarsus III, 8 plumose ventral and 6 lateral tactile setae, 1 trichoboth near base; tarsus IV, 8 plumose ventral and 5 lateral tactile setae, 1 attenuate sensory seta distal to trichoboth, 1 trichoboth near base; dorsoterminals, dt1 long and faintly pilose, dt2 and dt3, plumose.

Male: Unknown. In all, 43 mounted and 25 unmounted B. humida were examined without locating a single male.

Holotype: Female collected at Millstream, W. A., Fortescue River 3-iv-1971, M.M.H. Wallace, Ref. FT185-11-2, Acacia, Eucalyptus litter, LP, Hoyers.

Location of types: Holotype female and 2 paratype females at ANIC, 1 paratype each at SAM, BM, Bishop Museum, U.S. National Museum, and Institute of Acarology, Ohio.

Habitat: Acacia litter seems to be the favoured habitat of this species. All the collections in W.A. were made close to river courses, and one collection in Queensland was made in Melaleuca litter.
Food: Unknown.

Spermatophore: Unknown.

Egg: One egg was obtained from a bulk cage of Bdella humida. This egg was almost spherical — about 170 μ in diam., with a covering of fine twisted membranous material. Absolute proof is lacking that it was in fact laid by B. humida, but the probability is extremely high.


Remarks.

This species is named humida to draw attention to its apparent preference for moist tropical localities or local moist habitats within the dry tropics.

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Fig. 4. — Localities in Australia from which specimens of the genus *Bdella* were collected.
Fig. 5. — Localities in Australia from which specimens of the genus *Biscirus* were collected.
To enable the Australian species of *Bdella* to be fitted into the overall world distribution of this genus, as it is at present known, a key has been prepared to separate all species described since Atyeo's revision of the American fauna (ATYE 1960). This key is based on examination of specimens loaned to the authors by Dr. Atyeo, on material collected by one of us (MMHW) on two overseas surveys, and on information obtained from the following publications: The U.S.A. and Central America, Atyeo 1960; Iceland, Atyeo and Tuxen 1962; Japan, Ehara 1961; U.S.S.R., Gomezauri 1963; Antarctic regions, Wallace 1970.

**Key to *Bdella* species of the world.**

1. Striae of dorsal propodosoma longitudinal between both anterior sensilla and median propodosomal setae ................................................. 2
   Striae of dorsal propodosoma transverse between anterior sensilla ........................................... 4
2. Tarsus IV with trichoboth ......................................................... 3
   Tarsus IV without trichoboth ........................................... *Bdella mexicana* Baker & Balock
3. Dorsal hysterosomal setae simple ........................................... *Bdella captiosa* Atyeo
   Dorsal hysterosomal setae coarsely branched distally .......... *Bdella distincta* Baker & Balock
4. Striae of dorsal propodosoma longitudinal on median line between median propodosomal setae. .............................................................. 5
   Striae of dorsal propodosoma transverse to almost random on median line between median propodosomal setae .............................................................. 7
5. Ventral hypostomal setae with *vh1* and *vh4* lateral to a line formed by the other setae ........... *Bdella iconica* Berlese
   Ventral hypostomal setae in almost continuous curved line .......................................................... 6
6. Internal humeral seta about 1/2 first interspace; external humeral seta almost 2x internal humeral seta ........................................................................................................... *Bdella humida* sp. nov.
   Internal humeral seta approximately 5/6 first interspace; external humeral seta 1.5x internal humeral seta ................................................................................. *Bdella tropica* Atyeo
7. Striae of dorsal propodosoma sparsely broken ................................................................................................. 8
   Striae of dorsal propodosoma finely broken ........................................... 9
8. Palpal basifemur with 13 or more setae ........................................... *Bdella semiscutata* Sig Thor
   Palpal basifemur with maximum of 12 setae ........................................... *Bdella muscorum* Ewing
9. Striae of dorsal propodosoma longitudinal centrally between lateral propodosomal setae .......... 10
   Striae of dorsal propodosoma transverse centrally between lateral propodosomal setae ........... 11
10. Striae of dorsal propodosoma longitudinal median between propodosomal setae .................. *Bdella longistriata* Atyeo
11. Striae of dorsal propodosoma transverse or oblique between median propodosomal setae .......... *Bdella nuchidai* Ehara
    Palpal tibiotarsus less than 1/2 palpal basifemur ................... *Bdella longicornis* Linnaeus
    Palpal tibiotarsus more than 1/2 palpal basifemur ................... *Bdella septentrionalis* Atyeo

Subfamily SPINIBDELLINAE Grandjean 1938.
Represented in Australia by two genera, viz. *Spinibdella* with 5 species and *Biscirus* with 4 species.

**Key to genera and species of *Spinibdellinae*.**

1. Lateral propodosomal setae present ........................................... *Spinibdella* Sig Thor ...... 2 p.
   Lateral propodosomal setae absent ........................................... *Biscirus* Sig Thor .......... 7 p.
2. Cheliceral setae minute; chelicerae long and narrow.  
   Spinibdella tenuirostris (Ewing) ... p.  
Cheliceral setae normal; chelicerae not excessively narrow.     3
3. Only one pair of eyes; position of posterior eyes marked by striation pattern.  
   Spinibdella depressa (Ewing) ... p.
Two pairs of eyes present. ... p.  
4. Some striae on dorsal propodosoma longitudinal (or nearly so) medially.  
   Spinibdella cronini (Baker & Balock) ... p.
All striae on dorsal propodosoma transverse medially. .... p.  
5. Lateral propodosomal setae well forward almost on line with anterior sensilla.  
   Spinibdella corticis (Edwing) ... p.
Lateral propodosomal setae not placed near anterior sensilla. .... p.  
6. Lateral propodosomal setae much closer to posterior sensilla than to anterior sensilla.  
   Spinibdella thori (Meyer & Ryke) ... p.
Lateral propodosomal setae about midway between anterior and posterior sensilla. .... p.  
7. Palpal genu up to 8x longer than broad and more than 2x as long as palpal telofemur.  
   Biscirus thori Womersley ... p.
Palpal genu at most 1.5x longer than broad and only fractionally longer than palpal telofemur. ... p.  
8. Median propodosomal setae short, less than 200 μ in length.  
   Biscirus aquilonius sp. nov. ... p.
Median propodosomal setae longer than half the distance between them. ... p.  
9. Striae on dorsal propodosoma longitudinal or oblique between median propodosomal setae.  
   Biscirus obliquus sp. nov. ... p.
Striae on dorsal propodosoma transverse between median propodosomal setae.  
   Biscirus arenarius sp. nov. ... p.

Biscirus thori Womersley 1933.  
(Figures. 5, 6, 18).

This is the most abundant and widespread member of the genus in Australia (figure. 3). It 
seems to be confined to the drier parts of southern Australia which experience a Mediterranean-type 
climate. No specimens have been collected in the far southwest of W. A. or in Tasmania. Its 
inland limit is defined approximately by the 150 mm isohyet for the growing season May to 
October inclusive, and its eastern limits agree well with the 225 mm isohyet for the summer 
period December to March inclusive, apart from one specimen collected near Moruya on the 
south coast of New South Wales. That line was used to define the eastern limits of another 
bdeiid mite, Bdellodes lapidaria (Kram.) (Wallace and Mahon 1971).

Atyeo (1963) described B. thori but was unable to give any information on the living mite. 
It is a striking species, easily identified in the field. The basic colour is black or dark brown, 
and in most specimens there are two large silver spots on the dorsum — an anterior patch on the 
propodosoma and a transverse band posteriorly. There is wide variation in the size and shape 
of these spots, from complete absence in some individuals (rare) to those in which the two spots 
have become enlarged and almost joined to form a broken dorsal longitudinal band.

Male: The male genitalia, not figured by Atyeo (1963), are shown in figure 18.

Habitat: Woodland, grassland, and mallee (Eucalyptus spp.) areas. Sometimes found 
persisting in sown pastures of legumes and grasses.
Food: Noted feeding upon small Collembola, specially Entomobryidae. Often produces a web with it ties its prey to the substrate to facilitate feeding.

Spermatophore (figure 6).—Consists of a narrow basal disc and a basal portion of the stem which is narrow and cylindrical with some undulating structure on one side. The junction of the basal and distal portions of the stem is complex and expanded. The distal stem is slightly tapering with strong undulate sculpturing. The sperm sac support has two arms emerging from a triangular platform. These arms are fine and pointed. There is a rounded central protruberance on the platform to which the irregularly shaped sperm sac is joined.

Measurements: Total height 530 µm; maximum diameter of base 35 µm; maximum height of base 45 µm; basal portion of stem 265 µm in length and 15 µm in diameter; distal portion of stem 130 µm in length and 10 µm in diameter at its narrowest point; triangular platform 35 µm in length and 50 µm in breadth; arms 35 µm in length.

Spermatophores were usually deposited near the dry end of the cage.

Egg (figure 6).—Generally rounded oval in shape, flat, and strongly sculptured, specially around the edges where there is often an irregular series of almost circular projections. The eggs are pale pink when newly laid, and were usually deposited towards the dry end of the cage and even on the dry tissue. Length 500 µm; breadth 350 µm.

Ecdysis: When moulting B. thorii invariably spins a thin, silken cocoon to protect it during the few days when it is unable to move and thus vulnerable to attack by predators. Usually a crak or crevice is selected and the cocoon then takes the form of a barrier spun across the entrance. After ecdysis the mite escapes by forcing a hole in the silken barrier.

Remarks.

*B. thori* is the only Australian species of *Biscirrus* possessing a long palpal genu and in this respect resembles the European *B. silvaticus*. 
**Biscirus arenarius** sp. nov.  
(Figures 5, 7, 8).


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![Figure 7 - Biscirus arenarius](image.png)

**Fig. 7.** — *Biscirus arenarius*. A. palp; B. chelicera; C. ventral gnathosoma; D. dorsal propodosoma; E. dorsal aspect of legs I-IV from telofemur to pre-tarsi.

A rare species confined to west coastal regions of Western Australia. Only single individuals collected from any one locality. Characters distinguishing this species from others of the genus include the relatively short palpal genu (less than 1.5 x longer than wide), the transverse striation pattern between the relatively long median propodosomal setae, up to 60 μ in length.

**Female** (holotype): Colour in life diffuse dark brown, almost black at times, with paler appendages; length (including gnathosoma) 1 000 μ; breadth 350 μ.

**Gnathosoma**: Palp 250 μ, reaching beyond tip of hypostome by about 1/2 length of tibiotarsus; I 11 μ; II, 125 μ; III, 20 μ; IV, 20 μ; V, 75 μ; des, 170 μ; ves, 140 μ; II with 2 setae, proximal one long, distal one short; III with 1 seta; IV with 2 setae; V with 1 straight tactile seta and 1 long curved sensory seta at about 1/2, and 2 end setae. Chelicerae narrow, dorsally with strong, longitudinal striations; length 220 μ; breadth at widest point 30 μ, and at narrowest point 7 μ; fixed chela straight, pointed, about 2/3 length of movable chela which is also straight and pointed, without teeth; distal seta 45 μ in length and 60 μ from the tip; proximal seta 45 μ in length, 80 μ from the distal seta, and 85 μ from the base of the chelicera. Gnathosomal base,
100 μ in width with 35-40 transverse striations extending as far forward as the bases of the palps. Hypostome, 205 μ with prominent lips 25 μ in length, and with longitudinal striations for whole length; distal ventral setae 50 μ in length, 15 μ apart, 80 μ from proximal setae, and 80 μ from the tip of the hypostome; proximal ventral setae 70 μ in length and 35 μ apart: dorsal hypostomal setae wanting.

**Dorsal propodosoma**: Striae sparsely broken, transverse over whole length; anterior sensilla fine, 150 μ in length and 50 μ apart; posterior sensilla fine, 175 μ in length and 145 μ apart; median propodosomal setae strong, 55 μ in length, 50 μ apart, and 50 μ from the posterior sensilla. Eyes separated by 12 μ with 6-8 oblique striations; anterior eye 17 μ in diameter; posterior eye 17 μ in diameter.

**Dorsal hysterosoma**: Striae sparsely broken; internal humeral setae 40 μ in length; external humeral setae 45 μ in length; first interspace, 105 μ.

**Ventral idiosoma**: Striae sparsely broken, finer than dorsal striae; genital plates approximately 155 μ in length with 11-12 setae in an irregular line.

**Legs**: Length (excluding coxae), I-IV, 350 μ, 325 μ, 400 μ, 510 μ; basifemora I-IV, 70 μ, 65 μ, 80 μ, 110 μ; telofemora I-IV, 40 μ, 35 μ, 40 μ, 40 μ; genua I-IV, 30 μ, 30 μ, 40 μ, 60 μ; tibiae I-IV, 70 μ, 60 μ, 65 μ, 95 μ; tarsi I-IV, 105 μ, 95 μ, 125 μ, 140 μ; pretarsi 15-20 μ; claws 15 μ with weak lateral rays.

**Chaetotaxy**: Coxae I-IV, 5, 4, 5, 3 blunt, tactile setae; trochantera I-IV, 1 tactile seta each; basifemora I-IV, 7, 7, 6, 3 tactile setae; telofemora I-IV, 5, 5, 4-5, 4 tactile setae; genua I-IV, 4 tactile setae each; genu I with 4-5 attenuate sensory setae; genu II with 1 distal attenuate sensory seta; genua III-IV with 1 basal attenuate sensory seta each; tibia I, 12 tactile setae, 2 attenuate sensory setae near base, 1 attenuate sensory seta, 1 long blunt sensory seta, and 1 peg at distal end, 1 trichoboth at 2/3; tibia II, 10 tactile setae, 1 long blunt sensory seta and 1 blunt peg at distal end; tibia III, 9 tactile setae, 1 distal long blunt sensory seta; tibia IV, 11 tactile setae, 1 trichoboth at 1/2; tarsus I, 12 ventral, 7-8 lateral, 1 dorsal tactile setae, distal ventral pair plumose, 2 large blunt sensory setae, 2 attenuate sensory setae, 1 peg; tarsus II, 12 ventral, 6 lateral, 2 dorsal tactile setae, distal ventral pair plumose, 2 blunt sensory setae; tarsus III, 15 ventral, 7 lateral tactile setae, 3 distal ventral setae plumose, 1 trichoboth near base; tarsus IV, 18 ventral, 6 lateral, 3 distal ventral setae plumose, 1 trichoboth near base, 1 attenuate sensory seta basal to trichoboth. Dorsoterminals solid, simple.

**Male**: Unknown.

**Holotype**: Female collected at Perth, W. A., 5-v-1931, H. Womersley.

**Location of types**: Holotype at SAM, 2 paratypes at ANIC.

**Habitat**: Coastal d'une vegetation or nearby habitats. Seems to prefer sandy soils.

**Food**: Unknown.

**Spermatophore**: Unknown.

**Egg** (Figure 8): Almost boat-shaped, flat or partly concave on top and strongly sculptured. Similar to that of Biscinus thori. Laid usually in dry situations. Length 270 μ; breadth 160 μ.

Distribution and specimens examined (Figure 5). — 4 ♀♀, 3 nymphs, 1 larva. 

Western Australia: Perth, 5-v-1931, HW, 1 ♂ (holotype); Derby, 28 mi. S, 2-iv-1966, JAM, 1 ♀; Mt. Claremont, Perth, 10-iv-1971, JAM, 1 ♀; Perry Lakes, Perth, 16-vi-1971, KDW, 1 ♀; Lyndon River, 33 mi. N, on NW Coastal Highway, 30-iii-1971, MMHW, 1 DN; Wooramel River, 1 mi. S on NW Coastal Highway, 29-iii-1971, MMHW, 1 larva; Barradale, 14 mi. S, 30-iii-1971, MMHW, 1 DN; Barrows Is., 4-iv-1971, D. H. Perry, 1 TN.

Remarks.

A rare species although widely distributed. Womersley collected the first specimen in Perth in 1931 and it wasn't until 40 years later that the authors collected it again in that locality. The species is named arenarius to draw attention to its apparent preference for sandy soils.

Biscirus aquilonius sp. nov.

(Figures 5, 9, 18).


A small species widely distributed in north western Australia, but uncommon. Distinguished by the short median propodosomal setae which rarely exceed 20 μ in length, by the
transverse or random striation pattern between the median propodosomal setae, and by the presence of transverse striae across the basal portion of the chelicerae.

Female (holotype): Colour in life dark brown with silvery spots; length (including gnathosoma), 780 μ; breadth, 380 μ. Gnathosoma: Palp, 150 μ, not reaching the tip of the hypostome; I, 12 μ; II + III, 75 μ; IV, 15 μ; V, 60 μ; des, 120 μ; pes, 100 μ; II with 2 setae, proximal one normal, distal one very short; III with 1 very short seta; IV with 2 short setae; V with 1 tactile seta and 1 curved sensory seta on distal half of segment, and 2 end setae. Chelicerae with strong dorsal longitudinal striaions curving inwards basally to form about 8 transverse striaions; length, 190 μ, breadth at widest point 30 μ, and at narrowest point, 8 μ; fixed chela straight and pointed, about half length of moveable chela which is also straight and pointed with 1-2 weak teeth; distal seta 40 μ in length and 60 μ from the tip; proximal seta 35 μ in length, 70 μ from distal seta, and 65 μ from the base of the chelicera. Gnathosomal base 85 μ in width with 20-25 strong transverse striaions. Hypostome 190 μ in length with strong striaions ventrally along whole length, slightly weaker distally, transverse near base and becoming longitudinal after the proximal seta; lips prominent, 30 μ in length; distal ventral setae 30 μ in length, 25 μ apart, 75 μ from proximal setae, and 75 μ from the tip; proximal ventral setae 30 μ in length and 33 μ apart; dorsal setae wanting.

Dorsal propodosoma: Striae sparsely broken, transverse between anterior sensilla, transverse to broken and random between the median propodosomal setae; anterior sensilla lost, 55 μ apart; posterior sensilla lost, but based on calculations from a TN probably about 85 μ in length, 150 μ apart; median propodosomal setae short and stout, 17 μ in length, 75 μ apart, and 40 μ from posterior sensilla. Eyes close together, 13 μ apart with 5-6 transverse to oblique striaions; anterior eye 22 μ in diameter; posterior eye 18 μ in diameter.
Dorsal hysterosoma: Striae basically unbroken but with a superimposed finely broken pattern; internal humeral setae 20 μ in length and 70 μ apart; external humeral setae 14 μ in length; first interspace 85 μ.

Ventral idiosoma: Striae almost unbroken, finer than dorsal striae; genital plates 130 μ in length with 11-13 setae in an irregular line; paragenital setae short; anal setae short and stout but longer and finer than hysterosomal setae.

Legs: Length (excluding coxae), I—IV, 330 μ, 315, 370 μ, 435 μ; basifemora I—IV, 60 μ, 50 μ, 60 μ, 65 μ; telofemora I—IV, 40 μ, 40 μ, 50 μ, 50 μ; genua I—IV, 30 μ, 35 μ, 40 μ, 50 μ; tibiae I—IV, 50 μ, 45 μ, 60 μ, 70 μ; tarsi I—IV, 85 μ, 80 μ, 90 μ, 105 μ; pre-tarsi, 15-20 μ; claws 15 μ with 5-6 lateral rays.

Chaetotaxy: Coxae I—IV, 4, 4, 4, 3 tactile setae; trochantera I—IV, 1 tactile seta each; basifemora I—IV, 7-8, 7, 5, 4 tactile setae, anterior seta stouter than others; telofemora I—IV, 5, 5, 3, 3 tactile setae, a pointed, deeply-recessed seta present on the postero-dorsal margin on each leg; genua I—IV, 2 ventro-lateral tactile setae, 2 dorsal stouter tactile setae; genu I with 2 attenuate sensory setae; genua II and III with 1 attenuate sensory seta each; tibia I, 7 tactile setae, 3 attenuate sensory setae in median line, 1 attenuate peg, 1 trichoboth at 3/4; tibia II, 6 tactile setae, 1 attenuate sensory seta and 1 blunt peg at distal end; tibia III, 6 tactile setae, 1 distal attenuate sensory seta; tibia IV, 6 tactile setae, trichoboth wanting; tarsus I, 9 ventral, 5-6 lateral, 1 dorsal tactile setae, 3 large blunt sensory setae, 2 attenuate sensory setae, 1 peg; tarsus II, 9 ventral, 4 lateral, 1 dorsal tactile setae, 2 blunt sensory setae, 1 peg; tarsus III, 9-10 ventral, 5 lateral tactile setae, 1 trichoboth near base; tarsus IV, 9 ventral, 4 lateral tactile setae, 1 attenuate sensory seta basal to trichoboth, 1 trichoboth near base; dorsoterminal setae, d1x and d12, solid d13, hollow.

Male: Generally as for female. Male genitalia as figured (Figure 18). Genital slit shorter than in female with 2 rows of setae.


Location of types: Holotype and allotype et ANIC.

Habitat: Grassland and woodland, usually under dry grass and bark.

Food: Unknown.

Spermatophore and egg: Unknown.

Distribution and specimens examined (Figure 5). — 1 ♂, 4 ♀♀, 4 nymphs.

REMARKS.

The absence of the trichoboth on tibia IV is not consistent in this species and its significance is unknown. On the 9 specimens available for study, 6, including the holotype and allotype, had that trichoboth missing whilst 3 possessed the full complement of 4 trichoboths typical of the genus Biscirus.

**Biscirus ubliquus** sp. nov.

(Figures 5, 10).

A very rare species easily separated from all other Biscirus spp. by the presence of sparsely broken and oblique striae the median propodosomal setae. Closely related to *B. aquilonius* in possessing a deeply recessed sensory seta on each telofemur but distinct from the latter in having longer palps reaching beyond the tip of the hypostome, and longer dorsal setae.

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**Fig. 10.** — *Biscirus ubliquus*. A. palp; B. chelicera; C. ventral gnathosoma; D. dorsal propodosoma; E. dorsal aspect of legs I-IV from telofemur to pre-tarsi.

*Female* (holotype): Colour in life generally dark brown with silvery markings dorsally; hypostome and appendages paler; length (including gnathosoma), 850 μ; breadth, 420 μ.

*Gnathosoma*: Palps 215 μ, reaching beyond tip of hypostome by half the length of the tibiotarsus; I, 12 μ; II + III, 110 μ; IV, 20 μ; V, 70 μ; *des*, 110 μ; *ves*, 100 μ; II with 2 setae; III with 1 seta; IV with 2 distal setae; V with 1 tactile seta and 1 curved sensory seta on distal half of the segment, and 2 end setae. Chelicerae with strong dorsal longitudinal striations along the whole length; length 205 μ; breadth at widest point, 40 μ, and at narrowest point, 13 μ; fixed chela straight, pointed, little more than half the length of the movable chela which is also
straight and pointed without teeth; distal seta 50 μ in length and 65 μ from the tip; proximal seta 45 μ in length, 55 μ from distal seta and 80 μ from the base. Gnathosomal base 120 μ in width with 17-18 strong transverse striations. Hypostome 200 μ in length with strong striations ventrally, transverse up to proximal setae, oblique or longitudinal on remainder; lips prominent, 20-25 μ in length; distal ventral setae 40 μ in length, 30 μ apart, 75 μ from proximal setae, and 65 μ from the tip; proximal ventral setae 45 μ in length and 45 μ apart; dorsal setae wanting.

**Dorsal propodosoma**: Striae sparsely broken, transverse between anterior sensilla, longitudinal and oblique between median propodosomal setae; anterior sensilla lost, 5 μ apart; posterior sensilla lost, 50 μ apart; median propodosomal setae stout, 40 μ in length, 5 μ apart, and 50 μ from posterior sensilla. Eyes close together, 12 μ apart with 3-4 transverse striations and 4-5 oblique striations from antero-median to postero-lateral; anterior eye 25 μ in diameter; posterior eye 20 μ in diameter.

**Dorsal hysterosoma**: Striae close together and almost unbroken; setae stout and tapering; internai humeral setae 35 μ in length and 85 μ apart; externai humeral setae 40 μ in length; first interspace 50 μ.

**Ventral idiosoma**: Striae almost unbroken, finer than dorsal striae; genital plates about 150 μ in length with 9-11 fine setae in an irregular line; paragenital setae simple, stronger than genital setae; anal setae stout, shorter than hysterosomal setae.

**Legs**: Length (excluding coxae), I — IV, 340 μ, 350 μ, 420 μ, 460 μ; basifemora I — IV, 70 μ, 65 μ, 75 μ, 80 μ; telofemora I — IV, 45 μ, 40 μ, 50 μ, 60 μ; genua I — IV, 35 μ, 40 μ, 50 μ, 55 μ; tibiae I — IV, 60 μ, 55 μ, 70 μ, 85 μ; tarsi I — IV, 95 μ, 90 μ, 105 μ, 110 μ; pre-tarsi 15-18 μ, claws 12-15 μ, lateral rays either absent or very weak.

**Chaetotaxy**: Coxae I — IV, 3-4, 3, 4, 2 tactile setae, rather blunt; trochanera I — IV, 1 tactile seta each; basifemora I — IV, 7, 7, 4-5, 3 tactile setae; telofemora I — IV, 5, 5, 3, 3 tactile setae, a pointed, deeply-recessed seta present on the postero-dorsal margin on each leg; genua I — IV, 4 tactile setae each; tibia I, 8 tactile setae, 1 attenuate and 1 blunt sensory seta, 1 peg, 1 trichoboth at 2/3; tibia II, 8-9 tactile setae, 1 attenuate and 1 blunt sensory seta; tibia III, 7 tactile setae, 1 distal attenuate sensory seta; tibia IV, 6 tactile setae, 1 trichoboth at 1/2; tarsus I, 9 ventral, 6 lateral, 1 dorsal tactile setae, 3 large blunt sensory setae, 2 attenuate sensory setae; tarsus II, 9 ventral, 6 lateral, 1 dorsal tactile setae, 1 blunt sensory seta, 1 attenuate sensory seta, both distally placed; tarsus III, 9 ventral, 6 lateral tactile setae, 1 trichoboth near base; tarsus IV, 9-10 ventral, 6 lateral tactile setae, 1 trichoboth near base. Dorso-terminal setae, dt1 and dt2 solid, dt3, hollow.

**Male**: Unknown.


**Location of types**: Holotype at ANIC.

**Habitat**: Grass tufts or litter. Annual rainfall at the two collecting sites was 275 and 215 mm respectively, falling mostly during the late summer and late autumn months.

**Food**: Unknown.

**Spermatophore and egg**: Unknown.
Distribution and specimens examined (Figure 5). — 1 ♀, 3 nymphs.

Western Australia: Mundiwendi, 28 mi. N, 9-iv-1966, JAM, 1 ♀ (holotype); Meekatharra, 11 mi. N, 9-iv-1971, MMHW, 1 TN, 1 DN.

Remarks.

A very rare species whose specific habitat requirements are not known but are either extremely local or rarely satisfied. The species is named obliquus to refer to the oblique striations on the posterior propodosoma between the median propodosomal setae.

Spinibdella cronini (Baker and Balock).
(Figures 12, 18).

In view of its wide distribution in native habitats in Australia it seems unlikely that this species is, in fact, the same as that described by BAKER and BALOCK (1944) from lichens in California. However, no consistent morphological character has been found to enable a definite separation to be made and until a closer examination is possible the Australian species must remain Spinibdella cronini. The species can immediately be separated from others of the genus in Australia by the longitudinal or oblique striae in the centre of the dorsal propodosoma between the lateral propodosomal setae.

Female: Colour in life pale red with darker markings on the dorso-lateral propodosoma; generally slow moving. The Australian specimens agree well with the description given by ATYEO (1960).

Male: Only a single damaged specimen has been collected. This specimen is essentially the same as the female except that the genital setae are strongly branched instead of simple and blunt. The male genitalia are as shown in Figure 16, and closely resemble those of Spinibdella depressa figured by ATYEO (1960).

Habitat: Collected from a wide range of habitats including pastures, Woodland, forest and grassland.

Food: Noted feeding on Acari including Tetranychidae and Cunaxidae. Prey held to substrate by silk threads.

Spermatophore: Unknown.

Egg (Figure 11): Almost spherical but slightly elongated. Surface smooth or nearly so without prominent sculpturing, pale orange in colour. Laid in dry situations, usually within a silken enclosure and apparently able to hatch without contact with free water. Length 160 μ; breadth 105 μ.

Ecdysis: When moulting S. cronini may spin a thin-walled silken cocoon, in which it remains for several days.

Acarologia, t. XIV, fasc. 4, 1972.
REMARKS.

*S. cronini* appears to be restricted by high rainfall both in its northern and southern distributions. It has not been collected in summer rainfall areas where the annual rainfall exceeds about 700 mm and in southern Western Australia it is generally difficult to locate although collected widely in the inner and drier agricultural districts and in the Metropolitan area of Perth. Possibly it was originally a northern species, confined mainly to summer rainfall zones and has been brought southwards in modern times as communications have improved.

*Spinildella corticis* (Ewing).

(Figures 12, 18).

A widely distributed but uncommon species collected in Western Australia and the Northern Territory only. Like *S. depressa* this species has the lateral propodosomal setae well forward almost level with the anterior sensilla but can be distinguished from the former by the presence of two fully developed eyes on each side.

**Female**: Colour in life pale red, similar to *S. cronini*, but generally a little darker. The Australian specimens agree well with the description given by Atyeo (1960) except that the striations between the eyes are transverse or partly oblique and not longitudinal as stated by Atyeo. This is probably an error in the description since two U.S.A. specimens seen by us also have transverse striae between the eyes.

**Male**: Essentially as in the female. The male genitalia are shown in Figure 18 and closely resemble those of *S. cronini* and *S. depressa*.

**Habitat**: Collected in woodland and grassland on both sandy and loamy soils. Also found in rocky areas, often near river beds.

**Food**: Unknown.

**Spermatophore and egg**: Unknown.


REMARKS.

Unlike *S. cronini* of which only a single male is known, males of *S. corticis* are quite common, 8 of the 24 adult specimens collected being of this sex.
Spinibdella tenuirostris (Ewing).
(Figure 12).

Easily separated from other Spinibdella species by the minute, distal, cheliceral setae. Collected from northern Australia only.

**Female**: Colour in life generally pale but with some dark spotting dorsally. Gnathosoma held well forward giving the appearance of a long pointed body. The Australian specimens agree well with the description given by Atyeo (1960) although there is some variation in the number of sensory setae on the legs, and, as pointed out by that author, the blunt sensory seta on tibia II is deeply recessed in the Australian specimens and not recessed in the U.S.A. specimens although there is a tendency in some for the seta to be more deeply seated than usual. Atyeo also noted that Australian specimens had an attenuate sensory seta on tarsus II and that this was lacking in the north American specimens. However, a further examination reveals that the same seta is present on all specimens.

**Male**: Unknown.

**Habitat**: One of the Australian specimens was collected in a moist, almost rain-forest type of habitat, with a dense overhead canopy and practically no herbaceous ground cover. The exact nature of the habitat of the specimens collected by G. F. Bornemissa is not known but a similar moist situation is probable since another species, Bdella humida, known to prefer moist habitats, was collected in the same general area. Irrigation on the Research Station where these latter specimens were collected may have had some influence.

**Food**: Unknown.

**Spermatophore and egg**: Unknown.

**Distribution and specimens examined** (Figure 12). — 2 ♀♂. **Western Australia**: Kimberley Research Station, near Kununurra, February, 1954, G. F. Bornemissa, 1 ♀; **Northern Territory**: Darwin, 3 mi. E. 22-iii-1966, JAM, 1 ♀.

Spinibdella depressa (Edwing).
(Figures 12, 18).


This is the only Australian species collected to date in which the posterior eye is lost, its position being shown by the striae forming a semi-circular pattern. Wallace (1971) described S. antarctica (Tragardh) from South Georgia with a similar eye pattern, but in that species the median position of the lateral propodosomal setae, the transverse propodosomal striation pattern, and the relatively long (35 µ) dorsal hypostomal setae clearly separate it from S. depressa.

**Female**: The Australian specimens agree well with the description given by Atyeo (1960) except that the cheliceral setae tend to be slightly closer to the base than those in the north American specimens.

**Male**: As for the female. The male genitalia of the Australian specimens shown in Figure 18 are similar to those figured by Atyeo.
Habitat: Collected from leaf and bark litter of Eucalyptus and Acacia, and from mosses. One specimen from Chiltern, Victoria, was collected from a pasture area but grape vines were growing on the site in previous years and probably supported mosses and lichens.

Food: Unknown.

Spermatophore and egg: Unknown.


Spinibdella thori Meyer and Ryke.

Womersley collected the only known specimen of this species in Australia at Glen Osmond, S.A., in 1933, identifying it then as Bdella lignicola. ATYEO (1963) considered the Australian specimen was similar to S. thori as described by MEYER and RYKE from South Africa but thought that a synonym for both could be S. Ornata described from California (ATYEO 1960). Until further specimens are collected this identification must remain in doubt.

Spinibdella ampulla sp. nov.
(Figures 12, 13).

Unique amongst Australian Spinibdella in that the lateral propodosomal setae, which are unusually weak, lie much closer to the posterior sensilla than to the anterior sensilla. The striation pattern on the propodosoma is medially transverse throughout rather similar to that of S. tenuirostris and tibia II possesses a deeply recessed blunt sensory seta like that in S. depressa. These characters place the species close to S. antarctica from South Georgia (WALLACE 1971) but the absence of the posterior eye in the latter clearly distinguishes it. The presence of two setae on the palpal telofemur also seems to be a unique character.

Female (holotype): Colour in life unknown; length (including gnathosoma) 750 μ; breadth 280 μ.

Gnathosoma: Palp 190 μ, just reaching the tip of the hypostome; I, 10 μ; II + III, 120 μ; IV, 20 μ; V, 40 μ; ω, 160 μ; ω, 145 μ; II with 9 setae; III with 2 setae; IV with 4 setae; V with 4 tactile setae, 1 sensory seta near tip, and 2 end setae. Chelicerae narrow, swollen basally with weak longitudinal striations; length 190 μ; breadth at widest point 30 μ, and at narrowest point 7 μ; fixed chela straight; movable chela curved, approximately same length as fixed chela; distal seta 45 μ in length and 60 μ from the tip; proximal seta 50 μ in length, 80 μ from distal seta, and 50 μ from the base of the chelicera. Gnathosomal base 80 μ in width with transverse striations to level of base of palpal basifemur; striations in central basal area with sharp convex curvature towards the posterior. Hypostome 170 μ in length with weak longitudinal striations except for several transverse lines near the base; distal ventral setae 60 μ in length, 16 μ apart, 40 μ from the proximal setae, and 85 μ from the tip of the hypostome; proximal ventral setae 45 μ in length and 25 μ apart.
Dorsal propodosoma: Striae sparsely broken, almost continuous, transverse over whole length centrally, curving towards the anterior on either side; anterior sensilla lost but calculations from those present on a deutonymph specimen suggest a length of about 140 μ, 45 μ apart; posterior sensilla lost but similar calculations suggest a length of about 190 μ, 135 μ apart; median propodosomal setae 55 μ in length, 110 μ apart, and 15 μ from the posterior sensilla; lateral propodosomal setae weak, 25 μ in length, 120 μ apart, 60 μ from the anterior sensilla, and 22 μ from the posterior sensilla. Eyes close together, 7-8 μ apart with 7-8 μ transverse to oblique striations running from the antero-lateral point to the postero-median point; anterior eye 15 μ in diameter; posterior eye 8 μ in diameter.

Dorsal hysterosoma: Striae sparsely broken, almost continuous; internal humeral setae 35 μ in length; external humeral setae 55 μ in length; first interspace 75 μ.

Ventral idiosoma: Striae almost continuous; genital plates approximately 100 μ in length with 9 blunt setae in an irregular row; anal slit about 85 μ in length with longitudinal striae.

Legs: Length (excluding coxae), I — IV, 320 μ, 300 μ, 370 μ, 480 μ; basifemora I — IV, 70 μ, 65 μ, 85 μ, 110 μ; telofemora I — IV, 40 μ, 35 μ, 35 μ, 35 μ; genua I — IV, 30 μ, 30 μ, 40 μ, 60 μ; tibiae I — IV, 60 μ, 55 μ, 70 μ, 85 μ; tarsi I — IV, 85 μ, 85 μ, 105 μ, 115 μ; pre-tarsi 15-20 μ; claws 15-20 μ with weak lateral rays.

Chaetotaxy: Coxae I — IV, 4, 7-8, 7, 3 blunt tactile setae except for the anterior attenuate seta on coxa I; trochantera I — IV, 1, 1, 2, 1 tactile setae, attenuate on trochanter I and II,
1 attenuate and 1 blunt on trochanter III, and 1 blunt on trochanter IV; basifemora I — IV, 9, 8, 5, 3 stout tactile setae; telofemora I — IV, 7, 7, 5, 5 tactile setae; genua I and II, 6 tactile setae, 1 blunt sensory seta, 1 attenuate sensory seta; genu III, 5 tactile setae, 1 long and 1 short attenuate sensory seta; genu IV, 6 tactile setae; tibia I, 13 tactile setae, 1 attenuate sensory seta near base, 1 attenuate and 1 blunt sensory seta near trichoboth, 1 trichoboth at 4/5; tibia II, 12 tactile setae, 1 attenuate sensory seta, 1 blunt sensory peg in deep goblet-shaped pit near distal end; tibia III, 12 tactile setae, 1 attenuate sensory seta near distal end; tibia IV, 17-12 tactile setae, 1 trichoboth near 1/2; tarsi I — IV, ventral setae becoming more strongly plumose distally; tarsus I, 12 ventral, 7 lateral, 3 dorsal tactile setae, 2 large blunt sensory setae, 1 attenuate sensory seta, 1 peg; tarsus II, 10 ventral, 7 lateral, 3 dorsal tactile setae, 1 blunt sensory seta at about 1/3; tarsus III, 12 ventral, 7 lateral, 1 dorsal tactile setae, 1 trichoboth near base; tarsus IV, 12 ventral, 6 lateral tactile setae, 1 trichoboth near base. Dorsoterminal setae solid.

Male : Unknown.

Holotype : Female collected at Millstream, W.A., 1 mi. N of homestead, 3-vi-1971, M. M. H. WALLACE, FT 185-12-2, green herbaceous, couch grass, Eucalyptus litter, LP, Hoyers.

Location of type : Holotype at ANIC.

Habitat : Moist area with Eucalyptus leaf and bark litter and dense cover of low herbaceous plants.

Food : Unknown.

Spermatophore and egg : Unknown.

Distribution and specimens examined (Figure 12). — 1 ♀, 3 nymphs. Western Australia ; Millstream, 3-iv-1971, MMHW, 1 ♀ (holotype), 1 TN, 2 DN.

Remarks.

Apparently a rare species or one with a highly specialised habitat. Since it was found at the same site as Bdella humida it is probable that S. ampulla is essentially a moist tropical species and was found at Millstream only because of the permanent spring water which is a feature of that site. The species is named ampulla to draw attention to the unusual shape of the chelicerae.

Subfamily CYTINAE Grandjean 1938.

Represented in Australia by the single genus Cyta, containing two species, C. latirostris, which is world-wide in distribution, and a new species C. longiseta, so far known only from Australia.

Key to Australian species of the genus Cyta.

Trichoboth present on tibia IV only .................. Cyta latirostris (Hermann) ........ p.
Trichoboths present on tibia I, tarsus III, and tibia IV ............. Cyta longiseta sp. nov. p.
Cyta latirostris (Hermann).
(Figures 14, 15, 18).

An abundant species widely distributed throughout southern Australia. The Australian specimens, both male and female, agree well with the description given by ATYEO (1960).

Habitat: With rare exceptions associated with roadside verges, this species has been collected from agricultural land only. At times it can be extremely abundant in pastures.

Food: Seems to have a particular affinity for oribatid mites but will also feed upon Colembola, usually Arthronea but occasionally also on Symphylea. When disturbed during feeding the species carries its prey around attached to the end of its hypostome. It does not seem to spin any web to aid in holding its prey to the substrate although we have noted it going through the body weaving actions typical of some other bdellid mites which do attach silken threads to their prey, such as Bdellodes lapidaria.

Spermatophore (Figure 14): Basal disc small not much larger than the diameter of the stem. Basal portion of stem short and constricted; remainder almost cylindrical but expanding slightly along its length with two lateral, simple ridges and a third undulating ridge. Distally the stem expands more rapidly to form a concave platform with a striated surface and two inwardly curving arms terminating in fine vertical spines. In the centre of the platform there is a small protuberance to which the spherical sperm sac is attached; this sac has a central tapering spine reaching up to the tips of the two arms.

Measurements: Total height 290 μ; basal portion of stem 40 μ; distal portion of stem up to base of expanding platform 140 μ, diameter basally 12 μ, expanding to 16 μ distally; height of platform expansion to base of arms 65 μ; diameter of platform 35 μ; diameter of sperm sac, 10 μ. Spermatophores were usually deposited in dry situations.

Egg (Figure 14): Spherical, pale cream to pink, with a dense covering of fine, long, and often twisted, projections. Usually laid in moist situations such as the damp tissue or cellophane at the base of the breeding cage. Diameter 180 μ.

Ecdysis: Not observed.

Distribution and specimens examined (Figure 15). — 126♂, 186♀, 36 nymphs. Western Australia: Perth, 29-iv-1932, HW, 1♀; North Dandalup, 19 mi. N, 21-vi-1953, MMHW, 2♂♂. A TN; Waroona, 15-vii-1953, JAM, 3♂♂; Geraldton, 8 mi. N, 19-vii-1953, MMHW, 1TN; Geraldton, 11 mi. E, 20-viii-1953, MMHW, 1♀; Brunswick Junction, 2 mi. S, 14-ix-1953, JAM, 1♀; Albany, 16 mi. NE, 14-ix-1953, JAM, 1♂, 1♀; Pemberton, 10 mi. N, 16-ix-1953, JAM, 1♂, 3♀♀; Margaret River, 8 mi. S, 14-ix-1953, JAM, 3♂♂, 1♀; Nannup, 1 mi. E, 15-ix-1953, JAM, 1♂; Balingup, 1 mi. N, 15-ix-1953, JAM, 1♀; Bridgetown, 4 mi. N, 15-ix-1953, JAM, 2♀♀; Bridgetown, 4 mi. S, 15-ix-1953, JAM, 1♂; Northcliffe, 2 mi. N, 15-ix-1953, JAM, 1♂; Normalup, 15-ix-1953, JAM, 1♂; Busselton, 2 mi. N, 14-ix-1953, JAM, 2♂♂, 1♀; Alexandra Bridge, 1 mi. W, 15-ix-1953, JAM, 2♂♂, 1TN; Toodyay, 2 mi. N, 29-vii-1954, JAM, 1♂, 1♀; Tammin, 2 mi. W, 25-viii-1954, JAM, 1DN; Mandurah, 20 mi. N, 27-vii-1955, JAM, 1♂; Kulin, 5 mi. 10-viii-1955, JAM, 1♀; Kurnal, 2 mi. S, 3-viii-1959, MMHW, 1♀; Scadden, 6 mi. S, 3-viii-1959, MMHW, 1♀; Regents Ford, 15 mi. N, 2-vi-1960 MMHW, 8♂♂, 6♀♀; Encla, 93 mi. W, 18-vii-1962, JAM, 1♀; Berkshire Valley, 1 mi. SW, 5-vii-1963, EH, 1♀; Round Hill, 2 mi. W, 5-vii-1963, GSM, 1♀; Nedlands, Perth, various dates 1961-1967, JAM, EH and GSM, 9♂♂, 1♂, 1♀; Dalkin, Perth, 14-viii-1963 EH and GSM, 1♂, 3♀♀; Kings Park, Perth, 3-ix-1963, EH, 1♀; Coolup, 1 mi. E,
Fig. 15.—Localities in Australia from which specimens of the genus Cyta were collected.

This species is most abundant in the moister parts of Australia, such as southern Victoria, Tasmania, and the far southwest corner of Western Australia. It has not been collected in areas which receive less than about 150 mm rainfall during the winter period May to October inclusive. The characters given by Meyer and Ryke (1959) to separate Cyta phaseoli from C. latirostris could apply equally well to the latter species and we consider that these two species are probably synonymous. One of us (MMHW) collected in South Africa in 1965 and obtained specimens of C. latirostris from 3 localities which perhaps tends to support that conclusion.
Cyta longiseta sp. nov.  
(Figures 15, 16, 17, 18).

Readily distinguished from Cyta latirostris by the possession of trichoboths on tibia I and tarsus III, as well as on tibia IV. It can easily be identified in the field with a low power lens because of the long strong dorsal setae and the rapid jerky walk; C. latirostris has a smoother walk although it too tends to stop and start at intervals.

Female (holotype): Colour in life bright red all over with paler appendages; length (including gnathosoma), 1015 μ; breadth 545 μ.

Fig. 16. — Cyta longiseta. A. palp; B. chelicera; C. ventral gnathosoma; D. dorsal propodosoma; E. dorsal aspect of legs I-IV from telofemur to pre-tarsi.

Gnathosoma: Palp 350 μ, the last three segments reaching beyond the tip of the hypostome; I, 15 μ; II + III, 220 μ; IV, 25 μ; V, 90 μ; des, 250 μ; ves, 190 μ; II with 7–8 setae, the two distal setae more plumose and stronger than the remainder; III with 1 plumose seta; IV with 3 plumose setae; V with 4 tactile setae, more plumose proximally, 1 sensory seta near the tip, and 2 end setae. Chelicerae stout with longitudinal striations curving inwards to become transverse between the proximal seta and the base; length 205 μ; breadth at widest point 70 μ and at narrowest point 18 μ; both fixed and movable chelae slightly curved and about the same length; distal seta 65 μ in length and 55 μ from the tip; proximal seta strong and plumose, 120 μ.
in length, 110 μ from the distal seta, and 45 μ from the base of the chelicera. Gnathosomal base with mostly transverse striations coarsely broken; breadth 170 μ. Hypostome with longitudinal striations becoming oblique basally; length 150 μ, breadth near base 100 μ; distal setae 50 μ in length, 45 μ from the tip; proximal ventral setae 85 μ in length, 45 μ apart, 40 μ from the base, and 65 μ from the distal setae; fringe of lateral lips composed of cuticular ridges extending forward into free blade-like flaps; dorsal hypostomal setae weak, 50 μ in length, 85 μ apart.

**Dorsal propodosoma**: Striae finely broken, transverse between anterior sensilla, longitudinal centrally between median propodosomal setae; anterior sensilla fine, weakly pilose, 270 μ in length, 135 apart; posterior sensilla fine, weakly pilose, 315 μ in length, 400 μ apart; median propodosomal setae strong, plumose, 135 μ in length 340 μ apart, and 30 μ from the posterior sensilla; lateral propodosomal setae strong, plumose, 135 μ in length, 210 μ apart, 70 μ from the anterior sensilla, and 120 μ from the posterior sensilla. Eyes 60 μ apart with transverse striations between; diameter of anterior eye 30 μ; diameter of posterior eye 30 μ.

**Dorsal hysterosoma**: Striae sparsely or finely broken; internal humeral setae 125 μ in length; external humeral setae 120 μ in length; first interspace 135 μ.

**Ventral idiosoma**: Striae finely broken; genital plates 170 μ in length with 10-11 fine setae in an irregular row; paragenital setae blunt and faintly plumose; anal slit 140 μ; anal setae plumose and strong but weaker than dorsal hysterosomal setae.

**Legs**: Length (excluding coxae), I — IV, 560 μ, 540 μ, 620 μ, 695 μ; basifemora I — IV, 120 μ, 120 μ, 125 μ, 125 μ; telofemora I — IV, 75 μ, 65 μ, 65 μ, 80 μ; genua I — IV, 60 μ, 55 μ, 60 μ, 75; tibiae I — IV, 90 μ, 90 μ, 100 μ, 135 μ; tarsi I — IV, 150 μ, 160 μ, 195 μ, 200 μ; pretarsi 25-30 μ; claws 20-22 μ with many short lateral rays.

**Chaetotaxy**: Coxae I — IV, 5-6, 3-4, 5, 3-5 blunt tactile setae; trochanter I, 1 strong and 1 weak tactile seta; trochanter II, 1 strong and 2 weak tactile setae; trochanter III, 1 strong and 1 weaker tactile seta; trochanter IV, 1 moderately strong tactile seta; basifemora I — IV, 9-10, 9-10, 8-10, 4 tactile setae, those on the dorsal surface more strongly plumose; telofemora I — IV, 5 tactile setae each, those on dorsal surface stronger and more plumose; genua I — IV, 4, 4, 5, 5 tactile setae, 1 attenuate duplex sensory seta each; tibia I, 8 tactile setae, 2 attenuate sensory setae, 1 peg, all distal to trichoboth, 1 trichoboth at about 1/2; tibia II, 9 tactile setae, 1 attenuate and 1 blunt sensory seta near distal end; tibia III, 8 tactile setae, 1 blunt sensory seta near distal end; tibia IV, 12-12 tactile setae, 1 trichoboth at 3/5; tarsus I, 12 ventral, 8 lateral, 4 dorsal tactile setae, 1 attenuate sensory seta near base, 2 blunt sensory setae near distal end, close to δt; tarsus II, 12 ventral, 8 lateral, 4 dorsal tactile setae, 2 blunt sensory setae near distal end, proximal to δt; tarsus III, 15 ventral, 12 lateral or dorsal tactile setae, 1 trichoboth near base; tarsus IV, 14 ventral, 6 lateral tactile setae, 1 attenuate sensory seta near base.

(Note: the rows of dorsal and lateral tactile setae on the tarsi merge into one another and it is difficult to assign them to a specific surface). Dorsoterminal setae all solid.

**Male**: (allotype) : Essentially as in female. Genitalia as shown in Figure 18.


Fig. 18. — Male genitalia and laminated gland. A. Spinibdella cronini; B. Spinibdella depressa; C. Spinibdella corticis; D. Biscirus aquilonius; E. Biscirus thori; F. Cyta latirostris; G. Cyta longiseta.

Location of types: Holotype, allotype, and 14 paratypes at ANIC. One paratype at SAM, BM, Bishop Museum, Institute of Acarology, Columbus, Ohio, and U.S. National Museum.

Habitat: Mostly Eucalyptus forest and natural bushland.

Food: Small Prostigmata, such as Tetranychidae and Tydaeida. Carries its prey around held in the air on the tip of its hypostome.

Spermatophore (Figure 17): Basal disc small, about twice diameter of stem. Basal portion of stem narrow with one undulating ridge; distal portion of stem more robust with strongly
undulating surface. Near its apex this portion becomes smooth before expanding into a flattened
conic platform with 2 short and weak, slightly inwardly-pointing lateral arms. Partly buried
in the centre of the platform is the spherical sperm sac which has a short tapering apical spine
reaching almost to the tip of the lateral arms.

**Measurements**: Total height 360 µ; basal portion of stem 155 µ; distal portion of stem up
to end of undulating section 150 µ; distal smooth portion 20 µ; height of platform expansion
to base of arms 30 µ; length of arms 18 µ; breadth of platform 30 µ; diameter of sperm sac 7 µ.
Spermatophores deposited in dry situations, at dry end of breeding cage or on dry tissue.

**Egg (Figure 17)**: Spherical or nearly so, pale cream to pink, with a dense covering of fine
long, often twisted projections. Many of these projections end in a small expansion in contrast
to those on the eggs of *C. latirostris* where they terminate in a blunt point. Eggs usually laid
on the damp tissue or cellophane in the breeding cage. Diameter 180 µ.

**Ecdysis**: Not observed.


**Remarks.**

Species of *Cyta* can be divided into three groups depending on whether they possess three
trichoboths (on tibiae I and IV, and tarsus III), only a single trichoboth on tibia IV, or no tricho­
both on any leg. In Europe the first group is represented by *C. coerulipes*, the second by *C. lati­
rostris*, and the third by an undescribed species which seems to be confined to Mediterranean
regions (WALLACE, unpublished). A study of the habitats of *C. latirostris* in other regions of
the world seems to suggest that it is not endemic to any of them and is probably a relatively recent
introduction. Hence the *Cyta* group bearing only one trichoboth is not represented by endemic
species outside Europe and western Asia. On the other hand the group possessing three tricho­
both is represented in Europe and western Asia by *C. coerulipes*, in north America by *C. spuria*
and *C. coerulipes*, in Australia by *C. longiseta*, and in South Africa by an as yet undescribed species
collected by one of us (MMHW) in 1965 in the Cape Province (WALLACE, unpublished). The
Mediterranean species lacking trichoboths has not yet been collected outside that region.

The only figures of *C. latirostris* describing that species from Europe and seen by us are
those published by SIG THOR (1931, p. 16-17). Two of these (Figures 22 and 23, taken from
BERLESE) show a species with some characterstics similar to those noted above in the species
of *Cyta* which is apparently restricted to Mediterranean regions. Thus in Figure 22 of the whole
mite, there are no trichoboths shown on the legs, and in Figure 23 the palpal genu is shown with
only 3 setae. We have not yet been able to trace the early reference of HERMAN (1804) in which
*C. latirostris* (then *Scirus latirostris*) was first described. It seems likely that if that author
collected his type specimen(s) in northern or central Europe then his *S. latirostris* refers to the
species re-described as *C. latirostris* by Attyeo (1960). However, if Herman's collections were made in Mediterranean regions, the name *latirostris* could equally well apply to the species lacking trichoboths on the legs and having only 3 setae on the palpal genu.

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