

A new genus and two new species of millipedes from the Cape Range, Western Australia (Diplopoda, Polydesmida, Paradoxosomatidae)

William A. Shear*

Abstract

Two new species of millipede, *Boreoesperus capensis*, gen nov., sp. nov., and *Antichiropus humphreysi*, sp. nov. (Polydesmida, Paradoxosomatidae) are described from cave and epigeal localities on the North West Cape, Western Australia. The former represents the first record of the Tribe Australiosomatini from Western Australia.

Introduction

The millipede fauna of Western Australia was last examined in a more or less comprehensive way by Attems in 1911. He recorded 17 diplopod species in four families, all of them described as new. Seven of these species were paradoxosomatids, and six of them were placed in his new genus, *Antichiropus*. He also described as new *Orthomorpha triaina*, which we now know to be a synonym of *Akamptogonus novarae* (Humbert and de Saussure), a synanthropic species, probably from eastern Australia but now established in New Zealand, Hawaii, and California, USA (Jeekel 1981; Hoffman 1980). Verhoeff described *Helicopodosoma*, with two new species (1924; Attems 1937; Jeekel 1968). More recently, as a result of an intensive effort to explore the caves of the semi-arid North West Cape region, additional paradoxosomatid taxa have come to light. Living in these caves as troglobites are three species of a new genus in the tribe Antichiropodini (Humphreys and Shear, in press). Also taken in the caves were several specimens of paradoxosomatids unmodified for cave life, obviously inhabitants of the surface, but which found the conditions of the caves congenial. These consisted of members of two species, one of which represents a new genus, and the second a new species of *Antichiropus*.

* Department of Biology, Hampden-Sydney College, Hampden-Sydney, Virginia 23943, USA

Systematics
Family Paradoxosomatidae Daday
Subfamily Australiosomatinae Brölemann
Tribe Australiosomatini Brölemann
***Boreohesperus*, gen. nov.**

Type Species

Boreohesperus capensis, sp. nov.

Etymology

From the Latin, *Boreus*, god of the North, and *hesperus*, the west. The gender is masculine.

Diagnosis

Differing from other members of its tribe in the simple structure of the male gonopod, with a short femorite, long solenomerite bent over and coiled in nearly a complete circle at its apex, and shorter, simple, rodlike tibiotarsus.

Description

Twenty segments. Pore formula normal. Segments about as long as broad, strongly constricted between prozonite and metazonite, unsculptured, smooth and shining. Pleural keels present only on second segment. Paranota absent, segments cylindrical. Sternites sparsely setose; sternite of fifth segment modified in males. Legs and antennae normal. First legs of males incrassate, with strong ventral femoral tubercle; other anterior legs of males unmodified. Gonopod coxae robust, prefemora short, densely setose, articulation with acropodite distinct. Acropodite long, quite straight. Femorite about one-third of acropodite length. Femoral process absent; articulation at end of femur moderately distinct. Tibiotarsus (*tt*, Figure 1) long, thin, unbranched. Solenomerite (*s*, Figure 1) without processes, twisted 360 degrees around its lengthwise axis, apical third abruptly deflected mesally and ventrally, curving in nearly a complete circle.

Distribution

Known only from the Cape Range, Western Australia.

Included species

Only the type.

Remarks

Boreohesperus is placed in the Tribe Australiosomatini with some hesitation, on the basis of the short femorite and the presence of a distinct tibiotarsus. The nonseminiferous branch is regarded here as a tibiotarsus in spite of the fact that it

departs the acropodite on the anteriolateral, not posterior surface; this is a reflection of the extreme coiling of the gonopod in this genus, as the drawing shows. The presence of only two acropodite branches suggests a relationship to a group of genera from eastern and southern Australia, to wit: *Dicladosoma* (Victoria), *Phyllocladosoma* (Queensland, New South Wales), *Somethus* (South Australia, Tasmania, Victoria), and *Oncocladosoma* (South Australia). In *Dicladosoma* Brölemann, 1913 and *Phyllocladosoma* Jeekel, 1968, the tibiotarsus is by far the largest of the two branches (Attems 1937; Jeekel 1968). *Somethus* Chamberlin, 1920 and *Oncocladosoma* Jeekel, 1985 retain femoral processes and have the tip of the solenomerite uncate, not coiled (Jeekel 1985). Further, in all these genera the femorite is much shorter than in *Boreohesperus*.

In the Antichiropodini, well represented in Western Australia, the homologies of the gonopod branches remain in confusion, but in at least one group of genera in the tribe, including *Antichiropus* and *Helicopodosoma*, the gonopod solenomerite is strongly coiled as it is in *Boreohesperus*. *Antichiropus* species (Attems 1911, 1937) usually have two or three short processes of indeterminate identity at the base of the long, coiled solenomerite, a long femorite and no tibiotarsus (unless the tibiotarsus has fused for most of its length with the solenomerite). *Helicopodosoma* (Attems 1937) evidently lacks all processes; the gonopod is a simple rod with a coiled tip. The new genus (Humphreys and Shear, in press) is strongly modified for a troglobitic existence, with elongated segments, legs and antennae, and lacks all pigment.

If the assignment of *Boreohesperus* to the Australiosomatini holds up, it represents the first record of that tribe in Western Australia.

Boreohesperus capensis, sp. nov.

Figure 1

Holotype

Male, Cave 324 (22° 22'34"S; 113° 51'25"E), Cape Range, North West Cape, Western Australia, 27 August 1989, M. East (WAM 91/1408).

Paratypes

Female, same collection data as male (WAM 91/1409). 2 males, Cave 203 (22° 26'14"S; 113° 54'39"E), 19 July 1989, W. F. Humphreys (WAM 91/1410-1411). Male, surface near Cave 106, 21 June 1989, M. S. Harvey (Australian Museum). Male, Cave 222, 10 July 1989, E. Bowra (American Museum of Natural History). Male, Cave 225 (21° 56'31"S; 114° 05'39"E), near entrance, 30 June 1989, M. East (Zoologische Museum Amsterdam).

Diagnosis

See Diagnosis of the genus.

Description

Male. About 18-20 mm long, 1.9 mm wide. Segments as described for genus; second segment with pronounced pleural keel, anterior angle of keel strongly projecting. Third segment with low projection in usual position of paranota, subtended by few indistinct striae. Subsequent segments without pleural keels or paranota, pores, when

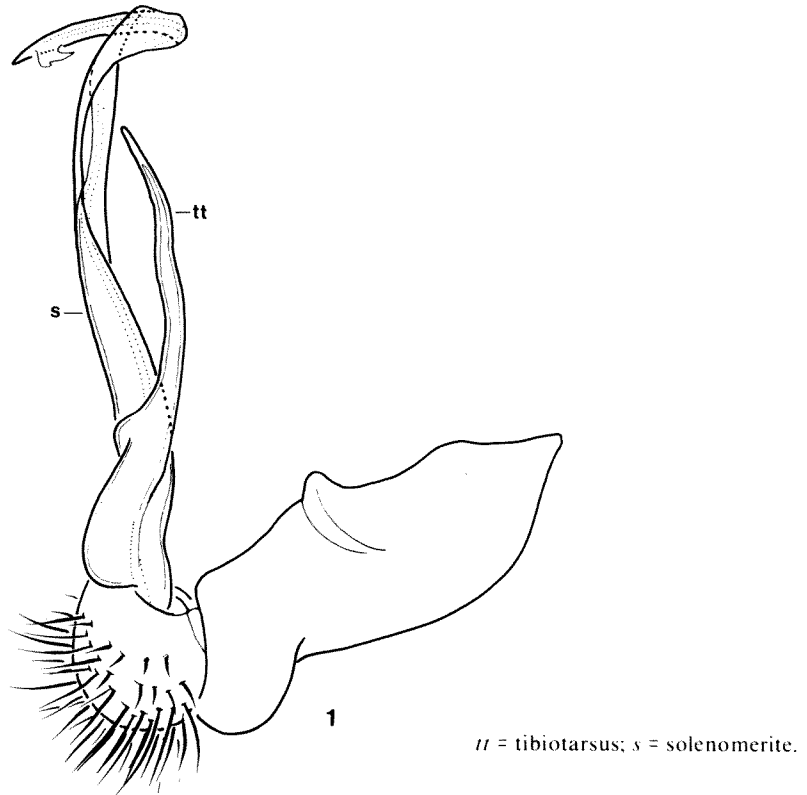


Figure 1 Left gonopod of *Boreoheperus capensis*, lateral view.

present, opening flush on surface of segment. Legs and antennae robust. First legs with usual modifications. Sternum of fifth segment with anteroventrally projecting process between coxae of anterior pair of legs; process roughly trapezoidal in posterior view, with notch in apex; anteriorly, apex set with fine setae.

Gonopods (Figure 1) with coxa nearly three times as long as broad, coxa with strong anterior ridge which in situ rests on anterior margin of gonopod socket. Prefemur short, subglobose, articulation with acropodite distinct. Femorite about one-third to one-fourth of acropodite length, twisted, enlarged at base. Tibiotarsus not exceeding solenomerite, slender, acuminate, curved mesally, appearing to arise posteriolaterally because of twist in femorite. Solenomerite twisted 360 degrees or more on its long axis, apical part coiled in nearly a complete circle, tip with small, laminate subterminal process.

Colour dark brown at low magnification, appearing black in the field.

Female. Structure in nonsexual characters as in male. About 20-22 mm long, 2.0 mm wide.

Distribution

Caves in the Cape Range of the North West Cape, Western Australia, in addition to the type localities as follows (all specimens in WAM): Cave 328 (22°01'21"S; 113°55'39"E) 28 August 1989, M. East (male). Cave 68, 26 June 1989, R. Wood (male). Cave 162 (22°09'00"S; 113°59'51"E), 20 June 1989, M. S. Harvey (male). Cave 232, 10 July 1989, M. Bowra (male). Surface at 22°03'S; 114°02'E, 26 June 1989, W. F. Humphreys (male). Cave 18 (22°05'24"S; 113°59'30"E), 26 June 1989, B. Vine (juvenile). Near Cave 21 (22°14'00"S; 113°58'18"E) on surface, 10 July 1989, A. J. Humphreys (female). Surface near Cave 161 (22°12'33"S; 113°58'14"E), 2 August 1989, E. Pryor (female). Cave 107 (22°07'00"S; 113°59'54"E), 30 June 1989, B. Vine (female). Surface near Cave 203 (22°26'14"S; 113°59'54"E), in litter among rocks below a fig tree, 19 July 1989, B. Jones (2 females, juvenile). Cave 177 (22°06'19"S; 113°57'48"E), 7 July 1989, M. East (female). Cave 111 (22°55'08"S; 114°00'17"E), 5 July 1989, R. Wood (2 females). Cave 21 (22°14'00"S; 113°58'18"E), 10 July 1989, A. J. Humphreys (female).

Notes

This species has commonly been found in caves, often near the entrance, as well as on the surface. The species shows no troglobitic adaptations, and its presence in caves is probably accidental, though cave entrances may present attractive refuges in the dry environment of the Cape Range. The details of distribution remain unknown, as little surface collecting has been done on the North West Cape Peninsula.

The females (and even juveniles) of this species may be separated at a glance from the females of the following species by the strongly projecting triangular anterior corner of the pleural keel of the second segment. However, at present we have only one syntopic record, from Cave 225.

Tribe Antichiropodini Brölemann *Antichiropus* Attems

Antichiropus Attems, 1911, 3:168. 1937, p. 266. Jeekel, 1968, p. 29. 1982, 8:121-124. 1985, 19:34.

Species of the genus *Antichiropus* are among the most distinctive of Australian Paradoxosomatidae. The gonopod has a comparatively long femorite (as in most antichiropodines), but the solenomerite is nearly as long and strongly coiled, in most species in at least a complete circle.

Attems (1911) named seven species and subspecies from Western Australia, and Jeekel (1982) added one from South Australia. The New Guinea species (Silvestri 1895) placed in the genus by Attems (1937) were re-examined by Jeekel (1956, 1964). *Strongylosoma luxuriosum* Silvestri was assigned to *Hoplotessara*; Jeekel (1956) speculated that this represented a mislabelled Australian collection. *Strongylosoma maculatum* Silvestri was assigned to *Dendrogonopus* (Jeekel 1964). *Hoplotessara* (Australiosomatini) and *Dendrogonopus* (Aschistodesmini) differ from *Antichiropus* at the tribal level.

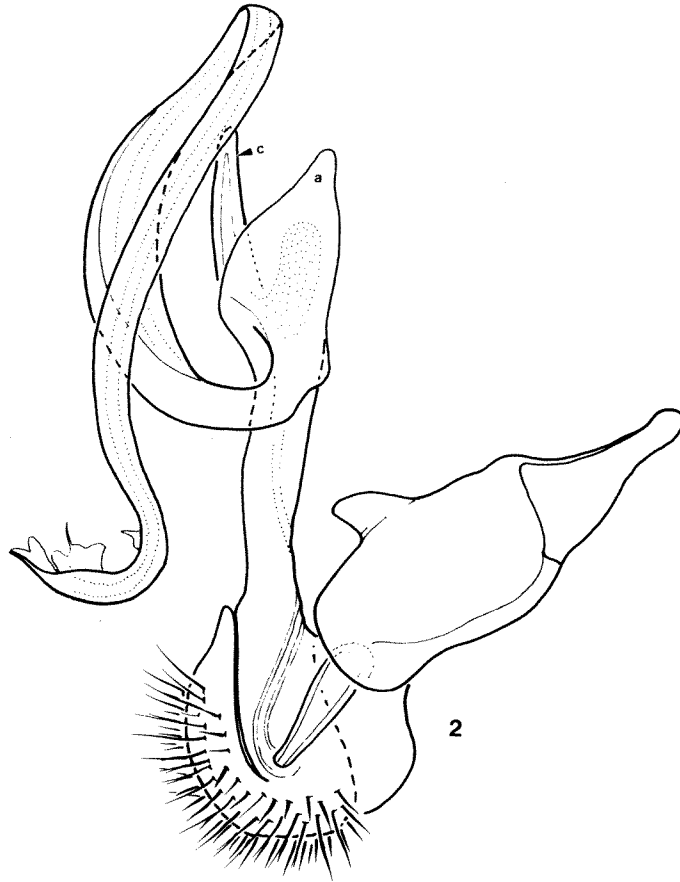


Figure 2 Right gonopod of *Antichiropus humphreysi*, mesal view.

***Antichiropus humphreysi*, sp. nov.**

Figure 2

Holotype

Male, Cave 225 (21°56'31"S; 114°05'39"E), Cape Range, North West Cape, Western Australia, 10 July 1989, R. Young (WAM 91/1412).

Paratypes

Female, same collection data as holotype (WAM 91/1413). Male, same collection data as holotype (WAM 91/1414). Male, same collection data as holotype, but 30 June 1989 (Zoologische Museum Amsterdam).

Diagnosis

Easily distinguished from the other species of *Antichiropus* by the enormous development of the coiled solenomerite, far exceeding that of any previously described species.

Description

Male. About 18 mm long, 1.8 mm wide. Segments somewhat longer than broad, strongly constricted between metazonite and prozonite, unsculptured, smooth and shining. Second segment with weak pleural keel; third and fourth metazonites with low swellings representing paranota, subsequent segments without paranota, pores opening flush on surface. Labrum with pronounced transverse oval depression set with setae. First legs strongly incrassate, with prominent basoventral femoral tubercle. Fifth sternum with large lobe between anterior leg pair; lobe with evenly curved distal margin of hyaline cuticle, anterior surface with bilaterally paired setose swellings near base.

Gonopod coxae (Figure 2) twice as long as broad, with very pronounced shelf on anterior surface, in life lodging under anterior border of gonopod socket. Prefemur subglobose, nearly as massive as coxa, articulation with acropodite distinct, with posterior articular lip. Femorite long, about two-thirds acropodite length, distally thickened, flaring, with acute subtriangular terminus (femoral process?). Process *a* (see notes below) prominent, smoothly tapering to bluntly rounded tip. Solenomerite very long, estimated twice as long as remainder of acropodite if uncoiled; curving first posteriorly, then laterally, widening, then turning anteriorly, finally dorsally in shallow, sigmoid curves. Tip of solenomerite complex, with two subterminal processes, actual apex evidently bifid.

Colour dark brown, somewhat lighter than the foregoing, with prozonites lighter brown still.

Female. Structure in nonsexual characters as in male. About 20 mm long, 2.0 mm wide.

Etymology

It is a pleasure to name this distinctive species for William F. Humphreys, who has led the biological exploration of the Cape Range caves.

Distribution

So far this species has been collected in only one cave, Cave 225. There it is syntopic with *Boreoheperus capensis*. The cave is in a very dry, shallow rock-shelter halfway up the wall of a gorge, 200 m from C-222, the only known location for one species in the new genus of Antichiropodini (Humphreys and Shear, in press).

Notes

The identities of the gonopod processes in *Antichiropus* remain obscure; the lettering of Figure 2 follows the scheme of Attems (1937) and Jeekel (1982). As in *A. minimus* and *whistleri*, process *b* seems to be missing. Without much to go on, the positions of the three basic processes suggest that *a* is simply a prolongation of the femorite consequent to making the sharp retrorse angle into the solenomerite, that *b* is the tibiotarsus, and that *c* is a prefemoral process.

References

- Attems, C. 1911. Myriopoda exkl. Scolopendridae. Pp. 147-204 in Michaelsen, W., and Hartmeyer, R., (Eds.) *Die Fauna Sudwest-Australiens*, vol. 111. Gustav Fischer Verlag, Jena.
- Attems, C. 1937. Myriopoda 3. Polydesmoidea I, Fam. Strongylosomatidae. *Das Tierreich* 68: 1-300, +i-xxii.
- Hoffman, R. L. 1980. An Australian polydesmoid milliped in San Francisco (Paradoxosomatidae). *Wasmann J. Biol.* 37: 55-58.
- Humphreys, W. F., and W. A. Shear. In press. Troglobitic millipedes (Diplopoda: Paradoxosomatidae) from semi-arid Cape Range, Western Australia — systematics and biology. *Aust. J. Zool.*
- Jeekel, C. A. W. 1956. On the generic status of *Strongylosoma luxuriosum* Silvestri 1894 from New Guinea (Diplopoda, Polydesmida, Strongylosomatidae). *Ent. Ber. Amsterdam* 25: 7-14.
- Jeekel, C. A. W. 1964. Notes on the genus *Akamptogonus* Attems, with descriptions of a new genus and species from New Guinea. *Nova Guinea, Zool.* 29: 105-116.
- Jeekel, C. A. W. 1968. On the classification and geographical distribution of the Family Paradoxosomatidae (Diplopoda, Polydesmida). Privately published, Amsterdam.
- Jeekel, C. A. W. 1981. Australia Expedition 1980; legit C. A. W. Jeekel and A. M. Jeekel-Rijvers. List of collecting stations, together with general notes on the distribution of millipeds in eastern Australia and Tasmania. *Versl. tech. Geg., Inst. Taxon. Zol Univ. Amsterdam*, no. 30: 1-59.
- Jeekel, C. A. W. 1982. Millipedes from Australia, 2: Antichiropodini from Victoria (Diplopoda, Polydesmida, Paradoxosomatidae). *Bull. Zool. Mus. Univ. Amsterdam* 8: 201-212.
- Jeekel, C. A. W. 1985. Millipedes from Australia, 5. Australiosomatinae from South Australia, with a note on the status of *Polydesmus innotatus* Karsch, and first record of a second Mediterranean julid in Australia (Diplopoda: Polydesmida, Paradoxosomatidae & Julida, Julidae). *Rec. S. Australian Mus.* 19: 19-37.
- Silvestri, F. 1895. Chilopodi e Diplopodi della Papuasia. *Ann. Mus. civ. Stor. nat. Genova* 34: 619-659.
- Verhoeff, K. W. 1924. Results of Dr. E. Mjoberg's scientific expeditions to Australia, 1910-1913, 34. Myriopoda: Diplopoda. *Ark. Zool.* 16: 1-142.