Records of the Western Australian Museum **22**: 165–191 (2004).

The water mite genus *Koenikea* Wolcott from Australia (Acari: Hydrachnidia: Unionicolidae)

Harry Smit
Zoological Museum, University of Amsterdam
Plantage Middenlaan 64, 1018 DH Amsterdam
The Netherlands
e-mail: smit.h@wolmail.nl

Abstract – Six new *Koenikea* species are described, *viz. K. circularis, K. gracilipalpis, K. lewisensis, K. pauciacetabulata, K. rubipes* and *K. setosa. Koenikea verrucosa* Lundblad is synonymized with *K. australica* Lundblad, and *K. purpurea* Smit with *K. crinita* Cook. New descriptions are provided for the female of *K. curtiseta* Cook and also for what is very likely the female of *K. jacunda* Cook, and for males of *Koenikea distans* K.O. Viets and *K. lemba* Cook. The genus is reported for the first time from Western Australia, the Northern Territory and South Australia. Finally, a key is given for all known Australian species.

INTRODUCTION

Koenikea species are among the most common water mite genera occurring in standing water in Australia (personal observation). The genus is also found in rivers, mainly in parts with reduced flow. So far, 17 species have been described from Australia (Harvey, 1998). Worldwide many subgenera have been described, but from Australia only two subgenera are known, i.e. *Koenikea* and *Notomideopsis*. Within Australia, there are no published records of *Koenikea* from South Australia, Western Australia and the Northern Territory (Harvey, 1998).

Outside Australia, *Koenikea* is widely distributed. The genus is known from Africa, while numerous species have been described from South America (Lundblad, 1943). In the New World *Koenikea* occurs as far north as Canada (Cook, 1974). Within the Australian faunal region, *Koenikea* species are known from New Guinea (Wiles, 1997) and New Caledonia (Smit, 2002), and they have also been found in Fiji (Smit, 2003).

In Australia, quite a few species are known from a few specimens only or from a limited geographical area. Therefore, variation in measurements or characters is poorly known.

The results presented in this study are from collection trips to all states of Australia, including the Northern Territory. In this paper, two species are synonymized, and a description is given of six new species, bringing the total number of species known from Australia to 21. A first description is given for the female of *K. curtiseta* Cook and very likely a first desciption is given for *K. jacunda* Cook, and for males of *Koenikea distans* K.O. Viets and *K. lemba* Cook. A key is given for all known Australian species.

MATERIAL AND METHODS

Unless stated otherwise, all material has been collected by the author. All non-type material has been deposited in the Zoological Museum of the University of Amsterdam (ZMAN) and the Western Australian Museum in Perth (WAM).

The following abbreviations have been used: PI-PV palp segments 1-5; IV-leg-4-6 fourth-sixth segments of fourth leg; d.s. dorsal shield; dgl dorsoglandularia; cxgl coxoglandularia; SMF Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt am Main; NMV Museum of Victoria, Melbourne; NTM Museum and Art Gallery of the Northern Territory; SAM South Australian Museum, Adelaide; QM Queensland Museum, Brisbane.

Range measurements given comprise all specimens mentioned in the material examined. All *Koenikea* species have ventral and dorsal shields, and this is not repeated in the descriptions of the new species. Frequently the minute setae associated with the glandularia are lost (e.g. as a result of mounting), and consequently, they are not illustrated.

SYSTEMATICS

Koenikea Wolcott

Koenikea Wolcott, 1900: 189.

Koenikea (Koenikea) sorpresa Cook

Koenikea (Koenikea) sorpresa Cook, 1986: 199; Smit, 1992: 103; Harvey, 1998: 142.

Material Examined

Paratype

Female, Nigger Creek, south of Herberton, Queensland, Australia, 4 May 1981, leg. D.R. Cook (NMV K578).

Other material

Australia: Western Australia: 1 female, small pond near Crossing Pool, Millstream-Chichester National Park, 16 August 1994; 3 males, Fortescue River at crossing with highway, 18 August 1994; 1 female, Cockatoo Creek at crossing with Great Northern Highway, 8 September 1998; 1 female, Fitzroy River at crossing with Great Northern Highway, south of Derby, 8 September 1998; 4 females, plunge pool Adcock Gorge, Kimberley, 12 September 1998; 1 male, 3 females, pond Kalamina Gorge (near falls), Hamersley Range National Park, 13 August 1994 (WAM); 2 females, pond near Adcock Gorge, Kimberley, 12 September 1998; 2 males, 3 females, pool Amalia Gorge, El Questro Station, Kimberley, 16 September 1998; 1 male, 1 female, Spillway Creek, near Lake Argyle, 20 September 1998 (WAM); 1 female, Palm Springs, south of Halls Creek, 25 September 1998; 1 female, unnamed creek at crossing with Windjana Gorge Road, 38 km north of Great Northern Highway, Kimberley, 30 September 1998 (WAM). **Northern Territory**: 1 female, Radon Springs, Kakadu National Park, 19 July 1994; 17 males, 24 females, Lake Jabiru, Jabiru, 20 July 1994; 2 males, 1 female, pond in Jim Jim Creek, near Jim Jim Campground, Kakadu National Park, 23 July 1994; 3 females, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 2 females, Lily Pond Falls, Katherine Gorge National Park, 27 July 1994. **Victoria**: 2 females, Shipwreck Creek, Mallacoota, Croajingolong National Park, 23 October 1997. **Queensland**: 3 females, Nankeen Creek, 4 May 1981, leg. A.P. Mackay; 1 female, same location, 26 June 1982; 1 female, Fitzroy River, Rockhampton, 13 April 1983, leg. A.P. Mackay.

Remarks

The original description of the species was based on three specimens only. Therefore, some additional measurements are given here. Males of this study are 429–551 µm long and 425–575 µm wide. Females exhibit a large variation in size, and were 494–721 µm long and 478–729 µm wide. Moreover, there is much variation in the shape. Length/width ratio varies from 0.99–1.15 in the females and 1.04–1.08 in the males. The coxal setae of my specimens are much longer than illustrated by Cook (1986). I examined one of the paratype females, but most of these setae have been lost or are not well visible. Previously reported from Queensland and New South Wales, *K. sorpresa* is reported here for the first time from Victoria, the Northern Territory and Western Australia.

Koenikea (Notomideopsis) australica Lundblad

Koenikea (Koenikea) australica Lundblad, 1941: 117; Lundblad, 1947: 63; Cook, 1986: 185; Smit, 1992: 103; Harvey, 1998: 142.

Koenikea (Koenikea) verrucosa Lundblad, 1947: Cook, 1986: 185; 65; Smit, 1992: 103; Harvey, 1998: 142. **New syn.**

Material Examined

Australia: Tasmania: 1 male, Apsley River at crossing with Tasmania Highway, 19 October 1997; 7 males, 21 females, Jock's Lagoon, south of St Helens, 20 October 1997; 1 female, Windmill Lagoon, St Helens, 20 October 1997; 9 males, 47 females, 2 nymphs, swamp 12 km south of Gladstone, along road B82, 20 October 1997; 3 females, Big Waterhouse Lake, Waterhouse Protected Area, 21 October 1997. **Western Australia**: 2 females, 1 nymph, Moore River, at crossing with Brandt's Highway, Regans Ford, 26 August 1994. **Victoria**: 2 males, 14 females, Shipwreck Creek, Mallacoota, Croajingolong National Park, 23 October 1997; 4 males, 11 females, unnamed creek 4.5 km east of Shipwreck Creek, Croajingolong National Park, 23 October 1997; 3 females, Darby River, Wilsons Promontory National Park, 27 October 1997.

Remarks

Lundblad (1947) based his description of *K. verrucosa* on two males. Males show large variation in the size of the tubercles. Therefore, contrary to my earlier opinion (Smit, 1992), I now agree with Cook (1986) that the two species are conspecific.

Females show quite a bit of variation in size. Specimens from one location from Tasmania vary in length between 721 µm and 925 µm, in width between 591 µm and 838 µm.

Widespread in eastern Australia, previously reported from Tasmania, Victoria, New South Wales and Queensland. The species is reported here for the first time from Western Australia.

Koenikea (Notomideopsis) branacha Cook

Koenikea (Notomideopsis) branacha Cook, 1986: 190; Smit, 1992: 103; Harvey, 1998: 142.

Material Examined

Type material: Holotype male, creek on Bunya

Mt. road, 6 km south of Bunya Highway, Queensland, 23 April 1981, leg. D.R. Cook (NMV K564). Paratype female, same data as holotype (NMV K565).

Other material

Australia: Western Australia: 1 female, pond Kalamina Gorge (near falls), Hamersley Range National Park, 13 August 1994; 1 female, Chinderwariner Pool, Millstream-Chichester National Park, 15 August 1994; 4 females, western part Deep Reach Pool, Millstream-Chichester National Park, 16 August 1994; 8 females, 1 male, Crossing Pool, Millstream-Chichester National Park, 16 August 1994 (WAM); 1 female, Fortescue River at crossing with highway, 18 August 1994; 1 male, 11 females, Cockatoo Creek at crossing with Great Northern Highway, 8 September 1998; 1 female, pool Lennard River, Windjana Gorge National Park, 9 September 1998; 4 females, pools 3 km from Lennard Gorge, Kimberley, 10 September 1998; 1 female, pool downstream of Manning Gorge Falls (at campground), Kimberley, 12 September 1998; 1 female, pool near Adcock Gorge, Kimberley, Western Australia, 12 September 1998; 14 females, plunge pool Adcock Gorge, Kimberley, 12 September 1998 (WAM); 2 females, pool Galvans Gorge, Kimberley, 12 September 1998; 2 females, pool Manning Gorge Falls, Kimberley, 13 September 1998; 1 female, Russ Creek at crossing with Gibb River Road, Kimberley, 14 September 1998; 12 females, Miner's Pool, Drysdale River Homestead, Kimberley, 14 September 1998 (WAM); 1 male, 15 females, pool Amalia Gorge, El Questro Station, Kimberley, 16 September 1998; 9 females, Zebedee Springs (hot springs), El Questro Station, Kimberley, 16 September 1998; 6 females, Middle Springs, west of Kununurra, 18 September1998 (WAM); 4 males, 48 females, pool Valentine Springs, west of Kununurra, 18 September 1998; 4 females, Lake Kununurra, 10 km southeast of Kununurra, 19 September 1998; 5 females, Spillway Creek, near Lake Argyle, 20 September 1998; 1 male, 6 females, pool Saw Pit Gorge, south of Halls Creek, 25 September 1998 (WAM); 1 female, pools in creek at Old Halls Creek, south of Halls Creek, 26 September 1998; 1 female, pool west of Tunnel Creek, Tunnel Creek National Park, Kimberley, 30 September 1998. **Queensland**: 1 female, Fitzroy River, Yaamba, 30 May 1982, leg. A.P. Mackay; 3 females, Fitzroy River, Rockhampton, 23 November 1982, leg. A.P. Mackay; 1 female, same location, 4 January 1983; 2 females, same location, 1 March 1983; 1 female, same location, 15 March 1983; 3 females, same location, 13 April 1983; 4 females, same location, 30 August 1983; 1 female, same location, 8 November 1983; 1 male, 3 females, same location, 6 December 1983; 1 female, same location, 20 February 1984; 1 female, same location, 5 March 1984; 2 females, Catfish Waterhole, Lakefield National Park, 4 September 2000; 1 female, West Claudie River, Iron Range National Park, 7 September 2000; 1 male, Packers Creek, Iron Range National Park, 9 September 2000; 1 male, 3 females, Cockatoo Creek, Cape York Peninsula, 11 September 2000; 1 female, Coen River at Coen, 12 September 2000; 1 female, Broken River near Conical Pool, Eungella National Park, 18 September 2000; 1 male, 23 females, Little Yabba Creek, south of Kenilworth, 20 September 2000. **Northern Territory**: 1 female, Magela Creek floodplain, Island Billabong, 22 January 1979, leg. R. Tait (SMF 7162); 1 male, 3 October 1979, same location, leg. R. Tait (SMF 7147); 1 female, Magela Creek floodplain, Nankeen Billabong, 4 October 1979, leg R. Tait (SMF 7119); 7 males, 8 females, Radon Springs, Kakadu National Park, 19 July 1994; 2 males, Home Billabong, Kakadu National Park, 22 July 1994; 1 male, 2 females, plunge pool Gunlom Falls, Kakadu National Park, 25 July 1994; 3 males, 4 females, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 1 male, 3 females, Lily Pond Falls, Katherine Gorge National Park, 27 July 1994; 1 male, Katherine river near visitors centre, Katherine River National Park, 28 July 1994; 1 male, 1 female, pond Chinaman Creek, 16 km south of Katherine, 29 July 1994; 1 female, plunge pool Edith Falls, Katherine Gorge National Park, 30 July 1994; 1 female, outlet Upper Pool, Edith Falls, Katherine Gorge National Park, 30 July 1994; 1 male, billabong near Douglas Hot Springs, 1 August 1994; 1 male, Manton Dam, 1 August 1994. **South Australia**: 1 female, Dalhousie Springs, spring Ca5, 14 June 1984, leg. W. Zeidler & K.L. Gowlett (SAM).

Morphology

Male

Body 462–535 µm long and 458–502 µm wide. Genital field bulging. IV-leg-6 with 4-5 setae on ventral margin.

Female

Body 518–745 µm long and 478–648 µm (745 µm) wide. Genital field bulging. IV-leg-6 with six setae on ventral margin.

Remarks

Morphologically, *Koenikea branacha* is in all aspects similar to *K. distans* K.O. Viets. Also the females are very close to those of *K. pseudodistans* Cook. Cook (1986) separated *K. branacha* and *K. distans* based on the shape of the body, but in my opinion this is not a good character. *Koenikea branacha* is much smaller, and leg and palp segments are shorter (see Table 1). The body length of the male of *K. branacha* is smaller than 550 µm, while the female of *K. branacha* is smaller than 700 µm (but occasionally up to 745 µm).

Table 1 Measurements of females of *Koenikea branacha* and *K. distans*.

slide	K565	AUS245	AUS247	AUS248	AUS244	6724	6450
species	*branacha*	*branacha*	*branacha*	*branacha*	*distans*	*distans*	*distans*
	Paratype	–	–	–	–	Holotype	–
L	656	559	616	616	–	826	770
W	608	535	573	599	–	798	–
d.s. L	619	518	559	559	786	761	705
d.s. W	502	446	510	526	688	688	624
PI	22	17	20	14	26	26	18
PII	82	78	68	74	106	96	82
PIII	42	40	38	38	56	48	46
PIV	82	75	70	80	108	96	82
PV	38	32	32	30	44	38	36
I-leg-4	158	154	158	169	234	200	172
I-leg-5	148	127	150	152	206	184	164
I-leg-6	158	126	120	130	194	178	160
IV-leg-4	163	145	154	162	220	200	190
IV-leg-5	190	160	188	200	266	228	214
IV-leg-6	170	152	172	176	246	200	190

IV-leg-6 of the female is shorter than 170 µm in *K.branacha*, and longer than 190 µm in *K. distans*. In the males IV-leg-6 is shorter than 181 µm in *K. branacha*, and longer than 206 µm in *K. distans*. In his key, Cook (1986) separated *K. branacha* from *K. pseudodistans* by using the size of the gland openings, but the only reliable character is the size of the claws of the fourth legs, which are enlarged in *K. pseudodistans* (see under the latter in this paper).

Previously, the species has been reported from New South Wales and Queensland, and it is reported here for the first time from Western Australia, the Northern Territory and South Australia.

Koenikea (Notomideopsis) circularis sp. nov.

Figures 1–7

Material Examined

Holotype

Female, stream El Questro Gorge, El Questro Station, Kimberley, Western Australia, Australia, 15 September 1998 (WAM).

Paratypes

Female, same data as holotype (ZMAN); 1 male, plunge pool Adcock Gorge, Kimberley, Western Australia, 12 September 1998 (WAM); 1 female, pool Manning Gorge Falls, Kimberley, 13 September 1998 (ZMAN); 1 male, 1 female, 17 Mile Creek, tributary of Katherine River, Katherine Gorge National Park, Northern Territory, Australia, 28 July 1994 (NTM).

Diagnosis

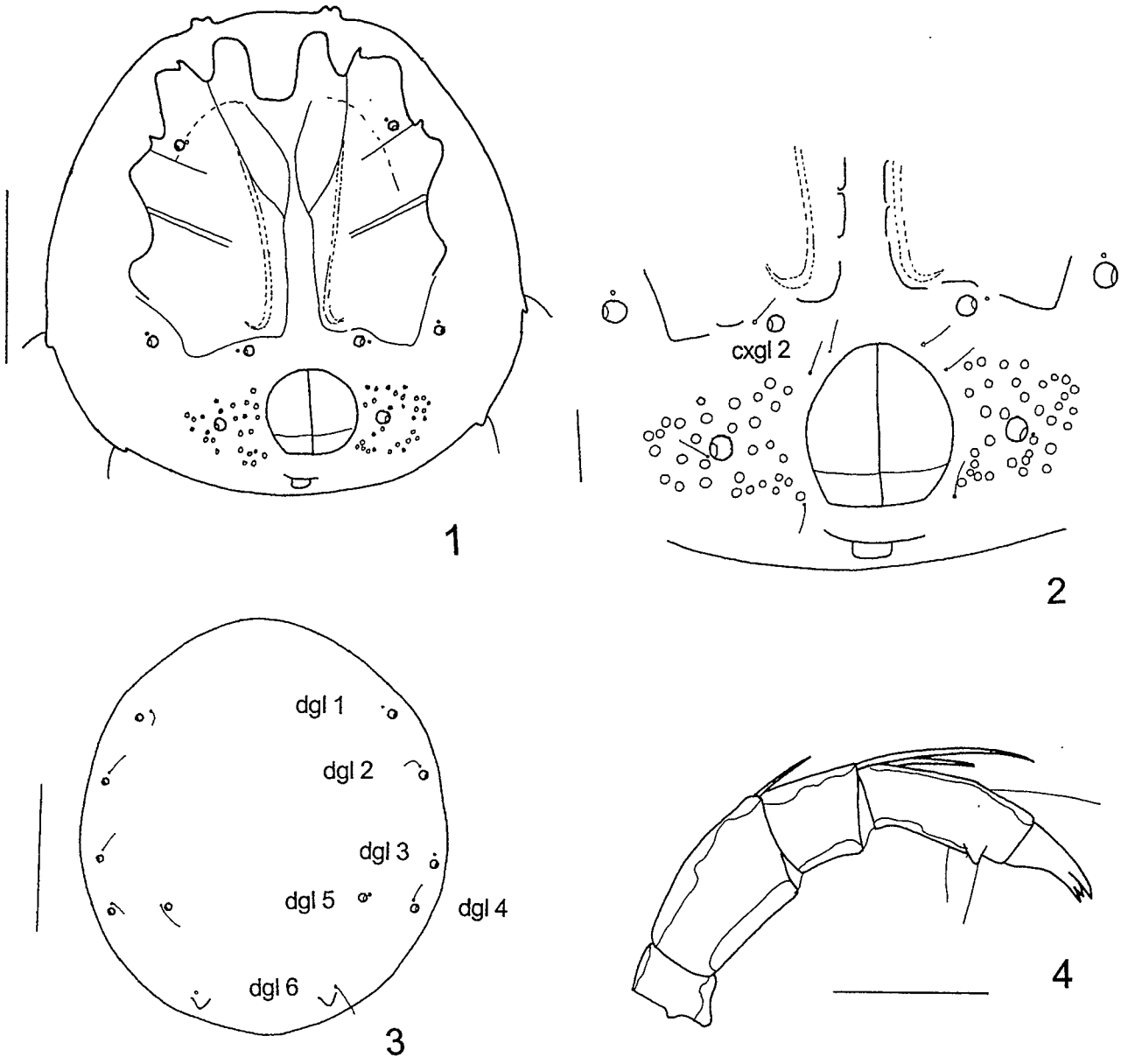
Apodemes very long, extending to posterior margin of fourth coxal plates.

Description

Male

Body 591 µm (526 µm) long and 591 µm (526 µm) wide. Dorsal shield 551 µm long and 551 µm wide. Dorsal shield with six pairs of glandularia; glandularia 3, 4 and 6 on small tubercles. First coxal plates not extending to anterior body margin. Apodemes of anterior coxal plates very long, extending almost to posterior margin of fourth coxal plates. Coxoglandularia 2 located near posterior margin of fourth coxal plates. Gonopore 74 µm long. Genital plates with approximately 20–25 acetabula, which are surrounding an enlarged glandularium. Lengths of PI-PV: 18 µm, 58 µm, 38 µm, 60 µm, 26 µm; peg-like seta of PIV on a short tubercle. Lengths of I-leg-4-6: 104 µm, 108 µm, 118 µm. Grooved or fluted setae ("rillborsten") of first and second legs relatively short. Lengths of IV-leg-4-6: 151 µm, 160 µm, 172 µm; chaetotaxy of IV-leg-5 and -6 as in female. I-leg-5 and II-leg-5 with two swimming setae, III-leg-4 with two and III-leg-5 with three swimming setae, IV-leg-3 with one, IV-leg-4 with five and IV-leg-5 with three swimming setae.

Female: body 557 µm (582–640 µm) long and 559 µm (575–632 µm) wide. Dorsal shield 502 µm long and 506 µm wide. Dorsal shield with six pairs of glandularia, glandularia 4 and 5 lying in a line. Glandularia 6 on small tubercles. First coxal plates not extending to anterior body margin. Apodemes of anterior coxal plates very long, extending almost to posterior margin of fourth coxal plates. Coxoglandularia 2 located near posterior margin of fourth coxal plates. Gonopore 108 µm long. Genital plates with approximately 30 acetabula, which are surrounding an enlarged glandularium. Lengths of PI-PV: 18 µm, 58 µm, 34 µm, 58 µm, 31 µm. Peg-like seta of PIV not on a tubercle. Lengths of I-leg-4-6: 90 µm, 90 µm, 80 µm. Rillborsten of first and second leg



Figures 1–4 *Koenikea circularis* sp. nov., holotype female. **1**, ventral view; **2**, genital field; **3**, dorsal view; **4**, palp. (Scale bars: **1**, 3 = 200 µm; **2**, **4** = 50 µm).

relatively short. Lengths of IV-leg-4-6: 112 µm, 138 µm, 130 µm. IV-leg-6 with a row of four pectinate setae and a two normal setae; IV-leg-5 with a row of five pectinate setae. I-leg-5 with two swimming setae, II-leg-5 with two swimming setae, III-leg-3 with one, III-leg-4 with two and III-leg-5 with three swimming setae, IV-leg-3 with one, IV-leg-4 with five and IV-leg-5 with three swimming setae.

Etymology

Named for its rounded body shape.

Remarks

The species is characterised by the very long apodemes of the anterior coxal plates. *Koenikea rotunda* Smit from New Caledonia also has a rounded body shape, but this species has much shorter apodemes, while glandularia 5 of the dorsal shield are located anteriorly of glandularia 3. The male differs from the female in bearing PIV on a short tubercle, but shares the long apodemes and relatively short heavy ventral setae of first and second leg.

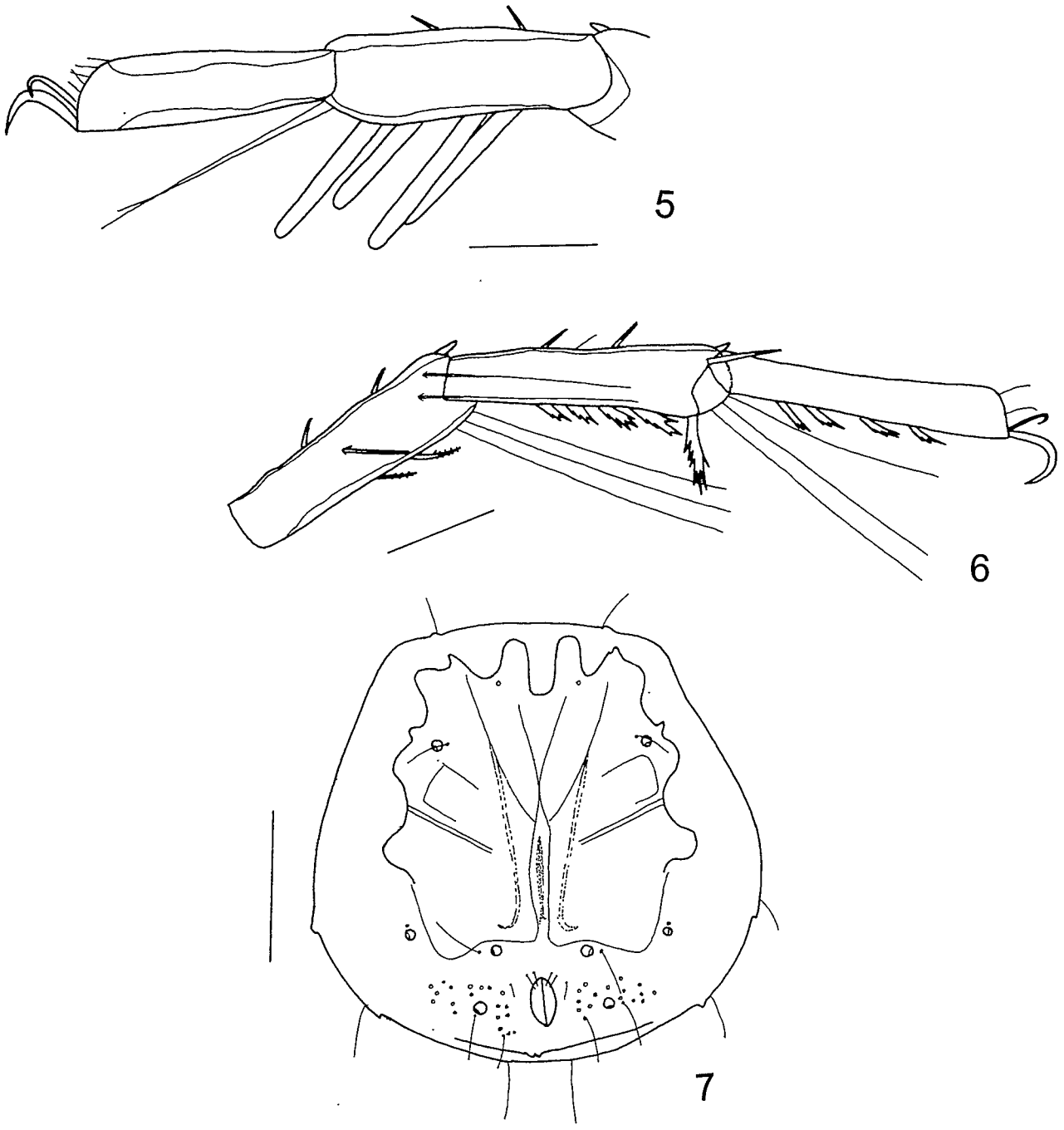
Koenikea (Notomideopsis) crinita Cook

Koenikea crinita Cook, 1986: 197; Harvey, 1998: 142.

Koenikea purpurea Smit, 1992: 105; Harvey, 1998: 142. **New syn.**

Material Examined

Koenikea purpurea Smit



Figures 5–7 5, *Koenikea circularis* sp. nov., holotype female, I-leg-5-6; 6, *Koenikea circularis* sp. nov., holotype female, IV-leg-4-6. 7, *Koenikea circularis* sp. nov., paratype male, ventral view. (All scale bars = 50 µm).

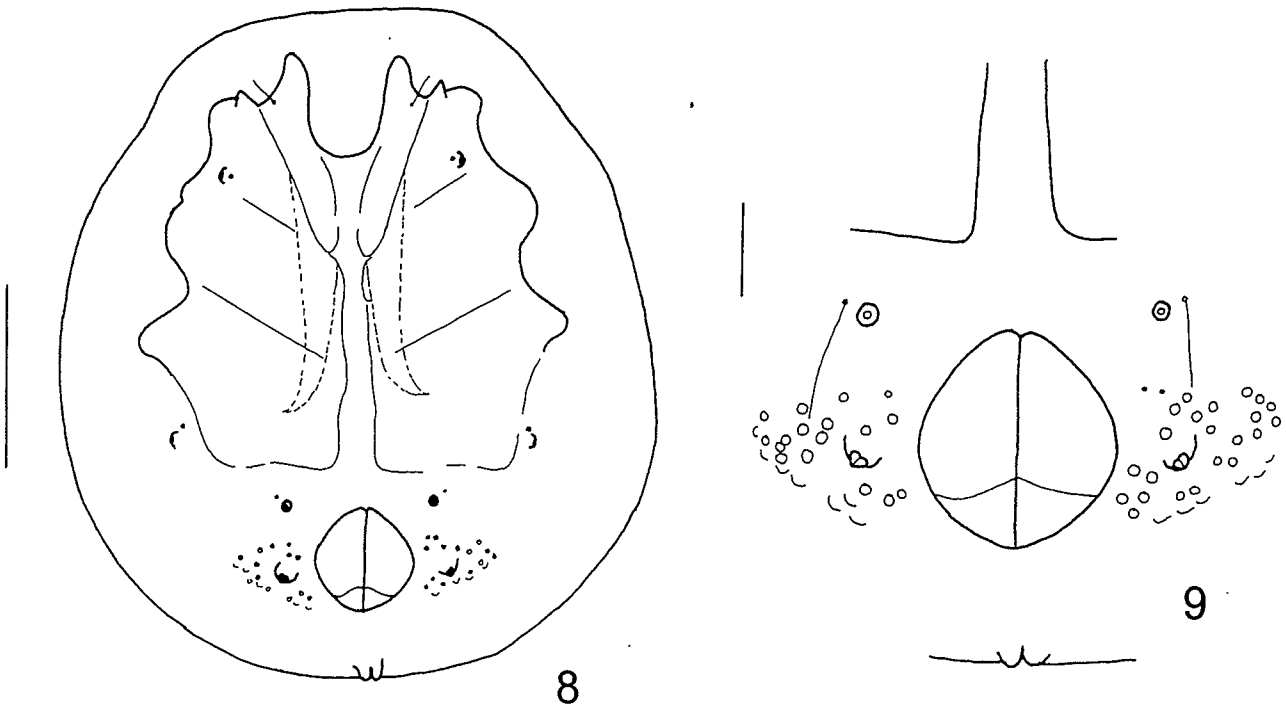
Paratype

Female, Teewah Creek, Cooloola National Park, Queensland, Australia, 22 July 1989 (ZMAN).

Australia: Tasmania: 1 male, 4 females, old river branch Coal River, north of Richmond, 17 October 1997; 2 males, 5 females, Reservoir of Darlington, Maria Island National Park, 18 October 1997; 1 male, Jock's Lagoon, south of St Helens, 20 October 1997. **Victoria**: 1 female, Betka River, at crossing with Stoney Creek Road, southwest of Genoa, 24 October 1997. **New South Wales**: 1 female, School Creek near Morton National Park, 5 November 2001; 1 male, 1 female, Tonoum Brook, Royal National Park, 8 November 2001.

Remarks

My description of *Koenikea purpurea* Smit was based on the conspicuous purple colour and the stiff setae of the coxal plates. However, now that I have seen more specimens of *K. crinita*, it appears that the coxal setae are not as flexible as can be judged from the illustrations of Cook (1986). Therefore, I synonymize *K. purpurea* with *K. crinita*. Colour is apparently a variable character within *K. crinita*. My specimens from Tasmania as well as *K. purpurea* have the glandularia 4 and 5 in a line, while in Cook's illustrated specimens glandularia 4 are located more anteriorly. However, Cook (1986) mentioned variation in the location of glandularia



Figures 8–9 *Koenikea curtiseta* Cook, female; 8, ventral view; 9, detail of genital field. (Scale bars: 8 = 200 µm; 9 = 50 µm).

3, 4 and 5. The females reported by Cook (1986) measured 821–1003 µm in length and 744–927 µm in width. The female reported here from Victoria measured only 599 µm in length and 559 µm in width. The coxal setae of this specimen are finer than those of larger specimens.

Previously, the species has been reported from Tasmania, Victoria, New South Wales and Queensland.

Koenikea (Notomideopsis) curtiseta Cook
Figures 8–9

Koenikea (Notomideopsis) curtiseta Cook, 1986: 188; Harvey, 1998: 142.

Material Examined

Australia: Queensland: 1 male (not completely sclerotized), 1 female, Fitzroy River, Rockhampton, 8 November 1983, leg. A.P. Mackay; 1 female, same location, 6 December 1983; 1 female, Fitzroy River, Yaamba, 20 February 1984, leg. A.P. Mackay; 1 male, Flinders River, 22 June 1983, leg. A.P. Mackay; 4 females, Cockatoo Creek, Cape York Peninsula, 11 September 2000.

Morhpology

Male

Body 664 µm long and 607 µm wide.

Female

Body 713 µm (672–761 µm) long and 632 µm (607–705 µm) wide. Dorsal shield 640 µm long and 567 µm wide. Dorsal shield with six pairs of glandularia, configuration of glandularia as in male. First coxal plates not reaching to anterior body margin. Apodemes of anterior coxal plates reaching beyond suture line of third and fourth coxal plates, occasionally up to middle of fourth coxal plates. Coxoglandularia 2 located halfway between the posterior margin of fourth coxal plates and genital plates. Gonopore 116 µm long. Genital plates with one enlarged glandularium, surrounded by numerous acetabula. Lengths of PI-PV: 24 µm, 78 µm, 42 µm, 70 µm, 28 µm; palp as in male, but setae of dorsal margin of segments heavy. Lengths of I-leg-4-6: 122 µm, 114 µm, 106 µm. Rillborsten of legs I and II short, as in male. Lengths of IV-leg-6: 158 µm, 170 µm, 160 µm. Swimming setae stiff, short and somewhat thickened. Chaetotaxy of swimming setae as in male.

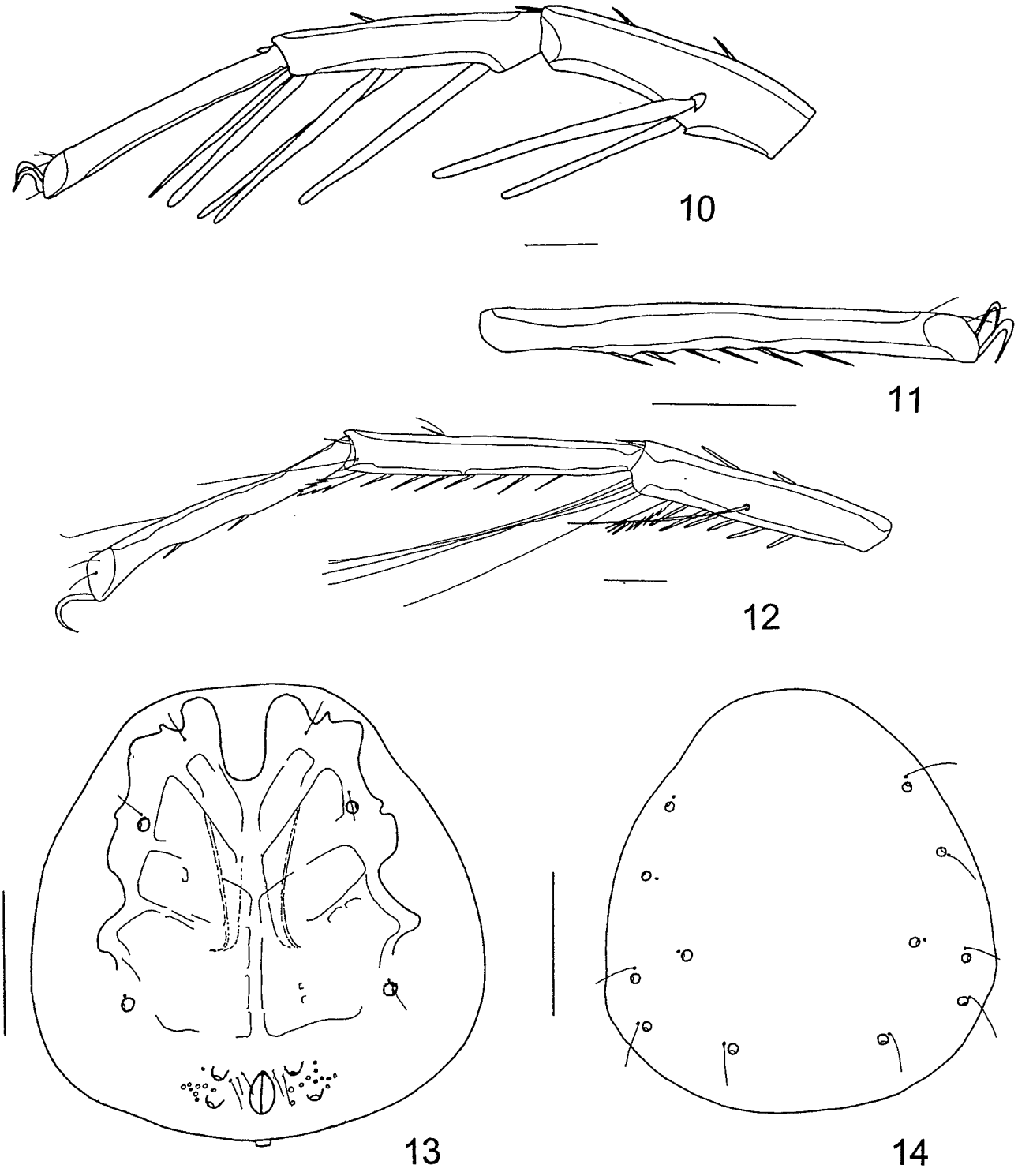
Remarks

The description of Cook (1986) was based on the holotype male only. Therefore, the female is described here for the first time. The species is only known from Queensland.

Koenikea (Notomideopsis) distans K.O. Viets
Figures 10–14

Koenikea distans K.O. Viets, 1980: 160.

Koenikea (Notomideopsis) distans K.O. Viets: Harvey, 1998: 142.



Figures 10–14 **10–12** *Koenikea distans* K.O. Viets, holotype female; **10**, I-leg-4-6; **11**, IV-leg-6; **12**, IV-leg-4-6. **13, 14** *Koenikea distans* K.O. Viets, male; **13**, ventral view; **14**, dorsal view. (Scale bars: **10–12** = 50 µm; **13, 14** = 200 µm).

Material Examined

Holotype

Female, Morisset Hospital Dam, New South Wales, Australia, 7 September 1977, leg. B.V. Timms (SMF 6724).

Other material

Australia: Queensland: 4 males, Lake Poona via Gympie, 20 July 1980, leg. B.V. Timms (slides SMF 7389, 7390, 7391, 7392); 2 females, Catfish Waterhole, Lakefield National Park, 4 September 2000; 1 female, Hann Crossing (stagnant), Lakefield National Park, 4 September 2000. **New South Wales**: 1 female, Skardon's Lagoon near Cooranbong, 2 January 1977, leg. B.V. Timms (SMF 6450); 1 female, Waterfall Creek at Gunjulla Flat, Royal National Park, 8 November 2001. **Western**

Australia: 2 females, pond Snake Creek, Millstream-Chichester National Park, 17 August 1994; 1 female, pool east side Windjana Gorge, Windjana Gorge National Park, Kimberley, 10 September 1998; 4 females, pool Silent Grove Spring, Kimberley, 11 September 1998 (WAM); 2 males, 5 females, pool Silent Grove (behind ranger station), Kimberley, 11 September 1998 (WAM); 5 males, 19 females, plunge pool, Adcock Gorge, Kimberley, 12 September 1998; 1 female, pool near Adcock Gorge, Kimberley, 12 September 1998; 2 females, pool Galvans Gorge, Kimberley, 12 September 1998; 2 females, Miner's Pool, Drysdale River Homestead, Kimberley, 14 September 1998; 2 males, 1 female, pool Amalia Gorge, El Questro Station, Kimberley, 16 September 1998 (WAM); 1 female, Lake Kununurra, 10 km southeast of Kununurra, 19 September 1998; 2 females, plunge pool Cathedral Gorge, Purnululu National Park, 24 September 1998; 4 females, Palm Springs, south of Halls Creek, 25 September 1998. **Northern Territory**: 2 females, Magela Creek floodplain, Winmurra Billabong, 15 November 1979, leg. R. Tait (slides SMF 7207, 7208); 1 female, pond in Jim Jim Creek, at Jim Jim Crossing, Kakadu National Park, 22 July 1994; 7 males, 2 females, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 1 male, 1 female, Lily Pond Falls, Katherine Gorge National Park, 27 July 1994.

Morphology

Male: Body 640 µm (567–632 µm) long and 640 µm (551–648 µm) wide. Dorsal shield 599 µm long and 551 µm wide. Dorsal shield with six pairs of glandularia, none of which are on tubercles. First coxal plates almost reaching to anterior body margin. Posterior apodemes of anterior coxal plates reaching beyond suture line of third and fourth coxal plates. Genital field located halfway between posterior margin of fourth coxal plates and posterior body margin. Coxoglandularia 2 located close to genital field. Gonopore 72 µm long. Genital field with one large, somewhat bulging glandularium surrounded by approximately 12 small acetabula (but number difficult to ascertain). Lengths of PI-PV: 20 µm, 82 µm, 46 µm, 88 µm, 34 µm; palp as in female. Lengths of I-leg-4-6: 166 µm, 168 µm, 188 µm. Lengths of IV-leg-4-6: 196 µm, 224 µm, 206 µm. Chaetotaxy as in female, but IV-leg-4 with five swimming setae. IV-leg-6 more slender compared to female.

Female: In addition to the original description of Viets (1980) I give here illustrations of the first and fourth leg as well as some measurements. Body 737–879 µm long and 616–786 µm wide. Dorsal shield 656–794 µm long and 571–688 µm wide. Dorsal lengths of I-leg-4-6 of holotype: 200 µm, 186 µm, 180 µm. Dorsal length of IV-leg-4-6 of holotype: 202 µm, 230 µm, 212 µm. Viets (1980) mentioned the presence of a row of eight small setae on IV-leg-4, but actually two rows are present, one of six and one of two setae (compare figures 11 and 12).

Remarks

The original description was based on the holotype female only. The male is therefore described for the first time. Previously, the species was only known from New South Wales, and it is reported here for the first time from Western Australia, the Northern Territory and Queensland. For differences with *K. branacha* and *K. pseudodistans* see under the latter species.

Koenikea (Notomideopsis) gracilipalpis sp. nov.

Figures 15–22

Material Examined

Holotype

Male, plunge pool Edith Falls, Katherine Gorge National Park, Northern Territory, Australia, 30 July 1994 (NTM).

Paratype

Female, Radon Springs, Kakadu National Park, Northern Territory, 19 July 1994 (NTM).

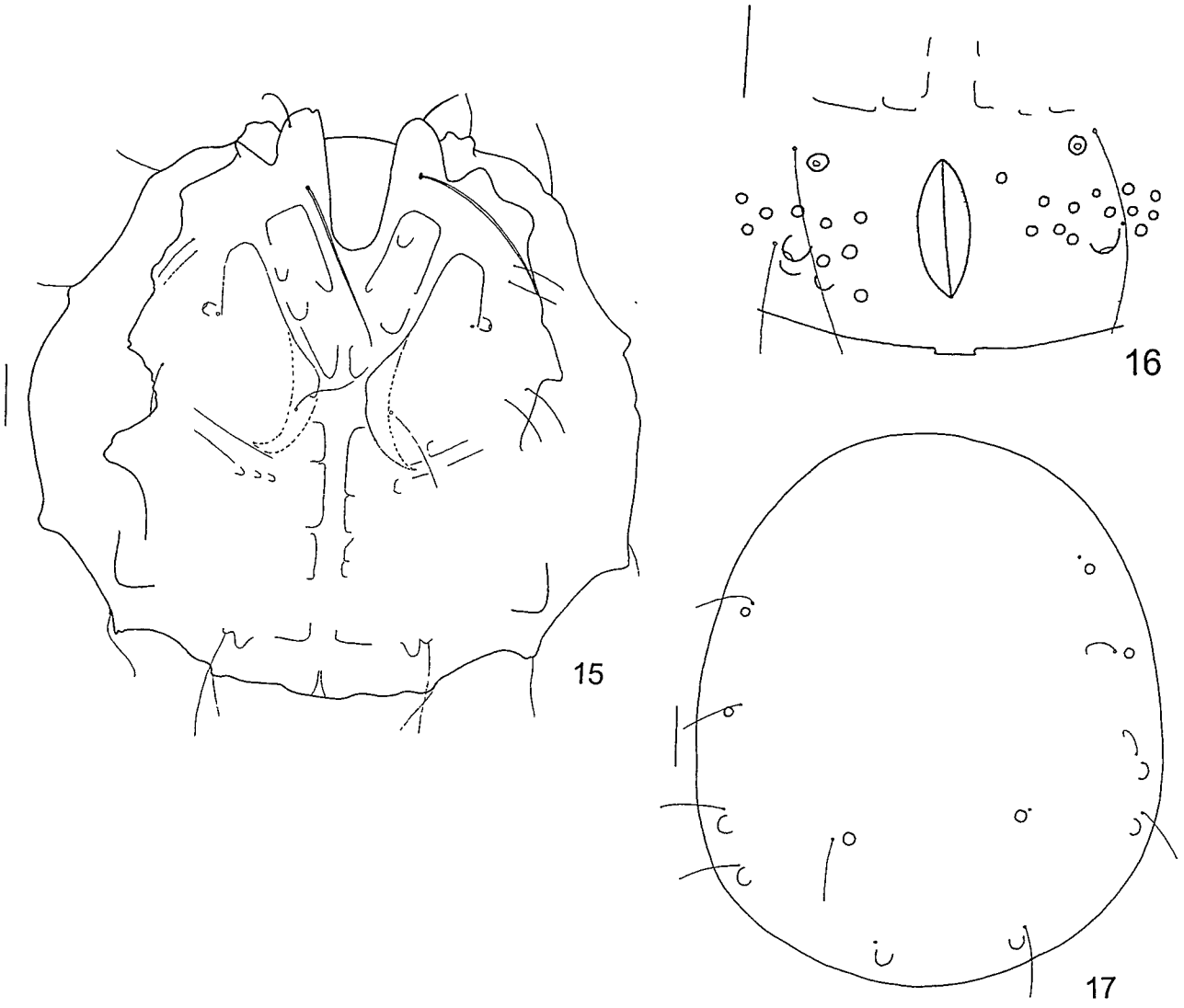
Diagnosis

Very slender palp.

Description

Male

Body 478 µm long and 448 µm wide. Dorsal shield 445 µm long and 393 µm wide. Dorsal shield with six pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. Third, fifth and sixth pair of glandularia on small tubercles. Ventral shield with tubercles near lateral margin. Tips of first coxal plates blunt, extending beyond anterior margin of body; first coxal plates with one pair of long setae. Posterior apodemes of anterior coxal plates extending to suture line of third and fourth coxal plates. Excretory pore terminal. Coxoglandularia 2 located halfway posterior margin of fourth coxal plates and genital field. Gonopore 98 µm long. Genital field with approximately 13 pairs of acetabula. Genital field in normal position, but cannot be seen in Fig. 15 due to skew position in slide. Lengths of PI-PV: 16 µm, 48 µm, 34 µm, 87 µm, 44 µm. Palp slender, especially PV. Lengths of I-leg-4-6: 156 µm, 150 µm, 148 µm. Rillborsten of first and second legs relatively long. Lengths of IV-leg-5-6: 156 µm, 140 µm; IV-leg-6 with two setae on ventral margin. II-leg-5 with one swimming seta, III-leg-4 and 5 with two swimming setae (but number is difficult to



Figures 15–17 *Koenikea gracilipalpis* sp. nov., holotype male; **15**, ventral view; **16**, genital field; **17**, dorsal shield. (All scale bars = 50 µm).

ascertain), IV-leg-4 with two and IV-leg-5 with three swimming setae. Swimming setae relatively short.

Female

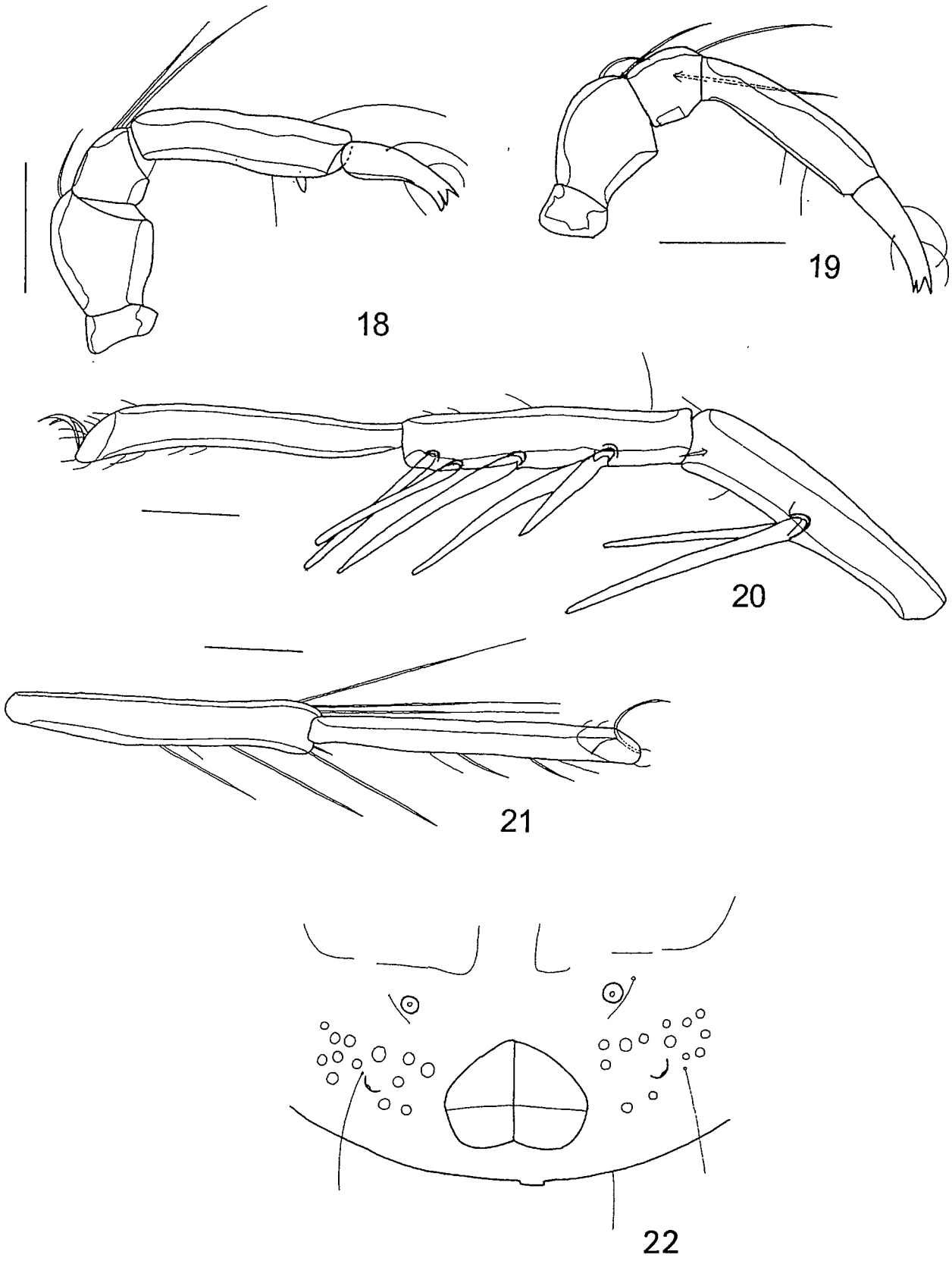
Body 591 µm long and 564 µm wide. Dorsal shield 543 µm long and 494 µm wide. Dorsal shield with six pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. Third, fifth and sixth pair of glandularia on small tubercles. Tips of first coxal plates blunt, extending beyond anterior margin of body; first coxal plates with long setae. Posterior apodemes of anterior coxal plates extending to suture line of third and fourth coxal plates. Gonopore terminal, measurement of length not possible. Excretory pore terminal. Lengths of PI-PV: 18 µm, 54 µm, 38 µm, 90 µm, 50 µm; palp as in male. Lengths of I-leg-4-6: 184 µm, 146 µm, 132 µm. Rillborsten of first and second leg long. Lengths of IV-leg-4-6: 163 µm, 168 µm, 151 µm; IV-leg-6 with 5 setae on ventral margin. I-leg-5, II-leg-4, III-leg-3 and IV-leg-3 with one swimming seta, III-leg-4, III-leg-5 and IV-leg-5 with three swimming setae and IV-leg-4 with five swimming setae. Swimming setae of normal length.

Etymology

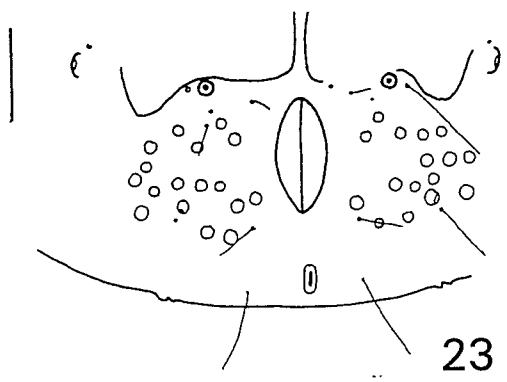
Named for its slender palp.

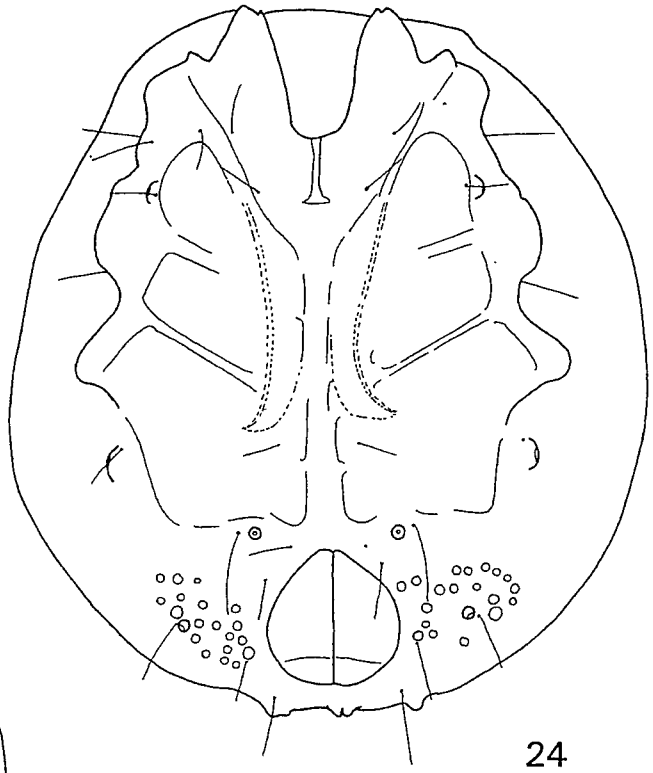
Remarks

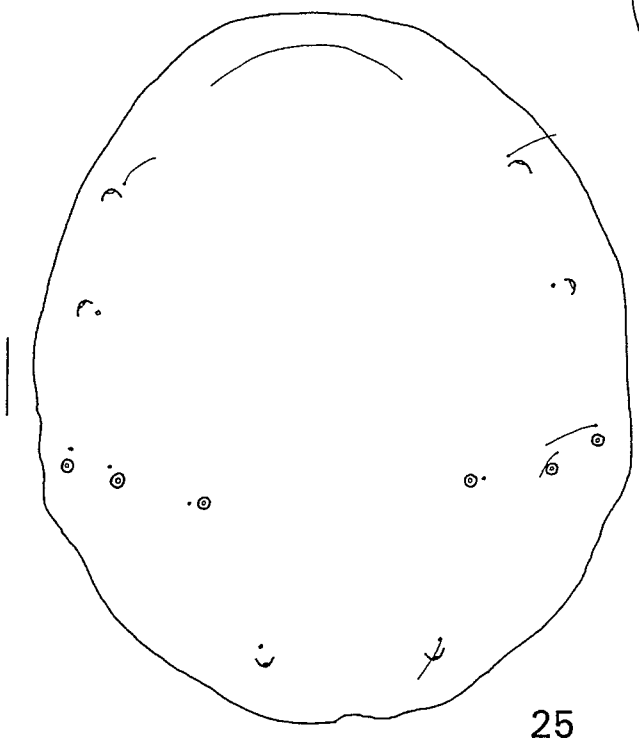
The new species shares the long coxal setae with *K. crinita*, but differs in the very slender palp.

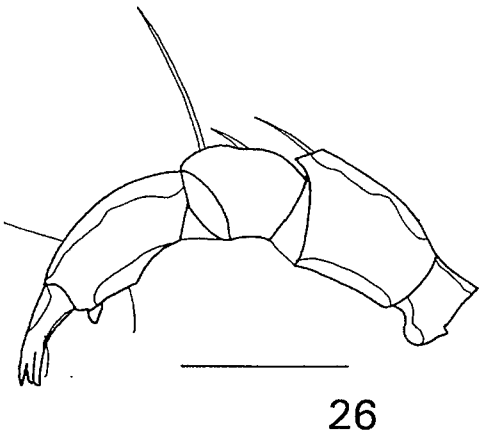


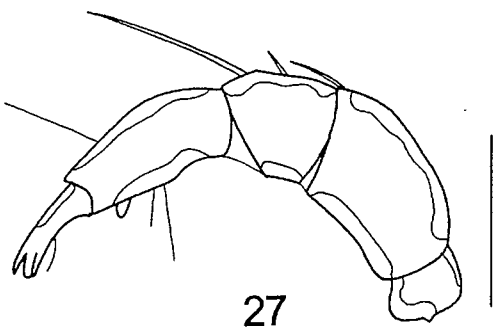
Figures 18–22 18–21 *Koenikea gracilipalpis* sp. nov., holotype male, **18**, left palp; **19**, right palp; **20**, I-leg-4-6; **21**, IV-leg-5-6; **22**, *Koenikea gracilipalpis* sp. nov., paratype female, genital field. (All scale bars = 50 µm).











Figures 23–27 23, *Koenikea* cf *jacunda* Cook, male, detail of genital field; **24,** *Koenikea* cf *jacunda* Cook, female, ventral view; **25,** *Koenikea* cf *jacunda* Cook, female, dorsal shield; **26,** *Koenikea* cf *jacunda* Cook, male, right palp. **27,** *Koenikea* cf *jacunda* Cook, male, left palp (All scale bars = 50 µm).

Koenikea (Notomideopsis) cf. *jacunda* Cook

Figures 23–27

Koenikea (Notomideopsis) jacunda Cook, 1986: 194; Harvey, 1998: 142.

Material Examined

Australia: Northern Territory: 1 male, 2 females, Baboalba Springs (Gubarra), Kakadu National Park, 20 July 1994.

Description

Male

Body 385 µm long and 342 µm wide. Dorsal shield lost during mounting, but glandularia 3, 4 and 5 in a line. First coxal plates extending beyond anterior body margin. Apodemes of first coxal plates extending beyond suture line of third and fourth coxal plates. Coxoglandularia 2 near posterior margin of fourth coxal plates. Gonopore 61 µm long. Genital field with 15–16 acetabula. Glandularium of genital field of same size as surrounding acetabula. Lengths of PI-PV: 17 µm, 42 µm, 34 µm, 52 µm, 32 µm. PIV stocky, tubercle of PIV inserted directly on ventral margin. Lengths of I-leg-4-6: 106 µm, 124 µm, 128 µm. Lengths of IV-leg-4-6: 100 µm, 96 µm, 108 µm. Ventral margin of IV-leg-6 with four setae. Chaetotaxy of swimming setae as described by Cook (1986).

Female

Body 454 µm (478 µm) long and 413 µm (429 µm) wide. Dorsal shield 445 µm long and 365 µm wide. Dorsal shield with six pairs of glandularia. Glandularia 3, 4 and 5 more or less in a line. First coxal plates extending slightly beyond anterior body margin. Coxoglandularia 2 near posterior margin of fourth coxal plates. Gonopore 100 µm long. Genital field with 24–26 acetabula. Glandularium of genital field of same size as surrounding acetabula. Length of PI-PV: 20 µm, 58 µm, 36 µm, 54 µm, 32 µm; palp as in male. Lengths of I-leg-4-6: 110 µm, 104 µm, 108 µm. Lengths of IV-leg-4-6: 110 µm, 132 µm, 130 µm. Chaetotaxy as in male.

Remarks

The male from this study differs from the holotype (the only known specimen known so far) in having a stockier palp, especially PIV. Cook (1986) mentioned that the tubercle of PIV is located on a small tubercle, while it is inserted directly on the segment in my specimen. Moreover, my specimen is smaller, and the leg segments are shorter. However, my specimens have a similar dorsal shield and small size, and are therefore assigned to *K. jacunda*, but this assignment must be considered preliminary.

Koenikea (Notomideopsis) lemba Cook

Koenikea (Notomideopsis) lemba Cook, 1986: 193; Harvey, 1998: 142.

Material Examined

Australia: Victoria: 1 female, Double Creek, Croajingolong National Park, 23 October 1997. **New South Wales**: 14 males, 18 females, Tonoum Brook, Royal National Park, 8 November 2001; 11 males, 27 females, Waterfall Creek at Gunjulla Flat, Royal National Park, 8 November 2001; 1 female, Wattamolla Creek, Royal National Park, 8 November 2001. **Tasmania**: 4 females, Apsley River at crossing with Tasmania Highway, 19 October 1997.

Morphology

Male

Body 737 µm (624–753 µm) long and 632 µm (535–642 µm) wide. Dorsal shield 664 µm long and 559 µm wide. Dorsal shield with six pairs of glandularia, none of which are on tubercles. Glandularia 3, 4 and 5 in a line. First coxal plates not reaching to anterior body margin. Posterior apodemes of anterior coxal plates reaching beyond suture line of third and fourth coxal plates. Coxoglandularia 2 located near posterior margin of fourth coxal plates. Genital plates each with 14 acetabula. Gonopore 92 µm long. Lengths of PI-PV: 24 µm, 88 µm, 40 µm, 90 µm, 40 µm; palp as in female (see Cook, 1986). Lengths of I-leg-4-6: 172 µm, 160 µm, 154 µm. Lengths of IV-leg-4-6: 164 µm, 174 µm, 176 µm. Chaetotaxy of legs as in female. IV-leg-6 with 5-6 setae, the two posterior setae pectinate.

Female

Body 705–895 µm long and 575–786 µm wide. IV-leg-6 with 5-7 setae on ventral margin, the two posterior setae pectinate.

Remarks

Cook (1986) based his description on three females from Tasmania and New South Wales. Therefore, the male is described here for the first time. As the morphology of the male is similar to that of the female, no illustrations are provided. The species is reported here for the first time from Victoria.

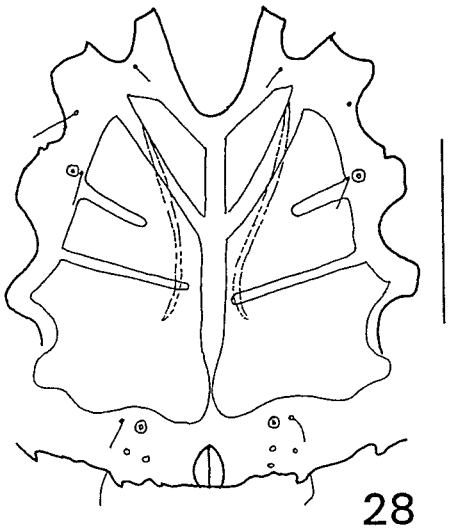
Koenikea (Notomideopsis) lewisensis sp. nov.

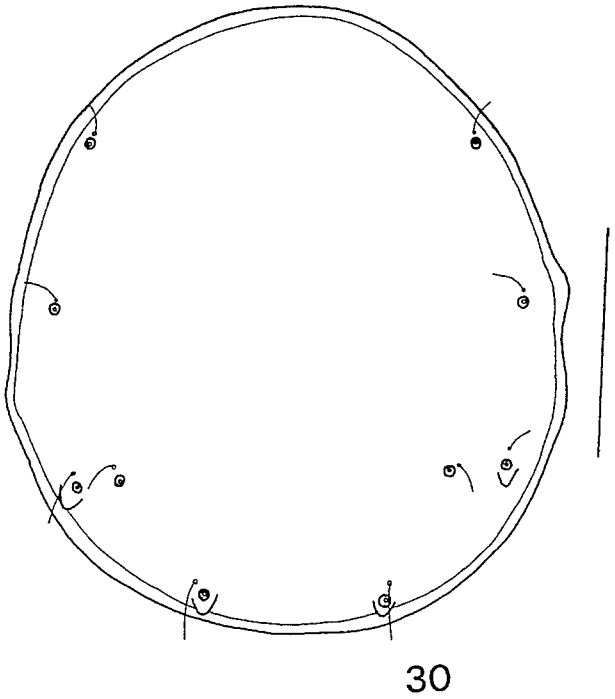
Figures 28–38

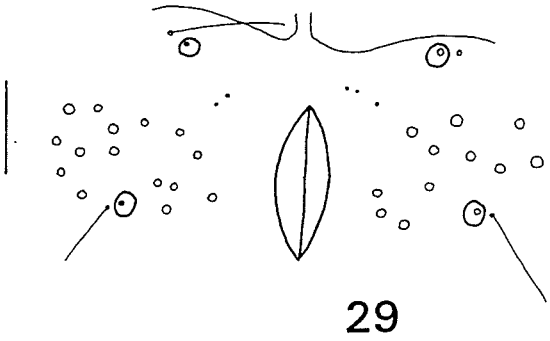
Material Examined

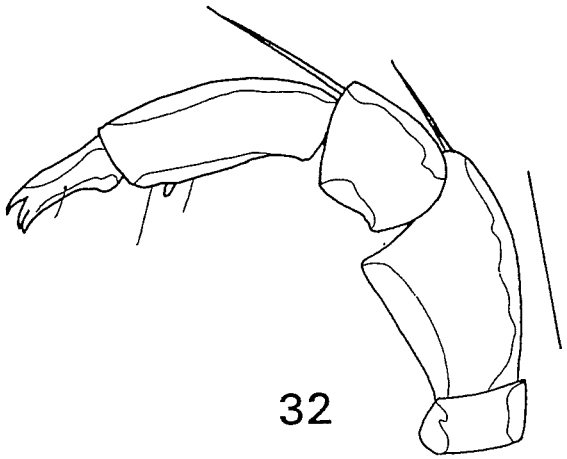
Holotype

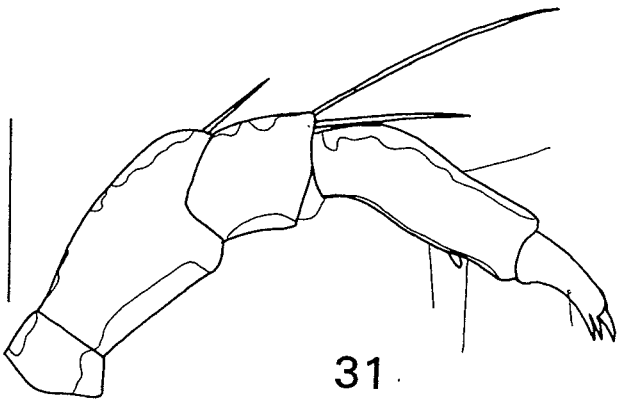
Male, unnamed creek Mt Lewis Road, 900 m a.s.l., Julatten, Queensland, Australia, 14 September 2000 (QM).

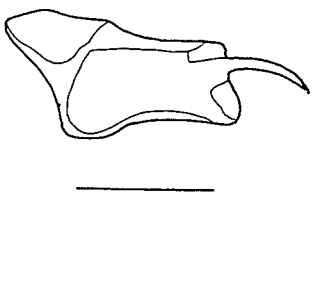












Figures 28–33 **28**, *Koenikea lewisensis* sp. nov., holotype male, ventral view; **29**, *Koenikea lewisensis* sp. nov., paratype male, genital field; **30**, *Koenikea lewisensis* sp. nov., holotype male, dorsal shield; **31**, *Koenikea lewisensis* sp. nov., holotype male, palp; **32**, *Koenikea lewisensis* sp. nov., paratype male, palp; **33**, *Koenikea lewisensis* sp. nov., holotype male, chelicere. (Scale bars: **28**, **30** = 200 µm; **29**, **31**, **32** = 50 µm).

Paratypes

Nine males (QM), 8 males (ZMAN), 7 females (QM), 6 females (ZMAN), same data as holotype.

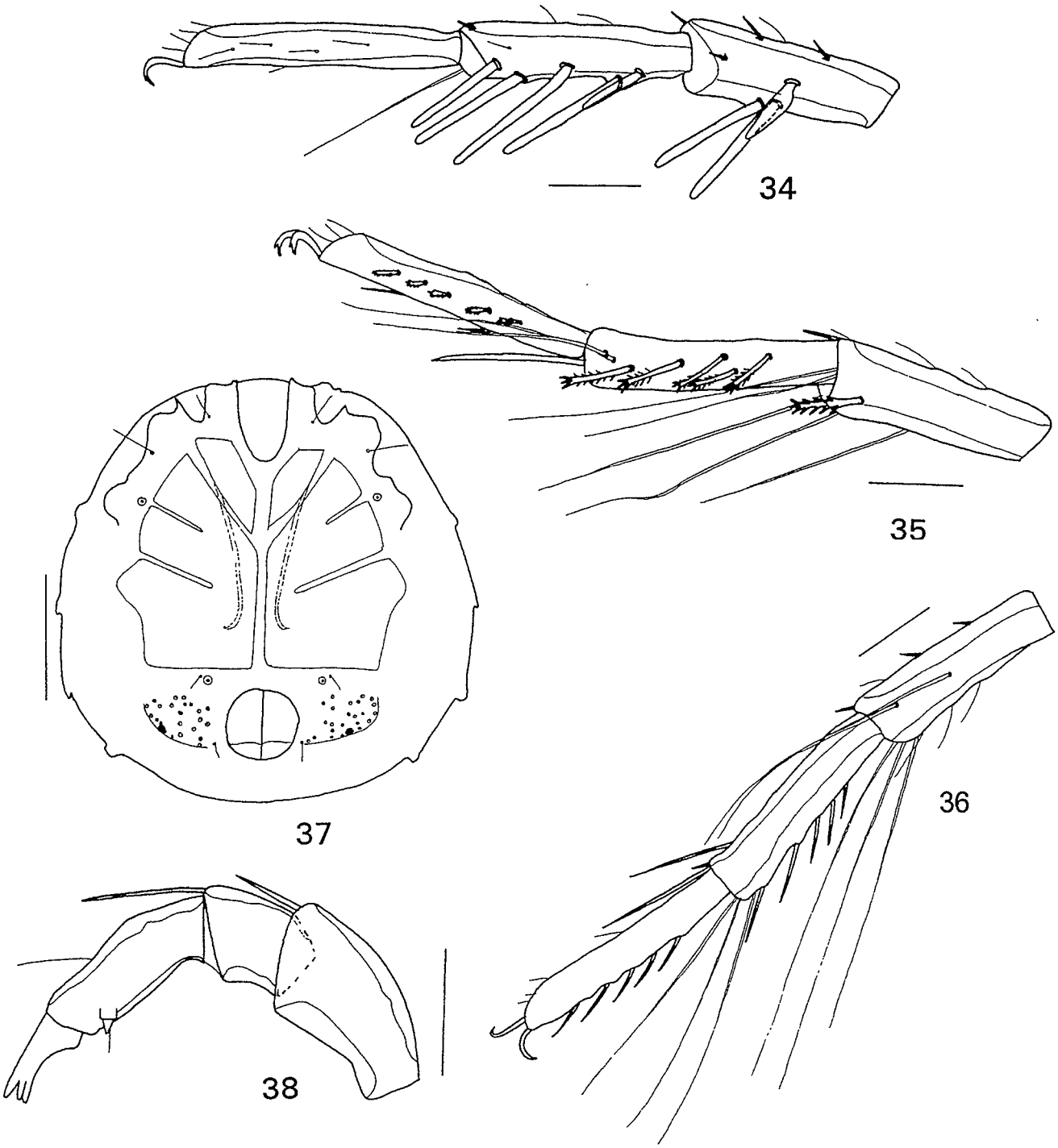
Diagnosis

Dorsal shield with five pairs of glandularia, leg segments short, PIV with a short tubercle.

Description

Male

Body 591 µm (535–575 µm) long and 559 µm (494–550 µm) wide. Body colour orange. Dorsal shield 518 µm long and 478 µm wide. Dorsal shield with five pairs of glandularia on small tubercles; all glandularia near lateral margin of dorsal shield,



Figures 34–38 34–36 *Koenikea lewisensis* sp. nov., holotype male; **34**, I-leg-4-6; **35**, IV-leg-4-6; **36**, IV-leg-4-6; **37**, *Koenikea lewisensis* sp. nov., paratype female, ventral view; **38**, *Koenikea lewisensis* sp. nov., paratype female, palp (Scale bars: **34–36**, 38 = 50 µm; 37 = 200 µm).

except fourth pair. Ventral shield with tubercles near lateral margin. Tips of first coxal plates blunt, not extending beyond anterior margin of body. Posterior apodemes of anterior coxal plates extending beyond suture line of third and fourth coxal plates. Excretory pore terminal. Genital field of holotype difficult to observe; gonopore of paratype 80 µm long. Genital field of paratypes with 18–19 acetabula on each side. Dorsal lengths of PI-V: 17 µm, 64 µm, 30 µm, 64 µm, 34 µm. Peg-like seta of PIV located on a very short tubercle (better visible in illustrated female). Lengths of I-leg-4-6: 116 µm, 126 µm, 136 µm; I-leg-5 with one long swimming seta. Rillborsten of first and second legs relatively long. Lengths of IV-leg-4-6: 122 µm, 126 µm, 136 µm. IV-leg-5 and -6 with five pectinate setae. IV-leg-5 with three swimming setae, IV-leg-4 with five swimming setae, IV-leg-3 with one swimming seta, III-leg-5 and -4 with three swimming seta, II-leg-5 with two swimming setae and II-leg-4 with one swimming seta.

Female

Body 664 µm (591–721 µm) long and 640 µm (579–680 µm) wide. Dorsal shield 624 µm long and 559 µm wide. Dorsal shield with five pairs of glandularia on small tubercles; all glandularia near lateral margin of dorsal shield, except fourth pair. Tips of first coxal plates blunt, extending to anterior margin of body. Posterior apodemes of anterior coxal plates extending halfway down fourth coxal plates. Gonopore 120 µm long. Genital plates each with 23–24 acetabula. Lengths of PI-PV: 18 µm, 74 µm, 40 µm, 75 µm, 40 µm; palp as in male. Lengths of I-leg-4-6: 140 µm, 134 µm, 136µm. Rillborsten of first and second legs relatively long. Lengths of IV-leg-4-6: 138 µm, 142 µm, 144 µm. Chaetotaxy of legs as in male.

Etymology

Named after Mt Lewis.

Remarks

Only two other Australian *Koenikea* species have the dorsal shield with five pairs of glandularia, i.e. *K. australica* Lundblad and *K. decapora* Cook. The new species differs from both species in much shorter leg segments (e.g. I-leg-6 is 136 µm long in *K. lewisensis* and 214-236 µm and 246 µm respectively in *K. australica* and *K. decapora*). Moreover, the tubercle of PIV is large in *K. australica* and absent in *K. decapora*, while it is short in *K. lewisensis*.

Koenikea (Notomideopsis) pauciacetabulata sp. nov.

Figures 39–45

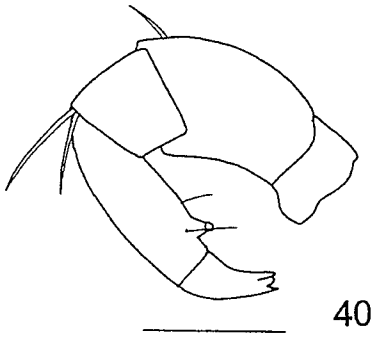
Material Examined

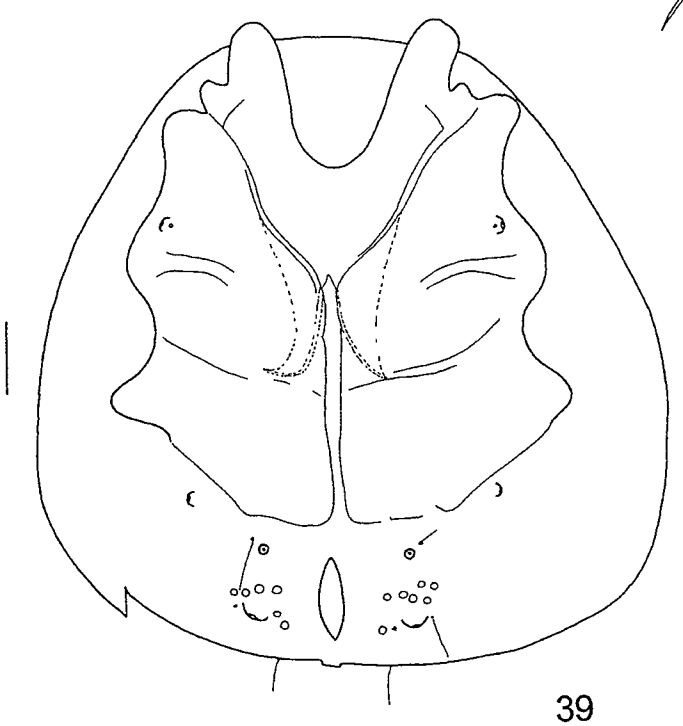
Holotype

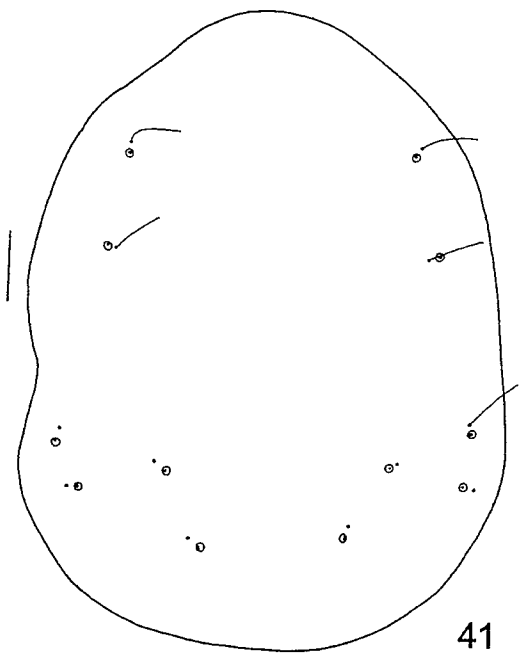
Male, Dalhousie Springs, spring Ca1 (pool), South Australia, Australia, 14 June 1985, leg. W. Zeidler & K.L. Gowlett (SAM).

Paratype

Female, same data as holotype (SAM).







Figures 39–41 *Koenikea pauciacetabulata* n. sp., holotype male; **39**, ventral view; **40**, palp; **41**, dorsal shield. (All scale bars = 50 µm).

Other material

Female, not fully sclerotized, same data as holotype (SAM).

Diagnosis

Very few acetabula, male with enlarged claw of IV-leg-6.

Description

Male

Body 445 µm long and 397 µm wide. Dorsal shield 429 µm long and 332 µm wide. Dorsal shield with six pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. Distance between third and fourth pair slightly smaller than distance between fifth and sixth pair. Due to inappropriate fixation in alcohol, not all details visible. First coxal plates extending beyond anterior body margin. Apodemes of anterior coxal plates extending until suture line of third and fourth coxal plates. Coxoglandularia 2 located halfway posterior margin of fourth coxal plates and genital field. Gonopore 58 µm long. Genital plates small, each with 6–7 acetabula, partly surrounding enlarged glandularia. Excretory pore terminal. Lengths of PI-PV: 20 µm, 68 µm, 34 µm, 72 µm, 30 µm. Peg-like seta of PIV on a tubercle, well distanced from distal end of segment. Lengths of I-leg-4-6: 120 µm, 116 µm, 120 µm. First and second legs with long rillborsten. Lengths of IV-leg-4-6: 144 µm, 156 µm, 112 µm. Claw of IV-leg-6 enlarged, 62 µm from base to tip. Ventral margin of IV-leg-6 with a row of 7-8 short setae. III-leg-4 and IV-leg-4 with three swimming setae, III-leg-5 with two and IV-leg-5 with one (two?) swimming setae, but very likely some swimming setae lost. Swimming setae relatively short.

Female

Body 587 µm long and 494 µm wide. Dorsal shield 510 µm long and 397 µm wide. Dorsal shield with six pairs of glandularia. All glandularia near lateral margin of dorsal shield, except fifth pair. First coxal plates not extending beyond anterior body margin. Apodemes of anterior coxal plates extending until suture line of third and fourth coxal plates. Coxoglandularia 2 located halfway between posterior margin of fourth coxal plates and genital field. Gonopore large, 140 µm long. Genital plates small, with 6 pairs of acetabula, partly surrounding enlarged glandularia. Excretory pore terminal. Lengths of PI-PV: 20 µm, 76 µm, 36 µm, 76 µm, 32 µm; palp as in male. Lengths of I-leg-4-6: 138 µm, 120 µm, 116 µm. Rillborsten of first and second legs long. Lengths of IV-leg-4-6: 144 µm, 166 µm, 160 µm. Claw of IV-leg-6 not enlarged, 32 µm in width. Ventral margin of IV-leg-6 with 7-8 setae. III-leg-4 and IV-leg-5 with two swimming setae, III-leg-5 with 3 and IV-leg-4 with five swimming setae.

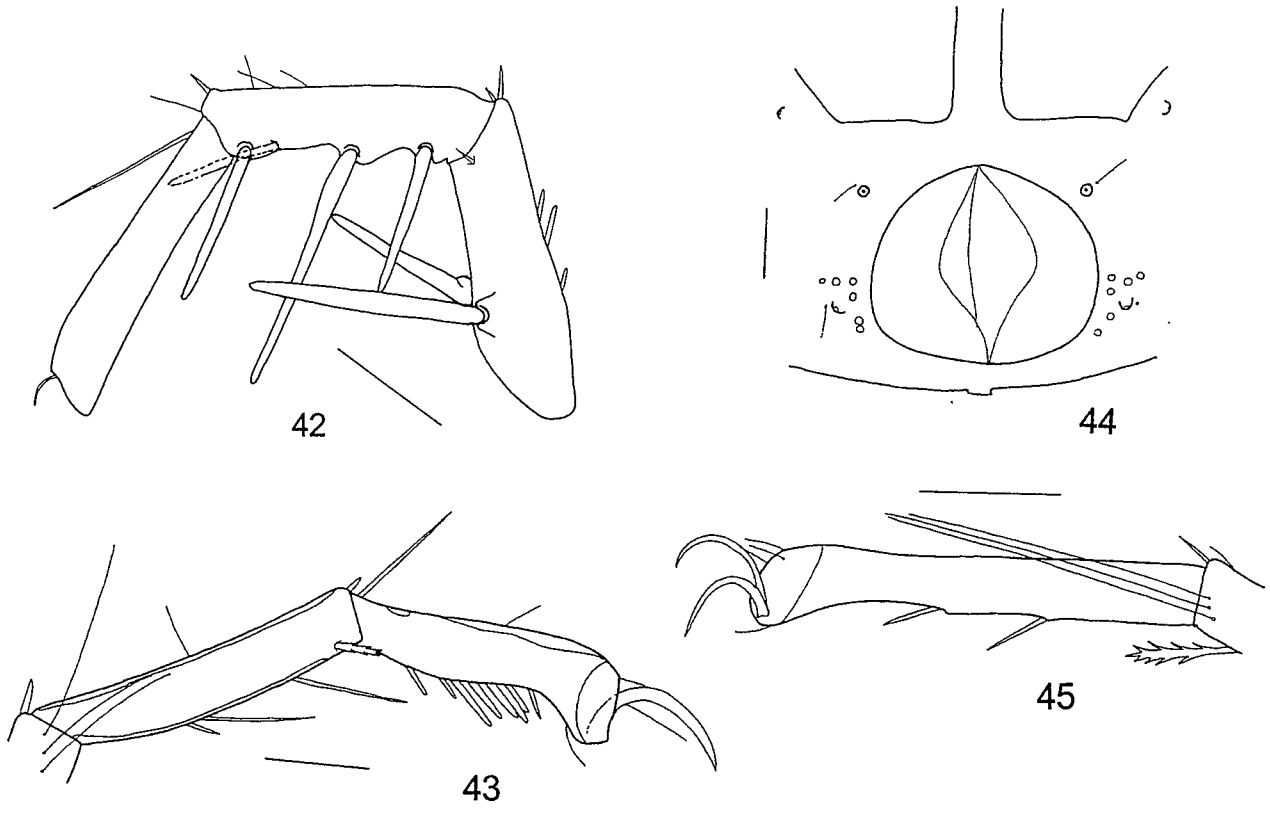


Figure 42–45 **42, 43** *Koenikea pauciacetabulata* n sp., holotype male; **42**, I-leg-4-6; **43**, IV-leg-5-6; **44, 45** *Koenikea pauciacetabulata* n sp., paratype female; **44**, genital field; **45**, IV-leg-6. (All scale bars = 50 µm).

Etymology

Named for its genital field with few acetabula.

Remarks

IV-leg-6 of the male of the new species is very similar to that of *K. pseudodistans*, but it is shorter. Moreover, the male of the new species is smaller, has many fewer acetabula and the coxoglandularia are not located close to the genital field as in *K. pseudodistans*. The configuration of the glandularia on the dorsal shield in the male is somewhat similar to *K. rutala* Cook, but the latter species lacks an enlarged claw. The female has some similarity with *K. rubipes*, which also has genital plates with few acetabula. However, *K. rubipes* has more acetabula (7–10), coxoglandularia 2 are located close to the genital field, and IV-leg-6 is much longer (more than 200 µm).

Koenikea (Notomideopsis) pseudodistans Cook

Figures 46–48

Koenikea (Notomideopsis) pseudodistans Cook, 1986: 192; Harvey, 1998: 142.

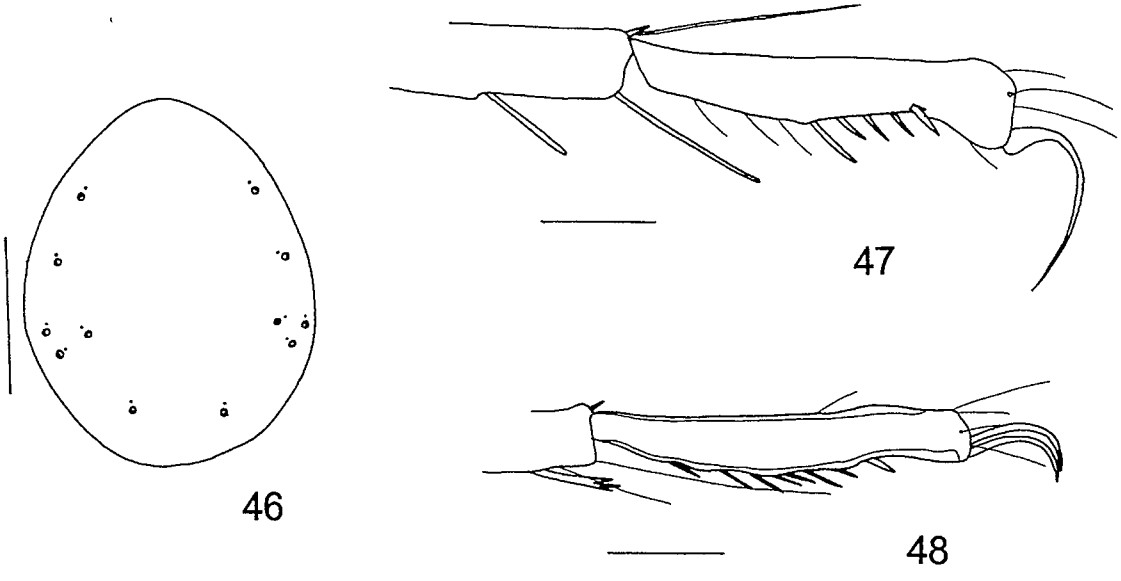
Material Examined

Australia: Western Australia: 1 female, Chinderwariner Pool, Millstream-Chichester National Park, 15 August 1994; 1 male, 1 female, Deep Reach Pool, Millstream-Chichester National Park, 15 August 1994; 1 male, pools upstream of Bell Gorge Falls, Kimberley, 11 September 1998; 1 female, Palm Springs, south of Halls Creek, 25 September 1998. **Northern Territory**: 1 female, Magela Creek floodplain, Winmurra Billabong, 15 November 1979, leg. R. Tait (slide SMF 7206); 1 male, Manton Dam, 1 August 1994. **Queensland**: 1 female, Fitzroy River, Rockhampton, 20 February 1982, leg. A.P. Mackay; 2 males, 2 females, same location, 23 November 1982; 1 male, same location, 4 January 1983; 2 males, 3 females, same location, 11 January 1983; 3 males, 10 females, same location, 1 February 1983; 1 male, 4 females, same location, 1 March 1983; 3 males, 6 females, same location, 15 March 1983; 1 female, same location, 29 March 1983; 3 males, 12 females, same location, 13 April 1983; 1 female, same location, 7 July 1983; 2 males, 2 females, same location, 2 August 1983; 2 males, 22 females, same location, 30 August 1983; 3 females, same location, 27 September 1983; 6 females, same location, 11 October 1983; 3 males, 5 females, same location, 25 October 1983; 17 males, 14 females, same location, 8 November 1983; 1 male, 4 females, 23 November 1983; 10 males, 8 females, same location, 6 December 1983; 1 male, same location, 16 April 1984; 1 female, same location, 3 May 1984; 1 female, same location, 7 June 1984; 1 female, same location, 20 June 1984; 1 male, 1 female, Fitzroy River, Yaamba, 20 February 1981, leg. A.P. Mackay; 1 male, 3 females, same location, 20 February 1984; 1 female, same location, 5 March 1984; 1 female, same location, 2 April 1984; 1 female, same location, 30 May 1984; 1 male, same location, 13 June 1984; 1 female, Nankin Creek, 4 May 1981, leg. A.P. Mackay; 1 male, 2 females, Flinders River, 22 June 1983, leg. A.P. Mackay; 2 females, Lacey Creek, Mission Beach, 17 September 2000.

Description

Male

Body 486–612 µm long and 462–567 µm wide. Dorsal shield 470 µm long and 381 µm wide. Lengths of PI-PV: 18 µm, 67 µm, 45 µm, 76 µm, 31



Figures 46–48 *Koenikea pseudodistans* Cook, male; **46**, dorsal shield; **47**, IV-leg-6; **48**, IV-leg-6. (Scale bars: **46** = 200 µm; **47**, **48** = 50 µm)

µm. Lengths of I-leg-4-6: 160 µm, 154 µm, 176 µm. Lengths of IV-leg-4-6: 172 µm, 200 µm, 152 µm; IV-leg-5 with 8-12 pectinate setae, IV-leg-6 with 8-10 normal setae (but in one of the legs only 6 of these setae are visible). Claws of IV-leg-6 large, 66 µm in width, IV-leg-6 indented distally. II-leg-4, III-leg-3, III-leg-5 and IV-leg-3 with one swimming seta, III-leg-4 with 3, IV-leg-4 with five and IV-leg-5 with two swimming setae. One of the swimming setae of IV-leg-5 reduced in length. Other characters as given by Cook (1986).

Female

Body 745–875 µm long and 662–795 µm wide. IV-leg-6 with 5-10 setae on ventral margin.

Remarks

Males of this species are easily separated from *K. distans* by the enlarged claw of IV-leg-6. However, the separation of the females from *K. distans* with the characters given by Cook (1986) is problematic. Cook (1986) mentioned the following distinguishing characters between the two species: coxoglandularia 2 located more posteriorly in *K. pseudodistans*, gonopore placed well forward in *K. distans* and more near posterior margin in *K. pseudodistans*, the tubercle of the peg-like seta of PIV is more distally located in *K. pseudodistans* and the body of *K. distans* is nearly as wide as long, while it is proportionally narrower in *K. pseudodistans*. Finally, in *K. pseudodistans* the claw of IV-leg-6 of the female is enlarged, but less than in the male. Cook (1986) based his comparison on the holotype of *K. distans* only, as no other specimens were known at that time. Now that I have examined more specimens of *K. distans*, it is clear that the coxoglandularia 2 are also located close to the genital field in *K. distans*. Neither the location of the tubercle of PIV nor the location of the gonopore differ from *K. pseudodistans*. I examined the differences in shape between the females of the two species by using the length/width ratio of the dorsal shield, as this is less deformed in mounted specimens than the body itself. In the two paratype females of *K. pseudodistans*, this ratio is 1.10 and 1.25 respectively, while in the specimens from this study assigned to *K. pseudodistans* the ratio is between 1.17 and 1.23. In females of *K. distans* this ratio varies from 1.12 to 1.16 (1.17) (n=14). In the specimens from the Fitzroy River (Queensland), where only males of *K. pseudodistans* were found, females were found with a ratio up to 1.09. These females had the enlarged claw characteristic for *K. pseudodistans* (see below). Although most females of *K. pseudodistans* are more slender than *K. distans*, this character cannot be used to separate the two species. In my opinion, the only character to separate the females of the two species is the claw of IV-leg-6. The width of this claw, measured from its base to the tip, is 38-42 µm in *K. pseudodistans* and 31–33 µm in *K. distans*. Although females of *K. pseudodistans* usually have a larger IV-leg-6 than *K. branacha*, occasionally an overlap is found. Therefore, the size of the claw is a better character to separate the females of the *K. pseudodistans* and *K. branacha*. The size of the claw of IV-leg-6 of *K. branacha* is 22–30 µm.

Cook (1986) collected the species in Queensland, so it is reported here for the first time from Western Australia and the Northern Territory.

Koenikea (Notomideopsis) rubipes sp. nov.

Figures 49–56

Material Examined

Holotype

Male, Chinderwariner Pool, Millstream-Chichester National Park, Western Australia, Australia, 15 August 1994 (WAM).

Paratypes

1 male, 7 females, same data as holotype (WAM); 1 female, Deep Reach Pool, Millstream-Chichester National Park, Western Australia, 15 August 1994 (ZMAN); 1 female, Crossing Pool, Millstream-Chichester National Park, 16 August 1994 (WAM); 1 male, 8 females, western part Deep Reach Pool, Millstream-Chichester National Park, Western Australia,16 August 1994 (ZMAN).

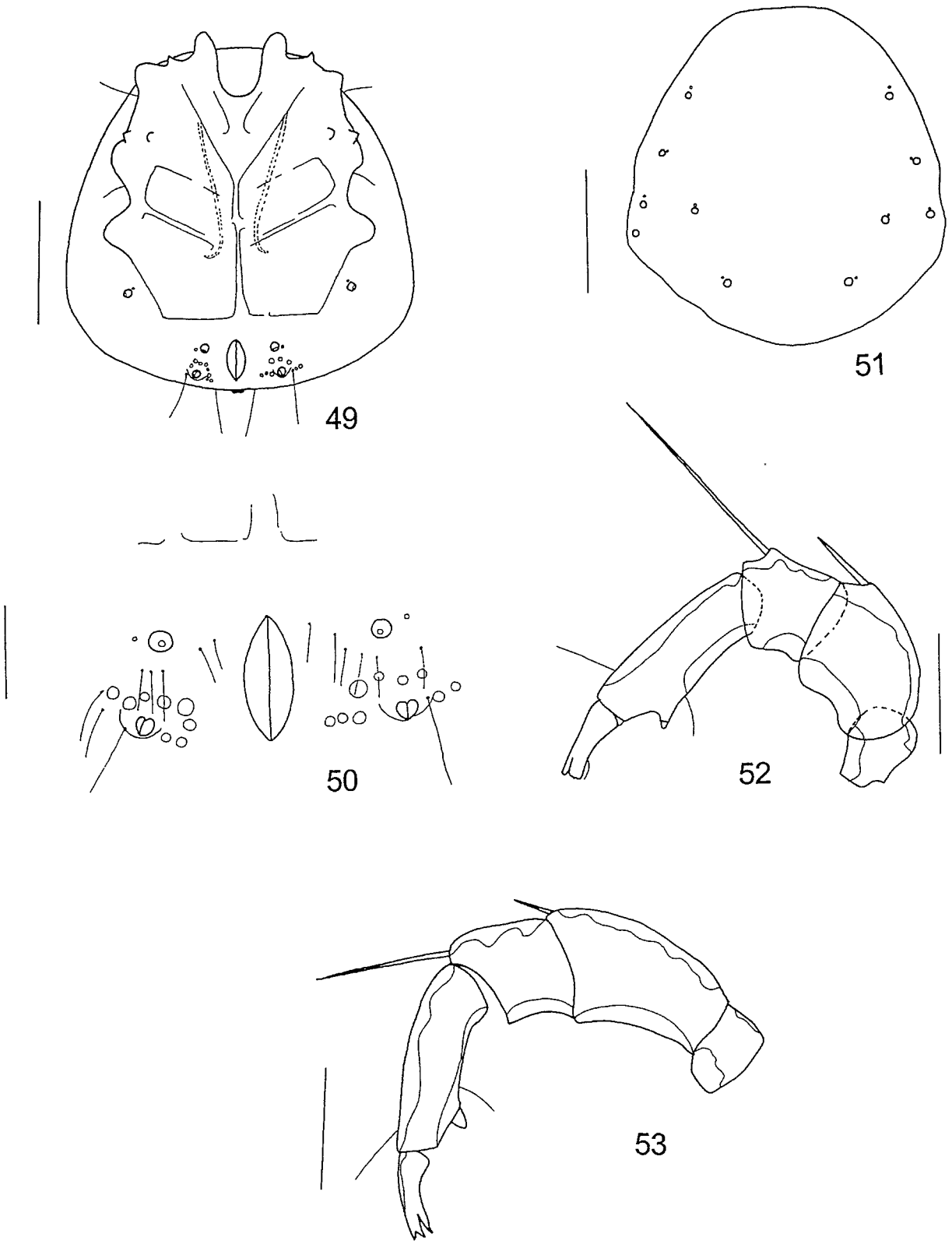
Diagnosis

Genital field small, with only approximately 7–10 acetabula. IV-leg-5 of male with three short swimming setae.

Description

Male

Body 586 µm (543–579 µm) long and 591 µm (522–583 µm) wide. Dorsal shield 559 µm long and 547 µm wide. Dorsal shield with five pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. None of the glandularia on tubercles. Tips of first coxal plates blunt, extending beyond anterior body margin. Posterior apodemes of anterior coxal plates extending beyond suture line of third and fourth coxal plates. Excretory pore terminal. Gonopore 70 µm long. Genital field small, with approximately 7–10 acetabula surrounding an enlarged glandularium. Coxoglandularia 2 lying close to genital field. Lengths of PI-PV: 22 µm, 79 µm, 41 µm, 88 µm, 36 µm. Peg-like seta of PIV on a tubercle, well-distanced from anterior tip of segment. Lengths of I-leg-4-6: 168 µm, 154 µm, 160 µm, these segments with numerous fine setae. Lengths of IV-leg-4-6: 184 µm, 218 µm, 184 µm. IV-

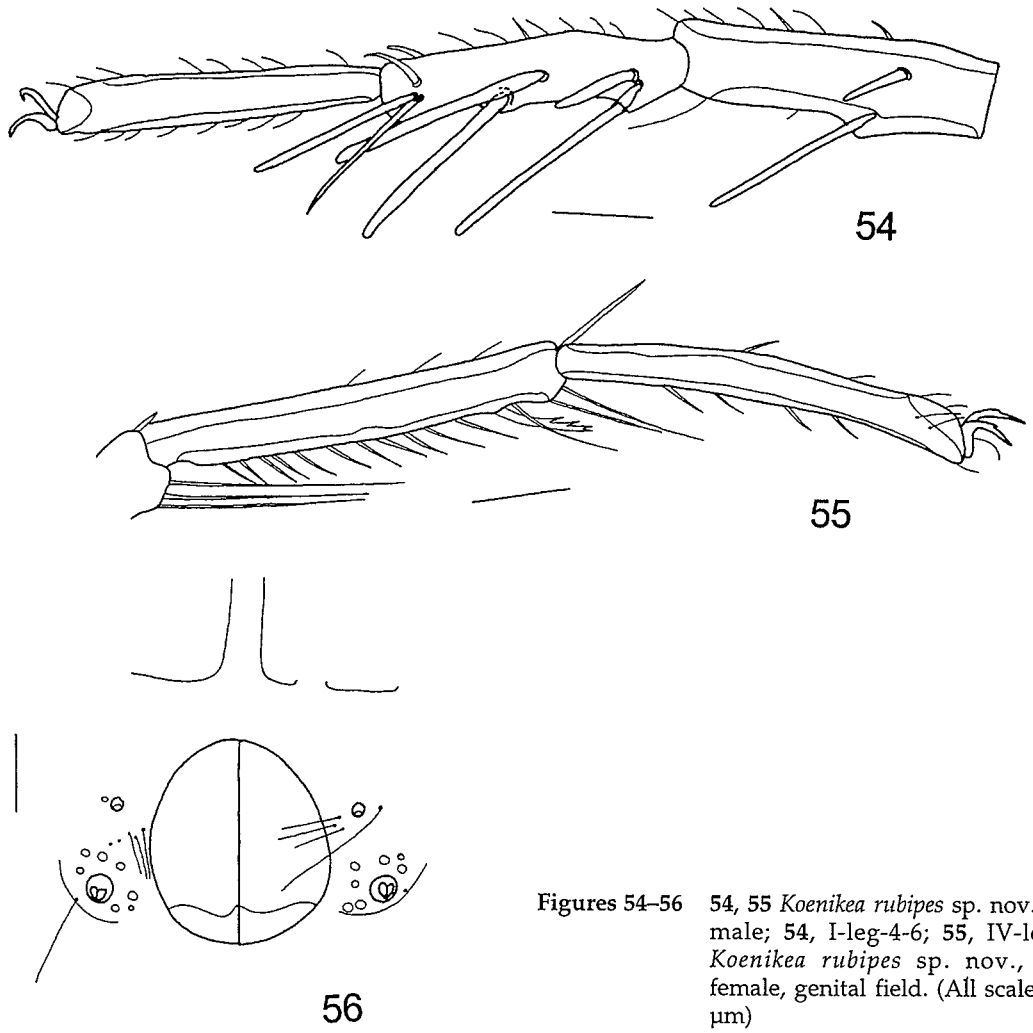


Figures 49–53 *Koenikea rubipes* sp. nov., holotype male, **49**, ventral view; **50**, genital field; **51**, dorsal shield; **52**, left palp; **53**, right palp. (Scale bars: **49**, **51** = 200 µm; **50**, **52**, **53** = 50µm).

leg-6 with 4 (5) small setae, IV-leg-5 with 11 small setae and one large pectinate seta. IV-leg-5 with three short swimming setae, shorter than half of IV-leg-6. Number of swimming setae of other leg segments: IV-leg-3 with one, IV-leg-4 with three, IV-leg-5 with five (not all setae visible in illustrated leg), III-leg-4 and -5 with three swimming setae. All swimming setae stiff, and all legs conspicuously coloured red.

Female

Body 713 µm (624–697 µm) long and 648 µm



Figures 54–56 **54, 55** *Koenikea rubipes* sp. nov., holotype male; **54**, I-leg-4-6; **55**, IV-leg-5-6; **56** *Koenikea rubipes* sp. nov., paratype female, genital field. (All scale bars = 50 µm)

(608–632 µm) wide. Dorsal shield 656 µm long and 544 µm wide. Dorsal shield with five pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. None of the glandularia on tubercles. Tips of first coxal plates blunt, extending beyond anterior body margin. Posterior apodemes of anterior coxal plates extending beyond suture line of third and fourth coxal plates. Excretory pore terminal. Gonopore 114 µm long. Genital field small, with approximately 7–10 acetabula surrounding an enlarged glandularium. Coxoglandularia 2 lying close to genital field. Lengths of PI-PV: 30 µm, 98 µm, 52 µm, 96 µm, 42 µm. Lengths of I-leg-4-6: 216 µm, 184 µm, 162 µm. Lengths of IV-leg-4-6: 198 µm, 214 µm, 216 µm. IV-leg-6 with 6-8 small setae, IV-leg-5 with 16 small setae and one large pectinate seta. Chaetotaxy of legs as in male, but swimming setae of IV-leg-5 not shortened.

Etymology

Named for its conspicuous red legs.

Remarks

The new species is close to *Koenikea branacha* and *K. distans*, but differs in the small genital field with few acetabula. Moreover, the swimming setae of IV-leg-5 of the male are much longer in *K. branacha* and *K. distans*.

Koenikea (Notomideopsis) cf. *rutala* Cook

Koenikea (Notomideopsis) rutala Cook, 1986: 189; Harvey, 1998: 142.

Material Examined

Australia: Northern Territory: 1 male, Lily Pond Falls, Katherine Gorge National Park, 27 July 1994.

Remarks

The specimen from this study keys out to *K. rutala*, as the dorsal glandularia 3 and 4 are only slighter closer to each other than 5 and 6. However, my specimen is 470 µm long and 447 µm wide, and therefore smaller than the specimens of Cook (1986), which are 577–582 µm long and 577–608 µm wide. Moreover, the genital field is not terminally placed, and the distance between the genital field and the posterior margin of the fourth coxal plates is larger. The projections associated with the

openings for the fourth legs are somewhat hooked, but beside the configuration of the dorsal glandularia mentioned before, my specimen resembles *K. branacha*, with which it was found. Therefore, its assignment to *K. rutala* is tentative.

Koenikea (Notomideopsis) setosa sp. nov.
Figures 57–63

Material Examined

Holotype

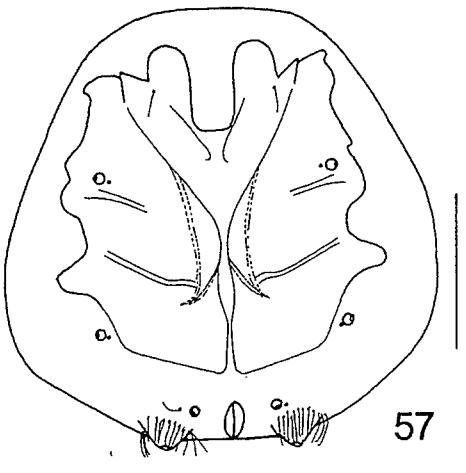
Male, Fortescue River at crossing with North West Coastal Highway, Western Australia, Australia, 18 August 1994 (WAM).

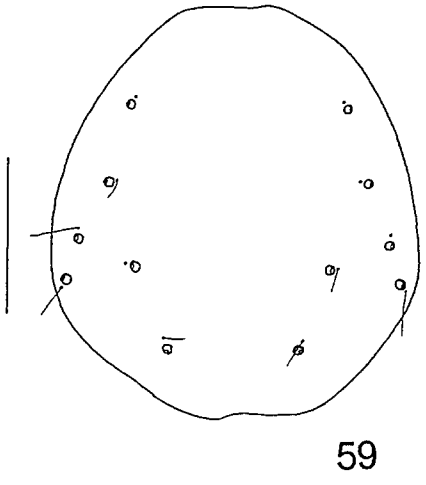
Paratypes

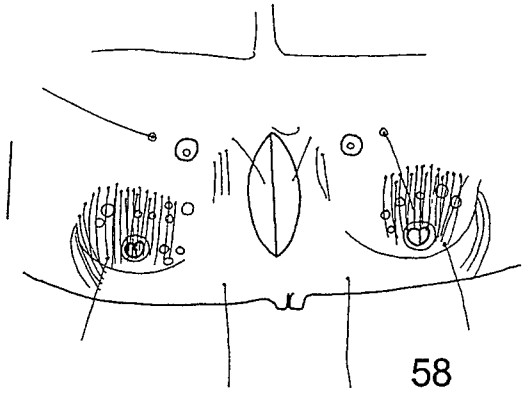
13 males, 4 females, same data as holotype (WAM); 2 males, 4 females, pond Kalamina Gorge (near falls), Hamersley Range National Park, Western Australia, 13 August 1994 (ZMAN); 1 female, Palm Pool, Millstream-Chichester National Park, Western Australia, 15 August 1994 (WAM); 3 males, western part Deep Reach Pool, Millstream-Chichester National Park, Western Australia, 16 August 1994 (ZMAN); 1 female, small pond near Crossing Pool, Millstream-Chichester National Park, Western Australia, 16 August 1994 (WAM); 2 males, Jones River, east of Roeburne, Western Australia, 17 August 1994 (ZMAN); 3 females, pond Snake Creek, Millstream-Chichester National Park, Western Australia, 17 August 1994 (WAM); 1 female, Ashburton River at crossing with North West Coastal Highway, Western Australia, 18 August 1994 (ZMAN); 1 male, Jim Jim Billabong at crossing with Kakadu Highway, Kakadu National Park, Northern Territory, Australia, 22 July 1994 (NTM); 1 male, pool west of Tunnel Creek, Tunnel Creek National Park, Kimberley, Western Australia, Australia, 30 September 1998 (ZMAN).

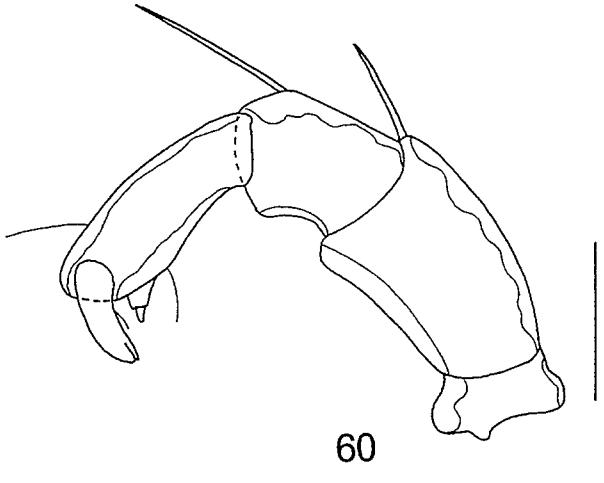
Other material

Australia: Northern Territory: 1 male, Magela Creek floodplain, Island Billabong, 22 January 1979, leg. R. Tait (SMF 7164).

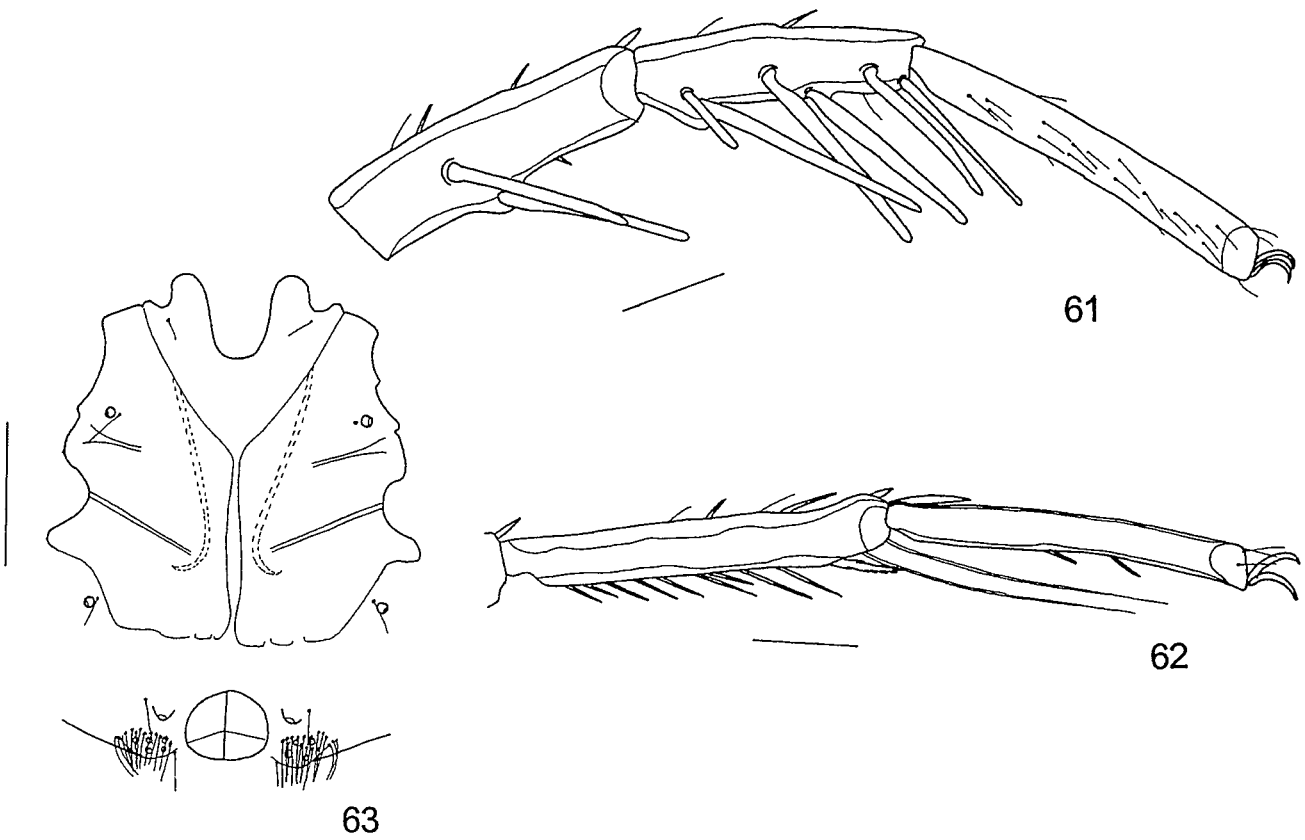








Figures 57–60 **57**, *Koenikea setosa* sp. nov., holotype male, ventral view; **58** *Koenikea setosa* sp. nov., paratype male, genital field; **59** *Koenikea setosa* sp. nov., holotype male, dorsal shield; **60** *Koenikea setosa* sp. nov., holotype male, palp (Scale bars: **57**, **59** = 200 µm; **58**, **60** = 50 µm)



Figures 61–63 **61**, **62** *Koenikea setosa* sp. nov., holotype male; **61**, I-leg-4-6; **62**, IV-leg-5-6; **63** *Koenikea setosa* sp. nov., paratype female, ventral view (Scale bars: **61**, **62** = 50 µm; **63** = 200 µm)

Diagnosis

Genital field cone-shaped, with an enlarged, glandularium on top; anterior margin of genital field with numerous small setae.

Description

Male

Body 567 µm (591–640 µm) long and 575 µm (575–640 µm) wide. Dorsal shield 535 µm (543 µm) long and 496 µm (535 µm) wide. Dorsal shield with five pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. None of the glandularia on tubercles. Tips of first coxal plates blunt, not extending beyond anterior margin of body. Posterior apodemes of anterior coxal plates extending beyond suture line of third and fourth coxal plates. Excretory pore terminal. Gonopore 56 µm long. Genital field cone-shaped, with enlarged glandularium on top. Number of acetabula difficult to ascertain, approximately 15–20. Anterior margin of genital field with numerous small setae. Dorsal lengths of PI-V: 18 µm, 80 µm, 56 µm, 84 µm, 35 µm. Peg-like seta of PIV on a distinct tubercle, inserted somewhat distal of anterior tip of segment. Lengths of I-leg-4-6: 158 µm, 140 µm, 176 µm. Rillborsten of first and second legs relatively long. Lengths of IV-leg-4-6: 165 µm, 188 µm, 170 µm. IV-leg-6 with two (four) setae on ventral margin, IV-leg-5 with nine setae and one pectinate seta. The following swimming setae are present: II-leg-4 with one, II-leg-5 with two (but these are very stiff setae), III-leg-4 with three, III-leg-5 with two, IV-leg-3 with one, IV-leg-4 with five and IV-leg-5 with three swimming setae.

Female

Body 794 µm (753–851 µm) long and 688 µm (680–761 µm) wide. Dorsal shield 713 µm long and 591 µm wide. Dorsal shield with five pairs of glandularia; all glandularia near lateral margin of dorsal shield, except fifth pair. Glandularia 3 located somewhat more medially in most females, but in the female from Ashburton River it is distinctly located medially. None of the glandularia on tubercles. Tips of first coxal plates blunt, not extending beyond anterior margin of body. Posterior apodemes of anterior coxal plates extending beyond suture line of third and fourth coxal plates. Excretory pore terminal. Gonopore 104 µm long. Genital field cone-shaped, with enlarged glandularium on top. Number of acetabula difficult to ascertain, approximately 15–20. Lengths of PI-PV: 24 µm, 102 µm, 56 µm, 102 µm, 44 µm; palp as in male. Lengths of I-leg-4-6: 191 µm, 160 µm, 156 µm. Lengths of IV-leg-4-6: 165 µm, 188 µm, 170 µm.

IV-leg-5 with 8-9 of setae (the most distal seta serrated) on ventral margin and one pectinate seta, IV-leg-6 with 4-5 setae on ventral margin. Chaetotaxy of legs as in male.

Etymology

Named for the numerous small setae anterior to the genital field.

Remarks

The configuration of the glandularia of the dorsal shield is similar to that of other Australian species of the genus, but the cone-shaped genital field in combination with the numerous small setae is characteristic for the new species.

Koenikea (Notomideopsis) timmsi K.O. Viets

Figure 64–65

Koenikea (? Koenikea) timmsi K.O. Viets, 1977: 81.

Koenikea (Notomideopsis) timmsi K.O. Viets: Cook, 1986: 190; Wiles, 1997: 410; Harvey, 1998: 142.

Material Examined

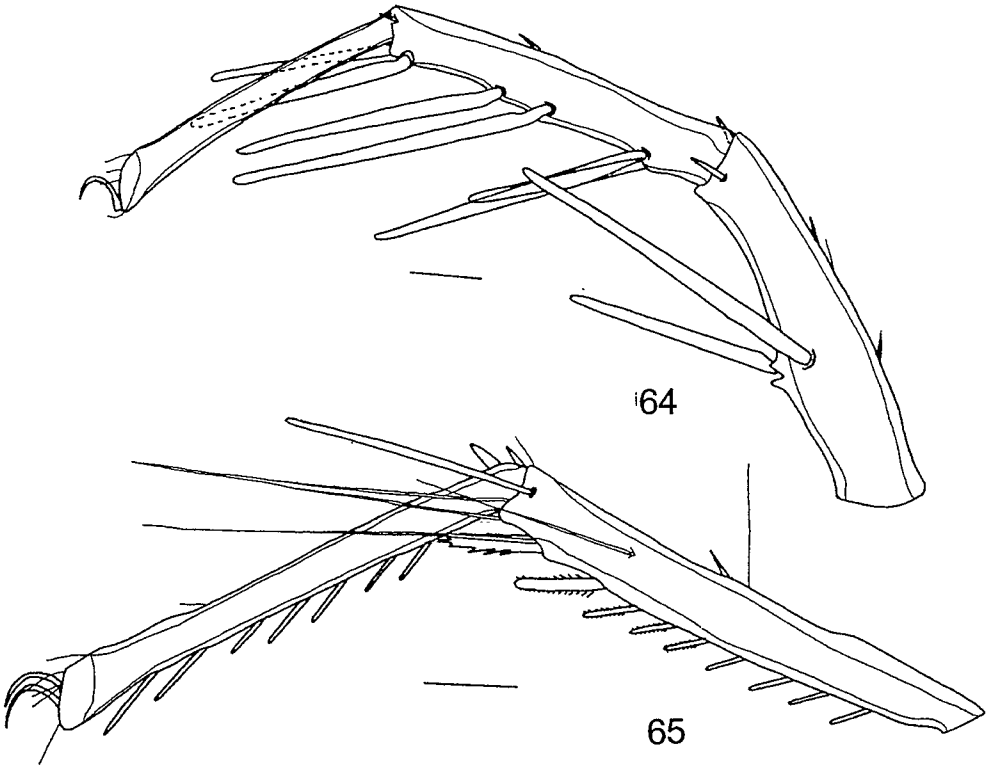
Holotype

Female, Lake Eacham, Queensland, Australia, leg. Timms, 7 July 1974 (SMF 5670).

Other material

Australia: Western Australia: 1 female, pool Lennard River, Windjana Gorge National Park, 9 September 1998; 1 male, 2 females, pool Lennard Gorge, Kimberley, 10 September 1998 (WAM); 4 males, 1 female, pools 3 km from Lennard Gorge, Kimberley, 10 September 1998; 1 female, pools upstream of Bell Gorge Falls, Kimberley, 11 September 1998; 3 males, 6 females, pool Silent Grove (behind ranger station), Kimberley, 11 September 1998 (WAM); 10 males, 4 females, pool Galvans Gorge, Kimberley, 12 September 1998; 1 female, pools downstream of Manning Gorge Falls (at campground), Kimberley, 12 September 1998; 1 male, 4 females, plunge pool Adcock Gorge, Kimberley, 12 September 1998 (WAM); 1 male, pool near Adcock Gorge, Kimberley, 12 September 1998; 2 males, El Questro Gorge, El Questro Station, Kimberley, 15 September 1998; 9 males, 13 females, pool Amalia Gorge, El Questro Station, Kimberley, 16 September 1998; 9 males, 13 females, Middle Springs, west of Kununurra, 18 September 1998 (WAM); 1 male, Spillway Creek, near Lake Argyle, 20 September 1998.

Northern Territory: 1 female, Magela Creek floodplain, Leichhart Billabong, 14 May 1979, leg. Tait (slide SMF 7108); 1 female, Magela Creek floodplain, Driffalo (?) Billabong, 20 July 1979, leg. Tait (slide SMF 7114); 1 male, Radon Springs, Kakadu National Park, 19 July 1994; 1 female, pond Jim Jim Creek, near Jim Jim campground, Kakadu National Park, 23 July 1994; 2 males, 2 females, pools upstream of Waterfall Creek, Kakadu National Park, 25 July 1994; 1 male, 1 female, Lily



Figures 64–65 *Koenikea timmsi* K.O. Viets, holotype female; **64**, I-leg-4-6; **65**, IV-leg-5-6. (All scale bars = 50 μm).

Pond Falls, Katherine Gorge National Park, 27 July 1994; 2 females, plunge pool Edith Falls, Katherine Gorge National Park, 30 July 1994.

Morphology

Male

Body 741 µm (575–761 µm) long and 672 µm (538–705 µm) wide; body widened posteriorly. Dorsal shield with six pairs of glandularia, none of which are on tubercles. Five pairs of dorsoglandularia near margin of dorsal shield and one pair situated more medially. First coxal plates extending to anterior body margin. Posterior apodemes of anterior coxal plates reaching beyond suture line of third and fourth coxal plates. In one population (pools 3 km from Lennard Gorge) reaching to the middle of fourth coxal plates. Coxoglandularia 2 a little bit distanced from posterior margin of fourth coxal plates, but closer to posterior margin of fourth coxal plates than to genital plate. Gonopore of paratype 86 µm long. Genital field subterminal, with numerous pairs of acetabula surrounding an enlarged glandularium. Excretory pore terminal. Lengths of PI-PV: 26 µm, 98 µm, 52 µm, 110 µm, 36 µm. Peg-like seta of PIV on a short but distinct tubercle, near distal end of segment. Lengths of I-leg-4-6: 234 µm, 206 µm, 204 µm. Lengths of IV-leg-4-6: 204 µm, 234 µm, 224 µm. IV-leg-6 with nine short setae, IV-leg-5 with one pectinate seta and 11 short setae. The distribution of the swimming setae is as follows: II-leg-4 with 1, III-leg-4 with 2, III-leg-5 with 3, IV-leg-3 with 2, IV-leg-4 with 4 and IV-leg-5 with 3 swimming setae.

Female

Body 810 µm (786–955 µm) long and 721 µm (684–802 µm) wide. Dorsal shield with six pairs of glandularia, none of which are on tubercles. Five pairs of dorsoglandularia near margin of dorsal shield and one pair situated more medially. First coxal plates extending beyond anterior body margin. Coxoglandularia 2 a little bit distanced from posterior margin of fourth coxal plates, but closer to posterior margin than to genital field. Gonopore 146 µm long. Genital field with numerous pairs of acetabula surrounding an enlarged glandularium. Peg-like seta of PIV on a distinct tubercle.

Remarks

Viets (1977) based his description on the holotype female only. In the holotype female the coxoglandularia 2 are located halfway between the posterior margin of the fourth coxal plates and the genital field, but in most specimens I collected they are closer to the posterior margin of the fourth coxal plates. Cook (1986) described the male, but was uncertain of his assignment as his specimen was collected in a stream, while the holotype was collected in a lake. Now that more males have been found, Cook's assignment can be confirmed. In his key, Cook (1986) mentioned that the peg-like seta of PIV is inserted directly on the segment, but from this study it is clear that it is located on a distinct tubercle. The species was previously reported from Queensland, and is reported here for the first time from Western Australia and the Northern Territory.

Koenikea (Notomideopsis) voloma Cook

Koenikea (Notomideopsis) voloma Cook, 1986: 195; Smit, 1992: 104; Harvey, 1998: 142.

Material Examined

Australia: Queensland: 1 female, Broken River near Conical Pool, Eungella National Park, 18 September 2000.

Remarks

Previously known from New South Wales and Queensland.

ACKNOWLEDGEMENTS

I am indebted to Dr Peter Jäger (SMF) for the loan of material from the Viets collection, to Dr Ken Walker and Peter Lillywithe (NMV) for the loan of water mites from the Cook collection and to Dr Davis Hirst (SAM) for sending me material lodged in the South Australiam Museum. Dr Terry Gledhill donated water mites collected by A.P. Mackay in the beginning of the1980s. The national park authorities of Western Australia, the Northern Territory, Queensland, New South Wales, Victoria and Tasmania gave permission to collect in their national parks. Truus van der Pal assisted me with the fieldwork, and Johannes Postma (Ann Arbor) reviewed the English.

REFERENCES

Cook, D.R. (1974). Water mite genera and subgenera. *Memoirs of the American Entomological Institute* **21**: 1–860.

Cook, D.R. (1986). Water mites from Australia. *Memoirs of the American Entomological Institute* **40**: 1–568.

Harvey, M.S. (1998). The Australian Water Mites. A Guide to Families and Genera. *Monographs on Invertebrate Taxonomy* **4**. CSIRO Publishing, Collingwood, 150 p.

Lundblad, O. (1941). Neue Wassermilben. Vorläufige Mitteilung. *Entomologisk Tidskrift* **62**: 97–121.

Lundblad, O. (1943). Die Hydracarinenfauna Südbrasiliens und Paraguays. *Kungliga Svenska vetenskapsakademiens handlingar* (s. 3) **20**: 1–148.

Lundblad, O. (1947). Zur Kenntnis Australischer Wassermilben. *Arkiv för Zoologi* **40A (2)**: 1–82.

Smit, H. (1992). Water mites from New South Wales and Queensland, Australia (Acari, Hydrachnellae). *Tijdschrift voor Entomologie* **135**: 91–112.

Smit, H. (2002). Water mites from New Caledonia (Acari: Hydrachnidia). In: Najt, J. & Grandcolas P. (eds.), Zoologia Neocaledonica 5. Systématique et endémisme en Nouvelle-Calédonie. *Memoirs du Muséum national d'Histoire naturelle* **187**: 161–206.

Smit, H. (2003). Water mites from Fiji (Acari: Hydrachnidia). *Acarologia* **42**: 351–360.

Viets, K.O. (1977). Über drei neue Wassermilben (Hydrachnellae, Acari) aus Australien. *Gewässer und Abwässer* **60/61**: 71–84.

Viets, K.O. (1980). Weitere neue Wassermilben (Hydrachnellae, Acari) aus Australien. *Gewässer und Abwässer* **66/67**: 143–169.

Wiles, P.R. (1997). The water mites (Acari: Hydrachnidia) of New Guinea. *The Raffles Bulletin of Zoology* **45**: 375–418.

Wolcott, R.H. (1900). New genera and species of North American Hydrachnidae. *Transactions of the American Microscopical Society* **22**: 105–117.

Key to the Australian *Koenikea* species

1. Without apophyses associated with the dorsal shield, apodemes of anterior coxal plates extending to or beyond suture line if third and fourth coxal plates 2

   With apohyses associated with dorsal shield (see Cook, 1986, figure 1047), apodemes of anterior coxal plates extending to middle of third coxal plates ..... *Koenikea sorpresa* Cook

2. Five pairs of glandularia on dorsal shield (fig 30) 3

   Six pairs of glandularia on dorsal shield 5

3. I-leg-6 < 150 µm ..... *Koenikea lewisensis* sp. nov.

   I-leg-6 > 200 µm 4

4. Peg-like seta of PIV located on a tubercle (see Cook, 1986, figure 969) .... *Koenikea australica* Lundblad

   Peg-like seta of PIV inserted directly on segment (see Cook, 1986, figure 976) .... *Koenikea decapora* Cook

5. Dorsal shield with one pair of glandularia placed very close together near middle of shield, the other five pairs peripheral (see Cook, 1986, figure 983) ... *Koenikea piota* Cook

   Dorsal shield not with one pair very close together near middle of shield 6

6. Grooved or fluted setae ("rillborsten") of first and second leg relatively short (rillborsten of I-leg-4 shorter than half of segment) (see Cook, 1986, figure 984) .... *Koenikea curtiseta* Cook

   Grooved or fluted setae longer, those of I-leg-4 longer than half of segment (usually nearly as long as segment) 7

7. Glandularia 3, 4 and 5 more or less in a line (see Cook, 1986, figure 1020) 8

   Glandularia 3, 4 and 5 not in a line, but glandularia 3 and 4 much closer to lateral margin than glandularium 4 (figure 17) 10

8. Small species, both male and female < 500 µm, peg-like seta of PIV inserted well before distal end of segment (see Cook, 1986, figure 1021) ..... *Koenikea jacunda* Cook

   Larger species, both male and female > 600 µm, peg-like seta of PIV inserted near distal end (see Cook, 1986, figure 1028) 9

9. Peg-like seta of PIV inserted on a long tubercle (peg-like seta shorter than its tubercle), (see Cook, 1986, figure 1018) .... *Koenikea lemba* Cook

   Peg-like seta of PIV inserted on a short tubercle (peg-like seta longer than its tubercle) (seee Cook, 1986, figure 1028) .... *Koenikea voloma* Cook

10. Palp very slender (figure 19) .... *Koenikea gracilipalpis* sp. nov.

    Palp not very slender 11

11. Coxal setae very long, especially of first coxal plates (anterior coxal setae extending beyond suture lines of first and coxal plates) (see Cook, 1986, figures 1039 and 1040) .... *Koenikea crinita* Cook

    Coxal setae not very long 12

12. Glandularia 3 and 4 of dorsal shield only slightly closer to each other on their respective sides than glandularia 5 and 6 are to each other (but when a male, claw of IV-leg-6 not enlarged) (see Cook, 1986, figure 989) .... *Koenikea rutala* Cook

    Glandularia 3 and 4 much closer to each other on their respective sides than 5 and 6 are to each other 13

13. Anterior margin of genital field with numerous small setae (figure 58) .... *Koenikea setosa* sp. nov.

    Anterior margin of genital field with only a few small setae 14

14. Apodemes of first coxal plates very long, reaching to posterior margin of fourth coxal plates (figure 1) .... *Koenikea circularis* sp. nov.

    Apodemes shorter, not reaching posterior margin of fourth coxal plates 15

15. Very slender species, length/width ratio of dorsal shield 1.47 (see Cook, 1986, figure 1030) ..... *Koenikea rodosa* Cook

Not as slender, length/width ratio of dorsal shield less than 1.25 16

16. Genital field small, with fewer than 10 acetabula 17

Genital field larger, with more than 10 acetabula 18

17. Coxoglandularia 2 halfway between posterior margin and genital field, genital plates with 6–7 acetabula (figure 44), IV-leg-6 < 180, IV-leg-6 of male enlarged .... *Koenikea pauciacetabulata* sp. nov.

Coxoglandularia 2 close to gential field, genital plates with 7–10 acetabula (figure 56), IV-leg-6 > 200, IV-leg-6 of male not enlarged .... *Koenikea rubipes* sp. nov.

18. Coxoglandularia 2 located near posterior margin of fourth coxal plates (see Cook, 1986, figure 996), tubercle of PIV near distal end (see Cook, 1986, figure 994) .... *Koenikea timmsi* K.O. Viets

Coxoglandularia 2 located closer to genital field, tubercle of PIV located well anterior to distal end of segment 19

19. Claw of IV-leg-6 large (figure 47), in male 60–70 µm in width (= from tip of claw to base), in female 38–42 µm in width .... *Koenikea pseudodistans* Cook

Claw of IV-leg-6 smaller 20

20. IV-leg-6 in male < 180 µm, < 170 µm in female, small species ..... *Koenikea branacha* Cook

IV-leg-6 in male > 190 µm, in female > 200 µm, large species ..... *Koenikea distans* K.O. Viets

Manuscript received 1 September 2003; accepted 11 November 2003