

The cavernicolous pseudoscorpions (Chelicerata: Pseudoscorpionida) of Cape Range, Western Australia

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Abstract

The pseudoscorpions collected from caves in Cape Range, Western Australia are described. Six species are recorded: *Austrochthonius easti*, sp. nov., *Tyrannochthonius butleri*, sp. nov., *T. brooksi*, sp. nov. (Chthoniidae), *Ideoblothrus woodi*, sp. nov., *I. papillon*, sp. nov. (Syarinidae) and an undescribed genus and species of Hyidae. The origins of the fauna are discussed.

Introduction

Although several cave-dwelling pseudoscorpions have been described from eastern Australia (Beier, 1967; Beier, 1968; Beier, 1969; Beier, 1975; Beier, 1976; Chamberlin, 1962; Dartnall, 1970; Harvey, 1989; Muchmore, 1982b), little is known of those from Western Australia. Several species from the Nullarbor Plain and the Yanchep region were recorded by Beier (1969), and a single species from the Margaret River region by Beier (1971). Recent field work in Cape Range by Dr W.F. Humphreys and his associates has uncovered a rich cavernicolous fauna, with six new species. Five of these species are described below, while the sixth will be treated in a forthcoming review of the Hyidae (Harvey, in preparation).

Materials and Methods

All material is lodged in the Western Australian Museum (WAM), and many are mounted on microscope slides in Euparal. Terminology follows Chamberlin (1931).

Systematics

Family Chthoniidae Daday

Genus *Austrochthonius* Chamberlin

Remarks

Australian species of *Austrochthonius* have been collected from south-eastern Australia (*A. australis* Hoff and *A. cavicola* Beier), south-western Australia, north-western Australia and north-eastern Australia. Beier (1966) incorrectly attributed material from south-western Australia to *A. australis*, and these populations represent a

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distinct, undescribed species (Kennedy, 1989). Likewise, the species from north-western Australia and north-eastern Australia are undescribed (Harvey, 1991b).

***Austrochthonius easti*, sp. nov.**

(Figures 1-7)

Holotype

♂, Dry Swallett Cave, C-18, Cape Range, Western Australia, 22°05'24"S, 113°59'30"E, under stone, 26 June 1989, M.S. Harvey (WAM 91/272, slide).

Paratypes

Western Australia, Cape Range: 1 tritonymph, Loop Cave, C-222, 21°56'26"S, 114°05'44"E, 10 July 1989, M. East (WAM 91/273); 1 deutonymph, Trionomo Cave, C-103, 22°07'26"S, 113°59'18"E, 19 August 1989, B. Jones (WAM 91/274).

Diagnosis

This species differs from the two other described Australian species of *Austrochthonius* by the presence of 2 small eyes; *A. australis* Hoff possesses 4 corneate eyes, and *A. cavicola* Beier is totally blind.

Description

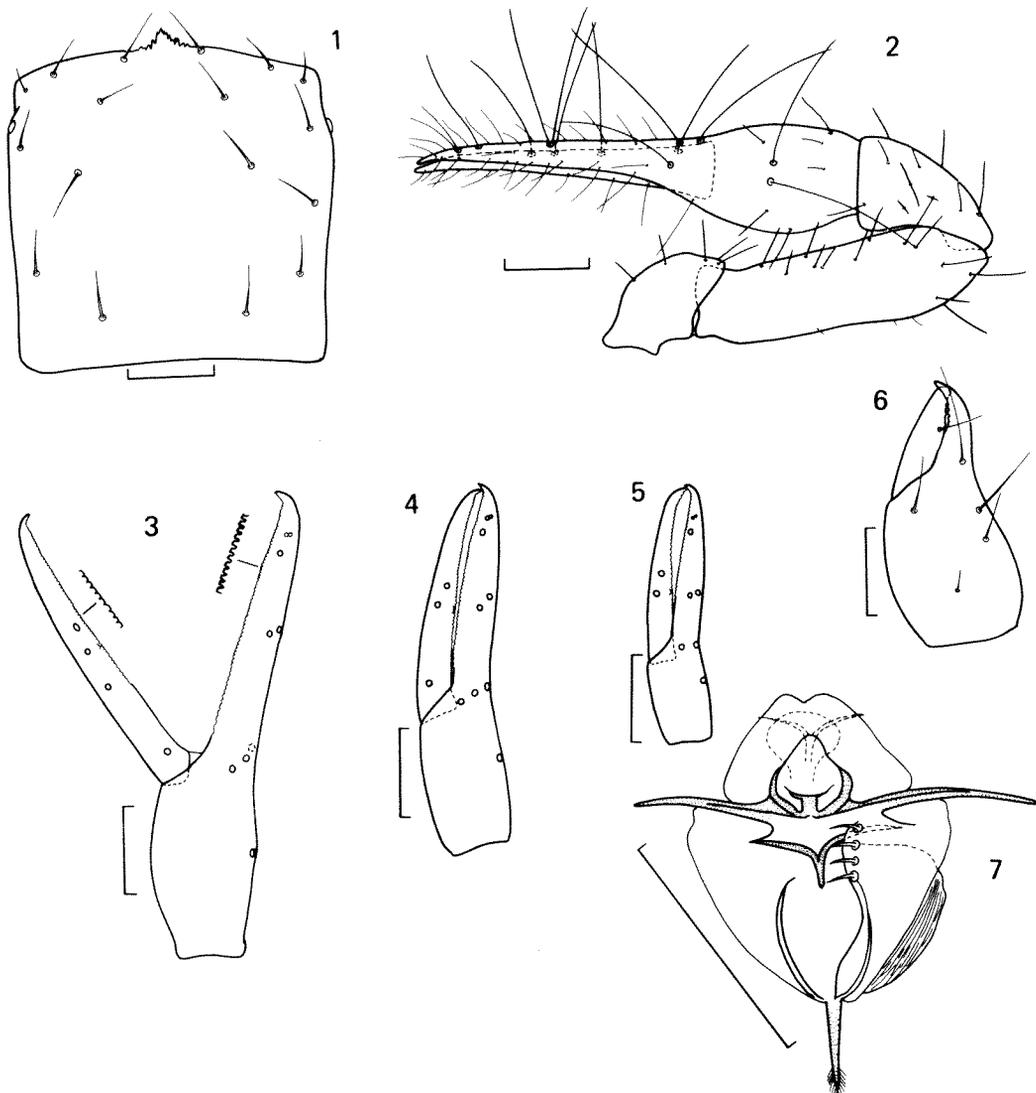
Male

Colour light red-brown. Setae straight and acicular. Pedipalp (Figure 2): trochanter 1.67, femur 3.40, tibia 1.80, chela 4.17, hand 1.33 times longer than broad, movable finger 2.06 times longer than hand. Fixed chelal finger and hand with 8 trichobothria, movable chelal finger with 4 trichobothria (Figure 3); *ib* and *isb* situated on dorsum of hand; *sb* closer to *t* than to *b*; *st* closer to *t* than to *sb*. Venom apparatus absent. Chelal teeth contiguous: fixed finger with 62 teeth; movable finger with 59 teeth. Chelicera (Figure 6): with 5 setae on hand; movable finger with 1 seta; galea represented by mound; fixed finger with 14 teeth; movable finger with 18 teeth; flagellum composed of 11 bipinnate blades. Carapace (Figure 1) 0.92 times as long as broad; lateral margins slightly convex; with 2 small eyes, posterior eyes absent; epistome serrate; with 18 setae arranged 6: 4: 4: 2: 2; without furrows. Tergites and sternites undivided. Tergal chaetotaxy: 4: 4: 4: 6: 6: 6: 6: 5: 0: 0. Sternal chaetotaxy: 12: (2)22[8](2): (2)7(2): 8: 8: 7: 8: 8: 7: 4: 2. Coxal chaetotaxy: 5: 3+cs: 5: 5; coxa II with 4 small pinnate coxal spines; pedipalpal coxa with 2 apical setae. Genitalia as in Fig. 7. Legs: femur IV 2.29 times longer than broad; heterotarsate; arolium slightly shorter than claws; claws simple.

Dimensions (mm): Body length 1.19. Pedipalps: trochanter 0.15/0.09, femur 0.34/0.10, tibia 0.18/0.10, chela 0.50/0.12, hand length 0.16, movable finger length 0.33. Chelicera 0.30/0.14, movable finger length 0.15. Carapace 0.34/0.37. Anterior eye diameter 0.02. Leg I: basifemur 0.18/0.05, telofemur 0.10/0.05, tibia 0.12/0.04, tarsus 0.20/0.03. Leg IV: femur 0.32/0.14, tibia 0.24/0.07, basitarsus 0.10/0.05, telotarsus 0.20/0.03.

Tritonymph

Pedipalps: trochanter 1.63, femur 3.71, tibia 1.67, chela 4.00, hand 1.30 times longer than broad, movable finger 2.08 times longer than hand. Fixed chelal finger with 7



Figures 1-7. *Austrochthonius easti*, sp. nov., holotype ♂ unless otherwise stated: 1, carapace. 2, right pedipalp, dorsal. 3, left chela, lateral. 4, left chela, lateral, paratype tritonymph. 5, left chela, lateral, deutonymph paratype. 6, left chelicera, dorsal. 7, ♂ genitalia, ventral. Scale lines = 0.1 mm.

trichobothria, movable chelal finger with 3 trichobothria (Figure 4); *isb* and *sb* absent. Chelicera with 5 setae on hand; 1 on movable finger. Carapace 0.94 times longer than broad; 2 very small eyes present.

Dimensions (mm): Body length 1.11. Pedipalps: trochanter 0.13/0.08, femur 0.26/0.07, tibia 0.15/0.09, chela 0.40/0.10, hand length 0.13, movable finger length 0.27. Carapace 0.30/0.32. Chelicera 0.25/0.14, movable finger length 0.14.

Deutonymph

Pedipalps: trochanter 4.00, femur 3.20, tibia 1.67, chela 4.00, hand 1.29 times longer than broad, movable finger 2.00 times longer than hand. Fixed chelal finger with 6 trichobothria, movable chelal finger with 2 trichobothria (Figure 5); *esb*, *isb*, *sb* and *b* absent. Chelicera with 4 setae on hand; 1 on movable finger. Carapace 0.95 times longer than broad; 2 very small eyes present.

Dimensions (mm): Body length 0.62. Pedipalps: trochanter 0.08/0.05, femur 0.16/0.05, tibia 0.10/0.06, chela 0.28/0.07, hand length 0.09, movable finger length 0.18. Carapace 0.21/0.22. Chelicera 0.16/0.09, movable finger length 0.09.

Etymology

This species is named for Malcolm East, who collected one of the specimens.

Remarks

This small species is not highly modified for cave existence, but the loss of the posterior eyes and reduction of the anterior eyes suggests that it is a facultative troglobite. Only five other described species of the genus have reduced eyes: *A. cavicola* (Australia) and *A. iguazuensis* Vitali-di Castri (Brazil) are completely blind, and *A. paraguayensis* Vitali-di Castri (Paraguay), *A. persimilis* Beier (Chile) and *A. tullgreni* (Beier) (South Africa) possess only two eyes. *Austrochthonius easti* is larger than those species of *Austrochthonius* with two eyes, and possesses a different tergal chaetotaxy.

Genus *Tyrannochthonius* Chamberlin

Remarks

This genus is common in tropical and subtropical regions, and extends into temperate zones such as Tasmania. Two cave-dwelling species have been previously described from mainland Australia: *T. cavicola* (Beier) from New South Wales (Beier, 1967) and *T. rex* Harvey from northern Queensland (Harvey, 1989).

Tyrannochthonius butleri, sp. nov.

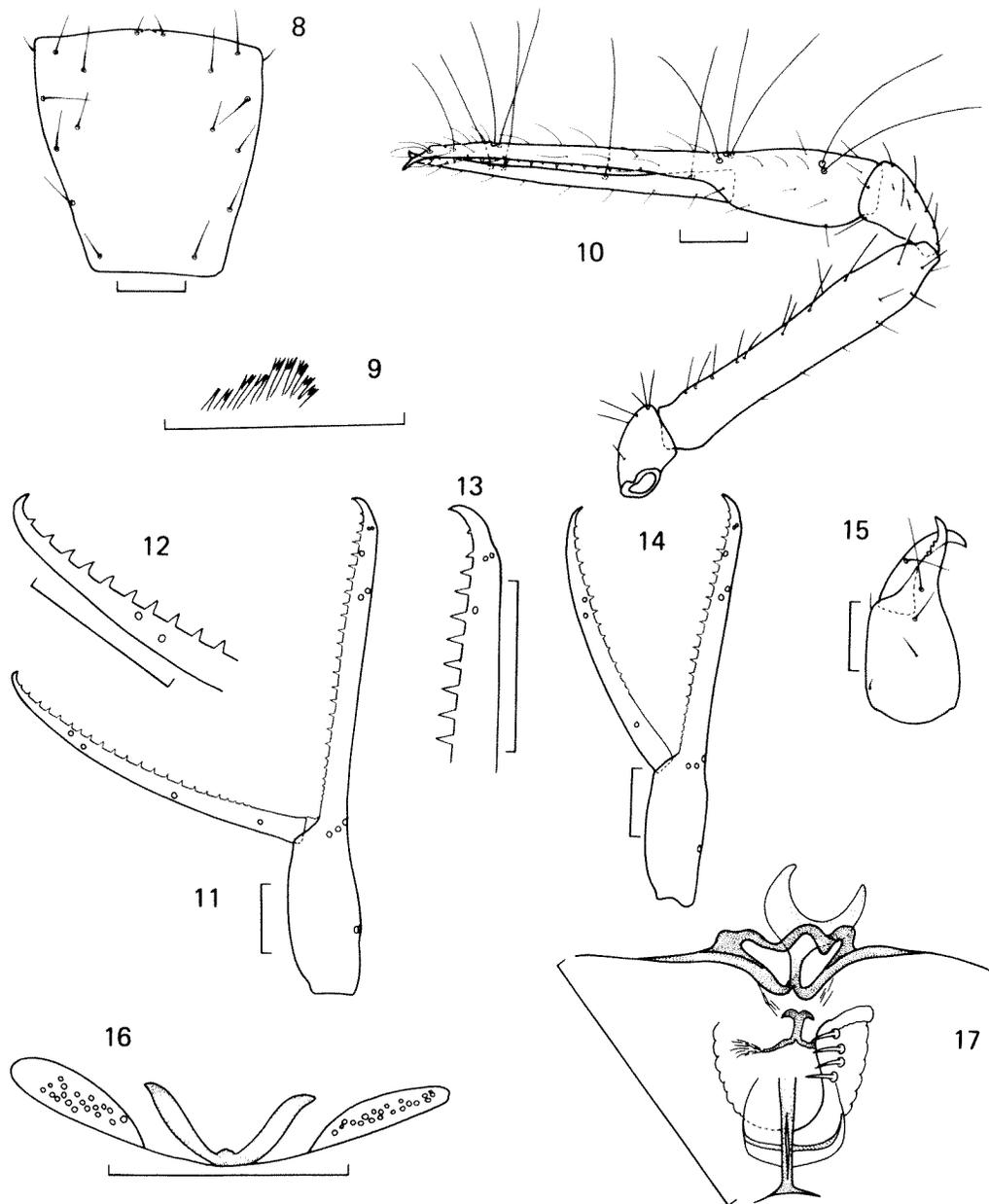
(Figures 8-17)

Holotype

♂, unnamed cave, C-167, Cape Range, Western Australia, 22°09'09"S, 113°59'39"E, under rock in dark zone, 20 June 1989, M.S. Harvey (WAM 91/275, slide).

Paratypes

Western Australia, Cape Range: 1 deutonymph, collected with holotype (WAM 91/276, slide); 1 tritonymph, unnamed cave, C-167 [22°09'09"S, 113°59'39"E], litter, September 1988, M.R. Gray (WAM 91/279); 1 ♀, unnamed cave, C-291, 22°16'01"S, 113°57'53"E, 16 August 1989, D. Brooks (WAM 91/277, slide); 1 ♀, Papillon Cave, C-15, 22°12'48"S, 113°58'32"E, 25 June 1989, M.S. Harvey (WAM 91/278); 1 ♂, 1 ♀ Papillon Cave, C-15, 22°12'48"S, 113°58'32"E, 29 March 1991, D. Brooks (WAM 91/1052-3).



Figures 8-17. *Tyrannochthonius butleri*, sp. nov., holotype ♂ unless otherwise stated: 8, carapace. 9, coxal spines. 10, right pedipalp, dorsal. 11, left chela, lateral. 12, tip of movable chelal finger. 13, tip of movable chelal finger. 14, left chela, lateral, paratype tritonymph. 15, left chelicera, dorsal. 16, ♀ genitalia, ventral. 17, ♂ genitalia, ventral. Scale lines = 0.1 mm.

Diagnosis

Eyes absent. Epistome very small. Chelal teeth homodontate and erect.

Description*Adults*

Colour very pale yellow. Setae long, straight and acicular. Pedipalp (Figure 10): trochanter 1.75 (♂), 1.80 (♀), femur 5.88 (♂), 5.70 (♀), tibia 1.67 (♂), 1.90 (♀), chela 6.90 (♂), 6.15 (♀), hand 2.10 (♂), 1.30 (♀) times longer than broad, movable finger 2.19 (♂), 1.96 (♀) times longer than hand. Fixed chelal finger and hand with 8 trichobothria, movable chelal finger with 4 trichobothria (Figure 11); *ib* and *isb* situated on dorsum of hand; *sb* midway between *st* and *b*. Hand with 1 small, medial acuminate spine-like seta at level of *esb*. Venom apparatus absent. Chelal teeth erect, homodontate (Figures 12, 13): fixed finger with 27 (♂), 26 (♀) teeth; movable finger with 24 (♂), 24 (♀) teeth. Chelicera (Figure 15): with 5 setae on hand; movable finger with 1 seta; galea absent; fixed finger with 9 (♂), 11 (♀) teeth; movable finger with 9 (♂), 10 (♀) teeth; flagellum composed of *ca.* 7 blades, all except anterior blade bipinnate, anterior blade finely denticulate. Carapace (Figure 8) 1.06 (♂), 1.21 (♀) times longer than broad; lateral margins constricted posteriorly; eyes absent; epistome very small; with 18 setae arranged 6: 4: 4: 2: 2; without furrows. Tergites and sternites undivided. Tergal chaetotaxy: ♂, 2: 2: 4: 4: 4: 4: 4: 4: 2: 0: 0; ♀ 2: 2: 4: 4: 4: 4: 4: 4: 2: 0: 0. Sternal chaetotaxy: ♂, 9: (3)20[4](3): (2)6(2): 7: 7: 7: 7: 7: 6: 4: 2; ♀ 8: (2)7(2): (2)6(2): 6: 7: 7: 6: 6: 6: 2. Coxal chaetotaxy: ♂, 3: 3+cs: 5: 5; ♀, 3: 3+cs: 5: 5; coxa II with 9-11 (♂), 8-9 (♀) terminally incised coxal spines set in an oblique row; pedipalpal coxa with 2 apical setae. Male genitalia as in Figure 17. Female genitalia (Figure 16) with incomplete lateral apodeme frame, lateral diverticulum sparsely cribrate. Legs: femur IV 2.93 (♂), 2.94 (♀) times longer than broad; heterotarsate; arolium slightly shorter than claws; claws simple.

Dimensions (mm): ♂ (♀): Body length 1.07 (1.22). Pedipalps: trochanter 0.14/0.08 (0.18/0.10), femur 0.47/0.08 (0.57/0.10), tibia 0.15/0.09 (0.19/0.10), chela 0.69/0.10 (0.80/0.13), hand length 0.21 (0.26), movable finger length 0.46 (0.51). Chelicera 0.30/0.13 (0.39/0.18), movable finger length 0.15 (0.21). Carapace 0.34/0.32 (0.41/0.34). Leg I: basifemur 0.25/0.04 (0.27/0.05), telofemur 0.16/0.04 (0.19/0.05), tibia 0.13/0.03 (0.16/0.04), tarsus 0.28/0.03 (0.32/0.03). Leg IV: entire femur 0.41/0.14 (0.50/0.17), tibia 0.28/0.06 (0.33/0.06), basitarsus 0.11/0.04 (0.14/0.05), telotarsus 0.32/0.03 (0.36/0.03).

Tritonymph

Pedipalps: trochanter 1.71, femur 5.71, tibia 1.71, chela 6.11, hand 2.11 times longer than broad, movable finger 1.95 times longer than hand. Fixed chelal finger with 7 trichobothria, movable chelal finger with three trichobothria (Figure 14); *isb* and *sb* absent. Chelicera with 4 setae on hand; 1 on movable finger; galea absent. Carapace 1.08 times longer than broad; eyes absent.

Dimensions (mm): Body length 0.70. Pedipalps: trochanter 0.12/0.07, femur 0.40/0.07, tibia 0.12/0.07, chela 0.55/0.09, hand length 0.19, movable finger length 0.37. Carapace 0.26/0.24. Chelicera 0.25/0.11, movable finger length 0.13.

Etymology

This species is named for W.H. Butler, who provided funds for field work in Cape Range.

Remarks

Tyrannochthonius butleri is quite similar to *T. brooksi* based on the homodontate chelal teeth and the small epistome, unusual character states amongst *Tyrannochthonius* species. The two species differ in the dentition of the movable chelal finger (erect in *T. butleri*, retrorse in *T. brooksi*), the absence (*T. butleri*) or presence (*T. brooksi*) of eyes, the tergal setation (2: 2: 4: 4: 4: 4: 4: 4: 4: 6: in *T. butleri*, 4: 4: 4: 4: 6: in *T. brooksi*), and the colour of the cuticle (very pale in *T. butleri*, darker in *T. brooksi*).

Tyrannochthonius brooksi, sp. nov.

(Figures 18-26)

Holotype

♂, Monajee Cave, C-21, 22°14'00"S, 113°58'18"E, Cape Range, Western Australia, 20 July 1989, D. Brooks (WAM 91/280, slide).

Paratypes

Western Australia, Cape Range: 1 ♂, collected with holotype (WAM 91/281, slide); 1 ♀, unnamed cave, C-107, 22°07'00"S, 113°59'54"E, 2 July 1989, D. Brooks (WAM 91/283, slide); 1 ♂, unnamed cave, C-107, 22°07'00"S, 113°59'54"E, 30 June 1989, B. Vine, E. Bowra (WAM 91/285); 1 ♀, Breakdown Maze, C-111, 22°55'08"S, 114°00'17"E, 28 August 1989, B. Vine (WAM 91/282, slide).

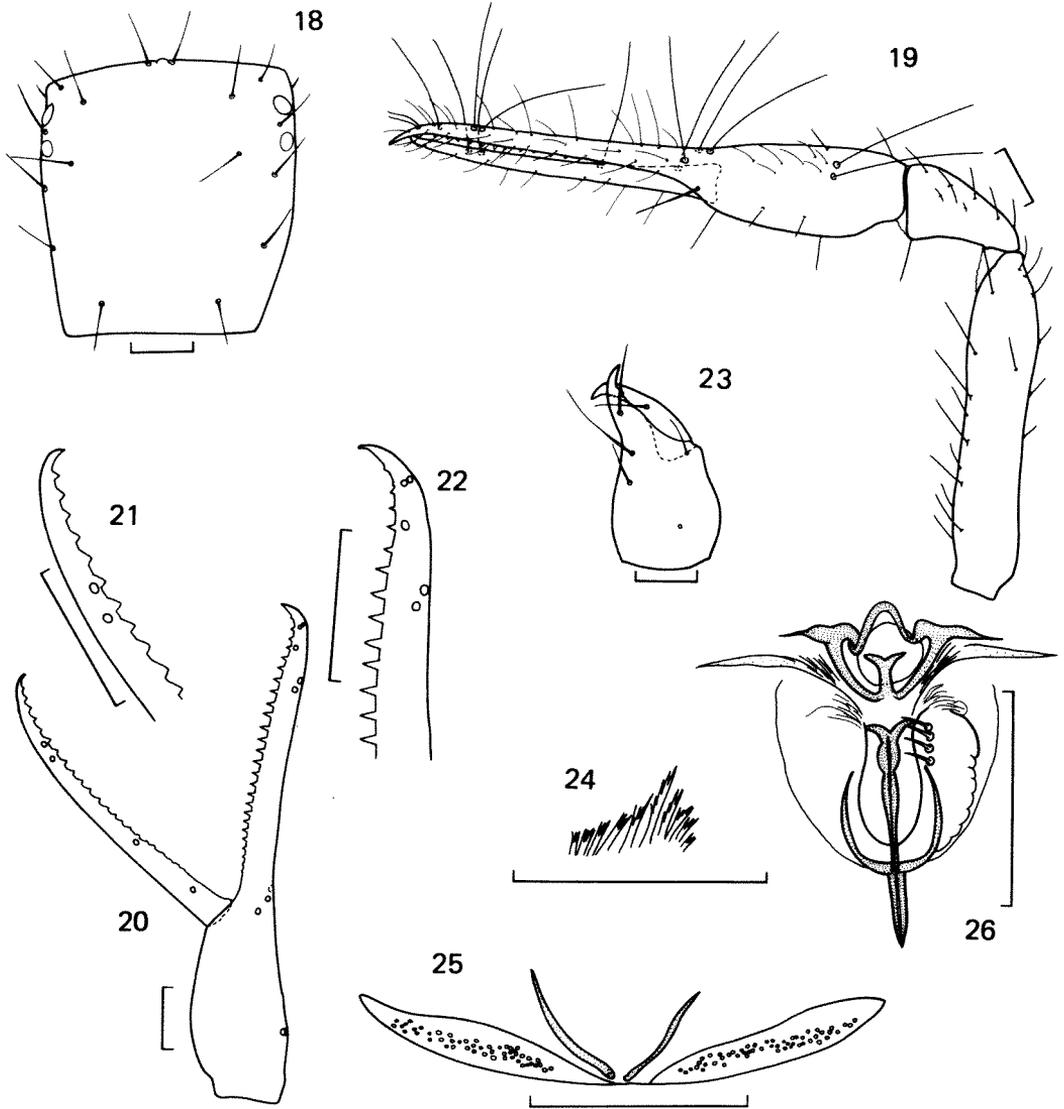
Diagnosis

Eyes present: anterior eyes corneate; posterior eyes reduced to eye-spots. Epistome very small. Chelal teeth homodontate, erect on fixed finger, retrorse on movable finger.

Description

Adults

Colour light yellow-brown. Setae long, straight and acicular. Pedipalp (Figure 19): trochanter 1.60-1.78 (♂), 1.67-1.77 (♀), femur 5.00-5.10 (♂), 4.46-5.00 (♀), tibia 1.82-1.83 (♂), 1.71-1.80 (♀), chela 5.64-5.69 (♂), 5.15-5.29 (♀), hand 1.92-2.00 (♂), 1.80-1.88 (♀) times longer than broad, movable finger 1.73-1.85 (♂), 1.78 (♀) times longer than hand. Fixed chelal finger and hand with eight trichobothria, movable chelal finger with four trichobothria (Figure 20); *ib* and *isb* situated on dorsum of hand; *sb* closer to *b* than to *st*. Hand with one large, medial acuminate spine-like seta at level of *esb*. Venom apparatus absent. Chelal teeth homodontate (Figures 21-22): fixed finger with 25-27 erect teeth; movable finger with 27-29 retrorse teeth. Chelicera (Figure 23): with five setae on hand; movable finger with one seta; galea represented by small mound; fixed finger with seven teeth; movable finger with 10 teeth; flagellum composed of *ca.* five blades, all except anterior blade bipinnate, anterior blade finely denticulate. Carapace (Figure 18) 0.95-1.00 (♂), 0.94-1.02 (♀) times longer than broad; lateral margins subparallel; with four eyes, anterior pair corneate, posterior pair represented by eye-spots; epistome very small; with 18 setae arranged 6: 4: 4: 2: 2; without furrows. Tergites and sternites undivided. Tergal chaetotaxy: ♂, 4: 4: 3-4: 4: 6: 6: 6: 6: 4-5: 0: 0; ♀, 4: 4: 4: 4: 6: 6: 6: 6: 4: 0: 0.



Figures 18-26. *Tyrannochthonius brooksi*, sp. nov., holotype ♂ unless otherwise stated: 18, carapace. 19, right pedipalp (without trochanter), dorsal. 20, left chela, lateral. 21, tip of movable chelal finger. 22, tip of fixed chelal finger. 23, left chelicera, dorsal. 24, coxal spines. 25, ♀ genitalia, ventral. 26, ♂ genitalia, ventral. Scale lines = 0.1 mm.

Sternal chaetotaxy: ♂, 10: (3)24-28[8](3): (3)9-10(3): 10: 9-10: 9: 7-9: 9: 6-7: 4: 2; ♀, 8: (3)10(3): (3)9(3): 9-10: 7-10: 7-8: 8-9: 8-9: 7-9: 4: 2. Coxal chaetotaxy: ♂, ♀, 3: 3+cs: 6: 5; coxa II with 9-10 (♂), 8-10 (♀) terminally incised coxal spines set in an oblique row; pedipalpal coxa with two apical setae. Male genitalia as in Figure 26. Female genitalia (Figure 25) with incomplete lateral apodeme frame, lateral diverticulum sparsely cribrate. Legs: femur IV 2.38-2.42 (), 2.52-2.86 () times longer than broad; heterotarsate; arolium slightly shorter than claws; claws simple.

Dimensions (mm): ♂ (♀): Body length 1.34-1.35 (1.58-1.60). Pedipalps: trochanter 0.16/0.09-0.10 (0.20-0.23/0.12-0.13), femur 0.51-0.55/0.10-0.11 (0.58-0.70/0.13-0.14), tibia 0.20-0.22/0.11-0.12 (0.24-0.27/0.14-0.15), chela 0.74-0.79/0.13-0.14 (0.90-1.03/0.17-0.20), hand length 0.26-0.27 (0.32-0.36), movable finger length 0.45-0.50 (0.57-0.64). Chelicera 0.34/0.17 (0.38-0.41/0.19-0.20), movable finger length 0.18 (0.21-0.23). Carapace 0.36-0.38/0.36-0.40 (0.42-0.45/0.41-0.48). Anterior eye diameter 0.04 (0.04), posterior eye diameter 0.03 (0.03-0.04). Leg I: basifemur 0.27-0.30/0.06 (0.32-0.38/0.07), telofemur 0.16-0.17/0.05-0.06 (0.190.20/0.06-0.07), tibia 0.15-0.16/0.04 (0.18-0.20/0.04-0.05), tarsus 0.270.30/0.03-0.04 (0.34-0.38/0.04). Leg IV: entire femur 0.46-0.50/0.19-0.21 (0.53-0.63/0.21-0.22), tibia 0.32-0.35/0.07-0.08 (0.37-0.44/0.08-0.09), basitarsus 0.16/0.05-0.06 (0.18-0.21/0.06-0.07), telotarsus 0.28-0.32/0.03 (0.34-0.42/0.04).

Etymology

This species is named for Darren Brooks, collector of some of the type specimens.

Remarks

The female from Breakdown Maze (C-111) is slightly larger than the female from C-107. However, significant differences in setation and chelal teeth morphology could not be found, and the C-111 population is considered conspecific with *T. brooksi*.

Family Syarinidae Chamberlin

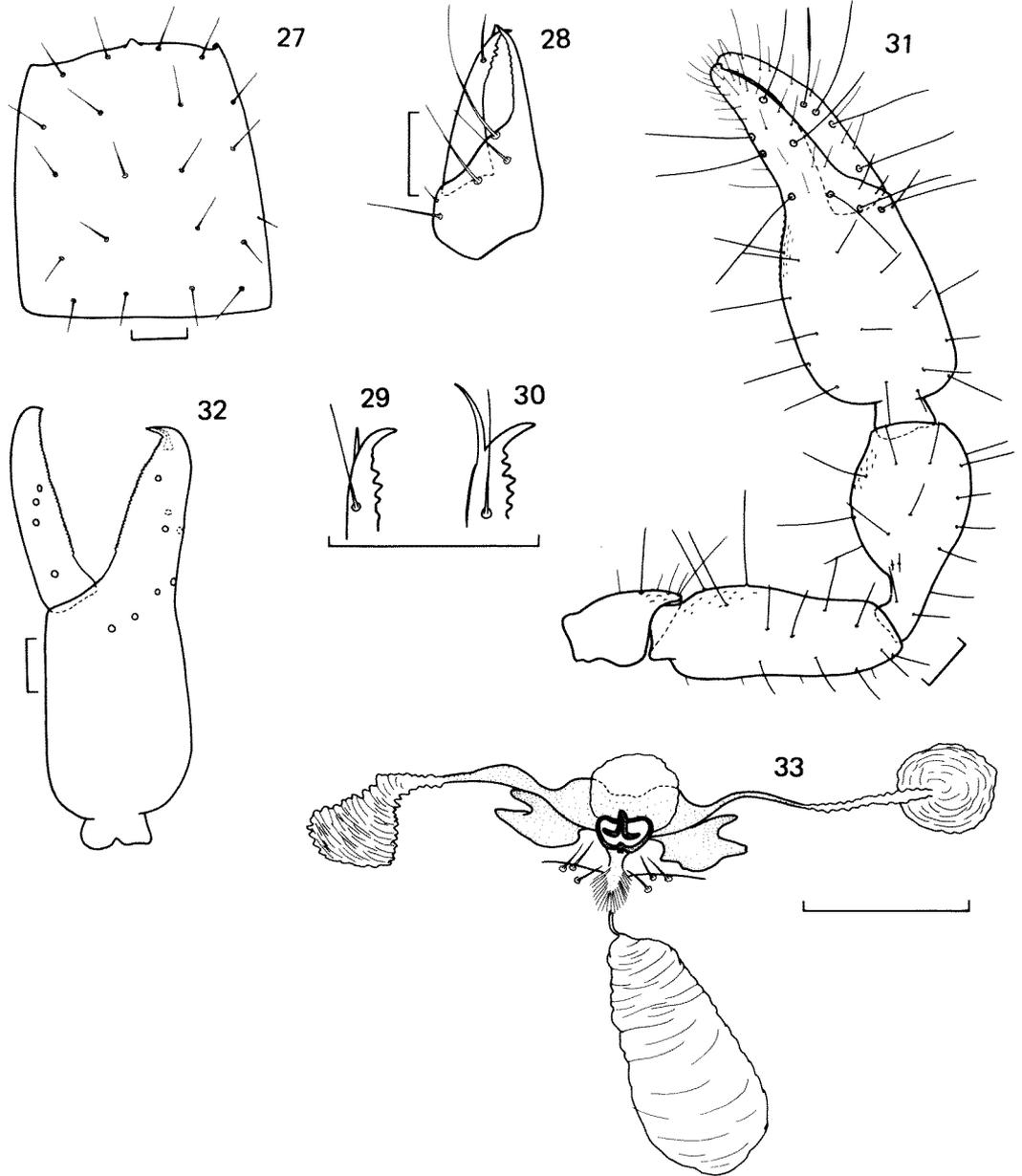
Remarks

Syarinids have not previously been described from Australia, although representatives of *Ideoblothrus* Balzan and *Ideobisium* Balzan are not uncommon in the rainforests of eastern Queensland. An undescribed genus of Syarinidae is present in Tasmanian temperate rainforests (Harvey, unpubl. data).

Genus *Ideoblothrus* Balzan

Remarks

The generic diagnosis provided by Muchmore (1982a) must be altered slightly with the discovery of the two species described below. The pedipalpal femur of *I. papillon* is greater than 3.0 times longer than broad, and the diagnosis (p. 208) should now read "... none of the segments more than 3.2 times as long as broad".



Figures 27-33. *Ideoblothrus woodi*, sp. nov., holotype ♂ unless otherwise stated: 27, carapace. 28, left chelicera, dorsal. 29, detail of left chelicera, movable finger. 30, detail of left chelicera, movable finger, paratype ♀. 31, right pedipalp, dorsal. 32, left chela, lateral. 33, ♂ genitalia, ventral. Scale lines = 0.1 mm.

***Ideoblothrus woodi*, sp. nov.**

(Figures 27-33, 40-41)

Holotype

♂, unnamed cave, C-167, Cape Range, Western Australia, 22°09'09"S, 113°59'39"E, under stone in dark zone, 20 June 1989, M.S. Harvey (WAM 91/286, slide).

Paratype

Western Australia, Cape Range: 1 ♀, collected with holotype (WAM 91/287, slide).

Diagnosis

Male galea short. Chelal hand 1.33 (♂), 1.40 (♀) times longer than broad; pedipalpal femur length 0.45 mm (♂), 0.49 mm (♀).

Description

Adults

Colour light red-brown. Setae long, straight and acicular. Pedipalp (Figure 31): trochanter 1.85 (♂), 1.86 (♀), femur 2.81 (♂), 2.88 (♀), tibia 1.95 (♂), 2.00 (♀), chela (with pedicel) 2.81 (♂), 2.82 (♀), chela (without pedicel) 2.67 (♂), 2.63 (♀), hand 1.33 (♂), 1.40 (♀) times longer than broad, movable finger 0.97 (♂), 0.88 (♀) times as long as hand. Flexor margins of chela, tibia, femur and trochanter sparsely granulate. Fixed chelal finger and hand with 8 trichobothria, movable chelal finger with four trichobothria (Figure 32); *eb*, *esb*, *isb* and *ib* in oblique row on distolateral margin of hand; *t* barely lanceolate. Venom apparatus present only in fixed chelal finger, venom duct very short, terminating in nodus ramosus near distal end of finger. Chelal teeth: fixed finger with 37 (♂), 39 (♀) teeth; movable finger with 46 (♂, ♀) teeth. Chelicera (Figure 28): with five setae on hand; movable finger with 1 seta; galea very slender, not extending past tip of finger in ♂ (Figure 29), extending slightly past tip of finger in ♀ (Figure 30); fixed finger with 7-8 teeth; movable finger with 10-11 teeth; flagellum of 5 blades, distal blade finely denticulate. Carapace (Figure 27) 1.16 (♂) times longer than broad; lateral margins subparallel; epistome present; without eyes; with 21 (♂) setae arranged 4: 4: 4: 5: 4; without furrows. Tergites and sternites undivided, except for sternite IV which is incompletely divided. Tergal chaetotaxy: ♂, 5: 6: 7: 8: 9: 9: 9: 8: 7: 6: 2; ♀, 5: 6: 6: 9: remainder crumpled. Sternal chaetotaxy: ♂, 9: (3)11[6](3): (2)8(2): 10: 10: 11: 11: 11: 11: 8: 2; ♀, 7: (3)8(3): (2)8(2): remainder crumpled; internal genital setae of ♂ arranged in two triads. Coxal chaetotaxy: ♂, ♀, 6: 4: 3: 5; pedipalpal coxa with 2 apical setae. Male genitalia as in Figure 33. Female genitalia not unusual. Legs: femur IV 3.00 (♂), 3.14 (♀) times longer than broad; dorsal surface of femur IV smooth; diplotarsate; subterminal tarsal seta denticulate; arolium slightly shorter than claws; claws simple.

Dimensions (mm): ♂ (♀): Body length 1.69 (?). Pedipalps: trochanter 0.24/0.13 (0.26/0.14), femur 0.45/0.16 (0.49/0.17), tibia 0.41/0.21 (0.46/0.23), chela (with pedicel) 0.76/0.21 (0.85/0.30), chela (without pedicel) 0.72 (0.79), hand length 0.36 (0.42), movable finger length 0.37 (0.37). Chelicera 0.27/0.13 (0.30/0.14), movable finger length 0.20 (0.24). Carapace 0.50/0.43 (?). Leg I: basifemur 0.19/0.09 (0.20/0.10), telofemur 0.16/0.08 (0.17/0.10), tibia 0.23/0.06 (0.25/0.06), basitarsus 0.08/0.04 (0.09/0.04),

telotarsus 0.14/0.03 (0.15/0.04). Leg IV: entire femur 0.42/0.14 (0.44/0.14), tibia 0.34/0.07 (0.34/0.07), basitarsus 0.10/0.06 (0.11/0.06), telotarsus 0.18/0.05 (0.19/0.05).

Etymology

This species is named for Ray Wood.

Remarks

This species is extremely similar to *I. papillon*, but they differ in the size and shape of the pedipalpal segments (Figures 40, 41), and in the form of the male galea (short in *I. woodi*, long in *I. papillon*).

Ideoblothrus papillon, sp. nov.

(Figures 34-41)

Holotype

♂, Papillon Cave, C-15, Cape Range, Western Australia, 22°12'48"S, 113°58'32"E, under stone in dark zone, 25 June 1989, M.S. Harvey (WAM 91/288, slide).

Paratype

Western Australia, Cape Range: 1 ♀, Papillon Cave, C-15, 22°12'48"S, 113°58'32"E, 16 July 1989, W.F. Humphreys (WAM 91/289, slide).

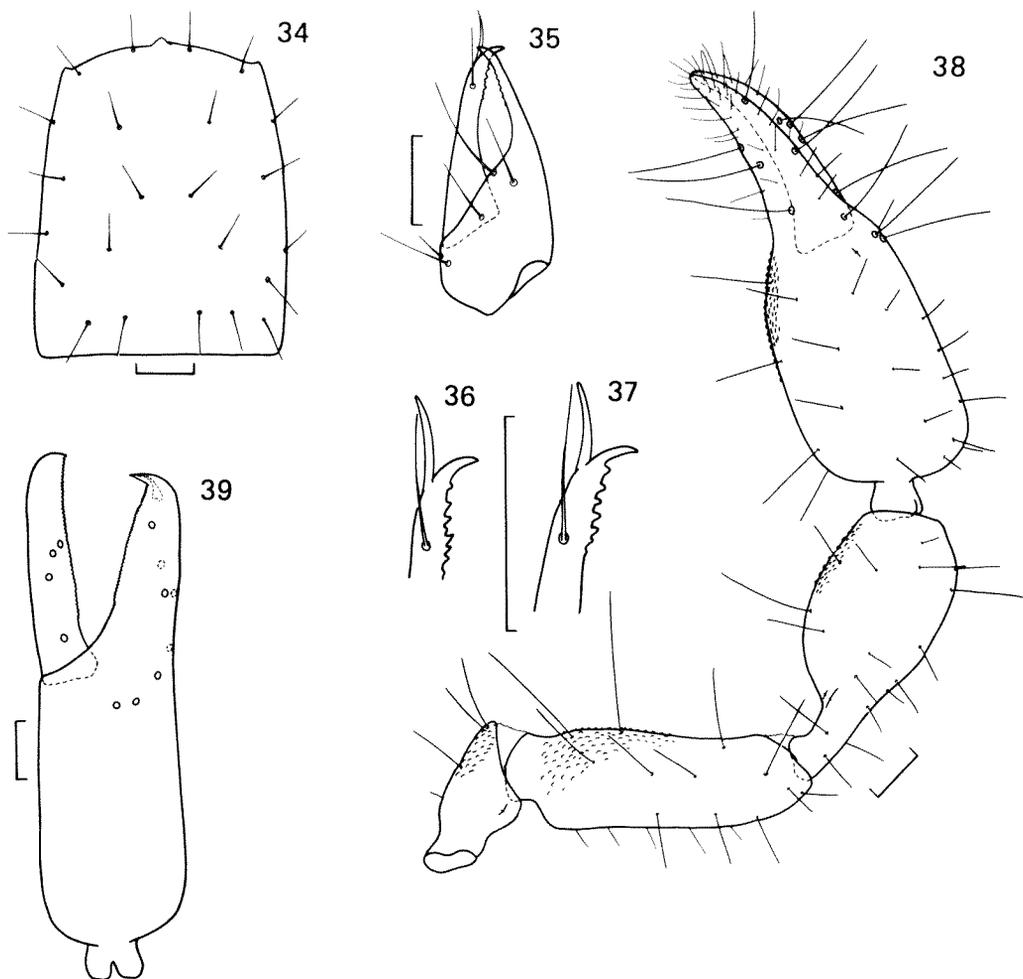
Diagnosis

Male galea long. Chelal hand 1.52 (♂), 1.58 (♀) times longer than broad; pedipalpal femur length 0.53 mm (♂), 0.55 mm (♀).

Description

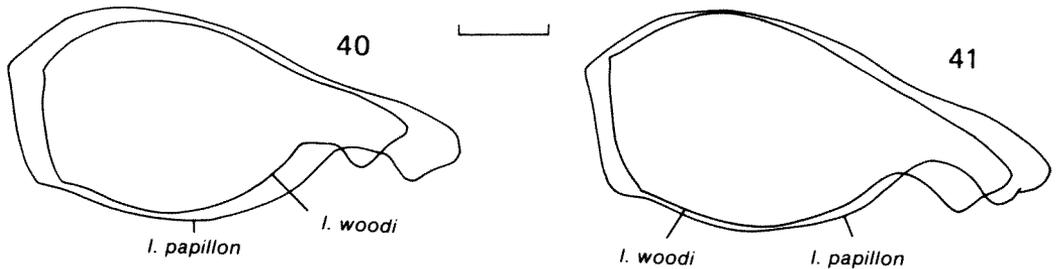
Adults

Colour light red-brown. Setae long, straight and acicular. Pedipalp (Figure 38): trochanter 2.23 (♂), 2.00 (♀), femur 3.12 (♂), 3.05 (♀), tibia 2.22 (♂), 2.17 (♀), chela (with pedicel) 3.00 (♂), 3.00 (♀), chela (without pedicel) 2.83 (♂), 2.74 (♀), hand 1.52 (♂), 1.58 (♀) times longer than broad, movable finger 0.86 (♂), 0.78 (♀) times as long as hand. Flexor margins of chela, tibia, femur and trochanter coarsely granulate. Fixed chelal finger and hand with eight trichobothria, movable chelal finger with four trichobothria (Figure 39); *eb*, *esb*, *isb* and *ib* in oblique row on disto-lateral margin of hand; *t* barely lanceolate. Venom apparatus present only in fixed chelal finger, venom duct very short, terminating in nodus ramosus near distal end of finger. Chelal teeth: fixed finger with 36 (♂), 35 (♀) teeth; movable finger with 46 (♂, ♀) teeth. Chelicera (Figure 35): with five setae on hand; movable finger with one seta; galea of and very slender, extending well beyond tip of finger (Figures 36, 37); fixed finger with nine teeth; movable finger with eight teeth; flagellum of five blades, distal blade finely denticulate. Carapace (Figure 34) 1.31 (♂), 1.23 (♀) times longer than broad; lateral margins subparallel; epistome present; without eyes; with 23 (♂, ♀) setae arranged 4: 4: 4: 2: 5 (♂, ♀); without furrows. Tergites and sternites undivided, except for sternite IV which is incompletely divided. Tergal chaetotaxy: ♂, 6: 6: 7: 7: 7: 8: 8: 9: 10: 9: 8: 2; ♀, 6: 6: 7: 7: 8: 9: 9: 9: 9: 8: 2: 2. Sternal



Figures 34-40. *Ideoblothrus papillon*, sp. nov., holotype ♂ unless otherwise stated: 34, carapace. 35, left chelicera, dorsal. 36, detail of left chelicera, movable finger. 37, detail of left chelicera, movable finger, paratype ♀. 38, right pedipalp, dorsal. 39, left chela, lateral. Scale lines = 0.1 mm.

chaetotaxy: ♂, 11: (3)11[6](3): (2)9(2): 10: 12: 11: 11: 11: 11: 11: 2; ♀, 8: (3)6(3): (3)6(3): 11: 11: 11: 11: 11: 6: 2; internal genital setae of ♂ arranged in two triads. Coxal chaetotaxy: ♂, 5: 5: 4: 7; ♀, 5: 6: 4: 6; pedipalpal coxa with two apical setae. Male genitalia as in *I. woodi*. Female genitalia not unusual. Legs: femur IV 2.93 (♂), 3.00 (♀) times longer than broad; dorsal surface of femur IV smooth; diplotarsate; subterminal tarsal seta denticulate; arolium slightly shorter than claws; claws simple.



Figures 40-41. *Ideoblothrus woodi* and *I. papillon*, right pedipalpal tibia, dorsal, superimposed for comparison: 40, males. 41, females. Scale lines = 0.1 mm.

Dimensions (mm): ♂ (♀): Body length 2.32 (2.67). Pedipalps: trochanter 0.29/0.13 (0.30/0.15), femur 0.53/0.17 (0.55/0.18), tibia 0.51/0.23 (0.52/0.24), chela (with pedicel) 0.87/0.29 (0.93/0.31), chela (without pedicel) 0.82 (0.85), hand length 0.44 (0.49), movable finger length 0.38 (0.38). Chelicera 0.30/0.13 (0.32/0.14), movable finger length 0.23 (0.24). Carapace 0.55/0.42 (0.58/0.47). Leg I: basifemur 0.19/0.10 (0.21/0.10), telofemur 0.16/0.09 (0.18/0.10), tibia 0.25/0.06 (0.26/0.06), basitarsus 0.09/0.04 (0.09/0.04), telotarsus 0.15/0.03 (0.16/0.03). Leg IV: entire femur 0.44/0.15 (0.45/0.15), tibia 0.37/0.08 (0.36/0.09), basitarsus 0.11/0.05 (0.11/0.06), telotarsus 0.18/0.05 (0.18/0.05).

Etymology

The specific epithet is a noun in apposition taken from the type locality, Papillon Cave.

Family Hyidae Chamberlin

Gen. et sp. nov.

Material examined

Western Australia, Cape Range: 1 ♀, Papillon Cave, C-15, under stone in dark zone, 22°13'S 113°59'E, 28 June 1989, M.S. Harvey, W.F. Humphreys (WAM 90/726); 1 tritonymph, Papillon Cave, C-15, 22°12'48"S, 113°58'32"E, 29 March 1991, D. Brooks (WAM 91/1054); 1 tritonymph, Trionomo Cave, C-103, 22°07'S 113°59'E, 15 August 1988, D. Brooks (WAM, 90/727).

Remarks

This unusual species will be described in a complete revision of the family (Harvey, in preparation).

Discussion

The affinities of the Cape Range pseudoscorpion fauna are diverse. The new hyid genus and *Ideoblothrus* spp. are clearly related to tropical elements. The hyid belongs to a subfamily that is elsewhere known only from rainforest patches in north-western Australia (Kimberley), India and Madagascar (Harvey, in preparation). *Ideoblothrus*

spp. are found in tropical rainforests in Africa, Asia, the Americas, and eastern Australia (Muchmore, 1982a; Harvey, unpublished data). Members of this genus were not found in the Kimberley rainforests. Like all other members of the genus (Muchmore, 1982a), the Cape Range *Ideoblothrus* spp. are completely blind.

The affinities of the chthoniids are more difficult to ascertain. *Austrochthonius* spp. are restricted to gondwanan elements [Australia, New Zealand, South America and South Africa (Harvey, 1991a)], and it appears likely that *A. easti* may be a southern relic. However, the presence of an undescribed species from the Kimberley indicates that the genus may have once had a much wider distribution. Detailed analyses of relationships within the genus are needed before the affinities of *A. easti* are known.

Tyrannochthonius species are found in many different regions of Australia and other tropical and temperate zones around the world, and a large number of new species await description. The relationships of the two Cape Range species, *T. butleri* and *T. brooksi*, will depend on a full revision of the vast Australian fauna. Neither species appears to be closely related to the other cavernicolous members of *Tyrannochthonius* known from Australia, *T. cavicola* and *T. rex*.

The surface fauna

Although little collecting for epigeal forms was conducted during the expeditions, four species of Olpiidae were found (*Xenolpium* sp., *Austrohorus* sp., Genus A and Genus B). One specimen of *Xenolpium* sp. was found under a rock in the fully lit entrance of a cave (C-64), and this species is not considered a cavernicole. A single *Tyrannochthonius* specimen was taken from under a rock amongst leaf litter on the surface. It is unclear whether this species is very closely related to *T. brooksi*.

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Bill Humphreys' interest in the ecology of Cape Range provided the impetus to visit the region, which was made possible by a grant from the W.H. Butler Fund. Field work was partly funded under the National Estate Programme. The caving enthusiasm of Darren Brooks, Ray Wood, Brian Vine and Malcolm East convinced me to enter small crevices and to descend on long ropes, and their encouragement was much appreciated.

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