

***Barbaraella* gen. nov. and *Cacoxylus* Beier (Pseudoscorpionida: Chernetidae), two remarkable sexually dimorphic pseudoscorpions from Australasia**

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Abstract – A new genus, *Barbaraella*, with the new species, *B. mainae*, is described from northwestern Australia, in which males possess greatly elongate pedipalps. The possible relationships of the genus are discussed and a close affinity with *Teratochernes* is suggested. *Cacoxylus echinatus* Beier is redescribed, and the unusual sexual dimorphism of the body is highlighted. The composition of the Lamprochernetinae is discussed and 7 genera are included: *Lamprochernes* Tömösváry, *Allochernes* Beier, *Wyochernes* Hoff, *Pselaphochernes* Beier, *Nudochernes* Beier, *Lasiochernes* Beier and *Megachernes* Beier.

INTRODUCTION

Sexual dimorphism in pseudoscorpions is generally restricted to the genital region, although differences may be observed in other areas of the body (Chamberlin 1931) such as the abdomen (e.g. Syarinidae, Cheliferidae, Withiidae, Atemnidae), chela (e.g. Chernetidae), coxae (e.g. Feaellidae, Pseudochiridiidae, Cheliferidae), cheliceral galea, and tarsal claws (some Cheliferidae). Of the chelal modifications, size differences skewed in favour of females (Zeh 1987) are the most apparent, although the males of some species, especially chernetids, possess enlarged pedipalps that increase male mating success through elevated combat ability (Zeh 1987). Males of some other chernetid species possess elaborate processes on the chelal hand (e.g. *Semeiochernes* Beier and *Mirochernes* Beier; see Beier 1932; Hoff 1949b; Zeh and Zeh 1992), or possess extremely elongate pedipalps (e.g. *Metagoniochernes* Vachon; see Vachon 1939; Sato 1991) which are presumably utilised during mating or whilst fighting with conspecific males.

Australasian dimorphic chernetids are scarce in museum collections and the opportunity is taken here to present data on a new genus from the Kimberley that is apparently related to *Teratochernes* Beier, and on *Cacoxylus echinatus* (Beier) from Papua New Guinea. Both display substantial dimorphism, especially in the relative sizes of the pedipalps which are deemed worthy of discussion.

This paper is dedicated with great pleasure to Barbara York Main. I well remember first meeting Barbara in the summer of 1979–1980 whilst on a collecting trip to Western Australia, where we exchanged material – my large male *Aname diversicolor* (Hogg) collected with great trepidation

in the Eucla Caravan Park for a series of pseudoscorpions collected over many years sampling the varied habitats in Western Australia.

MATERIALS AND METHODS

The specimens that form the basis of this study are lodged in the American Museum of Natural History, New York (AMNH), Natural History Museum, London (BMNH), the Smithsonian Institution, Washington D.C. (USNM) and the Western Australian Museum, Perth (WAM). Some specimens were fully dissected, cleared and mounted on microscope slides in Euparal. Measurements and terminology basically follow Chamberlin (1931); the terminology of the appendages and trichobothria follows Harvey (1992).

SYSTEMATICS

Family Chernetidae Menge

Subfamily classification

Few pseudoscorpion families have posed as many problems in internal classification as the Chernetidae. Beier (1932) divided the family into three subfamilies, Lamprochernetinae, Chernetinae and Goniochernetinae, and the Chernetinae were further divided into two tribes, Chernetini and Hesperochernetini. A fourth subfamily, Xenochernetinae, was proposed by Feio (1945) and is now considered a junior synonym of the chernetid tribe Myrmochernetini (Harvey 1994). The classification recently proposed by Legg (1987) and Legg and Jones (1988) divides the family into two subfamilies (omitting the Goniochernetinae,

presumably because no European species are known). No mention is made of genera other than those occurring in Western Europe and its effectiveness will be tested as additional genera are examined.

The Goniochernetinae are probably the most easily recognised of all chernetids, due to the angulate posterior carapacial margin (e.g. Heurtault 1983, fig. 36). However, the posterior margin is only slightly angulate in some species of *Conicochernes* Beier (Harvey, unpublished data), while the three described species of *Metagoniochernes* Vachon (*M. picardi* Vachon from Central African Republic, *M. milloti* Vachon from Madagascar and *M. tomiyamai* Sato from Japan) differ substantially in the shape of the posterior carapacial margin. In *M. picardi* it is angulate (Vachon 1939, fig. 1), yet in *M. milloti* and *M. tomiyamai* it is straight (Vachon 1951, figs 1–2; Sato 1991, figs 1–2). If these three species are indeed congeneric, the diagnostic feature of the subfamily would be brought into question and require that further research be undertaken into the monophyly and composition of the Goniochernetinae.

Muchmore (1972) highlighted the tenuous definitions presented for the subfamilies Lamprochernetinae and Chernetinae, and for the tribes Chernetini and Hesperochernetini. Traditional diagnoses for the Lamprochernetinae (Beier 1932, 1963) utilise character states that appear to grade into those possessed by genera placed in the Chernetinae (Muchmore 1972), resulting in an artificial classification unsupported by apomorphic character states.

In particular, the composition of the Lamprochernetinae has posed considerable dilemmas. Beier (1932) restricted the group to those chernetids that possess long, acuminate vestitural setae, long 'pseudotactile' setae on the pedipalpal femur, patella and chelal hand, and tarsus IV with a basally situated tactile seta.

An alternative character state that may be of great value in defining a monophyletic Lamprochernetinae is the T-shaped spermathecae (Muchmore 1972, 1975; Legg 1987). Such spermathecae are found in species of *Lamprochernes* Tömösváry (e.g. Vachon 1938; Muchmore 1976; Callaini 1986; Harvey 1987), *Allochernes* Beier (e.g. Callaini 1986; Harvey 1988), *Wyochernes* Hoff (Hoff 1949a; Muchmore 1990), *Pselaphochernes* Beier (e.g. Callaini 1986), *Lasiochernes* Beier (e.g. Callaini 1986), *Nudochernes* Beier (Vachon 1938; Mahnert 1982) and *Megachernes* Beier (Vachon 1938). The inclusion of *Megachernes* amongst this group is predicated upon the morphology of the spermathecal tubes, which although greatly elongated, are clearly T-shaped (Vachon 1938; Harvey, unpublished data of several Asian and Australian species).

Outgroup comparison with the other three

cheliferoid families Withiidae, Cheliferidae and Atemnidae (Harvey 1992) suggests that the T-shaped spermathecae of lamprochernetines are apomorphic. The spermathecae of withiids consist of two separate tubules leading to slightly enlarged sacs, while those of cheliferids and atemnids, when present, consist of one or two short sacs (e.g. Vachon 1938). These character states are more similar to the 'chernetine' condition, and none correspond to the T-shaped spermathecae of the lamprochernetines. Therefore, the Lamprochernetinae appears to represent a monophyletic group consisting of, at least, the seven genera listed above.

Verrucachernes Chamberlin and *Cacoxylus* Beier may also warrant inclusion in the Lamprochernetinae. The spermathecae of *V. oca* Chamberlin (Chamberlin 1947; Harvey 1988) and *C. echinatus* (Beier) (Fig. 16) consist of a single long median tube which terminates in a large bulb, and therefore appears similar to that of the Lamprochernetinae except that it lacks the terminal tubes. The only other known chernetid with such spermathecae is *Myrmochernes africanus* Tullgren (Judson 1985), but a strong sister-group relationship with *Xenochernes caxinguba* Feio (Harvey 1994), in which the spermathecae consist of 2 short separate tubules, suggests that *Myrmochernes* is not the sister-group to either *Verrucachernes* or *Cacoxylus*.

Harvey (1990) erroneously transferred *Americhernes* Muchmore and *Cordylochernes* Beier to the Lamprochernetinae. As noted by Muchmore (1976), the spermathecae of these genera (along with other American genera such as *Lustrochernes* Beier, *Gomphochernes* Beier, *Mesochernes* Beier, *Odontochernes* Beier and *Incachernes* Beier) are quite different from those of the lamprochernetines and Harvey's transfer is not accepted.

Therefore, with a monophyletic Goniochernetinae (carapacial margin posteriorly angulate, at least in most species, see above) and Lamprochernetinae (spermathecae T-shaped), a dilemma arises as to where the remaining 90 or so genera should be placed. The diagnoses of Beier (1932), Legg (1987) and Legg and Jones (1988) utilise character states that are either plesiomorphic (e.g. spermathecae not T-shaped) or that exhibit considerable heterogeneity (e.g. morphology of vestitural setae and position of tarsus IV tactile seta), thus reducing their effectiveness. Unfortunately, our current lack of knowledge concerning the spermathecal morphology of most 'chernetines' is hampering our understanding of the group. Those which have been examined and illustrated by authors do not possess T-shaped spermathecae, but not all adhere to the diagnosis of the Chernetinae provided by Legg (1987) and Legg and Jones (1988). Most possess two separate

tubules often leading to expanded sacs (e.g. Vachon 1938; Muchmore 1974), although other arrangements are present which further compound an already nebulous situation.

The only option at present for the remainder of the genera is to combine them in a separate subfamily, Chernetinae (Legg 1987), based solely on plesiomorphic character states. A thorough review of the spermathecal morphology of most chernetine genera is urgently needed to assist in the establishment of a rigorous phylogenetic framework within this large (Harvey 1991) and complex family.

Barbaraella gen. nov.

Type species

Barbaraella mainae sp. nov.

Diagnosis

Legs III and IV with short 'tactile' seta distributed as follows: patella with 1 subdistally; tibia with 1 medially; and tarsus with 1 subbasally. Flagellum with 3 blades. Vestitural setae mostly long and slender, but nearly all with at least slight distal bifurcation and subsidiary subdistal and medial denticles. Carapace with straight posterior margin and 1 median furrow; posterior furrow absent. Male pedipalpal segments greatly elongated. Spermathecae consisting of 2 thickened tubes.

Etymology

The generic and specific epithets are dedicated to Barbara York Main, whose untiring efforts in the field of Arachnology have inspired an entire generation of enthusiasts.

Barbaraella mainae sp. nov.

Figures 1–11

Material Examined

Holotype

♂, Kalumburu Mission, Western Australia, Australia, 14°18'S, 126°39'E, under banana fronds near trunk, 5 May 1989, D.K. Yeates (WAM 94/70).

Paratypes

Australia: Western Australia: 6♂, 2♀, same data as holotype (WAM 94/71–78).

Diagnosis

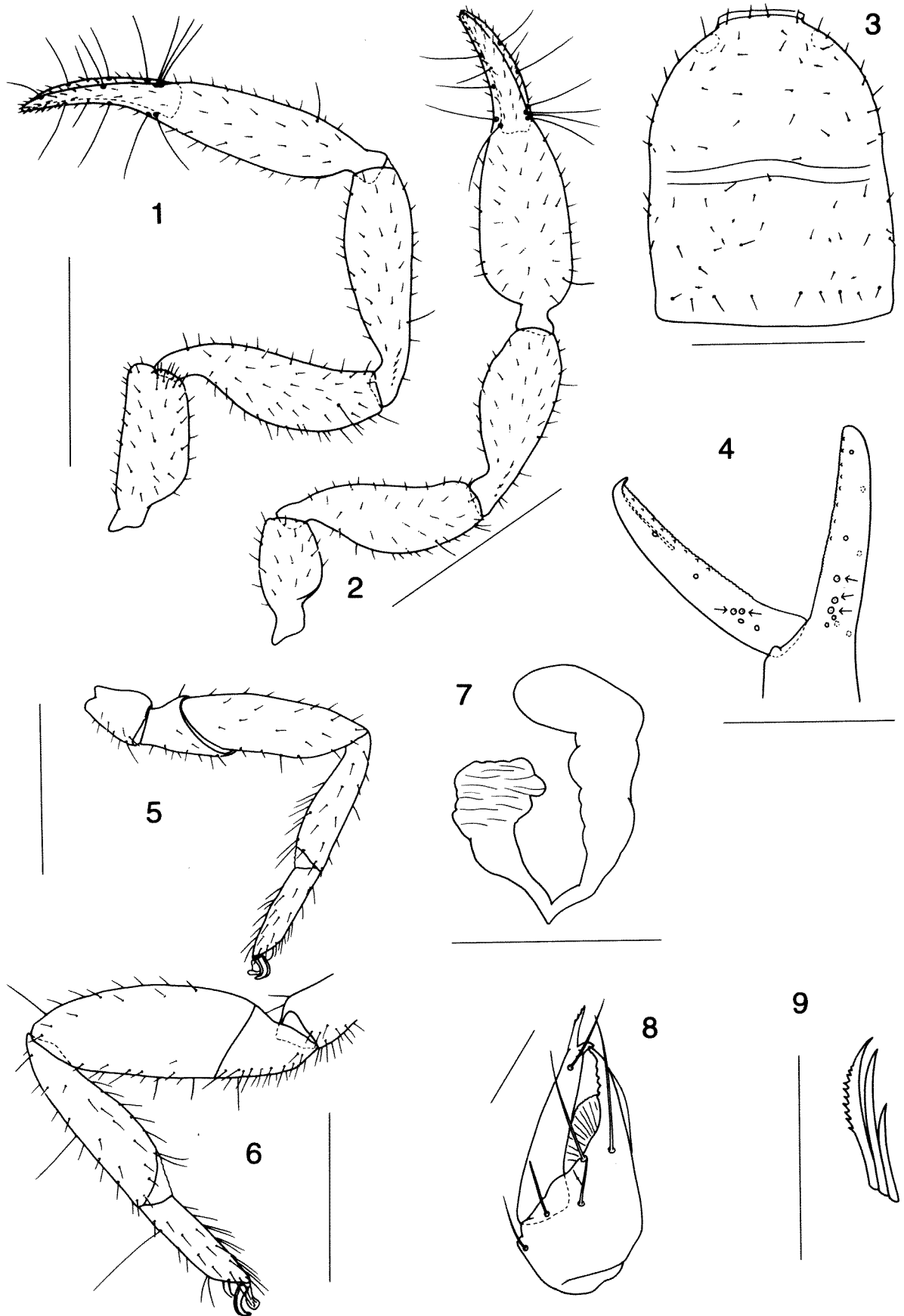
As for genus.

Description

Adult

Pedipalps pale red-brown, remainder of body

pale yellow. Vestitural setae mostly long and slender, but nearly all with at least slight distal bifurcation and subsidiary subdistal and medial denticles; most sternal setae truly acuminate. Pleural membrane longitudinally striate for entire length. Pedipalps of (Fig. 1) greatly enlarged with robust trochanter, and elongate femur, patella and chela, of (Fig. 2) not as large or slender; trochanter 2.48–2.57 (♂), 1.97–1.98 (♀), femur 3.19–3.33 (♂), 2.77–3.00 (♀), patella 3.17–3.56 (♂), 2.57–2.62 (♀), chela (with pedicel) 5.05–5.41 (♂), 3.11–3.64 (♀), chela (without pedicel) 4.70–5.00 (♂), 2.88–3.38 (♀), hand 2.44–2.69 (♂), 1.63–1.90 (♀) times longer than broad, movable finger 0.84–0.92 (♂), 0.80–0.82 (♀) times as long as hand. Pedipalps very finely granulate on all surfaces except chelal fingers. Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 4); *eb* and *esb* very close, separated by less than 1 areolar diameter; *et* very close to tip of finger; *isb* midway between *ist* and *it*; *it* slightly closer to *ist* than to tip of finger; *est* slightly distal to level of *isb*; *b* and *sb* subbasal, separated by 2 areolar diameters; *st* midway between *sb* and *t*. Venom apparatus present in movable chelal finger, terminating in nodus ramosus situated midway between *st* and *t*. Fixed finger with 46–53 (♂), 45–47 (♀) marginal teeth; movable finger with 50–56 (♂), 49–50 (♀) marginal teeth; accessory teeth present, fixed finger with 6–9 (♂), 8 (♀) external teeth and 5–6 (♂), 4–5 (♀) internal teeth, movable finger with 6–8 (♂), 7 (♀) external and 4–5 (♂), 4 (♀) internal teeth. Chelal fingers with several sense spots: 3–4 distal to *esb*; 5–7 clustered proximal to *ib* and *ist*; 1 slightly proximal to *isb*; 2 slightly distal to *sb*. Pedipalpal femur and chelal hand with long acuminate setae; fixed and movable fingers each with single long acuminate setae situated slightly anterior to *est* and slightly posterior to *t*, respectively. Manducatory process barely granulate laterally, with 5–6 acuminate setae, with 2 situated distally, 1 of these longer than all others. Chelicera (Fig. 8) with 5 setae on hand and 1 on movable finger, *ls* and *is* long, slender and acuminate; *sbs* and *bs* short and terminally denticulate; *es* and *gs* short and acuminate; serrula exterior with 19 (♂, ♀) lamellae; flagellum of 3 blades (Fig. 9), distal blade with serrate anterior margin, other 2 blades completely smooth; galea of ♂ slightly shorter than of ♀ (0.052, 0.068, respectively) with 5–6 rami. Carapace (Fig. 3) with 4 (♂, ♀) setae on anterior margin, and 8–9 (♂), 9–10 (♀) setae on posterior margin; 1.17–1.25 (♂), 1.21–1.28 (♀) times longer than broad; 1 pair of distinct eye spots; single transverse furrow situated near middle of carapace; posterior 15% of carapace paler than anterior portion. Tergites II–X and sternites IV–X divided. Tergal chaetotaxy (entire segments): ♂, 12–14: 13: 12–14: 15–18: 17–19: 18: 19: 17–19: 19–20: 18–20: 12–14: 2; ♀, 12–13: 15–17: 13–14: 15–20:



Figures 1-9 *Barbaraella mainae* sp. nov., holotype ♂ unless otherwise stated: 1, right pedipalp, dorsal. 2, right pedipalp, dorsal, paratype ♀ (WAM 94/77). 3, carapace. 4, left chela, lateral (arrows denote sense spots). 5, left leg I. 6, left leg IV (trochanter broken). 7, spermathecae (1 somewhat crumpled), paratype ♀ (WAM 94/77). 8, left chelicera, paratype ♂ (WAM 94/72). 9, right flagellum, paratype ♂ (WAM 94/71). Scale lines, 1 mm (Figs 1, 2), 0.5 mm (Figs 3-6), 0.1 mm (Figs 7-9).

18–20: 19–21: 19–23: 21–23: 20–22: 21–22: 14–15: 2; setae mostly situated on posterior margin of tergite, except for occasional mediolateral and externolateral setae. Sternal chaetotaxy (entire segments): ♂, 22–27: (3)7–10[4–6](3): (1)6–9(1): 19–24: 19–23: 22: 20–24: 20–22: 18–20: 12–13: 2; ♀, 22–28: (3)9–10(3): (1)7–9(1): 18–25: 19–26: 22–26: 23–26: 21–24: 23: 10–18: 2. Tergites X–XI and sternites X–XI each with 2 pairs of longer setae set in slightly larger areoles (these are included in chaetotaxy counts). Genital opercula of male (Fig. 10): with several pairs of long, curved setae, some reaching genital opening; 1 pair of slit sensilla on each of anterior and posterior operculum, with smaller sensillae present on posterior operculum. Genital opercula of female (Fig. 11): with tightly clustered patch of small setae; anterior operculum with 1 pair of small slit sensilla. Male genitalia not unusual. Female genitalia with spermathecae consisting of 2 thickened tubes (Fig. 7). Legs: legs I (Fig. 5) and II with oblique junction between femur and patella; leg IV (Fig. 6): femur + patella 3.00–3.11 (♂), 3.09–3.29 (♀) times longer than broad; tactile seta of legs III and IV distributed as follows: patella with 1 subdistally, tibia with 1 medially, and tarsus with 1 subbasally (TS = 0.23); all tarsi with subbasal slit sensillum; claws simple; arolium slightly shorter than claws.

Dimensions (mm), ♂ n = 3 (♀ n = 2): Body length

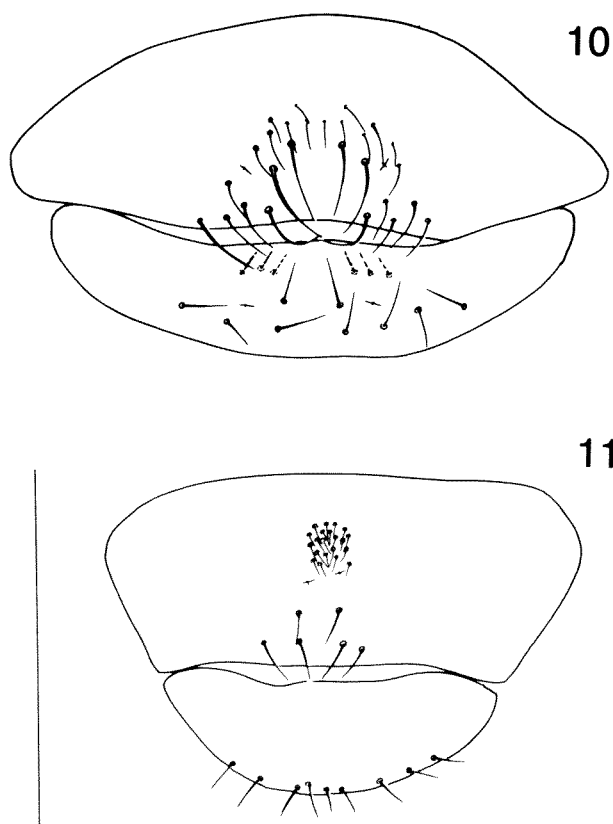
2.67–3.26 (3.79–3.82). Pedipalps: trochanter 0.745–0.83/0.29–0.335 (0.535–0.59/0.27–0.30), femur 0.94–1.08/0.295–0.32 (0.845–0.96/0.305–0.32), patella 1.00–1.12/0.315–0.32 (0.835–0.93/0.325–0.355), chela (with pedicel) 1.59–1.73/0.315–0.325 (1.445–1.565/0.43–0.465), chela (without pedicel) 1.48–1.60 (1.34–1.455), movable finger length 0.71–0.75 (0.61–0.67), hand length 0.77–0.86 (0.76–0.815). Chelicera 0.285–0.29/0.14–0.15 (0.28–0.285/0.145–0.155), movable finger length 0.20–0.225 (0.225–0.23). Carapace 0.85–0.90/0.69–0.755 (0.90–0.96/0.705–0.795). Leg I: femur 0.265–0.28/0.16–0.17 (0.255–0.275/0.155–0.165), patella 0.50–0.59/0.16–0.165 (0.48–0.51/0.16–0.17), tibia 0.40–0.43/0.10–0.11 (0.39–0.425/0.10–0.11), tarsus 0.29–0.315/0.07–0.08 (0.295–0.325/0.07–0.075). Leg IV: femur + patella 0.765–0.84/0.255–0.27 (0.79–0.855/0.255–0.26), tibia 0.50–0.60/0.15–0.16 (0.145–0.15), tarsus 0.35–0.38/0.095–0.10 (0.09–0.095).

Remarks

The systematic position of *Barbaraella mainae* is perplexing. Many of the character states displayed by this species are shared by those genera included in the Lamprochernetinae by Beier (1932), including the long, acuminate vestitural setae, the long 'pseudotactile' setae on the pedipalpal femur, patella and chelal hand, and the basal position of the tactile seta of tarsus IV. However, it is clear that *Barbaraella* is not amongst the close relatives of *Lamprochernes* Tömösváry and should not be included in the Lamprochernetinae (see above) due to the spermathecal morphology (Fig. 7), and can be excluded from the Goniochernetinae as the posterior carapacial margin is straight (Fig. 3).

The elongate male pedipalps of *B. mainae* are somewhat reminiscent of those of the three species of *Metagoniochernes* Vachon (Vachon 1939, 1951; Sato 1991), currently placed in the Goniochernetinae. However, the two genera differ in a number of respects, most notably in the number of flagellar blades (2 in *Metagoniochernes* and 3 in *Barbaraella*), and the presence of tactile setae on the posterior patellae, tibiae and tarsi (absent in *Metagoniochernes*).

The only genus which qualifies as a close relative of *Barbaraella* is *Teratochernes* Beier from the Caroline Islands (Beier 1957). Females of the sole species, *T. mirus* Beier, are currently unknown. Several differences are apparent between the two genera (Table 1) which are here considered to warrant generic separation. In particular, the lack of a posterior carapacial furrow and the position of trichobothrium *isb* are considered particularly important. I have confirmed these differences by examination of the paratype male of *T. mirus* (lodged in the Smithsonian Institution, Washington D.C.), but qualified the TS ratio given by Beier (1957) to 0.31 (rather than 0.38).



Figures 10–11 *Barbaraella mainae* sp. nov., genital opercula: 10, holotype ♂. 11, paratype ♀ (WAM 94/77). Scale lines, 0.3 mm.

Table 1 Character states which distinguish *Teratochernes* and *Barbaraella*.

	<i>Teratochernes</i>	<i>Barbaraella</i>
Carapacial furrows	2, posterior deepest	1, posterior absent
Flagellum	1 and 2 serrate	1 serrate
♂ pedipalpal trochanter	small	very large
Trichobothrium <i>isb</i>	very close to <i>ist</i>	midway between <i>it</i> and <i>ist</i>
Tarsal tactile seta	TS = 0.31	TS = 0.23

The danger in attributing species with extreme sexual dimorphism to separate genera is well exemplified by Zeh and Zeh (1992), where adult males of *Semeiochernes armiger* (Balzan) raised from a single brood possess radically different chelal morphology. A taxonomist without knowledge of the breeding history of these specimens may have regarded them as separate species (Zeh and Zeh 1992). Additional collecting and research must be undertaken on the extensive Australasian chernetid fauna to determine the relationships of *Barbaraella* and *Teratochernes*.

Distribution

This species is only known from the Kimberley district of northwestern Australia, where it has been found under the base of banana fronds.

Genus *Cacoxylus* Beier

Cacoxylus Beier, 1965: 787–788.

Type species

Hebridochernes (?) *echinatus* Beier, 1964, by original designation.

Diagnosis

Male with elongate abdomen and patches of setae on sternites V–VI. Chelal fingers without accessory teeth.

Remarks

This monotypic genus appears to be related to *Hebridochernes*, and may simply represent an extremely apomorphic member of that genus. The morphology of the spermathecae (Fig. 16) suggest a possible relationship with *Verrucachernes* Chamberlin (Chamberlin 1947; Harvey 1988), and more distantly, with the Lamprochernetinae (see above). Detailed examination of the spermathecae of many other Australasian genera are needed before a full assessment of the relationships of *Cacoxylus* can be achieved.

The greatly elongate abdomen and enlarged pedipalps of male *C. echinatus* invite speculation concerning the factors that govern the development of sexual dimorphism in this species. However, this must await detailed field observations. The male abdomen is somewhat reminiscent of a beetle lar-

va, and bears conspicuous muscles between the tergites and sternites, with marked corresponding apodemes. Thus, the abdomen appears to be capable of considerable flexure. The patches of setae on male sternites V and VI, although reminiscent of those in male withiids (e.g. Heurtault 1971), differ in morphology.

Cacoxylus echinatus (Beier)

Figures 12–26

Hebridochernes (?) *echinatus* Beier, 1964: 598, fig. 4.

Cacoxylus echinatus (Beier): Harvey, 1991: 548 (full synonymy).

Material Examined

Holotype

Deutonymph, Mt Austen, Guadalcanal, Solomon Islands, 13 January 1963, P. Greenslade (BMNH, not examined).

Other material examined

Papua New Guinea: 1♂, 1♀, 1 deutonymph, Agamoia, Fergusson Island, 200 m, 18–24 June 1956, L. Brass (AMNH).

Diagnosis

As for genus.

Description

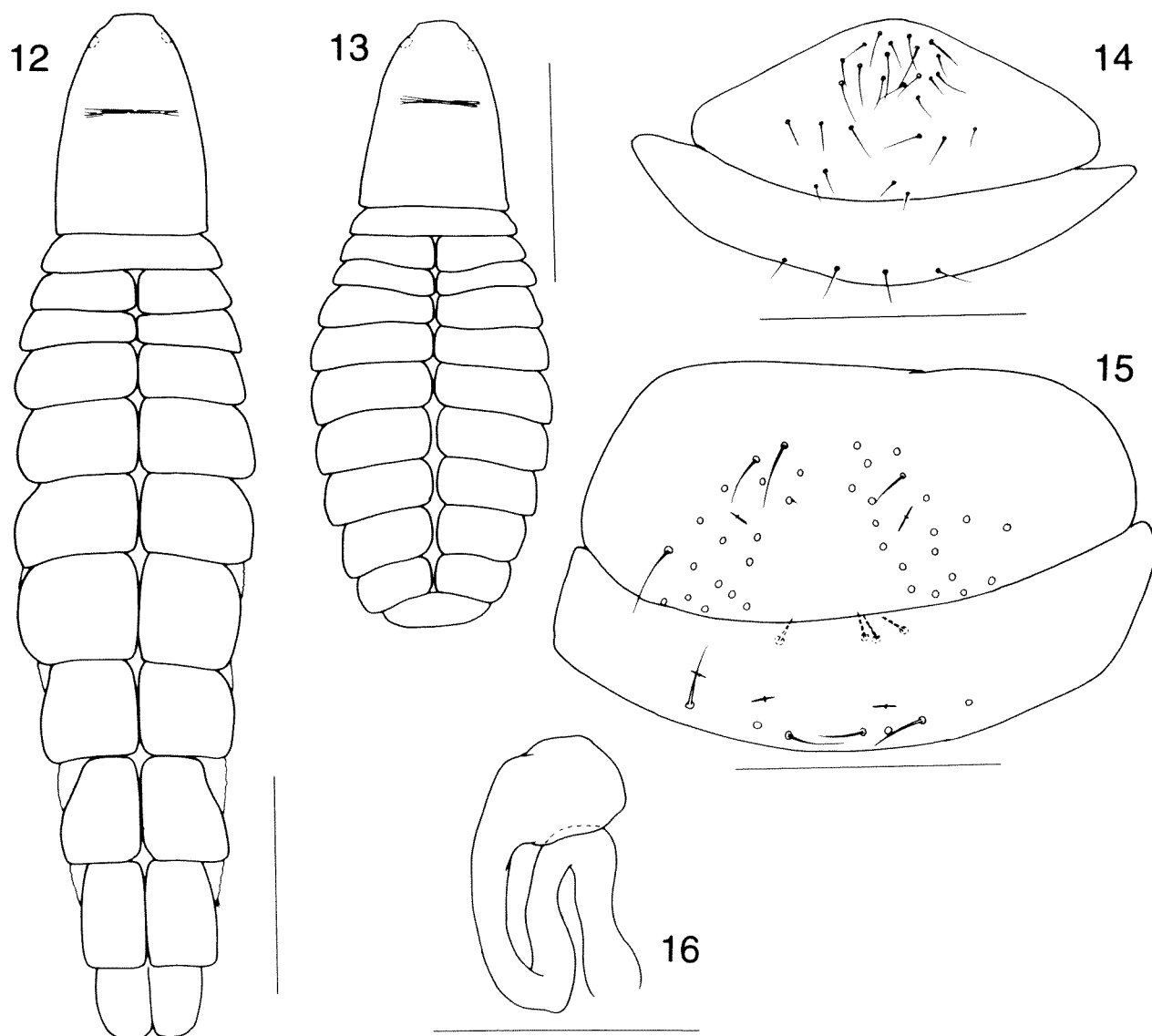
Adult

Pedipalps pale red-brown, remainder of body pale yellow. Pleural membrane wrinkled. Pedipalps (Figs 18–19): trochanter 2.19 (♂), 1.81 (♀), femur 6.57 (♂), 4.85 (♀), patella 5.68 (♂), 4.05 (♀), chela (with pedicel) 5.39 (♂), 4.23 (♀), chela (without pedicel) 5.13 (♂), 4.00 (♀), hand 3.03 (♂), 2.13 (♀) times longer than broad, movable finger 0.73 (♂), 0.92 (♀) times as long as hand. Pedipalps generally fairly smooth, setae of femur and patella set in tubercles. Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 20); *it* much closer to tip of finger than to *ist*, *est* slightly distal to level of *ist*, *st* closer to *t* than to *sb*. Venom apparatus present in movable finger terminating in nodus ramosus near *st*. Fixed finger with 49 (♂), 46 (♀) marginal teeth;

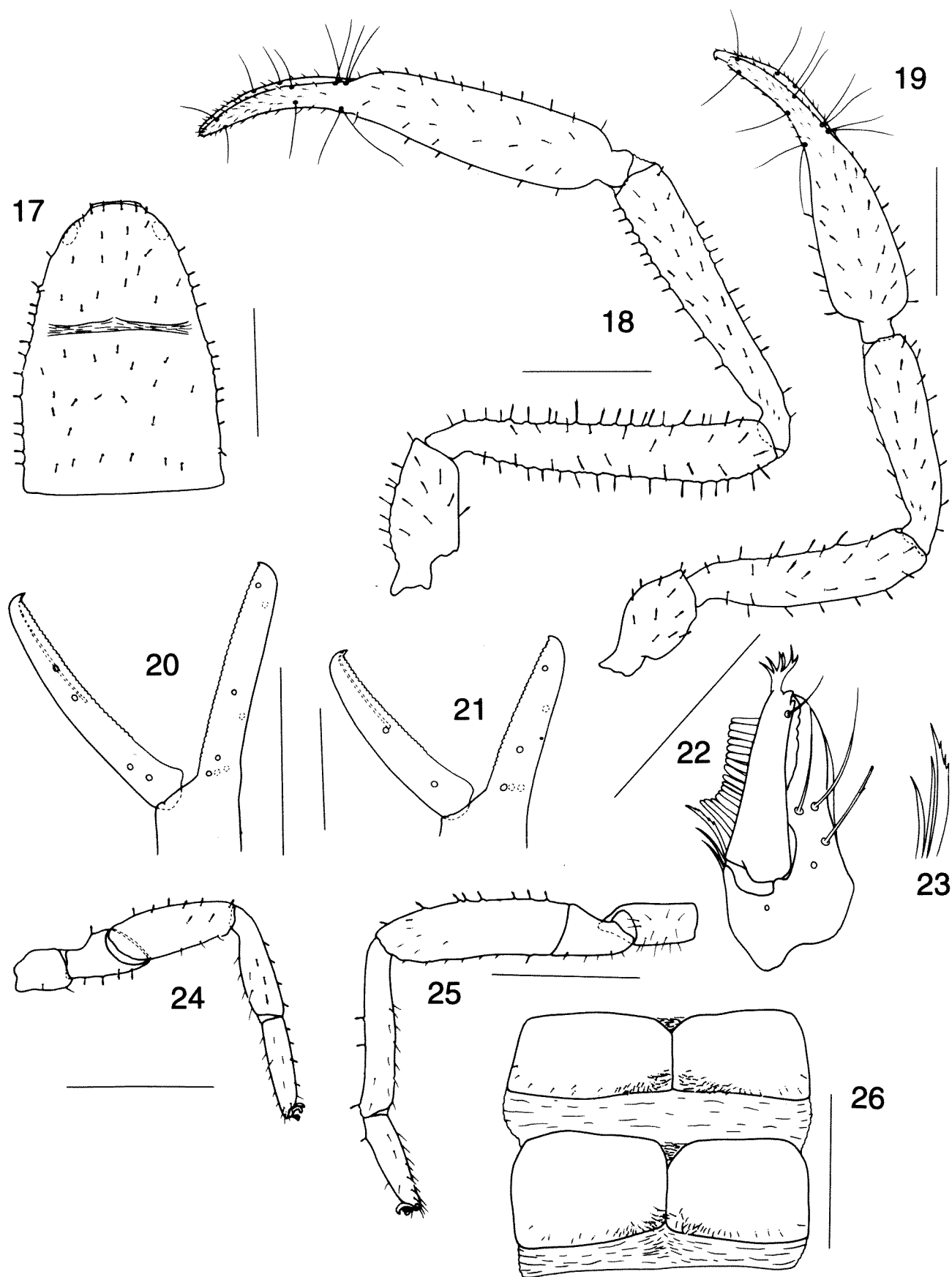
movable finger with 55 (δ), 50 (φ) marginal teeth; accessory teeth absent. Chelicera (Fig. 22) with 5 setae on hand, *sbs* and *bs* terminally denticulate; serrula exterior with 15 (δ), 16 (φ), lamellae; flagellum of 3 blades (Fig. 23); galea of male simple, of female with numerous rami. Carapace (Fig. 17) with 4 (δ), 5 (φ) setae on anterior margin, and 6 (δ), 8 (φ) setae on posterior margin; 1.38 (δ), 1.21 (φ) times longer than broad; 1 pair of eye spots; 1 transverse furrow situated near middle of carapace. Tergites II–XI (δ), II–X (φ) and sternites IV–XI (δ , φ) divided. Tergal chaetotaxy: δ , 10: 10: 12: 14: 14: 13: 15: 15: 14: 12: 9: 2; φ , 9: 10: 10: 13: 13: 15: 14: 13: 12: 11: 8: 2; setae situated on posterior margin of tergite, except for single lateral seta. Sternal chaetotaxy: δ , 37: (1)7[3](1): (2)14(2): 76: 75: 22: 20: 20: 15: 14: 2; φ , 27: (?)4(?): (2)6(2): 16: 23: 17: 15: 12: 9: 4: 2. Sternite XI without tactile setae. Sternites V–

VI of male with medial patches of sensory setae (Fig. 26). Genital opercula of male (Fig. 14): anterior and posterior opercula each with single pair of prominent slit sensillae; opercula of female (Fig. 15): anterior operculum with setae of moderate length not tightly clustered. Male genitalia of typical chernetid conformation, although the paired median genital sac large and somewhat sclerotised; female genitalia with spermathecae consisting of single thick, somewhat folded tubule with enlarged terminal receptaculum (Fig. 16). Leg IV (Fig. 25): femur + patella 4.83 (δ), 4.44 (φ) times longer than broad; without tactile seta. All tarsi with a proximal slit sensillum. Claws simple. Arolium shorter than claws.

Dimensions (mm), δ (φ): body length 5.07 (2.88). Pedipalps: trochanter 0.59/0.27 (0.47/0.26), femur 1.38/0.21 (0.97/0.20), patella 1.25/0.22 (0.85/0.21),



Figures 12–16 *Cacoxyllus echinatus* (Beier), Ferguson Is., Papua New Guinea: 12, δ , dorsal, appendages omitted. 13, φ , dorsal, appendages omitted. 14, genital opercula, δ . 15, genital opercula (most setae absent), φ . 16, spermathecae, φ . Scale lines = 10.0 mm (Figs 12–13), 0.20 mm (Figs 14–16).



Figures 17-26 *Cacoxyclus echinatus* (Beier), Fergusson Is., Papua New Guinea: 17, carapace, ♂. 18, right pedipalp, ♂. 19, right pedipalp, ♀. 20, left chela, lateral, ♂. 21, left chela, lateral, deutonymph. 22, left chelicera, ♀. 23, flagellum, ♂. 24, left leg I, ♂. 25, left leg IV, ♂. 26, sternites V-VI, ♂. Scale lines = 0.50 mm (Figs 17-20, 24-26), 0.20 mm (Figs 21, 22).

chela (with pedicel) 1.67/0.31 (1.31/0.31), chela (without pedicel) 1.59 (1.24), movable finger length 0.69 (0.61), hand length 0.94 (0.66). Chelicera 0.26/? (0.24/0.12), movable finger length 0.18 (0.18). Carapace 1.08/0.78 (0.92/0.76). Leg I: femur 0.29/0.16 (0.25/0.13), patella 0.43/0.15 (0.37/0.14), femur + patella 0.60 (0.52), tibia 0.40/0.10 (0.33/0.10), tarsus 0.34/0.08 (0.31/0.08). Leg IV: femur + patella 0.87/0.18 (0.71/0.16), tibia 0.60/0.11 (0.49/0.10), tarsus 0.37/0.10 (0.34/0.09).

Deutonymph

Colour paler than adults. Pedipalp: trochanter 1.80, femur 3.62, patella 2.71, chela (with pedicel) 3.83, chela (without pedicel) 3.67, hand 2.00 times longer than broad, movable finger 0.86 times as long as hand. Fixed chelal finger with 6 trichobothria, movable chelal finger with 2 trichobothria (Fig. 21): *esb*, *isb*, *sb* and *st* absent. Carapace 1.27 times longer than broad.

Dimensions (mm): Body length 1.69. Pedipalps: trochanter 0.27/0.15, femur 0.47/0.13, patella 0.38/0.14, chela (with pedicel) 0.69/0.18, chela (without pedicel) 0.66, hand length 0.36, movable finger length 0.32. Carapace 0.62/0.49.

Remarks

The dimensions of the three specimens from Fergusson Island are quite similar to those given by Beier (1964, 1965, 1967), clearly demonstrating their conspecificity.

Distribution

C. echinatus was originally described from the Solomon Islands (Beier 1964) and later recorded from New Ireland and Mussau Island in the Bismarck Archipelago (Beier 1965, 1967). The present record from Fergusson Island extends the distribution further to the southwest.

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REFERENCES

- Beier, M. (1932). Pseudoscorpionidea II. Subord. C. Cheliferinea. *Tierreich* 58: i-xxi, 1-294.
- Beier, M. (1957). Pseudoscorpionidea. *Insects of Micronesia* 3: 1-64.
- Beier, M. (1963). Ordnung Pseudoscorpionidea (Afterskorpione). In: *Bestimmungsbücher zur Bodenfauna Europas*, vol. 1. Akademie-Verlag: Berlin.
- Beier, M. (1964). Further records of Pseudoscorpionidea from the Solomon Islands. *Pacific Insects* 6: 592-598.
- Beier, M. (1965). Die Pseudoscorpioniden Neu-Guineas und der benachbarten Inseln. *Pacific Insects* 7: 749-796.
- Beier, M. (1967). Die Pseudoscorpione der Noona Dan Expedition nach den Philippinen und Bismarck Inseln. *Entomologische Meddelelser* 35: 315-324.
- Callaini, G. (1986). Appunti su alcune specie italiane della famiglia Chernetidae Menge (Arachnida, Pseudoscorpionida). *Notulae Chernetologicae* XV. *Bollettino del Museo Civico di Storia Naturale, Verona* 11: 379-401.
- Chamberlin, J.C. (1931). The arachnid order Chelonethida. *Stanford University Publications, Biological Science* 7 (1): 1-284.
- Chamberlin, J.C. (1947). Three new species of false scorpions from the islands of Guam. *Occasional Papers of the Bernice P. Bishop Museum* 18 (20): 305-316.
- Feio, J.L. de Araújo (1945). Novos pseudoscorpões de região neotropical (com a descrição de uma subfamília, dois géneros e sete espécies). *Boletim do Museu Nacional Rio de Janeiro, n.s. Zoologia* 44: 1-47.
- Harvey, M.S. (1987). Redescription and new synonyms of the cosmopolitan species *Lamprochernes savignyi* (Simon) (Chernetidae: Pseudoscorpionida). *Bulletin of the British Arachnological Society* 7: 111-116.
- Harvey, M.S. (1988). Pseudoscorpions from the Krakatau Islands and adjacent regions, Indonesia (Chelicerata: Pseudoscorpionida). *Memoirs of the Museum of Victoria* 49: 309-353.
- Harvey, M.S. (1990). New pseudoscorpions of the genera *Americhernes* Muchmore and *Cordylochernes* Beier from Australia (Pseudoscorpionida: Chernetidae). *Memoirs of the Museum of Victoria* 50: 325-336.
- Harvey, M.S. (1991). *Catalogue of the Pseudoscorpionida*. Manchester University Press: Manchester.
- Harvey, M.S. (1992). The phylogeny and classification of the Pseudoscorpionida (Chelicerata). *Invertebrate Taxonomy* 6: 1373-1435.
- Harvey, M.S. (1994). Redescription and the systematic position of the Brazilian genus *Xenochernes* Feio (Pseudoscorpionida: Chernetidae). *Journal of Arachnology* 22: (in press).
- Heurtault, J. (1971). Chambre génitale, armature génitale et caractères sexuels secondaires chez quelques espèces de Pseudoscorpions (Arachnida) du genre *Withius*. *Bulletin du Muséum National d'Histoire Naturelle, Paris* (2) 42: 1037-1053.
- Heurtault, J. (1983). Pseudoscorpions de Côte d'Ivoire. *Revue Arachnologique* 5: 1-27.
- Hoff, C.C. (1949a). *Wyochernes hutsoni*, a new genus and species of chernetid pseudoscorpion. *Transactions of the American Microscopical Society* 68: 40-48.
- Hoff, C.C. (1949b). The pseudoscorpions of Illinois. *Bulletin of the Illinois Natural History Survey* 24: 407-498.
- Judson, M.L.I. (1985). Redescription of *Myrmochernes*

- Tullgren (Chelonethida: Chernetidae). *Bulletin of the British Arachnological Society* 6: 321–327.
- Legg, G. (1987). Proposed taxonomic changes to the British pseudoscorpion fauna (Arachnida). *Bulletin of the British Arachnological Society* 7: 179–182.
- Legg, G. and Jones, R.E. (1988). *Synopses of the British Fauna (new series)*. 40. *Pseudoscorpions (Arthropoda; Arachnida)*. Brill/Backhuys: Leiden.
- Mahnert, V. (1982). Die Pseudoskorpione (Arachnida) Kenyas V. Chernetidae. *Revue Suisse de Zoologie* 89: 691–712.
- Muchmore, W.B. (1972). Observations on the classification of some European chernetid pseudoscorpions. *Bulletin of the British Arachnological Society* 2: 112–115.
- Muchmore, W.B. (1974). Clarification of the genera *Hesperochernes* and *Dinocheirus* (Pseudoscorpionida, Chernetidae). *Journal of Arachnology* 2: 25–36.
- Muchmore, W.B. (1975). Use of the spermathecae in the taxonomy of chernetid pseudoscorpions. *Proceedings of the 6th International Arachnological Congress, Amsterdam*: 17–20.
- Muchmore, W.B. (1976). Pseudoscorpions from Florida and the Caribbean area. 5. *Americhernes*, a new genus based upon *Chelifer oblongus* Say (Chernetidae). *Florida Entomologist* 59: 151–163.
- Muchmore, W.B. (1990). A pseudoscorpion from arctic Canada (Pseudoscorpionida, Chernetidae). *Canadian Journal of Zoology* 68: 389–390.
- Sato, H. (1991). *Metagoniochernes tomiyamai*, a new pseudoscorpion (Chernetidae) from the Ogasawara Islands, Japan. *Bulletin of the Biogeographical Society of Japan* 46: 97–101.
- Vachon, M. (1938). Recherches anatomiques et biologiques sur la reproduction et le développement des Pseudoscorpions. *Annales des Sciences Naturelles, Zoologie* (11) 1: 1–207.
- Vachon, M. (1939). Remarques sur la sous-famille des Goniochernetinae Beier a propos de la description d'un nouveau genre et d'une nouvelle espèce de Pseudoscorpions (Arachnides): *Metagoniochernes picardi*. *Bulletin du Muséum National d'Histoire Naturelle, Paris* (2) 11: 123–128.
- Vachon, M. (1951). Les Pseudoscorpions de Madagascar. I. Remarques sur la famille des Chernetidae J.C. Chamberlin, 1931, a propos de la description d'une nouvelle espèce: *Metagoniochernes milloti*. *Mémoires de l'Institut Scientifique de Madagascar* 5: 159–172.
- Zeh, D.W. (1987). Aggression, density and sexual dimorphism in chernetid pseudoscorpion (Arachnida: Pseudoscorpionida). *Evolution* 41: 1072–1087.
- Zeh, J.A. and Zeh, D.W. (1992). Are sexually-selected traits reliable species characters? Implications of intra-brood variability in *Semeiochernes armiger* (Balzan) (Pseudoscorpionida: Chernetidae). *Bulletin of the British Arachnological Society* 9: 61–64.

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