

## A new genus of the pseudoscorpion family Tridenchthoniidae from Pakistan, with notes on the South American genus *Cryptoditha* Chamberlin & Chamberlin, 1945 (Arachnida: Pseudoscorpiones)

## Новый род ложноскорпионов семейства Tridenchthoniidae из Пакистана с заметками о южноамериканском роде *Cryptoditha* Chamberlin & Chamberlin, 1945 (Arachnida: Pseudoscorpiones)

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KEY WORDS: Pseudoscorpiones, Tridenchthoniidae, Verrucadithinae, new genus, new species, taxonomy, Brazil, Pakistan.

КЛЮЧЕВЫЕ СЛОВА: Pseudoscorpiones, Tridenchthoniidae, Verrucadithinae, новый род, новый вид, таксономия, Бразилия, Пакистан.

ABSTRACT: *Rheodithella kalashana* gen.n., sp.n., is described from Chitral, in the Hindu Kush Range of Northwest Pakistan. *Rheodithella* gen.n. is the first representative of the subfamily Verrucadithinae Chamberlin, 1929 (new status) known from the Palaearctic. A revised diagnosis of the related South American genus *Cryptoditha* Chamberlin & Chamberlin, 1945 is given, based on an examination of the type species, *C. elegans* (Beier, 1931). The Brazilian species *Verrucadithella francisi* Feio, 1945 is transferred to *Cryptoditha*, comb.n. A key is given to the genera of the Verrucadithinae. The genus *Anisoditha* Chamberlin & Chamberlin, 1945 is removed from the Tridenchthoniidae Balzan, 1892 and assigned to the Chthoniidae Daday, 1888.

РЕЗЮМЕ: Из Читрала (горы Гиндукуш, Северо-Западный Пакистан) описана *Rheodithella kalashana* gen.n., sp.n. Это первый представитель подсемейства Verrucadithinae Chamberlin, 1929 (новый статус), известный из Палеарктики. Представлен новый диагноз близкого южноамериканского рода *Cryptoditha* Chamberlin & Chamberlin, 1945 на основании переисследования типового вида *C. elegans* (Beier, 1931). Бразильский вид *Verrucadithella francisi* Feio, 1945 помещен в состав рода *Cryptoditha*, comb.n. Дан ключ для родов Verrucadithinae. Род *Anisoditha* Chamberlin & Chamberlin, 1945 выведен из состава Tridenchthoniidae Balzan, 1892 и перенесен в состав Chthoniidae Daday, 1888.

### Introduction

Most members of the tridenchthoniid subfamily Verrucadithinae Chamberlin (new rank) are distributed in the Southern Hemisphere, the exception being *Ver-*

*rucaditha spinosa* (Banks, 1893), from the southeastern United States. It was therefore a surprise to find an undescribed species of Verrucadithinae amongst material collected by C. Besuchet & I. Löbl in Pakistan. Because the specimens were collected from a natural habitat in a relatively isolated region, we consider it highly unlikely that this species could have been introduced to Pakistan. It seems probable that it is a relictual taxon, being either an ancient Palaearctic element or, perhaps, having arrived on the Indian tectonic plate. Many parts of Asia remain poorly known in terms of their pseudoscorpion faunas, so it is possible that other Verrucadithinae remain to be discovered there.

Because the new species shows similarities with the South American genus *Cryptoditha* Chamberlin & Chamberlin, 1945, material of the type species, *Cryptoditha elegans* (Beier, 1931), was examined for comparison. This allows us to give a revised diagnosis of this poorly known genus.

Measurements and terminology follow Chamberlin [1931] and Harvey [1992].

### Systematics

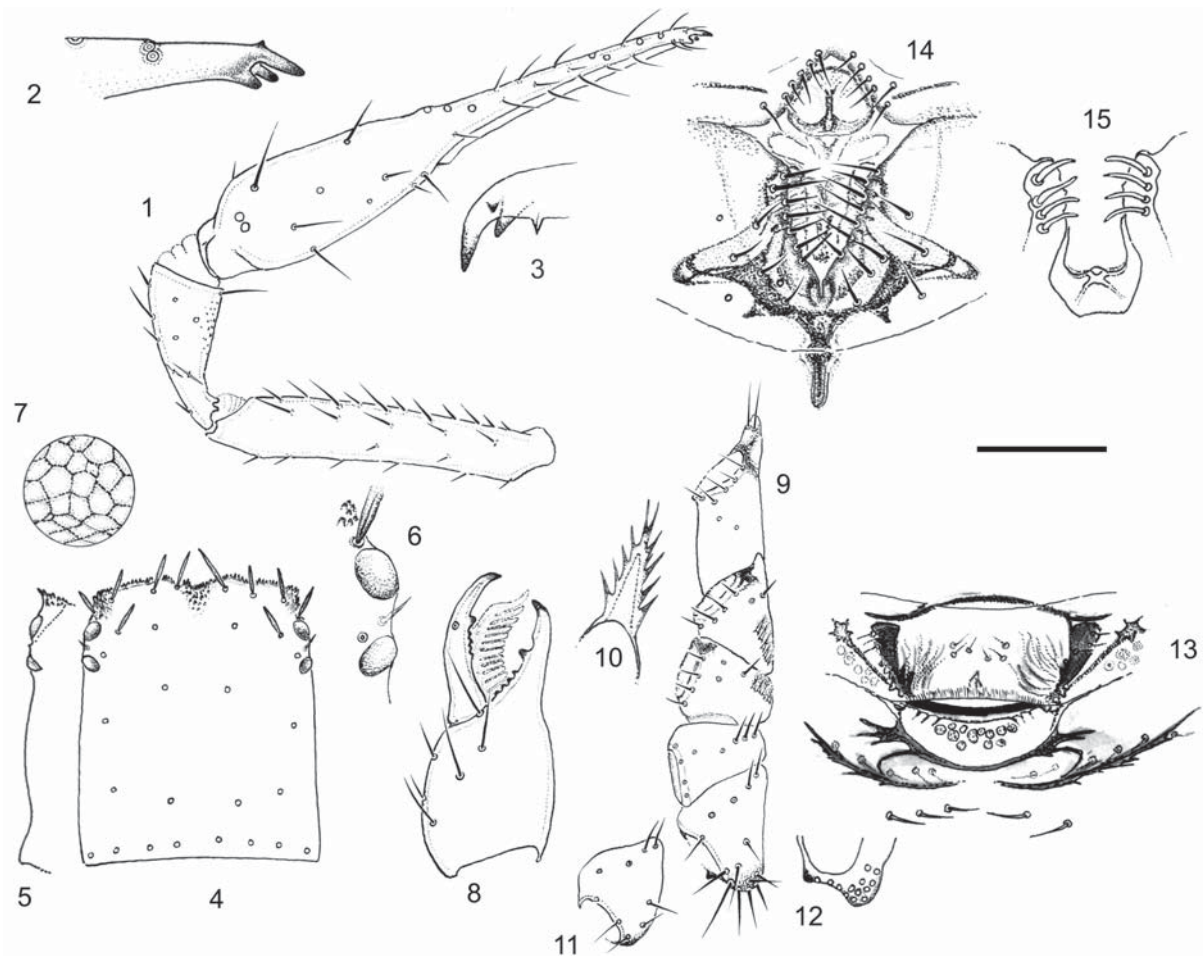
Family TRIDENCHTHONIIDAE Balzan, 1892

Subfamily VERRUCADITHINAE Chamberlin, 1929, **new rank**

Verrucadithini Chamberlin, 1929: 59; Beier, 1931: 49; Chamberlin & Chamberlin, 1945: 17.

Type genus: *Verrucaditha* Chamberlin, 1929.

REMARKS: Chamberlin & Chamberlin [1945] divided the Tridenchthoniidae into two subfamilies: Tridenchthoniinae Balzan, 1893 and Cecodithinae Chamberlin & Chamberlin, 1945. However, the Cecodithinae has recently been re-



Figs 1–15. *Rheodithella kalashana* gen.n., sp.n.: 1 — female palp, dorsal view; 2 — tips of fingers, dorsal view; 3 — tips of fingers, lateral view; 4 — female carapace, dorsal view; 5 — lateral contour of male carapace; 6 — anterolateral corner of carapace; 7 — mesh-like structure of carapace surface (posterolateral corner); 8 — left chelicera of male, dorsal view; 9 — right coxae of female; 10 — coxal spine on coxa II; 11 — right coxa IV of male; 12 — detail of posterior margin of coxa IV of female, lateral view; 13 — ventral aspect of female genitalia; 14 — ventral aspect of male genitalia; 15 — setae of male genitalia, ventral view. Scale line: 0.2 (1, 4, 5, 9, 11, 12), 0.1 (8), 0.06 mm (2, 3, 6, 13–15).

Рис. 1–15. *Rheodithella kalashana* gen.n., sp.n.: 1 — палпа самки, сверху; 2 — вершины пальцев, сверху; 3 — то же, сбоку; 4 — карапакс самки, сверху; 5 — боковой контур карапакса самца; 6 — переднебоковой угол карапакса; 7 — ячеистая структура поверхности карапакса (заднебоковой угол); 8 — левая хелицера самца, сверху; 9 — правые тазики самки; 10 — коксальный шип на тазиках II; 11 — правый тазик IV у самца; 12 — детали строения заднего края тазика IV у самки, сбоку; 13 — вид снизу гениталий самки; 14 — вид снизу гениталий самца; 15 — щетинки на гениталиях самца, снизу. Масштаб: 0,2 (1, 4, 5, 9, 11, 12), 0,1 (8), 0,06 мм (2, 3, 6, 13–15).

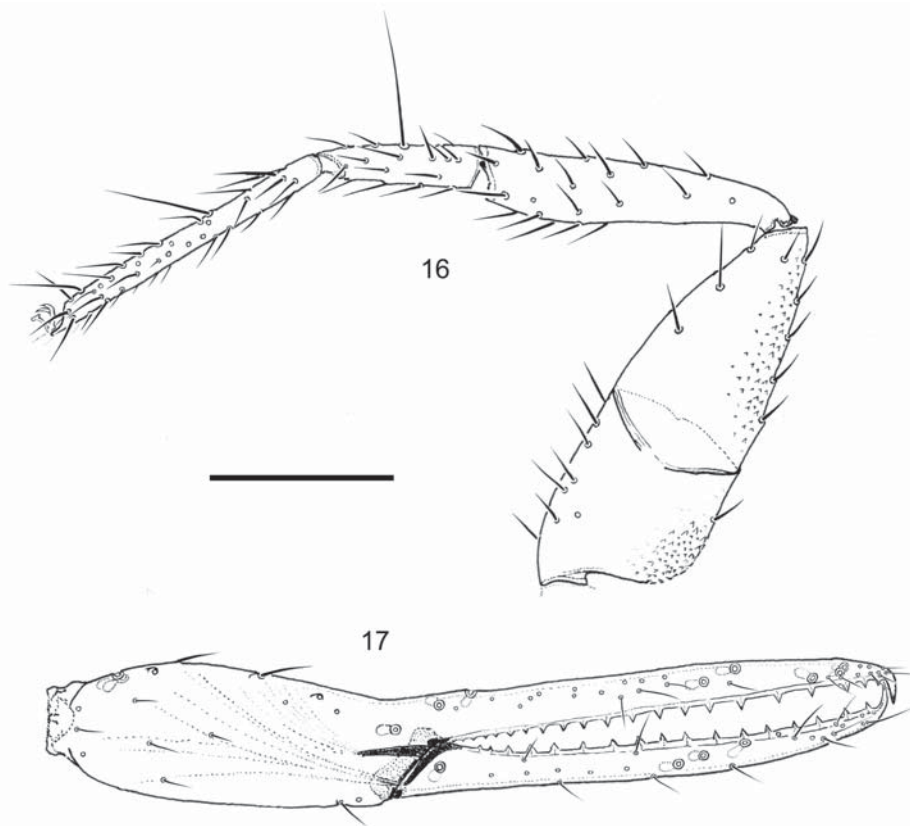
moved from the Tridenchthoniidae and synonymized with the chthoniid subfamily Chthoniinae Daday, 1888 [Judson, 2001]. This leaves the Tridenchthoniidae with only a single subfamily, Tridenchthoniinae, containing the tribes Tridenchthoniini Balzan and Verrucadithini Chamberlin. To eliminate redundancy between the subfamily and subfamily categories, we here raise these tribes to subfamilial level.

The Verrucadithinae is here considered to comprise the following genera: *Anaulacodithella* Beier, 1944; *Cryptoditha* Chamberlin & Chamberlin, 1945; *Pycnodithella* Beier, 1947; *Rheodithella* n. gen.; *Sororoditha* Chamberlin & Chamberlin, 1945; *Verrucaditha* Chamberlin, 1929; and *Verrucadithella* Beier, 1931. The systematic position of *Anisoditha* Chamberlin & Chamberlin, 1945 (which Chamberlin & Chamberlin [1945] placed in the Verrucadithini) is discussed below.

### *Rheodithella* gen.n.

Type species: *Rheodithella kalashana* sp.n.

DIAGNOSIS: Verrucadithinae of normal facies. Vestitural setae not greatly increased in number (weakly neotrichous); carapace with about 30–32 setae. Tergites uniseriate, with six setae at most. Carapace broadest posteriorly; hispid at sides; eyes well-developed; anterior margin depressed medially, epistome absent. Notch of male sternite III broadest distally. Chelicera with six setae on hand; movable finger without an isolated apical tooth. Hand of chela slightly narrowed at base of fingers, but without an abrupt constriction or sulcus. Movable finger of chela with complex arrangement of apodemes: anterior apodeme long and strongly sclerotized, directed downwards, posterior apodeme smaller and



Figs 16–17. *Rheodithella kalashana* gen.n., sp.n.: 16 — leg IV of male; 17 — male chela, lateral view. Scale line: 0.2 mm.  
 Рис. 16–17. *Rheodithella kalashana* gen.n., sp.n.: 16 — нога IV у самца; 17 — хела самца, сбоку. Масштаб: 0,2 мм.

directed posteriorly. Dentition of chela simple, consisting of spaced, upright teeth, without smaller intercalary teeth; teeth of movable finger only decreasing in size at base, not becoming flattened or contiguous; accessory tooth at tip of fixed finger large. Trichobothrium *et* much closer to *ds* than to *it*; *est* and *it* separated by about two bothridial diameters; *sb*, *st* and *t* forming a fairly compact group (distance *sb*–*t* about 1/7 of finger length), *st* slightly nearer to *sb* than to *t*. Intercostal tubercle absent. Coxal spines present on coxae I and II, bipinnate for most of their length.

ETYMOLOGY: From the Greek *rheos* (of or pertaining to a stream), with the suffix *dithella* (a diminutive derived from the name Edith); gender feminine.

*Rheodithella* is similar to the South American genus *Cryptoditha*, but they can be separated by the shape and sculpturing of the carapace, the number of setae on its posterior margin, the spacing of trichobothria *sb*–*st*–*t*, the development of the apodemes of the movable chelal finger and the form of the notch on male sternite III.

*Rheodithella kalashana* sp.n.

Figs 1–17.

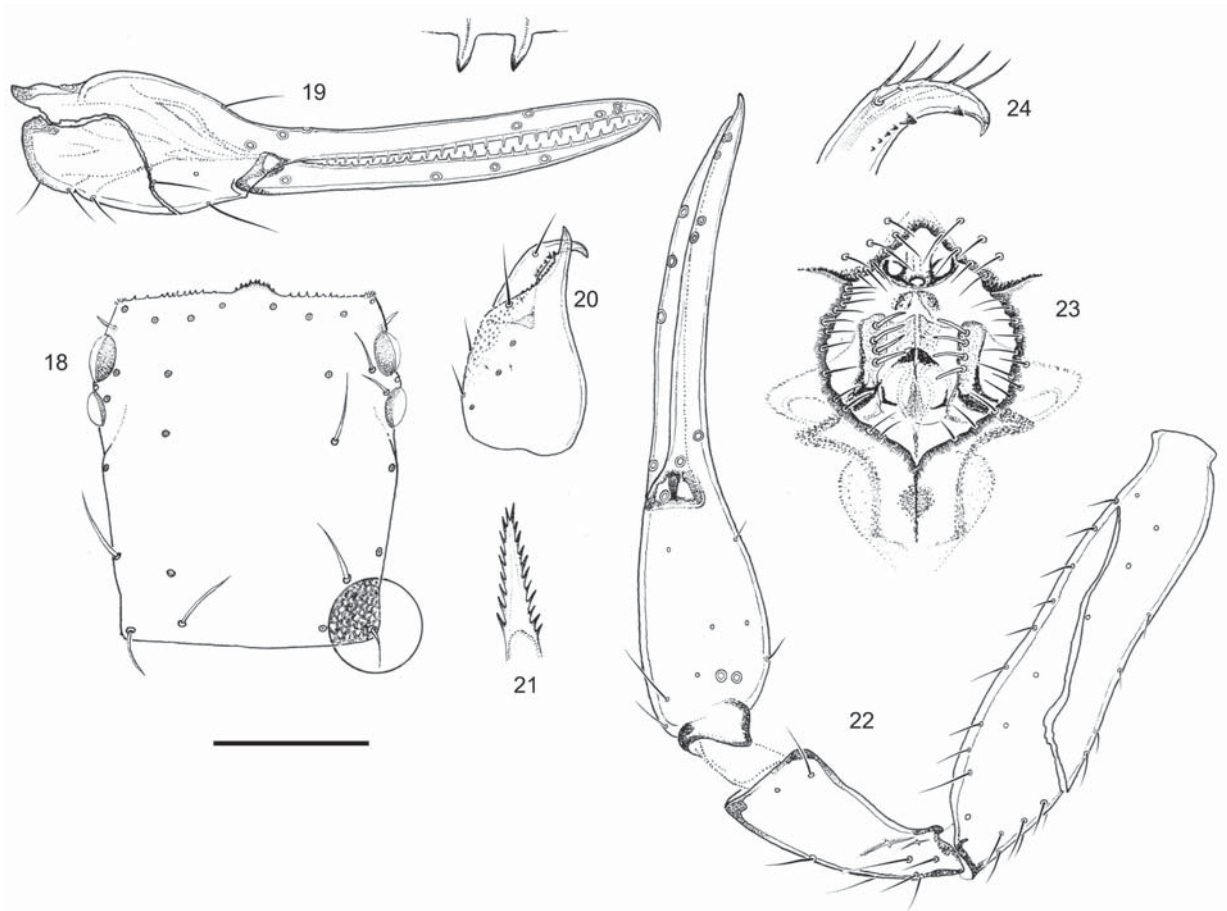
Holotype ♂ (Muséum d'Histoire naturelle, Geneva), Pakistan, Chitral, Bumburet, in damp gravel along a stream, 24 May 1983, leg. C. Besuchet & I. Löbl.

Paratype ♀ (Muséum d'Histoire naturelle, Geneva), same data as holotype.

ETYMOLOGY. Named in reference to the Kalash people, inhabitants of the Bumburet valley.

DESCRIPTION. Carapace (Figs 4–7) slightly longer than broad, with moderate net-like reticulation laterally; eyes well-developed, posterior eye nearly one ocular diameter from anterior eye (Fig. 6); anterior margin depressed in middle and denticulate, without an epistome; setae 8:m4m:4:4:8 (30) in ♂ and 8:m6m:4:4:8 (32) in ♀; setae slightly lanceolate; microseta (*m*) lying below eyes (Fig. 6). Tergites with net-like reticulation, setae 4:6:6:6:6:6:6:4 (♀ 6):4:2:0. Coxal setae P 9 (two on manducatory process), I 6, II 7, III 9, IV 8; coxa II with 4–5 spines, coxa III with 4 spines, spines bipinnate for most of their length (Fig. 10); coxa I with a blunt apical process; coxae IV showing sexual dimorphism: ♀ with posterior margin produced into a lobe and bearing more setae than in ♂ (Figs 9, 11, 12). Intercostal tubercle absent. ♂ genital region as in Fig. 14; internal genitalia with 4 pairs of glandular setae (Fig. 15); anterior operculum with 12 setae, posterior with (3m)15(3m), plus 6–7 along each side of notch [total (3m)29(3m)]; chaetotaxy of sternites IV–XII (3m)5 (3m):9:8:7:8:8:6:4:0:2. ♀ genital region as shown in Fig. 13; gland pores arranged in numerous small plates; sternal chaetotaxy 12:(3m)10(3m):(3m)5(3m):9:9:7:8:8:6:4:0:2. Pleural membrane of opisthosoma plicate.

Chelicera with six setae in basal part; movable finger with seta distad of middle of finger; serrula exterior with 15 lamellae; flagellum of 10–11 blades; fixed and movable fingers with five teeth, distal tooth larger than the others; movable finger without raised spinneret.



Figs 18–24. *Cryptoditha elegans* (Beier, 1931), syntypes (all figures of male, except 24): 18 — carapace; 19 — right chela (hand broken), with detail of teeth; 20 — left chelicera; 21 — coxal spine on coxa II; 22 — left palp (femur broken), dorsal view; 23 — male genital area; 24 — tip of movable cheliceral finger of tritonymph, showing spinnerets. Scale line: 0.2 (18–20, 22), 0.06 mm (23–24).

Рис. 18–24. *Cryptoditha elegans* (Beier, 1931), синтипы (все рисунки самца, кроме 24): 18 — карапакс; 19 — правая хела (рука сломана) с деталями строения зубов; 20 — левая хелицера; 21 — коксальный шип на тазике II; 22 — левая пальпа (бедро сломано), сверху; 23 — район гениталий у самца; 24 — вершина подвижного пальца хелицер у тритонимфы, демонстрирующая паутинные грифельки. Масштаб: 0,2 (18–20, 22), 0,06 мм (23–24).

Palp (Figs 1, 16) with trichobothriotaxy as illustrated. Marginal teeth of chelal fingers sparse, acute, prominent and distinctly spaced; fixed finger of chela with 20 (♀ 17), movable finger with 16 (♀ 14) teeth. Fixed finger with a long 'accessory tooth' (Fig. 2); when the chela is closed, the tip of the movable finger rests between the terminal tooth of the fixed finger and the accessory tooth (Fig. 2). Apodemes of movable finger complex: anterior apodeme directed downwards at an angle of about 45°; posterior apodeme long and in line with axis of finger.

Legs typical (Fig. 17), leg IV basitarsus with tactile seta near middle (TS=0.51), telotarsus with tactile seta proximad of middle (TS=0.38).

Measurements (in mm), with standard ratios in parentheses.

♂. Carapace 0.42 × 0.39 (1.1). Palp: femur 0.63 × 0.10 (6.3); patella 0.28 × 0.11 (2.6); chela 0.87 × 0.15 (5.8); hand 0.39 (2.6); movable finger 0.49 (1.3 × hand). Leg IV: femur+patella 0.48 × 0.17 (2.8); tibia 0.35 × 0.07 (5.0); basitarsus 0.19 × 0.05 (3.8); telotarsus 0.34 × 0.03 (11.3).

♀. Carapace 0.43 × 0.40 (1.1). Palp: femur 0.63 × 0.11 (5.7); patella 0.29 × 0.12 (2.4); chela 0.90 × 0.16 (5.6); hand 0.39 (2.4); movable finger 0.52 (1.3 × hand).

### *Cryptoditha* Chamberlin & Chamberlin, 1945

*Cryptoditha* Chamberlin & Chamberlin, 1945: 29–30.

Type species: *Tridenchthonius elegans* Beier, 1931, by original designation.

REVISED DIAGNOSIS. Verrucadithinae of typical facies. Vestitural setae showing only weak neotrichy; carapace with about 30–36 setae. Tergites uniseriate, with six setae at most. Carapace broadest at level of eyes; surface reticulate; eyes strongly developed, with large lenses; anterior margin not depressed medially, provided with a broad epistome; posterior margin with only four setae. Notch of ♂ sternite III broadest half-way along its length. Chelicera with six setae on hand; movable finger with an isolated apical tooth; tritonymph with five spinnerets (absent in adult). Hand of chela without an abrupt constriction or sulcus. Dentition simple, with spaced, upright teeth on both fingers; accessory tooth at tip of fixed finger small. Apodemes of movable chelal finger only weakly developed. Trichobothrium *et* much closer to *ds* than to *it*; trichobothria *sb*, *st* and *t* well spaced (distance between *sb*–*t* about 1/4 of finger length), *st* slightly nearer to *t* than to *sb*. Intercoxal

tubercle absent. Coxal spines present on coxae I and II, bipinnate along whole length.

*Cryptoditha elegans* (Beier, 1931)

Figs 18–24.

*Tridenchthonius elegans* Beier, 1931: 52, 1932: 34–35, fig. 40–41.

*Cryptoditha elegans* (Beier, 1931): Chamberlin & Chamberlin, 1945: 30, fig. 6; Mahnert, 2001: 96 (in part: not *Cryptoditha* cf. *elegans*).

**Material examined.** Syntypes: 3 ♂♂, 1 T (NHMW), Brazil (ex Sellnick collection). The types are in poor condition, having previously dried out. According to Beier [1931], they were collected at Passo Quatro, which probably corresponds to the town of that name in the province of Minas Gerais.

**SUPPLEMENTARY DESCRIPTION OF ♂.** Carapace (Fig. 18) longer than broad; with well-developed eyes, anterior pair with strongly vaulted lens; anterior margin strongly serrate, with a broad epistome; setae 8:m8m:4:4:4 (30), microsetae (m) lying lateroventrad of eyes. Tergites reticulate; chaetotaxy of tergites I–VIII 4:6:6:6:6:6:6:6. Palp coxa with two setae on manducatory process. Coxa II with six bipinnate spines; coxa III with four spines; intercoxal tubercle absent. Chelicera (Fig. 20) with six setae on hand; flagellum of 11 blades; fixed finger with ten teeth, distal tooth enlarged; movable fingers with six teeth, distal tooth enlarged; no spinneret evident. Palp (Figs 19, 22) with hand not constricted, fingers gently curved in dorsal view; marginal teeth of fingers sparse, acute, prominent and widely spaced; fixed finger of chela with 25, movable finger with 28 teeth; distal accessory tooth of fixed finger small. Trichobothria as illustrated (Figs 19, 22). ♂ genital region (Fig. 23) with notch of posterior operculum broadest at middle and bordered by 12 setae on each side; internal genitalia with four pairs of glandular setae.

Measurements (in mm), with standard ratios in parentheses. Carapace 0.46 × 0.38 (1.2). Palp: femur 0.63 × 0.13 (4.85); tibia 0.32 × 0.13 (2.5); chela 0.85 × 0.17 (5.0); hand 0.32 (1.9); movable finger 0.53 (1.7 × hand).

**REMARKS.** Mahnert [2001] suggested that the types of *C. elegans* might be lost because they were not present in the Sellnick collection, which is housed in the Zoologisches Museum Hamburg (H. Dastych, *in litt.*). Fortunately, the types have been found in the Vienna Museum by J. Gruber and were available for study.

It is now clear that the female described by Mahnert [2001] from a cave in Minas Gerais as '*Cryptoditha* cf. *elegans*' is not conspecific with the types. Mahnert's species resembles *Rheodithella* in having well-developed apodemes, straight chelal fingers, carapace broadest posteriorly and trichobothria *sb-t* relatively close. We believe that these characteristics are sufficient to exclude this species from *Cryptoditha*, but it remains to be seen whether it should be placed in *Rheodithella* or some other genus. Mahnert's species differs from *Rheodithella kalashana* sp.n. in having only four posterior setae on the carapace (as in *Cryptoditha*), larger, less robust palps, and a slightly higher number of teeth of the chelal fingers, with those at the base of the movable finger becoming blunt.

We here transfer another Brazilian species, *Verrucadithella francisi* Feio, 1945, to *Cryptoditha*. Feio [1945] was unaware of the papers by Beier [1944] and Chamberlin & Chamberlin [1945], in which a more restricted concept of the genus *Verrucadithella* was adopted. It has long been evident that *francisi* is misplaced in *Verrucadithella*, but no attempts

have been made to assign it elsewhere. Feio's description is rather brief, but his figures suggest that *francisi* is congeneric with *elegans*. Although this placement requires confirmation, it is certainly preferable to leaving *francisi* in *Verrucadithella*. *Cryptoditha francisi* (Feio), **comb.n.**, can be separated from *C. elegans* by the relative length of the chelal fingers (only 1.3 × hand in *francisi*) and the lower number of chelal teeth (fixed finger with about 17 and movable finger with about 14 in *francisi*).

KEY TO THE GENERA OF VERRUCADITHINAE

1. Distal teeth of movable finger of chela upright and well spaced, setae of carapace simple or only weakly tuberculate ..... 2.
- Distal teeth of movable finger of chela low and contiguous, setae of carapace set on distinct tubercles ..... 2. .... *Verrucaditha* Chamberlin (North America).
2. Trichobothrium *et* closer to *it* than to *ds* or midway between them ..... 3.
- Trichobothrium *et* clearly closer to *ds* than to *it* ..... *Anaulacodithella* Beier (South Africa, New Caledonia, Lord Howe Island, Australia).
3. Dorsum of chelal hand with abrupt depression or sulcus near base of fixed finger ..... *Verrucadithella* Beier (East Africa).
- Dorsum of chelal hand normal, without abrupt depression or sulcus ..... 4.
4. Median tergites with six setae ..... 5.
- Median tergites with more than ten setae ..... 6.
5. Trichobothrium *st* midway between *sb* and *t* or slightly closer to latter; accessory tooth of fixed chelal finger small; carapace hispid ..... *Cryptoditha* Chamberlin & Chamberlin (South America).
- Trichobothrium *st* closer to *sb* than to *t*; accessory tooth of fixed chelal finger large; carapace reticulate ..... *Rheodithella* gen.n. (Pakistan).
6. Carapace granulate, with less than 35 setae ..... *Pycnodithella* Beier (East Africa).
- Carapace smooth or reticulate, with at least 40 setae ... 7.
7. Carapace smooth, tergites biseriate ..... *Sororoditha* Chamberlin & Chamberlin (South America).
- Carapace reticulate, tergites uniseriate ..... 'Pycnodithella' *harveyi* Kennedy, 1989 (Southeastern Australia).

Transfer of *Anisoditha* Chamberlin & Chamberlin to the Chthoniidae

*Chthonius curvidigitatus* Balzan, 1887, the type species of *Anisoditha* Chamberlin & Chamberlin, was placed in the Tridenchthoniidae by Beier [1932] (as a doubtful species of *Verrucaditha*), and later by Chamberlin & Chamberlin [1945], based on Balzan's [1890] redescription. The only characters that could support this interpretation are the basal position of trichobothria *ib* and *isb* on the hand, as illustrated in Balzan's [1890] figure 27, and the chaetotaxy of the tergites, which Balzan [1890] described as being similar to that of *Sororoditha hirsuta* (Balzan) (i.e. "*molti peli, disposti disordinatamente su due file*"). However, in his original description of the species, Balzan [1887] illustrated the

trichobothria in the *middle* of the hand [Balzan, 1887: unnumbered (13th) plate, fig. B] and described the tergal setae as “*paucis*” (few). The chela of *curvidigitatus*, with its curved fingers and reduced dentition on the movable finger, is quite unlike that of any known tridenchthoniid. This type of chela is only found in Chthoniidae, such as *Austrochthonius* Chamberlin, 1929, *Drepanochthonius* Beier, 1964 and *Pseudochthonius* Balzan, 1892. All three of these genera occur in South America, so it is possible that *Anisoditha* is a junior synonym of one of them, although Balzan’s description of two pairs of eyes would seem to exclude *Pseudochthonius*. Balzan [1887] himself compared *A. curvidigitata* to the chthoniid *Chthonius* (*E.*) *tetrachelatus* (Preyssl, 1790), rather than to tridenchthoniids. An examination of the types or topotypic material of *A. curvidigitata* will be required to resolve the status of *Anisoditha*, but in the meantime we are confident in removing this genus from the Tridenchthoniidae and transferring it to the Chthoniidae.

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