

## Revised diagnoses for the pseudoscorpion genera *Metawithius* and *Microwithius*, with the description of a new Australian genus, and notes on *Withius* (Pseudoscorpiones, Withiidae)

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**Abstract.** Pseudoscorpions of the family Withiidae are distributed in most regions of the world, but are less common in the Australian region. Apart from the cosmopolitan genus *Withius* Kew, 1911, the fauna is dominated by the endemic genera *Metawithius* Chamberlin, 1931 and *Hyperwithius* Beier, 1951. A review of material of both genera reveals that *Metawithius* is a senior synonym of *Hyperwithius*, and is defined by the presence of a patch of rugose cuticle on the internal surface of the male maxilla. The genus contains the following taxa: *M. murrayi* (Pocock, 1900), *M. philippinus* Beier, 1937, *M. spiniventer* Redikorzev, 1938, *M. spiniventer pauper* Beier, 1953, three species newly transferred from *Hyperwithius* to *Metawithius*, *M. annamensis* (Redikorzev, 1938), comb. nov., *M. tonkinensis* (Beier, 1951), comb. nov. and *M. dawydoffi* (Beier, 1951), comb. nov., and *M. nepalensis* (Beier, 1974) which is newly transferred from *Withius*. The remaining species previously attributed to *Metawithius* are transferred to other genera, primarily because they lack the patch of rugose cuticle. The subgenus *Metawithius* (*Microwithius*) Redikorzev, 1938 is once again raised to generic level, and provisionally contains four species, *M. yurii* Redikorzev, 1938 from southeast Asia, and *M. indicus* (Murthy and Ananthakrishnan, 1977), comb. nov., *M. chamundiensis* (Sivaraman, 1980), comb. nov. and *M. bulli* (Sivaraman, 1980), comb. nov. from India. *Metawithius* (*Microwithius*) *tweediei* Beier, 1955 also lacks the rugose patch of cuticle and is provisionally transferred to *Withius*, forming the new combination *W. tweediei* (Beier, 1955). Two new species from northern Australian rainforests are found to be most similar to *Metawithius* but instead of an internal patch of rugose cuticle, they have an external patch. These new species, *R. bulbosus* sp. nov. (type species) and *R. longissimus* sp. nov., are placed in a new genus, *Rugowithius*. *Afrowithius* Chamberlin, 1931 is regarded as a new synonym of *Withius*, and the type species *Chelifera paradoxus* Ellingsen, 1912 from South Africa is treated as a senior synonym of *Withius crassipes* (Lawrence, 1937).

**Keywords:** Taxonomy, new species, morphology, new synonyms

Pseudoscorpions of the family Withiidae occur in many parts of the world, but are most abundant in tropical and sub-tropical biotopes. Species of *Withius* Kew, 1911 are found all over the world, and *Sphaerowithius* Mahnert, 1988 is found in Africa and the Solomon Islands but the sole Solomon Islands species, *S. salomonensis* (Beier, 1966), is morphologically somewhat anomalous and its relationship with other members of the genus requires further testing (Mahnert 1988). The remaining 34 withiid genera show strong biogeographic fidelity with 21 genera restricted to the sub-Saharan region of Africa (including various peripheral islands such as Ascension, Reunion, Mauritius, Seychelles and Saint Helena) and the adjacent Middle East, eight genera restricted to the American region (ranging from southern U.S.A. to the Archipiélago Juan Fernández), and two genera endemic to southeastern Asia, *Metawithius* Chamberlin, 1931 and *Hyperwithius* Beier, 1951 (Harvey 2013). The sole fossil genus, *Beierowithius* Mahnert, 1979 with one included species *B. sieboldtii* (Menge, 1854), has been found in Tertiary Baltic Amber deposits, but appears to differ little from Recent taxa based on the available descriptions (Menge, in Koch & Berendt 1854; Menge 1855; Beier 1937b, 1955a).

*Metawithius* currently contains nine species which are distributed throughout the Asian region from India to the Indonesian archipelago (Harvey 2013). It is divided into two subgenera, *M.* (*Metawithius*) and *M.* (*Microwithius*) Redikorzev, 1938,

although the latter was initially described as a distinct genus (Redikorzev 1938) before being treated as a subgenus by Beier (1951). The status of the three species of *Hyperwithius*, which were originally based upon small differences in pedipalp proportions, abdominal setation and the shape of the male coxa IV (Beier 1951), was questioned by Schawaller (1995).

The discovery of two new species of Withiidae in northern Australia has prompted a reexamination of the status of *Metawithius* and *Hyperwithius*, and the subgenus *Microwithius*. While the Australian species were found to resemble *Metawithius* and *Hyperwithius* in some morphological features, they were found to differ in others and are here placed in a new genus which is named *Rugowithius*. In addition to treating *Hyperwithius* as a junior synonym of *Metawithius*, the subgenus *Microwithius* is once again treated as a valid genus. One of the species previously included in *Microwithius*, *Me. (Mi.) tweediei* Beier, 1955, is tentatively transferred to *Withius* as it lacks the morphological features of both *Metawithius* and *Microwithius*. To aid future research into this group, the type species of *Metawithius*, *M. murrayi* (Pocock, 1900), is redescribed based on the type specimens and other material. And finally, the status of the African genus *Afrowithius* Chamberlin, 1931, is examined and shown to be based on an anomalous specimen; the genus is synonymized with *Withius*.

## METHODS

The specimens used for this study are lodged in the following institutions: Natural History Museum, London (BMNH); Museum and Art Gallery of the Northern Territory Museum, Darwin (MAGNT); Muséum d'Histoire Naturelle, Geneva (MHNG); Naturhistorisches Museum, Basel (NHMB); Naturhistorisches Museum, Wien (NHMW); Museum Victoria, Melbourne (NMV); Queensland Museum, Brisbane (QM); Senckenberg Gesellschaft für Naturforschung, Frankfurt am Main (SMF); Western Australian Museum, Perth (WAM); and Zoological Museum, University of Copenhagen (ZMUC).

The specimens were examined by preparing a temporary slide mount by immersing the specimen in 75% lactic acid at room temperature for several days, and mounting them on microscope slides with 10 mm coverslips supported by small sections of 0.25 mm diameter nylon fishing line. The specimens were observed with an Olympus BH-2 or a Leica DM2500 compound microscope and illustrated with the aid of a drawing tube. Measurements were taken at the highest possible magnification using an ocular graticule. After study, the specimens were rinsed in water and returned to 75% ethanol with the dissected portions placed in 12 x 3 mm glass genitalia microvials (BioQuip Products, Inc.). The scanning electron micrographs were obtained in a Philips XL30 scanning electron microscope after the specimens were prepared by dehydration in 1,1,1,3,3,3-Hexamethyldisilazane (HMDS), air-dried and mounted on SEM stubs with carbon tape.

Terminology and mensuration mostly follow Chamberlin (1931a), with the exception of the nomenclature of the pedipalps and legs, and with some minor modifications to the terminology of the trichobothria (Harvey 1992), cheliceral setation (Harvey & Edward 2007), cheliceral rallum (Judson 2007) and faces of the appendages (Harvey et al. 2012). The synonymies under each taxon only include the original description; subsequent descriptions and generic transfers may be found in Harvey (2013). The ratio TS is the distance from the base of tarsus IV to the tactile seta, divided by the length of the entire tarsus. The abbreviation gls refers to the abdominal glandular setae found on the sternites of many withiids. The following abbreviations are used for the male genitalia: ca, chitinized arch; dd, dorsal diverticulum; ejca, ejaculatory canal atrium; la, lateral apodeme; md, median diverticulum.

## SYSTEMATICS

## Family Withiidae Chamberlin, 1931

**Male genitalic morphology.**—The male genitalia of some withiids are modified such that the lateral apodemes are long, somewhat triangular and bear an extended ejaculatory canal that extends posteriorly far into the abdomen. This state has been found in a variety of both Old World and New World withiid genera including some species of *Withius* [including *W. hispanus* (L. Koch, 1873), *W. faunus* (Simon, 1879), *W. neglectus* (Simon, 1878) (Heurtault 1971; pers. obs.) and *W. japonicus* Morikawa, 1954 (Morikawa 1954)], *Balanowithius* Beier, 1959 (pers. obs.), *Cacodemonius* Chamberlin, 1923 (Chamberlin 1923; pers. obs.), *Cystowithius* Harvey, 2004 (Harvey 2004), *Dolichowithius* Beier, 1932 (pers. obs.), *Metawithius* (pers. obs.), *Microwithius* (Harvey 1988), *Parawithius* Beier, 1932 (Harvey 2004), *Pycnowithius* Beier, 1979

(Mahnert 1988), *Rexwithius* Heurtault, 1994 (Heurtault 1994), *Rugowithius* gen. nov. (pers. obs.), *Thaumatoewithius* Beier, 1940 (pers. obs.), *Trichotowithius* Beier, 1944 (Dashdamirov 1992) and *Victorwithius* Beier, 1932 (pers. obs.). Other withiids possess shortened lateral apodemes that look more similar to the configuration found in other cheliferoids. These include many species of *Withius* including the type species *W. piger* (Simon, 1879) (e.g., Chamberlin 1931a; Beier 1947; Heurtault 1971; Mahnert 1988), *Aisthetowithius* Beier, 1967 (Mahnert 1988), *Cryptowithius* Beier, 1967 (pers. obs.), *Girardowithius* Heurtault, 1994 (Heurtault 1994), *Ectromachernes* Beier, 1944 (Vachon 1952), *Juxtachelifer* Hoff, 1956 (pers. obs.), *Nannowithius* Beier, 1932 (Mahnert 1988; Harvey in press), *Stenowithius* Beier, 1932 (Mahnert 1988; pers. obs.), *Nesowithius* Beier, 1940 (pers. obs.), *Parallowithius* Beier, 1955 (pers. obs.), *Pogonowithius* Beier, 1979 (pers. obs.), *Scotowithius* Beier, 1977 (pers. obs.), *Sphallowithius* Beier, 1977 (pers. obs.), *Stenowithius* Beier, 1932 and *Termitowithius* Muchmore, 1990 (pers. obs.). The triangular conformation is rather striking, and would appear to signify that this group of genera represent a monophyletic group which is here termed the *Cacodemonius* group. There is an available genus-group name, the *Cacodemoniini* Chamberlin, 1931 (Chamberlin 1931b), which can be used for this group. The remaining genera are not supported by any known synapomorphy, and changes to the subfamily or tribal classification are not proposed until a robust phylogenetic analysis can be performed.

The male genitalic morphology confirms that at least four species currently included in *Withius* are misplaced and should be removed to another genus. These four species, *W. hispanus*, *W. faunus*, *W. neglectus* and *W. japonicus*, are unlikely to be the only misplaced species, as many species of *Withius* lack descriptions or illustrations of the male genitalia and the number of misplaced species will most likely increase. In addition, the internal trichobothrial series of the chelal fingers of these four species as well as *Withius despaxi* Vachon, 1937 are all basally clustered with trichobothria *it* and *isb* situated virtually adjacent to each other (Beier 1932a; Vachon 1937; Morikawa 1954), unlike most other species of *Withius* in which the trichobothria are slightly more widespread with *it* and *isb* separated from each other (e.g., Beier 1932a; Mahnert 1988).

Genus *Metawithius* Chamberlin, 1931

*Metawithius* Chamberlin 1931b:293.

*Hyperwithius* Beier 1951:99–100. **Syn. nov.**

**Type species.**—*Metawithius: Chelifer murrayi* Pocock, 1900, by original designation.

*Hyperwithius: Sundowithius annamensis* Redikorzev, 1938, by original designation.

**Diagnosis.**—Species of *Metawithius* differ from all other genera of Withiidae in the possession of a small patch of rugose cuticle on the internal surface of the maxilla of males, which is situated slightly anterior to the median maxillary lyrifissure (Fig. 5); the only other pseudoscorpion with a similar feature is *Rugowithius*, in which this patch is situated externally on the maxilla (Fig. 17). Males also differ from other withiids by the sub-oral setae of maxilla being on a 'hooked' mound (Fig. 5). It further differs from *Rugowithius* by the sternal glandular setae of males being short and conical (Fig. 11)

(long and distally spatulate in *Rugowithius*), the glandular setae of males being present on sternites IV–X, and occasionally XI (on sternites VI–IX in *Rugowithius*) (Fig. 10) and the spermathecal receptacula of females coiled (not coiled in *Rugowithius*) (Fig. 13).

**Description.**—Setae: most dorsal setae strongly clavate and denticulate; setae on sternites acicular.

*Chelicera* (Fig. 2): With 5 setae on hand, *sbs* always denticulate, *bs* either denticulate or acuminate, *es*, *ls* and *is* always acuminate; movable finger with 1 subdistal seta (*gs*); rallum of 4 blades (Fig. 3), the most distal blade with several serrations on leading edge, other blades smooth; lamina exterior present.

*Pedipalp*: Not particularly sexually dimorphic; femur of male without hypertrophied base (Fig. 4). Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 7); trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. Chelal teeth all closely spaced; accessory teeth absent.

*Carapace*: With 2 non-corneate eyes; with 2 furrows, anterior furrow distinct, posterior furrow indistinct; posterior furrow closer to posterior margin of carapace than to anterior furrow.

*Coxal region*: Median maxillary lyrifissure present and sub-medially situated (Figs. 5, 6); sub-oral seta of male maxilla on 'hooked' mound (Fig. 5); males with patch of ridged cuticle on internal margin of maxilla (Fig. 5).

*Legs*: Junction between femora and patellae I and II only slightly oblique; tactile seta of posterior legs sub-medial (Fig. 1); subterminal tarsal setae arcuate and acute; arolium slightly shorter than claws; claws slender and simple.

*Abdomen*: Most tergites and sternites with medial suture. Male tergites without lateral keels. Males without paired sac-like invaginations on anterior margins of sternites; males with patches of glandular setae on most sternites (Fig. 10), females with 2 glandular setae on segments VIII–IX; glandular setae of male short and conical (Fig. 11). Spiracular helix present. Pleural membrane longitudinally striate and somewhat wrinkled.

*Genitalia*: Male genitalia with long, triangular lateral apodemes (Fig. 12); female genitalia with T-shaped spermathecae, each receptaculum coiled (Fig. 13).

**Remarks.**—All of the males included in the genus *Metawithius* examined during this study were found to possess a small internal patch of rugose cuticle situated near the mid-line of the maxilla (Fig. 5). This feature has not been detected in any other withiid examined to date. It was first noticed and illustrated by With (1906, plate III fig. 8g) but has apparently gone unnoticed since, even by the normally attentive J.C. Chamberlin when he created the genus *Metawithius* (Chamberlin 1931b). The function of this bizarre structure remains to be discovered and its presence only in adult males hints at some sort of sexual function such as a pheromone-producing or receiving region. This conjecture is reinforced by the presence of parallel ridges on the structure that may serve to increase the surface area of the organ. The other feature shared by species of *Metawithius* is the excavated mesal margin of the male maxilla such that the sub-oral seta is borne on a small protuberance (Fig. 5).

These two features are found in the type species of *Metawithius*, *M. murrayi*, as well as males of *M. philippinus*, *M.*

*spiniventer*, *Hyperwithius dawydoffi* Beier, 1951, *H. tonkinensis* Beier, 1951 and *Withius nepalensis* Beier, 1974, which calls into question the status of the genus *Hyperwithius*. This genus was originally distinguished from *Metawithius* by the proximally widened pedipalpal femur. Although specimens of the type species of *Hyperwithius*, *Sundowithius annamensis* Redikorzev, 1938, were not examined for this study, there is little doubt that they will have all the morphological features mentioned above. The only appreciable differences between species of *Metawithius* and *Hyperwithius* appear to be the shape of the pedipalpal femur which in species of *Hyperwithius* possess a slightly expanded basal region which is lacking in *Metawithius*. This difference is not considered sufficient to warrant the retention of separate genera and the genus *Hyperwithius* is relegated as a junior synonym of *Metawithius*, and reflects the comments of Heurtault (1986) who suggested that *Hyperwithius* should be regarded as a subgenus of *Metawithius*.

*Metawithius* includes seven species and one subspecies, *M. annamensis* (Redikorzev, 1938), *M. dawydoffi* (Beier, 1951), *M. murrayi* (Pocock, 1900), *M. nepalensis* (Beier, 1974), *M. philippinus* Beier, 1937, *M. spiniventer* Redikorzev, 1938, *M. spiniventer pauper* Beier, 1953 and *M. tonkinensis* (Beier, 1951). The other species that have been previously attributed to *Metawithius* are treated below under the genus *Microwithius* and the genus *Withius*.

*Metawithius murrayi* (Pocock, 1900)

Figs. 1–13

*Chelifer murrayi* Pocock 1900: 156–157, plate 16 fig. 1, 1a.

**Material examined.**—*Lectotype*. AUSTRALIA: *Christmas Island*: male, North West Point [10°26'S, 105°33'E], August 1897, C.W. Andrews (BMNH 1898.10.14.8).

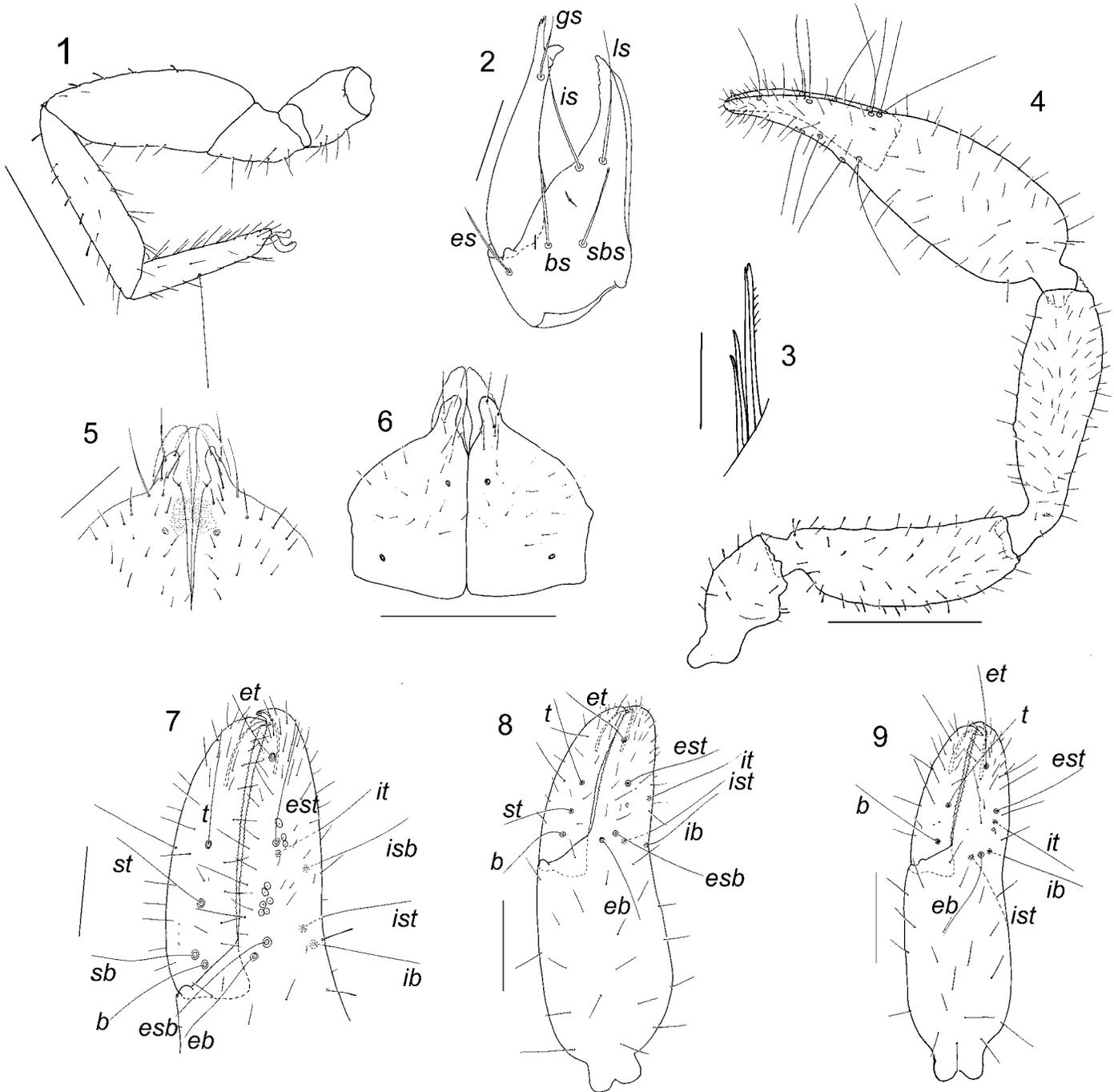
*Paralectotype*. 1 female, same data as lectotype (BMNH 1898.10.14.9).

*Other material*: AUSTRALIA: *Christmas Island*: 1 tritonymph, below Tom's Ridge Road, 1 km E. of West White Beach walking track, site 7E, 10°30'S, 105°40'E, 18 June 1990, primary rainforest, P. Green (WAM T110459). INDIA: *Andaman and Nicobar Islands*: Nicobar Islands: 1 male, Nankovry [7°59'N, 93°32'E], Galatea Expedition (ZMUC, no. 23); 1 male, 1 female, Car Nikobar [9°10'N, 92°47'E], Galatea [Expedition] (ZMUC, no. 25). INDONESIA: *Nusa Tenggara*: 1 male, 1 female, 1 deutonymph, Sui, Timor, 9°50'S, 124°29'E, 14 August 1990, D. Agosti (WAM T78680); 1 female, same data (WAM T78681); *Sumatera Barat*: 1 male, 1 tritonymph, Lac Maninjau (36 km de Bukittinggi), Lawang, à env. 5 km de Maninjau, au bord du lac, 0°20'S, 100°11'E, 21 July 1984, J. Robert (MHNG). MYANMAR: *Mandalay*: 4 males, 1 female, Maymyo [22°02'N, 96°28'E], 700–800 m, sous écorce, 12 February 1996, S. Kurbatov (MHNG).

**Diagnosis.**—*Metawithius murrayi* appears to be most similar to *M. philippinus* but differs in the reduced number of glandular setae on the male sternites.

**Description.**—*Adults*: Colour: with sclerotized portions generally dark red-brown; carapaceal metazone without paired pale spots.

*Chelicera* (Fig. 2): With 5 setae on hand, *sbs* slightly dentate, *bs* smooth; movable finger with 1 subdistal seta; galea of male with 3 very small terminal rami, of female with 1 sub-terminal

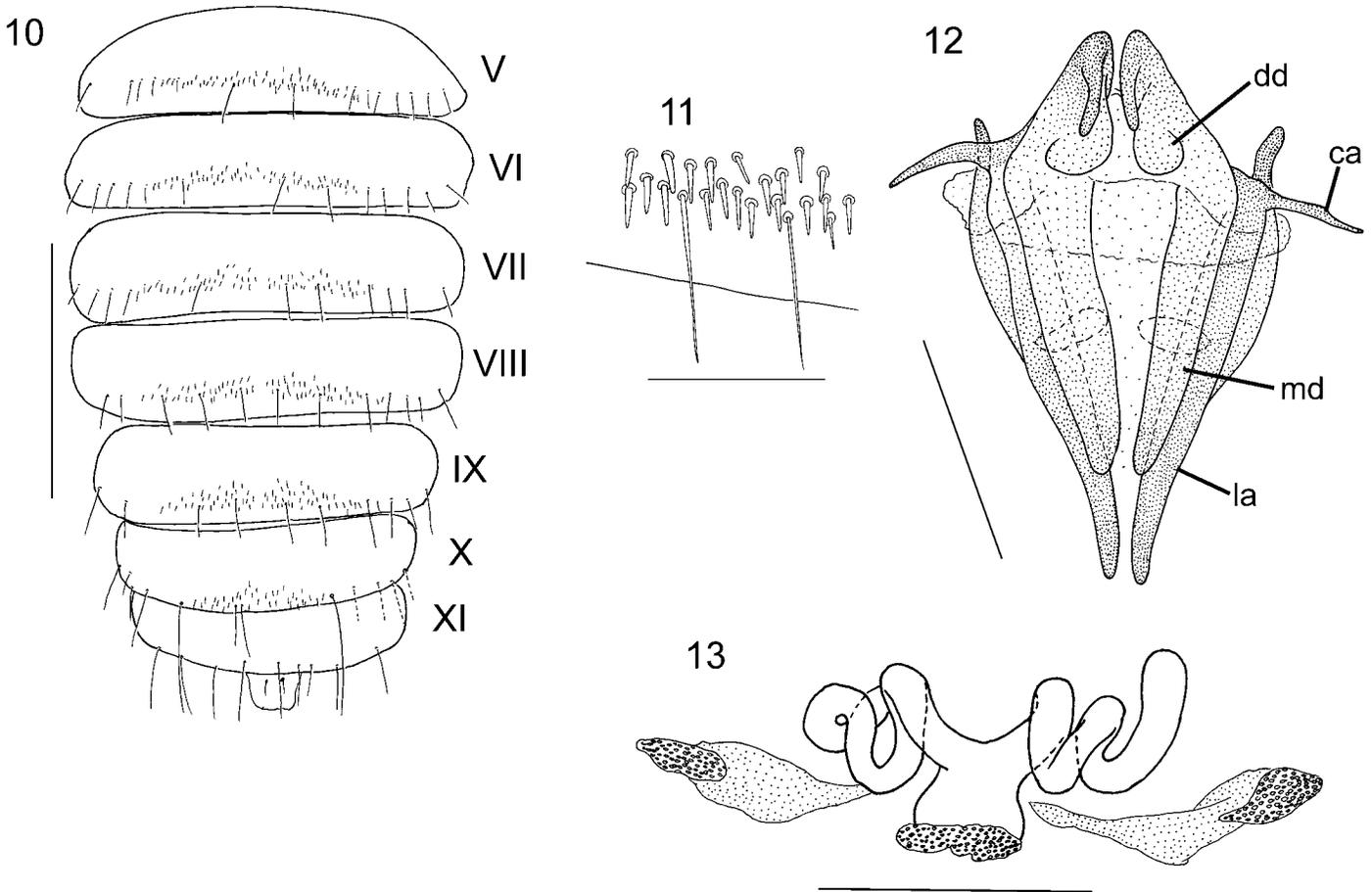


Figures 1–9.—*Metawithius murrayi* (Pocock): 1. Left leg IV, male from Timor (WAM T78680); 2. Left chelicera; 3. Rallum, male from Timor (WAM T78680); 4. Right pedipalp, dorsal, lectotype male; 5. Maxillae, male from Timor (WAM T78680); 6. Maxillae, female from Timor (WAM T78680); 7. Left chela, male from Timor (WAM T78680); 8. Left chela, tritonymph from Lac Maninjau Sumatera Barat (MHNG); 9. Left chela, deutonymph from Timor (WAM T78680). Scale lines = 0.5 mm (Figures 1, 4–6); 0.2 mm (Figures 7–9); 0.1 mm (Figure 2); 0.05 mm (Figure 3).

and 4 terminal rami; rallum of 4 blades, the most distal blade with several serrations on leading edge, other blades smooth (Fig. 3); serrula exterior with 20 (♂), 18 (♀) blades; lamina exterior present.

**Pedipalp:** Trochanter, femur and patella granulate, chela smooth; dorsal setae clavate and denticulate; trochanter 1.88 (♂), 1.84 (♀), femur 3.25 (♂), 3.24 (♀), patella 3.53 (♂), 2.99 (♀), chela (with pedicel) 3.57 (♂), 3.17 (♀), chela (without

pedicel) 3.35 (♂), 3.00 (♀), hand 1.97 (♂), 1.86 (♀) x longer than broad, movable finger 0.74 (♂), 0.69 (♀) x longer than hand. Femur of male with basal region not expanded (Fig. 4). Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 7): *eb* and *esb* situated basally; trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger; *b* and *sb* situated near one another; *st* slightly closer to *sb* than to *t*. Venom apparatus present in both chelal fingers, venom ducts



Figures 10–13.—*Metawithius murrayi* (Pocock), lectotype male unless stated otherwise: 10. Abdominal segments V–XII, ventral; 11. Glandular setae, sternite VII, left hemi-sternite; 12. Male genitalia, ventral, male from Timor (WAM T78680); 13. *Metawithius* sp. from Maymyo, Myanmar (MHNG), female, genitalia, ventral. Scale lines = 0.5 mm (Figure 10); 0.2 mm (Figures 12, 13); 0.1 mm (Figure 11).

long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. External margin of fixed finger with 6 sense-spots situated midway between *esb* and *est*, and with 3 near *est*; external margin of movable finger with three sense-spots situated between *sb* and *st*, within a common sulcus. Chelal teeth rounded; fixed finger with 37 (♂), 41 (♀) teeth; movable finger with 42 (♂), 45 (♀) teeth; accessory teeth absent.

**Carapace:** 1.24 (♂), 1.23 (♀) x longer than broad; lateral margins strongly convex, not posteriorly widened; with 2 non-corneate eyes; with ca. 71 (♂), 78 (♀) setae, including 4 (♂, ♀) near anterior margin and 9 (♂), 8 (♀) near posterior margin; with 2 furrows, with distinct anterior furrow and indistinct posterior furrow; posterior furrow slightly closer to posterior carapaceal margin than to median furrow.

**Coxal region:** Coxal chaetotaxy: ♂, 12: 10: 12: 23, ♀, 12: 12: 10: 25; maxilla with 2 apical setae and 1 very small internal, sub-oral seta (Figs. 5, 6); interno-median region of male maxilla with rugose area; sub-oral seta of male maxilla on 'hooked' mound (Fig. 5).

**Legs:** Junction between femora and patellae I and II only slightly oblique; femur + patella of leg IV 2.70 (♂), 2.66 (♀) x longer than broad; tarsal tactile seta of leg IV situated medially,

0.46 (♂), 0.51 (♀) of tarsus length (Fig. 1); subterminal tarsal setae arcuate and acute; arolium slightly shorter than claws.

**Abdomen:** Tergites and sternites with faint medial suture. Tergal chaetotaxy: male, 8: 9: 10: 10: 12: 12: 13: 12: 12: 11: 12 (including 4 tactile setae): 2; ♀, 11: 12: 13: 15: 15: 16: 16: 18: 15: 14: 10 (including 2 tactile setae): 2; mostly uniseriate but some tergites with a few setae placed anteriorly; all setae foliate. Sternal chaetotaxy: male, 13: (2) 10 (2): (2) 8 + gls 1/0 (2): 14 + 29/22 gls: 16 + 26/24 gls: 11 + 30/32 gls: 13 + 35/29 gls: 11 + 34/29 gls: 12 (including 2 tactile setae) + 17/18 gls: 13 (including 4 tactile setae): 2; ♀, 12: (3) 9 (3): (2) 11 (2): 18: 20: 20: 17 + 1/1 gls: 14 + 1/1 gls: 9 (including 2 tactile setae): 12 (including 4 tactile setae): 2; sternites IV–X of male with patches of glandular setae (Fig. 10); glandular setae ca. 26 µm in length, stout and conical (Fig. 11); sternites VIII–IX of female with glandular setae; setae uniseriate and acuminate; male without paired invaginations on anterior margins of sternites.

**Genitalia:** Male with elongated and posteriorly tapering lateral apodemes (Fig. 12); female with 2 tubes each with approximately two coils (Fig. 13), with a single median cribriform plate and a pair of lateral cribriform plates, and with triangular, sclerotised lateral apodemes (Fig. 13).

*Dimensions (mm)*: Males: lectotype, followed by other males (where applicable): body length 2.65. Pedipalps: trochanter 0.48/0.255, femur 0.86/0.265 (0.724–0.976/0.251–0.266), patella 0.935/0.265 (0.792–1.056/0.259–0.269), chela (with pedicel) 1.32/0.370 (1.107–1.411/0.328–0.410), chela (without pedicel) 1.24 (1.039–1.328), hand length 0.73 (0.776), movable finger length 0.54 (0.560). Chelicera 0.275/0.136, movable finger length 0.202. Carapace 0.872/0.704 (width at medial area); eye diameter 0.076. Leg I: tibia 0.350/0.088, tarsus 0.328/0.060. Leg IV: femur + patella 0.670/0.248, tibia 0.535/0.075, tarsus 0.400/0.071, TS 0.182.

*Female*: Paralectotype, followed by other males (where applicable): body length 3.07. Pedipalps: trochanter 0.46/0.25, femur 0.825/0.255 (0.95–1.066/0.28–0.313), patella 0.825/0.276 (0.98–1.101/0.30–0.334), chela (with pedicel) 1.33/0.42 (1.54–1.640/0.46–0.531), chela (without pedicel) 1.26 (1.48–1.557), hand length 0.78 (0.86–0.928), movable finger length 0.54 (0.66–0.648). Chelicera 0.275/0.136, movable finger length 0.202. Carapace 0.910/0.740 (width at medial area); eye diameter 0.064. Leg I: tibia 0.362/0.090, tarsus 0.336/0.063. Leg IV: femur + patella 0.665/0.250, tibia 0.560/0.121, tarsus 0.390/0.075, TS 0.200.

*Tritonymph (from Christmas Island, WAM T110459)*: Colour: pale yellow-brown, pedipalps red-brown.

*Chelicera*: With 5 setae on hand and a single seta (*gs*) on movable finger; rallum with 4 blades, the anterior blade with 4 spinules on anterior face, other blades smooth.

*Pedipalp*: Trochanter 1.85, femur 3.07, patella 2.95, chela (with pedicel) 3.56, chela (without pedicel) 3.36, hand 1.87 x longer than broad. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Fig. 8): *isb* and *sb* absent.

*Carapace*: 1.24 x longer than broad; with 2 non-corneate eyes; with ca. 60 setae, including 5 near anterior margin and 6 near posterior margin; with deep median furrow and shallow posterior furrow.

*Coxal region*: Maxilla with 2 apical setae and 1 very small internal, sub-oral seta; internal margin of pedipalpal coxa unmodified.

*Legs*: TS = 0.48.

*Abdomen*: Tergal chaetotaxy: 6: 7: 7: 10: 10: 10: 10: 10: 8: 10: 6 (arranged T4T): 2. Sternal chaetotaxy: 4: (1) 6 (1): (1) 6 (1): 11: 10: 9: 9 + 1/1 gls: 9 + 1/1 gls: 8 (arranged 2T2T2): 6 (arranged 1T2T1): 2; sternites VII–VIII each with 2 glandular setae.

*Dimensions (mm)*: Body length 1.78. Pedipalps: trochanter 0.336/0.182, femur 0.590/0.192, patella 0.598/0.203, chela (with pedicel) 0.965/0.271, chela (without pedicel) 0.911, hand length 0.508, movable finger length 0.390. Carapace 0.699/0.563.

*Deutonymph (from Timor, WAM T78680)*: Colour: pale yellow-brown, with pedipalps and carapace red-brown.

*Chelicera*: With 5 setae on hand and a single seta (*gs*) on movable finger; rallum with 4 blades, the anterior blade with 4 spinules on anterior face, other blades smooth.

*Pedipalp*: Trochanter 1.89, femur 3.14, patella 2.82, chela (with pedicel) 3.49, chela (without pedicel) 3.26, hand 1.87 x longer than broad. Fixed chelal finger with 6 trichobothria, movable chelal finger with 2 trichobothria (Fig. 9): *esb*, *isb* and *sb* and *st* absent.

*Carapace*: 1.42 x longer than broad; with 2 non-corneate eyes; with ca. 31 setae, including 4 near anterior margin and 6 near posterior margin; with 2 furrows, a shallow anterior furrow and a deep posterior furrow.

*Coxal region*: Maxilla with 2 apical setae and 1 very small internal, sub-oral seta; internal margin of pedipalpal coxa unmodified.

*Legs*: TS = 0.47.

*Abdomen*: Tergal chaetotaxy: 6: 6: 6: 6: 6: 6: 6: 6: 6: 8 (arranged T1T2T1T): 2. Sternal chaetotaxy: 0: (0) 4 (0): (2) 4 (2): 6: 6: 6: 6 + 1/1 gls: 6 + 1/1 gls: 8 (arranged 2T2T2): 8 (arranged 2T2T2): 2; sternites VIII–IX each with 2 glandular setae.

*Dimensions (mm)*: Body length 1.80. Pedipalps: trochanter 0.280/0.148, femur 0.461/0.147, patella 0.451/0.160, chela (with pedicel) 0.760/0.218, chela (without pedicel) 0.710, hand length 0.408, movable finger length 0.336. Carapace 0.664/0.468.

**Remarks.**—The syntype specimens of *M. murrayi* are in good condition and although the label reads “1898.10.14.7–9”, possibly implying that the vial contained three specimens, only two specimens are included (Judson 1997, and pers. obs.). The male is here nominated as the lectotype. *Metawithius murrayi* occurs throughout southeast Asia, including Christmas Island, Nicobar Islands, Myanmar, Sumatra and Timor.

*Metawithius annamensis* (Redikorzev, 1938), comb. nov.

*Sundowithius annamensis* Redikorzev 1938:101–103, figs. 29–31.

**Type material.**—*Holotype*. VIETNAM: *Quảng Nam*: male, Mount Ba Na (as Bana), near Da Nang (Tourane) [16°04'N, 108°13'E], 1400 m, 28 September 1931, forêt tropicale, C. Dawydoff (MNHN, not examined).

**Remarks.**—Redikorzev (1938) described this species from a single male collected in Vietnam, but no other specimens have been identified. Although no specimens were examined for this study, the original description by Redikorzev (1938) depicts a withiid with very similar characteristics to *H. dawydoffi* and *H. tonkinensis*, and it is clear that it is a species of *Metawithius*.

*Metawithius dawydoffi* (Beier, 1951), comb. nov.

Fig. 14

*Hyperwithius dawydoffi* Beier 1951: 102–104, figs. 34a, 35.

**Material examined.**—*Syntypes*: **Vietnam**: *Lam Dong*: 4 males, Cao Nguyen Lâm Vien (as Plateau von Langbian) [12°00'N, 108°25'E], 1938–1939, C. Dawydoff (NHMW).

**Remarks.**—*Hyperwithius dawydoffi* was described from five males from “Plateau von Langbian”, Vietnam by Beier (1951), of which four were available for this study. As these males possess all the characteristics of *Metawithius*, including the internal patch of rugose cuticle and pre-oral seta on a hooked mound (Fig. 14), it is transferred to that genus.

*Metawithius nepalensis* (Beier, 1974), comb. nov.

*Withius nepalensis* Beier, 1974: 277–278, fig. 11.

**Material examined.**—*Holotype*: **NEPAL**: *Central*: Daman, Mahabarat region [27°41'N, 85°07'E], under bark of *Rhododendron arboreum*, February 1970, J. Martens (SMF 28969).

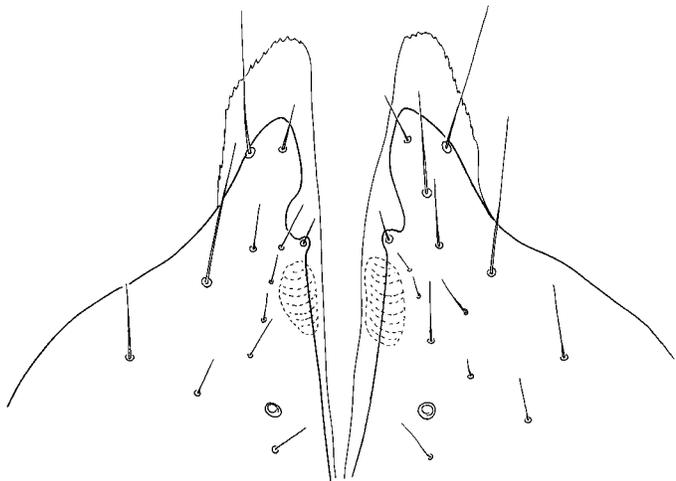


Figure 14.—*Metawithius dawydoffi* (Beier), syntype male, maxillae, ventral. Scale line = 0.2 mm.

*Allotype*: NEPAL: *Central*: 1 female, collected with holotype (SMF 28970).

**Remarks.**—The male holotype of *W. nepalensis* from central Nepal has all the characteristics of *Metawithius*, including the internal patch of rugose cuticle and pre-oral seta on a hooked mound, it is transferred to that genus.

*Metawithius philippinus* Beier, 1937

*Metawithius philippinus* Beier 1937:274–275, fig. 5.

**Material examined.**—*Holotype*. PHILIPPINES: *Bataan*: female, Luzon Island, Limay [14°34'N, 120°36'E], 30 July 1915, S. Böttcher, V. Heyne (ZMB 31879).

*Paratypes*. PHILIPPINES: *Bataan*: 2 males, 4 females, Luzon Island, Limay [14°34'N, 120°36'E], March 1914, S. Böttcher, V. Heyne (ZMB 31880); *Lanao del Norte*: 3 females, Mindanao Island, Balo-i (as Mommangan) [8°07'N, 124°14'E], 23 February 1915, S. Böttcher, V. Heyne (ZMB 31882); North Luzon Island: *Ilocos Norte*: 2 females, Prov. Bangui [18°28'N, 120°45'E], January 1918, S. Böttcher, V. Heyne (ZMB 31881).

**Remarks.**—*Metawithius philippinus* was described from the Philippines by Beier (1937a). Males possess all the characteristics of *Metawithius*, and it is retained in that genus.

*Metawithius spiniventer* Redikorzev, 1938

*Metawithius spiniventer* Redikorzev 1938:103–106, figs. 32–34.

**Material examined.**—MALAYSIA: *Pahang*: 1 male, Kampung Kuala Terla, Telom Valley, Cameron Highlands [4 32'N, 101 25'E], ca. 4500 feet elevation, March 1935, M.W.F. Tweedie (NHMW). VIETNAM: *Lam Dong*: 3 males, 10 females, 6 nymphs, Cao Nguyen Lam Vien (as Plateau von Langbian) [12°00'N, 108°25'E], 1938–1939, C. Dawydoff (NHMW).

**Remarks.**—Redikorzev (1938) described this species from three collections from Vietnam and Cambodia, and further specimens have been reported from Vietnam (Beier 1951, 1967), Malaysia (Beier 1955b) and Thailand (Beier 1967;

Schawaller 1994). Males possess all the characteristics of *Metawithius*, and it is retained in that genus.

*Metawithius spiniventer pauper* Beier, 1953

*Metawithius spiniventer pauper* Beier 1953:86, fig. 5.

**Material examined.**—*Syntypes*. INDONESIA: *Nusa Tenggara Timur*: 1 male, 4 females, Langgai, Sumba [10°03'S, 120°27'E], “unter Rinde eines Baum stumpfes beim Seelein Pakaba Mata”, 10 July 1949, Bühler, Sutter (NHMB).

**Remarks.**—Beier (1953a) described *Metawithius spiniventer pauper* from a male and six females from Sumba. The male possess all the characteristics of *Metawithius*, including the internal patches of rugose cuticle on the maxilla, and the taxon is retained in *Metawithius*. Beier (1953a) separated this taxon from the nominate subspecies, *M. spiniventer spiniventer*, by its smaller size. However, its status is uncertain as he did not compare it with other similar taxa, including *M. murrayi* and *M. philippinus*. It was not possible during this study to resolve the status of this taxon, which is here retained as a subspecies of *M. spiniventer* until more detailed work can be undertaken on the species of *Metawithius*.

*Metawithius tonkinensis* (Beier, 1951), comb. nov.

*Hyperwithius tonkinensis* Beier 1951:100–102, figs. 33, 34b.

**Material examined.**—*Syntypes*. VIETNAM: *Lai Chau*: 1 male, 1 female, 2 protonymphs, Lai Chau [22°04'N, 103°10'E], June 1939, C. Dawydoff (NHMW).

**Remarks.**—The syntypes of *Hyperwithius tonkinensis* have the morphological features found in *Metawithius*, including the internal patches of rugose cuticle on the maxilla. It is therefore transferred to *Metawithius*.

Genus *Rugowithius* gen. nov.

<http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:BEA73C4B-6AEE-46DC-8387-4A62967CB58E>

**Type species.**—*Rugowithius bulbosus* sp. nov.

**Diagnosis.**—The genus *Rugowithius* differs from all other withiids by the presence of a small patch of rugose cuticle on the external surface slightly posterior to the median maxillary lyrifissure in males (Figs. 16, 17), the bulbous, hypertrophied postero-basal portion of the male pedipalpal femur (Figs. 18, 19, 24, 33), and the expanded tips of the sternal glandular setae (Fig. 21). It strongly resembles *Metawithius* in the presence of a patch of rugose cuticle on the maxilla, but in *Metawithius* the patch is situated internally (Fig. 5). It further differs from *Metawithius* by the glandular setae of males being present on sternites VI–IX (on IV–X, and occasionally XI, in *Metawithius*), and the spermathecal receptacula of females being not coiled (coiled in *Metawithius*) (Fig. 32).

**Description.**—*Setae*: most dorsal setae strongly clavate and denticulate; setae on sternites acicular.

*Chelicera* (Fig. 25): With 5 setae on hand, *bs* and *sbs* slightly denticulate, others acuminate; movable finger with 1 subdistal seta; rallum of 4 blades, the most distal blade with several serrations on leading edge, other blades smooth (Fig. 26); lamina exterior present.

*Pedipalps*: Sexually dimorphic with that of males longer than females (Figs. 23, 24, 33, 34, 37); femur of male with

hypertrophied base (Figs. 18, 19, 24, 33). Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Figs. 29, 35); trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. Chelal teeth all closely spaced; accessory teeth absent.

**Carapace** (Fig. 22): With 2 non-corneate eyes; with 2 furrows, anterior furrow distinct, posterior furrow indistinct; posterior furrow closer to posterior margin of carapace than to anterior furrow.

**Coxal region:** Median maxillary lyrifissure present and sub-medially situated; medial margin of maxilla not 'hooked' (Fig. 16); males with medial margin concave and with distinct patch of ridged cuticle on external surface posterior to median maxillary lyrifissure (Fig. 17).

**Legs:** Junction between femora and patellae I and II only slightly oblique (Fig. 27); tactile seta of posterior legs sub-medial (Fig. 28); subterminal tarsal setae arcuate and acute; arolium slightly shorter than claws; claws slender and simple.

**Abdomen:** Tergites I–X with medial suture, sternites VI–IX with faint medial suture. Male tergites without lateral keels. Males without paired sac-like invaginations on anterior margins of sternites; males with patches of glandular setae on sternites VI–IX (Fig. 20), females with 2 glandular setae on segments VIII–IX; glandular setae of male long and distally spatulate (Fig. 21). Spiracular helix present. Pleural membrane longitudinally striate and somewhat wrinkled.

**Genitalia:** Male with elongated and posteriorly rounded lateral apodemes (Fig. 31); female with T-shaped spermathecae, each receptaculum not coiled (Figs. 32, 36).

**Remarks.**—*Rugowithius* is the first indigenous withiid genus recorded from mainland Australia, with only the introduced, synanthropic *Withius piger* previously known (Beier 1966b, as *Withius subrubus* (Simon)). The genus appears to be restricted to northern Australia where it inhabits tropical forests.

**Etymology.**—The generic name refers to the corrugated patch of cuticle on the male maxillae (*ruga*, Latin, crease, wrinkle) (Brown 1956) combined with the generic name *Withius* which is derived from the eminent Danish pseudoscorpionologist Carl Johannes With (1877–1923) who first noticed and illustrated the remarkable maxillary feature discussed in this paper. It is masculine in gender.

***Rugowithius bulbosus* sp. nov.**

<http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:35051601-547A-4EA4-B787-990FF483D3F0>

Figs. 15–32

**Material examined.**—*Holotype.* AUSTRALIA: *Northern Territory:* holotype male, Manggarre Rainforest, Cahills Crossing, banks of East Alligator River, Kakadu National Park, 12°25'30"S, 132°58'00"E, under *Ficus* bark, 29 May 1992, M.S. Harvey, J.M. Waldock (MAGNT).

*Paratypes.* AUSTRALIA: *Northern Territory:* 8 males, 3 female, 1 tritonymph, same data as holotype (WAM T78992–T79003); 1 male, 1 female, same data as holotype (MAGNT); 1 male, same data as holotype (CAS); 1 male, same data as holotype (QM S90005).

*Other material.* AUSTRALIA: *Northern Territory:* 1 male, Batchelor [13°02'S, 131°01'E], 10 July 1914, G.F. Hill (NMV).



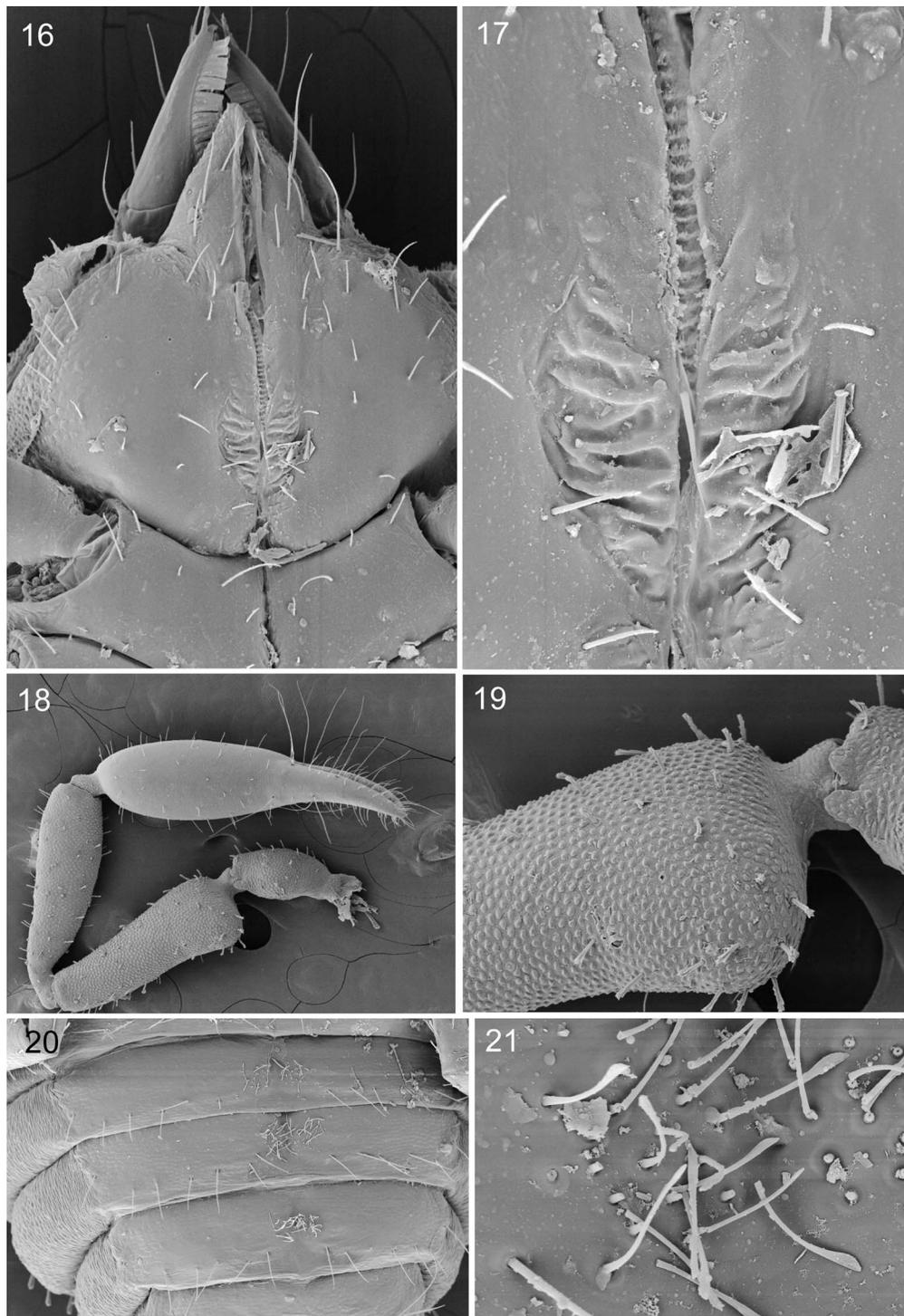
Figure 15.—*Rugowithius bulbosus* sp. nov., paratype male, dorsal.

**Diagnosis.**—Males of *Rugowithius bulbosus* are slightly smaller than *R. longissimus*, e.g. chela (with pedicel) 0.944–1.115 mm in length, the pedipalpal patella is less slender, 3.77–4.43 × longer than broad, and there are fewer glandular setae on male sternites IV–IX, i.e. 29: 46: 50: 38. Females appear to be indistinguishable from those of *R. longissimus*.

**Description.**—*Adults:* Colour (Fig. 15): with sclerotized portions generally dark red-brown; carapaceal metazone without paired pale spots.

*Chelicera* (Fig. 25): With 5 setae on hand, *bs* and *sbs* slightly dentate; movable finger with 1 subdistal seta; galea of male with 2 or 3 small terminal rami, of female with ca. 6 small terminal rami; rallum of 4 blades, the most distal blade with several serrations on leading edge, other blades smooth (Fig. 26); serula exterior with 16 (♂), 17 (♀) blades; lamina exterior present.

*Pedipalp* (Figs. 23, 24): Trochanter, femur and patella granulate, chela completely smooth; dorsal setae clavate and denticulate; trochanter 1.76–1.94 (♂), 1.86–2.00 (♀), femur 2.64–2.83 (♂), 3.26–3.61 (♀), patella 3.77–4.43 (♂), 2.65–3.29 (♀), chela (with pedicel) 3.60–3.96 (♂), 2.97–3.05 (♀), chela (without pedicel) 3.36–3.71 (♂), 2.75–2.85 (♀), hand 1.95–2.25 (♂), 1.67–1.71 (♀) × longer than broad, movable finger 0.66–0.76 (♂), 0.61–0.74 (♀) × longer than hand. Femur of male with basal region greatly expanded (Fig. 24). Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 29): *eb* and *esb* situated basally; trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger; *b* and *sb* situated near one another; *st* slightly closer to *t* than to *sb*. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. External margin of fixed finger with 2 sense-spots situated slightly anterior to *esb*; external margin of movable finger with three sense-spots, two slightly anterior to *sb*, and



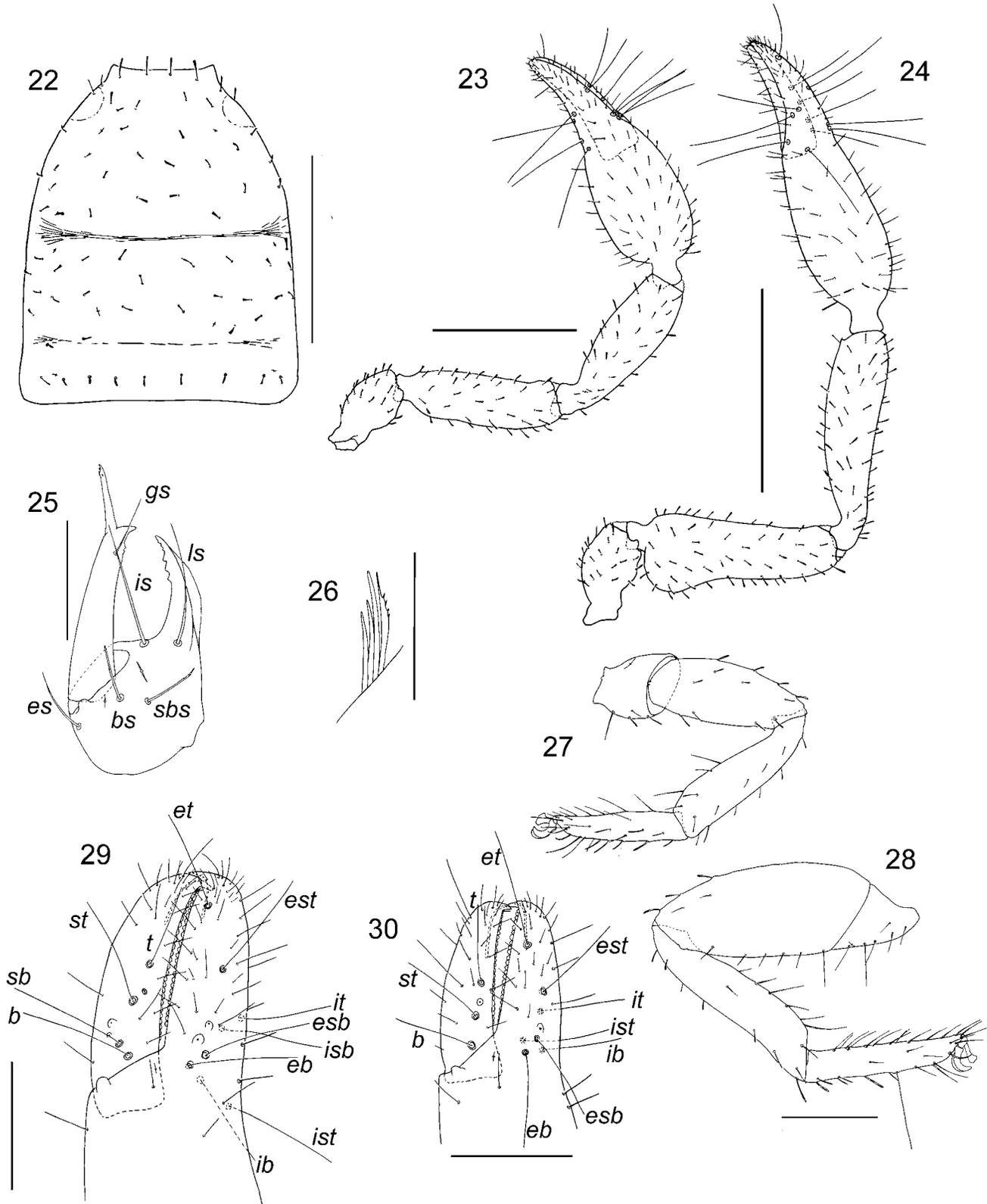
Figures 16–21.—*Rugowithius bulbosus* sp. nov., paratype male, scanning electron micrographs: 16. Maxillae; 17. Detail of central area showing rugose region; 18. Left pedipalp, dorsal; 19. Detail of base of pedipalpal femur; 20. Posterior sternites, ventral; 21. Detail of glandular setae.

the other slightly anterior to *st*. Chelal teeth rounded; fixed finger with 30 (♂), 26 (♀) teeth; movable finger with 29 (♂), 28 (♀) teeth; accessory teeth absent.

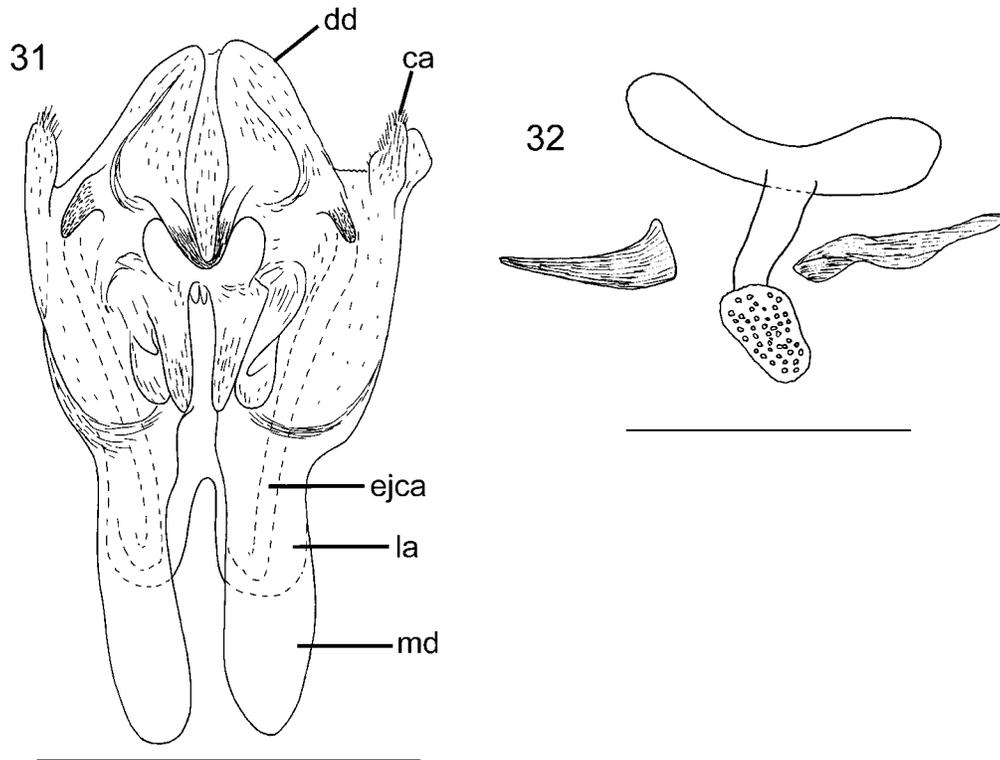
*Carapace* (Fig. 22): 1.21–1.30 (♂), 1.27–1.28 (♀) x longer than broad; lateral margins slightly convex, not posteriorly widened; with 2 non-corneate eyes; with *ca.* 79 (♂), 75 (♀) setae, including 6 near anterior margin and 9 (♂), 11 (♀) near

posterior margin; with 2 furrows, with distinct anterior furrow and indistinct posterior furrow; posterior furrow slightly closer to posterior carapaceal margin than to median furrow.

*Coxal region*: Maxilla with 2 apical setae and 1 very small internal, sub-oral seta (Fig. 16); externo-median region of male maxilla with patch of rugose cuticle (Fig. 17), females without patch; chaetotaxy of coxae I–IV: ♂, 11: 9: 7: 17, ♀, 11: 7: 6: 15.



Figures 22–30.—*Rugowitzius bulbosus* sp. nov., holotype male unless stated otherwise: 22. Carapace, dorsal; 23. Right pedipalp, dorsal, paratype female (WAM T79000); 24. Right pedipalp, dorsal; 25. Left chelicera, paratype female (WAM T79000); 26. Rallum; 27. Left leg I; 28. Left leg IV; 29. Left chela, lateral; 30. Left chela, lateral, paratype tritonymph (WAM T79003). Scale lines = 0.5 mm (Figures 23, 24), 0.2 mm (Figures 22, 27, 28, 30), 0.1 mm (Figures 29, 25, 26).



Figures 31–32.—*Rugowithius bulbosus* sp. nov.: 31. Genitalia, dorsal, holotype male; 32. Genitalia, ventral, paratype female (WAM T79000). Scale lines = 0.2 mm (Figure 31), 0.02 mm (Figure 32).

*Legs* (Figs. 27, 28): Junction between femora and patellae I and II only slightly oblique; femur + patella of leg IV 2.78 (♂), 3.04 (♀) x longer than broad; tarsal tactile seta of leg IV situated sub-medially (Fig. 28), 0.58 (♂), 0.63 (♀) of tarsus length; subterminal tarsal setae arcuate and acute; arolium slightly shorter than claws.

*Abdomen*: Tergites and sternites with faint medial suture. Tergal chaetotaxy: ♂, 11: 11: 10: 12: 16: 15: 17: 15: 17: 13: 12 (including 2 tactile setae): 2; ♀, 9: 13: 11: 14: 17: 18: 14: 17: 14: 14: 11 (including 2 tactile setae): 2; mostly uniseriate but some tergites with a few setae placed anteriorly; all setae foliate. Sternal chaetotaxy: ♂, 7: (1) 9 (1): (1) 10 (1): 17: 20 + ca. 29 gls: 17 + ca. 46 gls: 15 + ca. 50 gls: 13 + ca. 38 gls: 12 (including 2 tactile setae): 12 (including 4 tactile setae): 2; ♀, 15: (1) 9 (1): (2) 12 (2): 14: 18: 17: 16 + 1/1 gls: 16 + 1/1 gls: 12 (including 2 tactile setae): 12 (including 4 tactile setae): 2; sternites VI–IX of male with patches of glandular setae (Fig. 20); sternites VIII–IX of female with 2 glandular setae; setae uniseriate and acuminate, except for smaller setae on sternite XI which are denticulate; glandular setae of male, long and distally spatulate (Fig. 21); male without paired invaginations on anterior margins of sternites.

*Genitalia*: Male with elongated and posteriorly rounded lateral apodemes (Fig. 31); female with T-shaped spermathecae (Fig. 32), receptacula not coiled and with large central cribriform plate and a pair of large triangular apodemes.

*Dimensions* (mm): Males: holotype followed by other males (where applicable): body length 2.00 (1.95–2.08). Pedipalps: trochanter 0.365/0.188 (0.304–0.371/0.173–0.191), femur 0.763/0.281 (0.627–0.797/0.225–0.282), patella 0.824/0.193 (0.678–0.864/0.174–0.195), chela (with pedicel) 1.104/0.290

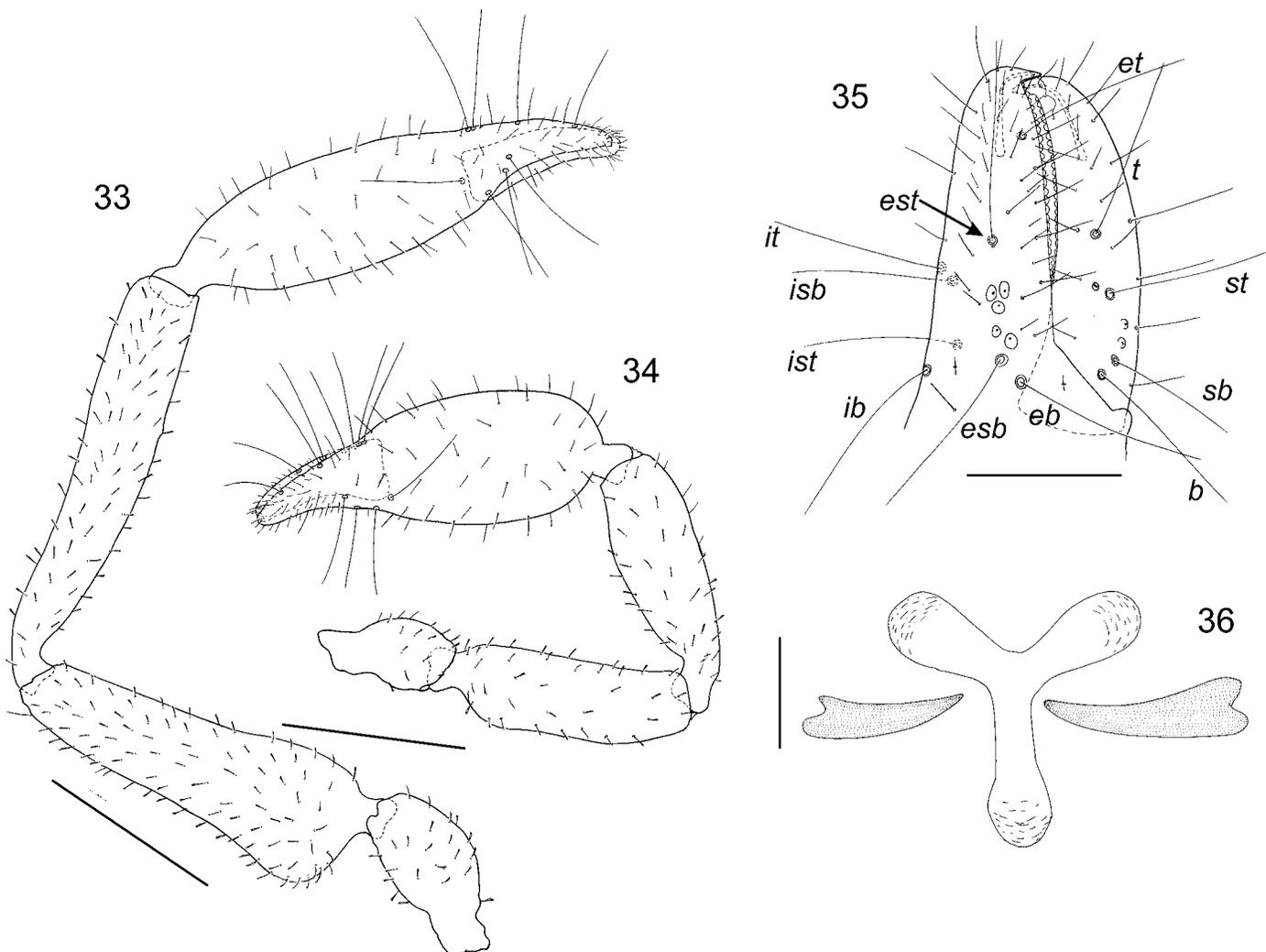
(0.944–1.115/0.262–0.288), chela (without pedicel) 1.024 (0.880–1.024), hand length 0.592 (0.512–0.624), movable finger length 0.448 (0.369–0.410). Chelicera 0.216/0.120, movable finger length 0.163. Carapace 0.739/0.569 (0.646–0.659/0.499–0.536) (width at medial area); eye diameter 0.045. Leg I: femur 0.181/0.128, patella 0.327/0.129, tibia 0.344/0.094, tarsus 0.252/0.061. Leg IV: femur + patella 0.550/0.198, tibia 0.447/0.102, tarsus 0.339/0.065, TS 0.195.

*Females*: Paratype (WAM T79000) followed by other females (where applicable): body length 2.61 (1.60–2.91). Pedipalps: trochanter 0.326/0.175 (0.310–0.376/0.165–0.195), femur 0.621/0.172 (0.584–0.700/0.179–0.211), patella 0.627/0.192 (0.538–0.756/0.198–0.230), chela (with pedicel) 0.928/0.304 (0.930–1.109/0.311–0.364), chela (without pedicel) 0.866 (0.860–1.038), hand length 0.513 (0.518–0.621), movable finger length 0.378 (0.322–0.410). Chelicera 0.218/0.119, movable finger length 0.166. Carapace 0.691/0.540 (0.662–0.774/0.522–0.530) (width at medial area); eye diameter 0.080. Leg I: femur 0.138/0.115, patella 0.279/0.110, tibia 0.269/0.072, tarsus 0.280/0.052. Leg IV: femur + patella 0.526/0.173, tibia 0.428/0.090, tarsus 0.335/0.064, TS 0.211.

*Tritonymph* (WAM T79003): Colour: paler than adults.

*Chelicera*: With 5 setae on hand and a single seta (*gs*) on movable finger; rallum with 4 blades, the anterior blade with 4 spinules on anterior face, other blades smooth.

*Pedipalp*: Trochanter 2.05, femur 3.07, patella 2.88, chela (with pedicel) 3.01, chela (without pedicel) 2.84, hand 1.59 x longer than broad. Fixed chelal finger with 7 trichobothria, movable chelal finger with 3 trichobothria (Fig. 30); *isb* and *sb* absent.



Figures 33–36.—*Rugowithius longissimus* sp. nov., holotype male unless stated otherwise: 33. Left pedipalp, dorsal; 34. Right pedipalp, dorsal, paratype female; 35. Left chela, lateral; 36. Spermathecae, ventral, paratype female. Scale lines = 0.5 mm (Figures 33, 34), 0.2 mm (Figure 35), 0.02 mm (Figure 36).

**Carapace:** 1.22 x longer than broad; with 2 non-corneate eyes; with ca. 45 setae, including 6 near anterior margin and 8 near posterior margin; with 1 furrow, the posterior furrow apparently absent.

**Legs:** TS = 0.52.

**Abdomen:** Tergal chaetotaxy: 6: 6: 8: 10: 10: 10: 10: 10: 9: 10 (including 4 tactile setae): 2. Sternal chaetotaxy: 4: (1) 4 (1): (2) 4 (2): 10: 9: 10 + 1/1 gls: 11 + 1/1gls: 9: 9 (including 2 tactile setae): 8 (including 4 tactile setae): 2; sternites VII–VIII each with 2 glandular setae.

**Dimensions (mm):** Body length 1.71. Pedipalps: trochanter 0.262/0.128, femur 0.454/0.148, patella 0.444/0.154, chela (with pedicel) 0.674/0.224, chela (without pedicel) 0.636, hand length 0.357, movable finger length 0.275. Carapace 0.499/0.410.

**Remarks.**—*Rugowithius bulbosus* is known only from two localities in the Northern Territory. The type specimens were taken from a small patch of rainforest on the edge of the East Alligator River where they were found under small pieces of tight-fitting bark of a fig tree (*Ficus* sp). Searches for this

species in other rainforest patches in the Northern Territory has failed to uncover any further specimens of *R. bulbosus*, suggesting that this species may represent a short-range endemic species (Harvey 2002).

**Etymology.**—The specific epithet refers to the swollen basal region of the pedipalpal femur (*bulbosus*, Latin, swollen).

***Rugowithius longissimus* sp. nov.**

<http://zoobank.org/?lsid=urn:lsid:zoobank.org:act:C50F379B-EE51-4673-9EF8-CBE43F8E2037>

Figs. 33–36

**Material examined.**—*Holotype.* AUSTRALIA: *Queensland:* male, 20 km N. of Cape Tribulation, 15°54'S, 145°29'E, 200 m, logs, 2 December 1990, Monteith, Sheridan and Thompson (QM S27199).

*Paratypes.* AUSTRALIA: *Queensland:* 1 male, same data as holotype (QM S90006); 1 female, Home Rule, Wallaby Creek, 15°45'S, 145°18'E, beating, 13 November 1974, V.E. Davies, K. McDonald (QM S27201).

**Diagnosis.**—Males of *Rugowithius longissimus* are slightly larger than those of *R. bulbosus*, e.g., chela (with pedicel) 1.189–1.344 mm in length (Fig. 37), the pedipalpal patella is more slender, 4.92–5.60 x longer than broad, and there are more glandular setae on male sternites IV–IX, i.e. 52: 61: 68: 58. Females appear to be indistinguishable from those of *R. bulbosus*.

**Description.**—*Adults*: Colour: dark red-brown; carapaceal uniformly coloured.

*Chelicera*: With 5 setae on hand, *bs* and *sbs* slightly dentate; movable finger with 1 subdistal seta; galea of male with 2 or 3 small terminal rami, that of female with 6 small terminal rami; rallum of 4 blades, the most distal blade with several serrations on leading edge, other blades smooth; serrula exterior with 17 (♂), 19 (♀) blades; lamina exterior present.

*Pedipalp* (Figs. 33, 34): Trochanter, femur and patella granulate, chela smooth; dorsal setae clavate and denticulate; trochanter 1.94–2.08 (♂), 1.97 (♀), femur 2.77–3.00 (♂), 3.44 (♀), patella 4.92–5.60 (♂), 3.18 (♀), chela (with pedicel) 3.77–4.20 (♂), 2.83 (♀), chela (without pedicel) 3.50–3.89 (♂), 2.64 (♀), hand 2.25–2.61 (♂), 1.72 (♀) x longer than broad, movable finger 0.53 (♂), 0.54 (♀) x longer than hand. Femur of male with basal region greatly expanded (Fig. 33). Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria (Fig. 35): *eb* and *esb* situated basally; trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger; *b* and *sb* situated near one another; *st* midway between *t* and *sb*. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. External margin of fixed finger with 5 (♂), 4 (♀) sense-spots situated between *esb* and *est*; external margin of movable finger with 2 sense-spots situated between *sb* and *st*, and 1 situated adjacent to *st*. Chelal teeth rounded; fixed finger with 27 (♂), 22 (♀) teeth; movable finger with 26 (♂), 25 (♀) teeth; accessory teeth absent.

*Carapace*: 1.19–1.29 (♂), 1.25 (♀) x longer than broad; lateral margins slightly convex, not posteriorly widened; with 2 non-corneate eyes; with ca. 75 (♂), 63 (♀) setae, including 4 near anterior margin and 9 near posterior margin; with 1 furrow situated medially, posterior furrow absent.

*Coxal region*: pedipalpal coxa with 2 apical setae and 1 very small internal, sub-oral seta, externo-median region of male maxilla with rugose area; chaetotaxy of coxae I–IV: ♂, 10: 7: 8: 21; ♀, 11: 7: 7: 17.

*Legs*: Junction between femora and patellae I and II only slightly oblique; femur + patella of leg IV 2.93 (♂), 2.80 (♀) x longer than broad; tarsal tactile seta of leg IV situated sub-medially, 0.63 (♂), 0.61 (♀) of tarsus length; subterminal tarsal setae arcuate and acute; arolium slightly shorter than claws.

*Abdomen*: Tergites and sternites with faint medial suture. Tergal chaetotaxy: ♂, 11: 12: 10: 14: 17: 18: 17: 18: 14: 14: 10 (including 2 tactile setae): 2; ♀, 12: 11: 11: 16: 18: 17: 17: 17: 16: 14: 4 (arranged T2T): 2; mostly uniseriate but some tergites with a few setae placed anteriorly; all setae foliate. Sternal chaetotaxy: ♂, 9: (1) 10 (1): (2) 12 (2): 18: 28 + ca. 27/25 gls: 17 + ca. 32/29 gls: 14 + ca. 33/35 gls: 14 + ca. 29/29 gls: 15 (including 2 tactile setae): 16 (including 4 tactile setae): 2; ♀, 10: (1) 9 (1): (2) 15 (2): 18: 17: 17: 18: 17: 14 (including 2 tactile setae): 11 (including 4 tactile setae): 2; sternites VI–IX of male with patches of glandular setae, those on paratype male

arranged ca. 27/23: ca. 31/28: ca. 27/33: ca. 29/29, respectively; sternites VII–VIII of female without glandular setae; setae uniseriate and acuminate; glandular setae long and distally spatulate; male without paired invaginations on anterior margins of sternites.

*Genitalia*: Male with elongated and posteriorly rounded lateral apodemes; female with T-shaped spermathecae (Fig. 36), receptacula not coiled, with a pair of large triangular apodemes.

*Dimensions (mm)*: Males: holotype followed by paratype (where applicable): body length 2.85 (2.50). Pedipalps: trochanter 0.493/0.237 (0.422/0.218), femur 1.056/0.352 (0.883/0.319), patella 1.187/0.212 (1.024/0.208), chela (with pedicel) 1.344/0.320 (1.189/0.315), chela (without pedicel) 1.245 (1.102), hand length 0.834 (0.710), movable finger length 0.442 (0.378). Chelicera 0.256/0.138, movable finger length 0.186. Carapace 0.816/0.685 (0.754/0.584); eye diameter 0.083. Leg I: femur 0.179/0.166, patella 0.365/0.165, tibia 0.400/0.108, tarsus 0.316/0.069. Leg IV: femur + patella 0.672/0.229, tibia 0.522/0.128, tarsus 0.397/0.071, TS 0.250.

*Female*: Paratype: body length 2.24. Pedipalps: trochanter 0.359/0.182, femur 0.725/0.211, patella 0.726/0.228, chela (with pedicel) 1.024/0.362, chela (without pedicel) 0.954, hand length 0.623, movable finger length 0.339. Chelicera 0.219/0.122, movable finger length 0.181. Carapace 0.768/0.614; eye diameter 0.075. Leg I: femur 0.185/0.146, patella 0.334/0.154, tibia 0.310/0.096, tarsus 0.266/0.058. Leg IV: femur + patella 0.566/0.202, tibia 0.467/0.109, tarsus 0.358/0.069, TS 0.218.

**Remarks.**—*Rugowithius longissimus* is only known from two localities in north-eastern Queensland, each of which is dominated by rainforest habitats.

**Etymology.**—The specific epithet refers to the large size of this species in comparison with *R. bulbosus* (*longissimus*, Latin, longest).

*Microwithius* Redikorzev, 1938

*Microwithius* Redikorzev 1938:106.

**Type species.**—*Microwithius yurii* Redikorzev, 1938, by monotypy.

**Diagnosis.**—Males of *Microwithius* differ from all other genera of Withiidae by the presence of two discrete rounded patches of glandular setae on either side of the mid-line of sternites VII, VIII and IX (Harvey 1988, fig. 84).

**Description.**—Setae: most dorsal setae strongly clavate and denticulate; setae on sternites acicular.

*Chelicera*: With 5 setae on hand, *bs* and *sbs* denticulate, *es*, *ls* and *is* acuminate; movable finger with 1 subdistal seta (*gs*); rallum of 4 blades, the most distal blade with several serrations on leading edge, other blades smooth; lamina exterior present.

*Pedipalp*: Not sexually dimorphic; femur without hypertrophied base. Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria; trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. Chelal teeth all closely spaced; accessory teeth absent.

*Carapace*: With 2 non-corneate eyes; median furrow present, posterior furrow absent.

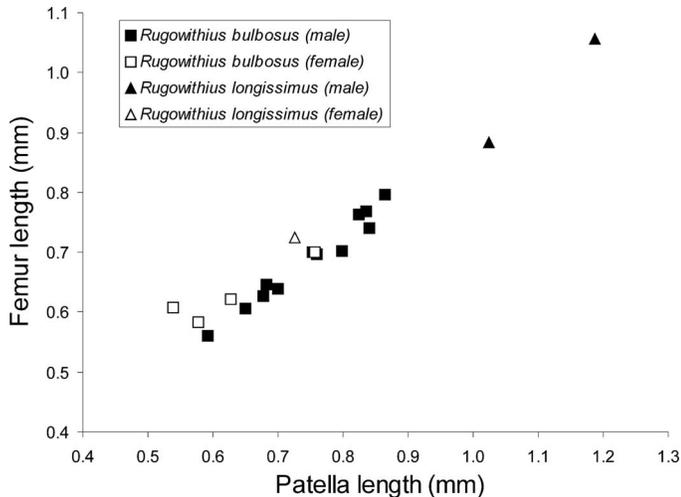


Figure 37.—Graph depicting the size of *Rugowithius bulbosus* sp. nov. and *R. longissimus* sp. nov.

**Coxal region:** Median maxillary lyrifissure present and sub-medially situated; sub-oral seta of maxilla not on 'hooked' mound; males without patch of ridged cuticle on internal margin of maxilla.

**Legs:** Junction between femora and patellae I and II only slightly oblique; tactile seta of posterior legs sub-medial; sub-terminal tarsal setae arcuate and acute; arolium slightly shorter than claws; claws slender and simple.

**Abdomen:** Tergites II–IX with medial suture, sternites V–X with faint medial suture. Male tergites without lateral keels. Males without paired sac-like invaginations on anterior margins of sternites; males with patches of glandular setae on sternites VII–IX, females with 2 glandular setae on sternites VII–IX; glandular setae of male short and conical. Spiracular helix present. Pleural membrane longitudinally striate and somewhat wrinkled.

**Genitalia:** Male genitalia with lateral apodemes long and triangular; female genitalia with 1 pair of coiled spermathecae.

**Remarks.**—The genus *Microwithius* was proposed by Redikorzev (1938) for the southeast Asian species *M. yurii* Redikorzev. Beier (1955b) added a second species, *M. tweediei*, from Malaysia and reduced *Microwithius* to a subgenus of *Metawithius*, noting that *M. tweediei* possessed intermediate character states similar to those of species of *Metawithius*. Sivaraman (1980) added two new species from India, *M. chamundiensis* Sivaraman, 1980 and *M. bulli* Sivaraman, 1980. As discussed above, males of the species here assigned to *Metawithius* possess a rugose patch on the internal surface of the maxilla, and the sub-oral seta is borne on a small hooked process on the internal maxillary margin (Fig. 5). These modifications are lacking in *Microwithius yurii* (Fig. 38), as are the features that are peculiar to members of the genus *Rugowithius*. Accordingly, *Microwithius* is here returned to full generic level as first proposed by Redikorzev (1938). The relationships of *Microwithius* to other withiid genera are uncertain and a thorough review of the Old World genera of Withiidae is necessary before any potential sister-group can be recognised.

Apart from the type species *M. yurii* from southeast Asia and Indonesia (see redescription by Harvey 1988), three Indian

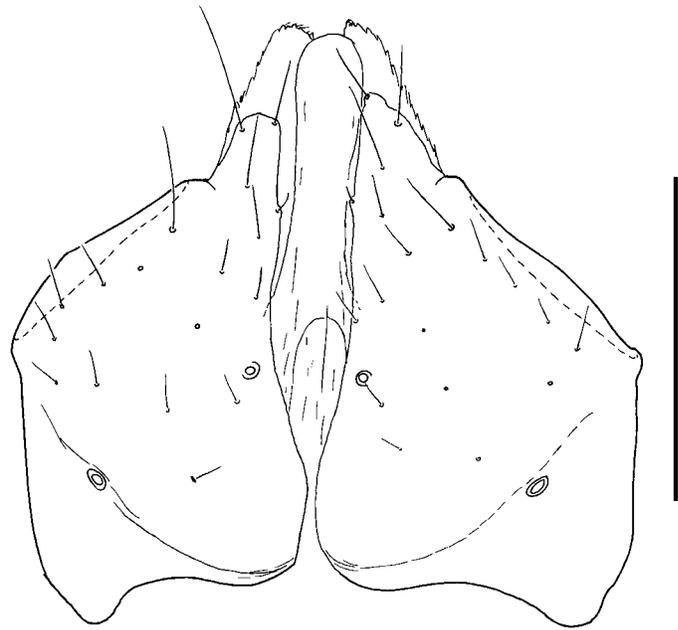


Figure 38.—*Microwithius yurii* Redikorzev, male (NMV), maxilla, ventral. Scale line = 0.2 mm.

species are here included in the genus *Microwithius*: *M. indicus* (Murthy & Ananthakrishnan, 1977), **comb. nov.** from Tamil Nadu State, and *M. chamundiensis* (Sivaraman, 1980), **comb. nov.** and *M. bulli* (Sivaraman, 1980), **comb. nov.** both from Karnataka State. These generic transfers are justified on the grounds that males have two discrete rounded patches of glandular setae on either side of the mid-line of sternites VII, VIII and IX (Murthy & Ananthakrishnan 1977; Sivaraman 1980), a pattern that conforms to that found in *M. yurii* (Harvey 1988), but differs from those found in *Metawithius* where the glandular setae are laterally dispersed and tending to merge medially (Fig. 10). These Indian species require further study to ascertain their status as the original descriptions and illustrations are inadequate to fully separate them from each other or from *M. yurii*. The only other species previously included in *Metawithius* (*Microwithius*), *M. tweediei*, does not belong in the genus *Microwithius*, and is treated below in the genus *Withius*.

*Microwithius yurii* Redikorzev, 1938

Fig. 38

*Microwithius yurii* Redikorzev 1938:106–108, figs. 35–38.

**Material examined.**—INDONESIA: *Jawa Barat*: 1 male, Krakatau Islands, Sertung, east ridge, 6°05'S, 105°23'E, 11 September 1984, beating in rainforest, 1984 Zoological Expedition Krakataus (NMV); 1 female, Krakatau Islands, Panjang, 6°05'S, 105°28'E, 25 September 1986, 1986 Zoological Expedition Krakataus (WAM T62538).

**Description.**—See Harvey (1988).

**Remarks.**—*Microwithius yurii* has been recorded from Cambodia, Indonesia and Vietnam (Redikorzev 1938; Harvey 1988). One of the four syntype male specimens of *M. yurii* from Vietnam was examined by (Harvey 1988).

Genus *Withius* Kew, 1911

*Chelifer* (*Withius*) Kew 1911:49.

*Afrowithius* Chamberlin 1931b:293. **Syn. nov.**

*Allowithius* Beier 1932b:53 (synonymized by Beier 1979: 107).

*Xenowithius* Beier 1953:75–76 (synonymized by Mahnert 1988: 65).

**Type species.**—*Withius*: *Chelifer subruber* Simon, 1879 (junior synonym of *Chelifer piger* Simon, 1878) by original designation.

*Afrowithius*: *Chelifer paradoxus* Ellingsen, 1912, by original designation.

*Allowithius*: *Chelifer* (*Chelifer*) *simoni* Balzan, 1892, by original designation.

*Xenowithius*: *Xenowithius transvaalensis* Beier, 1953, by original designation.

**Diagnosis.**—The majority of *Withius* species most closely resemble the *Aisthetowithius*, *Cryptowithius*, *Girardwithius*, *Ectromachernes*, *Juxtachelifer*, *Nannowithius*, *Stenowithius*, *Nesowithius*, *Parallowithius*, *Plesowithius*, *Pogonowithius*, *Scotowithius*, *Sphallowithius*, *Stenowithius* and *Termitowithius* as they all lack the long triangular lateral apodemes of the male genitalia. They differ from *Juxtachelifer* and *Termitowithius* by the presence of glandular setae on the abdominal sternites (absent in *Juxtachelifer* and *Termitowithius*); from *Nannowithius* by the presence of a tactile seta on tarsi III and IV (absent in *Nannowithius*); from *Girardwithius* by the straight chelal tooth rows (curved in *Girardwithius*); from *Ectromachernes* by the lack of a prolateral tubercle on the pedipalpal femur of males (present in *Cyrtowithius* and most *Ectromachernes*); from *Nesowithius* by trichobothrium *est* being equidistant between *esb* and *et* (closer to *esb* in *Nesowithius*); from *Stenowithius* by trichobothrium *it* being distal of *ist* and *est* (on same level as *ist* and *est* in *Stenowithius*); from *Aisthetowithius* by the relatively straight carapaceal furrows (sinuate in *Aisthetowithius*); from *Sphallowithius* by the pedipalps not being sexually dimorphic (male pedipalps much larger than female in *Sphallowithius*); from *Cryptowithius* and *Parallowithius* by trichobothrium *st* closer to *t* than *sb*, or midway between *t* and *sb* (*st* closer to *sb* than *t* in *Parallowithius*); and from *Pogonowithius* by the distinct submedian furrow (barely visible in *Pogonowithius*).

**Description.**—Setae: most dorsal setae strongly clavate and denticulate; setae on sternites acicular.

*Chelicera*: With 5 setae on hand; movable finger with 1 subdistal seta (*gs*); rallum of 4 blades; lamina exterior present.

*Pedipalp*: Not sexually dimorphic; femur without hypertrophied base. Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria; trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger, or *isb* and *it* situated medially. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger. Chelal teeth all closely spaced; accessory teeth absent.

*Carapace*: With 2 corneate eyes; median and furrows present.

*Coxal region*: Median maxillary lyrifissure present and submedially situated; sub-oral seta of maxilla not on 'hooked' mound; males without patch of ridged cuticle on internal margin of maxilla.

*Legs*: Junction between femora and patellae I and II only slightly oblique; tactile seta of posterior legs sub-medial; sub-terminal tarsal setae arcuate and acute; arolium slightly shorter than claws; claws slender and simple.

*Abdomen*: Male tergites without lateral keels; males without paired sac-like invaginations on anterior margins of sternites; males with patches of glandular setae on sternites V–IX, and sometimes on IV and X; females with 2 glandular setae on sternites VII–IX; glandular setae of male short and conical. Spiracular helix present. Pleural membrane longitudinally striate and somewhat wrinkled.

*Genitalia*: Male genitalia with shortened lateral apodemes, or with lateral apodemes long and triangular (but these species most likely misplaced in *Withius*); female genitalia with 1 pair of spermathecae.

**Remarks.**—As discussed elsewhere in this paper, the genus *Withius* is difficult to define and currently includes species that are most likely misplaced such as *W. hispanus*, *W. faunus*, *W. neglectus* and *W. japonicus* which have totally different male genitalia to other species of the genus. Despite this uncertainty, the following two species are transferred to *Withius*.

*Withius paradoxus* (Ellingsen, 1912), comb. nov.

*Chelifer paradoxus* Ellingsen 1912:98–99.

*Stenowithius crassipes* Lawrence 1937:270–272, fig 30a–c.

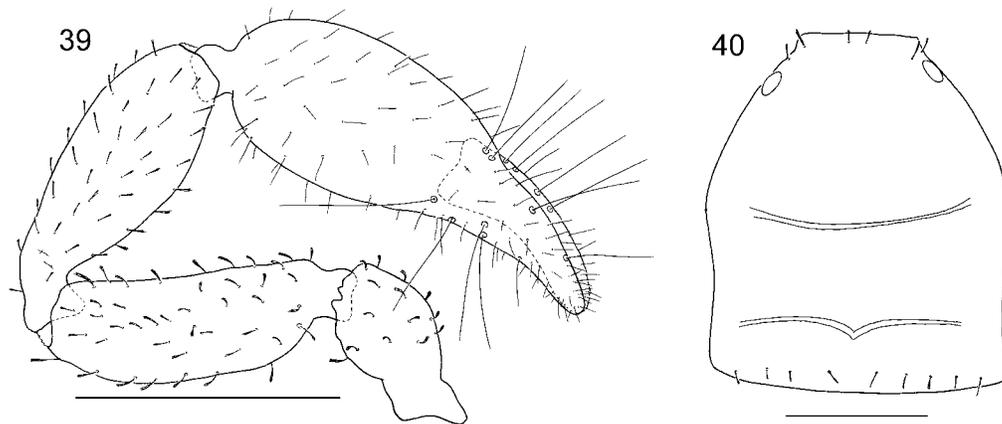
**Syn. nov.**

**Material examined.**—SOUTH AFRICA: *Eastern Cape*: 2 males, 2 females, 2 tritonymphs, Glenconner [33°24'S, 25°09'E], iii.1964, R.F. Lawrence (NMP 7904); 1 male, 1 female, Grahamstown [33°19'S, 26°32'E] (CAS JC–237.01001–2).

**Description.**—See Mahnert (1988).

**Remarks.**—Ellingsen (1912) described *C. paradoxus* from three specimens collected in South Africa: the holotype (cited as the "type") from Ntaba Kandoda, near King Williams Town (32°52'S, 27°23'E), a male from Blythswood (32°13'S, 27°59'E) and a female from Kei Bridge (32°30'S, 27°59'E), all localities are nowadays situated in Eastern Cape Province. The specimens were collected by R. Godfrey and most likely returned to him (Ellingsen 1912, p. 90), although they could not be located in the Albany Museum, Grahamstown where Godfrey's collection was apparently lodged (J. Midgley, in litt., 11 March 2014) or in the South African Museum, Cape Town (M. Cochrane, in litt., 28 August 2009). The collections of the Albany Museum were extensively damaged in a fire in 1941 and it is possible that they were lost during this incident.

Two slide-mounted specimens labeled *Afrowithius paradoxus* by J.C. Chamberlin are lodged in CAS and were examined as part of this study. Although these specimens were not explicitly listed by Chamberlin (1931b) and are not type specimens, they were evidently used by Chamberlin when formulating his diagnosis of *Afrowithius*. These specimens conform quite closely to Ellingsen's description especially in the thickened male tibia IV which Ellingsen (1912) noted was "very broad (high), being very convex on the inner side". This feature is also characteristic of *Withius crassipes* (Lawrence 1937) (originally described as *Stenowithius crassipes*) which has an enlarged male tibia IV (Lawrence 1937; Beier 1958; Mahnert 1988). There are no appreciable differences between these specimens of *C. paradoxus* and *S. crassipes* and, therefore, *S. crassipes* is here



Figures 39–40.—*Withius tweediei* (Beier), lectotype male: 39. Left pedipalp, dorsal; 40. Carapace, dorsal. Scale lines = 0.5 mm (Figure 39), 0.25 mm (Figure 40).

designated as a junior subjective synonym of *C. paradoxus*. *Stenowithius crassipes* was originally described from Nkandhla Forest, in KwaZulu-Natal of South Africa, and has been subsequently recorded from other locations in South Africa (Beier 1958, 1964, 1966a) and central Kenya (Mahnert 1988).

Chamberlin (1931b) transferred *C. paradoxus* to the new monotypic genus *Afrowithius* which he distinguished from all other withiid genera by the presence of five blades in the cheliceral rallum. Whilst the male of *C. paradoxus* examined by Chamberlin (1931b) has one chelicera with five rallar blades, the other chelicera, and both chelicerae of the female, possesses the four blades typical of all Withiidae. Therefore, the main diagnostic feature distinguishing *Afrowithius* from other withiid genera is removed, and *Afrowithius* is considered to be a junior synonym of *Withius*. The male and female genitalia of Chamberlin's specimens and other specimens of this species are of the type that characterize species of *Withius* (Mahnert 1988).

*Withius tweediei* (Beier, 1955), comb. nov.  
Figs. 39, 40

*Metawithius* (*Microwithius*) *tweediei* Beier 1955b:43–45, fig. 5.

**Material examined.**—*Lectotype*. MALAYSIA: *Pahang*: male, near Telom Valley, Gunung Siku, Cameron Highlands [4°36'N, 101°24'E], ca. 4500 feet elevation, March 1935, M. W.F. Tweedie (NHMW).

*Paralectotypes*. MALAYSIA: *Pahang*: 1 female, collected with lectotype (NHMW); 1 male, Kampung Kuala Terla, Telom Valley, Cameron Highlands [4°32'N, 101°25'E], ca. 4500 feet elevation, March 1935, M.W.F. Tweedie (NHMW).

**Diagnosis.**—*Withius tweediei* is most similar to those species of *Withius* in which trichobothria *isb* and *it* are clustered in the basal half of the fixed chelal finger. It lacks the male genitalic conformation of *W. faunus*, *W. hispanus*, *W. japonicus* and *W. neglectus*, and has a different shaped chela than *W. despaxi* and *W. transvaalensis*.

**Description.**—*Adults*: Colour: with sclerotized portions generally dark red-brown; carapaceal metazone without paired pale spots.

*Chelicera*: With 5 setae on hand, *bs* and *sbs* slightly dentate; movable finger with 1 subdistal seta; galea of male with 3 small terminal rami, of female unknown (broken from only known

specimen); rallum of 4 blades; serrula exterior with 16 (♂), 18 (♀) blades; lamina exterior present.

*Pedipalp* (Fig. 39): Trochanter, femur and patella granulate, chela smooth; dorsal setae clavate and denticulate; trochanter 1.72–2.06 (♂), 1.99 (♀), femur 2.93–2.95 (♂), 3.01 (♀), patella 2.88–3.03 (♂), 2.60 (♀), chela (with pedicel) 3.01–3.09 (♂), 2.86 (♀), chela (without pedicel) 2.82–2.88 (♂), 2.66 (♀), hand 1.68–1.73 (♂), 1.66 (♀) x longer than broad, movable finger 0.71–0.73 (♂), 0.59 (♀) x longer than hand. Femur of male with basal region not expanded. Fixed chelal finger with 8 trichobothria, movable chelal finger with 4 trichobothria: *eb* and *esb* situated basally; trichobothria *ib*, *ist*, *isb* and *it* grouped in basal half of finger; *b* and *sb* situated near one another; *st* slightly closer to *t* than to *sb*. Venom apparatus present in both chelal fingers, venom ducts long, terminating in nodus ramosus slightly basal to *et* in fixed finger and distal to *t* in movable finger.

*Carapace* (Fig. 40): 1.23–1.31 (♂), 1.17 (♀) x longer than broad; lateral margins strongly convex, not posteriorly widened; with 2 non-corneate, flat eye-spots; with numerous setae, including 5 (♂, ♀) near anterior margin and 9 (♂), 10 (♀) near posterior margin; with 2 furrows, with distinct anterior furrow and indistinct posterior furrow; posterior furrow slightly closer to posterior carapaceal margin than to median furrow.

*Coxal region*: Maxilla with 2 apical setae and 1 very small internal, sub-oral seta, externo-median region of male maxilla without rugose area; chaetotaxy of coxae I–IV: ♂, 9: 10: 8: 19, ♀, 9: 8: 9: 17.

*Legs*: Junction between femora and patellae I and II only slightly oblique; femur + patella of leg IV 2.51 (♂), 2.80 (♀) x longer than broad; tarsal tactile seta of leg IV situated sub-medially, 0.50 (♂), 0.57 (♀) of tarsus length; subterminal tarsal setae arcuate and acute; arolium slightly longer than claws.

*Abdomen*: Tergites and sternites with faint medial suture. Tergal chaetotaxy: ♂, 10: 10: 11: 11: 14: 13: 15: 14: 14: 15: 8 (including 2 tactile setae); 2; ♀, 12: 10: 11: 17: 17: 18: 16: 18: 17: 12: 8 (including 2 tactile setae); 2; mostly uniseriate but some tergites with a few setae placed anteriorly; all setae foliate. Sternal chaetotaxy: ♂, 8: (1) 8 (1): (2) 9 (2): 14 + ca. 20/20 gls: 11 + ca. 45/45 gls: 12 + ca. 40/40 gls: 10 + ca. 35/35 gls: 10 + 20/21 gls: 12 (including 2 tactile setae): 12 (including 4

tactile setae): 2; ♀, 8: (1) 8 (1): (2) 8 (2): 16 + 2/2 gls: 16 + 2/2 gls: 16 + 2/2 gls: 13 + 1/1 gls: 13 + 1/0/ gls: 12 (including 2 tactile setae): 14 (including 4 tactile setae): 2; sternites V–IX of male with patches of glandular setae; sternites V–IX of female with glandular setae; setae uniseriate and acuminate; glandular setae of male stout and conical; male without paired invaginations on anterior margins of sternites.

**Genitalia:** Male with lateral apodemes short, other details not visible in specimens; female spermathecae not observable in specimen.

**Dimensions (mm):** Males: Lectotype from Gunong Siku, followed by paralectotype male from Kampung Kuala Terla (where applicable): body length 2.10 (ca. 2.00). Pedipalps: trochanter 0.307/0.179 (0.408/0.198), femur 0.582/0.197 (0.626/0.214), patella 0.608/0.211 (0.685/0.226), chela (with pedicel) 0.884/0.294 (0.960/0.311), chela (without pedicel) 0.830 (0.896), hand length 0.493 (0.538), movable finger length 0.362 (0.384). Chelicera 0.217/0.103, movable finger length 0.173. Carapace 0.666/0.541 (0.752/0.576) (width at medial area); eye diameter 0.070. Leg IV: femur + patella 0.424/0.169, tarsus 0.300/0.064, TS 0.150.

**Female:** Paralectotype from Gunong Siku: body length 2.16. Pedipalps: trochanter 0.316/0.159, femur 0.512/0.170, patella 0.509/0.196, chela (with pedicel) 0.806/0.282, chela (without pedicel) 0.750, hand length 0.468, movable finger length 0.277. Chelicera 0.212/0.108, movable finger length 0.160. Carapace 0.608/0.518 (width at medial area); eye diameter 0.060. Leg IV: femur + patella 0.471/0.168, tarsus 0.314/0.032, TS 0.179.

**Remarks.**—The type series consists of three specimens, a pair of adults from Gunong Siku stated by Beier (1955b) to be “Types”, and a paratype male from Kuala Terla. Beier frequently failed to segregate a single specimen from the type series as a holotype, and often referred to a vial with more than one specimen as the “types” and labelled the remaining specimens as “paratypes”. As Beier clearly intended that the three specimens were not syntypes, I hereby designated the male from Gunong Siku as lectotype, and the other two specimens as paralectotypes. A search for further specimens in the vicinity of the two known localities in 2009, including sifting leaf litter and searching under the bark of trees and logs, failed to locate any further specimens.

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