RAFFLES BULLETIN OF ZOOLOGY Supplement No. **30**: 71–80
Date of publication: 25 December 2014
http://zoobank.org/urn:lsid:zoobank.org:pub:C3CF589C-86CF-444D-8DA0-9B45294E671F

Recent collections of centipedes from Christmas Island (Myriapoda: Chilopoda)

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Abstract. Recent collections have revealed the possibility of a total of ten species of centipede on Christmas Island: seven scolopendromorphs, a henicopid lithobiomorph, *Lamyctes* sp. and two species of mecistocephalid geophilomorphs assigned to *Mecistocephalus*. The large scolopendrid known on Christmas Island as the Giant Centipede is recognised as *Scolopendra subspinipes* Leach, 1815. Three other scolopendrid species are added to the centipede fauna, *Rhysida immarginata immarginata* (Porat, 1876), *Rhysida longipes longipes* (Newport, 1845) and *Otostigmus rugulosus* Porat, 1876. Additionally two species of cryptopids, *Cryptops* sp. and *Paracryptops* cf. *weberi* Pocock, 1891 are also recorded for the first time. Detailed descriptions are given of the available material. The specimen identified by Pocock in 1888 as "*Cryptops hortensis*" is certainly not that species and is here described as *Cryptops* sp. A. It may be conspecific with *Cryptops inermipes* Pocock, 1888, which is still only represented by the holotype; their relationship is discussed.

Key words. Christmas Island, centipedes

INTRODUCTION

Early observations. The earliest literature references to centipedes on Christmas Island date back to 1887 as material collected by officers of the surveying vessel "HMS FLYING FISH" in January 1887 and by J. J. Lister in autumn the same year on the surveying vessel "HMS EGERIA" (see Pocock, 1900: 153). These centipedes were identified by Pocock as two species of Cryptopidae, *Cryptops hortensis* (Donovan, 1810) and *C. inermipes* Pocock, 1888 (Pocock, 1888; Pocock, 1900).

On a subsequent collecting expedition by C. W. Andrews in 1897–1898 no cryptopids were found but the geophilomorph, *Mecistocephalus castaneiceps* Haase, 1887 was added.

In 1908 C. W. Andrews revisited Christmas Island with the principal purpose of documenting any effects following introductions of a number of animal and plant species consequent to the increased traffic to the island with the quarrying and export of phosphate of lime (Andrews, 1909). Andrews commented that "no changes of importance were noticed among the native invertebrates: but the large *Scolopendra*, of which a very few individuals were noticed during my first visit, is now much more numerous" (Andrews, 1909). Also, Andrews (undated and unreferenced comment in Chasen, 1933) mentioned "large centipedes (*Scolopendra*) arriving in coco-nut [sic.] leaves imported for thatching". The identity of the "large *Scolopendra*" remains uncertain as Pocock mentions *S. morsitans* (as *Scolopendra morsicans*) in reference to Christmas Island in 1900 but he did not list it as occurring on the island and there are no identified specimens of *S. morsitans* known from Christmas Island from this period.

Present observations. Following much discussion over the years (see Koch, 1983; Lewis, 2002; Würmli, 1975, 1978) the consensus is that *S. morsitans* Linnaeus is native to Africa, Australia, mainland southeast Asia from coastal Pakistan eastwards as well as Taiwan and Indonesia and possibly the Philippines (Shelley et al., 2005). However, the global distribution of *S. morsitans* Linnaeus is now considered cosmopolitan and much of its present distribution seems to reflect human introductions (Shelley et al., 2005).

A large scolopendrid centipede has been considered a suspect in the decline to extinction on Christmas Island in 2009 of an endemic chiropteran, the Christmas Island pipistrelle, *Pipistrellus murrayi* Andrews, 1900 as outlined in Beeton et al. (2010). Beeton et al. (2010) identifies the Giant Centipede as *Scolopendra morsitans* Linnaeus, 1758 and in a table giving a chronology of some significant animal introductions mentions the Giant Centipede as "Abundant by 1907" (see Andrews, 1909), "island-wide by 1939" (no reference given) and "2004, trend of increasing numbers detected" (observation by Parks Australia North staff, quoted in Beeton et al., 2010). There is no indication in Beeton et al. (2010) where the original species identification originated or from which specimens.

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ISSN 2345-7600 (electronic) | ISSN 0217-2445 (print)

In the collections of the Western Australian Museum there are several specimens of scolopendrid centipedes collected from Christmas Island in the 1960s which were identified as *S. subspinipes* Leach by persons unknown. There were also four specimens identified by L. E. Koch (WAM 80/1603, 80/1636, 81/568–9) as *S. morsitans* Linnaeus but these have since been re-assessed by JMW and are now considered to be *S. subspinipes* Leach.

Shelley (2004) gives several examples of the co-existence of *S. morsitans* Linnaeus and *S. subspinipes* Leach on some islands in the Pacific and it was therefore possible that *S. morsitans* Linnaeus had been introduced to Christmas Island more recently as most of the material in the Western Australian Museum was collected in the 1960s and earlier. Following a request by Bill Humphreys for material, a collection of specimens arrived at the Western Australian Museum in August 2010 from Parks Australia North.

A total of 56 samples were received. The majority of the collection were scolopendromorphs of the family Scolopendridae (54) and two geophilomorphs of the family Mecistocephalidae. Of the 54 samples of Scolopendridae, 47 were *Scolopendra subspinipes* Leach, 1815 (Scolopendrinae), and eight vials were Otostigminae from two genera: *Rhysida* (*R. immarginata immarginata* (Porat, 1876) and *R. longipes longipes* (Newport, 1845)) and *Otostigmus* (*O. rugulosus* Porat, 1876 and a juvenile *Otostigmus* sp.). Two earlier collections of Cryptopidae, *Cryptops* sp. A (one specimen) and *Paracryptops* cf. *weberi* (one specimen) (the Otostigminae and Cryptopidae were identified by JGEL) and a recent lithobiomorph (one specimen) bring the total chilopod species for Christmas Island to 10 species. In addition, JGEL has examined the cryptopid specimen Pocock had identified in 1888 as *Cryptops hortensis* Leach and considers that this specimen is certainly not that species and is here assigned to *Cryptops* sp. A. It may be conspecific with *Cryptops inermipes*.

There were no specimens of *S. morsitans* Linnaeus amongst this material.

MATERIAL AND METHODS

Drawings and measurements by JMW were made using a Leica MS 5 and Leica MZ 16A stereo microscopes and Leica Application Suite V3.8.0 from Leica Microsystems Ltd. Those by JGEL with Bausch & Lomb StereoZoom 4 and student monocular microscopes using an eyepiece graticule to make drawings onto squared paper calibrated for different magnifications using a stage micrometer. Specimens of Cryptopidae were cleared in 2-phenoxyethanol. Morphological terminology follows that of Bonato et al. (2010). Descriptions are specifically of the Christmas Island specimens. The specimens in this paper were collected by Parks Australia North staff unless stated otherwise.

Abbreviations of repository names are: WAM –Western Australian Museum, Perth, Australia; BMNH – Natural History Museum, London, UK.

Provisional key to the centipedes of Christmas Island

1. With 15 pairs of legs (Fig. 1) .... LITHOBIOMORPHA
– With more than 15 pairs of legs 2
2. With 31 or more pairs of legs. (Fig. 2) .... GEOPHILOMORPHA 3
– With 21 pairs of legs .... SCOLOPENDROMORPHA 4
3. With 47 pairs of legs .... *Mecistocephalus castaneiceps*
– With 49 pairs of legs .... *Mecistocephalus* sp.
4. With a cluster of four ocelli on each side of head plate (Scolopendridae) 5
– Ocelli absent (Cryptopidae) 9
5. Spiracles elongated antero-posteriorly with a three-flapped valve. The head plate overlies the first tergite 6
– Spiracles round or oval, without a three-flapped valve. The head plate overlapped by the first tergite 7
6. Prefemur of ultimate leg with 1–3, typically 2 spines ventrally, coxopleural side spine absent (Fig. 3) .... *Scolopendra subspinipes*
– Prefemur of ultimate leg with 7–10 spines ventrally, typically with 3 rows of 3. May be more in regenerated legs. Coxopleural side spine present .... *Scolopendra morsitans* (no definite records)
7. Leg-bearing segment 7 without spiracles .... *Otostigmus rugulosus*
– Leg-bearing segment 7 with spiracles 8
8. Only tergite of ultimate leg-bearing segment marginate .... *Rhysida immarginata immarginata*
– Tergites with complete margination from tergite 9 or 10 .... *Rhysida longipes longipes*
9. Forcipular coxosternal margin lacking lobes (Fig. 23), tarsungulum moderately developed 10
– Forcipular coxosternal margin with rounded lobes, tarsungulum very short (Fig. 30) .... *Paracryptops* cf. *weberi*
10 Femur, tibia and tarsus 1 of ultimate pair of legs with saw teeth (Fig.28) .... *Cryptops* sp. A
– Ultimate pair of legs without saw teeth .... *Cryptops inermipes* (requires confirmation)

Lithobiomorpha Pocock, 1902

Henicopidae Pocock, 1901

Henicopinae Pocock, 1901
(Fig. 1)

Lamyctes sp.

Material examined. 1 female, (WAMT129174), Grants Well, CI-11 (BES: 17391), 10°30'13"S 105°39'23"E, 23 March 2013, J. Anderson.

Remarks. This record of a *Lamyctes* is the first of a lithobiomorph for Christmas Island.

Geophilomorpha Leach, 1815

Mecistocephalidae Bollman, 1893

Mecistocephalus sp.
(Fig. 2)

Material examined. 1 specimen, (WAMT104545), 1.4 km SE. of Margaret Knoll, 10°29'14.4"S, 105°40'38.9"E,

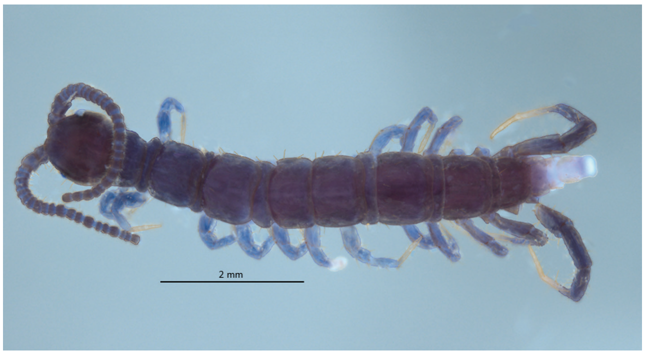


Fig. 1. *Lamyctes* sp., general dorsal view (WAM T129174), ultimate legs missing.

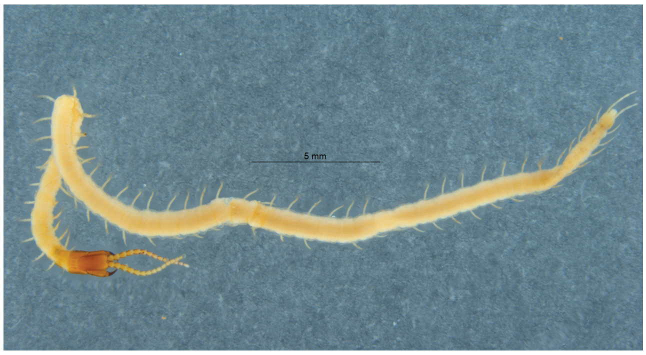


Fig. 2. *Mecistocephalus* sp., general view (WAM T104545).

17 June 2010; 1 specimen (WAMT106089), Silver City, M.Smith's house, 10°25'20.5"S, 105°40'41.8"E, 4 August 2010; 4 specimens (WAMT109317), Silver City, 10°25'S, 105°41'E, 4 July 2004. All with 49 pairs of legs.

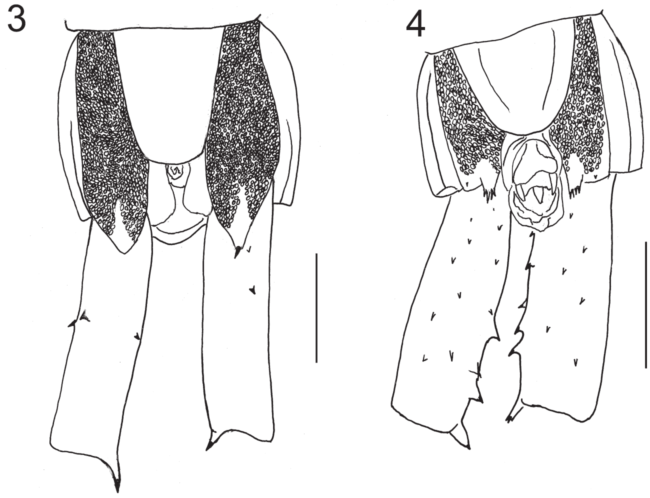
Scolopendromorpha Pocock, 1895

Scolopendridae Leach, 1814

Scolopendrinae Leach, 1814

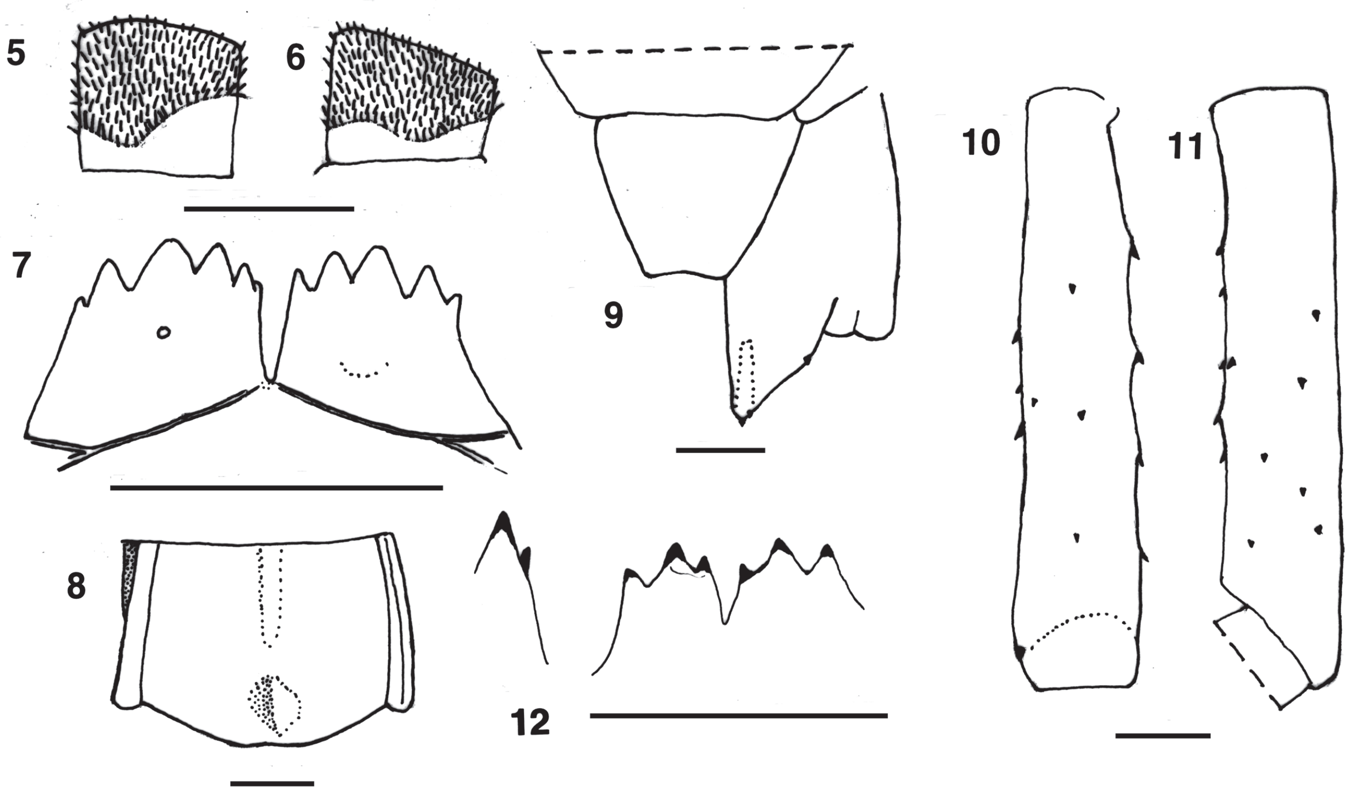
***Scolopendra subspinipes* Leach, 1815**
(Fig. 3)

Material examined. 1, WAM T102365, 1.4 km NE. of airport, squashed on road, 10°26'20.1"S, 105°41'43.6"E, 16 June 2010; 1, WAM T102366, 0.4 km SW. of airport (site UWP17), 10°27'11.0"S, 105°41'16.8"E, 23 June 2010; 1, WAM T106073, 0.4 km SW. of airport (site UWP17), 10°27'11.1"S, 105°41'16.6"E, 17 June 2010; 1, WAM T106068, 0.4 km SW. of airport (site UWP17), 10°27'11.1"S, 105°41'16.6"E, 17 June 2010; 1, WAM 80/1603, Christmas Island, coll. unknown, 15 June 1961; 1, WAM T65646, Christmas Island, coll. G. Foo, July 2005; 1, WAM T102364, Christmas Island, site UWP26, 17 June 2010; 2, WAM 81/568-9, Drumsite, c. 10°26'S, 105°40'E, coll. R. W. George, 12 February 1978; 1, WAM T102360, Drumsite area (site UWP40), 10°25'48.9"S, 105°40'30.8"E, 17 June 2010; 1, WAM T102363, Drumsite area (site UWP39), 10°25'53.1"S, 105°40'21.1"E, 17 June 2010; 1, WAM T106085, Drumsite area (site UWP38), 10°25'36.4"S, 105°40'38.7"E, 3 August 2010; 1, WAM T102359, SE. of Egeria Point (site MCP6), 10°30'53.6"S, 105°32'13.9"E, 10 July 2010; 1, WAM T106063, 0.6 km NNE. of Egeria Point, 10°30'25.2"S, 105°32'07.9"E, 21 July 2010; 1, WAM T101358, Environmental Research Station, on outside wall, 10°29'30.6"S, 105°38'49.2"E, coll. W. F. Humphreys, 29 March 1998; 1, WAM T102367, 'Pink House' [= Environmental Research Station], woodpile (322), 10°29'31"S, 105°38'50"E, 23 June 2010; 1, WAM T102369, SE. of 'Pink House', large woodpile, 10°29'32.5"S, 105°38'51.6"E, 23 June 2010; 1, WAM T102370, same data except woodpile (342); 1, WAM T102373, same data except junk pile (342), 10°29'31"S, 105°38'50"E, 23 June 2010; 1, WAM T106059, same data except gazebo, 16 June 2010;



Figs. 3, 4. 3, *Scolopendra subspinipes*, ventral view of ultimate leg-bearing segment. Specimen from Silver City, Christmas Island (WAM T65645). Scale bar = 5.0 mm. 4, *Scolopendra morsitans*, ventral view of ultimate leg-bearing segment. Specimen from Peak Charles National Park (32°54'34.3"S, 121°10'19.3"E), Western Australia (WAM T127859). Scale bar = 5.0 mm.

1, WAM T106061, same data except 1 July 2010; 1, WAM T106062, same data except 2 July 2010; 1, WAM T106064, same data except 25 June 2010; 1, WAM T106074, same data except gazebo, 23 July 2010; 1, WAM T106075, same data except, 27 July 2010; 1, WAM T106076, same data except June–August 2010; 1, WAM T106077, same data except under crab fences, 28 July 2010; 1, WAM T106078, same data ; 1, WAM T106079, same data ; 1f, WAM T102368, above Hugh's Dale, in forest (NWP), in rotten log curled around eggs, 10°28'33.2"S, 105°34'00.3"E, 24 June 2010; 1, WAM T102375, above Hugh's Dale, 10°28'47.1"S, 105°34'23.1"E, 6 July 2010; 1, WAM T104542, above Hugh's Dale, in forest (NWP), from rotten log, 10°28'33.2"S, 105°34'00.3"E, 24 June 2010; 1, WAM T102362, main road above Margaret Beaches (site UWP24), 10°27'09.6"S, 105°39'28.5"E, 17 June 2010; 1, WAM T104546, 1.4 km SE. of Margaret Knoll, 10°29'14.4"S, 105°40'38.9"E, 17 June 2010; 1, WAM T104548, 1.3 km SE. of Margaret Knoll, 10°29'11.4"S, 105°40'40.3"E, 17 June 2010; 1, WAM T104541, road 0.8 km E. of mine buildings (site UWP9), wood pile 9, 10°28'20.1"S, 105°35'02.0"E, 22 June 2010; 1, WAM T104543, road 0.7 km SW. of new mine buildings



Figs. 5–12. 5–11, *Otostigmus rugulosus*: 5, antennal article 3, specimen 4 dorsal; 6, antennal article 3, specimen 2 dorsal; 7, coxosternal tooth plates, specimen 3; 8, tergite of ultimate leg-bearing segment, specimen 3; 9, sternite and left coxopleuron of ultimate leg-bearing segment, specimen 3. Pores not shown, pore free area shown by dotted line. 10, Loose ultimate leg; 11, ultimate leg, specimen 5. 12, *Otostigmus* sp., right forcipular trochanteroprefemopral process and tooth plates. Scale bars = 0.5 mm (Figs. 5–11); 0.25 mm (Fig. 12).

(site UWP2), in wood pile 2, 10°28'33.5"S, 105°34'18.1"E, 23 June 2010; 1, WAM T106060, road 1.3 km SE. of new mine buildings, 10°28'32.8"S, 105°34'00.3"E, 29 June 2010; 1, WAM T106065, road 0.8 km SW. of mine buildings (site UWP3), 10°28'35.4"S, 105°34'21.2"E, 17 June 2010; 1, WAM T106066, road 0.6 km SSW. of mine buildings (site UWP5), 10°28'35.9"S, 105°34'29.3"E, 17 June 2010; 1, WAM T106067, road 0.5 km SSW. of mine buildings (site UWP6), 10°28'34.9"S, 105°34'32.6"E, 17 June 2010; 1, WAM T106069, 0.8 km SW. of mine buildings (site UWP2), 10°28'35.4"S, 105°34'18.3"E, 17 June 2010; 1, WAM T106071, road 0.3 km SE. of mine buildings (site UWP7), 10°28'21.5"S, 105°34'48.7"E, 17 June 2010; 1, WAM T106080, road 0.8 km SW. of new mine buildings (site UWP1), 10°28'32.1"S, 105°34'15.2"E, 3 August 2010; 1, WAM T106081, road 0.7 km SW. of new mine buildings (site UWP2), 10°28'33.5"S, 105°34'18.1"E, 3 August 2010; 1, WAM T106083, 0.8 km SW. of mine buildings (site UWP3), 10°28'35.5"S, 105°34'18.0"E, 3 August 2010; 1, WAM T106087, road 0.6 SSW. km of mine buildings (site UWP6), 10°28'35.1"S, 105°34'32.5"E, 3 August 2010; 1, WAM T106088, road 0.7 km SW. of mine buildings (site UWP40), 10°28'36.1"S, 105°34'24.8"E, 3 August 2010; 3, WAM T74281, Phosphate Hill, 10°25'S, 105°41'E, coll. unknown, 8 July 1961; 1, WAM T102372, Settlement, N. of Isabel Beach (UWP34), in wood pile, 10°25'05.5"S, 105°40'29.1"E, 23 June 2010; 1j, WAM 80/1636, Settlement, c. 10°25'S, 105°41'E, coll. S. Slack-Smith, Patterson, 6 October 1969; 1, WAM T65645, Silver City, in house, 10°25'20"S, 105°40'40"E, coll. V. W. Framenau, 22 September 2005; 1, WAM T102371, Silver City, 10°25'20.7"S, 105°40'51.3"E, 30 June 2010; 1, WAM T106082, 2.3 km SSW. of Smith Point, on road (site UWP21), 10°26'57.8"S, 105°39'41.1"E, 3 August 2010; 1, WAM T106084, 2.3 km SSW. of Smith Point, on road (site UWP21), 10°26'57.8"S, 105°39'41.1"E, 3 August 2010.

Otostigminae Kraepelin, 1903

Otostigmus Porat, 1876

Otostigmus rugulosus Porat, 1876

(Figs. 5–12)

Material examined. 1 (= specimen 1), WAM T102374, above Hugh's Dale, in forest (NWP), under bark of rotten log, 10°28'33.2"S, 105°34'00.3"E, 24 June 2010; 3 (= specimens 2, 3 & 4), WAM T102376, 'Pink House'[= Environmental Research Station], junk pile (342), 10°29'31"S, 105°38'50"E, 23 June 2010; 1 (= specimen 5), WAM T106070, road 0.6 km SW. of mine buildings (site UWP5), 10°28'35.9"S, 105°34'29.3"E, 17 June 2010; 1, WAM T106072, road 0.5 km SSW. of mine buildings (site UWP6), 10°29'34.9"S, 105°34'32.6"E, 17 June 2010.

Description. Length 33.5–41 mm. Colour, after preservation in 70% ethanol, olive brown. 17–21 antennal articles, the basal 2.3–2.5 glabrous (Figs. 5 & 6). However, the fact that the boundary between the glabrous and setose regions on antennomere 3 is irregular and the fact that the articles may be somewhat telescoped as in specimen 2, means that these figures cannot be precise. The second maxillary telopodite lacks spur on telomere 2 but pretarsal accessory spines present. Forcipular coxosternal tooth plates with four main and one small lateral and sometimes a small median tooth (Fig 7).

Tergites with complete paramedian sutures from 3, 4 or 5, marginate from 7, 8 or 9. Lateral corrugations from tergites 3 and 5 (specimen 1) 5 and 7 (specimen 3) and 7 (specimens 2 and 4). A weak median keel from tergite 5. No lateral keels or spines. Tergite of ultimate leg-bearing segment with low median keel and small posterior median depression (Fig. 8). Sternites with short anterior paramedian sutures each ending in a weak depression and occupying about anterior 50% of sternite in mid trunk. A very slight posterior median depression in specimens 2 and 3. Sternite of ultimate leg-bearing segment with sides converging posteriorly and posterior margin straight or slightly concave (Fig. 9).

Coxopleural process short with two apical, one subapical and one lateral spine (Fig. 9) or two apicals and two laterals. One dorsal spine near apex. Loose ultimate leg (in tube with specimen 1) prefemur with four ventrolateral spines, three ventromedials, one medial, four dorsomedials and a corner spine (Fig. 10). Specimen 5 with a single ultimate leg with five + one ventrolaterals, two ventromedials one medial and four dorsomedials, but no corner spine (Fig. 11). The spinulation is atypical and the leg may be regenerated. Ambulatory legs, many of which are missing, with one tibial spur on legs 1–3, two tarsal spurs from 1 to 13, 14, 15 or 16 and a single tarsal spur on the remainder (to 20). Specimen 5 with a single leg 20 which lacks a dorsodistal prefemoral spine.

Distribution. Indian subcontinent, Indian Ocean islands, the Malay Peninsula, Thailand and Sumatra (Lewis, 2010).

Remarks. Lewis (2010) gave in his diagnosis of the species: antennal articles (19, 20) 21. The small Christmas Island sample shows greater variation. Also, Lewis (2010) gave 2–2.25 (2.4) basal articles as glabrous but as pointed out above, these figures cannot be precise. He also noted "Each forcipular coxosternal tooth plate with four main teeth, typically the inner two on each side partially fused and rounded, the outer two acute, the outermost smaller than the other three. Sometimes a small outer fifth subsidiary tooth." The Christmas Island specimens do not fully correspond to this but JGEL does not consider the minor differences very significant.

Attems (1930) gave claw of second maxilla with accessory spines and second telopodite with a distal spine as a character of *Otostigmus* differentiating it from *Digitipes* Attems, 1930 which lacks them. However, Schileyko (1995) reported that the spine was absent in *O. reservatus* reducing the gap between the two genera. Furthermore Chagas-Jr et al. (2007) did not observe accessory claw spurs or a spine on the article 2 of the second maxilla in seven South American species of *Otostigmus* (*Parotostigmus*) and the distal spine is absent in Christmas Island *O. rugulosus*. Joshi & Edgecombe (2013) have shown that the absence of these two characters is not diagnostic for *Digitipes* as they are present in Indian species. The spurs and the spine are often difficult to see unless the second maxillary telopodite is mounted separately and so their reported absence may sometimes be more apparent than real.

Otostigmus sp.
(Fig. 12)

Material examined. 1 juvenile, WAM T106072, length 10.5 mm, road 0.5 km SSW of mine buildings (site UWP6), 10°29'34.9"S, 105°34'32.6"E, 17 June 2010. In two halves.

Description. This is a very early adolescens stadium *Otostigmus* and may well be an *O. rugulosus* but many characters could not be observed. Antennal articles 21+16 (damaged).

Coxosternal tooth plates each with three teeth (Fig. 12). This may be a juvenile character.

***Rhysida* Wood, 1862**

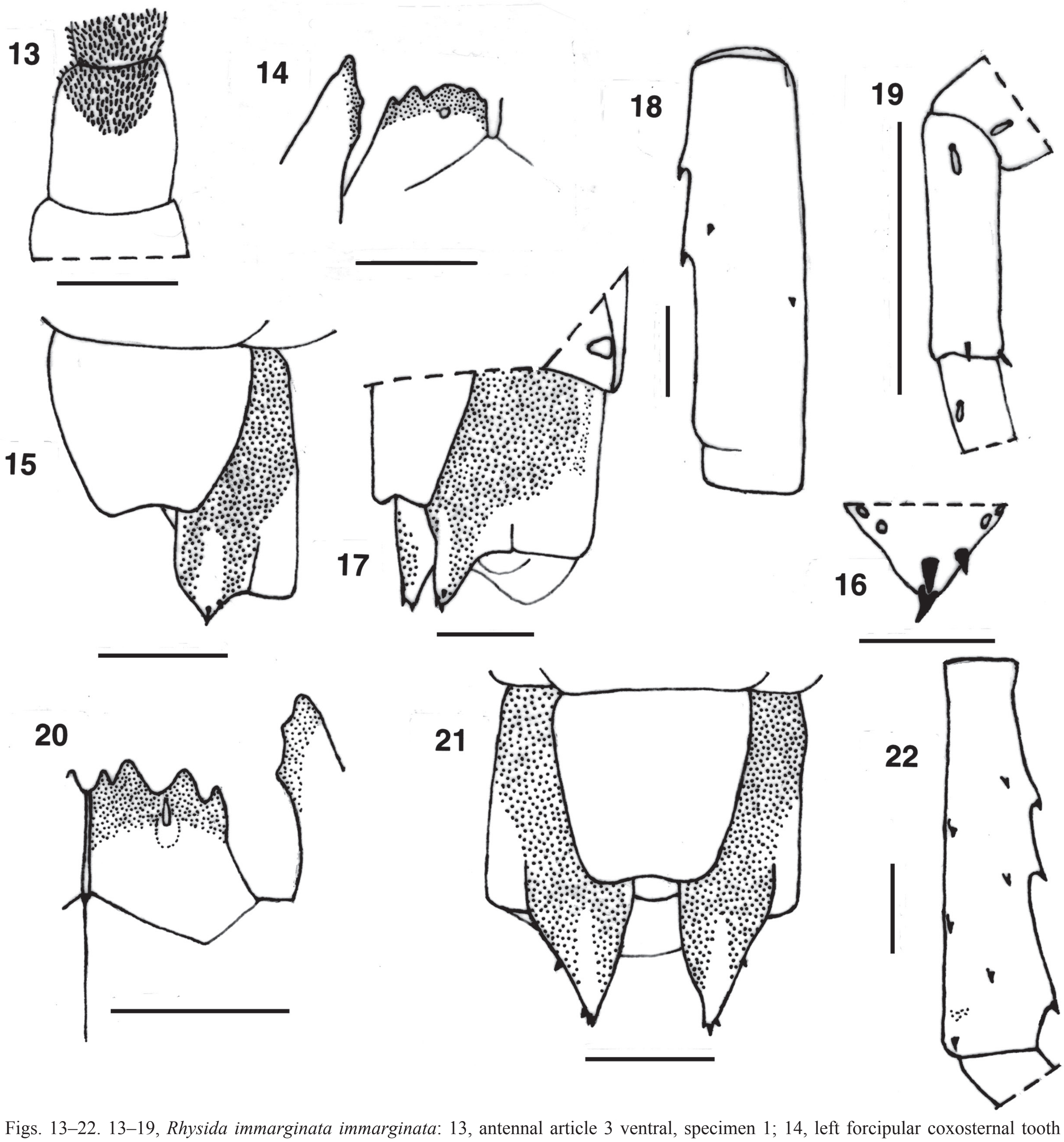
***Rhysida immarginata immarginata* (Porat, 1876)**
(Figs. 13–19)

Material examined. Specimen 1, 55mm, WAM T104544, and specimen 2, 48 mm, WAM T104547, 1.3.km SE of Margaret Kroll.10°29'11.4"S, 105°40'40.3"E (GPS) in log 17 June 2010 via Parks Australia North.

Description. Length up to 55 mm. Colour after preservation in 70% ethanol for three years, dark green, legs greyish yellow. Antennal articles 19 or 20 reaching tergite 5 when reflexed. The basal three articles glabrous dorsally, a semicircular area of setae occupying the distal 45% of article 3 ventrally (Fig. 13). Forcipular coxosternal tooth plates with four main teeth and a slight indication of an additional medial tooth (Fig. 14). Basal sutures of tooth plates meeting at an obtuse angle. Trochanteroprefemoral process with two low medial denticles (Fig. 14).

Tergite paramedian sutures very fine. Complete or almost complete from tergites 5, 6 or 7, complete from tergite 8 (difficult to be certain). Only tergite of ultimate leg-bearing segment marginate. Sternites with very short anterior paramedian sutures. Sternite of ultimate leg-bearing segment with sides converging posteriorly and posterior margin slightly concave (Fig. 15).

Coxopleural process short with two apical and one subapical spine (three end spines sensu Attems, 1930), no lateral or dorsal spines (Fig. 16). Dorsal margin of pore field deeply sinuous (Fig. 17). Prefemur of loose ultimate leg of specimen 1 with two ventrolateral spines, one ventromedial, no medials, one dorsomedial, no coxopleural side spine (Fig.18). Specimen 2 lacks ultimate legs.



Figs. 13–22. 13–19, *Rhysida immarginata immarginata*: 13, antennal article 3 ventral, specimen 1; 14, left forcipular coxosternal tooth plate and trochanteroprefemoral process, specimen 1; 15, sternite and left coxopleuron of ultimate leg-bearing segment, specimen 1; 16, detail of spinulation of left coxopleural process, specimen 1; 17, lateral view of ultimate leg-bearing segment, specimen 2; 18, ultimate leg prefemur lateral view, specimen 1; 19, tarsus 1 and part of tibia and tarsus 2 leg 3, specimen 1. 20–22, *Rhysida longipes longipes*: 20, left forcipular coxosternal tooth plate and trochanteroprefemoral process, specimen 1; 21, ultimate leg-bearing segment ventral, specimen 1; 22, ultimate leg prefemur ventromedial, specimen 1. Scale bars = 1.0 mm (Figs. 13–15, 17–19, 21, 22); 0.5 mm (Figs. 16, 20).

Leg 1 with one femoral spur, one tibial spur on legs 1 and 2, two tarsals on 1–16/17, one tarsal on 17/18 and 19. Legs 20 and 21 without spurs. There are club-shaped structures attached to some tibiae and tarsi 1 & 2 of some of the first four pairs of legs (Fig. 19) they are, almost certainly, fungi of the order Laboulbeniales. A similar structure is present on the forcipular tarsungulum of the specimen of *Paracryptops* (Fig. 30c).

Distribution. Although *R. immarginata* appears to be very widely distributed, the nominate subspecies has only been recorded from, Kalimantan, Mentawai Island, Sumatra. (Lewis, 2001), Uruguay, Kedah (Malaysia) and Taiwan (Chao, 2008)

Rhysida longipes longipes (Newport, 1845)
(Figs. 20–22)

Material examined. Specimen 1, 53mm, WAM T102361 Drumsite area (site UWP20) 10°26'11.0"S, 105°40'10.8"E (GPS) 17 June 2010 via Parks Australia North; specimen 2, 38 mm, WAM T106086 Drumsite area (site UWP38) 10°25'36.4"S, 105°40'32.7"E (GPS) 3 August 2010 via Parks Australia North.

Description. Length up to 53 mm. Colour after preservation in 70% ethanol for three years olive, legs greyish green. Antennal articles 14 and 15 (both antennae damaged) in specimen 1, five (damaged) +18 in specimen 2, reaching tergite 4 when reflexed. The basal three articles glabrous dorsally, a semicircular area of setae occupying the distal 40% of article 3 ventrally. Forcipular coxosternal tooth plates with four main teeth, a slight indication of an additional medial tooth (Fig. 20) and a minute lateral tooth on left tooth plate in specimen 2. Basal sutures of tooth plates meeting at an obtuse angle. A very fine median longitudinal suture occupying about 25% of coxosternite. Trochanteroprefemoral process with two low medial denticles.

Tergite paramedian sutures very fine, complete or almost so from tergite 4 or 6 (difficult to be certain). Tergite margins incomplete from 7 or 8, complete from 9 or 10. Sternites with very short anterior paramedian sutures. Sternite of ultimate leg-bearing segment with sides converging posteriorly and posterior margin slightly concave (Fig. 21).

Coxopleural process relatively long, with two apical, one subapical spine (three end spines sensu Attems, 1930), and a lateral spine (Fig. 21). Dorsal margin of pore field sinuous. Ultimate leg prefemora with three or four ventrolateral spines, no ventromedials, three medials, two dorsomedials and a corner spine (Fig. 22). Lewis (2002) noted in specimens from Mauritius that two spine rows are visible ventrally and these could be regarded as ventrolateral and medial or ventromedial and medial or ventrolateral and ventromedial according to Attems (1930). Leg 1 with a single femoral spur, one tibial on legs 1 and 2, two tarsals on first five or seven, one tarsal to 19. Legs 20 and 21 without spurs.

Distribution. Australia, India, East and West Africa, Madagascar, Seychelles, Central and South America (Attems, 1930). Yemen (Lewis & Wranik, 1990), Mauritius (Lewis, 2002), introduced into Florida (Shelley et al., 2005), Chagos Islands, (Lewis & Cole, 2007), Taiwan, Haiti (Chao, 2008). Koch (1985) discounted the Australian records.

Cryptopidae Kohlrausch, 1881

Cryptopinae Kohlrausch, 1881

Cryptops Leach, 1815

Cryptops sp. A
(Figs. 23–29)

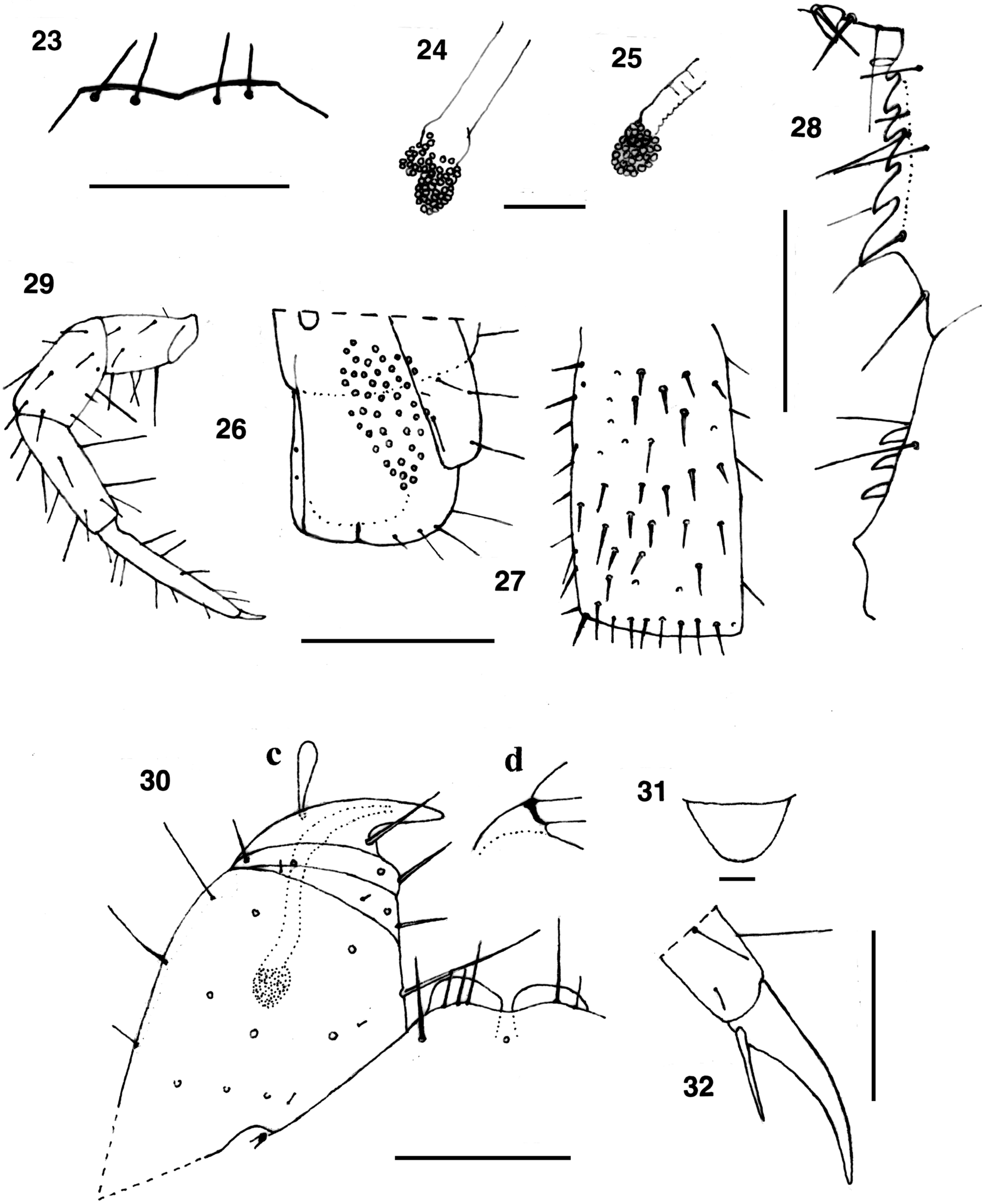
Material examined. Specimen 1, 13mm, (specimen curved so not all characters could be observed) WAM T95580, Whip Cave, CI-54, inside cave, 10°25'22.0"S, 105°42'04.4"E, 30 April 2006, coll. I. Collette; specimen 2, 17mm, (in two pieces: head and segments 1–17 broken between 11 and 12, and segments 17–21); 1, Indian Ocean Xmas [sic.] Island, Flying Fish Cove, January 1887, coll. J. J. Lister (BMNH (E) #200119 Chilo 1888.96) identified as *Cryptops* (*Cryptops*) *hortensis* Leach by R. I. Pocock in 1888.

Description. Data for specimen 2 in square brackets. Colour in 70% ethanol yellowish orange, [light brown]. Antennal articles 17 (loose in tube) + 13 (regenerated), [15 + 13 (damaged) in specimen 2]. Article 1 with long setae, second with long and short, third with short and an irregular whorl of long setae, short setae increasing in density on 4 and 5 with basal whorl of long setae. Article 10 ratio of length to width 1:0.6, [1:0.7]. Tergite 1 overlies cephalic plate. Forcipular coxosternite with 2+2 submarginal setae (Fig. 23). Poison gland calyx seen to be bilobed when examined laterally (Fig. 24) but ovoid when viewed ventrally (Fig. 25).

Tergite 1 without sutures, sutures and sulci on remaining tergites and sternite cruciform sulci not observable. [Paramedian sulci and crescentic sulci clearly visible from tergite 3 but paramedian sutures apparently absent. The longitudinal sternite cruciform sulci shallow, the transverse very narrow].

Pore field of 47 pores occupying the anterior 70% of coxopleuron, without setae in pore field on right, one in centre on left, four setae on posterior margin, none between (Fig. 26). [At least 50 pores occupying approximately the anterior 65% of coxopleuron, with 3 setae in pore field, 5 on posterior margin, none between]. The ultimate leg prefemur (Fig. 27) and the femur with strong setae, the tibia and tarsi with fine setae. Saw teeth 1+8+5, [1+6+3] (Fig. 28). Ambulatory legs setose (Fig. 29). Tarsi undivided, accessory pretarsal spines minute or absent.

Remarks. Lewis (2011) redescribed the holotype (the only known specimen) of *Cryptops inermipes* Pocock, 1888, from Christmas Island. It is unique in the genus in that, according to Pocock (1888), the ultimate legs lack saw teeth. However, the ultimate legs are missing and Lewis (2011) suggested that Pocock (1888) may have mistaken the twentieth pair of legs for the ultimate pair. Lewis (2011) stated that the description provided should allow confirmation of the suggestion when further material becomes available. Unfortunately the specimens here described as *Cryptops* sp. A do not provide sufficient data for this decision to be made.



Figs. 23–43. 23–29, *Cryptops sp.*: 23, anterior margin of forcipular coxosternite, specimen 2; 24, poison gland calyx lateral view, specimen 1; 25, poison gland calyx ventral view, specimen 2; 26, right coxopleuron of ultimate leg-bearing segment, specimen 1; 27, ultimate leg prefemur lateral, specimen 2; 28, detail of ultimate leg femoral, tibial and tarsal saw teeth, specimen 2; 29, ambulatory leg, specimen 1. 30–32, *Paracryptops* cf. *weberi*: 30, anterior part of coxosternite and right forcipule. c, probably a fungus of the order Laboulbeniales; d, detail of tarsungular articulation dorsal. 31, ultimate sternite; 32, pretarsus leg 15. Scale bars = 0.5 mm (Figs. 23, 26, 27, 29); 0.1 mm (Figs. 24, 25, 30, 31); 0.05 mm (Fig. 30).

Pocock's *C. inermipes* is 27 mm long, whereas the present specimens of *Cryptops* sp. A are considerably shorter. The fact that despite the size difference the specimens have a similar number of coxopleural pores suggests very different growth patterns. The two 'species' are similar in that the pretarsal accessory spines are minute or absent and the forcipular coxosternite has a low number of submarginal setae. The present specimens may well be a species distinct from *C. inermipes*, but further material is still required in order to resolve this problem and clarify the nature of *C. inermipes*. Of interest is the fact that specimen 2 has an apparently normal antenna of 15 articles given as a diagnostic character of *C. tahitianus* Chamberlin (1920).

Paracryptops Pocock, 1891

Paracryptops cf. *weberi* Pocock, 1891
(Figs. 30–32)

Material examined. 1 male, WAM T109316, under bark of rotten log, Silver City, 10°25'S, 105°41'E, 4 July 2004.

Description. Mature male, length 9.0 mm. Broken at about segment 8 with protruding gut covered with humus-like material. Colour pale yellow. Forcipular segment typical of the genus with very short tarsungula and anterior margin of coxosternite with rounded plates without teeth (Fig. 30). Duct of poison gland wide, the calyx ovoid situated in approximately the anterior third of the trochanteroprefemur. There is a club-shaped structure (c) attached to the right tarsungulum that is, almost certainly, a fungus of the order Laboulbeniales similar to those seen on the anterior legs of the *Rhysida i. immarginata* reported above. The hinge between the articles of the forcipule is not visible in ventral view but is apparent dorsally in the cleared specimen (Fig. 30d**)**.

Tergite 1 without sutures and overlying cephalic plate. Very fine complete paramedian sutures from 3 (absent on 1 and 2). No data on tergite of ultimate leg-bearing segment nor on sternite cruciform sulci. Sternite of ultimate leg-bearing segment linguiform (Fig. 31).

Coxopleuron with seven pores. Ultimate legs wanting. Ambulatory legs moderately setose. Pretarsi each with a single long accessory spine (Fig. 32).

A complete spermatophore in segment 20, another forming anterior to this.

Distribution of *P. weberi.* Flores (Lesser Sunda Islands), Java (Attems, 1930), Singapore (Chamberlin, 1930), Labuan Island (Sabah), East Sumba (Würmli, 1972), Sulawesi (Vahtera et al., 2012).

Remarks. The Christmas Island specimen runs down to *P. weberi* Pocock, 1891 in Attems' (1930) key. Having a forcipular coxosternite without a median suture and the rounded plates on the anterior margin distinct (delimited by a transverse suture) separates it from *P. indicus* Silvestri, 1924 (distribution India and Vietnam). However, the other characters used by Attems, namely ultimate tibia with four, tarsus 1 with one saw tooth and tergite of ultimate leg-bearing segment rectangular, could not be observed. Attems' data were taken from Kraepelin (1903) whose description was based on specimens from Java. Kraepelin did not examine Pocock's (1891) types which consisted of two mutilated specimens from Flores and his (1894) description is brief, the specimens lacked ultimate legs. The specimen described here may well be *P. weberi* but with the limited information on its characteristics it would be premature to identify it as that species with certainty and further data are required on the species in this genus. It is not the more recently described Indian species *Paracryptops spinosus* Jangi & Dass, 1978.

ACKNOWLEDGEMENTS

The authors acknowledge the assistance of Parks Australia North staff on Christmas Island for their collecting efforts in 2010 and to Bill Humphreys (Western Australian Museum) for requesting this collection and specimen contributions to this collection. Many thanks to Rowland Shelley (North Carolina Museum of Natural Sciences) for assisting JMW in confirming the identification of *Scolopendra subspinipes* in the early stages of this project. Thanks are also due to Greg Edgecombe (Natural History Museum, London) for arranging the shipment of specimens from Australia and constructive comments on the manuscript, also to an anonymous referee for additional comments and for suggesting the identity of the cyst-like structures in *Rhysida i. immarginata* and *Paracrytops* sp., to Jan Beccaloni (Natural History Museum, London) for arranging the loan of Pocock's *Cryptops* and to Roger Lewis and Michael Baker for processing the figures for JGEL. JMW is also grateful to Greg Edgecombe for his invaluable assistance in clarifying the identity of the lithobiomorph.

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