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Notes on some Old World schizomids of the genera *Ovozomus* and *Schizomus* (Schizomida: Hubbardiidae)

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ABSTRACT – To clarify the systematic status of several Asian schizomid species, type specimens of several species were examined. *Schizomus (Trithyreus) lunatus* Gravely from India is transferred to *Ovozomus* Harvey, forming the new combination *Ovozomus lunatus* (Gravely). *Schizomus similis* Hirst from India, and S. remyi Lawrence from Réunion are new junior synonyms of *O. lunatus*, which is newly recorded from Christmas Island and Cook Islands. *Schizomus (Trithyreus) peradeniyensis* Gravely from Sri Lanka is redescribed and transferred to the genus Ovozomus, forming the new combination *Ovozomus peradeniyensis* (Gravely). *Schizomus perplexus* Gravely from Sri Lanka, recently moved to *Notozomus* Harvey, is returned to the genus *Schizomus*. *Trithyreus suboculatus* Pocock (from Sri Lanka) is designated as a *nomen dubium* as the holotype is an unidentifiable juvenile.

KEYWORDS: taxonomy, morphology, new synonyms, new combinations, *Trithyreus*.

INTRODUCTION

The Old World schizomid fauna is poorly known. Of a total world fauna of 272 species, only 114 species are described from the Old World with nearly half (52 species) endemic to Australia (Harvey 1988, 1992, 2000a, 2000b, 2001b, 2003; Harvey and Humphreys 1995; Harvey *et al.* 2008). Until the early 1990's only a handful of schizomid genera were described including two genera of Protoschizomidae (Rowland 1971, 1975) and seven genera of Schizomidae. However, the status and validity of some of these genera waxed and waned (e.g. Hansen and Sörensen 1905; Lawrence 1969; Rowland and Reddell 1979a, 1979b, 1980, 1981). Schizomidae was later found to be a junior synonym of Hubbardiidae, a name that is currently used for this family (Reddell and Cokendolpher 1995; Harvey 2003). During the 1990s, subdivision of Hubbardiidae, and in particular the catch–all genus *Schizomus* Cook, 1899, into a number of distinct generic entities commenced, with descriptions of 23 new genera (Reddell and Cokendolpher 1991; Harvey 1992; Cokendolpher and Tsurusaki 1994; Reddell and Cokendolpher 1995; González–Sponga 1997) and a further 17 genera in the 2000s (Armas 2002; Armas and Colmenares 2006; Armas and Teruel 2002; Bastawade 2004; Cokendolpher and Reddell 2000; Harvey 2000a, 2001a, 2001b, 2006; Harvey *et al.* 2008; Teruel 2003; Teruel and Armas 2002; Villareal M. *et al.* 2008). This increased rate of taxon recognition within Schizomida has been summarised and portrayed graphically by Harvey (2002, 2007).

Despite a good modern description of the type species of *Schizomus*, *S. crassicaudatus* (O.P.–Cambridge, 1872), by Reddell and Cokendolpher (1991), many Old World hubbardiid species are still placed in *Schizomus*, an arrangement that is unlikely to reflect their true systematic position as they lack the diagnostic morphological features of that genus, distinct spurs on the trochanter and patella of the pedipalp (Reddell and Cokendolpher 1991, 1995). Indeed, only two hubbardiid species fit this diagnosis, *S. crassicaudatus* and *S. perplexus* Gravely, 1915, both from Sri Lanka. *Schizomus perplexus* was transferred to *Notozomus* Harvey, 1992 by Bastawade (2004), but this placement is hereby reversed and the species is returned to *Schizomus*.

Whilst some Old World species previously described in *Schizomus* have been revised and transferred to other genera (e.g. Reddell and Cokendolpher 1995; Harvey 2001a, 2006; Bastawade 2004), there are still 26 species that appear to be misplaced and warrant further investigation. Although somatic characters are useful in modern schizomid classifications, the most reliable generic features can be found in the female genitalic region, with the shape of the spermathecae and associated structures such as the chitinised arch and gonopod proving useful in distinguishing taxa. Early taxonomic publications of schizomids did not include descriptions or illustrations of the spermathecae, but their recent utility in systematic studies has allowed an improved understanding of schizomid diversity (e.g. Brignoli 1973, 1974; Rowland and Reddell 1979a, 1979b, 1980, 1981; Harvey 1992; Reddell and Cokendolpher 1995). In order to understand the systematic placement of some of the older species from the Old World, I have been able to examine specimens of several species named during the early to mid–20th century (Pocock 1900; Gravely 1911a, 1911b; Lawrence 1969). Whilst one species is designated as a *nomen dubium*, the others are referrable to named genera.

MATERIAL AND METHODS

The specimens examined for this study are lodged in the Natural History Museum, London (BMNH), Muséum National d'Histoire Naturelle, Paris (MNHN), Royal Museum for Central Africa, Tervuren (MRAC), Western Australian Museum, Perth (WAM) and the Zoological Museum, University of Copenhagen (ZMUC).

The specimens were studied using a Leica MZ16A dissecting microscope, and immersed in 70–75% ethanol. The chelicerae and female genitalic structures were examined by dissecting them from the specimen, and placing them in 50% lactic acid on a microscope slide with a small glass cover slip supported by two pieces of nylon fishing line of appropriate thickness. Where it was not possible to dissect the specimen due to curatorial preferences, the entire specimen was mounted in glycerol or clove oil on a microscope slide and the genital region examined through the cuticle. An Olympus BH–2 compound microscope was used to examine the spermathecae and illustrated using a drawing tube. The specimens were rinsed and returned to ethanol after examination.

TAXONOMY

Family Hubbardiidae Cook, 1899

Ovozomus Harvey, 2001

Ovozomus Harvey 2001a: 687; Harvey 2003: 114.

TYPE SPECIES

Schizomus similis Hirst, 1913 (junior synonym of *Schizomus (Trithyreus) lunatus* Gravely, 1911a, see below), by original designation.

REMARKS

The schizomid genus *Ovozomus* was established for the type species *Schizomus similis* from the Seychelle Islands, and was based upon the unusual morphology of the female genitalia where the chitinised arch is curved into two ovoid structures (Harvey 2001a). The synonymy of two further species with *O. similis*, including the slightly older *S. lunatus*, and the identification of additional specimens from islands in the Indian and Pacific Oceans, demonstrates a much wider distribution for this species than previously suspected.

Ovozomus lunatus (Gravely, 1911), new combination

Figure 1

Schizomus (Trithyreus) lunatus Gravely, 1911a: 33–35, figures 1a–b.

'*Schizomus*' *lunatus* Gravely: Reddell and Cokendolpher, 1995: 50; Bastawade, 2004: 213–215, figures 14–24.

Schizomus lunatus Gravely: Harvey, 2003: 120 (full synonymy).

Schizomus similis Hirst, 1913: 33–34, figures 1–3. **New synonymy.**

'*Schizomus*' *similis* Hirst: Reddell and Cokendolpher, 1995: 54.

Ovozomus similis (Hirst): Harvey, 2001a: 687–688, figure 8; Harvey, 2003: 114 (full synonymy); Harvey, 2010: 337.

Schizomus remyi Lawrence, 1969: 253–254, figures 11j–m, 12a; Harvey, 2003: 121 (full synonymy). **New synonymy.**

'*Schizomus*' *remyi* Lawrence: Reddell and Cokendolpher, 1995: 53–54.

MATERIAL EXAMINED

Paralectotypes of Schizomus (Trithyreus) lunatus

India: ***West Bengal*****:** 1 ♀, Botanic Gardens, Sibpur, Kolkata (as Calcutta) [22°34'N, 88°19'E], 20 April 1910, F.H. Gravely (BMNH 1911.7.12.2); 1 specimen without abdomen, same data except 22 April 1910 (ZMUC 00012641).

Syntypes of Schizomus similis

Seychelle Islands: 2 ♀, Long Island, Mahé [4°37'S, 55°30'E], specimens from wood containing termites, July 1908, J.S. Gardiner (BMNH 1913.8.27.15–16).

Holotype of Schizomus remyi

Réunion: ♀, Sainte-Rose [21°06'N, 55°47'E], 5 August 1947, P. Rémy (MNHN No. Ur 19).

NEW MATERIAL EXAMINED

Australia: ***Christmas Island*****:** 1 ♀, Sepulchral Soil

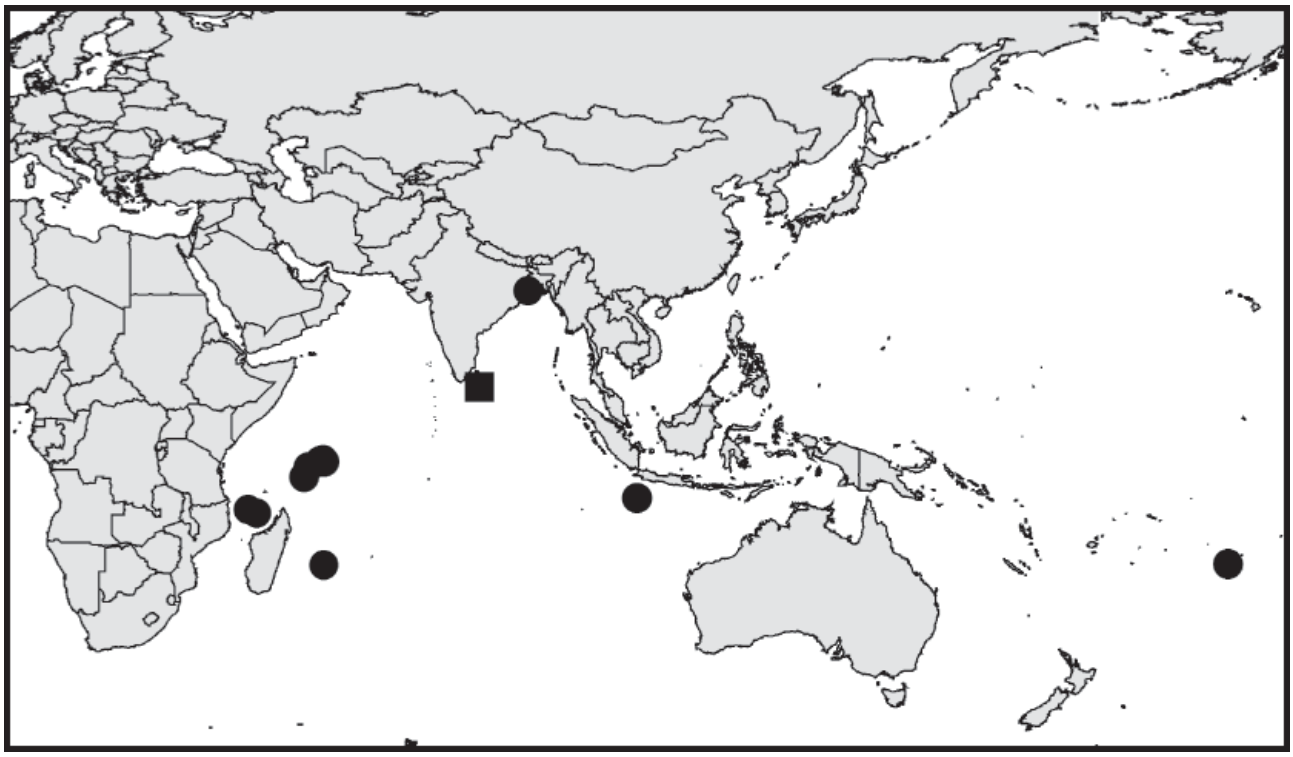

FIGURE 1 Known distribution of *Ovozomus* species: *O. lunatus* (Gravely) (●) and *O. peradiniyensis* (Gravely) (■).

Sink, CI–103, inside cave, 10°25'07"S, 105°41'03"E, 14 May 2006, J. Tapper (WAM T95540); 2 juveniles, same data (WAM T95541).

Cook Islands: 1 ♀, Raratonga Island, 'Arorangi, 21°13'S, 159°49'W, 9–14 March 1996, A. van Harten (WAM T42225).

Mayotte: 1 ♀, Coconi, campus de la DAF [12°47'S, 45°9'E], 18 July 1998, R. Jocqué (MRAC 208.203).

Seychelle Islands: ***Les Amirantes:*** 1 ♀, Amirantes Islands, Saint Joseph Island, 5°26'S, 53°20'E, 22 June 2003, J. Gerlach (WAM T57382).

DIAGNOSIS

Females of *O. lunatus* differ from *O. peradeniyensis* by the morphology of the genitalia which bears multiple pairs of spermathecal lobes and a bifurcate gonopod (Harvey 2001a, figure 8).

DESCRIPTION

Adult male

See Gravely (1911a) and Bastawade (2004).

Adult female

See Harvey (2001a).

REMARKS

Schizomus lunatus was described from an unspecified number of male and female syntypes by Gravely (1911a) of which some are lodged in the Zoological Survey of India, ZMUC and BMNH (Reddell and Cokendolpher 1995; Bastawade 2004). Two syntypes, a male and a female lodged in the Zoological Survey of India, were recently redescribed by Bastawade (2004) who retained the species within *Schizomus*. He designated the male as lectotype and the female as paralectotype. Examination of the female syntype (now a paralectotype) lodged in BMNH clearly demonstrates that *S. lunatus* is conspecific with the holotype of *S. similis* from the Seychelle Islands, which was redescribed and transferred to a separate genus *Ovozomus* by Harvey (2001a). Due to the precedence of *S. lunatus* over *S. similis*, the former becomes the valid name. The female holotype of *S. remyi* from Réunion is also referred to *O. lunatus*, as the morphology of the female genitalia does not differ in any substantial detail from that species.

Ovozomus lunatus is widely distributed in the Australasian region (Figure 1), with confirmed records from India, Seychelle Islands, Comoros, Réunion and Christmas Island in the Indian Ocean region, as well as from the Cook Islands which represents the first record from the Pacific Ocean area. Cokendolpher and Tsurusaki (1994) recorded a female of *S. lunatus* from the Botanic Gardens, Sibpur, Kolkata, India, collected on 22 April 1910 and lodged in Zoologisches Museum, Hamburg that is likely to have been donated to the museum by Gravely and is likely to be a part of the type series of *S. lunatus*. They also record specimens of new species apparently related to *O. lunatus* from Thailand, Philippines and the Marianas Islands.

Ovozomus peradeniyensis (Gravely, 1911), comb. nov.

Figures 1, 2

Schizomus (Trithyreus) peradeniyensis Gravely, 1911b: 137–138, figure 2b.

'*Schizomus*' *peradeniyensis* Gravely: Reddell and Cokendolpher, 1995: 52–53.

Schizomus peradeniyensis Gravely: Harvey, 2003: 120–121 (full synonymy).

MATERIAL EXAMINED

Syntypes

Sri Lanka: *Central Province*: 1 ♀, [Royal Botanic Gardens], Peradeniya [7°15'N, 80°36'E], 19–22 July 1910 (BMNH 1911.7.12.3); 1 ♀, same data (ZMUC 00012643).

DIAGNOSIS

Females of *O. peradeniyensis* differ from those of *O. lunatus* by the morphology of the genitalia which have only two major pairs of spermathecal lobes and apparently lack a gonopod (Figure 2). Males are currently unknown.

DESCRIPTION

Adult female (syntype, BMNH 1911.7.12.3)

Colour: deep yellow-brown.

Propeltidium: with 11 setae, arranged 2 (in row): 1: 2: 2: 2: 2; anterior margin drawn to a sharply downturned point between chelicerae; large eye spots present. Mesopeltidia widely separated. Metapeltidium divided. Anterior sternum with 17 setae, including 2 sternapophysial setae; posterior sternum triangular, with 6 setae. Chaetotaxy of tergites I-IX: 2+4 (4 microsetae diagonal): 2+6 (6 microsetae in column): 3: 4: 4: 6: 6; segment XII without dorsal process.

Flagellum: absent from specimen.

Genitalia (Figure 2): chitinised arch forming two ovoid loops; with 2 major pairs of receptacula, the lateral pair forming a broad medially arched loop with broad extremities, the mesal pair broad and relatively undifferentiated; gonopod apparently absent.

Pedipalp: without apophyses; trochanter without sharply produced distal extension, ventral margin with stout setae, with distinct mesal spur; tibia and tarsus lacking spines; tarsus with spurs.

Chelicera: not examined in detail.

Legs: tarsus I with 6 segments; femur IV 2.87 x longer than wide.

Dimensions (mm): Body length 4.03. Propeltidium 1.42/0.80. Flagellum absent from specimen. Pedipalp: trochanter 0.66, femur 0.65, patella 0.68, tibia 0.64, tarsus 0.29, claw broken, total excluding claw 3.56. Leg I: trochanter 0.49, femur 1.61, patella 1.92, remainder to leg missing. Leg IV: trochanter 0.49, femur 1.58/0.55, patella 0.71, tibia 1.08, metatarsus 0.99, tarsus 0.58, total 5.43.

REMARKS

Schizomus peradeniyensis was described from an unspecified number of female specimens, of which some are lodged in Zoological Survey, India, BMNH, ZMUC, and Zoologisches Museum, Hamburg (Reddell and Cokendolpher 1995). Close examination of the female syntypes in BMNH and ZMUC reveals that the internal genitalia (Figure 2) are of the form that diagnoses the genus *Ovozomus*, and that it is sufficiently distinct from that of *O. lunatus* to be regarded as a separate species. *Ovozomus peradeniyensis*is is currently known only from the type locality in Sri Lanka (Figure 1).

Schizomus Cook, 1899

Nyctalops O.P.–Cambridge, 1872: 410–411 [junior homonym of *Nyctalops* Wagler, 1832 (Aves)].

Schizonotus Thorell, 1888: 358 [replacement name for *Nyctalops* O.P.–Cambridge, 1872; junior homonym of *Schizonotus* Ratzeburg, 1852 (Insecta: Hymenoptera)].

Schizomus Cook, 1899: 249; Reddell and Cokendolpher, 1995: 96–98; Harvey, 2003: 117 (full synonymy) [replacement name for *Schizonotus* Thorell, 1888].

TYPE SPECIES

Nyctalops crassicaudatus O.P.–Cambridge, 1872, by subsequent designation of Cook, 1899.

Schizomus perplexus Gravely, 1915

Schizomus (Trithyreus) perplexus Gravely, 1915: 383–385, figs 1–2.

Schizomus perplexus Gravely: Harvey, 2003: 121.

'Schizomus' perplexus Gravely: Reddell and Cokendolpher, 1995: 53.

Notozomus perplexus (Gravely): Bastawade, 2004: 215–216, figs 25–27.

REMARKS

Schizomus perplexus was described from several males, females and juveniles collected from Polonnuruwa, North-Central Province, Sri Lanka (Gravely 1915). Bastawade (2004) redescribed the species based upon the type specimens lodged in the Zoological Survey, India, and transferred it to *Notozomus*, a genus currently known from eastern Australia (Harvey 1992, 2000b, 2003) and New Caledonia (Harvey, unpublished data), noting strong similarities in the female genitalic morphology. Whilst the spermathecae of *S. perplexus* and *Notozomus* spp. do indeed resemble each other, the great similarity in ventral armature of the pedipalpal trochanter and patella, particularly in the male (Gravely 1915, figures 1, 2; Bastawade 2004, figures 27, 28), so strongly resembles that of *S. crassicaudatus* (Reddell and Cokendolpher 1991, figures 9, 10, 17, 18) –

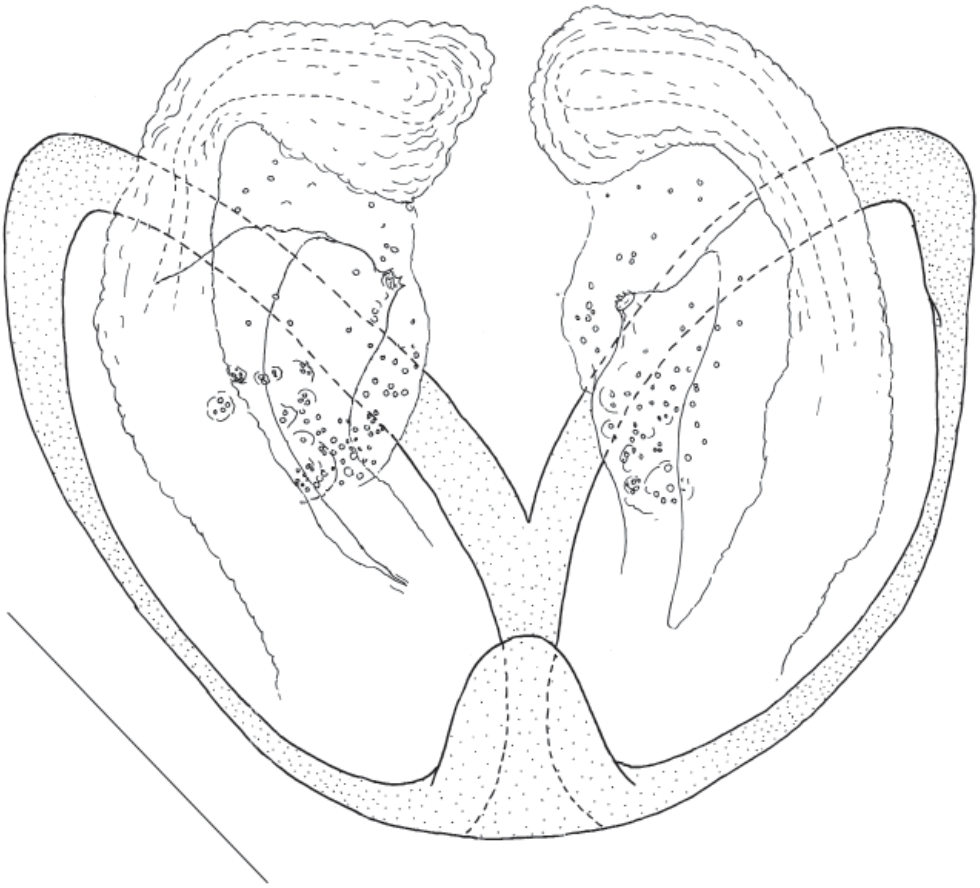

FIGURE 2 *Ovozomus peradeniyensis* (Gravely), female syntype (BMNH 1911.7.12.3), genitalia, ventral aspect. Scale line = 0.2 mm.

also described from Sri Lanka – that they are best considered as congeneric. Therefore, *N. perplexus* is hereby returned to *Schizomus*. It seems that of the many species originally placed in *Schizomus*, only *S. crassicaudatus* and *S. perplexus* share the peculiar pedipalpal morphology, in which the trochanter and patella bear distinct ventral processes, that distinguishes the genus *Schizomus* from all other hubbardiid genera (Reddell and Cokendolpher 1991, 1995), and that all other species currently included in *Schizomus* belong to other genera.

Trithyreus suboculatus Pocock, *nomen dubium*

Trithyreus suboculatus Pocock 1900: 121–122, figures 39a–c.

'*Schizomus*' *suboculatus* (Pocock): Reddell and Cokendolpher 1995: 54–55.

Schizomus suboculatus (Pocock): Harvey 2003: 121 (full synonymy).

MATERIAL EXAMINED

Holotype

Sri Lanka: ***Central Province:*** juvenile, Pundaluoya (as Punduloya) [7°01'N, 80°40'E], no date, Green (BMNH).

REMARKS

Pocock (1900) described *Trithyreus suboculatus* based upon a single specimen from 'Punduloya', Sri Lanka. This location is most likely a lapsus for Pundaluoya which is situated in the Central Province. Shortly thereafter, Hansen and Sörensen (1905) suggested that the specimen was in fact immature, based on observations of the holotype by their colleague Mr C.J. With who examined the specimen during a visit to the British Museum (as it was then known). My examination of the holotype confirms it as a juvenile, and the species is here regarded as a *nomen dubium*. The main diagnostic features of schizomids, at both

the generic and specific levels, are found in the female genital system and in the morphology of the adult male flagellum, and juveniles lack distinguishing diagnostic features. The island of Sri Lanka harbours schizomids of at least four different genera, *Apozomus* Harvey, *Ovozomus*, *Schizomus* and *Zomus* (Reddell and Cokendolpher 1995; Harvey 2003; Bastawade 2004), but the specimen of *T. suboculatus* can be excluded from *Schizomus* and *Zomus* due to the lack of ventral projections on the pedipalpal trochanter and patella which are found in *Schizomus*, and the lack of corneate eyes which are found in *Zomus*. Without new collections from the type locality, this specimen cannot be ascertained to any other schizomid genus. Hansen and Sörensen (1905) attributed a male, two females and several immature specimens collected from Maturata, Sri Lanka to this species, but this attribution cannot be confirmed.

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