# Article

# A new tarantula genus, *Psednocnemis*, from West Malaysia (Araneae: Theraphosidae), with cladistic analyses and biogeography of Selenocosmiinae Simon 1889

RICK C. WEST[1], STEVEN C. NUNN[2] & STEPHEN HOGG[3]

[1] *3436 Blue Sky Place, Victoria, British Columbia, Canada V9C 3N5; rickcwest@shaw.ca, corresponding author*

[2] *43 Range Road, Sarina, Queensland, 4737, Australia; cnu84149@bigpond.net.au*

[3] *14 Jalan Angeric Oncidium 31/74, Kota Kemuning, 40460 Shah Alam, Selangor Darul Ehsan, Malaysia; stephen.wildtrack@gmail.com*

## Abstract

The selenocosmiine genus *Psednocnemis* gen. nov. is described from the Sundaland region of South-east Asia. The type species *Psednocnemis davidgohi* sp. nov., which the male was incorrectly identified as *Coremiocnemis hoggi* West & Nunn 2010, is herein described. Cladistic analyses of 46 morphological characters and 39 exemplar taxa from 12 genera were done. The genera analysed were: *Reichlingia* Rudloff 2001; ingroup: *Chilobrachys* Karsch 1891; *Coremiocnemis* Simon 1892; *Haplocosmia* Schmidt & von Wirth 1996; *Lyrognathus* Pocock 1895; *Orphnaecus* Simon 1892; *Phlogiellus* Pocock 1897; *Poecilotheria* Simon 1885; *Psednocnemis* gen. nov.; *Selenobrachys* Schmidt 1999; *Selenocosmia* Ausserer 1871 (in part: Sundaland fauna only); *Yamia* Kishida 1920. The results presented *Psednocnemis* gen. nov. as monophyletic based on presence of a distal embolic spiral curl in males and presence of a distodorsal spiniform brush on the retrolateral surfaces of coxa IV, as well as the reduction in density of hair type 4, located along the proximoventral abdomen of both sexes. Two new tribes are described: Chilobrachini trib. nov. and Phlogiellini trib. nov., based upon basal nodes with strongest branch support that best reflected natural groups. Selenocosmiini Simon 1889 and Poecilotheriini Simon 1889 are revised and redescribed. *Yamia* Kishida 1920 is placed into junior synonymy of *Phlogiellus* (syn. nov.); *Chilocosmia* Schmidt & von Wirth 1992 and *Selenobrachys* Schmidt 1999 are placed into junior synonymy of *Orphnaecus* (syn. nov.); *Selenocosmia xinping* Zhu & Zhang 2008 is transferred to *Phlogiellus*, makng the new combination *Phlogiellus xinping* (Zhu & Zhang 2008) comb. nov.; *Selenocosmia dichromata* (Schmidt & von Wirth 1992) is transferred to *Orphnaecus*, making the new combination *Orphnaecus dichromata* (Schmit & von Wirth 1992) comb. nov.; *Coremiocnemis brachyramosa* West & Nunn 2010, *Coremiocnemis gnathospina* West & Nunn 2010, *Coremiocnemis jeremyhuffi* West & Nunn 2010 and *Selenocosmia imbellis* (Simon 1891) are transferred to *Psednocnemis* gen. *et* comb. nov. Poecilotherinae (Schmidt 1995) is no longer considered a valid subfamily and is replaced into Selenocosmiinae as the tribe Poecilotheriini. *Chilocosmia barensteinerae* Schmidt *et al.* 2010 is considered a Selenocosmiinae species *incertae sedis*. *Ischnocolella senffti* Strand 1907 is considered a *nomen dubium*. All other genera examined were retrieved as monophyletic in the first cladistic analyses exclusive to Selenocosmiinae genera (Australo-Papuan selenocosmiines are outside the scope of this work and are not considered). Biogeography of all Selenocosmiinae is discussed; the group is a potential model North Gondwanan taxon. A key to *Psednocnemis* species is provided.

**Key words:** mygalomorph, taxonomy, Gondwana, distribution, zoogeography, natural history

## Introduction

The theraphosid subfamily Selenocosmiinae Simon 1889 comprises 2 tribes, 12 recognised genera, 119 species and subspecies (Platnick 2012), and can be found from eastern Pakistan, India, Nepal and Sri Lanka across to China and Taiwan (Lanyu Island only), south through Myanmar, Thailand, Vietnam, Laos, Cambodia, West Malaysia, Singapore, Borneo, Philippines and across most of the Indonesian islands, east to New Guinea, the Solomon Islands (Santa Cruz) and Australia (Fig. 54).

Simon (1889) keyed out his new tribes within the subfamily Avicularinae: Selenocosmiini Simon 1889 were primarily defined by scopulate morphology and the "half moon" shape of the procurved foveal groove and

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Poecilotheriini Simon 1889 were defined by scopulate morphology and the transverse foveal groove. Simon (1892) keyed Aviculariinae and included his new tribe Phlogiini (Simon 1892), differing from Selenocosmiini and Poecilotheriini by divided scopula on tarsi IV. Pocock (1895a) elevated Selenocosmiini, including *Poecilotheria* (Poecilotheriini) and all genera from Phlogiini within his new subfamily. Simon (1903) placed Phlogiini into junior synonymy of the tribe Selenocosmiini, based largely on variation noted in tarsal scopula division across the subfamily. Simon also keyed Selenocosmiinae to genus level (Simon 1903).

Roewer listed Selenocosmiinae (Roewer 1942); Brignoli (1983) followed Roewer (1942). Raven (1985) provided the first cladistic analysis of theraphosid subfamilies, returning Selenocosmiinae as monophyletic based on the presence of clavate setae (bacillae) on the prolateral maxillary surface. The author considered the Ornithoctoninae Pocock 1895 plus Thrigmopoeinae Pocock 1900 as sister group to Selenocosmiinae based on the presence of a stridulating organ between retrolateral chelicerae and prolateral maxillae (Raven 1985). Raven also presumed the genera *Euphrictus* Hirst 1908, *Annandaliella* Hirst 1909 and *Selenogyrus* Pocock 1897 were plesiomorphic selenocosmiines lacking a stridulating organ, and sister group of all other Selenocosmiinae, Ornithoctoninae and Thrigmopoeinae, based on the presence of interchelicerale peg-shaped setae which he noted in the selenocosmiine genus *Coremiocnemis* Simon 1892 (Raven 1985). Goloboff (1993a) considered Raven (1985) as the starting point for higher level phylogenies of Mygalomorphae. Smith (1986, 1987) reviewed Selenocosmiinae and listed *Euphrictus* and *Selenogyrus* as Ischnocolinae Ausserer 1872. Smith (1990) described a new theraphosid subfamily, Selenogyrinae Smith 1990, transferring *Euphrictus*, *Annandaliella* and *Selenogyrus* to it, defining the group from Ischnocolinae based on presence of interchelicerale peg setae. Schmidt (1995) elevated the selenocosmiine tribe Poecilotheriini to subfamilial status, based on a brief two page discussion suggesting vast differences in morphology between Poecilotheriini and other Selenocosmiinae tribes. However, he failed to adequately diagnose the group from all other selenocosmiine genera or present any cladistic analysis that would justify his elevation. Further, he failed to define either Selenocosmiinae or Poecilotheriinae as two distinct monophyletic assemblages. While some authors have followed Schmidt's findings (West *et al.* 2008), others have not (Raven 2005).

Selenocosmiinae, while a distinct monophyletic group (Raven 1985), are morphologically conservative with most genera displaying limited variation. The monophyly of Selenocosmiinae genera have never been tested and the alpha-taxonomy is confusing. Outside of two generic revisions (West & Nunn 2010a, 2010b), several partial and full reviews (Simon 1892, 1903; Pocock 1895a; Hirst 1909; Gravely 1915; Roewer 1942; Smith 1986, 1987; Schmidt 1999, 2003; Zhu & Zhang 2008) and one cladistic analysis to subfamily level (Raven 1985), relationships among selenocosmiine genera and species are largely unknown. To date, diagnostic keys represent the only form of classification for Selenocosmiinae, new genus and species descriptions have been published outside of revisions and without comparison to adequate or truly relevant material (Raven 2000). Like most theraphosid subfamilies, biogeographical history has rarely been discussed, Gravely (1915, 1935) did provide a brief biogeographical account, comparing Selenocosmiinae distribution to that of Ischnocolinae. With the discovery *of Psednocnemis davidgohi* gen. *et* sp. nov., cladistic analyses of Selenocosmiinae taxa (exc. Australo–Papuan fauna) are performed for the first time, retrieving most selenocosmiine genera as monophyletic (and firmly placing *Poecilotheria* within Selenocosmiinae). By plotting distribution records across Selenocosmiinae phylogenies, we hypothesize biogeographical history based on vicariance and consider the subfamily a potential model North Gondwanan taxon for further biogeographical studies.

## Material & Methods

Taxonomic description follows Raven (2005), West *et al.* (2008) and West & Nunn (2010a). All measurements are given in millimeters (mm) and were made to the nearest 0.01 mm using a squared eyepiece and digital dial callipers. Images were made by mounting a Nikon CP8800 to the phototube of a WILD Heerbrugg M8 stereozoom microscope via Scopetronix Maxview TM system, with external cold light illumination. Leg and pedipalp measurements were taken from their dorsal aspect on the left side of all specimens, coxae and trochantera were measured from their ventral aspect, on the same side. Eyes of the type species *Psednocnemis davidgohi* gen. *et* sp. nov. were measured dorsally in cross-section at the longest and widest points with inter-distances between all eyes provided. Claws are not included in measurements of tarsi. Total body length measurements include chelicerae.

Sternal sigilla measurements do not include labio-sternal sigilla. Hair types (following West & Nunn 2010a) in the type species are also provided. Spermathecae were dissected from females and cleared in lactic acid for 24 hours. Leg formula is given in order of size from largest to smallest in both length and width proximally from a lateral prospective. Leg relation factor [RF~] followed von Wirth & Striffler 2005 and is calculated by multiplying the length of leg I by 100, then dividing by the length of leg IV. Values equal to 100: equal sized leg I and IV; above 100: longer leg I; below 100: longer leg IV. Trichobothrial terminology follows Raven (2005). Scopula extents are given as distal extents, i.e., 2/3 means for distal two-thirds and refer to the ventral extent. Methodology for scopula divisions follows Guadanucci (2005). Embolus terminology follows Bertani (2000), with several new keels identified. DIVA–GIS Version 5.4.0.1 was utilized for geographic plotting (Fig. 27). Distribution of Australian Theraphosidae follows Raven *et al.* (2002). All newly designated type material is housed at the QM.

Cladistics: A data matrix (Table 1) consisting of 46 morphological characters and 39 taxa, selected via an exemplar approach (Mishler 1994; Prendini 2001), was utilized for cladistic analyses, using TNT version 1.1 (Goloboff *et al.* 2004), random addition sequence *Heuristic* searches with tree bisection/reconnection (TBR) branch swapping (Swofford 1990), using equal weights and implied weights (Goloboff 1993b): K = 6 (the concavity constant, or "K" value, negatively correlates with how strongly homoplasious characters are down–weighted), collapsing branches with no possible support ("rule 3"; collapsing branches with 0 maximum length). Additional TNT "New Technologies" searches were also carried out using the Ratchet with TBR, default settings (up–weighting probability of 4, and down–weighting probability of 4), following Nixon (1999). All searches were undertaken with 1000 replications, retaining 500 trees per replication. Clade support was calculated with 1000 pseudo replicates using jack-knife resampling (Farris *et al.* 1996: P = 36), with absolute frequency values (F). As pointed out by Kopuchian & Ramirez (2010), jack-knife resampling methods usually produce better measures of support than bootstrapping, and absolute frequency (F values) may be better indicators of support than difference in frequency between a group and its most frequent contradictory group (GC' values). Bremer support/decay indices (Bremer 1988, 1994) were calculated holding up to 10,000 suboptimal trees up to 10 steps longer than optimal trees, branch swapping with TBR, using the commands: hold 10000; sub 10; bb = fillonly tbr. All characters were treated as unordered, multi–state characters were coded as non–additive (Fitch 1971) and characters unapplied to taxa (or unknown) were coded "?" within the executable matrix, and as "?" for unknown or "-" for non-applicable within the published matrix.

Data for *Reichlingia annae* were taken from Reichling (1997) and from holotype examination. Data for *Poecilotheria* species were taken from Smith (2004, 2006), holotype *P. formosa* Pocock 1899 and non-type *P. metallica* Pocock 1899 QM S88462 specimens. Data for *Phlogiellus xinping* (Zhu & Zhang 2008) comb. nov. were taken from Zhu & Zhang (2008). Data for *Phlogiellus watasei* (Kishida 1920) comb. nov. were taken from Haupt & Schmidt (2004) and conspecific non-type specimen QM S83757. Data for *Haplocosmia nepalensis* Schmidt & von Wirth 1996 were taken from Schmidt & von Wirth (1996), the holotype and 4 conspecific non-type specimens (QM S88900, QM S83827, QM S83828 and QM S83829). Data for *Orphnaecus philippinus* (Schmidt 1999) comb. nov. were taken from Schmidt (1999), the holotype and conspecific non-type specimens QM S3833. Data for *Lyrognathus*, *Selenocosmia* and *Coremiocnemis* were taken from West & Nunn (2010a, 2010b). Data for all other taxa were taken from material examined (marked with *). Copies of the data matrix in either NEXUS or Hennig86 format are available from S. Nunn.

Global positioning system (GPS) numerical co-ordinates are given in squared brackets for type material and in round brackets for non-type material.

Note: West & Nunn (2010b) were in error in their examination of the type *C. valida*. The actual specimen examined was a non-type belonging to a new species (description in prep.) used for cladistic analyses within this paper. Additionally, the number logged for the non-type within that paper was also incorrect and is amended herein (NHM 1895.7.18). The correct number for the *C. valida* type is NHM 1860.15 (V. v. Wirth, pers. comm.).

Note: Tribal names follow Raven (2005) and changes following the ICZN (article 29.2).

**Characters used in cladistic analyses:**

**Strikers:**

0.  Cheliceral strikers in multiple rows: (0) absent; (1) present (Figs 12, 48, 50b, 51b, 52b). Length = 1, CI = 1, RI = 0. As noted by West & Nunn (2010a), while some Selenocosmiinae species show "complete" loss of lyrate bacillae on prolateral maxillary surface, opposing cheliceral strikers are always retained. We, therefore, include this character to define our ingroup.

1.  Number of cheliceral strikers: (0) less than 50; (1) 70 or more. Length = 2, CI = 0.5, RI = 0.86.

2.  Longest strikers with long filiform ends (Fig. 12): (0) present (Fig. 52b); (1) absent (Fig. 50b). Length = 1, CI = 1, RI = 0.

3.  Primary strikers thick and heavy thorn-like (Fig. 50b): (0) absent (Figs 12, 51b, 52b); (1) present (Fig. 50b). Length = 1, CI = 1, RI = 0. The primary stikers of *Chilobrachys* are somewhat unique in their robust thorn-like shape (Fig. 50b). All other genera possess primary strikers far thinner in form.

4.  Secondary rows of cheliceral strikers: (0) needleform (Fig. 12); (1) lanceolate with stout bases (Fig. 51b); (2) scimitar form (Fig. 52b); (3) tubercles (Fig. 48); (4) thorn-like (Fig. 50b). Length = 5, CI = 0.8, RI = 0.92. Secondary rows of strikers seem to show more variation than primary rows. In *Poecilotheria*, secondary strikers are tubercle-shaped (Fig. 48), in *Chilobrachys* these strikers are thorn-like (Fig. 50b), in *Orphnaecus*, secondary strikers are lanceolate with stout bases (Fig. 51b), in *Selenocosmia* and some *Lyrognathus* these strikers are scimitar-shaped (Fig. 52b), and all other genera examined display needleform morphology (Fig. 12).

**Lyra:**

5.  Female lyra: (0) rudimentary (Fig. 47) or absent; (1) oval with proximally truncate form (Fig. 49a); (2) almost circular (Fig. 52a); (3) reniform (Fig. 51a); (4) 1–3 rows of heavy clavates (not reniform) (Fig. 50a). Length = 6, CI = 0.66, RI = 0.86. In those selenocosmiine species that show loss of prolateral maxillary lyra, several issues arise, namely this trait (loss of lyra) is the singular defining feature of *Yamia* (Schmidt & Haupt 2004, Raven 2005, Zhu & Zhang 2008). Yet, many undescribed *Orphnaecus* species (West & Nunn, pers. obs.) and some Australian species (R. Raven, pers. comm. 2008) also show losses of maxillary lyra. Secondly (and most critical to character state coding), *Phlogiellus* species show wide ranges of lyrate bacillae counts, but no distinct division between presence/absence (some species such as *P. baeri* show 1–3 bacillate setae). Therefore, instead of using the ambiguous state "absent", due to overly subjective character delineation combined with false multi-state character coding (Sereno 2007), it becomes logical to include the rudimentary condition within the same transformational character state (0). This resolves those subjective character state tendencies, as noted by Jenner (2004), Sereno (2007, 2009), Assis (2009) and Vogt *et al.* (2010) which can threaten the value of morphological characters. This was so critical to Jenner (2004) and Sereno (2009), they stated that such artificial/weak character state delineation can "*threaten the very future of morphology based cladistics as a vigorous discipline*" (surely a strong enough argument as to support our reasoning). Other genera display unique maxillary lyrate arrangements, *Selenocosmia* have an almost circular patch of very short bacillae (Fig. 52a), some *Orphnaecus* possess a reniform patch (Fig. 51a), while *Chilobrachys* lyra comprises 1–3 rows of heavy claviform bacillae (Fig. 50a).

6.  Setal fringe ventrally to prolateral maxillary suture: (0) absent; (1) fine pallid setae (Figs 49a, 50a); (2) scopulate, dark setae (Fig. 47). Length = 3, CI = 0.66, RI = 0.8. The genera *Poecilotheria*, *Haplocosmia* and some *Chilobrachys* possess a setal fringe just ventral to the prolateral maxillary suture, but dorsal to the lyra. In *Poecilotheria* this fringe is dark, almost scopulate (Fig. 47), while in *Haplocosmia* (Fig. 49a) and *Chilobrachys* (Fig. 50a) the fringe is formed from fine, pallid setae.

7.  Tubercles on prolateral maxillary surface: (0) absent; (1) present (Fig. 47). Length = 1, CI = 1, RI = 0. All *Poecilotheria* possess 1–12 tubercles immediately distad to patch of rudimentary bacillae on prolateral maxillary surfaces (Fig. 47). These tubercles are not known in any other selenocosmiine genus.

Sexual morphology (female): Pérez-Miles *et al.* (1996: characters 13, 14) used spermathecal morphology in their cladistic analysis of Theraphosinae. Guadanucci (2005: characters 11, 12) also used spermathecal morphology in his analysis of Ischnocolinae. Pérez-Miles *et al.* (2008: characters 8–11) used spermathecal

morphology to define their new theraphosine genus *Ami* Pérez-Miles 2008; West *et al.* (2008: characters 23, 24) used spermathecal morphology in their analysis of Theraphosidae. Five characters were used based on spermathecal morphology, all of which (with the exception of character 8, states 0 and 1 = West *et al.* 2008: character 23, states 2 and 0) are new.

8. Spermathecae: (0) fused (Figs 28b, 30); (1) not fused (Fig. 31b). Length = 2, CI = 0.5, RI = 0.83. Within Selenocosmiinae examined, both fused (Smith 2004: fig. 6; 2006: fig. 6) and unfused (Kulczyński 1908: fig. 1; Schmidt 1999: fig. 5; Haupt & Schmidt 2004: figs 7–9; Zhu & Zhang 2008: figs 4 I, 6 I, 8 I, 9 F; West & Nunn 2010a: figs 6, 23, 51, 70, 101; 2010b: figs 17, 37, 84, 141, 160, 181, 200, 201) spermathecae were noted.

9. Lateral bilobe spermathecal morphology: (0) apically swollen (Fig. 38b); (1) not apically swollen (Fig. 6). Length = 2, CI = 0.5, RI = 0.75. In all *Psednocnemis* (West & Nunn 2010b, figs 37, 64, 141; herein, (Figs 6, 40) as well as *L. robustus* (Smith 1988; West 1991; West & Nunn 2010a, fig. 101), lateral bilobes lack apical swelling, differing from all other selenocosmiine species with bilobed spermathecal morphology.

10. Bilobed spermathecae with medial and lateral lobes of similar length (Fig. 43): (0) absent (Figs 38b, 45); (1) present (Figs 40, 43, 44b). Length = 2, CI = 0.5, RI = 0.91.

11. Spermathecal lobes with mushroom cap ends (mushroomiform): (0) absent; (1) present. Length = 2, CI = 0.5, RI = 0.8. All *Selenocosmia* within this analysis (Figs 44b, 45), *L. fuscus* and *L. lessunda* (West & Nunn 2010a: figs 51, 70), respectively, herein: (Fig. 38b) possess at least one lobe with mushroom cap (mushroomiform) ends.

12. Spermathecae tombstone-shaped (Fig. 36): (0) absent; (1) present. Length = 1, CI = 1, RI = 0. This trait was noted in an undescribed *Orphnaecus* species used in our analysis as well as *Orphnaecus philippinus* (Schmidt 1999: fig. 5).

Sexual morphology (male): Male palpal bulb characters are well established synapomorphies of and within Theraphosinae (Raven 1985, Pérez-Miles *et al.* 1996, Bertani 2000). Bertani (2000) identified homologous keels within Theraphosinae, we follow him in exploring embolus morphology in Selenocosmiinae, utilizing six characters, herein.

13. Terete embolus lanceolate (LTE) (Figs 41, 44a): (0) absent (Figs 28a, 31a, 32, 34, 35a, 37a, 38a); (1) present (Figs 39, 41, 44a). Length = 1, CI = 1, RI = 0.

14. Single retrolateral keel on embolus (R): (0) absent; (1) strong and heavy (Figs 34, 35a); (2) weak (Figs 37a, 38a). Length = 2, CI = 1, RI = 0. In all *Phlogiellus* (Fig. 34) and *Orphnaecus* (Fig. 35a) examined, a strong and heavy single keel (similar position to R, or retrolateral keel of Bertani 2000) runs along the entire embolus, twisting 90 degrees distally. *Lyrognathus* (except *L. robustus*) also possess a single retrolateral (RR) keel (West & Nunn 2010a: figs 5, 40 and, herein, Figs 37a, 38a), although it is far less pronounced.

15. Basal embolus with distinct heavy retrolateral lobe (BL): (0) absent; (1) present (Figs 34, 35a). Length = 1, CI = 1, RI = 0. In all *Phlogiellus* (Zhu & Zhang 2008: figs 8 B, 9 I and, herein, (Fig. 34) and *Orphnaecus* (Fig. 35a), retrolateral embolus keel terminates basally as an enlarged lobe (BL). A similar lobe is present in Lyrognathus (RBL) (Figs 37a, 38a), but is far smaller, not so distinct. Additionally, an apophysis is present in *Haplocosmia himalayana*, however, this structure originates from the tegulum, not from the embolus and thus not applicable to this character.

16. Embolus with distal (A) and sub-distal (SA) keels (Figs 31a, 32): (0) absent; (1) present. Length = 1, CI = 1, RI = 0. All *Chilobrachys* and *Haplocosmia* used in this analysis (Figs 31a, 32, respectively) possess both A and SA keels.

17. Distal spiral curl on embolus (AC): (0) absent; (1) present (Fig. 39). Length = 1, CI = 1, RI = 0. In all known male *Psednocnemis* (herein, Fig. 39; West & Nunn 2010b: figs 58, 116, 135), the embolus terminates distally with distinct distal "spiral curl" (AC).

18. Embolus with multiple distal keels: (0) present; (1) absent. Length = 1, CI = 1, RI = 0. Among all species used in this analysis, those with more than one keel (or what could be interpreted as a keel) were scored with the state "present". The outgroup taxon *Reichlingia annae* (Reichling 1997: fig. 1) possesses a ventral crest (VC) and prolateral inferior (PI) keel. In *Poecilotheria* (Smith 2004: fig. 13, 14; Smith 2006: figs 13, 14; herein, Fig. 28a) three keels are distinct, one reverse twisting retrolateral (RCR) keel, as well as prolateral superior (PS) and prolateral inferior (PI) keels, corkscrewing along the entire embolus (in the opposite direction to other selenocosmiine species with embolus keels). *Chilobrachys* displays prolateral superior (PS) and inferior (PI)

keels, sub-distal (SA) and distal (A) keels (Fig. 31a) and in *Haplocosmia*, male embolus is flattened, twisted, with strong distal (A), sub-distal (SA), and retrolateral (R) keels (Fig. 32).

Legs:

19. Scopula division on tar. III: (0) divided; (1) undivided. Length = 2, CI = 0.5, RI = 0.89. The conditions "divided/undivided tarsal scopula" have been used extensively throughout history of classification of Mygalomorphae but, herein, is applied only to tar. III. Raven discussed tarsal scopula division in regard to "Anterior/Posterior Gradations" (Raven 1985); Guadanucci (2005) followed from Raven, both concluded a dependency for tarsal scopula division with most developed scopulation in anterior legs, grading to weaker conditions in hind legs. Furthermore, Guadanucci (2005) concluded tarsal scopula division is not dependant upon size and is useful in phylogenetic analysis (contra Pérez-Miles 1994).

20. Scopula division on met. IV: (0) divided; (1) undivided. Length = 1, CI = 1, RI = 0. West & Nunn (2010b, figs 19, 69, 74), following Pocock (1895a; 1900a) used undivided met. IV scopula to diagnose most *Lyrognathus* species. Gallon (2003) considered undivided met. IV scopula apomorphic for Eumenophorinae. Guadanucci (2005) concluded, in his work on tarsal scopula division, that dependency of tarsal scopula condition between legs means the more entire scopulate condition, the more apomorphic states it will show. This would also apply to metatarsal scopula.

21. Scopula on met. IV retrolaterally stronger: (0) absent; (1) present. Length = 1, CI = 1, RI = 0. West & Nunn (2010b) first noted the presence of scopula on retrolateral side of division on met IV as almost entire, with prolateral side only extending 1/3 to 2/3 basally in *Coremiocnemis* (group 1) species (West & Nunn 2010b: figs 21, 87, 163, 206).

22. Met. IV scopula divided by strong diagonal line: (0) absent; (1) present. Length = 1, CI = 1, RI = 0. Both *Coremiocnemis kotacana* and the *Coremiocnemis* sp. from Borneo, used within our data matrix, possess met IV scopula divided and separated distally by strong dividing lines; there is no gradual diminishing of scopula (West & Nunn 2010b: figs 165, 206).

23. Scopula on tarsi laterally extended: (0) absent (Figs 29, 35c, 38c, 42,); (1) present (Fig. 46). Length = 1, CI = 1, RI = 0. Following West *et al*. (2008: character 9, state 3). Raven (1985: table 3, character 17) utilized a similar character in his cladistic analysis of Theraphosidae subfamilies, "*tarsi broader than metatarsi: absent/ present*", a trait he found synapomorphic for Aviculariinae. This character is noted in all *Poecilotheria* considered for analyses.

Leg morphology:

24. Width of Tib. IV in relation to Tib. I: (0) similar to, or smaller than (Fig. 17); (1) incrassate, much thicker than (Fig. 38c). Length = 1, CI = 1, RI = 0. Pocock (1895a; 1900a) used incrassate tib. IV to diagnose *Lyrognathus*. Smith (1988), West (1991) and West & Nunn (2010a: fig. 38c) followed Pocock (1895a). Pérez-Miles *et al*. (1996: character 16) used this character in their analysis of Theraphosinae.

25. Leg spines on tibia: (0) present; (1) absent. Length = 1, CI = 1, RI = 0. Raven (1985) and West *et al*. (2008: character 11) discussed leg spination in Barychelidae and considered reductions in leg spination to be a derived condition in Theraphosidae.

26. Number of clavate trichobothria on tar. IV: (0) under 25; (1) 25 and over. Length = 2, CI = 0.5, RI = 0.91. Raven (1985: table 1, character 37) considered reduction/loss of tarsal trichobothria a synapomorphy for Atypoidina.

27. Position of clavates on tar. IV: (0) proximal 2/3 to 3/4 in straight line; (1) proximal 1/2 or less in straight line; (2) In proximal 1/3 in "U" shape. Length = 3, CI = 0.66, RI = 0.91. Raven (1985) discussed variation of leg trichobothria in Mygalomorphae and used those variations in his systematic revision of the infraorder. Among Selenocosmiinae examined, several clavate trichobothrial conditions were noted. Additionally, Guadanucci (in prep.) noted the clavate arrangement in *Poecilotheria* (Guadanucci, in prep.: fig. 167) as our state (2).

28. Brush of penicillate setae on retrolateral tib. IV (Fig. 38c): (0) absent; (1) present. Length = 1, CI = 1, RI = 0. West & Nunn (2010a) used the presence of penicillate setae along retrolateral surfaces of tib. IV to diagnose all *Lyrognathus* (West & Nunn 2010a: figs 8, 20, 53, 71, 98). We introduce this character for analysis for the first time.

29. Brush of recurved setae along retrolateral met. IV (Fig. 42): (0) absent; (1) present. Length = 1, CI = 1, RI = 0. West & Nunn noted in *Coremiocnemis* (group 1) the presence of recurved setae in brushform along retrolateral

surfaces of met. IV (West & Nunn 2010b: figs 21, 87, 165, 206). The description of *Psednocnemis* gen. nov. indicates this characteristic is diagnostic to *Coremiocnemis* (except *C. tropix* Raven 2005) which is tested here for the first time.

30. Leg width formula IV, III, I, II: (0) absent; (1) present. Length = 2, CI = 0.5, RI = 0.83.

Chelicerae:

31. Intercheliceral setal fringe proximodorsally: (0) absent (Fig. 14); (1) present (Fig. 49b). Length = 1, CI = 1, RI = 0. In *Haplocosmia*, a distinct fringe of long pallid setae is present, intermixed with intercheliceral pegs. This fringe has not been seen outside *Haplocosmia*, and is considered here for the first time.

32. Intercheliceral pegs with prolateral keeled ridge (Fig. 49b): (0) absent; (1) present. Length = 1, CI = 1, RI = 0. In *Haplocosmia*, and only within that selenocosmiine genus, intercheliceral pegs possess a distinct prolateral keel. As in character 31, this trait is tested for the first time.

33. Spine cluster on retrolateral proximomedial chelicerae (Fig. 15): (0) absent; (1) present. Length = 2, CI = 0.5, RI = 0.94. West & Nunn first noted retrolateral cheliceral spines in *Lyrognathus* (West & Nunn 2010a: figs 26, 60, 80, 96), *Coremiocnemis* (West & Nunn 2010b: figs 9, 47, 69, 107, 170, 189, 215) and in *Selenocosmia* (West & Nunn 2010a). The same feature is present in *Psednocnemis* (Fig. 15).

**Other:**

34. Number of labial cuspules: (0) 0–200; (1) 200–350; (2) 350–700. Length = 2, CI = 1, RI = 0. Raven (1985: table 1, character 23) used density and count of labial cuspules to define Theraphosoidae from Barychelidae (with homoplasy in two barychelid subfamilies). Pérez-Miles *et al.* (1996) used counts in labial cuspules in their key to Theraphosinae genera, as well as their cladistic analysis (char 24). Guadanucci (2005) used cuspule counts in his cladistic analysis of Theraphosidae. Raven (2005), followed by West & Nunn (2010a) used high count of labial cuspules to diagnose Selenocosmiinae. West *et al.* (2008, character 6) used labial cuspule counts in their cladistic analysis of Theraphosidae. Pérez-Miles *et al.* (2008) used cuspule counts in their analysis of *Ami* species. Among all species used in these analyses, the only outgroup taxon *Reichlingia annae* as well as all *Poecilotheria* show labial cuspule counts under 200. Only *Phlogiellus* have labial cuspules numbering 200 to 350, remaining taxa show state (2), 350 to 700.

35. Endocuticular studs between coxa III and IV and sternum (West & Nunn 2010b: fig. 203): (0) absent; (1) present. Length = 1, CI = 1, RI = 0. This character refers to presence/absence of heavily sclerotized pallid (West & Nunn 2010b: fig.159) or black (West & Nunn 2010b: fig. 203) studs located between posterior sternal borders and coxa III to IV on endocuticle surfaces. This trait is only known in the *Coremiocnemis* sp. from Borneo, used within our data matrix, and *C. kotacana*. In many selenocosmiine species, the ventral pedicel is covered by many short black thorns; it appears that the endocuticular studs may be a derived extension of those thorns.

36. Apical segment of PLS: (0) short; (1) long. Length = 1, CI = 1, RI = 0. Following Raven (1985), Goloboff (1993a), Guadanucci (2005) and West *et al.* (2008).

37. Variegated body pattern (Fig. 46): (0) absent (Figs 1a, 1b, 29, 35c, 38c, 42); (1) present (Fig. 46). Length = 1, CI = 1, RI = 0. Throughout its history, the variegated pattern of *Poecilotheria* has been used to diagnose it (Latreille 1804; Pocock 1899; 1900a; 1900b; Kirk 1996; 2001; Smith 1986; 1987; 2004; 2006; Krehenwinkel *et al.* 2007), and thus is utilized, herein.

38. Retrolateral surface of coxa IV entirely hirsute: (0) absent; (1) present. Length = 1, CI = 1, RI = 0. West & Nunn (2010a) noted this trait in *Lyrognathus* (except *L. robustus*). However, West & Nunn were in error in stating this trait is present in *L. crotalus* and *L. saltator*. It is however, present in remaining members of *Lyrognathus* and only within that selenocosmiine genus so is used, herein.

39. Retrolateral surface of coxa IV with DD spiniform brush: (0) absent; (1) present. Length = 1, CI = 1, RI = 0. Retrolateral surfaces of coxae IV in *Psednocnemis* possess distinct distodorsal spiniform brushes, which differ from all other selenocosmiines, which show either pallid, with medial brush as in cox. I–III, or entirely hirsute surfaces.

40. Hair type 4 on anterioventral abdomen: (0) absent; (1) present (West & Nunn 2010b, Fig. 6). Length = 1, CI = 1, RI = 0. West & Nunn (2010a; 2010b) noted for the first time, presence of a unique patch of setae, found along the anterioventral abdomen, just posterior to the pedicel, but anterior to the book lungs (2010b: figs 6, 7).

These setae are found in *Lyrognathus, Coremiocnemis, Selenocosmia* (west of the Wallace Line) and in *Psednocnemis*.

41. Density of hair type 4: (0) dense (West & Nunn 2010b: fig. 6); (1) sparse. Length = 1, CI = 1, RI = 0. *Psednocnemis* show a distinct reduction in density of hair type 4.

42. Posterior lateral spinneret length: (0) much shorter than met. IV; (1) nearly as long or equal to met. IV. Length = 1, CI = 1, RI = 0. We introduce this character for the first time.

43. Male palpal patella with dorsal brush of dense, long setae: (0) absent; (1) present. Length = 1, CI = 1, RI = 0. In *Orphnaecus* males examined, a distinct brush of much longer setae are found along the dorsal surface of the patella, these setae are much longer and greater in number than all other dorsal setae of the male palp (V. v. Wirth, pers. comm.). We introduce this character for the first time.

44. Foveal depth: (0) shallow to medium; (1) deep. Length = 1, CI = 1, RI = 0. Raven (1985) discussed variation of foveal structure among Mygalomorphae and used various traits to define taxa. For theraphosids, Pérez-Miles *et al.* (1996: character 25) used foveal morphology in their cladistic analysis of Theraphosinae. West *et al.* (2008: character 5) introduced depth of fovea as a new character in their analysis of Theraphosidae. Although they scored a *Phlogiellus* species with shallow fovea, we discovered deep foveal grooves in all *Phlogiellus* examined, and only within that selenocosmiine genus since all others possess shallow to medium depth fovea. Zhu & Zhang (2008) also recorded deep fovea for *P. xinping* (Zhu & Zhang 2008).

45. Intercheliceral pegs terete, patch density: (0) sparse (Fig. 49b); (1) not sparse (Fig. 14). Length = 2, CI = 0.5, RI = 0.75.


Material from the following institutions were cited, examined or had images of type material supplied to the authors: MCSN—Museo Civico di Storia Naturale di Genoa, Genoa; MNHN—Muséum National d'Histoire Naturelle, Paris; MZB—Museum Zoologicum Bogoriense, Bogor; NHM—The Natural History Museum, London; NHMW—Naturhistorisches Museum, Vienna; NRM—Swedish Museum of Natural History, Stockholm; NUS—National University of Singapore, Singapore; QM—Queensland Museum, Brisbane; RMBR—Raffles Museum of Biodiversity Research, National University of Singapore, Singapore; SMF—Senckenberg Museum, Frankfurt am Main; ZMB—Museum für Naturkunde an der Humboldt Universtät zu Berlin, Berlin; ZMH—Zoologisches Museum Hamburg, Hamburg; ZMUC—Zoological Museum, University of Copenhagen, Copenhagen.

Abbreviations: ALE—anterior lateral eyes, AME—anterior median eyes, CI—consistency index, cox.–coxa, D—dorsal, DD–distodorsal, DL—distolateral, DPD—distal prodorsal, DPV–distal proventral, DRD—distal retrodorsal, DRV—distal retroventral, DV—distoventral, fem.—femur, K—concavity (following Goloboff *et al.* 2004), met.—metatarsus, OT—ocular tubercle, P—prolateral, pat.—patella, PI—prolateral inferior, PLE—posterior lateral eyes, PLS—posterior lateral spinnerets, PME—posterior median eyes, PMS–posterior median spinnerets, PSS—posterior sternal sigilla, PS—prolateral superior, R—retrolateral, RAS—random addition sequence, RI—retention index, tar.—tarsus, TBR—tree bisection/reconnection, tib.—tibia, tro.—trochanter, V—ventral, VC—ventral crest.

Geographical regional distribution definitions followed Svenson & Whiting (2009): Afroasia—central Asia, near eastern countries (including north Africa), Turkey, Iran, Afghanistan, Pakistan to the Thar Desert; Australasia—Australia, New Zealand, New Guinea, New Britain, New Ireland and surrounding islands; Eurasia—Europe and northern Asia; Indomalaya—Thar Desert (India) to Wallace's Line (eastern Indonesia), including subtropical China.


## Material

### Type material:

Note: Coordinates and data in square brackets are traced with Google Earth and were added subsequently, thus, are not part of the original data.

* *Chilobrachys andersoni* (Pocock 1895), holotype female, 1891.10.15.6, Mergui (Myeik Archipeligo) [12°29' N, 98°23' E], Myanmar, NHM (D. Court examined and sent images); [=*Phlogius cervinus* (Thorell 1895)] syntype male, 1895.9.21.21, Tenasserim [=Taninthary, 13°00′ N, 98°45′ E], Myanmar, NHM (D. Court examined and sent images).

*Chilobrachys bicolor* Pocock 1895, holotype female, 1891.11.25.3, Kyaukse [21°37′ N, 96°8′ E], Myanmar, NHM (D. Court examined and sent images).

*Chilobrachys brevipes* (Thorell 1897), holotype female, 1896.2.20.1a, Tharrawaddy [17°39′ N, 95°48′ E], Myanmar, NHM (D. Court examined and sent images).

* *Chilobrachys fimbriatus* (Pocock 1899), holotype female, 1899.11.2.22, Khandala [20°01′ N, 74°48′ E], Maharashstra, India, NHM (D. Court examined and sent images).

*Chilobrachys nitelinus* Karsch 1891, holotype female, 308801a, Sri Lanka, ZMB (V. v. Wirth examined and sent images).

* *Chilobrachys sericeus* (Thorell 1895), syntype female, 1895.9.21.40, Rangoon [= Yangon, 16°48′ N, 96°9′ E], Myanmar, NHM (D. Court examined and sent images).

* *Coremiocnemis cunicularia* [*Phlogius cunicularius*] (Simon 1892), lectotype mature female, AR4547, Penang Hill (= Bukit Bendera, 5°25' N, 100°16' E), Penang Island, Penang, West Malaysia, MNHN—images (F. Vol, pers. comm.)—examined; paralectotype immature female, AR4547, Penang Hill, Penang Island, Penang, West Malaysia, MNHN (F. Vol examined and sent images).

* *Coremiocnemis hoggi* West & Nunn 2010, holotype female, S88042, Fraser's Hill [3°43' N, 101°45' E] Selangor, West Malaysia, QM—examined; paratype female, S74074, Fraser's Hill, Selangor, West Malaysia, QM—examined; 2 females S88076, S88078, Fraser's Hill, Selangor, West Malaysia, QM—examined; paratype female, ZRC ARA.741, Fraser's Hill, Selangor, West Malaysia, RMBR—examined; paratype female, ZRC ARA.67, Fraser's Hill, Selangor, West Malaysia, RMBR—examined; 2 paratype females, ZRC ARA.756, ZRC ARA.757, Fraser's Hill, Selangor, West Malaysia, RMBR– examined.

* *Coremiocnemis kotacana* West & Nunn 2010, holotype female, S83759, Ketambe Research Station [3°41´ N, 97°39´ E], Gunung Leuser National Park, Aceh Teneggara, Sumatra, QM—examined.

* *Coremiocnemis obscura* West & Nunn 2010, holotype female, 4 paratype females. S83745, S83747, S83748, S83749, S83750, respectively, Mile 19 road marker [4°20' N, 101°20' E], Perak, Cameron Highlands, West Malaysia, QM—examined; 2 paratype females, S83743, S83751, Taiping (4°51' N, 100°48' E), Perak, West Malaysia, QM—examined; 1 paratype female and 1 juvenile, ZRC ARA.742, Renglet Camp (= Ringlet, 4°26' N, 101°23' E), Cameron Highlands, Pahang, West Malaysia, RMBR—examined.

*Coremiocnemis valida* Pocock 1895, holotype female, 1860.15, "East Indies", NHM (V. v. Wirth examined and sent images).

* *Haplocosmia nepalensis* Schmidt & von Wirth 1996, paratype female, 38652–84, Kathmandu (27°42′ N, 85°20′ E), Nepal, SMF (V. v. Wirth examined and sent images).

* *Lyrognathus achilles* West & Nunn 2010, holotype female, S88049; paratype male S88050; 2 paratype females S88047 and S88048, Gunung Nibung [2°07' S, 112°00' E], Kotawaringin Barat, Borneo, Indonesia, QM—examined.

* *Lyrognathus crotalus* Pocock 1895, holotype female, 1854.16, Assam State, northeastern India, NHM (R. Raven, A. Smith, V. von Wirth examined and sent illustrations and images, respectively).

* *Lyrognathus fuscus* West & Nunn 2010, holotype female, 3 paratype females S88054, S88051, S88052 and S88053, respectively, Simpang Kubur [2°29' S, 111°25' E], Katawaringin, Kotawaringin Barat, Borneo, Indonesia, QM—examined.

* *Lyrognathus lessunda* West & Nunn 2010, holotype female, paratype female, 3 paratype males, S74067, S74066, S74070, S74068 and S74069, respectively, Lombok Island [8°08' S, 117°24' E], Lesser Sunda Islands, Indonesia, QM—examined.

*Lyrognathus liewi* West 1991 [= *Lyrognathus robustus*], holotype female, 4 paratype females, S15460, S15461, S15462, S88463 and S88502 respectively, 24 mile road marker, Cameron Highlands [4°41' N, 101°52' E], Pahang, West Malaysia, QM—examined.

* *Lyrognathus pugnax* Pocock 1900, holotype female, 1895.1.28.1, Shillong [25°34' N, 91°53' E], Meghalaya State, northeastern India, NHM (A. Smith, V. von Wirth examined and sent illustrations and images, respectively).

* *Lyrognathus robustus* Smith 1988, holotype female, 1988.6.2.1.2, Cameron Highlands, West Malaysia, (collector and date unknown), NHM (R. Raven, V. von Wirth examined and sent images).

* *Lyrognathus saltator* Pocock 1900, holotype female, 1897.6.24.24, North Khasi Hills [25°34' N, 91°37' E], Meghalaya State, Northeast India, NHM (A. Smith, von Wirth examined and sent illustrations and images, respectively).

*Musagetes decipiens* Thorell 1897 [= *Chilobrachys flavopilosus*] holotype female, 1896.2.20.2a, Tharrawaddy, Myanmar, NHM (D. Court examined and sent images).

*Orphnaecus dichromata* (Schmidt & von Wirth 1992) comb. nov., holotype female, 37099–84, Irian Jaya, New Guinea, SMF (R. Raven examined and sent images).

* *Orphnaecus pellitus* Simon 1892, syntype male and female, AR4678, Calapnitan Caves [= Kulapnitan Caves 13° 45' N, 122° 58' E], Camarines Sur Province, Luzon Island, Philippines, MNHN (F. Vol examined and sent images).

* *Orphnaecus philippinus* (Schmidt 1999) comb. nov., holotype female, 39202–84, Mambucal [= Mambukal, 10°24′42″, N 123°7′54″ E] Mount Kanlaon, Negros Island, Philippines, (R. Raven examined and sent images).

* *Phlogiellus atriceps* Pocock 1897, holotype male and paratype female, 1897.11.1.6–7, Buitenzorg [= Bogor, 6° 36′ S, 106° 48′ E], Java, NHM (R. Raven examined and sent images).

* *Phlogiellus baeri* (Simon 1877), holotype female, AR 46711146, Manila [14°35′ N, 120°58′ E], Luzon Island, Philippines, MNHN (R. Raven examined and sent images).

*Phlogius cervinus* Thorell 1895 [= *Chilobrachys flavopilosus*] paratype female, 79/26, Thayetmyo [19°19' N, 95°10' E], Myanmar, NRM (R. Raven, V. von wirth examined and sent images)

* *Poecilotheria formosa* Pocock 1899, holotype female, 1898.10.10.1–2, Kadiampatti [= Kadayampatti, 11°52′26" N, 78°05′48" E], Tamil Nadu, India, NHM (D. Court examined and sent images).

* *Psednocnemis brachyramosa* (West & Nunn 2010) comb. nov., holotype female, paratype female, S83826, S83825, respectively, Gunung Ledang [2°22' N, 102°36' E], Johor, West Malaysia, 2008, QM—examined; paratype male, S83927, Gunung Ledang, Johor, West Malaysia, QM—examined; paratype male, S88160, Gunung Ledang, Johor, West Malaysia, QM—examined.

* *Psednocnemis gnathospina* (West & Nunn 2010) comb. nov., holotype female, ZRC ARA.745, Fraser's Hill [3°43' N, 101°45' E] Selangor, West Malaysia, RMBR—examined.

* *Psednocnemis davidgohi* West, Nunn & Hogg (male transfered from *Coremiocnemis hoggi* type series) sp. nov., paratype male QM S88022, Fraser's Hill [3°42'N, 101°45'E], Selangor, West Malaysia, QM—examined.

* *Psednocnemis imbellis* (Simon 1891) comb. nov., holotype male, AR 4699, Borneo, Indonesia, MNHN (F. Vol examined and sent images).

* *Psednocnemis jeremyhuffi* (West & Nunn 2010) comb. nov., holotype male, 2 paratype males, S83823, S83821, S83824, respectively, Tapah [4°06' N, 101°25' E], Perak, West Malaysia, QM—examined; paratype male, ZRC ARA 743, Pahang, West Malaysia, RMBR—examined; 2 paratype females S88071, S88072, Fraser's Hill, Pahang, West Malaysia, QM—examined.

* *Reichlingia annae* (Reichling 1997), holotype male, paratype female, 1999-136, Indian Church Village [17°46′ N, 88°39′ W], New River Lagoon, Orange Walk District, Belize, NHM (R. Raven examined and sent images).

*Selenocosmia arndsti* (Schmidt & von Wirth 1991), holotype female, 37095–84, Sorong [0°53' S, 131°15' E], Irian Jaya, New Guinea, SMF (R. Raven examined and sent images).

*Selenocosmia aruana* Strand 1911, holotype male, 2685–84, Aru Island [6°10′ S, 134°30′ E], Indonesia, SMF (R. Raven examined and sent images).

*Selenocosmia deliana* Strand 1913, syntype female, 2688–84, Deli (= Deli Serdang, 3°27′29″ N, 98°52′50″ E), Aceh, Sumatra, Indonesia, SMF (R. Raven, P. Jäger examined and sent images).

*Selenocosmia fuliginea* (Thorell 1895), holotype female, 1895.9.21.23, Tharrawaddy, Myanmar, NHM (R. Raven, D. Court examined and sent images).

* *Selenocosmia himalayana* Pocock 1899, holotype female, 1899.8.19.3, Dehra Dun [= Dehradun 30°18′57″ N, 78°02′01″ E]?, Uttarakhand State, India, NHM (R. Raven, D. Court examined and sent images).

*Selenocosmia hirtipes* Strand 1913, syntype female, 2690–84, Moluccas (2°00′ S, 128°00′ E), Indonesia, SMF (R. Raven, P. Jäger examined and sent images).

*Selenocosmia honesta* Hirst 1909, holotype male, 1908.6.27.1, Fak Fak [2°55' S, 132°18' E], Irian Jaya, NHM (R. Raven examined and sent images).

*Selenocosmia insulana* Hirst 1909, holotype male, 96.5.25.37, Djampea Island [7°4'60" S, 120°42'0" E], Indonesia, NHM (R. Raven, D. Court examined and sent images).

*Selenocosmia kovariki* (Schmidt & Krause 1995), holotype female and paratype female, 37350–84 and 37347–84 respectively, Tam Dao [21°27' N, 105°38' E], Vietnam, SMF (R. Raven examined and sent images).

*Selenocosmia lyra* Strand 1913, holotype juvenile male, 2691–84, Bandar Kwala [3°21′41″ N, 98°53′36″ E], Aceh, Sumatra, Indonesia, SMF (P. Jäger, R. Raven examined and sent images).

*Selenocosmia obscura* Hirst 1909, holotype male, 1894.9.19.3–7, Sarawak, East Malaysia, NHM (D. Court examined and sent images).

*Selenocosmia peerboomi* (Schmidt 1999), holotype female, 39185–84, Negros Island [10°0' N, 123°0' E], Philippines, SMF (R. Raven examined and sent images).

*Selenocosmia strubelli* Strand 1913, syntype female, 2694–84, Java, Indonesia, SMF (R. Raven, P. Jäger examined and sent images

* *Selenocosmia tahanensis* Abraham 1924, holotype male, 1924.2.27.22, Gunung Tahan [4°38' N, 102°14' E], Pahang, West Malaysia NHM (R. Raven, J. Beccaloni, D.Court examined and sent images).

*Selenotholus foelschei* Hogg 1902, holotype female, 1924.111.1.22, Palmerston [12°27' S, 130°57' E], Northern Territory, Australia, NHM (A. Smith examined and sent illustrations).

*Selenotypus plumipes* Pocock 1895, holotype female, 1892.5.15.1, Majors Creek [19°40' S, 147°4' E], Queensland, Australia, NHM (R. Raven, A. Smith examined and sent images and illustrations, respectively).


**Other material:**

*Chilobrachys fumosus* Pocock 1895, 2 males, S83830 and S83831, Ri–Bhoi District (25°55' N, 91°53' E), Meghalaya State, India, QM—examined.

*Chilobrachys hardwicki* (Pocock 1895), female, 1899.7.14.2, Chota Nagpur (23°00′ N, 85°00′ E), Bengal, India, NHM (D. Court examined and sent images).

*Chilobrachys huahini* Schmidt & Huber 1996, 2 females, 2 males, S83774, S8376, S83770 and S83780, respectively, Thailand, QM—examined.

* *Chilobrachys sericeus* (Thorell 1895), 1 male, 1 female S74077, S83774, Northwest Thailand, QM—examined.

*Chilobrachys* species, 2 males, S88311, S88312, Teluk Bahang (5° 27′ N, 100° 13′ E), Penang Island, Penang, West Malaysia, QM—examined.

* *Coremiocnemis cunicularia* (Simon 1892), female, ZRC ARA.739, Penang Hill, Penang Island, Penang, West Malaysia, RMBR—examined; female, S83742, Penang Hill, Penang Island, Penang, West Malaysia, QM; female, S83744, Penang Hill, Penang Island, Penang, West Malaysia, QM—examined; formerly identified as *C. validus* (Abraham 1924), 1 male, 1 female, 1924.II 27:23, 1924.II 27:24, respectively, Penang Hill, Penang Island, Penang, West Malaysia, NHM—images (R. Raven, pers. comm.)—examined; 2 females, 3 egg sacs with juveniles, ZRC ARA.740, Penang Hill, Penang Island, Penang, West Malaysia, RMBR—examined; 2 females, ZRC ARA.68, Penang Hill, Penang Island, Penang, West Malaysia, RMBR—examined; 1 female, ZRC ARA.335, Penang Hill, Penang Island, Penang, West Malaysia, RMBR—examined.

* *Coremiocnemis hoggi* West & Nunn 2010, 1 male, 2 juveniles, S88314, S88077, S88079, Fraser's Hill, Selangor, West Malaysia, QM—examined.

* *Coremiocnemis jeremyhuffi* West & Nunn 2010, 2 juveniles, S88069, S88070, Fraser's Hill, Pahang, West Malaysia, QM—examined; juvenile, S83755, QM—examined; juvenile, S88021, Tapah, Perak, West Malaysia, QM—examined.

* *Coremiocnemis obscura* West & Nunn 2010, male, S88360, Tapah, Perak, Cameron Highlands, West Malaysia, QM—examined.

* *Coremiocnemis* sp., 1 female, 1895.7.18, Baram, Sarawak, East Malaysia, NHM—examined.

* *Coremiocnemis* sp., 1 female, ZRC ARA.751, Baram, Sarawak, East Malaysia, RMBR—examined.

* *Coremiocnemis* sp., 1 male and 1 juvenile, S88461, Sungai Liang (4°25' N 114°34' E), Belait District, Brunei Darussalam, Borneo, QM—examined.

* *Haplocosmia nepalensis* Schmidt & von Wirth 1996, 1 female, 3 males, S88900, S83827, S83828 and S83829, Kathmandu (27°42' N, 85°19' E), Nepal, QM—examined.

* *Lyrognathus crotalus* Pocock 1895, topotypic female, 09.10.7.36, North Khasi Hills (25°34' N, 91°37' E), Meghalaya State, northeastern India, NHM (A. Smith examined and sent illustrations).

* *Lyrognathus crotalus* Pocock 1895, 1 female, 1 male S88362, S88361, Darugiri (25°37' N, 90°45' E), Meghalaya State, northeastern India, QM—examined.

* *Lyrognathus crotalus* Pocock 1895, male, 00000641, North Khasi Hills, Meghalaya State, northeastern India, ZMUC (A. Smith examined and sent illustrations).

* *Lyrognathus robustus* Smith 1988 3 females, 1 male, S74339, S74341, S74342 and S74340, respectively, Cameron Highlands, Pahang, West Malaysia, QM—examined; 1 male, S88073, Maxwell Hill (= Bukit Larut,

4°52′ N, 100°48′ E), Perak, West Malaysia, QM—examined; 2 females, ZRC ARA.747, Taiping (4°51' N, 100°48' E), Perak, West Malaysia, col. H. C. Abraham, 1 Nov. 1925, RMBR (D. Court examined and sent images).

* *Lyrognathus saltator* Pocock 1895, male, 1853.54–11, Shillong, Meghalaya State, northeastern India, ZSL (A. Smith examined and sent illustrations).

*Orphnaecus dichromata* (Schmidt & von Wirth 1992) comb. nov., female, S88497, Irian Jaya, New Guinea, QM—examined.

* *Orphnaecus pellitus* Simon 1892, 1 female, S83791, Sorsogon Province (12°50′ N, 123°55′ E?), Luzon Island, Philippines, QM—examined.

* *Orphnaecus philippinus* (Schmidt 1999) comb. nov., 1 female, S83833, Sipalay (9°45' N, 122°26' E), Negros Island, Philippines, QM—examined.

* *Orphnaecus* species (A), 2 females and 4 males in multi-jars, S83782, S83783, Bagacay (12°20′ N, 123°40′ E?), Mobo, Masbate Island, Philippines, QM—examined.

* *Phlogiellus atriceps* Pocock 1897, 1 female, 1 male, 18987.16.1–5, West Java, NHM (D. Court examined and sent images).

* *Phlogiellus baeri* (Simon 1877), 1 female, S83748, Mt. Arayat (15°12′ N, 120°45′ E), Pampanga, Luzon Island, Philippines, QM—examined.

* *Phlogiellus watasei* (Kishida 1920) comb. nov., 1 male, S83757, Lanyu (= Orchid) Island (22°30' N, 121°31' E), Taiwan, QM—examined.

* *Phlogiellus "Yamia"* sp. (A), 2 males, 1 female S88045, S88046, S88067, Ranong (9°46' N, 98°42' E), Ranong province, Thailand, QM—examined.

* *Phlogiellus "Yamia"* sp. (B), 1 male, 1 female S88043, S88044, Ko Samui Island (9°30' N, 100°1' E), Thailand, QM—examined.

* *Poecilotheria metallica* Pocock 1899, 1 female, S88462, Giddalur (15°20'59" N, 78°55'12" E), Nallamala Range, Pradesh, India, QM—examined.

* *Psednocnemis jeremyhuffi* (West & Nunn 2010) comb. nov., 2 juveniles, S88069, S88070, Fraser's Hill, Pahang, West Malaysia, QM—examined; juvenile, S83755, QM—examined; juvenile, S88021, Tapah, Perak, West Malaysia, QM—examined.

*Selenocosmia effera* (Simon 1891). 1 male, S88310, Halmahera Island (0°36' N, 127°52' E), Maluku Islands, Indonesia, QM—examined.

*Selenocosmia javanensis sumatrana* Strand 1907, female, 1897.12.15.1, Deli, Sumatra, NHM (D. Court examined and sent images).

*Selenocosmia orophila* (Thorell 1897), juvenile, 597, Carin–Cheba or Bia–Po [= Karen Mountains, 19°16' N, 96°35' E], Toungoo District, Karen State, Myanmar, ZMH (R. Raven examined and sent images).

*Selenocosmia* sp. 1 female, S74072, West Java, QM—examined.

*Selenocosmia* sp. 1 female, S74078, Thailand, QM—examined.

*Selenocosmia* sp. 2 females, 1 male, S83929, S83928, S88918, Yong Peng (2°01' N, 103°04' E), Johor State, West Malaysia, QM—examined.

* *Selenocosmia* sp. (*javanensis*?) 2 females, S88464, S88484, Bogor (6°35' S, 106°47' E), West Java, QM—examined; male, 173, Java (Novara Exp.), NHMW (V.v.Wirth examined and sent images).

* *Selenocosmia* sp. (A), 1 female, 1 male, ZRC ARA.02, ZRC ARA.333, Singapore, RMBR (D. Court examined and sent images).

* *Selenocosmia* sp. (B), 1 female, 1 male, S88493, S88159, Keraya village, Kumai District (2°44' N, 111°41' E), Kotawaringin Barat, Borneo, QM—examined.

* *Selenocosmia* sp. (C), 1 male, 1 female, S88496, S88919, Keraya village, Kumai District (2°44' N, 111°41' E), Kotawaringin Barat, Borneo, QM—examined.

*Selenocosmia* sp. 2 females, S83754, S88355, Bogor (= Kebun Raya, 6°35' S, 106°47' E), Java, QM—examined.

## Systematics

**Selenocosmiinae Simon 1889**

Selenocosmiini Simon 1889: 204 (sub Selenocosmiae); Simon 1892: 147 (sub Selenocosmieae); Pocock 1895a: 168 (sub Selenocosmiidae); Raven 1985: 118.

Phlogiini Simon 1892: 144 (sub Phlogieae). (synonymised by Simon 1903: 953).

Poecilotheriini Simon 1889: 204 (sub Poecilotheriae); Simon 1892: 144 (sub Poecilotherieae); Schmidt 1995:1–2 (subfamilial elevation); Raven 2005: 16; West *et al.* 2008: 38. Newly replaced into synonymy of Selenocosmiinae.

Chilobrachini trib. nov. West, Nunn & Hogg

Phlogiellini trib. nov. West, Nunn & Hogg

**Diagnosis** Maxilla with stridulation organ formed by an oval patch of modified setae (often bacillate) on prolateral face (Figs 8, 9, 47, 49a, 50a, 51a, 52a), originating medially (not ventrally from the oral fringe), opposing modified setae (strikers) in multiple rows on the retrolateral cheliceral surface (Figs 10, 12, 48, 50b, 51b, 52b): maxillary lyra reduced or absent in some genera, cheliceral strikers retained, sternal sigilla largely removed from sternal margins (Fig. 5), many labial cuspules (>200, except *Poecilotheria* >50) (Fig. 4), leg spines only found distally on metatarsi, tibial apophyses on leg I in mature males absent.

**Genera included:** *Chilobrachys* Karsch 1891, *Coremiocnemis* Simon 1892, *Haplocosmia* Schmidt & von Wirth 1996, *Lyrognathus* Pocock 1895, *Orphnaecus* Simon 1892, *Phlogiellus* Pocock 1897, *Poecilotheria* Simon 1885, *Psednocnemis* gen. nov. West, Nunn & Hogg, *Selenocosmia* Ausserer 1871, *Selenotholus* Hogg 1902 and *Selenotypus* Pocock 1895.

**Remarks:** West *et al.* (2008) considered *Poecilotheria* as its own subfamily Poecilotherinae, presumably following Schmidt (1995). However, we do not recognize Poecilotherinae as a valid subfamily as it lacks any significant synapomorphies to define it from other subfamilies, particularly from Selenocosmiinae (but only synapomorphies of generic significance). Further, dividing the two groups would leave Selenocosmiinae lacking any synapomorphies, something Schmidt (1995) apparently did not consider. With the two groups synonymized, herein, Selenocosmiinae can again be defined by synapomorphies discovered herein (but subject to further testing through the addition of outgroups), and previously (Raven 1985). During the course of gathering data for cladistic analyses, the authors noted a distinct lack of labial cuspules in *Poecilotheria* species compared to all other Selenocosmiinae and have, herein, adjusted the Selenocosmiinae diagnosis to account for this trait. Additionally, the authors consider the presence of multiple rows of cheliceral strikers a serial homologue for Selenocosmiinae (see Character discussion), but only when Poecilotheriini is included.

**Chilobrachini trib. nov.**

**Diagnosis:** Differs from all other selenocosmiine tribes in the presence (except some *Chilobrachys*) of a pallid setal fringe on the prolateral maxillary surface, ventrally to maxillary suture (Fig. 50a); clavate trichobothria in proximal half of all tarsi, spermathecae fused (*Haplocosmia* and *Chilobrachys fimbriatus*, Fig. 30) or with simple unilobes (all other *Chilobrachys*, Fig. 31b); male embolus with apical (A) and subapical (SA) keels (Fig. 31a); lyra with 1–3 rows of heavy clavate bacillae (*Chilobrachys*, Fig. 50a), or multiple rows of bacillae (*Haplocosmia*, Fig. 49a), oval in shape and truncate proximally (Figs 49a, 50a); strikers needleform (*Haplocosmia*) or thorn-like (*Chilobrachys*, Fig. 50b).

**Genera included:** *Chilobrachys* and *Haplocosmia*.

**Phlogiellini trib. nov.**

**Diagnosis:** Differs from all other selenocosmiine tribes in reduced count (>50) of cheliceral strikers which are needleform (*Phlogiellus*), or lanceolate with stout bases (*Orphnaecus*, Fig. 51b); male embolus with strong single retrolateral (R) keel, with strong basal lobe (BL) (Figs 34, 35a); undivided scopula on tar. III (sometimes also on tar. II), third claw present on leg III, and unilobal spermathecae with distally rounded edges (Figs 33, 35b), or tombstone-shaped (Fig. 36).

**Genera included:** *Orphnaecus* and *Phlogiellus*.

**Poecilotheriini Simon 1889**

Poecilotheriini Simon 1889: 204 (sub Poecilotheriae); Simon 1892: 144 (sub Poecilotherieae).

**Diagnosis:** Differs from other selenocosmiine tribes in possessing tubercle-shaped secondary rows of strikers (Fig. 48), tubercles on prolateral maxillary surface (Fig. 47); maxilla with scopulate setal fringes on prolateral surfaces (ventrally and dorsally to maxillary suture) (Fig. 47), laterally extended tarsal scopula (Fig. 46); rudimentary lyra (Fig. 47); arboreal lifestyle.
    **Genera included:** *Poecilotheria*.


**Selenocosmiini Simon 1889**

Selenocosmiini Simon 1889: 204 (sub Selenocosmiae); Simon 1892: 147 (sub Selenocosmieae); Raven 1985: 118.
Phlogiini Simon 1892: 144 (sub Phlogieae) (synonymised by Simon 1903: 953).

**Diagnosis:** Differs from other selenocosmiine tribes by the presence of retrolateral proximomedial cheliceral spines (absent in *L. crotalus* and *L. saltator*) (Fig. 15), hair type 4 (West & Nunn 2010b, fig. 6) present on proximoventral abdomen; female unilobal (some *Selenocosmia*, Fig. 45) or bilobed spermathecae (all others, Figs 6, 38b, 40, 43, 44b) and male palpal embolus elongate, thin, with reduced retrolateral (RR) keel (*Lyrognathus*, Figs 37a, 38a) or terete (all others); lyra (in females) rounded (*Selenocosmia*, Fig. 52a) or oval with truncate form proximally (all others), and strikers scimitar-shaped (*Selenocosmia, Lyrognathus achilles, L. fuscus* and *L. lessunda, Viz.* Fig. 56) or needleform (all others, *Viz.* Fig. 12).
    **Genera included:** *Coremiocnemis, Lyrognathus, Psednocnemis* gen. nov. and *Selenocosmia* (in part, species west of Wallace's Line).
    **Remarks:** Tribal clades within Selenocosmiinae have not been considered since Simon synonymized Phlogini with Selenocosmiini (Simon 1903). This resulted in two tribes remaining, poorly defined and with no informative value (since the two remaining tribes defined *Poecilotheria* from all other Selenocosmiinae, tribes served no purpose other than a secondary all inclusive generic diagnosis for *Poecilotheria*). Our cladistic analyses define strongly supported higher phylogenies that represent natural groups and key divergence events for Selenocosmiinae. Based upon those nodes with strongest support (Bremer supports 2–5; jack-knife resampling 67–98), two new tribes are evident, and Simon's original tribes can be preserved and diagnosed based on synapomorphies proposed, herein (see Cladistics). Because *Selenocosmia* east of Wallace's Line and north of West Malaysia, as well as the Australian genera *Selenotypus* and *Selenotholus,* are not included within this work, we do not consider them for tribal placement, herein, but shall do so in a more thorough work on the subfamily which will include those taxa (in prep).


*Psednocnemis* **gen. nov.**
(Figs 1–27, 39, 40, 53)

**Type species:** *Psednocnemis davidgohi* sp. nov.
    **Etymology:** A compound noun whose first element is the Greek noun *Psedno*, meaning 'scanty' or 'spare', and whose second element is the Greek feminine noun *knemis*, meaning 'shin guard', which describes the hirsute character of leg IV. The gender is feminine.
    **Diagnosis:** *Psednocnemis* gen. nov. differs from *Coremiocnemis* in Leg Relation Factor: RF~ 89.03–94.81 (*Coremiocnemis* leg RF~ 78.26–83.04), lack of bottlebrush setae formation on leg IV, lack of recurved setal brush on retrolateral surface of met. IV (Fig. 18), met. IV scopula on retrolateral side of division only extending 1/3 distally (Fig. 20), male embolus with distal spiral form (Fig. 39) and female spermathecae with lobes lacking apical swelling (Fig. 6). It differs from *Selenocosmia* east of the Wallace Line (Wallace 1860) by possessing female bilobed spermathecae (Figs 6, 40) and male embolus that emerges distally from the tegulum (Fig. 39), hair type #4 (West & Nunn 2010a, 2010b, Fig. 6) present on proximoventral abdomen, as well as possessing a small cluster of spines on retrolateral proximomedial cheliceral surfaces (Fig. 15). It differs from *Selenocosmia* west of the Wallace Line (Java, Sumatra, Borneo, West Malaysia and Singapore) in low cephalothoracic profile, fovea smaller in width

than the ocular tubercle (except *P. gnathospina*), cheliceral strikers lanceolate (Fig. 12), male embolus with distal "spiral curl" and no distal flaring (Fig. 39), and female bilobed spermathecae with lateral bilobes that lack distal swelling (Figs 6, 40). *Psednocnemis* gen. nov. differs from *Lyrognathus* in thin build of tib. IV (incrassate in *Lyrognathus*) (Fig. 17) and lack of penicillate setal fringe along the retrolateral surface of tib. IV (Fig. 17). It also differs from *Coremiocnemis*, *Selenocosmia* and *Lyrognathus* in possessing hair type 4 in a reduced and sparse patch on the proximoventral surface of abdomen and lack of swollen retrolateral scopulation on tar. IV (Fig. 20). It differs from *Phlogiellus* and *Orphnaecus* in possessing female spermathecae with basally dividing paired bilobes (Figs 6, 40), lanceolate and terete male embolus that lacks a well defined single keel (Fig. 39), undivided scopula on tar. III, no third claw on leg III, small cluster of spines on retrolateral proximomedial surface of chelicerae (Fig. 15), and hair type 4 on proximoventral surface of abdomen (more distinct in females, *Viz.* West & Nunn 2010b, fig. 6). It differs from *Haplocosmia* in terete morphology of intercheliceral pegs (Fig. 16), unordered arrangement of intercheliceral peg setae (Fig. 14), female bilobed spermathecae (Figs 6, 40), male embolus lanceolate and terete (Fig. 39) and lack of long setae forming fringe above maxillary lyra (but below maxillary suture). It differs from *Chilobrachys* in possessing longest cheliceral strikers with very long filiform ends (Fig. 12), long needle-like form of cheliceral strikers (Fig. 12), intercheliceral peg setae (Figs 14, 16), female spermathecae bilobed (Figs 6, 40), and male embolus with distal "spiral curl" (Fig. 39). It differs from *Selenotypus* and *Selenotholus* in possessing intercheliceral peg setae (Figs 14, 16), retrolateral proximomedial spine cluster on chelicerae (Fig. 15), and female spermathecae bilobed (figs 6, 40). *Psednocnemis* gen. nov. differs from *Poecilotheria* in lacking variegated body pattern, no tubercles on maxillary lyra (Figs 8, 9), female spermathecae with bilobes (Figs 6, 40) and male embolus terete with distal "spiral curl" (Fig. 39).

**Description**: Leg formula (length) IV, I, II, III; leg RF~ 89.03–94.81; eyes: AME, ALE, PLE, PME; 10–90 medium length intercheliceral peg setae; maxillary lyra oval in form consisting of medium to long shafted bacillae, butterknife (*P. brachyramosa*, *P. jeremyhuffi*) or paddleform (*P. davidgohi* sp. nov., *P. gnathospina*), with or without distal blades, opposing needleform strikers on retrolateral cheliceral surface; foveal groove of less width than OT (except *P. gnathospina*); tar. IV with transverse weakening medially; paired claws (unarmed) on legs I–IV, third claw on leg IV; low cephalothoracic profile; retrolateral proximomedial spine cluster (1–7 spines) on chelicerae; female with bilobed spermathecae that lack apical swelling, bilobes divide basally, with (*P. brachyramosa*) or without (all other species) apical branching ends; male with palpal bulb with proximally swollen embolus, terete, emerges distally from tegulum, with distal "spiral curl" (no distal flaring); hair type #4 (West & Nunn 2010a, 2010b) present on ventral abdominal surface in sparse patch; long setae on legs that form scopula on legs I and II sparse (*P. jeremyhuffi*) or thick (all other species); metatarsi scopula I–III undivided, IV divided by several rows of spiniform setae; scopula on metatarsi IV on distal 1/3 or less, retrolateral surfaces of coxa I–III with median narrow brush, IV with distodorsal brush of elongate spiniform setae; metatarsi III and/or IV with 1DD, 1 DPD, 2DV, 1 DPV, 1 DRV spine arrangement; no dorsal carapace thorns; no basifemoral thorns.

**Remarks:** *Coremiocnemis gnathospina* and *Coremiocnemis jeremyhuffi* (Fig. 40) females possess bilobed spermathecae with lobes lacking apical swelling and slight distinction of sclerotization between apical ends and lobe shafts, Leg RF~ 89.03–94.81, no recurved retrolateral setal brush on met. IV, and met. IV scopula only extending 1/3 or less distally (both sides of scopula division), differing from *Coremiocnemis cunicularia* and its closest relatives. *Coremiocnemis brachyramosa* also shares these traits, although possesses female bilobed spermathecae with apical branching and heavy sclerotization of spermathecae entirely (West & Nunn 2010b, Fig. 37). These three spider species differ from all *Coremiocnemis* in the above traits, which are found (in combination) in the type species of *Psednocnemis*, *P. davidgohi* sp. nov., and only within this new selenocosmiine genus. Thus, we transfer *C. brachyramosa*, *C. gnathospina* and *C. jeremyhuffi* to *Psednocnemis*, making the new combinations *Psednocnemis brachyramosa* comb. nov., *Psednocnemis gnathospina* comb. nov. and *Psednocnemis jeremyhuff* comb. nov. *Selenocosmia imbellis* is known from a single holotype male that possesses male embolus with distal spiral curl, intercheliceral pegs, lyra with pointed distal end, proximally truncate with long shafted bacillae, as well as strikers which are needleform, differing from *Selenocosmia javanensis* and its closest relatives. We, therefore, transfer *S. imbellis* to *Psednocnemis*, making the new combination *Psednocnemis imbellis* comb. nov.

**Species included:** *Psednocnemis davidgohi* sp. nov.; *P. brachyramosa* (West & Nunn 2010) new combination; *P. gnathospina* (West & Nunn 2010) new combination; *P. imbellis* (Simon 1891) new combination and *P. jeremyhuffi* (West & Nunn 2010) new combination.

**Distribution:** West Malaysia and Borneo (Fig. 27).

**Identification key for adult females of *Psednocnemis* gen. nov.**

Note: Couplets 1 and 2 are taken from West & Nunn (2010b: couplets 6 and 7, p. 9) key to *Coremiocnemis* (group 2), however a new key is presented for *Psednocnemis* gen. nov. to include the type species *P. davidgohi* sp. nov. *P. imbellis* is only known from a single holotype male and thus not included in the key to female species.

1. Large intercheliceral pegs greater than 45 in number (West & Nunn 2010b: fig. 71) . . . . . . . . . . . . *P. gnathospina* comb. nov.
- Large intercheliceral pegs less than 45 in number (Fig. 14) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2
2. Spermathecae evenly sclerotized, lobes with apical branching (West & Nunn 2010b: fig. 37) . . . *P. brachyramosa* comb. nov.
- Spermathecae unevenly sclerotized, lobes lack apical branching (Fig. 6) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 3
3. Longest lyra bacillae thick and of medium length, without distal blades (Fig. 9) . . . . . . . . . . . . . . . . . . . .*P. davidgohi* sp. nov.
- Longest lyra bacillae thin and long, with distal blades (West & Nunn 2010b: fig. 142) . . . . . . . . . . *P. jeremyhuffi* comb. nov.

**Identification key for known adult males of *Psednocnemis* gen. nov.**

1. Largest intercheliceral pegs elongate (West & Nunn 2010b: fig. 55) . . . . . . . . . . . . . . . . . . . . . . . *P. brachyramosa* comb. nov.
- Largest intercheliceral pegs not elongate . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 2
2. Largest lyrate bacillae distally pointed (West & Nunn 2010b: fig. 102) . . . . . . . . . . . . . . . . . . . . . . . . . . *P. davidgohi* sp. nov.
- Largest lyrate bacillae not distally pointed . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . 3
3. Lyra ovular in shape (West & Nunn 2010b: fig. 142) . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . *P. jeremyhuffi* comb. nov.
- Lyra elongated in shape, truncate proximally . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . . *P. imbellis* comb. nov.

## *Psednocnemis davidgohi* sp. nov.
(Figs 1–27, 39)

*Coremiocnemis hoggi* (in part: male) West & Nunn 2010: 28, figs 112–118.

**Etymology:** A patronym in honour of Mr. David Goh for his help and support with our research over the past decade in West Malaysia.

**Types:** female holotype QM S88303, Fraser's Hill [3°42'N, 101°45'E], Selangor, West Malaysia; female paratypes QM S88306, QM S88313, QM S88074 and QM S88075, Fraser's Hill [3°42'N, 101°45'E], Selangor, West Malaysia, R. C. West and S. Hogg col., Sept. 7, 2009, QM.

*Coremiocnemis hoggi*, paratype male QM S88022, Fraser's Hill [3°42'N, 101°45'E], Selangor, West Malaysia, QM.

**Diagnosis:** *P. davidgohi* sp. nov. females differ from all other *Psednocnemis* species in possessing female bilobed spermathecae with lateral lobes mildly shorter than medials, and in extremely thick build of largest lyrate bacillae. *P. davidgohi* sp. nov. females also differ from *P. brachyramosa* comb. nov. and *P. jeremyhuffi* comb. nov. in possessing paddleform lyrate bacillae and from *P. gnathospina* comb. nov. in <45 intercheliceral pegs. Males differ from all other male *Psednocnemis* in having distally pointed lyrate bacillae (West & Nunn 2010b, fig. 102).

**Description:** Female holotype QM S88303. Body length: 49.88.
Carapace (Fig. 2): length 20.61, width 16.91 (width across anterior edge 11.34). Fovea 3.21 wide, procurved, deep, not as wide as OT. Distance from anterior carapace to fovea, 14.94. Carapace with 4 discernible hair types (C1 to C4): type C1 long, needleform pallids border carapace entirely: type C2 long brown spiniforms, located along posterior carapace border only: type C3 short, thin wavy pallids, forming basis of carapace mat: type C4 emerge

**FIGURES 1a–b.** *Psednocnemis davidgohi* sp. nov., a. Holotype female, QM S88303, in life, from Fraser's Hill, Selangor, West Malaysia. b. Paratype male, QM S88022, in life, from Fraser's Hill, Selangor, West Malaysia. Photos: R. West.
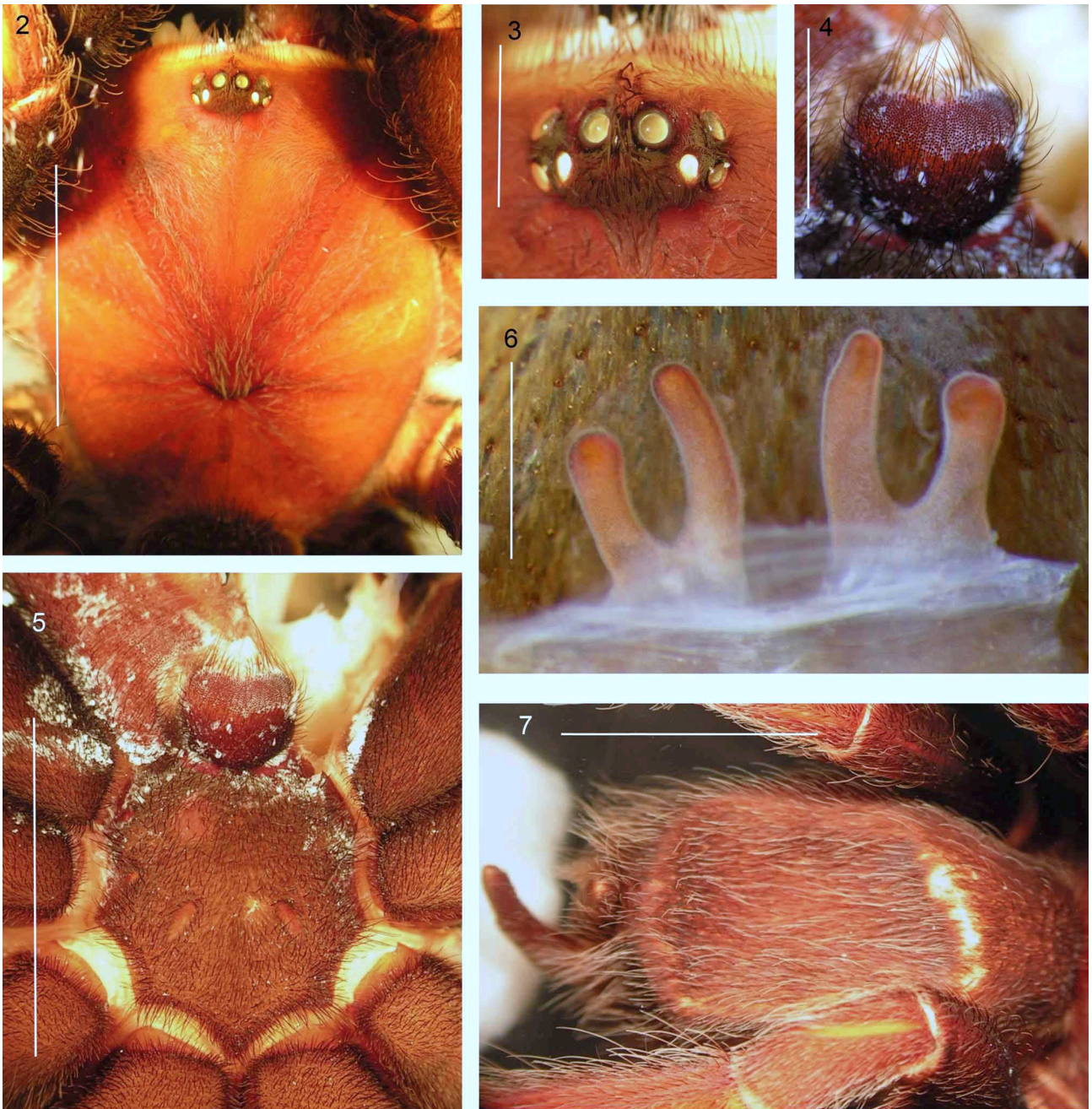
**FIGURES 2–7.** *Psednocnemis davidgohi* sp. nov., holotype female, QM S88303. 2. Carapace, dorsal view. 3. Eyes, dorsal view. 4. Labium, ventral view. 5. Sternum, labium, maxilla and coxae, ventral view. 6. Spermatheca, ventral view. 7. Abdomen, dorsal view. Scale bar = 10 mm for 2, 5 and 7; 5 mm for 4; 2 mm for 3; 1 mm for 6. Photos: S. Nunn.

from what look to be bothrial collars, largely spiniform, pallid, aligned in uniform arrangement: (>9) along anterior edge of each radial groove, (>7) along anterior edge of each thoracic groove, (>5 ) along anterior edge of each caput groove and a line of >3 along medial caput ridge (between OT and fovea). >3 more behind each side of the OT, nearest median caput row.

Eyes (Fig. 3): ocular tubercle; length 1.75, width 3.25. Anterior row straight. Posterior row slightly recurved. Eyes: AME 0.51/0.52, ALE 0.48/0.22, PLE 0.46/0.22, PME 0.41/0.22. Inter–ocular distances: AME–AME 0.51, AME–ALE 0.61, AME–PME 0.41, ALE–ALE 2.49, ALE–PME 0.44, PME–PME 1.71, PME–PLE 0.19, PLE–PLE 2.76, ALE–PLE 0.26. OT hair types: 16 to 20 C4's directly posterior to AME's and PME's. OT entirely covered in short weak, pallid setae (C3), directionally point to centre of OT, posteriorly and anteriorly. Lateral small pallids (C3) very sparse with no uniform direction/random point.

Chelicerae (Figs 10–11): length 11.99, width at base of each lobe 5.35 (bases widest point, dorsally). Retrolateral lyrate region (Fig. 12): a series of strikers (>80 ), in >7 horizontal rows (rows unordered). Strongest/longest strikers on lowest rows. Each striker needleform, with some filiform ends. Teeth 12 larger, >120 proximomesals. Intercheliceral pegs (>10 larger: 0.26–0.52 long, >27 smaller) in tight cluster on proximodorsal surface (Figs 14, 16). Retrolateral face proximomedially with 1 short but strong spine (0.47 long) and >6 strong spiniform setae (Fig. 15), distad.
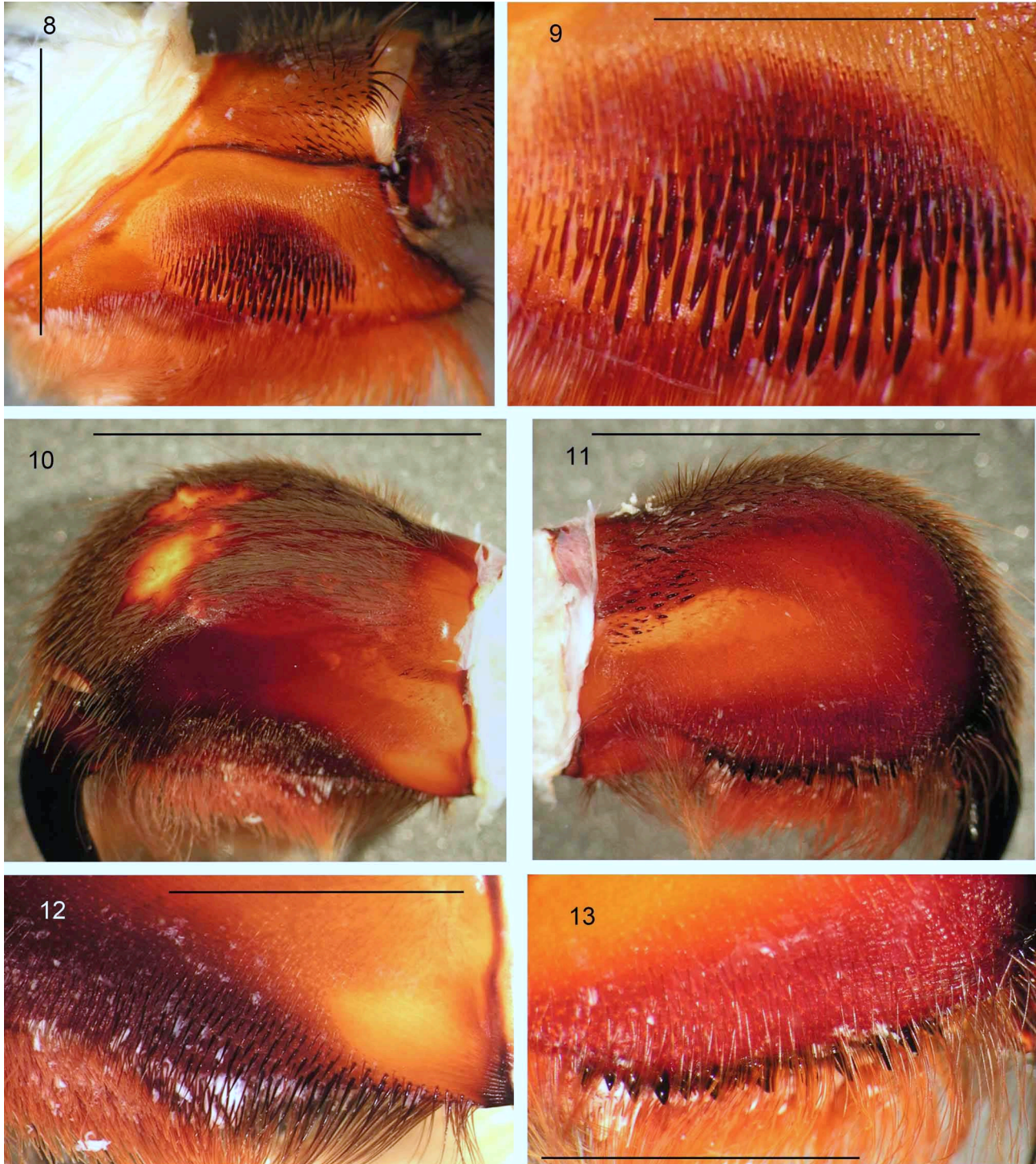


**FIGURES 8–13.** *Psednocnemis davidgohi* sp. nov., holotype female, QM S88303. 8. Left maxilla, prolateral view. 9. Maxillary lyra, prolateral view. 10. Left chelicera, retrolateral view. 11. Left chelicera, prolateral view. 12. Cheliceral strikers, retrolateral view. 13. Left cheliceral teeth. Scale bar = 10 mm for 10 and 11; 5 mm for 8, 12 and 13; 2 mm for 9. Photos: S. Nunn.

**FIGURES 14–20.** *Psednocnemis davidgohi* sp. nov., holotype female, QM S88303. 14. Left intercheliceral pegs, prolateral view. 15. Left proximomedial retrolateral cheliceral spine cluster. 16. Close up of intercheliceral pegs. 17. Left patella and tibia IV, dorsal view. 18. Left metatarsus and tarsus IV, prolateral view. 19. Left metatarsus and tarsus IV, retrolateral view. 20. Left metatarsus and tarsus IV, ventral view. Scale bar = 10 mm for 17–19; 5 mm for 20; 2 mm for 14 and 15; 1 mm for 16. Photos: S. Nunn.

Maxillae (Fig. 8): prolaterally plano-convex, anterior lobe well pronounced, many cuspules (>90) on inner proximoventral surface. Lyra (Fig. 9): many bacilliform rods (>90 larger, >150 smaller) form dense, ovoid patch prolaterally (3.35 long, 1.95 high), lowest row with >15 bacillae, longest rods in centre of lowest row. Rods paddle-shaped (paddles up to 0.40 long) medium shafts (length including paddles up to 0.63), largest without distal blades (very thick and powerful *ca.* congeners). At widest point, lyrate patch 10–12 rows deep, smallest rods dorsally. Proximal end of patch truncate, distal end mildly pointed. Dorsal to maxillary suture > 30 small spines (Fig. 8) on distal margin of maxillae, rows unordered.

Labium (Fig. 4): length 3.44, width 4.51, many small cuspules (>600) along anterior 1/4 surface. Two hair types on labium (L1, L2), L1: long, reasonably dark spiniform in shape, curving distally toward anterior, most concentrated along lateral borders. Setae longest along anterior edge. L2: short dark spiniforms, similar morphology to L1, but half size.

Sternum (Fig. 5): length 8.99, width 4.47. Slightly wider posteriorly than anteriorly, with 5 discernible hair types (S1 to S5): type S1 longest, thickest, darker basally, becoming pallid distally, entire but sparse over sternum: type S2 elongate spiniforms, entirely dark, border sternum, most concentrated posteriorly: type S3 with same morphology as S1, although only 1/4–1/2 length by comparison, entire but sparse over sternum: type S4 short thin pallids, forming basis of sternal mat: type S5 elongate filiforms bordering sternum, most concentrated posteriorly. Posteriorly between left and right cox. IV, sternal border acuminate, lateral sternal points also acuminate. Sternal sigilla (Fig. 5): 3 pairs (not including labio-sternal sigilla), posterior medium in size; right length 1.36, width 0.35, left length 1.36, width 0.34, ovoid, 2.4 apart, 1.65–1.68 from sternal margin. Median pair 1/3 size of posterior, similar in form, 0.45–0.61 from sternal margin. Anterior pair quarter size of posterior, somewhat obscured, border sternal margin. Labio-sternal sigilla large, as big as PSS, 1.25 apart.

Leg setation: All longer leg setation curves distad, lengths of specimen longer tibial setae: palp 0.79, I 0.85, II 0.74, III 0.75, IV 0.94. Lengths of specimen longer metatarsal setae: I 1.08, II 0.97, III 0.98, IV 1.21. Tibia and metatarsi IV with most setae (met. IV *ca*. 12X met. I). All femora covered in short dark setae that form the setal mat, with many long distally curving pallids, most concentrated ventrally.

Legs: formula (length); IV, I, II, III: (width) I, II, III, IV. Leg RF~94.74. Leg lengths (fem., pat., tib., met., tar., total): palp: 11.19, 6.72, 8.17, 0.00, 7.02, 33.10. I: 15.58, 10.79, 11.92, 9.35, 6.76, 54.40. II: 13.23, 8.89, 9.60, 9.56, 5.69, 46.97. III: 12.79, 7.19, 7.68, 9.11, 5.94, 42.71. IV: 16.74, 7.98, 11.88, 14.6, 6.22, 57.42. Leg mid–widths (fem., pat., tib., met., tar., total.): palp: 2.97, 3.01, 3.15, –, 2.15, 11.28. I: 3.78, 3.55, 3.63, 4.04, 3.54, 18.54. II: 3.75, 3.42, 3.42, 3.41, 2.74, 16.74. III: 3.91, 3.62, 3.27, 2.76, 2.39, 15.95. IV: 3.69, 3.64, 3.2, 2.29, 2.67, 15.49. Tar. IV with transverse weakening, most obvious from lateral views.

Scopula: met. and tar. I–III undivided, met. and tar. IV divided by several rows of long, straight spiniform setae (Fig. 20). Met. I: entire, II: 4/5, III: 3/4, IV: 1/4. Tar. IV without wider /incrassate retrolateral scopulate field than seen prolaterally. Met. I–III with dense scopula, setae long, met. IV not as dense, scopula sparse.

Coxae (Figs 5, 23): many small black thorns prolatero-dorsally, some thorns retrolaterally on I–III. Coxae easily seen dorsally. I longest, *ca.* 1.2 times length of II. IV widest, basally rectangular with rounded corners. Coxae with small patch of dorsoprolateral thorns on I–IV. I–III ventrally with many long thick blunt setae proximally, dark in color. Sparse mid-length black setae found evenly over ventral surfaces. IV with mixture of long thick blunt setae entirely, pallid intermixed with shorter thin pallid setae. Ventral I–IV gently sloping anteriorly. Retrolateral setation: I–III with median narrow light brush, grading to spiniform setae dorsally. IV with distodorsal brush, setae long, spiniform. I–IV retrolaterally lack ventral ledge. Ventral measurements for coxae: palp–length 8.43, width 4.83; I– 9.12, 4.78; II– 7.55, 4.59; III– 6.56, 4.33; IV– 7.28, 4.86.



**FIGURES 21–23.** *Psednocnemis davidgohi* sp. nov., holotype female, QM S88303. 21. Left tarsus IV, ventral view. 22. Left tarsus and metatarsus I, retrolateral view. 23. Left coxa II and III, lateral view. Scale bar = 10 mm for 22; 5 mm for 21; 2 mm for 23. Photos: S. Nunn.

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Trochantera: palp–length 2.11, width 3.14; I– 4.13, 4.42; II– 4.06, 4.09; III– 3.78, 4.23; IV– 3.61, 4.22.

Trichobothria: Tarsi: on all tarsi proximal filiform field slightly wider than clavate field, merges evenly. Clavates on tar. I in proximal 2/3 (>30), long filiforms only in proximal half, shorter filiforms intermixed with clavates distally. Clavate extent on tar. II–IV *cf.* I, in distal 2/3. Shorter filiforms for length (following Raven 2005). Short epitrichobothrial field on tar. I shorter than clavates, uniform height for length. Tarsal organ evident on legs I–IV under stereoscope (up to 50X), organ domed. Tar. I with field 0.82 long, 0.16 wide distally, 0.23 wide proximally. Tar. IV with field 0.83 long, 0.11 wide distally, 0.19 proximally. Metatarsi: trichobothrial field not detected. Tibia: Tib. I prolaterally and proximally with short, possibly clavate trichobothria (>12 per 0.2 mm squared) with patch 0.87 long, 0.94 wide, clearly pallid: >8 filiforms detected in semicircular pattern proximally to clavate patch. Tib. IV prolaterally and proximally with short clavates (>9 per 0.2 mm squared) with patch 1.15 long and 1.21 wide: >9 filiforms detected in semicircular pattern ventrally to clavate patch.

Spines: right met. I with 1 DV (left absent), met. II with 1 DV, 1 DRV, met. III (right) with 1 DV, 1 DPV, 1 DRV, (left) with 1DV, 1 DRV, 1 DPD, 1 DD, met. IV with 2 DV, 1 DPV, 1 DRV, 1 DPD, 1 DD.
Claws: paired claws on all legs and palpal claw unarmed. Reduced third claw present on leg IV.

Abdomen (Fig. 7): 21.76 long, ovular, elongated, yellow brown (in alcohol), with 4 discernible hair types (A1 to A4): Dorsally with 3 hair types: type A1 long, dark, but distally pallid: type A2 mid-length, also dark, but distally spiniform: type A3 form dense mat of abdomen, mid-length, but not spiniform. Longest hairs (A1) more concentrated posteriorly toward spinnerets, distad. Ventral hair types similar to dorsal, although types A2, A3 more dense entirely. Hair type A4 in very sparse patch (1.08 length, 1.15 width), trapezoid-shaped, immediately posterior to pedicel between median regions of cox. IV. Hairs medium length, wavy, pallid.

Genitalia: epigastric fold 3.14. Spermathecae (Fig. 6): paired but not fused, separated by 0.45 (width including spermatheca 2.05), bilobed (basally dividing), each lobe with apical rounded ends (lateral bulbs strongest), not apically swollen: lateral bilobe apical widths 0.23 (left)– 0.25 (right): medial bilobe apical widths 0.2 (left)– 0.17 (right), sclerotization heaviest apically, gradually decreasing basally. Lateral lobes (including shaft length) not as long as medials (laterals 0.96–medials 1.23). Epigastric fold extends *ca.* 2/3 length of medial spermathecal lobes.

Spinnerets: PMS: length 2.93, width (medially) 1.08. PLS: section lengths; proximal 4.27, medial 3.4, distal 3.57. PLS section widths (medially); proximal 1.63, medial 1.34, distal 1.17. Spinnerets with 2 discernible hair types (SP1, SP2): SP1 very short and distally blunt pallid, covers both pairs ventrally, second form (SP2), very similar but up to two times longer, dorsally on all segments.

Color (in life, Fig. 1) post and mid moult; chelicerae, carapace and abdomen dorsally chocolate brown with violet hues, coxae and trochantera slightly paler: darker ventrally. Femora I–IV dark violet, pat., tib., met. and tar. I bright cinnamon, pat., tib., met. and tar. II pallid cinnamon, pat., tib., met. and tar. III and IV mildly paler than femora, similar color; premoult: orange brown entirely, femora slightly darker.

**Distribution and natural history:** To date, all specimens (known to the authors) of *P. davidgohi* sp. nov. have come from the summit and south-western slopes of Fraser's Hill, Selangor, West Malaysia, at approximately 1150 meters in elevation (Figs 24, 27). It is a fossorial theraphosid that constructs its burrow retreat in steep sloped ground in shaded areas of montane tropical rainforest. Depending on the size of the specimen, burrows were found to range 25–90 cm in depth and to be a simple, self-excavated, unsilk-lined, tunnel that terminated in an enlarged flask-like chamber. The soil was moist and clay-like soil. The burrow opening consisted of an unflared and poorly silken collar, usually cryptic amongst low mosses (Figs 25, 26). *Psednocnemis davidgohi* sp. nov. was found living sympatrically with *Coremiocnemis hoggi* West & Nunn 2010 and *Psednocnemis jeremyhuffi* (West & Nunn 2010), sometimes as close as 70 cm. The species were found in the lower region of sloped embankments and in areas that were denser in root fibers and mosses (R. West and S. Hogg, pers. obs.). Although Peninsular Malaysia is monsoonal, it has two more noticeable monsoon seasons: February to May and August to December. Males have been found between the months of September and November, during the onset of the monsoons.


## Results and discussion

In a recent paper, Schmidt *et al.* (2010) described a new species, *Chilocosmia barensteinerae* Schmidt *et al.* 2010 from Kalimantan, Borneo. Raven (2000) synonymised *Chilocosmia* (Schmidt & von Wirth 1992) with *Selenocosmia* due to lack of comparison to relevant Selenocosmiinae material and flawed diagnosis. Despite this,

while stating he rejected Raven's synonymy (Schmidt 2002), has thus far failed to adequately define the type species by original designation, *Selenocosmia dichromata* (Schmidt & von Wirth 1992), from other selenocosmiine genera. Considering Schmidt *et al*.'s most recent work (2010), and the inadequate support against Raven's argument for synonymy (Raven 2000), the holotype female *Selenocosmia dichromata* (Schmidt & von Wirth 1992), formerly *Chilocosmia dichromata*, was compared to all Selenocosmiinae genera. Based upon lyrate morphology (reniform, only derived in *Orphnaecus*, Fig. 51a), median carapace line, spermathecal morphology (unilobed, distally reduced ends as in *O. pellitus*, Fig. 35), male embolus morphology (with single retrolateral keel and basal lobe, only found in Phlogiellini trib.nov., Figs 34 and 35a) and retrolateral chelicerae striker morphology (lanceolate with stout bases, a synapomorphy for *Orphnaecus*, Fig. 51b), herein, we transferred *Selenocosmia dichromata* to *Orphnaecus* Simon 1892, making the new combination *Orphnaecus dichromata* (Schmidt & von Wirth 1992) comb. nov. This transfer renders *Chilocosmia* a junior synonym of *Orphnaecus* (new synonymy). However, we suggest all other species attributed to *Chilocosmia* continue to be treated as *Selenocosmia* (following Raven 2000), until a revision of that genus (Nunn, West & Court, in prep.).



**FIGURES 24–26.** *Psednocnemis davidgohi* sp. nov., biotope (24) and burrows (25, 26), Fraser's Hill, Selangor, West Malaysia. Photos: 24 R. West; 25, 26 S. Hogg.

*Selenocosmia barensteinerae* (Schmidt *et al*. 2010) does not readily fit any known selenocosmiine genus. Although Schmidt *et al*. (2010) stated the male is not known, R. West received a mature male of this species from Dr Birute Galdikas in 1994, collected from the Orangutan Sanctuary in South Kalimantan, type locality for this species. The specimen has been rigorously examined against all known selenocosmiine genera. Male embolus and lyrate morphology are unique; we believe this species may be a "relic" selenocosmiine species, possibly isolated during the rifting of either Sibumasu or the West Burma shelf. Other close relatives are known to the authors. Until

the male and congeners can be described (and thus avoid another hastily erected monotypic selenocosmiine genus), we, herein, consider *Selenocosmia barensteinerae* (Schmidt *et al*. 2010) a selenocosmiine species *incertae sedis*.
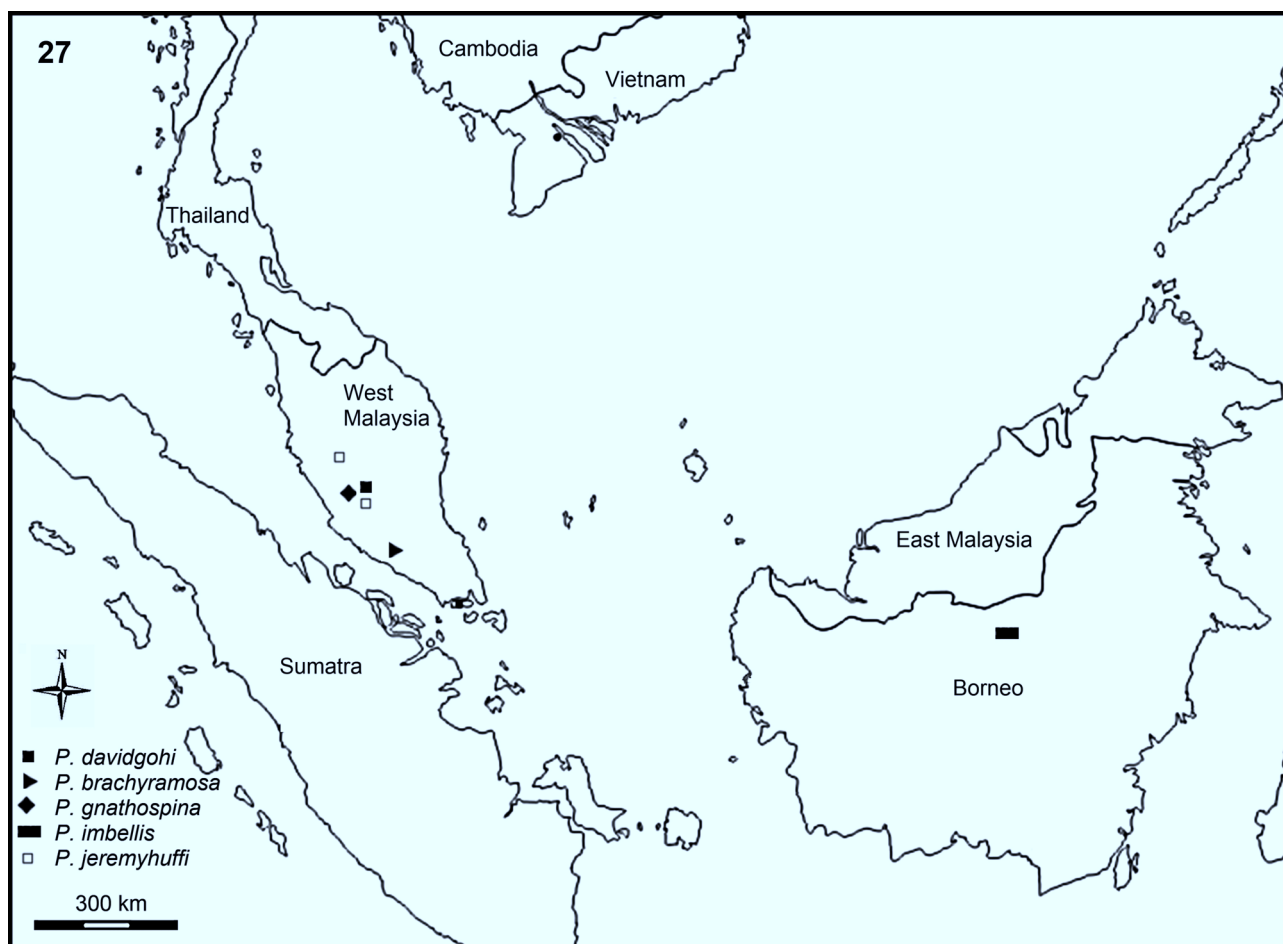


**FIGURE 27.** Map showing records of *Psednocnemis* gen. nov. species in South-east Asia.

In another recent paper, Huber (2010) removed *Ischnocolella* Strand 1907 from synonymy of *Plesiophrictus* Pocock 1899, transfering the genus from Ischnocolinae to Selenocosmiinae (contra: Raven 1985), based upon the original description (Strand 1907) and geographic separation of Ischnocolinae from Selenocosmiinae (following Gravely 1915), as another selenocosmine genus lacking maxillary lyra (Huber 2010). Additionally, Huber proposed that *Yamia* and *Ischnocolella* may be synonymous, based upon the lack of any stridulating organ noted in both genera (Huber 2010). However, as has been shown within this paper, the loss of maxillary lyra within selenocosmiinae is not phylogenetically informative and thus not diagnostic to any one genus. Huber (2010) also discussed the possibility that Raven did not consider any species lacking maxillary lyra as belonging to Selenocosmiinae. The type *Ischnocolella senffti* Strand 1907 is presumed lost during WWII, and Huber made no attempt to examine conspecifics, but seems to have based his resurrection solely upon the above points, (he certainly does not list any conspecifics as examined). Unlike Huber (and contrary to his comment that Raven had based his findings solely upon historic literature), Raven had examined conspecifics held in the AMNH, as well as the *Plesiophrictus* and *Ischnocolus* types from the NHM (Raven 1985, p.155). Also contrary to Huber's discussion, Raven considered the possibility that some Selenocosmiinae lacked maxillary lyra, he had included the alyrate genera *Annandaliella*, *Euphrictus* and *Selenogyrus* (Raven 1985: p.118) as "*plesiomorphic Selenocosmiinae that have not acquired the lyra*" (Raven 1985: p. 37). In our opinion, before any further work can be done on this species, conspecifics need to be examined again, redescribed and compared to current literature, to determine correct placement. Until such time we consider *Ischnocolella senffti* a *nomen dubium*.

*Phlogiellus nebulosus* (Rainbow 1899) from New Britain is not a theraphosid, but a barychelid (R. Raven, pers. comm.), and as such, is not considered within the distribution map for Selenocosmiinae.
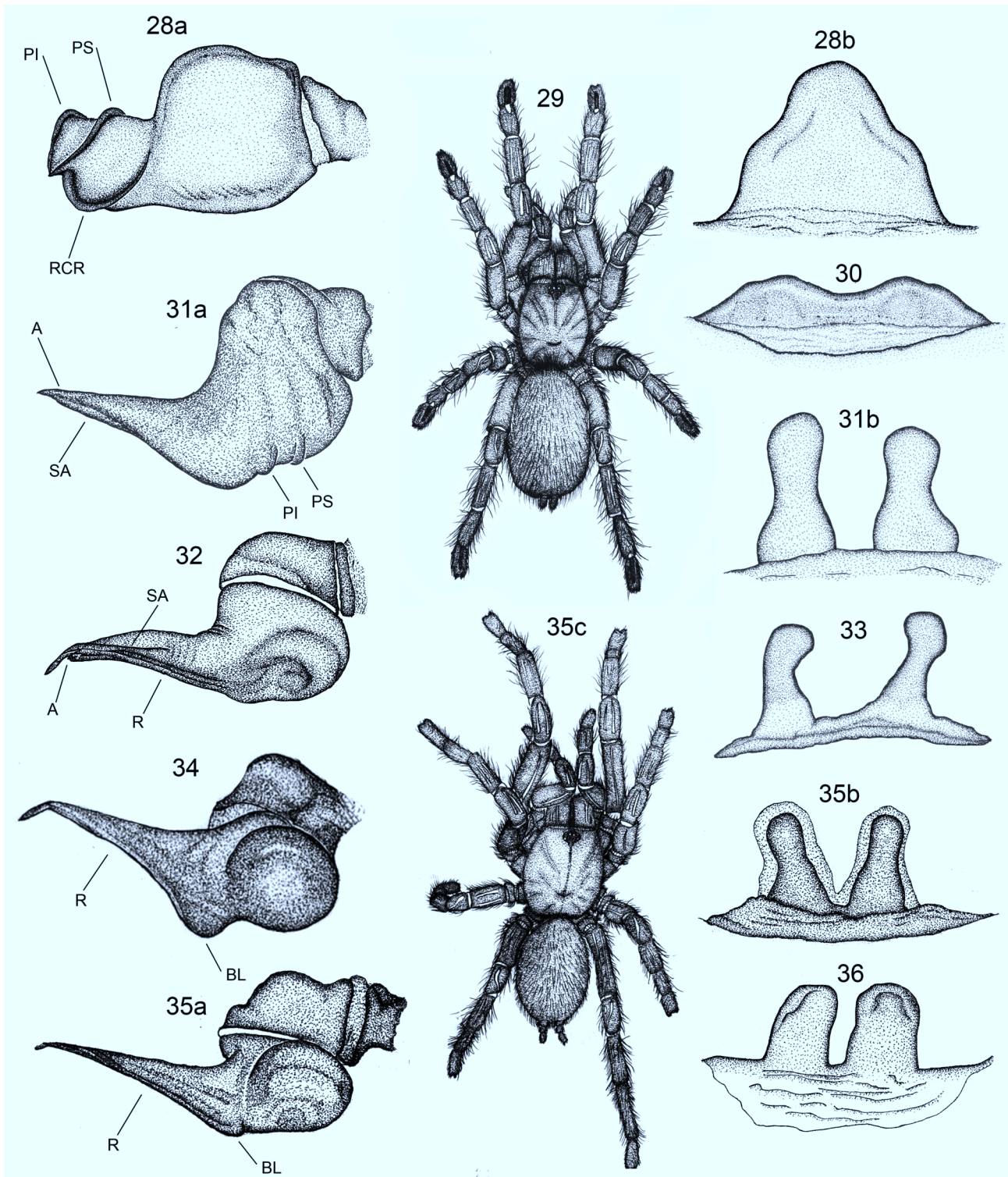
**FIGURES 28–36.** 28a–b: a. *Poecilotheria tigrinawesseli* Smith 2006, male, embolus, retrolateral view. b. *P. tigrinawesseli*, female, spermatheca, dorsal view. 29. *Phlogiellus watasei* (Kishida 1920), female, dorsal habitus. 30. *Chilobrachys fimbriatus* Pocock 1899, holotype female, NHM 1899.11.2.22, spermatheca, dorsal view. 31a–b: a. *Chilobrachys andersoni* (Pocock 1895), paratype male, NHM 1895.9.21.21, embolus, retrolateral view. b. *Chilobrachys andersoni*, holotype female, NHM 1891.10.15.6, spermatheca, dorsal view. 32. *Haplocosmia nepalensis* Schmidt & von Wirth 1996, male, QM S83827, embolus, retrolateral view. 33. *Phlogiellus atriceps* Pocock 1897, paratype female, NHM 1897.11.1.6–7, spermatheca, dorsal view. 34. *Phlogiellus baeri* (Simon 1877), male, QM S83789, embolus, retrolateral view. 35a–c: a. *Orphnaecus pellitus* Simon 1892, syntype male, MNHN AR4678, embolus, retrolateral view. b. *Orphnaecus pellitus*, paratype female, MNHN AR4678, spermatheca, dorsal view. c. *Orphnaecus pellitus*, female, dorsal habitus. 36. *Orphnaecus philippinus* (Schmidt 1999), female, QM S83833, spermatheca, dorsal view. Abbreviations: A—apical keel, BL—basal lobe, PI—prolateral inferior keel, PS—prolateral superior keel, R—retrolateral keel, RCR—reverse corkscrew retrolateral keel, SA—sub-apical keel. Illustrations: S. Nunn.
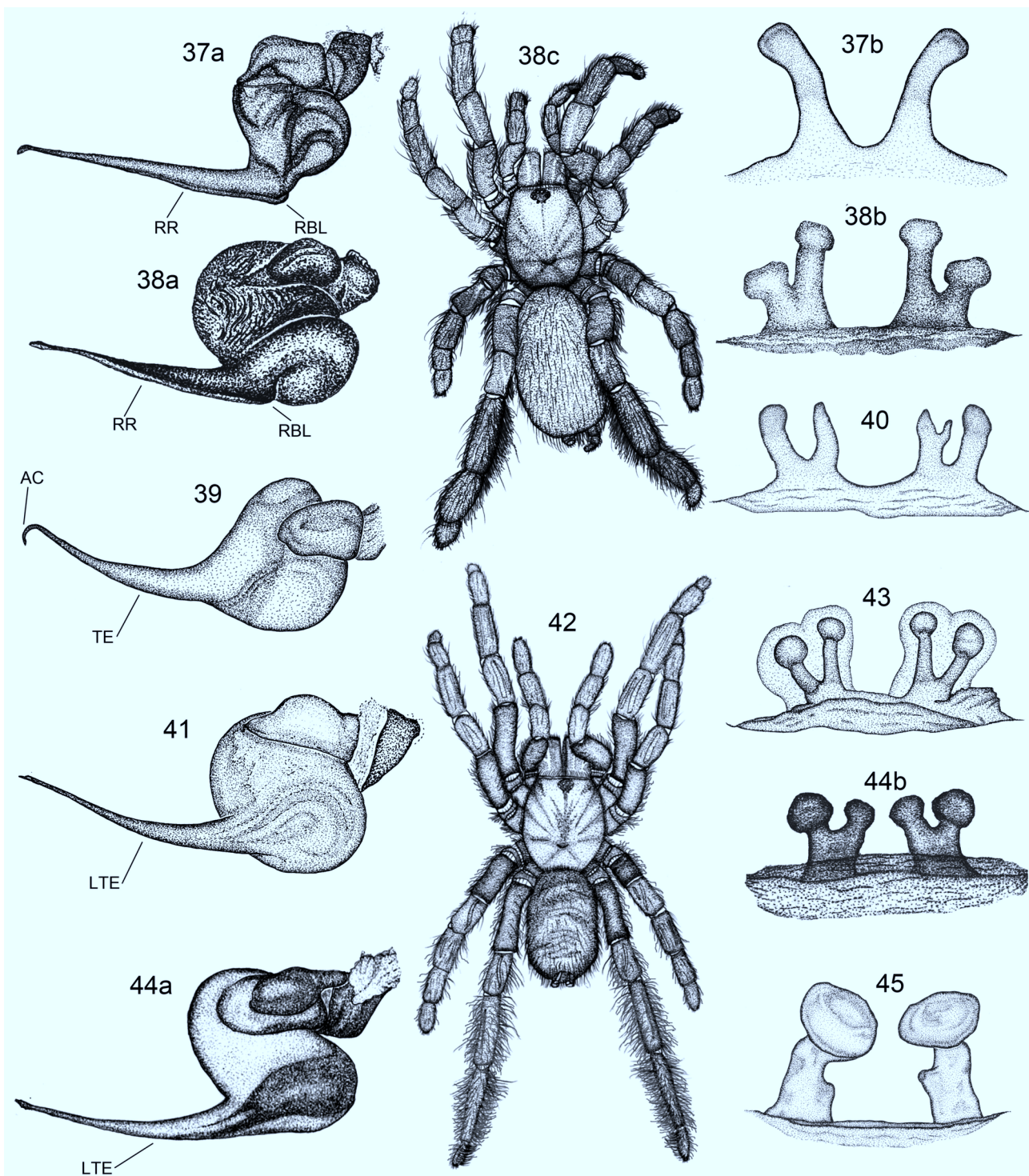
**FIGURES 37–45.** 37a–b: a. *Lyrognathus crotalus* Pocock 1895, male, QM S88361, embolus, retrolateral view. b. *Lyrognathus crotalus*, female, QM S88362, spermatheca, dorsal view. 38a–c: a. *Lyrognathus lessunda* West & Nunn 2010, paratype male, QM S74066, embolus, retrolateral view. b. *Lyrognathus lessunda*, holotype female, QM S74067, spermatheca, dorsal view. c. *Lyrognathus lessunda*, holotype female, QM S74067, habitus, dorsal view. 39. *Psednocnemis davidgohi* sp. nov., paratype male, QM S88022, embolus, retrolateral view. 40. *Psednocnemis jeremyhuffi* (West & Nunn 2010), paratype female, QM S88071, spermatheca, dorsal view. 41. *Coremiocnemis obscura* West & Nunn 2010, male, QM S88360, embolus, retrolateral view. 42. *Coremiocnemis hoggi* West & Nunn 2010, paratype female, QM S74074, dorsal habitus. 43. *Coremiocnemis kotacana* West & Nunn 2010, holotype female, QM S83759, spermatheca, dorsal view. 44a–b: a. *Selenocosmia javanensis* (Walckenaer 1837), male, NHMW 173 embolus, retrolateral view. b. *Selenocosmia javanensis*, female, QM S88355, spermatheca, dorsal view. 45. *Selenocosmia* species (A), female, RMBR ZRC.ARA.02, spermatheca, dorsal view. Abbreviations: AC—apical spiral curl, LTE—lanceolate terete embolus, RBL—reduced basal lobe, RR—reduced retrolateral keel, TE—terete embolus. Illustrations: S. Nunn.
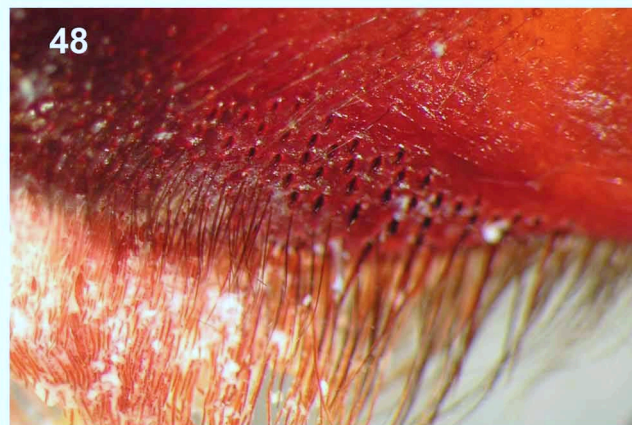
**FIGURES 46–48.** *Poecilotheria* species. 46. *P. metallica* Pocock 1899, female, in life, Nallamala Range, Pradesh, India, dorsal view. 47. *P. formosa* Pocock 1899, holotype female, NHM 1898.10.10.1–2, right maxillae (inverted), prolateral view. 48. *P. metallica*, female, QM S88462, left strikers, retrolateral view. Photos: 46 R. West; 47 D. Court; 48 S. Nunn.
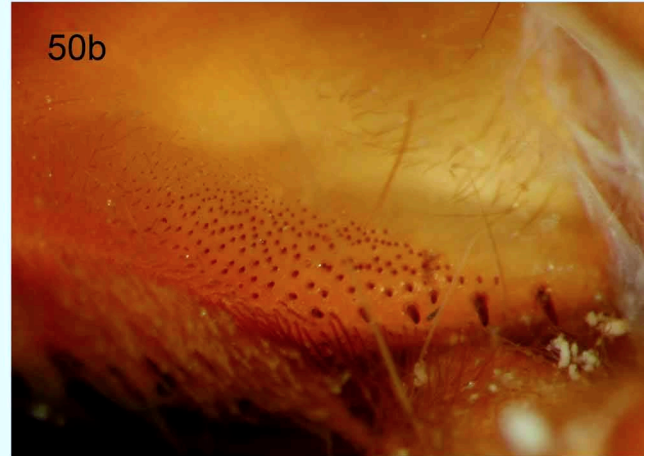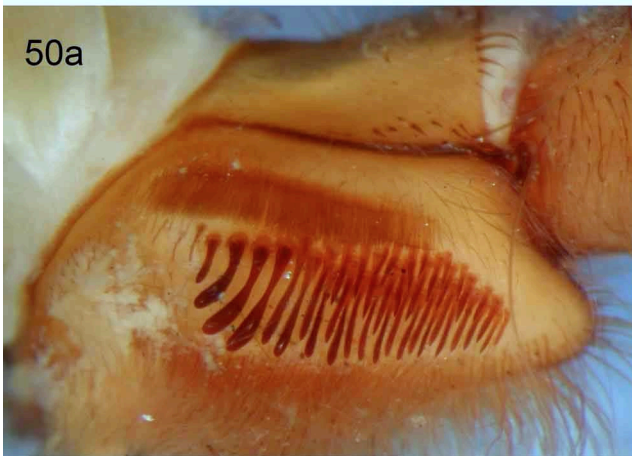
**FIGURES 49a–50b.** 49a,b. *Haplocosmia himalayana* (Pocock 1899), holotype female, NHM 1899.8.19.3. 49a. Right maxillae (inverted), prolateral view. 49b. Right chelicerae, prolateral view. 50a,b. *Chilobrachys sericeus* (Thorell 1895), syntype male, NHM 1895.9.21.21. 50a. Left maxillae, prolateral view. 50b. Left strikers, retrolateral view. Photos: R. Raven.
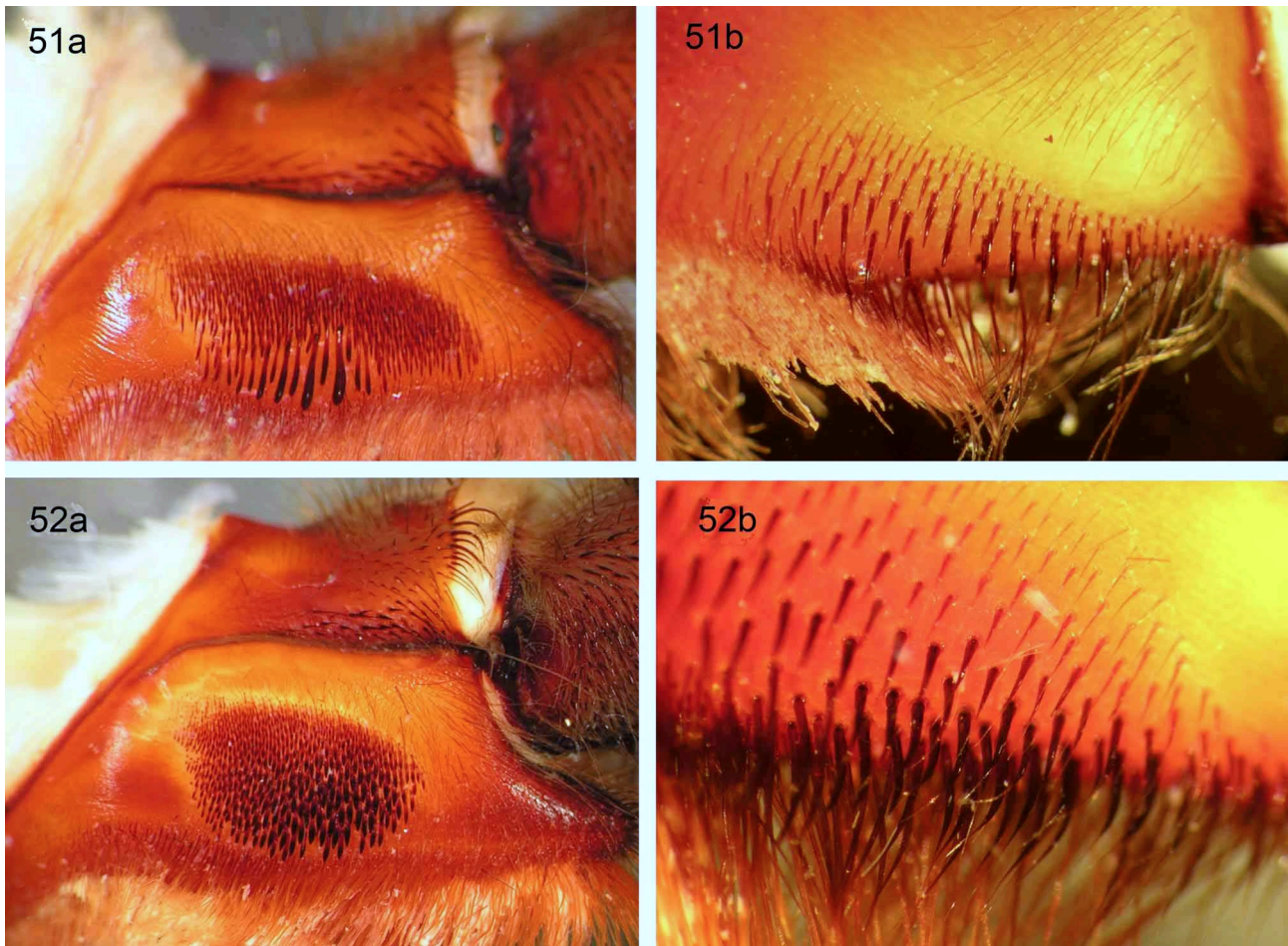
**FIGURES 51a–52b.** 51a,b. *Orphnaecus* species, female, QM S83783. 51a. left maxillae, prolateral view. 51b. *Orphnaecus* species, female, QM S83783, strikers, retrolateral view. 52a. *Selenocosmia javanensis* (Walckenaer 1837), female, QM S83754, left maxillae, prolateral view. 52b. *S. javanensis* female QM S83754, strikers, retrolateral view. Photos: S. Nunn.

## Cladistics

Cladistic analyses using TNT random addition sequence heuristic searches (RAS), with tree bisection/reconnection (TBR) branch swapping (1000 replications, holding 500 trees per replication) under equal weights yielded 2 trees of identical toplogy, length = 72, CI = 78, RI = 94, only differing in placement of characters 1, 5 and 12 (traded between nodes 41, 43, 46 and 62). "New Technologies" searches using the Ratchet (Nixon 1999) with default settings yielded the same 2 trees of equal topology, length, CI and RI. Heuristic searches (RAS + TBR) under implied weights (K = 6, following Ramirez 2003) and following the above parameters, returned a single tree of same topology and length = 72, total fit: 40.75, adjusted homoplasy: 2.25 (Fig. 53, table 2). In all searches, the repetitive topology and length of all MPT's is a clear indication as to the robust nature of the selected cladogram, behaving well in our "sensitivity analysis" (Wheeler 1995), based on variation in weighting characters, as well as multiple search strategies.

   *Psednocnemis* gen. nov. was retrieved as monophyletic based upon three unambiguous synapomorphies: distal spiral curl of terete embolus in males (character 17, Fig. 39), presence of strong DD spiniform brush along retrolateral surfaces of coxa IV (character 39, Fig. 23), and reduction of setal counts/density of hair type 4, along proximoventral abdominal surface between pedicel and anterior book lungs (character 41, West & Nunn 2010b, fig. 139). A fourth trait, loss of apical swelling of lateral bilobes of female spermathecae (character 9), is also noted in *L. robustus*. Clade support was very strong for monophyly of *Psednocnemis* (Bremer support 2; jack-knife 85). *Psednocnemis* appears to be sister group to (*Selenocosmia+Coremiocnemis*) based upon a single synapomorphy: female spermathecae bilobed with medial and lateral lobes similar length (character 10, with homoplasy at node 28).
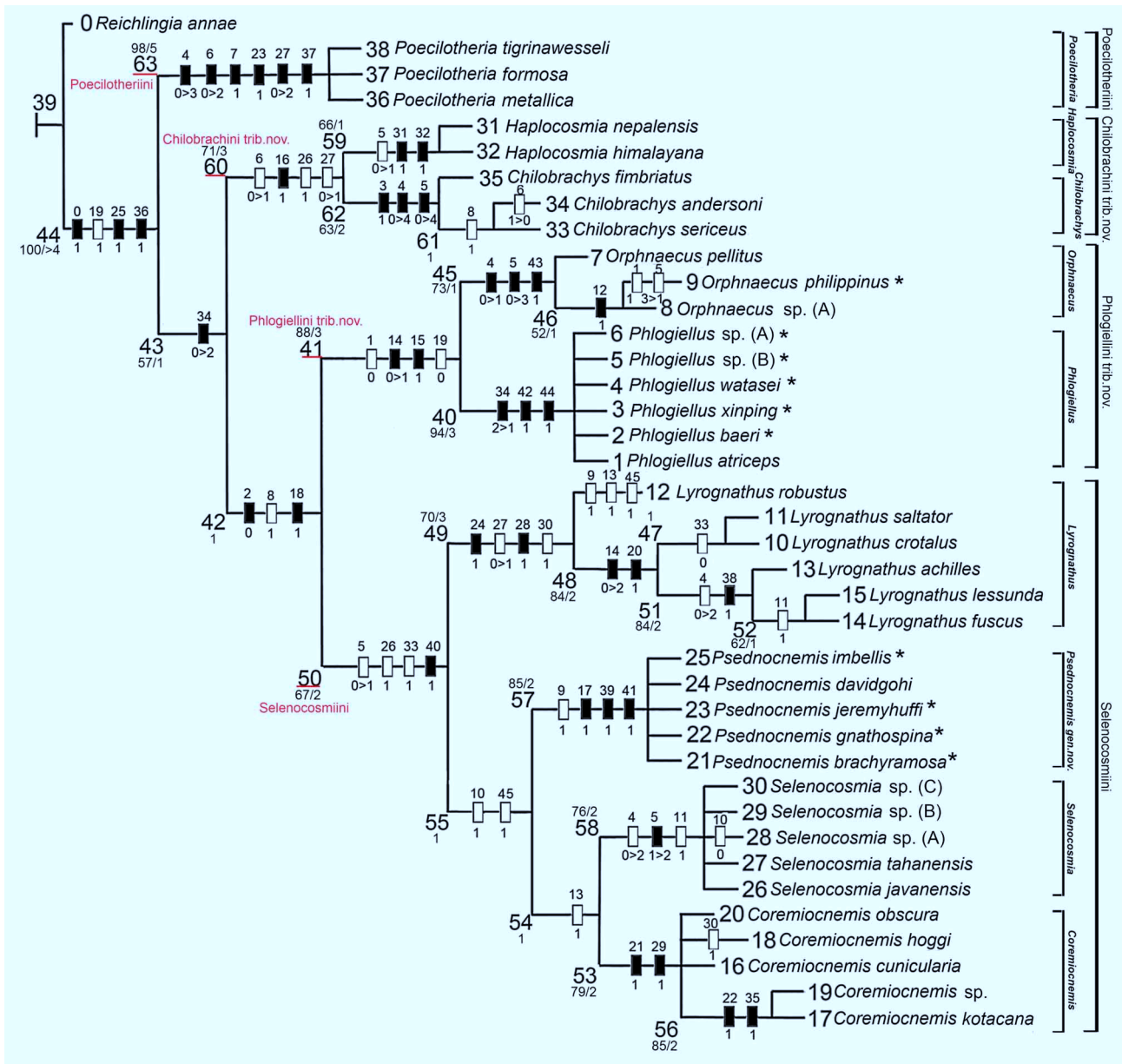
**FIGURE 53.** Single tree of Selenocosmiinae obtained with TNT: RAS & TBR searches with implied weighting (K = 6), length: 72, total fit: 40.75, adjusted homoplasy: 2.25. Node numbers in bold, character numbers above rectangles, character states (state transformations for multi-state characters) below. Hollow rectangles indicate homoplasy, solid rectangles indicate non-homoplasy. Jack-knife resampling values (F)/bremer supports (absolute) provided directly below or above each node number. Species marked with * are transferred to their respective genera.

*Coremiocnemis* was retrieved as monophyletic based upon two unambiguous synapomorphies: scopula on retrolateral side of met. IV stronger than prolateral side (character 21), and presence of recurved setae along retrolateral surfaces of met. IV (character 29). Clade support was strong for monophyly of *Coremiocnemis* (Bremer support 2; jack-knife 79). *Coremiocnemis* is considered sister group to *Selenocosmia* based upon lanceolate morphology of terete male embolus (character 13: with homoplasy at node 12, *L. robustus*.

West & Nunn (2010b) diagnosed a distal embolic spiral curl in all *Coremiocnemis* (groups 1 and 2), based upon the male paratype *C. hoggi* possessing this trait. However, the male *C. hoggi* was misidentified and is the male for *P. davidgohi* sp. nov. Further, the authors have since received male *C. valida, C. hoggi* and *C. obscura* that lack any embolic distal spiral curl, but possess mild distal flaring as in *Selenocosmia*.

**TABLE 1.** Data matrix used for cladistic analyses (? = unknown; – non-applicable, both treated as missing).

| Taxon / Character | 00 | 01 | 02 | 03 | 04 | 05 | 06 | 07 | 08 | 09 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *R. annae* | 0 | – | – | – | – | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | – |
| *P. atriceps* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | – | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | – | 1 | 0 | 1 | – |
| *P. baeri* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | – |
| *P. xinping* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 |
| *P. watasei* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | – |
| *Phlogiellus* (A) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – |
| *Phlogiellus* (B) | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – |
| *O. pellitus* | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – |
| *Orphnaecus* sp. | 1 | 0 | 0 | 0 | 1 | 3 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 |
| *O. philippinus* | 1 | 1 | 0 | 0 | 1 | 3 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | – |
| *L. crotalus* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *L. saltator* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | – |
| *L. robustus* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | – | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| *L. achilles* | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *L. fuscus* | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | – | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *L. lessunda* | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *C. cunicularia* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *Coremiocnemis* sp. | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *C. hoggi* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | ? | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 |
| *C. kotacana* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | ? | ? | ? | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *C. obscura* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 2 | 0 | ? | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 |
| *P. brachyramosa* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | ? | ? | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 |
| *P. gnathospina* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | ? | ? | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| *P. jeremyhuffi* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| *P. davidgohi* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 2 | 0 | ? | ? | 1 | 1 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 |
| *P. imbellis* | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | ? | ? | ? | ? | 0 | 2 | 0 | 0 | ? | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 |
| *S. javanensis* | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | – |
| *S. tahanensis* | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | – |
| *Selenocosmia* (A) | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 |
| *Selenocosmia* (B) | 1 | 1 | 0 | 0 | 2 | 2 | 0 | 0 | 1 | ? | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | ? | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *Selenocosmia* (C) | 1 | 1 | 0 | 0 | 2 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| *H. nepalensis* | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 2 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 |
| *H. himalayana* | 1 | 1 | 1 | 0 | 4 | 4 | 1 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *C. sericeus* | 1 | 1 | 1 | 1 | 4 | 0 | 1 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *C. andersoni* | 1 | 1 | 1 | 1 | 4 | 0 | 1 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *C. fimbriatus* | 1 | 1 | 1 | 1 | 4 | 0 | 0 | 0 | 0 | – | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *P. formosa* | 1 | 1 | 1 | 0 | 3 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 1 | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *P. metallica* | 1 | 1 | 1 | 0 | 3 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |
| *P. tigrinawesseli* | 1 | 1 | 1 | 0 | 3 | 0 | 2 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 1 | 1 | 0 | 1 | 0 | 1 | 0 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 0 | 1 |

**TABLE 2.** Synapomorphies/autapomorphies for cladogram in Figure 53.

| Taxa or node | Character | Change | Taxa or node | Character | Change |
|---|---|---|---|---|---|
| 44 (ingroup) | 0 | 0→1 | 50 (SELENOCOSMIINI) | 33 | 0→1 |
| | 19 | 0→1 | | 40 | 0→1 |
| | 25 | 0→1 | | | |
| | 36 | 0→1 | | | |
| O. philippinus | 1 | 0→1 | 51 | 4 | 0→2 |
| | 5 | 3→1 | | 38 | 0→1 |
| L. robustus | 13 | 0→1 | 52 | 11 | 0→1 |
| C. hoggi | 30 | 0→1 | 53 (*Coremiocnemis*) | 21 | 0→1 |
| | | | | 29 | 0→1 |
| *Selenocosmia* sp. (A) | | | 54 | 13 | 0→1 |
| | 10 | 1→0 | | | |
| C. andersoni | 6 | 1→0 | 55 | 10 | 0→1 |
| 40 (*Phlogiellus*) | 34 | 2→1 | 56 | 22 | 0→1 |
| | 42 | 0→1 | | 35 | 0→1 |
| | 44 | 0→1 | | | |
| 41 (PHLOGIELINI trib. nov.) | 1 | 1→0 | 57 (*Psednocnemis* gen. nov.) | 17 | 0→1 |
| | 14 | 0→1 | | 39 | 0→1 |
| | 15 | 0→1 | | 41 | 0→1 |
| | 19 | 1→0 | | | |
| 42 | 2 | 1→0 | 58 (*Selenocosmia*) | 4 | 0→2 |
| | 18 | 0→1 | | 5 | 1→2 |
| | | | | 11 | 0→1 |
| 43 | 34 | 0→2 | 59 (*Haplocosmia*) | 31 | 0→1 |
| 45 (*Orphnaecus*) | 4 | 0→1 | 60 (CHILOBRACHINI trib. nov.) | 6 | 0→1 |
| | 5 | 0→3 | | 16 | 0→1 |
| | 43 | 0→1 | | 27 | 0→1 |
| 46 | 12 | 0→1 | 61 | 8 | 2→0 |
| 47 | 33 | 1→0 | 62 (*Chilobrachys*) | 3 | 0→1 |
| | | | | 4 | 0→4 |
| | | | | 5 | 0→4 |
| 48 | 14 | 0→2 | 63 (*Poecilotheria*) (POECILOTHERIINI) | 4 | 0→3 |
| | 20 | 0→1 | | 6 | 0→2 |
| | | | | 7 | 0→1 |
| | | | | 23 | 0→1 |
| | | | | 27 | 0→2 |
| | | | | 37 | 0→1 |
| 49 (*Lyrognathus*) | 24 | 0→1 | | | |
| | 27 | 0→1 | | | |
| | 28 | 0→1 | | | |
| | 30 | 0→1 | | | |

*Selenocosmia* (in part: Sundaland fauna only) was retrieved as a monophyletic unit based on three synapomorphies: secondary rows of cheliceral strikers being scimitar-shaped (character 4) with homoplasy at node 51 (*L. achilles*, (*L. fuscus*+*L. lessunda*)); female lyrate patch almost circular in shape (character 5, unambiguous), and spermathecal lobes in females with mushroom cap ends (character 11) with homoplasy at node 52 (*L. fuscus*+*L. lessunda*). Clade support was strong for monophyly of *Selenocosmia* (Bremer support 2; jack-knife 76). *Lyrognathus* was retrieved as monophyletic based upon four synapomorphies: tib. IV very incrassate *cf*. tib. I (character 24, unambiguous); clavate trichobothria on tarsi only present along apical half (character 27) with homoplasy at node 60 (*Haplocosmia*+*Chilobrachys*); penicillate brush of setae along retrolateral surfaces of tib. IV (charatcer 28, unambiguous) and leg width formula IV, III, I, II (character 30) with homoplasy at node 18 (*C. hoggi*). Support was strong for monophyly of *Lyrognathus* (Bremer support 3; jack-knife 70). Node 50 (*Lyrognathus*, (*Psednocnemis*, (*Selenocosmia*+*Coremiocnemis*))) form the tribe Selenocosmiini (Bremer support 2;

jack-knife 67) and are sister group to node 41 (*Orphnaecus*+*Phlogiellus*) based upon two unambiguous synapomorphies: longest cheliceral strikers with long filiform ends (character 2) and male embolus lacking multiple distal keels (character 18).

*Orphnaecus* was retrieved as monophyletic (node 45) based upon three unambiguous synapomorphies: secondary rows of cheliceral strikers being lanceolate with very stout bases (character 4), reniform shape of lyra (character 5) and presence of male palpal patella with dorsal brush of setae (character 43). The species *Orphnaecus philippinus* comb. nov. was returned as a terminal branch in node 46 as sister taxon to *Orphnaecus* species (A), together are sister group to type species *O. pellitus*. Even though lyrate morphology for *O. philippinus* was scored separately to other *Orphnaecus* (as it does not show reniform morphology of *O. pellitus*, only derived in *Orphnaecus*), variation of lyra was not sound enough to shift this species out of node 45 (*Orphnaecus*). Despite an intensive search for additional supporting characters that show variation to *Orphnaecus*, none were found. The oval with proximally truncate lyrate patch in *O. philippinus*, while considered an autapomorphy, must also be considered homoplasious with node 50 and of questionable value. The tombstone-shaped morphology of *O. philippinus* spermathecae is also present in *Orphnaecus* species (A), a spider that possesses reniform-shaped lyra, and all other characters noted in *Orphnaecus* species. We, therefore, consider *Selenobrachys* Schmidt 1999 a junior synonym of *Orphnaecus* (Simon 1892) syn. nov. Clade support was mild for monophyly of *Orphnaecus* (Bremer support 1; jack-knife 73).

The clade (*Phlogiellus* + *Yamia*) including *P. xinping* (Zhu & Zhang 2008), comb. nov., were retrieved as a monophyletic unit based upon three unambiguous synapomorphies (node 40): reduction in number of labial cuspules (from 350–700 to 200–350) (character 34), posterior lateral spinnerets nearly as long or equal to length of met. IV (character 42), and a very deep fovea (character 44). The only trait that differs "*Yamia*" from *Phlogiellus* is "complete" loss of maxillary lyra (Kishida 1920; Haupt & Schmidt 2004; Raven 2005; Zhu & Zhang 2008). However, as discussed elsewhere within, scoring maxillary lyra as "absent" presents multiple problems, namely defining adequate boundaries between those species with greatly reduced lyra, to those lacking lyrate bacillae. Loss of lyra is also noted in some *Orphnaecus* species (S. Nunn, pers. obs.) and some Australian selenocosmiine taxa (R. Raven, pers. comm.) that seem to have nothing nearer to do with alyrate *Phlogiellus*, leaving the "*Yamia*" not just lacking any synapomorphies, but also character or character combination to define them. We therefore consider *Yamia* Kishida 1920 a junior synonym of *Phlogiellus* Pocock 1897 syn. nov., in agreement with Raven (2005), contra Haupt & Schmidt (2004) and Zhu & Zhang (2008). Clade support was exceptionally strong for monophyly of *Phlogiellus* (Bremer support 3; jack-knife 94), second strongest of all selenocosmiine genera. As mentioned above, *Phlogiellus* is considered sister group to *Orphnaecus* and form Phlogiellini trib. nov. based on four synapomorphies: reduced number of cheliceral strikers (<50) (character 1), single retrolateral keel on male embolus strong and heavy (character 14), distinct retrolateral basal lobe on embolus (character 15), and tar. III scopula undivided (character 19). Clade support was very strong for monophyly of Phlogiellini trib. nov. (Bremer support 3; jack-knife 88).

*Chilobrachys* was retrieved as a monophyletic unit based upon three unambiguous synapomorphies: primary strikers with thorn-like morphology (character 3), secondary rows of strikers thorn-like (character 4), and female lyra with 1–3 rows of heavy clavate bacillae (not reniform) (character 5). Clade support was relatively strong for monophyly of *Chilobrachys* (Bremer support 2; jack-knife 63).

*Haplocosmia* was retrieved as a monophyletic unit based on one unambiguous synapomorphy: interchetliceral setal fringe present along proximodorsal surfaces (character 31). Two other traits support monophyly of *Haplocosmia*: lyra shape as oval with proximal truncate morphology (character 5) with homoplasy at nodes 9 and 50, and presence of prolateral ridges along intercheliceral peg setae (character 32, unambiguous). Clade support was weakest for monophyly of *Haplocosmia* (Bremer support 1; jack-knife 66). *Haplocosmia* is considered sister group to *Chilobrachys* and together from Chilobrachini trib. nov. based upon three synapomorphies: apical (A) and sub-apical (SA) keels present on male emboli (character 16, non-homoplasious), setal fringe of fine pallid setae present on prolateral maxillary surface, ventral to maxillary suture, but above lyra (character 6), and clavate trichobothria on tarsi limited to apical half (character 27, with homoplasy at node 49, *Lyrognathus*). Clade support was strong for monophyly of Chilobrachini trib. nov. (Bremer support 3; jack-knife 71). Together, *Chilobrachys*+*Haplocosmia* are considered sister group to node 42 ((*Orphnaecus*+*Phlogiellus*) (*Lyrognathus* (*Psednocnemis* (*Selenocosmia*+*Coremiocnemis*)))) based upon a single synapomorphy (character 34): labial cuspules numbering 350–700 (with reduction of cuspules in *Phlogiellus*).

*Poecilotheria* (forming the tribe Poecilotheriini) was found to be monophyletic based on six unambiguous synapomorphies: secondary rows of cheliceral strikers being tubercle-shaped (character 4), setal fringe ventral to prolateral maxillary suture scopulate with dark setae (character 6), tubercles present on prolateral maxillary surface (character 7), scopula on tarsi laterally extended (character 23), clavate trichobothria on tarsi in apical 1/3 in "U"-shaped patch (character 27), and variegated body pattern (character 37). Clade support was strongest for monophyly of *Poecilotheria* (Bremer support 5; jack-knife 98). *Poecilotheria* is considered sister group to all other Selenocosmiinae.

**Note:** Nunn & West plan to test the monophyly of Selenocosmiinae in a future analysis. This work will also include all genera from the subfamily and seek to comfirm the placement of *Poecilotheria* within Selenocosmiinae. In our opinion, West *et al.* (2008) did not address the issue of monophyly of Selenocosmiinae, however, because their work questioned the placement of *Poecilotheria* within Selenocosmiinae (and following Schmidt), this issue does need to be addressed in a forthcoming work (Nunn & West, in prep.).

**Character discussion**

Homology within stridulating organs and prolateral maxillary lyra as a character

Raven (1985) first subjected presence/absence of maxillary/cheliceral lyra to cladistic analysis of theraphosid subfamilies (table 3, character 5), retrieving Thrigmopoeinae, Ornithoctoninae and Selenocosmiinae as monophyletic. He applied further detail, considering the presence of claviform pegs (bacillae) on prolateral maxillae a synapomorphy of Selenocosmiinae. "Presence/absence" of maxillary lyra seems to be homoplasious at generic (absent in some *Orphnaecus*, *Phlogiellus* and some Australian taxa), subfamilial (also present in Aviculariinae, see West *et al*. 2008) and familial (also present in Dipluridae and Barychelidae, see Pocock 1895b, Raven 1985) levels. Therefore, while "presence of a maxillary lyra" could be argued a synapomorphy for Selenocosmiinae, derived conditions of both the maxillary lyra and opposing cheliceral strikers are clearly homologous to many selenocosmiine genera, indicating the organ forms a distinct bauplan for the group. West & Nunn (2010a) proposed in their amended diagnosis of Selenocosmiinae, that instead of scoring maxillary lyra as "present/absent", scoring the structure as "originating medially, not ventrally from oral fringe", corrected the issue of homoplasy with certain Aviculariinae species. This also falls into accordance with character coding principles (Sereno 2007), as we regard a variable attribute of the lyra (a transformation), not it's presence/absence (a neomorphic statement). Coding maxillary lyra as 'absent' within Selenocosmiinae is also problematic in that it infers some level of homeostatic property to its absence. However, our findings indicate no stability of the loss of lyra within and between selenocosmiine genera, only progressive reduction among varied species within several Selenocosmiinae that are not nearer related to one another. Further support of secondary reduction can be found in opposing cheliceral strikers (which are always retained) and the ventro-prolateral coverage of the maxillary oral fringe. In those theraphosid subfamilies that lack any prolateral maxillary stridulating organ, the ventral oral fringe reaches up 1/3 of the lower prolateral maxillary surface, yet this prolateral part of the maxillary oral fringe remains notably absent in those selenocosmiines lacking lyra. Therefore, alyrate *Phlogiellus* cannot be considered a sister group to all other selenocosmiines based on "maxillary lyra absent", the absence can only be considered a secondary loss within Selenocosmiinae, lacking any homeostatic properties, that has ocurred several times among several genera and is always progressive (ie: of no phylogenetic value).

Also of interest are those noted variations of lyrate bacillae, compared to noted variation of cheliceral strikers. While lyrate bacillae morphology seems subject to changes within Selenocosmiinae that are remarkably similar to morphology seen outside the subfamily (e.g.: clavates in *Chilobrachys cf. Idiomnata* species from Barychelidae), strikers apparently are not subject to the same levels of homoplasy. In fact, all those derived conditions seen in Selenocosmiine species remain derived only within that subfamily, not outside. The only striker condition that exists outside Selenocosmiinae consists of several unordered rows of strongly built setae. Selenocosmiinae strikers by contrast range from modified needleform morphology, through to curved scimitar-shaped setae, thin and stout thorn like setae and tubercles. All exist in several rows (ordered and unordered, primary and secondary rows). We therefore consider the presence of modified multiple rows of cheliceral strikers a serial homologue of Selenocosmiinae.

## Sexual characters

There is a general belief that male genitalia undergo rapid rates of evolution (compared to non-genital traits), due to pressures of sexual selection (Anrqvist 1998). Recent studies have shown that regardless of rate of divergence (due to sexual selection or otherwise), phylogenetic signal is often no better or no worse between male genital and non-genital characters in defining clades (Song & Bucheli 2010). Thus, there is, herein, no greater/lesser consideration toward male genitalic characters than somatic traits.

Considering homologous embolus keels found in Theraphosinae genera by Bertani (2000), we did consider a fair quantity of similar traits, focused strictly on the male embolus. Out of six selected characters, only one showed homoplasy (character 13) in the form of parallelism, the remaining five embolus characters were returned homologous. Following Bertani's terminology where possible (2000), we have identified and named additional traits of the male palpal bulb, not all of which were considered in these analyses, but described for future reference. Unlike male embolus morphology, female spermathecal traits are largely homoplasious. It seems given rapid rates of evolution due to sexual selection (Lande 1981, Gavrilets 2000), combined with limited variation of a simple organ structure, multiple examples of apparent convergence and reversal are no surprise. This alone by no means should indicate ignorance toward female sexual morphology, only that selection of small variations be treated with due caution. Some homoplasies are easily explained: when considering character 10 (bilobed spermathecae with lateral and medial bilobes of similar length) and sexual morphology of *Selenocosmia* species (A) (Fig. 45), the reduction/loss of medial bilobes is distinctly evident and the relationship between all *Selenocosmia* species spermathecae and of node 55 spermathecae bauplan is evident, explainable, and thus useful to some degree.

## Leg morphology (including scopula, morphometrics and trichobothriotaxy)

Considering all five scopulate characters selected for analyses, only one displayed homoplasy (in the form of reversal), presence/absence of divided scopula on tar. III, with the undivided condition found at node 44 (ingroup) and reversal to divided scopula at node 41 (*Phlogiellus+Orphnaecus*). Characters 20, 21 and 23 are focused on increases of scopulate conditions, including the absence of scopula divisions, as well as increases in length of scopulate setae and density (all of which were returned without homoplasy). Following Raven (1985) and Guadanucci (2005), we are in agreement that the more entire/developed the scopulate condition, the stronger its phylogentic signal, providing valuable characters in any phylogenetic analyses involving Theraphosidae.
In relation to the two morphometric leg characters (characters 24 and 30), the results were mixed since character 24 (width of tib IV *cf.* Tib I: similar or smaller than/ much thicker than) showed no homoplasy and is one of the synapomorphies of *Lyrognathus*, while character 30 (leg width formula IV, III, I, II: absent/present) showed homoplasy in the form of convergence.

## Chaetotaxy

Characters 28 and 29 refer to modified setal brushes on Selenocosmiinae legs III and IV. Character 28 (penicillate brush of setae along retrolateral tib. IV surface: absent/present) is a synapomorphy without homoplasy for *Lyrognathus*, while character 29 (recurved setal brushes along retrolateral surface of met. IV: absent/present) is a synapomorphy without homoplasy for *Coremiocnemis*. Other setal conditions considered include characters 38 and 39, which focus on setal conditions noted on retrolateral surfaces of coxa IV (both of which were returned without homoplasy), as well as characters 41 and 42, which focus on modified setae in a distinct trapezoid patch along the proximoventral abdominal surface (also returned without homoplasy). Considering the overall hirsute condition is a well defined synapomorphy for Theraphosidae (Raven 1985, Goloboff 1993a), it stands to reason to explore hirsute characters of all theraphosids at all levels possible, instead of restricting ourselves to only those previously described traits (e.g.: urticating setae of neotropical species, leg scopulation and stridulatory setae).

**Cheliceral chaetotaxy**

Aside from stridulatory setae, modified setae form several traits of significance in selenocosmiine chelicerae. West & Nunn (2010a, 2010b) first noted retrolateral proximomedial spines (character 33) in *Lyrognathus, Psednocnemis, Coremiocnemis* and *Selenocosmia*. The cladistic analyses show the presence of this trait is a synapomorphy for node 50 (Selenocosmiini), with a reversal in taxa *L. crotalus+L. saltator*. Character 31 (intercheliceral setal fringe proximodorsally: absent/present) is yet another chaetotaxic trait without homoplasy and a synapomorphy for *Haplocosmia*.

**Intercheliceral pegs as a character**

Similar to lyra, intercheliceral pegs "present/absent" as a character is problematic. Some clades of selenocosmiine genera possess intercheliceral pegs, while others lack intercheliceral pegs. Some genera, such as *Selenocosmia*, *Phlogiellus* and *Lyrognathus* have species with both conditions, but no distinct division between states (West & Nunn 2010a). Further, intercheliceral pegs are also present in genera outside Selenocosmiinae (*Annandaliella*, *Euphrictus*, *Selenogyrus*, see Raven 1985 and Smith 1990). Particular variations of intercheliceral pegs do seem to be informative; morphology varies among groups, as do counts and patch density.

**Biogeographical history:** Geographic patterns of fauna and flora in East and South-east Asia display complex patterns that are intimately linked with the geological history of the region (Sanmartín & Ronquist 2004). East and South-east Asia comprise numerous continental fragments which have progressively rifted from North Gondwana and assembled during the last 400 million years (Metcalfe 1998).

Estimating time divergence for mygalomorph families is difficult since fossil records are poor in comparison to most invertebrate groups (Wunderlich 2004), but current fossil records date back to 240 Ma (Selden & Gall 1992, Dunlop *et al*. 2008). Despite 4 of the 15 families lack any fossil evidence (Selden 2002, Dunlop *et al*. 2008), the general belief is that Mygalomorphae had radiated into its major lineages during or just prior to the Early Mesozoic (Dunlop *et al*. 2008). To date only 2 confirmed theraphosid fossil records exist (Dunlop *et al*. 2008). Both are from the Miocene, from Chiapas and Dominican amber and are small by todays standards, perhaps juveniles, one is an exuvium (Dunlop *et al*. 2008). The low count of mygalomorph fossil records may not be due to an absence of the group during earlier times. Possible explanations are that mygalomorphs are generally fossorial in lifestyle, are large and powerful and probably able to escape sticky resin/sap (explaining the lack of known fossil evidence in amber deposits) and have soft internal structures which are problematic for other fossil records (Wunderlich 2004). Molecular clock time divergence studies including Theraphosidae show mixed results, ranging from ~20 Ma (Selden & Penney 2010) to ~230 Ma (Ayoub *et al*. 2007).

By plotting distribution records across Selenocosmiinae phylogeny, our hypothesis presents the subfamily as a potential model North Gondwanan taxon for vicariance biogeographical studies, which falls within the Northern Gondwana Pattern (NGP) of Sanmartín & Ronquist (2004). The NGP is best explained by 3 hypotheses (two dispersal models and one vicariance model) meaning we couldn't rely upon most known animal migration patterns as support for either dispersal or vicariance.

We hypothesize the subfamily to have been present in the current areas of distribution (except South-east China and the Eastern Thai-Malay Peninsula), prior to the break-up of Gondwana (160–250 Ma, Fig. 55). Once Madagascar had rifted from India (Ali & Aitchison 2008), the absence of Selenocosmiinae in this area is somewhat remarkable, but could best be explained by an early distribution pattern throughout tropical Northern Gondwana, with gradual southern migration during the rifting of sub-continental fragments (<90 Ma).

We consider *Poecilotheria* most likely diverged as they adapted to arboreal lifestyle, the palaeoclimatological conditions in tropical Northern Gondwana (~160–250 Ma) being ideal for such specialization (Sanmartín & Ronquist 2004). Therefore, *Poecilotheria* appear to represent a specialized life history strategy within Selenocosmiinae, an ecomorph that exhibits behavioural and morphological specializations as a result of the opportunities provided by the environment they inhabit. Several similar ecomorph specialization traits repeat themselves in other theraphosid subfamilies that have members adapted to arboreal lifestyle (laterally extended tarsal scopula, variegated body pattern, etc.). There are some exceptions though, but are fairly simply explained. Because *Ephebopus* originates from a subfamily that displays arboreal behaviour (Aviculariinae) that is considered

a synapomorphy for the subfamily (West *et al.* 2008), the change to fossorial lifestyle, means that *Ephebopus*, most likely, has plesiomorphically retained lateral extended tarsal scopula as seen in the rest of its subfamily (even though it is primarily fossorial). Indeed, some early life stages of *Ephebopus murinus* are known to exhibit arboreal behaviour (Marshall & West 2008).
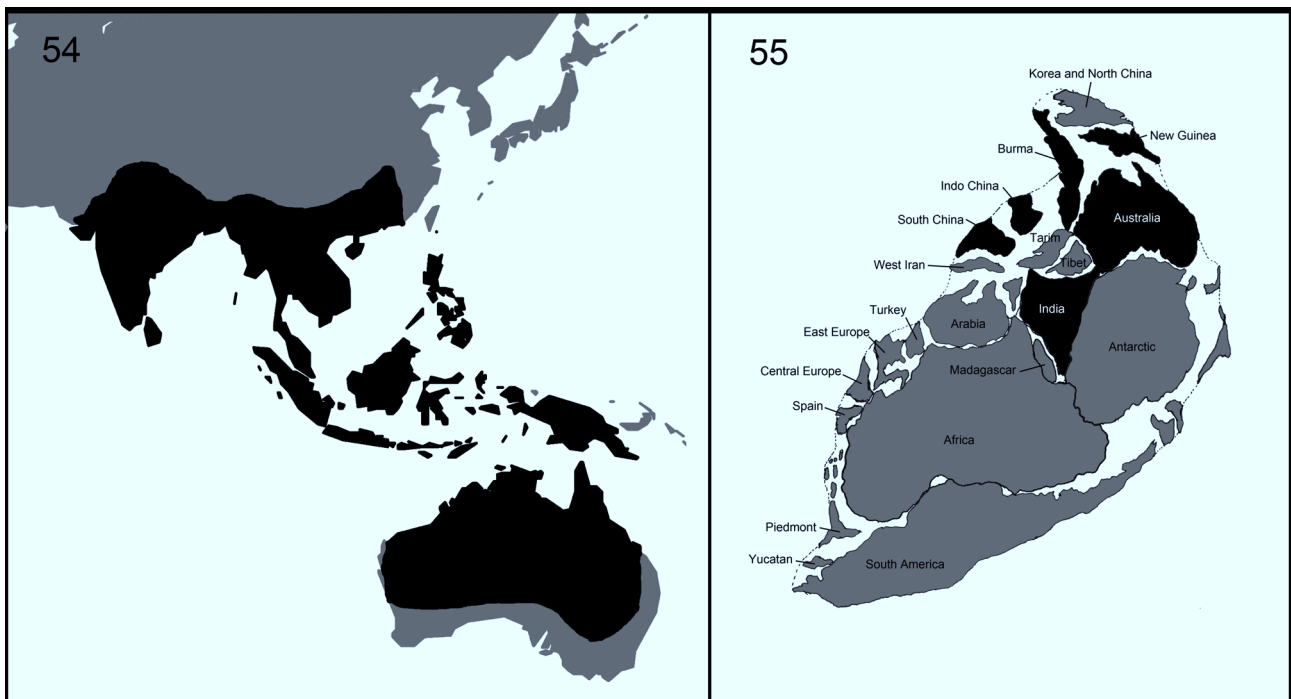


**FIGURES 54–55.** 54. Distribution of Selenocosmiinae. 55. Gondwana 250 Ma and present distribution of Selenocosmiinae.

The second key divergence event being the rifting and accretion of either Sibumasu or the West Burma Shelf (incorporating parts of Sumatra, Burma and other Indonesian islands) from north Gondwana (255–120 Ma, respectively, following Metcalfe 1998) to the Thai-Malay Peninsula (220–80 Ma), which we believe isolated the shared ancestor of Phlogiellini trib. nov. +Selenocosmiini (node 42), and which appears to have invaded most of the Malay Peninsula, thereafter (220–80 Ma).

The rifting of Sibumasu and the West Burma Shelf left *Poecilotheria* and Chilobrachini trib. nov. inhabiting tropical northern Gondwanan regions. As the Lhasa block rifted from Gondwana during the Early Jurassic to Middle Cretaceus (Metcalfe 1998), *Haplocosmia* most likely diverged. This genus also adapted to high elevations as the Lhasa block accreted with lower Eurasia firstly (~100 Ma), then rose in altitude as India eventually collided immediately south ~35 Ma (Ali & Aitchison 2008). As mentioned above, when India broke from the remaining portions of Gondwana ~100 Ma (Metcalfe 1998), *Chilobrachys* most likely spread throughout the microcontinent, as *Poecilotheria* migrated south. Because of the immense range of *Chilobrachys*, it is reasonable to assume as India collided with Burma ~40 Ma (Ali & Aitchison 2008), intercontinental invasion from India to Burma occurred, with many *Chilobrachys* known in this region, east to South-east China. We, therefore, postulate a post India/Eurasia collision migration <35 Ma is not the only explanation for their large range, but most likely the result of at least two collisions between India and the Thai-Malay Peninsula ~40 Ma and eventually Eurasia ~35 Ma (Ali & Aitchison 2008).

*Phlogiellus* show a wide distribution pattern from South-east China through to Eastern parts of Sundaland, but due to presence of this genus on Djampea Island (Nunn, West & Court, in prep.), as well as high species diversity on Borneo (Nunn & West, in prep.), it would appear *Phlogiellus* may have originated as south-west Borneo rifted from the Thai-Malay Peninsula ~80 Ma (Metcalfe 1998). As Borneo later reconnected with the peninsula (due to episodic declining/rising sea levels), *Phlogiellus* should have migrated north along the eastern coast of South-east Asia. Hall (2001) showed there was no direct way of crossing between Borneo and West Sulawesi. However, the depths of water on the Sunda Shelf suggest there were always routes from Borneo via Java into Sulawesi by way of small islands (such as Djampea), although West Sulawesi may itself have been little more than islands until the

Pliocene (Hall 2009). We presume *Phlogiellus* also migrated to north Palawan Island around a similar time and as Palawan became isolated from Borneo (Hall 2009, Blackburn *et al.* 2010), *Orphnaecus* diverged, most likely on Palawan or one of the nearby islands. Additionally, Moss and Wilson (1998) suggested island hopping routes between Borneo and the Philippines via any number of volcanic arcs in the region at that time. Starr & Schoenig (1983) also discussed the distinct faunal connection between Borneo and Palawan, in comparison to other Philippine islands. The presence of *O. dichromata* in Irian Jaya is somewhat unique, however, parts of the East Philippines (South Caroline Arc, see van Tol, 2007) could have been emergent and connected at various times during the last 30Ma, with land bridges to western parts of Irian Jaya most likely between 23 to 20 Ma (R. Hall, pers. comm.). Additionally, other faunal groups, such as the *Drepanosticta lymetta* group (Platystictidae, Odonata), show a similar disjunct range from the Philippines to Irian Jaya (v. Tol, 2007).

Note: Although Schmidt and von Wirth (1992) list the type locality of *O. dichromata* as "Sarong, Irian Jaya", von Wirth has determined that Sarong was only the point of purchase for this species for the pet trade. Therefore, Sarong may be an erroneous locality (V. v. Wirth, pers. comm.).

With the exception of *Selenocosmia* east of Wallace's Line and north of West Malaysia, 2 *Lyrognathus* species in North-east India and one *Lyrognathus* on Lombok Island, Selenocosmiini are only found in Sundaland (West & Nunn 2010a). Although the distribution of *Lyrognathus* falls within similar geographic distributions of other fossorial taxa (V*iz.* "Clade A" from the Stylocellidae, Opiliones from Clouse & Giribet (2010)) and can be explained best by vicariance, a discussion on biogeography of this genus is striking for the potential historical relevance alone. We postulate *Lyrognathus* began on the Thai-Malay Peninsular, the North-east Indian populations most likely migrated into the region (intercontinental invasion) from the Thai-Malay Peninsula as the North-east tip of Greater India collided first with Sumatra ~50 Ma, then Burma ~40 Ma, before finally colliding with lower Eurasia ~35 Ma (Ali & Aitchison 2008). Such a hypothesis accounts for the absence of this genus between West Malaysia and North-east India and is, therefore, the most likely scenario, as opposed to any dispersal or extinction event. The presence of *Lyrognathus lessunda* West & Nunn 2010 on Lombok Island is more difficult to explain, however, there is question over the interaction between the Lesser Sunda Islands and Borneo/Sulawesi in the Early Cenozoic (Holloway & Hall 1998). But, throughout the entire Cenozoic (and possibly as recently as the Pleistocene, when sea levels were greatly reduced) there were probably many opportunities to cross from Sundaland into the Sumba region (R. Hall, pers. comm.).

*Lyrognathus* is sister group to all other Selenocosmiini, which are isolated to Sundaland, comprising the Malay Peninsula, Singapore, Sumatra, Java and Borneo. Once continental slivers had formed the areas we see today, episodic sea level changes repeatedly connected and isolated the islands of Sundaland, creating ideal conditions for multiple divergence events (Hall 2002). Indeed, Sundaland is one of the twenty-five world biodiversity "hotspots" (Myers *et al.* 2000), largely due to such ideal conditions for speciation.

*Psednocnemis* gen. nov. is found in West Malaysia (4 species) and Borneo (1 species), indicating the group most likely began on the Malay Peninsula, with a recent migration into Borneo (Fig. 27).

While *Selenocosmia* show a massive range, this is merely a reflection the genus as a whole is currently paraphyletic and in need of revision (Nunn, West & Court, in prep.). Spiders presumed to be the type species; *S. javanensis* and its closest relatives are monophyletic, but only within Sundaland (this paper). In our opinion, those selenocosmiine taxa outside Sundaland (except *Lyrognathus*) do not belong in the tribe Selenocosmiini. By morphology alone, the authors have noted the reduction or secondary loss of medial bilobes of spermathecae only within several undescribed West Malaysian and Singaporean *Selenocosmia* species (one of which, species A, is included in our cladistic analyses). Those *Selenocosmia* on Borneo, Java and Sumatra all possess well developed medial bilobes noted in all other Sundaland Selenocosmiini fauna. The most parsimonious hypothesis, therefore, is that *Selenocosmia* diverged outside of West Malaysia, most likely Borneo or Sumatra, as its closest relatives are not recorded on Java (the most recent significant Indonesian island), and regarding sister group *Coremiocnemis*, it appears they began on the peninsula, later migrating into Borneo and Sumatra. *C. kotacana* from Sumatra and the *Coremiocnemis* sp. from Borneo, used within our data matrix, are sister taxa, suggesting *Coremiocnemis* may not have radiated throughout Indonesian islands at a similar time but rather appeared to have migrated to either Borneo or Sumatra, from West Malaysia, then between Borneo-Sumatra sometime thereafter.

The origins of Australo-Papuan and East Indonesian Selenocosmiinae are very confusing. To date, no solid explanation as to the origins of these taxa exists. Main (1981) proposed recent southern migration into Australia from New Guinea via the "Cape York Corridor", although no mechanism for such migration was presented (Raven 1986) and Main did not adequately account for presence of Selenocosmiinae on either landmass (Main 1981). Given the large range of Australian Selenocosmiinae (Raven *et al.* 2002), such high levels of dispersal (originating west of Wallace's Line) over a relatively short period of time seem highly unlikely (as trans-oceanic dispersal would have had to occurred at least once by a gravid female, against known currents), we consider origins of Australian fauna may be far older than Main proposed (Main 1981), perhaps ancestral in nature, dating back to Gondwanan times. Described species in Australia do not reflect true species numbers or diversity in that region (S. Nunn, pers. obs.; R. Raven, pers. comm.), with many new species to be described covering most of Central to Northern Australia (Raven, in prep.). There is no doubt a close relationship between Australian, New Guinea and Wallacea fauna, however, the boundaries and age of that relationship, as well as polarity, remain unclear.

Of the six recognised Gondwanan biogeographic distribution patterns (Sanmartín & Ronquist 2004), the Northern Gondwana Pattern (NGP) is one of the more complex to explain, but for Selenocosmiinae considered, vicariance via Mesozoic-Cenozoic accretion of North Gondwanan terraines, followed by vicariance via rising/ declining sea levels in Sundaland and temporary volcanic "arc" corridors throughout and surrounding the Philippine archipelago and Java seems the most logical explanation for biogeographical history of the group.

In our opinion, the high levels of island endemism in selenocosmiine species is a strong argument for vicariance as the primary mechanism for speciation of the group, as opposed to an 'out of India' <35 Ma dispersal hypothesis. Given the low dispersal capabilities of tarantulas (cannot fly, inability to balloon, fossorial lifestyle, etc), dispersal as the primary mechanism for divergence seems even less plausible. Additionally, the clear morphological distinction between selenocosmiine fauna east and west of Wallace's Line (*Viz.* Beck *et al.* 2006) cannot be ignored and may prove to be the strongest argument for Gondwanan origins of Selenocosmiinae.

## Final remarks

 Given two new tribal descriptions, the revision of tribes, the new genus description, three generic synonymies and 12 species transfers, herein, it becomes clear that previous generic definitions and methods for Selenocosmiinae classification have been flawed to various degrees. Most selenocosmiine genera were poorly defined in literature and the classification has been further compounded by new genus and species descriptions that often relied upon previous literature with no comparison to types. Previous hypotheses of selenocosmiine groups, such as *Selenocosmia+Phlogiellus* (Simon 1903, Gravely 1915, Hirst 1909), *Coremiocnemis+Selenotypus+Lyrognathus* (Pocock 1895), *Selenocosmia+Chilobrachys+Phlogiellus* (Gravely 1915) do not ally with our cladistic analyses presented here (although it must be said any assumption of groups by previous authors have always been tentatively expressed). While our cladistic analyses do not consider particular groups, such as Australo-Papuan fauna and some far northern "*Selenocosmia*", it does provide some resolution with many new synapomorphic traits possibly diagnostic to most genera considered. More work needs to be focused on certain selenocosmiine groups, particularly *Selenocosmia* (Nunn, West & Court, in prep.) and all Australo-Papuan Selenocosmiinae (Raven, in prep.). Once these taxa are revised, Nunn, West & von Wirth plan to test phylogenetic and biogeographic relationships of all Selenocosmiinae.

## Acknowledgements

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