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Research article

[urn:lsid:zoobank.org/pub:B73C6A06-1245-41CB-9175-C33BC2273245](http://urn.lsid:zoobank.org/pub:B73C6A06-1245-41CB-9175-C33BC2273245)

A new genus of ground and litter-dwelling pholcine spiders from Sarawak (Araneae, Pholcidae)

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Abstract. Two small, ground and litter-dwelling pholcid species from northern Borneo are described as representatives of a new genus, *Hantu* gen. nov.: *H. kapit* gen. et sp. nov. and *H. niah* gen. et sp. nov. Previous cladistic analyses suggested a closer relationship with the genera *Savarna* Huber, 2005 and *Khorata* Huber, 2005 (mainland Southeast Asia) than with the geographically closer genus *Aetana* Huber, 2005 (Borneo and Philippines to Fiji). Since the two species do not share any of the synapomorphies of *Khorata* and *Savarna* while having several synapomorphies on their own (ventral apophysis on male palpal coxa; male palpal trochanter apophysis with small teeth or scales; spines on male femora 1; high density of vertical hairs on male femora; presence of scape on epigynum), they are here proposed as representing a new genus.

Keywords. Borneo, Sarawak, endemism, taxonomy, Pholcidae.

Huber B.A. 2016. A new genus of ground and litter-dwelling pholcine spiders from Sarawak (Araneae, Pholcidae). *European Journal of Taxonomy* 186: 1–15. <http://dx.doi.org/10.5852/ejt.2016.186>

Introduction

The two species newly described herein were initially to be included in a revision of the Southeast Asian pholcid genus *Aetana* Huber, 2005 (Huber *et al.* 2015a). Superficially, they resembled ground and litter-dwelling representatives of that genus, and their geographic origin also pointed towards *Aetana* (ranging from Borneo and the Philippines to Fiji) rather than to other similar genera on the Southeast Asian mainland (*Savarna* Huber, 2005; *Khorata* Huber, 2005). However, closer examination and cladistic analyses revealed that these two species (under the names “Gen.n. Bor80” and “Gen.n. Bor20” in Huber *et al.* 2015a) were not only different from *Aetana* in many details, but, in fact, closer to *Khorata* and *Savarna*. At the same time, the two species do not share any of the distinctive characters of *Khorata* (Huber 2005b) and *Savarna* (Huber 2005b; Huber *et al.* 2015b). As a consequence, they are here described as representatives of a new genus.

Material and methods

The material studied herein was collected during a recent expedition to northern Borneo (Jul.–Aug. 2014). It is currently deposited at the Zoologisches Forschungsmuseum Alexander Koenig, Bonn (ZFMK), and the Sarawak Museum, Kuching (SMK).

Methods and terminology are as in recent revisions (Huber 2011, 2013). Measurements are in mm unless otherwise noted. Eye measurements are $\pm 5 \mu\text{m}$. Epigyna were cleared in warm NaOH solution and stained with chlorazol black. For SEM photos, specimens were dried in HMDS (Brown 1993), and photographed with a Hitachi S-2460 scanning electron microscope. SEM data are presented within the descriptions, but are not based on the holotype specimens described. The distribution map was generated with ArcMap 10.0. The following abbreviations are used in the text:

ALE = anterior lateral eyes
ALS = anterior lateral spinnerets
AME = anterior median eyes
a.s.l. = above sea level
L/d = length/diameter
PME = posterior median eyes

Further abbreviations used only in figures are explained directly in the figure legends.

Results

Class Arachnida Cuvier, 1812
Order Araneae Clerck, 1757
Family Pholcidae C.L. Koch, 1851

Hantu gen. nov.

urn:lsid:zoobank.org:act:9DBC7B6-8A03-4346-BFA7-9DE99CD065D7

Type species

Hantu kapit gen. et sp. nov.

Diagnosis

Small, six-eyed, dark, ground and litter-dwelling pholcids with dark (usually black) sternum, with thoracic furrow extending over entire length of carapace, and without epiandrous spigots. Distinguished from putatively closest known relatives (*Khorata*, *Savarna*) by ventral apophysis on male palpal coxa (arrows in Figs 9, 19, 27), by scales or teeth on male palpal trochanter (Fig. 16), by spines on male femora 1 (~10–25 in single ventral row), by short vertical hairs in high density on male femora (in two dorsal rows), and by scape on female external genitalia (Figs 40–45); from *Savarna* also by presence of distal cheliceral apophyses (Figs 11, 28) and by male palpal trochanter apophysis not fused to femur (Figs 9, 27); from *Khorata* also by absence of sclerotized ledges laterally on male chelicerae (Figs 11, 28) and by absence of retrolateral process on male palpal femur (Figs 9, 27).

Etymology

Named for the Hantu Rimba, deep-forest ghosts in traditional Malaysian mythology. Gender masculine.

Description

Male

MEASUREMENTS. Total body length ~2.0–2.5; carapace width 0.9–1.0; leg 1 length ~20–25; tibia 1 length ~4.5–6.0; tibia 2/tibia 4 length 1.0–1.1; tibia 1 L/d ~55–75.

COLOR. In life (Figs 1–6) mostly ochre-gray with black marks, sternum black, legs without dark rings; abdomen with dark brown to black marks dorsally, laterally, and ventrally.

BODY. Carapace with distinct median furrow (Figs 14, 31, 34); ocular area raised, eye triads on short stalks directed toward lateral (Figs 14, 31), with complex modification in *H. kapit* gen. et sp. nov. (Figs 10,

14, 15, 17). AME absent. Clypeus high, either unmodified or with small median process (Figs 15, 17). Abdomen slightly longer than high, pointed at spinnerets (Figs 1–6). Male gonopore without epiandrous spigots (Figs 23, 32). ALS with large widened spigot and pointed spigot, without further cylindrically shaped spigots (Figs 24, 38); PMS with two spigots each.

CHELICERAE. With two pairs of processes, one proximal lateral, one distal frontal (Figs 11, 28); without modified hairs; without stridulatory ridges.

PALPS. Coxa with distinct ventral process (Figs 8, 19, 27); trochanter with retrolateral process of varying length provided with small scales or teeth (Fig. 16); femur large, without processes; patella relatively long ventrally (not triangular in lateral view; Figs 9, 27); tibia rather small and slender, with retrolateral trichobothrium in ‘normal’ (not very distal) position (at ~60% of tibia length); palpal tarsus small, with pit-shaped rather than capsular tarsal organ (Figs 21, 33); procurus complex, proximal and distal parts connected by membranous hinge; bulb with weakly sclerotized embolus as only process (Figs 9, 27).

LEGS. With spines on femora 1; without curved hairs; vertical hairs in two dorsal rows on all femora and tibiae; retrolateral trichobothrium on tibia 1 at ~6–8% of tibia length; prolateral trichobothrium absent on tibia 1, present on other tibiae. Tarsal organ not examined. Tarsus 1 with ~15–20 pseudosegments fairly distinct distally; tarsus 4 with single row of ventral comb-hairs of *Belisana*-type (cf. Huber & Fleckenstein 2008) (Figs 25, 39).

Female

Similar to male but eye triads on low humps (Fig. 34); clypeus and chelicerae unmodified; legs slightly shorter than in male (tibia 1 ~4.0–5.0); without spines on femora 1. Epigynum weakly sclerotized, with distinct scape directed toward posterior (Figs 12, 29, 40–45). Internal genitalia with pair of oval pore plates.

Monophyly and relationships

In a recent morphological cladistic analysis of *Aetana* and putatively close relatives (Huber *et al.* 2015a), the monophyly of *Hantu* gen. nov. was consistently supported by five synapomorphies: (1) presence of ventral apophysis on male palpal coxa (Figs 9, 19, 27); (2) male palpal trochanter apophysis with small teeth or scales (Fig. 16); (3) presence of spines on male femora 1; (4) high density of vertical hairs on male femora; (5) presence of scape on epigynum (Figs 40–45).

Three characters suggested a closer relationship with the mainland genera *Khorata* and *Savarna* rather than with *Aetana*: (1) thoracic furrow extending over entire length of carapace (Figs 14, 31, 32); (2) dark (usually black) sternum; and (3) absence of epiandrous spigots (Figs 23, 32). A single character supported a sister-group relationship with *Savarna*: high density of vertical hairs on tibiae. Preliminary molecular data (A. Valdez-Mondragón, D. Dimitrov, B.A. Huber, unpubl. data) are not conclusive: while *H. niah* gen. et sp. nov. is placed in a clade together with *Khorata* and *Savarna* (in agreement with morphology), *H. kapit* gen. et sp. nov. is currently misplaced in *Belisana* Thorell, 1898 for unknown reasons.

Natural history

Both species were found in small protected spaces close to the ground (in small holes; among and under rocks, logs, and large leaves) where they build their domed webs.

Composition

Only the two species newly described below.

Distribution

Known from Sarawak only (Fig. 7).

Hantu kapit gen. et sp. nov.

[urn:lsid:zoobank.org:act:C86E7783-5E91-4FB9-AB7E-A7F32FDA9431](https://doi.org/10.21203/rs.3.rs-1000000)

Figs 1–2, 8–25, 40–42

Gen.n. Bor80 – Huber *et al.* 2015a: 73–74.

Diagnosis

Easily distinguished from *H. niah* gen. et sp. nov. (and from other putatively close relatives in the genera *Khorata*, *Savarna*, and *Aetana*) by two pairs of horns on male ocular area (Figs 10, 14, 15, 17),



Figs 1–6. Live specimens. 1–2. *Hantu kapit* gen. et sp. nov., ♂ and ♀ from Kapit, Sarawak. 3–6. *Hantu niah* gen. et sp. nov., ♂ and ♀ from Niah, Sarawak.

by extremely long apophysis on male palpal trochanter (longer than femur; Fig. 9), and by scape on epigynum (Fig. 40) less sclerotized than in *H. niah* gen. et sp. nov. and with fine transversal folds.

Etymology

The species name is derived from the type locality; noun in apposition.

Type material

MALAYSIA-BORNEO: holotype, ♂, Sarawak, near Kapit, forest along river, 1.937–1.944° N, 112.904–112.910° E, 80–120 m a.s.l., 20 Jul. 2014 (B.A. Huber, S.B. Huber), ZFMK (Ar 15068).

Other material examined

MALAYSIA-BORNEO, Sarawak: 7 ♂♂, 4 ♀♀, same data as holotype, ZFMK (Ar 15069–70; 6 ♂♂, 3 ♀♀) and SMK (1 ♂, 1 ♀); 2 ♀♀, 4 juvs, same data, in pure ethanol, ZFMK (Bor 183).

Description

Male (holotype)

MEASUREMENTS. Total body length 2.4, carapace width 0.9. Leg 1: 24.5 (5.8 + 0.4 + 5.7 + 9.3 + 3.3), tibia 2: 3.4, tibia 3: 2.4, tibia 4: 3.1; tibia 1 L/d: 72. Distance PME-PME 500 µm, diameter PME 105 µm, distance PME-ALE 25 µm, no AME.

COLOR. Carapace pale ochre with large dark lateral marks and median mark posteriorly, dark median line, ocular area and clypeus dark brown. Sternum dark brown to black. Legs ochre to light brown, without dark rings. Abdomen ochre-grey with large dorsal and lateral marks; ventral side largely covered by large dark mark and smaller dark mark at spinnerets.

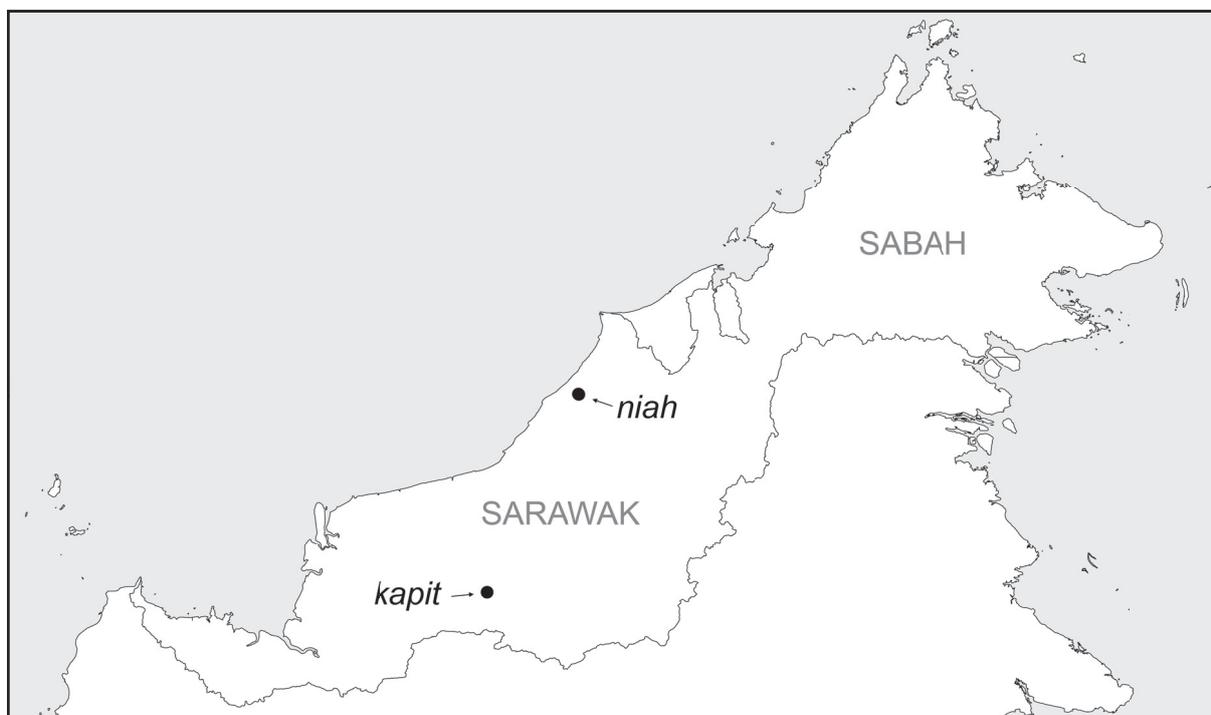
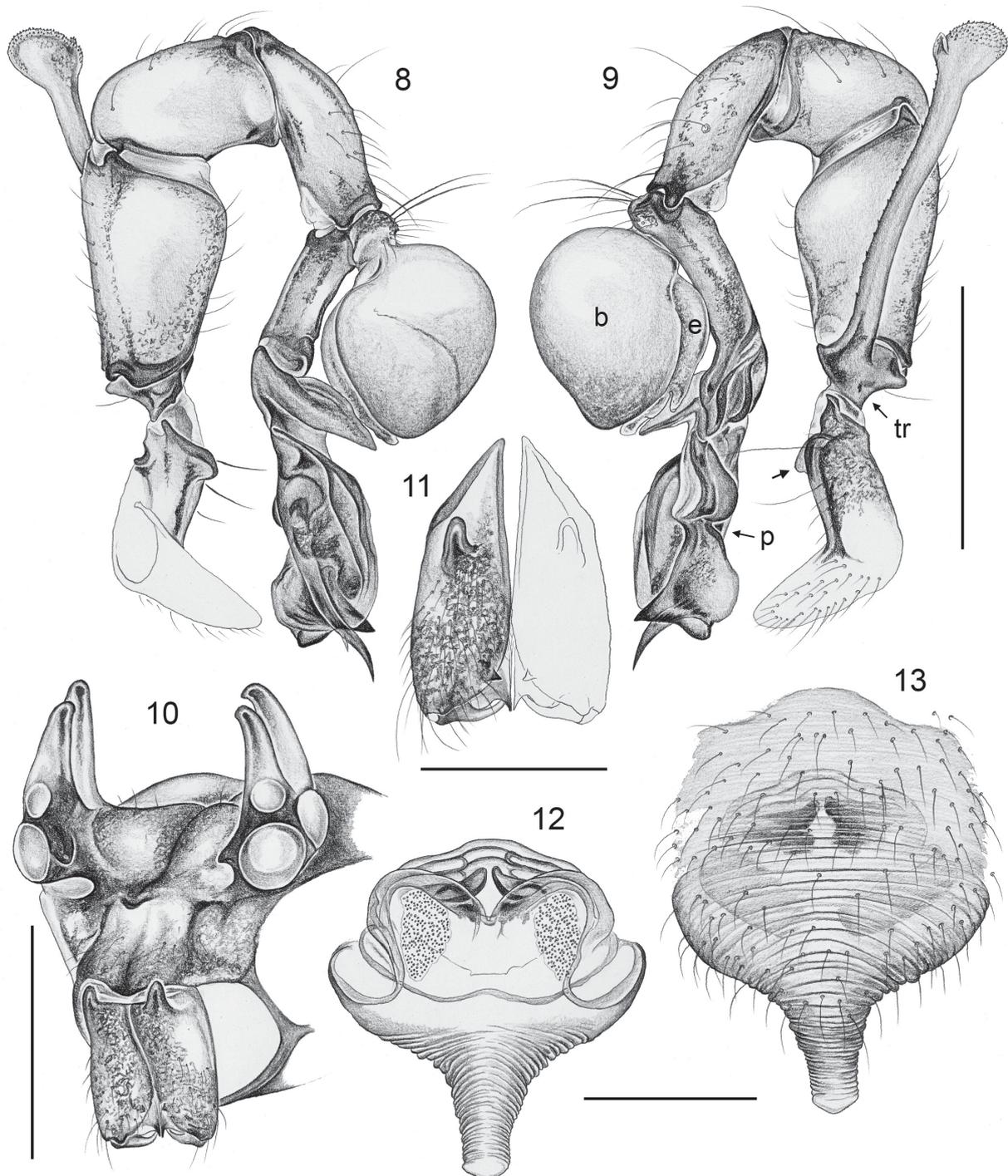


Fig. 7. Map of northern Borneo, showing known records of *Hantu* gen. nov.

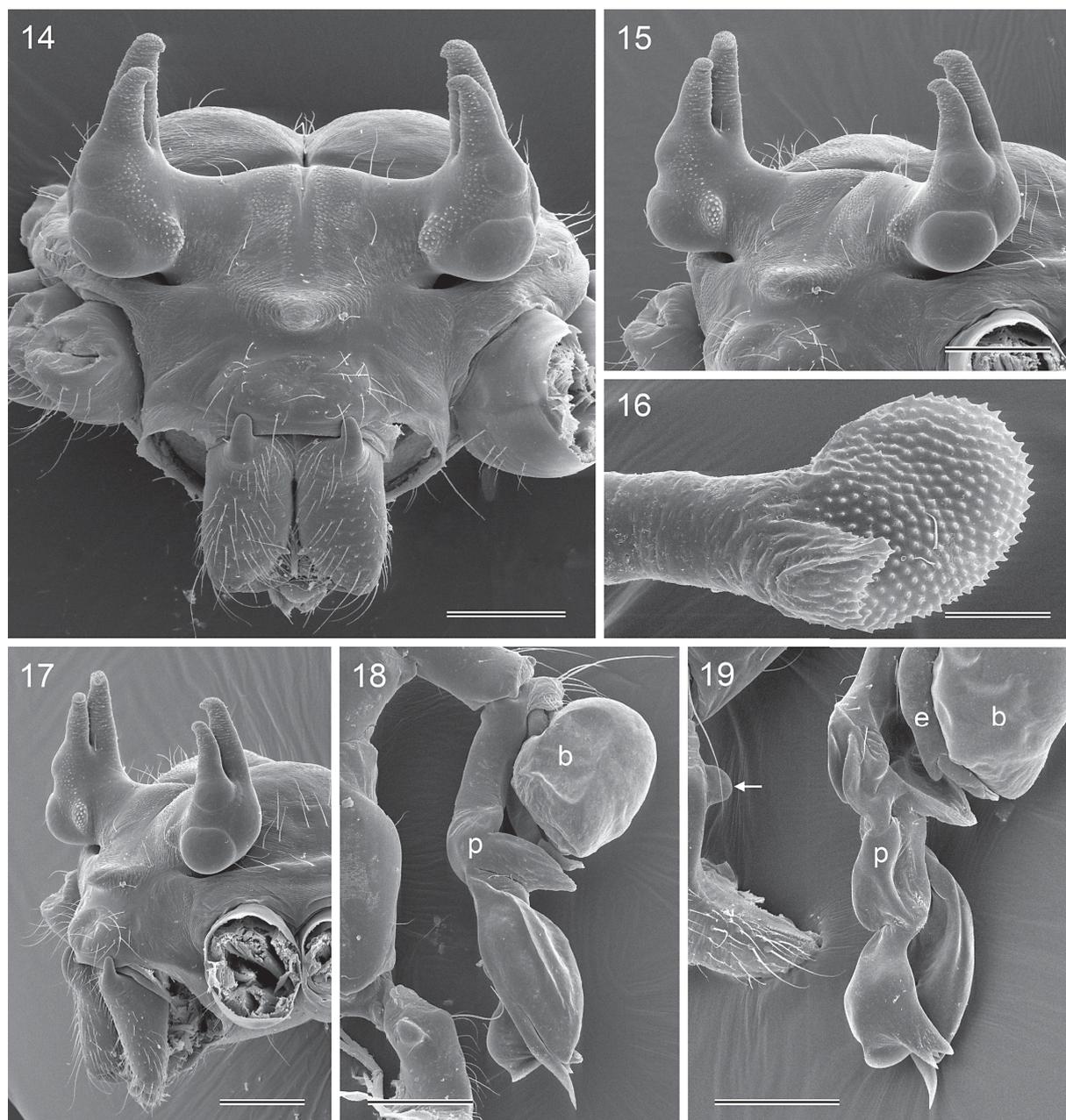
BODY. Habitus as in Fig. 1; ocular area highly modified (Figs 10, 14, 15, 17), with two pairs of large horns arising from near PME and PLE and pair of smaller processes arising from near ALE; each triad on short stalk directed toward lateral; carapace with distinct thoracic furrow; clypeus with small median



Figs 8–13. *Hantu kapit* gen. et sp. nov., ZFMK Ar 15069–70. **8–9.** Left male palp, prolateral and retrolateral views (arrow points at ventral process on coxa). **10.** Male prosoma, oblique frontal view. **11.** Male chelicerae, frontal view. **12–13.** Cleared female genitalia, dorsal and ventral views. Abbreviations: b = genital bulb; e = embolus; p = procurus; tr = trochanter. Scale lines: 0.5 mm (8–10); 0.3 mm (11–13).

process (Figs 15, 17); sternum wider than long (0.60/0.50), unmodified. Chelicerae as in Fig. 11, with pair of proximal lateral apophyses in rather frontal position and pair of small, distal apophyses near lamellae; without modified hairs.

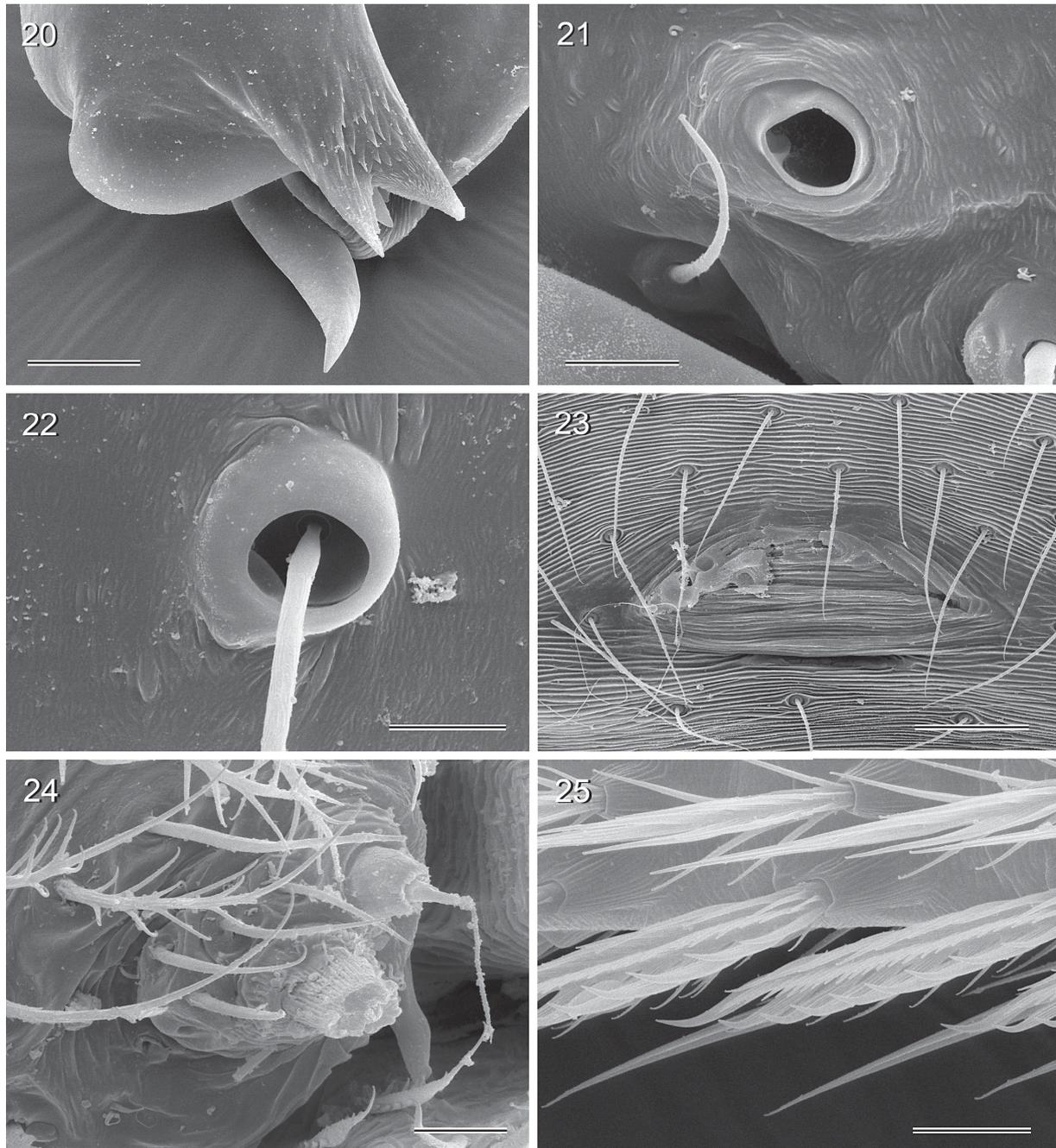
PALPS. As in Figs 8–9, coxa with sclerotized protruding rim ventro-distally; trochanter with distinctive long retrolateral apophysis widening distally and provided with small teeth at tip (Fig. 16); femur large,



Figs 14–19. *Hantu kapit* gen. et sp. nov., ZFMK Ar 15069. **14–15.** Male prosoma, frontal and slightly oblique frontal views. **16.** Tip of right male palpal trochanter apophysis. **17.** Male prosoma, oblique frontal view. **18.** Left procurus and genital bulb, prolateral view. **19.** Right procurus and bulb, retrolateral view (arrow points at ventral process on coxa). Abbreviations: b = genital bulb; e = embolus; p = procurus. Scale lines: 50 µm (16); 200 µm (14–15, 17–19).

without processes; patella unusually long; tibia long and slender. Procursus highly complex, apparently with several hinges between distinctive sclerites. Bulb simple, weakly sclerotized embolus with subdistal branch.

LEGS. With single ventral row of ~25 spines on femora 1; without curved hairs; with short vertical hairs in two dorsal rows on all femora and tibiae; retrolateral trichobothrium on tibia 1 at 6%; prolateral



Figs 20–25. *Hantu kapit* gen. et sp. nov., ZFMK Ar 15069. **20.** Tip of right procurus, retrolateral view. **21.** Male palpal tarsal organ. **22.** Trichobothrium base on male palpal tibia. **23.** Male gonopore. **24.** Male ALS. **25.** Comb-hairs on male tarsus 4. Scale lines: 8 μm (21); 10 μm (22, 24–25); 40 μm (20, 23).

trichobothrium absent on tibia 1, present on other tibiae. Tarsus 1 pseudosegments indistinct, only distally ~15 visible in dissecting microscope.

Male (variation)

Tibia 1 in 7 other males: 5.6–5.9 (mean 5.7). Spines on femora variable in thickness and number (~20–30).

Female

In general similar to male (Fig. 2); ocular area unmodified, triads closer together (distance PME-PME 220 µm), not on stalks; clypeus unmodified; no spines on femora; fewer vertical hairs on femora and tibiae (but especially on tibiae also with higher than usual density). Tibia 1 in 4 females: 4.7, 4.8, 4.9, 4.9. Epigynum large dark plate, weakly sclerotized, slightly protruding and with many fine transversal folds, especially in posterior half (Figs 13, 40, 41); with distinctive scape, pale whitish distally; internal genitalia as in Figs 12 and 42.

Natural history

The spiders were found in domed webs in small holes in the ground along a river in well-preserved forest.

Distribution

Known from type locality near Kapit only (Fig. 7).

Hantu niah gen. et sp. nov.

[urn:lsid:zoobank.org:act:0C378095-994C-427A-8989-E119A644A7EC](https://zoobank.org/act:0C378095-994C-427A-8989-E119A644A7EC)

Figs 3–6, 26–39, 43–45

Gen.n. Bor20 – Huber *et al.* 2015a: 73–74.

Diagnosis

Easily distinguished from *H. kapit* gen. et sp. nov. by absence of horns in male ocular area (Fig. 31), by highly distinctive male palp (Figs 26–27; square-shaped trochanter apophysis; dorsal process on procurus), by strong distal apophyses on male chelicerae (Fig. 28), and by scape on epigynum (Figs 29, 43) more sclerotized and without fine transversal folds. From other putatively close relatives in the genera *Khorata* and *Savarna* by male procurus shape (dorsal process) and epigynal scape.

Etymology

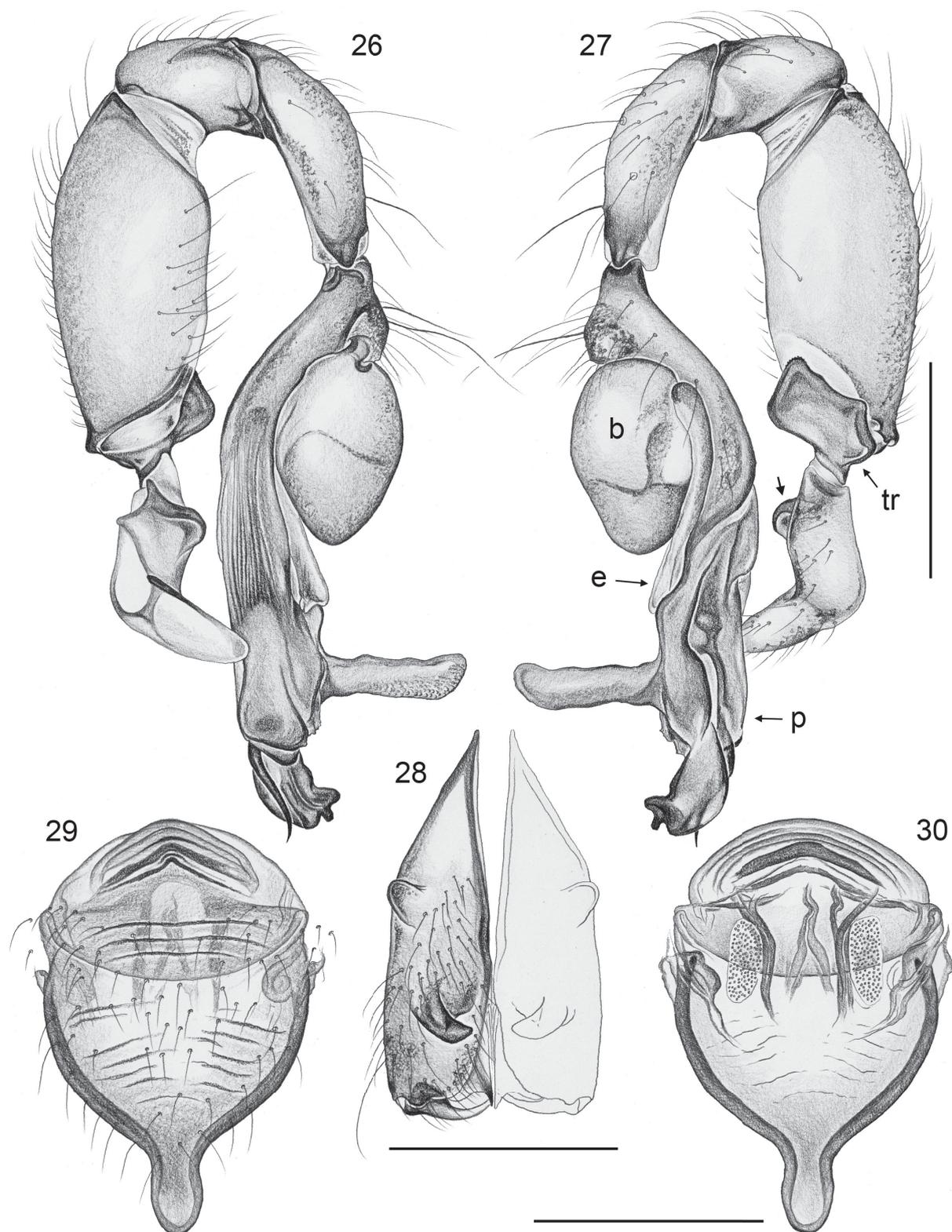
The species name is derived from the type locality; noun in apposition.

Type material

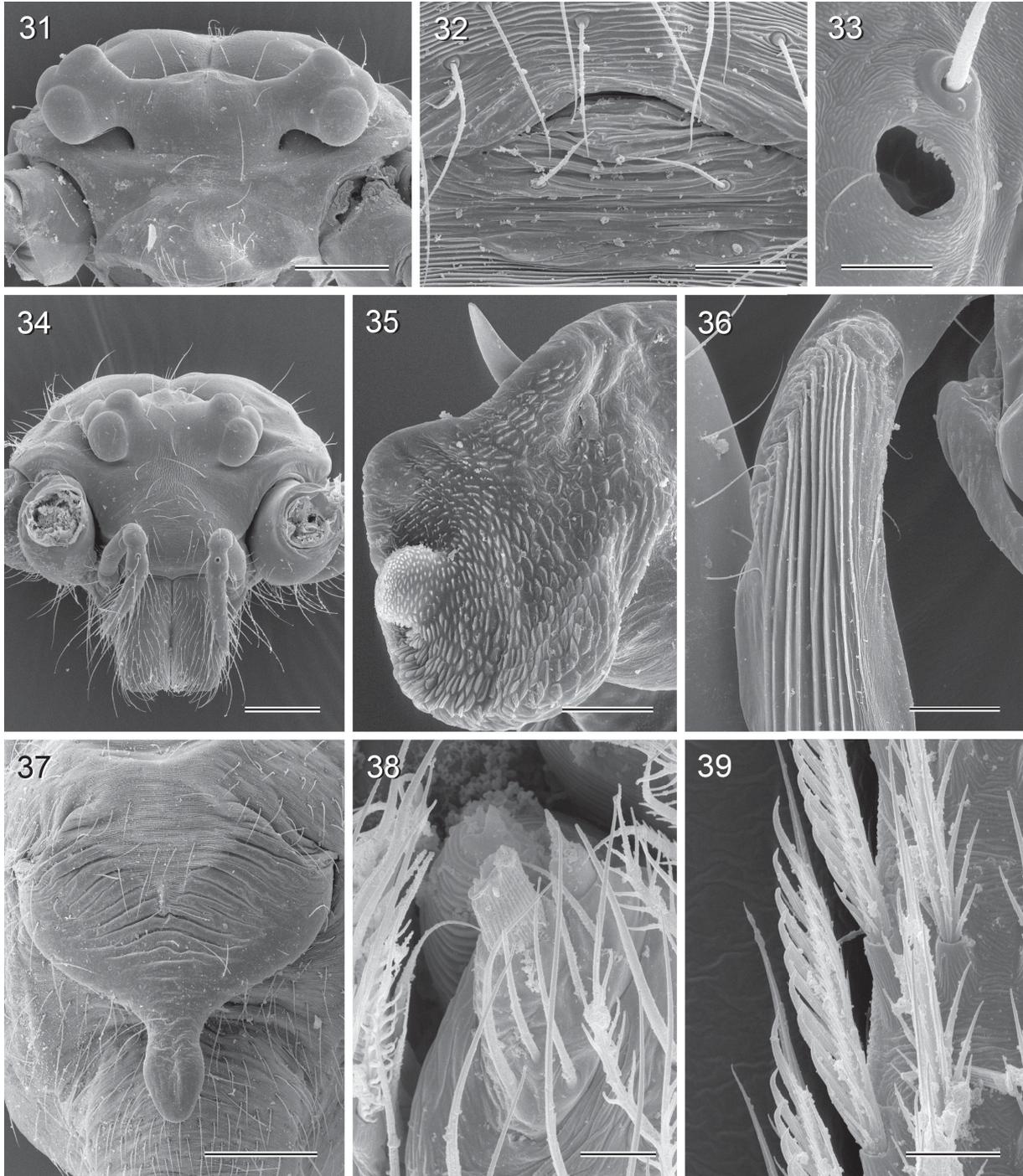
MALAYSIA-BORNEO: holotype, ♂, Sarawak, Niah Cave N.P., forest near cave, 3.814° N, 113.771° E, 40 m a.s.l., 28 Jul. 2014 (B.A. Huber), ZFMK (Ar 15071).

Other material examined

MALAYSIA-BORNEO, Sarawak: 10 ♂♂, 15 ♀♀, 1 juv., same data as holotype, ZFMK (Ar 15072–73; 9 ♂♂, 14 ♀♀) and SMK (1 ♂, 1 ♀); 4 ♀♀, same data, in pure ethanol, ZFMK (Bor 226); 2 ♀♀, Niah Cave N.P., forest along main trail, 3.814–3.821° N, 113.763–113.771° E, 20–40 m a.s.l., 27 Jul. 2014 (B.A. Huber, S.B. Huber), ZFMK (Ar 15074); 1 ♀, 1 juv., same data, in pure ethanol, ZFMK (Bor 177).



Figs 26–30. *Hantu niah* gen. et sp. nov., ZFMK Ar 15072–73. **26–27.** Left male palp, prolateral and retrolateral views (arrow points at ventral process on coxa). **28.** Male chelicerae, frontal view. **29–30.** Cleared female genitalia, ventral and dorsal views. Abbreviations: b = genital bulb; e = embolus; p = procurus; tr = trochanter. Scale lines: 0.5 mm (26–27, 29–30); 0.3 mm (28).



Figs 31–39. *Hantu niah* gen. et sp. nov., ZFMK Ar 15072–73. **31.** Male prosoma, anterior view. **32.** Male gonopore. **33.** Male palpal tarsal organ. **34.** Female prosoma, frontal view. **35.** Tip of right procurus, retrolateral view. **36.** Lamellae of left procurus, prolateral view. **37.** Epigynum, ventral view. **38.** Male ALS. **39.** Comb-hairs on male tarsus 4. Scale lines: 8 μ m (33); 10 μ m (38–39); 30 μ m (32, 35); 80 μ m (36); 200 μ m (31, 34, 37).

Description

Male (holotype)

MEASUREMENTS. Total body length 2.3, carapace width 1.0. Leg 1: 20.5 (5.0 + 0.4 + 5.1 + 7.7 + 2.3), tibia 2: 3.0, tibia 3: 2.2, tibia 4: 2.9; tibia 1 L/d: 58. Distance PME-PME 420 μ m, diameter PME 90 μ m, distance PME-ALE 25 μ m, no AME.

COLOR. Carapace light ochre with narrow lateral dark margins and large median dark mark including ocular area. Clypeus not darkened. Sternum dark brown. Legs ochre to light brown, without dark rings. Abdomen grey with large dorsal and lateral marks; ventrally with three large dark marks (in genital area, at spinnerets, and in-between).

BODY. Habitus as in Figs 3–4; ocular area slightly raised, each triad on short stalk directed toward lateral (Fig. 31); carapace with shallow but distinct thoracic furrow; clypeus unmodified; sternum wider than long (0.65/0.55), unmodified. Chelicerae as in Fig. 28, with pair of proximal lateral apophyses and pair of strong distal apophyses curved toward median line; without modified hairs.



Figs 40–45. Female genitalia; untreated in ventral view, cleared in ventral and dorsal views. **40–42.** *Hantu kapit* gen. et sp. nov., ZFMK Ar 15070. **43–45.** *Hantu niah* gen. et sp. nov., ZFMK Ar 15073. At varying scales.

PALPS. As in Figs 26–27, coxa with sclerotized protruding rim ventro-distally; trochanter with short but very large, square-shaped ventral apophysis with very small teeth distally; femur very large, without processes; patella unusually long; tibia long and slender. Procursus very long; with distinctive dorsal process and complex tip. Bulb oval, with simple weakly sclerotized embolus.

LEGS. With single ventral row of ~10 spines on femora 1; without curved hairs; with short vertical hairs in two dorsal rows on all femora and tibiae; retrolateral trichobothrium on tibia 1 at 7.5%; prolateral trichobothrium absent on tibia 1, present on other tibiae. Tarsus 1 pseudosegments indistinct, only distally ~20 visible in dissecting microscope.

Male (variation)

Tibia 1 in 8 other males: 4.8–5.3 (mean 5.0). Margins of carapace sometimes not dark; dorsal pattern on abdomen sometimes indistinct. Number and thickness of spines on femora variable, from few barely thicker hairs (small males) to ~20 distinct spines (large males).

Female

In general similar to male (Figs 5–6); eye triads closer together (distance PME-PME 220 μm), not on stalks (Fig. 34); no spines on femora; fewer vertical hairs on femora and tibiae (but especially on tibiae also with higher than usual density). Tibia 1 in 16 females: 4.3–4.7 (mean 4.5). Entire epigynal area protruding, posteriorly sclerotized with distinctive scape (Figs 29, 43, 44); internal genitalia as in Figs 30 and 45.

Natural history

The spiders were found close to the ground in small domed webs among and under rocks, under dead leaves, and in little cavities. They were extremely efficient at escaping through the closed hand, then dropped to the ground and remained motionless, becoming essentially invisible.

Distribution

Known from Niah Cave N.P. only (Fig. 7).

Discussion

Pholcid spiders are widely known for their long-legged representatives, some of which are synanthropic, but a large number of species in a range of genera are actually relatively short-legged ground and litter-dwellers. About half of all currently recognized genera either include or consist entirely of such short-legged species (e.g., Huber 2005a, 2005b, 2011, 2013, 2015; Huber *et al.* 2005). This suggests multiple convergent shifts among microhabitats; in fact, molecular data support the notion that such shifts have occurred repeatedly in various directions (Huber *et al.* 2010; Dimitrov *et al.* 2013; see also Huber & Dimitrov 2014).

Ground and litter-dwelling pholcids share a similar habitus to a degree that allows reasonable predictions even for museum specimens without microhabitat information. They are small (body size ~1–3 mm), relatively short legged (leg 1 length < 30 mm), rather dark (brown), and have a globular or oval abdomen. This combination seems to be extremely rare in pholcids living in other microhabitats. The only apparent exception known to me are West and Central African representatives of the genus *Anansus* Huber, 2007 that were collected by canopy fogging (Huber 2007).

In Southeast Asia, at least seven pholcid genera other than *Hantu* gen. nov. include ground and litter-dwelling representatives: *Aetana* Huber, 2005; *Belisana* Thorell, 1898; *Holocneminus* Berland, 1942; *Pholcus* Walckenaer, 1805; *Savarna* Huber, 2005; *Spermophora* Hentz, 1841; and *Wugigarra* Huber, 2001.

Acknowledgements

I thank Charles Leh Moi Ung and the Sarawak Museum Department for assistance in the request of permits and in field logistics, and Samuel B. Huber for help in the field. The Natural History Museum in Kuching kindly offered its facilities as the base of the field work. Permits were received from the Forest Department, Sarawak (Permit No. NCCD.907.4.4(JLD.10)-211, Park Permit No. 174/2014). I thank Facundo M. Labarque and an anonymous reviewer for valuable comments on the manuscript. The German Research Foundation provided financial support (DFG Project HU 980/11-1).

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Manuscript received: 12 October 2015

Manuscript accepted: 10 December 2015

Published on: 1 April 2016

Topic editor: Rudy Jocqué

Desk editor: Kristiaan Hoedemakers

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