

## Two new species of the phyline plant bug genus *Randallopsallus* from Southeast Asia (Hemiptera: Heteroptera: Miridae)

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**Abstract.** The phyline plant bug genus *Randallopsallus* Yasunaga, 2013 (Hemiptera: Heteroptera: Miridae: Phylinae) is rediagnosed, with discussion on its tribal placement in the subfamily Phylinae. Current evidence suggests that this unique genus is best placed in Pilophorini and may be closely related to *Parastenaridea* Miller, 1937. Two new species, *Randallopsallus berastagi* sp. nov. (from North Sumatra, Indonesia) and *R. malayanus* sp. nov. (Peninsular Malaysia), are described. A key is provided to facilitate the identification of the three known *Randallopsallus* species.

**Keywords.** Heteroptera, Miridae, Phylinae, *Randallopsallus*, new species, tribal placement, Indonesia, Malaysia, Thailand

### Introduction

The genus *Randallopsallus* of the largest plant bug subfamily Phylinae was recently proposed by YASUNAGA (2013) to accommodate a unique phyline, *R. paracastaneae* Yasunaga, 2013, known from central Thailand. SCHUH & MENARD (2013) placed *Randallopsallus* in the Exaeretini Puton, 1875, based on the elevated posterior process of the left paramere, which is shared with the exaeretine species and the lamellate parempodia of *Randallopsallus* also similar to those possessed by species of *Moissonia* Reuter, 1894.

While sorting specimens collected by the first author from Peninsular Malaysia and North Sumatra, two undescribed species were confirmed to be members of *Randallopsallus*. After reevaluation of external and genitalic characters, we concluded that the genus should be placed in the Pilophorini Douglas & Scott, 1876 rather than the Exaeretini. The present paper discusses the systematic position of *Randallopsallus* and describes these new species.

## Material and methods

The specimens examined are deposited in the following collections:

AMNH	American Museum of Natural History, New York, U.S.A.;
CNC	Canadian National Collection, Ottawa, Ontario, Canada;
DOAT	Entomology & Zoology Group, Plant Protection Research and Development Office, Department of Agriculture, Bangkok, Thailand;
TYCN	Tomohide Yasunaga collection, Nagasaki, Japan.

Matrix code labels were attached to the holotype and some representative specimens, which uniquely identify each specimen, and are referred to as ‘unique specimen identifiers’ (USIs). The USI codes [e.g., AMNH\_PBI 0012345] comprise an institution and project code (AMNH\_PBI) and a unique number (0012345). These data were digitized on the Arthropod Easy Capture (formerly the Planetary Biodiversity Inventory) database maintained by the American Museum of Natural History, New York, USA (<http://research.amnh.org/pbi/>) and are also searchable on ‘Heteroptera Species Pages’ (<http://research.amnh.org/pbi/heteropteraspeciespage/>).

All measurements were made with an ocular micrometer and are given in millimeters. Terminology of the genitalia mainly follows SCHUH (1984), SCHUH & SCHWARTZ (2016) and YASUNAGA et al (2015). Scanning electron micrographs were taken with Hitachi Tabletop Microscope® TM3030.

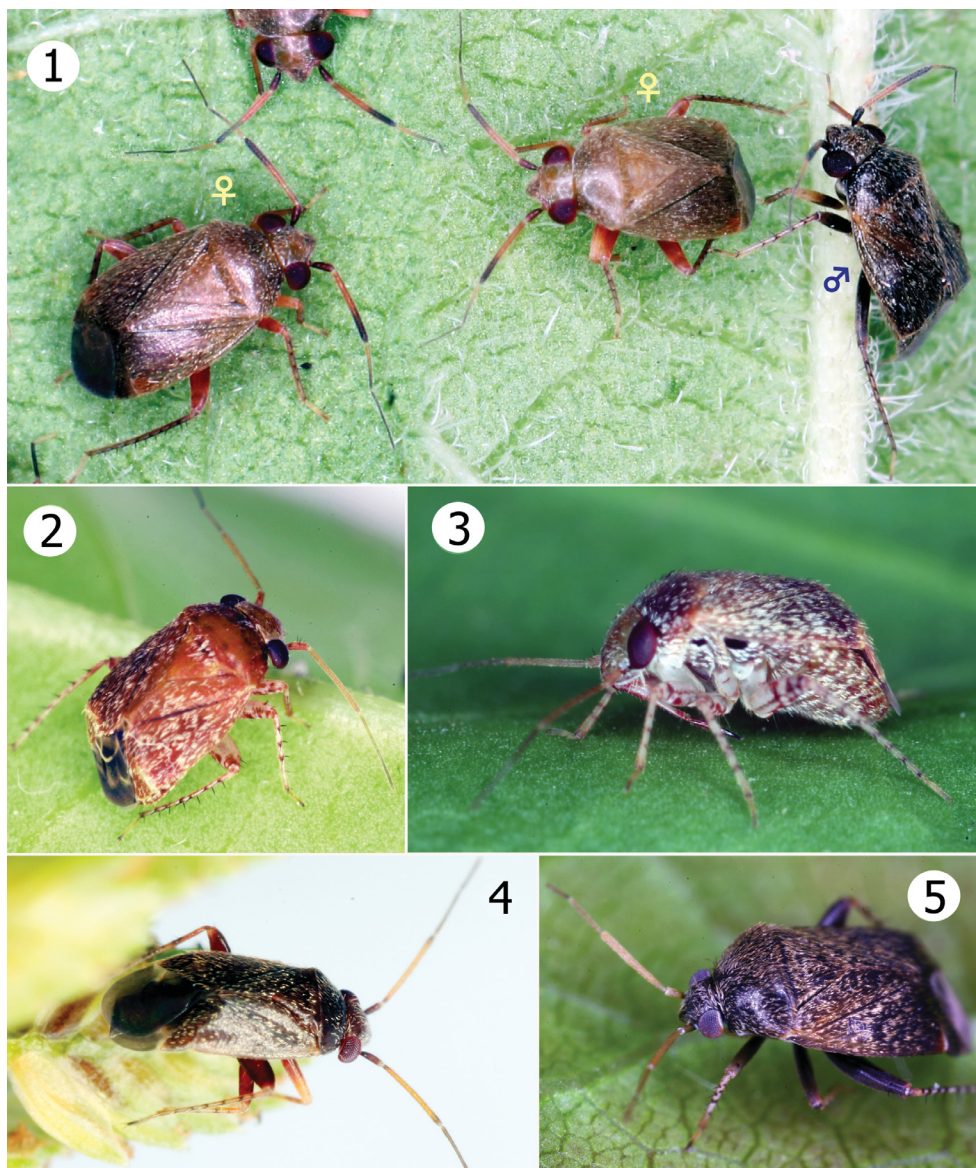
## Taxonomy

### Genus *Randallopsallus* Yasunaga, 2013

*Randallopsallus* Yasunaga, 2013: 197 (gen. nov.). Type species by original designation: *Randallopsallus paracastaneae* Yasunaga, 2013.

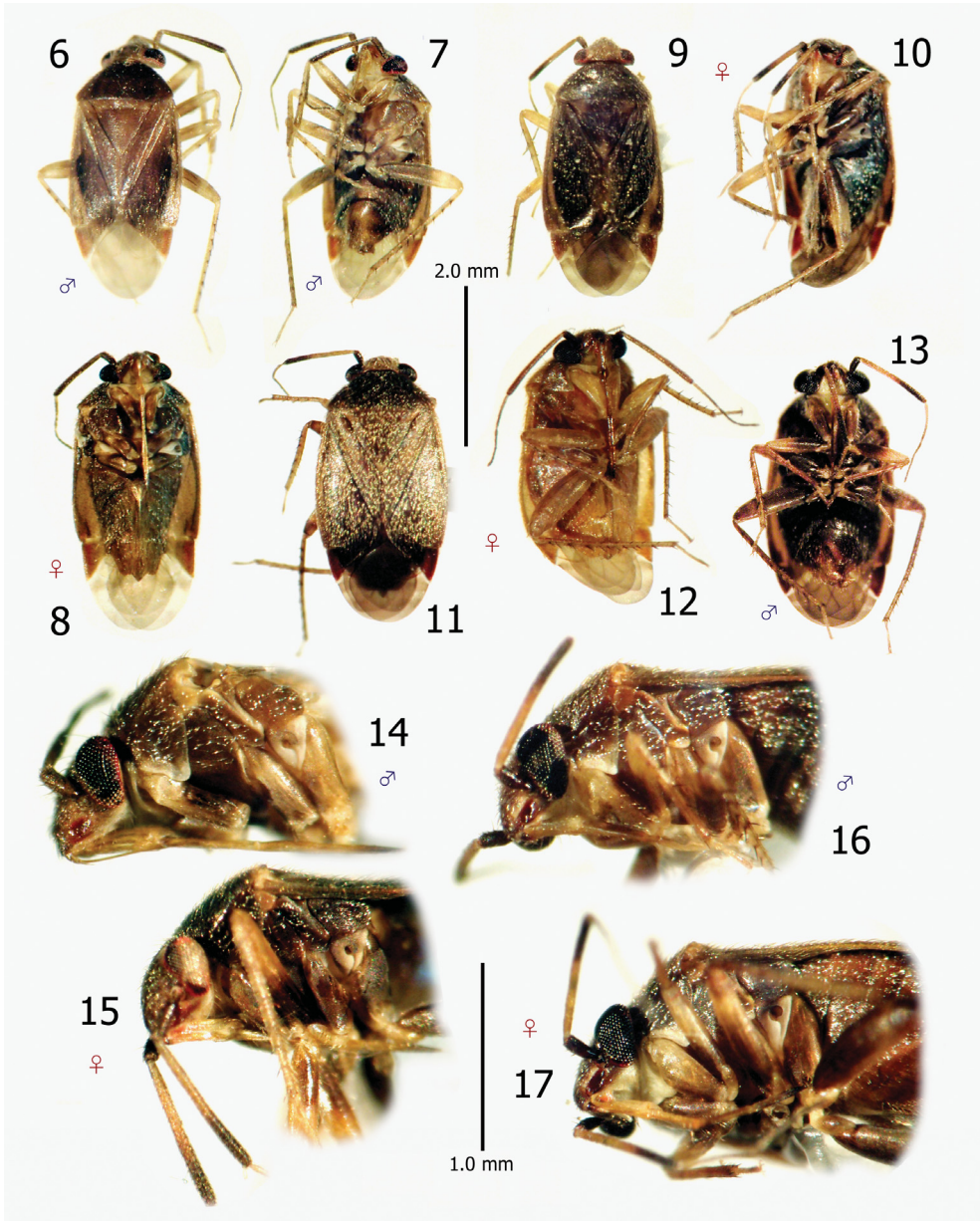
*Randallopsallus*: SCHUH & MENARD (2013): 21 (tribal placement in Exaeretini).

**Diagnosis.** Recognized by moderate size (2.9–3.5 mm in total length); ovoid, rather tumid, always macropterous body form (Figs 1, 6, 9, 11); dark brown or castaneous basic coloration; dorsal vestiture with uniformly distributed, brownish, reclining (common) setae, intermixed with moderately or rather sparsely distributed, silvery, sericeous, appressed setae; head across eyes broader than height in frontal view (Figs 18–21); antennal segment IV longer than III; long, stout labium slightly exceeding apex of metacoxa; short, scalelike setae (that are uniformly scattered and not partly aggregated) on thoracic pleura and abdominal sterna (Figs 7, 10, 14–17, 48, 51); thickened or roundly produced margin of ostiole (Figs 14–17); fleshy, somewhat lanceolate, apically convergent parempodia (Figs 25–27); more or less splayed-out left paramere (Figs 30, 33); tumid, elongate-oval right paramere (Figs 29, 33); apically folded or keeled phallosome (Figs 31, 34); J-shaped, broad endosoma with well-developed secondary blade (Figs 32, 35); thick-rimmed secondary gonopore; rather toughened bursa copulatrix (Figs 36, 41, 45); posterior wall with relatively clear interrampal sclerite (Figs 40, 42, 44); developed medioventral extension of ventral labiate plate (Figs 39, 43, 46). See YASUNAGA (2013) for more detailed diagnostic characters.

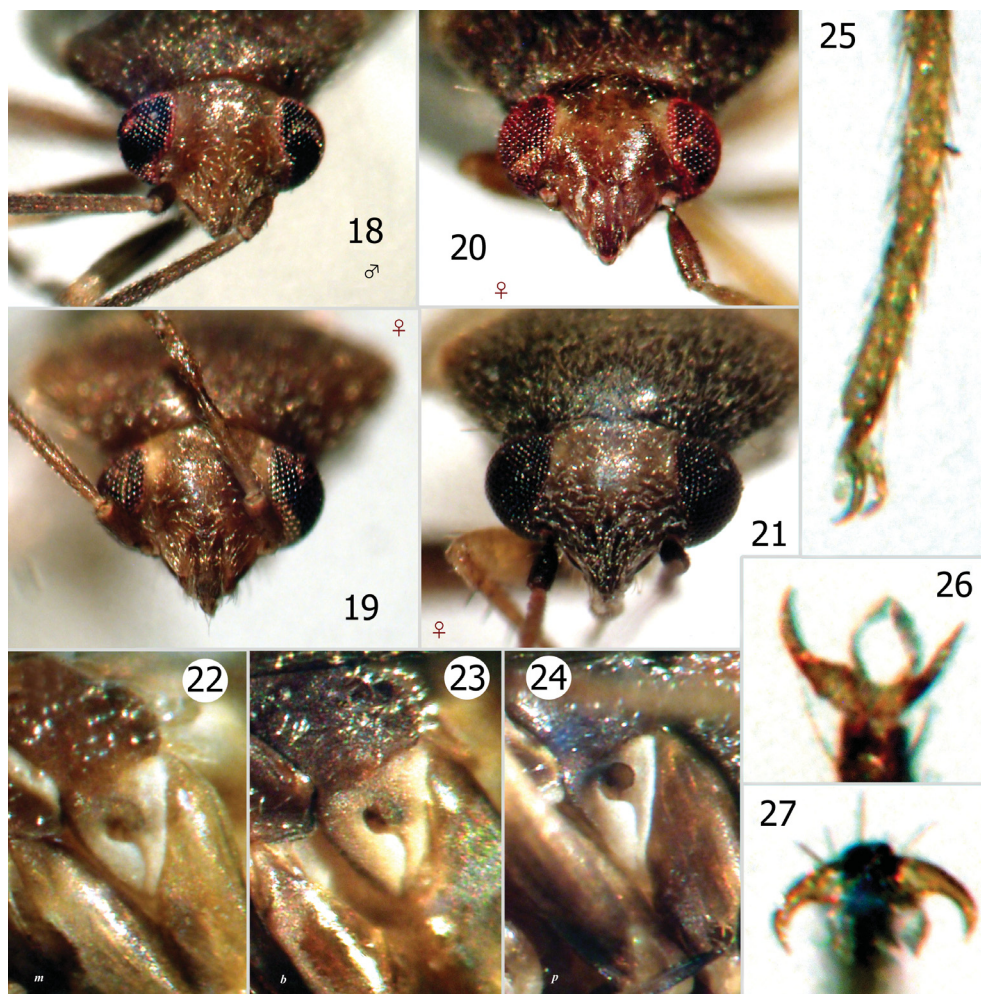


Figs 1–6. Habitus images of phyline plant bugs, live adult individuals. 1 – *Randallopsallus paracastaneae* Yasunaga, 2013 (all attracted to UV light trap) (SERS, Thailand), 2–3 – *Hypseloecus castaneus* Yasunaga, Yamada & Artchawakom, 2015 (2 – ♂, Chaityaphum, Thailand; 3 – ♀, Nakhon Nayok, Thailand), 4 – *Sthenaridea piceonigra* (Motschulsky, 1863) (♂, Yangon, Myanmar), 5 – *Psallus edoensis* Yasunaga & Vinokurov, 2000 (♀, Tokyo, Japan).





Figs 6–17. Habitus images of *Randallopsallus* spp. (6, 9, 10 – dorsal, 7, 8, 12–13 – ventral, 14–17 – left lateral views). 6–8, 14 – *R. malayanus* sp. nov. 9–10, 15 – *R. berastagi* sp. nov. 11–13, 16–17 – *R. paracastaneae* Yasunaga, 2013.



Figs 18–27. *Randallopsallus* spp., head in frontal view (18–21), scent efferent system (22–24), and pro- (27), meso- (26) and metatarsus (25). 18, 19, 22, 25 – *R. malayanus* sp. nov.; 20, 23, 26 – *R. berastagi* sp. nov.; 21, 24, 27 – *R. paracastaneae* Yasunaga, 2013.

**Distribution.** Now known widely in the central Oriental Region, ranging from Indochina (Thailand) to the Sundaland (Peninsular Malaysia and Sumatra).

**Discussion.** *Randallopsallus* can be separated from any other phylinae genera by the distinctive male genitalic structures, particularly strongly bifurcate endosoma, in spite of presence of other features in *Randallopsallus* (cf. Figs 2–5) that cause it to superficially resemble members of genera placed within other tribes of Phylinae. YASUNAGA (2013) mentioned that

the similarity in appearance of this taxon with the large Holarctic genus *Psallus* Fieber, 1858 (cf. Fig. 5, *Psallus edoensis* Yasunaga & Vinokurov, 2000) is considered only superficial. SCHUH & MENARD (2013) placed *Randallopsallus* in the tribe Exaeretini based on the possession of lamellate parempodia (cf. Fig. 63) and the elevated posterior process of the left paramere, which are shared by some genera in the Exaeretini (e.g., *Opuna* Kirkaldy, 1902; *Moissonia*).

Nonetheless, we now consider that *Randallopsallus* most probably belongs to the tribe Pilophorini. This tribe is known to comprise morphologically very diverse taxa. Some members of *Pilophorus* Hahn, 1826 are strikingly antlike because of a conspicuous modification of the pronotum or scutellum (see SCHUH 1989, 1991; YASUNAGA & SCHUH 2013; YASUNAGA et al. 2016). In *Chimairacoris* Yasunaga, Schuh & Cassis, 2015, the external appearance is reminiscent of a certain deraeocorine or termatophyline mirid (Deraeocorinae) rather than phyline (YASUNAGA et al. 2015, YASUNAGA & DUWAL 2017). Therefore, morphological features in the Pilophorini may be even more variable than in other phyline tribes.

The following characters in *Randallopsallus* are shared by several pilophorine genera: ovoid, tumid body with broad head (cf. *Hypseloecus* Reuter, 1891 as in Figs 2–3, *Parasthenaridea* Miller, 1937); vestiture on body surface with brownish, simple setae intermixed with sericeous or scalelike setae that are uniformly distributed and neither aggregated nor striped (*Lasiolabops* Schuh, 1984 [Fig. 55]; *Parasthenaridea*; *Stheneridea* Reuter, 1885 [Fig. 4]); long, stout labium (*Parasthenaridea*); left paramere more or less splayed-out (*Druthmarus* Distant, 1909, *Hypseloecus*, *Pherolepis* Kulik, 1968, *Pilophorus*, cf. Figs 58, 60); C- or J-shaped, stout endosoma with apically situated, heavy-rimmed gonopore (*Chimairacoris* [see YASUNAGA & DUWAL 2017], *Lasiolabops* [see SCHUH 1984]); and developed, bifurcate medioventral extension of ventral labiate plate (Figs 39, 43, 46) (*Hypseloecus*, Fig. 47). Based on these characters, in addition to the lamellate, apically convergent parempodia (cf. Figs 54, 56, 59) that are possessed commonly by pilophorines as well as quite a few taxa of other phyline tribes (e.g., Decomiini [Fig. 61], Exaeretini [Fig. 63], Nasocorini [Fig. 62]; as documented by SCHUH (1984), pretarsus often with setiform parempodia and enlarged flabellate pulvillus on the interior surface of the claw), we presume that *Randallopsallus* should belong to the Pilophorini and has the closest relationship to *Parasthenaridea* (known only from Peninsular Malaysia) (see SCHUH 1984). SCHUH (1974) suggested that the form of the posterior wall is distinctive for the Pilophorini, with the posterior margin of the wall being distinctly evaginated. However, we did not recognize the feature pointed out by SCHUH (1974) in *Randallopsallus* (cf. Figs 40, 42, 44). A definitive systematic position of *Randallopsallus* further requires the acquisition of DNA sequence data and biological information.

Three congeners are revealed to occur in Indochina and western Sundaland (Fig. 64). The current distribution of *Randallopsallus* is restricted to the tropical part (between the equator and the 15th parallel north) along the 100th meridian east in the Oriental Region. Needless to say, our previous fieldwork is insufficient, and further surveys in broader areas will probably yield additional data. All available specimens of *Randallopsallus* were collected only by UV light traps; they are assumed to inhabit forest canopy as supposed for some *Hypseloecus* species (YASUNAGA et al. 2015).



**Key to the species of *Randallopsallus***

1. Body small, narrower than 1.45 mm in dorsal view; antennal segment II uniformly dark brown (Figs 6–8), shorter than 0.84 mm; known from Peninsular Malaysia. .... *R. malayanus* sp. nov.
- Body wider than 1.50 mm in dorsal view; at least basal half of antennal segment II yellowish (in fresh specimen reddish) brown (Figs 10, 15–17), longer than 0.90 mm. .... 2
2. Antennal segment III equal to or more than twice as long as I; apical half of metafemur (except for obscure subapical ring) yellowish brown (Fig. 10); metatarsomere II about 1.5 times as long as metatarsomere I; N. Sumatra. .... *R. berastagi* sp. nov.
- Antennal segment III less than twice as long as I; metafemur almost uniformly dark or chocolate brown (reddish brown in teneral and fresh individuals) (Figs 12–13); metatarsomere II about twice as long as tarsomere I; central Thailand. .... *R. paracastaneae* Yasunaga, 2013

***Randallopsallus paracastaneae* Yasunaga, 2013**

(Figs 1, 11–13, 16, 17, 21, 24, 27, 28–32, 44–46, 51–54, 64)

*Randallopsallus paracastaneae* Yasunaga, 2013: 197 (sp. nov.); YASUNAGA et al. (2016): 445 (status of type depository).

**Type material.** HOLOTYPE: ♂, **THAILAND: NAKHON RATCHASIMA:** Wang Nam Khiao, Udom Sap, Sakaerat Environmental Research Station (SERS), N14.507645 E101.927677, 410 m alt., UV light trap, 15–16 Sep 2008, T. Yasunaga (AMNH\_PBI 00379407) (DOAT). PARATYPES: Same data as for the holotype, 3 ♂♂ 5 ♀♀ (AMNH\_PBI 00379408–00379415) (AMNH, CNC & TYCN); same data, except for date 28 Oct 2008, T. Yasunaga, 1 ♂ 1 ♀ (00379416–00379417) (TYCN), and 31 May 2012, T. Yasunaga, 1 ♀ (00379498) (TYCN).

**Additional material examined.** **THAILAND:** Same locality (SERS), UV light trap, 12 Dec 2015, T. Yasunaga, 2 ♂♂ 4 ♀♀ (TYCN, without USIs).

**Diagnosis.** Recognized by its moderate size; antennal segment II more than four times as long as I; dark apical 2/5–1/3 of basally yellowish brown antennal segment II; scent efferent system with a distinct knob (Fig. 24); uniformly chocolate (in fresh specimen reddish) brown metacoxa and metafemur; short metatarsomere I (proportion of metatarsomeres I–III = 2 : 4 : 5); and distinctive form of male (Figs 28–32) and female (Figs 44–46) genitalia. See YASUNAGA (2013) for detailed description.

**Measurements.** See Table 1.

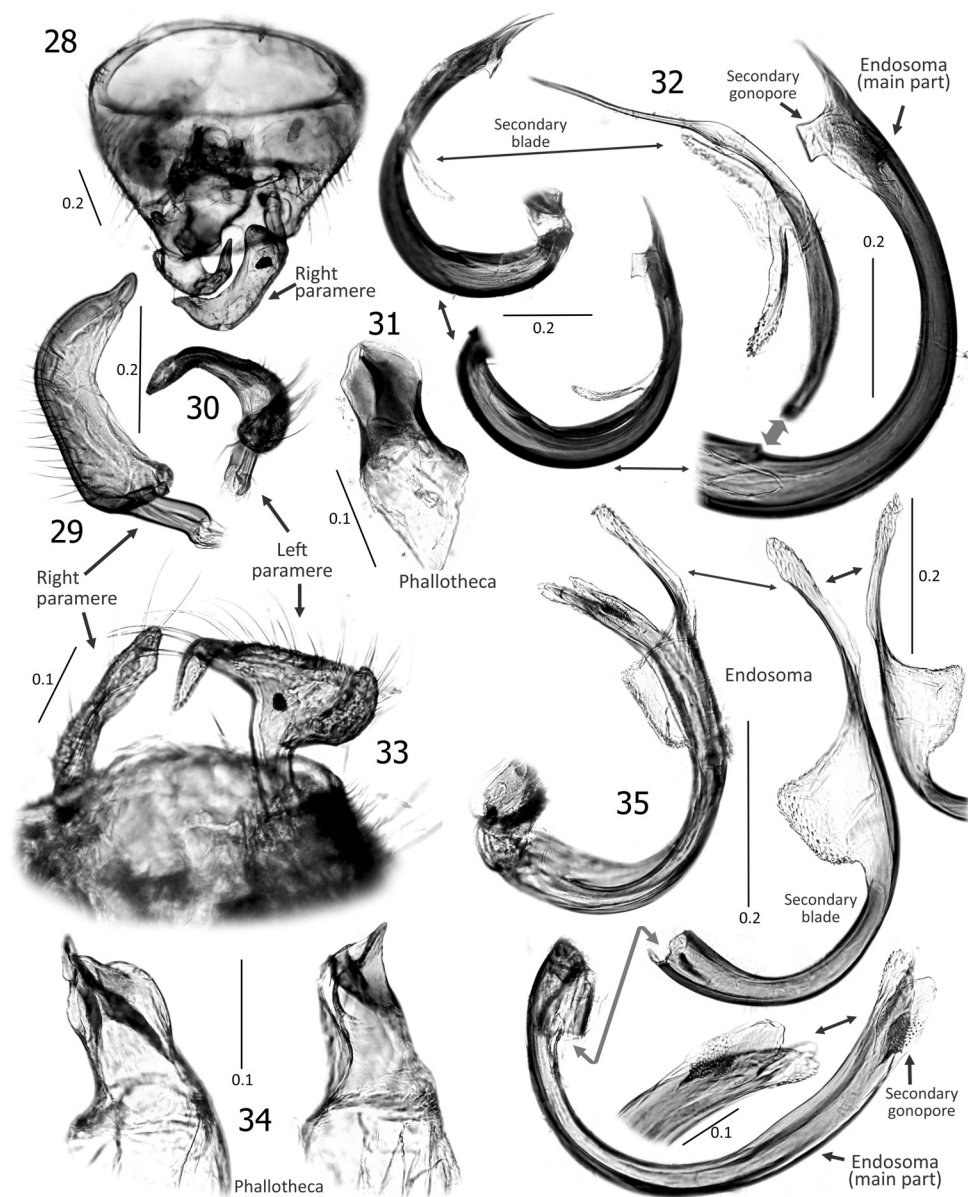
**Biology.** Collection records suggest *R. paracastaneae* has at least two generations per year; fresh adult individuals (Fig. 1, females with the reddish femora, and Fig. 12) were collected by using UV light trap in May, September and December.

**Distribution.** Central Thailand (Nakhon Ratchasima).

***Randallopsallus berastagi* sp. nov.**

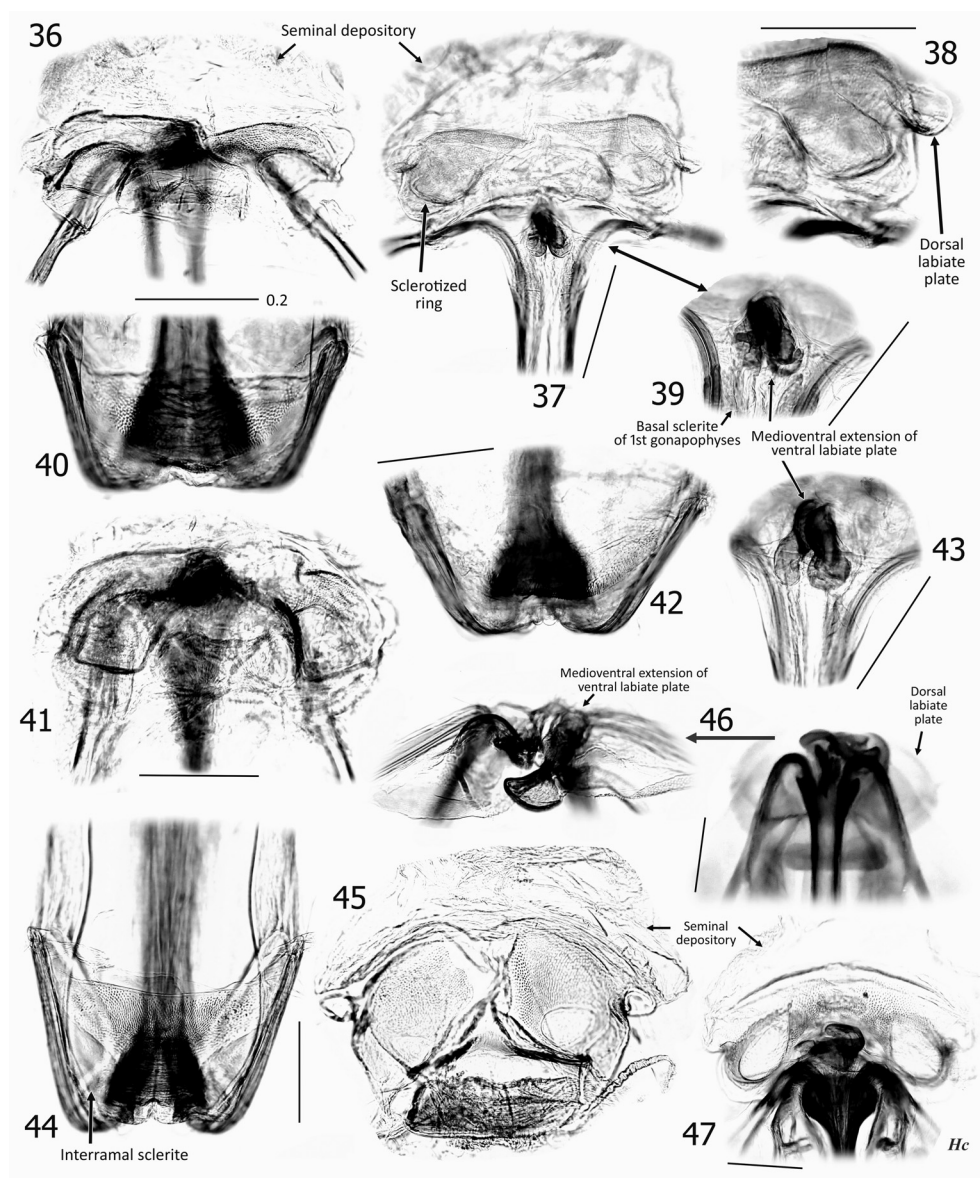
(Figs 9, 10, 15, 20, 23, 26, 36–40, 48–50, 64)

**Type material.** HOLOTYPE: ♀, **INDONESIA: NORTH SUMATRA:** Brastagi [= Berastagi], North of Toba Lake, N3.18 E98.50, 1,400 m, at fluorescent lamp [of lodge balcony], 5 Dec 1989, T. Yasunaga (AMNH) (AMNH\_PBI 00380578). PARATYPES: Same data as for holotype, 1 ♀ (TYCN) (00380580); same data, except for date 7 Dec 1989, 1 ♀ (00380579), 2 ♀♀ (without USIs).

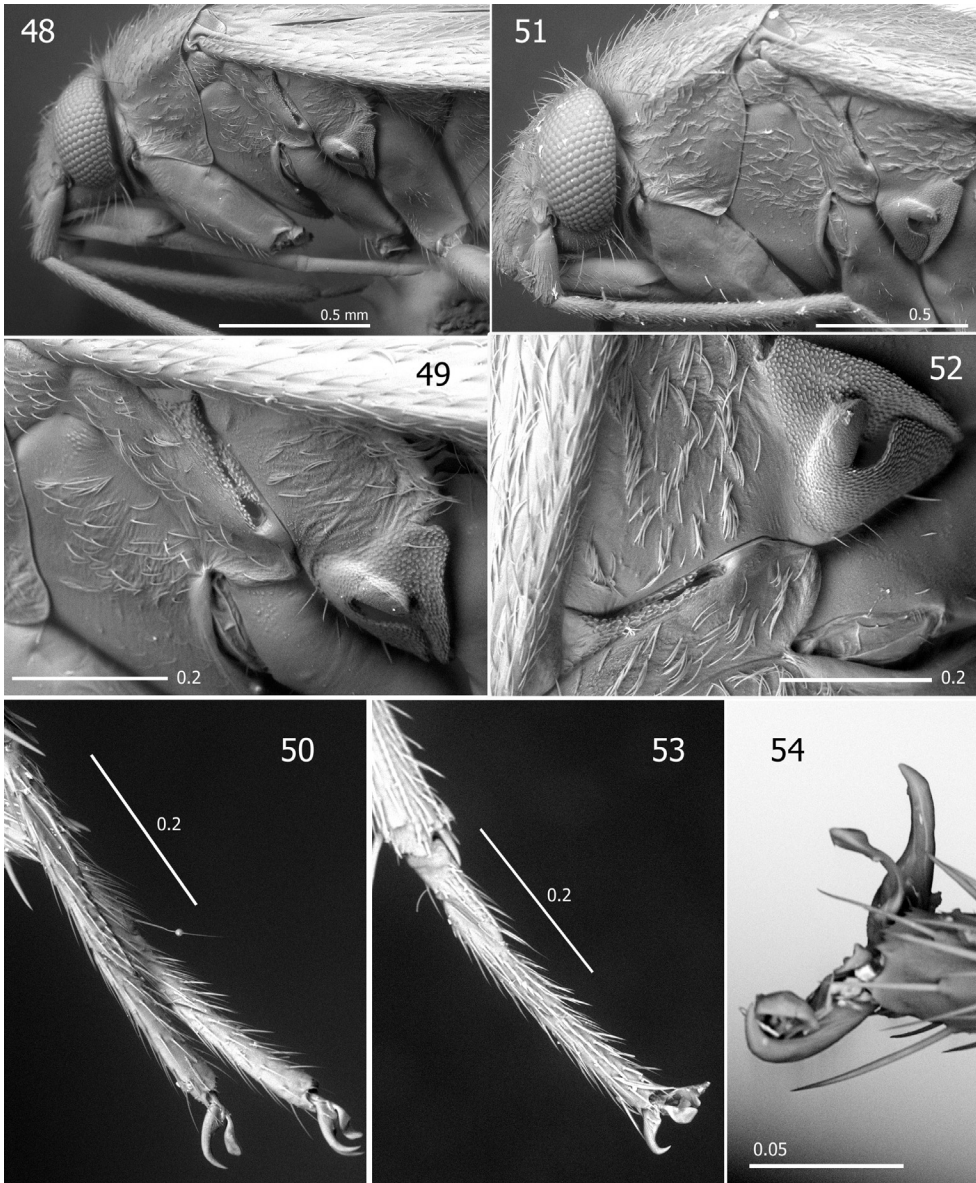


Figs 28–35. *Randallopsallus* spp., male genitalia. 28–32 – *R. paracastaneae* Yasunaga, 2013: 28 – pygophore in dorsal view, 29 – right paramere, 30 – left paramere, 31 – phallosome, 32 – endosoma; 33–35 – *R. malayanus* sp. nov.: 33 – apex of pygophore in dorsal view, 34 – phallosome, 35 – endosoma.





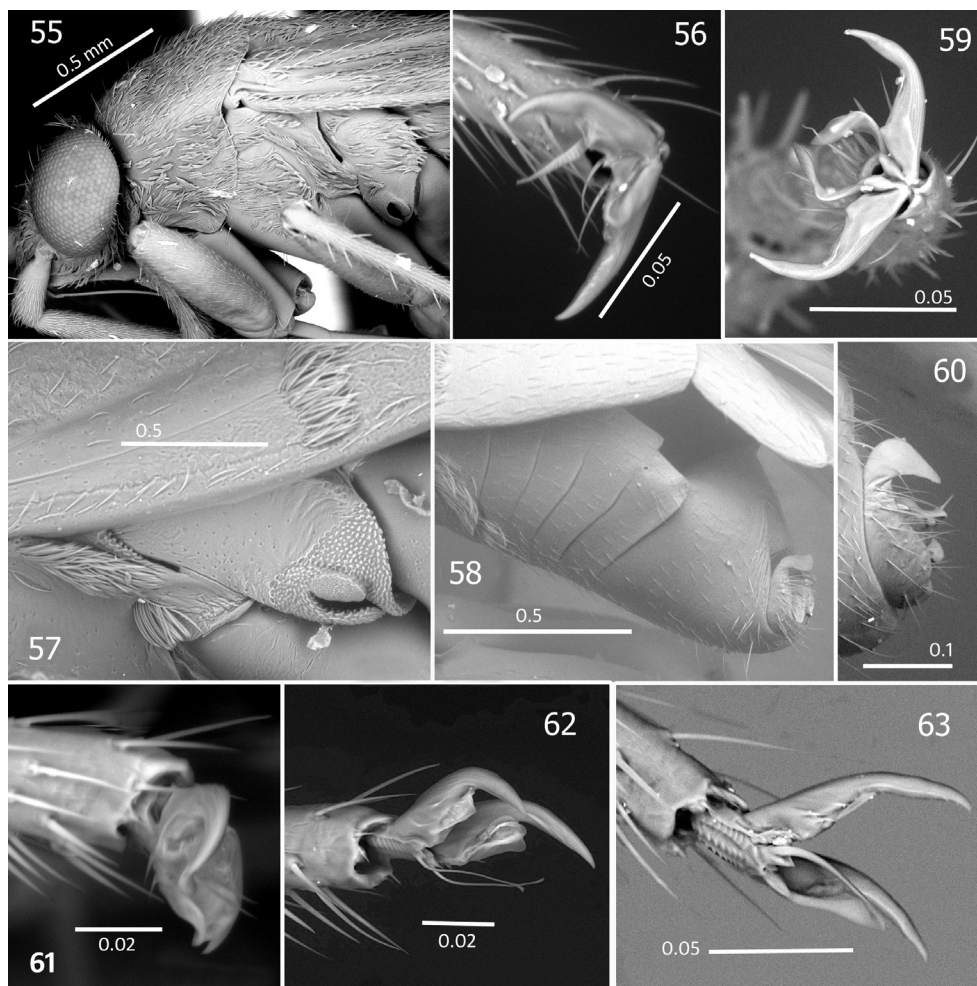
Figs 36–47. *Randallopsallus* spp. and *Hypseloecus castaneus* Yasunaga, Yamada & Artchawakom, 2015, female genitalia: 36–40 – *R. berastagi* sp. nov.: 36 – bursa copulatrix in dorsal view, 37 – ditto in ventral view, 38 – sclerotized ring, 39 – medioventral extension of ventral labiate plate, 40 – posterior wall; 41–43 – *R. malayanus* sp. nov.: 41 – bursa copulatrix in dorsal view, 42 – posterior wall, 43 – medioventral extension of ventral labiate plate; 44–46 – *R. paracastaneae* Yasunaga, 2013: 44 – posterior wall, 45 – bursa copulatrix in dorsal view, 46 – medioventral extension of ventral labiate plate; 47 – *Hypseloecus castaneus*: bursa copulatrix in dorsal view. Scale bars 0.2 mm.



Figs 48–54. Scanning electron micrographs for *Randallopsallus* spp. 48–50 – *R. berastagi* sp. nov., ♀: 48 – head and thorax, left lateral view, 49 – thoracic pleura and scent efferent system, 50 – metatarsi; 51–54 – *R. paracastaneae* Yasunaga, 2013, ♀: 51 – head and thorax, left lateral view, 52 – thoracic pleura and scent efferent system, 53 – metatarsi, 54 – pretarsus of foreleg.



**Differential diagnosis.** Currently known only by female adults. Very similar in general appearance and size to *R. paracastaneae*, from which this new species can be distinguished by the characters in the key (2nd couplet), slightly narrower head and hemelytra (Table 1), labium as long as or slightly longer than metatibia, larger, clear-rimmed sclerotized ring (Figs 36–38), and smaller medioventral extension of ventral labiate plate (Fig. 39).



Figs 55–63. Scanning electron micrographs for Asian phylines. 55–56 – *Lasiolabops cosmopolites* Schuh, 1984, ♂: 55 – head and thorax, left lateral view, 56 – pretarsus (hind leg); 57–58 – *Pilophorus lucidus* Linnavuori, 1962, ♂: 57 – scent efferent system, left lateral view, 58 – abdomen, left lateral view; 59–60 – *Pilophorus typicus* (Distant, 1909), ♂: 59 – pretarsus (hind leg), 60 – left paramere, left lateral view; 61 – *Decomia indochinensis* Schuh, 1984 (Decomiini), pretarsus (hind leg); 62 – *Campylomma livida* Reuter, 1885 (Nasocorini), pretarsus (hind leg); 63 – *Moissonia punctata* (Fieber, 1861) (Exaeretini), pretarsus (hind leg).



Table 1. Measurements for *Randallopsallus* species.

		Body		Head		Vertex width	Length antennal segments				Labium		Pronotum		Length of hind leg			
		length	width	width	height		I	II	III	IV	length		length	width	femur	tibia	tarsus	
<i>R. paracastaneae</i>																		
	<b>M</b>	00379410	3.43	1.65	0.90	0.60	0.44	0.24	0.96	0.48	0.60	1.65	0.60	1.29	1.14	1.65	0.42	
	<b>F</b>	00379413	3.48	1.77	0.93	0.65	0.45	0.21	0.93	0.51	0.60	1.59	0.62	1.38	1.17	1.65	0.42	
<i>R. malayanus</i>																		
	<b>M</b>	00380575	2.94	1.35	0.78	0.51	0.36	0.21	0.77	0.44	0.47	1.50	0.41	1.08	0.98	1.44	0.45	
	<b>M</b>	00380576	3.01	1.32	0.77	0.60	0.37	0.20	0.78	0.45	0.54	1.53	0.48	1.17	1.05	1.50	0.44	
	<b>F</b>	00380577	3.31	1.44	0.77	0.60	0.44	0.23	0.84	0.44	0.48	1.62	0.50	1.20	?	?	?	
	<b>F</b>	00380583	3.19	1.50	0.80	0.60	0.44	0.26	0.89	?	?	1.65	0.51	1.22	1.05	1.65	0.45	
<i>R. berastagi</i>																		
	<b>F</b>	00380578	3.43	1.62	0.81	0.60	0.41	0.26	0.93	0.47	0.57	1.65	0.57	1.25	1.08	1.65	0.45	
	<b>F</b>	00380579	3.41	1.50	0.77	0.60	0.39	0.28	0.90	?	?	1.62	0.50	1.22	1.05	1.62	0.44	
	<b>F</b>	00380580	3.36	1.62	0.86	0.62	0.42	0.29	0.93	0.44	0.50	1.74	0.60	1.35	1.16	1.65	0.45	

**Description.** *Female.* Macropterous; body generally chocolate brown, ovoid, slightly elongate; dorsal surface weakly shining, with uniformly distributed, reclining, silky setae. Head tinged with red, somewhat polished, with sparsely distributed, short, silvery setae intermixed with uniformly distributed, brownish setae; vertex narrowly pale brown along inner margin of eye; clypeus slightly produced and pointed in front. Antenna dark brown; segment I tinged with red; basal halves of segments II and III yellowish brown. Labium shiny brown; base of segment I reddish brown; segment IV darkened. Pronotum weakly shining; apical part of scutellum slightly paler; pleura chocolate brown; scent efferent system pale grayish yellow, rather rectangular. Hemelytron chocolate brown; anterior margin of cuneus narrowly pale; membrane smoky brown, with pale veins. Coxae and legs dark brown; each coxa largely matte and shagreened; more than apical half of each femur and all tibiae yellowish brown; tibial spines reddish brown; tarsi pale brown; proportion of metatarsomeres I–III = 10 : 14 : 15. Abdomen entirely fuscous brown. Female genitalia (Figs 36–40): Sclerotized ring clear-rimmed, sub-triangular (Figs 36–38); medioventral extension of ventral labiate plate small, bilobate (Fig. 39).

*Male.* Unknown.

**Measurements.** See Table 1.

**Etymology.** Named for the type

locality of this new species, Berastagi (= Brastagi in Dutch) of North Sumatra, Indonesia; a noun in apposition.

**Collecting circumstances.** At fluorescent lamp on lodge balcony facing secondary tropical rain forest.

**Distribution.** Indonesia (North Sumatra) (Fig. 64).

***Randallopsallus malayanus* sp. nov.**

(Figs 6–8, 14, 18, 19, 22, 25, 33–35, 41–43, 64)

**Type material.** HOLOTYPE: ♂, **MALAYSIA: PERAK:** Taiping, Bukit Larut (Maxwell Hill), N4.8625 E100.8000, 1100 m, at mercury light, 13 Jul 1989, T. Yasunaga (AMNH) (AMNH\_PBI 00380575). PARATYPES: **MALAYSIA: PERAK:** Same data as for holotype, 1 ♂ (TYCN) (AMNH\_PBI 00380576); same data, except for date 7 Dec 1989, 1 ♀ (TYCN) (00380577). **PAHANG:** Fraser's Hill, N3.71, E101.73, 6 Jan 1997, S. Gotoh, 1 ♀ (TYCN) (00380583).

**Differential diagnosis.** Similar in general appearance to *R. berastagi* and *R. paracastaneae*, from which this new species can be distinguished by the characters in the key (1st couplet), generally smaller size (Table 1), uniformly darkened, short antennal segment II that is distinctly shorter than twice the length of segment III, almost entirely dark antennal segment III, relatively light brown hemelytron (Fig. 6), well splayed-out left paramere and medium-sized right paramere (Fig. 33), broad, winged secondary blade of endosoma (Fig. 35), and enlarged, rectangular sclerotized ring (Fig. 41).

**Description.** Macropterous; body generally smoky brown, ovoid, somewhat elongate; dorsal surface weakly shining, with uniformly distributed, reclining, silky setae intermixed with uniformly distributed, brownish setae. Head smoky brown, with rather uniformly distributed, short, slivery, reclining setae; vertex in female narrowly pale brown along inner margin of

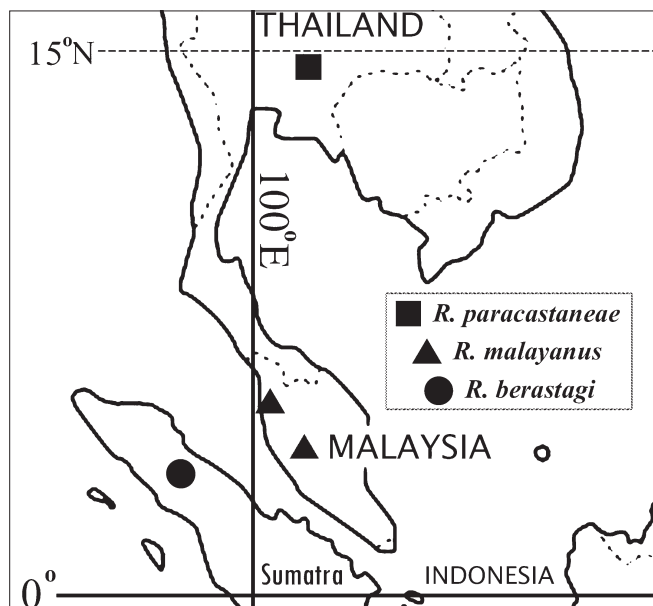


Fig. 64. Distribution map for species of *Randallopsallus*.

eye (Fig. 19); clypeus slightly produced and pointed in front. Antenna dark brown; segment II almost uniformly darkened; extreme base of segment III yellowish brown. Labium shiny reddish brown; apical half of segment IV darkened. Pronotum relatively shining; scutellum brown, lighter than pronotum; pleura chocolate brown; ventral margin of propleuron yellowish brown; scent efferent system pale grayish yellow, subtriangular, with a small, ear-like process posterior to ostiole (Fig. 14). Hemelytron somber brown, paler than pronotum; cuneus somewhat tinged with red; membrane including veins pale smoky brown, semitransparent. Coxae and legs somber brown; bases and apices of pro- and mesocoxae more or less pale brown; apical 1/3 of each femur and all tibiae yellowish brown; tibial spines dark brown; tarsi pale brown; proportion of metatarsomeres I–III = 10 : 15 : 16. Abdomen dark brown, with ventral median part somewhat paler (Figs 7, 8). Male genitalia (Figs 33–35): Left paramere splayed-out, with a sharp hypophysis (Fig. 33); right paramere not enlarged as seen in *R. paracastaneae* (Figs 29 vs. 33); apex of phallosome distinctly keeled (Fig. 34); endosoma distinct in form, strongly bifurcate, with secondary blade winged and spinulate from middle to apex (Fig. 35). Female genitalia (Figs 41–43): Sclerotized ring widened, rectangular (Fig. 41); medioventral extension of ventral labiate plate similar to *R. berastagi* (Fig. 39) but more inflated and bulbous apically (Fig. 43).

**Measurements.** See Table 1.

**Etymology.** Named for the type locality of this new species, Malaya (Malaysia); latinized as an adjective.

**Collecting circumstances.** This new species was collected at a mercury light trap, facing toward a dense, primary tropical rain forest.

**Distribution.** West (Peninsular) Malaysia (Pahang and Perak) (Fig. 64).

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Special thanks are due to Dr. Randall T. Schuh (Curator Emeritus, AMNH) and Dr. Katrina L. Menard (Sam Noble Museum, University of Oklahoma, USA) for sharing their ideas. We are grateful to Dr. Taksin Artchawakom (Ex-director) and Dr. Phuvasa Chanonmuang (currently in Thailand Institute of Science & Technology Research, Thanyaburi) of Sakaerat Environmental Research Station (SERS) for supporting the first author's field research. The first author is grateful to Nagasaki West High School (Super-Science High School program, biology, Mr. Tetsuya Nagashima) and to Mr. Daihei Terada (CSR Division, Hitachi High-Technologies Corporation, Tokyo) for generously allowing to use a scanning electron microscope (demo unit). Thanks are extended to Dr. R. T. Schuh (AMNH), Dr. Frédéric Chérot (Service Public de Wallonie, Gembloux, Belgium) and Dr. Petr Kment (editor, AEMNP) for reviewing and commenting on the manuscript.

### References

- DUWAL R. K., YASUNAGA T., JUNG S. & LEE S. H. 2012: The plant bug genus *Psallus* (Heteroptera: Miridae) in the Korean Peninsula with descriptions of three new species. *European Journal of Entomology* **109**: 603–632.
- SCHUH R. T. 1974: The Orthotylinae and Phylinae (Hemiptera: Miridae) of South Africa with a phylogenetic analysis of the ant-mimetic tribes of the two subfamilies for the world. *Entomologica Americana* **47**: 1–332.



- SCHUH R. T. 1984: Revision of the Phylinae (Hemiptera, Miridae) of the Indo-Pacific. *Bulletin of the American Museum of Natural History* **177**: 1–476.
- SCHUH R. T. 1989: Old World Pilophorini: Descriptions of nine new species with additional synonymic and taxonomic changes (Heteroptera: Miridae: Phylinae). *American Museum Novitates* **2945**: 1–16.
- SCHUH R. T. 1991: Phylogenetic, host and biogeographic analysis of the Pilophorini (Heteroptera: Miridae: Phylinae). *Cladistics* **7**: 157–189.
- SCHUH R. T. & MENARD K. L. 2013: A revised classification of the Phylinae (Insecta: Heteroptera: Miridae): arguments for the placement of genera. *American Museum Novitates* **3785**: 1–72.
- SCHUH R. T. & SCHWARTZ M. D. 2016: Nineteen new genera and 82 new species of Cremnorrhinina from Australia, including analyses of host relationships and distributions (Insecta, Hemiptera, Miridae, Phylinae, Cremnorrhinini). *Bulletin of the American Museum of Natural History* **401**: 1–279.
- YASUNAGA T. 2013: New genera and species of the Phylinae Plant Bugs from Thailand (Heteroptera: Miridae: Phylinae). *Entomologica Americana* **118** [2012]: 192–201.
- YASUNAGA T. & DUWAL R. K. 2017: A new species of the phylina plant bug genus *Chimairacoris* from central Sulawesi, Indonesia (Hemiptera: Heteroptera: Miridae: Phylinae). *Zootaxa* **4282**: 593–599.
- YASUNAGA T. & SCHUH R. T. 2013: Morphologically novel members of the ant-mimetic plant bug genus *Pilophorus* Hahn found in Thailand, with descriptions of three new species (Heteroptera: Miridae: Phylinae: Pilophorini). *American Museum Novitates* **3768**: 1–18.
- YASUNAGA T., SCHUH R. T., POORANI J. & CASSIS G. 2015: A remarkable new genus and new species of the plant bug (Heteroptera, Miridae, Phylinae), inhabiting psyllid leaf margin roll gall on Indian banyan, *Ficus benghalensis*. *American Museum Novitates* **3839**: 1–15.
- YASUNAGA T. & VINOKUROV N. N. 2000: The phylina plant bug genus *Psallus* Fieber in Japan (Heteroptera: Miridae: Phylinae). *Entomological Science* **3**: 653–668.
- YASUNAGA T., YAMADA K. & ARTCHAWAKOM T. 2015: First Indochinese records of the plant bug genus *Hypseloecus* Reuter (Hemiptera: Heteroptera: Miridae: Phylinae: Pilophorini), with descriptions of eight new species from Thailand. *Zootaxa* **3925**: 75–93.
- YASUNAGA T., YAMADA K., MORAKOTE R., TAEKUL C. & DUANGTHISAN J. 2016: Transferred depository for twenty-seven holotypes of the plant bug and flower bug species recently described from Thailand (Hemiptera: Heteroptera: Miridae and Anthocoridae). *Zootaxa* **4107**: 444–446.