

The genus *Kanigara* Distant (Heteroptera: Lygaeoidea: Rhyparochromidae) from Malay Peninsula and Thailand, with description of a new species

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Abstract. This paper presents a taxonomic revision of the representatives of genus *Kanigara* Distant, 1906, distributed in Thailand and the Malay Peninsula. Three species are recognised, including a new species, *Kanigara nebulosa*, from the Malay Peninsula, and *Kanigara punctata* Scudder, 1969, which is recorded from Thailand for the first time. Illustrations of the genital structures of the new species and a key to all described species are provided.

Key words. seed bug, taxonomy, key to species, Malaysia, Oriental Region

INTRODUCTION

The genus *Kanigara* of lygaeoid seed bugs (Lygaeidae at that time) was established by Distant (1906) as monotypic, with the species *Kanigara flavomarginata* Distant, 1906, collected in Sri Lanka. The genus was moved from “Aphanaria” of Distant to the tribe Drymini by Scudder (1957) and later revised by him (Scudder, 1969); it currently comprises nine described species (Slater & O’Donnell, 1995; Dellapé & Henry, 2021), all of which are distributed in the Oriental Region and Papuan subregion. Prior to the present study, only a single representative of the genus has been reported from the Malay Peninsula, *Kanigara oculata* Scudder, 1969, recorded from Johore (Scudder, 1969), whereas there had been no reliable accounts of any *Kanigara* species in Thailand. During my continuous surveys, in which I have sought to revise the Rhyparochromid fauna of these regions, I recently discovered an undescribed species of the genus collected from the Malay Peninsula and *Kanigara punctata* Scudder, 1969, collected from Thailand, which represents the first record of this genus in Thailand.

In this paper, I present a revision of the representatives of the *Kanigara* Distant, 1906 from the Malay Peninsula and Thailand, including the description of a new species, *Kanigara nebulosa*, and the diagnoses of the two previously described species based on collected specimens. I provide illustrations of the male and female genitalia for the new species and a key to all ten currently known species of *Kanigara*.

MATERIAL AND METHODS

Dried specimens were used for the present study. Exoskeletal structures were studied using the Olympus SZ40 and Olympus SZX12 stereoscopic microscope. For observations of genitalia, the male and female abdomens were dissected after the specimens were softened with hot steam. The removed parts were immersed in hot 10% KOH solution for an hour and then soaked in distilled water for further dissection. The endosoma of the phallus was everted naturally by osmotic pressure during the immersion of the phallus or was pulled out by tweezers or a needle with a shaft.

Genitalia were observed and drawings were made using Nikon Optiphot optical microscope mounted with drawing tube. The genitalia were preserved in small glass, fixed with glycerin, and mounted on the pin with the respective specimen. Photos of habitus were taken using Nikon D7000 digital single-lens reflex camera mounted with Nikon Ai Micro-Nikkor 55mm f/2.8S lens. Photos were focus stacked using digital image processing software Helicon Focus (Helicon Soft Ltd.) and then edited with Adobe Photoshop ver. 22.3.1. (Adobe Inc.). Measurements were taken by micrometer in eyepiece grid. All measurements in the text are given in millimetres. Morphological terminology mainly follows Ban (2020).

Distribution records of species were mapped using SimpleMappr (Shorthouse, 2010). Geographic coordinates were obtained from Google Maps.

Bibliography of the studied species was referred from Lygaeoidea Species File (Dellapé & Henry, 2021) using their Life Science Identifier (LSID).

Depositories of the specimens are abbreviated as follows: CBM – Natural History Museum and Institute, Chiba, Japan TKPM – Tokushima Prefectural Museum, Tokushima, Japan UNML – University of Malaya, Kuala Lumpur, Malaysia

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ZRC – Lee Kong Chian Natural History Museum, National University of Singapore, Singapore

TAXONOMY

Genus *Kanigara* Distant, 1906

Kanigara Distant, 1906: 414 (new genus). Type species by original monotypy: *Kanigara flavomarginata* Distant, 1906. Distant, 1910: 66 (description); Scudder, 1957: 154 (Notes); Scudder, 1962: 768 (transfer *K. clypeata* Distant, 1904 from *Gonatas*); Slater, 1964: 941 (catalogue, world); Scudder, 1969: 535–540 (fauna of the world); Zheng & Zou, 1981: 135–136, 607 (fauna of China, photo); Chopra & Singal, 1982: 35–39 (redescription of *K. flavomarginata*); Slater & O'Donnell, 1995: 118–119 (catalogue, world); Péricart, 2001: 130 (catalogue, Palaearctic); Kondorosy, 2006: 485 (key to genera of the *Lampropalax* group); Tomokuni, 2010: 17, 20 (fauna of Borneo); Zheng & Lin, 2013: 175 (fauna of Taiwan, photo).

See <http://lygaeoidea.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1213122> for Bibliography of the genus.

Diagnosis. This genus is recognised among Drymini genera by the following combination of characters: body elongate, without erect setae; colouration of head, ground colour of pronotum and scutellum reddish brown to black; pronotum without transverse impression; lateral margin of pronotum carinate; each femur slender; femora and tibiae of middle and hind legs with long needle-shaped spines.

Key to the species of *Kanigara* Distant

1. Scutellum with yellow trifurcate carina. Mesosternum with a pair of tubercles.....2
- Scutellum without yellow trifurcate carina or with brown trifurcate carina. Mesosternum without a pair of tubercles...3
2. Body length more than 6.0 mm. Width of scutellum more than 1.5 mm, 1.15 times greater than length of antennal segment II.....*K. flavoscuta* Scudder, 1969
- Body length less than 5.0 mm. Width of scutellum 1.0 mm, equal to length of antennal segment II.....*K. tuberculata* Scudder, 1969
3. Scutellum with brown trifurcate carina. Lateral margin of scutellum with a pair of yellowish spots at middle.....*K. clypeata* (Distant, 1904)
- Scutellum without trifurcate carina. Lateral margin of scutellum without yellowish spot.....4
4. Lateral area of posterior half of pronotum with pale yellow spot.....5
- Lateral area of posterior half of pronotum without pale yellow spot, pronotum uniform colour.....8
5. Lateral area of anterior lobe of pronotum with distinct yellow longitudinal line. Scutellum with apical and lateral punctures of same size as on pronotum and basal area of scutellum.....*K. flavomarginata* Distant, 1906
- Lateral area of anterior lobe of pronotum with or without indistinct yellow line. Scutellum with apical and lateral punctures larger than on pronotum and basal area of scutellum.....6
6. Head, disc of pronotum and scutellum dull dark brown. Distance between ocelli 1.5 times wider than eye width.....*K. punctata* Scudder, 1969
- Head, disc of pronotum and scutellum reddish brown. Distance between ocelli subequal to eye width.....7

7. Body length less than 5.5 mm. Maximum width of pronotum less than 2.0 mm. Humeral angle of pronotum with diffused pale yellow colouration.....*K. nebulosa*, new species
- Body length more than 6.5 mm. Maximum width of pronotum more than 2.0 mm. Humeral angle of pronotum with distinct yellow line.....*K. oculata* Scudder, 1969
8. Pronotum shiny, without punctures. Apical half of corium yellowish brown with brown spot on apex*K. virtuosa* Scudder, 1969
- Pronotum dull, covered with fine punctures. Apical half of corium brown9
9. Body length less than 4.5 mm. Corium entirely dark brown. Membrane subhyaline*K. fumosa* Scudder, 1969
- Body length more than 6.0 mm. Basal half of corium yellowish brown. Membrane brownish grey.....*K. fusca* Scudder, 1969

Kanigara nebulosa, new species

(Figs. 1, 2)

Type Material. Holotype: male (CBM - ZI 179325), MALAYSIA: Johor, Mersing, Semberong, Taman Negara Endau-Rompin (Kg. Peta), light trap, Maruyama, Jimbo & Yamada coll., 13–17 May 2005. Paratypes: all of them same data as holotype: 6 males, 13 females (CBM - ZI 179326–179341); 1 male, 2 females (TKPM), 1 male, 3 females (UNML), 1 male, 2 females (ZRC).

Diagnosis. Distinguished from congeners of *Kanigara* by the following characters: body length 3.9–5.1 mm; head and pronotum brown; distance between ocelli subequal to eye width; labium surpassing procoxae, not reaching mesocoxae; lateral part of posterior lobe with blurred yellow line; scutellum matte reddish brown; punctures on apical and lateral part of scutellum distinctly larger than in the basal area; apex of corium with irregular pale brown spot; legs yellowish brown; abdominal sternite brown.

Description. Colouration. Head brown. Clypeus brown. Antennal segments I to IV uniformly yellowish brown. Labium yellowish brown. Pronotum reddish brown, lateral margin of anterior lobe with 0.1 mm wide indistinct yellow line; lateral area of posterior lobe with blurred yellow line. Venter of mesothorax and metathorax reddish brown; peritreme dull reddish brown; scent gland yellowish brown. Scutellum matte reddish brown. Corium and clavus pale yellowish brown. Membrane hyaline. Supracoxal lobes yellowish brown; coxae and trochanter yellowish brown; femora yellowish brown; pro- and mesotibia yellowish brown, metatibia dark yellowish brown; tarsomere I reddish brown; tarsomeres II and III yellowish brown. Abdominal sternites reddish brown; trichobothria bright brown. Long decumbent setae on abdominal venter silver.

Structure. Body 2.5 times as long as wide across hemelytra. Head 1.5 times as wide as its length, without hairs; clypeus projecting anteriorly; vertex weakly convex; distance between ocelli subequal to eye width. Antennal segments covered with setae; proportional length of antennal segments I to IV 1:1.9:1.9:1.8. Labium surpassing procoxae, not reaching mesocoxae (Fig. 1B); proportional length of rostral segments I to IV 1:1:0.6:0.4.



Fig. 1. *Kanigara nebulosa*, new species. A, B, holotype, male (A, dorsal view; B, ventral view); C, D, paratype, female (C, dorsal view; D, ventral view). Scale bars = 1.0 mm.

Pronotum (Fig. 1A) smooth, 1.4 times as wide as its length, trapezoidal, without setae and transverse impression; anterior margin of pronotum concave, lacking collar, covered with rough punctures; disc of anterior half of pronotum covered with fine punctures; posterior half of pronotum covered with rough punctures; posterior margin of pronotum concave; venter of prothorax, mesothorax, and metathorax covered with distinct punctures. Scutellum triangular (Fig. 1A), 1.2 times as long as its width, without trifurcate carina; punctures on apical and lateral area of scutellum larger than punctures on basal area of scutellum and surface of pronotum. Hemelytra (Fig. 1A) exceeding apex of abdomen; corium covered sparsely with erect setae and punctures; claval suture 1.7 times longer than apical margin of corium. Each femur slender, with 3 stiff setae on apex and 6 stiff setae ventrally on femora; meso- and metafemora each with 6 needle-shaped spines; inner surface of protibia with row of needle-shaped spines; meso- and metatibia covered with needle-shaped spines.

Abdominal sternum densely covered with decumbent setae.

Genital structures of paratypes: Pygophore (Fig. 2A) globose, covered with relatively dense erect setae; dorsal pygophore opening nearly rectangle-shaped, gradually broadened to about basal one-third, then sharply narrowed by a pair of rounded protrusions; posterior margin of pygophore and cup-like sclerite fused; anterior margin of cup-like sclerite almost straight. Paramere (Fig. 2B–E) sparsely covered with erect setae, expanded at midpoint. Phallus as in Fig. 2F, G; phallosoma without processes; sperm reservoir as in Fig. 2H.

Female (paratypes): Female resembles male in general appearance. Ovipositor bisecting sternites VI to VII. Spermatheca (paratype) as in Fig. 2I.

Measurements. Holotype [minimum–maximum]. Body length 4.0 (3.96–5.1); body height between coxae and dorsum 1.25 (1.25–1.52); head length 0.55 (0.48–0.64); head width

across eyes 0.85 (0.8–1.0); interocular space 0.28 (0.25–0.34); eye length 0.25 (0.24–0.3); eye width 0.24 (0.22–0.29); length of antennal segment I–IV respectively 0.45 (0.45–0.6), 0.85 (0.79–0.96), 0.85 (0.83–0.9), 0.83 (0.75–0.95); length of rostral segment I–IV respectively 0.43 (0.42–0.5), 0.45 (0.43–0.53), 0.25 (0.23–0.28), 0.2 (0.19–0.26); medial pronotal length 1.1 (1.05–1.35); width of anterior margin of pronotum 0.85 (0.8–1.0); maximum width of pronotum 1.75 (1.5–1.9); scutellar length 1.1 (1.05–1.45); scutellar width 0.95 (0.95–1.15); hemelytral length 2.7 (2.7–3.36); maximum width across hemelytra 1.6 (1.6–1.95); corium length 2.0 (2.0–2.55); length of claval commissure 0.35 (0.27–0.4); length of ovipositor (0.9–1.04).

Distribution. Malay Peninsula (Johor).

Etymology. The species epithet “*nebulosa*” (meaning nebulous) is a Latin adjective referring to the characteristic longitudinal spot on the humeral angles of the pronotum.

Remarks. This new species resembles *K. oculata* Scudder, *K. punctata* Scudder, and *K. flavomarginata* Distant in general appearance, although it can be distinguished from these species by the following combination of characters: body length less than 5.5 mm (in *K. oculata* body length more than 6.5 mm); distance between ocelli subequal to eye width (in *K. punctata* and *K. flavomarginata* distance between ocelli 1.5 times wider than eye width); lateral area of anterior lobe of pronotum with 0.1 mm wide indistinct yellow line (in *K. flavomarginata* lateral area of anterior lobe of pronotum with distinct yellow line); humeral angle of pronotum with diffuse pale yellow colouration (vs. humeral angle of pronotum with distinct yellow line); maximum width of pronotum less than 2.0 mm (in *K. oculata* body length more than 2.0 mm); scutellum with apical and lateral punctures distinctly larger than punctures on basal area and pronotum (in *K. flavomarginata* scutellum with apical and lateral punctures same size as punctures on basal area and pronotum); anterior margin of cup-like sclerite almost

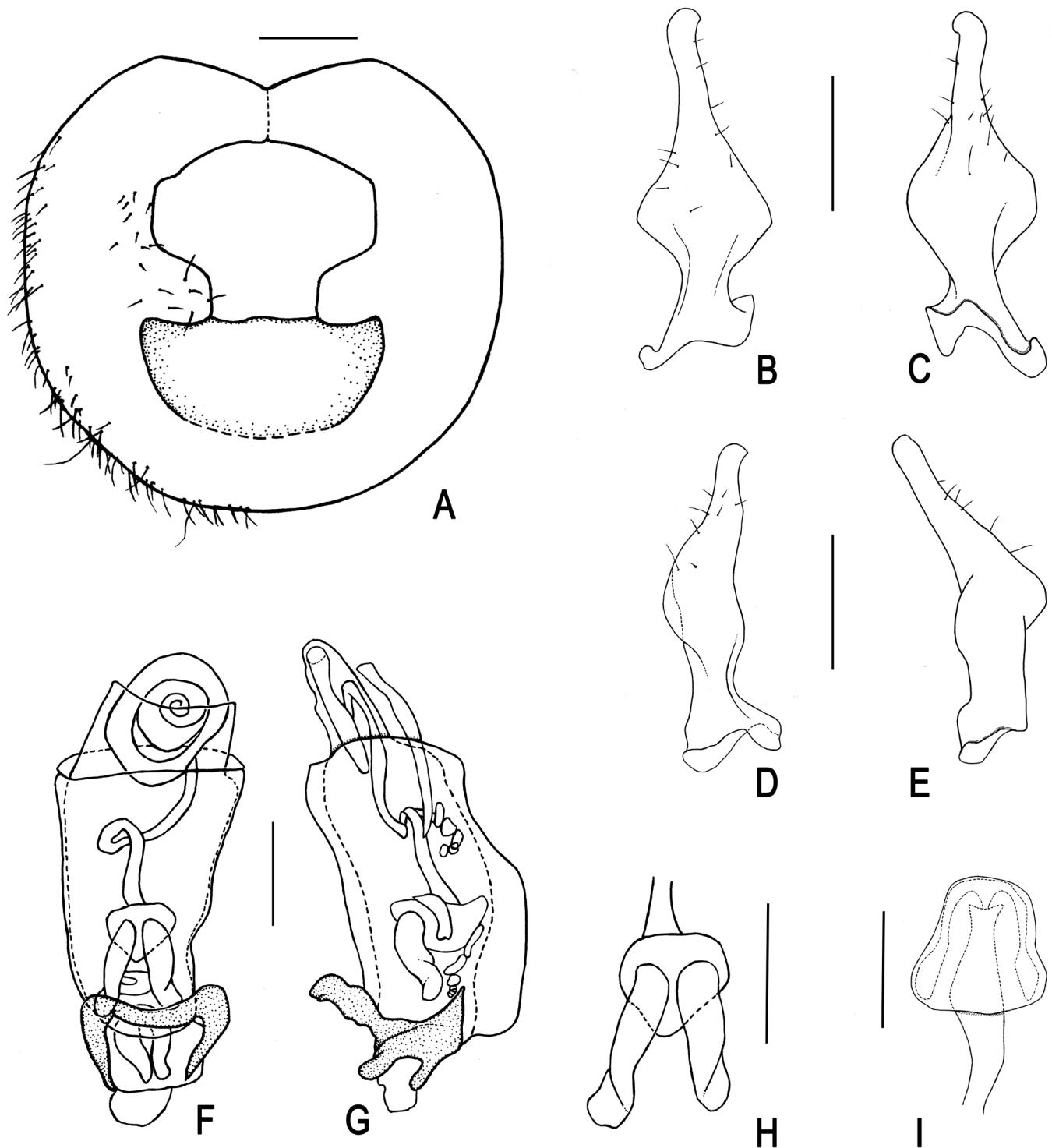


Fig. 2. Male and female genitalia of *Kanigara nebulosa*, new species. A, pygophore, dorsal view; B–E, right paramere, four different aspects; F, G, phallus (F, dorsal view; G, lateral view); H, sperm reservoir; I, spermatheca. Scale bars = 0.1 mm.

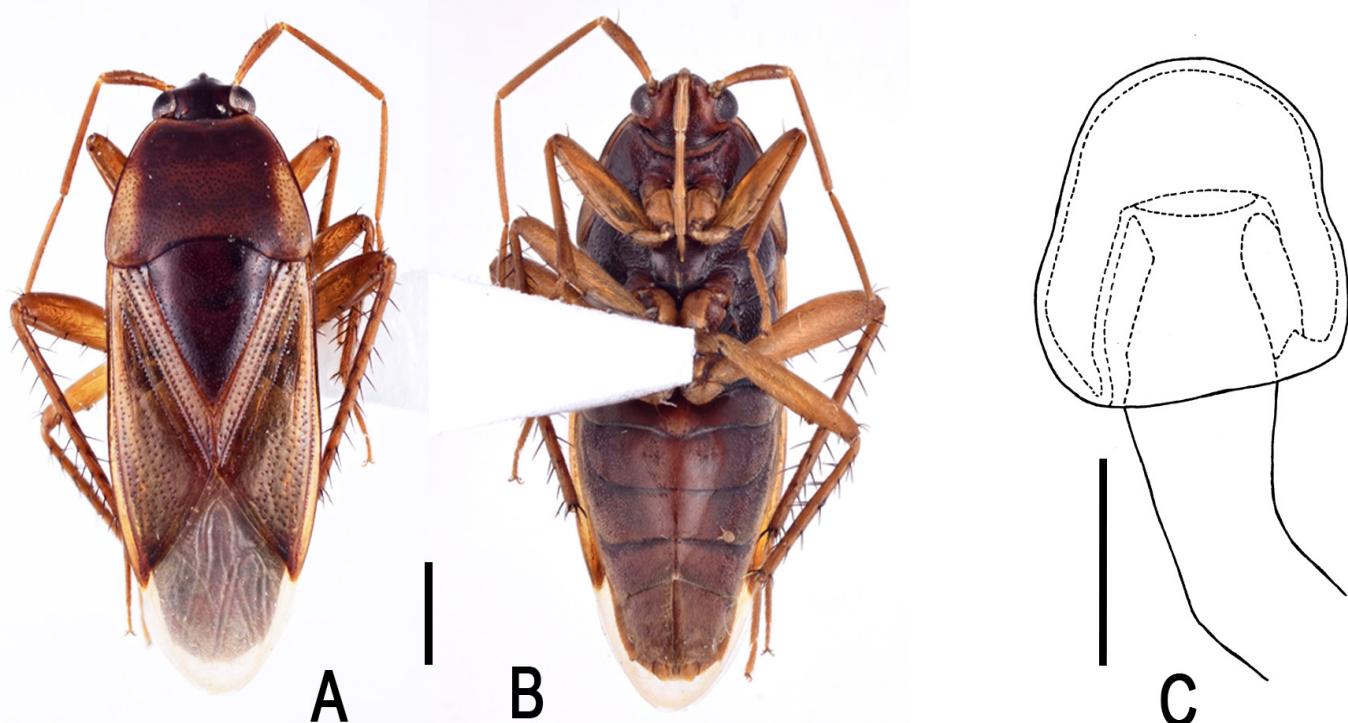


Fig. 3. *Kanigara oculata* Scudder, 1969. A, B, female (A, dorsal view; B, ventral view); C, spermatheca. Scale bars: A, B = 1.0 mm; C = 0.1 mm.

straight (in *K. punctata* anterior margin of cup-like sclerite indented medially).

Biological notes. Specimens were collected along with those of several other heterogastrid and rhyparochromid species in the vicinity of artificial light within an area adjacent to mountainous forest. However, detailed biological information, including the identity of host plant(s), has yet to be obtained.

***Kanigara oculata* Scudder, 1969**
(Fig. 3)

Kanigara oculata Scudder, 1969: 537–538, 540 (original description, keyed); Slater & O'Donnell, 1995: 119 (catalogue); Kondorosy, 2006: 488 (fauna of Brunei); Tomokuni, 2010: 17, 20 (fauna of Borneo).

See <http://lygaeoidea.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1222703> for Bibliography of this species.

Material examined. 5 females (CBM - ZI 179345–179349), MALAYSIA: Johor, Mersing, Semberong, Taman Negara Eudau-Rompin (Kg. Peta), light trap, Maruyama, Jimbo & Yamada coll., 13–17 May 2005; 1 female (UNML), MALAYSIA: Johor, Mersing, Semberong, Taman Negara Eudau-Rompin (Kg. Peta), light trap, Maruyama, Jimbo & Yamada coll., 13–17 May 2005.

Diagnosis. Distinguished from other congeners of *Kanigara* by the following characters: body length more than 6.5 mm; head and pronotum shiny brown; distance between ocelli equal to eye width; antennal segment II less than 1.5 times longer than segment I; labium surpassing procoxae, not reaching mesocoxae; lateral area of posterior lobe of pronotum with distinct pale yellowish line; corium shiny

yellowish brown, subhyaline; apex of corium with blackish spot; length of ovipositor more than 1.0 mm, truncated at approx. sternite VI. Spermatheca as in Fig. 3C.

See Scudder (1969) for a detailed description of this species.

Distribution. Malay Peninsula (Johor), Borneo (Sarawak, Brunei), Sumatra.

Biological notes. Specimens were collected along with those of several other heterogastrid and rhyparochromid species in the vicinity of artificial light within an area located adjacent to mountainous forest. However, detailed biological information, including the identity of host plant(s), has yet to be obtained.

***Kanigara punctata* Scudder, 1969**
(Figs. 4, 5)

Kanigara punctata Scudder, 1969: 538 (original description); Slater & O'Donnell, 1995: 119 (catalogue); Tomokuni, 2010: 17, 20 (fauna of Borneo).

See <http://lygaeoidea.speciesfile.org/Common/basic/Taxa.aspx?TaxonNameID=1222704> for Bibliography of this species.

Material examined. 2 males, (CBM - ZI 179350–179351), THAILAND: Chanthaburi Prov., Krathing Country Resort, 12°49'14.5"N, 102°07'40.6"E, alt. 66 m, Light trap, Teruaki Ban leg., 14 March 2015; 3 males, 5 females, (CBM - ZI 179352–179359), THAILAND: Rayong Prov., Near Rayong, 12°40'13.5"N, 101°24'49.5"E, alt. 452 m, Light Trap, Teruaki Ban leg., 17 March 2015; 1 female, (CBM - ZI 179360), THAILAND: Rayong Prov., Near Rayong, 12°40'14–30"N, 101°24'50–52"E, alt. 452–552 m, Teruaki Ban leg., 17 March 2015.



Fig. 4. *Kanigara punctata* Scudder, 1969. A, B, male (A, dorsal view; B, ventral view); C, D, female (C, dorsal view; D, ventral view). Scale bars = 1.0 mm.

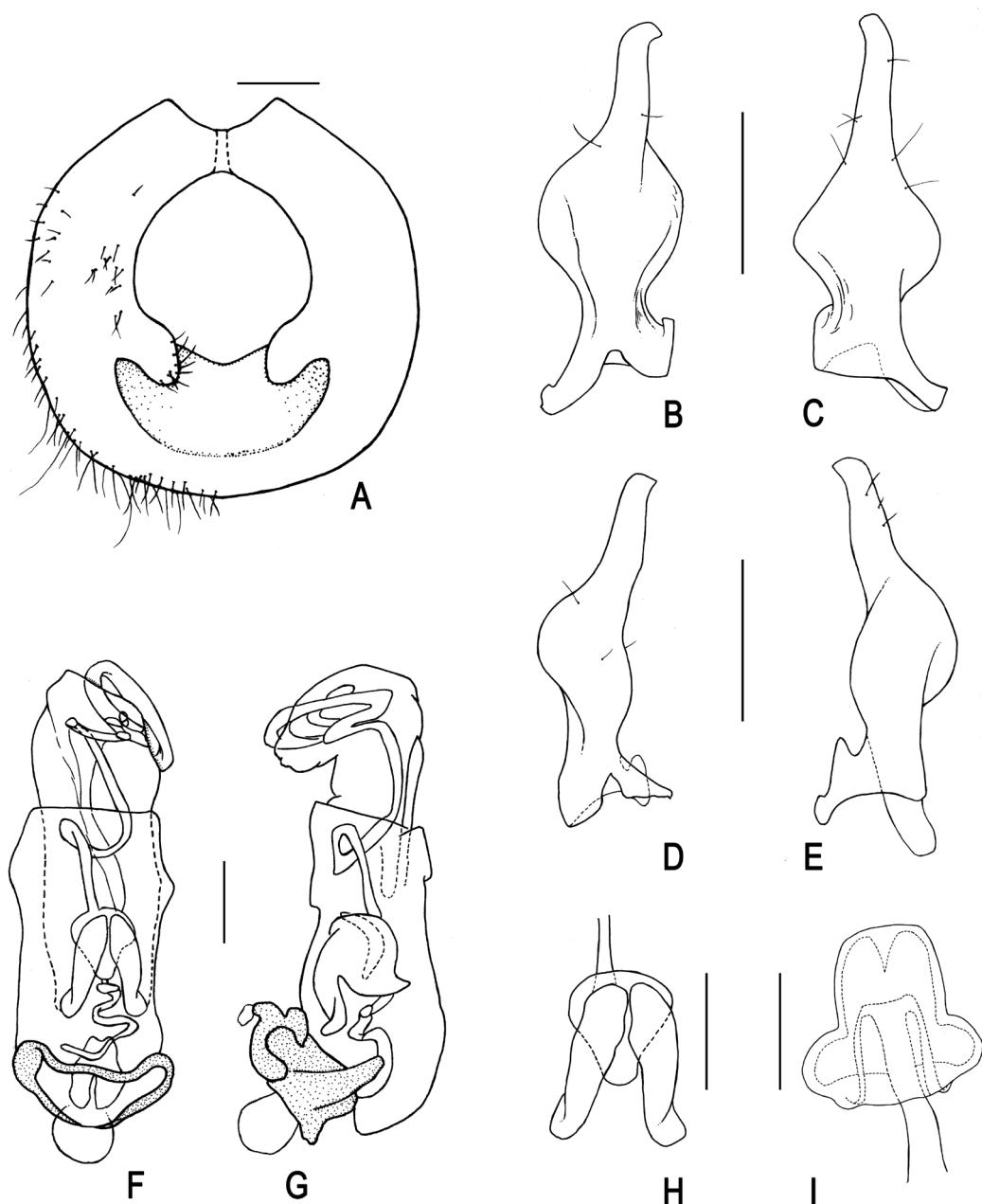


Fig. 5. Male and female genitalia of *Kanigara punctata* Scudder, 1969. A, pygophore, dorsal view; B–E, right paramere, four different aspects; F, G, phallus (F, dorsal view; G, lateral view); H, sperm reservoir; I, spermatheca. Scale bars = 0.1 mm.

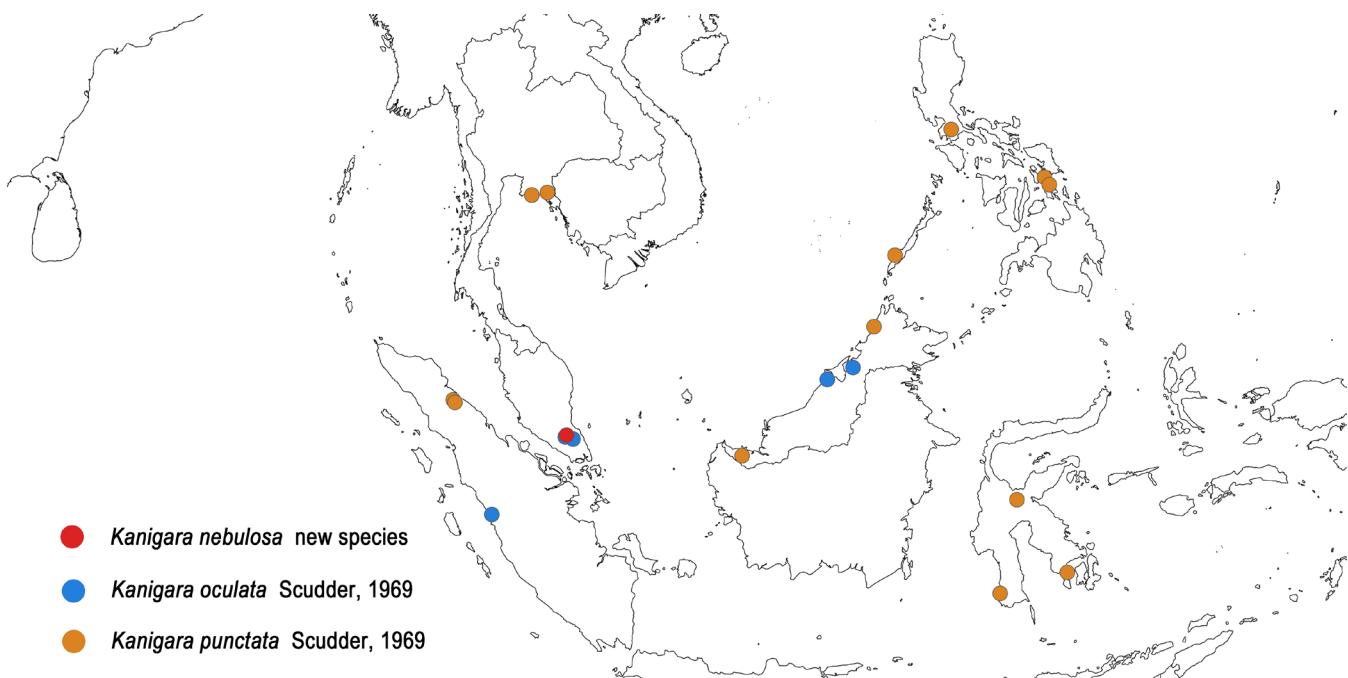


Fig. 6. Distribution of *Kanigara nebulosa*, new species, *Kanigara oculata* Scudder, 1969, and *Kanigara punctata* Scudder, 1969.

Diagnosis. Distinguished from other congeners of *Kanigara* by the following characters: body length more than 4.0 mm and less than 5.5 mm; head, pronotum, and scutellum matte dark brown; distance between ocelli 1.5 times wider than eye width; labium reaching midpoint between procoxae and mesocoxae; lateral area of posterior lobe of pronotum with distinct pale yellowish line; punctures on apical and lateral area of scutellum larger than punctures on basal area of scutellum and surface of pronotum; corium white, subhyaline; pygophore (Fig. 5A) globose, covered with relatively dense erect setae; dorsal pygophore opening circle-shaped, broadened to about basal one-third, then sharply narrowed by a pair of rounded protrusions; posterior margin of pygophore and cup-like sclerite fused; anterior margin of cup-like sclerite concave at middle; paramere (Fig. 5B–E) sparsely covered with erect setae, expanded at midpoint; phallus as in Fig. 5F, G; phallosoma without processes; sperm reservoir as in Fig. 5H; length of ovipositor less than 1.0 mm, truncated at approx. sternite VI; spermatheca as in Fig. 5I.

See Scudder (1969) for a detailed description of this species.

Distribution. Luzon, Leyte, Palawan, Thailand, Borneo (Sarawak, Sabah), Sulawesi, Sumatra. New to Thailand.

Biological notes. Specimens were collected in the vicinity of artificial light within areas located adjacent to mountainous forest and open forest adjacent to a resort hotel.

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