

THE *PHORTICA* SENSU STRICTO (INSECTA: DIPTERA: DROSOPHILIDAE) FROM MALAYSIA

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ABSTRACT. – Fifteen species, including 12 new species, of *Phortica* sensu stricto were found from Malaysia, i.e., *P. gombakana* (Takada & Momma), *P. nigrifoliiseta* (Takada et al.), *P. tanabei* Chen & Toda, *P. alpha* Chen & Toda, new species, *P. ni* Chen & Toda, new species, *P. jamilii* Chen & Toda, new species, *P. liewi* Chen & Toda, new species, *P. epsilon* Chen & Toda, new species, *P. lanuginosa* Chen & Toda, new species, *P. zeta* Chen & Toda, new species, *P. expansa* Chen & Toda, new species, *P. kinabalensis* Chen & Toda, new species, *P. palmata* Chen & Toda, new species, *P. pasohensis* Chen & Toda, new species and *P. membranifera* Chen & Toda, new species. A key to all the species of this subgenus from Malaysia is provided.

KEY WORDS. – Drosophilidae, *Phortica*, taxonomy, new species, Malaysia.

INTRODUCTION

Phortica Schiner, 1862, has long been placed as a subgenus of the genus *Amiota* Loew, 1862 (Wheeler, 1952). Recently revising the classification of some taxa previously assigned to the genus *Amiota*, Máca (2003) raised *Phortica* to the generic rank and recognized three subgenera, *Phortica* sensu stricto, *Allophortica* Máca, 2003, and *Sinophthalmus* Coquillett, 1904, within it. Up to the present, 84 species of *Phortica* sensu stricto have been reported from the world. The Oriental Region is the richest in the number of *Phortica* sensu stricto species (65 species, about 77% of the world total). Most of them have been recorded from subtropical regions, especially 55 species from southern China including Taiwan (Okada, 1977; Zhang & Gan, 1986; Toda & Peng, 1990, 1992; Máca & Lin, 1993; Zhang et al., 1996; Zhang & Shi, 1997; Chen & Toda, 1997, 1998; Máca, 2003; Chen et al., 2005a, 2005b). In contrast, the number of species recorded from tropical regions has been limited despite of the much higher species richness of other drosophilid taxa there. This suggests that the diversification of the subgenus *Phortica* has taken place in the regions with cooler climatic conditions than

the real tropics (Table 1). In this context, tropical highlands should be of interest and importance for considering the evolution of this subgenus. This paper reports on the taxonomic and ecological information of 15 species from are recorded from the tropical lower mountain forests at 700 to 1,700 m a.s.l. on Mt. Kinabalu (4,095 m; 6°05'N, 116°33'E; the highest in Southeast Asia), the adjoining Crocker Range National Park in Sabah (northeastern Borneo) of Malaysia, and along with two species from Peninsular Malaysia. Twelve new species are also described in this paper (11 from Sabah and one from Peninsular Malaysia). Authorship of all these 12 new species should be attributed to the first and second author only.

MATERIALS AND METHODS

Most specimens examined were captured while hovering in front of people's eyes in the forest, or obtained while the flies were resting on tree trunks. The type specimens are deposited in the following institutions: Forest Research Institute Malaysia, Kuala Lumpur, Malaysia (FRIM); Institute for

Table 1. The numbers of *Phortica* sensu stricto species recorded from the biogeographic regions of the world, separately shown for each of climatic zones and selected areas of the Oriental and Eastern Palearctic Regions.

Region	Climate	Area	Altitude	No. of species
Oriental				77
	Tropics			24
		Sumatra, Indonesia	Lower mountain	3*
		Pasoh, Malaysia	Lowland	2*
		Mt. Kinabalu (including the Crocker Range), Malaysia	Lower mountain	14
	Subtropics			56
		Xishuangbannan, Southwest China	Lower mountain	13
		Hengduan mountains, Southwest China	Higher mountain	15
		South China	Lowland	7
		South China	Lower mountain	28
		East China	Lower mountain	11
		Taiwan, China	Lower mountain	17
		Ryukyu Is., Japan	Lowland	2
Eastern Palearctic				9
Warm temperate			6	
	Kyushu & southern Honshu, Japan	Lowland	5	
Cool temperate			4	
	North & Northeast China	Lowland	3	
	Mt. Changbai, Northeast China	Lower mountain	2	
	Ussuri, Russia	Lowland	2	
	Hokkaido, Japan	Lowland	3	
	Boreal	Yakutsk, Russia	Lowland	1
Western Palearctic				4
Afrotropical			4	
Australian				3
Nearctic				2
Neotropical				0
World				96

* poorly known.

Tropical Biology and Conservation, Universiti Malaysia Sabah, Kota Kinabalu, Sabah, Malaysia (ITBC); Kinabalu Park, Sabah Parks, Sabah, Malaysia (KPSP); Department of Entomology, South China Agricultural University, Guangzhou, China (SCAU); Systematic Entomology, the Hokkaido University Museum, Hokkaido University, Sapporo, Japan (SEHU). The morphological terminology and the definitions of indices follow Chen & Toda (2001) and Chen & Aotsuka (2003). All scale lines throughout the paper are equal to 0.1 mm.

TAXONOMY

Phortica Schiner, 1862 (sensu stricto)

Phortica Schiner, 1862: 433; Máca, 2003: 251. Type species: *Drosophila variegata* Fallén, 1823.
Amiota (*Phortica*): Wheeler, 1952: 167.

Diagnosis. – Leg tibiae with 3 dark rings; additional plate present between cerci and 10th sternite (Figs. 4, 9, 14, 18, 23, 28, 32, 39, 43, 48, 52, 56); aedeagal median rod developed, basally and/or medially connected to basal corners of gonopods by 1 or 2 pair(s) of bridges (Figs. 5, 10, 15, 19, 24, 29, 33, 40, 44, 49, 53, 57).

Description. – Eyes brownish red. Ocellar triangle brown to black, with 1 pair of small setae below ocellar setae. Frons brown to black, medially with a few interfrontal setulae. Fronto-orbital plate pale, often silvery white; proclinate orbital seta nearer to inner vertical seta than to ptilinal fissure. Pedicel and first flagellomere grayish yellow. Face yellow to brown, with yellowish white patches on lower corners. Clypeus medially white to yellow, laterally dark brown to black. Gena grayish brown; postgena dark brown. Palpus somewhat triangular, grayish yellow distally, brown basally, with 1 hollow sense organ and a few setae distally. Vibrissa prominent; other orals small. Occiput glossy, brownish black.

Thorax yellow to orange brown, usually with brownish to black patches and pollinose pattern. Postpronotal lobe pale yellow, with 1 long and a few short setae. Acrostichal setulae in ca. 10 irregular rows. Prescutellar setae usually 1 pair. Anepisternum usually lacking setulae. Scutellum usually concolorous with thorax, with dark brown to black patch. Basal scutellar setae divergent; apicals cruciate.

Wing hyaline, sometimes smoky; veins grayish yellow. Basal medial-cubital crossvein present; C_1 setae 2, indistinctly differentiated. Costal vein with spinules on ventral surface between R_{2+3} and R_{4+5} . R_{2+3} slightly curved to costa at tip; R_{4+5} distally convergent with M_1 . Halteres white.

Legs yellow; femora usually brown to black except for apical portions. Foreleg femur with 2-3 irregular rows of long setae on posterior surface. Preapical dorsal setae present on all tibiae. Midleg tarsus ventrally with 2 rows of minute cuneiform setulae on inner and outer sides; hindleg tarsus with 1 row of minute cuneiform setulae on underside; fore- and hindleg first tarsomeres each as long as three succeeding tarsomeres together; midleg first tarsomere as long as other tarsomeres combined.

Abdominal tergites yellow to orange yellow; second to fifth tergites with broad brownish to black bands on posterior margins. Sternites usually grayish yellow.

Male terminalia: Epandrium almost not constricted mid-dorsally, with pubescence and setae; apodeme developed along anterior margins. Cercus almost oval, but elongate in *P. hani* (Zhang & Shi, 1997) and *P. varipes* Duda, 1926, separated from epandrium, entirely pubescent and setigerous. Surstylus with numerous setae on outer surface. Membrane between epandrium and cercus pubescent. Hypandrium arched, usually with 1 pair of apodeme processes on anterior portion; posterior ends contiguous to lateral corners of gonopods and anteroventral corners of epandrium. Gonopods fused to each other, forming posteromedian plate, anteriorly forming vertical process. Parameres usually basally contiguous to anterior portion of hypandrium and tips of distally bifurcated ventral branch of aedeagal apodeme. Aedeagus composed of outer membranous tube and more or less sclerotized median rod; outer membrane posteriorly connected to vertical process of gonopod; median rod basally contiguous to dorsal branch of aedeagal apodeme; basal bridge sometimes with sclerotized branch (Figs. 5, 24, 29, 33); ventral bridge (termed inner paraphysis by Bächli et al., 2004) usually contiguous to medial process of aedeagus (Figs. 40, 44, 49, 53), sometimes elongated and dilated apically (Fig. 57). Aedeagal apodeme mostly laterally flattened. Ejaculatory apodeme rudimentary (in Asian species).

Classification. – Supraspecific division within the genus *Phortica* has not been fully settled yet, although the following species-group or complexes have been erected: the *variegata* complex by Máca (1977), the *foliiseta* complex by Tsacas & Okada (1983), the *magna* complex by Chen & Toda (1997), the *omega* complex by Chen & Toda (1998) and the *varipes* group by Máca (2003). According to Chen's (2001) phylogenetic analysis, the classification within the genus *Phortica* will be fully revised in the near future. For the present we follow the previous classification system within *Phortica*, only assigning some species to known species-complexes, except for the *variegata* complex of which the diagnosis is insufficient in the light of recent phylogenetic analysis by Chen (2001).

I. *Phortica* (*Phortica*) *foliiseta* species-complex

Amiota (*Phortica*) *foliiseta* species-complex, Tsacas & Okada, 1983: 229.

Phortica foliiseta species-complex: Chen et al., 2005b: 419.

Diagnosis. – (Modified from Tsacas & Okada, 1983). Interfrontal setae thick, dense; additional plate between cerci and 10th sternite absent; paramere short, rod-shaped, basally usually projected and with a few sensilla, apically usually knobbed.

Phortica (*Phortica*) *nigrifoliiseta* (Takada, Momma & Shima, 1973)

Amiota (*Phortica*) *nigrifoliiseta* Takada, Momma & Shima, 1973: 74; Tsacas & Okada, 1983: 236.

Diagnosis. – Surstylus with 2–3 peg-like prensisetae; vertical process of gonopods nearly entirely sclerotized apically; paramere finely serrated apically; aedeagal outer membrane with minute warts.

Material examined. – MALAYSIA: 1 male paratype, Mt. Kinabalu, Sabah, coll. H. Takada, 28 Jun. 1972 (SEHU).

Distribution. – Malaysia (Sabah).

Phortica (*Phortica*) *tanabei* Chen & Toda, 2005

Phortica tanabei Chen & Toda, in Chen et al., 2005b: 427.

Diagnosis. – Vertical process of gonopods slightly sclerotized; aedeagal outer membrane with numerous, weakly sclerotized, small triangle processes; median rod deformed to small, strongly sclerotized piece.

Material examined. – MALAYSIA: 2 male paratypes, Mt. Kinabalu, Sabah, coll. M. J. Toda, 27 May. 1999 (SEHU).

Distribution. – China (Guangdong, Hainan, Yunnan), Myanmar (Pyinoolwin), Malaysia (Sabah).

II. *Phortica* (*Phortica*) *magna* species-complex

Amiota (*Phortica*) *magna* species-complex, Chen & Toda, 1997: 785.

Diagnosis. – Surstylus with black, thick spine-like prensisetae (Fig. 3); additional plate between cerci and 10th sternite lacking pubescence, separated from 10th sternite (Fig. 4); paramere foliate (Fig. 5); aedeagus basolaterally with 1 pair of seemingly looped processes (Fig. 5).

Phortica (*Phortica*) *alpha* Chen & Toda, new species (Figs. 1–5)

Diagnosis. – Paramere basally broadened and with 1 acute projection, distally deeply bifurcated: apical process with 1–2 sensilla and 3 small teeth; lateral process with 2 acute projections (Fig. 5).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 7 Mar. 2000 (KPSP). Paratypes: MALAYSIA: 1 male, same

data as holotype except for 1 Oct.1999 (KPSP); Mahua, Crocker Range, Sabah, 1 male, coll. M. J. Toda, 16 Oct.1999 (SEHU); Poring, Sabah, 3 males, coll. M. J. Toda, 3 Oct.1999 (1 male FRIM, 1 male ITBC, 1 male SCAU).

Description. – Head: Frons brownish black on upper half, brown on lower half.

Thorax: Scutellum with triangular black patch.

Wing: Slightly smoky, dark on anterior margin.

Legs: Fore- and midleg femora dark brown. Midleg tibia subapically lacking longer setae on anterior surface.

Abdomen: First to fourth tergites yellow; second tergite with black patches submedially and laterally; third and fourth tergites each with broad, medially slightly protruded, black band on posterior margin and 1 pair of yellow patches anterolaterally; fifth and sixth tergites nearly entirely black; sixth tergite broadened on posterior corners of lateral margins, broader than 1.2 times of dorsomedian section (Fig. 1).

Male terminalia: Epandrium lacking pubescence anteroventrally, with 6 setae on dorsal to posterolateral portion

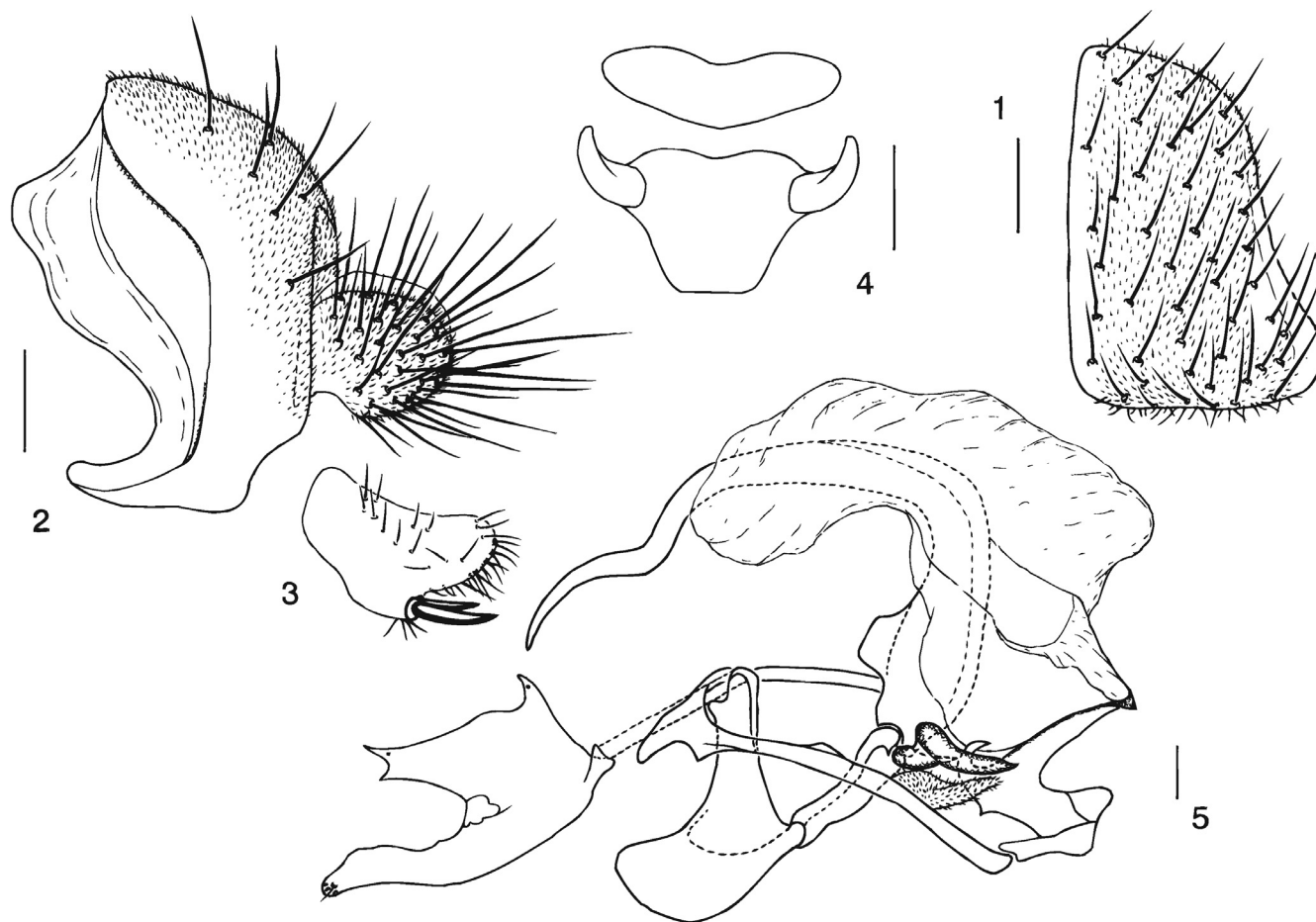
per side (Fig. 2). Surstylus lacking pubescence, with 1 verly long, stout spine (2 spines, probably as an aberration, in the male from Mahua, Crocker Range, Sabah) (Fig. 3). Posterolateral lobe of hypandrium pubescent (Fig. 5). Paramere lacking pubescence (Fig. 5). Vertical process of gonopods curved at anteroventral corners (Fig. 5). Aedeagus with 1 pair of bridges basally.

Female: Unknown.

Measurements: BL = 3.62 mm in holotype (range in 4 male paratypes: 3.40–4.18); ThL = 1.85 mm (1.64–1.88); WL = 3.11 mm (2.64–3.20); WW = 1.26 mm (1.20–1.36).

Indices: arb = 4–5/0, adf = 1.46 (1.30–1.80), flw = 1.50 (1.50–1.60), FW/HW = 0.45 (0.40–0.45), ch/o = 0.06 (0.06), prorb = 1.10 (1.00–1.15), rcorb = 0.50 (0.40–0.50), vb = 0.35 (0.30–0.35), dcl = 0.50 (0.50–0.60), presctl = 0.65 (0.55–0.65), sctl = 1.10 (1.10–1.20), sterno = 0.90 (0.90–0.95), orbito = 1.45 (1.40–1.50), dcp = 0.25 (0.24–0.25), sctlp = 1.00 (0.95–1.00), C = 2.00 (2.10–2.25), 4c = 1.50 (1.50–2.10), 4v = 2.73 (2.73–3.46), 5x = 0.81 (0.67–0.89), ac = 4.00 (3.60–4.20), M = 0.58 (0.58–0.73), C3F = 0.75 (0.67–0.76).

Etymology. – In reference to the branch of basal bridge of aedeagus looking like Greek letter ‘alpha’ in lateral view.



Figs. 1–5. *Phortica (Phortica) alpha* Chen & Toda, new species, male: 1, sixth tergite in ventral view; 2, epandrium and cercus in lateral view; 3, surstylus in frontal view; 4, tenth sternite and additional plate in frontal view; 5, hypandrium, gonopod, paramere and aedeagus in lateral view.

Distribution. – Malaysia (Sabah).

Remarks. – This species is easily distinguished from the other members of the *magna* species-complex by the diagnostic characters, but somewhat resembles *P. (P.) foliata* (Chen & Toda, 1997) from southern China in the morphology of aedeagus and gonopods.

III. *Phortica (Phortica) omega* species-complex

Amiota (Phortica) omega species-complex, Chen & Toda, 1998: 403.

Diagnosis. – Paramere basally bifurcated into narrow long processes (Fig. 10).

Phortica (Phortica) ni Chen & Toda, new species (Figs. 6–10)

Diagnosis. – Male sixth tergite with single prickly, anteriad curved projection at anteroventral corner (Fig. 6); lateral process of paramere ca. 2/3 as long as apical one, apically with 1 sensillum and 1 black spine (Fig. 10).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 11 Mar. 1999 (KPSP). Paratype: 1 male, same data as holotype (SEHU).

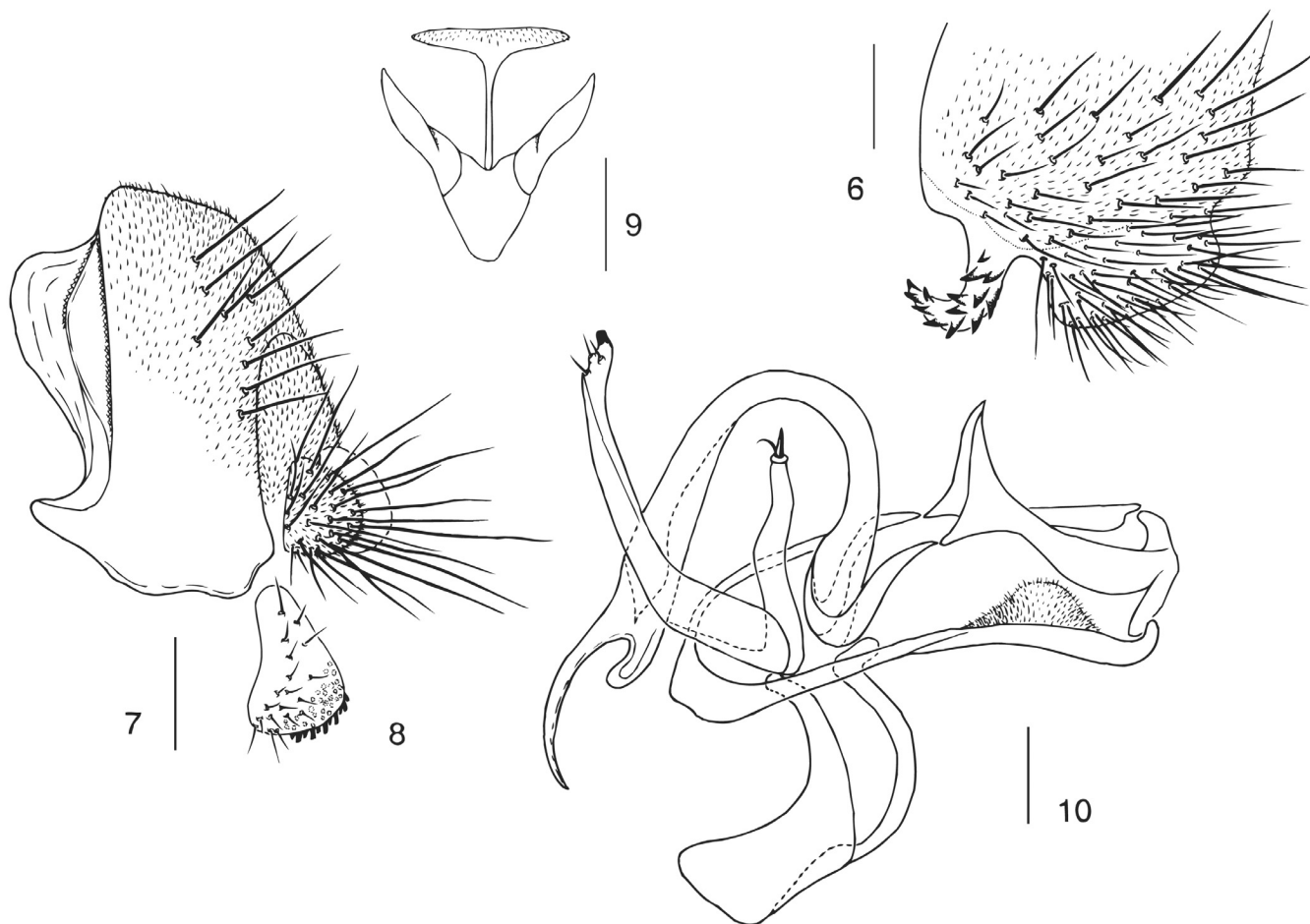
Description. – Male. Head: Frons brown with large triangular black patch on upper half.

Thorax: Orange yellow. Scutellum with triangular brownish-black patch.

Wing: Slightly smoky on anterior margin.

Legs: All femora dark brown except apical portions. Midleg tibia subapically with 2–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second to fifth tergites each with brownish black band on posterior margin and 1 pair of yellow patches anterolaterally; caudal band medially broadly interrupted on second tergite, but protruded on third to fifth; sixth tergite nearly entirely black except yellow medial line.



Figs. 6–10. *Phortica (Phortica) ni* Chen & Toda, new species, male: 6, sixth tergite in ventral view; 7, epandrium and cercus in lateral view; 8, surstylus in frontal view; 9, tenth sternite and additional plate in frontal view; 10, hypandrium, gonopod, paramere and aedeagus in lateral view.

Male terminalia: Epandrium lacking pubescence anteroventrally, with 9 setae on dorsal to posterolateral portion per side (Fig. 7). Surstylus lacking pubescence, with several, apically rounded prensisetae (Fig. 8). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 9). Posterolateral lobe of hypandrium pubescent (Fig. 10). Aedeagal median rod with knot subapically and 1 pair of bridges basally (Fig. 10).

Female: Unknown.

Measurements: BL = 4.06 mm in holotype (1 male paratype: 4.57); ThL = 2.13 mm (2.06); WL = 3.32 mm (3.36); WW = 1.40 mm (1.48).

Indices: arb = 4-5/2 (5/2), avd = 0.60 (0.60), adf = 1.65 (1.65), flw = 1.50 (1.40), FW/HW = 0.40 (0.35), ch/o = 0.08 (0.08), prorb = 1.15 (1.10), rcorb = 0.40 (0.35), vb = 0.35 (0.40), dcl = 0.60 (0.60), presctl = 0.65 (0.55), sctl = 1.10 (1.10), sterno = 0.90 (0.85), orbito = 1.40 (1.40), dcp = 0.24 (0.23), scltp = 1.10 (1.00), C = 2.27 (2.24), 4c = 1.47 (1.62), 4v = 2.60 (2.92), 5x = 0.90 (0.80), ac = 3.67 (3.50), M = 0.60 (0.62), C3F = 0.64 (0.67).

Etymology. – In reference to the paramere looking like Greek letter ‘niu’ in lateral view.

Distribution. – Malaysia (Sabah).

Remarks. – This species is very similar to *P. (P.) biprotrusa* (Chen & Toda, 1998) from Yunnan, China, in the male sixth tergite with prickly process at the anteroventral corner, but can be distinguished from it by the posteroventral corners of male sixth tergite (in *P. biprotrusa*: with 2 prickly projections per side).

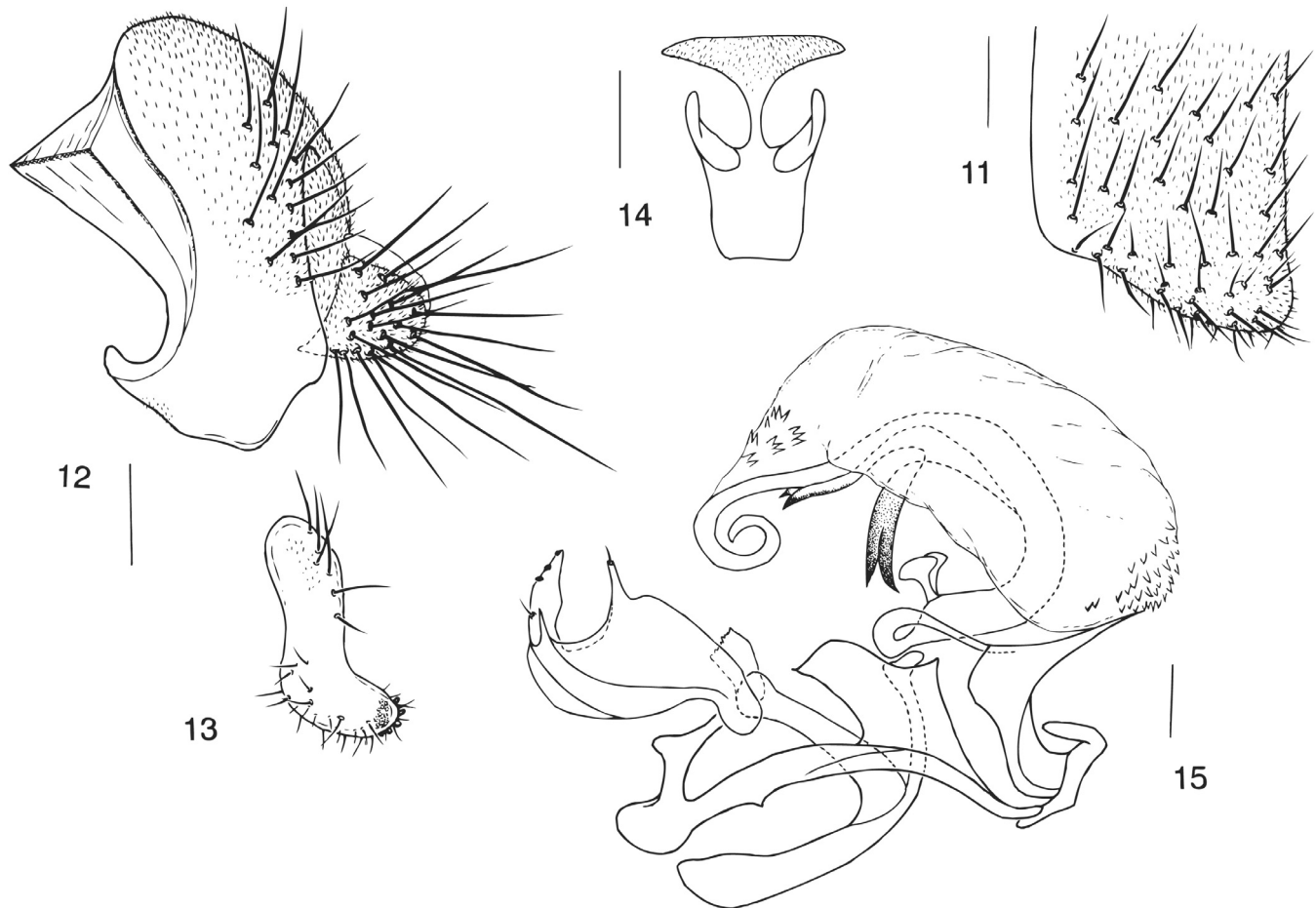
IV. Species unassigned to any species-complex

Species are arranged according to their presumed taxonomic relationships.

Phortica (Phortica) gombakana (Takada & Momma, 1975)

Amiota (Phortica) gombakana Takada & Momma, 1975: 14.

Diagnosis. – Vertical process of gonopods with spinules apicomediaally; aedeagus with 2 pairs of bridges, of which the ventral pair is strongly sclerotized.



Figs. 11–15. *Phortica (Phortica) jamilii* Chen & Toda, new species, male: 11, sixth tergite in ventral view; 12, epandrium and cercus in lateral view; 13, surstylus in frontal view; 14, tenth sternite and additional plate in frontal view; 15, hypandrium, gonopod, paramere and aedeagus in lateral view.

Material examined. – Holotype male, MALAYSIA: Gombak, near Kuala Lumpur, coll. H. Takada, 4 Jul.1972 (SEHU); Ulu Senagang, Crocker Range, Sabah, 1 male, coll. M. J. Toda, 18 Oct.1999 (KPSP).

Distribution. – Malaysia (Malaya, Sabah).

***Phortica (Phortica) jamilii* Chen & Toda, new species**
(Figs. 11–15)

Diagnosis. – Aedeagal median rod subapically with 1 pair of long slender projections and submedially with 1 pair of long, broad, apically bifurcated projections (Fig. 15).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 20 Mar.1999 (KPSP). Paratype: 1 male (terminalia dissected), same data as the holotype except for 7 Mar.2000 (SEHU).

Description. – Male. Head: Frons brown with large triangular black patch on upper half.

Thorax: Orange yellow. Scutellum with trifurcate brown patch, yellowish white on tip.

Wing: Slightly smoky.

Legs: All femora almost brown. Midleg tibia subapically lacking longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with black patches submedially and laterally; third tergite with medially and laterally slightly protruded, sublaterally nearly interrupted, brown band on posterior margin; fourth and fifth tergites each with medially and laterally slightly protruded, brown band on posterior margin and 1 pair of small yellow patches sublaterally; sixth tergite nearly entirely black except yellow medial line, extended below at posterolateral corners (Fig. 11).

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with ca. 14–15 setae near dorsal to posterolateral margin per side (Fig. 12). Surstylus pubescent basally, with several wedge-shaped prenisetae on apical margin to inner surface (Fig. 13). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 14). Posterolateral lobe of hypandrium large, lacking pubescence (Fig. 15). Paramere lacking pubescence; apical process with 3 teeth apically and 1 sensillum subapically; median process triangular; proximal process slender, with 1 sensillum apically (Fig. 15). Vertical process of gonopods triangular lobe-like (Fig. 15). Aedeagal median rod subbasally with 1 pair of small processes; outer membranous tube convoluted apically, with transparent minute spinules subapically and basally (Fig. 15). Aedeagus with 1 pair of looped bridges basally (Fig. 15).

Female: Unknown.

Measurements: BL = 4.20 mm in holotype (1 male paratype: 4.18); ThL = 1.94 mm (1.83); WL = 3.20 mm (3.08); WW = 1.36 mm (1.28).

Indices: arb = 3-4/2-3 (3-4/2-3), avd = 0.67 (0.70), adf = 1.45 (1.50), flw = 1.30 (1.40), FW/HW = 0.38 (0.35), ch/o = 0.06 (0.06), prorb = 1.00 (1.00), rcorb = 0.55 (0.60), vb = 0.35 (0.30), dcl = 0.55 (0.60), presctl = 0.60 (0.60), sctl = 1.00 (1.00), sterno = 0.90 (0.95), orbito = 1.30 (1.30), dcp = 0.25 (0.25), sctlp = 1.00 (1.00), C = 2.25 (2.20), 4c = 1.67 (1.60), 4v = 3.33 (3.00), 5x = 1.13 (1.10), ac = 5.00 (4.80), M = 0.75 (0.73), C3F = 0.70 (0.70).

Etymology. – Patronym, in honor of Dr. Jamili Nais of the Sabah Parks, Malaysia.

Distribution. – Malaysia (Sabah).

Remarks. – This species is similar to *P. (P.) eugamma* (Toda & Peng, 1990) from southern China in the pattern of abdominal tergites, but can be distinguished from it by the aedeagal median rod (in *P. eugamma*: aedeagal median rod subapically with 1 single, submedially with 1 paired, small, simple projections).

***Phortica (Phortica) liewi* Chen & Toda, new species**
(Figs. 16–19)

Diagnosis. – Aedeagal median rod submedially with 1 pair of small symmetric and 1 pair of long, apically unbifurcated projections (Fig. 19).

Material examined. – Holotype male, MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 11 Mar.1999 (KPSP). Paratypes: MALAYSIA: 2 males, same data as holotype (1 male SCAU, 1 male SEHU); 2 males (terminalia dissected), same data as holotype except 13 Mar.1999 (1 male KPSP, 1 male ITBC); 4 males (3 male terminalia dissected), same data as holotype except 20 Mar.1999 (2 males FRIM, 1 male SCAU, 1 male SEHU); Poring, Sabah, 2 males, coll. M. J. Toda, 25 Mar.1999 (1 male KPSP, 1 male ITBC); Ulu Senagang, Crocker Range, Sabah, 1 male (terminalia dissected), coll. M. J. Toda, 18 Oct.1999 (SEHU).

Description. – Male. Head: Frons brown with large triangular black patch on upper half.

Thorax: Orange yellow. Scutellum with trifurcate brown patch, yellowish white on tip.

Wing: Slightly smoky.

Legs: All femora partly brownish. Midleg tibia subapically lacking longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with black patches submedially and laterally; third tergite with medially and laterally slightly protruded, sublaterally nearly interrupted, brown band on posterior margin; fourth and fifth tergites each with medially and laterally slightly protruded, brown band on posterior margin and 1 pair of small yellow patches sublaterally; sixth tergite nearly entirely black except yellow medial line.

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with 7 setae near dorsal to posterolateral margin per side (Fig. 16). Surstylus lacking pubescence, with several wedge-shaped prensisetae on apical margin to inner surface (Fig. 17). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 18). Posterolateral lobe of hypandrium large, lacking pubescence (Fig. 19). Paramere lacking pubescence; apical process with 3 teeth apically and 1 sensillum subapically; median process triangular; proximal process slender, with 1 sensillum apically (Fig. 19). Vertical process of gonopods nearly triangular (Fig. 19). Aedeagal median rod apically with 2 pairs of (inner longer and outer small) triangular processes, subbasally with 1 pair of small processes; outer membranous tube convoluted apically, with transparent minute spinules subapically and basally (Fig. 19). Aedeagus with 1 pair of looped bridges basally (Fig. 19).

Female: Unknown.

Measurements: BL = 3.75 mm in holotype (range in 4 male paratypes: 3.52-3.87); ThL = 1.78 mm (1.69-1.83); WL = 3.17 mm (2.80-3.40); WW = 1.40 mm (1.24-1.36). Indices: arb = 4/2-3 (3-5/2-3), avd = 0.47 (0.43-0.50), adf = 1.90 (1.80-1.2.10), flw = 1.30 (1.20-1.40), FW/HW = 0.45 (0.40-0.45), ch/o = 0.08 (0.08-0.09), prorb = 1.05 (1.00-1.10), rcorb = 0.50 (0.45-0.50), vb = 0.40 (0.40-0.45), dcl = 0.60

(0.55-0.60), presctl = 0.65 (0.60-0.70), sctl = 1.10 (1.00-1.15), sterno = 0.85 (0.85-0.95), orbito = 1.30 (1.20-1.35), dcp = 0.23 (0.22-0.24), sctlp = 1.15 (1.05-1.15), C = 1.96 (1.81-2.25), 4c = 1.77 (1.53-1.91), 4v = 2.85 (2.77-3.25), 5x = 1.00 (1.00-1.14), ac = 4.60 (4.00-4.20), M = 0.62 (0.58-0.73), C3F = 0.74 (0.76-0.85).

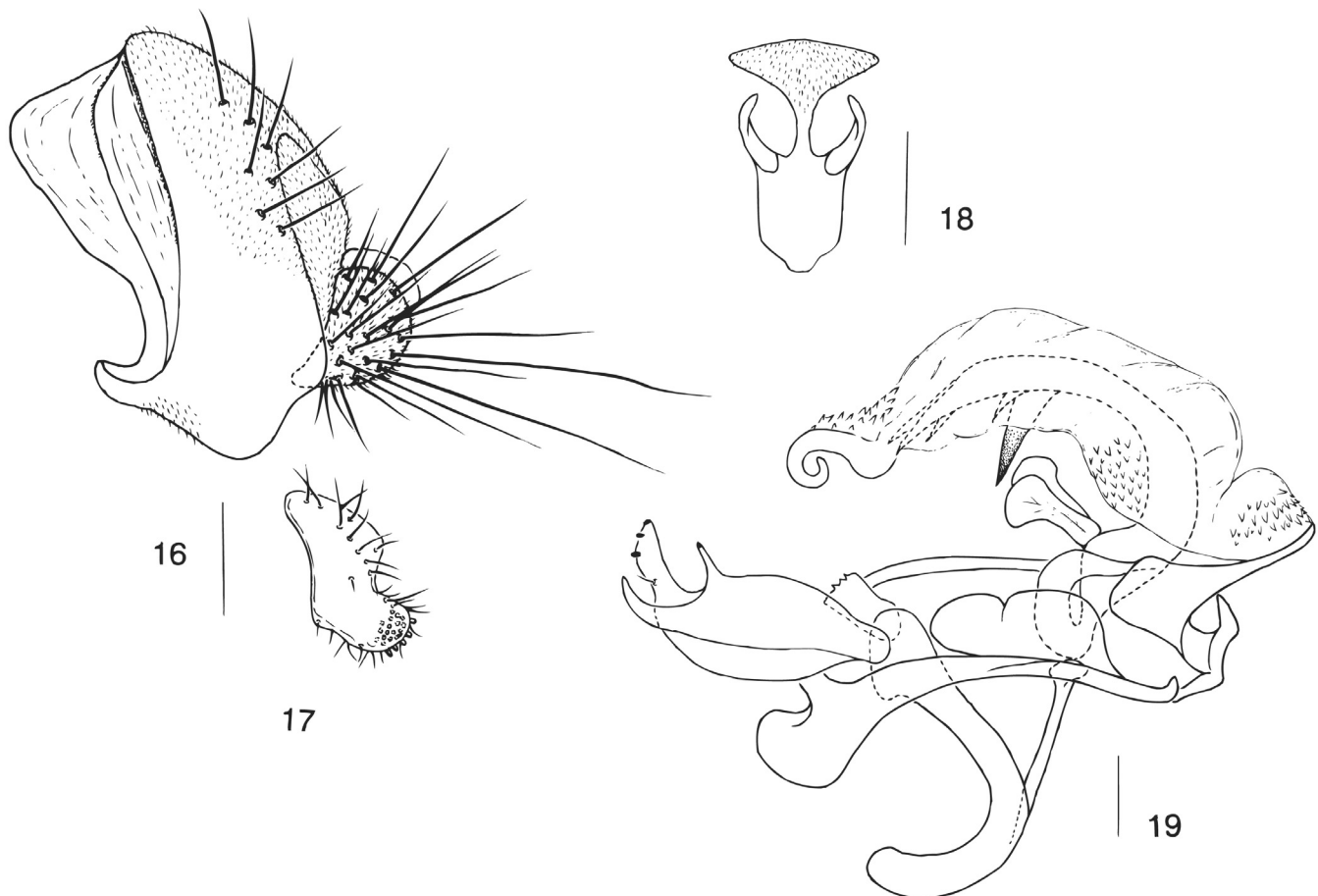
Etymology. – Patronym, in honor of Dr. Francis Liew of the Sabah Parks, Malaysia.

Distribution. – Malaysia (Sabah).

Remarks. – This species is similar to *P. (P.) lineae* (Máca & Chen, in Máca & Lin, 1993) from Taiwan and central China in the morphology of phallic organs, but can be distinguished from it by the aedeagal median rod (in *P. lineae*: aedeagal median rod subapically with 1 pair of asymmetric or only 1 triangular projection(s) in addition to 1 pair of submedial long projections).

***Phortica (Phortica) epsilon* Chen & Toda, new species**
(Figs. 20–25)

Diagnosis. – Paramere almost lacking pubescence, subapically with 1 acute projection (Fig. 24); aedeagal median rod apically asymmetrically bifurcated, subapically expanded and with minute



Figs. 16–19. *Phortica (Phortica) liewi* Chen & Toda, new species, male: 16, epandrium and cercus in lateral view; 17, surstylus in frontal view; 18, tenth sternite and additional plate in frontal view; 19, hypandrium, gonopod, paramere and aedeagus in lateral view.

warts on surface (Figs. 24, 25); aedeagal basal bridge strongly sclerotized, tripartite: anterior lobe with 2 triangular teeth apically and many spinules on lateral surface; median lobe widely clavate, with 1 triangular tooth apically; posterior process slender (Fig. 24).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 11 Mar. 1999 (KPSP).

Description. – Male. Head: Frons brown. Arista without ventral branches.

Thorax: Orange brown. Scutellum with trifurcate dark brown patch, pale on tip. Anepisternum lacking setulae.

Wing: Slightly smoky on anterior margin.

Legs: All femora brown except apical portions. Midleg tibia subapically with 3–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with black patches submedially; third to fifth tergites each with medially slightly protruded, sublaterally interrupted, black band on posterior margin; sixth tergite nearly entirely dark, pointed anterolaterally, with a few long strong setae on posterolateral margins (Fig. 20).

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with 12 setae on dorsal to posterolateral portion per side (Fig. 21). Surstylus pubescent, with dense setae medially and apically rounded prensisetae on inner margin (Fig. 22). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 23). Posterolateral lobe of hypandrium undeveloped. Paramere with 2 sensilla and 2 pointed teeth apically (Fig. 24). Aedeagus with 1 pair of bridges (Fig. 24).

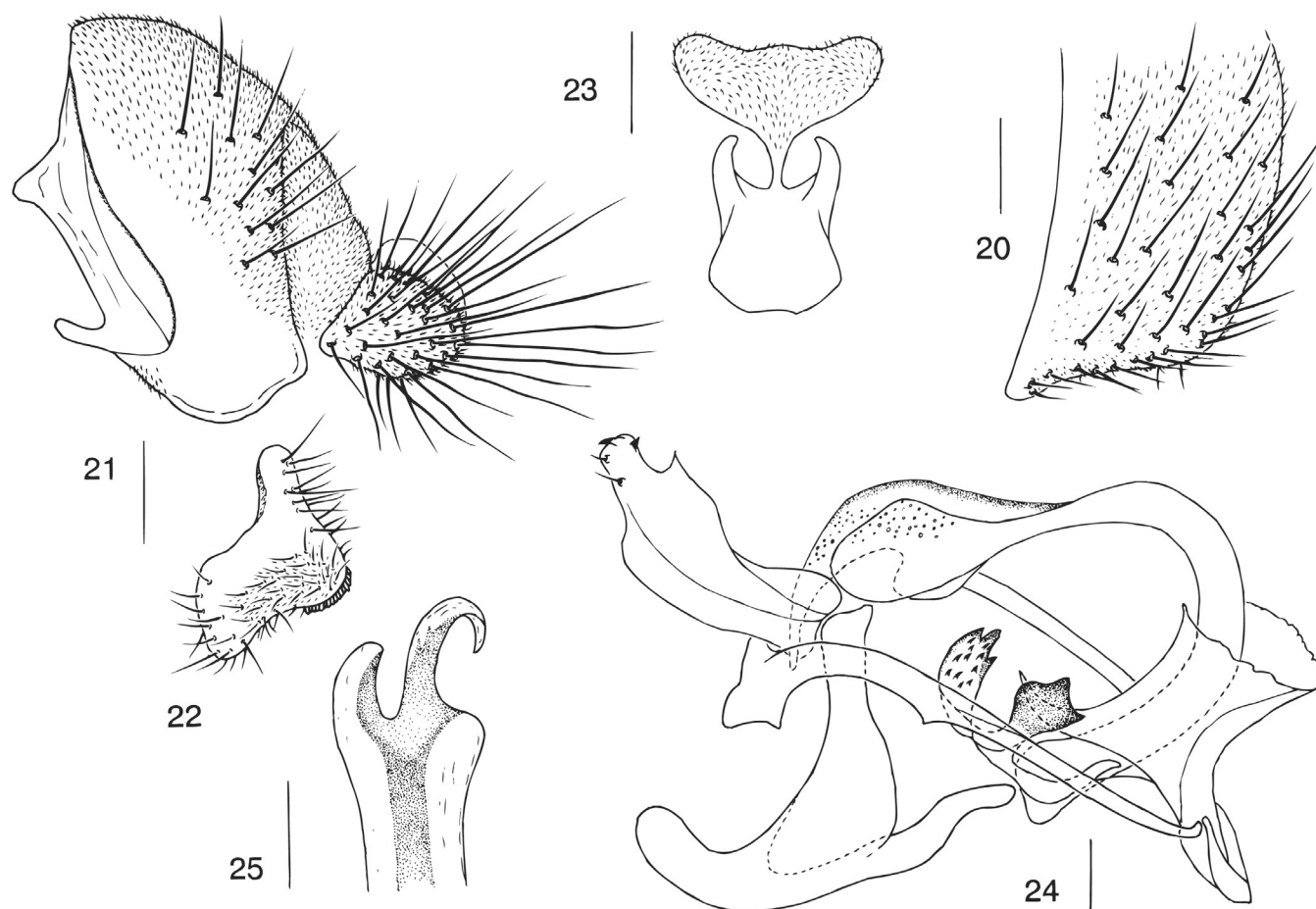
Female: Unknown.

Measurements: BL = 4.00 mm in holotype; ThL = 1.28 mm; WL = 3.18 mm; WW = 1.40 mm.

Indices: arb = 3/0, adf = 1.80, flw = 1.30, FW/HW = 0.45, ch/o = 0.07, pror = 1.10, rcorb = 0.45, vb = 0.40, dcl = 0.60, presctl = 0.80, sctl = 1.15, sterno = 0.90, orbito = 1.20, dcp = 0.23, sctlp = 1.00, C = 2.05, 4c = 1.47, 4v = 2.33, 5x = 0.70, ac = 3.67, M = 0.47, C3F = 0.73.

Etymology. – In reference to the aedeagal basal bridge looking like Greek letter ‘epsilon’ in lateral view.

Distribution. – Malaysia (Sabah).



Figs. 20–25. *Phortica (Phortica) epsilon* Chen & Toda, new species, male: 20, sixth tergite in ventral view; 21, epandrium and cercus in lateral view; 22, surstylus in frontal view; 23, tenth sternite and additional plate in frontal view; 24, hypandrium, gonopod, paramere and aedeagus in lateral view; 25, tip of aedeagal median rod in ventral view.

Remarks. – This species is very similar to *P. (P.) cardua* (Okada, 1977) in that the arista lacks ventral branches and the anepisternum lacking setulae, but can be distinguished from it by the aedeagal median rod and the paramere (in *P. cardua*: aedeagal median rod slender, unexpanded subapically; paramere pubescent distally).

***Phortica (Phortica) lanuginosa* Chen & Toda, new species**
(Figs. 26–29)

Diagnosis. – Anepisternum with setulae; aedeagal basal bridge with ca. 10 triangular, strongly sclerotized teeth along margin (Fig. 29).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 11 Mar.1999 (KPSP).

Description. – Male. Head: Frons dark brown on upper half, brown on lower half. Arista sometimes with 1 small ventral branch.

Thorax: Orange yellow. Scutellum with trifurcate brown patch, pale yellow on tip.

Wing: Smoky.

Legs: All femora slightly brown. Midleg tibia subapically with 3–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with brownish black patches submedially; third to fifth tergites

each with medially protruded, sublaterally interrupted, black band on posterior margin; sixth tergite nearly entirely black, narrowed on lateral margins, with a few long strong setae on posterolateral margins.

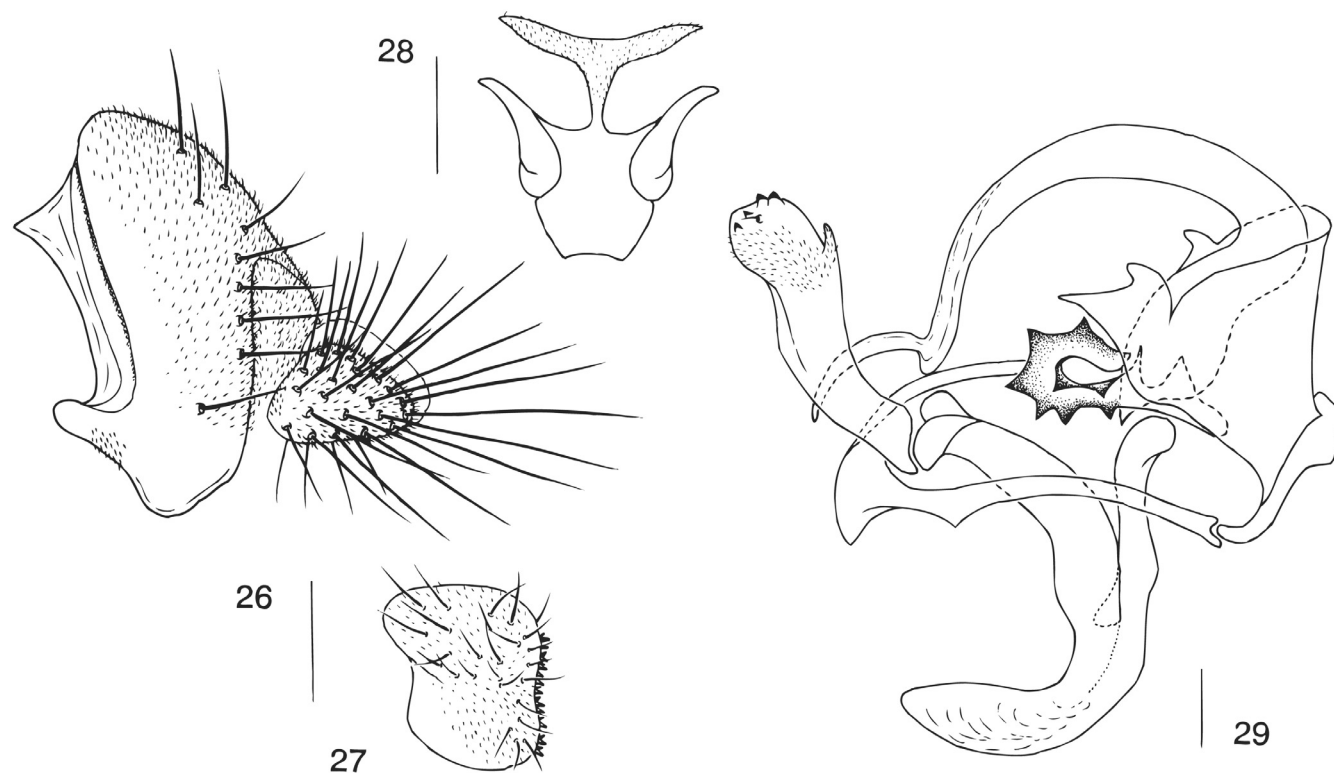
Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with 9 setae on dorsal to posterolateral portion per side (Fig. 26). Surstylus pubescent and setigerous, with wedge-shaped prenisetae on inner margin (Fig. 27). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 28). Posterolateral lobe of hypandrium undeveloped. Paramere with pubescence distally, 1 sensillum and 4 teeth apically, and 1 small process subapically (Fig. 29). Vertical lobe of gonopods with 1 pair of somewhat triangular lobes basally (Fig. 29). Aedeagal median rod with knot subapically, basally with 1 pair of bridges (Fig. 29).

Female: Unknown.

Measurements: BL = 4.81 mm in holotype; ThL = 2.31 mm; WL = 3.32 mm; WW = 1.44 mm.

Indices: arb = 4/0–1, avd = 0.36, adf = 2.20, flw = 1.30, FW/HW = 0.40, ch/o = 0.07, prorb = 1.15, rcorb = 0.45, vb = 0.35, dcl = 0.60, presctl = 0.90, sctl = 0.90, sterno = 1.10, orbito = 1.20, dcp = 0.25, sctlp = 0.90, C = 2.00, 4c = 1.47, 4v = 2.59, 5x = 0.80, ac = 3.57, M = 0.47, C3F = 0.72.

Etymology. – From the Latin word “lanuginosus”, meaning clothed with several setulae, referring to the anepisternum.



Figs. 26–29. *Phortica (Phortica) lanuginosa* Chen & Toda, new species, male: 26, epandrium and cercus in lateral view; 27, surstylus in frontal view; 28, tenth sternite and additional plate in frontal view; 29, hypandrium, gonopod, paramere and aedeagus in lateral view.

Distribution. – Malaysia (Sabah).

Remarks. – This species is somewhat similar to *P. (P.) cardua* in the morphology of arista and paramere, but can be distinguished from it by the setigerous anepisternum and the aedeagal basal bridge (in *P. cardua*: anepisternum lacking setulae; aedeagal basal bridge with ca. 5 triangular, sclerotized teeth along margin and 2–3 apically sclerotized lobe-like processes).

***Phortica (Phortica) zeta* Chen & Toda, new species**
(Figs. 30–35)

Diagnosis. – Paramere medially much expanded, pubescent on submedial small part, distally with 2 processes: apical process with 1 sensillum and 3 small teeth apically; subapical process longer than apical one, with spine-shaped projection apically (Figs. 33, 34); aedeagal median rod subapically expanded and asymmetrical, with 1 pair of small acute projections submedially (Figs. 33, 35); aedeagal basal bridges asymmetric, tripartite, strongly sclerotized, but without small teeth except for triangular tip of anterior process (Fig. 33).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Ulu Senagang, Crocker Range, Sabah, coll. M. J. Toda, 18 Oct. 1999 (KPSP).

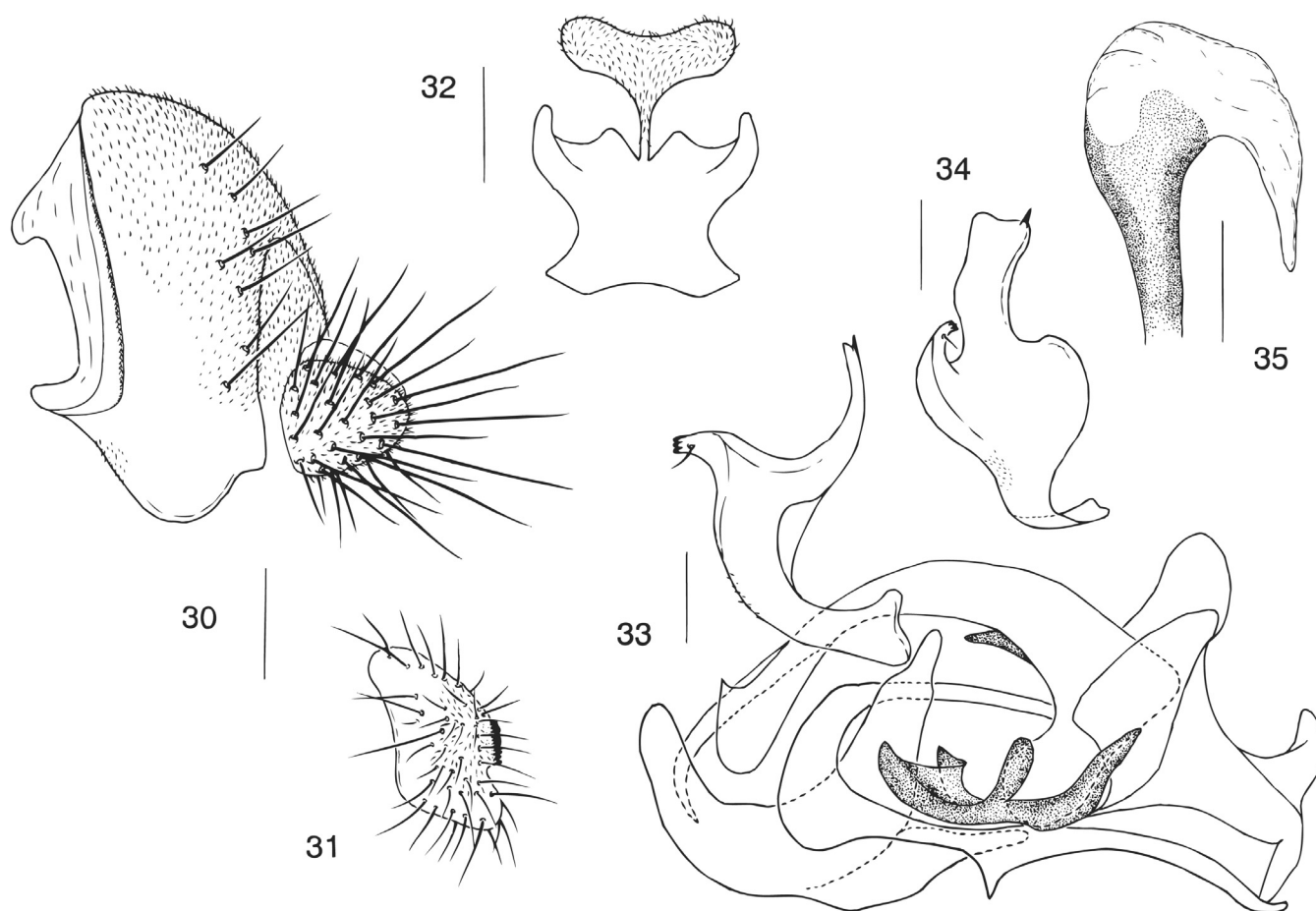
Description. – Male. Thorax: orange yellow. Scutellum with trifurcate brown patch, pale yellow on tip. Anepisternum with several setulae.

Wing: Hyaline.

Legs: All femora lacking patches. Midleg tibia subapically with 3–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with brownish black patches submedially; third to fifth tergites each with medially nearly interrupted, laterally protruded, black band on posterior margin and 1 pair of yellow patches laterally; sixth tergite nearly entirely black, narrowed on lateral margins, with a few long strong setae on posterolateral margins.

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with 8 setae on dorsal to posterolateral portion per side (Fig. 30). Surstylus pubescent, with dense setae medially and apically rounded prensisetae on inner margin (Fig. 31). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 32). Posterolateral lobe of hypandrium undeveloped. Aedeagus with 1 pair of bridges (Fig. 33).



Figs. 30–35. *Phortica (Phortica) zeta* Chen & Toda, new species, male: 30, epandrium and cercus in lateral view; 31, surstylus in frontal view; 32, tenth sternite and additional plate in frontal view; 33, hypandrium, gonopod, paramere and aedeagus in lateral view; 34, paramere in frontal view; 35, tip of aedeagal median rod in ventral view.

Female: Unknown.

Measurements: BL = 3.78 mm in holotype; ThL = 1.94 mm; WL = 3.00 mm; WW = 1.28 mm.

Indices: arb = 6/3, avd = 0.83, adf = 2.20, flw = 1.60, FW/HW = 0.40, ch/o = 0.08, prorb = 1.15, rcorb = 0.50, vb = 0.35, dcl = 0.60, presctl = 0.80, sctl = 1.10, sterno = 0.95, orbito = 1.60, dcp = 0.24, sctlp = 1.10, C = 2.21, 4c = 1.36, 4v = 2.43, 5x = 0.88, ac = 3.80, M = 0.50, C3F = 0.74.

Etymology. – In reference to the paramere looking like Greek letter ‘zeta’ in lateral view.

Distribution. – Malaysia (Sabah).

Remarks. – This species is very similar to *P. (P.) eparmata* (Okada, 1977) from Taiwan in the shape of paramere, but can be distinguished from it by the aedeagal median rod and the aedeagal basal bridge (in *P. eparmata*: aedeagal median rod much expanded apically, without submedial projections; aedeagal basal bridge with a few acute teeth).

***Phortica (Phortica) expansa* Chen & Toda, new species**
(Figs. 36–40)

Diagnosis. – Aedeagal median rod submedially with asymmetrically bifurcated process (Fig. 40); aedeagal basal bridge laterally with large, somewhat triangular flap (Fig. 40).

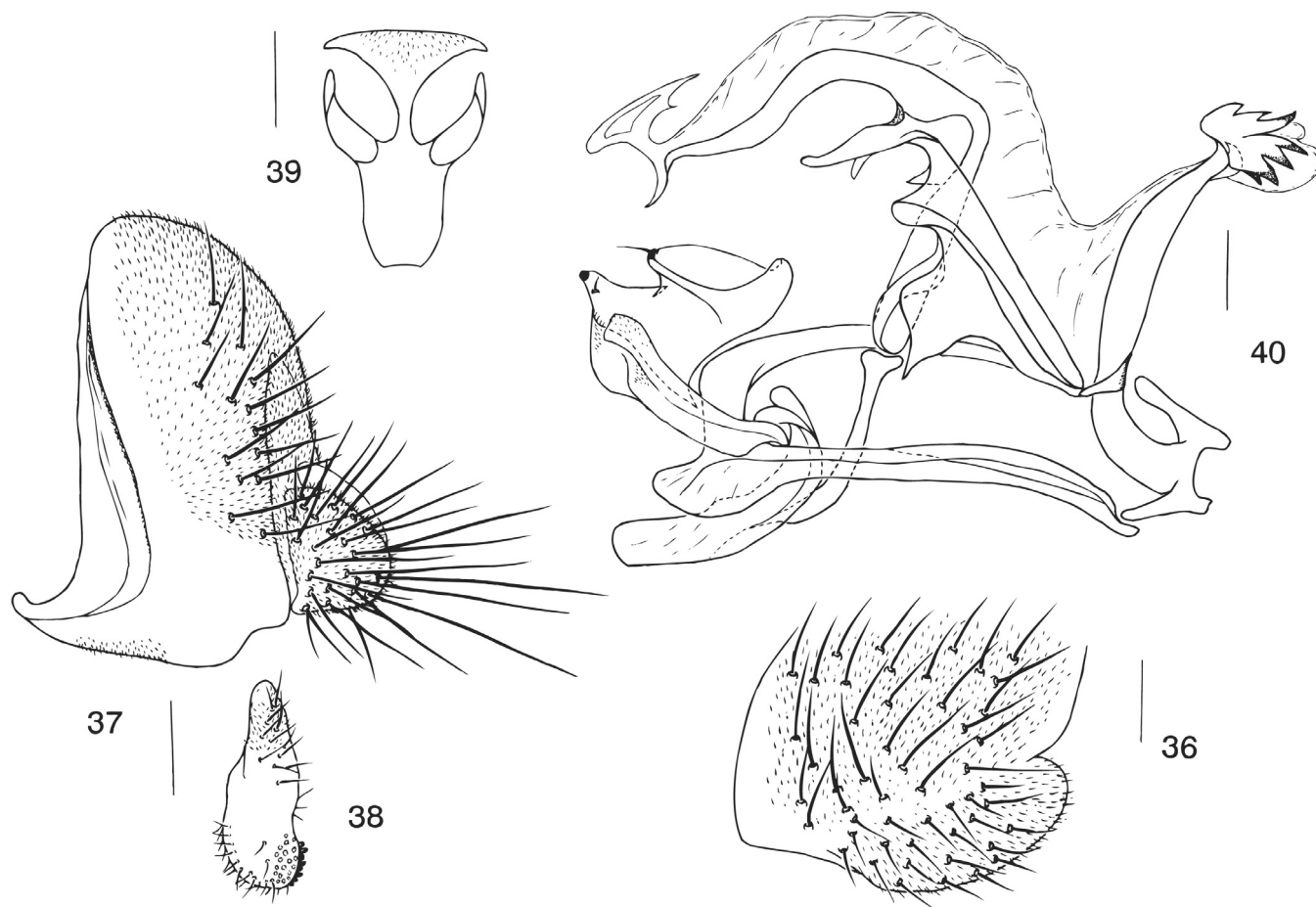
Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 27 Dec.1998 (KPSP). Paratypes: 2 males, same data as the holotype except for 7 Mar.2000 and 11 Mar.2000 (SEHU, ITBC).

Description. – Male. Thorax: orange brown, with black patches. Scutellum with trifurcate brown patch, pale yellow on tip.

Wing: Slightly smoky, dark on anterior margin.

Legs: All femora partly dark brown. Midleg tibia subapically with 3-4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with brown patches submedially; third to fifth tergites each with medially slightly protruded, brown band on posterior margin and 1 pair of yellow patches laterally; sixth tergite nearly



Figs. 36–40. *Phortica (Phortica) expansa* Chen & Toda, new species, male: 36, sixth tergite in ventral view; 37, epandrium and cercus in lateral view; 38, surstylus in frontal view; 39, tenth sternite and additional plate in frontal view; 40, hypandrium, gonopod, paramere and aedeagus in lateral view.

entirely black except yellow medial line, with expanded lobe on lateral margin (Fig. 36).

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with ca. 14 setae on dorsal to posterolateral portion per side (Fig. 37). Surstylus with pubescence basally and several wedge-shaped prenisetae on apical margin to inner surface (Fig. 38). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 39). Posterolateral lobe of hypandrium undeveloped. Paramere expanded distally, pubescent on and around proximal process; apical process with 1 sensillum; medial process with 1 sensillum and 1 tooth (Fig. 40). Vertical process of gonopods apically with ca. 3-5 sclerotized projections per side (Fig. 40). Aedeagus with 2 pairs of bridges; ventral bridge slightly expanded apically (Fig. 40).

Female: Unknown.

Measurements: BL = 4.18 mm in holotype (range in 2 male paratypes: 4.07-4.20); ThL = 1.88 mm (1.84-1.86); WL = 3.20 mm (3.13-3.20); WW = 1.32 mm (1.30-1.36).

Indices: arb = 4-5/2-3 (4-5/2-3), avd = 0.80 (0.80), adf = 1.50 (1.30-1.50), flw = 1.40 (1.40-1.50), FW/HW = 0.45 (0.40-0.45), ch/o = 0.06 (0.06), prorb = 1.10 (1.00-1.04), rcorb = 0.50 (0.40-0.50), vb = 0.30 (0.30-0.35), dcl = 0.60 (0.50-0.60),

presctl = 0.65 (0.60-0.65), sctl = 1.00 (1.00-1.10), sterno = 0.90 (0.90-0.95), orbito = 1.45 (1.40-1.45), dcp = 0.25 (0.25), sctlp = 1.00 (1.00-1.05), C = 2.14 (2.10-2.16), 4c = 2.10 (1.91-2.10), 4v = 3.70 (3.46-3.65), 5x = 1.22 (1.13-1.26), ac = 4.20 (4.20-4.46), M = 0.60 (0.68-0.82), C3F = 0.67 (0.70-0.76).

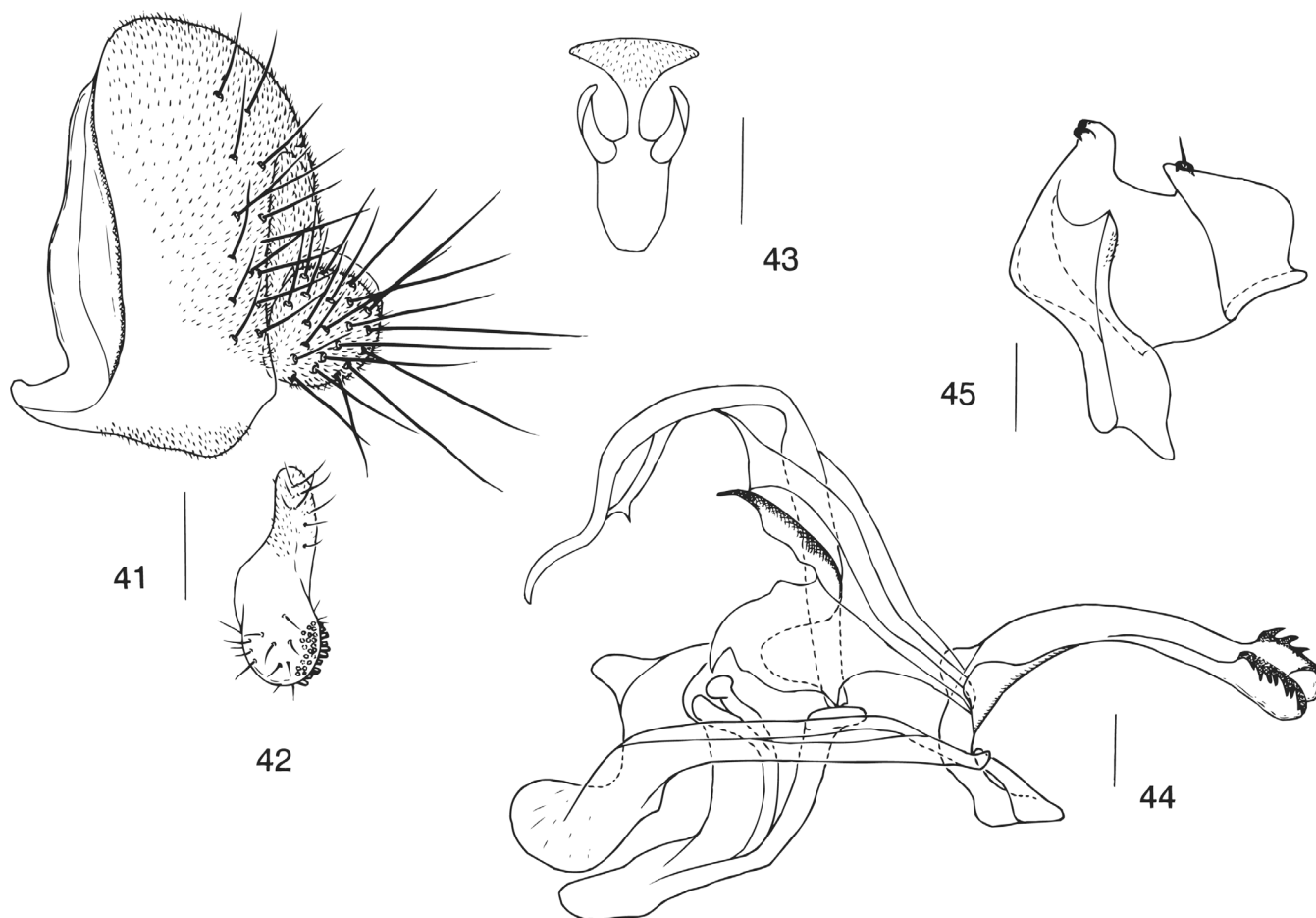
Etymology. – From the Latin word “expansus”, referring to the distally expanded paramere.

Distribution. – Malaysia (Sabah).

Remarks. – This species is very similar to *P. (P.) subradiata* (Okada, 1977) in the paramere expanded distally, but can be distinguished from it by the aedeagal median rod (in *P. subradiata*, based on 3 male specimens from the type locality of Taiwan, China: aedeagal median rod subbasally with 1 pair of symmetric processes; flap of aedeagal basal bridge not so large, with 2-4 acute projections).

***Phortica (Phortica) kinabalensis* Chen & Toda, new species**
(Figs. 41–45)

Diagnosis. – Aedeagal median rod submedially with slender, apically asymmetric, slightly sclerotized process (Fig. 44); aedeagal basal bridge with long, sclerotized, apically pointed projection



Figs. 41–45. *Phortica (Phortica) kinabalensis* Chen & Toda, new species, male: 41, epandrium and cercus in lateral view; 42, surstylus in frontal view; 43, tenth sternite and additional plate in frontal view; 44, hypandrium, gonopod and aedeagus in lateral view; 45, paramere in lateral view.

anteroventrally, and large flap bearing 2 small acute projections antero- and mediodorsally (Fig. 44).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Park Headquarters, Mt. Kinabalu, Sabah, coll. M. J. Toda, 2 Oct. 1999 (KPSP). Paratypes: MALAYSIA: Mahua, Crocker Range, Sabah, 2 males (terminalia dissected), coll. M. J. Toda, 16 Oct. 1999 (SEHU, ITBC).

Description. – Male. Head: Frons brown on upper half, dark brown on lower half.

Thorax: Orange yellow. Scutellum with trifurcate dark brown patch, pale yellow on tip.

Wing: Hyaline.

Legs: Foreleg femur only partly brown. Midleg tibia subapically with 3-4 longer setae on anterior surface.

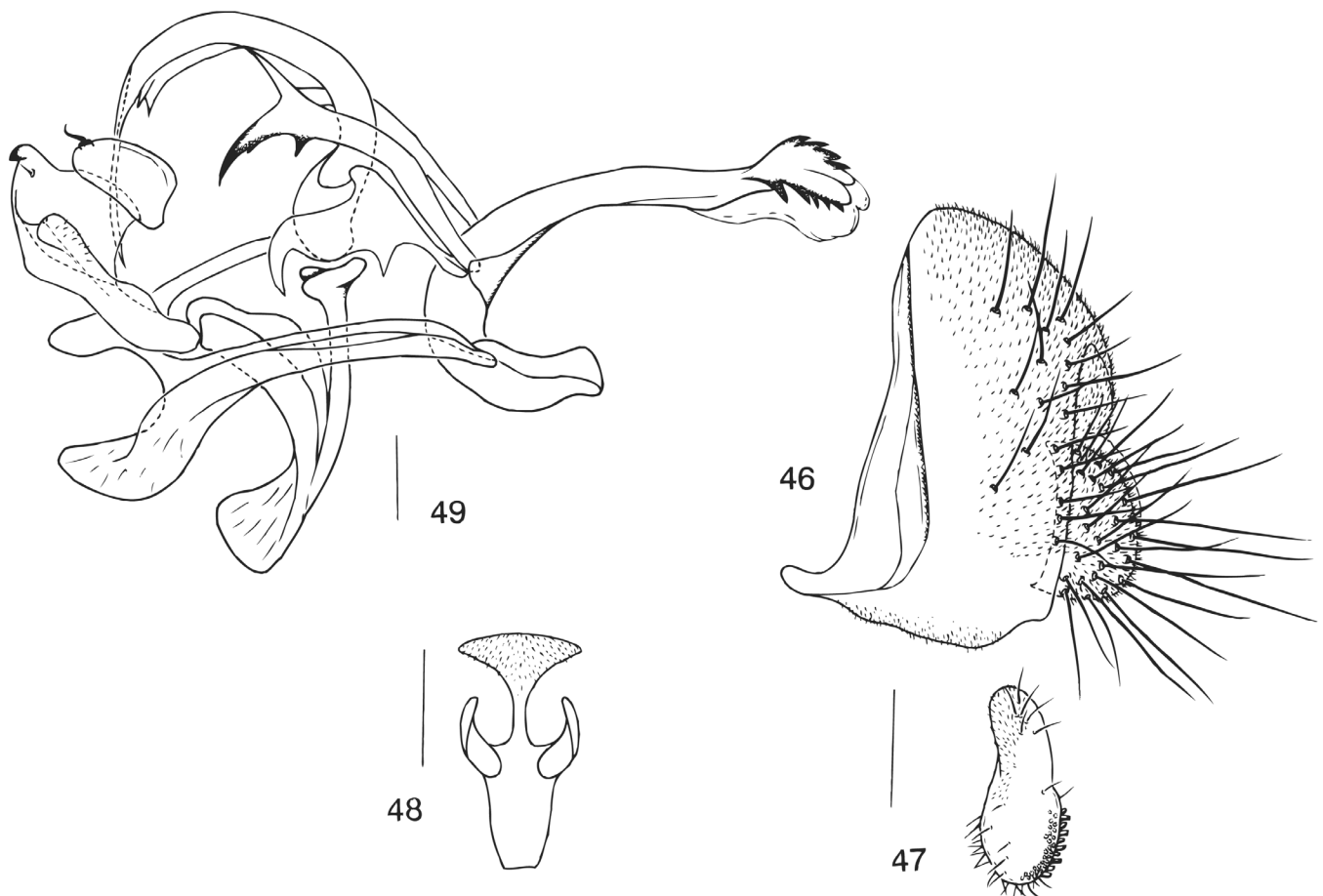
Abdomen: First to fifth tergites yellow; second tergite with brown patches submedially; third to fifth tergites each with medially slightly protruded, brown band on posterior margin and 1 pair of yellow patches laterally; sixth tergite nearly entirely dark except yellow medial line, with expanded lobe on lateral margin.

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with ca. 15 setae on dorsal to posterolateral portion per side (Fig. 41). Surstylus with pubescence basally and several wedge-shaped prenisetae on apical margin to inner surface (Fig. 42). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 43). Posterolateral lobe of hypandrium undeveloped. Paramere expanded distally; apical process with 1 sensillum; medial process with 2 teeth; proximal process pubescent (Fig. 45). Vertical process of gonopods apically with 4-6 sclerotized projections per side (Fig. 44). Aedeagus with 2 pairs of bridges; ventral bridge slender, apically somewhat truncate (Fig. 44).

Female: Unknown.

Measurements: BL = 3.80 mm in holotype (range in 2 male paratypes: 3.68-4.10); ThL = 1.92 mm (1.72-1.88); WL = 2.80 mm (2.68-3.00); WW = 1.40 mm (1.20-1.40).

Indices: arb = 5/2-3 (4-5/2-3), avd = 0.60 (0.70), adf = 1.90 (1.80), flw = 1.60 (1.65-1.70), FW/HW = 0.38 (0.40), ch/o = 0.06 (0.06), prorb = 1.00 (1.10-1.20), rcorb = 0.40 (0.40), vb = 0.45 (0.45), dcl = 0.60 (0.60), presctl = 0.70 (0.70), sclt = 1.10 (1.10), sterno = 1.00 (0.90-0.95), orbito = 1.50 (1.45-1.60), dcp = 0.25 (0.24-0.26), scltp = 1.10 (1.10), C = 2.25 (2.11-2.15), 4c = 1.54 (1.67-1.73), 4v = 2.69 (3.00-3.08), 5x = 1.13 (1.13-1.14), ac = 4.00 (3.80-4.00), M = 0.69 (0.73-0.75), C3F = 0.70 (0.68-0.70).



Figs. 46–49. *Phortica (Phortica) palmata* Chen & Toda, new species, male: 46, epandrium and cercus in lateral view; 47, surstylus in frontal view; 48, tenth sternite and additional plate in frontal view; 49, hypandrium, gonopod, paramere and aedeagus in lateral view.

Etymology. – Pertaining to the type locality.

Distribution. – Malaysia (Sabah).

Remarks. – This species is similar to *P. (P.) expansa* in the morphology of aedeagus, but can be distinguished from it by the diagnostic characters.

***Phortica (Phortica) palmata* Chen & Toda, new species**
(Figs. 46–49)

Diagnosis. – Aedeagal median rod submedially with slender, apically somewhat asymmetric process (Fig. 49); aedeagal ventral bridge slender, apically largely bifurcated, sometimes with 1 or 2 small acute projections on dorso-subapical margin; aedeagal basal bridge with flap bearing 1 large and 1 small acute projections antero- and mediodorsally, respectively (Fig. 49).

Material examined. – Holotype male, MALAYSIA: Poring, Sabah, coll. M. J. Toda, 30 Dec.1998 (KPSP). Paratypes: MALAYSIA: 3 males, same data as holotype except for 17 Mar.1999 (terminalia dissected, KPSP), 24 Mar.1999 (ITBC), 3 Oct.1999 (SEHU); Ulu Senagang, Crocker Range, Sabah, 4 males (1 male terminalia dissected), coll. M. J. Toda, 18 Oct.1999 (FRIM, KPSP, SCAU, ITBC).

Decription. – Male. Head: Frons brown on upper half, dark brown on lower half.

Thorax: Orange yellow. Scutellum with trifurcate brown patch, pale yellow on tip.

Wing: Hyaline.

Legs: All femora partly brown. Midleg tibia subapically with 3–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with brown patches submedially; third to fifth tergites each with medially slightly protruded, brown band on posterior margin and 1 pair of yellow patches laterally; sixth tergite nearly entirely dark except yellow medial line, with expanded lobe on lateral margin.

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with ca. 18 setae on dorsal to posterolateral portion per side (Fig. 46). Surstylus with pubescence basally and several wedge-shaped prenisetae on apical margin to inner surface (Fig. 47). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 48). Posterolateral lobe of hypandrium undeveloped. Paramere expanded distally; apical process with 1 sensillum; medial process with 1 sensillum and 1 tooth; proximal process pubescent (Fig. 49). Vertical process of gonopods apically with 4–5 sclerotized projections per side (Fig. 49). Aedeagus with 2 pairs of bridges (Fig. 49).

Female: Unknown.

Measurements: BL = 3.60 mm in holotype (range in 4 male paratypes: 3.40–4.18); ThL = 1.84 mm (1.64–1.88); WL = 3.13 mm (2.64–3.20); WW = 1.36 mm (1.20–1.32).

Indices: arb = 4/2–3 (4–6/2–3), avd = 0.80 (0.80), adf = 1.50 (1.30–1.80), flw = 1.40 (1.50–1.60), FW/HW = 0.45 (0.40–0.45), ch/o = 0.06 (0.06), prorb = 1.10 (1.00–1.15), rcorb = 0.50 (0.40–0.50), vb = 0.30 (0.30–0.35), dcl = 0.60 (0.50–0.55), presctl = 0.65 (0.55–0.65), sctl = 1.00 (1.10–1.20), sterno = 0.90 (0.90–0.95), orbito = 1.45 (1.40–1.50), dcp = 0.25 (0.24–0.25), sctlp = 1.00 (0.95–1.00), C = 2.14 (2.10–2.25), 4c = 2.10 (1.50–1.91), 4v = 3.70 (2.73–3.46), 5x = 0.67 (0.88–0.89), ac = 4.20 (3.60–4.20), M = 0.60 (0.58–0.73), C3F = 0.67 (0.67–0.76).

Etymology. – From the Latin word “palmatus”, meaning palm, referring to the palm-shaped vertical process of gonopods.

Distribution. – Malaysia (Sabah).

Remarks. – This species is very similar to *P. (P.) kinabalensis* in the morphology of male terminalia, especially of the aedeagal basal bridge, but can be distinguished from it by the diagnostic characters.

***Phortica (Phortica) pasohensis* Chen & Toda, new species**
(Figs. 50–53)

Diagnosis. – Aedeagal median rod subbasally with single, apically symmetrically bifurcated process (Fig. 53); aedeagal ventral bridge distally expanded (Fig. 53); aedeagal basal bridge with small flap bearing 2 acute projections anteriorly and medioventrally (Fig. 53).

Material examined. – Holotype male, MALAYSIA: Pasoh, Selangor, Malaya, coll. N. Osawa, 2–9 May.1995 (FRIM).

Decription. – Male. Thorax: Orange yellow. Scutellum with trifurcate brown patch, pale yellow on tip.

Wing: Hyaline.

Legs: All femora partly brown. Midleg tibia subapically with 2–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with brown patches submedially; third to fifth tergites each with medially slightly protruded, brown band on posterior margin and 1 pair of yellow patches laterally; sixth tergite nearly entirely dark except yellow medial line, with expanded lobe on lateral margin.

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with ca. 12 setae on dorsal to posterolateral portion per side (Fig. 50). Surstylus with pubescence basally and several wedge-shaped prenisetae on apical margin to inner surface (Fig. 51). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 52). Posterolateral lobe of hypandrium undeveloped.

Paramere expanded distally, pubescent between medial and proximal processes; apical process with 1 sensillum; medial process with 1 sensillum and 2 teeth (Fig. 53). Vertical process of gonopods apically with 4-5 sclerotized projections per side (Fig. 53). Aedeagus with 2 pairs of bridges (Fig. 53).

Female: Unknown.

Measurements: BL = 3.47 mm in holotype; ThL = 1.76 mm; WL = 2.60 mm; WW = 1.24 mm.

Indices: arb = 5-6/3-4, avd = 0.60, adf = 1.80, flw = 1.70, FW/HW = 0.38, ch/o = 0.06, prorb = 1.10, rcorb = 0.45, vb = 0.45, dcl = 0.65, presctl = 0.70, sctl = 1.05, sterno = 0.85, orbito = 1.40, dcp = 0.23, sctlp = 1.10, C = 1.90, 4c = 1.67, 4v = 2.67, 5x = 1.33, ac = 4.00, M = 0.67, C3F = 0.70.

Etymology. – Pertaining to the type locality.

Distribution. – Malaysia (Malaya).

Remarks. – This species is very similar to *P. (P.) expansa* in the morphology of male terminalia, but can be distinguished from it by the diagnostic characters.

***Phortica (Phortica) membranifera* Chen & Toda,
new species
(Figs. 54–57)**

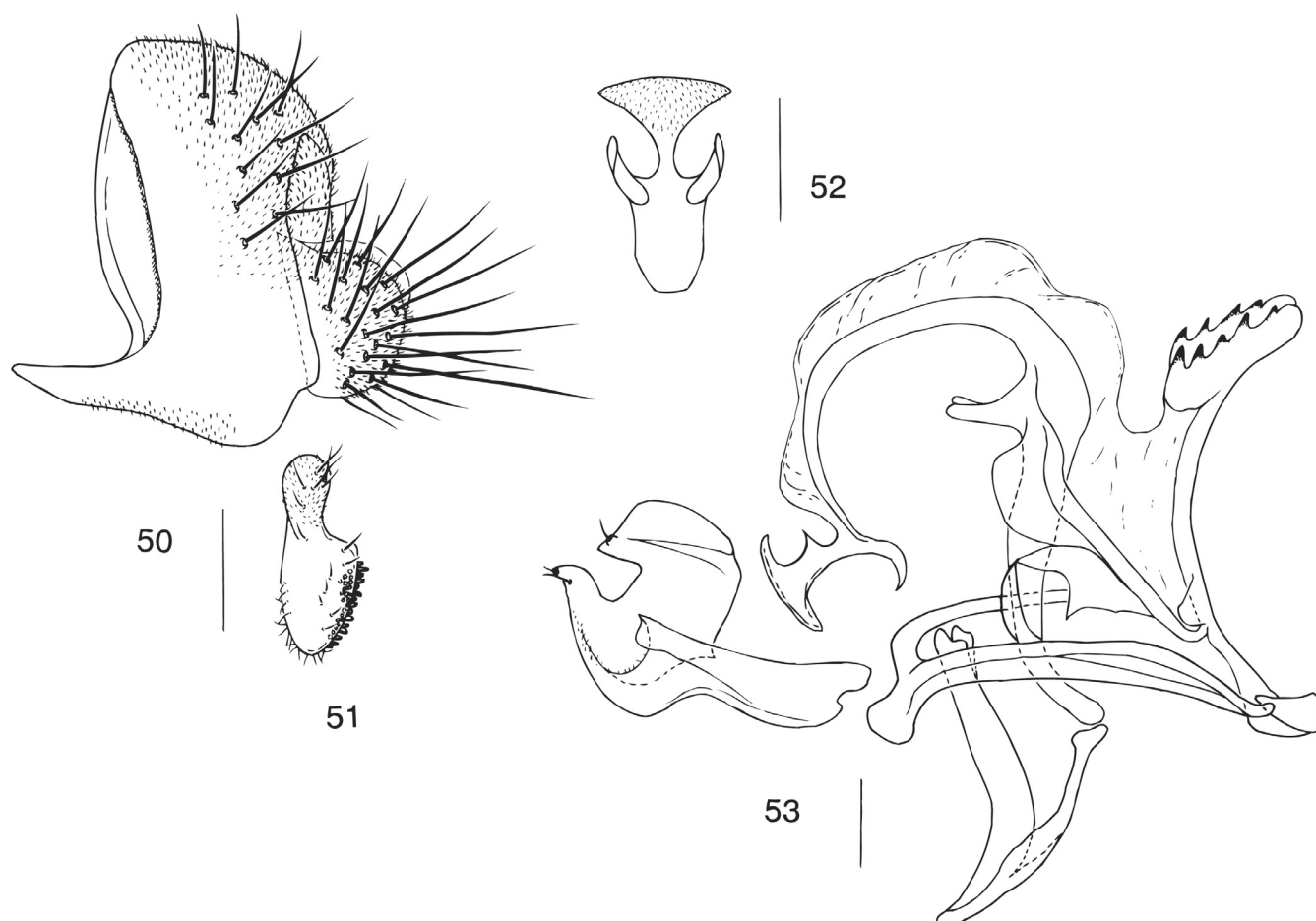
Diagnosis. – Vertical process of gonopods with 2 pairs of strongly sclerotized processes connected to each other with membrane: processes of the posterior pair apically fused together (Fig. 57); aedeagal ventral bridge strongly sclerotized, elongated to tip of aedeagal median rod, pointed apically, with large pointed flap submedially (Fig. 57); aedeagal median rod slightly sclerotized proximally, with bipartite lobe apically (Fig. 57).

Material examined. – Holotype male (terminalia dissected), MALAYSIA: Ulu Senagang, Crocker Range, Sabah, on fallen logs, coll. M. J. Toda, 18 Oct.1999 (KPSP). Paratypes: 3 males, same data as holotype (KPSP, SEHU, ITBC).

Description. – Male. Head: Frons dark brown on upper half, brown on lower half.

Thorax: Orange yellow. Scutellum with trifurcate brown patch, pale yellow on tip.

Wing: Slightly smoky on anterior margin.



Figs. 50–53. *Phortica (Phortica) pasohensis* Chen & Toda, new species, male: 50, epandrium and cercus in lateral view; 51, surstylus in frontal view; 52, tenth sternite and additional plate in frontal view; 53, hypandrium, gonopod, paramere and aedeagus in lateral view.

Legs: All femora dark brown except apical portion. Midleg tibia subapically with 3–4 longer setae on anterior surface.

Abdomen: First to fifth tergites yellow; second tergite with brown patches submedially; third to fifth tergites each with medially slightly protruded, brown band on posterior margin and 1 pair of yellow patches laterally; sixth tergite nearly entirely dark except yellow medial line, with expanded lobe on lateral margin.

Male terminalia: Epandrium pubescent anteroventrally and dorsomedially, with 13–14 setae on dorsal to posterolateral portion per side (Fig. 54). Surstylus with pubescence subbasally and several wedge-shaped prensisetae on apical margin to inner surface (Fig. 55). Additional plate between cerci and 10th sternite pubescent, medially connected to 10th sternite (Fig. 56). Posterolateral lobe of hypandrium undeveloped. Paramere medially pubescent; apical process slender, with 1 tooth; median process with 1 sensillum and 3 teeth; proximal process round apically (Fig. 57). Aedeagus with 2 pairs of bridges; basal bridge looped (Fig. 57).

Female: Unknown.

Measurements: BL = 4.02 mm in holotype (range in 3 male paratypes: 4.20–4.60); ThL = 2.00 mm (2.00–2.16); WL =

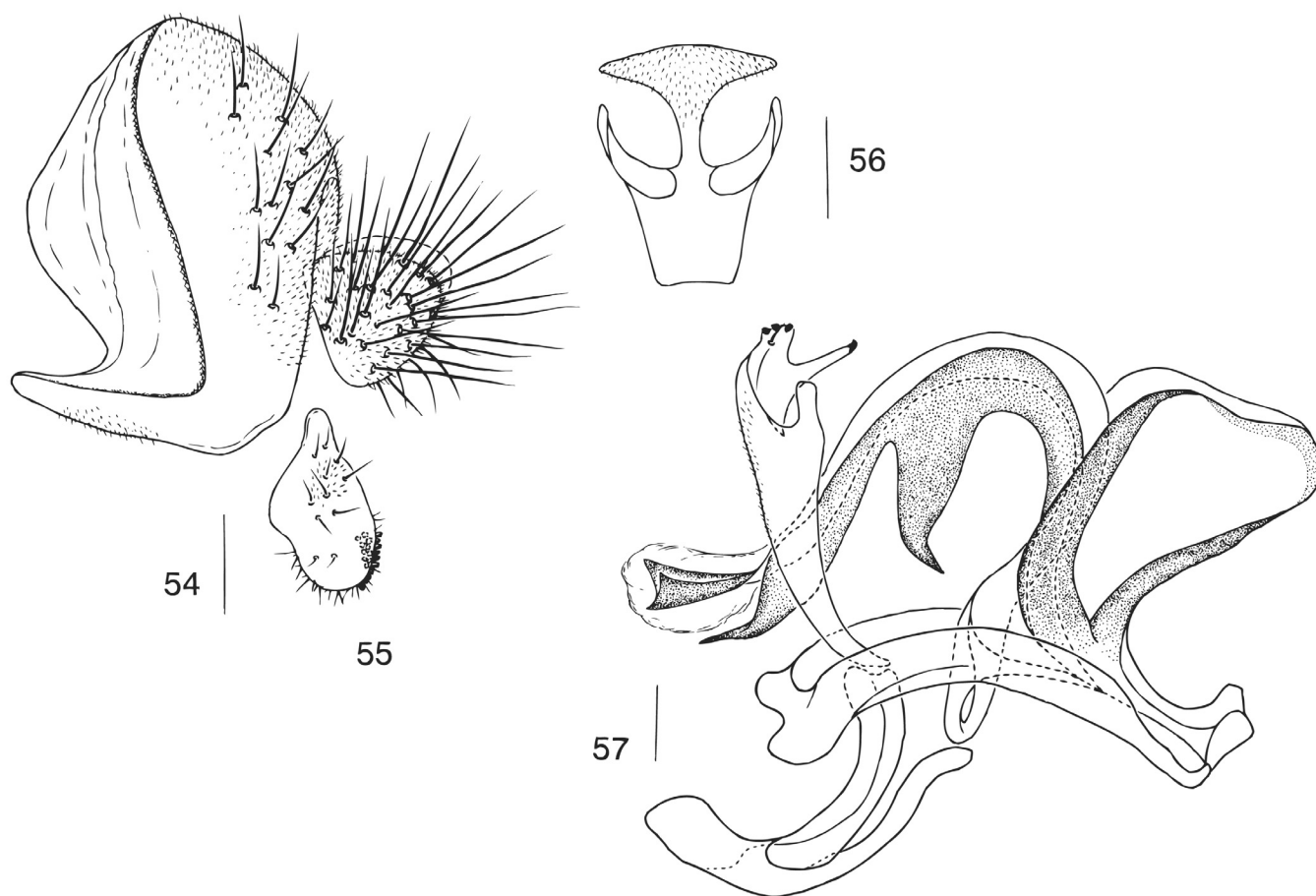
3.12 mm (3.04–3.16); WW = 1.32 mm (1.32–1.44).

Indices: arb = 4–5/2–3 (5–6/2–3), avd = 0.50 (0.50–0.55), adf = 1.85 (1.80–1.90), flw = 1.50 (1.40–1.55), FW/HW = 0.40 (0.35–0.40), ch/o = 0.06 (0.06–0.07), prorb = 1.00 (1.05–1.10), rcorb = 0.50 (0.45–0.50), vb = 0.30 (0.35–0.40), dcl = 0.60 (0.60), presctl = 0.80 (0.70–0.75), sctl = 1.10 (1.05–1.10), sterno = 0.90 (0.90–0.95), orbito = 1.60 (1.55–1.65), dcp = 0.23 (0.22–0.23), sctlp = 1.10 (1.00–1.10), C = 2.19 (2.25–2.37), 4c = 1.62 (1.43–1.46), 4v = 2.92 (2.67–2.86), 5x = 0.89 (0.78–0.80), ac = 4.20 (3.33–3.80), M = 0.62 (0.50–0.57), C3F = 0.71 (0.74–0.75).

Etymology. – From the Latin word “membranifer”, referring to the vertical process of gonopods partly membranous.

Distribution. – Malaysia (Sabah).

Remarks. – This species is somewhat similar to *P. (P.) lambda* (Toda & Peng, 1990) from China in having the vertical process of gonopods partly sclerotized, but can be distinguished from it by the aedeagal median rod (in *P. lambda*: ventral bridge between aedeagus and gonopods not reaching to tip of aedeagal median rod, without submedial branch; aedeagal median rod entirely sclerotized, with 1 process subapically and 1 pair of long lateral processes submedially).



Figs. 54–57. *Phortica (Phortica) membranifera* Chen & Toda, new species, male: 54, epandrium and cercus in lateral view; 55, surstylus in frontal view; 56, tenth sternite and additional plate in frontal view; 57, hypandrium, gonopod, paramere and aedeagus in lateral view.

Key to the species of the subgenus *Phortica* from Malaysia

1. Interfrontal setae thick and dense; additional plate between cerci and 10th sternite absent; paramere rod-shaped, basally mostly projected and with a few sensilla, apically usually knobbed (the *foliiseta* species-complex) 2
 - Interfrontal setae thin and rare; additional plate between cerci and 10th sternite present; paramere apically with a few sensilla 3
2. Surstylus with only 2–3 prenisetae; vertical process of gonopods nearly entirely sclerotized apically; aedeagal outer membrane with minute warts *P. (P.) nigrifoliiseta* (Takada et al.)
 - Surstylus with ca. 11 prenisetae; vertical process of gonopods slightly sclerotized; aedeagal outer membrane with numerous, weakly sclerotized, small triangle processes *P. (P.) tanabei* Chen & Toda
3. Surstylus with strong spine(s); additional plate between cerci and 10th sternite lacking pubescence, separated from 10th sternite (the *magna* species-complex) *P. (P.) alpha* Chen & Toda, new species
 - Surstylus without strong spine; additional plate between cerci and 10th sternite pubescent, and connected to 10th sternite.... 4
4. Paramere deeply bifurcated from base (the *omega* species-complex); male sixth tergite with single prickly projection curved anteriorly at anteroventral corner; lateral process of paramere narrower than and ca. 2/3 as long as apical one, apically with 1 sensillum and 1 black spine *P. (P.) ni* Chen & Toda, new species
 - Paramere not bifurcated from base 5
5. Paramere tripartite distally 6
 - Paramere not tripartite distally 13
6. Paramere: basal process with tooth or sensillum; median process tongue- or finger-shaped, without tooth or sensillum 7
 - Paramere: basal process tongue- or finger-shaped; median process apically with tooth and sensillum 9
7. Aedeagal median rod lacking projections *P. (P.) gombakana* (Takada & Momma)
 - Aedeagal median rod with apically pointed projection(s) ... 8
8. Aedeagal median rod subapically and submedially with 1 pair of small and 1 pair of long, apically bifurcated projections, respectively *P. (P.) jamilii*, new species
 - Aedeagal median rod submedially with 2 pairs of apically unbifurcated projections *P. (P.) lieui* Chen & Toda, new species
9. Vertical process of gonopods broad, largely membranous except for medial and lateral, strongly sclerotized portions; aedeagal ventral bridge strongly sclerotized, elongated to tip of aedeagal median rod, pointed apically, with large branch submedially .. *P. (P.) membranifera* Chen & Toda, new species
 - Vertical process of gonopods basally to submedially narrow and evenly sclerotized 10
10. Aedeagal basal bridge with somewhat triangular flap acutely pointed only anterodorsally *P. (P.) expansa* Chen & Toda, new species
 - Aedeagal basal bridge with flap acutely pointed antero- and mediodorsally 11
11. Aedeagal median rod with subbasal process *P. (P.) pasohensis* Chen & Toda, new species
 - Aedeagal median rod with submedial process 12
12. Aedeagal basal bridge with long, sclerotized, apically pointed projection anteroventrally; ventral bridge apically somewhat truncate *P. (P.) kinabalensis* Chen & Toda, new species
 - Aedeagal basal bridge without long projection anteroventrally; ventral bridge apically largely bifurcated *P. (P.) palmata* Chen & Toda, new species
13. Anepisternum lacking setulae; paramere lacking pubescence; aedeagal median rod apically with distinct asymmetric bifurcation, subapically expanded and with minute warts on surface *P. (P.) epsilon* Chen & Toda, new species
 - Anepisternum with setulae 14
14. Paramere medially not expanded, distally pubescent; aedeagal median rod with knot subapically; anterior branch of aedeagal basal bridge with ca. 10 acute projections along margin *P. (P.) lanuginosa* Chen & Toda, new species
 - Paramere medially much expanded, submedially pubescent; aedeagal median rod much expanded subapically; aedeagal basal bridge without small acute projections *P. (P.) zeta* Chen & Toda, new species

A note on the species richness of the subgenus *Phortica* in the world

Table 1 summarizes the number of *Phortica* sensu stricto species recorded from the biogeographic regions of the world. The total number of species is now 96, including the 12 new species reported in this study. The species richness of the Oriental Region is extraordinarily high, corresponding to about 80% (77 spp.) of the world's total. The second richest region is the adjoining Eastern Palearctic which has only nine species. Less than five species have been recorded from each of the other regions. The species richness within the Oriental and Eastern Palearctic Regions is shown separately for each climatic zone and each area for which the *Phortica* sensu stricto fauna is relatively well explored. The subtropical zone is the richest (56 spp.) with high species diversity (11 to 28 spp.) in lower and higher mountain forests. It is noteworthy that the species richness (14 spp.) in lower mountain forests on Mt. Kinabalu (including the Crocker Range) corresponds to the area species diversity in the subtropical zone, although the knowledge of the *Phortica* sensu stricto fauna is still limited for the tropical zone. This may suggest some faunal relationships of this subgenus between tropical highlands and subtropical areas in the Oriental Region. However, a detailed discussion on this issue awaits phylogenetic analyses on the relationships between different biogeographic and climatic elements of this subgenus.

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