A NEW BLACKFLY SPECIES OF SIMULIUM (GOMPHOSTILBIA) FROM JAVA, INDONESIA (DIPTERA: SIMULIIDAE)

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Abstract: A new blackfly species, Simulium (Gomphostilbia) parahiyangum sp. nov. is described based on the female, male, pupal and larval specimens collected from Java. This new species is very distinctive among the Gomphostilbia species in possessing prominent dorsal protuberances on abdominal segments 1-5 and a deep postgenal cleft reaching the hypostomium in the larval stage. By the number of antennal segments (11 vs. 10) the male of this species is easily distinguished from that of S. (G.) varicorne Edwards, 1927 reported from Sumatra, to which the larva and pupa of this species had been once thought to be conspecific.

INTRODUCTION

The Simuliidae of the Sunda Islands has not been studied since Edwards (1934) described 11 new species from Sumatra, Java and Bali, making a total of 19 taxa (including two subspecies) for this archipelago.

Our recent preliminary survey on the blackflies in East and West Java yielded a total of 16 species of Simulium Latreille s. l. including several new species, of which two belonging to the subgenus Simulium Latreille s. str. have already been described (Takaoka and Hadi, 1991). This paper describes one new blackfly species of the subgenus Gomphostilbia Enderlein.

The classification follows that of Crosskey (1969). Collecting and rearing methods, as well as dissection of anatomical parts for description, were mentioned in Takaoka (1983).

DESCRIPTION

Simulium (Gomphostilbia) parahiyangum sp. nov.

Female. Body length 1.8 mm. Head slightly narrower than width of thorax. Frons brownish, whitish grey pruinose, densely covered with whitish yellow recumbent pubescence except middle longitudinal portion narrowly bare; frontal ratio (i.e., ratio of the greatest width at vertex, the narrowest near antennal base, and the height of the frons) 1.7:1.0:1.8.

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Frons-head ratio (i.e., ratio of the greatest width of the frons against that of head) 1.0:3.9.

Clypeus brownish black, whitish grey pruinose, and densely covered with whitish yellow pubescence interspersed with several dark hairs. Antenna composed of 2 + 9 segments, brownish black except scape and pedicel (in one female, base of 1st flagellar segment too) yellow. Maxillary palp composed of 5 segments with proportional length of 3rd, 4th and 5th segments being 1.0:1.1:2.3; 3rd segment not so enlarged, but sensory vesicle (Fig. 1) enlarged, 0.6× as long as 3rd segment and with its opening on distal 1/3. Maxilla with 14 inner and 15 outer teeth. Mandible with ca. 30 small inner teeth and devoid of outer ones. Cibarium with heavily sclerotized arms but without any denticles medially. Thorax. Scutum brownish black in ground colour, thinly whitish grey pruinose, with three dark longitudinal lines which are distinct when viewed anterodorsally; scutum densely covered with whitish yellow recumbent pubescence. Scutellum brown with whitish yellow pubescence as well as long upstanding dark hairs along posterior margin. Postscutellum brownish black, whitish grey pruinose and bare. Pleural membrane bare. Katepisternum brownish black, whitish grey pruinose, with numerous pale and dark hairs, and longer than deep; sulcus distinct. Legs. All coxae and trochanters yellow except mid and hind coxae brown. All femora yellow, somewhat darkened distally and brown on distal cap. All tibiae yellow to dark yellow on basal 2/3, brown on distal 1/3, and with subbasal dark spot. Fore tarsi brownish black. Mid and hind tarsi brown except basal 1/3 of mid basitarsus, basal 2/3 of hind basitarsus and basal 1/2 of hind 2nd tarsal segment yellowish. Fore basitarsus slightly dilated, ca. 5.9× as long as its greatest width. Hind basitarsus (Fig. 3) slender, parallel-sided. Calcipala (Fig. 3a) moderately developed, nearly as long as wide, and ca. 0.6× width of basitarsal tip. Pedisulcus also distinct at basal 1/3 of 2nd tarsal segment. Claws (Fig. 3b) each with large basal tooth which is 1/2× as long as claw. Wing. Length 1.7 mm. Costa with spinules as well as hairs. Subcosta haired. Tuft hairs at base of stem vein dark brown. Basal portion of radius fully haired. Abdomen. Basal scale yellow with a fringe of pale yellow hairs. Dorsal surface of abdomen brown to brownish black except that of 2nd segment entirely pale yellow; tergite of 2nd segment whitish pruinose; tergites of 6th, 7th and 8th segments wide and shiny. Genitalia. Sternite 8 (Fig. 5a) bare medially, and with ca. 18 dark macrosetae on each side. Anterior gonapophyses (Fig. 5b) thin, membraneous, rounded posteriorly, covered densely with microsetae except posterointernal margins narrowly bare, and with a few short setae near anterior border; inner margins well sclerotized. Genital fork (Fig. 5c) of usual reversed-Y form, with arms each produced inwards to some extent but lacking any projection directed forwards. Paraproct (Figs. 6 and 7) of usual form, and with ca. 12 macrosetae ventrally and laterally. Cercus (Fig. 7) short, 1/2× as long as wide, rounded posteriorly, when viewed laterally, and covered with ca. 14 macrosetae on outside surface. Spermatheca (Fig. 5d) oblong, well sclerotized except small adjacent area near tubal juncture unsclerotized.

Male. Body length 1.8 mm. Head slightly wider than width of thorax. Upper eye consisting of 17 vertical colums and 15 horizontal rows of large facets. Clypeus brownish black, whitish pruinose, and covered densely with yellow pubescence interspersed with dark hairs. Antenna composed of 2 + 9 segments, dark brown except scape and pedicel yellow; 1st flagellar segment elongated, 2× as long as 2nd flagellomere. Maxillary palp with 5 segments; proportional length of 3rd, 4th and 5th segment 1.0:1.1:2.3; sensory vesicle (Fig. 2) small, ca. 0.17× as long as 3rd segment and with very small opening distally. Thorax. Scutum brownish
Figs. 1-14  Adult of S. (G.) parahiyangum sp. nov.: 1 and 2, 3rd segments of maxillary palp showing sensory vesicle in front view (1, female; 2, male); 3 and 4, hind legs (3, female; 4, male—a, calcipala; b, claw); 5-7, female genitalia (5, 8th sternite (a), anterior gonapophysis (b), genital fork (c) and spermatheca (d) in ventral view; 6 and 7, paraprocts and cerci in ventral view (6) and in lateral view (7)); 8-14, male genitalia (8, coxite (a), style (b) and ventral plate (c) in ventral view; 9 and 10, styles viewed mediolaterally (9) and ventrolaterally (10); 11 and 12, ventral plates viewed laterally (11) and posteriorly (12); 13, paramere with 3 distinct parameral hooks; 14, median sclerite).
black, entirely whitish pruinose in certain angle of light and densely covered with bright yellow recumbent pubescence. Scutellum brownish black, with bright yellow pubescence and several long marginal hairs. Postscutellum brownish black, whitish pruinose, and bare. Pleural membrane and katepisternum as in female. 

**Legs.** Mostly brown to brownish black except hind trochanter, base of hind femur and tibia, basal 2/3 of hind basitarsus and basal 1/2 of hind 2nd tarsal segment whitish yellow. Fore basitarsus slender, ca. 6.9× as long as its greatest width. Hind tibia (Fig. 4) subequal to hind femur in greatest width. Hind basitarsus (Fig. 4) slender, parallel-sided. Calcipala (Fig. 4a) well developed, 1.2× as long as wide, and 0.65× as wide as basitarsal tip. Pedisulcus well developed. 

**Wing.** Length 1.6 mm. Other features as in female except subcosta bare. **Abdomen.** Basal scale dark brown and its hair fringe dark basally and pale distally. Dorsal surface of abdominal segments brownish black except that of 2nd segment brown, and covered with short hairs; a pair of dorsolateral whitish pruinose patches on segments 2, 6 and 7. **Genitalia.** Coxite (Fig. 8a) nearly rectangular in ventral view, ca. 1.6× as long as wide. Style (Figs. 8b, 9 and 10) much shorter than coxite, gently curved inwards and without apical spine. Ventral plate (Fig. 8c, 11 and 12) flat, with microsetae almost entirely on ventral surface but only medially on posterior surface. Paramere (Fig. 13) with 3 long parameral hooks and a few small, indistinct ones. Median sclerite (Fig. 14) plate-like, with widened tip.

**Pupa.** Body length (excluding gill filaments) 2.0 mm. **Head and thorax.** Integument yellowish brown, covered densely with cone-shaped tubercles. Antennal sheath (Fig. 15) along its length with 9 well marked ridges on outer margin, each covered with several cone-shaped tubercles. Head with 1 facial and 3 frontal pairs of simple long trichomes. Thorax with 5 pairs of simple long trichomes on anterior 1/2. Gill (Fig. 16) with 8 slender greyish brown filaments arranged in 3 groups, i.e., upper and middle triplets and 1 lower pair; all filaments very short (ca. 0.7 mm), subequal in length and thickness to one another, with numerous transverse furrows becoming indistinct towards apex, and covered with minute tubercles. **Abdomen.** Terga 1 and 2 slightly darkened, and without tubercles; tergum 1 with a long simple seta on each side, and tergum 2 on each side with 6 simple minute setae, of which 1 seta is longer than others. Terga 3 and 4 each with 4 hooked spines directed forwards along posterior margin, and a short seta medially on each side. Tergum 5 with 5 very minute setae but devoid of spine combs. Terga 6–8 each with spine combs in transverse row, and comb-like groups of very minute spines on each side; terga 6–8 each also with a pair of minute setae on each side; tergum 9 with comb-like groups of minute spines and a pair of simple terminal hooks (Fig. 17). Sterna 4–8 each with comb-like groups of minute spines scattered all over. Sternum 4 with 1 simple slender hook on each side. Sternum 5 with a pair of bifid or trifid hooks situated close together on each side. Sterna 6 and 7 each with a pair of inner bifid or trifid and outer simple hooks widely spaced on each side. Sternum 9 with 3 grapnel-shaped hooks on each side. Cocoon simple, slipper-shaped, moderately woven, extending ventrolaterally, and with thick anterior margin which has no anterior projection.

**Mature larva.** Body length 4.0 mm. Body colour greyish yellow to yellowish brown. Head moderately covered with minute setae; cephalic apotome (Fig. 19) pale on anterior 1/2, somewhat darkened on posterior 1/2 and with negative head spots. Antenna longer than cephalic fan stem, with 4 segments, proportional length of 1st, 2nd and 3rd segments 1.0:0.9:
0.9. Cephalic fan with ca. 30 main rays. Mandible (Fig. 18) with 2 mandibular serrations; comb teeth decreasing in length and thickness from 1st to 3rd tooth. Hypostomium with a...
row of 9 apical teeth, of which corner and median teeth are moderately developed; lateral serration absent; 4 hypostomial setae lying parallel to lateral margin on each side. Postgenal cleft (Fig. 20) deep, widely reaching posterior margin of hypostomium. Histoblast of pupal gill with 8 slender filaments, arranged in 3 + 3 + 2. Thoracic segments densely covered, on dorsal and lateral surfaces, with small dark flat spinules which have several transparent slender branches apically (Fig. 23). Abdominal segments 1–5 each with a dorsal pair of conical protuberances and a dorsolateral pair of rather smaller protuberances (that of segment 5 not well defined) (Figs. 21 and 22) which are covered with a few colorless setae and numerous small dark spinules similar to those on thoracic cuticle; abdominal cuticle, besides on protuberances, covered densely with similar spinules dorsally and laterally except on intersegment spaces; there are also 12–20 black distinct spines scattered dorsally on segments 6–8 (Figs. 21 and 24); colorless setae also present on dorsal and lateral surface of last segment. Rectal gill lobes compound, each lobe with 8–10 finger-like lobules. Anal sclerite of usual X-form, posterior arms a little longer than anterior ones; basal portion of arms widely sclerotized. Ventral papillae well developed. Posterior cirrlet with ca. 74 rows of up to 13 hooks per row.

Type specimens. Holotype ♂ slide-mounted together with its pupal skin and cocoon on glass slide, reared from pupa, taken at foot of Mt. Tangkubanperahu, 6 km north of Bandung, West Java, Indonesia, 30.XII.1990, H. Takaoka. Allotype ♀, slide-mounted, same data as holotype. Paratypes, 3 ♀, 1 ♂, reared from pupae, and 3 mature larvae (all preserved in alcohol except 1 larva slide-mounted), same data as holotype. Holotype ♀, allotype ♂, 1 paratype ♀ and 1 larval paratype will be deposited at the Department of Parasitology and Pathology, Faculty of Veterinary Medicine, Bogor Agricultural University, and 1 ♀ and 1 larval paratype at the Department of Entomology, Bogor Museum of Zoology, Bogor, and other paratypes (1♀, 1♂ and 1 larva) at the Natural History Museum, London.

Distribution. Java.

Ecological note. The pupae and larvae of this species were found on banana leaves and on slender plant roots trailing in the water of a small shaded stream (ca. 1 m wide; ca. 1,000 m in altitude) running down through the sloped field cultivated for tea plantation not far from the northern exit of National Park of Mt. Tangkubanperahu, along the road to Segalaherang. Collected together with this species were S. (G.) batoense Edwards, 1934 and S. (S.) sigiti Takaoka and Hadi, 1991.

DISCUSSION

This new species was named after the Sundanese “parahiyanga” (= remarkable) because its larva is very distinct in possessing prominent dorsal protuberances (Fig. 22) on the abdomen and the deep postgenal cleft (Fig. 20) reaching the hypostomium, a combination of these characters being unusual among the known species of the subgenus Gomphostilbia. There has been no report of any Gomphostilbia species with these peculiar characters except S. (G.) nr. varicorne (only larval stage known) which was collected from Assam (Datta, 1975). The larva of S. (G.) parahiyangum resembles that of S. (G.) nr. varicorne, from which
it is differentiated by the branching method of respiratory filaments as seen in the histoblast (i.e., two triplets plus one pair vs. four pairs). The pupa of S. (G.) *parahiyangum* is characterized by the short slender filaments. In this aspect, this species is similar to S. (G.) *montiblense* Takaoka, 1983 from Palawan Island of the Philippines (Takaoka, 1983), and S. (G.) *darjeelingense* Datta, 1973 from India (Datta, 1973). However, there is a clear difference in the branching method of the respiratory filaments.

The larva and pupa of S. (G.) *parahiyangum* are probably conspecific to those thought as the immature stages of S. (G.) *varicorne* Edwards, 1925 which was known only from the type male specimen collected from Sumatra (Edwards, 1934). Our study showed that Edwards' tentative association was incorrect since the reared adults of S. (G.) *parahiyangum* had a normal antenna composed of 11 segments (not 10 as seen in S. (G.) *varicorne*). The immature stages of S. (G.) *varicorne* may be of different form. In this connection, it should be noted that two Malayan specimens of male adults labelled as S. *varicorne* at the Natural History Museum, in London, had their pupal exuvia with long-stalked respiratory filaments which were apparently different from those of S. (G.) *parahiyangum* (Takaoka, unpublished data).

The male of this new species is similar to S. (G.) *friederichsi* Edwards, 1934 known only from male type specimen taken from Java in having the dark leg coloration and the slender hind basitarsus. The male of S. (G.) *parahiyangum* is easily distinguished from the latter by lacking a distinct terminal spine on the style as well as any pruinose scutal pattern.

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**REFERENCES**


ジャワ島産ナンヨウプロ属の1新種について

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1990年12月から1991年1月にかけて、ジャワ島において吸血性昆虫属の採集調査を行った。得られた標本を検討した結果、数種の新種が含まれていることが分かった。本論文では、プロ属ナンヨウプロ属に属する1新種の記載を行った。本種は、幼虫の頭部腹面のpostgenal cleftが深く、腹部第1節から5節の背面に顕著な瘤様の突起を持つなど、これまでこの属のなかでは見られない珍しい形態的特徴を有する。

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