Description of adults of *Simulium* (*Simulium*) baimaii from Thailand (Diptera: Simuliidae) and its assignment to the *malyschevi* species-group

Hiroyuki TAKAOKA\(^1\) and Wej CHOOCHOTE\(^2\)

\(^1\) Department of Infectious Disease Control, Faculty of Medicine, Oita University, Hasama, Yufu City, Oita, 879-5593 Japan
\(^2\) Department of Parasitology, Faculty of Medicine, Chiang Mai University, Chiang Mai, 50200 Thailand

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Abstract: The adult female and male of *Simulium* (*Simulium*) baimaii originally described from the pupal and larval stages from Thailand are described for the first time. This species is assigned to the *malyschevi* species-group judging from the morphological characteristics of the female and male genitalia, although it has the pupal gill of two carrot-like filaments, a character never before observed in this and other species-groups within the subgenus *Simulium* s. str.

Key words: *Simulium*, black fly, Simuliidae, Thailand, *malyschevi* species-group

*Simulium* (*Simulium*) baimaii was described from the pupal and larval stages from Thailand (Takaoka and Kuvangkadilok, 1999), and has been left unclassified to any of the species-groups within the subgenus *Simulium* Latreille s. str. because its adult stage remained unknown (Takaoka, 2003; Takaoka and Choochote, 2004). Recently, we were able to collect many pupae of this species near the type locality in Loei province, northeastern Thailand, and obtained adult females and males reared from pupae.

In this paper, the female and male of S. (S.) baimaii are described for the first time. In addition, this species is assigned to the *malyschevi* species-group defined by Crosskey and Howard (1997).

The terms for morphological features used here follow those of Takaoka (2003). Adult specimens of the species are deposited at the Department of Infectious Disease Control, Faculty of Medicine, Oita University, Oita, Japan.

*Simulium* (*Simulium*) baimaii
Kuvangkadilok and Takaoka

*Simulium* (*Simulium*) baimaii; Takaoka and Kuvangkadilok, 1999: 507-508 (pupa and mature larva).

DESCRIPTION. Female. Body length 2.3–2.7 mm. **Head.** Narrower than width of thorax. Frons black, shiny, with several dark stout hairs along lateral margins; frontal ratio 1.2–1.3 : 1.0 : 1.1; frons-head ratio 1.0 : 3.4–3.8. Fronto-ocular area (Fig. 1A) well developed, directed laterally. Clypeus black, shiny at certain angle of light, grey pruinose, iridescent at certain angle of light, moderately covered with dark stout hair except medial portion bare. Labrum 0.65–0.71 times as long as clypeus. Antenna composed of 2+9 segments, brownish black except scape, pedicel and base of 1st flagellar segment yellow. Maxillary palp medium to dark brown, composed of 5 segments, proportional lengths of 3rd, 4th, and 5th segments 1.0 : 1.2–1.4 : 2.6–2.9; 3rd segment (Fig. 1B) not enlarged; sensory vesicle (Fig. 1B) of medium size, ellipsoidal, 0.28–0.32 times as long as 3rd segment, with medium-sized round
openings apically. Maxillary lacinia with 12–14 inner and 16 or 17 outer teeth. Mandible with 28–30 inner and 12 or 13 outer teeth. Cibarium (Fig. 1C) with short median projection from posterior margin, and with or without several minute tubercles near posterior margin. 

**Thorax.** Scutum black, unpatterned, shiny, thinly white pruinose at certain angle of light, moderately covered with light to medium brown recumbent fine hairs interspersed with dark long upright hairs on prescutellar area. Scutellum dark brown, shiny, white pruinose, with dark long upright hairs. Postnotum dark brown to brownish-black, shiny, whitish pruinose and bare. Pleural membrane bare. Katepistonum longer than deep, black, whitish-grey pruinose at certain angle of light and bare. 

**Legs.** Foreleg: coxa whitish-yellow; trochanter light brown; femur medium brown with apical cap dark brown except inner surface of basal 1/2 yellowish; tibia light to medium brown with apical cap dark brown, except outer surface of basal 5/6 white and white sheeny when illuminated; tarsus brownish-black, basitarsus moderately dilated, 4.4 times as long as its greatest width. Midleg: coxa dark brown to brownish-black; trochanter medium brown except base yellow; femur dark brown except extreme base yellow; tibia dark brown except posterior surface of basal 1/3 yellowish-white (its border obliquely defined in lateral view), and widely white sheeny on posterior surface.
when illuminated; tarsus yellowish-white except apex of basitarsus, apical 1/3 of 2nd tarsal segment, apical 1/2 of 3rd tarsal segment and entire 4th segment light brown, and 5th segment entirely brownish-black. Hind leg: coxa dark brown to brownish-black; trochanter yellow though partially darkened; femur dark brown with base yellow; tibia dark brown except posterior surface of basal 2/5 to 1/2 yellowish-white (its border obliquely defined in lateral view), and widely white sheeny on posterior surface when illuminated; tarsus yellowish-white except apical 1/4 of basitarsus, apical 1/2 of 2nd segment and entire 3rd and 4th segments light brown, and entire 5th segment brownish-black; basitarsus (Fig. 1D) parallel-sided, 6.27 times as long as its greatest width, 0.72 and 0.58 times as wide as greatest widths of hind tibia and femur, respectively; calcipala short, slightly shorter than wide; pedisilusculus distinct; tarsal claws (Fig. 1E) each with small subbasal tooth. **Wing.** Length about 2.0 mm. Costa with spinules and hairs. Subcosta sparsely haired on basal 2/3 (less than 10 hairs). Basal section of vein R bare; R₁ with spinules and hairs; R₂ with hairs only. Hairs at base of stem vein dark brown. Basal cell absent. **Abdomen.** Basal scale light to dark brown, with fringe of pale hairs; dorsal surface of abdomen medium to dark brown except basal 1/4 of 2nd segment pale, moderately covered with dark hairs; tegrite 2 with pair of large silvery iridescent dorsolateral spots broadly connected to each other medially; tegites 6–9 shiny. Ventral surface of abdomen ochreous basally, medium brown posteriorly (gradually darkened toward posterior tip); ventral surface of segment 7 without sternal plate medially, covered with dark simple hairs. **Genitalia.** Sternite 8 (Fig. 1F) well sclerotized, bare medially but with 7–10 long hairs on each side; ovipositor valve (Fig. 1F) flap-like, bluntly truncate posteriorly, forming oblique roof-like ridge parallel to posterior margin running obliquely, thin, membranous, and covered with 5–10 simple short to long hairs as well as numerous microsetae; inner margins not sclerotized, moderately concave medially, and widely separated from each other. Genital fork (Fig. 1G) of inverted-Y form; stem slender and well sclerotized; arms of moderate width, each with distinct projection directed anterodorsally. Paraproct in ventral view (Fig. 1H) with unpigmented shallow depression on ventral surface along anteromedial margin; anteromedial surface moderately sclerotized and with 5 or 6 sensilla; paraproct in lateral view (Fig. 1I) with wide shallow depression along anteroventral margin, somewhat protruding beyond ventral margin of cercus. Cercus in lateral view (Fig. 1I) rounded posteriorly, about half as long as wide, covered with numerous stout hairs. Spermatica (Fig. 1J) nearly globular with swollen portion near junction to duct appearing a pear, well sclerotized, with no or very faint reticulate surface patterns; minute internal setae present; both accessory ducts subequal in diameter to each other and also to main duct.

**Male.** Body length 2.6–3.0 mm. **Head.** Slightly wider than thorax. Upper eye consisting of large facets in 21 horizontal and 21 vertical rows. Clypeus black, whitish-grey pruinose, iridescent when illuminated, moderately covered with dark brown long hairs except median longitudinal portion narrowly bare. Antenna composed of 2+9 segments, dark brown except scape, pedicel and base of 1st flagellar segment yellow; 1st flagellar segment elongate, about 1.6 times as long as 2nd one. Maxillary palpal medium to dark brown, composed of 5 segments, proportional lengths of 3rd, 4th, and 5th segments 1:0.1:1.5:3.1; 3rd segment (Fig. 2A) of normal size, with small ellipsoid sensory vesicle (Fig. 2A) 0.27 times as long as 3rd segment. **Thorax.** Scutum black, with distinct white pruinose and silvery iridescent pattern; i.e., anterolateral spot on each shoulder which extends posteriorly along lateral margin and is connected to large spot on prescutellar area; scutum uniformly and moderately covered with ochreous recumbent fine hairs interspersed with dark similar hairs near anterior border and dark long upright hairs on prescutellar area. Scutellum brownish-black, not shiny, with several dark long upright hairs. Postnotum, pleural membrane and katepisternum similar to those of female. **Legs.** Foreleg: nearly as that of female except basitarsus moderately dilated, 5.5 times as long as its greatest width. Midleg: nearly as that of female except femur entirely dark brown and tibia dark brown except base narrowly yellow and white sheeny on posterior surface of basal 2/5 or a little more when illuminated. Hind leg: coxa brownish-black; trochanter dark yellow; femur and tibia brownish-black except base narrowly yellow; tibia white sheeny only.
basally on posterior surface when illuminated; tarsus dark brown to brownish-black except basal 7/10 or a little less of basitarsus and basal 1/2 of 2nd tarsal segment yellowish-white; basitarsus (Fig. 2B) nearly parallel-sided, 5.5 times as long as its greatest width, 0.72 and 0.65 times as wide as greatest widths of hind tibia and femur, respectively; calcipala short, slightly shorter than width at base; pedisulcus distinct. **Wing.** Length about 2.5 mm; other characters as in female except subcosta with 0–3 hairs. **Abdomen.** Basal scale blackish, with fringe of dark long hairs. Dorsal surface of abdomen dark brown to brownish-black, with dark hairs; segments 2, 6 and 7 each with pair of silvery iridescent dorsolateral spots (connected broadly in middle on segment 2).

**Genitalia.** Coxite in ventral view (Fig. 2C) nearly quadrate, slightly longer than wide, somewhat protruding posterolaterally beyond anterior margin of style. Style in ventral view (Fig. 2C) elongate, about 1.7 times as long as coxite, bulged inwardly on basal 1/2, nearly parallel-sided or slightly narrowed on apical 1/2, with inner margin deeply concave on apical 1/2, and with very slender apical spine; style in lateral view (Fig. 2D) spatulate ventrodorsally. Ventral plate in ventral view (Fig. 2C) with body narrow, well sclerotized, bare; basal arms long, stout, with apex curved inwardly; ventral plate in lateral view (Fig. 2E) with body slightly curved ventrally and with dentate posterior margin; ventral plate in end view (Fig. 2F) with body equilaterally triangu-

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Fig. 2. Male of *Simulium (Simulium) baimaii*. A, 3rd segment of maxillary palp with sensory vesicle (right side, front view); B, basitarsus and 2nd tarsal segment of hind leg showing calcipala and pedisulcus (left side, outer view); C, coxites, styles and ventral plate in situ (ventral view); D, coxite and style (right side, lateral view); E and F, ventral plates (E, lateral view; F, end view); G, median sclerite; H, paramere (left side, ventral view); I, dorsal plate; J and K, cerci (right side, J, lateral view; K, end view). Scale bars. 0.05 mm for B; 0.02 mm for A and C–K.
lar in shape, bare, with pair of 4 or 5 teeth in vertical rows on posterior surface. Median sclerite (Fig. 2G) wide, plate-like, with apex having small incision medially. Paramere (Fig. 2H) with large base having several parameral hooks apically. Aedeagal membrane sparsely covered with minute setae, with weakly sclerotized narrow dorsal plate (Fig. 2I). Ventral surface of 10th abdominal segment without any distinct hairs. Cercus (Fig. 2J, K) rounded, with 8 distinct hairs.

SPECIMENS EXAMINED. 5 females and 6 males, all reared from pupa, collected from a stream (width about 2.0 m, depth 10–15 cm, water temperature 22.0°C, partially shaded) moderately running in a sparsely forested area at Wang Kwang waterfall (altitude 1,210 m), Phu Kradueng National Park, Loei province, northeastern Thailand, 30.X.2005, by W. Choochote.

REMARKS. The female and male of Simulium (S.) baimaii are described for the first time, and it is clarified that this species is assignable to the malyschevi species-group from the characteristic shape of the ovipositor valves (Fig. 1F) as well as the female claw with a small subbasal tooth (Fig. 1E), the female scutum un-patterned, the male hind basitarsus not enlarged (Fig. 2B) and ventral plate with a narrow body (Fig. 2F).

This species is distinguished from S. (S.) siripoomense Takaoka and Saito, thus far the only species of the malyschevi species-group reported from Thailand (Takaoka and Choochote, 2004), in the female by the absence of branched hairs on the seventh sternite (cf., branched hairs present in S. (S.) siripoomense), and in the male by the hind tibia brownish-black with the base narrowly yellow (cf., hind tibia entirely brownish-black in S. (S.) siripoomense).

It is striking to note that S. (S.) baimaii has the pupal gill of two carrot-like filaments (Takaoka and Kuvangkadilok, 1999), a character never before observed in this and other species-groups within the subgenus Simulium s. str.

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REFERENCES