

## TWO NEW SPECIES OF *SIMULIUM* (*NEVERMANNIA*) (DIPTERA: SIMULIIDAE) FROM NORTHERN THAILAND

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**Abstract:** Two new species of black flies, *Simulium* (*Nevermannia*) *fruticosum* sp. nov. and *S.* (*N.*) *chiangklangense* sp. nov. are described on the basis of samples collected in northern Thailand. These new species are assigned to the *feuerborni* species-group of the subgenus *Simulium* (*Nevermannia*), and are easily distinguished from *S.* (*N.*) *feuerborni* Edwards, the only species of the same group known thus far in Thailand, by their simple cocoon without any anterodorsal projection.

**Key words:** *Simulium*, black fly, Simuliidae, Thailand, new species, *Nevermannia*.

In Thailand, the *feuerborni* species-group within the subgenus *Simulium* (*Nevermannia*) Enderlein redefined by Takaoka [1] is represented by only one species, *S.* (*N.*) *feuerborni* Edwards, which was originally described from Java [2] and later recorded from Peninsular Malaysia [3], Thailand [4] and Sumatra [5]. We collected two more species of the *feuerborni* species-group, which are easily distinguished from *S.* (*N.*) *feuerborni* by their simple cocoon. These are described here as new species.

The terms for morphological features used here follow those of Takaoka [1]. Holotype and paratype specimens of the new species are deposited at the Department of Infectious Disease Control, Oita University, Oita, Japan.

### *Simulium* (*Nevermannia*) *fruticosum* sp. nov.

**DESCRIPTION. Female.** Body length 2.4–3.0 mm. **Head.** Narrower than thorax. Frons brownish-black, not shiny, thinly whitish-grey pruinose, densely covered with whitish-yellow recumbent hairs, interspersed with several dark longer and stouter hairs along each lateral margin. Frontal ratio 1.3–1.7 : 1.0 : 2.0–2.5. Frons-head ratio 1.0 : 4.8–5.2. Fronto-ocular area (Fig. 1A) well developed, triangular, directed somewhat upward. Clypeus brownish-black, not shiny, whitish-grey pruinose, densely covered with whitish-yellow recumbent hairs (except portion near upper margin bare), intermixed with several dark longer and stouter hairs on each side of lower 1/2. Labrum nearly as long as clypeus. Antenna composed of 2+9 segments, medium to dark brown, except scape, pedicel, and minute base of 1st flagel-

lar segment yellow or light yellowish-brown; 1st flagellar segment 2.0–2.2 times as long as 2nd one. Maxillary palp consisting of 5 segments, medium to dark brown, proportional lengths of 3rd, 4th, and 5th segments 1.0 : 0.7–0.8 : 1.3–1.5; 3rd segment (Fig. 1B) much enlarged, with sensory vesicle elongate, 0.58–0.66 times as long as 3rd segment, with medium-sized opening medially. Maxillary lacinia with 8 or 9 inner teeth and 12–14 outer ones. Mandible with 20–22 inner teeth but lacking outer teeth. Cibarium (Fig. 1C) smooth on posterior margin, with well sclerotized arms directed anterolaterally. **Thorax.** Scutum light to dark brown (except anterolateral calli ochreous) though somewhat darker along lateral margins and on prescutellar area, shiny at certain angles of light, thinly whitish-grey pruinose, with 3 faint dark narrow longitudinal vittae (1 medial and 2 submedial), densely covered with whitish-yellow (golden in light) recumbent hairs, and with several dark brown upright hairs on prescutellar area. Scutellum ochreous, with many dark upright hairs as well as whitish-yellow shorter hairs. Postnotum medium to dark brown, thinly whitish-grey pruinose, slightly shiny at certain angles of light, bare. Pleural membrane bare. Katepisternum longer than deep, medium brown, and bare. **Legs.** Foreleg: coxa and trochanter whitish-yellow; femur yellow to dark yellow with apical cap medium brown; tibia medium to dark brown with median large portion of outer surface light brown; tarsus brownish-black; basitarsus slightly dilated, 7.7 times as long as its greatest width. Midleg: coxa light brown with posterior surface dark brown; trochanter yellow; femur yellow to dark yellow, with apical cap medium brown; tibia

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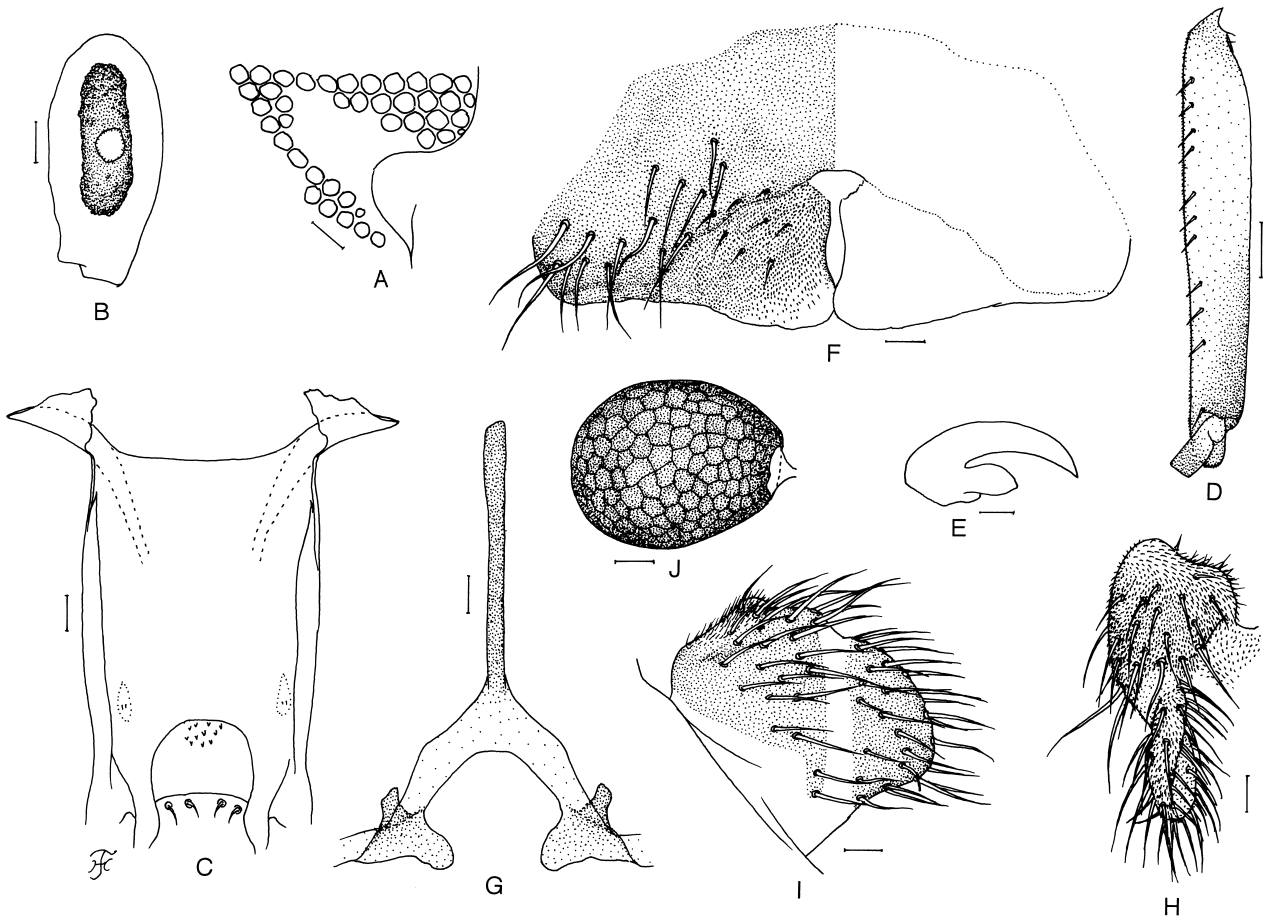


Fig. 1. Female of *Simulium (Nevermannia) fruticosum* sp. nov. A, fronto-ocular area (right side); B, 3rd segment of maxillary palp with sensory vesicle (left side, front view); C, cibarium; D, basitarsus and second tarsal segment of hind leg showing calcipala and pedisulcus (left side, outer view); E, claw; F, 8th sternite and ovipositor valves *in situ* (ventral view); G, genital fork (ventral view); H and I, paraprocts and cerci (right side; H, ventral view; I, outer view); J, spermatheca. Scale bars. 0.1 mm for D; 0.03 mm for A and B; 0.02 mm for F J; 0.01 mm for E.

medium brown with apical cap dark brown and median large portion on outer and inner surfaces light brown; tarsus brownish-black. Hind leg: coxa dark yellow or light brown; trochanter yellow; femur yellow to dark yellow with apical cap medium to dark brown; tibia medium brown with apical cap dark brown and median large portion on outer and inner surfaces light brown; tarsus medium to dark brown except basal 1/2 (or a little more) of basitarsus and basal 1/2 of 2nd segment dark yellow to light brown (though base of basitarsus medium brown); basitarsus (Fig. 1D) nearly parallel-sided on basal 1/2, then slightly narrowed toward apex, 6.1 times as long as wide, and 0.77 times and 0.63 times as wide as hind tibia and femur, respectively; calcipala (Fig. 1D) well developed, about 1.1 times as long as wide, and about half as wide as greatest width of basitarsus; pedisulcus (Fig. 1D) well developed. Claws (Fig. 1E) each with large basal tooth half as long as claw. **Wing.** Length 2.4

2.6 mm. Costa with 2 parallel rows of dark short spines as well as dark hairs except subbasal portion of costa near humeral cross vein with whitish-yellow hairs. Subcosta with dark hairs except near apex bare. Basal portion of radius fully haired;  $R_1$  with dark spinules and hairs;  $R_2$  with dark hairs. Hair tuft on stem vein dark brown. Basal cell absent. **Abdomen.** Basal scale light to medium brown, with fringe of pale long hairs. Dorsal surface of abdomen medium to dark brown except that of segment 2 whitish-yellow or ochereous to light brown (though tergal plate light to medium brown), moderately covered with whitish-yellow short hairs, interspersed with dark ones; tergite 5 slightly shiny at certain angle of light, tergites 6-9 shiny when illuminated; ventral surfaces of abdominal segments 2-6 whitish-yellow; segment 7 with large sternal plate medially. **Genitalia.** Sternite 8 (Fig. 1F) wide, bare medially but furnished with 18-43 short and long hairs on each side. Ovipositor valves

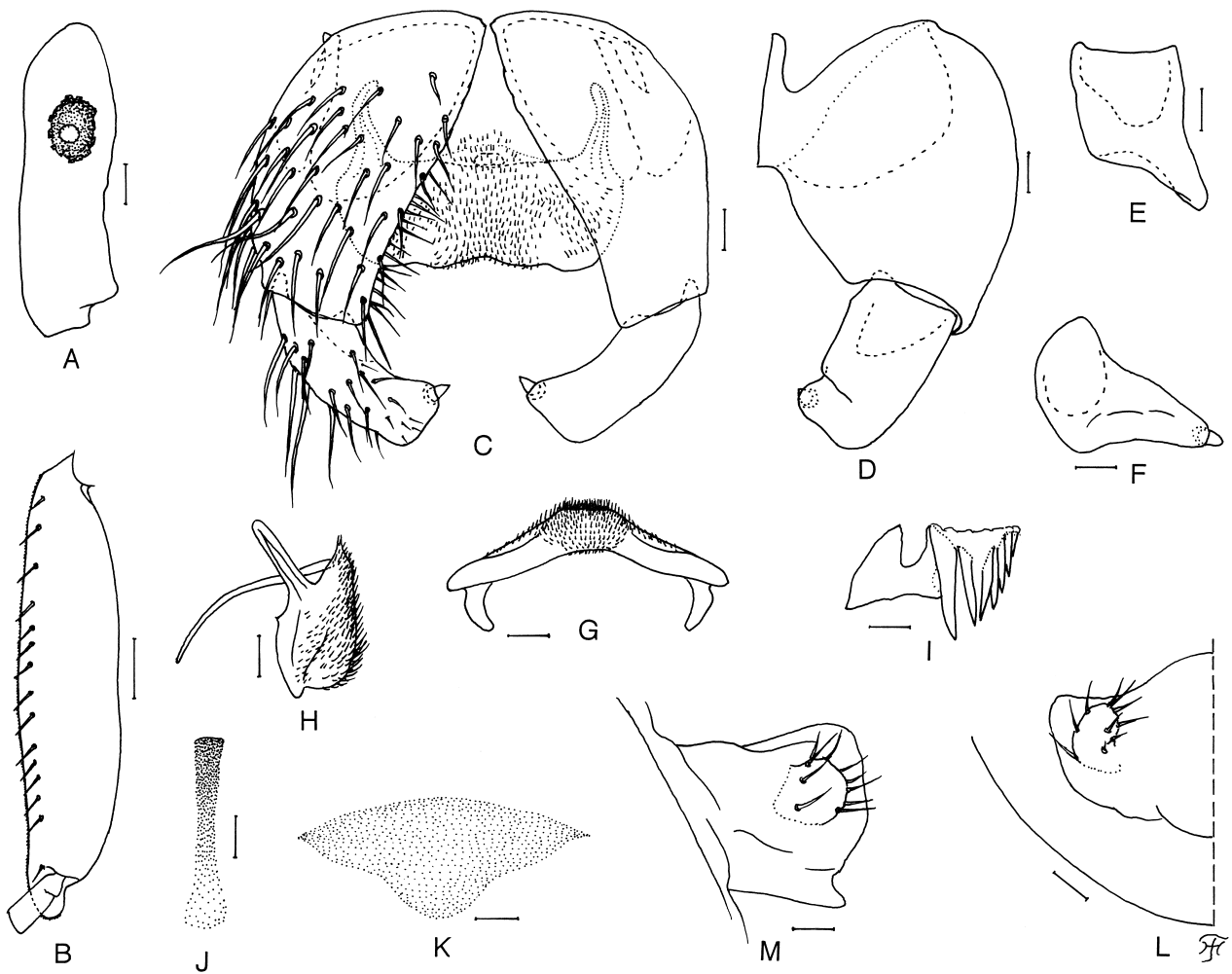


Fig. 2. Male of *Simulium (Nevermannia) fruticosum* sp. nov. A, 3rd segment of maxillary palp with sensory vesicle (right side, front view); B, hind basitarsus (left side, outer view); C, coxites, styles and ventral plate *in situ* (ventral view); D, coxite and style (right side; outer view); E and F, styles (right side; E, ventrolateral view; F, end view); G, ventral plate (end view); H, ventral plate and median sclerite (lateral view); I, paramere (right side; end view); J, median sclerite; K, dorsal plate; L and M, 10th abdominal segments with cercus (right side; L, end view; M, outer view). Scale bars. 0.1 mm for B; 0.02 mm for A, C, M.

(Fig. 1F) triangular, thin, membranous except inner margin narrowly sclerotized, densely covered with microsetae, interspersed with 5–7 short setae; inner margins gently sinuous and narrowly separated medially from each other. Genital fork (Fig. 1G) of inverted Y-form, with well sclerotized stem and wide arms; each arm with wide round lobe-like projection directed medioposteriorly and prominent projection directed forward. Paraproct (Fig. 1H, I) of usual form, only slightly protruding ventrally, with 24–30 hairs on ventral and lateral surfaces, and with 5–8 sensilla on anteroinner surface. Cercus in lateral view (Fig. 1I) rounded posteriorly, 0.5–0.7 times as long as paraproct. Spermatheca (Fig. 1J) ovoidal, about 1.2 times as long as its greatest width,

strongly sclerotized except small area around juncture to duct, and duct itself unsclerotized, with distinct reticulate surface pattern, and without internal setae; main spermathecal duct narrow, while both accessory ducts slightly wider than main duct.

**Male.** Body length 2.6–3.2 mm. **Head.** Slightly wider than thorax. Holoptic; upper eye consisting of large facets in 14 or 15 vertical columns and 17 or 18 horizontal rows. Clypeus dark brown, not shiny, whitish-grey pruinose, moderately covered with yellow short and long hairs interspersed with dark long hairs. Antenna composed of 2+9 segments, light brown except base of 1st flagellar segment pale yellow, or dark brown except scape and most of pedicel

dark yellow and base of 1st flagellar segment pale yellow; 1st flagellar segment elongate, about twice as long as 2nd one. Maxillary palp medium to dark brown, composed of 5 segments, proportional lengths of 3rd, 4th, and 5th segments 1.0:1.0 1.2:1.7 2.1; 3rd segment (Fig. 2A) of moderate size; sensory vesicle (Fig. 2A) small, globular or ellipsoidal, 0.22 times as long as 3rd segment. **Thorax.** Nearly as in female except anterolateral calli light brown and postnotum light to dark brown. **Legs.** Foreleg: coxa and trochanter yellow; femur light brown with apical cap medium brown (though most of inner surface lighter); tibia dark brown to brownish-black with median large portion of outer surface medium brown; tarsus brownish-black; basitarsus very slightly dilated, 10 times as long as its greatest width. Midleg: coxa medium brown with posterior surface dark brown; trochanter yellow; femur yellow to dark yellow, with apical cap medium brown; tibia dark brown to brownish-black with base and subbasal portion medium brown; tarsus brownish-black. Hind leg: coxa light brown; trochanter yellow; femur yellow to dark yellow with apical cap dark brown; tibia dark brown to brownish-black with base dark yellow and subbasal portion light to medium brown; tarsus dark brown except basal 1/2 of basitarsus medium brown though border not well defined; basitarsus (Fig. 2B) enlarged, spindle-shaped, 4.2 times as long as its greatest width, and 1.04 times and 0.96 times as wide as greatest widths of hind tibia and femur, respectively; calcipala (Fig. 2B) well developed, nearly as long as wide, and 0.35 times as wide as greatest width of basitarsus; pedisulcus (Fig. 2B) well developed. **Wing.** As in female except subcosta bare or with 1 or 2 hairs; length 2.5–2.6 mm. **Abdomen.** Basal scale dark brown, with fringe of yellow long hairs. Dorsal surfaces of abdominal segments medium to dark brown (except that of segment 2 pale yellow though tergal plate medium to dark brown), not shiny, covered with dark simple hairs; ventral surfaces of abdominal segments 2–4 yellow though sternites of segments 3 and 4 medium brown; ventral surfaces of segments 5–8 light to medium brown. **Genitalia.** Coxite in ventral view (Fig. 2C) subquadrate much longer than wide. Style in ventral view (Fig. 2C) short, 0.7 times as long as coxite, bent inwardly, nearly parallel-sided, with stout spine apically; style in ventrolateral view (Fig. 2E) broad, nearly parallel-sided from base to a little beyond middle, then abruptly tapered apically; style in end view (Fig. 2F) tapered inwardly. Ventral plate in ventral view (Fig. 2C) lamellate, much shorter than wide, well sclerotized, with 3 concavities on posterior margin, and moderately covered with fine short setae on ventral surface (except lateral portions partially setose); arm of moderate length, slender, and curved inwardly; ventral plate in end view (Fig. 2G) with fine short setae centrally on posterior

surface; ventral plate in lateral view (Fig. 2H) with ventral margin of body nearly straight, and arm directed dorsally and forwardly. Paramere (Fig. 2I) with 6 or 7 hooks of different sizes. Median sclerite in end view (Fig. 2J) simple, club-shaped, narrow, slightly widened toward apex. Aedeagal membrane moderately covered with spinous microsetae, moderately sclerotized basally forming dorsal plate (Fig. 2K). Ventral surface of 10th segment without any hairs near each posterolateral corner. Cercus (Fig. 2L,M) small, rounded and with 9–11 simple hairs.

**Pupa.** Body length 3.0–3.5 mm. **Head.** Integument dark yellow to light brown, densely covered with round tubercles; antennal sheaths bare; frons with 2 short slender simple trichomes (Fig. 3A) on each side; face with 1 long simple trichome (Fig. 3B) (a little over 3 times as long as frontal trichomes) on each side. **Thorax.** Integument dark yellow to light brown, moderately or densely covered with round tubercles, with 3 very long slender simple trichomes with coiled apex (Fig. 3C) mediodorsally, 2 slender simple trichomes (1 very long, and 1 short) (Fig. 3D) mediolaterally, 1 long slender simple trichome (Fig. 3E) posterolaterally, and 3 short slender simple trichomes (Fig. 3F) ventrolaterally, on each side. Gill with 6 long thread-like slender filaments arranged in 2 groups (1 ventral group consisting of paired filaments with long stalk, and the other dorsal group consisting of 4 filaments), arising from short basal common stalk (Fig. 3G); 4 filaments of dorsal group usually arising close together, with their arrangement somewhat variable, e.g., lying nearly side by side horizontally forming middle pair with very short stalk and inner and outer individual filaments (Fig. 3H), or forming outer triplet plus inner individual filament (Fig. 3I), or forming inner pair with no stalk and outer pair with very short stalk (Fig. 3J), or forming inner and outer pairs with very short to short stalk (Fig. 3K) (as an exception, in 1 pupa stalk of inner pair of dorsal group long on left side and very long on right side as shown in Fig. 3L,M); basal common stalk with transparent bulb-like organ ventrally (Fig. 3G); all filaments dark brown, directed forward, tapered apically, subequal in length to one another (lengths from base of gill to tips of filaments variable from 3.8 to 4.8 mm depending upon individual pupae), and longer than pupal body; cuticular surface with distinct annular ridges and furrows (though ridges becoming indistinct apically), and densely covered with minute tubercles of different sizes (larger ones on ridges and smaller ones on interridges). **Abdomen.** Dorsal surfaces of all segments weakly sclerotized, yellowish except medial portions of segments 1 and 2 light brown, densely and elaborately covered with minute tubercles; segment 1 with 1 medium-long slender simple seta on each side; segment 2 with 1 medium-long slender simple seta and 5 short spinous

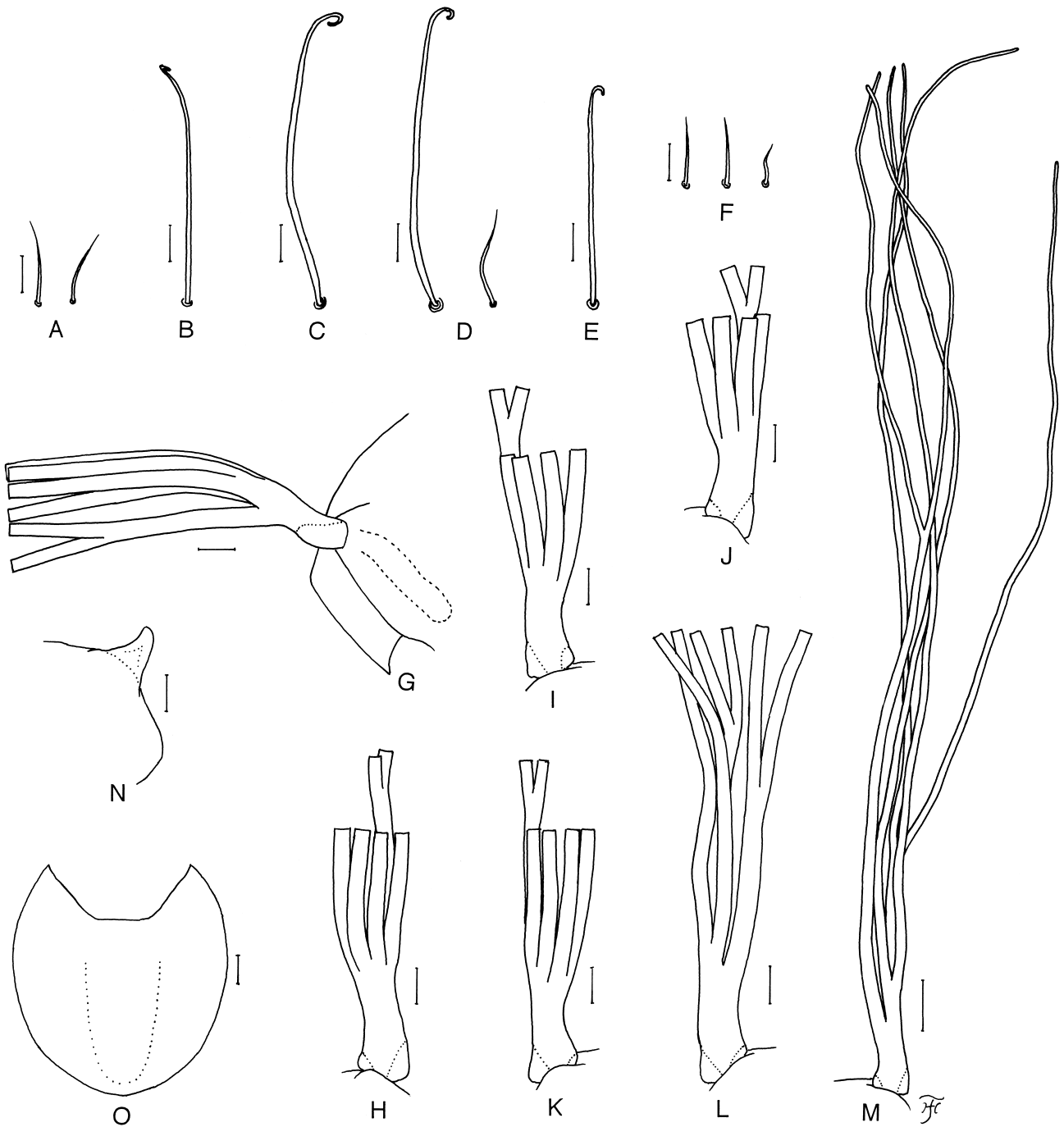


Fig. 3. Pupa of *Simulium (Nevermannia) fruticosum* sp. nov. A, frontal trichomes; B, facial trichome; C F, trichomes on thorax (C, mediodorsal; D, mediolateral; E, posterolateral; F, ventrolateral); G, basal portion of gill filaments (left side, outer view); H L, basal portions of gill filaments (all dorsal view; H and J, left side; I, K and L, right side); M, entire gill filaments showing very long stalk of inner pair of dorsal group (dorsal view); N, terminal hook (lateral view); O, cocoon (dorsal view). Scale bars. 0.5 mm for O; 0.2 mm for M; 0.1 mm for G L; 0.02 mm for A F and N.

setae on each side; segments 3 and 4 each with 4 hooks and 1 short spinous seta on each side; segment 5 bare or with 1 or 2 spine-combs on each side; segments 6 8 each with spine-combs directed backward in transverse row on each

side; segments 6 9 each with comb-like groups of minute spines on each side; segment 9 with a pair of distinct cone-shaped terminal hooks curved posteroinwardly (Fig. 3N). Lateral surfaces of segments 2 4 each with 3 spinous setae

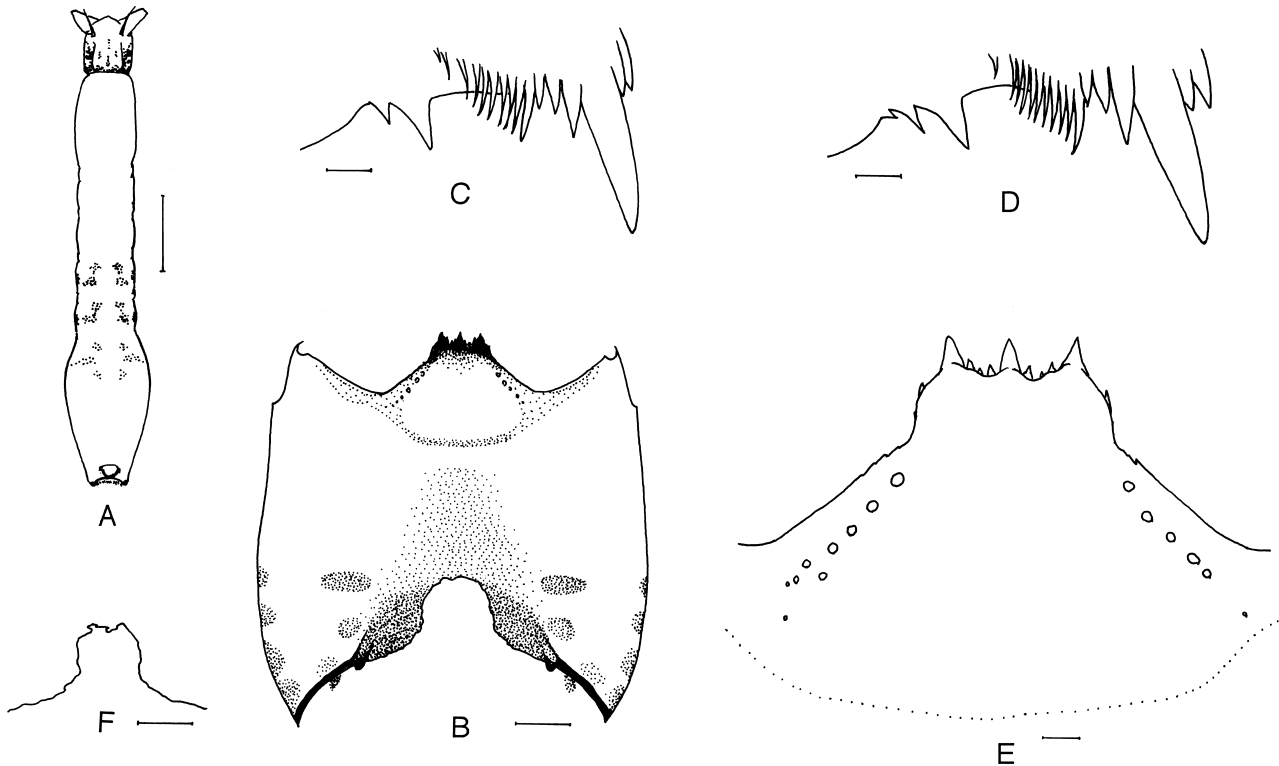


Fig. 4. Mature larva of *Simulium* (*Nevermannia*) *fruticosum* sp. nov. A, whole body (dorsal view); B, head capsule (ventral view); C, mandible; D, mandible with supernumerary serration; E, hypostomium; F, postgenal cleft. Scale bars. 1.0 mm for A; 0.1 mm for B and F; 0.02 mm for E; 0.01 mm for C and D.

on each side. Ventrally, segments 3–8 with comb-like groups of minute spines; segments 5–8 each with a pair of weakly-sclerotized light yellowish wide submedial sternal plates, on which comb-like groups of minute spines present; segment 4 nearly transparent, with 4 short slender simple setae on each side; segment 5 with a pair of bifid hooks submedially and a few short slender setae on each side; segments 6 and 7 each with 1 bifid hook submedially and 1 simple hook laterally, and a few slender setae on each side. **Cocoon** (Fig. 3O). Simple, wall-pocket-shaped, compactly woven without open spaces in web, very thin, with anterior margin thickly woven, and extending ventrolaterally; individual threads invisible; 3.5–4.5 mm long by 2.5–3.6 mm wide.

**Mature larva.** Body length 6.2–6.5 mm. Body greyish yellow or light tawny, with well-defined colored markings (Fig. 4A); i.e., abdominal segments 3 and 4 each with 3 reddish-brown spots on each side, of which 2 spots lying submedially on dorsal surface (those spots very narrowly connected to each other), and 1 lying medially on lateral surface; abdominal segment 5 on each side with 1 reddish-brown spot submedially on anterior 1/2 of dorsal surface and 1 transverse similar colored band along its posterior

margin; and abdominal segment 6 on each side with 1 reddish-brown spot submedially on anterior 1/2 of dorsal surface. Cephalic apotome yellow except posterior margin darkened, with distinct positive head spots; lateral surface of head capsule yellow, with distinct eyebrow containing dark spot; 2 large spots behind eye-spot region and 3 isolated spots below eye-spot region distinctively positive; ventral surface of head capsule (Fig. 4B) yellow (though postgenal bridge mostly darkened, with dark basal area on each side of postgenal cleft; horizontal and round spots on each side of postgenal cleft distinctively positive. Cervical sclerite composed of 2 small elliptical pieces, not fused to occiput, very widely separated medially from each other. Antenna consisting of 3 segments and apical sensillum, much longer than stem of labral fan; proportional lengths of 1st, 2nd, and 3rd segments 1.00 : 1.00 : 1.05 : 0.87 : 0.91. Labral fan with 26–29 main rays. Mandible (Fig. 4C) with mandibular serrations consisting of 2 teeth (1 large and 1 small); large tooth making nearly a right angle with mandible on apical side; supernumerary serrations absent (though 1 minute supernumerary tooth present on right mandible of 1 larva as shown in Fig. 4D); comb-teeth composed of 3 teeth, shortened from 1st to 3rd. Hypostomium (Fig. 4E)

with 9 apical teeth in row; median and corner teeth well developed; median tooth of 3 intermediate teeth on each side smallest; lateral serrations weakly developed apically; 6–9 hypostomal bristles lying slightly divergent posteriorly from lateral margin on each side. Postgenal cleft (Fig. 4B) small, 0.53–0.57 times as long as postgenal bridge, with anterior margin roughly rounded or irregularly defined (Fig. 4F). Thoracic cuticle bare. Abdominal cuticle bare except both sides of anal sclerite moderately covered with simple colorless setae, and lateral surface of last segment down to middle of ventral papilla also sparsely covered with similar but shorter setae. Rectal scales present. Rectal papilla compound, each of 3 lobes with 11 or 12 finger-like secondary lobules. Anal sclerite of usual X-form, with anterior arms slightly shorter than posterior ones, narrowly sclerotized along anterior arms; sensilla absent on and just posterior to basal juncture area; accessory sclerite absent. Last abdominal segment much expanded ventally forming large ventral papilla. Posterior circlet with about 86 rows of up to 16 hooklets per row.

**TYPE SPECIMENS.** Holotype female, reared from pupa, collected from a small stream slowly flowing among the bushes in a densely forested, leech-rich area (width 50 cm, depth ca. 2 cm, water temperature 25.0 °C, completely shaded, altitude 1,420 m above sea level), Doi Pui, Chiang Mai province, Thailand, 21. V. 2005, by W. Choochote. Paratypes 4 females, 8 males, and 3 mature larvae, same data and date as those of holotype; 1 male, same data as those of holotype except date, 14. V. 2005; 1 pupa, same data as those of holotype except date, 16. IX. 2004, and water temperature 20.0 °C.

**BIOLOGICAL NOTES.** The pupae and larvae of this new species were found on the surface of leaves and stalks of trailing grasses. Associated species were *S. (Gomphostilbia) inthanonense* Takaoka and Suzuki, *S. (Simulium) brevipar* Takaoka and Davies, *S. (S.) doipuiense* Takaoka and Choochote, *S. (S.) manooni* Takaoka and Choochote, and *S. (S.) mediocololatum* Takaoka and Choochote.

**DISTRIBUTION.** Thailand.

**ETYMOLOGY.** The species *fruticosum* refers to the stream running among the bushes where this new species was found. The Latin adjective *fruticosus* means bushy.

**REMARKS.** *Simulium (Nevermannia) fruticosum* sp. nov. is readily assigned to the *feuerborni* species-group by the combination of the following characters: male genitalia with a simple lamellate ventral plate, a short inwardly-

twisted style, several parameral hooks, and a simple narrow median sclerite; pupal gill with six long thread-like filaments per side; and larval head with small short postgenal cleft.

Among the 16 known species of the *feuerborni* species-group [1, 6, 7], four species, i.e., *S. (N.) feuerborni*, *S. (N.) leigongshanense* Chen and Zhang from China, *S. (N.) praelargum* Datta from India, and *S. (N.) sasai* (Rubtsov) from Japan, have a cocoon with a distinct anterodorsal projection and thus differ from this new species. Eight other species of the same species-group have a simple cocoon but differ from this new species in the arrangement of gill filaments. Interestingly, *S. (N.) feuerborni* has the gill filaments arranged in a similar manner to those of *S. (N.) fruticosum* (i.e., four dorsal filaments arising close together and lying almost side by side horizontally as shown in Fig. 3 H–K).

The remaining four known species of the *feuerborni* species-group were described from adult males (and also females in one species) alone, their pupal and larval stages remaining unknown. Among these, *S. (N.) fuscinervis* Edwards recorded from Sabah [8] differs from the new species by having the paramere with 10 or 11 hooks; *S. (N.) bryopodium* Delfinado, described from Palawan Island, Philippines [9], also differs by the dark brown hind femora and ventral plate much depressed posteriorly; *S. (N.) senile* Brunetti, described from West Himalaya [10], is different by the style with no apical spine; *S. (N.) rufithorax* Brunetti, described from a male and four females collected from India [10], has a reddish-brown thorax according to the original description.

***Simulium (Nevermannia) chiangklangense* sp. nov.**

**DESCRIPTION. Female.** Body length 2.5 mm. Nearly the same as the female of *S. (N.) fruticosum* except for the following characteristics. **Head.** Frontal ratio 1.5:1.0:2.3. Frons-head ratio 1.0 : 4.8. Fronto-ocular area (Fig. 5A) somewhat shorter than that of *S. (N.) fruticosum*. Labrum 0.97 times as long as clypeus. Antenna with 1st flagellar segment about 1.6 times as long as 2nd one. Maxillary palp with proportional lengths of 3rd, 4th, and 5th segments 1.0:1.0:1.6; 3rd segment (Fig. 5B) with elongate sensory vesicle 0.52 times as long as 3rd segment. Maxillary lacinia with 8 inner and 12 outer teeth. Mandible with 20 inner teeth but lacking outer teeth. **Legs.** Fore basitarsus 7.4 times as long as its greatest width. Hind basitarsus 6.6 times as long as wide, and 0.69 times and 0.61 times as wide as hind tibia and femur, respectively; calcipala well developed, nearly as long as wide, and 0.55 times as wide as greatest width of basitarsus. Claws (Fig. 5C) each with large basal tooth 0.43

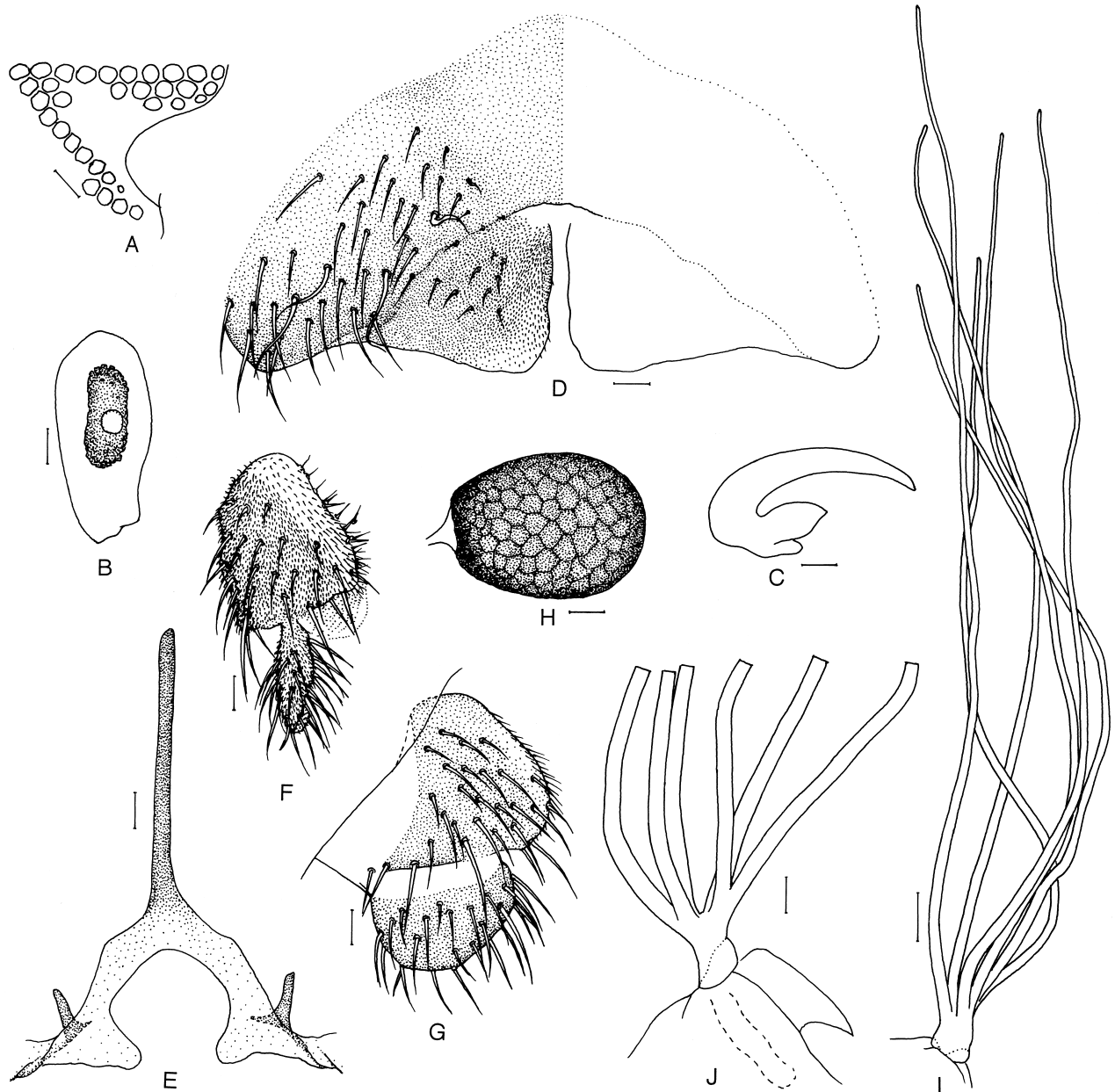


Fig. 5. Female and pupa of *Simulium (Nevermannia) chiangklangense* sp. nov. A, fronto-ocular area (right side); B, 3rd segment of maxillary palp with sensory vesicle (right side, front view); C, claw; D, 8th sternite and ovipositor valves *in situ* (ventral view); E, genital fork (ventral view); F and G, paraprocts and cerci (right side; F, ventral view; G, outer view); H, spermatheca; I, whole gill filaments (dorsal view); J, basal portion of gill filaments (outer view). Scale bars. 0.2 mm for I; 0.1 mm for D H; 0.03 mm for A and B; 0.02 mm for D H; 0.01 mm for C.

times as long as claw. **Wing.** Length 2.6 mm. **Genitalia.** Sternite 8 (Fig. 5D) wide, bare medially but furnished with 30–40 short and long hairs on each side. Ovipositor valves (Fig. 5D) with 9 or 10 short setae; inner margins gently undulate. Genital fork (Fig. 5E) with longer and narrower projection directed anteriorly on each arm than that of *S. (N.)*

*fruticosum*. Paraproct in ventral view (Fig. 5F) somewhat wider than that of *S. (N.) fruticosum*; its anteroinner surface with 16 or 17 sensilla. Cercus in lateral view (Fig. 5G) about half as long as paraproct. Spermatheca (Fig. 5H) ovoidal, 1.3 times as long as its greatest width.

**Male.** Unknown.



**Pupa.** Body length 3.5 mm. Nearly the same as the pupa of *S. (N.) fruticosum* except for the following characteristics. **Head.** Integument moderately covered with round tubercles. **Thorax.** Gill (Fig. 5I,J) with 6 long thread-like slender filaments (length including basal common stalk 4.0–4.5 mm), of which 2 inner filaments arising independently, and 4 others arranged in 2 short-stalked pairs (1 ventroouter and 1 dorsal), all arising nearly at the same level from short basal common stalk; all filaments somewhat diverged basally from one another, then directed forwards; all filaments dark brown, tapered apically, subequal in length and thickness to one another, and longer than pupal body. **Abdomen.** Dorsal surfaces of all segments uniformly yellowish; minute tubercles on surfaces of segments 5–9 indistinct. **Cocoon.** 5.0 mm long by 3.2 mm wide.

**Mature larva.** Unknown.

**TYPE SPECIMEN.** Holotype female, reared from pupa, collected from a slow-flowing stream (width 0.3–0.5 m, depth 2–3 cm, water temperature 15.0°C, partially shaded, altitude 790 m above sea level) in a forested area, Chiang Klang, Nan province, northern Thailand, 2.XII. 2004, by W. Choochote.

**BIOLOGICAL NOTES.** The pupa of this new species was found on the surface of a leaf in the water. Associated species was *S. (G.) inthanonense*.

**DISTRIBUTION.** Thailand.

**ETYMOLOGY.** The species *chiangklangense* refers to the region, Chiang Klang, where this new species was found.

**REMARKS.** *Simulium (Nevermannia) chiangklangense* sp. nov. is also assigned to the *feuerborni* species-group by the female genitalia and pupal gill with six long thread-like filaments per side.

This new species is characterized by the simple cocoon and the pupal gill filaments arranged in two short-stalked pairs and two individual filaments (Fig. 5J). The combination of these two characteristics easily separates *S. (N.) chiangklangense* from other members of the *feuerborni* species-group.

The female of this new species is very similar in appearance to those of *S. (N.) feuerborni* [11] and *S. (N.) fruticosum* but appears to be distinguished from the latter two species by the longer and narrower projection directed

anteriorly from each arm of the genital fork (Fig. 5E), and also from *S. (N.) fruticosum* by the shorter claw tooth (Fig. 5C).

There is a possibility that *S. (N.) chiangklangense* is conspecific to one of the three known species of the *feuerborni* species-group which were described from adult males alone (i.e., *S. (N.) fuscineris*, *S. (N.) bryopodium*, and *S. (N.) senile*).

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