

Three new phytotelma mosquitoes of the genus *Topomyia* (Diptera: Culicidae) from Katibas, Lanjak-Entimau, Sarawak, Malaysia

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Abstract Three new species belonging to the subgenus *Topomyia* of the genus *Topomyia* are described under the name of *Topomyia (Topomyia) katibasensis*, *To. (Top.) chaili* and *To. (Top.) nicksoni*. The adults and pupae are described in detail and illustrations of the male genitalia and pupae are provided. Partial descriptions and illustrations of their fourth-instar larvae are also provided based on associated larval exuviae of the species. These species occur in the secondary rain forest along Katibas River in the Lanjak-Entimau Wildlife Sanctuary at elevation of approximately 200 m. The larvae of these species breed in the leaf axils of phytotelma plants, *Pandanus* sp., *Phrynium* sp. and arrowroot (Marantaceae). The new species described in the present paper are attributed to Miyagi and Toma.

Keywords genus *Topomyia* – subgenus *Topomyia* – new species – phytotelmata – Lanjak-Entimau – Sarawak

INTRODUCTOIN

The genus *Topomyia* is a relatively small group, with 60 species in two subgenera, *Topomyia* (38 species) and *Suaymyia* (22 species). They occur mainly in the Oriental Region, with extensions into the Southern Palaearctic (South Japan and China) and the Australasian (Sulawesi and New Guinea) Regions [1]. After the pioneer works by Leicester [2] and Edwards [3], extensive surveys for *Topomyia* mosquitoes throughout Peninsular Malaysia, Sarawak and Sabah were carried out by Ramalingam and Banu [4–8] and Miyagi and Toma [9–20], and 14 species of the genus have been recorded in these regions. The immature stages of the *Topomyia* mosquitoes are found exclusively in phytotelmata, small water bodies held by living or dead terrestrial plants. Phytotelmata are usually overlooked because

they are small and inconspicuous [21]. Adult *Topomyia* mosquitoes are non-blood sucking and hence not significant from the point of disease transmission. The taxonomic work of the genus still remains to be done.

Since 2005, in connection with the project “Study on taxonomy and bionomics of two winged flies, Diptera in Sarawak”, conducted with the coordination and cooperation of the Sarawak Museum in Kuching, extensive larval collections of *Topomyia* have been made in the leaf axils of many kinds of phytotelma plants in the secondary riparian forests of Matang National Park, Borneo High, Bario and Ba Kelalan Kerabit highlands, and the Lanjak-Entemau Wildlife Sanctuary (LEWS). In the LEWS, collections were made in dipterocarp forest in March and September, 2011 for a total of about 30 days. The immature stages collected in the phytotelmata of different plants by slender glass pipettes with 2–5 mm diameter tip were transported to the Sarawak Museum, Kuching, and reared individually to adults in small tubes with habitat water. Larval and pupal exuviae were preserved in 80% alcohol. The newly emerged adult was reared for about 24 h and then mounted on a minute pin. The associated exuviae and male genitalia were mounted in euparal medium on two slides labeled with the corresponding individual and genital numbers.

Preliminary studies of the materials indicated three new species of *Topomyia* occurring near the headquarter of Katibas, LEWS (N 01°38.777' and E 112°167.709'). They belong to the subgenus *Topomyia* according to Thurman's treatment [22]. We describe the adult males and pupae of the species in this paper. Although several larval exuviae associated with the males of the species are available, they are in poor condition. Some important characters of head and siphon of the larvae are described and illustrated. The siphon and trumpet indices of larva and pupa used here follow Belkin's “Ratio of dorsal length to median width” [23]. Measurements and drawings of pupa and larva are made from pupal and larval skins. Terminology follows mostly Harbach and Knight [24], and Harbach and Peyton [25]. Holotype and some of the paratypes are deposited in the Smithsonian Institution, Washington D.C., USA, and some of the paratypes are in the Sarawak Museum, Kuching, Malaysia.

DESCRIPTIONS AND DISCUSSION

Topomyia (Topomyia) katibasensis Miyagi and Toma new species (Figs. 1, 2, 7E; Table 1)

Description

Male (Figs. 1A, 7E) — Wing, 2.26–2.60 mm (mean 2.43 mm). Proboscis, 1.50 mm. Forefemur, 1.43–1.76 mm (mean 1.59 mm). Small to medium in size; dark brown

Table 1. Numbers of branches for pupae of *Topomyia (Topomyia) katibasensis* n. sp.

Seta no.	Cephalo- thorax	Abdominal segments							
		I	II	III	IV	V	VI	VII	VIII
0	-	-	1	1	1	1	1	1	1
1	2	M	2-8	2-5	2-5	1-3	2-5	1, 2	-
2	2	1(1, 2)	1(1, 2)	1	1	1	1	1	-
3	2-4	1	1, 2	1	2-5	2-4	1-3	1, 2	-
4	1-5	1-4	1-6	2-5	2-5	2-5	1-3	1-3	1
5	4-6	4-8	1-5	2-4	1	1	1	1	-
6	1-3	1, 2	1	1, 2	1, 2	1, 2	1, 2	1-3	-
7	1-3	2-4	1-3	1-5	1-4	1-5	1	1	-
8	1, 2	-	-	1-4	1-4	1-3	1-4	2-6	-
9	2-5	1-3	1	1	1	1	1	19-27*	20-25*
10	2, 3	-	-	1-3	1-4	1, 2	1-3	1, 2	-
11	1	-	-	1, 2	1-3	1, 2	1-3	1, 2	-
12	3-6	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	1

M: dendritic with many branches. *aciculated.

Obsolete and missing setae are shown with a hyphen (-).

Specimens examined; 4 pupal exuviae from LEWS, Sarawak, Malaysia

with silver markings on antepronotum, head, scutum and scutellum. *Head:* Occiput and side of head with broad, flat dark brown decumbent scales with green sheen at certain angles. A large patch of flat silvery scales on vertex, just above eyes. Interocular and ocular setae present; erect scales absent. Clypeus oval in shape and elongate, integument brown without scales. Maxillary palpus light brown, about 0.14 of proboscis. Proboscis entirely dark, slender, elongate and slightly swollen at tip; a distinct ventral white line absent but several white scales at basal ventral part. Pedicel of antenna dark brown in colour and bare of scales; flagellum pillose, as long as or little shorter than proboscis. *Thorax:* Integument of scutum and scutellum brown covered with dark scales; a silver central line starting at anterior promontory and extending caudally to approximately the wing roots; the line broad uniformly in anterior part and towards the end. Scutal-fossal, dorsocentral, prescutellar and supraalar setae well developed. Median scutellar lobe with a patch of silver scales, lateral lobes with small patches of brown scales, without silver scales; conspicuous setae present on all three lobes posteromarginally. Mesopostnotum bare. Antepronotal lobe with conspicuous silver patch on dorsum, dark brown scales present on lower side; a row of prominent setae on anterior side. Postpronotum covered with flat brown scales on upper 2/3 and a few silver scales on lower margin; single prominent seta present at middle of the posterior border. Three fine prespiracular setae present. Postspiracular setae absent. Pleuron covered with patches of silver scales.

Paratergite bare. Silver scales forming large patch to cover most of the pleuron, including post- and subspiracular areas, most of the mesokatepisternum and the mesepimeron. Metepisternum bare. Several setae present on upper mesepimeron and prealar areas. *Legs*: All coxae and trochanters covered with silver scales. Dorsal part of all legs covered with small dark brown scales, and ventral part with a white line extending from base of femora to tips of tarsi, the line not so clear in foreleg. Junction between apical part of tibia and basal part of first tarsus with a line of fine setae (ciliation). Foretarsus Ta-I₂ shorter than Ta-I₃, apical tarsomeres

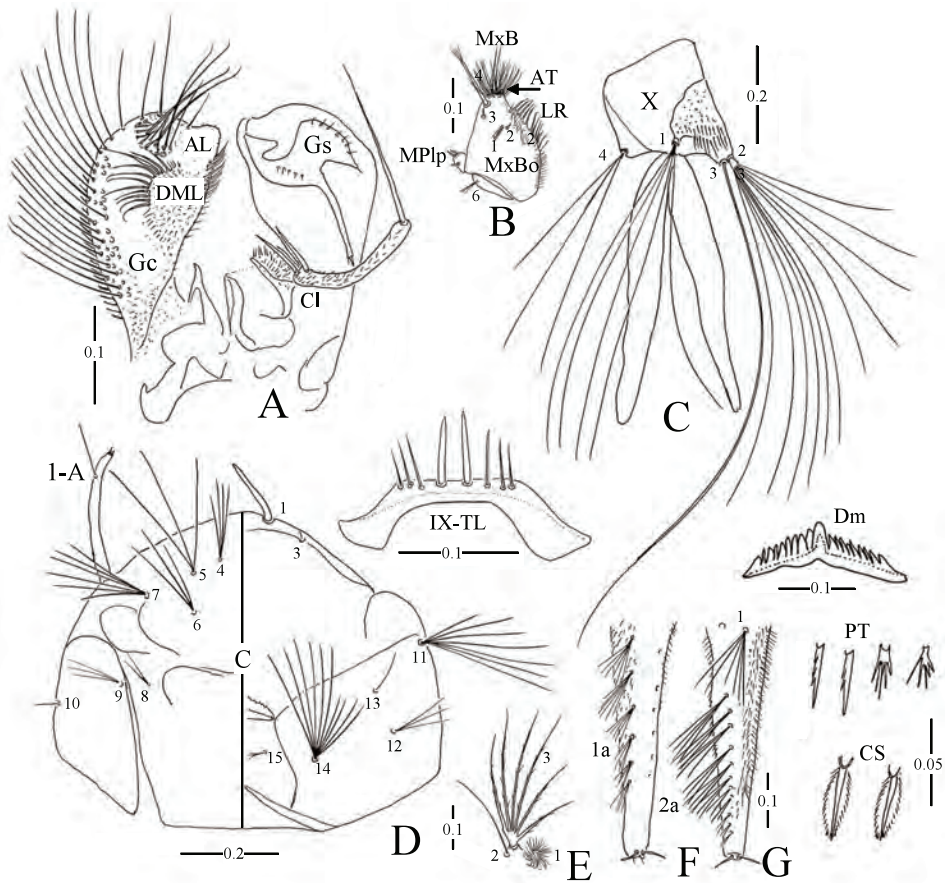


Figure 1. *Topomyia (Topomyia) katibasensis*, new species. Male (A) and 4th instar larva (B-G). A, male genitalia (paratype G-1); B, maxilla; C, abdominal segment X; D, head; E, prothoracic setae 1-3; F, siphon; G, siphon in different view. AL, apical lobe; Cl, claspette; DML, dorsomesal lobe; Gc, gonocoxite; Gs, gonostylus; IX-TL, terugam IX; AT, apical teeth; LR, laciniarastrium; MPlp, maxillary palpus; MxB, maxillary brush; MxBo, maxillary body; Dm, dorsomentum; 1-A, antennal seta 1; CS, comb scale; PT, pecten. Scales in mm.

elbowed, directed posteriorly. Ungues on all legs small, simple and equal. *Wing*: Brown-scaled. Cell R_2 about 4 times length of its stem. Alula with a row of fine, hair-like scales; upper calypter bare. *Halter*: Pedicel and capitellum covered with dark brown scales. *Abdomen*: Terga I–VIII densely covered with small, dark brown scales, except upper border of pale strip appearing as a straight line in lateral view. Sterna II–VII entirely covered with flat pale scales. *Genitalia* (Figs. 1A, 7E): Tergum of IX segment arched and broad throughout, two large (one pair) flattened spines tapering towards a point, situated centrally, close to each other on either side of midline; usually 3 fine setae on the outer side of the spine (Fig. 1, IX-TL). Gonocoxite (Gc) length about 2.5 times width at middle, narrow at base and fairly broad at apical end; on the dorsal aspect, outer 2/3 of gonocoxite is highly sclerotized and bears many long incurved setae; apical lobe (AL) with a bunch of 5–7 stout setae; dorsomesal lobe (DML) situated at slightly above the center, outer margin of the lobe bearing about 12 flattened setae and fine setae scatteringly. Dorsal lobe of claspette (Cl) is composed of broad rod-like stem which bears 2 or 3 spines basally and many fine setae uniformly from base to tip and with a narrow long elongated apical spine tapering to a point. The spine longer than the rod-like stem. Gonostylus (Gs) broad, expanded into two lobes, the outer lobe broad with several fine marginal setae and inner one slender with a gonostylar claw and with minute setae apex. Paraproct long with sclerotized arms.

Female — Unknown.

Pupa (Fig. 2, Table 1) — Abdomen (I–VIII), 2.10–2.25 mm (mean 2.17mm). Trumpet, 0.24–0.26 mm (mean 0.25 mm). Paddle, 0.46–0.48 mm (mean 0.47 mm). Integument of cephalothorax and abdomen pale yellow, with yellow brown stripes on anterodorsal aspect of abdominal segments II–VII. Chaetotaxy as figured. *Cephalothorax* (Fig. 2B): Trumpet (T), dark yellow, with distinct sculpturing; index, 3.7–4.7 (mean 4.2). *Abdomen* (Fig. 2A, C), microtrichia present on all abdominal segments. Paddle with marginal spicules. Male genital lobe large, extending to 0.59–0.63 of paddle.

Fourth-instar larva (Fig. 1B–G) — Head, 0.65 mm. Siphon, 0.51–0.55 mm (mean 0.53). Chaetotaxy of head and terminal abdominal segments as in Fig. 1C, D. Setae lightly pigmented. Abdominal and thoracic setae conspicuous and many branched. Setae 1–III–VII well developed, stellate with many branches. *Head*: Integument smooth, pale yellow in colour. Maxillar as in Fig. 1B, maxillary horn absent. Dorsomentum with a prominent middle tooth with 9 to 10 small regular teeth on either side. Seta 1-C single, prominent, thick and slightly curved inwardly, with blunt end; seta 4 with 4 branches; seta 5-C long with 3 branches, placed well behind 4-C; seta 6 long with 3 branches; seta 7 with 6 branches; setae

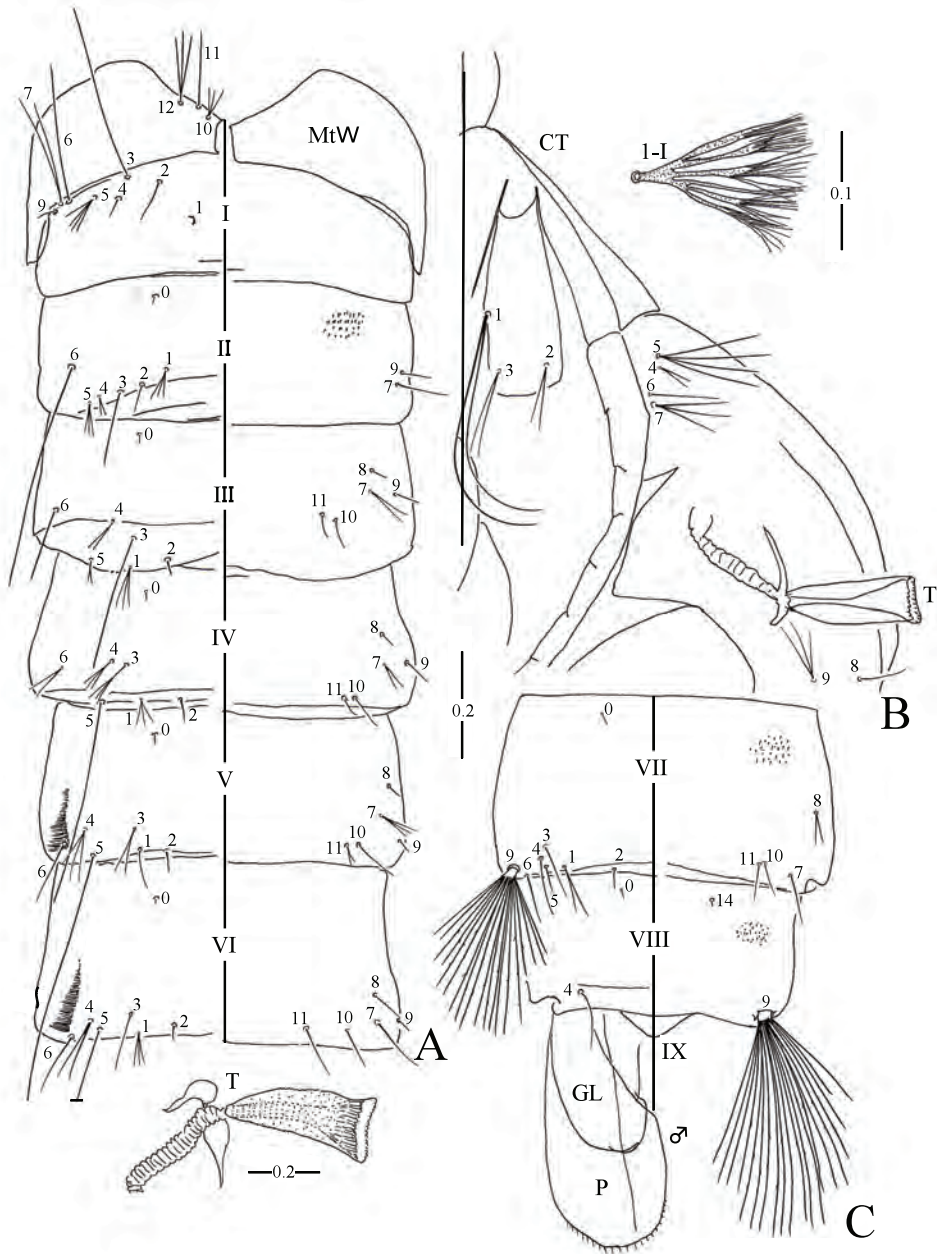


Figure 2. Pupal exuviae (A – C) of *Topomyia (Topomyia) katibasensis*, new species. A, metathoracic wing (MtW) and abdominal segments I – VI; B, cephalothorax (CT); C, abdominal segments VII – IX with genital lobe (GL) and paddle (P). T, trumpet; 1-I, seta 1 of abdominal segment I. Scales in mm.

11- and 12-C prominent with more than 7 branches. Prothoracic seta 1–3 as in Fig. 1E. *Antenna*: Length about 0.25 mm; shaft with slight narrowing of width from base to tip. Integument smooth, without spicules; seta 1-A long and single, placed on 0.75 from base. *Abdomen*: Segment VIII: Comb scales approximately 20, in irregular row or patch; very finely fringed marginally and pointed at tip (Fig. 1CS). Segment X (Fig. 1C): Saddle incomplete, spicules present on caudolateral border; anal papilla about 2.5 times the length of the anal segment, with rounded ends. Seta 1-X long, with 5 branches, 2-X with 10, 11 branches, 3-X single, longer than the others, 4-X with 3 branches. All these setae without pectination. Siphon (Fig. 1F, G): Pale yellow pigmentation, smooth integument. Index, 5.7–6.5 (mean 6.1). Pecten with approximately 100 teeth, extending from base to apical 0.1 of siphon. Seta 1-S long with usually 6 branches; usually 6 subventral setae (1a-S), each with 2–6 branches; usually 11 or 12 subdorsal setae (2a-S) with 2–4 branches as figured (Fig. 1F, G). Comb scales (CS) as in Fig. 1, and pectens (PT) have two types as in Fig. 1.

Type specimens

Holotype ♂ (20110227-10) on pin with L (fourth-instar larva) and P (pupa) exuviae mounted on slide (159) and genitalia on other slide (G-59) with following collection data; Headquarters (N 01°38.777' and E 112°167.709') of LEWS on 27 February, 2011. Paratypes. 3♂ (20110301-3) with P (146, 287, 178) and G (G-55, -124, -69); 1♂ (20110304-5) with G (G-1); 1♂ (20110910-6) with P, L (356) with G (G-173) same place as the holotype.

Etymology

The species name *katibasensis* refers to the name of the river, Sg. Katibas that flows through the LEWS, where this new species was found.

Taxonomic Discussion

Topomyia katibasensis, new species, is separated from all other known species of the subgenus *Topomyia* by the following distinctive structures of the male genitalia: (1) A bunch of about 5–7 stout setae is present on the apical lobe of the gonocoxite; (2) Dorsomesal lobe bears about 12 flattened setae with whip-like tips; (3) Gonostylus expanded basally and bifurcated, the outer lobe is broad with several fine marginal setae and inner one is slender with a claw and minute setae apex; and (4) Tergum of IX segment arched and broad throughout, with two (one pair) large, flattened spines tapering towards a point. The spines situated centrally, close to each other on either side of midline; three fine setae are situated on outer side of the spine; they are apparently shorter than the central spines.

As the detailed descriptions of the immature stages of most species of the subgenus are not available, it is not feasible to point out the distinctive characters

of these stages of *To. katibasensis*, but a lateral patch of distinct spicules or ciliations in abdominal segments V and VI in the pupa is characteristic of *To. katibasensis*. In the larva, on the presence of many conspicuous stiff stellate setae on the thorax and abdomen and many scattered pecten on lateral and ventral sides of the siphon, this species may be closely related to *Topomyia hardini* Miyagi and Toma [10] from Sarawak but it is easily separated from the latter by the head setae 4-, 5-, 6- and 7-C which are usually 4, 3, 3 and 6 branched respectively, while in *To. hardini*, these setae are usually all single.

Biological notes

Larvae of *To. katibasensis* were collected in association with *Topomyia gracilis*, *Malaya* sp. *Aedes* sp. (*kochi* group) and *Toxorhynchites* sp. in the leaf axils of screw pines (*Pandanus*).

Distribution

Katibas, Lanjak-Entemau Wildlife Sanctuary, Sarawak, Malaysia.

***Topomyia (Topomyia) chaii* Miyagi and Toma new species** (Figs. 3, 4, 7C; Table 2)

Description

This species resembles the preceding species, *To. katibasensis*, in general appearance. It is differentiated by the following:

Male (Fig. 3A, 7C) — Wing, 2.60–2.66 mm (mean 2.63 mm). Proboscis, 1.50–1.80 mm (mean 1.65 mm). Forefemur, 1.50–1.80 mm (mean 1.65 mm). Medium in size. **Head:** Maxillary palpus brown, small, about 0.1 of proboscis. Proboscis entirely dark dorsally, elongate and swollen at tip; white scale patch at base and a narrow ventral line of white scales extending forward to the tip of proboscis. Flagellum pillose, as long as proboscis. **Thorax:** Usual silver line on scutum broad gradually toward end. All three lobes of scutellum with a patch of silver scales, often obsolete on laterals. Anteprenotal lobe with conspicuous silver scale patch uniformly and with a row of several setae on anterior side. Postpronotum covered with flat silver scales and with single prominent seta at middle. Four fine prespiracular setae present. Pleuron covered with patches of silver scales. **Legs:** All coxae and trochanters covered with silver scales. Dorsal part of all legs covered with small dark brown scales and ventral part with a white line extending from base of femora to tips of tarsi, but the line not so clear in foreleg. Joint between apical part of tibia and basal part of first tarsal segment of the hindleg with a line of fine setae (ciliation). Foretarsomere Ta-I₂ equal or shorter than Ta-I₃, apical tarsomeres usually not elbowed. Ungues of all legs small, simple and

equal. *Wing*: Brown-scaled. Cell R_2 about 3.9 times length of stem. *Abdomen*: Terga I-VIII densely covered with small, dark brown scales, except upper border of this pale strip appearing as a straight line in lateral view. Sterna II-VII entirely covered with flat pale scales. *Genitalia* (Figs. 3A, 7C): Tergum of IX segment arched and broad throughout, slightly concave on posterocentral surface, with two median flattened spines tapering towards a point, situated close to each other on either side of midline, the outer side of the spine with usually 2 flattened setae which are apparently longer than the median spines (Fig. 3, IX-TL). Gonocoxite (Gc) length about 2.4 times width at middle, narrow at base and at apical end with a row of many fine setae of inner apical margin. On the dorsal aspect, outer 2/3 of gonocoxite is sclerotized and bears many long setae; dorsomesal lobe (DML) bearing many fine and well developed hair-like setae. Dorsal lobe of claspette (Cl) bear 5-8 basal spines and composed of broader rod-like stem which bears a narrow elongated spine tapering to a point. The spine is shorter than the rod-like stem. Gonostylus (Gs) simple and slender with hook-like apex. Paraproct long with sclerotized arms.

Female — Wing, 2.30 mm. Proboscis, 1.40 mm. Forefemur, 1.50 mm. Resembles male except for following characters. Whitish scale patch on ventral aspect of proboscis absent. All coxae and trochanters covered with silvery scales. Remaining parts of legs uniformly covered with small dark brown scales dorsally, except for

Table 2. Numbers of branches for pupae of *Topomyia (Topomyia) chaii* n. sp.

Seta no.	Cephalo-thorax	Abdominal segments								
		I	II	III	IV	V	VI	VII	VIII	
0	-	-	1	1	1	1	1	1	1	1
1	2	M	1-6	1-3	2-4	1-4	1-3	1, 2	-	-
2	1-4	1	1	1	1	1	1	1	-	-
3	2-5	1	1	1-3	1-4	1-4	1-3	1-3	-	-
4	2-4	1, 2	2-4	1-5	1-4	1-6	1-4	1-4	1, 2	-
5	2-5	3-7	1, 2	1, 2	1	1	1	1	-	-
6	1	1-3	1	1-4	1-3	1-3	1, 2	1, 2	-	-
7	1-5	1-4	1-3	1-5	1-4	1-4	1, 2	1, 2	-	-
8	1, 2	-	-	1-4	1-5	1-4	1-4	1-4	-	-
9	1-3	1, 2	1	1	1	1	1	7-14*	11-15*	-
10	1-3	-	-	1-3	1, 2	1, 2	1, 2	1, 2	-	-
11	1	-	1-3	1-3	1-3	1, 2	1-3	2-4	-	-
12	2, 3	-	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	-	1

M: dendritic with many branches. *aciculated.

Obsolete and missing setae are shown with a hyphen (-).

Specimens examined; 5 pupal exuviae from LEWS, Sarawak, Malaysia

a ventral line of pale scales extending from base to apical part of femur; antenna about same length as forefemur. *Abdomen*: Terga 1–VIII densely covered with flat, dark brown scales. Lateral margin of all terga without strip of pale scales. Sterna I–VII covered by flat silver colored scales.

Pupa (Fig. 4; Table 2) — Abdomen (I–VII), 2.62–2.80 mm (mean 2.71 mm). Trumpet, 0.28–0.32 mm (mean 0.30 mm). Paddle, 0.45–0.49 mm (mean 0.47

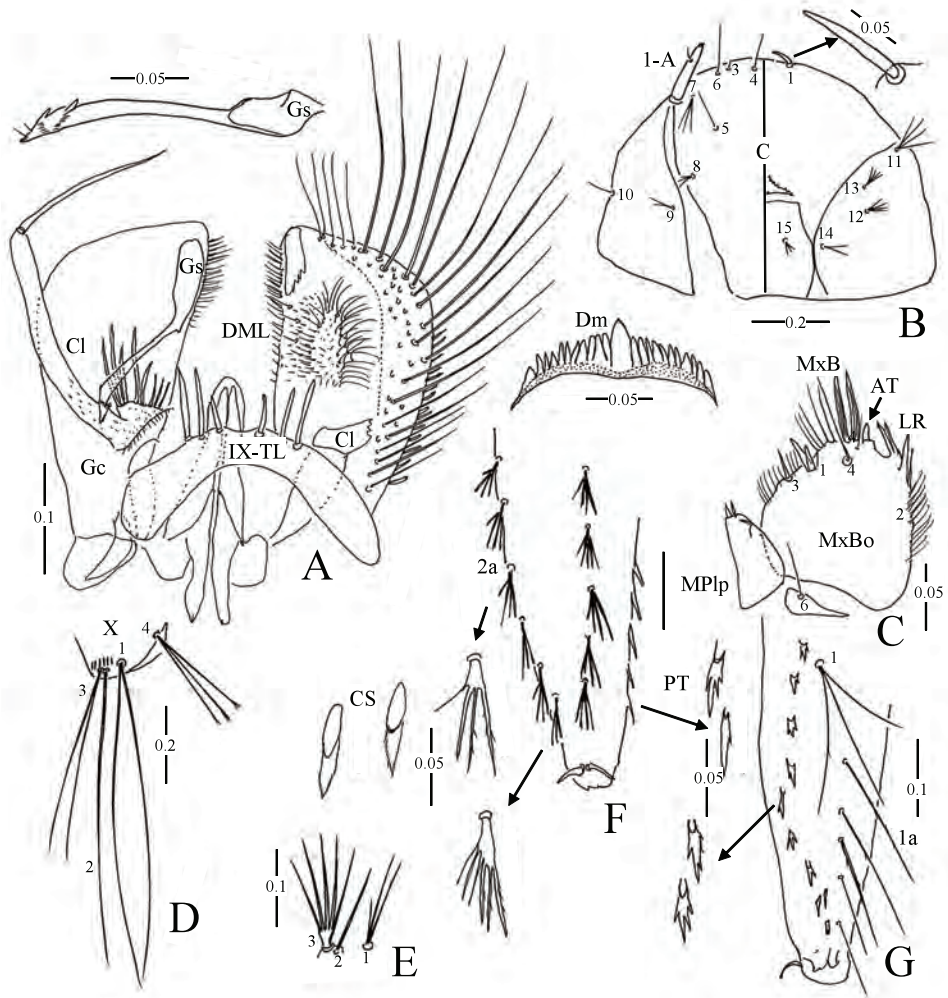


Figure 3. *Topomyia (Topomyia) chaih*, new species. Male (A) and 4th instar larva (B–G). A, male genitalia (paratype G-21); B, head; C, maxilla; D, abdominal segment X; E, prothoracic setae 1–3; F, siphon; G, siphon in different view. Cl, claspette; DML, dorsomesal lobe; Gc, gonocoxite; Gs, gonostylus; IX-TL, terugam IX; AT, apical teeth; LR, laciniarastrum; MP1p, maxillary palpus; MxB, maxillary brush; MxBo, maxillary body; Dm, dorsomentum; 1-A, antennal seta 1; CS, comb scale; PT, pecten. Scales in mm.

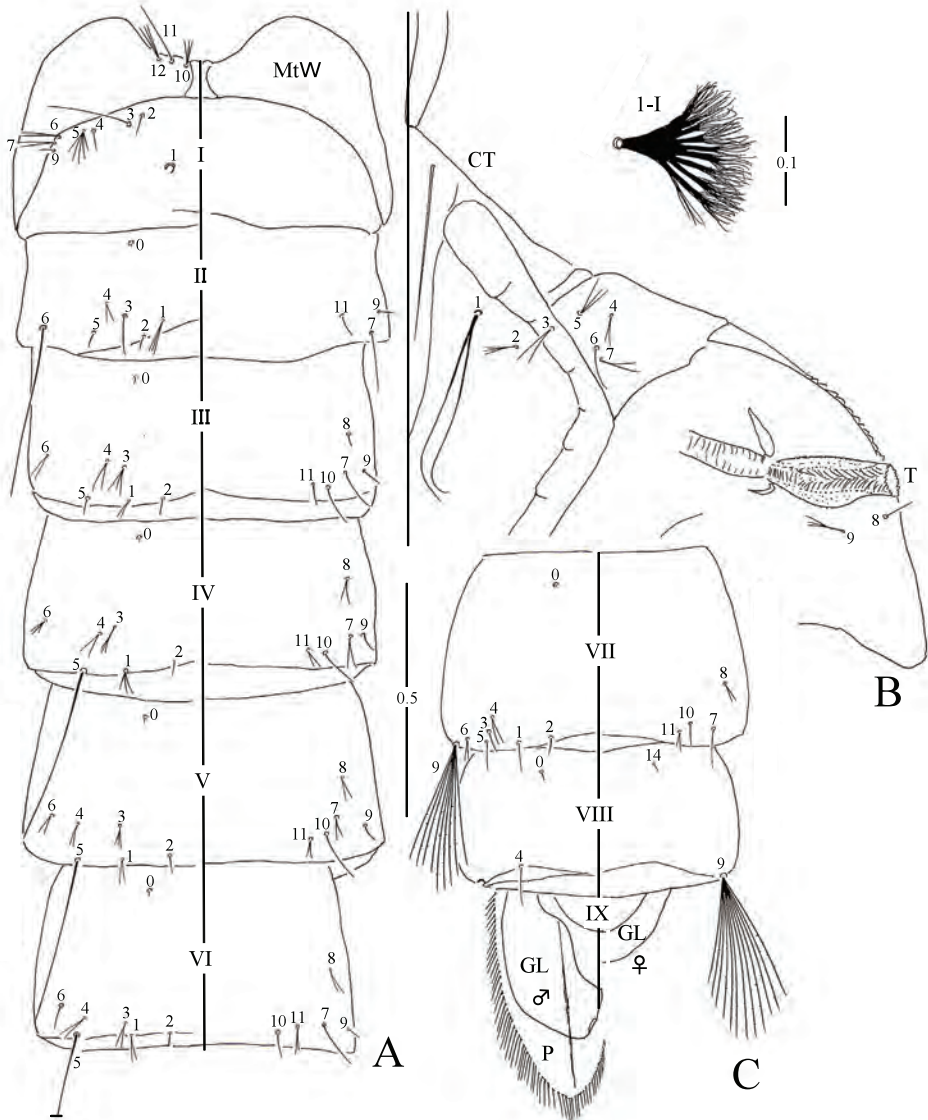


Figure 4. Pupal exuviae (A-C) of *Topomyia (Topomyia) chaii*, new species. A, metathoracic wing (MtW) and abdominal segments I-VI; B, cephalothorax (CT); C, abdominal segments VII-IX with genital lobe (GL) and paddle (P). T, trumpet; 1-I, seta 1 of abdominal segment I. Scales in mm.

mm). Integument of cephalothorax and abdomen pale yellow, with darker yellow brown stripes on anterodorsal aspect of abdominal segments II–VII. Chaetotaxy as figured. *Cephalothorax*: Trumpet: Dark yellow, with sculpturing, slightly expanded medially, index, 2.80–3.25 (mean 3.0). *Abdomen*: Microtrichia scanty on all abdominal segments. Seta 1-I long, conspicuous (Fig. 4, 1-I). Paddle with conspicuous marginal fringe. Male genital lobe (GL) large, extending to 0.73 of paddle.

Fourth-instar larva (Fig. 3 B–G) — Head, 0.65–0.79 mm (mean 0.72 mm). Siphon, 0.52–0.55 mm (mean 0.53 mm). Chaetotaxy of head and terminal segments as figured. Stellate setae present. *Head* (Fig. 3B): Width about 1.33 of length. Integument smooth, pale yellow in colour. Mouth brushes well-developed. Maxillar (Fig. 3C), horn absent. Dorsomenta (Dm) with a prominent middle tooth with 11 or 12; head seta 1-C prominent, thick, with blunt end; seta 3 single minute, 4–6-C usually single, 7-C 3 branched, 11-C developed 4 branched, 14-C bifid shorter than seta 11-C. *Antenna*: Length about 0.33 of head. Shaft with very slight narrowing of width from base to tip. Integument smooth, without spicules; pale yellow in colour. Seta 1-A short, single, situated about 0.87 from base. Prothoracic seta 1–3 as in Fig. 3E. *Abdomen*: Comb scales (CS) approximately 17 in a row; lightly pigmented; free portion finely fringed and pointed at tip. *Siphon* (Fig. 3F, G): Index, 2.61–3.14 (mean 2.87). Pecten (PT) with about 20 teeth extending from base to apical 0.85, each with a large denticle and 2, 3 small lateral denticles; seta 1-S large with 3 branches; ventral setae (1a-S) as figured, 5 setae, all these setae well developed, single; subdorsal setae (2a-S) 4–6 in number, each stellate, pointed tip, fringed laterally (Fig. 3 F). Segment X (Fig. 5D): Seta 1 long, bifid; 2 bifid; 3 long, single; 4 short triple. All setae without pectination.

Type specimens

Holotype ♂ (20110909-5) on pin with L (larva) and P (pupa) exuviae mounted on slide (247) and G (genitalia) on same slide (G-114) with following collection data: Headquarter (N 01°38.777' and E 112°167.709') of LEWS, Sarawak on 9 September, 2011. Paratypes 6 ♂♂ (20110909-5), L, P (121, 70, 93, 85, 226), G (G-24, -16, -37, -50, -104, -23), collection data same as the holotype; 1 ♂ (20110227-6), P, L (57), G (G-21) on 27 February 2011; 1 ♀ (20110909-5), P, L (119) on 9 September 2011; 1 ♀ (20110911-5), P, L (117), on 11 September, 2011, at the same place as the holotype.

Etymology

The species name *chaii* is in honour of Dr Paul Chai for his many contributions to the biodiversity conservation in the Lanjak-Entimau Wildlife Sanctuary, Sarawak.

Taxonomic discussion

Topomyia chaii has similarities in the general appearance of male genitalia with *Topomyia yongi* from Gombak, Malaysia [11]. However, *To. chaii* can be separated from the latter by following characters. The gonocoxite has a dense tuft of many curved short hair-like setae on dorsomesal lobe and apical part of gonocoxite without dense patch of setae. The rod-like dorsal lobe of claspette is not setaceous and longer than the apical spine. Two median spines of IX tergum are apparently shorter than the outer spines. As the larva of *To. chaii* is described partially and most larvae of the genus are as yet unknown, it is difficult to discuss the characteristic feature of *To. chaii*. However, the followings may be characteristic of *To. chaii*: Head seta 14-C is small with 2 branches, siphonal seta 1-S is long triple; 1a-S 5–7 in number, each seta is single branched; seta 2a-S is stellate with 5–6 branches.

Biological notes

Larvae of *To. chaii* were collected in association with *To. katibasensis*, *To. gracilis*, *Malaya* sp. and *Aedes* sp. (*kochi* group) in leaf axils of screw pines. They are not predacious.

Distribution

Katibas, Lanjak-Entemau Wildlife Sanctuary, Sarawak, Malaysia.

***Topomyia (Topomyia) nicksoni* Miyagi and Toma new species** (Figs. 5, 6, 7A, 7B; Table 3)

Description

This species resembles *To. katibasensis* in general appearance. It is differentiated as follows.

Male (Fig. 5A, 7B) — Wing, 2.16–2.60 mm (mean 2.38 mm). Proboscis, 1.60–1.66 mm (mean 1.63 mm). Forefemur, 1.66–2.00 mm (mean 1.83 mm). Medium in size, dark brown with silver markings on antepnotum, head, scutum and scutellum. *Head*: Maxillary palpus light brown, small, about 0.12 of proboscis. Proboscis slender and slightly swollen at tip; entirely dark dorsally, without distinct ventral white line but several white scales at base and apex ventrally. Vertex with several erect scales. Flagellum less pillose, about same length as proboscis. *Thorax*: Integument of scutum and scutellum brown. A median silver line on scutum straight from anterior promontory to the wing root. Scutal-fossal, dorsocentral, prescutellar and supraalar setae present. All three lobes of scutellum with dark scales, without patch of silver scales; setae present on all lobes. Antepnotal lobe with conspicuous silver patch on dorsum, dark brown scales

present on lower side; several prominent setae on anterior margin. Postpronotum covered with flat brown scales, without silver scales. Three fine prespiracular setae present. Paratergite bare. Silver scales forming large patch to cover most of the pleuron, including post- and subspiracular areas, most of the mesokatepisternum and the mesanepimeron. Metepisternum bare. Upper mesepimeron and prealar areas without setae. *Legs*: All coxae and trochanters covered with silver scales. Dorsal part of all legs covered with small dark brown scales, and ventral part with a white line extending from base of femora to tips of tarsi, but the line not so clear in foreleg. Junction between apical part of tibia and basal part of first tarsus of hindleg with a line of fine setae (ciliation). Foretarsomere Ta-I₂ apparently longer than Ta-I₃, apical tarsomeres elbowed, directed posteriorly. Ungues on all legs small, simple and equal. *Wing*: Brown-scaled. Cell R₂ about 4 times length of the stem. Alula with a row of fine, hair-like scales; upper calypter bare. *Abdomen*: terga with dark scales; sterna I–VII pale, mingled with dark scales; sternum VIII with dark scales. Genitalia (Figs. 5A, 7D). Tergum of IX segment arched and broad throughout, slightly concave on postercental surface, with two large and flattened spines tapering towards a point, situated close to each other on either side of midline, the outer side of the spine without lateral setae (IX-TL). Sternum IX broad, lateral borders sclerotized, with scattered scales and setae. Gonocoxite (Gc) length about 3.5 times width at middle, narrow at apical end. On the dorsal aspect, outer 2/3 of gonocoxite is highly sclerotized with a row of many long incurved setae; dorsomesal lobe (DML) bearing hair-tufts, composed of bundle long setae situated inner corner and many long matted and twisted setae. Dorsal lobe of claspette (Cl) composed of broader rod-like stem which bears 2 spines at base and a narrow long elongated spine at apex. The spine shorter than the rod-like stem. Gonostylus (Gs) slender, curved at apical half, with a gonostylar claw and two fine setae at apex. Paraproct long with sclerotized arm.

Female (Fig. 7A) — Wing, 2.83 mm. Proboscis, 1.93 mm. Forefemur, 1.93 mm. Resembles male except for following characters. *Head*: Whitish scale patch on ventral aspect of proboscis absent. Antenna pilose, about same length as forefemur. *Legs*: All coxae and trochanters covered with silvery scales; remaining parts of legs uniformly covered with small dark brown scales dorsally, except for a line of pale scales extending from base to apical part of ventral aspect of femur. *Abdomen*: Terga 1–VIII covered with flat, dark brown scales with metallic green sheen at certain angles. Lateral margin of all terga without strip of pale scales. Sterna I–VIII covered by flat silver colored scales.

Pupa (Fig. 6, Table 3) — Abdomen (I–VII), 2.32–2.62 mm (mean 2.47 mm). Trumpet, 0.23–0.29 mm (mean 0.26 mm). Paddle, 0.48 mm. Integument of cephalothorax and abdomen pale yellow, with yellow brown stripes on anterodorsal

Table 3. Numbers of branches for pupae of *Topomyia (Topomyia) nicksoni* n. sp.

Seta no.	Cephalo- thorax	Abdominal segments							
		I	II	III	IV	V	VI	VII	VIII
0	-	-	1	1	1	1	1	1	1
1	2	M	2-6	1-5	2-5	2-4	2-4	1-3	-
2	1-3	1	1	1	1	1	1	1	-
3	1-3	1	1	1	2, 3	2, 3	1, 2	1	-
4	2-4	1	1-6	2-4	1-5	2-4	1, 2	1	1
5	2-9	3-5	2, 3	1-3	1	1	1	1	-
6	1-4	1, 2	1	1, 2	1-3	1-3	1	1-3	-
7	1, 2	1	1, 2	1-3	1-4	2-4	1	1	-
8	1, 2	-	-	1-3	2, 3	1-4	1-3	2-4	-
9	1, 2	1, 2	1	1	1	1	1	11-26*	15-20*
10	1-4	-	-	1, 2	1-3	1, 2	1-3	1, 2	-
11	1, 2	-	1-3	1-3	1-3	1-3	1, 2	1	-
12	2-4	-	-	-	-	-	-	-	-
14	-	-	-	-	-	-	-	-	1

M: dendritic with many branches. *aciculated.

Obsolete and missing setae are shown with a hyphen (-).

Specimens examined; 4 pupal exuviae from LEWS, Sarawak, Malaysia

aspect of abdominal segments II–VII. Chaetotaxy as figured. Abdominal seta 1-I conspicuous 7 or 8 basal branched, each branch with many apical branches (Fig. 6, 1-I). *Cephalothorax*: Trumpet (T), dark yellow, with distinct sculpturing. Index, 3.2–4.0 (mean 3.6). Seta 1 long, conspicuous, bifid. *Abdomen*: Microtrichia absent on all segments. Paddle with conspicuous marginal fringe. Male genital lobe (GL) large, extending to 0.84 of paddle.

Fourth-instar larva (Fig. 5 B–F) — Head, 0.71–0.75 mm (mean 0.72 mm). Siphon, 0.57–0.59 mm (mean 0.58 mm). Chaetotaxy of head and terminal segments as figured. Setae lightly pigmented. Stellate setae present on all abdominal segments. A strongly sclerotized stellate seta with 11–13 brush-like tip branches is found in the mesothracic setae (Fig. 5, MT). *Head* (Fig. 5B): Width about 1.28 of length. Integument smooth, pale yellow in colour. Mouth brushes well-developed, brown in colour. Maxillary (Fig. 5D), horn absent. Dormontal plate with a prominent middle tooth with 8 to 10 small regular teeth on either side. Seta 1-C single, prominent, thick and slightly curved, with blunt end; setae 4–7-C rather long, single; 9-C with 4 branches; 11 and 14-C conspicuous with 5, 6 branches. *Antenna*: 0.26 mm length, about 0.38 of head; shaft with slight narrowing of width from base to tip. Integument smooth, without spicules; pale yellow in colour; seta 1-A single, situated at about 0.78 from base. *Abdomen*: Comb scales (CS) approximately 20, in 2 or 3 rows; each pointed at tip with fine

fringes at base. Siphon (Fig. 5F, G) yellow pigmentation, integument smooth; index 3.83–4.55 (mean 4.0). Pecten (PT) extending from base to apex of siphon; individual pecten pointed towards tip and finely fringed. Seta 1 of siphon large with 4 branches; accessory ventral setae (1a-S) about 7 setae in a row, each with 1–4 branches; accessory subdorsal setae (2a-S) 4 with 3–5 branches. Segment X (Fig. 5C), seta 1 with 6 branches, 2 with 7 branches, 3 single, 4 with 6 branches. All setae with fine pectination.

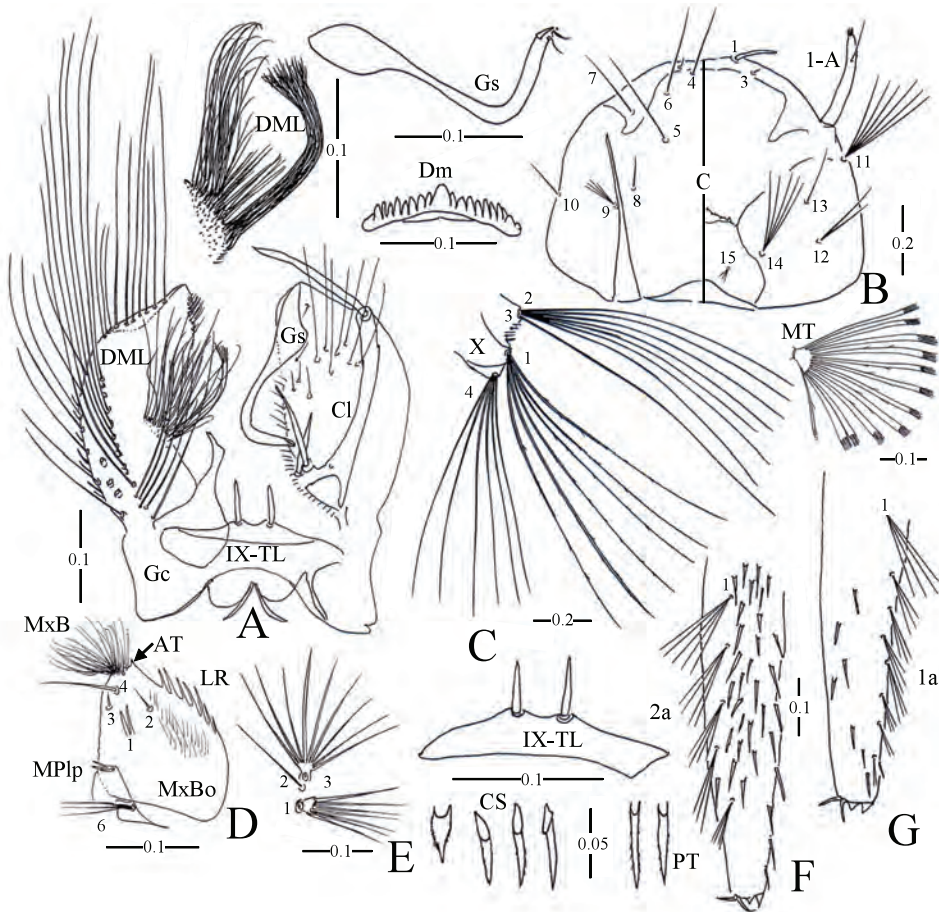


Figure 5. *Topomyia (Topomyia) nicksoni*, new species. Male (A) and 4th instar larva (B–G). A, male genitalia (paratype G-87); B, head; C, abdominal segment X; D, maxilla; E, prothoracic setae 1–3; F, Siphon; G, Siphon in different view. Cl, claspette; DML, dorsomesal lobe; Gc, gonocoxite; Gs, gonostylus; IX-TL, terugam IX; AT, apical teeth; LR, laciniarastrium; MPip, maxillary palpus; MxB, maxillary brush; MxBo, maxillary body; Dm, dorsomentum; 1-A, antennal seta 1; MT, mesothracic seta; CS, comb scale; PT, pecten. Scales in mm.

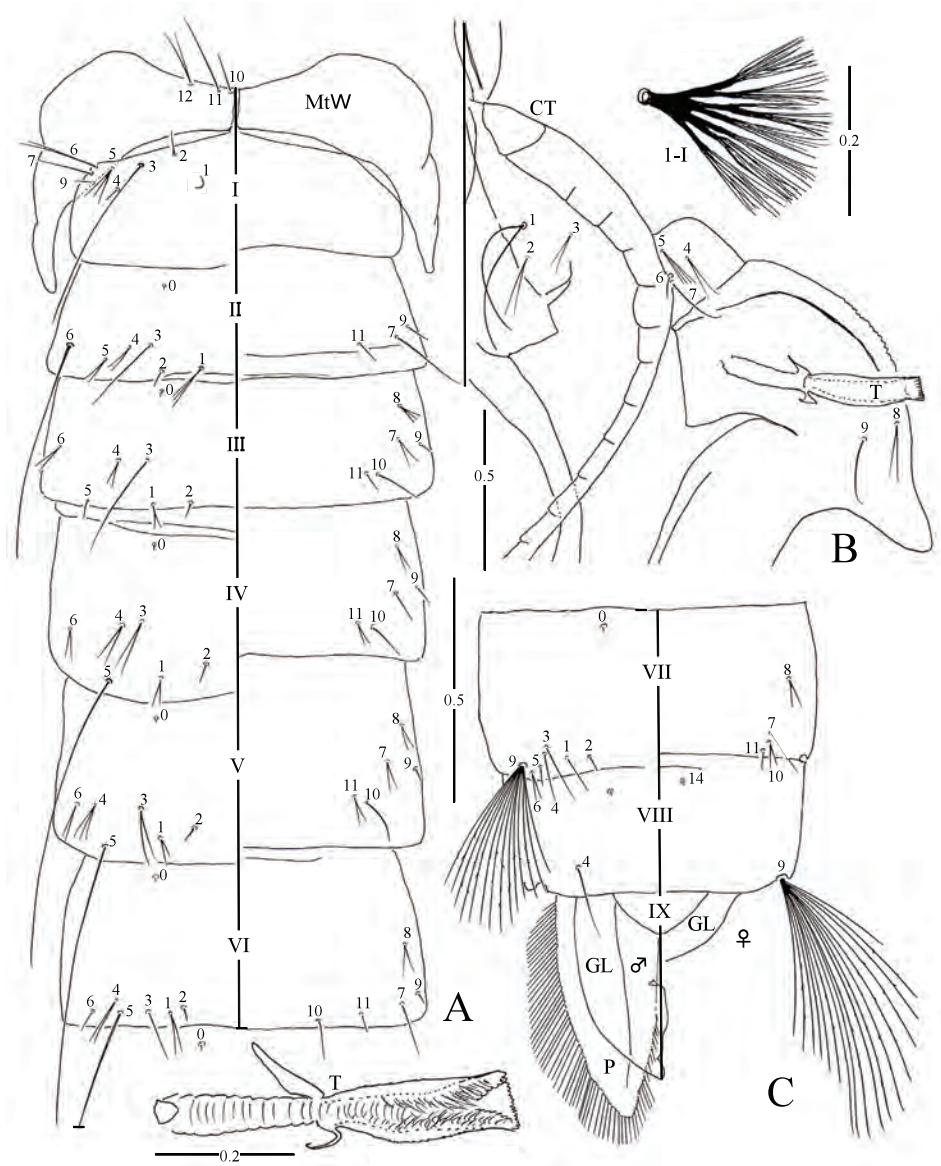


Figure 6. Pupal exuviae (A-C) of *Topomyia (Topomyia) nicksoni*, new species. A, metathoracic wing (MtW) and abdominal segments I–VI; B, cephalothorax (CT); C, abdominal segments VII–IX with genital lobe (GL) and paddle (P). T, trumpet; 1–I, seta 1 of abdominal segment I. Scales in mm.

Type specimens

Holotype ♂ (20110305-10) on pin with L (fourth-instar larva) and P (pupa) exuviae mounted on slide (239) and G (genitalia) on another slide (G-126) with following collection data: Headquarter (N 01°38.777' and E 112°167.709') of LEWS, Sarawak on 5 March, 2011. Paratypes 1♂ (20110303-2) with P, L (213), G (G-87), 3 March, 2011; 2♂♂ (20110909-5), with P, L (158,16), G (G-119, -8) on 9 Sept. 2011; 1♂ (20110911-5) with P, L (157), G (G-47) on 11 September, 2011; 2♀♀ (20110909-5) with P, L (282, 316) on 9 September, 2011.

Etymology

The species name *nicksoni* is in honour of Mr Nickson Joseph Robi, Warden, LEWS, Sarawak, for his many contributions to the biodiversity conservation and for his support and encouragement during our filed research in the Lanjak-Entimau Wildlife Sanctuary, Sarawak.

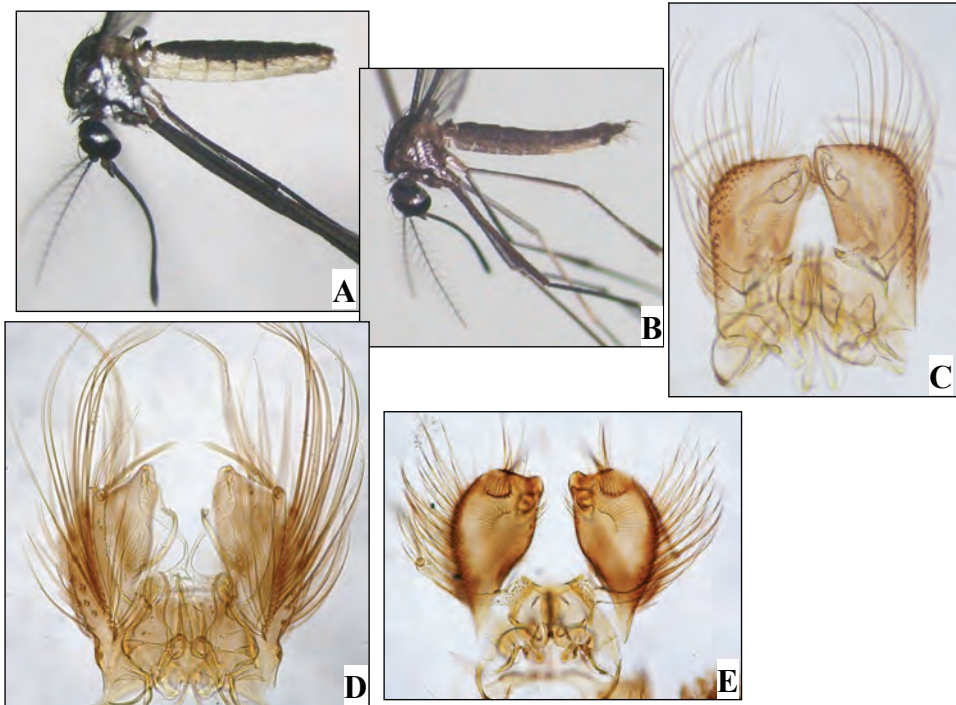


Figure 7.

- A. Female *Topomyia (Topomyia) nicksoni*, new species (lateral view)
- B. Male *Topomyia (Topomyia) nicksoni*, new species (lateral view)
- C. Male genitalia, *Topomyia (Topomyia) chaiti*, new species (ventral view)
- D. Male genitalia, *Topomyia (Topomyia) nicksoni*, species (ventral view)
- E. Male genitalia, *Topomyia (Topomyia) katibasensis*, new species (ventral view)

Taxonomic discussion

Topomyia nicksoni has the following distinctive structures of the male genitalia. Dorsomesal lobe in the gonocoxite bears conspicuous hair-tuft, composed of bundle of long setae situated at inner corner and with many long matted and twisted setae. Gonostylus is slender and curved, apical half with a gonostylar claw and 2 minute setae at apex. The IX tergum is convex at postercentral margin and bearing only one (one pair) conspicuous spine at center, without additional lateral setae. The pupa of this species is very similar to *To. chaiti* but easily separated by short trumpet, with index 3.3 (2.9 in *To. chaiti*) and the large male genital lobe, extending to 0.84 of paddle (in *To. chaiti* extending to 0.73). The larva of *To. nicksoni* has characteristic conspicuous stellate seta with 11–13 brush-tipped setae in mesothorax. This species is also related to *To. katibasensis* but differs in having head setae 4–7-C which are all single, while in the latter species, seta 4-C is 3 or 4 branched, setae 5- and 6-C are usually 3 branched, 7-C is usually 6 branched.

Biological notes

Larvae of this species were collected in the leaf axils of *Phrynium* sp. and arrowroot (Marantaceae) in association with *Topomyia* sp. near *Topomyia sabahensis* in riparian forest. They are not predacious.

Distribution

Katibas, Lanjak-Entemau Wildlife Sanctuary, Sarawak, Malaysia.

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