

DESCRIPTION OF TWO NEW SPECIES OF *AEDES* (*DICEROMYIA*) FROM SOUTH INDIA (DIPTERA: CULICIDAE)

S.C. TEWARI AND J. HIRIYAN

*Centre for Research in Medical Entomology, Post Box No. 5, Sri Satya Sai Nagar,
Madurai—625 003, Tamil Nadu, India*

ABSTRACT. Female, male, pupa and larva of *Aedes* (*Diceromyia*) *agastyai* n. sp. and *Ae.* (*Dic.*) *reubenae* n. sp. are described and illustrated. Characters to distinguish the new species from closely allied ones are discussed.

INTRODUCTION

Aedes (*Diceromyia*) *nummatus* was originally described from Bengal, India by Edwards (1923) who placed it in subgenus *Aedimorphus* Theobald. Barraud (1934) considered it to be an aberrant member of the subgenus. Subsequently, Reinert (1973) shifted this species to subgenus *Diceromyia* Theobald and described a new species, *Ae.* (*Dic.*) *pseudonummatus*, from Thailand that is very similar to *Ae. nummatus*. We have collected two new species from the wooded slopes of the Western Ghats, southern India, both possessing great similarities with *Ae. nummatus* and *Ae. pseudonummatus*. In view of their close affinities, all four species are placed into a single group, the *Aedes nummatus* group of the subgenus *Diceromyia*. An adult key is provided to identify the species of the group.

The terminology used follows Harbach and Knight (1980, 1982) and abbreviations of generic and subgeneric names are from Reinert (1975) and Bickley and Ward (1989). In immature descriptions the range of setal branching number is followed by the mode in parenthesis.

TAXONOMIC TREATMENT

Aedes (*Diceromyia*) *nummatus* group (new group)

Included species: *Aedes agastyai* n. sp., *Ae. nummatus* Edwards, *Ae. pseudonummatus* Reinert and *Ae. reubenae* n. sp.

The Southeast Asian *Ae. nummatus* group is characterized by following combination of characters.

Female. Head: Pedicel with few broad scales; vertex with few broad decumbent scales, without 2 or 3 dark areas alternating with pale patches. **Thorax:** Scutum with a large patch of narrow snowy-white scales on anterior 0.5; acrostichal setae absent; pleuron with patches of broad snowy-white scales. **Wing:** With dark brown scales on all veins (*Ae. pseudonummatus* with a small patch of snowy-white scales at base of costa). **Legs:** Posttarsi I,II toothed; III with simple ungues. **Abdomen:** Terga dark-brown scaled, I-VII with a laterobasal triangular patch of snowy-white scales. **Genitalia:** Cerci short; postgenital lobe with broadly rounded apex.

Male. Head: Palpus short, about 0.5 length of proboscis; antenna plumose, flagellar setae not directed dorsally and ventrally. **Genitalia:** Gonostylus forked medially into 2 subequal arms (male of *Ae. pseudonummatus* is unknown).

Aedes (*Diceromyia*) *agastyai*, n. sp. (Figs. 1-5)

Female. Head (Fig.1): Antenna dark brown, slightly longer than proboscis (1.2 length of proboscis); pedicel dark brown with a small patch of broad pale scales mesally, flagellomere 1 about length of flagellomere 2, with basal 0.5 pale-scaled and slightly swollen; clypeus dark, bare; maxillary palpus dark brown-scaled, about 0.22 length of proboscis; proboscis dark brown-scaled, 0.78-0.84 length of forefemur; eyes contiguous in front;

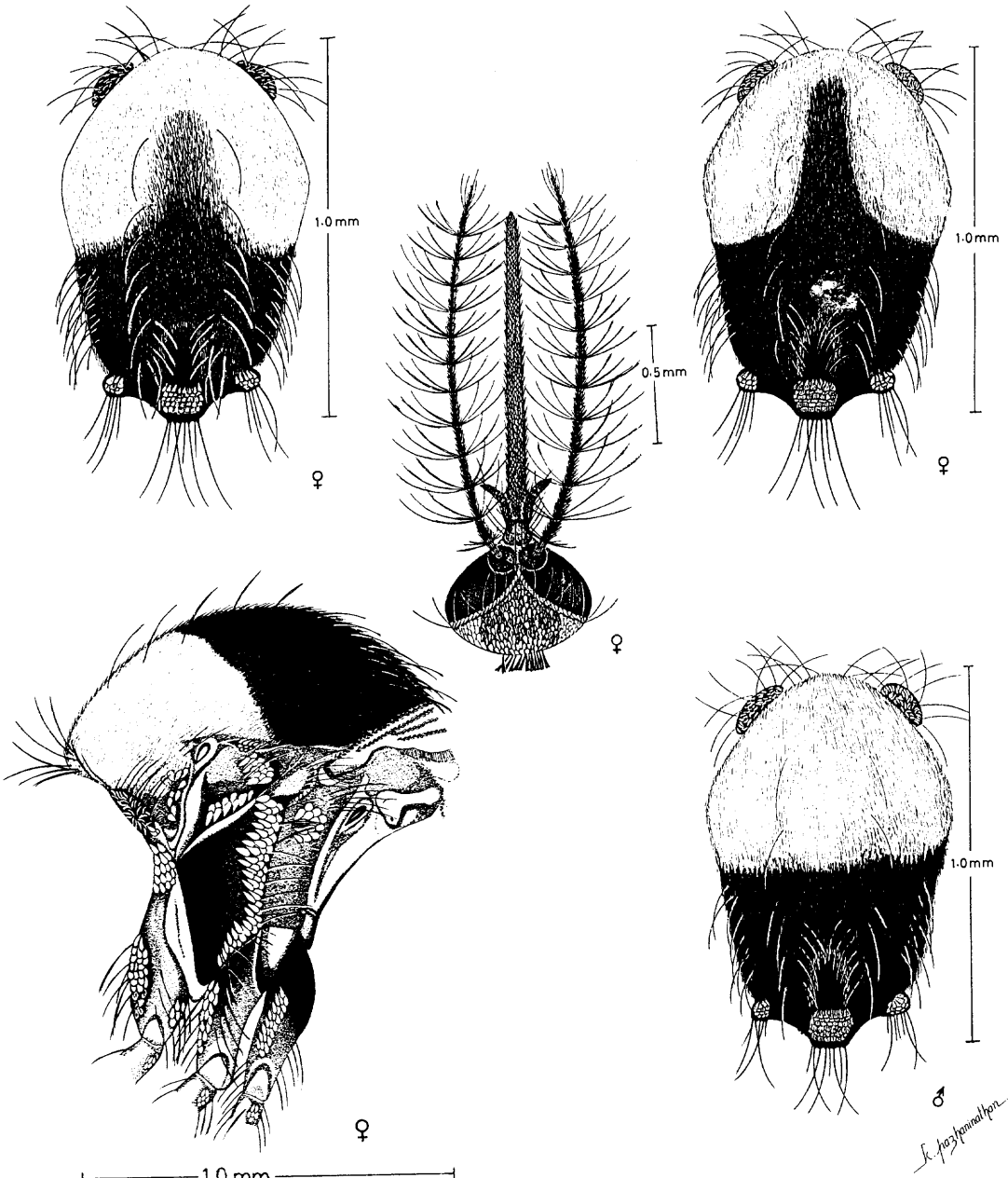


Fig. 1. *Aedes (Diceromyia) agastyai*.

vertex with broad, dark brown, decumbent scales (sometimes with scattered pale or dusky-white scales), laterally (postgena) pale-scaled, ocular line with broad pale scales, interocular space with a pair of long, strong setae with golden sheen; 8-10 well developed dark brown ocular setae on each side; occiput

with few golden erect forked scales. *Thorax* (Fig. 1): Scutal integument dark brown; scutum covered with narrow curved scales except prescutellar space, a large patch of snowy-white scales occupying about anterior 0.5, extending anteriorly and also laterally to paratergite, white scales relatively fewer and nar-

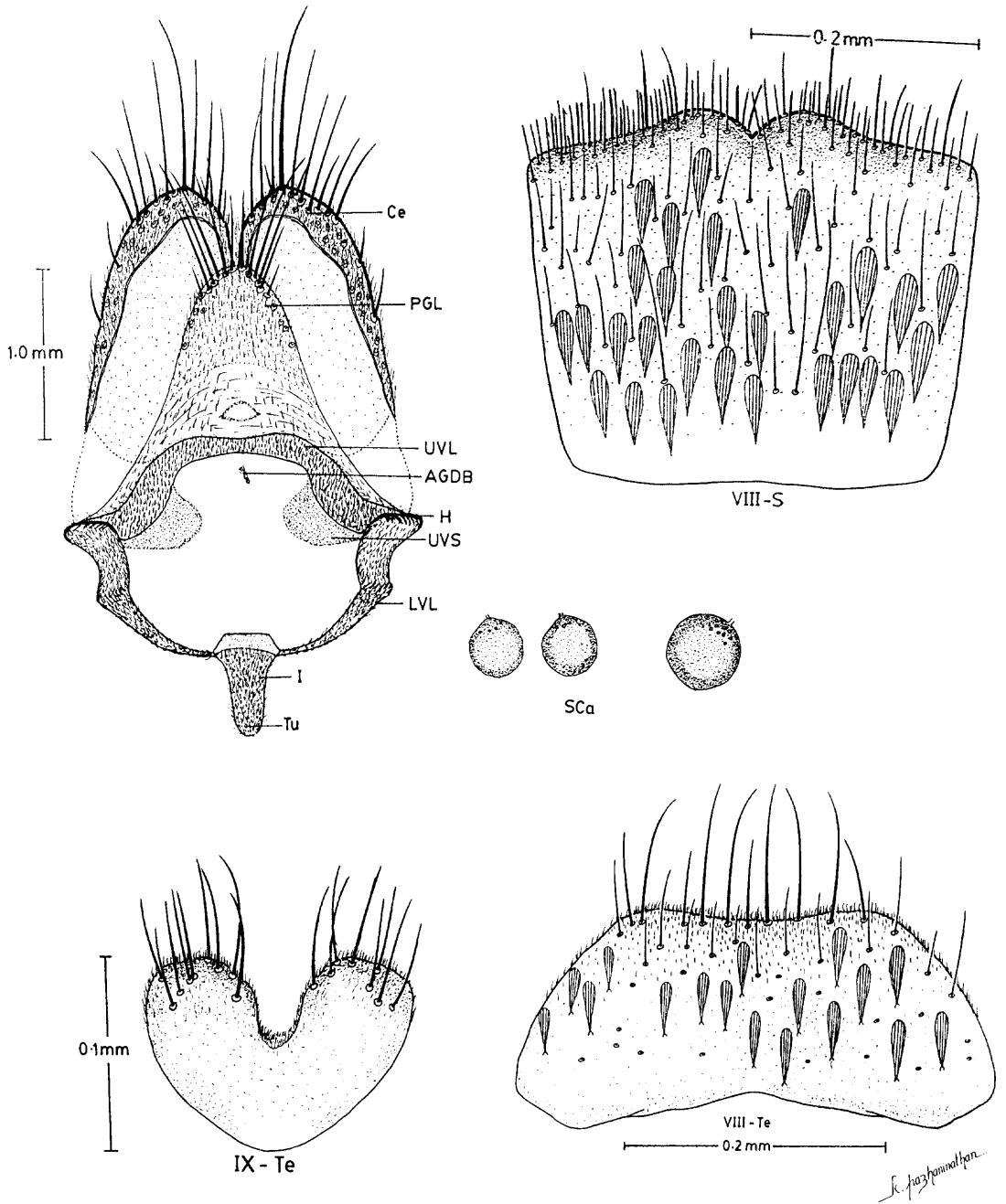


Fig. 2. *Aedes (Diceromyia) agastyai*, female genitalia. AGDB = accessory gland duct base, Ce = cercus, H = hinge, I = insula, LVL = lower vaginal lip, PGL = postgenital lobe, SCa = spermathecal capsule, Tu = tuberculus, UVL = upper vaginal lip, UVS = upper vaginal sclerite, VIII-S = sternum VIII, VIII-Te = tergum VIII, IX-Te = tergum IX.

rower on median acrostichal area, posterior mesal area of this white patch with a deep indentation of light brown scales, which varies in extent, reaching anterior promontory in some specimens, a few narrow pale scales on

lateral margins of prescutellar bare space, remaining posterior area of scutum brown-scaled, 4-6 blackish-brown setae on anterior promontory and several well developed setae on supraalar, dorsocentral and prescutellar

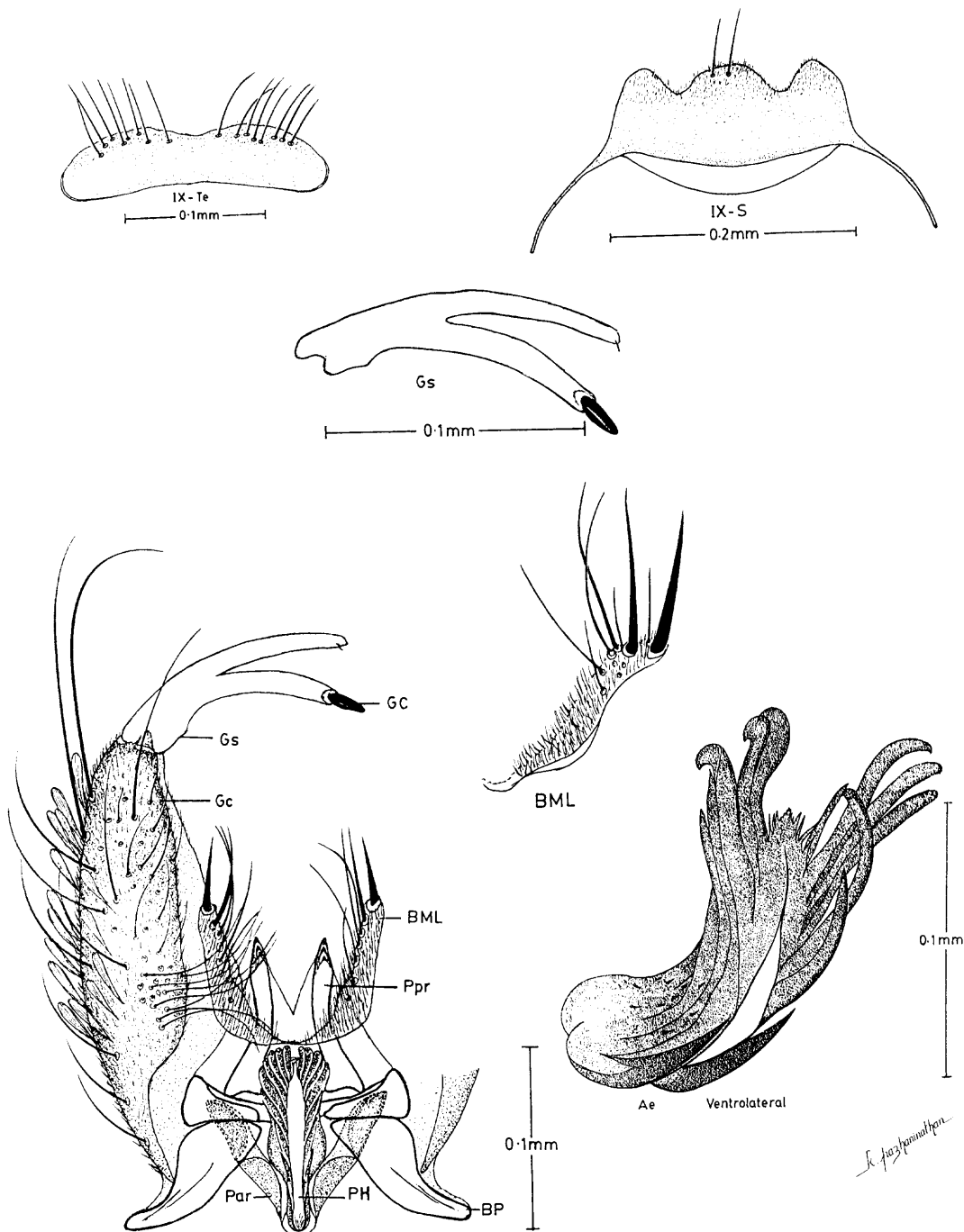


Fig. 3. *Aedes (Diceromyia) agastyai*, male genitalia. Ae = aedeagus, BML = basal mesal lobe, BP = basal piece, Gc = gonocoxite, GC = gonostylar claw, Gs = gonostylus, Par = paramere, PH = phallosome, Ppr = paraproct, IX-S = sternum IX, IX-Te = tergum IX.

areas, acrostichal setae absent; scutellum with a patch of broad brown scales on each lobe, 2,3 long and 2-4 short setae on lateral lobes

and 4,5 long and 2-6 short setae on middle lobe; pleural integument dark brown; antepronotum well separated, with snowy-white

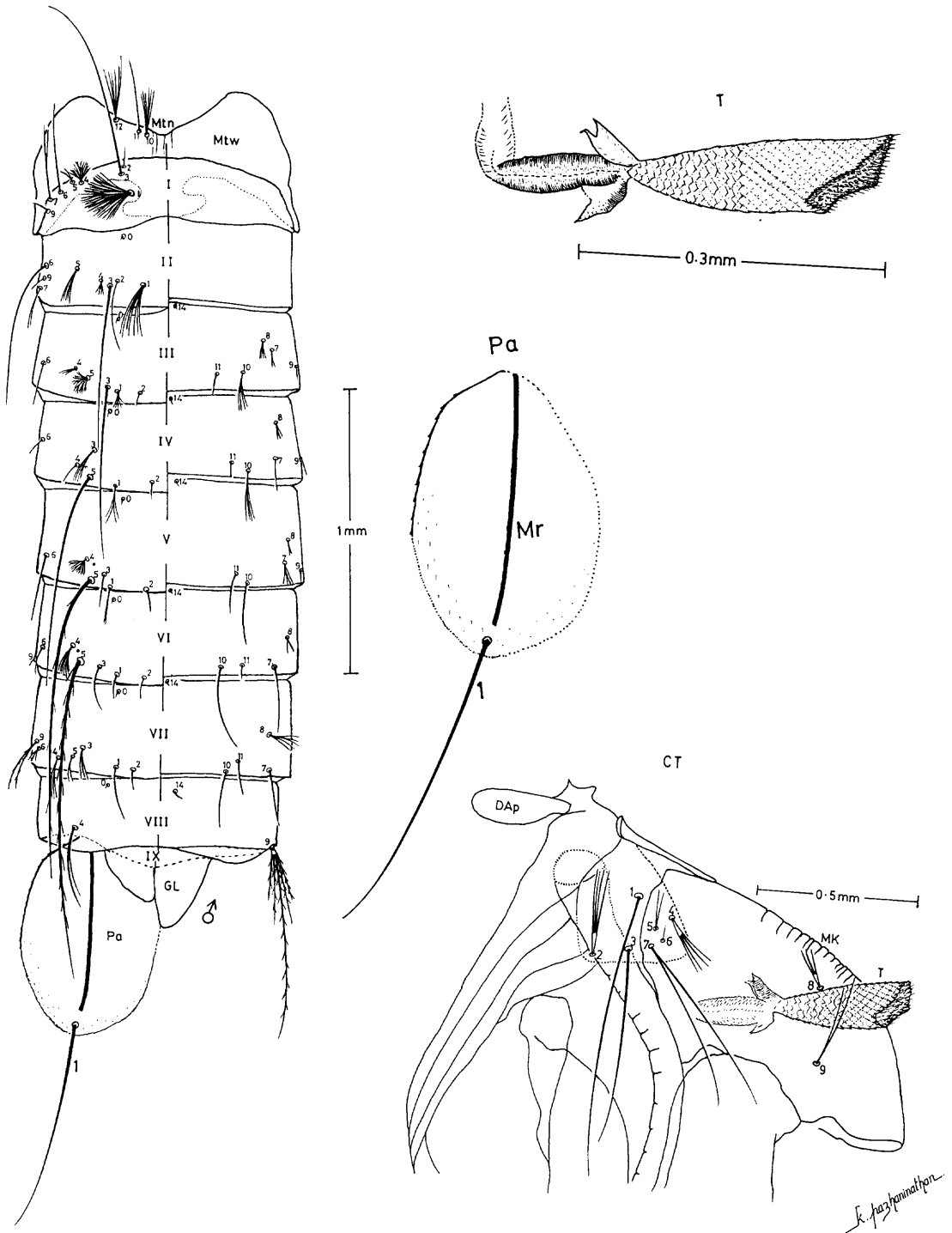


Fig. 4. *Aedes (Diceromyia) agastyai*, pupa. CT = cephalothorax, DAp = dorsal apotome, GL = genital lobe, MK = median keel, Mr = midrib, Mtn = metanotum, MtW = metathoracic wing, Pa = paddle, T = trumpet, I-IX = abdominal segments.

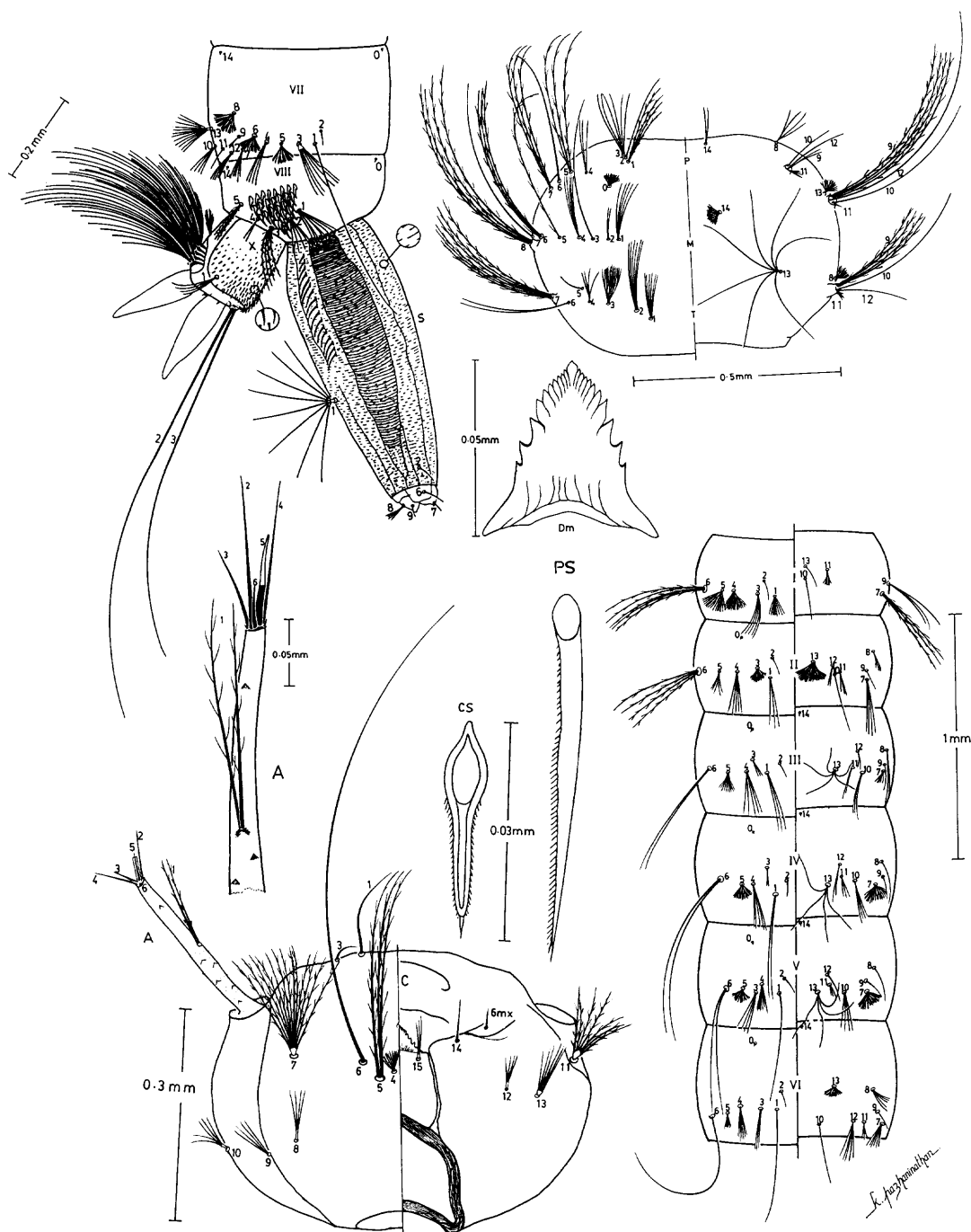


Fig. 5. *Aedes (Diceromyia) agastyai*, larva. A = antenna, C = cranium, CS = comb scale, Dm = dorsomentum, PS = pecten spine, S = siphon, I-VIII, X = abdominal segments, 6-Mx = seta 6-Mx.

narrow curved scales mixed with few (2-4) broad white scales which can be seen in lateral view only (Fig. 1), with 7-10 long and short setae; postpronotum mainly covered with

narrow curved snowy-white scales mixed with a few overlapping broad snowy-white scales on posterior area, upper narrow scales touching snowy-white scales of scutum; 1,2 fine,

golden setae posteriorly; lower proepisternum bare; upper proepisternum covered with broad snowy-white scales, 4,5 golden setae; postspiracular area with a patch of broad snowy-white scales, 2,3 golden setae; subspiracular area with broad snowy-white scales; mesokatepisternum with a large patch of broad snowy-white scales on upper area and extending to lower area, 4–6 upper and 6–8 lower long and short setae; prealar knob with 5–8 golden setae; paratergite with few broad snowy-white scales; mesepimeron with a patch of broad snowy-white scales on upper area, 8–10 golden setae along posterior margin of scale-patch. *Legs*: Coxae I-III each with several golden setae and a patch of broad snowy-white scales anteriorly, larger on coxa I and continuous ventrally with a light brown-scaled patch, a small patch of broad snowy-white scales posteriorly; trochanters I-III each with several short, fine golden setae and snowy-white scales; femur I anteriorly with basal 0.3 pale-scaled and remaining area covered with brown scales, posteriorly pale-scaled with a narrow, longitudinal brown-scaled stripe on dorsoapical and ventroapical margin, femur II with anterior surface completely covered with brown scales except at base, posterior surface pale-scaled with a narrow brown-scaled stripe beginning near base and broadening toward apex to cover about apical 0.25, femur III covered with pale scales with a narrow longitudinal stripe of brown scales dorsally from near base to apex, broadening on posterior surface toward apex; tibiae I-III and tarsi I-III dark brown-scaled; posttarsi I-III with 2 ungues, I and II with ungues equal in size, each with a tooth, III with ungues equal in size, simple. *Wing*: Dorsal and ventral veins dark brown-scaled; alula with broad dark brown scales on margins; upper calypter with dark brown setae on margin. *Halter*: Pedicel pale; capitellum covered with broad pale scales on apical area, with brown scales on base. *Abdomen*: Terga I-VII each dark brown-scaled with a laterobasal triangular patch of snowy-white scales, row of fine golden setae on apical margin; sterna snowy white-scaled with narrow apical dark bands, covered with numerous fine golden setae.

Genitalia (Fig. 2): Tergum VIII covered with spicules and numerous broad scales covering nearly 0.75 of surface, basal 0.5 retracted into segment VII, moderately to heavily pigmented, base slightly concave, apex very slightly concave in median area, apical 0.4 with numerous short and moderately long setae; sternum VIII moderately to heavily pigmented, covered with broad scales and setae on most of surface, apex with a median indentation and a small lobe on each side of middle line, setae dense and moderately long and stout on apical margin; tergum IX moderately pigmented, covered with minute spicules except basomesal area, somewhat triangular in shape with a median indentation leading to 2 lateral lobes bearing 5–11 setae on each side, index 0.60–0.66; insula longer than broad, covered with spicules, 1,2 tuberculi at apex; lower and upper vaginal lips narrow, densely spiculate, moderately pigmented; upper vaginal sclerite large, pigmented, lower vaginal sclerite absent; postgenital lobe moderately broad with rounded apex, index 1.47, covered with spicules, several short and long setae apically; cercus moderately long with rounded apex with 4–6 long setae, covered with spicules, several short and long setae and broad scales dorsally; 3 spermathecal capsules, one slightly larger than other 2.

Male. Essentially as in female, differing in the following respects. *Head*: Antenna plumose, about 0.7 length of proboscis; maxillary palpus about 0.5 length of proboscis, slender, dark brown-scaled, with 5 palpomeres, apical palpomere slightly curved with 2,3 long and 2,3 short setae at apex, few short setae ventrally; vertex covered with broad decumbent pale scales, with few intermixed light brown scales. *Thorax* (Fig. 1): Scutum with large patch of snowy-white scales, posterior margin of snowy-white patch curved and without indentation, unlike female. *Legs*: Posttarsi I and II with unequal ungues each with a tooth. *Abdomen*: Tergum VIII pale-scaled; sternum VIII dark brown-scaled. *Genitalia* (Fig. 3): Tergum IX bilobed, spiculate with 6–11 setae on each lobe; gonocoxite short and moderately broad, covered with scales and setae,

longer and stronger setae laterally; gonostylus broad basally, forked at about middle (basal 0.42–0.50 broad and apical 0.50–0.58 forked) into 2 narrower lateral subequal arms, longer arm with a short fine seta at apex and shorter arm bearing a short heavily pigmented blunt claw apically; basal mesal lobe composed of moderately pigmented band with 6–8 apical setae including 1,2 strong stout setae at apex, usually first apical stout seta shorter than remaining slender seta/setae, remaining surface densely covered by numerous short fine hairs and hair-like spicules, each band connected with its mate ventrally to form a U-shaped structure with an indentation at junction; proctiger long, paraproct heavily pigmented apically with 2,3 unequal tooth-like projections, cercal setae absent; phallosome with aedeagus composed of a sclerotized lateral plate on each side, each lateral plate with 2–5 long, ribbon-shaped, apically recurved teeth with rounded apices bearing small pointed projections and 4–6 short, thick teeth with pointed apices, including a heavily pigmented thorn-shaped tooth at base; paramere well developed, about 0.83 to 0.87 length of aedeagal sclerite; basal piece long, broad basally and curved, tapering apically; sternum IX large, covered by minute spicules with 2,3 long setae on caudomesal area, laterally elevated to form a lobe on each side.

Pupa (Fig. 4). *Cephalothorax*: Moderately pigmented; seta 1-CT single, long, strong, occasionally 2-branched; 2-CT with 3–5(4) branches; 3-CT single, long, strong, rarely 2-branched; 4-CT with 3–5(4) branches; 5-CT single to 2(2)-branched; 6-CT very short, single to 2(1)-branched, shorter than 7-CT; 7-CT long, strong, single to 3(2)-branched; 8-CT with 2–6(3) branches; 9-CT with 2,3(2) branches. *Metanotum*: Seta 10-CT with 4–10(6) branches, mesad and caudad of 11-CT; 11-CT long, single; 12-CT with 3–8(6) branches. *Trumpet*: Heavily pigmented with scattered spicules; index 3.12–4.33, mean 3.51 (s.d. 0.34). *Abdomen*: Seta 1-I well developed, dendritic with 6–14(10) branches; 2-I single, rarely 2,3-branched; 3,6,9-I single; 4-I dendritic with 4–8(6) branches; 5-I with 2–5(2) branches; 7-I single to 4(2)-branched;

0,2,3,6,9-II single (3,6-II long and strong); 1-II with 6–17(8) branches; 4-II with 3–6(4) branches; 5-II with 4–12(5) branches; 7-II single to 4(2)-branched; 0,2,3,9,11,14-III single (3-III very long); 1-III with 3–10(5) branches; 4-III single to 4(2)-branched; 5-III with 2–7(5) branches; 6-III single to 3-branched; 7-III single to 3(2)-branched; 8-III with 2–6(3) branches; 10-III single to 4(3)-branched; 0,2,9,11,14-IV single; 1-IV with 2–7(3) branches; 3-IV with 2–5(4) branches, occasionally 8-branched; 4-IV single to 2-branched; 5-IV long, reaching base of segment VII, simple, single to 2-branched; 6-IV single, occasionally 2-branched; 7-IV single to 2-branched; 8-IV with 2–4(3) branches; 10-IV with 2–4(3) branches; 0,2,6,9,11,14-V single; 1,3-V single to 2-branched; 4-V dendritic with 4–7 branches; 5-V single to bifid, weakly barbed, very long, reaching to base of paddle; 7-V with 4–7(5) branches; 8-V with 2–4(2) branches; 10-V single, occasionally bifid; 0,2,5,6,9,10,11,14-VI single (5-VI weakly barbed, long, about length of 5-V); 1,3-VI single to 2-branched; 4-VI with 3–5(4) branches; 7-VI single, rarely bifid; 8-VI with 2–4(2) branches; 0,2,14-VII single; 1-VII single to 3-branched; 3-VII single to 4(2)-branched; 4-VII with 2–6(3) branches; 5-VII single to 3(2)-branched; 6-VII with 2–7(3) branches; 7-VII single to 2-branched; 8-VII with 2–8(5) branches; 9-VII strong, weakly barbed, single to 5(2)-branched; 10-VII single to 2-branched; 11-VII single to 4-branched; 0,14-VIII single; 4-VIII single to 3(2)-branched; 9-VIII long, strong, barbed with 3–5(4) branches, usually one branch longer than remainder. *Paddle*: Ovoid, with minute, widely spaced serrations on basal 0.5 of outer margin and sparse, minute spicules on apical 0.5 of inner and outer margins; midrib terminates just before base of 1-P; seta 1-P single (rarely bifid at tip), long and about length of paddle; index 1.23–1.56, mean 1.4 (s.d. 0.09).

Larva (Fig. 5). *Head*: Antenna about 0.6 length of head, with sparse spicules usually in basal 0.5; seta 1-A 2-branched (occasionally 3-branched), weakly barbed, inserted at 0.46–0.51 (0.48) length of antenna, reaching about apex of antenna; 2,4-A single, long and of

same length; 3-A about 0.5 length of 2-A; 1-C long, slender, curved; 3-C short, simple, single; 4-C well developed with 9-14(10) branches, occasionally 17-branched; 5-C long, barbed with 2-5(4) branches, caudad to 6-C; 6-C single, rarely bifid, very long, about twice length of 5-C; 7-C caudad of antennal base, fan-shaped, barbed with 8-14(13) branches; 8-C with 3-6(4) branches; 9-C with 3-5(4) branches; 10-C with 4-6(5) branches; 11-C barbed, fan-shaped with 5-9(7) branches; 12-C with 4-8(5) branches; 13-C with 6-8(6) branches; 14-C thick, single; 15-C with 2-5(3) branches; 6-Mx always single; dorsomentum heavily pigmented with 10,11 teeth on each side of a large central tooth. *Thorax*: Seta 0-P dendritic with 6-11 branches; 1-P barbed with 2-5(4) branches; 2,6,10,12-P always single; 3-P with 5-8(6) branches; 4-P with 2-4(3) branches; 5-P barbed with 2-4(3) branches; 7-P barbed with 2,3(3) branches; 8-P with 2-5(4) branches; 9-P single to 2(2)-branched; 11-P with 4-6(4) branches; 14-P with 2,3(2) branches; 1-M with 3-7(4) branches; 2-M single to 3(2)-branched; 3-M single to 3(1)-branched; 4-M with 4-7(5) branches; 5-M barbed, always single; 6-M barbed with 2-5(3) branches; 7,10,12-M single; 8-M barbed with 3-6(4) branches; 9-M barbed with 2-4(3) branches; 11-M minute, single; 13,14-M dendritic with 7-12 branches; 1-T with 6-8(6) branches; 2-T with 5-7(6) branches; 3-T dendritic with 6-9(7) branches; 4-T with 3-6(4) branches; 5-T single, occasionally bifid; 6-T with 2,3(2) branches; 7-T barbed with 5-8(6) branches; 8-T dendritic with 6-8(7) branches; 9-T barbed with 3-6(4) branches; 10-T long, single; 11-T with 2-4 minute, fine branches; 12-T short, fine, single; 13-T stellate with 4-7(6) slender, long, well developed branches. *Abdomen*: Seta 1-I with 7-12(9) branches; 2-I single, occasionally bifid; 3-I with 4-6(5) branches; 4-I dendritic with 6-10(8) branches; 5-I dendritic with 4-7(5) branches; 6-I long, barbed with 3-6(5) branches; 7-I long, barbed with 3,4(3) branches; 9-I with 3 branches (occasionally 4-branched); 10-I always single; 11-I dendritic with 2-5(4) branches; 13-I single, rarely bifid; 0,2,10-II single; 1-II with 2-5(3) branches; 3-II dendritic with 5-8(8) branches; 4-II with 4-7(5) branches; 5-II dendritic with 4-6(5) branches; 6-II barbed with 3-6(4) branches; 7-II with 3-7(5) branches; 8-II with 3-5(5) branches; 9-II single to 3(1)-branched; 11,12-II with 2-4(3) branches; 13-II dendritic with 8-11(10) branches; 0,2,9,14-III single; 1-III with 2-4(3) branches; 3-III with 2,3 branches (occasionally 4-branched); 4-III with 3-7(5) branches; 5-III dendritic with 4-9(6) branches; 6-III bifid; 7-III dendritic with 6-15 branches; 8-III bifid; 10-III with 2-5(3) branches; 11-III single to 4(2)-branched; 12-III with 2-4(3) branches; 13-III stellate with 3-6(5) branches; 0,2,8,9,14-IV single; 1-IV with 2-4(2) branches; 3-IV with 2,3 branches (occasionally 4-branched); 4-IV with 4-8(5) branches; 5-IV dendritic with 4-8(6) branches; 6-IV long, bifid, occasionally single; 7-IV dendritic with 5-9(7) branches; 10-IV with 3,4(4) branches; 11-IV with 2-6(3) branches; 12-IV with 2-4(2) branches; 13-IV stellate with 3-5(4) branches; 0,2,8,9,14-V single; 1-V single to 2(1)-branched; 3-V with 4-6(4) branches; 4-V with 6-11(8) branches; 5-V dendritic with 3-6(6) branches; 6-V bifid, occasionally single; 7-V dendritic with 7-14(8) branches; 10-V with 3,4(4) branches; 11-V single to 4(3)-branched; 12-V single, rarely 2-branched; 13-V stellate with 3,4(4) branches; 0,1,2,9,10,14-VI single; 3-VI with 2-4(3) branches; 4-VI with 4-7(6) branches; 5-VI dendritic with 3-7(6) branches; 6-VI long, single to 3(1)-branched; 7-VI with 3-8(5) branches; 8-VI with 4-7(5) branches; 11-VI with 2-4(3) branches; 12-VI with 3-5(3) branches; 13-VI dendritic with 8-10 branches; 0,1,2,14-VII single (usually 1-VII long); 3-VII with 6-8(7) branches; 4-VII with 3-6(4) branches; 5-VII dendritic with 5-7(7) branches; 6-VII dendritic with 7-10(8) branches; 7-VII with 3-5(4) branches; 8-VII dendritic with 6-10(8) branches; 9-VII with 2-6(2) branches; 10-VII with 3-5(4) branches; 11-VII single, occasionally bifid; 12-VII with 4-7(5) branches; 13-VII dendritic with 10-15(12) branches (occasionally 22-branched); 0,14-VIII single; 1-VIII with 5-10(7) branches; 2-VIII with 3-6(5) branches; 3-VIII barbed with 3-6(4) branches; 4-VIII single to 2-branched; 5-VIII weakly barbed with 3-6(5)

branches; VIII with comb composed of 20–32 scales arranged in a triangular patch between setae 1 and 5, each scale moderately pigmented with a long, tapering median spine and a fine fringe from base to apex; seta 1-X with 3–6(4) branches; 2,3-X single, long; 4-X with 10,11 setae, all multiple (4–20)-branched, occasionally 2,3 setae proximad of grid; saddle incomplete, moderately pigmented, spiculate; acus absent; 2 pairs of anal papillae, short, 0.67–1.25 length of saddle. *Siphon*: Moderately pigmented, spiculate, moderately long, index 2.13–3.75, mean 2.72; acus absent; pecten composed of 15–21 evenly spaced teeth, basal teeth shorter than apical teeth, each tooth long, tapering, serrate ventrally from base to near apex; seta 1-S stellate with 5–9(7) branches, inserted on about basal 0.59 of siphon, distad of last pecten tooth; 2,6,7,9-S single; 8-S with 4–6(4) branches.

Egg. Unknown.

Type data. The holotype male (A 611) with associated larval (l 179) and pupal (p 136) exuviae mounted on a slide with following collection data: INDIA, South India, Tamil Nadu, Tirunelveli District, Ambasamudram, Kannikatti (750 m), 15 October 1986, collected as larva from a tree hole, Coll. A. Munirathinam. Deposited in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC.

The allotype female (A 605) with associated larval (l 173) and pupal (p 130) exuviae with collection data same as holotype, also deposited in NMNH.

Additional specimens designated as paratypes with collection data same as holotype are deposited as follows: one male (A 600) with associated slides l 169, p 126, G 101; one female (A 608) with associated slides l 170, p 127, G 72; two males (A 576, A 589); one male genitalia (G 196); and one 4th-instar larva (L 82) mounted on slides are deposited in NMNH. One male (A 610) with associated larval (l 178) and pupal (p 135) exuviae mounted on a slide; one female (A 641) with associated slides l 183, p 140, G 105; one male genitalia (G 359); and one 4th-instar larva (L

75) mounted on slides are deposited in National Institute of Virology, Pune, India.

Etymology. This species is named after the Agastya Hills of the Western Ghats, southern India, which includes the type locality.

Distribution (Fig. 9). Based on the collections made in 19 localities in three hill ranges of Western Ghats, southern India, a total of 829 specimens of *Ae. agastyai* were examined. Data for these specimens are as follows: *Agastya Hill Ranges*: Tamil Nadu, Tirunelveli District, Ambasamudram, Kannikatti, tree hole, 600–750 m, 25 males, 33 females, 43 pl, 24 male genitalia, 11 female genitalia, 15 L; Kodamady, tree hole, 350 m, 8 males, 4 females, 10 pl; Banatheertham, tree hole, 350 m, 4 males, 8 females, 3 pl; date of collection 22.01.1985, 14–16.10.1986. *Sholayar and Parambikulam Hill Ranges*: Kerala, Trichur District, Sholayar, Pulilapara, tree hole, 500 m, 4 males, 6 females, 2 pl, 3 male genitalia; Karantodu, tree hole, 500 m, 1 male, 3 females, 1 pl, 1 male genitalia, bamboo stump, 1 female; Sholayar Powerhouse, tree hole, 650 m, 1 male, 1 male genitalia; Sholayar, tree hole, 750 m, 2 males, 4 females, 2 pl, 2 male genitalia; Chandantodu, tree hole, 750 m, 2 males, 2 male genitalia; Palghat District, Parambikulam, Karian shola, tree hole, 650 m, 1 male, 1 male genitalia; Madam, tree hole, 750 m, 2 males, 2 females, 1 male genitalia; date of collection 03–13.05.1988. *Coorg Hills*: Karnataka, Coorg District, Madikeri, Kallala, tree hole, 700 m, 1 male, 5 females; Thottipalam, bamboo stump, 500 m, 10 males, 11 females, tree hole, 4 males, 10 females; Makuta, tree hole, 500 m, 5 males, 2 females, bamboo stump, 50 males, 63 females; Karike, tree hole, 500 m, 5 males, 6 females, bamboo stump, 44 males, 100 females, cut bamboo, 2 males; Patty, tree hole, 750 m, 4 males, 4 females. Man biting outdoor, 1 female; Marigundi, bamboo stump, 500 m, 1 male, 2 females, tree hole, 4 males, 1 female; Glen Coorg, tree hole, 750 m, 1 male, 4 females; Jodupal, outdoor resting, 750 m, 1 female; Devarakolly, tree hole, 750 m, 2 males, 3 females; Chittakana, bamboo stump, 500 m, 29 males, 19 females, 2 male genitalia, tree hole, 13 males, 11 females; Bheemagundi,

tree hole, 500 m, 54 males, 61 females; date of collection 12–28.10.1988, 08.05.1989.

Bionomics. *Aedes agastyai* was collected during a survey of the hematophagous arthropod fauna of the Western Ghats between 1985–89. It was mainly found breeding in tree holes. In some places larvae were collected from bamboo stumps and cut bamboo in natural forest in high rainfall areas at elevations ranging from 350 to 750 m. Other mosquito species associated with *Ae. agastyai* in the immature collections were *Ae. (Chistophersiomyia) annulirostris* (Theobald), *Ae. (Finlaya) albolateralis* (Theobald), *Ae. (Fin.) aureostriatus* (Doleschall), *Ae. (Fin.) chrysolineatus* (Theobald), *Ae. (Fin.) cogilli* Edwards, *Ae. (Fin.) khazani* Edwards, *Ae. (Stegomyia) albopictus* (Skuse), *Ae. (Stg.) krombeini* Huang, *Ae. (Stg.) novalbopictus* Barraud, *Ae. (Stg.) subalbopictus* Barraud, *Armigeres (Armigeres) subalbatus* (Coq.), *Ar. (Leicesteria) digitatus* (Edwards), *Ar. (Lei.) flavus* (Leicester), *Ar. (Lei.) omissus* (Edwards), *Heizmannia (Heizmannia) chandi* Edwards, *H. (Hez.) greenii* (Theobald), *H. (Mattinglyia) discrepans* (Edwards), *Culex (Culiciomyia) pallidothorax* Theobald, *Cx. (Eumelanomyia) brevipalpis* (Giles), *Cx. (Eum.) khazani* Edwards, *Cx. (Lophoceraomyia) mammilifer* (Leicester), *Cx. (Lop.) minor* (Leicester), *Cx. (Lop.) uniformis* (Theobald), *Orthopodomyia anopheloides* (Giles), *Or. flavithorax* Barraud, *Tripteroides (Rachionotomyia) affinis* (Edwards), *Tp. (Rah.) aranoioides* (Theobald), *Tp. (Rah.)* sp. undet., *Uranotaenia (Pseudoficalbia) lutescens* Leicester, *Ur. (Pfc.) obscura* Edwards, *Ur. (Pfc.) recondita* Edwards, *Ur. (Pfc.) stricklandi s.l.* Barraud, *Toxorhynchites (Toxorhynchites) splendens* (Wied.).

Medical importance of this species is not known, but on one occasion a female was captured biting man inside the forest during daytime.

***Aedes (Diceromyia) reubanae*, n. sp.**

(Fig. 6–8)

Female. *Head* (Fig. 6): Antenna dark brown, about 0.90 length of proboscis; pedicel

dark brown with a small patch of broad pale scales mesally, flagellomere 1 about length of flagellomere 2 with basal 0.5 pale-scaled and slightly swollen; clypeus dark, bare; maxillary palpus dark brown-scaled, about 0.19 length of proboscis; proboscis dark brown-scaled, 0.96–1.05 length of forefemur; eyes contiguous in front; vertex with broad, dusky white, decumbent scales (sometimes with scattered dark brown scales), laterally (postgena) pale-scaled, ocular line with broad pale scales, interocular space with a pair of long golden setae, well developed dark brown 8–10 ocular setae on each side; occiput with few golden erect forked setae. *Thorax* (Fig. 6): Scutal integument dark brown; scutum covered with narrow curved scales except prescutellar space, a large patch of snowy-white scales occupying about anterior 0.5 of scutum, extending anteriorly and also laterally to paratergite, usually median acrostichal area occupied by narrow light brown scales which divides white patch into 2 lateral patches, few narrow pale scales on lateral margins of prescutellar bare space, remaining posterior area of scutum covered with curved light brown scales, 4–6 blackish-brown setae on anterior promontory and several well developed supraalar, dorsocentral and prescutellar setae, acrostichal setae absent; scutellum with a patch of white or broad light-brown scales on median lobe and narrow curved white or light brown scales on lateral lobe, 3,4 long and 2–5 short setae on lateral lobe, and 4,5 long and 2–6 short setae on middle lobe; pleural integument dark brown; antepnotum well separated, with snowy-white narrow curved scales mixed with few broad white scales and 6–8 long and short setae; postpronotum covered with narrow curved reddish-brown scales anteriorly, with narrow curved and few broad intermixed snowy-white scales on posterior area, upper narrow scales touching snowy-white scales of scutum, with 2,3 fine, golden setae posteriorly; prosternum bare; upper proepisternum covered with broad snowy-white scales, 4,5 golden setae; postspiracular area with a small patch of broad snowy-white scales, 3–5 golden setae; subspiracular area with broad snowy-white scales; mesokatepi-

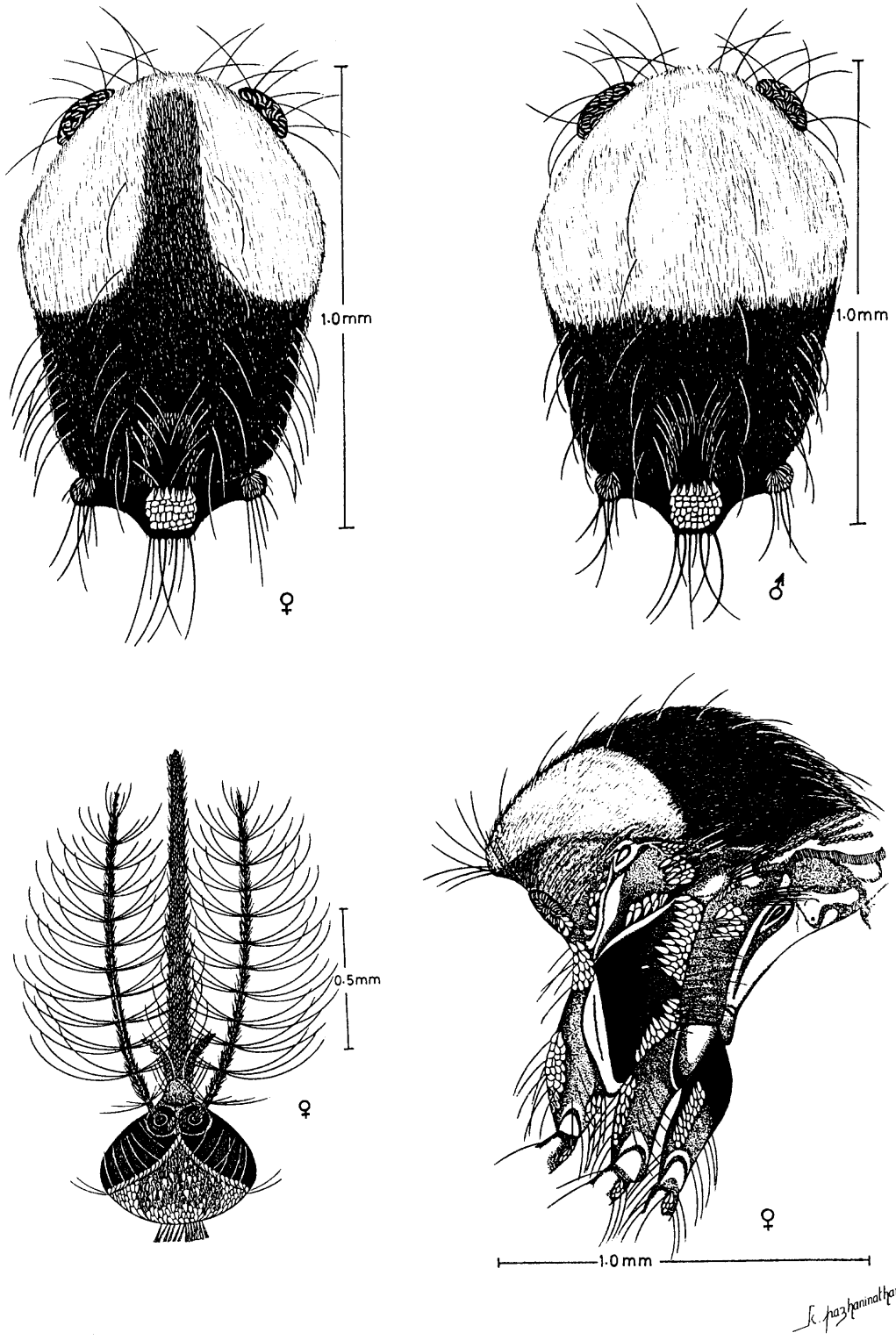


Fig. 6. *Aedes (Diceromyia) reubeniae*.

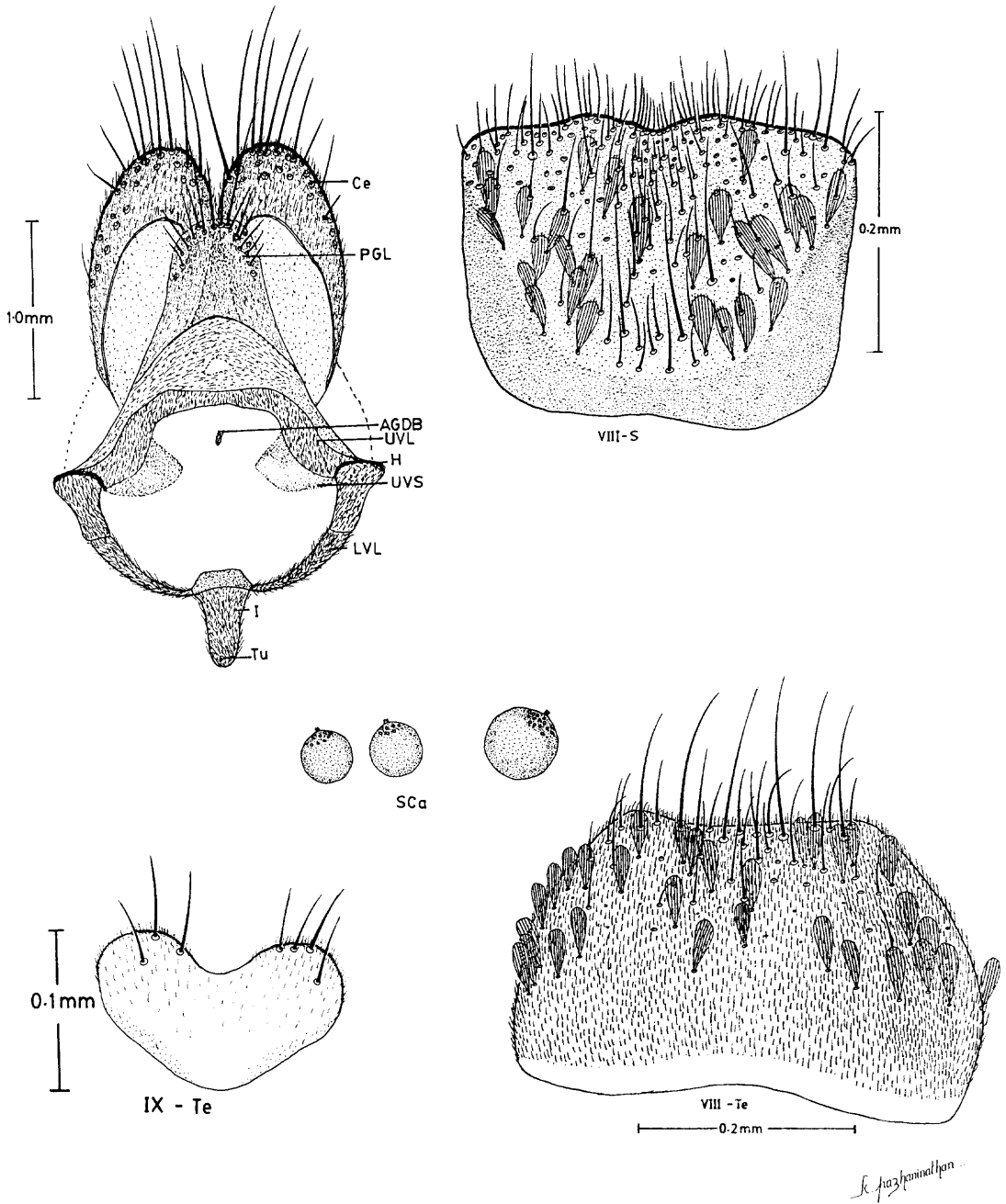


Fig. 7. *Aedes (Diceromyia) reubensae*, female genitalia. AGDB = accessory gland duct base, Ce = cercus, H = hinge, I = insula, LVL = lower vaginal lip, PGL = postgenital lobe, SCa = spermathecal capsule, Tu = tuberculus, UVL = upper vaginal lip, UVS = upper vaginal sclerite, VIII-S = sternum VIII, VIII-Te = tergum VIII, IX-Te = tergum IX.

sternum with 2 narrowly separated large patches of broad snowy-white scales posteriorly, 4-6 upper and 7-12 lower long and short setae; prealar knob with 6-9 golden

setae; paratergite with few broad snowy-white scales; mesepimeron with a patch of broad snowy-white scales on upper area, 7-12 golden setae along posterior margin of scale-

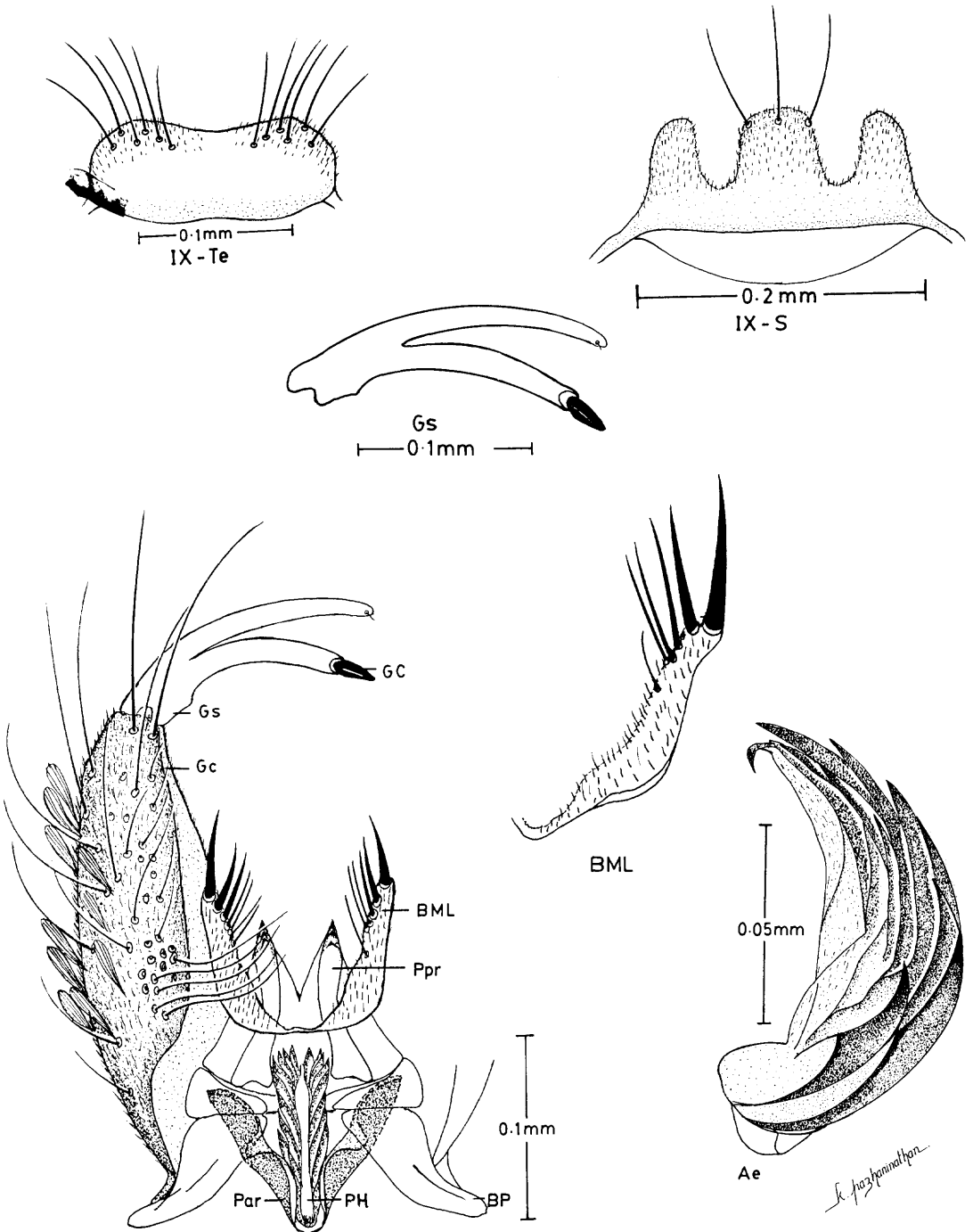


Fig. 8. *Aedes (Diceromyia) reubenae*, male genitalia. Ae = aedeagus, BML = basal mesal lobe, BP = basal piece, Gc = gonocoxite, GC = gonostylar claw, GS = gonostylus, Par-paramere, PH = phallosome, Ppr = paraproct, IX-S = sternum IX, IX-Te = tergum IX.

patch. *Legs*: Coxae I-III each with several golden setae and a patch of broad snowy-white scales anteriorly, larger on coxa I and

continuous ventrally with a distinct light brown-scaled patch, a small patch of broad snowy-white scales posteriorly; trochanters I-

III each with several short fine golden setae and snowy-white scales; femur I anteriorly with basal 0.3 pale-scaled and remaining area covered with brown scales, posteriorly pale-scaled with a narrow, longitudinal brown-scaled stripe on dorsoapical and ventroapical margins, femur II with anterior surface completely covered with brown scales except at base, posterior surface pale-scaled with a narrow brown-scaled stripe beginning near base, broadening toward apex and covering about 0.25 of apical area, femur III covered with pale scales, with a narrow longitudinal stripe of brown scales dorsally from near base to apex which broadens on posterior surface toward apex; tibiae I-III and tarsi I-III dark brown-scaled; posttarsi I-III with 2 ungues, I and II with ungues equal in size, each with a tooth, III with ungues equal in size, simple. *Wing*: Dorsal and ventral veins dark brown-scaled; alula with broad dark brown scales on margins; upper calypter with dark brown setae on margin. *Halter*: Pedicel pale; capitellum covered with broad pale scales on apical area with brown scales on base. *Abdomen*: Terga I-VII each dark brown-scaled with a latero-basal triangular patch of snowy-white scales, row of fine golden setae on apical margins; sterna snowy white-scaled with narrow apical dark bands, covered with numerous fine golden setae. *Genitalia* (Fig. 7): Tergum VIII covered with spicules and numerous broad scales covering nearly 0.75 of surface, basal 0.5 retracted into segment VII, moderately to heavily pigmented, base slightly concave, apex very slightly concave in median area, apical 0.4 with numerous short and moderately long setae; sternum VIII moderately to heavily pigmented, covered with broad scales and setae on most of surface, apex with a median indentation and a small lobe on each side of middle line, setae dense and moderately long and stout on apical margin; tergum IX moderately pigmented, covered with minute spicules except basomesal area, somewhat triangular in shape with a deep median indentation leading to 2 lateral lobes bearing 3-8 setae on each side, index 0.56; insula longer than broad, covered with spicules, 1,2 tuberculi at apex; lower and upper vaginal lips

narrow, densely spiculate, moderately pigmented; upper vaginal sclerite large, pigmented, lower vaginal sclerite absent; post-genital lobe moderately broad with rounded apex, covered with spicules, several short and long setae apically, index 1.44; cercus moderately long with rounded apex with 4-6 long setae, covered with spicules, several short and long setae and broad scales dorsally; 3 spermathecal capsules, one slightly larger than other 2.

Male. Essentially as in female, differing in the following respects. *Head*: Antenna plumose, 0.8 length of proboscis; maxillary palpus about 0.5 length of proboscis, slender, dark brown-scaled, with 5 palpomeres, apical palpomere slightly curved with 2,3 long and 2,3 short setae at apex, few short setae ventrally; vertex largely covered with broad decumbent pale scales, with few intermixed light brown scales. *Thorax* (Fig. 6): Large patch of snowy-white scales on scutum, patch curved posteriorly. *Legs*: Posttarsi I and II with unequal ungues each with a tooth. *Abdomen*: Tergum VIII pale-scaled; sternum VIII dark brown-scaled. *Genitalia* (Fig. 8): Tergum IX bilobed, spiculate, 4-8 setae on each lobe; gonocoxite short and moderately broad, covered with scales and short and long setae, stronger and long setae laterally; gonostylus with basal 0.35-0.49 broad and apical 0.53-0.65 forked into 2 narrower lateral subequal arms, long arm with a short fine seta at apex and shorter arm bearing a short heavily pigmented blunt claw apically; basal mesal lobe composed of moderately pigmented band with 4-6 apical spine-like setae including 1,2 strong, stout setae at apex, usually setae arranged in decreasing order in thickness toward base, remaining surface covered by short fine setae and hair-like spicules, each band connected with its mate ventrally and resembling a U-shaped structure with an indentation at juncture; proctiger long, paraproct heavily pigmented apically with 1-3 unequal teeth-like projections, cercal setae absent; phallosome with aedeagus composed of a sclerotized lateral plate on each side, each lateral plate with 7-9 longitudinal, gently curved, tapering teeth with pointed apices including a

thorn-shaped tooth at base; paramere well developed, about 0.62–0.68 length of aedeagal sclerite; basal piece long, broad basally, curved, tapering apically; sternum IX large, bilobed, covered by minute spicules with 2–4 long setae on caudomesal area.

Pupa. *Cephalothorax*: Moderately pigmented; seta 1-CT single, long, strong, occasionally 2-branched; 2-CT with 2–5(3) branches; 3-CT single, long, strong, rarely 2-branched; 4-CT with 2–5(4) branches; 5-CT with 2–5(2) branches; 6-CT very short, with 1,2(1) branches, shorter than 7-CT; 7-CT long, strong, single to 5(2)-branched; 8-CT with 2–6(3) branches; 9-CT single to 2(2)-branched. *Metanotum*: Seta 10-CT with 6–10(6) branches, mesad and caudad of 11-CT; 11-CT long, single; 12-CT with 2–6(4) branches. *Trumpet*: Heavily pigmented, with scattered spicules; index 2.81–3.44, mean 3.11 (s.d. = 0.16). *Abdomen*: Seta 1-I well developed, dendritic with 8–16(14) branches; 2-I single rarely 2,3-branched; 3,6,9-I single; 4-I dendritic with 4–9(5) branches; 5-I with 2–4(3) branches; 7-I single to 3(2)-branched; 0,3,6,9-II single (3,6-II long and strong); 1-II with 10–20(10) branches; 2-II single, rarely bifid; 4-II with 3–6(4) branches; 5-II with 4–10(8) branches; 7-II single to 4(2)-branched; 0,2,3,6,9,11,14-III single (3-III very long); 1-III with 4–10(7) branches; 4-III with 1–4(2) branches; 5-III with 3–8(6) branches; 7-III single to 3(2)-branched; 8-III with 3–5(4) branches; 10-III with 2,3(2) branches; 0,2,4,6,7,9,11,14-IV single; 1-IV with 2–7(3) branches; 3-IV with 3–7(5) branches; 5-IV long (reaching to base of segment VII), simple, single to 2(1)-branched; 8-IV with 2–4(3) branches; 10-IV with 2–4(3) branches; 0,2,5,6,9,10,11,14-V single (5-V weakly barbed, very long reaching base of paddle); 1-V single to 3(2)-branched; 3-V single, rarely bifid; 4-V dendritic with 5–9(7) branches; 7-V with 5–8(6) branches; 8-V with 2–4(3) branches; 0,2,5,7,9,10,11,14-VI single (5-VI weakly barbed, long, same length of 5-V); 1,3-VI single to 2-branched; 4-VI with 2–5(3) branches; 6-VI single, rarely bifid; 8-VI with 2–4(3) branches; 0,2,14-VII single; 1-VII with 1–3(1) branches; 3-VII with 2–5(3) branches;

4-VII with 1–3(2) branches; 5-VII with 1–4(2) branches; 6-VII with 2–5(3) branches; 7-VII single to 2-branched; 8-VII with 3–5(4) branches; 9-VII strong, weakly barbed with 1–5(3) branches; 10-VII single to 3(2)-branched; 11-VII single to 3(2)-branched; 0,14-VIII single; 4-VIII with single to 2(2)-branched; 9-VIII long, strong, barbed with 4–8(6) branches, usually one or 2 branches longer than remainder. *Paddle*: Ovoid, with minute, widely spaced serrations on basal 0.5 of outer margin and sparse minute spicules on apical 0.5 of inner and outer margins, midrib terminates just before base of 1-P; seta 1-P single (rarely bifid at tip), long about length of paddle; index 1.32–1.57, mean 1.4 (s.d. = 0.08).

Larva. *Head*: Antenna about 0.6 length of head, with sparse spicules usually in basal 0.5; seta 1-A 2-branched (occasionally 3-branched), weakly barbed, inserted at 0.53–0.60 (0.57) length of antenna, reaching about apex of antenna; 2,4-A single, long and of same length; 3-A about 0.5 length of 2-A; 1-C long, slender, curved; 3-C short, simple, single; 4-C with 5–12 branches; 5-C long, barbed, single to 4(3)-branched, caudad to 6-C; 6-C single, rarely bifid, very long, about twice length of 5-C; 7-C caudad of antennal base, fan-shaped, barbed with 8–14(10) branches; 8-C with 3–6(4) branches; 9-C with 4,5(4) branches; 10-C with 4–6(5) branches; 11-C barbed, fan-shaped with 4–7(5) branches; 12-C with 3–6(4) branches; 13-C with 6–8(6) branches; 14-C thick, single; 15-C with 2–4(4) branches; 6-Mx always single; dorsotum heavily pigmented with 10,11 teeth on each side of a large central tooth. *Thorax*: Seta 0-P dendritic with 6–11 branches; 1-P barbed with 2–5(4) branches; 2,10,12-P always single; 3-P with 4–7(5) branches; 4-P with 2–4(3) branches; 5-P barbed with 2–4(3) branches; 6-P single, occasionally bifid; 7-P barbed with 2,3(3) branches; 8-P with 2–5(4) branches; 9-P with 2,3(2) branches; 11-P with 2–4(2) branches; 14-P with 2,3(2) branches; 1-M with 3–7(4) branches; 2-M with 1,2(1) branches; 3,7,10,12-M single; 4-M with 3–5(4) branches; 5-M barbed, always single; 6-M

barbed with 3-5(4) branches; 8-M barbed with 4-6(6) branches; 9-M barbed with 3,4(4) branches; 11-M minute, single; 13,14-M dendritic with 5-11 branches; 1-T with 4-6(4) branches; 2-T with 5-7(6) branches; 3-T dendritic with 6-9(7) branches; 4-T with 3-6(4) branches; 5-T single, occasionally bifid; 6-T with 2,3(2) branches; 7-T barbed with 6-9(8) branches; 8-T dendritic with 4-8(6) branches; 9-T barbed with 3-6(4) branches; 10-T long, single; 11-T with 2-4 minute, fine branches; 12-T short, fine, single; 13-T stellate with 3-6(4) slender, long branches. *Abdomen*: Seta 1-I with 4-7(5) branches; 2-I single, occasionally bifid; 3-I with 3-5(4) branches; 4-I dendritic with 8-10(10) branches; 5-I dendritic with 4-7(5) branches; 6-I long barbed with 3-6(5) branches; 7-I long, barbed with 3,4(3) branches; 9-I with 2-4(2) branches; 10-I always single; 11-I dendritic with 2-4(3) branches; 13-I single, rarely bifid; 0,2,10-II single; 1-II with 2-5(3) branches; 3-II dendritic with 5-7(6) branches; 4-II with 4-7(5) branches; 5-II dendritic with 4-6(5) branches; 6-II barbed with 3-6(4) branches; 7-II with 3-6(4) branches; 8-II with 3-5(5) branches; 9-II single to 3(1)-branched; 11-II single to 2(2)-branched; 12-II with 2-4(3) branches; 13-II dendritic with 5-7(5) branches; 0,2,9,14-III single; 1-III with 2-4(3) branches; 3-III single to 2-branched; 4-III with 3-7(5) branches; 5-III dendritic with 3-6(5) branches; 6-III single to 3(2)-branched; 7-III dendritic with 6-10 branches; 8-III single or bifid; 10-III single to 3(3)-branched; 11-III with 2,3(2) branches; 12-III single to 2(2)-branched; 13-III stellate with 3-5(4) branches; 0,2,9,14-IV single; 1-IV with 2,3(2) branches; 3,12-IV single to 2(1)-branched; 4-IV with 2-6(4) branches; 5-IV dendritic with 2-5(3) branches; 6-IV long, bifid, occasionally single; 7-IV dendritic with 5-9(7) branches; 8-IV single or bifid; 10-IV single to 4(3)-branched; 11-IV single to 3(2)-branched; 13-IV stellate with 3-5(4) branches; 0,2,8,9,12,14-V single; 1-V single to 2(1)-branched; 3-V with 3-5(4) branches; 4-V with 5-8(6) branches; 5-V dendritic with 2-4(3) branches; 6-V single to 2(2)-branched; 7-V dendritic with 5-8(6) branches; 10-V with 2-4(3) branches; 11-V single to 2(2)-branched;

13-V stellate with 3-5(4) branches; 0,2,10,14-VI single; 1,11-VI single to 2(1)-branched; 3-VI with 2-4(3) branches; 4-VI with 4-6(5) branches; 5-VI dendritic with 2-4(2) branches; 6-VI long, single to 2(1)-branched; 7-VI with 3-5(3) branches; 8-VI with 3-6(4) branches; 9-VI single or bifid; 12-VI with 3-5(3) branches; 13-VI dendritic with 6-10(6) branches; 0,1,2,14-VII single, usually 1-VII long; 3-VII with 4,5(5) branches; 4-VII with 3,4(4) branches; 5-VII dendritic with 5-7(7) branches; 6-VII dendritic with 7-10(8) branches; 7-VII with 3-5(4) branches; 8-VII dendritic with 6-10(8) branches; 9,11-VII single to 2(1)-branched; 10-VII with 2-4(3) branches; 12-VII with 2-4(4) branches; 13-VII dendritic with 6-9(8) branches; 0,14-VIII single; 1-VIII with 5-8(7) branches; 2-VIII with 2-5(4) branches; 3-VIII barbed with 3,4(4) branches; 4-VIII single to 3(2)-branched; 5-VIII weakly barbed with 3-6(5) branches; VIII with comb composed of 20-32 scales arranged in a triangular patch between setae 1 and 5, each scale moderately pigmented with a long tapering median spine and a fine fringe from base to apex; seta 1-X with 3-6(3) branches; 2,3-X single, long; 4-X with 10,11 setae, all multiple (4-20)-branched, occasionally 2,3 setae proximad of grid; saddle incomplete, moderately pigmented, spiculate; acus absent; 2 pairs of anal papillae, short, 0.83-1.32 length of saddle. *Siphon*: Moderately pigmented, spiculate, moderately long, index 3.00-3.45, mean 3.23; acus absent; pecten composed of 11-17 evenly spaced teeth, basal teeth shorter than apical teeth, each tooth long, tapering, serrate ventrally from base to near apex; seta 1-S stellate with 3-6(3) branches, inserted on about basal 0.56 of siphon, distad of last pecten tooth; 2,6,7,9-S single; 8-S with 3,4(3) branches.

Egg. Unknown.

Type data. The holotype male (A 893) with associated larval (l 347) and pupal (p 310) exuviae mounted on a slide with the following collection data: INDIA, South India, Kerala, Palghat District, Silent Valley, Panthanthodu (900 m), 8 October 1987, collected as larva from a tree hole, Coll. K. Ayanar. Deposited

in the National Museum of Natural History (NMNH), Smithsonian Institution, Washington, DC.

The allotype female (A 891) with associated larval (l 345) and pupal (p 308) exuviae, collection data same as in holotype, deposited in NMNH.

Additional specimens designated as paratypes with collection data same as holotype are deposited as follows: one male (A 892) with associated slides, l 346, p 309, G 205; one female (A 890) with associated slides, l 344, p 307, G 206; 2 females (A 1059, A 1060); and one 4th-instar larva (L 114) mounted on slide deposited in NMNH. One male (A 1227) with associated larval (l 418) and pupal (p 379) exuviae mounted on a slide; one female (A 1228) with associated larval (l 420) and pupal (p 381) exuviae mounted on a slide; one male genitalia (G 237); one female genitalia (G 263); and one 4th-instar larva (L 170) mounted on slides deposited in the National Institute of Virology, Pune, India.

Etymology. This species is named after Dr. Rachel Reuben, Director, Centre for Research in Medical Entomology, Madurai, India, in recognition of her contribution to Medical Entomology.

Distribution (Fig. 9). Based on collections made in 10 localities in three hill ranges of Western Ghats, Southern India, a total of 405 specimens of *Ae. reubena* were examined. Data for these specimens are as follows: *Silent Valley National Park Hill Ranges*: Kerala, Palghat District, Mannarghat, Molaghampara, tree hole, 850 m, 1 male, 2 females, 1 male genitalia, 2 female genitalia; Ponnampal, outdoor resting, 1,050 m, 2 females; camp-shed, tree hole, 1,200 m, 5 males, 9 females, 8 pl, 1 male genitalia, 1 female genitalia, 7 L; Thaloki, tree hole, 900 m, 7 males, 11 females, 5 pl, 1 female genitalia, 9 L; Kummatantodu, tree hole, 850 m, 1 male; Pathirakadavu, tree hole, 900 m, 18 males, 20 females, 21 pl, 2 male genitalia, 2 female genitalia, 5 L; Mayilampara, tree hole, 900 m, 1 male, 2 females, 1 pl, 1 male genitalia, 3 L; Panthantodu, tree hole, 900 m, 37 males, 39 females, 30 pl, 16 male genitalia, 6 female genitalia, 44 L, fallen-tree hole, 2 males, 2

females, 1 female genitalia; date of collection 25.01.1987, 08–25.10.1987. *Wynad Hill Ranges*: Kerala, Wynad District, Mannantody, Thirunelly, tree hole, 850 m, 1 male, 1 pl, 1 male genitalia; date of collection 28.01.1988. *Munnar Hills*: Kerala, Idukki District, Devicolam, Gap, tree hole, 1,600 m, 2 males, 3 females, 2 pl, 1 male genitalia; date of collection 19.09.1988.

Bionomics. Based on collections made between 1985 and 1989, immatures of *Ae. reubena* were collected from tree holes in wet evergreen forests where annual rainfall ranged from 2,700–5,725 mm, having at the maximum three dry months. It was found in association with *Ae. (Fin.) albolateralis*, *Ae. (Fin.) aureostriatus*, *Ae. (Fin.) chrysolineatus*, *Ae. (Fin.) dissimilis* (Leicester), *Ae. (Fin.) prominens* (Barraud), *Ae. (Stg.) albopictus*, *Ae. (Stg.) krombeini*, *Ar. (Lei.) omissus*, *Hz. (Hez.) chandi*, *Hz. (Mat.) discrepans*, *Cx. (Cui.) pallidothorax*, *Cx. (Eum.) khazani*, *Cx. (Lop.) uniformis*, *Or. flavithorax*, *Tp. (Rah.) affinis*, *Tp. (Rah.) aranoides*, *Tp. (Rah.)* sp. undet., *Ur. (Pfc.) novobscura novobscura* Barraud, *Tx. (Tox.) splendens*.

There are no distinct variations in the bionomics and distributions of *Ae. agastyai* and *Ae. reubena*. However, the former species was recorded at altitudes ranging from 350–750 m on the eastern and western slopes of the Western Ghats, whereas the latter species was always collected at higher elevations between 850–1,600 m on the western slopes. The medical importance of *Ae. reubena* is unknown.

Taxonomic discussion. *Aedes agastyai* and *Ae. reubena* are very similar. Distinguishing features include relative lengths of antenna and proboscis of the female, scaling on scutum, scutellum and postpronotum, and the male genitalia as described. However, the diagnostic character for the separation of these two species as adults is the presence of broad scales on all three scutellar lobes in the case of *Ae. agastyai* while in *Ae. reubena* broad scales are present only on the midlobe, the lateral lobes having only narrow scales. The aedeagus of the male genitalia also provides useful characters for separation of the two

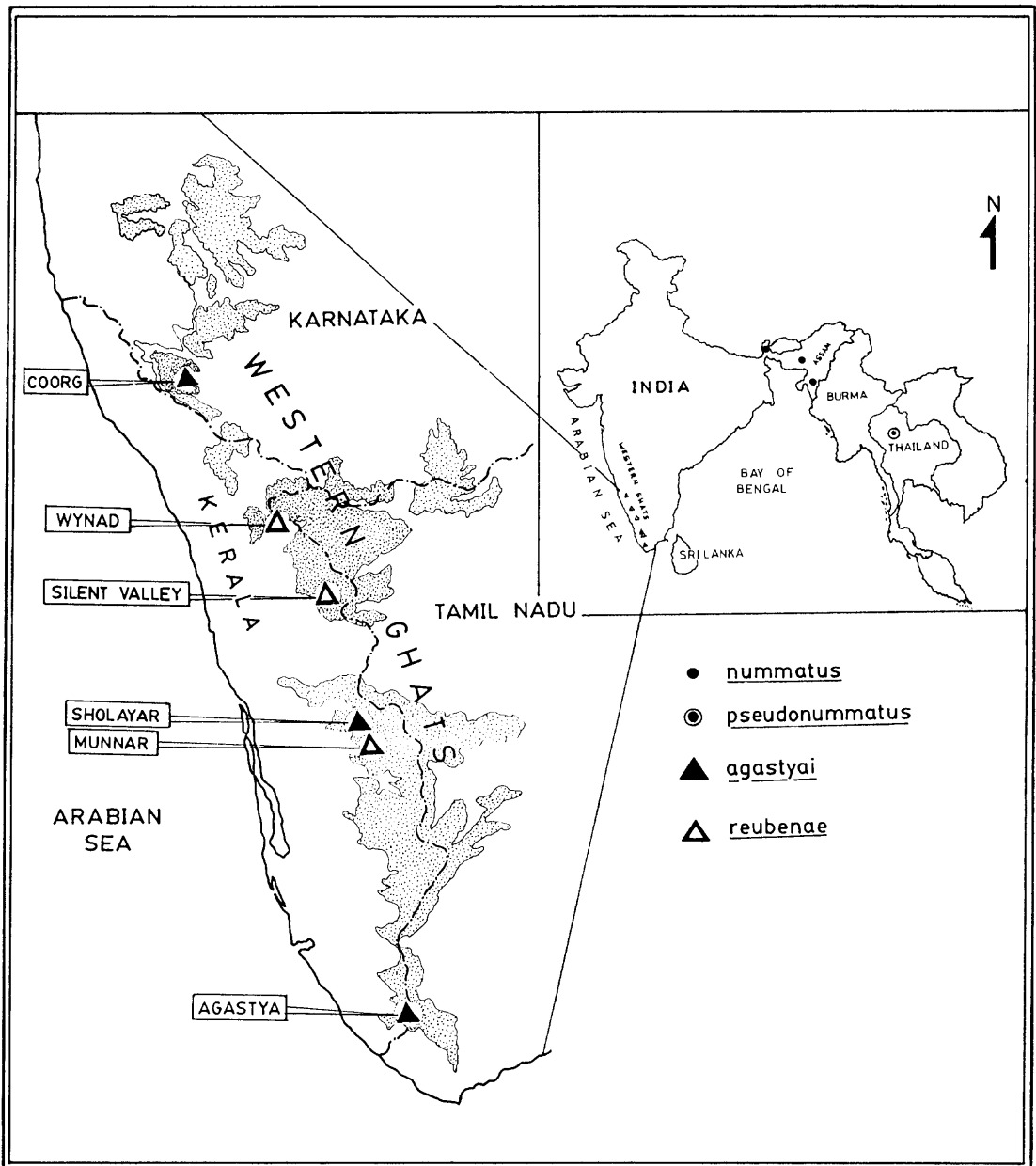


Fig. 9. Distribution of species of the *Aedes nummatus* group.

species. In lateral view the lateral plates of the aedeagus in *Ae. agastyai* exhibit four to six long, broadly rounded and recurved apical teeth, while in *Ae. reubeniae* these are gently curved and taper to a point. The basal mesal lobe in *Ae. agastyai* is densely covered with fine hair-like spicules, while in *Ae. reubeniae* these are fewer.

The larva and pupa of both of the new species are extremely similar in chaetotaxy and cannot be differentiated. Overlapping minor variation are recorded in the descriptions.

Aedes agastyai and *Ae. reubeniae* are extremely similar to *Ae. nummatus* and *Ae. pseudonummatus*. The differential characters of these are presented in Table 1. All four

Table 1. Differential characters for species of the *Aedes* (*Diceromyia*) *nummatus* group.

Character	<i>agasyai</i> n. sp.	<i>reubene</i> n. sp.	<i>nummatus</i>	<i>pseudonummatus</i>
Antenna (female)	1.20 length of proboscis	0.90 length of proboscis	0.87 length of proboscis	0.90 length of proboscis
Proboscis (female)	0.78-0.84 length of forefemur	0.90-1.05 length of forefemur	1.10 length of forefemur	1.08 length of forefemur
Scutum (female)	Anterior 0.5 with narrow curved snowy-white scales extending anteriorly and laterally to margins; snowy-white scale-patch with a deep indentation of narrow light brown scales on median area With a few broad snowy-white scales	Anterior 0.5 with narrow curved snowy-white scales extending anteriorly and laterally to margins; snowy-white scale-patch divided into 2 lateral patches by narrow light brown scales on median area With a few broad snowy-white scales	Anterior 0.5 with narrow curved snowy-white scales not extending to anterior and lateral margins; snowy-white scale-patch circular	Anterior 0.5 with narrow snowy-white scales extending to lateral margins
Paratergite	With a few broad snowy-white scales	With a few broad snowy-white scales	Bare	Bare
Scutellum	With broad brown scales on all 3 lobes	With broad white or light brown scales on median lobe and narrow curved white or light brown ones on lateral lobes	With broad brown scales on median lobe and narrow curved brown scales on lateral lobes	With broad snowy-white scales on median lobe and narrow curved snowy-white scales on lateral lobes
Antepronotum	With narrow curved snowy-white scales mixed with few broad white ones posteriorly	With narrow curved snowy-white scales mixed with few broad white ones posteriorly	With narrow curved reddish-brown scales	With narrow curved snowy-white scales
Postpronotum	With narrow curved snowy-white scales dorsally and few broad snowy-white scales mixed with narrow curved snowy-white scales below; 1,2 posterior golden setae	With narrow curved reddish-brown scales dorsally and few broad snowy-white scales mixed with narrow curved snowy-white scales below; 2,3 posterior golden setae	With narrow curved reddish-brown scales dorsally and 4,5 moderately broad white ones below; 3 posterior golden setae	With narrow curved reddish-brown scales dorsally and a small lower posterior patch of snowy-white ones; 4 posterior golden setae
Postgenital lobe (ventral) index	1.47	1.44	2.15	1.30
Aedeagus	Lateral teeth with broadly rounded and recurved apices	Lateral teeth gently curved and tapered to a point	Lateral teeth with tergally curved apices	—

species possess most of the characters of the subgenus *Diceromyia* in the Oriental Region (Reinert 1970). *Aedes platylepidus* Knight and Hull is another Oriental species which shows some resemblance to these four species due to the presence of a reduced maxillary palpus and the absence of alternating black and white patches on the vertex. However, *Ae. platylepidus* is distinct in having the scutum covered completely by broad scales, posttarsi of the female simple and the male antennal flagellar whorls mainly directed dorsally and ventrally. The presence of scales on the paratergite is a constant character of *Diceromyia* (Reinert 1970). However, *Ae. nummatus*, *Ae. pseudonummatum* and *Ae. platylepidus* have the paratergite bare, but *Ae. agastyai* and *Ae. reubeniae* both have patches of broad pale scales on the paratergite.

The immature stages of *Ae. pseudonummatum* are not known and only two damaged larval exuviae are available for *Ae. nummatus*. The immatures of *Ae. agastyai* and *Ae. reubeniae* have some unique features, including the pupa with seta 5-IV,V,VI very long and about equal in length, 5-V reaching the base of the paddle, seta 1-P about the length of the paddle and the larva with seta 6-C very long, about 1.5 length of the head, and seta 13-T stellate with 3-7 well developed branches.

In view of the similarities in the adult and immature stages, we have placed *Ae. nummatus*, *Ae. pseudonummatum*, *Ae. agastyai* and *Ae. reubeniae* in a group called the *Aedes nummatus* group of the subgenus *Diceromyia*. An adult key is presented here which can easily separate all four species.

- 1. Anterior 0.5 of scutum with a large patch of snowy-white scales. ♂*: palpus short, about 0.5 length of proboscis; gonostylus forked at middle with 2 subequal arms (*Ae. nummatus* group) 2
- Scutum without a patch of snowy-white scales. ♂: palpus usually long, about length of proboscis; genitalia without forked gonostylus

* Males of *Ae. pseudonummatum* and *Ae. punctipes* are not described.

- All other species of subgenus (*Diceromyia*) in Southeast Asia
- 2. Paratergite with broad snowy-white scales 3
- Paratergite bare 4
- 3. Scutellum with broad scales on all 3 lobes *agastyai*
- Scutellum with broad scales on median lobe and narrow on lateral lobe *reubeniae*
- 4. Anteprenotum with narrow reddish-brown scales; scutellar scales brown *nummatus*
- Anteprenotum with narrow snowy-white scales; scutellar scales snowy-white *pseudonummatum*

ACKNOWLEDGMENTS

We are grateful to Dr. Yiau-Min Huang, Department of Entomology, Smithsonian Institution, Washington, DC, who kindly examined our specimens and gave helpful comments. We gratefully acknowledge Dr. R. Reuben, Director, Centre for Research in Medical Entomology, Madurai for her support and encouragement. Our thanks to Shriyuts K. Ayanar and A. Munirathinam for their excellent assistance in field and laboratory work and Shri K. Pazhaninathan for preparing the illustrations. Thanks are also due to Miss A. Susila and Shri C. Ponnusamy for typing the manuscript.

REFERENCES CITED

Barraud, P.J. 1934. The fauna of British India, including Ceylon and Burma. Diptera. Vol. V. Family Culicidae. Tribes Megarhinini and Culicini. Taylor and Francis, London.

Bickley, W.E. and R.A. Ward. 1989. Usage of scientific names. J. Am. Mosq. Control Assoc. 5:305.

Edwards, F.W. 1923. Mosquito notes—IV. Bull. Entomol. Res. 14:1-9.

Harbach, R.E. and K.L. Knight. 1980. Tax-

- onomists' glossary of mosquito anatomy. Plexus Publishing, Inc. Marlton, New Jersey.
- Harbach, R.E. and K.L. Knight. 1982. Corrections and additions to *Taxonomists' glossary of mosquito anatomy*. *Mosq. Syst.* (1981) 13:201-217.
- Reinert, J.F. 1970. Contribution to the mosquito fauna of Southeast Asia—V. Genus *Aedes*, subgenus *Diceromyia* Theobald in Southeast Asia. *Contrib. Am. Entomol. Inst. (Ann Arbor)* 5(4):1-43.
- Reinert, J.F. 1973. Contribution to the mosquito fauna of Southeast Asia—XVIII. A reconsideration of *Diceromyia* Theobald with the inclusions of *Aedes nummatus* Edwards and *Aedes pseudonummatus* new species (Diptera: Culicidae). *Contrib. Am. Entomol. Inst. (Ann Arbor)* 10(1):22-40.
- Reinert, J.F. 1975. Mosquito generic and subgeneric abbreviations (Diptera: Culicidae). *Mosq. Syst.* 7:105-110.