

DESCRIPTION OF THE MALE, LARVA AND PUPA OF *Aedes (Diceromyia) kanarensis* (DIPTERA: CULICIDAE)

S.C. TEWARI, J. HIRIYAN AND R. REUBEN

Centre for Research in Medical Entomology, Madurai - 625 003, India

ABSTRACT. The male, larva and pupa of *Aedes (Diceromyia) kanarensis* are described and illustrated for the first time. The larva has a conspicuous maxillary 'horn' which is unique in the genus *Aedes*.

INTRODUCTION

The holotype female of *Aedes (Diceromyia) kanarensis* was described by Edwards in Barraud (1934) and doubtfully assigned to subgenus *Canacraedes* Edwards. Subsequently, Mattingly (1959, 1965) provisionally placed it in subgenus *Diceromyia* Theobald after reexamining the female. Reinert (1970a) while reviewing the species of *Diceromyia* of Southeast Asia included *Ae. (Dic.) kanarensis* in the key, in view of strong evidence presented by Mattingly (1965). Major reasons for uncertainties in the past were lack of knowledge about the male, pupal and larval stages of this species. We have collected these stages in very small numbers in the Western Ghats, southern India. The following confirms that this species belongs to *Aedes (Diceromyia)* as currently defined.

Nomenclature and chaetotaxy used follow Harbach and Knight [1980, 1981 (1982)]. Generic and subgeneric abbreviations used in the description follow Reinert (1975) and Bickley and Ward (1989).

Aedes (Diceromyia) kanarensis Edwards, 1934

Male. Head: Antenna heavily plumose, flagellomeres with setae mainly directed dorsally and ventrally, about the length of proboscis; pedicel brown with a few pale scales on inner side; clypeus dark brown, bare; palpus dark brown, about the length of proboscis and turned downwards apically, scattered pale scales on underside, palpomere 5 with pale scales dorsally and shorter than palpomere 4; proboscis about 1.1 length of forefemur, dark brown scaled, ventrally a narrow pale scaled patch at about 0.75 length from base and connected with a narrow, inconspicuous line of pale scales to the base; eyes narrowly separated, a pair of long brown interocular setae, 4 upper and 3, 4 lower well developed dark ocular setae; decumbent scales of vertex all broad and flat, a median white scaled patch with small dark scaled patches anteriorly on each side (in one specimen this whole area covered with white scales), postgena with a line of dark scales on each side followed by a broad white scaled area; occiput with a few brown erect forked scales. **Thorax:** Scutal integument dark; scutum

largely covered with dark, narrow, straight scales, except for a narrow white scaled patch anteriorly which extends posteriorly to the wing base forming a broad white border on both sides, moderately broad white scales at antealar area, moderately broad pale scales and numerous long golden setae at supraalar area, anterior promontory area with 1, 2 long and 2, 3 short dark setae, acrostical, dorso-central, prescutellar areas with narrow scales, setae absent; scutellum covered with broad dark scales with 4-6 long and 4-6 short setae on each lobe; pleural integument pale brown; anteprenotum well separated, covered with broad white scales, 7-10 long and 4-7 short setae; postpronotum with a few narrow white scales on upper area and a few broad white scales on lower area, 3-5 long setae; upper proepisternum with a patch of broad white scales; a conspicuous wide line of broad white scales across the pleura starting from proepisternum to metepisternum covering a portion of subspiracular area, mesokatepisternum, mesanepimeron; paratergite covered with broad white scales; remaining pleural area without scales; pleural setae pale golden, on following areas: 7, 8 upper proepisternal, 3-5 postspiracular, 8-12 prealar, 2, 3 upper and 4-7 lower mesokatepisternal, 5-7 upper mesepimeral, lower mesepimeral setae absent. **Legs:** Coxae I-III each with several golden setae and a patch of moderately broad pale scales dorsally; femora I-III mainly pale, slightly covered by dark scales on dorsoapical area, II anteriorly covered with dark scales; tibiae mainly dark, I-II ventrally pale scaled from base to apex, III with a pale spot dorsally at base and a very narrow pale strip ventrally from base to apex; tarsi I-III mainly dark, midtarsomere I with indistinct pale ring at base; hindtarsomere I with distinct basal pale band, II occasionally with indistinct pale ring at base; posttarsi I-III with 2 unguis, I and II with unguis unequal, larger unguis toothed and smaller unguis simple, III with unguis equal, both simple. **Wing:** Veins with dark squame and plume scales, squame scales dense on apical area; Cell R_2 about 2.0 length of R_{2+3} ; alula with narrow scales; upper calypter fringed; one remigial seta. **Halter:** Pedicel pale, capitellum with dark brown scales. **Abdomen:** Terga mainly dark; tergum I with large, distinct lateral patch of broad white scales, tergum II dark, terga III-VII with small

patch of lateral white scales produced onto the dorsum forming subbasal bands on V-VII (one specimen having a narrow band on IV also), tergum VIII with elongate and semi-erect broad dark scales; sterna mainly pale scaled with narrow dark apical bands on I-V, broader apical dark bands on VI-VII, sterna V-VIII with few dark, elongate, semi-erect broad scales, sternum VIII completely dark. **Genitalia** (Fig. 1): Tergum IX moderately pigmented, laterally broadly connected with sternum IX, cephalic margin slightly concave, caudal margin evenly concave and connected with tergum X, lateral lobes covered with fine hair-like spicules and each lobe with 9-11 strong setae mesally; gonocoxite heavily pigmented, short, broad basally, dorsal and ventral surface covered with fine spicules and short and long setae extending to apex, stronger and well developed setae laterally with broad scales, sternomesal margin area with moderately long curved setae; gonostylus attached apically to gonocoxite, elongate, narrow, curved, about 0.8 length of gonocoxite, with a fine, delicate, short seta apically, gonostylar claw short, heavily pigmented, spiniform, attached subapically; basal mesal lobe covered with spicules, apical portion with numerous long setae, connected sternally by a narrow membranous band to its mate at base; proctiger moderately long, paraproct heavily pigmented, basolaterally sclerotized, cercus with a pair (one on each side) of strong and 1, 2 short setae; phallosome with aedeagus having a pair of lateral aedeagal sclerites, each with 10-12 longitudinal teeth; paramere well developed, pigmented, about 0.85 length of aedeagal sclerite; basal piece pigmented, curved apically; sternum IX moderately pigmented with fine spicules, usually with 1, 2 small setae on the median posterior area.

Pupa. (Fig. 2). Chaetotaxy and measurements based on 8 pupal exuviae with associated adults. **Cephalothorax:** Moderately pigmented; seta 1-CT single, shorter than 2,3-CT; 2-CT single, strong, longer than 3-CT; 3-CT single; 4-CT single to 2 branched; 5,6,7-CT single, 6-CT stout and shorter than 7-CT; 8,9-CT single. **Metanotum:** Setae 10,11-CT single; 12-CT single to 2 branched. **Trumpet:** Heavily pigmented, spiculate; index 2.0. **Abdomen:** Seta 1-I well developed, dendritic with 8-10(9) branches; 2,3,5-I single; 4-I with 2,3(2) branches; 6,9-I single to 2 branched; 7-I single to 3 branched; 0,2,3,5,9-II single, 3-II long; 1-II with 2-5 branches; 4-II with 2-4(3) branches; 6-II single to 2 branched; 7-II single to 2(2) branched; 0,2,3,5,9,10,11,14-III single; 1-III with 2-4(2) branches; 4-III single to 4 branched; 6-III single to 3 branched; 7-III with 3-5(4) branches; 8-III with 2-4(2) branches; 0,2,5,9,10,11,14-IV single; 1-IV with 3-5 branches; 3-IV with single to 2(1) branched; 4,6,7-IV single to 3 branched; 8-IV with 2, 3 branches; 0,2,3,5,9,10,11,14-V single; 1,4-V with 2-4(3) branches; 6-V single to 3(1) branched; 7,8-V with 2,3 branches; 0,2,3,5,7,9,10,11,14-VI single; 1,8-VI with 2,3 branches; 4-VI single to 2(1) branched; 6-VI single to 5 branched; 0,2,3,4,5,7,10,11,14-VII single; 1-VII single to 2(2) branched; 6-VII with 2-4 branches (in two specimen

subdivided into 2-4 branches); 8-VII single to 2(1) branched; 9-VII well developed, about 0.6 length of segment VII, with 3-7 barbed branches (in three specimens subdivided into 2-4 branches); 0,4,14-VIII single; 9-VIII well developed about 1.2 length of segment VIII, with 6-9 barbed branches. **Paddle:** Oval shaped, apex rounded, shallowly emarginate; outer margin 0.35-0.44 serrated and 0.56-0.64 spiculated; inner margin 0.62-0.69 spiculated; 1-P simple, single to 4 branched, about 0.29 length of paddle (in one specimen 2-P bifid); index 1.42-1.50.

Larva (Fig. 3). Chaetotaxy and measurements based on 3 damaged larval exuviae which have associated adult specimens. **Head:** Moderately pigmented, without spicules, 1,3,5,6,8,9,10,12,13,14 and 18-C single, 1-C tapering, moderately long, 5-C very long; 4,7-C with 4,5 branches (4-C probably displaced while mounting exuviae); 11-C with 2,3 branches; 15-C with 5 branches; dorsomentum with 8,9 teeth on each side of a larger central tooth; maxilla well developed with conspicuous long maxillary 'horn' with spatulate tip, protruding in front of the head (Fig. 3); seta 6-Mx short, stout, single. **Antenna:** Length, 0.38 of head, without spicules; 1-A single, simple, inserted about 0.54 - 0.60 from base of the shaft, reaching to apex; 2-6-A all simple, single, attached at apex of shaft. **Thorax and Abdomen:** Conspicuously heavily spiculate; extensive twisting of exuviae made it difficult to interpret the thoracic and abdominal setae accurately, however most of these setae are well developed and stellate; segment VIII with comb composed of 4,5 scales arranged in a single row, each scale moderately pigmented, large and with a fine lateral fringe; seta 1-X strong, slightly barbed, bifid; 2-X long with 5,6 branches; 3-X long with 4,5 branches; 4-X composed of 4,5 pairs of long well developed multiple branched setae; precratal setae absent; saddle moderately pigmented, incomplete ventrally; anal papillae not visible. **Siphon:** Heavily pigmented, short, index 1.62-1.65; pecten on basal 0.47 of siphon, composed of 4-7 long tapering teeth without denticles, fringed laterally; seta 1-S single to 2 branched, long, inserted on basal 0.56-0.60 of siphon, slightly distad of last pecten tooth reaching to the apex of siphon; 2,7,8,9-S single, 6-S bifid.

Specimen Data. One male of *Ae. (Dic.) kanarensis* (A 822) with associated larval (l 276) and pupal (p 229) exuviae with the following collection data: Golor, Kurchiyat Forest Range, Sultan's Battery, Wynad District, Kerala State, India, 20th May 1987, collected as a larva from a tree hole in the forest area. Deposited in the U.S. National Museum of Natural History, Smithsonian Institution, together with a male (A 824) with mounted genitalia (G 353) on a slide. One male (A 825) with mounted genitalia (G 355) deposited in National Institute of Virology, Pune, India.

Distribution. Altogether 21 specimens including immature and associated adults were examined, of these 1 ♂ p, 1 ♀ p (15.5.1987; 750 m) from a locality named Amarakuni and 3 ♂ pl, 3 ♂ p, 2 ♂ genitalia (20.5.1987; 900 m)

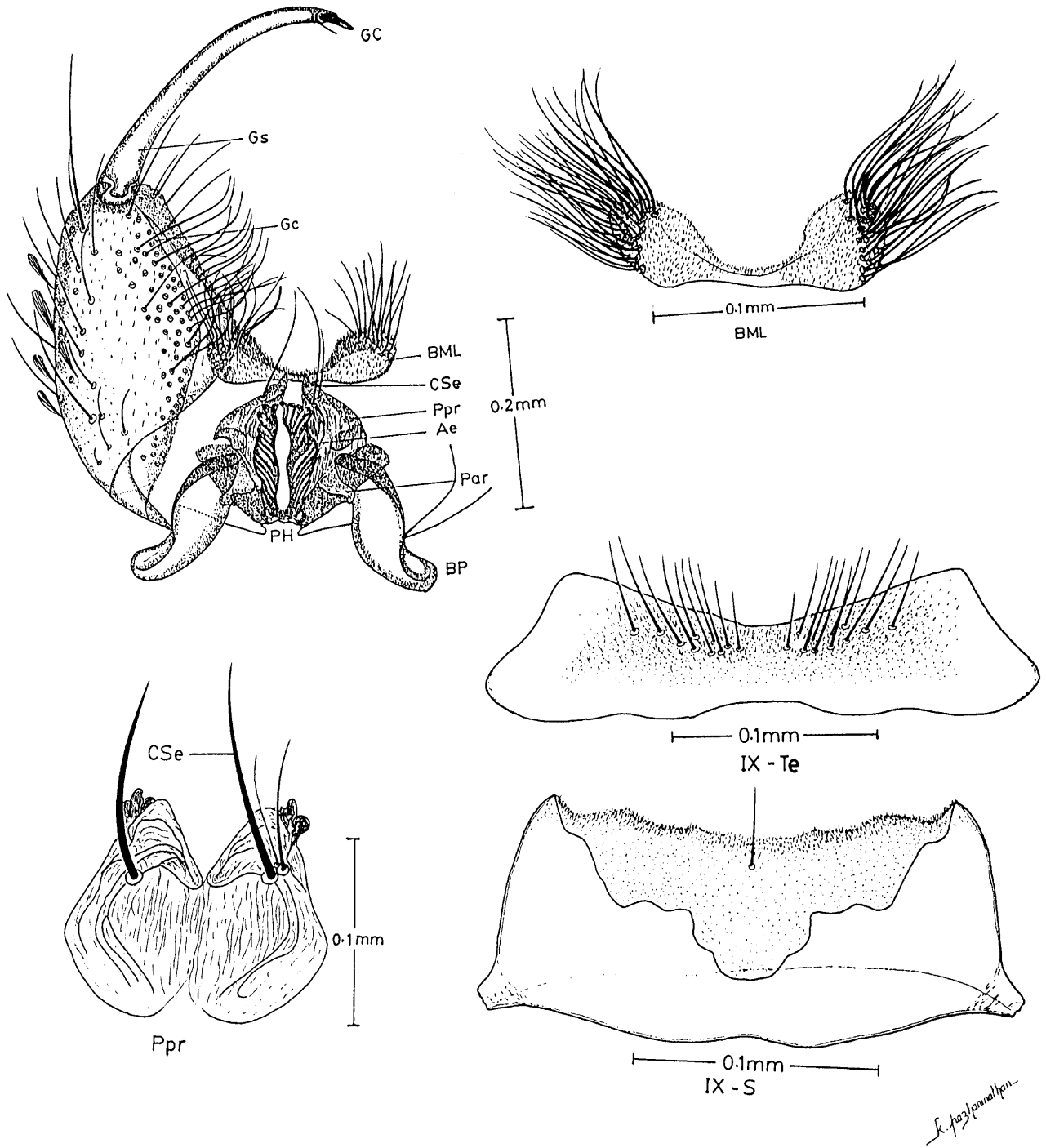


Fig. 1. *Ae. (Dic.) kanarensis*. Genitalia. Ae = aedeagus; BML = basal mesal lobe; BP = basal piece; CSe = cercal seta; Gc = gonocoxite; GC = gonostylar claw; Gs = gonostylus; IX-S = sternum IX; IX-Te = tergum IX; Par = paramere; PH = phallosome; Ppr = paraproct.

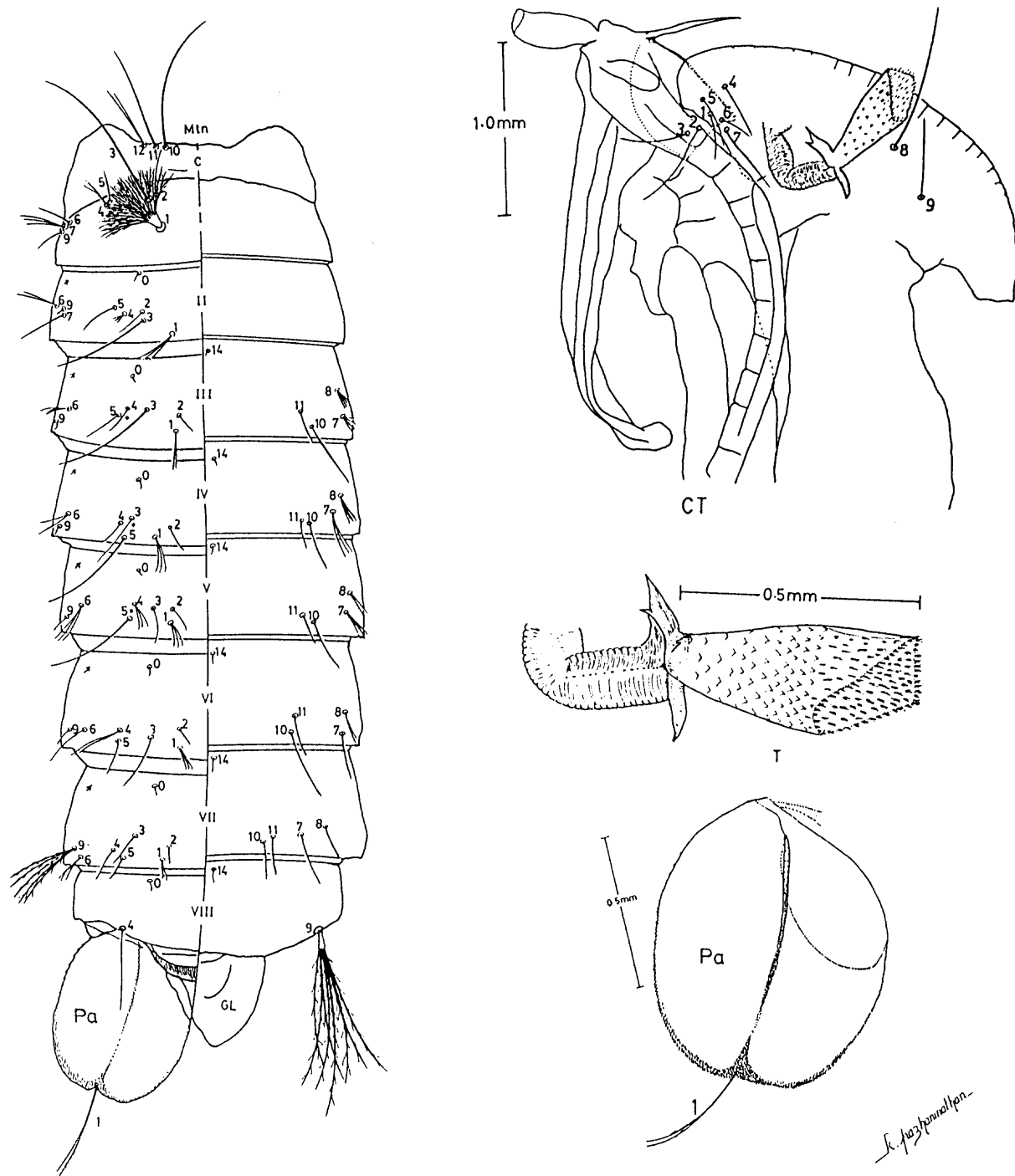


Fig. 2. *Ae. (Dic.) kanarensis*. Pupa. CT = cephalothorax; GL = genital lobe; Mtn = metanotum; Pa = paddle; T = trumpet; I-VIII = abdominal segments I-VIII.

K. Puzosmellen

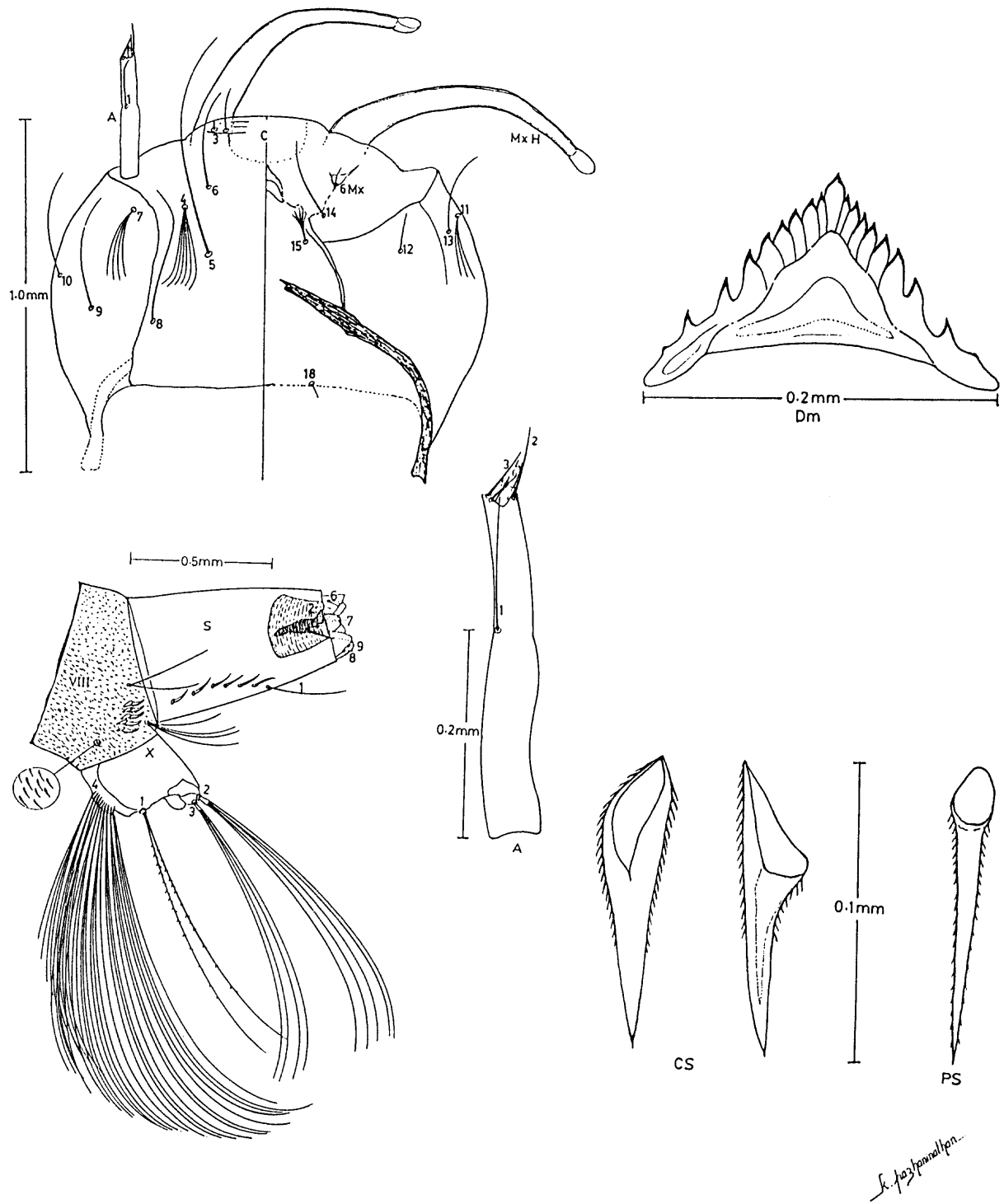


Fig. 3. *Ae. (Dic.) kanarensis*. Larva. A = antenna; C = cranium; Cs = comb scale; Dm = dorsosentum; MxH = maxillary horn; Ps = pecten spine; S = siphon; VIII, X = abdominal segments VIII, X; 6-Mx = seta 6-Mx.

from Golur, both places located in Kurchiyat Forest Range (11° 45'N 76° 15'E), Wynad District, Kerala State, Southern India.

TAXONOMIC DISCUSSION

The subgeneric status of species of *Diceromyia* can only be determined on the basis of diagnostic characters of adult males (Reinert 1970a). This author stated that males have the following combination of characters: (i) palpus with the two apical segments very short, (ii) antenna with plume hairs directed mainly dorsally and ventrally, (iii) aedeagus divided into 2 lateral plates (aedeagal sclerite) each with several teeth, (iv) absence of cercal setae, (v) posttarsi I-II with unequal unguis, larger unguis toothed and III with unguis smaller, equal, simple. The male of *Ae. (Dic.) kanarensis* exhibits all these characters, except unlike other species of *Diceromyia* the cercus has a pair of long, strong setae, one on each side and 1,2 short ones. Cercal setae are characteristic of some African species of subgenera *Aedimorphus* and *Stegomyia* (Reinert 1973, Huang 1981) which may support Reinert's (1970b) hypothesis that subgenus *Diceromyia* evolved from the stock of *Aedimorphus* in the Indian area and subsequently dispersed to the Ethiopian Region. The male genitalia of *kanarensis* closely resembles the Oriental species, *Ae. (Dic.) reginae* Edwards and *Ae. (Dic.) micropterus* (Giles), but can be distinguished by the presence of cercal setae and absence of setae on sternum IX.

The pupa of *kanarensis* has all the common subgeneric characters of subgenus *Diceromyia* as described by Reinert (1970a): setae 6,8,9,11-C single; trumpet short; abdominal seta 9-I-VI small and stout, 9-VII about 0.5 length of segment VII, 9-VIII well developed, more than the length of segment VII; setae 2,3-I-VII single; paddle oval with seta 1-P well developed. The pupa is similar to those of *Ae. (Dic.) whartoni* Mattingly, *Ae. (Dic.) reginae* and *Ae. (Dic.) micropterus*. In *kanarensis* the presence of short trumpet and abdominal seta 5,I-VII single, distinguishes it from the former species, and branched seta 1-II separates it from the latter two species.

The larva of *kanarensis* is unique and can be easily distinguished from all other allied species due to the presence of a pair of conspicuous maxillary 'horn'. The remaining characters, as far as can be determined from our limited material, are similar to other species of subgenus *Diceromyia*.

Bionomics. The larvae of *Ae. (Dic.) kanarensis* were found breeding in tree holes twice in different types of forest, dry deciduous and semi evergreen, at lower altitudes (750 m - 900 m, msl). One of the breeding sites was close to human habitation (Amarakuni-tribal colony). Subsequently extensive collections failed to yield further specimens.

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