

VERRALLINA (NEOMACLEAYA) ASSAMENSIS, A NEW SPECIES FROM ASSAM, INDIA

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ABSTRACT. The adult female, adult male, pupa, and larva of *Verrallina (Neomacleaya) assamensis*, a new mosquito species, are described from the Dibrugarh District of Assam State, India.

KEY WORDS Culicidae, India, new species, *Verrallina*

INTRODUCTION

Verrallina and *Neomacleaya* originally were described by Theobald (1903, 1907) as genera. Edwards (1913) synonymized *Verrallina* and *Neomacleaya* with the genus *Aedes* Meigen. Subsequently, Belkin (1962) resurrected *Verrallina* as a distinct subgenus of *Aedes* and considered *Neomacleaya* as a synonym of *Verrallina*. Delfinado (1967, 1968) later resurrected *Neomacleaya* from *Aedes* and *Verrallina* and recognized it as a distinct subgenus of *Aedes*. Recently, Reinert (1999) restored *Verrallina* to generic rank and included *Neomacleaya* as a subgenus. The genus *Verrallina* is mainly distributed in the Oriental region, where members of the genus prefer temporary, shaded, stagnant water pools in forest areas for oviposition. Little is known about the medical importance of *Verrallina*, although many species have been recorded feeding on humans and animals. Reinert (1999) included 94 species in the genus *Verrallina*—13 in subgenus *Harbachius*, 51 in subgenus *Neomacleaya*, and 30 in subgenus *Verrallina*. We propose a new species in subgenus *Neomacleaya* from Assam State of India. The morphological terminology of Harbach and Knight (1980) and the abbreviations of generic and subgeneric names of Reinert (2001) are followed in this paper.

VERRALLINA (NEOMACLEAYA) ASSAMENSIS, NEW SPECIES

Female. Description based on 4 specimens. Medium-sized species. *Head:* Antenna dark brown, about 0.8 length of proboscis; flagella whorls each with 3–5 dark brown setae; flagellomeres I–VIII with narrow apical white area; pedicel dark with patch of dark brown scales and few dark fine setae on basal inner side; maxillary palpus dark scaled, 4 segmented, fine setae throughout the length, setae long and more numerous apically on 4th palpo-

mere; maxillary palpus about 0.1 length of proboscis; proboscis dark scaled, about 1.3 length of forefemur; vertex covered with metallic dark scales dorsally, line of pale scales laterally; broad line of erect forked dark scales posteriorly; ocular margin with line of pale scales; 3–4 ocular setae on each side with 1 pair of long dark setae on interocular space. *Thorax:* Scutal integument dark brown; scutum with dark narrow curved scales; dark setae present on anterior promontory, acrostichal, dorso-central, scutal, and fossal areas; setae more numerous on supraalar area; scutellum trilobed with narrow scales; 2–5 long setae and 4 short setae on lateral lobes and 5,6 long and 3–5 short setae on midlobe; integument of pleura pale brown; antepnotum with few broad scales and dark well-developed setae; postpronotum largely bare with a few narrow curved dark scales in upper portion and with 3–5 setae; pleura with patches of pale white scales on upper and lower meskatepisternum; mesepimeron with large patch of broad white scales with some fine setae; lower mesepimeron with numerous golden fine hairs; postspiracular area bare with 4 setae; upper meskatepisternum with 6–9 dark setae and lower portion with few fine setae; prealar area with 8–10 dark setae; propleuron with small patch of pale scales and 3–4 dark setae. *Legs:* Forecoxa with patch of overlapping pale scales on upper area and dark scales on lower area; mid- and hindcoxae with few pale scales; femora dark dorsally with narrow pale stripe ventrally along entire length, distinct and broad on hind femora; tibiae and tarsi dark scaled; ungues simple on hind legs and unidentate on mid and forelegs. *Wing:* Dark scaled; allula with few dark scales; upper calypter with several light brown setae on margin. *Halter:* Pedicel pale, capitulum dark. *Abdomen:* Terga dark scaled with small basolateral pale patches of broad white scales, basolateral pale patches larger and visible dorsally on VI and VII tergal segments; sterna pale with narrow apical dark bands. *Genitalia* (Figs. 1a and 2): Tergum VIII moderately pigmented, many broad scales covering apical 0.8, base slightly concave and retracted into segment VII, apex slightly convex with many long and short setae; sternum VIII moderately pigmented, numerous broad scales and setae covering most of surface except for small basal and lateral areas, base concave mesally, apex

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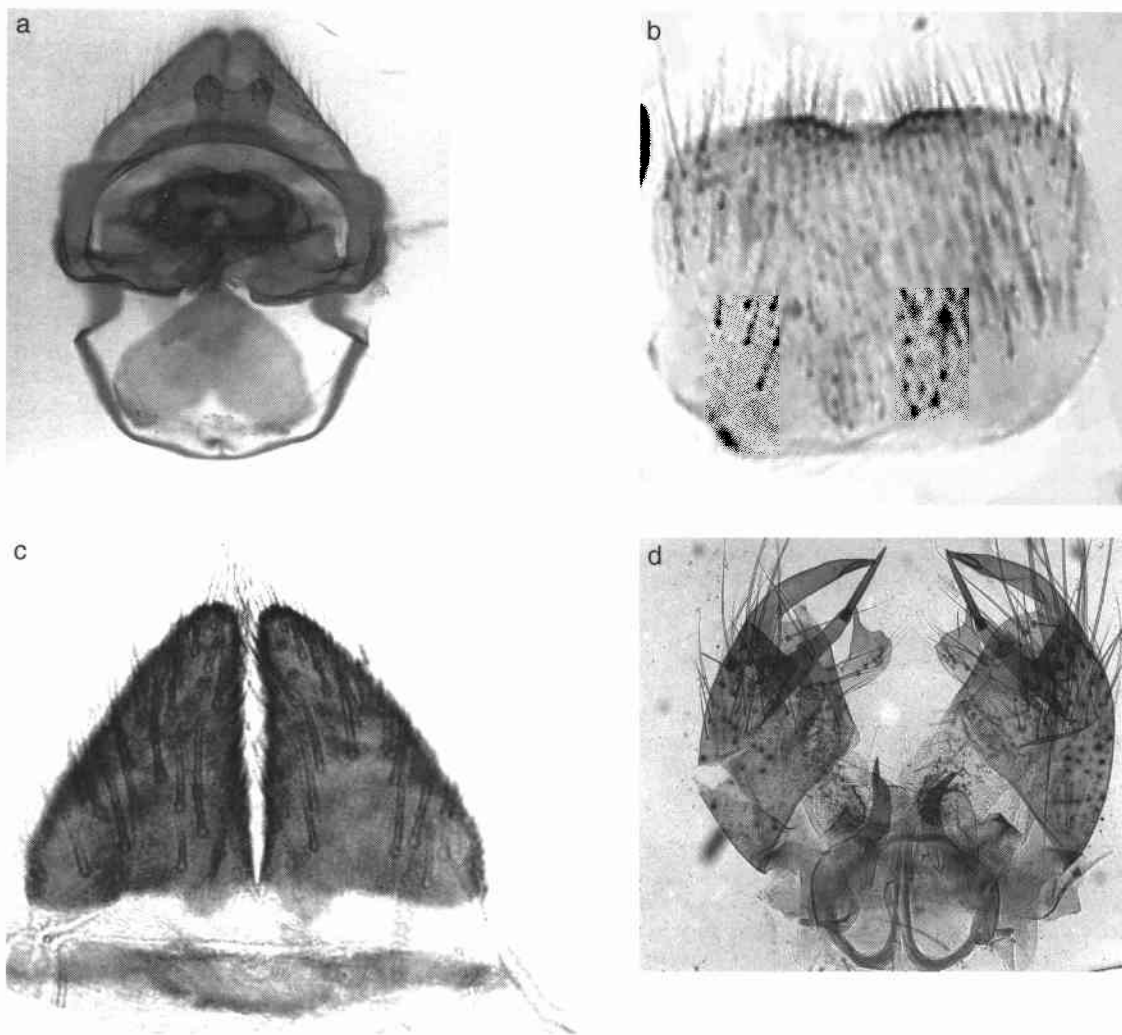


Fig. 1. *Verrallina (Neomacleaya) assamensis*, sp. nov. (a) Female genitalia. (b) Sternum VIII of female. (c) Tergum IX and cercus (dorsal) of female. (d) Male genitalia.

with shallow median indentation producing 2 small lobes—1 on each side of midline, intersegmental fold unpigmented (Fig. 1b); tergum IX lightly pigmented with an unpigmented median area, short and wide, without setae, base with median area convex (Fig. 1c); insula ill defined, small, unpigmented; lower vaginal lip heavily pigmented with small caudally projecting median structure, spicules on basal portion and hinge area; lower vaginal sclerite single, large, leaflike with apical median notch; upper vaginal lip heavily pigmented and moderately broad; upper vaginal sclerite moderate to heavily pigmented, large and well developed, base attached to basal half of lateral area of upper vaginal lip with heavily pigmented projection on basoposterior area, sclerite bifurcated, anterior branch moderately pigmented, attached to cephalic

portion of spermathecal eminence, posterior branch ending caudally; spermathecal eminence heavily pigmented, deep, inner margin heart-shaped, moderately long spicules on cephalic and lateral area; postgenital lobe short with deep median indentation, body covered with setae and small spicules; cercus somewhat triangular, broad at base, apex acute, dorsal surface covered with many short and moderately long setae over most of surface, index about 2.42 (Fig. 1c).

Male. Description based on 3 specimens. Adult habitus similar to female except for sexual differences. *Genitalia* (Figs. 1d and 2): Gonocoxite short, broader mesally and narrow basally, extended dorsoapically as heavily pigmented apical elongated projection with beaklike tip, with subapical long spiniform projection heavily pigmented at

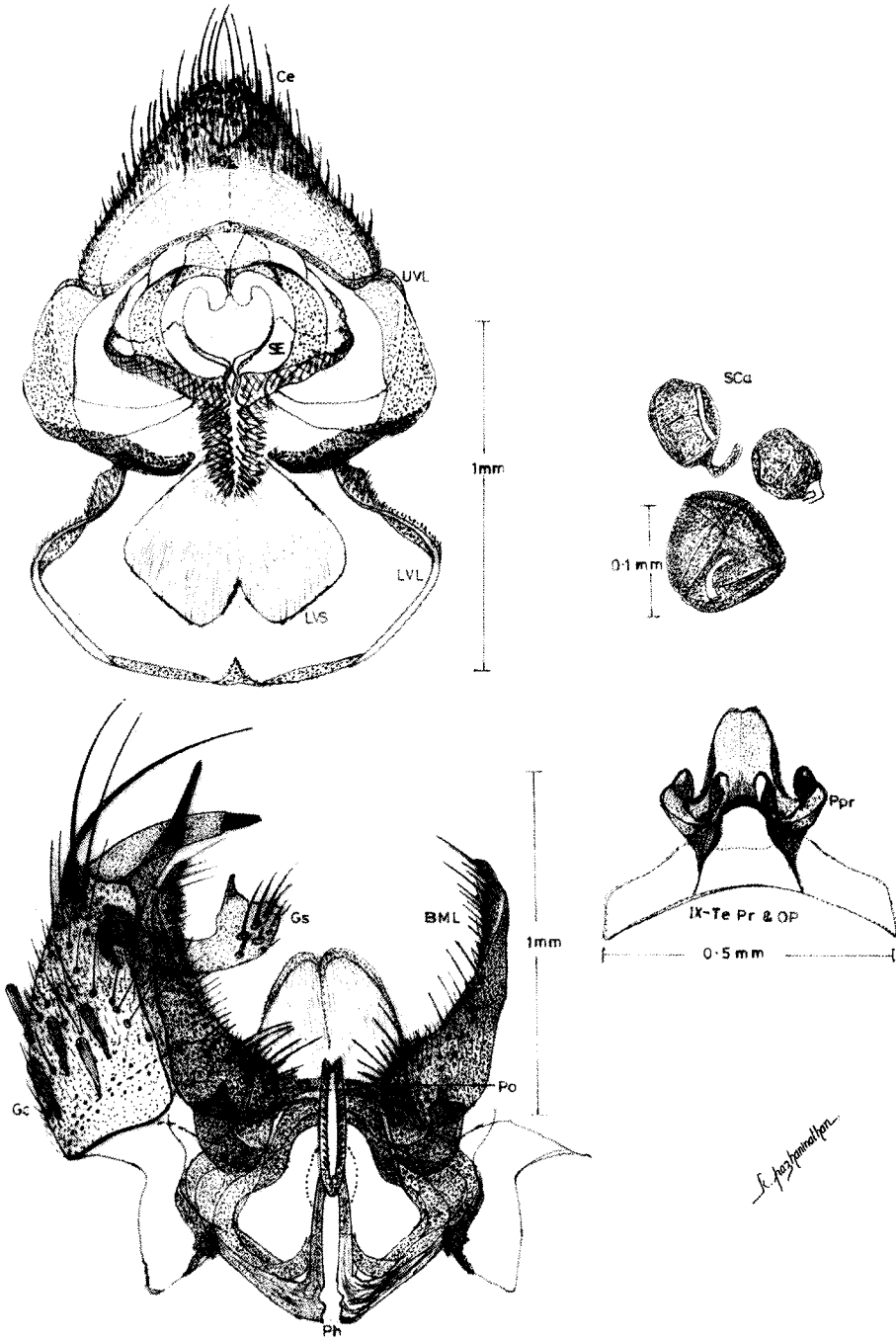


Fig. 2. Female and male genitalia of *Verrallina (Neomacleaya) assamensis*, sp. nov.

base; gonocoxite pigmented, heavily spiculate, with long and short setae; basal mesal lobe broader at base, tapering toward apex, membranous, spiculate and elongated, reaching apex of gonocoxite, covered with several long and short setae; gonostylus attached subapically, shape as illustrated, broad apically, narrowed on inner side forming a tip, apex

with 3,4 long stout setae in 1 line and another group of 4-7 long and short setae, gonostylar claw absent; paraproct small, heavily pigmented; proctiger heavily pigmented; phallosome complex; ophisthophallus slightly concave basally, lightly pigmented; phallus composed of pair of long aedeagal sclerites fused together by narrow bridge; prosophallus with

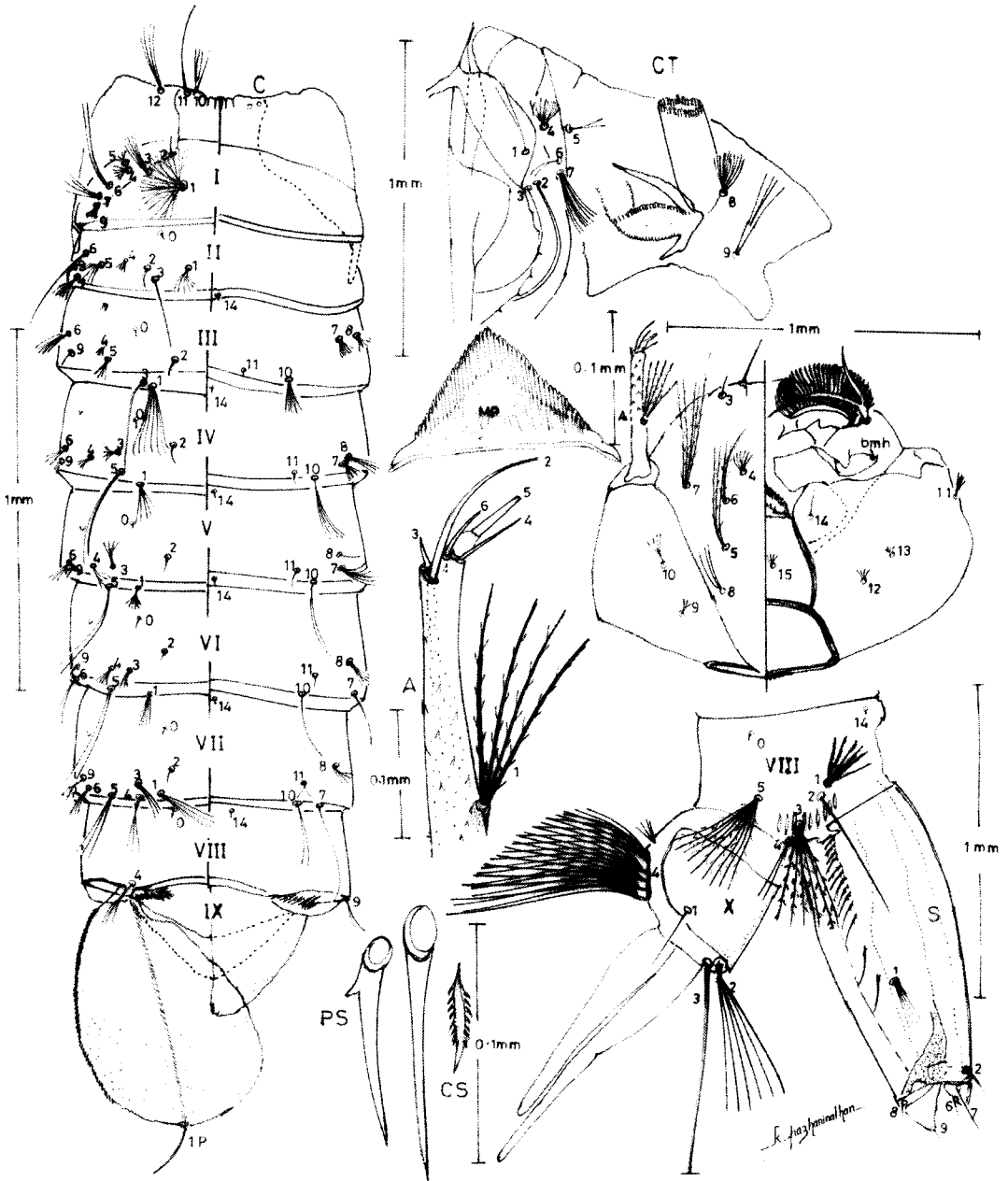


Fig. 3. Pupa and larva of *Verrallina (Neomacleaya) assamensis*, sp. nov.

pair of long laterally curved arms attached to parameres; paramere short, attached to basal piece of gonocoxite at its base.

Pupa (Fig. 3). Description based on 4 exuviae. **Cephalothorax:** Seta 1,2-CT double branched (br); 3-CT single, double; 4-CT 6-9 br; 5-CT 2-5 br; 6-CT single, double; 7-CT 3-5 br; 8-CT 6-8 br; 9-CT 3-5 br; 10-CT 4-7 br; 11-CT single; 12-CT 4-5 br. **Trumper:** Moderately pigmented, index about 3.87. **Abdomen:** Seta 1-I dendritic with 15-17 main branches; seta 2-I-VII stout, spinelike; seta 3-I sit-

uated far from 2-I; seta 5-IV-VI usually double, not reaching distal margin of following segment; seta 7-VI,VII long, single or double; seta 9-VII short, 2-4 br; seta 9-VIII single or double. **Paddle:** Ovoid; index about 1.39; 1-P single, fringed border of the paddle about 0.74.

Larva (Fig. 3). Description based on 4 exuviae. **Head:** Hair 1-C stout, long; 4-C with 7,8 weak branches; 5-C with 2,3 barbed branches; 6-C single, barbed; 7-C with 7,8 barbed branches; dorsentum with 40-42 lateral teeth; antenna moderately

long, lightly pigmented with several small spicules, 1-A inserted just before middle, 4,5 br, 2-A single, long, 3-A short, 4,5,6-A single. *Thorax*: Seta 1-P double, seta 2-4-P 4 br, seta 5,6,8-P single, seta 7-P double. *Abdomen*: Seta 6-I single, 6-II double; segment VIII with 12 comb scales arranged in single row, each scale with stout median apical spine and lateral denticles; seta 1-VIII 6 branched, unbarbed; seta 2-VIII single; seta 3-VIII with 7,8 barbed branches; seta 4-VIII double; seta 5-VIII with 8-10 barbed branches; siphon moderately pigmented, index about 2.17, pecten composed of 13-16 teeth, distal 2,3 teeth longer, widely spaced, and without basal denticles, seta 1-S short with 3,4 weak branches; saddle moderately pigmented, incomplete, acus absent, seta 1-X single, seta 2-X with 7 branches, seta 3-X single, seta 4-X with 10 setae on grid and 1,2 precratal setae, 4 long anal gills present.

TAXONOMIC DISCUSSION

As with many other species of *Verrallina* subgenus *Neomacleaya*, the new species *Ve. assamensis* cannot be separated with certainty from closely related species on the basis of adult habitus alone. However, this species can be easily distinguished by characters of the male and female genitalia. The female genitalia of *Ve. assamensis* are closest to those of *Ve. unca* (Theobald). However, in *Ve. unca* the lower vaginal sclerite is almost completely divided, whereas in the new species this structure is undivided except for an apical median notch. Moreover, the shape of the IX tergum of the female of the new species can be used to separate it from other closely related species. The pupa of *Ve. assamensis* is closest to that of *Ve. unca* and the larva to that of *Ve. latipennis* (Delfinado). However, the larva of *Ve. latipennis* possesses 15-18 setae on a grid and 3,4 precratal setae on segment X in comparison to 10 setae on the grid and 1,2 precratal setae in the new species.

Bionomics

Specimens of *Ve. assamensis* were collected in the Soraipung range (27°35'N, 95°41'E) of Dihing Reserve Forest (subtropical rain forest) in the Dibrugarh District of Assam, India. Second and 3rd instars of this species were collected twice, in October 2002 and June 2003, from a rain-filled, completely shady ground pool that contained rotten leaves and no bottom vegetation in the forest fringes. Larvae of *Aedes* (*Paraedes*) *ostentatio* (Leicester), *Anopheles* (*Cellia*) *dirus* Peyton and Harrison, *Culex* (*Lophoceraomyia*) *mammilifer* (Leicester), and *Ve. (Nma.) rami* Barraud were found in association with *Ve. assamensis* in the same pool. Heavy mortality of larvae of *Ve. assamensis* was observed during link rearing in the laboratory.

Type series

The holotype male (A-1857) with associated larval (l-916) and pupal (p-901) exuviae on 1 slide and dissected genitalia (G-579a and G-579b) on 2 separate slides and the allotype female (A-1858) with associated larval (l-917) and pupal (p-902) exuviae mounted on the same slide are deposited in the Natural History Museum, London, United Kingdom. They bear the following collection data. India. North-east India, Assam. Dibrugarh District. Dihing Reserve Forest (152 meters above mean sea level), 28.10.2002 and 26.6.2003. Collected as larva and pupa from a completely shaded ground pool. Coll. A. C. Rabha.

One paratype male (A-1859) without associated skins, with dissected genitalia mounted on 2 separate slides (G-580a and G-580b), 2 paratype females (A-1860 and A-1861), 1 with associated larval (l-918) and pupal (p-903) skins and dissected genitalia mounted on 2 slides (G-581a and G-581b) and the other (A-1861) without associated skins with dissected genitalia mounted on single slide (G-582) also are deposited in the Natural History Museum, London. One male (A-1862) with dissected genitalia mounted on 1 slide (G-583) and 1 female with associated larval (l-919) and pupal (p-904) skins and with dissected genitalia on 2 slides (G-583a and G-583b) are kept in the museum of the Regional Medical Research Centre, Dibrugarh.

Etymology

The species is named after the state of Assam, in northeastern India where the collection site is situated.

ACKNOWLEDGMENTS

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REFERENCES CITED

- Belkin JN. 1962. *The mosquitoes of the South Pacific (Diptera: Culicidae)* Volumes I, II. Berkeley, CA: University of California Press.
- Delfinado MD. 1967. Contributions to the mosquito fauna of Southeast Asia—I. The genus *Aedes*, subgenus *Neomacleaya* Theobald in Thailand. *Contrib Am Entomol Inst (Ann Arbor)* 1(8):1-56.

- Delfinado MD. 1968. Contributions to the mosquito fauna of Southeast Asia—III. The genus *Aedes*, subgenus *Neomacleaya* Theobald in Southeast Asia. *Contrib Am Entomol Inst (Ann Arbor)* 2(4):1–74.
- Edwards FW. 1913. New synonymy in Oriental Culicidae. *Bull Entomol Res* 4:221–242.
- Harbach RE, Knight KL. 1980. *Taxonomists' glossary of mosquito anatomy* Marlton, NJ: Plexus Publishing Inc.
- Reinert JF. 1999. Restoration of *Verrallina* to generic rank in tribe Aedini (Diptera: Culicidae) and descriptions of the genus and three included subgenera. *Contrib Am Entomol Inst (Gainesville)* 31(3):1–83.
- Reinert JF. 2001. Revised list of abbreviations for genera and subgenera of Culicidae (Diptera) and notes on generic and subgeneric changes. *J Am Mosq Control Assoc* 17:51–55.
- Theobald FV. 1903. *A monograph of the Culicidae or mosquitoes* Volume III. London, United Kingdom: British Museum (Natural History).
- Theobald FV. 1907. *A monograph of the Culicidae or mosquitoes* Volume IV. London, United Kingdom: British Museum (Natural History).