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AEDES (STEGOMYIA) CORNETI, A NEW SPECIES OF THE *AFRICANUS* SUBGROUP (DIPTERA: CULICIDAE)[1]

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Abstract.—Adults of both sexes and the larva and pupa of *Aedes* (*Stegomyia*) ***corneti*** n. sp. from Sierra Leone are described and illustrated. Diagnostic characters for separating the adults of *Ae.* ***corneti*** from closely allied species are given. The distribution of *Ae.* ***corneti*** is based on examined specimens.

A new species of *Aedes* (*Stegomyia*) belonging to the *africanus* subgroup of the *aegypti* group was recently collected while conducting field work in Sierra Leone in 1984. This new species, which is extremely similar in overall habitus to adults of *Aedes* (*Stegomyia*) *africanus* (Theobald), 1901, was found also among specimens misidentified as *Ae. africanus* from the Services Scientifiques Centraux, Office de la Recherche Scientifique et Technique Outre-Mer (ORSTOM), Institut Pasteur, Paris (PIP) and the British Museum (Natural History) collections.

In view of the medical importance of several species in the *africanus* subgroup and the similarity of this new species with *Ae. africanus* (Theobald), it is desirable to describe the new species here to make its name available and to avoid future confusion between it and *Ae. africanus*. Because nothing is known about its biting habits and its potential as vector of human pathogens, it is hoped that this paper will stimulate investigations on these subjects.

MATERIALS AND METHODS

This study is based on specimens collected by the Systematics of *Aedes* Mosquitoes Project (SAMP), Department of Entomology, National Museum of Natural History, Smithsonian Institution (USNM), and on specimens borrowed from institutions mentioned in the acknowledgments section. Distributional records are listed in the following order and format: country names are in capital letters, administrative divisions, where known, are in italics, and place names have the first letter capitalized.

The terminology follows that of Harbach and Knight (1980), with the exception of "tarsal claws," which is retained for "unguis." The venational terms follow those of Belkin (1962).

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Aedes (*Stegomyia*) *corneti* Huang, New Species
Figs. 1–5

Female.—*Head:* Proboscis dark scaled, without pale scales on ventral surface, longer than forefemur (1.26–1.31 length of forefemur); maxillary palpus about 0.19 length of proboscis, dark, with white scales on entire dorsal surface of palpomere 4; pedicel covered with white scales except on dorsal surface; antenna with a few dark scales on flagellomere 1; clypeus bare; occiput with few erect forked scales; a row of broad white scales around eye margins; vertex with a median stripe or patch of broad white scales, with broad dark scales on each side interrupted by lateral stripe of broad white scales, followed ventrally by a patch of broad white scales. *Thorax* (Fig. 1A): Scutum with narrow dark scales, and a distinct median stripe of broad white scales on anterior promontory, a large patch of broad white scales on fossal area, a patch of broad white scales on lateral margin just in front of wing root; acrostichal setae absent; dorsocentral setae present; scutellum with broad white scales on all lobes and with a few broad dark scales at apex of midlobe; antepronotum with broad white scales; postpronotum with a patch of broad white scales; paratergite with broad white scales; postspiracular area without scales; hypostigmal area without scales; patches of broad white scales on propleuron, subspiracular area, upper and lower portions of mesokatepisternum, and on mesepimeron; upper mesokatepisternal scale patch not reaching to anterior corner of mesokatepisternum; upper mesepimeral scale patch connecting with lower mesepimeral scale patch; lower mesepimeron without setae; metameron and mesopostnotum bare. *Wing:* With dark scales on all veins except for a minute basal spot of white scales on costa; cell R_2 about 2.6 length of R_{2+3}. *Halter:* With dark scales. *Legs* (Fig. 2A): Coxae with patches of white scales; white knee-spot absent on femora; forefemur anteriorly with a narrow, white longitudinal stripe on ventral surface in apical 0.56; midfemur with 3 large, white patches on anterior surface (on basal, median and apical areas); hindfemur with 2 large, white patches on anterior surface (on median and apical areas); fore- and midtibiae anteriorly dark; hindtibia anteriorly dark, with a white longitudinal stripe on ventral surface in basal 0.20–0.25; fore- and midtarsi with a basal white band on tarsomeres 1, 2; hindtarsus with a basal white band on tarsomeres 1–4, the ratio of length of white band on dorsal surface to the total length of tarsomere is 0.22–0.25, 0.20–0.23, 0.82–0.88 and 0.33–0.50; tarsomere 5 all dark; fore-, mid- and hindlegs with tarsal claws equal, all toothed. *Abdomen* (Fig. 1B): Tergum I with white scales on laterotergite; terga II–VIII each with basolateral white spots which are not visible in dorsal aspect except on terga VII–VIII; sterna III–VII each with a basal white band; segment VIII largely retracted. *Genitalia:* Apical margin of sternum VIII with a median notch and with conspicuous rounded lateral lobes; insula longer than wide, with minute setae and with 3 larger setae on apical 0.25; apical margin of tergum IX with well developed lateral lobes, each with 2–6 setae; apical margin of postgenital plate with a median notch; cercus short and broad; 3 spermathecae, one larger than the other 2.

Male.—Essentially as in the female, differing in the following sexual characters: *Head:* Maxillary palpus slightly shorter than proboscis, predominantly dark, with a white band at base of palpomeres 2–5, those on palpomeres 4, 5 dorsally incomplete; palpomeres 4, 5 subequal, slender, dorsally curved and with only a few short setae; antenna plumose, shorter than proboscis. *Wing:* Cell R_2 about 2.1

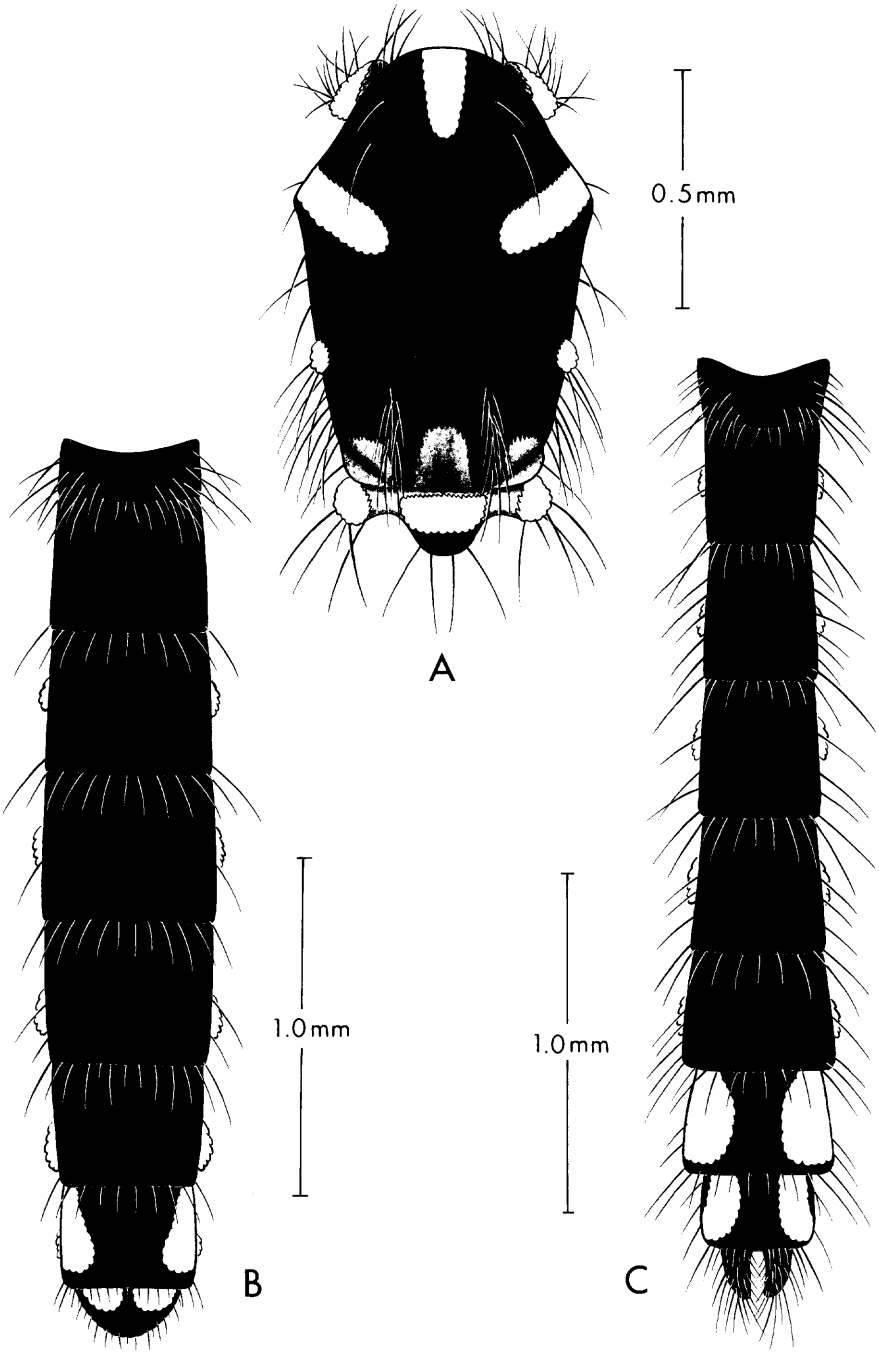


Fig. 1. *Aedes* (*Stegomyia*) *corneti* n. sp. A, Dorsal aspect of the allotype female thorax. B, Dorsal aspect of the allotype female abdomen. C, Dorsal aspect of the holotype male abdomen.

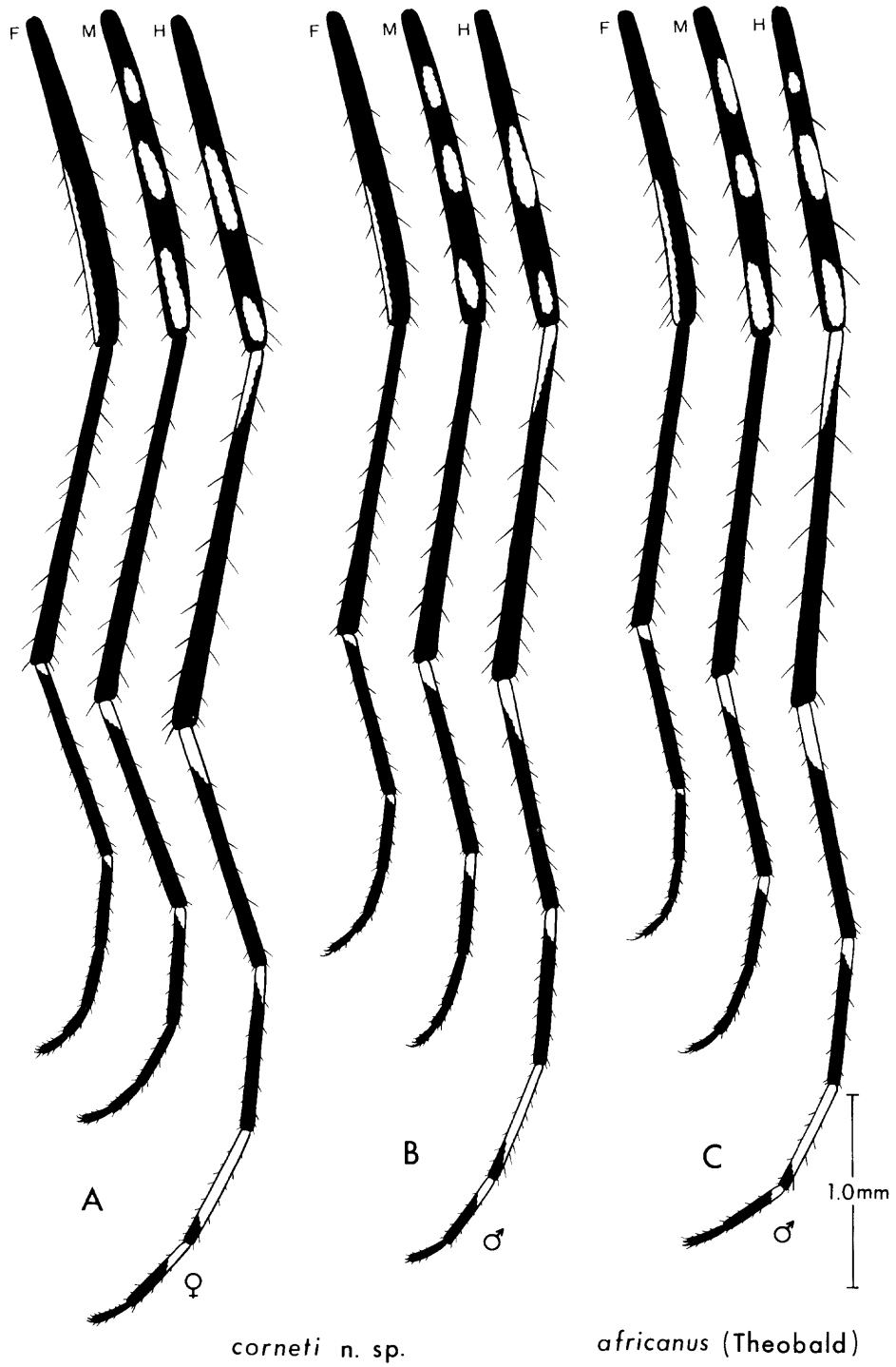
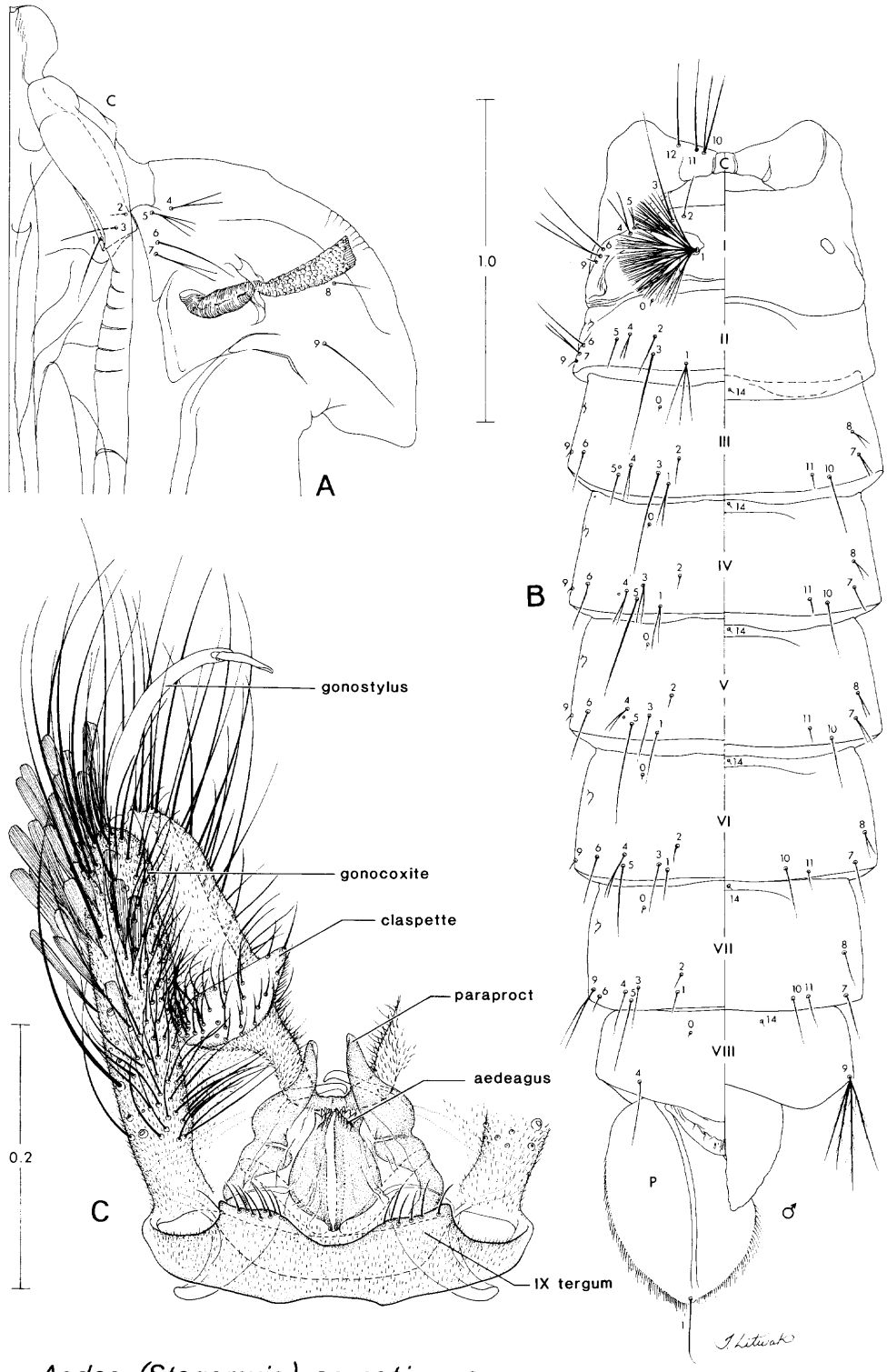


Fig. 2. A–B, *Aedes* (*Stegomyia*) *corneti* n. sp. A, Anterior surface of the female legs. B, Anterior surface of the male legs. C, *Aedes* (*Stegomyia*) *africanus* (Theobald), anterior surface of the male legs.



Aedes (Stegomyia) corneti n. sp.

length of vein R_{2+3}. *Legs* (Fig. 2B): Hindtarsus with a basal white band on tarsomeres 1–4, the ratio of length of white band on dorsal surface to the total length of tarsomere is 0.25–0.30, 0.20–0.24, 0.81–0.87 and 0.30-0.44; fore- and midlegs with tarsal claws unequal, the smaller one toothed, the larger one simple. *Abdomen* (Fig. 1C): Sternum VIII with basolateral white spots. *Genitalia* (Fig. 3C): Gonocoxite 2.0–2.2 as long as wide (width measured 0.5 from base), scales restricted to dorsolateral, lateral and ventral surfaces, with setae on dorsomesal surface, mesal surface membranous; claspette large, lobed, subtriangular in shape in dorsal aspect, narrows towards apicomesal angle, broadened apicolaterally, with apicolateral corner rounded, and with numerous simple setae and with 1 somewhat stronger, spine-like seta on apicomesal angle of expanded distal lobe; gonostylus simple, elongate, about 0.6 length of gonocoxite, with a long slender claw process at apex and with a few setae in apical 0.25; aedeagus with short teeth only; paraproct with a sternal arm; cercal setae absent; apical margin of tergum IX concave medially with 3–12 setae on lateral lobe; sternum IX without setae.

Pupa (Figs. 3A, 3B).—*Cephalothorax:* Trumpet about 4.0 as long as wide (width measured 0.5 from base); setae 1, 3-CT single, longer than 2-CT; 2-CT single, small; 4-CT double; 5-CT usually with 3 branches (2–3); 6-CT single, stout, slightly longer than 7-CT; 7-CT usually double (1–2); 8-CT usually single (1–2); 9-CT single, longer than 8-CT; 10-CT usually double (1–3), caudomesad of 11-CT; 11-CT single, stout; 12-CT usually single (1–2). *Abdomen:* Seta 1-I well developed, with more than 10 dendritic branches; 2-I single; 3-I usually single (1–2), long; 2-I and 3-I widely separated, distance between their bases about 1.5 of distance between those of 4-I and 5-I; seta 1-II usually with 3 branches (2–8); 3-II, III usually single (1–2); 1-III usually double (1–3); 1-IV usually double (1–2); 2-IV, V anteromesad of 1-IV,V respectively; 5-IV-VI usually single (1–2), short, not reaching beyond posterior margin of following segment; seta 9-I–VI small, single, simple; 9-VII usually with 2 branches (1–2); 9-VII, VIII much longer and stouter than 9-I–VI; 9-VIII usually with 4 branches (2–4) and barbed. *Paddle:* Oval, about 1.4 as long as wide; margins with fringe of long hair-like spicules; seta 1-p single.

Larva (Fig. 4).—*Head:* Antenna short, less than 0.5 length of head, without spicules; seta 1-A inserted in apical 0.5 of shaft, single; inner mouthbrushes apically pectinate; seta 4-C well developed, usually with 5 branches (4–6), cephalomesad of 6-C; 5-C single, long; 6-C single; 7-C usually double (2–3); 8–10, 13-C single; 11-C usually with 3 branches (2–3), barbed; 12-C usually double (2–3); 14-C usually with 4 branches (3–7); 15-C usually double (2–3); mentum usually with 13 (12–14) teeth on each side of central tooth. *Thorax:* Seta 1-P usually with 3 branches (2–3), barbed; 2-P single; 3-P double; 4-P usually with 4 branches (3–6); 5-P usually double (2–3), barbed; 6-P single and barbed; 7-P double and barbed; 9-P usually double (1–2); 11-P single; 14-P usually double (2–3); 5, 7-M single and barbed; 6-M with 3 branches, barbed; 8-M usually with 6 branches (5–6), barbed; 9-M with 3 branches, barbed; 10, 12-M single, long, stout and barbed; 11-M single, small; 7-T usually with 6 branches (5–6), barbed; 9-T usually with

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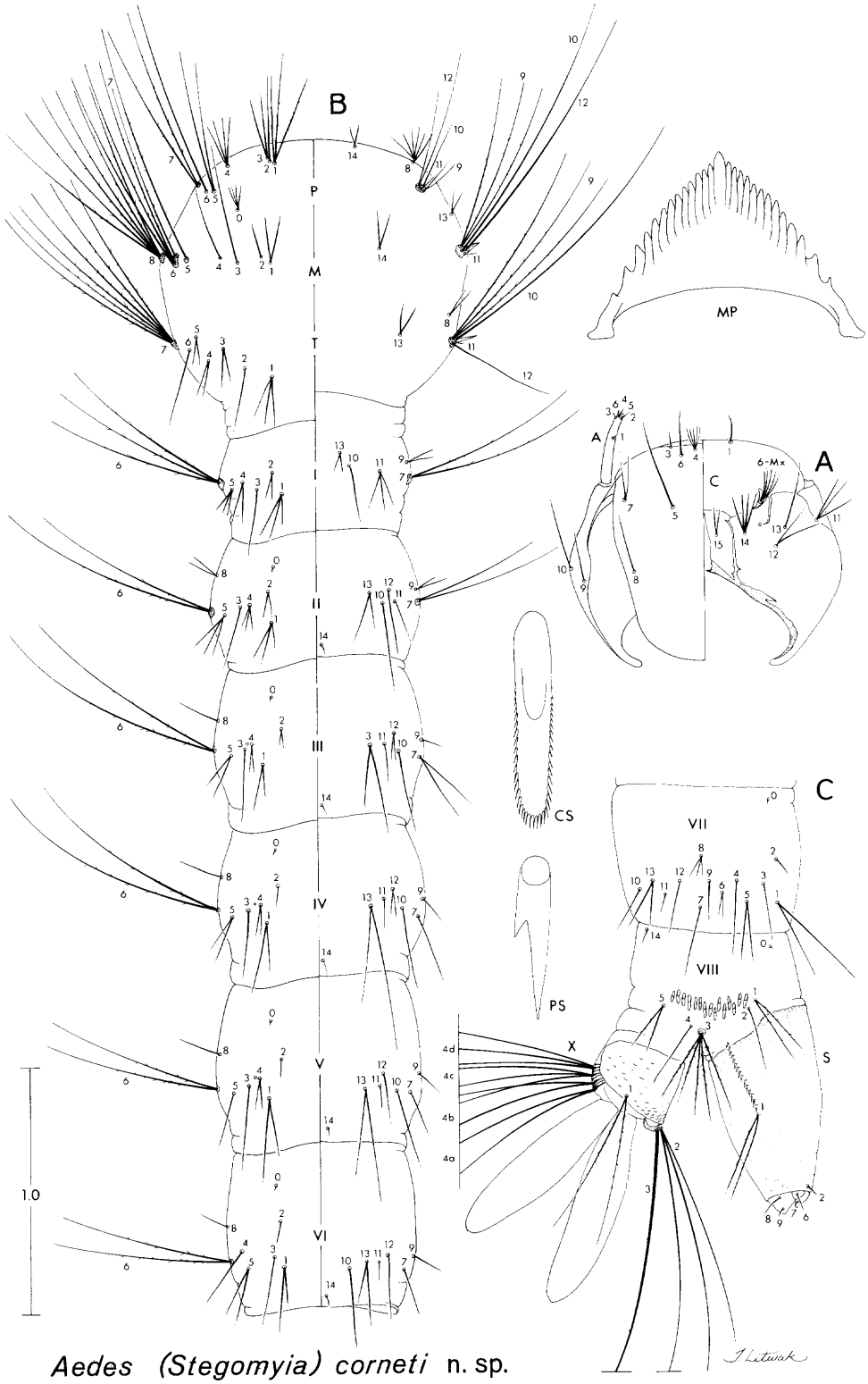
Fig. 3. *Aedes* (*Stegomyia*) *corneti* n. sp. A, Dorsolateral aspect of the cephalothorax of the male pupa. B, Dorsal and ventral aspects of the metathorax and abdomen of the male pupa. C, Tergal aspect of the male genitalia.



Aedes (Stegomyia) corneti n. sp.

3 branches (2–3), barbed; 10, 11-T similar to those on mesothorax; 12-T much reduced, single and simple; basal spine of meso- and metapleural setae long, apically pointed. *Abdomen:* Seta 6-I usually with 3 branches (3–4), barbed; 7-I double, barbed; 6-II–VI double and barbed; 7-II double, barbed; 1-VII double; 2-VII single; 2-VIII distant from 1-VIII; 1-VIII usually double (2–3), barbed; 3-VIII usually with 5 branches (5–7), barbed; 5-VIII usually double (2–5), barbed; 2, 4-VIII single; comb of VIII with 10–15 scales in a row, each scale spatulate, with apex rounded and with fringe all round the apex; segment X with saddle incomplete, marginal spicules very small and inconspicuous; seta 1-X double and barbed; 2-X with 3 branches; 3-X single; 4-X with 4 pairs of setae on grid, 4a, b-X double, 4c, d-X with 2–3 branches; no precratal tufts; anal papillae subequal, about 2.8 length of saddle, sausage-like. *Siphon:* 2.0–2.5 as long as wide 0.5 from base, acus absent; usually with 15 (11–19) pecten spines, evenly spaced, each spine usually with a single well developed ventral denticle, sometimes with 1–2 small basal denticles also; seta 1-S double, inserted beyond apical pecten spine and in line with pecten spines.

Type data.—Holotype ♂ (SAMP Acc. 1093, SL 197-11) with associated larval and pupal skins on slides, with genitalia on slide (84/423), Tiwai Island (on the Moa River), Potoru, *Southern Province,* SIERRA LEONE, collected as larvae from a cut bamboo, about 0.33 m above ground level, partially shaded, in the forest, June 8, 1984, Y. M. Huang [USNM]. Allotype female (SAMP Acc. 1093, SL 197-17) with associated larval and pupal skins on slide, same data as holotype [USNM]. Paratypes: 5 ♂, 1 ♀ and 1 4th instar larva as follows (SAMP Acc. 1093): 5 ♂ (SL 197-14, 15, 16, 18, 20) with associated larval and pupal skins on slides, with genitalia on slides (84/424, 84/425, 84/426, 84/427, 84/428) and 1 ♀ (SL 197-21) with associated larval and pupal skins on slides, with genitalia on slide (86/138), same data as holotype [USNM]; 1 4th instar larva (SL 197), same data as holotype [USNM].

Other material examined.—CAMEROON (Cameroun). *East Cameroon:* Obala (4°10′N, 11°32′E), Aug. 14, 1964, A. Rickenbach (MEP Acc. 724), 1 ♂, 1 ♂ gen. (82/100) [ORSTOM]. IVORY COAST. *Sud Département:* Abidjan, Forêt du Banco (5°25′N, 4°03′W), P. Cachan, (MEP Acc. 723), 3 ♂, 2 ♀, 3 ♂ gen. (82/98, 82/99, 84/297) [PIP]; same data, (MEP Acc. 724), 15 ♂, 6 ♀, 15 ♂ gen. (82/120, 82/121, 82/122, 82/123, 82/125, 82/126, 82/127, 82/128, 82/141, 82/142, 84/301, 84/302, 84/303, 84/305, 84/309), 2 ♀ gen. (84/299, 84/300) [ORSTOM]; Cercle de Sassandra, Saoua (6°19′N, 5°10′W), Apr. 13, 1962, J. Hamon, (MEP Acc. 724), 2 ♂ (#620413C, #620413D), 2 ♂ gen. (84/321, 84/322) [ORSTOM]; same data except Apr. 24, 1962, 1 ♀ (#620413A) [ORSTOM]. SIERRA LEONE. *Southern Province:* Mabang (8°21′N, 11°51′W), 1926, R. M. Gordon, (MEP Acc. 719), 1 ♂ (#548), 1 ♂ gen. (82/83) [BM].

Distribution (Fig. 5).—*Aedes corneti* is presently known from Cameroon, the Ivory Coast and Sierra Leone. Other records of *Ae. africanus* from the Afrotropical Region will require confirmation owing to probable confusion with *Ae. corneti.*

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Fig. 4. *Aedes* (*Stegomyia*) *corneti* n. sp. A, Dorsal and ventral aspects of the head of the fourth instar larva. B, Dorsal and ventral aspects of the thorax and abdomen of the fourth instar larva. C, Lateral aspect of the terminal abdominal segments of the fourth instar larva.

Fig. 5. Distribution of *Aedes* (*Stegomyia*) *corneti* n. sp. in Africa.

Etymology.—This species is named to honor Dr. Michel Cornet, Medical Entomologist, Services Scientifiques Centraux de l'O.R.S.T.O.M. (ORSTOM), and Chief, Medical Entomology Laboratory, Institut Pasteur de Darkar, Senegal, in recognition and appreciation of his contributions to our knowledge of the mosquito fauna of Africa.

Taxonomic discussion.—*Aedes* (*Stegomyia*) *corneti* is a member of the *africanus* subgroup, which presently comprises at least seven species: *Ae. africanus* (Theobald), 1901; *Ae. luteocephalus* (Newstead, *in* Newstead et al., 1907); *Ae. pseudoafricanus* Chwatt, 1949; *Ae. ruwenzori* Haddow and Van Someren, 1950; *Ae. opok* Corbet and Van Someren, 1962; *Ae. neoafricanus* Cornet, Valade and Dieng, 1978 and *Ae. corneti* n. sp. These species form a unique subgroup within the *aegypti* group, and share the following combination of characters: (1) maxillary palpus possessing white scales; (2) scutum with dorsocentral setae present; (3) scutum with a distinct patch of broad white scales on fossal area; (4) subspiracular area with broad white scales; (5) postspiracular area without scales; (6) paratergite with broad white scales; (7) white knee-spot absent on femora; (8) hindtarsus with a basal white band at least on tarsomeres 1–3; and (9) hindtarsomere 5 all dark. However, *Ae. corneti* differs from all other members of the *africanus* subgroup by the following combination of characters: (1) scutum without a distinct median longitudinal yellow line of narrow scales; (2) posterior dorsocentral yellow or white line of narrow scales not developed; (3) terga II–VIII (II–VII in male) each with basolateral white spots only; (4) hindfemur with at most 2 large, white patches on anterior surface (on median and apical areas); (5) hindtibia with a white longitudinal stripe on ventral surface in basal 0.20–0.25; and (6) hindtarsomere 4 with basal 0.30 or more white.

The adult male and female of *Ae. corneti* are extremely similar to those of *Ae. africanus* with which it has been confused and misidentified. In addition, *Ae. corneti* has been found in association with *Ae. africanus* in a forest in the Ivory Coast. Thus, great care must be taken in identifying them. They can be distinguished easily from those of *Ae. africanus* by the hindfemur with at most 2 large, white patches on the anterior surface (on median and apical areas) and by the hindtarsomere 4 with the basal 0.30 or more white. In *Ae. africanus,* the hindfemur has 3 large, white patches on the anterior surface (on basal, median and apical areas), and the hindtarsomere 4 is 0.25 or less white basally (Fig. 2C).

The male genitalia of *Ae. corneti* are easily differentiated from all other species in the *africanus* subgroup by the claspette, which has the distal expanded portion subtriangular in shape in dorsal aspect (narrows towards the apicomesal angle, becomes broader apicolaterally, with apicolateral corner rounded), with numerous simple setae on the expanded distal portion and bearing 1 somewhat stronger, spine-like seta on the apicomesal angle.

Bionomics.—The larvae of *Ae. corneti* were collected from a cut bamboo, about 0.33 m above the ground level, partially shaded, in the forest, on Tiwai Island, and in tree holes, in Mabang, Sierra Leone. In the Ivory Coast, the immature stages of *Ae. corneti* were collected in bamboo pots that were placed in forest (Forêt du Banco), Abidjan, and in tree holes in Saoua, Cercle de Sassandra.

Aedes corneti has been collected in association with *Culex albiventris* Edwards and *Eretmapodites oedipodius* Graham from Tiwai Island, Sierra Leone. It has

also been found in association with *Ae. africanus* from forest (Forêt du Banco), Abidjan, Ivory Coast.

Medical importance.—Unknown. However, *Aedes africanus* has been recognized as one of the most important virus vectors of the Afrotropical Region (Haddow, 1961). In Uganda, *Ae. africanus* has been incriminated as the principal vector of yellow fever of the monkey to monkey cycle in Semliki Forest (Haddow, Smithburn et al., 1947; Haddow et al., 1948; Haddow and Mahaffy, 1949; Smithburn et al., 1949) and from monkey to man in Bwamba County (Haddow, 1945; Haddow et al., 1947; Lumsden, 1951; Haddow, 1968). In eastern Africa, at least four arboviruses have been isolated from *Ae. africanus:* yellow fever (Smithburn and Haddow, 1946; Smithburn et al., 1949; Haddow, 1968; Kirya et al., 1977), chikungunya (Weinbren et al., 1958; Haddow et al., 1961; McCrae et al., 1971), Rift Valley fever (Weinbren et al., 1957) and Zika (Dick et al., 1952; Weinbren and Williams, 1958; Haddow et al., 1964) in Uganda, and yellow fever in Ethiopia (Sérié et al., 1968).

Aedes africanus from Nigeria is an efficient vector of yellow fever under laboratory conditions, as shown by Philip (1929, 1930). It is recognized as a vector of yellow fever in West and Central Africa (Hamon et al., 1971, in West Africa; Rickenbach et al., 1971 and Germain et al., 1972, in Cameroon; Pajot, 1972 and Germain, Sureau et al., 1976, in Central African Republic; Bang et al., 1979, in Nigeria). In West and Central Africa, yellow fever virus has also been isolated from *Ae. africanus* in the Ivory Coast (Chippaux et al., 1975) and in the Central African Republic (Germain, Sureau et al., 1976); it has also been isolated from *Aedes* (*Stegomyia*) *opok* Corbet and Van Someren in the Central African Republic (Germain et al., 1976), *Aedes* (*Stegomyia*) *neoafricanus* Cornet, Valade and Dieng, and *Aedes* (*Stegomyia*) *luteocephalus* (Newstead) in Senegal (Cornet et al., 1978; Cornet et al., 1979). In addition to the yellow fever virus, chikungunya, Zika and Bouboui viruses have been isolated from *Ae. africanus* and *Ae. opok* in the Central African Republic (Germain et al., 1978), and chikungunya, Zika and dengue 2 viruses have been isolated from *Ae. luteocephalus* in Senegal (Cornet et al., 1979). Members of the *africanus* subgroup are involved in the enzootic-epizootic cycles of yellow fever in primates in West and Central Africa (Germain, Sureau et al., 1976; Cornet *in* WHO, 1978; Cornet et al., 1979).

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