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FURTHER NOTES ON THE AEDES SCUTELLARIS GROUP (DIPTERA, CULICIDAE)

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For some time it has been known that the *scutellaris* group of *Aedes* (*Stegomyia*) was represented in the Philippine Islands, but until males were received it was impossible to be certain of the species. The recent arrival at the U. S. National Museum of males from the Philippine Islands showed that, not one, but two species are involved, in both the newly received material and among the previously collected females. One is the widespread *Aedes hebrideus* Edwards; the other, the new species here described and named in honor of the collector. We have also been fortunate in being able to obtain from the British Museum, through the kindness of N. D. Riley and John Smart, a number of males of this group. These specimens give additional information on the systematics and zoogeography of the group. Because additional adult characters have been discovered in the group and in order to facilitate determination, a tentative key to the known species is included.

Aedes (Stegomyia) paullusi, new species

Aedes (*Stegomyia*) *variegatus* (Doleschall), Bonne-Wepster and Brug, 1932, Geneesk. Tijdschr. v. Nederland.-Indie 72 (Bijblad 2): 87 (in part).

Aedes (*Stegomyia*) *scutellaris* (Walker), Bonne-Wepster and Brug, 1937, Geneesk. Tijdschr. v. Nederland.-Indie 77 (9/10): 544 (in part).

Male.—Length about 3.5 mm., wing about 2.5 mm. Vertex with broad

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appressed scales, with median broad white stripe and with two lateral white stripes on each side. Torus with white scales around entire circumference and forming a conspicuous broad inner patch. Clypeus bare. Proboscis dark except for a stripe of pale scales extending almost entire length of ventral surface; palpus about length of proboscis (the latter incomplete in holotype) with dorsal patch of pale scales on base of second segment, pale ring on base of third segment, and extensive pale ventral patches on bases of fourth and fifth segments. Anterior pronotal lobe with many broad appressed white scales continuing the lateral line of vertex; posterior pronotum with some narrow curved dark scales and an elongated patch of broad appressed white scales continuing the white line of vertex and anterior pronotal lobe. Scutum covered with narrow brown scales, with median broad white stripe narrowing posteriorly and faintly forked in the prescutellar area, with indistinct posterior submedian line of narrow yellowish scales, with a patch of broad appressed white scales over wing base, and with an anterior marginal line of white scales (figure 2). Scutellum with appressed broad white scales on all three lobes, and a few dark scales on apex of midlobe. Pleuron with white scales arranged more or less in two parallel lines and scattered spots. Coxae with patches of white scales. Ventral surface of front femur with somewhat interrupted line and apical patch of white scales, posterior surface with a broader, uninterrupted stripe of white scales broadening apically; anterior surface of midfemur with distinct line of white scales separated from apical white patch by dark scales, posterior surface with slightly narrower white line extending to apex; anterior surface of hind femur with broad white longitudinal stripe, widest at base, only slightly interrupted by dark scales from apical white patch, posterior surface with more or less distinct line of white scales, broadest at base, and extending to apex. All tibiae dark. Front tarsi and midtarsi dark with basal white patch on segments I and II; hind tarsal segments I to IV with basal white bands, the band on I from 1/4 to 1/3 length of segment and interrupted by dark scales on inner surface, on II about 1/3 length of segment, on III about 1/2 length of segment, IV about 2/3 length of segment; V completely white. Wing scales dark. Abdominal tergite I with lateral sub-basal white spots; abdominal tergites II to VI with subbasal white bands narrowed dorsally and turning abruptly forward at lateral margin, that on II interrupted (markings on VII and VIII not observed). Sternites II to VI with basal white bands. Genitalia with basal lobe truncate with a ventro-apical area of well-developed setae (figure 1).

Female.—Markings about as in male. Palpus about 1/5 the length of proboscis with large white patch on dorsal side of apical segment. Proboscis dark with at most a few scattered pale scales on ventral surface. Line of white scales on front femur absent or poorly developed; mid- and posterior femora similar to male. Tergite VII with band broken on either side of a median patch.

Holotype.—Male, San Antonio, Samar, Philippine Islands, December 6, 1944, J. H. Paullus, collector. *Paratypes:* 1 male, N'goles, Cali-

coan Island, Philippine Islands, January 27, 1945; 3 females, San Antonio, Samar, December 6, 1944, Baras, Calicoan Island, January 24, 1945, and small island near Calicoan, February 12, 1945, J. H. Paullus, collector; 1 female, Abuyog, Leyte, Philippine Islands, November 1944, O. H. Graham, collector; 2 males, Taroena, Sangir Islands, March 1928.

Type material deposited in U. S. National Museum (Cat. No. 57313); paratypes from Sangir Islands in British Museum.

The holotype and one paratype were collected in small pools of high organic content. The other paratypes from Mr. Paullus were reared from water in coconut shells.

The basal lobe of the basistyle is easily distinguished from that of all other named species of the *scutellaris* group for which the male genitalia have been described. In addition there are other distinctive morphologic characters in both sexes by which *paullusi* is easily separated from other species of the group. *Aedes paullusi* can be separated from other species of the group by the presence of the ventral white stripe on the male proboscis, by the white line on the anterior surface of the midfemur of both sexes, and by the line of white scales on the anterolateral margin of the scutum (these scales may be lacking in worn specimens). In *quasiscutellaris* there is a faint anterolateral line similar in location to that of *paullusi* but composed of very fine yellowish scales as compared with the conspicuously white scales in *paullusi*. It can also be separated from all other species of the group except *quasiscutellaris*, *tongae*, and *horrescens* by the stripe of white scales on the proboscis of the male.

The species described here as *paullusi* is the same as that observed and described by Bonne-Wepster and Brug (*2, pp. 42, 43, 87*) as an unnamed variety of *Stegomyia variegata* (Doleschall) from Taroena, Sangir Islands. An examination of two specimens from that island presented to the British Museum by S. L. Brug and H. de Rook confirm this, and these two specimens were therefore included in the paratype series. Bonne-Wepster and Brug's figures and descriptions show the anterolateral line on the scutum and describe the ventral white line on the proboscis of the male, but fail to point out the rather striking markings of the femora which are characteristic of *paullusi*. The hypopygium figured by these authors (*2, p. 85*) is very similar, if not identical, to that of *paullusi*; the statement that the hypopygium of the males from Taroena does not differ from that of males from other localities implies that this type of hypopygium is widespread. Bonne-Wepster and Brug do not, however, give the locality of the specimen from which their drawing was made. In a later paper these authors (*3, p. 87*) treated the Taroena form as an aberrant form of *scutellaris* (Walker). This raises the possibility that *paullusi* may be a synonym of *scutellaris* (Walker). However, it should be pointed out that Bonne-Wepster and Brug, in indicating that they had observed hypopygia of the type figured (*2, p. 85*) from several localities, did not include the Aroe Islands, the type locality of *scutellaris* (Walker). Furthermore, it is obvious that these authors were including more than one species in their "*scutellaris*." Because the genitalia of true *scutellaris* from the Aroe Islands have never been described and further because of

the known tendency of the *scutellaris* group to form endemic species, it appears best to regard *paullusi* as specifically distinct from *scutellaris* at least until topotypical material of the latter is available for study. Barraud's description (*1, p. 654*) of "*scutellaris*" from the Andaman Islands indicates that the basal lobe may be similar to that of *paullusi*. However, since he does not describe any of the distinctive characters of *paullusi*, the systematic placement of the Andamans form must await examination of material from those islands.

Distribution of *Aedes hebrideus* Edwards

The known range of this species has been extended to the Palau Islands, Ceram, and the Philippine Islands by specimens collected on Pulo Anna, Palau Islands, by C. K. Dorsey, March 1945; at Sawaai, Ceram, December 27, 1931, by S. L. Brug and H. de Rook; and on Calicoan Island, Philippine Islands, by J. H. Paullus, January 27, 1945.

Distribution of *Aedes guamensis* Farner and R. Bohart

The known range of this species, known heretofore from the island of Guam, has been extended to Saipan on the basis of a male collected at Marpi Point by J. E. Webb, Jr., October 31, 1944.

Distribution of *Aedes horrescens* Edwards

In a recent revision of the *scutellaris* group, Farner and Bohart (*6, pp. 42, 45*) gave the distribution of this species as restricted to the type locality, Taveuni. In a personal communication R. A. Lever has kindly brought to our attention the fact that this species has a much wider distribution. In addition to the type locality and Nabavatu (Lau group) cited by Edwards (*5, p. 129*), it has been recorded by Paine (*9, p. 12*) from Vanua Levu, Gau, Narai, Naigani, and Naitauba, and by Lever (*8, p. 47*) from Suva, Viti Levu.

Tentative Key to the Adults of the Scutellaris Group

The following key is presented, together with a tabulation of geographic distribution, as an aid in preliminary identification of the known species in this group. When the key is used, it must be borne in mind that in several cases externally similar species are easily distinguishable by examination of the male genitalia. This is particularly true in the differentiation of *pernotatus* from *pseudoscutellaris* and *hensilli* from *marshallensis*. No final identifications should be made until the mounts of the hypopygia have been studied and, if possible, compared with the hypopygia of other species of the group. The fact that the *scutellaris* group contains many rather localized species, some probably undescribed, emphasizes the importance of examination of the male genitalia. Apparently *horrescens* Edwards can be distinguished from *pseudoscutellaris* only in the larva and male genitalia. No specimens of *alorensis* Bonne-Wepster

and Brug, *andrewsi* Edwards, or *scutellaris* (Walker) from Aroe Islands have been examined. However, *andrewsi* has been placed in the key on the basis of the original description. The original description of *alorensis* makes it obviously a distinct species on the basis of the figured basal lobe; however, there is not a description of external morphology sufficient to place it in the key. Likewise, the description of *scutellaris*, also a banded species, is too inadequate to permit placing the species in the key. *Aedes albopictus* (Skuse) and *Aedes gurneyi* Stone and R. Bohart, although not members of the group, have been included in the key because of their morphologic similarity, and because their ranges overlap that of some species of the *scutellaris* group; *Aedes pseudalbopictus* Borel, *novalbopictus* Barraud, *subalbopictus* Barraud, and *flavopictus* Yamada, all members of the *albopictus* group, are not included, since their ranges do not overlap that of the *scutellaris* group. *Aedes galloisi* Yamada, reported only from Japan, was originally described as closely allied to *variegatus* (Doleschall) and *albopictus* (Skuse). It is difficult to place and, since no specimens were available for study, has not been included in the key. The morphology of the tarsi and the basal lobe of the dististyle might indicate a relationship to *marshallensis*, although the pattern of white scales of the pleuron, as described, seems to place it in the *albopictus* group. The hind tarsus is similar to that of *marshallensis* in having a dark tip; however, the basal 2/3 of both segments IV and V of the hind tarsus is white, whereas in *marshallensis* segment V is never more than 1/2 white, and segment IV is about 1/4 white.

1. White scales on pleuron arranged irregularly in patches; white scales of patch on posterolateral margin of scutum usually extending only to anterior margin of wing base..... 2
   White scales on pleuron arranged in two parallel and almost continuous stripes and some irregular patches; white scales on posterolateral margin of scutum forming a continuous line with dorsal pleural stripe and extending over wing base almost to patch of pale scales on scutellum..... 3
2. Bands on abdominal tergites basal (touching apex of preceding segments).....*albopictus*
   Bands on abdominal tergites sub-basal (not touching apex of preceding segment).....*gurneyi*
3. All white bands of hind tarsus interrupted completely by dark scales on the inner surface .....*guamensis*
   At least some complete white bands on hind tarsus..... 4
4. Apical half of segment V of hind tarsus dark. .*hensilli, marshallensis*
   Segment V of hind tarsus completely white except occasionally for a few scattered light brown scales..... 5
5. Basal white band on segment IV of hind tarsus narrowly interrupted by a row of dark scales, several scales in width, on dorsal surface; tergites with white scales restricted to lunate lateral spots.....*andrewsi*
   Basal white band on segment IV of hind tarsus complete..... 6

6. Basal patches of light scales (white or yellowish) on segments I, II, III, and sometimes on IV and V of fore- and midtarsi; those on IV and V sometimes reduced to a few scales.....*pernotatus*
   Basal white patches on fore- and midtarsi restricted to segments I and II..... 7
7. Anterior surface of midfemur with distinct line of pale scales extending to or almost to apical patch of white scales; line of white scales on anterolateral margin of scutum (may be lacking in worn specimens).....*paullusi*
   Anterior surface of midfemur without distinct line of pale scales; scutum without line of white scales on anterolateral margin (*quasicutellaris* has a faint line of fine yellowish scales in this position).... 8
8. Hind tarsal segment IV with dark band at its widest dimension (inner surface of segment) having a width of more than 1/2 the length of segment.....*tongae*
   Hind tarsal segment IV with dark band at its widest dimension having a width of 1/4 to 2/5 (sometimes 1/2 in *horrescens*) the length of segment..... 9
9. Proboscis with ventral longitudinal line of pale scales
   horrescens
   quasiscutellaris
   Proboscis without ventral longitudinal line of pale scales.....10
10. Abdominal tergites usually without complete bands of white scales; tergite IV never with complete band .....*pseudoscutellaris*
    Abdominal tergites (except I to III) always with bands of white scales; that on tergite IV either complete or narrowly interrupted. (This character is difficult or impossible to ascertain on worn or engorged specimens.).....*hebrideus*

Figures of basal lobes of the hypopygia of the species of the *scutellaris* group appear in the literature as follows:

Edwards (*4, p. 102*): *andrewsi, tongae, pseudoscutellaris, hebrideus, quasiscutellaris* (as *variegatus*).

Farner and R. Bohart (*6, p. 122*): *quasiscutellaris, pseudoscutellaris, pernotatus, guamensis, hebrideus.*

Farner and R. Bohart (*7, p. 40*): *pernotatus, pseudoscutellaris, quasiscutellaris, tongae, guamensis, marshallensis, hebrideus.*

Stone and R. Bohart (*10, p. 224*); *marshallensis, gurneyi.*

Bonne-Wepster and Brug (*2*): *albopictus* (*p. 75*), *paullusi* (*p. 85* as *variegata*), *alorensis* (*p. 93*).

Yamada (*11, p. 50*): *galloisi.*

The basal lobe of *horrescens* has not been previously figured and therefore is here presented (figure 3). That of *hensilli* is apparently indistinguishable from *guamensis*. Male genitalia of *scutellaris* from the type locality have not been described.

Known Distribution of the Species of the Scutellaris Group:[3]

Species	Distribution
pseudoscutellaris	Eastern Polynesia, Samoa and Wallis Islands, Fiji, Ellice Islands
tongae	Tonga, Solomon Islands[4]
pernotatus	New Hebrides
horrescens	Fiji
guamensis	Marianas Islands
hensilli	Caroline Islands
marshallensis	Marshall Islands, Gilbert Islands[5]
quasiscutellaris	Solomon Islands
hebrideus	Palau Islands, New Hebrides, Bismarck Archipelago (?), Queensland (?), New Guinea, Moluccas, Philippines.
paullusi	Moluccas (?), Sangir Islands, Philippines.
scutellaris	Aroe Islands
andrewsi	Christmas Island (south of Java)
alorensis	Lesser Sunda Islands

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(10) Stone, A., and Bohart, R. 1944. Studies on mosquitoes from the Philippine Islands and Australasia. (Diptera, Culicidae). Wash. Ent. Soc. Proc. 46: [205]-225.

(11) Yamada, S. 1921. Description of ten new species of *Aedes* found in Japan, with notes on the relation between some of these mosquitoes and the larvae of *Filaria bancrofti* Cobbold. Annot. Zool. Jap. 10:45–81.

[3] *Aedes albopictus* overlaps the *scutellaris* group throughout the insular part of the Oriental Region as well as on Saipan and possibly in the Moluccas; *gurneyi* occurs in the Solomons; *galloisi* has been reported for Japan only.

[4] Reported from Sikiana, Solomon Islands, by Edwards (*2, p. 103*); possibly an introduction. This material has been examined in the preparation of this paper and the identification seems to be correct.

[5] This record is based on examination of females only.

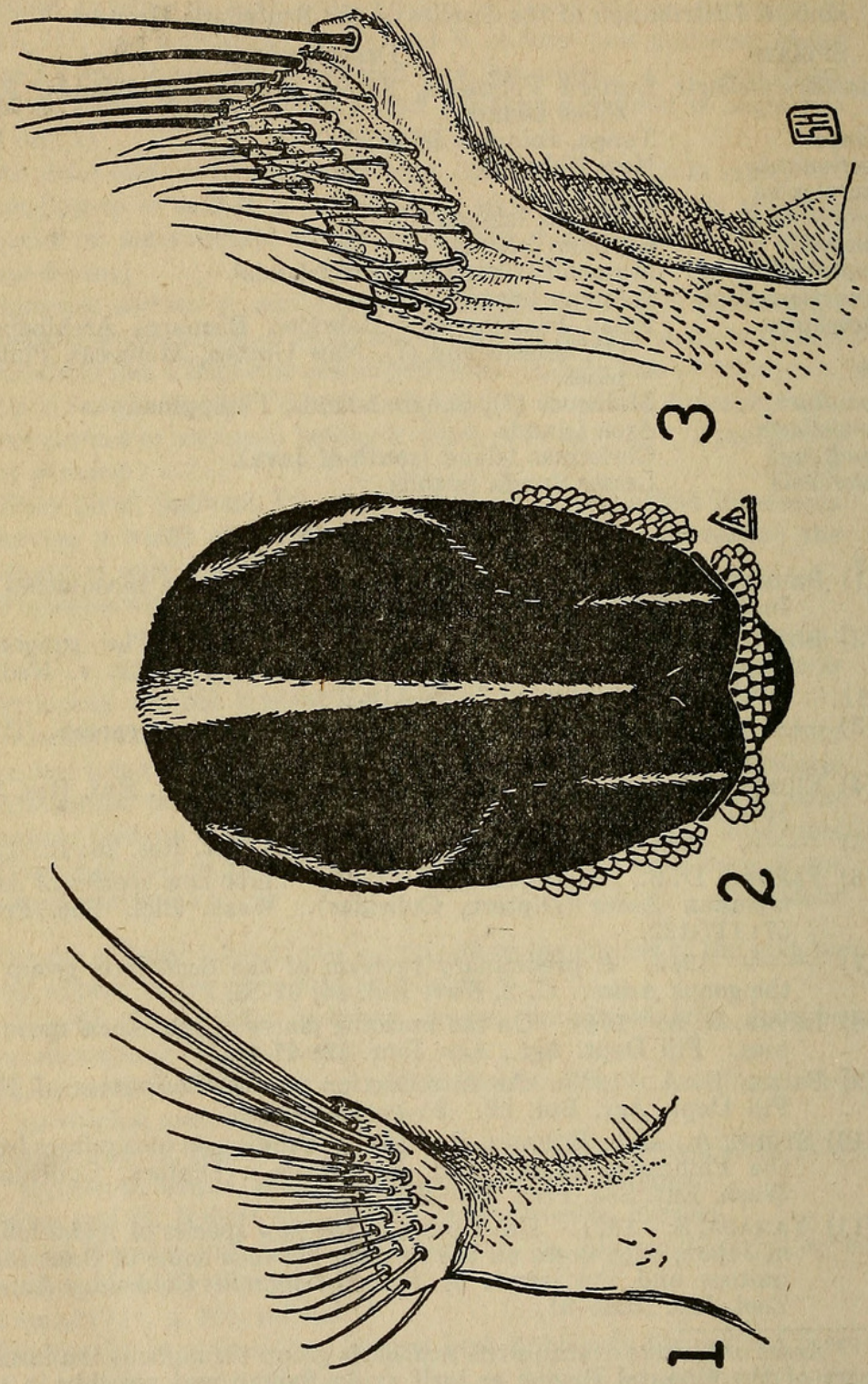

Fig. 1. *Aedes paullusi*, basal lobe of left basistyle, ventral view.
Fig. 2. *Aedes paullusi*, mesonotum, dorsal view.
Fig. 3. *Aedes horrescens*, basal lobe of left basistyle, ventral view.

(Figs. 1 and 2 drawn by Arthur D. Cushman; Fig. 3 by Sara Hoke DeBord).