

A Revision of the Subgenus
Chaetocruiomyia Theobald
(Diptera: Culicidae)

BY
ELIZABETH N. MARKS

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A REVISION OF THE SUBGENUS *CHAETOCRUIOMYIA* THEOBALD (DIPTERA: CULICIDAE)

The subgenus *Chaetocruiomyia* of *Aedes* Meigen, last reviewed by Edwards (1932), is known only from Australia where it has a wide distribution, but few specimens have been collected. Breeding places and early stages were hitherto unknown and male abdominal characters were undescribed. Male terminalia, pupa and larva of *A. tulliae* Taylor are described and figured from specimens collected in narrow treeholes 25-30 ft. above ground.

The 6 previously known species, *A. spinosipes* Edwards, *A. humeralis* Edwards, *A. wattensis* Taylor, *A. tulliae*, *A. moloensis* Taylor and *A. elchoensis* Taylor are redescribed; *A. calabyi* sp.n. is described from females from Western Australia; 1, possibly 2, additional species are recognized but not named. A key to adults is provided, as well as notes on the biology of each species. Head and scutal scaling of the described species, female terminalia of 4 species, and some other characters are figured.

The subgenus is divided into 2 species groups; the Elchoensis-group includes only *A. elchoensis*; the remaining species are included in the Spinosipes-group which, besides a tuft of long forked scales at the base of the wing, possesses previously undescribed forked bristles on various sites on the thorax and mid coxa. Affinities of the subgenus with the subgenus *Macleaya* Theobald are discussed.

INTRODUCTION

Theobald (1910) described the genus *Chaetocruiomyia* ("The Thorny-legged Mosquito") and the type species *C. sylvestris* Theobald, from 2 females collected by T. L. Bancroft at Kuranda, north Queensland. He distinguished the genus chiefly

by the many thorn-like chaetae on the legs. Edwards (1923) pointed out that *Chaetocruomyia* resembled the genus *Aedes* Meigen in all essentials, but retained it as a subgenus of *Aedes*, defined by possession of a fan-like tuft of extremely long scales on the small rounded knob at the base of the wing, a character overlooked by Theobald. He gave a new name, *A. spinosipes* Edwards, to *C. sylvestris* and described a second species, *A. humeralis* Edwards, from 5 females collected on the Burnett River, Queensland, in 1911 by T. L. Bancroft.

Taylor (1929) added 4 new species to the subgenus. Three, *A. wattensis* Taylor, *A. tulliae* Taylor and *A. moloiensis* Taylor, possessed the long scale tuft at the wing base and were described from females he had collected in north Queensland. The fourth, *A. elchoensis* Taylor, was described from a female and male collected by L. E. Cooling on Elcho I., Northern Territory (unfortunately the abdomen of the male was missing). This species lacked the long scale tuft on the wing and was placed with some hesitation in *Chaetocruomyia* because the legs and abdomen were typical of the subgenus.

Both Bancroft (quoted by Theobald, 1910) and Taylor (1929) found that prolonged search where females had been taken biting failed to reveal either further adults or the breeding places, and this, with a few exceptions, has been the experience of subsequent collectors, who have continued to take occasional females in widely scattered localities. In 1924 J. B. Cleland collected a specimen of the subgenus in South Australia, and E. J. Waterhouse collected others there in 1952 (Waterhouse, 1959). B. McMillan in 1951 took both sexes of an undescribed species in the Barrington Tops area, New South Wales. In 1953 females of the subgenus were collected in Victoria by G. W. Douglas and N. Dobrotworsky, and in Western Australia by J. H. Calaby and D. L. McIntosh.

Breeding places and early stages of *Chaetocruomyia* remained unknown until the ingenuity and perseverance of J. L. Wassell were rewarded in 1960 by discovery of larvae in treeholes at a height of 25-30 ft. above the ground; from these he reared a male and female of *A. tulliae*.

Edwards (1924) and Taylor (1929) noted the resemblance between the subgenera *Chaetocruomyia* and *Macleaya* Theobald and Taylor (1929) and Edwards (1932) considered that they might prove not to be clearly separable from one another. Edwards (1932) thought that *A. elchoensis* should probably be referred to *Macleaya* and that several of the 6 species named were probably only local or individual variations of *A. spinosipes*.

In the present study 91 specimens of *Chaetocruomyia* have been examined, and notes were available on 13 others seen previously. It has been possible to allot all but one of these to the 6 described and to 2 undescribed species (1 of which is described here); the remaining specimen may represent another undescribed species. Most of these distinctive forms have been found in several widely scattered localities. This lends support to their treatment as species, though possibly one or two when better known may prove to be subspecies.

Examination of the larva, pupa, and male of *A. tulliae* shows that at each stage it is distinct from species of *Macleaya*, although there are undoubtedly close affinities between the two subgenera, the differences being probably no greater than between some species groups of the subgenus *Finlaya* Theobald. *A. elchoensis* appears to be annectant but to have more characters in common with other species of *Chaetocruomyia* than with *Macleaya*. Edwards (1924, 1932) described the male terminalia of *Macleaya* as having the harpago without articulated appendage but there is a distinct articulation in all specimens I have seen, although the appendage is not expanded as it is in *A. tulliae*.

In the present state of our knowledge no change in the status of either the subgenus *Chaetocruomyia* or any of its included species is contemplated. Edwards

(1932) was the last to discuss the taxonomy of the subgenus; the many specimens now available show that some of his subgeneric characters are unreliable.

All species except *A. elchoensis* are characterized by forked cuticular processes from the thorax and its appendages. Which of these should be called scales and which bristles is not certain, but in the present paper those at the base of the wing (on the base of the remigium) are, in agreement with previous authors, termed scales, whereas those on the thorax and mid coxa, previously unrecorded, are termed bristles.

The nomenclature used for larval setae is that of Belkin (1950) and for pupal setae that of Belkin (1952, 1953). Localities have been listed from north to south in eastern Australia, and from west to east in western Australia. The following abbreviations have been used for collections: B.M., British Museum (Natural History); C.S.I.R.O. (C.S.I.R.O. Division of Entomology, Canberra, in which C.S.I.R.O. Wildlife Section mosquito collection is to be incorporated); Q.I.M.R., Queensland Institute of Medical Research, Brisbane; Q.M., Queensland Museum, Brisbane; S.P.H. & T.M., School of Public Health and Tropical Medicine, Sydney; U.Q., Department of Entomology, University of Queensland, Brisbane; W.A., Western Australian Museum, Perth.

Subgenus *CHAETOCRUIOMYIA* Theobald

Chaetocruiomyia Theobald, *Monogr. Culic.* 5:195, 1910.

Chaetocruiomyia Theobald of Edwards, *Bull. ent. Res.* 13:92, 1923 and 14:369, 1924; Taylor, *Bull. ent. Res.* 20:274, 1929; Edwards, *Genera Insectorum*, Fasc. 194:156, 1932.

TYPE SPECIES: *C. sylvestris* Theobald (= *A. spinosipes* Edwards) by monotypy.

DISTRIBUTION: Australia.

Distinguished from other subgenera of *Aedes* by the following combination of characters (male terminalia, larva and pupa known for one species group only).

Adult ♀. Small thick-set mosquitoes with high curved scutum and low-set head giving the adults in life a hump-backed appearance. Head mainly flat scaled; palp $\frac{1}{2}$ - $\frac{3}{4}$ length of proboscis which is short. Scutum pale scaled on anterior half, at least on fossae, darker posteriorly; scutellum usually with some flat scales at least on mid lobe (rarely all curved); postspiracular area and paratergite unscaled; subspiracular scale patch present; no lower *msp* bristle. Legs short, dark scaled with white or creamy markings; tibiae with strong bristles; on hind tibia dorsal and ventral rows of 3-5 long bristles 2-3 times as long as width of tibia; tarsi banded; hind tarsal segment V white; tarsal claws simple. Wings with very broad squame scales on C, Sc and R1 and at base of Cu and usually of An; most species with a prominent tuft of long forked scales at base of remigium. Abdominal segments I-VI broad, dorsoventrally flattened; VII and VIII large, laterally compressed; tergite VIII visible dorsally; sternite VIII large; cerci very short, sometimes hidden.

Adult ♂. Similar to ♀; palp about equal in length to proboscis; fore and mid tarsal claws unequal, the anterior longer with a strong tooth; hind equal, simple; no very broad squame scales on Cu and An. Coxite small with elongate basal lobe; style with terminal appendage; appendage of harpago broad; phallosome simple, with broadly rounded apex; sternite IX bilobed.

Pupa. Proboscis sheath and trumpet short. Seta 1 of abdominal segment I well developed, dendritic; seta 7 strongly developed, at least half length of segments III-VIII; paddles elongate, with very fine spicules on apical margin and seta 1 long, single.

Larva. Antennae non spiculate; bases of head setae 4-7 anterior to base of antenna. Seta 1 of metathorax, seta 1 of abdominal segments III-VII and seta 12 of III-V very long. Lateral comb a patch of fringed scales. Siphon not sclerotized to base ventrally, with broad basal collar; pecten short, seta 1 arising well beyond it; saddle not a complete ring.

Adults of the known species also have the following characters in common. Male antennae densely plumose. Clypeus bare. Palp and proboscis black scaled. Scutal scaling dense; bristles numerous, very long and strong; acrostichal and dorsocentral bristles present. Postnotum bare. Bristles of *stp* in 3 groups, an upper more or less horizontal row, a row of 1-4 along middle of posterior margin (of which one is very long and strong), and 1-6 fine ones low down in front of mid coxa; the prealar and upper and lower *stp* scale patches are completely separated by the two upper groups of bristles. Coxae with rows of long bristles; tibiae and tarsi with numerous bristles. Wings dark scaled (except base of C in some species); plume scales narrow on apical half of wing, broader basally, wing fringe long and dense; alula with small dark broad outstanding scales; squame with long fine

hair-like scales. Halteres pale with knob entirely or almost entirely clothed with white scales. Tergite I well clothed with scales and with lateral white border; tergites II-VII usually all with basal median pale patches and with lateral basal patches which are narrowly separated by dark scaling from the lateral border on III-VII and also separated from base on at least some of the distal segments.

KEY TO ADULTS

1. Wing with tuft of long forked scales at base of remigium. Head scales almost entirely flat, no large median patch of narrow scales. All femora with wide basal white bands, hind also with apical white band 2
- Wing without tuft of long scales at base of remigium. Head scales mainly flat, with median triangular patch of narrow curved white scales. Femora almost entirely dark at base, mid and hind with apical white bands. (Hind tarsal segments I-IV basally banded.) *elchoensis* Taylor (p. 207)
- 2 (1). Hind tarsal segments I-II with wide basal white bands, III dark or with a few white scales at base. Hind tibia with a distinct patch of creamy scales on about middle third. (C with pale scales at base. Posterior margin of pale scutal scaling only slightly irregular.) *spinosisipes* Edwards (p. 194)
- Hind tarsal segments I-III with wide basal white bands. Hind tibia dark (rarely with a few pale scales dorsally) 3
- 3 (2). Anterior half of scutum with fossae white scaled and broad submedian stripes of light brown scales (usually partly divided by narrow median white stripe) continuous with light brown scales on posterior half. (C with pale scales at base.) *humeralis* Edwards (p. 197)
- Anterior half of scutum entirely pale scaled, concolorous or with submedian stripes slightly deeper in colour but distinctly paler than scaling on posterior half 4
- 4 (3). Tergite I with broad median white stripe continuous with broad median basal patch on II. (No pale scales on C. Head white scaled to vertex in ♀, some dark scales at vertex in ♂. Anterior scutal scaling white with posterior margin only slightly irregular.) *tulliae* Taylor (p. 199)
- Tergite I dark mesially or with some pale scales but without continuous broad stripe 5
- 5 (4). Head with white scaling extending at least in a broad triangle from nape to vertex 6
- Head without white scaled triangle to vertex; usually a continuous band of dark scales across vertex, or else mottled anteriorly; white scales at nape 7
- 6 (5). Scutal integument dark brown. Pale scutal scaling usually creamy with deeper creamy submedian stripes; posterior margin indented, usually deeply, between acrostichal and dorsocentral bristles. Subspiracular scale patch usually elongate, large. (C dark or with some pale scales at base.) *wattensis* Taylor (p. 197)
- Scutal integument lightish brown. Pale scutal scaling creamy with only slightly irregular posterior margin. Subspiracular scale patch short. (C with pale scales at base.) "species B" (p. 206)
- 7 (5). Large species (wing length 2.5-3.2 mm.); thoracic integument usually medium or reddish brown, rarely dark. Subspiracular scale patch short, irregular, usually all white (12 or fewer scales). Scutellar scales all or nearly all golden, sometimes all curved. (C dark or with a few pale scales at base.) "species A" (p. 206)
- Smaller species (wing length 1.7-2.2 mm.); thoracic integument dark brown to pitchy. Subspiracular scale patch elongate, irregular or with second patch above, usually mainly dark and of 16 or more scales. Scutellar scales all or mainly dark, always some flat at least mesially on mid lobe 8
- 8 (7). Anterior pale scaling of scutum silvery white, at least on fossae, its posterior margin deeply indented between acrostichal and dorsocentral bristles. (C dark.) *moloienis* Taylor (p. 203)

Anterior pale scaling of scutum deep creamy, rarely paler but not silvery white, its posterior margin slightly irregular or moderately indented. (C dark or with a few pale scales at base.) *calabyi* sp.n. (p. 204)

SPECIES GROUPS

Two species groups are easily distinguishable.

Group A. (Spinosipes-group: *Chaetocroiomyia* s. str.). Head clothed with flat scales mesially; upright forked scales usually sparse except at nape. Very long strong forked-tipped bristles on *apn* and propleuron; others of various sizes on anterior margin of scutum, in front of wing root, on prealar knob, *stp*, and mid coxa. *Stp* scale patches large, upper extending right across *stp*; *msp* almost entirely pale scaled, sometimes narrowly divided into 2 patches. A tuft of about 20 long narrow forked scales of graduated lengths arising at the base of remigium. All femora with wide basal white bands, hind with apical white band. Hind tarsal bands basal only.

Included species: *spinipes*, *humeralis*, *wattensis*, *tulliae*, *moloiensis*, *calabyi*, "species A", "species B".

Group B (Elchoensis-group). Head with a median triangular patch of narrow curved scales not reaching vertex; upright forked scales very numerous, anteriorly very long. Thorax without forked bristles (some are blunt-tipped). Scale patches on *stp* reduced in size; 2 well separated patches on *msp*. Base of remigium bare of scales or bristles. Femora without wide basal white bands, mid and hind with apical white bands. Bands on hind tarsus extending on to apices of segments I and II.

Included species: *elchoensis*.

GROUP A

The included species resemble one another closely, differing mainly in details of scale pattern, and females have the following characters in common:

Head: Small narrow curved pale scales along eye margin towards vertex, sometimes small elongate flat pale or dark laterally; about 3 rows of rather short broad upright forked scales at nape, 2-5 moderately long narrow forked scales (about $\frac{2}{3}$ length of vertical bristles) behind upper orbital bristles, and a few other scattered forked scales often flattened by overlying broad scales; vertical and orbital bristles very strong, one pair of vertical, 3-4 mesially directed upper orbital, and 3-6 lower orbital bristles. Torus with fine hairs mesially, and usually with 1 or 2 small dark or pale scales; flagellar segments dark, the basal ones rather stout, the first about 3 times as long as wide, its basal half usually paler and bearing a few scales; verticillate hairs short, dark, clothing hairs silvery. Palp $\frac{1}{4}$ - $\frac{1}{3}$ length of proboscis, excluding labella, with some moderately strong bristles; labella dark.

Thorax (Fig. 1, a, b): Anterior margin of scutum with 3 groups of forked bristles, a pair of moderately long ones mesially in front of anterior pair of acrostichal bristles; a group of 5-9 similar ones, sometimes with 1 or 2 about twice as long, laterally in front of dorsocentral bristles. Scutum densely clothed with two types of curved scales, broad and narrow (to what extent the difference is a real one is often difficult to judge as the appearance may depend on the plane in which the scale lies); broad curved on the fossae, narrow between acrostichal and dorsocentral bristles on anterior half, broad behind scutal angle and round posterior margin of scutum and beside bare area, both types elsewhere. About 7-13 pairs acrostichal, 8-10 dorsocentral and 6-10 prescutellar bristles, several on fossae and lateral margin and numerous bristles above wing root. Above and in front of wing root is a patch of about 6-20 shortish forked bristles.

Apn clothed with broad and narrow curved scales the same colour as posterior scaling of scutum, sometimes some golden above, and some flat dark and usually some curved and/or flat white ones below, and with about 20-25 very long dark forked bristles; a few fine pale bristles below. *Ppn* clothed mainly with broad curved scales the same colour as darker scales of scutum, and usually with flat dark and a few flat or broad curved white at lower posterior angle; 3-6 *ppn* bristles, all strong or sometimes 1-4 finer. Propleuron with a patch of flat white scales and about 8-20 forked bristles, the 3-5 longest similar to those on *apn*. Postspiracular area with 3-8 bristles (1 may be fine) sometimes in a straight row. A patch of flat scales on subspiracular area. Prealar knob with about 10 fine bristles, at least some of which have forked tips. A dense patch of flat white scales below prealar knob; 2-6 upper *stp* bristles; one very long stout bristle with forked tip close to middle posterior margin of *stp*, often with 1-3 short fine bristles in vertical line with it. About 18 upper *msp* bristles.

Coxae large, clothed with white scales, fore with a black patch also; all coxae with long bristles; those on mid coxa very strong, with forked tips. Trochanters white scaled. All tibiae with strong spine-like bristles, the longest on fore and mid about twice and on hind about 3 times width of tibia; tarsi also bear shorter strong bristles.

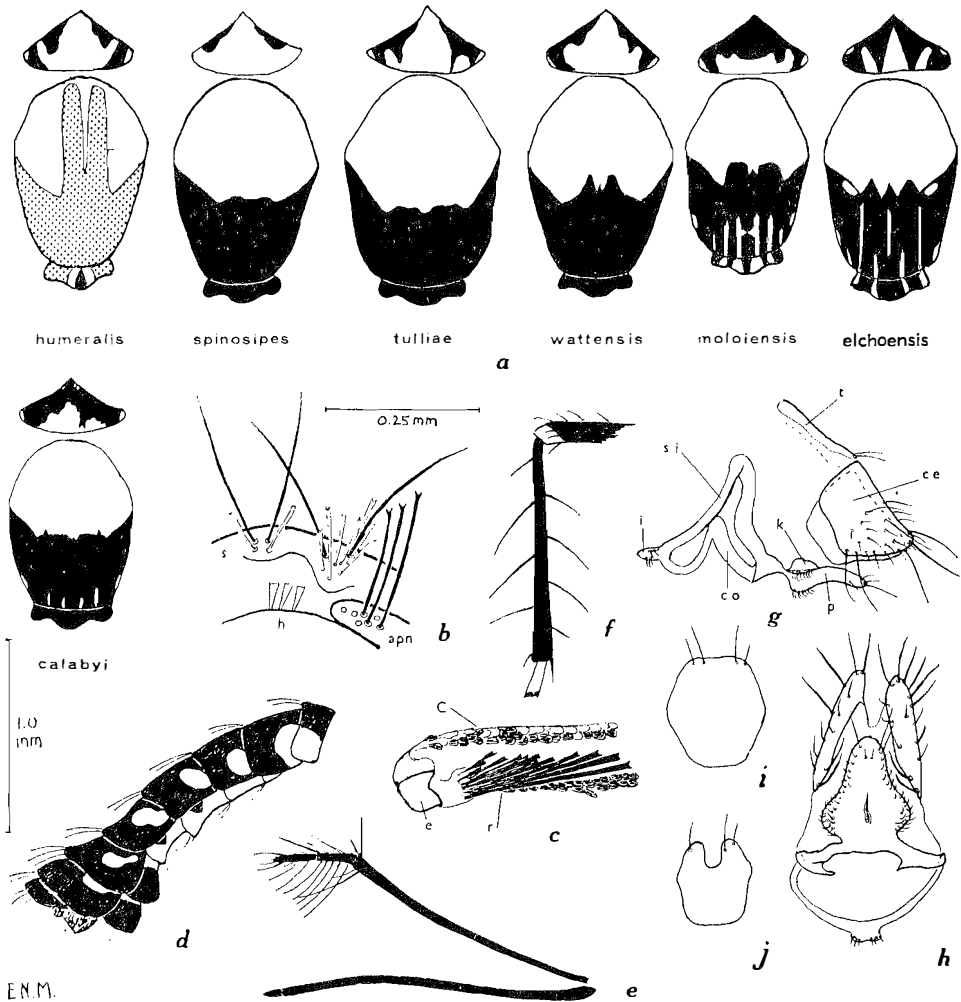


FIG. 1.—*a*, *Aedes (Chaetocruimyia)* spp. ♀ head and scutal scale pattern. *b*, *c*, *d*, *Aedes humeralis* Edwards, ♀; *b*, *c*, some forked cuticular processes; *b*, on head (*h*), anterior margin of scutum (*s*) and *apn*; *c*, at base of wing, (*C*, costa; *e*, epaulette; *r*, remigium); *d*, abdomen. *e*, *Aedes tulliae* Taylor, ♂ palp and proboscis. *f*, *g*, *h*, *i*, *j*, *Aedes calabyi* sp.n., ♀; *f*, right hind tibia, anterior view; *g*–*j*, terminalia; *g*, lateral view (*ce*, cercus; *co*, cowl; *i*, insula; *k*, keel-like sclerotization on *p*, post-genital plate; *si*, sigma; *t*, tergite IX); *h*, sternal view; *i*, *j*, tergite IX in 2 specimens. *a*, *e*, *f* to same magnification as *d*; *c* to same magnification as *b*; *g*–*j* to same magnification as FIG. 2 *a*–*g*.

Wing with broad squame scales at base of M, sometimes extending along basal third, on Cu to or beyond m-cu, sometimes on m-cu, and on up to basal $\frac{2}{3}$ An. Base of cell R1 proximal to that of cell R2; r-m 1-2 times its own length distal to base of M3+4.

Proximal sternites are largely pale with lateral black patches at mid length on IV-V, usually on III, sometimes II, or complete black bands on IV-VI; distal sternites black scaled with basal or subbasal white bands or lateral patches on VI and VII and sometimes on V; V and VI sometimes with white scales laterally at apex; VII sometimes all dark.

Aedes (Chaetocruimyia) spinosipes Edwards

Chaetocruimyia sylvestris Theobald, *Monogr. Culic.* 5:196, 1910.

Aedes (Chaetocruimyia) spinosipes Edwards, *Bull. ent. Res.* 13:92, 1922 (*nom. nov.* for *sylvestris* Theobald, 1910, *non* Theobald, 1901).

Female (Fig. 1, a). Wing length 1.7-2.4 mm.

Head: Creamy white scaled, with elongate dark subdorsal patch behind eyes, variable in extent, sometimes reduced to a few scales or larger and produced towards (but not reaching to) nape at either upper or lower end; a few narrow pale scales right at nape mesially; forked scales all dark or some pale.

Thorax: Integument lightish brown. Scutum entirely pale scaled anteriorly, creamy white usually with deeper creamy submedian stripes; posterior margin of pale area follows posterior margin of fossa with only slightly irregular line between. Posterior scutal scaling dark brown with golden reflections; sometimes a few golden scales in front of wing root and above supraalar bristles.

Scutellum dark scaled; flat black scales on mid lobe, sometimes with a few narrow curved with golden reflections laterally and at apex; similar broad and narrow curved on lateral lobe, sometimes with 1 or 2 flat black. (A Palm I. specimen was noted in 1945 to have 1 or 2 flat creamy scales on mid lobe and some narrow curved creamy on lateral lobe.) *Ppn* scales all dark or sometimes 1-3 flat white below. Subspiracular scale patch a single rather irregular patch of about 5-10 flat white scales.

Legs. Fore femur anteriorly with small pale median patch or some scattered pale scales; posteriorly pale except for subbasal dark ring (which may be narrowly interrupted by pale); usually dorsally with mottling proximal to a preapical pale patch (which may fuse with posterior pale scaling). Mid femur ventrally mottled or continuously pale; posteriorly extensively mottled, or mainly pale on distal $\frac{2}{3}$ - $\frac{3}{4}$, some mottling proximally. Hind femur ventrally with a few scattered pale scales on basal half. Fore tibia posteriorly pale, or with a few pale scales at apex. Mid tibia dorsally with a streak of pale scales on about middle $\frac{2}{3}$ or more, posteriorly pale almost to apex (sometimes interrupted subbasally); these two areas may be confluent so that there is only a fairly narrow continuous black streak anteriorly. Hind tibia anteriorly, ventrally and sometimes dorsally with an irregular mottled or continuous pale patch on about middle third; posteriorly with a small basal pale patch. Basal white bands on fore tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{3}$ - $\frac{2}{3}$ II, III-V dark; on mid tarsal segments $\frac{1}{4}$ - $\frac{1}{3}$ I, $\frac{1}{3}$ - $\frac{1}{2}$ II, III-V dark or V rarely with paler reflecting scales; on hind tarsal segments $\frac{1}{3}$ - $\frac{1}{2}$ I, $\frac{1}{3}$ - $\frac{1}{2}$ II, III all dark or with small basal white patch; IV dark, V all white or usually with 1 or 2 darker scales at base and apex, sometimes an almost continuous row of them ventrally.

Wing. Pale scales at base of C. Cell R2 2.6-3.2 times length of its stem; cell M1 0.9-1.0 times length of its stem.

Abdomen: Tergite I all dark mesially or with small white basal patch (a row of 5 white scales the largest); II-VII with median basal white patches, VIII usually with complete basal white band; sternite VIII with patch of scales laterally at base visible when mounted.

Terminalia (Fig. 2, a, b, described from one specimen from Noosa). Cerci short, with numerous setae, and a few small dark scales laterally. Tergite IX as broad as long, apex rounded with submedian groups of 4-6 setae. Postgenital plate broadest at mid length, with a few long setae at apex and numerous fine setae laterally on distal $\frac{2}{3}$, and a small median dorsal keel-like sclerotization which appears in sternal view as an irregular dark structure. Cowl narrow, sigma broader, insula with 7 setae. Three spermathecae of approximately equal size.

Type: ♀, Kuranda, Q., T. L. Bancroft (B.M.).

Biology: All specimens have been taken biting by day in or close to rainforest; this is the only species of the subgenus associated with rainforest. At Noosa in 1960, about 50 yds. inside the rainforest, 5 or 6 females came quite quickly to man, flying low over the ground, and attacked readily. Two blood-fed females were isolated in tubes over damp paper, but though one survived several days, both died without laying and apparently without developing eggs.

Annual rainfall in the known localities ranges from about 50 to 150 in.

Distribution: Rainforest areas along the east coast of Queensland. McIllwraith Range, 1 ♀ (4.iv.1953, biting in scrub 1400-1500 hrs., J. L. Wassell); Ellis Beach, via Cairns, 1 ♀ (18.vi.1944, biting, J. L. Wassell); Ellis Creek, via Cairns, 1 ♀ (11.x.1945, biting 1030 hrs., J. L. Wassell); Kuranda 2 ♀♀ (T. L. Bancroft (Theobald, 1910)); Innisfail (Taylor (Edwards, 1924)); Mourilyan Harbour, 2 ♀♀ (15.v.1952, biting in jungle, D. Kennedy); Palm I., 1 ♀ (G. F. Hill), 1 ♀ (x.1920, Breinl); O'Connell R., via Proserpine, 1 ♀ (8.x.1947, biting noon, J. L. Wassell); Noosa 1 ♀ (16.iii.1956, biting in rainforest 1530-1715 hrs., E. N. Marks and K. A. Walker), 4 ♀♀ (15.iv.1960, biting in rainforest 1100-1200 hrs., E. N. Marks and M. Hawken); Upper Cedar Creek, via Samford, 1 ♀ (20.xii.1943, biting in rainforest 1100 hrs., E. N. Marks and J. L. Wassell); Camp Mountain, 2 ♀♀ (15, 18.iv.1945, biting in scrub 1200 hrs., J. L. Wassell).

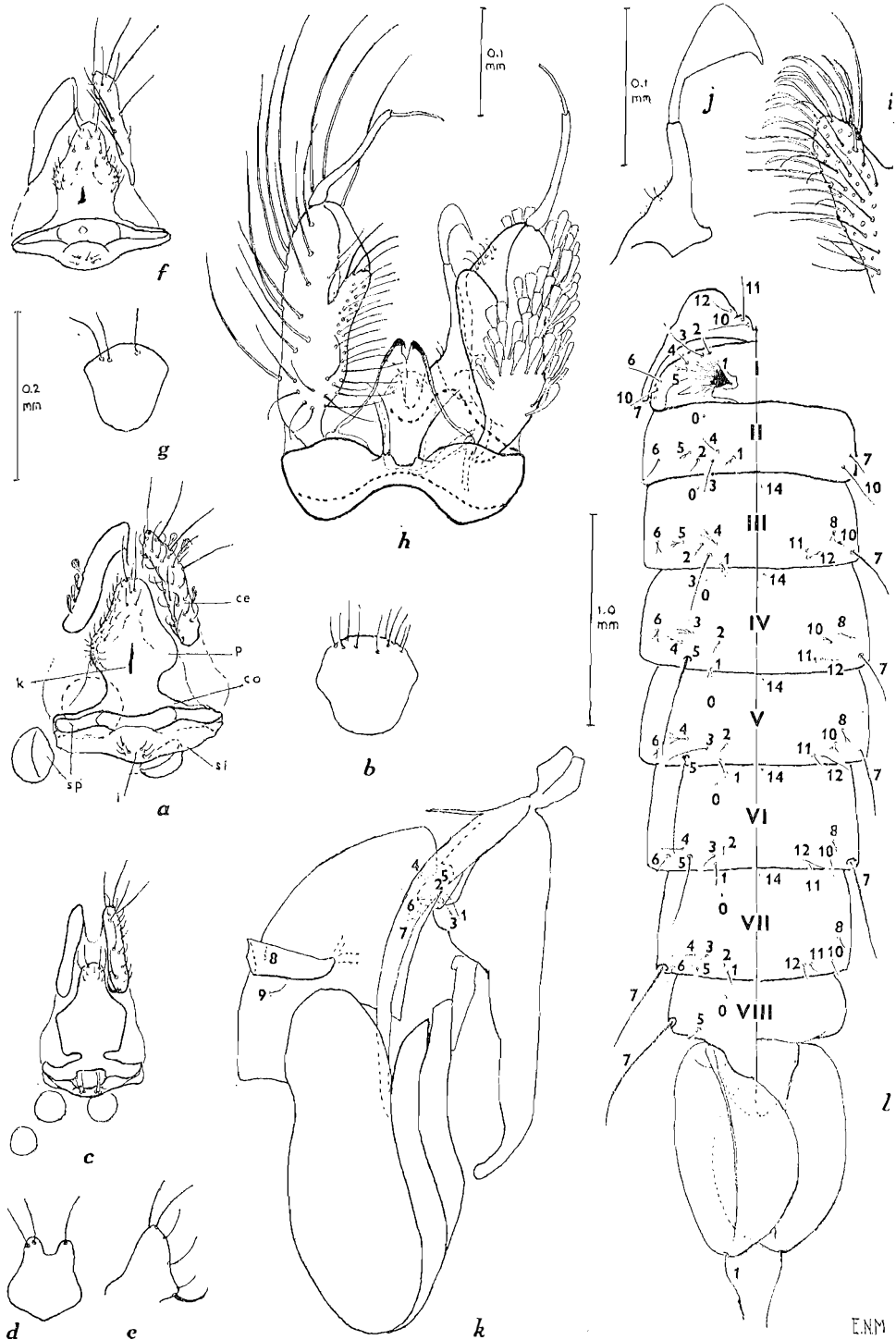


FIG. 2.—*a, b, Aedes spinosipes* Edwards, ♀ terminalia; *a*, sternal view (lettering as in Fig. 1; *g*; *sp*, spermatheca); *b*, tergite IX. *c, d, e, Aedes elchoensis* Taylor, ♀ terminalia; *c*, sternal view; *d*, tergite IX; *e*, lateral view of left cercus. *f-l, Aedes tulliae* Taylor; *f, g*, ♀ terminalia; *f*, sternal view; *g*, tergite IX; *h-j*, ♂ terminalia; *h*, tergal view (many structures shown on one side only); *i*, basal lobe of right coxite, tergal view; *j*, right harpago, inner sublateral view; *k, l*, pupa; *k*, cephalothorax; *l*, abdomen.

All specimens listed have been examined in this study and are in U.Q. except Palm I. specimens (on which notes were made at S.P.H. & T.M. in 1945) and Kuranda and Innisfail specimens which have not been seen.

Aedes (Chaetocruimyia) humeralis Edwards

Aedes (Chaetocruimyia) humeralis Edwards, *Bull. ent. Res.* 13:93, 1922.

Female (Fig. 1, a-d). Wing length 1.8-2.3 mm.

Head: White scales mesially extending as a broad irregular triangle from nape to vertex; sub-dorsal dark patch behind eyes not extending to nape, narrowly separated by white scales from a lateral dark patch reaching nape; white lateral to this; a few narrow pale scales right at nape mesially; forked scales mainly dark, some pale.

Thorax: Integument medium brown. Scutal scaling posteriorly light golden brown, extending forwards as a broad stripe between fossae almost to anterior margin; white scales on fossae and continuous across anterior margin with a narrow tapering median stripe on anterior $\frac{1}{3}$ - $\frac{1}{2}$ partly dividing the broad brown stripe. There may be some creamy or white scales in front of wing root more or less continuous with pale scaling on fossa, and creamy lateral to prescutellar bristles, and beside bare area, usually some flat scales on either side of bare area just in front of scutellum; in one specimen 4 short fine bristles just posterior to dorsocentrals.

Mid lobe of scutellum with flat scales, dark mesially, creamy laterally; lateral lobes with mixed dark and creamy flat scales, or some or all creamy or golden curved. *Ppn* scales golden brown, rarely with a few dark, and usually with 2 or 3 flat and sometimes a few curved white below. Sub-spiracular scale patch large, irregular, produced dorsally near anterior end, usually of 15 or more flat white scales (about 10 in small specimens).

Legs. Fore femur with a wide ill-defined median creamy band, complete or narrowly or broadly interrupted dorsally or anteriorly; dorsally 2 or 3 scattered pale scales near tip and posteriorly a white apical patch. Mid femur posteriorly with similar wide median band, which anteriorly is broadly interrupted and sometimes shows only on ventral margin; ventrally usually almost continuously pale, at least on basal $\frac{2}{3}$; posteriorly a few pale scales at apex. Hind femur ventrally with scattered pale scales or almost continuous streak, occasionally also a few pale dorsally. Fore tibia posteriorly pale, sometimes with fairly extensive pale scaling dorsally also. Mid tibia posteriorly with indefinite pale streak, or pale except for preapical dark band, sometimes scattered pale scales dorsally also. Hind tibia posteriorly with small pale patch at base, dorsally and ventrally occasionally a few pale reflecting scales. Basal white bands on fore tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{3}$ - $\frac{2}{3}$ II, sometimes 1 or 2 pale scales at base of III, IV and V dark; on mid tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{2}$ - $\frac{2}{3}$ II, usually some pale scales at base of III or dorsal patch up to $\frac{1}{3}$ III, IV and V dark; on hind tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{2}$ - $\frac{2}{3}$ II and III, IV dark, V all white, sometimes with a couple of dark scales apically.

Wing. Pale scales at base of C. Cell R2 2.1-2.8 times length of its stem, cell M1 0.9-1.0 times length of its stem.

Abdomen: Tergite I mesially with small basal white patch or a couple of white scales; II-VI or VII with small median basal white patches sometimes wider on IV-VI.

Type: ♀, Brigalow Scrub, Burnett River, Q., 1911, T. L. Bancroft (B.M.).

Biology: The type series of 5 females was taken biting. No specimens have been seen from outside the Eidsvold district and this species may prove to be associated with the monsoon forests of south and central Queensland in which brigalow (*Acacia harpophylla*) and bottle tree (*Brachychiton rupestre*) are prominent.

Distribution: Upper Burnett River district, south Queensland. The following specimens have been examined: 4 ♀♀, no locality data (labelled in T. L. Bancroft's handwriting, 3 "near Stegomyia ? new species No. 3", 1 "Chaetocruimyia humeralis", Q.M.). Eidsvold, 2 ♀♀ (Bancroft, 1 dated 27.iv.1924, Q.I.M.R.). In addition notes were made in 1945 on 4 ♀♀ in S.P.H. & T.M., Eidsvold, T. L. Bancroft. Dr. M. J. Mackerras has informed me that "Brigalow Scrub" does not refer to a specific locality, but to any of numerous such areas round Eidsvold where her father, T. L. Bancroft, collected.

Aedes (Chaetocruimyia) wattensis Taylor

Aedes (Chaetocruimyia) wattensis Taylor, *Bull. ent. Res.* 20:275, 1929.

Female (Fig. 1, a). Wing length 1.5-2.1 mm.

Head: White scales mesially extending as a broad triangle to vertex; lateral to this broadly black scaled behind eye margin, with white continuous round nape, and sometimes reaching almost to eye margin sublaterally, or partly or completely interrupted by black subdorsally and/or sublaterally; white scaled low down at sides; forked scales dark; no narrow scales at nape.

Thorax: Integument dark brown. Scutum entirely pale scaled anteriorly, usually creamy on fossae with deeper creamy submedian stripes, but the fossae may be partly white, with deeper creamy at scutal angle, or along lateral margin, or sometimes the scaling is almost pure white with slightly creamy sub-median stripes. Margin of pale scaling follows posterior margin of fossae (but creamy scales often extend a short distance behind scutal angle), is distinctly indented between dorsocentral and ascrostichal bristles (usually as figured but sometimes for $\frac{1}{2}$ distance to front margin) and slightly produced in mid line. Posterior scutal scaling dark bronzy brown; some creamy scales in front of wing root, usually some also above wing root, and some mesial to supraalar bristles; usually a few creamy scales or a distinct line lateral to prescutellar bristles; sometimes some pale scales and rarely some flat black lateral to bare area.

Mid lobe of scutellum with scales all flat, or some curved laterally; all black or some creamy laterally; lateral lobe with flat scales, or mixed flat and curved or all curved, all black, or some creamy mesially. *Ppn* with dark scales, occasionally with a few creamy or golden ones among them near upper margin or 1-3 white below. Subspiracular scale patch usually an elongate patch of mainly dark flat scales with a small patch of 1-4 scales above it, often the 2 patches confluent, sometimes all the scales white. The elongate patch is usually of about 12 scales, rarely only 6-8; in one Koonamore specimen it consists of about 16 scales partly separated from two patches in rows at an angle above it, the lower of about 8 white scales, the upper 2-4.

Legs. Fore femur anteroventrally with a distinct white patch or only a few white scales at mid length, occasionally a couple of white scales preapically; posteriorly with a wide median patch, sometimes extending as a streak to apex; dorsally a preapical patch which may be confluent with large posterior apical patch. Mid femur ventrally with almost continuous pale scaling, at mid length sometimes extending on to anterior surface; anteriorly sometimes a couple of pale scales distally; posteriorly at apex dark or with a couple of white scales and with a median pale patch separated from or confluent with ventral pale scaling, sometimes continuing in a streak to apex; or middle third mottled with slight mottling proximally and distally, or distal half extensively mottled; or posteriorly entirely pale except for short dark streaks subbasally and subapically. Hind femur ventrally with a few pale scales, or almost continuous pale scaling, rarely posteriorly with a pale streak on basal $\frac{2}{3}$. Fore tibia posteriorly with small basal and apical pale patches, usually also with some pale or pale reflecting scales or almost complete pale streak interrupted preapically; anteriorly rarely a couple of scattered white scales. Mid tibia posteriorly with small basal patch, sometimes apical one also and a few scattered pale scales or incomplete streak between; dorsally sometimes with a pale streak or a few scattered pale scales. Hind tibia dark, usually posteriorly with white basal patch. Basal white bands on fore tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{2}$ - $\frac{1}{3}$ II, III usually dark but sometimes with basal white patch, IV dark, V dark or with white scales dorsally at mid length; on mid tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{2}$ - $\frac{2}{3}$ II and III, or III dark, IV dark, V dark, or with a few white scales or mainly white with some dark at base and apex; on hind tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{2}{3}$ - $\frac{2}{3}$ II and III, IV usually dark, sometimes with dorsal patch on basal $\frac{1}{2}$ - $\frac{1}{3}$, V all white, rarely a couple of dark scales at apex.

Wings. C dark at base or with some white scales, seldom numerous. Cell R2 2.0-3.0 times length of its stem; cell M1 0.8-1.1 times length of its stem. Halteres rarely with a few dark scales apically.

Abdomen: Tergite I with median basal white patch, not extending to apex; II-VI or VII with median basal white patches, usually rounded on II-IV, sometimes wider and touching base only in mid line on IV-VI, VIII sometimes with basal white band; sternites V-VII may have subbasal white bands. Terminalia similar to *spinosipes*.

Type: ♀, Watten, Q., x.1927, F. H. Taylor (S.P.H. & T.M.).

Biology: Taylor (1929) stated that the type locality was in rolling downs country with isolated patches of growing timber. At Koonamore the vegetation is blue bush and salt bush association with some mulga. At Pink Lakes the mallee species of eucalypts form the dominant vegetation. Annual rainfall at Watten, Noondoo and Dirranbandi is about 18-19 in. and at Koonamore about 8 in. Lake Urana lies between 14 in. and 22 in. isohyets and Pink Lakes between 10 in. and 14 in. isohyets. The type specimen was taken biting in the late afternoon, and Lake Urana and Pink Lakes specimens in the early evening. Most Koonamore specimens were collected in a sweep net because they would not settle on man (Waterhouse, in litt.).

Distribution: Inland areas of eastern Australia. The following specimens have been examined: QUEENSLAND: Watten, 14 m. S.W. Hughenden, 1 ♀ (holotype); Noondoo, 12 m. E. Dirranbandi, 1 ♀ (30.iii.1952, W. Poole, C.S.I.R.O.), 1 ♀

(20.iv.1957, Q.I.M.R.); Dirranbandi, 1 ♀ (i.1947, M. J. Mackerras, Q.I.M.R.). SOUTH AUSTRALIA: Koonamore, 90 m. W. Broken Hill, 8 ♀♀ (1 13.ii.1953, 7 14.ii.1953, E. J. Waterhouse, C.S.I.R.O., U.Q.). NEW SOUTH WALES: Lake Urana, 3 ♀♀ (2 22.xii.1954, biting man 1900 hrs., 1 29.xii.1955, G. W. Douglas, U.Q.). VICTORIA: Pink Lakes, Underbool, 1 ♀ (18.ii.1956, biting man 2000 hrs., G. W. Douglas, U.Q.).

Notes were made in 1945 on 4 additional ♀♀, Watten, F. H. Taylor, in S.P.H. & T.M. A damaged ♀, Albury District (K. Myers, C.S.I.R.O.), probably this species, is almost certainly from Lake Urana according to A. Dyce (in litt.).

Aedes (Chaetocruimyia) tulliae Taylor

Aedes (Chaetocruimyia) tulliae Taylor, *Bull. ent. Res.* 20:275, 1929.

Female (Fig. 1, a). Wing length 1.5-2.4 mm.

Head: White scales mesially extending as a broad triangle from nape to vertex; a broad dark scaled area lateral to this partly divided by a white patch (sometimes reduced to 1 or 2 scales) at nape; white scales below at sides; forked scales black, a few narrow curved white scales among them right at nape.

Thorax: Integument dark brown. Scutum entirely white scaled anteriorly; posterior margin of pale area follows posterior margin of fossa with only slightly irregular curved line between; occasionally white scaling extends slightly behind scutal angle. Posterior scutal scaling dark brown, often with some pale above and in front of wing root; there may be a line of creamy scales lateral to prescutellar bristles and some pale scales either side of bare area (these are present in holotype); and there may be some flat dark scales beside bare area just in front of scutellum.

Mid lobe of scutellum with flat and sometimes also broad curved black scales and sometimes (including holotype) a few flat pale scales laterally; lateral lobe with curved, and usually also flat black scales, rarely some pale mesially. *Ppn* scales usually all black, sometimes a couple of white below. Subspiracular area with one rather short irregular patch of about 6-8 scales, all white, all dark or mixed.

Legs. Fore femur posteriorly with large median white patch, anteroventrally usually some white scales at mid length; anteriorly occasionally mottling towards apex; dorsally and/or posteriorly a small preapical or apical white patch. Mid femur ventrally and sometimes posteriorly with a few scattered white scales. Hind femur dark, except for basal and apical bands. Fore tibia posteriorly with small pale basal and apical patches, and sometimes a few pale or pale-reflecting scales between. Mid tibia posteriorly with small pale basal and sometimes apical patches; dorsally sometimes with an indefinite pale streak or a few pale-reflecting scales. Hind tibia all dark. Basal white bands on fore tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{2}$ - $\frac{1}{3}$ II, III dark or with a couple of white scales at base, IV and V dark; on mid tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{2}{3}$ - $\frac{1}{2}$ II, III dark or with patch or band on basal $\frac{1}{2}$ - $\frac{1}{3}$, IV dark, V dark or with some pale-reflecting scales; on hind tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{2}{3}$ - $\frac{1}{2}$ II and III, IV dark or with a few pale scales or a very narrow band at base, V all white.

Wings. No pale scales on C. Cell R2 2.4-3.1 times length of its stem; cell M1 0.8-1.2 times length of its stem.

Abdomen: Tergite I with broad median stripe of white scales continuous with median basal white patch on II, making a conspicuous white patch at base of abdomen; II sometimes with complete basal white band; III-V or VI with broad white median basal patches narrowly separated from sublateral patches; VI and VII with smaller median patches.

Terminalia (Fig. 2, f, g, described from one specimen from McIllwraith Range). Similar to *spinosipes*, but cerci with no scales and fewer setae and shape of tergite IX and postgenital plate differ slightly; 5 setae on insula; 1-2 submedian setae on tergite IX.

Male (Fig. 1, e). Wing length 2.2 mm. Differs from females as follows: *Head* with median and sublateral white patches narrowly separated from eye margin by continuous dark scaling round vertex; more numerous long upright forked scales towards vertex; torus large, dark brown with dark hairs mesially but no scales; flagellar segments light brown, verticillate hairs long, light brown, lying in a vertical plane. Palp about equal in length to proboscis, black scaled; at apex of segment III a very stout black seta dorsally, a short one mesially, and one long fine one ventrally; IV and V downturned, with a row of long fine setae dorsally and ventrally, a stout one dorsally and shorter stout one mesially at apex of IV.

Legs. Fore tarsal segment III with distinct white patch at base; hind tarsal segment IV with white band on basal $\frac{2}{3}$; claws of fore and mid tarsi unequal, the anterior longer, curved and with a long blunt tooth at about $\frac{1}{3}$ from base, posterior shorter, simple; hind tarsal claws equal, simple.

Wing. No broad squame scales on Cu and An. Cell R2 1.7 times length of its stem, cell M1 0.7 times length of its stem.

Abdomen: Numerous dark setae laterally on tergites. Tergite V with complete white band touching base in midline; VI with similar patch not continuous with sublateral patch; VII with median subbasal patch; sublateral patches do not reach base of segments III-VII. True tergite VIII dark scaled. Sternite II with lateral dark patches at mid length, III with complete band; IV and V black with white basal band (apparently subbasal laterally), VI and VII similar but bands interrupted mesially; true sternite VIII with white patch at mid length and large lateral subbasal patches. Coxites very small, scarcely visible dorsally.

Terminalia (Fig. 2, *h-j*). Coxite about $2\frac{1}{2}$ times as long as greatest width (but appearing broader due to the dense vestiture of black scales), with membranous area along mesial aspect, dorsal to which is an elongate basal lobe with rounded apex extending almost to $\frac{2}{3}$ length of coxite, with its distal third separated from coxite at an acute angle. Scales extend on to basal lobe dorsally and it bears very numerous moderately long setae of which 2 or 3 laterally at apex are broad and striated and a row of about 10 at apex and along distal third mesially have flattened tips. Coxite bears numerous long setae laterally and apically, a group of about 10 moderately long setae tergally at base, numerous short setae sternally on middle third towards inner aspect, and a group of about 6 fine setae distally on inner sternal margin. Style almost $\frac{1}{2}$ length of coxite, without setae, fairly straight, slender, base slightly broader; appendage terminal, $\frac{1}{2}$ length of style, slightly curved, with blunt tip. Harpago $\frac{1}{2}$ length of coxite, with 2 setae near base; appendage equal in length to harpago, lightly sclerotized, curved and broadly expanded on distal $\frac{2}{3}$ with short pointed tip. Paraproct with a single tooth and 2 fine setae. Phallosome simple, straight sided basally, widening beyond mid length with rounded apex. Lobes of tergite IX small, with 1-2 setae; sternite IX bilobed with 3 setae to each lobe.

Pupa (Fig. 2, *k, l*).

Cephalothorax: Proboscis sheath short (extending about $\frac{2}{3}$ way to lower margin). Trumpet dark, of fairly uniform width, 2.2-2.4 times as long as greatest width, with slightly oblique opening and shallow apical notch; ratio of meatus to whole 1:1.2. Setae short, simple; setae 1, 3-6, 8-12 single; seta 2 single or bifid; seta 7 single or trifid.

Abdomen: Setae 0-II-VIII, 14-III-VIII minute, single; 2-I-VII, 11, 12-III-VII single. Seta 7 single, well developed on II-VIII; progressively longer on posterior segments, about $\frac{1}{2}$ length of II, $\frac{1}{2}$ - $\frac{2}{3}$ III-IV, equal length on V-VII and very long on VIII ($\frac{2}{3}$ length of paddle); stout, slightly frayed and sometimes with bifid tip on IV-VIII. *Segment I*. Seta 1 strongly developed, dendritic, branches fused on about basal third; setae 3 and 7 single; seta 4 1-3 branched; seta 5 2-4 branched; setae 6 and 10 single or bifid. *Segment II*. Seta 1 3-5 branched; setae 3, 4, 6, 10 single; seta 5 2-5 branched; seta 2 is lateral to 3 and 4. *Segment III*. Seta 1 3-5 branched; seta 3 long, stout, single; seta 4 single or bifid, sometimes frayed; setae 5 and 6 2-4 branched; setae 8 and 10 3-4 branched; seta 2 is lateral or anterior to 3 and 4. *Segment IV*. Setae 1, 4 and 10, 2-4 branched; setae 3 and 6 2-3 branched; seta 5 long, stout, single, slightly frayed; seta 8 single or bifid. *Segment V*. Seta 1 2-4 branched; seta 3 single; seta 4 2-5 branched; seta 5 long, stout, single, slightly frayed; seta 6 2-3 branched; seta 8 1-3 branched; seta 10 3-7 branched. *Segment VI*. Setae 1, 3, 8, and 10, 1-3 branched; setae 4, 5, and 6 single, 5 long, stout, slightly frayed. *Segment VII*. Setae 1, 3, 4, 8, 10 single; seta 5 1-4 branched; seta 6 1-3 branched. *Segment VIII*. Seta 5 single. *Paddles* elongate oval with very fine spicules round apical margin; midrib slender and buttress undeveloped; index 1.6-1.7; seta 1 single, strong, $\frac{2}{3}$ length of paddle.

Larva (Fig. 3): Mr. Wassell described the living larva as milk white with brown head and black siphon. Length is about 7 mm.; saddle brown. The long, strong setae of thorax and abdominal segments I-VIII are darkly pigmented, frayed and arise from lightly sclerotized basal tubercles.

Head 9/10 as long as broad, none of the setae very long. Antenna $\frac{1}{2}$ length of head, 7-8 times as long as broad, slightly tapering, non-spiculate; seta 1 arising at $\frac{2}{3}$, single, short; 2-6 arising close together at tip, 2 the longest. Head seta 1 a stout bluntly pointed spine, usually straight (curved in one specimen), 3/10 or less length of antenna; 4 and 6 arising in line close to front of head, 5 backwardly directed, arising behind 6 and in line with 7 which arises slightly in front of base of antenna; 4 2-6 branched, shorter than 6; 5 and 7 single (7 may be slightly frayed); 6 and 8 2-3 branched; 9 1-3 branched; 10, 13 and 14 single; 11 single or bifid; 12 5-8 branched; 15 1-4 branched. Mouth brush with some small pectinate setae mesially. Mentum with strong median tooth and 7-9 lateral teeth, fairly uniform except that the outermost may be vestigial.

Thorax: The following setae are long, strong: 6-P, 1, 5, 7, 10, 12-M, 10-T single; 1, 7-P, 6, 9-M, 9-T bifid; 5-P, 8-M 2-3 branched; 7-T 3-4 branched. The following setae are fairly short and fine: 2, 3, 9, 10, 12-P, 2-4-M, 2, 5-T single; 4-P, 11-M, 6, 11, 12-T single or bifid (4-P 12 branched on one side in one specimen), 0-P 10-20 branched; 1-T 1-3 branched; 3-T 1-5 branched; 4-T 2-5 branched; 8-P 3-5 branched, 8-T 2-6 branched; 11-P 2-4 branched; 13-M-T 6-10 branched; 14-P 2-4 branched, 14-M 4-9 branched. Basal tubercles of 6-7-P and of 6-7-M are fused; bases of 9-12-M, and of 9-12-T bear only very short spines; 1-M is backwardly directed and about $\frac{2}{3}$ length of head.

Abdomen: Segments I-VII. The following setae are long, strong: 1-III-VI single, 1-VII bifid; 6-I-II bifid, 6-III-IV single or bifid; 6-V-VI, 7-I-II, 13-III-V single. The following setae are fairly

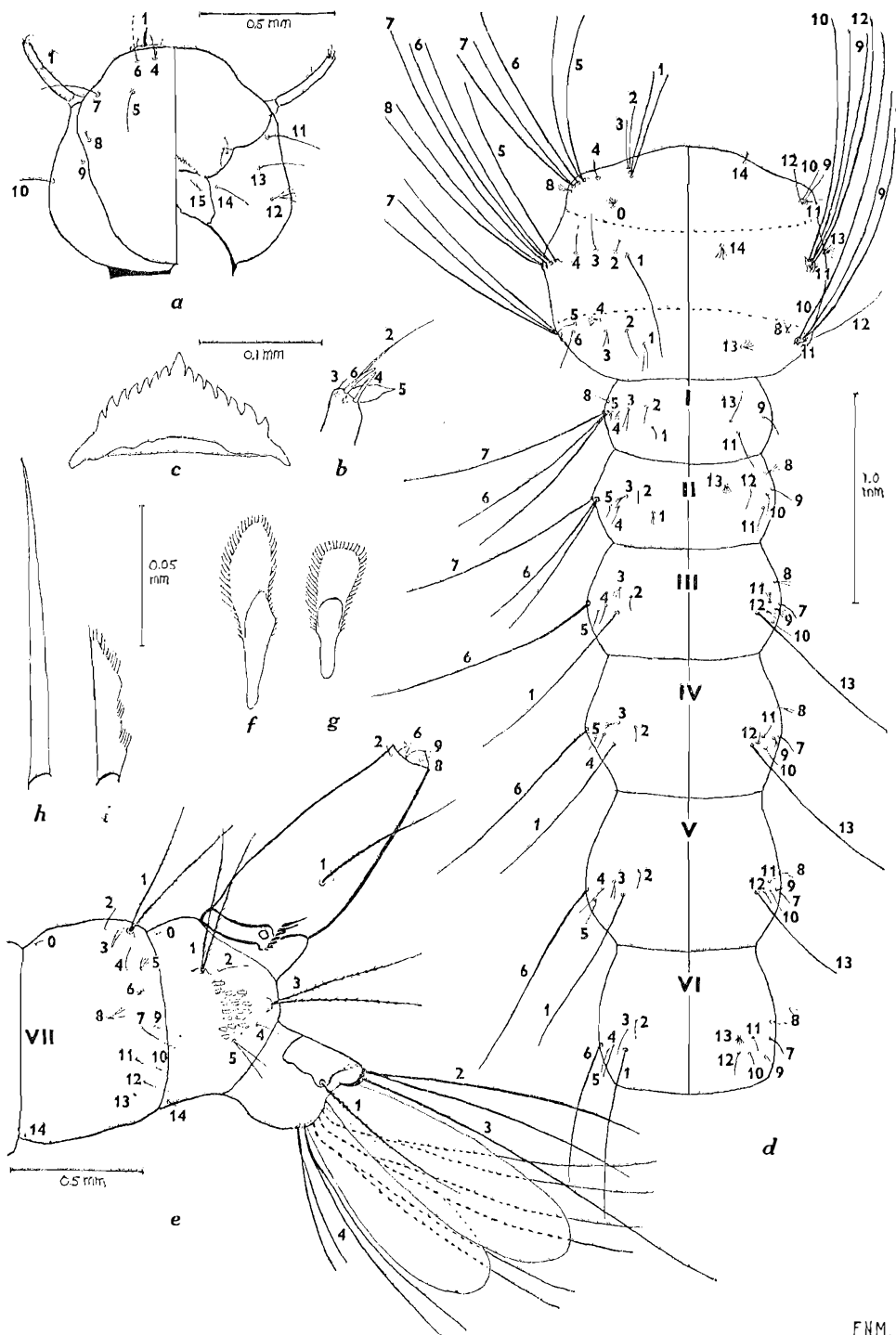


FIG. 3.—*Aedes nulliae* Taylor, larva. *a*, head; *b*, tip of left antenna, dorsal view; *c*, mentum; *d*, thorax and abdominal segments I-VI (abdominal setae 0 and 14 and fraying of long setae omitted); *e*, terminal abdominal segments; *f*, *g*, lateral comb teeth, *f*, most dorsal, *g*, near middle of comb; *h*, *i*, pecten teeth, *h*, most distal, *i*, near middle of pecten.

short, fine: 2-I-VII, 3-VI, 4-V-VII, 5-II-VI, 7-III-VII, 9-I-II, VII, 10-III-VII, 11-I-II, V-VII, 12-IV, VII, 13-I single; 3-I, 4-II-IV, 8-IV-V, 9-VI, 10-II, 12 II-III, V-VI single or bifid; 1-I 2-3 branched, 1-II 1-4 branched; 3-II 3-6 branched, 3-III, V 2-5 branched, 3-IV, VII 1-4 branched; 4-I 4-8 branched; 5-I 3-5 branched, 5-VII 4-6 branched; 6-VII 5-10 branched; 8-I, III 1-3 branched, 8-II, VI 2-4 branched, 8-VII 4-9 branched; 9-III 2-6 branched, 9-IV 4-5 branched, 9-V 3-5 branched; 11-III-IV 1-3 branched; 13-II 4-7 branched, 13-VI 6-12 branched, 13-VII 2-5 branched. The following setae are minute, single: 0-II-VIII, 14-III-VIII. The 3 ventral setae on segment I have been interpreted as 9, 11 and 13; 13 is moderately long, stout, dark in 3 specimens collected 11.ii.1960, fine in 4 specimens collected 1.iv.1960.

Segment VIII. Seta 1 bifid, 3 2-3 branched, both long, strong, frayed; 2 and 4 single, simple; 5 single or bifid, may be slightly frayed. Lateral comb a triangular patch of 16-22 fringed scales in 3 rows; the most dorsal 1 or 2 are larger, longer and darker, remainder pale with distal portion often almost as broad as long.

Siphon tapering, index 2.2-2.5, dorsally with a wide dark basal collar with a circular clear patch on it just before it terminates at the pecten; ventrally not sclerotized to base. Pecten of 4-7 teeth lying along margin of sclerotization, extending for basal $\frac{1}{2}$ - $\frac{1}{3}$ length of siphon; teeth decreasing in size from distal 1 or 2 which are elongate simple spines, followed by 1 or 2 spines with fine lateral basal fringe, remainder scale-like with apical and lateral fringe. Seta 1 single, long, strong, frayed, arising at $\frac{1}{3}$ - $\frac{2}{3}$ length of siphon; valve setae short, seta 8 2-4 branched.

Anal segment: Saddle covering dorsal $\frac{2}{3}$, dark dorsally, lighter laterally except lower posterior angle which forms base of seta 1; several rows of small fringed scales along distal margin. Seta 1 single, long, strong, frayed; setae 2-4 long, strong, simple; 2 2-3 branched; 3 single; 4 (ventral brush) consisting of 10 bifid setae arising from a very lightly sclerotized grid; gills broad, sausage-shaped, upper 3-4 times length of saddle, lower slightly shorter.

Type: ♀, Tully, Q., x.1928, F. H. Taylor (S.P.H. & T.M.).

Biology: Two larval collections were made by Mr. Wassell at Silver Plains. The first (11.ii.1960) was from two treeholes, 25 and 30 ft. above ground in a dead bloodwood tree (*Eucalyptus* sp.), in light forest country; *Aedes (Finlaya) purpureus* (Theobald) larvae were also present in this sample, but the two species may not have been from the same treehole. The second (1.iv.1960) was from a treehole 25 ft. high in a living bloodwood tree in the same locality. Mr. Wassell described the treeholes as follows: "They were in limbs sloping up from the trunk of the tree, and were apparently caused by small vertical branches being broken off and subsequent rotting taking place; their diameter was about 1 inch, depth 6-12 inches."

Taylor (1929) records that the type specimen was taken biting in the late forenoon in open forest country in the bed of a creek containing pot holes of water. Mitchell River Mission specimen was collected under large mango trees near the banks of Magnificent Creek; the surrounding country is open forest, with denser tree growth along the creek bed. McIlwraith Range specimen was also taken in open forest. Time of biting ranges from 0730-2200 hrs.

The average annual rainfall at Tully is 177 in., at Cairns 89 in., and at Roper River Mission 28 in.; the remaining localities lie between the 40 in. and 60 in. isohyets.

Distribution: Northern Australia. The following specimens have been examined and except holotype, are in U.Q.: QUEENSLAND: Garraway Creek (tributary of Pascoe River), 1 ♀ (17.xii.1945, biting 2100 hrs., J. L. Wassell); McIlwraith Range, foot of Massey Spur, 1 ♀ (2.iii.1953, biting 0730 hrs. in open forest, J. L. Wassell); Port Stewart, Silver Plains homestead, 1 ♂, 1 ♀, each with linked pupal skin and portions of larval skin, 1 additional incomplete larval skin (11.ii.1960, treehole, J. L. Wassell), 3 whole larvae (1 died pupating), 1 whole pupa with linked larval skin (1.iv.1960, treehole, J. L. Wassell); Mitchell River Mission, 1 ♀ (7.iv.1961, biting horse 1830-2000 hrs., E. N. Marks *et al.*); Half Moon Bay near Cairns, 2 ♀♀ (25.viii.1957, biting on skin at night, P. B. Wallis); Tully, 1 ♀ (holotype, S.P.H. & T.M.).

O'Gower (1958) recorded *A. tulliae* from Northern Territory: Roper River Mission (16.xi.1956, A. K. O'Gower).

Aedes (Chaetocruimyia) moloensis Taylor

Aedes (Chaetocruimyia) moloensis Taylor, *Bull. ent. Res.* 20:276, 1929.

Female (Fig. 1, a). Wing length 1.7-1.8 mm.

Head: Dark scaled at vertex and across front half of head dorsally, the dark scales extending to nape laterally with white scaling below this; white scaled or mottled at nape dorsally in a broad irregular area, sometimes reaching almost to eye margin sublaterally; forked scales dark.

Thorax: Integument dark brown to blackish. Scutum entirely silvery white scaled anteriorly; posterior margin of pale area follows posterior margin of fossa, and is deeply indented between dorsocentral and acrostichal bristles, with a projection in mid line indented at tip. Posterior scutal scaling dark brown with distinct lines of white or creamy scales beside bare area and lateral to pre-scutellar bristles, continuous with white scaling on scutellum (in the type these 4 lines extend half way to the anterior white scaling and the inner two are linked in front of bare area) there is also a line above the supraalar bristles, and there may be a pale patch in front of wing root and a few creamy or golden scales behind the scutal angle.

Mid lobe of scutellum with black flat scales mesially and white broad curved and sometimes flat laterally; lateral lobe with white curved mesially, black curved and sometimes flat laterally. *Ppn* scales all dark. Subspiracular area with an elongate patch of 10 or more scales running along margin of *stp*, usually dark with 1 or 2 white at either end, sometimes white more numerous; a separate small patch above this of 1-4 flat or broad curved scales, all or mostly dark. In one specimen there is a small fine bristle on lower *m_{sp}* close to the strong mid-*stp* bristle; this is apparently a natural displacement of a fine mid-*stp* bristle.

Legs. Mid coxa with some dark scales. Fore femur anteroventrally with some white scales about mid length; posteriorly with wide median white patch which shows dorsally (these two areas may be confluent ventrally); posteriorly also with prominent white apical or preapical patch. Mid femur ventrally with more or less continuous white scaling, showing anteriorly and posteriorly at mid length; posteriorly a couple of white scales at apex. Hind femur anteriorly may have a few scattered pale scales on basal half. Fore tibia posteriorly with some white scales at base and apex and with scattered pale scales or a fairly complete pale-reflecting streak. Mid tibia posteriorly with a few pale scales at base and apex, and sometimes dorsally with an irregular area of pale scales on middle $\frac{2}{3}$. Hind tibia all dark. Basal white bands on fore tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{4}$ - $\frac{1}{2}$ II, III-V dark; on mid tarsal segments $\frac{1}{5}$ - $\frac{1}{3}$ I, $\frac{1}{3}$ - $\frac{1}{2}$ II, III-V dark but V sometimes with paler-reflecting scales; on hind tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{3}$ - $\frac{1}{2}$ II, $\frac{1}{2}$ III, IV dark or with a couple of white scales at base, V white with 1 or 2 dark scales at base and apex.

Wings. No pale scales at base of C. Cell R2 2.0-2.3 times length of its stem, cell M1 0.8-1.0 times length of its stem.

Abdomen: Tergite I all dark mesially, or with small basal white patch; II-VI or VII with median basal white patches, small and rounded or fairly broad; VIII may have white basal band.

Type: ♀, Mt. Molloy, Q., iii.1928, F. H. Taylor (S.P.H. & T.M.).

Biology: A day-biting species associated with open eucalypt forest. Taylor (1929) took the holotype in open forest country in the bed of a dry creek, biting in the late forenoon; a Warwick specimen is from open forest. A Brisbane specimen was taken in Q.I.M.R. laboratory situated at the edge of Victoria Park in which there are many large eucalypts.

Annual rainfall for the known localities ranges from 27 in. at Warwick to 45 in. at Brisbane; no records are available for Mt. Molloy but it lies between 50 in. and 60 in. isohyets.

Distribution: Eastern Queensland. The following specimens have been examined: Mt. Molloy 16 m. S.W. Port Douglas, 1 ♀ (holotype, S.P.H. & T.M.); Eidsvold, 1 ♀ (25.iv.1924, Bancroft, Q.I.M.R.); Herston, Brisbane, 1 ♀ (3.iii.1960, coming indoors to bite, I. Cook, Q.I.M.R.); Warwick, 1 ♀ (30.iii.1956, biting open forest, 1600 hrs., I. C. Yeo, U.Q.).

Under *calabyi* and "sp.A", atypical specimens are discussed which in white scutal scaling show a resemblance to *moloensis*, but have been placed in their respective species on other characters.

***Aedes (Chaetocruimyia) calabyi* sp.n.**

Female (Fig. 1, a, f-j). Wing length 1.8-2.2 mm. (1.8 mm. in holotype).

Head: White scales at nape mesially, not extending in a continuous triangle to vertex; there is usually a continuous band of black scales dorsally behind eyes, mesially extending half way to nape ($\frac{2}{3}$ in holotype) or very narrow, or mottled with white scales; there may be 1-3 flat white scales just behind vertical bristles, or the curved creamy scales along the eye margin may be larger at vertex; white scales may be continuous round nape to the patch low at side, and/or reach almost to eye margin subdorsally, but usually there is a broad sublateral area of black scales continuous to nape (as in holotype) and dark scales may extend almost to nape subdorsally; forked scales dark, sometimes a couple of paler ones among them; sometimes a few narrow white scales right at nape.

Thorax: Integument pitchy. Scutum entirely deep creamy scaled anteriorly; margin of pale scaling follows posterior margin of fossae, with only a slightly irregular line between (as in holotype), or with short narrow indentation lateral to acrostichal bristles, and/or with pointed median projection. Posterior scutal scaling bronzy black; a patch of creamy scales in front of wing root, and broad curved creamy scales lateral to prescutellar bristles, usually in a definite line; usually also a short line above supraalar bristles and sometimes (as in holotype) broad curved creamy scales beside bare area. In one paratype one of the lower *stp* bristles in front of coxa has a forked tip.

Mid lobe of scutellum with flat black scales mesially and curved and/or flat creamy and occasionally curved black laterally; lateral lobe with curved and/or flat black scales, rarely 1 or 2 curved creamy mesially.

Ppn with black narrow curved, and flat scales and usually 1-4 (6-8 in one paratype) flat white below. Subspiracular area with an elongate patch along margin of *stp*, mainly dark scaled mesially, and sometimes with separate patch of 2-5 scales above it anteriorly, but often the two patches fused forming a large irregular patch usually of about 16 or more scales (about 12 in holotype).

Legs. Mid coxa usually with some dark scales. Fore femur anteroventrally with a few white scales or distinct patch at mid length and sometimes a few scattered white scales preapically; posteriorly with white median patch (sometimes continuous ventrally with anterior patch) usually extending as a streak towards or to apex and small or large preapical or apical white patch.

Mid femur ventrally with almost continuous pale scaling, sometimes showing anteriorly at mid length; posteriorly mottled or with a distinct pale patch mesially (which may be continuous with ventral pale scaling) sometimes continued as streak or mottling towards apex; and dark or with a couple of pale scales at apex.

Hind femur ventrally with a few scattered white scales, or almost continuous broad streak; posteriorly occasionally with a short streak of white scales at mid length. Fore tibia posteriorly with small basal and usually apical pale patches and sometimes with a pale streak or some pale or pale reflecting scales between; one paratype with some mottling anteroventrally. Mid tibia posteriorly with small basal and occasionally apical pale patches, and rarely an almost complete streak; dorsally usually dark with a few scattered white scales, sometimes more extensively pale. Hind tibia with small basal pale patch and rarely a few pale scales dorsally at mid length. Basal white bands on fore tarsal segments $\frac{1}{2}$ I, $\frac{1}{3}$ - $\frac{1}{2}$ II, III-V dark; on mid tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{4}$ - $\frac{2}{3}$ II, III dark or with 1 or 2 white scales or patch on basal $\frac{1}{3}$, IV dark, V dark, often with some pale scales dorsally; on hind tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, $\frac{1}{3}$ - $\frac{2}{3}$ II and III, IV dark, V all white or with 1 or 2 dark scales at apex.

Wing. C dark (in 7 paratypes) or with some pale scales at base (holotype and 3 paratypes). Cell R2 2.2-3.0 times length of its stem; cell M1 0.9-1.1 times length of its stem.

Abdomen: Tergite I dark scaled mesially or with small basal white patch; II-V with rounded median basal white patches, usually large, VI and VII similar or with smaller patches, or VII dark mesially; VIII dark mesially or with basal white band.

Terminalia (Fig. 1, g-j, described from 2 paratypes). Similar to *spinosipes*, but cerci without scales; in one specimen tergite IX has broad rounded apex though more lightly sclerotized in mid line distally; in a second specimen it is distinctly bilobed. The former (larger) specimen has scales laterally at base of sternite VIII, the latter apparently has none. The cowl appears broader than in *spinosipes*.

Terminalia of a female from Merredin resemble those of the larger paratype.

Described from holotype and 10 paratype females.

The following differences were observed in other specimens examined: Head with median white scaling continuing in a very narrow stripe to vertex in one Merredin specimen. Scutal scaling similar to type in South Australian specimen, posterior margin of pale scaling more distinctly indented and median projection with indented tip in most specimens from Western Australia (i.e. somewhat approaching the pattern in some specimens of *wattensis*); pale scaling whitish in Darkan specimen which thus resembles *moloensis* but has all scutellar scales dark. Fore and mid femur posteriorly with mottling basal to median pale patch, fore dorsally with a couple of white scales preapically. Basal bands on fore tarsal segments $\frac{1}{2}$ - $\frac{1}{3}$ I, rarely a couple of white scales at base of III;

on mid tarsal segments $\frac{1}{2}$ -I. South Australian specimen has bands on hind tarsal segments $\frac{1}{2}$ I, $\frac{1}{2}$ II and III, IV with a small basal white patch; wing length 1.7 mm., cell R1 2.0 times length of its stem. One Merredin specimen has tergite I mesially dark scaled except for a white scale at apex.

Type: ♀, 5 m. S. Queen Victoria Spring, Western Australia, 1.x.1956, J. H. Calaby in C.S.I.R.O. 10 paratype females, same data, 2 in U.Q., 1 each in S.P.H. & T.M., B.M. and W.A., 5 in C.S.I.R.O. Queen Victoria Spring is a little over 40 m. N. Zanthus, a station on the transcontinental railway about 140 m. E. Kalgoorlie.

Biology: The following is Mr. Calaby's account of his capture of the type series:

"They were collected on a hot day. In mid-afternoon dark clouds appeared and there was much thunder and lightning. From about 4 p.m. for half-an-hour or so some rain fell, including one fair shower. After the humidity began to rise and a quarter of an hour or so before the rain, considerable numbers of *Aedes tremulus* and the *Chaetocruiomyia* appeared and attacked very determinedly. They were still biting when we left the area after the rain. The two species were present in about equal numbers and perhaps half-a-dozen mosquitoes would be attempting to bite at any particular moment. No mosquitoes were seen at any time before the onset of the thunderstorm; and that was the only occasion on which I have seen more than one or two *Chaetocruiomyia* together at any one time.

The area was arid and consisted of sand dunes vegetated with mallee and *Triodia* with some sclerophyllous shrubs. There was much bare sand. As far as I am aware there was no free water anywhere within many miles. At the time of our visit there was no surface water at Queen Victoria Spring."

The country at Nanambinia is sclerophyll woodland—mallees and some tree eucalypts on limestone with an under-stratum of chenopodiaceous shrubs (Calaby in litt.).

There is mallee at Goongarrie and Encounter Bay, mallee and temperate woodland in the Merredin and Lake Grace areas and mixed temperate woodland round Darkan and Kojonup (*Atlas of Australian Resources*). Waterhouse (1959) described the vegetation of the area which included the Hundred of Senior as "a complex of mallee-broom-bush association (*Eucalyptus incrassata*, *E. leptophylla*—*Melaleuca uncinata*) and pink-gum (*E. fasciculosa*)"; mallee was rarely higher than 15 ft.

Annual rainfall at Kojonup and Darkan is 22 in.; 9-13 in. at the other west Australian localities (10 in. at Zanthus); Hundred of Senior lies between 15 and 20 in. and Encounter Bay between 20 and 25 in. isohyets.

A. calabyi therefore is a species associated with the drier areas of south and south-western Australia, particularly those where mallee (*Eucalyptus* spp.) occurs. It probably breeds in long narrow pipes in broken branches. When filled with water these might take a long time to dry out completely, and provide sufficiently humid resting places for survival of adults until conditions were favourable for them to seek a blood meal, as happened at the type locality; it might even be that small frogs or reptiles resting in the same sites provide a source of blood.

Britten (1958) caught *Chaetocruiomyia* adults, probably this species, biting in shade at 3 p.m., and also flying near the doorway of a farm house.

Distribution: Southern Western and South Australia. Specimens in C.S.I.R.O. have been examined from the following localities. WESTERN AUSTRALIA: 10 m. S.E. Darkan, 1 ♀ (29.i.1953, J. H. Calaby); Kojonup, 1 ♀ (16.iii.1955, D. L. McIntosh); 30 m. N.E. Merredin, 2 ♀♀ (17.xii.1953, D. L. McIntosh); 3 m. S. Goongarrie, 1 ♀ (27.x.1954, D. L. McIntosh); 17 m. S.S.W. Nanambinia, 1 ♀ (12.xii.1953, D. L. McIntosh); 5 m. S. Queen Victoria Spring, 11 ♀♀ (type series). SOUTH AUSTRALIA: Hundred of Senior, N. Bordertown, 1 ♀ (17.i.1952, E. J. Waterhouse).

Darkan is about 110 m. and Kojonup about 150 m. S.E. Perth; the other localities lie north and east of these, the northernmost, Goongarrie, about 50 m. N. Kalgoorlie.

Britten's (1958) record of *A. spinosipes* from Lake Grace, 175 m. S.E. Perth, may have been based on specimens of *A. calabyi*, as *A. spinosipes* is unlikely to occur in an area with about 14 in. annual rainfall. These specimens cannot now be found (Britten, in litt.).

Notes made in 1945, on a female in S.P.H. & T.M. from Encounter Bay, South Australia (i.1924, Cleland) indicate that it is a specimen of *A. calabyi*. The Hundred of Senior female is one of the *Aedes* (*Chaetocruimyia*) sp. (undescribed) specimens recorded by Waterhouse (1959) from Coonalpyn Downs, South Australia, and it is probable that those from the Hundreds of Pendleton and Petherick were also this species.

Aedes (*Chaetocruimyia*) "Species A"

This is to be described elsewhere from McMillan's series of both sexes. It resembles *molojiensis* and *calabyi* in having dark scales across the vertex. The thoracic integument is usually reddish or medium brown, but sometimes dark. The pale scaling of scutum is creamy or golden (white in one Ben Lomond specimen, which thus resembles *molojiensis*). It differs from the other known species of the subgenus in its larger size (wing length 2.5-3.2 mm. in specimens examined), and in the frequent complete absence of flat scales from the scutellum. Male and female terminalia differ little from those described for other species.

Biology: McMillan (personal communication) in the Barrington area took males flying with females as they came to bite in swampy snow-gum country at an altitude of 3800 ft. At Ben Lomond (alt. 4500 ft., annual rainfall 35 in.) specimens were taken biting man and dog in the late afternoon, and one resting on a tree trunk near a tree-hole at 0815 hrs. Point Lookout specimens were taken biting at 1130 hrs. in a wet forest thicket at about 5000 ft. altitude; annual rainfall in this area is about 40 in. Lee *et al.* (1957) recorded *Aedes* (*Chaetocruimyia*) sp. from Colo Vale and described the environment; the principal trees are *Eucalyptus* and *Acacia* spp. with thickets of paper-bark (*Melaleuca stypheloides*); annual rainfall is about 40 in. and altitude about 1300-2400 ft. Tidal River specimens were taken biting at 1900 hrs., in eucalypt forest with an understory of shrubby species of coastal heath country plants; annual rainfall here is 40-50 in.

Distribution: South-eastern Australia. The following specimens in U.Q., C.S.I.R.O., and University of Melbourne have been examined: NEW SOUTH WALES: Ben Lomond 35 m. N. Armidale, 3 ♀♀ (9.xi.1955, to man 1708 hrs.; 2.i.1956, resting on tree trunk near treehole 0815 hrs.; 23.i.1957, off dog 1807 hrs., all E. J. Waterhouse); Pt. Lookout, S.E. Ebor, 2 ♀♀ (20.i.1962, J. Bancroft and I. M. Mackerras); Guyra, 1 ♀ (17.iv.1953, E. F. Riek); Barrington Area, Gummi Plain, N.W. Dungog, 1 ♂ (2.iii.1951, B. McMillan); Colo Vale, N. Mittagong, 2 ♀♀ (3.iii.1956, A. L. Dyce), 1 ♀ (7.iii.1957, J. Calaby), 1 ♀ (14.iii.1957, W. W. Wirth); Upper Kangaroo Valley, 1 ♀ (23.xi.1960, D. H. Colless). VICTORIA: Orbost, 1 ♀ (21.ii.1956, N. Dobrotworsky); Sherbroke Forest, 1 ♀ (13.ii.1953, N. Dobrotworsky); Lyonville, 3 ♀♀ (8.ii.1955, bush, N. Dobrotworsky); Tidal River, Wilson's Promontory, 2 ♀♀ (2.iii.1953, biting man, bush, 1900 hrs., G. W. Douglas).

Aedes (*Chaetocruimyia*) "Species B"

The following specimen cannot be satisfactorily placed in any of the described species.

Female. Wing length 1.8 mm. **Head** similar to *wattensis*, but some narrow scales at nape. **Thorax.** Integument lightish brown. Scutum entirely pale creamy scaled anteriorly; margin of pale scaling

follows posterior margin of fossae, and appears fairly straight between (partly rubbed). Posterior scutal scaling brown with golden reflections, some golden scales lateral to bare area and to prescutellar bristles and above wing root. Scutellum with dark scales, flat mesially and narrow curved laterally on mid lobe, narrow curved on lateral lobes. *Ppn* scales all dark. A small, irregular subspiracular patch of 5-7 white scales with separate patch of 1-2 above it.

Legs. Fore femur posteriorly with median pale patch extending as streak towards apex, and apical pale patch, continued as preapical patch dorsally. Mid femur ventrally with a few pale scales near apex, posteriorly a pale streak on middle third, and couple of pale scales at apex. Hind femur dark except for basal and apical bands. Fore tibia posteriorly pale scaled. Mid tibia posteriorly with a few pale scales at base and apex and median pale streak, dorsally with indefinite pale streak. Hind tibia dark. Basal white bands on fore tarsal segments $\frac{1}{2}$ I, $\frac{1}{2}$ II, III-V dark; on mid tarsal segments $\frac{1}{2}$ I, $\frac{1}{2}$ II, III-V dark; on hind tarsal segments $\frac{1}{2}$ I, $\frac{2}{3}$ II, III broken but apparently with fairly wide basal band, IV and V missing.

Wings. Pale scales at base of C and Sc. Cell R1 2.3 times length of its stem; cell M1 equal in length to its stem.

Abdomen: Tergite I with broad median basal white patch not extending to apex; II-VII with median basal white patches, large on II-V.

Distribution: North Queensland. Bramston Beach, 6 m. E. Babinda, 1 ♀ (8.ix.1949, M. J. Mackerras, Q.I.M.R.). Annual rainfall in this area is over 150 in.

Discussion: On head and thoracic scaling this specimen appears closest to *spinosipes* and *tulliae*. It resembles *spinosipes* in the light thoracic integument and pale scales at base of C, but differs on tibial and tarsal markings. *A. tulliae* has a much darker integument, base of C dark scaled, and tergite I with complete white median stripe. Further specimens of "species B" are needed before one can judge whether it is a distinct species.

GROUP B

Aedes (Chaetocruiomyia) elchoensis Taylor

Aedes (Chaetocruiomyia) elchoensis Taylor, *Bull. ent. Res.* 20:276, 1929.

Female (Fig. 1, a). Wing length 1.9-2.3 mm.

Head: Clothed with flat black scales, extending from side round vertex, with a median triangle of narrow curved white scales extending from nape at least half way to vertex, sometimes 1 or 2 flat white at apex of triangle; two patches of flat white laterally, the upper at nape not reaching to eye margin, the lower on eye margin only; small narrow curved silvery scales along eye margin to vertex, extending a short distance between eyes, with a couple of small flat white or black laterally. Upright forked scales black, rarely 1 or 2 paler, very numerous; 2 or 3 rows of short ones at nape, remainder progressively longer, the most anterior almost as long as vertical bristles. Bristles long, strong, black; 2 vertical, 4 mesially directed upper orbital and 4-5 lower orbital bristles. Torus dark brown with fine dark hairs mesially; no scales on torus or first flagellar segment. Palp $\frac{2}{3}$ length of proboscis (excluding labella).

Thorax: Integument dark brown. On anterior margin of scutum mesially a pair of short blunt-tipped black bristles in front of most anterior acrostichal bristles; laterally a group of 4-7 similar and 2-3 very long stout bristles. Scutum entirely bright silvery-white scaled anteriorly (the scales on fossae not as large as in species of Group A); posterior margin of pale area follows posterior margin of fossa with indentations at the lines of acrostichal and dorsocentral bristles and submedian points between; there is also a small pale patch behind posterior margin of fossa. Posterior scutal scaling bronzy black with white lines not continuous with anterior white scaling; a median line extends slightly on to bare area, a line lateral to bare area is continuous with white scaling on mid lobe of scutellum; a line lateral to prescutellar bristles; a short line above prealar bristles which may be confluent with a short line in front of wing root. Bristles strong, black, 7 pairs of acrostichal, 8 dorsocentral, 8 prescutellar, a patch of about 6-8 blunt bristles in front of wing root.

Mid lobe of scutellum with flat scales, black mesially, white laterally; lateral lobes with curved white scales, and sometimes with flat black mesially; 4-5 long bristles to mid lobe and 4-7 to lateral lobes.

Apn with broad and narrow curved and flat black scales and a few curved white below and with about 9 stout black blunt-tipped bristles. *Ppn* with narrow curved black scales above, some flat black below and 3-5 bristles (1 may be finer). Pleural scale patches smaller than in species of Group A. Propleuron with flat and sometimes some narrow curved white scales and 6-7 dark bristles (not forked); subspiracular area with a row of 1-6 flat scales, all white or 1-2 dark; 2-5 postspiracular bristles (1 may be finer); 8-11 blunt black prealar bristles, a small patch of flat white scales below knob; upper *stp* scale patch well separated from lower; 2-5 upper *stp* bristles (1 may be smaller, and

bases may not be in a row); 1-2 mid *stp* bristles (one very strong, one moderately so); 2-4 lower *stp* bristles. *Msp* with small upper patch of white scales and larger horizontal patch at about mid length, 7-9 black upper *msp* bristles.

Legs. Fore coxa mainly black scaled with small white patch above and sometimes some white anteriorly; mid similar; hind white scaled usually with a few dark. Trochanters mainly white scaled. Femora dark scaled with basally a few inconspicuous pale scales; fore may have some pale reflecting scales posteriorly on distal half; mid and hind with prominent white apical bands; hind may have 1 or 2 silvery scales or an indefinite streak of pale reflecting scales anteriorly on distal $\frac{2}{3}$. Tibiae dark, length of longest bristle $1\frac{2}{3}$ width of fore, $1\frac{1}{2}$ width of mid and twice width of hind tibia. Basal white bands on fore tarsal segments $\frac{1}{3}$ - $\frac{1}{2}$ I, $\frac{2}{3}$ - $\frac{1}{2}$ II, III-V dark or may be a pale scale at base of III; on mid tarsal segments $\frac{1}{3}$ - $\frac{1}{2}$ I, $\frac{1}{3}$ - $\frac{2}{3}$ II and III (may be incomplete ventrally on II and III), some pale scales at apex of I, IV and V dark; on hind tarsal segments $\frac{1}{3}$ - $\frac{1}{2}$ I, $\frac{1}{3}$ - $\frac{1}{2}$ II, $\frac{1}{3}$ - $\frac{2}{3}$ III, $\frac{1}{3}$ - $\frac{1}{2}$ IV, V all white, apical dorsal white patches on I and II.

Wing. Dark scaled. Base of remigium bare of scales or bristles. Cell R2 2.2-3.4 times length of its stem, cell M1 0.9-1.3 times length of its stem. Knob of halteres entirely pale scaled or with some black scales at tip.

Abdomen: Tergite I all dark mesially; II-VI with wide basal median silvery white patches; VII apparently dark mesially; II-VII with rounded silvery sublateral patches, slightly removed from base of segment (or reaching base on II-IV); VIII all dark or with basal white band or lateral patches. Sternites dark scaled with large white basal lateral patches on II-III, IV or V, remainder entirely dark (but not as dark as tergites); sternite VIII with 1 or 2 scales laterally at base.

Terminalia (Fig. 2, c, d, e, described from 1 specimen from Townsville). Cerci short, with numerous setae; the most basal seta sternally is distinctly stouter than the rest. Tergite IX bilobed with 1-2 setae at apex of each lobe. Postgenital plate broadest at mid length, with setae at apex only; cowl appears broader and more heavily sclerotized than in Group A; insula with 4 setae. The cowl and stout basal seta of cercus are rather similar to *A. tremulus*.

Male: Known only from the holotype in which only segment I remains of the abdomen. From notes made on this in 1945 it resembles the female except for the usual sex differences; antennae, palps, tarsal claws apparently similar to *A. tulliae*.

Type: ♂, labelled "Holotype ♂ *Chaetocruomyia elchoensis* Taylor" "Elcho Is. N. Ter."; ♀, labelled "Allotype ♀", remaining data as for ♂; both in S.P.H. & T.M.

Biology: The specimens examined from Townsville and Garraway Creek were taken biting man at night. O'Gower (1960) recorded *A. elchoensis* collected from human bait at Townsville.

The collecting site on the Townsville common is coastal country dominated by small trees of *Melaleuca* spp. and vegetation of this type probably occurs in the vicinity of other localities from which *A. elchoensis* is recorded, though details are not available.

Distribution: Northern Australia. NORTHERN TERRITORY: Elcho I., 1 ♂, 1 ♀ (L. E. Cooling (Taylor, 1929)); Darwin (3.iii.1953, O'Gower (O'Gower, 1958)); Adelaide River (23.ii.1943, Woodhill (O'Gower, 1958)). QUEENSLAND: Garraway Creek (tributary of Pascoe River), 1 ♀ (17.xii.1945, biting 2100 hrs., J. L. Wassell); Townsville, 3 ♀♀ (10.iv.1952, biting man on common at night, Marks *et al.*) 1 ♀ (30.xi.1954, biting man on common at night, A. K. O'Gower).

Queensland specimens listed are in U.Q. and were examined in this study; Northern Territory specimens are in S.P.H. & T.M., where notes were made on Elcho I. specimens in 1945; further notes on allotype were kindly provided by D. J. Lee (in litt.).

DISCUSSION

Subgeneric and Group Characters. Adults of *Spinipes*-group are readily distinguished from all other *Aedes* by the tuft of long forked scales at base of remigium and forked bristles on *apn* and other sites. Adults of both groups of *Chaetocruomyia* differ from those of *Macleaya* principally in having (a) fossae or entire anterior half of scutum pale scaled; (b) no scales on paratergite and postspiracular area; (c) usually black scales mesially on mid lobe of scutellum (white in *Macleaya*). Female terminalia

of the two subgenera are quite similar, and while those of *A. elchoensis* appear more like *Macleaya* than do those of *Spinospes*-group species, too few specimens in either subgenus have been examined to determine the extent to which differences are subgeneric, specific, intraspecific, or due to variation in technique or angle of mounting. Male terminalia of the two subgenera, while generally similar, differ in the shape of the appendage of the harpago (slender in *Macleaya*), of the phallosome, and of sternite IX. *Chaetocruiomyia* pupae differ from *Macleaya* in the strong development of seta 7 on abdominal segments III-V, and larvae in having the lateral comb of fringed scales (it is a row of spines fused at the base in *Macleaya*), and siphon with basal collar and small pecten.

Chaetocruiomyia is known only from Australia; *Macleaya* is mainly Australian but extends to New Guinea. These two subgenera are clearly derived from a common stem of *Aedes*, affinities of which appear closest to the subgenera *Finlaya* and *Ochlerotatus* Lynch Arribalzaga.

Subgeneric Key Characters. Mattingly (1957, 1958, 1959, 1961) has provided keys to Culicine genera and subgenera. Adult females of *Chaetocruiomyia* run to Couplet 52 (Mattingly 1960, p. 6) where the subgenus has been keyed out in the first half as having "all scutellar scales broad and flat". Most specimens however fall in the second half of the couplet and follow through to the second half of couplet 59. Adult males run to couplet 44 (Mattingly 1960, p. 9) but do not fit either half of the couplet. The pupa runs to couplet 36 (Mattingly 1959, p. 14) if seta 7 on segments IV and V is considered to be a stout dark spine or if it is not, to couplet 50 with *Aedes* (*Diceromyia*) (part). The larva runs to the second half of couplet 37 (Mattingly 1959, p. 16).

Specific Characters: While *elchoensis* is distinguished by its species group characters, the species of Group A are very similar to one another. The presence or absence of a broad white basal band on hind tarsal segment III and of a large pale median patch on the hind tibia are reliable but serve to separate off only *A. spinospes*. Among the remaining species the tarsal markings show insufficient variation to be of use and femoral and tibial markings are so variable within a species that it is questionable whether any apparent differences between species in these characters can be relied upon. A broad white median stripe on tergite I appears a dependable character but distinguishes only *A. tulliae*. Apparent differences in abdominal scale patches in being basal or sub-basal, or the presence or absence of median patches on distal tergites are probably due to different degrees of contraction of the abdominal segments rather than to differences between species. Light brown posterior scutal scaling extending between the fossae to the anterior margin is good only for separating *A. humeralis*, but in the other species with darker posterior scaling and continuous pale scaling on anterior half, the pattern formed by the posterior margin of the pale scaling appears fairly reliable. A fairly straight or slightly irregular margin between the fossae contrasts with deep indentations of dark scaling between the dorsocentral and acrostichal bristles. There are a few specimens in each category which approach an intermediate condition and are difficult to distinguish; unfortunately also this part of the scutum is most liable to be denuded of scales. The colour of the pale scaling, and of the scutal integument are also fairly reliable, and these scutal characters used in combination with the pattern of head scaling appear the most satisfactory for separating species. On the head the presence or absence of a band of dark scaling across the vertex, as contrasted with a continuous median white triangle extending to the vertex or more extensive white scaling has proved a reliable character, and the few specimens with mottling at the vertex apparently belong with the dark scaled group. The shape and colour of the subspiracular scale patch is a useful supplementary character, but presence of pale scaling at the base of C is unreliable in several species.

Biology: Knowledge of the subgenus is too fragmentary for discussion of the possible factors involved in speciation. It is reasonable to assume that all species may be treehole breeders, and there are definite indications that certain species are associated with certain plant communities. This has perhaps been over-emphasized on rather slender evidence when discussed under each species but the purpose has been to stimulate collection of further data which may confirm or refute the suggestions put forward. It may not be the plant community itself, but the factors that determine its distribution that influence also the distribution of the mosquito, and it is not intended to imply that a particular species of *Chaetocruomyia* may breed only in trees of a particular genus or species. There is no doubt however that some species of trees will be found more prone than others to produce suitable breeding sites, which are likely to be long narrow pipes in comparatively slender stems or branches.

In this connection the larval siphon being not sclerotized to the base ventrally may be an adaptation to enable the siphon and saddle to be more closely approximated and allow the larva to pass through a narrower opening than it would otherwise be able to do.

Females of the various species bite man quite readily and the wide distribution suggests that they are not actually rare but rarely come in contact with man. Wassell's discovery of larvae in treeholes at a height of 25-30 ft. suggests that the explanation for this may be that they are primarily canopy-dwellers. This might not be important with inland species where mulga or mallee may be only about 15 ft. in height but Calaby's observations have indicated that meteorological conditions could be a critical factor in the activity of these mosquitoes.

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