

ENTOMOLOGY.—*New Guinea species of mosquitoes of the genus Aedes, subgenus Aedes.*¹ WILLARD V. KING, Colonel, and HARRY HOOGSTRAAL, Captain, Sn.C., AUS. (Communicated by ALAN STONE.)

Seventeen species of subgenus *Aedes*, of which 12 are described as new, are recognized herein from New Guinea and islands immediately adjacent. In addition, refer-

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ence is made to two species occurring in Australia and to several unidentified forms encountered in New Guinea. The taxonomic study of the group has been distinctly handicapped by inadequate material, especially the lack of reared series in which both sexes and the larvae were definitely associated. The present classification is based primarily on the male genitalia, which fortunately present good distinctions. The female is known in 11 of the 17 species and the larva in only 5.

The main recognition characters of the

subgenus *Aedes*, as defined by Edwards (1932), are as follows: Palpi very short in both sexes; proboscis, wings, and tarsi uniformly dark; male antenna densely plumose; recumbent scales of head mostly broad and flat; scutellar scales narrow; lower anterior mesepimeral bristle lacking, but usually a group of fine hairs posteriorly; tarsal claws either simple or toothed; phallosome simple, divided into a pair of plates or rods; harpago (claspette) lacking; eighth segment of female abdomen retractile, the cerci moderately long and slender.

Common characteristics among the New Guinea species may be given here and, to save repetition, omitted in the individual descriptions except to note variations: Proboscis distinctly longer than femur; head scales usually all flat and all dark except for a lateral stripe of creamy-white ones, sometimes a median stripe of broad white scales, or some narrow white scales on the nape, the midline, or eye margin; *apn* (anterior pronotum) bare of scales or with an occasional broad one (heavily scaled in one species, *lineatus*); *ppn* (posterior pronotum) with 4 to 6 posterior bristles, either bare of scales or with narrow dark ones on upper half and occasional broad ones below, sometimes a few hairs in front of the lower bristles; scutum with fine or narrow curved scales, usually with little or no ornamentation; patches of broad, usually white, scales on the upper and lower posterior sternopleuron and at about the upper third of the mesepimeron; propleuron with flat white scales and 6 to 8 bristles; sternopleuron sometimes with scattered small fine hairs; mesepimeron with a small group of hairs around the lower posterior corner of the scale patch or with most of the lower half hairy (all New Guinea species with some hairs); meteu-sternum (sclerite below the posterior spiracle) bare; lateral scales of the apical part of veins 2 to 4 usually elongate and somewhat spatulate, the tip distinctly broader than at basal third; hind tarsal claws simple so far as observed; fore and mid claws of male usually unequal and simple, of the female equal in size and frequently with a minute tooth, sometimes simple or with a large tooth; abdominal tergites III-VII (sometimes II and VIII) with white markings,

either lateral spots (usually "oblique") or dorsal transverse bands.

A characteristic of the male genitalia of the New Guinea fauna is the comparative simplicity of the coxite (basistyle), most of the species lacking the apical extension and the elongate lobes or arms found in practically all Oriental species. This has greatly reduced the problem of comparison with species of adjacent regions. Instead of such processes, a majority of the New Guinea species have one or more thick spines or small leaflets arising from the inner margin of the lower fold, subapically. Two of the species in the New Guinea list (*neomacrodixoa* and *panayensis*) and one from Australia (*A. cunninghami* Taylor) have a more complicated structure.

About midway of the inner margin of the lower fold of the coxite is a group of two or more slender bristles set in rather prominent tubercles. This is referred to as the median lobe. The basal lobe is represented by a flat area minutely pilose and bearing a few fine hairs. The style (dististyle) is attached near the apex of the coxite. Its basal third is more or less enlarged while the apical two-thirds forms a wide flattened arm, more or less curved or bent, without an apical appendage. The ninth tergite usually is emarginate posteriorly and bare of hairs; the ninth sternite usually with a posterior row of five setae (two short ones alternated with three longer ones). The anal membrane is indented posteriorly, the paraproct undeveloped and usually represented by only a very slight lateral thickening.

With the possible exception of *neomacrodixoa*, all the New Guinea species have a peculiar H-shaped structure visible below the anal membrane, the homology of which has not been determined. It appears to be a bridging of the dorsal arms of the tenth sternite, with flattened posterior projection on each side made up in some cases of a number of elongate, closely appressed, rounded filaments, and in others of a striated leaf-shaped membrane. These arms lie in a perpendicular plane and their formation is difficult to see except in mounts where they happen to have become flattened (see Figs. 12 and 16). A somewhat similar bridge has been observed in some of

the Philippine species (including *panayensis*) but the posterior arms are less developed or absent, and nothing comparable to the filaments was noted.

The female genitalia of the New Guinea group seem to be very uniform and simple in structure, and unfortunately, offer little assistance in identification. This was first pointed out to the writers by J. Laffoon. With better material, it is possible that a more thorough study than we have attempted would disclose useful characters.

The larvae (so far as known) have a spiculate antenna, a single row of comb scales, the last 1 to 3 pecten spines more widely spaced than the others, anal segment not completely ringed by the saddle and 1 to 3 small ventral precratal tufts present.

Only one Oriental species, *panayensis* of the Philippines, is definitely known from the New Guinea region. Another species, *neomacrodixoa*, is closely related to the Philippine *macrodixoa*. Two common New Guinea species, *carmentis* and *lineatus*, occur in the Solomons and the Moluccas, and *carmentis* in northern Australia also. (*A. ceramensis* Brug from Ceram is considered a synonym of *carmentis*.) The Australian species *funereus* has a limited distribution in New Guinea. Two Malayan species, *A. butleri* Theobald and *A. incertus* Edwards, have been reported from New Guinea, the former from Pionierbivak (Brug, 1923) and the latter from Merauke, Papua (Edwards, 1924). The identification of the first was probably based on females and was probably incorrect. At least none of the males examined by us resemble the male of *butleri*. The male of *incertus* is unknown but the Merauke record for this species was based on a male specimen (for which the genitalia were not described), which Edwards said agreed with females from the Malay Peninsula. The record now seems very doubtful. As described by Leicester (1908) under the preoccupied name of *taeniata*, *incertus* differs from all our species in having a combination of broad basal bands on the tergites (median spots only on the paratype), tarsal claws toothed, and a median line of narrow pale scales on the head.

Several of the species are common and widely distributed in New Guinea. The

adults are often extremely annoying in the forest during the day. A number of the species in the Hollandia area were obtained only from light trap collections. Larvae of New Guinea species so far as known have been taken only from ground pools.

The previously described species are discussed first, followed by descriptions of new species, each group being arranged in alphabetical order. Keys to adults, male genitalia and larvae are provided at the end.

Aedes (Aedes) carmentis Edwards

Aedes carmentis Edwards, Bull. Ent. Res. 20: 388. 1924. (Type female, with numerous other specimens, from Maravova, Guadalcanal, Solomon Islands, and one female from Palm Island, North Queensland, Australia.)

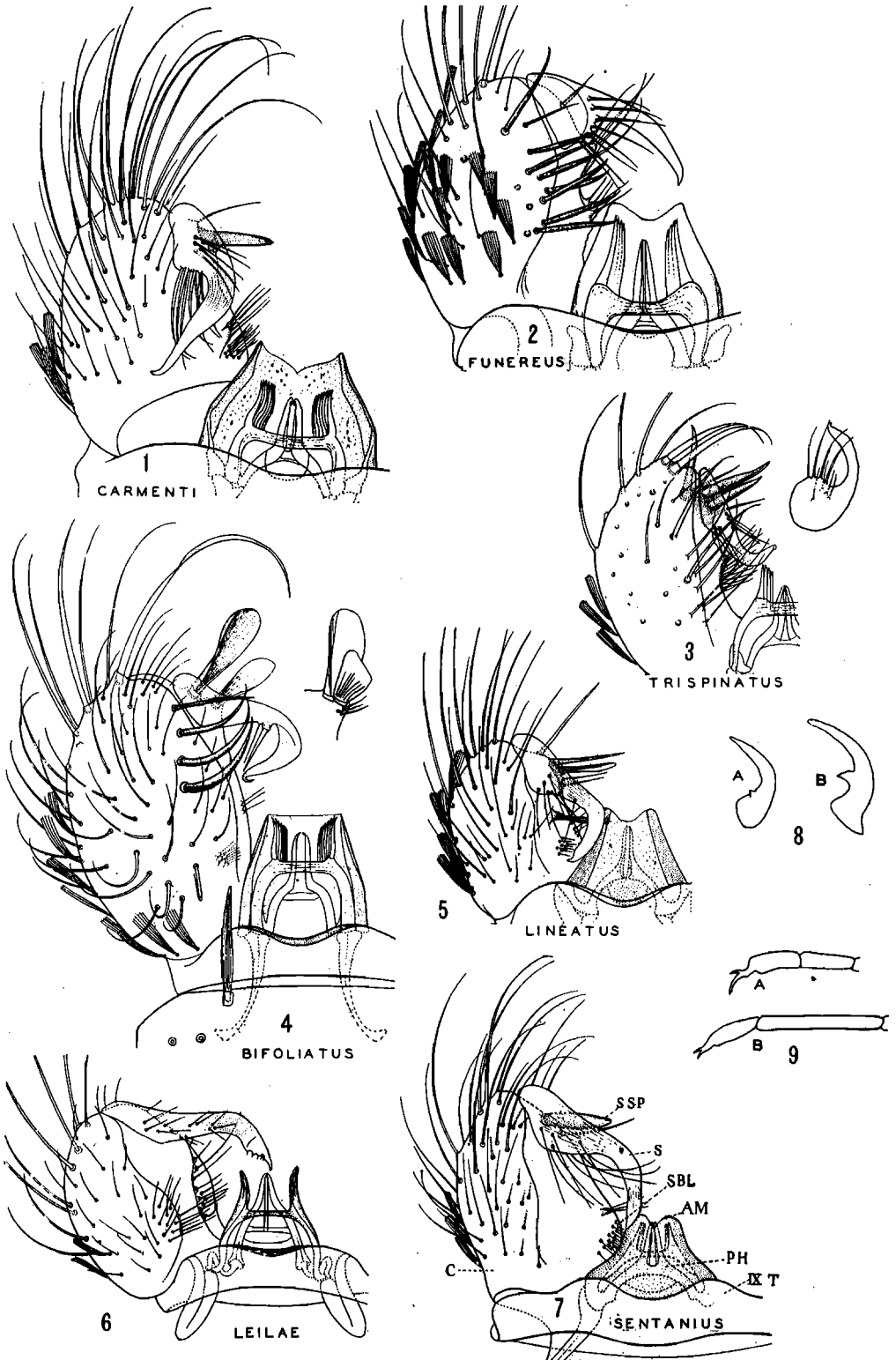
? *Aedes* (? *Skusea*) *funereus* (Theobald), Edwards, Bull. Ent. Res. 12: 76. 1921. (Male, from Amboina, said to have a short spine at tip of side piece.)

? *Aedes (Aedes) funereus* (Theobald), Brug, Bull. Ent. Res. 23: 79. 1932. (Figure of coxite of specimen described by Edwards.)

Aedes (Aedes) ceramensis Brug, Bull. Ent. Res. 25: 512. 1934. (Types, 2 males from Ceram, Moluccas.) (Coxite with a stout subapical spine and otherwise similar to *carmentis*.)

The species was described as closely resembling *A. funereus* and *A. similis* except that the fore and mid tarsal claws of the female were toothed, scales on the upper sternopleuron all dark, and abdominal bands incomplete dorsally. Adult specimens obtained by the writers, and adults and larvae from the collection of Rozeboom, Knight, and Laffoon from the Hollandia area, agree well with the material from Guadalcanal.

Adults.—Head vertex with all black flat scales; *apn* bare of scales; *ppn* with scattered dark narrow scales on the upper third and a patch of fine hairs in front of bristles; scutal scales mostly dark, with a sprinkling of pale ones on front margin, over the wing roots, around antescutellar space (none on median area) and on scutellum; upper sternopleuron with a large patch of appressed translucent scales that usually appear darkish or even black, and usually in addition rather numerous small pale hairs below the scale patch and along the anterior border, with a few longer dark hairs in the anterior angle; mesepimeron with a small number of rather long pale hairs posterior to and just below the scale patch. Abdominal tergites with lateral white spots,



FIGS. 1-7.—(See opposite page for legend.)

or stripes, that extend from the base underneath toward the middle of the segments at the sides and their tips usually showing slightly from above. Fore and mid tarsal claws equal and toothed (Fig. 8B) in the female, unequal in the male with only the larger claw toothed. *Male hypopygium* (Fig. 1, Hollandia specimen): Coxite with a stout subapical spine, bluntly pointed and slightly curved, with several small bristles near its base; median lobe with about 5 bristles; basal lobe with about 8 short hairs; enlarged basal portion of style with a group of about 6 rather stout bristles on the inner side, another distinct group of 4 or 5 more slender bristles on the upper side; arm of style strongly curved near base, tapered and ending in a sharp, bent tip.

Larva.—Antennal hair 4-branched; head hair B, 3-branched, C, 5- or 6-branched; comb of about 14 scales, each rounded and fringed; airtube (Fig. 19) long, index nearly 3.0; pecten with about fourteen spines, the distal two longer and more widely spaced, the others with a single lateral tooth at basal third or fourth; tuft 2- or 3-branched; dorsal subcaudal hair of anal segment with three branches, one very long (two-thirds as long as the ventral hair), the other two short.

Remarks.—Besides the large teeth on the tarsal claws, the hairiness of the *ppn* and sternopleuron, and the pale scales around the antescutellar space are distinct aids in identification. The larva is very similar to that of *funereus* but may differ in having only a single tooth on the pecten spines instead of one large and several small basal teeth.

A. carmentis is common in the Solomons, and the Museum collection contains numerous specimens from Guadalcanal, Bougainville, and New Georgia Islands. From New Guinea there is a large series from Nadzab, Markham River Valley, eastern New Guinea, and the species was common at Hollandia. The larvae were not often found, however, and only two males were recorded from our light-traps.

Aedes (Aedes) funereus (Theobald)

Skusea funerea Theobald, Monograph of the Culicidae 3: 292. 1903. [Type female, Queensland, Australia (probably Deception Bay, near Brisbane).]

Pseudoskusea basalis Taylor, Ann. Rept. Con. Publ. Health, Queensland, App. 6: 21 1912. (quoted from Edwards, Bull. Ent. Res. 14: 388. 1924).

Aedes (Aedes) funereus (Theobald), Lee, Atlas Mosq. Larv. Aust. Region: 76. 1944 (illustration of larva from Cairns, Australia).

Adults.—Head vertex all dark scaled; scutal extegument and scales very dark; *apn* normally bare of scales; *ppn* with narrow scales on upper third; mesepimeron with 6–8 hairs around the lower posterior corner of scale patch; claws of fore and mid tarsi of male unequal, simple, of female equal, each with a minute tooth. Abdomen with a median and lateral white spot on tergite II, complete transverse bands on III–VI, and lateral spots on VII, the bands usually touching the base at middle and sides but curved slightly away in between producing a scalloped effect, sometimes slightly removed for entire width of segment. *Hypopygium* (Fig. 2, from one of several males from Brisbane, Australia, P. L. Douglas, collector; genitalia not previously described): coxite with a median dorsal patch of about 10 stout spinelike bristles; inner margin of lower fold with a single rather stout subapical bristle (below base of style), a median group of 6–8 bristles set in prominent tubercles, and a small basal lobe with 4 or 5 fine hairs. Style of about the usual shape in this group, with a few hairs toward the apex of the enlarged basal portion. The group of stout bristles on the coxite is distinctive among the known species of this region. A slide mount of female genitalia (specimen from Cairns) shows a short, emarginate postgenital plate.

In the larva of *funereus* as described by Lee (1944), head hair B is 3-branched, the middle branch being longer and stouter than the side branches; hair C, 6-branched; comb of 8th

FIGS. 1–7.—Male genitalia of *Aedes*: 1, *carmentis*; 2, *funereus*; 3, *trispinatus*; 4, *bifoliatus*; 5, *lineatus*; 6, *leilae*; 7, *sentanius* (SSP subapical spine, S style, SBL subbasal lobe, AM anal membrane, Ph phallosome, IXT ninth tergite).

FIG. 8.—Claws of fore tarsus: 8A, Minute tooth in female of *parasimilis* series; 8B, female of *carmentis*.

FIG. 9.—Segments 4 and 5 of male fore tarsus: 9A, *parasimilis* series Type A; 9B, *parasimilis* series, Type B.

segment of about 14 rounded and fringed scales in a curved row; siphon rather long, index about 3.5; pecten with the distal three teeth widely spaced, long and simple, the others with a stout subbasal denticle and some smaller teeth; tuft placed beyond last pecten spine at about the apical fourth, with three branches; dorsal subcaudal hair of anal segment with three unequal branches; precratal tufts at most two.

Remarks.—Although this species has been reported rather widely from the Australasian Region, due in part to the misidentification of Amboina specimens (see under *carmentis*) by Edwards and Brug, authentic records of its occurrence outside of Australia are few. In the collections of the U. S. National Museum there are three males and one female of this species from Watutu Point, Goodenough Island, Papua, VII-17-43, B. E. Rees (of which the genitalia of one male was checked), two slide mounts of male genitalia labeled Milne Bay, New Guinea, T. K. Ruebush, and one male (of which the tip of the abdomen is missing) and one female, labeled Ladova, N. G., 10-30-43, T. K. Ruebush No. 58B. The latter locality is in the Milne Bay area. No specimens of the species were taken by the writers in the Hollandia or Oro Bay areas. Female specimens from Nadzab and Finschhafen, identified as this species, are described herein as *A. foliformis*. *A. funereus* has been reported by recent collectors from the Solomon Islands but none was found by the senior author among considerable material of this subgenus in the Museum collections. The form identified from there as *funereus* was found to be another new species, which will be described by others.

Aedes (Aedes) lineatus (Taylor)

Skusea funerea var. *ornatus* Theobald, Ann. Mus. Nat. Hung. 3: 79. 1905 (not *Culex ornatus* Meigen, 1818 = *A. (Finlaya) geniculatus* Oliver 1791; syn. by Edwards, Bull. Ent. Res. 12: 319. 1921). (Female types from Sattelberg, Huon Gulf, and Friedrich-Wilhelmshafen, New Guinea.)

Lepidotomyia lineatus Taylor, Trans. Ent. Soc. London, 1914 (pt. 1): 191. (Female types from Lakekamu Gold Field and Mekeo District, Papua.)

Aedes (? *Skusea*) *funereus* var. *ornatus* (Theobald), Edwards, Bull. Ent. Res. 12: 76. 1921. (Male and female from Ceram, the male hypopygium said to be identical with *funereus* from Amboina.)

Aedes (Aedes) funereus ornatus (Theobald), Lee, Atlas Mosq. Larv. Aust. Region: 77. 1944. (Description of larva from Milne Bay, Papua.)

Taylor's name *lineatus* is available for this species, which has become well known under the preoccupied name of *ornatus*. It is one of the commonest and most widely distributed species of the subgenus, having been recorded from New Hebrides, the Solomons, New Britain, New Guinea and adjacent islands, and Ceram. It is frequently an annoying daytime pest in and near woods.

Adults.—Head with median and lateral stripes of broad yellowish scales, narrow pale scales in the angle between the eyes and a thin line part way around the eye margin; *apn* covered with narrow-curved yellowish scales in the female (often a few broad ones lower down) and with broad white scales in the male; *ppn*, with narrow dark scales on the upper part (more extensive in female) and usually a few broad pale ones posteriorly. Scutum usually with distinct or fairly distinct median and lateral stripes of yellowish or golden scales. The median stripe extending onto the antescutellar space, the lateral ones curved around the posterior margins of the fossae; a patch of golden scales over the wing root and similar scales on scutellum; pleural bristles mostly pale yellowish; scale patches large, white; mesepimeron with a few hairs posterior to and just below the scale patch; tarsal claws apparently simple in both sexes (not mounted); abdominal tergites with complete pale bands somewhat variable in position but usually about median, curving forward toward base in the middle, often incomplete on part of the segments in the male. *Hypopygium* (Fig. 5; Hollandia specimen): Coxite with a narrow subapical leaflet, often partly furled and appearing scooplike, a stout bristle arising close to base of leaflet posteriorly or dorsally, and two smaller bristles anteriorly, the posterior bristle somewhat variable in size and appearing as a short slender spine in one specimen; median lobe with three rather long bristles; basal lobe with about six short hairs; style of usual shape, the arm strongly bent, the enlarged basal portion with a slightly scattered group of about six bristles, an additional bristle at about the basal third of the arm, just before or at the bend.

Larva (Fig. 21).—Head hair B with three

branches, the middle one longer and stouter than the others; C, 4-branched, set well back of and inside B; *d* minute, *e* single, *f* 4-branched. Comb of about 10 scales in a row, rounded and fringed. Siphon comparatively short, index about 2.0; pecten of about 15 spines, the apical one or two more widely spaced, simple, the others usually with one large and one smaller basal denticle; tuft 3-branched. Dorsal subcaudal hair of anal segment with about eight subequal branches.

This species is usually easily recognized by its ornamentation. Rubbed or poorly marked female specimens might be confused with *foliformis*, in which case the best distinction is the presence of narrow scales on the *apn*. The subapical leaflet on the male coxite is somewhat similar to *parasimilis* but the external markings are distinct. The larva is characterized by a rather short airtube and subequal branches of the dorsal subcaudal hair of the anal segment. The species has little resemblance to *funereus*, of which it has previously been regarded as a subspecies.

Aedes (Aedes) panayensis Ludlow

Aedes panayensis Ludlow, Psyche 21: 159. 1914. (48 cotypes from Iloilo, Panay, P. I.)

Aedes (Aedes) panayensis Ludlow, Laffoon, Journ. Washington Acad. Sci. 36: 242. 1946. (Designates a male lectotype and gives a full redescription of the species, with new records from Aioki Isle, Schouten Islands, Dutch New Guinea, 1944, and Point Gila, Morotai, Moluccas, 1945.)

Adults (Schouten Islands specimens).—

Head in both sexes with a few broad white scales on mid line and eye margin, sometimes a few narrow scales also on midline; *apn* with some flat pale scales; scutum with rather coarse yellowish scales forming a border in front and laterally and extending onto upper half of *ppn*, similar scales above wing roots, around antescutellar space, and on scutellum with a sprinkling of finer pale scales on dorsum. Upper sternopleuron with white semiraised scales; hairs on lower mesepimeron rather coarse, extending more than half way from scale patch to lower border posteriorly. Claws of fore and mid tarsi of both sexes equal and each with a comparatively large tooth. Abdomen with lateral oblique spots on segments II–VIII, extending slightly onto dorsum. *Hypopygium* (Fig. 6 in Laffoon, 1946): Coxite with a wide

flat apical extension directed mesad, minutely toothed apically on outer edge; a row of 3 stout dorsal bristles toward inner margin of coxite, an elongate stout arm basally from inner margin of lower fold, and a small submedian lobe with about 10 small bristles. Style with the basal portion elongate, bearing one stout bristle and about four smaller ones near the apex of this portion; arm long, wide, tapered to a point. Phallosome very small; paraproct short, stout, bluntly rounded. A specimen from the Philippines shows a bridge of the dorsal arms of the tenth sternite (H-shaped structure) with a short rounded posterior projection on each side. In the female genitalia the preatrial plates are hairy and united medially; the postatrial plate is apparently bare of hairs.

Larva.—Unknown.

The species was not taken by the present writers.

Aedes (Aedes) quadrifolium Brug

Aedes (Aedes) quadrifolium Brug, Bull. Ent. Res. 25: 512. 1934. (Type male from Torpedoboot River, New Guinea; type in British Museum.)

This species was described as having the head dark, scales on upper sternopleuron and mesepimeron dark brown, a row of hairs on the mesepimeron behind the scales, continued as a patch of hairs on the lower half, scales of anterior forked vein rather broadly lingulate, abdomen dark brown, crumpled, the venter invisible, style S-shaped with four or five rather strong hairs on inner border, coxite with four leaf-like appendages near apex, a small papilla with two hairs near base and a group of fine hairs still more basally, on inner side. In the illustration of the coxite the subapical leaflets are short and flared. Dark scales on the mesepimeron are unusual and this may have been due to discoloration. The species is not represented in our material but a related species is described under the name *multifolium*.

Aedes (Aedes) similis (Theobald)

Pseudokusea similis Theobald, Monograph of the Culicidae 5: 189. 1910. (Type female, Kuranda, Queensland, Australia.)

Aedes (Aedes) similis (Theobald), Edwards, Bull. Ent. Res. 14: 388. 1924. (Reported from Burengary, Queensland and Saparoea Island, Amboina.)

The type was described as having pale scales

(in some lights) in the middle of the head and around the eye margins, dull brown scales on the thorax with pale dull golden areas in front, over the wing roots and before the scutellum, the latter with narrow dull golden and brown scales, the abdomen with median lateral white spots above, which arise from more lateral basal white spots, the unguis all simple. Edwards (1924) stated that the scales on the upper sternopleuron were all white.

Additional notes on the species have kindly been furnished by Dr. Kenneth L. Knight from a recent examination of the type female in the British Museum. His notes may be excerpted as follows: vertex with some narrow white scales along eyes medially, some broad pale scales along nape, extending forward a ways on mid line; scutal integument dull reddish brown, scales bronzy, anterior margin of scutum with rather broad band of narrow ochreous scales; about 12 hairs on the posterior margin of the mesepimeral scale patch, one of which arises from the ventral margin; lateral spots of tergites visible dorsally on margin of II-VII, extending nearly a third the width of the dorsum, subbasally, on V-VII.

A pest mosquito commonly encountered in woods in southeastern New Guinea during the war agreed fairly well with Theobald's description (with the exception of pale scales on the head vertex) and was usually identified as *similis*. Larvae obtained by rearing from eggs laid by females collected at Milne Bay were described under this name by Lee (1944). Inquiries made by the senior author among Australian workers in 1944 and 1945, however, disclosed the fact that neither the male nor the larva of *similis* was definitely known. A sketch of the male genitalia of a specimen, possibly of this species, taken at Camp Mountain, near Brisbane, has kindly been sent us by Miss E. Marks. This shows a strong subapical spine on the coxite, very similar to that found in *carmentis*, and the hairs on the base of the style also appear similar, but the arm of the style is bent at nearly a right angle at the apical third instead of merely curved. The larva was said to be like *A. funereus* except for a longer siphon (index of 3.5 to 4.0 compared with 2.7) fewer comb scales (14-15 instead of 18-22) and a single large tooth on the pecten spines (instead of a large and several small side teeth). The female was said to be very dark, with

rather small basal lateral spots on the abdominal segments, and the claws simple. Until *similis* is more definitely defined it is impossible to determine whether it occurs in New Guinea. Edward's record (1924) from Amboina is a very doubtful one. The *similis*-like forms found in New Guinea are discussed under *parasimilis*, n. sp.

Aedes (Aedes) bifoliatus, n. sp.

Male.—Scales on vertex all dark; *apn* and *ppn* without scales, the latter with a few hairs in front of posterior bristles; scales on upper sternopleuron pale, translucent; mesepimeron with a few hairs just posterior to the lower part of scale patch; wing 2.2 mm, 1st fork cell about one and a half times as long as its stem, the lateral vein scales rather short and broad; fore and mid tarsal claws unequal, simple; segments 4 and 5 short, of equal length; abdomen with narrow transverse white bands on segments III to V, not basal, incomplete ones on VI and VII, segment II all dark above (in the Milne Bay paratype, segment III has a median basal spot only, complete bands on IV-VII, almost entirely basal). *Hypopygium* (Fig. 4): Coxite with two broadened leaflets, either flared and crinkled or somewhat spoonshaped, the distal one longer than the other, which is usually nearly as wide as long; toward inner margin of dorsum a row of three to five (usually four) spinelike curved bristles; a very stout hair at apex and several a little smaller on the outer margin; median lobe with two or three short bristles; basal lobe with about ten small fine hairs. Style strongly curved, the tip small and hooked, only three or four bristles about midway of the inner side (none on base), one rather stout and set in a prominent tubercle. Eighth sternite with a stout rod-like seta from the posterior margin on each side.

Female and larva.—Unknown.

Holotype.—Male, taken by the authors in a light-trap collection at Hollandia, May 18, 1945. Deposited in the U. S. National Museum.

Paratypes.—9 males, as follows: 8 from light-trap collections at Hollandia on January 18, 19, and 24, March 25, April 3 and 7, and May 5 and 6; male from Milne Bay, New Guinea, April 11, 1944, H. R. Roberts, No. 136 (slide 46, VII.24a).

Aedes (Aedes) foliformis, n. sp.

Male.—Scales of vertex apparently all dark on holotype (head shrunken) but two of paratypes with a median stripe of broad pale scales; upright scales on nape pale brown; scaling of *apn* and *ppn* not discernible; scutum dark, a sprinkling of golden scales around margins; pleura very dark; scales on upper sternopleuron pale; mesepimeron with a few hairs posterior to and just below the scale patch; wing 2.2 mm; first fork cell about equal its stem, the lateral vein scales moderately broad; fore and mid tarsal claws unequal, simple, segments 4 and 5 equal, short; abdominal tergites with wide transverse bands on segments II to VII, basal on II and III, subbasal on IV and V, submedian or median on VI and VII. *Hypopygium* (Fig. 15): Coxite with three comparatively long narrow subapical leaflets, (or two leaflets and a pointed spine), the two proximal ones somewhat spoonshaped, crinkled or striated, the tips broadly rounded but with a short point, the distal leaflet narrower and more pointed, or reduced to a pointed spine or heavy bristle; a rather stout bristle just beyond the group and a smaller one just before (basad); dorsum of coxite with two or three fairly heavy hairs and sparse slender ones; median lobe with two bristles; basal lobe with about five small hairs; style curved, with eight or nine scattered hairs from the moderately enlarged base.

Female.—Head with a median white stripe, consisting of a double row of broad white scales along posterior half or two-thirds of midline, sometimes spreading out a little on nape or with a few narrow pale scales in front of the stripe and in the angle between the eyes. *apn* bare of scales; *ppn* with narrow dark scales on upper third, and five posterior bristles. Scutum dark, with fine dark scales, a sprinkling of whitish or golden scales around the margins and sometimes faint indications of median and submedian lines; scutellar scales pale yellowish or golden. Upper scale patch on sternopleuron with about two-thirds of the scales pale, the lower third dark, no hairs along anterior margin of this sclerite; mesepimeron with a few hairs around the lower posterior corner of the scale patch. First fork cell a little longer than its stem, the lateral vein scales long and moderately broadened.

Claws of fore and mid tarsi each with a minute tooth (hardly visible unless mounted). Tergites II–VII with transverse white bands very similar to those in *lineatus*, usually about midway of the segments on VI and VII, curving forward in middle on the other segments and touching the base at the midline on II and III, also curving back to base underneath (the bands fairly close to the base for the entire width of the segment in a few specimens). In the genitalia, the postgenital plate is about as broad as long, with a shallow emargination.

The females are not definitely associated with the males but they are from the same locality and the markings are very similar in so far as can be determined from the rather poor condition of the males.

Larva.—Unknown.

Holotype.—Male, New Guinea, APO 322, IV-27-1944, E. S. Ross No. 50, with genitalia slide, 45-V-46 (Gusika, Finschhafen area, eastern New Guinea; no collection data), from the collection of the U. S. National Museum.

Paratypes.—3 males, 26 females as follows: 1 male from a light trap, Hollandia, Netherlands, New Guinea, December 4, 1944 (by the authors); 2 males, same lot as holotype; 15 females from same locality as holotype, Ross lots Nos. 29, 42, 44, 46 and 49, April and May 1944; 7 females, APO 713-J, New Guinea, August, 8-9, 1944, K. V. Krombein; 4 females same locality, Krombein lots 18 and 30, May 1944 (Nadzab on Markham River, eastern New Guinea). A few additional specimens (3 from Nadzab and 6 from Gusika) are not included as they are in poor condition.

Aedes (Aedes) leilae, n. sp.

Male.—Head vertex all dark; *apn* and *ppn* bare of scales, a few hairs in front of the bristles on *ppn*; scales of scutum and scutellum all dark; upper sternopleuron with only a few remaining scales, pale translucent, rather numerous minute hairs along anterior border; mesepimeron with a fairly large patch of hairs on posterior half extending more than half way from scale patch to lower border; wing 2.2 mm; first fork cell about equal its stem, the lateral vein scales rather short and broad; fore and mid tarsal claws unequal, simple. Abdomen with complete basal bands on segments III–VI, wide except in middle on III, apparently entirely basal (a stripe of bare in-

tegument between the bands and base of segment but no dark scales), segment II all dark above, scaling on base of segment VII indefinite, possibly an incomplete band. *Hypopygium* (Fig. 6): Coxite simple, without subapical processes or modified dorsal hairs; median area of lower fold with one strong bristle and two or three smaller ones; basal lobe with about 8 small hairs; dorsum with scattered small bristles, more numerous toward inner side at basal third. Style broad for most of its length, bent beyond middle, tapered at apex with four or five minute papillated hairs on inner side subapically; 12-15 small hairs scattered along dorsal and inner sides of style from extreme base to a little beyond the middle.

Female and larva.—Unknown.

Holotype.—Male, taken by the authors in light-trap No. 3, Hollandia, New Guinea, April 2, 1945, 500 feet elevation (with genitalia mount). Deposited in U. S. National Museum.

Paratypes.—6 males from light-trap collections at Hollandia, March 17 and 24, April 7 (2), April 12, and one undated, gen. No. 6 (the last four adults very moldy; genitalia of all mounted).

Aedes (Aedes) milnensis, n. sp.

This species is represented only by two slide mounts of the terminal segments of the male abdomen, the rest of the specimens having apparently been lost. The genitalia, however, are very distinct and it seems desirable to name the species as it stands.

Male.—Eighth sternite with two strong rod-like bristles arising near the posterior corner on each side, the bristles slightly swollen at basal third, the tips truncate, the longer one more than half as long as coxite. *Hypopygium* (Fig. 10): Coxite with a large dorsal patch of 15 to 20 bristles, a few rather thick, most of the others finely forked or trifold at tip; basal portion of dorsum with scattered slender normal hairs; a small sharply pointed leaflet subapically below base of style, flattened and striated basally; at apex, one very heavy blunt-pointed hair and two slightly smaller sharp-pointed ones; median lobe not visible; basal lobe with a few fine hairs. Style of about usual shape, with a pointed tip, 3 or 4 hairs in a group near apex of the enlarged basal portion.

Female and larva.—Unknown.

Holotype.—Male, represented by slide mount of terminal segments of abdomen, Milne Bay, New Guinea, T. K. Ruebush (? 1943); from the collection of the U. S. National Museum.

Paratype.—A similar slide of another specimen from same locality.

Aedes (Aedes) multifolium, n. sp.

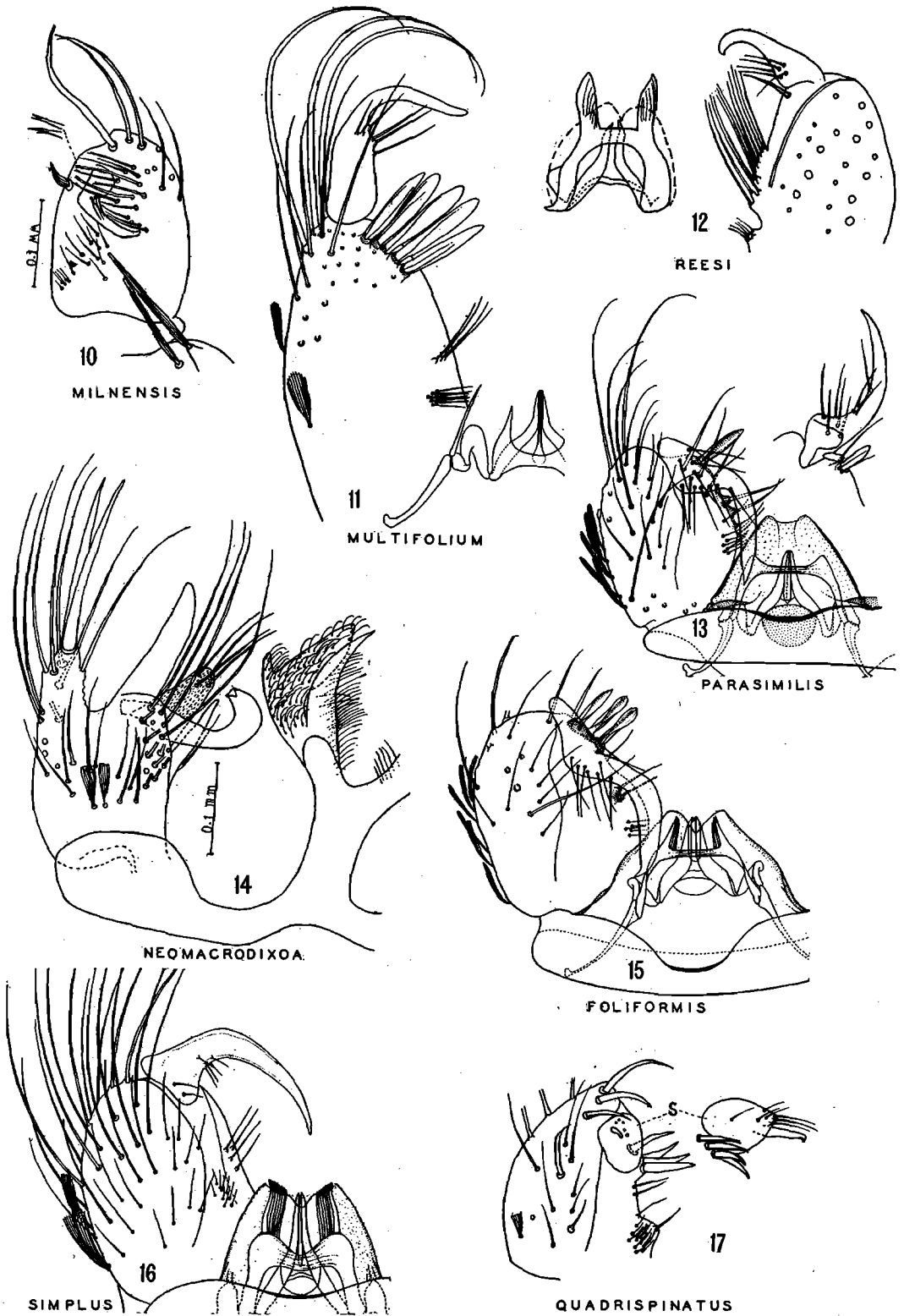
Male.—Scales of head vertex dark, a few on nape indistinctly palish; *apn* bare of scales; *ppn* with a few narrow scales on upper third and a very few hairs in front of bristles. Scutum and scutellum without pale scales (partly denuded); upper sternopleuron with appressed translucent scales and a few fine hairs toward anterior border; mesepimeron with 8 to 10 rather coarse hairs in a stripe beginning posterior to scale patch and ending about midway to lower border; wing 2 mm; first fork cell 1.7, times its stem, the lateral vein scales broadened; claws of fore and mid tarsi unequal, simple. Abdomen (partly denuded) apparently with only a median spot on segment II, complete narrow bands or indications on segments III-VI, distinctly removed from base. *Hypopygium* (Fig. 11): Subapical processes of coxite (of holotype) consist of a row of five elongate leaflets, broadly rounded at tip, the forward edge flattened bladelike, the posterior edge thicker. (In the paratype, which was badly mutilated in mounting and part of the leaflets broken off, the distal leaflet on one side appears to be replaced with a moderate bristle about as long as the leaflets, this portion being broken on the other coxite.) Apex of coxite with three very long, strong hairs; median lobe with three or four bristles; basal lobe with five or six fine hairs. Base of style unusually elongate, with five or six bristles on prominent tubercles toward apex of this portion; arm slender, strongly curved near base.

Female and larva.—Unknown.

Holotype.—Male, taken by the authors in a light trap at Hollandia, Netherlands New Guinea, January 18, 1945, with slide mount of genitalia.

Paratype.—Male, from a light trap same locality May 7, 1945. Types deposited in the U. S. National Museum.

Remarks.—The species is close to *A. quadri-folium* Brug, and the style appears identical. The holotype of *multifolium* has five instead of four subapical leaflets on the coxite, but only



FIGS. 10-17.—Male genitalia of *Aedes*: 10, *milnensis*; 11, *multifolium*; 12, *reesi*; 13, *parasimilis*; 14, *neomacrodixoa*; 15, *foliformis*; 16, *simplus*; 17, *quadrispinatus*.

four leaflets and a bristle may have been present in the paratype. From Brug's illustration and brief description, other distinctions may be noted as follows: leaflets of *multifolium* elongate and bladelike, instead of short and flared; dorsum of abdomen with white bands, instead of dark brown; hair patch on lower mesepimeron less extensive; scales on the mesepimeron pale, instead of dark as described by Brug.

***Aedes (Aedes) neomacrodixoa*, n. sp.**

Male.—Head vertex with flat black scales except for a small patch of narrow pale scales on the nape; *apn* unscaled; *ppn* with narrow scales on upper portion; scutum usually with a few pale scales over wing root, sometimes on median area of antescutellar space and on scutellum; sternopleuron with appressed darkish scales on upper third, and a few hairs in the anterior angle; mesepimeron nearly covered with pale hairs below the scale patch; wing 2.5–3.0 mm, first fork cell equal its stem, the lateral vein scales long and somewhat broadened; fore and mid tarsus with one claw much larger than the other and bearing a long tooth; claws of hind tarsus equal and simple; abdominal tergites unbanded dorsally, with large oblique spots laterally. *Hypopygium* (Fig. 14): Ninth tergite with a large Y-shaped median extension, considerably longer than the coxite, each arm tapered to a slender tip, bare above but with a fringe of hairs basally on the inner ventral side and scattered hairs underneath apically, a large ventrolateral branch, densely setose, with a lobelike division on the outer side. Coxite with a long stout apical membranous arm, bluntly rounded at tip and bare of hairs; a tall, columnar apicoventral lobe outwardly bearing two very stout apical bristles (three in one specimen) and about six to eight scattered slender ones; an equally long subapicoventral lobe on the inner side, finely pilose and with scattered slender bristles; a stout, tapered rod from the lower fold near base, with a single bristle from the basal fifth; a patch of 15 to 20 bristles on the apical half of the dorsum of the coxite toward the inner margin and a small group of 4 or 5 bristles on the venter; inner margin of lower fold fringed medianly with fine hairs. Style wide, attached near apex of coxite, bare of hairs, sharply bent near apex and ending in a blunt recurved tip. H-shaped

structure of tenth sternite not visible. Lateral plates of phallosome unusually long and slender.

Female.—Nape of head with a distinct patch of narrow pale scales mixed with the dark upright scales and extending forward part way on the midline, a few similar scales in the angle between the eyes; *apn* unscaled; *ppn* with scattered narrow scales on upper third, and about 6 posterior bristles; small patches of golden scales on front of scutum, over wing root, on scutellum and antescutellar space; sternopleuron with a large upper scale patch, the scales closely appressed but pale in appearance, fine pale hairs along the anterior border and in front of the bristles on the posterior border; mesepimeron with a large patch of hairs below the scale patch nearly to lower border; fore and mid tarsal claws with strong teeth; wing 2.7–3.0 mm (Hollandia specimen 3.5 mm), scales of first forked vein long, rather spatulate; abdomen with a basal lateral spot on segment II, oblique lateral stripes on III–VII extending well onto dorsum on the last three segments about midway from front to back.

Larva.—Unknown.

Holotype.—Male, taken by the authors in a light trap, Hollandia, Netherlands New Guinea May, 9, 1945 (gen. No. 1). Deposited in U. S. National Museum.

Paratypes.—20 males, 14 females, as follows: 2 males from light-trap collections, Hollandia, trap No. 1, May 16, 1945, and trap No. 2, April 4, 1945. 250 feet elevation; 1 male (Rozeboom, Knight, and Laffoon No. 221.1), 1 female (No. 221.5), Cyclops Mountains (Hollandia area), January 1945, 1,000 feet elevation; 17 males (E. S. Ross No. 51, April 23, 1944), 13 females (No. 50, April 24), and 4 females (No. 29, April 26), New Guinea, APO 322 (Gusika, Finschhafen area, eastern New Guinea), from the collection of the U. S. National Museum. Three additional males and two females of the Gusika lots are not included as they are in poor condition.

Remarks.—This species is very distinctive among the New Guinea forms not only by reason of the genitalia but by external markings as well. It is very similar to *A. macrodixoa* Dyar and Shannon, of the Philippines, but that species lacks the narrow pale scales on the nape. As mentioned by Laffoon (1946) the male genitalia differ in having more numerous

bristles in the group on the dorsum of the coxite (15–20 vs. 8–12) and a much longer apicoventral lobe, which is columnar in shape rather than triangular and has two or three strong apical bristles compared with one or two in *macrodixoa*. The arms of the Y-shaped process of the ninth tergite of *macrodixoa* are wider and more abruptly tapered apically and the hairy branch apparently lacks a lateral lobe. A male specimen from the upper Digoel River (South New Guinea) identified by Brug (1932) as *macrodixoa* is probably *neomacrodixoa*.

Aedes (Aedes) parasimilis, n. sp.

Female (holotype).—Specimen somewhat shrunken; scales on head vertex apparently all dark; *ppn* bare of scales and hairs; five posterior bristles. Scales of scutum and scutellum all dark, fine. Upper sternopleural scales distinctly pale, no hairs visible on anterior margin; mesepimeron with four or five hairs visible around lower posterior corner of scale patch. Wing length 2.8 mm; first fork cell 1.25 times its stem, the lateral vein scales moderately widened. Fore tarsal claws (mounted) simple; segment 4 normal, a little longer than 5. Abdomen unbanded dorsally, the lateral spots rather large, their tips distinctly removed from base of tergites and visible dorsally on some of the posterior tergites.

Male.—Known with certainty only from the genitalia (Fig. 13); coxite subapically with a flattened blade-shaped leaflet, slightly pointed, a moderate bristle slightly distal to the leaflet and 2 smaller bristles set very close to base of leaflet, dorsally; a single rather stout median bristle from the lower fold and several fine hairs on basal lobe; dorsum with fairly numerous moderately long hairs on apical half, two of them rather stout. Style with eight bristles, five on the enlarged basal portion, two close together at the base of the arm and one at its middle; arm wide, flat, moderately curved, tapered apically to a small point. H-shaped structure of tenth sternite present but posterior arms not visible in mount; other parts appear about as usual.

Larva (Fig. 20).—Antenna spiculate; tuft about at middle, with four or five lightly plumose branches. Preclypeal spines long and slender. Head hair A about 10-branched; B and C each with three lightly plumose branches, the central one longer and stronger than the others,

C well back of and inside of B; *d* minute, about 4-branched, well forward and inside of B; *e* single; *f* 3-branched. Mentum large, triangular, with about 18 small teeth on each side. Upper lateral hair of abdominal segment I 3-branched, lower single; lateral hair of II 2- or 3-branched, of III to VI usually single. Comb a single row of about 13 scales each rounded and fringed; pentad hair 1 much smaller than 5, with six or seven simple branches. Airtube, index about 2.5, acus present; pecten of 12–15 spines, the apical two longer and more widely spaced than the others, with one or two small side denticles; other spines with one strong and one or two small subbasal denticles; tuft 4-branched, inserted before the last spine; hair on ventral valve 3-branched. Anal segment not completely ringed by plate; lateral tuft single; dorsal subcaudal hair with 3 very unequal branches, the longest about two-thirds length of the single ventral subcaudal hair; two small tufts in front of ventral grid; anal gills moderate, equal, a little longer than saddle.

Holotype.—Female, with larval and pupal skins, Lot 634-1, 19th Medical General Laboratory, Hollandia, Netherlands New Guinea, December 22, 1944, reared from larva taken from a crayfish hole in rain forest, 250 feet elevation (W. T. Nailon, collector).

Paratypes.—A slide mount of two larval skins and the male genitalia taken from one of the two resulting pupae, which died after pupation, King Lot. No. 147, from pools at edge of swamp in Embi Lakes area, Dobodura, Papua, December 14, 1943 (W. V. King); 7 whole larvae (on slide mounts), H. R. Roberts No. 136, Milne Bay, Papua, April 11, 1944 (Faris and Gossington). The last are from the collection of the U. S. National Museum, and the other two types are deposited there.

Remarks.—This is one of the species of which females have been commonly encountered as pests in parts of New Guinea and usually identified as *similis*. It differs from *similis* in having the scales on vertex all dark and fewer hairs on the lower mesepimeron. The larva is the same as the one described by Lee (1944) from Milne Bay under this name (the paratype larval skins from Dobodura having been so identified by him). Unfortunately, we have only one female and one male terminalia (neither in the best of condition) definitely associated with this type of larva. Five unassociated male specimens at

hand have genitalic characters indistinguishable, or with only slight variations, from those of the paratype but the specimens show two types of tarsal characters that indicate specific differences in the series. One of these, type A (Fig. 9A), is represented by three specimens, one from our light-trap collections at Hollandia, 22-IV-45, one from our lot No. 459 at Hollandia, 22-XII-44, reared from a sago swamp pool, and one from lot No. 91, 40th MSU, Finschhafen, eastern New Guinea, 1944. They have segments 4 and 5 of the fore and mid tarsi of about equal length and the claws on each segment very unequal in size (as usual in the New Guinea species). The other, type B (Fig. 9B), represented by two specimens (one from our light-trap collections at Hollandia, 22-III-45, and one from H. R. Roberts lot No. 136, Milne Bay, 11-IV-45, slide No. 46-VII-28b, reared from a forest rain pool), has segment 4 of the fore and mid tarsi twice as long as segment 5, while the two claws on each foot are small and about equal in size (claws simple in both types). All segments of the legs of the type B specimens are in fact much longer than those of one measured type A specimen (light trap 22-IV-45), the total length of the fore legs of the two type B males being 7.5 and 7.0 mm., compared with 3.7 for the one type A. The Milne Bay male bears the same lot number (136) as the seven paratype larvae, thus indicating that the type B male is *parasimilis*. However, there were three other species reared in the same collection and several other kinds of larvae were found in the larval material so the association is not positive. There are also seven females from this lot that are very similar to the holotype except that the claws of the fore and mid tarsi (at least in mounts from three specimens) have minute teeth, a character that may be variable. Because of the several elements of doubt, further material will be needed to settle the identity of the males of the two types.

The Museum collection contains a rather large number of female specimens from Milne Bay, most of them (about 160 in all) from various Roberts lots taken in biting collections, which are referable to the *parasimilis* series. About a fourth of these have the scutal scales all dark while most of the others have small patches of golden scales over the wing root or on the antescutellar space, a small proportion

being indefinite or with only two or three pale scales. The tarsal claws of five specimens in these lots were mounted for examination (in addition to the three in lot 136 previously mentioned). One female in lot 130 had the same combination of simple claws and all dark scutal scales as in the holotype. Two others in this lot with small patches of pale scales on the scutum also had simple claws. Of two females from lot 127, each with a few pale scales on the scutum, one had simple claws, the other minute teeth on the fore and mid claws. Of seven females from the Hollandia area (Rozeboom, Knight, and Laffoon collections), four from the Cyclops Mountains (1,000 feet) had distinct patches of pale scales on the scutum, and the mounted claws of two of these were found to be simple; three from the vicinity of Lake Sentani had the scutal scales all dark and one mounted specimen showed minute teeth. Thus in the series examined, there was a negative correlation in nine of twelve females between the occurrence of claw teeth and pale scales on the scutum; two of the others (including the holotype) had simple claws and a dark scutum while one had toothed claws and a few pale scutal scales. A study of reared series will be required to determine whether the occurrence of minute teeth (see Fig. 8A) is variable within the species.

Aedes (Aedes) quadrispinatus, n. sp.

Male.—Tori dark; head shrunken in all specimens, broad scales on nape ruffled, more or less pale, extending forward a short distance along midline in some specimens (distinct in male from Goodenough Islands), a few narrow scales sometimes visible in angle between eyes. Scutal integument with a median dark stripe or submedian dark lines, paler laterally, the scales entirely dark or with a few pale ones in front; scutellar scales dark; *apn* bare of scales; *ppn* with scattered narrow scales on upper third and a few rather long hairs in front of the lower bristles; four or five posterior bristles. Pleura dark; upper sternopleuron with a small patch of appressed translucent scales, some fine hairs along anterior border; mesepimeron with unusually coarse hairs covering most of the posterior half below the scale patch or extending well toward the lower border. Wing .22 mm; first fork cell about equal its stem, the lateral scales rather broad and short. Claws of fore and mid tarsi unequal, simple. Abdomen with a

small median white spot on segment II, complete narrow bands on III and IV, complete or nearly so on V and incomplete in middle on VI and VII, the bands mostly basal or slightly sub-basal toward sides (complete and quite wide on III-VI in Goodenough specimen). *Hypopygium* (Fig. 17); Coxite with four heavy, bluntly pointed subapical spines below base of style, the distal one the smallest and sometimes reduced to a heavy bristle; apex of coxite extending a little beyond base of style, with three or four very heavy bristles in a row dorsally, the distal one the longest; usually one or two moderately strong hairs interspersed with six to eight slender hairs on remainder of dorsum; median lobe with two bristles; basal lobe with 10 to 14 fine hairs; style with a greatly enlarged base, ovoid in shape from above, with four or five scattered small bristles and three longer ones from distal edge; arm of style very small and slender (hardly discernible in the usual mount), bent into a right-angled beak at tip.

Female.—Abdomen with large lateral spots only, tending away from base slightly at edge of tergites, extending well onto dorsum of segment VII and often on V and VI. Claws of fore and mid tarsi with minute teeth (not visible until mounted). Wing 2.7 mm; first fork cell a little less than twice its stem. Post genital plate about as wide as long, very shallowly emarginate. One of the paratype females from Milne Bay has rather pale broad scales on the nape. In the females of Ross lot No. 27, the head is so badly shriveled that the color of the scales on the nape cannot be discerned.

Larva.—Unknown.

Holotype.—Male, New Guinea, APO 565 (Toem, Northern Netherlands, New Guinea), VIII-1-44, E. S. Ross No. 27. From the collections of U. S. National Museum.

Paratypes.—15 males, 35 females as follows: 13 males, 34 females from the same lot as the holotype (all more or less shriveled), with two slides of male genitalia and one of the female (1 additional male and 5 females from this lot, in poor condition, are not included); 1 male, Milne Bay, New Guinea IV-11-44, H. R. Roberts No. 136; 1 male, 1 female, Watutu Point, Goodenough Islands, Papua, New Guinea, VII-17-43, B. E. Rees.

Remarks.—The two specimens from Goodenough are included in the concept of this species although they differ in certain respects and

perhaps represent a subspecies. Both specimens have a distinct median stripe of broad pale scales on the head, the male has a complete white band on tergite VI and the female, in which the abdomen is partly denuded, has nearly a complete line of pale scales on tergite III and indications of one on IV. The female also has more distinct pale scaling on the scutellum and the antescutellar space. The pleural characters are very similar, as also most of the genitalia, especially the unusual style. Only three typical subapical spines are present on the coxites, the fourth one being represented by a stout bristle on one side (which also occurs in one side in a Toem specimen). A female specimen from Milne Bay (H. R. Roberts No. 220, IV-11-44) is probably this species and resembles the Goodenough female in having some pale scales on the nape.

Aedes (Aedes) reesi, n. sp.

Male.—Head vertex dark scaled; *apn* and *ppn* bare of scales (the latter possibly denuded), scutum and pleura very dark; scales of scutum and scutellum all dark; scales of upper sternopleuron translucent, very indistinct; mesepimeron with a few hairs posterior to and just below the small scale patch (none discernible on holotype); first fork cell about a half longer than its stem, the lateral scales rather slender; wing length 2.2-2.5 mm; fore and mid tarsal claws unequal, simple, Abdomen with basal white bands on segments III-VII, broad on posterior segments, II and VIII all dark (none of the paratypes, which are more or less rubbed, shows complete bands). *Hypopygium*: Coxite with a single bristle subapically below base of style; dorsum with an inner and outer row of strong hairs and 6 to 8 bristles in between; submedian lobe with a patch of 12 to 20 long bristles, appearing as a prominent fringe in profile; basal lobe with about 10 fine hairs. Style with a pointed arm, moderately curved, a group of five bristles near base. (Fig. 12).

Female.—Two specimens in the same collection as the males are probably this species although differing in the abdominal banding. Thorax very dark; *ppn* with scattered dark hairs on upper third in one specimen, two or three only on other (possibly rubbed); scales of upper sternopleuron appear dark; a few hairs posterior to scale patch on mesepimeron; tarsal claws apparently all simple (not mounted); first

fork cell about twice the length of its stem on one specimen, slightly shorter on the other, the lateral vein scales quite slender; wing length 2.2 mm. Abdomen with lateral white spots only, basal below, extending somewhat obliquely and the tips showing slightly above, removed from base, on some segments.

Larva.—Unknown.

Holotype.—Male, Vivigani, Goodenough Islands, Papua, New Guinea, VII-8-43, B. E. Rees (Genitalia slide 46.VII, 26a). From the collection of the U. S. National Museum.

Paratypes.—3 males (2 with the genitalia mounted) and 2 females, same data as holotype except that one of the males is dated July 9; one additional slide mount of male genitalia, the adult for which is missing; same locality as above but dated July 10.

***Aedes (Aedes) sentanius*, n. sp.**

Male.—Scales of head vertex all broad and dark. Scales of scutum and scutellum all narrow and dark or with a few pale ones over wing roots and on mid lobe of scutellum; *apn* bare of scales; *ppn* with a few narrow scales on upper half, and two long and two short posterior bristles; propleuron with white scales and about six bristles; scales on upper sternopleuron translucent, darkish; mesepimeron with a few pale hairs posterior to and just below the scale patch. Wing 2.5 mm; lateral scales of the forks of vein 2 slightly broadened; first fork cell about one and a half times the length of its stem. Segments 4 and 5 of fore and mid tarsi both short, subequal, the claws of each unequal, simple. Abdominal tergites with large lateral spots, extending slightly onto dorsum on segments VI and VII, either entirely basal or the more dorsal part slightly subbasal; sternites with the basal half pale scaled. *Hypopygium* (Fig. 7): Coxite with a single stout, straight subapical spine below the base of the style and a slightly longer bristle anterior to its base; median lobe with 3 close-set bristles; subbasal lobe with about 15 short hairs. Style with about 8 slender scattered bristles toward the inner side of the enlarged basal portion.

Female.—As in the male except that there are usually distinct small patches of yellowish scales on the front margin of the scutum, over the wing base, on the median area of the antescutellar space and on at least the mid lobe of the scutellum; upper fork cell about twice as

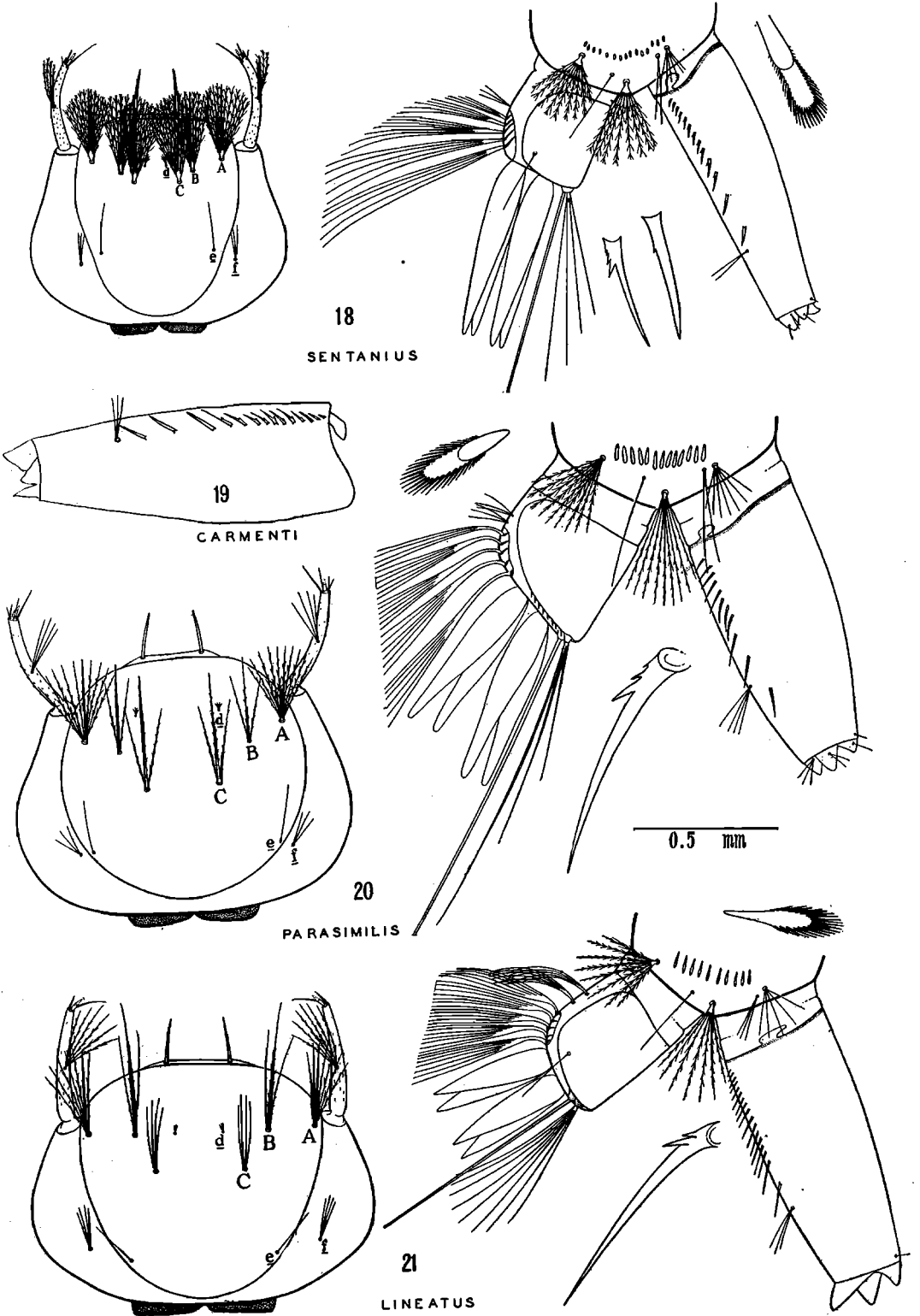
long as its stem; claws of fore and mid tarsi each with a minute tooth (not visible until mounted); lateral spots of abdomen visible above only on segment VIII.

Larva (Fig. 18).—Antenna nearly half as long as clypeus, somewhat bowed, with numerous fine spicules; tuft about at middle, with three to five (usually four) lightly plumose branches; preclypeal spines long and slender; hair A with 12 to 16 branches; B with 6–10 branches; C slightly behind and inside of B, with 7–13 branches; *d* minute, about 4-branched, *e* single, *f* 3- or 4-branched. Mentum with 16 or 17 fine teeth on each side. Mesopleural tufts double, arising from a sclerotized plate with two or three small spines; metapleural tufts triple, with an additional long hair. Upper lateral hair of the 1st abdominal segment triple, the lower single; lateral hair of segment II double, of III to V usually single; comb of 12 to 16 scales in a fairly regular row, each rounded and fringed; siphon index from 2.75 to 3.50; acus present; pecten of 11 to 14 spines extending beyond middle, the apical two or three more widely spaced and either simple or with a small lateral tooth, the others shorter, with a strong subbasal tooth and one to three smaller ones; tuft beyond last spine, with two or three branches. Lateral hair of anal segment single, dorsal subcaudal hair with four or five subequal branches, less than half as long as the ventral hair; gills slender, about twice as long as saddle.

Holotype.—Male (lot 1124 19th M.G.L.), reared from larva from a hogwallow in a sago swamp at Poeë Village on south side of Lake Sentani (Hollandia area), Netherlands New Guinea, June 5, 1945 (W. B. Crist and P. L. Douglas).

Paratypes.—9 males, 5 females as follows: 4 males (1043B, 1120, 1129-9, 1124) and 4 females (1043C, 1120-5, 1120-8, and 1120-10), all from the same location and from the same or similar breeding places as the holotype, April to June 1945; 2 males from light trap collections at Hollandia, April 3 and 9, 1945; 3 males (King No. 140 and 140-1), reared from shallow footprints in dense forest, Dobodura, Papua, New Guinea, December 5, 1943 (W. V. King).

Remarks.—The male genitalia of this species are very similar to those of *carmentis*, differing principally in the distribution of the bristles on the style and in the smaller number of bristles



FIGS. 18-21.—Head and terminal segments of *Aedes* larvae: 18, *sentanius*; 19, *carmenti* (siphon only); 20, *parasimilis*; 21, *lineatus*.

on the median lobe of the coxite; the adults have simple claws in the male and minute teeth on the fore and mid claws in the female (vs. large teeth in *carmentis*), and the *ppn* and sternopleuron are much less hairy. The genitalia and other characters of the adults also seem to be close to those of the Brisbane species previously mentioned as possibly being *A. similis*. The larva, however, differs from this as well as all other known Australasian larvae in having more branches in the head hairs and four or five subequal branches in the dorsal subcaudal tuft of the anal segment.

A series of 24 females in the writers' collection from Hollandia during 1945 (taken while biting), are identifiable as this species as they agree in all respects except that about half of them have from 1-3 broad pale scales in front of the bristles on the *ppn*, and one specimen has a large patch. Two females from Milne Bay (H. R. Roberts No. 203 and 218, April 1944) and two whole larvae from Hihilai, Milne Bay (Roberts No. 68, May 24, 1944) also are this species.

Aedes (Aedes) simplicus, n. sp.

Male.—Head vertex dark; *apn* and *ppn* bare of scales; scales of scutum and scutellum all dark; upper sternopleuron with a few pale translucent scales, no hairs visible anteriorly; about five hairs posterior to and just below scale patch on mesepimeron; claws of fore and mid tarsi unequal, simple; wing 1.7 mm, first fork cell about equal stem, the lateral vein scales short and quite broad; markings of abdomen indistinct, small basal lateral spots visible on segments V and VI, no pale scales dorsally on these segments. *Hypopygium* (Fig. 16): Coxite unusually simple for this group, without subapical processes or modified dorsal hairs; a few short bristles medianly on lower fold, not forming a distinct median lobe; basal lobe with about seven fine hairs. Style moderately curved, tapered to a small point; two small hairs on the widened base and five at about the basal fourth. Lateral plates of phallosome a little longer and slenderer than usual; posterior extensions of the H-shaped structure of the 10th sternite with about eight filaments each (more distinctly visible than usual in this mount), separated and rather blunt at tip.

Female and larva.—Unknown.

Holotype.—Male, taken by the authors in a

light trap at edge of rain forest, Hollandia area, Netherlands New Guinea, February 21, 1945. Deposited in U. S. National Museum.

Aedes (Aedes) trispinatus, n. sp.

Male.—Head missing in holotype, vertex in poor condition in the others; *apn* bare of scales, *ppn* with four posterior bristles and scattered dark hairs in front of the bristles, with a few toward the upper border; sternopleuron with the upper scales translucent, closely appressed, a few fine hairs along anterior border; mesepimeron almost entirely covered with fine pale hairs below the small scale patch; fore and mid tarsal claws unequal, simple. Abdomen with complete bands on segments II-VI (VII removed with genitalia), rather wide on IV-VI, slightly subbasal toward sides. Wing 2.2; 1st fork cell 1.5 times stem. *Hypopygium* (Fig. 3): Coxite with three strong, rather long, tapered subapical spines, the distal one smallest, and one or two slender bristles near their bases; at apex, two close-set strong curved bristles, somewhat longer than the longest spine; two or three strong hairs from dorsum; a rather prominent subbasal lobe, with 10 to 15 bristles; H-shaped structures of tenth sternite present, the posterior arms membranous, leaf-shaped; eighth sternite with the posterior row of about eight bristles considerably stronger than the preceding ones.

Female.—Head with a small triangular patch of broad pale scales on nape; *ppn* with scattered dark narrow scales on upper half; and rather numerous fine hairs in front of bristles, one also with scattered broad pale scales; scutum pale brown, the scales entirely dark. Sternopleuron and mesepimeron similar to male; tarsal claws apparently simple (not mounted); abdomen with complete white bands on segments II-V, complete or nearly complete on VI, incomplete on VII, entirely basal or slightly removed submedianly on V and VI, joined to large lateral basal spots. Wing 3 mm; 1st fork 1.5 times its stem; scales moderately spatulate.

Larva.—Unknown.

Holotype.—Male, Milne Bay, New Guinea (Papua), IV-11-44, (H. R. Roberts No. 136, gen. slide 46, VIII.4e). From collection of the U. S. National Museum.

Paratypes.—3 males, 5 females as follows: 3 males from light-trap collections by the authors at Hollandia in 1945, one ♂ on May 7 (gen.

No. 3), one April 6 (gen. No. 7; adult badly moulded), and one April 17 (gen. No. 11; adult moulded); 2 females, same lot as holotypes; 2 females (H. R. Roberts No. 203), IV-3-44, and one female (Roberts No. 127), IV-7-44, from Milne Bay. Three additional females of Roberts lot 136 are similar to the paratypes in most respects but the abdomen is not banded. One has a faint yellowish color at base of segments, the other two are partly denuded. These are possibly *quadrispinatus* but the hairs on the lower mesepimeron and on the *ppn* are more suggestive of *trispinatus*. Two of them have a triangular patch of white scales on the nape.

ADDITIONAL SPECIES

The following unnamed or unidentified forms have been examined in the Museum collection:

(1) A series of 26 females from APO 322 (Gusika, Finschhafen area, eastern New Guinea), E. S. Ross Nos. 2, 42, 44, 45, and 49, April and May 1944. These have a short median stripe of broad white scales on the head and are similar otherwise to *foliiformis* except that the abdomen is unbanded dorsally, having oblique lateral spots only. The form is possibly the female of one of the species described herein, or perhaps belongs to the *parasimilis* complex.

(2) Four larval skins, J. T. Medler, Malaria Unit No. 75, New Guinea, 1944 (probably from Milne Bay), Nos. 7-27, 1, 2, 3, and 4, with pupal skins also of subnumbers 1 and 2, but the adults missing from the pin mounts. Head hair B 2-branched; C, 3- or 4-branched; siphon index 3.2; pecten of 6 to 8 very strong teeth spaced along tube nearly to apex, a few very fine fringe hairs visible at base of some of the spines; tuft 4-branched, inserted near the second spine from apex; dorsal and ventral subcaudal hairs of anal segment each single, very long; gills very long, slender, from 1.5 to 2 times as long as siphon.

This distinctive larva is similar to two specimens from Guadalcanal (20th MSU No. 776 sub 101 and 102, J. N. Belkin; Stone sp. No. 12) from which adults were reared and which will be described by others.

(3) Four whole larvae, H. R. Roberts No. 136, Milne Bay, April 11, 1944. Head hairs B and C each 2-branched; comb of about 16 elongate scales, rounded and fringed; siphon index about 2.5; pecten of about 10 spines on

basal half, the apical one more widely spaced, the others with a single, very large basal denticle; tuft 3-branched, well beyond last spine; dorsal subcaudal hair with three subequal branches, less than half as long as the ventral subcaudal hair.

Of ten other larvae examined from this lot, seven were *parasimilis*, two were possibly *carmentis* and one differed slightly from *lineatus*. Four different species were represented by four males reared from this lot (*bifoliatus*, *parasimilis* type B, *trispinatus*, and *quadrispinatus*). Seven of the reared females belonged to the *parasimilis* series, two were *trispinatus* and two were near *trispinatus*. It is very unfortunate that there were no definite associations of the larvae with the adults of this interesting lot.

KEY TO ADULTS

Because of the limited number and poor condition of specimens in a part of the species, certain of the external characters employed in this key are provisional. Some caution in using the key is recommended, therefore, particularly with respect to the extent of white scaling on tergites II and VII.

1. Abdomen with complete transverse white bands. 2
- Abdomen with lateral white spots or oblique stripes only. 10
2. Scutum with median and lateral stripes of yellowish or golden scales; head with a median stripe of broad white scales and narrow pale scales along eye margin; *apn* covered with narrow yellowish scales in female, broad white scales in male; abdominal bands about midway of segments at sides, curving toward base in middle. *lineatus* (Taylor)
- Scutum without distinct ornamentation; *apn* bare of scales or with only occasional broad ones. 3
3. Mesepimeron largely covered with hairs below the scale patch or at least extending more than halfway from scale patch to lower border posteriorly; abdominal bands basal or nearly so. 4
- Mesepimeron with only a few hairs posterior to and just below the scale patch, sometimes extending a short distance below (less than halfway to lower border). 6
4. Tergite II dark or with a median white spot not joined to lateral spot, bands on VI and VII sometimes incomplete; hairs on mesepimeron comparatively coarse and dark. 5
- Complete bands on tergites 2-6; mesepimeral hairs fine, pale, very numerous; females at

- least with a triangular patch of broad white scales on nape. *trispinatus*, n. sp.
- 5. Tergite II with a median white spot; band incomplete on tergites VI and VII; head with pale broad scales on nape (? always); upper *ppn* with scattered dark scales. male of *quadriscopinatus* n. sp.
Tergite II entirely dark above; VI with a complete band (VII ?); head vertex all dark; *ppn* bare of scales (female unknown). *leilae*, n. sp.
- 6. Abdominal tergite II (usually VII also) without a transverse band. 7
Tergite 2 and 7 with complete transverse white bands, median or submedian on at least VI and VII; head with a median strip of broad pale scales in female, probably also in male. *foliiformis*, n. sp.
- 7. Abdominal bands mostly basal or only slightly removed. 8
Abdominal bands distinctly removed from base; tergite II with a median white spot; sternopleuron with a few fine hairs anteriorly; upper *ppn* with scattered dark scales (female unknown). *multifolium*, n. sp.
- 8. Tergite II with median and lateral white spots above; band incomplete on VII. *funereus* (Theobald)
Tergite II entirely dark above. 9
- 9. Tergite VI with a complete band. male of *reesi*, n. sp.
Tergite VI with band incomplete (female unknown). *bifoliatus*, n. sp.
- 10. A large patch of hairs on lower mesepimeron, extending more than halfway from scale patch to lower border. 11
Only a few hairs below the mesepimeral scale patch posteriorly, or not extending below middle of lower half. 14
- 11. Head with narrow pale scales on nape or broad pale ones on midline; claws of fore and mid tarsi with large teeth. 12
Head all dark or with broad pale scales on nape; tarsal claws, if present, very small (claws not described for *quadrifolium*) . . . 13
- 12. A triangular patch of narrow yellowish scales on nape; claws of fore and mid tarsi of male unequal, only the longer one toothed; apical lobe of coxite and Y-shaped extension of ninth tergite prominent. *neomacrodixoa*, n. sp.
Head with a few broad pale scales on midline and eye margin, sometimes 2 or 3 narrow scales on midline but none on nape; claws of fore and mid tarsi of male equal and each toothed; coxite and ninth tergite not as above. *panayensis* Ludlow
- 13. Head all dark (female unknown). *quadrifolium* Brug
Broad pale scales sometimes present on nape. female of *quadriscopinatus*, n. sp.
- 14. A large tooth present on the claws of fore and mid tarsi of female and the larger claws of males; *ppn* with a comparatively large patch of fine pale hairs in front of the

- bristles (in addition to narrow dark scales on upper third). *carmentis* Edwards
- Claws of fore and mid tarsi with very small teeth or simple (all simple in male); *ppn* with very few if any hairs in front of bristles. 15
- 15. Head with a stripe of broad white scales on posterior half of midline. Unidentified females from Finschhafen area
Head scales dark on midline. 16
- 16. *Ppn* with scattered narrow dark scales on upper third. 17
Ppn bare of scales. 18
- 17. Small patches of fine golden scales on front of scutum, above wing root, on median area of antescutellar space and on scutellum; lateral scales of forks of vein 2 somewhat broadened, distinctly wider apically than at basal third. *sentanius*, n. sp.
Scutal scales all dark; lateral scales of vein 2 linear. female of *reesi*, n. sp.
- 18. Males (see key to male genitalia). *parasimilis* series and *simplus*, n. sp.
Females (unknown in *simplus*). 19
- 19. Tarsal claws all simple (the validity of this character has not been fully established). *parasimilis*, n. sp.
Claws of fore and mid tarsi each with a minute tooth (visible after mounting). near *parasimilis*
(The female is unknown or not definitely associated in *quadrifolium*, *multifolium*, *bifoliatus*, *leilae*, *simplus* and *milnensis*; only the genitalic characters of the last species are known.)

KEY TO MALES BY THE GENITALIA

- 1. Ninth tergite with a large median Y-shaped extension, each arm with a large hairy branch; coxite with several processes including a subapical lobe bearing two or three heavy bristles at tip (plainly visible in unmounted terminalia). *neomacrodixoa*, n. sp.
Ninth tergite without such an extension. 2
- 2. Coxite with a wide flat apical extension, and a strong elongate arm from inner side of base. *panayensis* Ludlow
Coxite without such appendages. 3
- 3. Coxite with two or more subapical leaflets or heavy spines below base of style. 4
Coxite with a single subapical spine or leaflet, or with none. 9
- 4. Coxite with two flared subapical leaflets on inner margin and a row of four or five spine-like bristles on dorsum; 8th sternite with a heavy truncate bristle from each side of posterior margin. *bifoliatus*, n. sp.
Coxite with more than two subapical processes; 8th sternite without modified bristles. 5
- 5. Three subapical processes present. 6
Four or five subapical processes present. 7
- 6. Coxite with three heavy pointed subapical spines and a close set pair of heavy hairs at

- apex; median lobe with 10-12 bristles *trispinatus*, n. sp.
- Three rounded leaflets or two leaflets and a strong bristle, subapically; no heavy apical hairs; median lobe with only two bristles *foliiformis*, n. sp.
- 7. Four heavy spines below base of style (the distal one sometimes reduced in size), and three very heavy bristles near apex on dorsum; arm of style very small *quadrispinatus*, n. sp.
- Four or five leaflets subapically, no heavy bristles on dorsum; base of style elongate, the arm not unusually small 8
- 8. Four rather short, flared leaflets on coxite *quadrifolium* Brug
- Five (? sometimes four) comparatively long blade-like leaflets *multifolium*, n. sp.
- 9. Coxite very simple, without spines or unusual patches of bristles 10
- Coxite with a subapical spine or leaflet, or with unusual patches of bristles 11
- 10. Style with a group of about five hairs at basal third, the arm curved beyond these and tapered to a point *simplicis*, n. sp.
- Style with small hairs scattered on basal two-thirds, bent at apical fourth, a few minute papillated hairs near tip *leilae*, n. sp.
- 11. A group of rather short, modified bristles on dorsum of coxite 12
- Without a distinct group of modified bristles dorsally 13
- 12. Dorsal group consisting of about eight spine-like bristles, ending in a simple point; a single subapical bristle below base of style; eighth sternite without heavy truncate bristles posteriorly *funereus* (Theobald)
- Dorsal patch of ten or more moderately strong bristles, most of which are forked at tip or have one or two minute side branches subapically; a sharply pointed leaflet, flattened basally, below base of style; a pair of elongate, stout, truncate bristles on each side of posterior margin of 8th sternite *milnensis*, n. sp.
- 13. Inner margin of coxite with a prominent elongate median patch of 12 to 20 long slender bristles set in prominent tubercles; subapical process represented only by a moderately strong bristle *reesi*, n. sp.
- Median lobe and subapical process otherwise 14
- 14. Subapical process a very stout bluntly pointed spine 15
- Subapical process a slender leaflet, at least flattened apically 16
- 15. Style with a group of about 8 bristles on the inner side of the base, a second group of about five smaller ones on dorsal side; median lobe with about ten bristles *carmeni* Edwards
- Base of style with about 8 scattered slender bristles, not forming distinct groups; median lobe with one or two bristles *sentanius*, n. sp.

- 16. Arm of style with 3 bristles, 1 near middle and 2 near its base (in addition to several on the enlarged basal portion of style); subapical leaflet short, blade-shaped, a moderate bristle distal to it (*parasimilis* series) 17
- Arm of style with a single bristle, arising near its base; leaflet longer, frequently with the edges curled, scoop-shaped, a stout bristle or slender spine distally *lineatus* (Taylor)
- 17. Fore and mid tarsi with one claw distinctly larger than the other; segment 4 and 5 of about equal length *parasimilis* Type A
- Tarsal claws equal; segment 4 of fore and mid tarsi about twice as long as 5 Type B

KEY TO KNOWN LARVAE

- 1. Ventrolateral hair of siphon inserted before end of pecten 2
- Ventrolateral hair inserted beyond last pecten spine 3
- 2. Anal gills normal, shorter than siphon; dorsal subcaudal hair with 3 unequal branches; pecten with 12 to 15 spines *parasimilis*
- Anal gills very long, 1.5 to 2 times as long as siphon; dorsal subcaudal hair single, long; pecten of only 6 to 8 spines, extending nearly to apex species from ? Milne Bay (Medler No. 7-27)
- 3. Head hairs B and C each with 6 or more branches; dorsal subcaudal hair with 4-5 subequal branches *sentanius*
- Head hair B at least with no more than 3 branches 4
- 4. Dorsal subcaudal tuft of anal segment with about 8 subequal branches; siphon index usually about 2 5
- Dorsal subcaudal tuft with 3 branches; siphon index 2.5 or more 6
- 5. Head hair B 3-branched, C 4-branched *lineatus*
- Head hairs B and C each 2-branched specimens from Milne Bay (Roberts No. 136)
- 6. Head hairs B and C each 2-branched, pecten spines with a single, unusually large basal denticle; branches of dorsal subcaudal hair subequal 4 specimens from Milne Bay (Roberts No. 136)
- Head hair B 3-branched, C with 5 or 6; branches of subcaudal hair unequal 7
- 7. Pecten spines with a single basal denticle *carmeni*
- Pecten spines with one fairly large and several smaller basal denticles *funereus*

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