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BY

ELIZABETH N. MARKS, M.Sc., Ph.D.

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National Mosquito Control Committee

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# The Subgenus *Ochlerotatus* in the Australian Region (Diptera : Culicidae)

## II. Five new species from Western Australia

By ELIZABETH N. MARKS

Both sexes, larvae and pupae of *Aedes hodgkini* sp.n., *Aedes macintoshi* sp.n. and *Aedes ratcliffei* sp.n. are described. On male terminalia characters these are placed in the Perkinsi Section of Australian *Ochlerotatus*, and they are compared with other species of this section and with South African species. *Aedes hesperonotius* sp.n. and *Aedes purpureifemur* sp.n. are described from females and their affinities are uncertain. The five new species are known only from the south-west of Western Australia.

Records of the subgenus *Ochlerotatus* from Western Australia have been summarised by Mackerras (1927) and O'Gower (1958) and added to by Britten (1958). The following species have been recorded: *Aedes camptorhynchus* (Thomson), *Aedes clelandi* (Taylor), *Aedes normanensis* (Taylor), *Aedes pseudonormanensis* Marks, *Aedes sagax* (Skuse), *Aedes stricklandi* (Edwards), *Aedes vigilax* (Skuse). All these species occur also in eastern Australia.

Britten (*l.c.*) records in addition 6 undescribed species, 3 of which are described below as *Aedes hodgkini* sp.n., *Aedes macintoshi* sp.n., and *Aedes ratcliffei* sp.n. Two others described here, *Aedes hesperonotius* sp.n. and *Aedes purpureifemur* sp.n. were not recorded by Britten. Four undescribed species of the subgenus (3 mentioned by Britten) are also known from Western Australia, and will be treated at a later date.

The five new species described in this paper have been found only in the south-west of Western Australia. Both sexes, larvae and pupae of *A. hodgkini*, *A. macintoshi* and *A. ratcliffei* are described, and on male terminalia they all belong to the Perkinsi Section of Australian *Ochlerotatus*, as defined by Marks (1957), which was not previously known to be represented in Western Australia. In these three species the scutum has a broad margin of pale scales, a character also found in *Aedes andersoni* Edwards and *Aedes macleayanus* Mackerras which belong to other Sections of Australian *Ochlerotatus*. *A. hesperonotius* and *A. purpureifemur* are known from females only and their affinities are uncertain.

The nomenclature used for larval setae is that of Belkin (1950) and for pupal setae that of Belkin (1952, 1953). According to Belkin (1953) seta 4 of the pupal abdomen is normally anterior to 5 but may be lateral to it. In Australian *Ochlerotatus* on segment II, these two setae are frequently level, or either the inner or outer may be slightly anterior in different specimens of the one species. It seems unlikely that this is associated with a reversal in lateral positions, and for consistency in this series of papers the inner of the pair on segment II is numbered 4 and the outer 5. There may also be difficulty in identifying setae 4 and 5 on segment VII and in this paper the inner but posterior of the pair is numbered 5. The numbering of setae 4 and 5 on segment VII in the description and figure of the pupa of *A. calcariae* Marks (Marks, 1957) should therefore be reversed; in the same paper the paddle seta should be numbered 1 instead of 7. Few pupae of Australian species have yet been described, but the three described here may be distinguished from one another on the shape of the trumpet and branching of seta 1 on abdominal segment II.

***Aedes (Ochlerotatus) hodgkini* sp.n.\***

*Distinctive Characters:* A fairly large species with scutal integument dark brown, wings dark scaled, femora mottled, tarsi unbanded, hind claws toothed. Scutal scaling with broad creamy lateral border (including outer half of fossa), its inner edge slightly convex behind scutal angle; and dark mesial portion with some golden scales as in pattern of *A. ratcliffei* but lines rather ill-defined except for sublateral line on posterior half. Tergites of female with rounded basal median white patches which may be partly interrupted. Tergites of male with white basal bands partly interrupted.

**Male Terminalia:** Coxite with 4-5 rows of long mesially directed setae sternally; apical lobe large, not sharply demarcated distally; basal lobe with 2-3 stout recurved setae, slender on their distal fourth; appendage of harpago blade-like; phallosome conical on distal 2/5.

**Larva:** Head seta 5 (C) 3-4 branched, 6 (B) 2-3 branched; prothoracic seta 1 bifid; lateral comb of 19-24 slender pointed spines, finely fringed on basal third; siphonal index 2.7, no detached pecten spines; saddle covering 3/5 anal segment, saddle seta single, no precratal tufts.

*Holotype Male.*

Wing length, 5.1 mm. **Head:** Integument dark, clothed with narrow curved creamy white scales at nape, in mid line and along eye margin, with patches of narrow curved bronzy brown scales on either side of the mid line; broad flat white scales laterally divided by a small patch of flat black scales; upright forked scales mainly pale, with some dark ones laterally. Two pairs of pale bristles at vertex and a row of about 10 dark ocular bristles. Torus large, dark, bare; antenna with long black verticillate hairs lying mainly in a vertical plane. Clypeus brown. Palp slightly longer than proboscis (excluding labella), black scaled, segment V slightly down-turned; very long dark hairs ventrally at apex of III and along IV; shorter hairs and bristles on V. Proboscis almost 1½ times length of fore femur, black scaled; labella dark.

**Thorax:** Integument dark reddish brown. Scutum clothed dorsally with narrow curved black scales and with a broad lateral border of rather large narrow curved white scales covering outer half of fossa and extending back over the wing root, its inner edge with a convexity behind the scutal angle; smaller pale golden scales form a sublateral line, curving from the lateral margin behind the scutal angle and running back to the scutellum. Anterior to this there are a few golden scales along the line of dorsocentral bristles. The anterior median area is rubbed but there are indications of a line of similar scales on either side of acrostichal bristles running back to a large patch of larger white scales round the prescutellar bare area. Acrostichal and dorsocentral bristles dark. Scutellum clothed with narrow curved creamy white scales; 6 long bristles to each lobe as well as shorter bristles. *Apn* with large narrow curved white scales; *ppn* with narrow curved scales, bronzy brown and a few creamy above, white below; elongate white scales on propleuron, paratergite and with narrow curved white scales on postspiracular area; broad white scales on subspiracular area, upper half of *stp*, lower posterior margin of *stp*, upper 2/3 of *msh* and on and below prealar knob; metameron bare; 11-13 *ppn*, 8-9 pale postspiracular and 2-4 strong pale lower *msh* bristles.

**Legs:** Coxae with patches of white scales; some dark also on fore coxa. Fore and mid legs: Femur extensively mottled with white scales anteriorly, pale on basal 2/3 posteriorly and with white kneespot; tibia dark with a narrow streak of pale reflecting scales anteriorly and distinct streak of pale scales posteriorly; tarsal segment I with a streak of pale scales anteriorly and posteriorly on basal 1/2 (or 1/3 posteriorly on mid leg) and some pale scales on apical 1/2; II-V dark. Hind leg: Femur with pale scales on basal 2/3 anteriorly and 3/5 posteriorly and ventrally, with dark scales extending almost to base dorsally, some mottling of dark apical portion anteriorly but not posteriorly and white knee spot; tibia dark; tarsal segment I with

\*This species has been referred to as "Ratcliffe's No. 7" in correspondence between Australian workers on mosquitoes.

some scattered pale scales at base, and pale reflecting scales posteriorly on basal  $\frac{1}{2}$ ; II-V dark. Tarsal claws (Fig. 1, *a-c*): Fore claws curved, unequal, anterior larger with two strong teeth, a pointed basal tooth and a blunt tooth at mid length; posterior with a strong blunt tooth at  $\frac{1}{3}$  length. Mid claws markedly unequal, curved; anterior long, with a strong blunt tooth at  $\frac{1}{3}$  length; posterior with a large pointed tooth at mid length; hind claws smaller, equal, with a strong curved pointed tooth at mid length.

Wings: Dark scaled; outstanding scales all long and narrow. Cell  $R_2$   $1\frac{1}{5}$  length of its stem; cell  $M_1$   $\frac{3}{4}$  length of its stem, its base proximal to that of cell  $R_2$ ; *r-m* its own length distal to base of  $M_{3+4}$ . Halteres with pale stem and dark and pale scales on knob.

*Abdomen*: Tergite I very hairy; numerous long hairs along lateral margins of tergites II-VII. Tergite I dark and pale scaled mesially with white lateral border, II with basal median and lateral white patches, III-VII with basal white bands, indented mesially on III-V and interrupted in mid line on VI and VII; on VII the white scaling is wider laterally. Sternites II-VII white scaled with basal median and apical lateral black patches, the latter fused into complete apical dark bands on VI and VII.

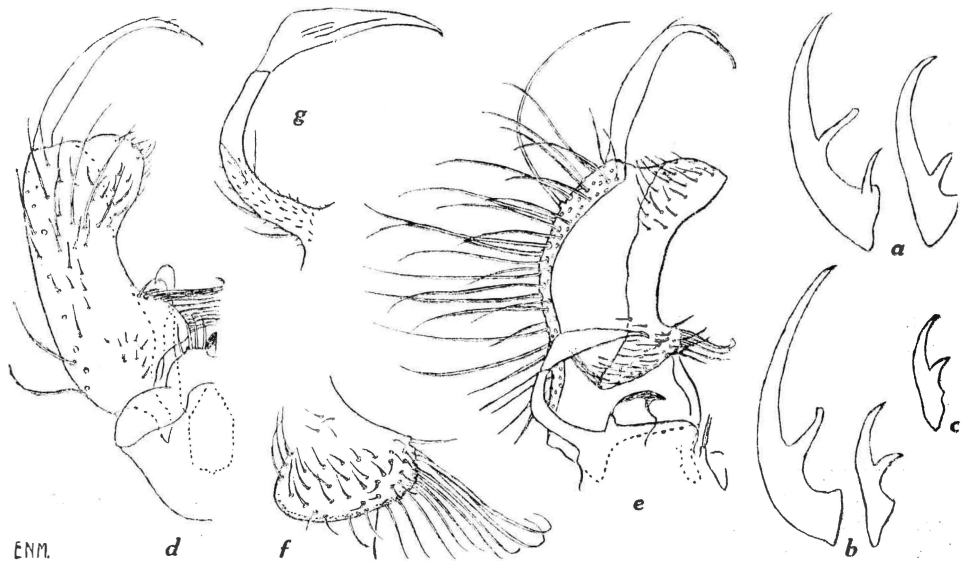


Fig. 1—*Aedes hodgkini* sp.n. *a-c*, ♂ tarsal claws; *a*, fore; *b*, mid; *c*, hind. *d-g*, ♂ terminalia; *d*, left half, tergal aspect (scales and long lateral bristles omitted); *e*, right half; *f*, basal lobe; *g*, harpago; *e-g*, from inner lateral aspect. *a-c*, x 200; *d, e*, x 94; *f, g*, x 188.

Terminalia (Fig. 1, *d-g*, described from holotype and 2 paratypes): Coxite dark scaled laterally, about 3 times as long as broad at mid length, with well developed apical and basal lobes, and a membranous area along inner aspect. Tergally the coxite bears moderately long setae on distal half, with finer setae extending to base of apical lobe, and towards base of coxite and a patch of about 10 small setae near base of coxite. Laterally there are some long strong setae. On the full length of the sternal aspect of the coxite mesially there are 4-5 rows of long mesially directed setae. Sternally there are several strong bristles the most distal of which is stouter and striated. The apical lobe is a broad swelling and bears 14-20 fine setae at apex and on sternal aspect. The basal lobe is shelf-like, and bears numerous setae along its rounded apical margin and on its upper surface (*i.e.* the surface towards apex of coxite); the most tergal seta on the margin of the lobe is short and stout, followed by 2-3 long stout setae, their distal fourth fine and recurved, the remainder of the setae are finer and straight. Style  $\frac{2}{3}$  length of coxite, slender, curved, tapering on distal  $\frac{1}{3}$  with 2 fine preapical setae; appendage terminal, about  $\frac{1}{5}$  length of style, slender with rounded tip. Harpago about  $\frac{1}{4}$  length of coxite, stout, curved; basal half pilose with 4 moderately strong setae; appendage

blade-like, evenly sclerotized, about  $1\frac{1}{3}$  length of harpago, expanding on basal  $\frac{1}{4}$  then tapering gradually to curved pointed tip. Paraproct with one strong tooth. Phallosome simple, straight sided basally, conical on distal  $\frac{2}{5}$ . Lobes of IXth tergite with 4-5 short strong setae. IXth sternite with about 5 setae.

The 2 paratype males show the following differences from the holotype: Wing length, 4.3-4.6 mm.; pale lateral scaling may cover most of fossa; a trace of submedian pale lines on anterior half of scutum; 6 postspiracular and 2-3 lower *msp* bristles; fore and mid femora only slightly mottled anteriorly; fore and mid tibiae dark anteriorly and fore with less extensive pale scales posteriorly; fore tarsal segment I dark; dark anterior scaling of hind femur unmottled; no pale scales at base of hind tarsal segment I. Cell  $R_2$   $1\frac{2}{5}$  length of its stem; cell  $M_1$   $\frac{2}{3}$  length of its stem.

#### *Female.*

The allotype and one paratype female differ from the males as follows:

Wing length, 4.0-4.8 mm. *Head*: Dark scales mesially on torus and first flagellar segment of antenna; verticillate hairs sparse, dark. Palp almost  $\frac{1}{4}$  length of proboscis, dark scaled with a few scattered white scales.

*Thorax*: Integument is dark brown in allotype (wild-caught) and light reddish brown in paratype (apparently pinned on emergence). Scutum with lateral scaling silvery white; some strong black bristles on fossa; *ppn* may have 2 or 3 large narrow curved pale scales in upper anterior angle; 8-11 *ppn* bristles. Legs: Posterior pale scaling almost continuous to apex on fore femur and may extend beyond  $\frac{2}{3}$  on mid femur; a few pale or pale reflecting scales posteriorly on hind tibia; hind tarsal segment I may be pale scaled on basal  $\frac{1}{4}$  posteriorly with scattered pale scales beyond. Claws of all legs equal, toothed, similar in shape to hind claws of male. Wings: Cell  $R_2$  twice length of its stem; cell  $M_1$  equal in length to its stem, their bases level.

*Abdomen*: Tergite I with white or white and dark scales mesially; II-VII with basal median white patches, well separated (except on VI-VII or IV-VII) from large basal lateral white patches which are about  $\frac{2}{3}$  length of segments. Median patch on tergite II rounded or triangular and may have a few scattered white scales distal to it in mid line; on III triangular; on IV-VII broadly triangular or completely interrupted in mid line. Sternite VII with only basal lateral white patches. Cerci long, dark.

#### *Larva* (Fig. 2, a-f).

Length, 10.0-10.1 mm.; colour dark; head, siphon and saddle brown.

*Head*:  $\frac{4}{5}$  as long as broad. Antenna a little more than  $\frac{1}{2}$  length of head, 8-9 times as long as broad, tapering, with numerous strong spicules; very dark except basal  $\frac{1}{5}$  which is lighter brown; seta 1 arising just before midlength of antenna, 5-7 branched, frayed; terminal and subterminal setae arising close together, 2 fairly long, stout, 3 and 4 shorter, slender; 5 broad, tapering; 6 short, stout. Head seta 1 single, slender, simple. Base of 7 slightly behind base of antenna, 6 level with 7, slightly more than half way between it and midline, 4 level with and mesial to 6, 5 directly behind 6; 4 short, fine, 2-4 branched; 5, 6 and 7 frayed, about  $\frac{3}{5}$  length of head, 5 3-4 branched, 6 2-3 branched, 7 5-8 branched; 8 long, single or bifid; 9 and 10 2-3 branched; 11 4-7 branched; 12 single; 13 4-7 branched; 14 single, stout; 15 4-6 branched. Setae of mouthbrushes pectinate. Mentum triangular with median tooth and 9-10 fairly even lateral teeth.

*Thorax*: Prothoracic setae 1, 2 and 3 frayed, arising from a single sclerotized base; 1 bifid, 2 single, 3 2-4 branched; prothoracic seta 14 single or bifid.

*Abdomen*: Seta 6 on segments I-VI and seta 7 on I and II long, bifid, frayed. VIIIth segment: Lateral comb a triangular patch of 19-24 slender pointed spines, finely fringed on basal third, in 2-3 rows; setae 1, 2, 3 and 5 arise from sclerotized bases; setae 1, 3 and 5 frayed, 2 and 4 simple; seta 1 4-7 branched; 2 and 4 single or bifid; 3 6-10 branched; 5 4-6 branched. Siphon slightly tapering on distal half, with well developed acus; index 2.7. Pecten extending over basal  $\frac{2}{5}$ - $\frac{1}{2}$ , of 21-27 slender, tapering, pointed spines gradually decreasing in size towards base of siphon; each spine has 4-6 denticles on its basal third, of which usually 2 are larger, the preapical being the largest; seta 1 arising beyond the end of the pecten at  $\frac{1}{2}$ - $\frac{3}{5}$  length of

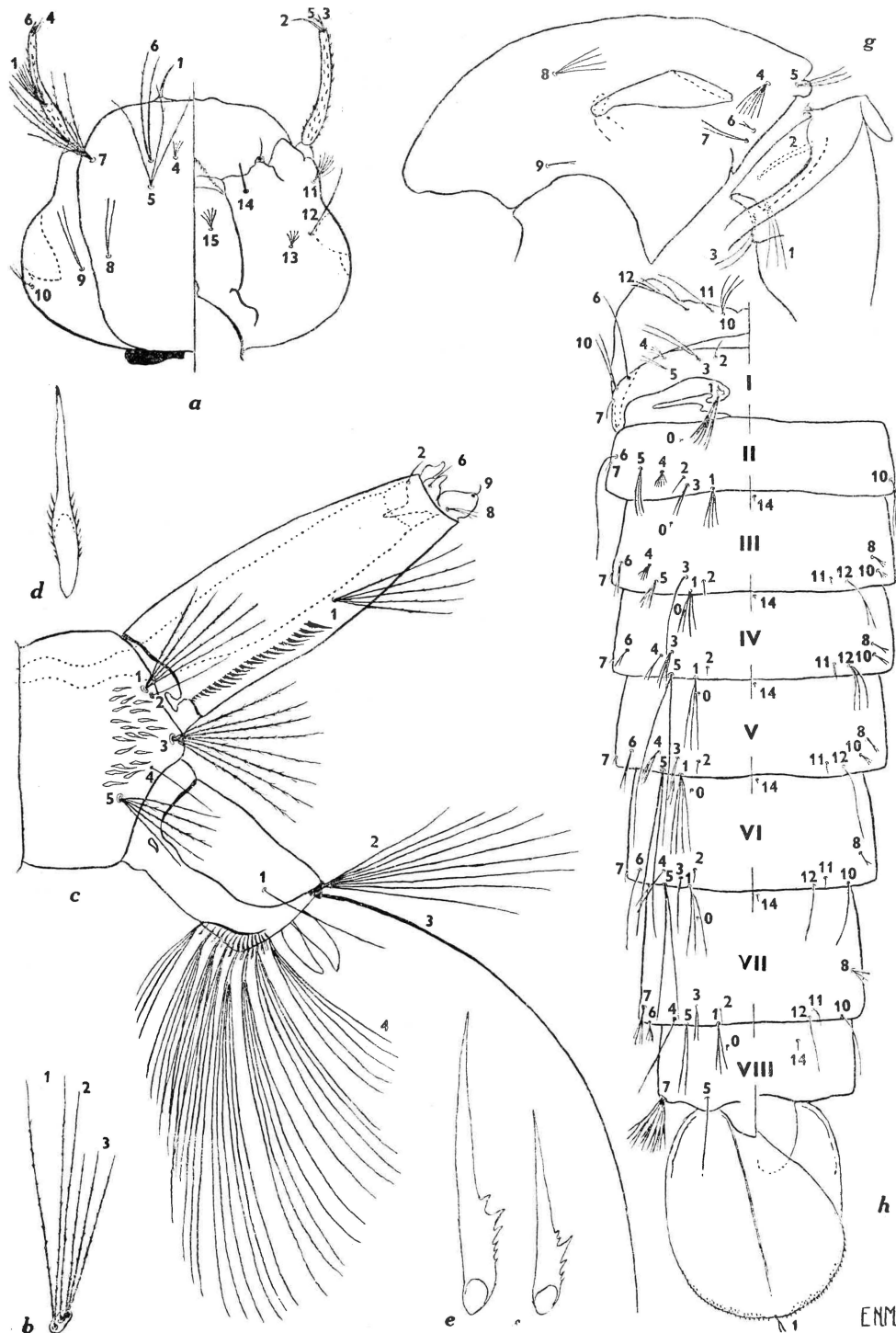


Fig. 2—*Aedes hodgkini* sp.n. a-f, larva; a, head; b, prothoracic setae 1-3; c, terminal segments; d, lateral comb tooth; e, distal pecten tooth; f, tooth from middle of pecten. g, h, pupa; g, cephalothorax; h, metanotum and abdomen. a and c, x 38; b, x 47; d-f, x 300; g and h, x 25.

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siphon, 5-6 branched, frayed; seta 8 2-5 branched. Anal segment: Saddle covering dorsal  $\frac{3}{5}$  of segment, surface spiculate, but without apical spines; a small separate sclerotized plate lies at the lower proximal angle of the saddle. Seta 1 single, simple,  $\frac{2}{3}$  length of saddle; 2 6-9 branched; 3 single; 4 (ventral brush) of 15-16 tufts, each with 4-9 branches all arising from well developed grid. Anal papillae bluntly pointed, subequal, the upper  $\frac{1}{2}$ - $\frac{2}{3}$  length of saddle, the lower  $\frac{1}{5}$  length of upper.

Description based on 3 larval skins (associated with holotype and two paratypes) and 2 morphotype larvae.

*Pupa* (Fig. 2, g, h).

*Cephalothorax*: Trumpet evenly coloured, 3 times as long as greatest width, with oblique opening; ratio of meatus to whole 1 : 1.5-1.8, apical notch shallow. Seta 1 1-3 branched; seta 2 1-2 branched; seta 3 2-3 branched; seta 4 4-7 branched; seta 5 2-4 branched; setae 6 and 7 2-3 branched; seta 8 3-5 branched; seta 9 1-2 branched; seta 10 2-5 branched, frayed; seta 11 single, stout, frayed; seta 12 1-3 branched.

*Abdomen*: Seta 2 on segments I-VII and seta 7 on segments I-VI single. *Segment I*. Seta 1 strongly developed, dendritic; seta 3 1-2 branched; seta 4 1-4 branched; seta 5 2-3 branched; seta 6 single; seta 10 1-3 branched. *Segment II*. Seta 1 3-7 branched; setae 3 and 5 2-4 branched; seta 4 6-9 branched; seta 6 single; seta 10 2-3 branched. *Segment III*. Seta 1 2-4 branched; seta 3 single or bifid at tip; seta 4 3-8 branched; seta 5 3-5 branched; seta 6 1-4 branched; seta 8 2-5 branched; seta 10 3-4 branched; seta 11 single; seta 12 2-4 branched. *Segment IV*. Seta 1 2-4 branched; seta 3 1-4 branched; seta 4 4-6 branched; seta 5 2 branched; seta 6 1-4 branched; seta 8 1-2 branched; seta 10 1-4 branched; seta 11 single; seta 12 1-3 branched. *Segment V*. Seta 1 2-4 branched; seta 3 1-3 branched; seta 4 2-4 branched; seta 5 2 branched; seta 6 1-3 branched; seta 8 2-3 branched; seta 10 3-5 branched; seta 11 single; seta 12 1-2 branched. *Segment VI*. Seta 1 2-4 branched; seta 3 1-2 branched; seta 4 2-6 branched; seta 5 1-3 branched; seta 6 1-2 branched; seta 8 1-3 branched; setae 10, 11 and 12 single. *Segment VII*. Seta 1 2-3 branched; seta 3 2 branched; seta 4 1-2 branched; seta 5 2 branched; setae 6, 7 and 8 2-4 branched; seta 10 single; setae 11 and 12 1-2 branched. *Segment VIII*. Seta 5 1-2 branched; seta 7 about  $\frac{1}{4}$  length of paddles with 4-7 branches which subdivide into 2 or 3 at about midlength. *Paddles* with oval or broadly rounded apex with finely denticulate margin; index 1.35-1.5; buttress and midrib moderately developed; seta 1 single or subdivided into 2-5 branches at mid length.

Described from 3 pupal skins associated with holotype and two paratypes.

*Types*: Holotype male, two paratype males and one paratype female, Woodanilling, W.A., 1630 hrs., 7.viii.1956, E. J. Britten; allotype female, Katanning, W.A., 16.x.1952, D. Gooding. The holotype and one paratype male are each labelled "(5)", the second paratype male is labelled "(1)"; slides of correlated larval and pupal skins are labelled "(5)", "(2)" and "(1)". Two morphotype larvae, same data as holotype.

The holotype has the right foreleg and left hind leg missing, and the allotype lacks the right hind tarsus.

Holotype, with larval and pupal skins "(5)", allotype and one morphotype larva deposited in the collection of C.S.I.R.O. Division of Entomology, Canberra; paratype male "(5)" with larval and pupal skins "(2)", paratype female, and one morphotype larva in the Perth Museum, Western Australia; paratype male "(1)" with correlated larval and pupal skins in University of Queensland Collection.

This species is named after Dr. E. P. Hodgkin, Zoology Department, University of Western Australia, who has collaborated with Mr. Britten in work on Western Australian mosquitoes.

*Biology*: The holotype and 3 paratypes were reared from a fresh, clear, grassy pool. The two morphotype larvae are from a water-logged rabbit warren. Britten (1958) records larvae of this species (as *Aedes* sp. "Ratcliffe's No. 7") also from

a road culvert, roadside drain, and a shallow winter swamp with abundant weed, grass and debris.

*Distribution*: Type material is from Woodanilling and Katanning, respectively 94 and 103 m. N. of Albany, Western Australia. In addition Britten (1958) lists this species (as *Aedes* sp. "Ratcliffe's No. 7") from Tambellup, 69 m. N. of Albany.

*Discussion*: Among the three Western Australian species of *Ochlerotatus* with broad pale margin to scutum, *A. hodgkini* is distinguished from *A. ratcliffei* on markings of the tergites, less extensive pale scaling on femora, and toothed hind tarsal claws, and from *A. macintoshi* by having the inner half of fossa dark scaled, and lacking pale scales at base of hind tarsal segments II and III. It also has a darker scutal integument than these two species. Among Australian species not recorded from Western Australia it is most likely to be confused on scale characters with *A. macleayanus* (Burpengaryensis Section) which likewise has a dark scutal integument but has the fossa entirely white scaled, and has a patch of white scales immediately below the anterior spiracle.

On male terminalia *A. hodgkini* is distinguished from other species of the Perkinsi Section on the shape of the apical lobe, the presence of only 2-3 long recurved setae on the basal lobe, and the reduced patch of fine setae tergally near the base of the coxite.

Only two other Western Australian species have larvae with a lateral comb of 20-25 spines. Of these *A. clelandi* (Taylor) has the saddle a complete ring, and an undescribed species from Koorda has head seta 5 and prothoracic seta 1 single and saddle seta bifid.

The larva of *A. hodgkini* closely resembles that of *Aedes perkinsi* Marks which differs in having prothoracic seta 1 single, siphonal index 3.7 and 1-2 precratal tufts. Both have a finer fringe on the comb spines than the undescribed larvae of four other *Ochlerotatus* spp. from eastern states.

#### ***Aedes (Ochlerotatus) macintoshi* sp.n.\***

*Distinctive Characters*: A fairly large species with scutal integument reddish, wings dark scaled, femora mottled, hind tarsus with narrow white rings or patches at bases of at least segments II and III, hind claws toothed. Scutal scaling with broad creamy white lateral border, covering less than outer half of fossa, and widening a little behind fossa; inner part of fossa golden scaled, continuous with sublateral golden line on posterior half of scutum; paired median golden lines; dark scales in broad submedian stripes anteriorly and sublateral stripes posteriorly, or all mesial portion of scutum golden scaled. Tergites of female with large rounded basal median white patches; tergites of male with white basal bands partly interrupted or with lateral patches.

Male Terminalia: Coxite with about 3 rows of long mesially directed setae sternally; apical lobe partly divided from coxite distally; basal lobe with 5-7 long recurved setae, slender on their distal half; appendage of harpago blade-like.

Larva: Head setae 5 (C) and 6 (B) 3-4 branched; prothoracic seta 1 bifid; lateral comb of 5-6 large pointed spines which may be inconspicuously fringed near base; siphonal index 2.75-3.0, no detached pecten spines; saddle covering 2/3 anal segment; 2 precratal tufts.

#### *Holotype Male.*

Wing length, 5.1 mm. *Head*: Integument dark, clothed with narrow curved white and creamy scales, with flat white scales laterally and creamy upright forked scales. Two pairs of

\*This species has been referred to as "Ratcliffe's No. 8" in correspondence between Australian workers on mosquitoes.

pale bristles at vertex and a row of ocular bristles, the more mesial ones pale. Torus large, dark, bare; antenna with long brown verticillate hairs with golden reflections lying mainly in a vertical plane. Clypeus dark brown. Palp slightly longer than proboscis (excluding labella), black scaled; segment V down-turned; very long dark hairs, and golden hairs with dark tips, ventrally on apical  $\frac{2}{5}$  of segment III and along IV; numerous shorter pale hairs ventrally on V and dark bristles dorsally. Proboscis  $\frac{1}{5}$  length of fore femur, black scaled; labella dark.

*Thorax*: Scutal integument bright reddish brown with a dark median stripe and with bare submedian patches on anterior margin. Scutum clothed with narrow curved scales. A lateral border of rather large white scales covers less than outer half of fossa, behind which it widens and extends back over wing root, with some golden scales along its inner edge. Similar white scales surround prescutellar bare area, with some golden in front of them. Remainder of fossa golden scaled with a few scattered dark scales, the golden scaling continuous with a sublateral line extending back to scutellum. Middle portion of scutum black scaled with a pair of golden lines on either side of acrostichal bristles and traces of golden lines mesial to dorsocentral bristles, *i.e.* there are broad dark submedian stripes on anterior  $\frac{2}{3}$  and sublateral stripes on posterior half of scutum, and some dark scales along mid line. Acrostichal and dorsocentral bristles dark; prescutellar bristles pale. Scutellum with narrow curved creamy scales. Postnotum reddish brown. Pleura reddish brown, *apn*, sub- and postspiracular areas and prealar knob darker. *Apn* with narrow curved scales, golden above, white below. *Ppn* with narrow curved scales, mainly golden with a few dark and 2 or 3 white below posteriorly. Propleuron and paratergite with elongate white scales; postspiracular area with narrow curved and broad white scales; broad white scales on sub-spiracular area, upper half and lower posterior margin of *stp*, upper  $\frac{2}{3}$  of *m<sub>sp</sub>*, on and below prealar knob; metameron bare; 6-9 *p<sub>pn</sub>*, 6 post-spiracular and 2 lower *m<sub>sp</sub>* bristles.

*Legs*: Coxae with patches of white scales; some dark also on fore coxa. Fore leg: Femur extensively mottled with white scales anteriorly, and with pale kneespot, pale posteriorly except for some scattered dark scales towards apex. Tibia dark dorsally, completely pale scaled postero-ventrally. Tarsal segment I dark anteriorly, pale almost to apex posteriorly, II and III with some pale scales ventrally at base, remainder of tarsus dark. Mid leg: Femur extensively mottled anteriorly, pale posteriorly on basal  $\frac{2}{3}$  extending as a streak and mottling to apex; small pale kneespot. Tibia extensively mottled anteriorly forming a fairly continuous area of pale scales on middle portion, entirely pale scaled posteriorly except near apex where there is only a pale streak. Tarsal segment I mottled anteriorly and with pale streak posteriorly almost to apex; II with narrow pale ring, extending posteriorly as a short streak, III with a couple of pale scales at base, IV and V dark. Hind leg: Femur pale on basal half except for dorsal mottling; apical half mottled anteriorly, dark posteriorly with a few scattered pale scales; small pale kneespot. Tibia extensively mottled on basal  $\frac{4}{5}$  anteriorly; pale posteriorly on basal  $\frac{4}{5}$  with some mottling beyond. Tarsal segment I pale anteriorly on basal  $\frac{1}{3}$  with mottling beyond, pale posteriorly on basal  $\frac{3}{4}$ ; II with a narrow ill-defined basal ring about  $\frac{1}{12}$  its length; III with some pale scales at base. Tarsal claws (Fig. 3, *a, b*): Fore claws curved, unequal, the anterior longer, with two strong teeth, a pointed basal tooth and a blunt tooth at mid length; the posterior with a strong pointed tooth near base. Mid claws unequal, the anterior very long, with a strong, slightly curved, blunt tooth at between  $\frac{1}{4}$  and  $\frac{1}{3}$  length; posterior with a rather short stout pointed tooth at mid length. Hind claws smaller, equal, with stout pointed tooth at mid length (not illustrated but similar in shape to female hind tarsal claw, Fig. 3, *d*).

*Wings*: Dark scaled; outstanding scales all long and narrow. Cell  $R_2$  1.6 times length of its stem, cell  $M_1$  0.7 times length of its stem, their bases level; *r-m* half its own length distal to base of  $M_{3+4}$ . Halteres with pale stem and dark and pale scales on knob.

*Abdomen*: Tergite I very hairy; numerous long hairs laterally on tergites II-VII. Tergite I with a few dark and pale scales mesially and white lateral border; II-VII dark scaled with basal white scaling forming a median patch on II, a band on III and lateral white patches on IV-VII. Sternites white scaled with apical lateral and elongate basal median black patches.



Fig. 3—*Aedes macintoshi* sp.n. a, ♂ fore tarsal claws; b, ♂ mid tarsal claws; c, ♀ fore tarsal claw; d, ♀ hind tarsal claw. e-h, ♂ terminalia; e, left half, tergal aspect (scales omitted); f, right half; g, basal lobe; h, harpago; f-h, from inner lateral aspect. a-d, x 200; e, f, x 94; g, h, x 188.

Terminalia (Fig. 3, e-h, described from holotype and 3 paratypes). Coxite dark scaled laterally,  $3\frac{1}{2}$ -4 times as long as broad at midlength, with well developed apical and basal lobes and a membranous area along inner aspect. Laterally there are many long setae on coxite; tergally there is a longitudinal row of about 12 short fine setae, mesial to which on basal half are 25-35 very small setae, mainly proximal to basal lobe, and on apical half 2-3 strong and numerous finer setae. Sternally there is a longitudinal row of long setae, the distal 2-3 of which are very strong and striated, and mesial to this numerous long mesially directed setae in about 3 rows running the length of the coxite. The apical lobe is rounded or subconical, partly divided from the coxite distally, and bears about 20 fine setae mainly on its sternal aspect but 1-6 may be present tergally near apex. The basal lobe is shelf-like and bears numerous setae along its rounded apical margin and on its upper surface. Of the marginal setae the most tergal is short and stout, followed closely by a row of 5-7 long setae each with proximal  $\frac{1}{2}$  stout and distal  $\frac{1}{2}$  slender, lash-like, and strongly recurved; the remaining setae are shorter, finer and of normal type. Style about  $\frac{3}{5}$  length of coxite, slender, curved and tapering on distal third which bears 2-3 setae; appendage terminal, about  $\frac{1}{5}$  length of style, slender, with blunt tip. Harpago about  $\frac{1}{4}$  length of coxite, strongly curved with 3-5 fine setae; appendage  $1\frac{1}{3}$  length of harpago, widening to almost midlength then narrowing to stout curved pointed tip, heavily sclerotized except along its distal edge. Paraproct with single tooth. Phallosome simple, straight sided with rounded apex. Lobes of IXth tergite with 4-7 short setae (some strong and striated); IXth sternite with 2 stout and 2-3 fine short setae.

The three paratype males show the following differences from the holotype: Wing length, 5.0-5.5 mm. Inner part of fossa may be entirely golden scaled and anterior mesial area of scutum mainly so, but some dark scales are present; scutellar scales may be white; 9-12 *ppn*, 5-6 postspiracular and 3-5 lower *msp* bristles. Fore tarsal segment I mottled anteriorly; pale scales may be lacking at base of fore and mid tarsal segment III. Hind tarsal segment I extensively mottled anteriorly, basal ring may cover  $\frac{1}{7}$  II and there may be a complete narrow ring on III and 1 or 2 white scales at base of IV. Wings: Cell  $R_2$  1.25-1.4 times length of its stem; cell  $M_1$  0.6-0.75 times length of its stem; its base may be slightly proximal to that of

cell  $R_2$ ;  $r-m$  may be its own length distal to base of  $M_{3+4}$ . Abdomen: Tergite I white scaled; II may have a basal band interrupted in mid line and III a partially interrupted basal band; II-VII may have dark scaling mottled with pale reflecting scales. True tergite VIII mainly white scaled with a few dark scales; true sternite VIII dark with lateral white patches.

*Female.*

The allotype and 7 paratype females differ from the male as follows:

Wing length, 4.7-5.4 mm. *Head*: Usually with submedian patches of narrow curved dark scales behind eye margin; some dark upright forked scales laterally; lateral flat white scales divided by a patch of dark scales; most of ocular bristles dark. Torus brown with some flat black scales mesially, and usually some white dorsally; first flagellar segment light brown with flat black scales and sometimes some white; verticillate hairs sparse, dark. Palp about  $\frac{1}{4}$  length of proboscis, dark scaled, sparsely or extensively mottled with pale scales.

*Thorax*: There may be dark submedian lines on the scutal integument; all scutal scales may be golden except white scales on lateral border and round prescutellar bare area; or the submedian dark stripes may extend back to the white scaling round prescutellar bare area; some strong dark bristles on fossa; *ppn* may have more extensive scattered dark scales; 6-11 *ppn*, 6-15 postspiracular and 2-5 lower *msp* bristles. Legs: Fore and mid tarsal segments II and III usually have a complete narrow basal white ring, which may extend ventrally, IV and V may have some white scales at base. Hind tarsal segment II with a narrow basal band up to  $\frac{1}{8}$  its length, and may be mottled beyond; III with basal patch or more frequently complete band up to  $\frac{1}{6}$  its length; IV and V usually with some white scales at base, sometimes an almost complete band on IV,  $\frac{1}{7}$  its length. Tarsal claws of all legs (Fig. 3, *c*, *d*) equal, with strong stout pointed tooth at mid length, fore and mid claws similar, hind slightly smaller.

Wings: Cell  $R_2$  2.0-2.6 times length of its stem; cell  $M_1$  1.1-1.3 times length of its stem, its base level with or slightly distal to that of cell  $R_2$ ;  $r-m$   $\frac{1}{3}$ -1 times its own length distal to base of  $M_{3+4}$ .

*Abdomen*: Tergites with long basal lateral white patches reaching almost to apex on IV-VII. Tergite I white or white and dark scaled mesially; II-VII with large rounded basal median white patches, which may be indented in midline on III-VII or reach to apex on VII; these may be contiguous with lateral patches on V-VII, or VI and VII may have complete wide basal bands, or there may be a complete interruption by dark scales mesially on V-VII. Sternites with small basal median dark patches on III-VI and small apical lateral dark patches on IV-VII or VI-VII. Cerci long, dark.

*Larva* (Fig. 4, *a-f*).

Length probably about 10 mm., head, siphon and saddle light brown.

*Head*: Apparently about  $\frac{2}{3}$  as long as broad. Antenna dark except at base, about  $\frac{1}{2}$  length of head, 9 times as long as broad, with numerous strong spicules; seta 1 arising at  $\frac{2}{5}$  from base, 4-5 branched, frayed; terminal and subterminal setae arising close together; 2 fairly long, stout, 3 and 4 shorter, slender; 5 broad; 6 short, stout. Head seta 1 fairly straight, single, stout, blunt. Base of 7 slightly behind base of antenna, 6 level with 7 and  $\frac{2}{3}$  distance between it and mid line, 4 level with and mesial to 6; 5 directly behind 6; 4 short, fine, 3-5 branched; 5, 6 and 7 frayed, almost  $\frac{1}{2}$  length of head; 5 and 6 3-4 branched, 7 6-7 branched; 8, 9 and 10 2-3 branched; 11 5-7 branched; 12 2 branched; 13 4-7 branched; 14 single, stout; 15 3-6 branched. Setae of mouthbrushes pectinate. Mentum triangular with median tooth and 10-11 fairly even lateral teeth.

*Thorax*: Prothoracic setae 1, 2 and 3 arising from a single sclerotized base, 1 and 3 2 branched, frayed, 2 single, simple; prothoracic seta 14 single.

*Abdomen*: Seta 6 on segments I-VI and seta 7 on segment I 2 branched, long, frayed; seta 7 on II finer, 3-4 branched. Segment VIII: Lateral comb an irregular row of 5-6 large pointed spines with slender bases, sometimes inconspicuously fringed near base. Setae 1-5 arise from sclerotized bases, 1 and 3 are plumose, 2 and 4 simple, 5 simple or frayed; seta 1 7 branched; 2 2 branched, 3 6-7 branched, 4 single, 5 5-7 branched. Siphon slightly tapering with well developed acus; index 2.75-3.0; pecten extending over a little less than basal  $\frac{1}{2}$ ,

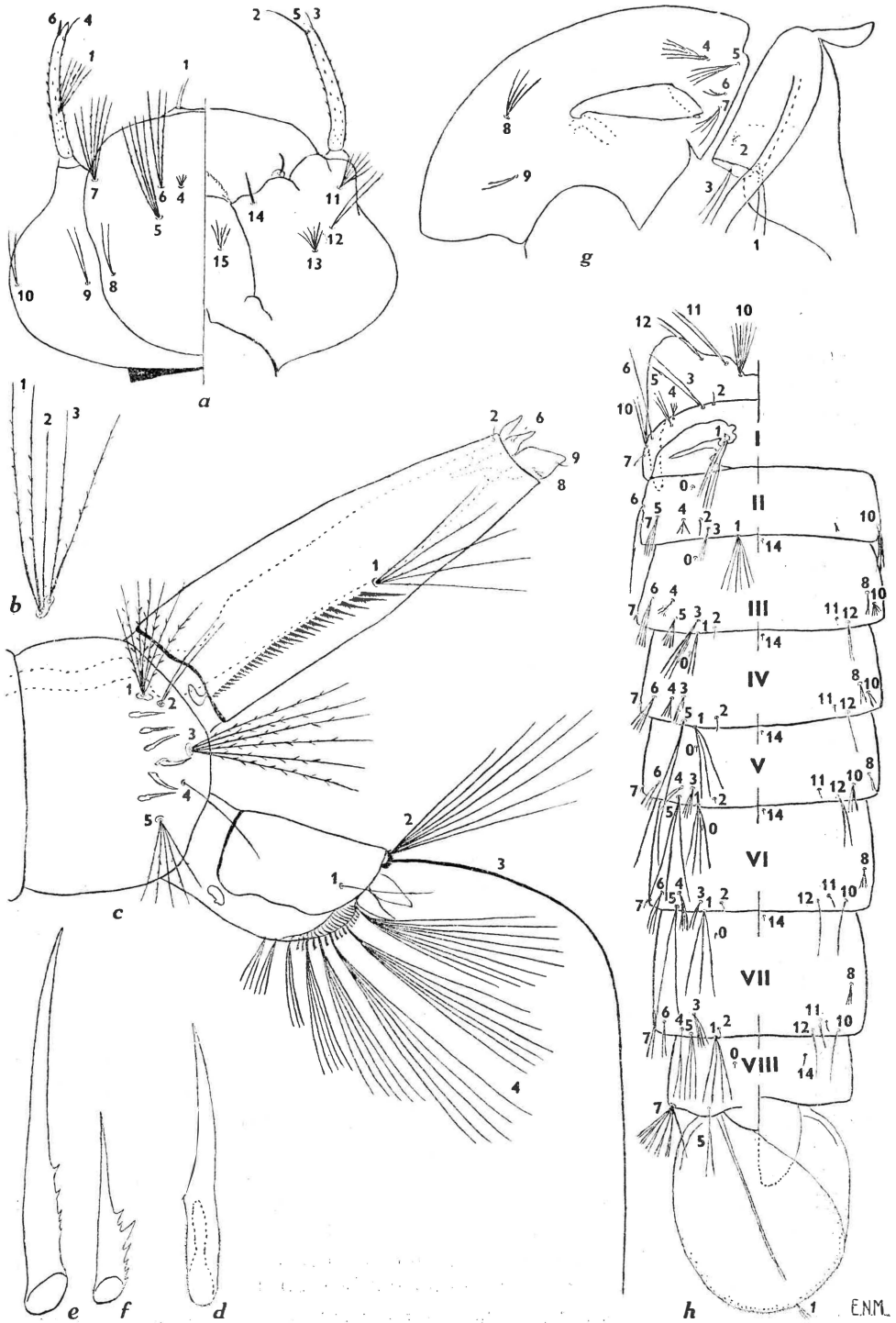


Fig. 4—*Aedes macintoshi* sp.n. a-f, larva; a, head; b, prothoracic setae 1-3; c, terminal segments; d, lateral comb tooth; e, distal pecten tooth; f, tooth from middle of pecten. g, h, pupa; g, cephalothorax; h, metanotum and abdomen. a and c, x 38; b, x 47; d-f, x 300; g and h, x 25.

of 28–30 spines, with slender pointed tips; the distal 1 or 2 spines are very long with about 6 fine denticles; each of the remaining spines (which gradually decrease in size towards base of siphon) has 5–10 denticles on its basal  $\frac{2}{5}$ , the proximal ones fine, followed by 1–2 large denticles and usually 2 smaller ones distally. Seta 1 arising at  $\frac{1}{2}$  length of siphon, 5 branched, frayed; seta 8 4–6 branched. Anal segment: Saddle covering dorsal  $\frac{2}{3}$  of segment, surface spiculate but without apical spines. A separate sclerotized plate lies at lower proximal angle of saddle. Seta 1 single, simple, almost as long as saddle; 2 7–8 branched, 3 single; 4 (ventral brush) of 20 tufts, each with 3–10 branches, 2 being precratal and the remainder arising from a well developed grid. Anal papillae short, pointed, subequal, about  $\frac{1}{3}$  length of saddle.

Description based on 2 larval skins associated with holotype and allotype.

On 2 mature 3rd instar larvae from Muchea, 4th instar hairs observed showed the following differences: Head seta 1 pointed. Segment VIII with seta 1 8–9 branched, 3 8–10 branched, 4 2 branched.

*Pupa* (Fig. 4, *g*, *h*).

*Cephalothorax*. Trumpet evenly coloured,  $3\frac{1}{2}$  times as long as greatest width, with oblique opening; ratio of meatus to whole 1 : 1.3–1.4; apical notch shallow. Setae 1, 2 and 3 2 branched; seta 4 5–8 branched; seta 5 4–5 branched; seta 6 2–3 branched; seta 7 4–5 branched; seta 8 3–4 branched; seta 9 2–3 branched; seta 10 6–8 branched; seta 11 1–2 branched; seta 12 2–3 branched.

*Abdomen*: Seta 2 on segments I–VII and seta 7 on segments I–VI single. *Segment I*. Seta 1 strongly developed, dendritic; seta 3 2–3 branched; seta 4 4–6 branched; seta 5 3–5 branched; seta 6 single; seta 10 2 branched. *Segment II*. Seta 1 5–8 branched; seta 3 3 branched; seta 4 3–7 branched; seta 5 4–7 branched; seta 6 1–2 branched; seta 10 3–4 branched (on the skin of the holotype there is an additional 2–3 branched small seta ventrally). *Segment III*. Seta 1 2 branched; seta 3 2–3 branched; seta 4 3–6 branched; seta 5 5–8 branched; seta 6 3–5 branched; seta 8 2–4 branched; seta 10 4–5 branched; seta 11 single; seta 12 1–2 branched. *Segment IV*. Seta 1 3–5 branched; seta 3 3–6 branched; seta 4 2–4 branched; seta 5 2 branched; seta 6 2–4 branched; seta 8 1–3 branched; seta 10 1–2 branched; setae 11 and 12 single. *Segment V*. Setae 1 and 3 3–4 branched; seta 4 4 branched; seta 5 2–3 branched; seta 6 1–3 branched; seta 8 2 branched; seta 10 3–5 branched; seta 11 single; seta 12 1–2 branched. *Segment VI*. Seta 1 2–4 branched; seta 3 2–3 branched; seta 4 3–5 branched; setae 5, 6 and 8 2–3 branched; setae 10 and 11 single; seta 12 1–2 branched. *Segment VII*. Seta 1 4–5 branched; seta 3 3–4 branched; seta 4 2–3 branched; seta 5 3 branched; seta 6 2–4 branched; seta 7 2–3 branched; seta 8 3–4 branched; setae 10, 11 and 12 single. (On the skin of the holotype there is a small single supernumerary seta ventrally on one side). *Segment VIII*. Seta 5 1–2 branched; seta 7 about  $\frac{1}{4}$  length of paddles, with 6 branches which bifurcate about midlength. *Paddles* with broadly rounded apex, the whole surface of the paddle finely spiculate with coarser denticles round the apical margin; index 1.3; buttress and midrib moderately developed; seta 1 1–4 branched.

Described from 2 pupal skins correlated with holotype and allotype.

*Types*: Holotype male, allotype and one paratype female, Albany, W.A., 1130 hrs., 11.viii.1956, E. J. Britten; 10 paratypes, Kings Park, Perth, W.A., viz. 3 males, 15.vii.1953, D. L. McIntosh, 1 female, 29.ix.1953, F. N. Ratcliffe, 6 females, 13.x.1953, D. L. McIntosh and F. N. Ratcliffe; 2 paratype females, Lancelin, W.A., 1400 hrs., 14.ix.1956, Malaria Control Unit.

The holotype male (labelled “(1)”) and allotype female (labelled “3”) have correlated larval and pupal skins; the paratype female from Albany, also labelled “(1)”, was reared from a pupa but has no associated skin.

The holotype has left palp and right mid tarsal segments III–V missing and both holotype and allotype have the scutum partly rubbed.

Holotype and allotype (with their correlated skins), and 3 female paratypes in C.S.I.R.O. Division of Entomology, Canberra; 1 male and 3 female paratypes

in Perth Museum; 1 male and 2 female paratypes in University of Queensland collection; 1 male and 1 female paratype in British Museum; two female paratypes in School of Public Health and Tropical Medicine, Sydney.

This species is named after Mr. D. L. McIntosh, C.S.I.R.O. Wild Life Survey Section, whose extensive collections have contributed materially to knowledge of Western Australian mosquitoes.

*Biology:* The holotype and allotype were reared from fresh clear open water with shallow reeds and grass. Two third instar larvae from Muchea, apparently of *A. macintoshi*, were collected from a small borrow pit, with fresh clear water, reeds and grass. Females from Lancelin were caught in the bush.

*Distribution:* Type material is from Perth, Albany and Lancelin (Karakin) Lakes; larvae have been seen from Muchea, W.A. (1530 hrs., 19.vi.1956, E. J. Britten). In addition Britten (1958) lists this species (as *Aedes* sp. "Ratcliffe's No. 8") from Brookton, Cranbrook, Gingin, Northam, Toodyay and Woodanilling. All localities are in the south-west of Western Australia, lying between Albany and about 80 m. N. of Perth.

*Discussion:* *A. macintoshi* is distinguished from other Australian species of *Ochlerotatus* with broad pale margin to scutum by the presence basally of white patches on fore and mid tarsal segments II and usually III and bands or patches on hind tarsal segments II and III. The male terminalia resemble those of other species in the Perkinsi Section, but the broad blade-like appendage of harpago, and 5-7 stout recurved setae on basal lobe with their distal half slender, should distinguish them. The larva is distinct from those of related species in the reduced number of spines in the lateral comb, a character found in the Burpengaryensis Section (in which there are detached pecten teeth beyond siphonal seta 1) and in the Stricklandi Section (in which head setae 5 and 6 are single).

#### *Aedes (Ochlerotatus) ratcliffei* sp.n.\*

*Distinctive Characters:* A fairly large species with scutal integument reddish, wings dark scaled, femora mottled, tarsi unbanded, hind claws not toothed (but with strong bristle). Scutal scaling with broad, creamy, straight-edged lateral border which includes outer half of fossa, and dark mesial portion with 6 golden longitudinal lines, the outermost on posterior half of scutum only. Abdomen with a complete or almost complete broad median creamy stripe through tergites II-VII in female; stripe variously developed but present at least as elongate patch on II in male.

Male Terminalia: Coxite with about 3 rows of long mesially directed setae sternally; apical lobe partly divided from coxite distally; basal lobe with 4-6 long recurved setae, slender on their distal third, the first much stouter than the rest; appendage of harpago blade-like with membranous expansion.

Larva: Head seta 5 (C) 4-6 branched, 6 (B) single or bifid; prothoracic seta 1 single, 3 usually bifid; seta 1 of segment VIII 5-9 branched; lateral comb of 35-60 short coarsely fringed scales; siphonal index 3.0-3.3; pecten of 22-36 spines, none detached; saddle covering 2/3-4/5 anal segment; 1-2 precratal tufts.

#### *Holotype Male.*

Wing length, 4.4 mm. *Head:* Integument dark, clothed with narrow curved creamy scales, with small submedian patches of narrow curved dark scales behind eye margin, and flat white scales laterally; upright forked scales creamy, a few dark ones laterally. Vertical and mesial ocular bristles pale, lateral ones dark. Torus large, dark, bare; antenna with long brown verticillate hairs lying in a vertical plane. Clypeus dark brown. Palp about equal in length

\*This species has been referred to as "Ratcliffe's No. 1" in correspondence between Australian workers on mosquitoes.



to proboscis (excluding labella), black scaled; segment V down-turned; very long dark hairs ventrally on apical  $\frac{2}{5}$  of III and on IV, shorter golden hairs at apex of IV and on V. Proboscis black scaled,  $1\frac{1}{2}$  times length of fore femur; labella dark.

*Thorax*: Scutal integument rather bright reddish brown with dark stripes along the lines of the acrostichal and dorsocentral bristles, the inner half of the fossa also darkened; two distinct submedian bare patches on anterior margin. The scales are narrow curved and form a distinct pattern with broad pale lateral border with straight inner margin, covering outer half of fossa and made up of fairly large creamy scales except behind scutal angle where there are golden scales in the outer part of the border and along its inner edge; prescutellar bare area surrounded by similar creamy scales. Remainder of scutum is clothed with black scales and 6 lines of golden scales; one pair on either side of acrostichal bristles run from anterior margin to prescutellar area, where they are linked by gold scales with a pair which run just mesial to the dorsocentral bristles from near the anterior margin to the scutellum; one pair run lateral to the dorsocentral bristles from just behind the level of scutal angle (where they curve to the lateral border) to the scutellum; there are a few golden scales lateral to dorsocentral bristles on anterior half of scutum but no continuous line. Acrostichal and dorsocentral bristles dark, numerous; supraalar and prescutellar bristles pale. Scutellum with narrow curved creamy scales and long pale bristles, 8 to mid and 7 to lateral lobes, as well as shorter bristles. Postnotum light brown. Pleura brown. *Apn* with narrow curved scales, golden above, white below. *Ppn* with narrow curved scales, mainly golden with a few dark on lower half and white narrow curved and elongate scales at lower posterior angle. Elongate white scales on propleuron and paratergite; 2 or 3 narrow curved white scales on postspiracular area; a long patch of broad white scales on subspiracular area with a small patch above it; white scales also on upper half and lower posterior margin of *stp*, on and below prealar knob, and on upper  $\frac{2}{3}$  *msp*; 12-14 pale *ppn* bristles, 6-7 postspiracular and 3 lower *msp* bristles. Metamerom with an elongate white scale or a fine pale bristle.

*Legs*: Fore and mid coxae with patches of white scales; hind bare. Fore leg: Femur mottled anteriorly, with pale kneespot, entirely pale posteriorly; tibia dark anteriorly, pale posteriorly; tarsal segments dark, but I with extensive pale scaling posteriorly and II with a couple of pale scales at base. Mid leg: Femur mottled dorsally and on upper anterior surface, more extensively pale below; pale posteriorly on basal  $\frac{2}{3}$  with mottling and a dark streak on apical  $\frac{1}{3}$  and with pale kneespot; tibia and tarsus as on fore leg. Hind leg: Femur pale on basal  $\frac{2}{3}$  except for a few scattered dark scales dorsally; anteriorly on distal  $\frac{1}{3}$  pale scales extend as a streak to apex with dark mottled scaling dorsally, and pale kneespot; posteriorly distal  $\frac{1}{3}$  dark with slight mottling of pale scales; tibia dark with pale reflecting scales posteriorly; tarsal segment I with patch of pale scales at base, mottled on basal  $\frac{2}{5}$  anteriorly and with discontinuous pale streak posteriorly; II-V dark. Tarsal claws (Fig. 5, *a-c*): Fore claws curved, unequal, the anterior with a long blunt tooth at midlength and a strong pointed basal tooth, the posterior with a strong pointed tooth at almost midlength. Mid claws curved, unequal, the anterior with a long blunt tooth at  $\frac{1}{3}$  length; the posterior with a strong blunt tooth at almost midlength. Hind claws equal, curved, without distinct tooth but with long straight bristle ventrally near base.

*Wings*: Dark scaled, outstanding scales all long and narrow; cell  $R_2$ ,  $1\frac{1}{3}$  times length of its stem; cell  $M_1$   $\frac{2}{3}$  length of its stem, its base proximal to that of cell  $R_2$ ; *r-m* its own length distal to base of  $M_{3+4}$ . Halteres with pale stem and dark and pale scales on knob.

*Abdomen*: Tergite I very hairy; numerous long hairs laterally on II-VII. Tergite I with white scales mesially and white lateral border; II with lateral basal white patches and with elongate median white patch forming an almost complete stripe, III similar but distal half of stripe indicated by mottling; IV-VII with complete basal bands, mottled median stripe on IV and V; VI and VII with basal band slightly produced in mid line and small median apical pale patches, VII with elongate lateral white patches continuous with basal band. True tergite VIII white scaled with a few dark scales mesially at base. Sternites white scaled, IV-VII with small lateral apical dark patches, V-VII also with elongate median basal dark patches, VIII dark with lateral white border.

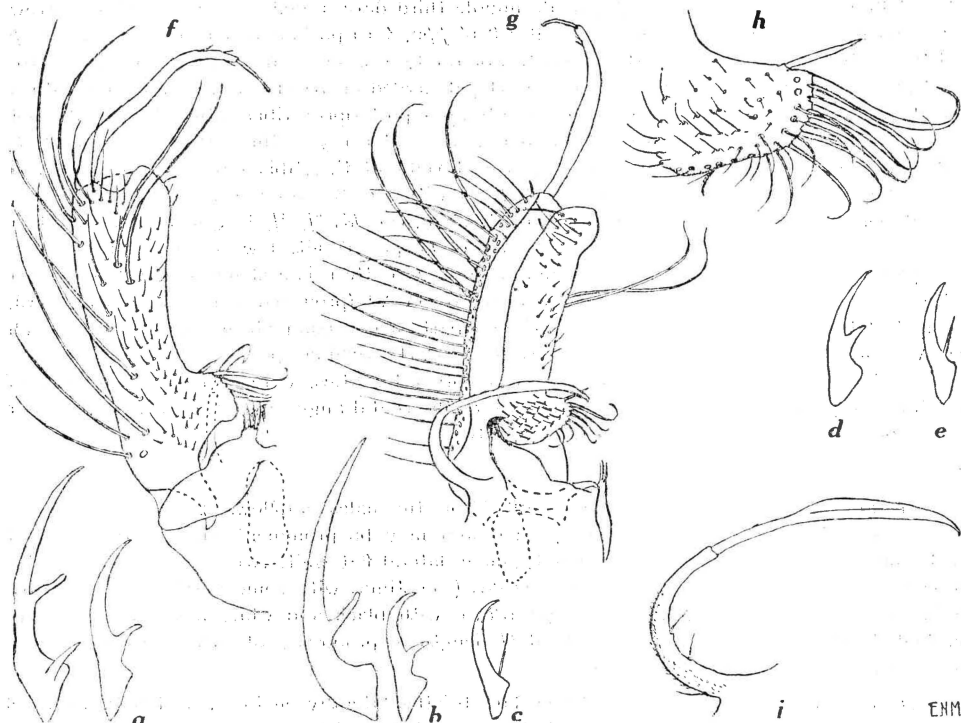


Fig. 5—*Aedes ratcliffei* sp.n. *a-c*, ♂ tarsal claws; *a*, fore; *b*, mid; *c*, hind; *d, e* ♀ tarsal claws; *d*, fore; *e*, hind. *f-i*, ♂ terminalia; *f*, left half, tergal aspect (scales omitted); *g*, right half; *h*, basal lobe; *i*, harpago; *g-i*, from inner lateral aspect. *a-e*, x 200; *f, g*, x 94; *h, i*, x 188.

Terminalia (Fig. 5, *f-i*, described from holotype and 4 paratypes): Coxite dark scaled laterally,  $3\frac{1}{2}$ –4 times as long as broad at mid length, with well developed apical and basal lobes and a membranous area along inner aspect. Tergally the coxite bears numerous long setae on its outer aspect, mesial to these some moderately long setae and at about  $\frac{2}{3}$  its length a pair of long strong setae, with numerous short setae extending along its inner aspect from base to near apex. Sternally there are scattered long setae, 2–3 distally being very strong and striated, and about 3 rows of long mesially directed setae extending the length of the coxite. The apical lobe is rounded, partly divided from the coxite distally and bears about 10 fine setae on its sternal aspect and at apex. The basal lobe is rounded with numerous setae on its sternal surface and round its margin; of the marginal setae, the most tergal is a short stout pointed seta followed by 4–6 strong recurved setae which taper on their distal third; the first of these is much stouter than the rest; the remaining setae on the lobe are shorter, fine, and of normal type. Style about  $\frac{2}{3}$  length of coxite, its distal  $\frac{1}{3}$  curved and tapering and bearing 2–7 fine setae; in the holotype 1–2 of these are replaced by small elongate scales and in one paratype there is a stronger seta arising at  $\frac{2}{3}$  and extending beyond tip of style; appendage terminal, about  $\frac{1}{5}$  length of style, slender with rounded grooved tip. Harpago about  $\frac{1}{4}$  length of coxite, strongly curved with 2–4 fine setae; appendage  $1\frac{1}{2}$  times length of harpago; widening gradually from  $\frac{2}{5}$  its length until twice its width at base, the expansion being membranous, and tapering to a curved pointed tip. Paraproct with single tooth. Phallosome single, straight-sided with rounded apex. Lobes of tergite IX with 3–7 setae; sternite IX with 5–9 setae.

Among the 14 paratype males the following differences from the holotype occurred: Wing length, 3.8–5.1 mm. No dark scales but some golden on head. No golden scales on scutum along inner edge of pale lateral border; the line just mesial to the dorsocentral bristles meets the anterior extremity of the lateral border; 7 long bristles on mid lobe and 6 on lateral lobe

of scutellum; no dark scales on *ppn*, or its middle third dark scaled; broad as well as narrow scales on postspiracular area and paratergite; 8-14 *ppn*, 4-10 postspiracular and 1-4 lower *msp* bristles. Metameron bare or with 1-2 bristles or rarely a scale. Pale scaling showing anteroventrally on fore tibia and tarsal segment I, II pale scaled on basal half ventrally, III with a couple of pale scales at base. Mid femur pale to apex posteriorly, tibia with anterior pale spot at apex, tarsal segment I with scattered pale scales anteriorly. Hind femur with apical  $\frac{1}{3}$ , extensively pale anteriorly and posteriorly except right at tip; tibia dark posteriorly, tarsal segment I with mottled pale scales on basal  $\frac{1}{5}$ , II with 1 or 2 white scales at base.

Wings: Cell  $R_2$   $1\frac{1}{6}$ - $1\frac{3}{5}$  times length of its stem, cell  $M_1$   $\frac{2}{3}$ - $\frac{4}{5}$  length of its stem, their bases level;  $r-m$   $\frac{1}{2}$  its own length distal to base of  $M_{3+4}$ . Tergite I with dark or mixed dark and pale scales mesially; on II-VII the minimum scale pattern is a stripe on basal  $\frac{2}{3}$  II, III with 3 or 4 white scales in mid line, basal bands on IV-VI (produced in long lateral patches), elongate lateral patches only on VII; maximum pattern is a complete median stripe through II-IV. Dark median basal patches on sternites III-VII reaching apex on VII.

Additional differences among 5 males from other localities, were a slight irregularity of the inner edge of the lateral border at the level of the scutal angle; no scales on postspiracular area; fore femur only slightly mottled anteriorly.

#### *Female.*

The allotype and 21 paratype females differ from the males as follows: Wing length, 3.7-5.2 mm. *Head*: Submedian dark patches present and may be prominent; dark upright forked scales more numerous; a small black patch among lateral flat white scales; torus dark, lighter brown dorsally, with numerous flat white scales (sometimes with some dark) and short dark hairs mesially; first flagellar segment light brown with black and white flat scales mesially; verticillate hairs sparse, dark. Palp about  $\frac{1}{5}$  length of proboscis, all dark or with a couple of white scales or moderately mottled.

*Thorax*: Scutum with a row of strong dark bristles laterally on fossa; scutellum with 5-8 long bristles on lateral lobe and 6-10 on mid lobe; middle half of *ppn* dark scaled; more numerous scales and up to 12 bristles on postspiracular area. A few pale scales on hind coxa. Fore and mid femora may have a greater proportion of pale scales in the anterior mottling; distal third of mid femur posteriorly may be only slightly mottled or almost entirely pale; hind femur may be pale almost to apex anteriorly except dorsally, and posteriorly except dorsally and ventrally; hind tibia may be extensively pale scaled posteriorly. There may be a few pale reflecting scales at bases of fore tarsal segments II-IV; scattered white scales anteriorly on mid tarsal I and posteriorly on II; hind tarsal I may be extensively pale both anteriorly and posteriorly. Tarsal claws (Fig. 5, *d, e*) equal, fore and mid claws with a strong pointed tooth about midlength; hind claws not toothed but with long stout bristle ventrally.

Wings: Cell  $R_2$  2.1-3.1 times length of its stem; cell  $M_1$  1-1.4 times length of its stem, its base level with or distal to that of cell  $R_2$ .

*Abdomen*: Tergites II-VII dark scaled with large lateral white patches, extending almost to apex of segments and sometimes showing dorsally on V and VI. Most specimens have a broad median creamy white stripe continuous through tergites II-VII, the minimum development being a stripe on basal  $\frac{2}{3}$  II, III-V with median basal patches and a few scattered white scales beyond, VI with a few scattered white scales in midline, and VII dark mesially. Sternites all white scaled or IV-VI with small basal median and lateral apical dark patches; VII pale; cerci long, dark.

The following differences occurred among 27 females from other localities: Wing length, 5.3 mm. Mid femur almost entirely pale with a few scattered dark scales anteriorly; hind femur almost entirely pale but with a small dorsal area of dark scales and a posteroventral dark streak near apex. Fore, mid and hind tarsal segment I quite extensively mottled anteriorly; mid tarsal segment II extensively pale posteriorly; fore and mid tarsal III with 1 or 2 pale scales at base.

#### *Larva* (Fig. 6, *a-f*).

Length about 10-11 mm.; head, siphon and saddle fairly dark brown.

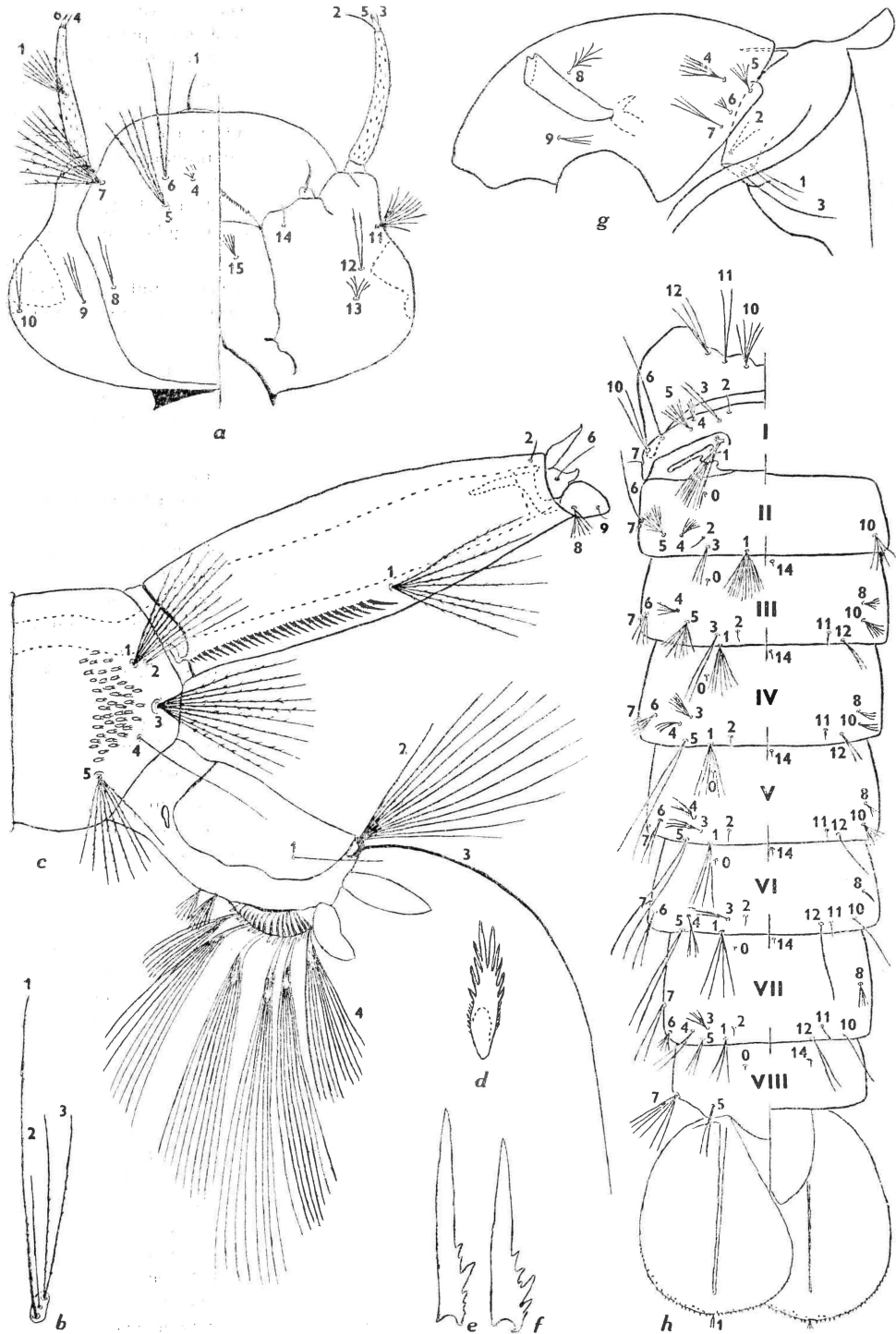


Fig. 6—*Aedes ratcliffei* sp.n. a-f, larva; a, head; b, prothoracic setae 1-3; c, terminal segments; d, lateral comb tooth; e, distal pecten tooth; f, tooth from middle of pecten. g, h, pupa; g, cephalothorax; h, metanotum and abdomen. a and c, x 38; b, x 47; d-f, x 300; g and h, x 25.

*Head*: About  $\frac{2}{3}$  as long as broad. Antenna very dark except basal  $\frac{1}{6}$  which is lighter, about  $\frac{1}{2}$  length of head, 8-9 times as long as broad, with numerous strong spicules; seta 1 arising at mid length or slightly less, 7-11 branched, frayed; terminal and subterminal setae arising close together; 2 fairly long, stout; 3 and 4 shorter, slender; 5 broad; 6 short, stout. Head seta 1 straight, stout, single, pointed. Base of 7 slightly behind base of antenna, 6 level with 7 and almost  $\frac{1}{2}$  distance between it and mid line; 4 level with and mesial to 6; 5 directly behind 6; 4 short, fine, 5-8 branched; 5, 6 and 7 about equal in length to antenna, frayed; 5 4-6 branched; 6 stout, bifid, rarely single on one side; 7 9-14 branched; 8 1-3 branched; 9 2-4 branched; 10 2-5 branched; 11 6-10 branched; 12 2-3 branched; 13 5-12 branched; 14 stout, single; 15 4-8 branched. Setae of mouthbrushes pectinate. Mentum triangular with median tooth and 11-13 fairly even lateral teeth.

*Thorax*: Prothoracic setae 1-3 arising from a single sclerotized base, 1 and 3 frayed, 2 shorter, simple; 1 and 2 single, 3 bifid, rarely single on one side; prothoracic seta 14 single, rarely bifid on one side.

*Abdomen*: Seta 6 on segments I-VI and seta 7 on segment I long, frayed. On segment I seta 6 bifid, rarely 3 branched on one side; seta 7 1-2 branched, their bases separate. On segment II seta 6 bifid, seta 7 4-13 branched, their bases separate. Seta 6 on segments III-IV 2 branched; on V 1-2 branched; on VI single.

Segment VIII: Lateral comb a triangular patch of 35-60 short broad scales in 4-6 rows, each scale with a fairly even apical fringe of coarse denticles, and finely fringed laterally. Setae 1-5 arise from sclerotized bases; 1 5-9 branched, plumose; 2 bifid, rarely 3 branched, simple; 3 9-16 branched, plumose; 4 1-2 branched, simple; 5 6-10 branched, simple or frayed. Siphon slightly tapering on distal half, with well developed acus; index 3.0-3.3; pecten extending over approximately basal  $\frac{1}{2}$ , of 22-36 stout spines all of similar form with 4-6 denticles on basal  $\frac{2}{5}$ , of which a middle one is the strongest; seta 1 arising just beyond pecten, 6-9 branched, plumose; seta 8 4-9 branched. Anal segment: Saddle covering dorsal  $\frac{2}{3}$ - $\frac{4}{5}$  segment, surface spiculate but without apical spines. A separate sclerotized plate lies at lower proximal angle of saddle. Seta 1 single, simple,  $\frac{3}{4}$  length of saddle; 2 9-18 branched; 3 single; 4 (ventral brush) of 17-20 tufts of which 1-2 are precratal and the remainder arise from a well developed grid; the larger tufts are 9-13 branched, some about middle of grid and precratal may be 5-6 branched. Anal papillae short, bluntly pointed, subequal, the upper about  $\frac{2}{5}$  length of saddle.

Description based on 16 larval skins associated with the holotype, allotype and 14 paratypes and on 11 morphotype larvae. One larva from Porongorup has antennal seta 1 6 branched, and another has head seta 4 4 branched. A larva from Denmark has head seta 7 8 branched.

*Pupa* (Fig. 6, g, h).

*Cephalothorax*. Trumpet evenly coloured, 4 times as long as greatest width, with oblique opening; ratio of meatus to whole 1 : 1.15-1.2; apical notch shallow. Setae 1 and 2 2-3 branched; seta 3 longer, 1-2 branched; setae 4 and 5 3-8 branched; seta 6 3-6 branched; seta 7 2-5 branched; seta 8 4-8 branched; seta 9 2-3 branched; seta 10 4-7 branched; seta 11 2-3 branched; seta 12 2-5 branched.

*Abdomen*: Setae 0 and 14 are minute and single, except in one specimen seta 14 is bifid on segments VI-VIII. Seta 2 on segments II-VI, seta 7 on I-VI, and seta 11 on III-VII single. *Segment I*. Seta 1 strongly developed, dendritic; seta 2 1-3 branched; seta 3 2-4 branched; seta 4 2-5 branched; seta 5 4-9 branched; seta 6 single; seta 10 2-3 branched. *Segment II*. Seta 1 14-30 branched, sometimes dendritic; seta 3 2-3 branched; seta 4 5-7 branched; seta 5 4-11 branched; seta 6 single; seta 10 3-4 branched. *Segment III*. Seta 1 5-10 branched; seta 3 2-6 branched; seta 4 4-8 branched; seta 5 8-12 branched; seta 6 2-5 branched; seta 8 4-8 branched; seta 10 5-9 branched; seta 12 1-3 branched. *Segment IV*. Seta 1 4-6 branched; seta 3 5-9 branched; seta 4 2-4 branched; seta 5 2-3 branched; seta 6 3-6 branched; seta 8 2-5 branched; seta 10 2-4 branched; seta 12 1-3 branched. *Segment V*. Seta 1 3-5 branched; seta 3 2-4 branched; seta 4 3-7 branched; seta 5 2 branched; seta 6 1-4 branched; seta 8 2-3 branched; seta 10 4-6 branched; setae 12 single. *Segment VI*. Seta 1

4-5 branched; setae 3 and 4 2-5 branched; seta 5 2 branched; seta 6 1-3 branched; seta 8 2-3 branched; setae 10 and 12 single. *Segment VII.* Seta 1 2-4 branched; seta 3 3-6 branched; setae 4 and 5 2-3 branched; seta 6 4-9 branched; seta 7 stout, 2-3 branched; seta 8 3-6 branched; seta 10 single; seta 12 1-2 branched. *Segment VIII.* Seta 5 2-3 branched; seta 7 5-9 branched, plumose,  $\frac{1}{4}$  length of paddle. *Paddles* with broadly rounded apex, and a border of 2 or 3 rows of fine spicules on apical half; index 1.3-1.5; buttress and midrib moderately developed; seta 1 1-3 branched.

Described from 5 pupal skins, one correlated with holotype and 4 with paratypes, and 3 whole morphotype pupae.

*Types:* Holotype male, Gngangara (12 m. N. Perth), W.A., 19.viii.1955, D. L. McIntosh (Serial No. 69), has associated larval and pupal skins; allotype female, same locality and collector, 7.ix.1955, has associated larval skin. Paratypes total 14 males, 21 females all from Gngangara; 15 females, 11.x.1954, F. N. Ratcliffe, the remainder collected by D. L. McIntosh, viz. 1 male, 8.viii.1955, with associated larval skin; 5 males, 2 females, 5 morphotype larvae, 19.viii.1955, of which 3 males and 1 female have associated larval and pupal skins, 1 male and 1 female have associated larval skins; 3 males, 4 females, 7.ix.1955, with associated larval skins; 5 males, 6 morphotype larvae, 3 morphotype pupae, 15.viii.1956.

The type series is distributed as follows: Holotype, allotype (with skins) 6 female paratypes (2 with larval and 1 with larval and pupal skins), 3 male paratypes (1 with larval and 1 with larval and pupal skins), 3 morphotype larvae and 1 morphotype pupa in C.S.I.R.O. Division of Entomology; 4 female paratypes (one with larval skin), 3 male paratypes (1 with larval and 1 with larval and pupal skins), 2 morphotype larvae and 1 morphotype pupa in Perth Museum; 3 female paratypes (1 with larval skin) and 3 male paratypes (1 with larval and 1 with larval and pupal skins), 2 morphotype larvae and 1 morphotype pupa in University of Queensland Collection; 2 female and 2 male paratypes (1 of each sex with larval skin), 2 morphotype larvae in School of Public Health and Tropical Medicine, Sydney; 1 female and 1 male (with larval skin) paratype, 1 morphotype larva in British Museum; 1 female and 1 male paratype and 1 morphotype larva in U.S. National Museum; 2 females and 1 male paratype in National Museum of Victoria; 1 female paratype each in Queensland and South Australian Museums.

This species is named after Mr. F. N. Ratcliffe, Officer in Charge, C.S.I.R.O. Wildlife Survey Section, in appreciation of his stimulating encouragement of research on Australian mosquitoes and of the valuable collections he has himself made.

*Biology:* Adults of *A. ratcliffei* apparently occur only in the spring but whether there is more than one generation each year is unknown. Among the specimens examined the earliest larval collection is 8th August and the latest 19th September, but these may be presumed to be of 3rd or 4th instar larvae. The earliest adult record is a male which emerged on 9th September and the latest 2 females caught at Albany on 9th November. Data accompanying link-bred specimens from Gngangara shows that males pupated from 2nd-24th September and emerged from 9th-30th September; females pupated from 8th-31st September and emerged from 17th September to 9th October. The pupal period occupied 7-8 days for males and 7-10 days for females.

At Manjimup Mr. Wilson collected larvae from a slit trench with straight vertical sides, the water being 18 in. deep and about 18 sq. ft. in surface area. There was very little sunlight, due to shade from a pine tree, and a large amount of pine needles in the water but no other vegetation. Fresh storm water collected in the trench and was turbid due to suspended fine particles of white clay.

Mr. Britten collected a pupa at Albany in a freshwater swamp with grass and reeds, the water discoloured brown; larvae at Porongorup from a fresh soak

with grass and algae in an open paddock, and at Denmark from a roadside drain in a fresh swamp area.

*Distribution:* In addition to the type material from Gngangara, specimens have been examined from the following localities: Doopiter, Lake Lancelin, 1 ♀ (11.ix.1956, Army M.C.U.); King's Park, Perth, 2 ♀♀ (24.x.1952, D. L. McIntosh; 13.x.1953, D. L. McIntosh and F. N. Ratcliffe); City Beach, 9 ♀♀ (14.x.1953, J. H. Calaby, D. L. McIntosh); Forrestdale, 7 ♀♀ (19.x.1952, 20.ix.1953, D. L. McIntosh); 7 m. S.S.E. Gleneagle, 4 ♂♂, 1 ♀ (19.ix.1956, D. L. McIntosh); 19 m. S.W. Beverly, 3 ♀♀ (3.x.1952, D. L. McIntosh); Manjimup, 2 ♀♀ (19.ix.1943, A. W. Wilson); Denmark, 1 larva (10.viii.1956, E. J. Britten); Porongorup, 2 larvae (13.viii.1956, E. J. Britten); Albany, 1 ♂, 2 ♀♀ (9.xi.1938, A. J. Turner; 11.viii.1956, E. J. Britten). In addition Mr. McIntosh informs me he has collected this species 7 m. E. Jarrahdale (30.ix.1956), and Britten (1958) records *A. ratcliffei* (as *Aedes* sp. "Ratcliffe's No. 1") from Gingin, Gnowangerup and Plantagenet.

All the foregoing localities lie in the south-west of Western Australia west of a line about 12 m. E. of Albany, and to about 80 m. N. of Perth.

*Discussion:* *A. ratcliffei* is distinguished from other species with broad pale margin to scutum by its abdominal markings. It is the only known species in the Perkinsi Section without toothed hind tarsal claws, but on male terminalia is quite close to *A. perkinsi* which likewise has the appendage of harpago with a membranous expansion. Among larvae of the Perkinsi Section both *A. ratcliffei* and *A. perkinsi* differ from other species in having prothoracic seta 1 single instead of bifid, but *A. ratcliffei* is the only species with the lateral comb of evenly fringed scales; the number of scales in the comb is generally greater than in other Australian *Ochlerotatus* species with similar comb scales.

#### THE PERKINSI SECTION.

The following species are now included in the Perkinsi Section of Australian *Ochlerotatus* on the basis of characters of the male terminalia: *A. perkinsi* and *Aedes luteifemur* Edwards from eastern Australia and *A. hodgkini*, *A. macintoshi* and *A. ratcliffei* from Western Australia. Not all stages of *A. perkinsi* and *A. luteifemur* have been described, and undescribed species from eastern Australia also belong in this Section, so that a full assessment of relationships cannot yet be made. However, there is no clear indication that any one of the eastern species is more closely related to any one of the western species.

*A. luteifemur* lacks any scutal scale pattern. *A. perkinsi* has no distinct lateral pale border, but it has submedian dark stripes on the anterior half, some dark scales behind the fossae, and some scales in the midline dividing the median golden stripe, features of the pattern developed in the three western species.

*A. perkinsi* has well defined basal bands on all hind tarsal segments; *A. macintoshi* has narrow bands or patches on II and III; *A. ratcliffei* and *A. luteifemur* may have a small patch at base of II. *A. ratcliffei* differs from all the others in the hind tarsal claws.

On male terminalia, *A. perkinsi* and *A. ratcliffei* appear closest to one another. *A. hodgkini* differs from the rest in the shape of the apical lobe of the coxite.

On larval characters, *A. perkinsi* and *A. hodgkini* are very similar, while *A. macintoshi* and *A. ratcliffei* are quite distinct.

It is of interest to compare the South African species *Aedes harrisoni* Muspratt and *Aedes breedensis* Muspratt. On terminalia they are quite close to species of the Perkinsi Section, having 2-3 rows of moderately long mesially directed setae

sternally on the coxite, though these are shorter than in Australian species; the apical lobe is also less prominent. The scutal pattern is well defined and has a general similarity to *A. ratcliffei*, *A. macintoshi* and *A. hodgkini*, but the inner edge of the lateral pale border is irregular and there are single median and sublateral pale lines, not double as in the Australian species. They resemble *A. ratcliffei* in having a more or less complete median stripe on the abdominal tergites, but these markings are usually broader at the base of the segments. They also resemble *A. ratcliffei* in lacking a tooth on the hind tarsal claws. Larvae of both *A. harrisoni* and *A. breedensis* have about 10 spines in the lateral comb—in this they resemble *A. macintoshi* and the form of the spines is similar in *A. harrisoni* and *A. macintoshi*.

### ***Aedes* (*Ochlerotatus*) *hesperonotius* sp.n.**

*Distinctive Characters:* A medium sized species, with dark scaled wings, no scutal pattern, scutal integument dark; mid femur unmottled (fore and hind may have some appearance of mottling); anterior surface of hind femur almost entirely dark but with some pale scales at base or slight mottling on basal 2/5; tarsal segments I-II or III with pale scales at base posteriorly; hind claws not toothed (but with strong bristle).

#### *Holotype Female.*

Wing length, 4.4 mm. *Head:* Integument dark; clothed with narrow curved creamy scales, with some dark behind the ocular border and with flat white and dark scales laterally; numerous dark upright forked scales. A pair of dark vertical bristles and a row of 8 long mesially directed dark ocular bristles with finer ones laterally. Torus yellowish above, otherwise dark, with fine hairs mesially and small flat scales, dark mesially, white dorsally; basal half of first flagellar segment yellowish with a few dark or pale scales, remainder of antenna dark. Clypeus dark brown. Palp  $\frac{1}{8}$  length of proboscis, black scaled. Proboscis almost  $1\frac{1}{3}$  times length of fore femur, black scaled; labella dark.

*Thorax:* Scutal integument dark brown with darker fossa and lines along the acrostichal and dorsocentral bristles. Scutal scales narrow curved, mixed dark and golden scales with larger creamy scales above wing roots and round prescutellar bare area; numerous dark acrostichal, dorsocentral and prescutellar bristles, others on fossae and above wing roots. Scutellum brown, with narrow curved creamy scales and long black bristles, 7 to mid lobe and 3-4 to lateral lobes, and some shorter pale bristles. Postnotum reddish brown. Pleural integument dark. *Apn* with mixed dark and pale narrow curved scales and numerous dark bristles. *Ppn* with narrow curved scales, dark except for a few creamy below. Narrow curved creamy scales on postspiracular area and paratergite. Elongate pale scales on propleuron and mixed elongate, flat and narrow curved scales on subspiracular area. Patches of flat pale scales on upper and lower *stp*, below prealar knob, and on upper and middle *msh*; metameron bare. 8-9 *ppn*, and 9 postspiracular bristles; 4-5 lower *msh* bristles of which 2 are strong and 2-3 shorter and finer.

*Legs:* Mainly dark scaled with purplish reflections. Fore and mid coxae with dark and pale scales, hind with pale only. Fore femur dark dorsally and ventrally except for pale ring at base, an indefinite line of scattered pale scales anteriorly and a few pale-reflecting scales dorsally near apex; pale from base to apex posteriorly. Mid femur pale on basal half posteriorly, continuing as a narrowing streak to apex, otherwise dark. Hind femur similar to mid femur but pale at base anteriorly. On all legs tibia pale from base to apex posteriorly, otherwise dark; tarsal segments dark except for a scattered streak of pale scales on I and some pale scales at base of II and III posteriorly. Claws equal, those of fore and mid legs with a strong tooth; hind claws without tooth (a strong bristle is present on hind claw in paratypes, presumably obscured in holotype whose claws are resting on pith).

*Wings:* Dark scaled; outstanding scales all long and narrow. Cell  $R_2$  2.7 times length of its stem, cell  $M_1$  1.6 times length of its stem, their bases level;  $r-m$  its own length distal to base of  $M_{3+4}$ . Halteres with pale stem and mixed dark and pale scales on knob.



*Abdomen*: Tergites purplish black scaled; I with mixed dark and pale scales mesially and white lateral border; II and III with a median basal pale patch (indented in mid line on III) and lateral basal white patches; IV-V with basal bands, widest at lateral border (but less than  $\frac{1}{2}$  length of segment), narrow in mid line and partly interrupted on IV, completely so on V; VI and VII with lateral basal patches about  $\frac{1}{2}$  length of segment; a few pale scales at apex of V-VII. Sternites pale scaled with mottling of dark scales mesially at base, and lateral preapical dark patches, these areas linked on VI and VII. Segment VIII narrow, retracted. Cerci long, dark.

Among the 3 paratype females the following differences occur: Wing length, 3.7-4.5 mm.

*Head*: A few scattered pale scales on under side of proboscis about mid length.

*Thorax*: 6-8 long bristles to mid lobe and 4-7 to lateral lobes of scutellum; some broad scales among narrow curved on postspiracular area and no narrow curved on subspiracular area; upper and middle patches on *msp* confluent; 5-9 *ppn*, 5-11 postspiracular and 3 strong or 1 fine and 2 strong lower *msp* bristles. Legs: Hind femur slightly mottled with pale scales on basal  $\frac{2}{5}$  anteriorly. Fore and mid tibia with some pale reflecting scales anteriorly; posterior pale streak on hind tibia not quite continuous. Fore or mid tarsal segment III all dark, or 1 or 2 pale scales at base of mid tarsal IV. Wings: Cell  $R_2$  2.0-2.8 times length of its stem. Cell  $M_1$  1.1-1.5 times length of its stem, its base slightly proximal to that of cell  $R_2$ .

*Abdomen*: Tergites III-V with lateral basal patches which show dorsally but are well separated; no pale scales at apex of V. Sternites with reduced mottling of dark scales except on VII which is mainly dark.

An additional female from Dale R. which is probably *A. hesperonotius* shows further variation but it lacks hind legs and might possibly be a specimen of *A. clelandi* with darkened scutum. This specimen has narrow scales of head all golden, a couple of pale upright forked scales, no white scales on torus, a couple of pale scales on palps; scaling of scutum, *apn* and *ppn* nearly all golden; postnotum dull brown; 2 strong lower *msp* bristles; fore femur pale scaled on basal  $\frac{1}{3}$  dorsally and more extensively pale towards apex (*i.e.* definitely mottled in appearance); tergite I with only pale scales mesially; tergites II-VII with practically complete bands, narrow mesially.

*Types*: Holotype and one paratype female, 2 m. N.E. Bullsbrook, W.A., 16.viii.1953; 1 paratype female 3 m. N. Bullsbrook, 25.viii.1954; 1 paratype female, Dale River, 10 m. S.W. Beverly, W.A., 3.x.1952, all collected by D. L. McIntosh. Bullsbrook is 23 m. N.N.E., and Beverly 62 m. E.S.E. of Perth.

The specific name refers to the known distribution of this species in south-west Australia. Holotype and one paratype in C.S.I.R.O. Division of Entomology, Canberra; one paratype each in Perth Museum and University of Queensland Collection.

*Discussion*: *A. hesperonotius* quite closely resembles *A. clelandi*, but the latter has reddish scutal integument, hind femur pale on basal  $\frac{3}{5}$  anteriorly, and larger lateral patches on the tergites. *A. hesperonotius* has darker scutal scaling but this might be more variable than indicated by the type series. Whether they are in fact closely related cannot be judged until males and larvae can be compared.

*A. hesperonotius* will probably have to be keyed out in two places in any key to *Ochlerotatus* that uses mottling of the femora for separating species, since there may be mottling present though slight and inconspicuous compared with many species.

### ***Aedes (Ochlerotatus) purpureifemur* sp.n.**

*Distinctive Characters*: A fairly large species, with dark scaled wings, unmottled femora, unbanded tarsi, hind claws toothed, and no scutal pattern; distinguished by having the hind femur entirely dark anteriorly and apical as well as basal pale lateral patches on tergites.

*Holotype Female.*

Wing length, 4.7 mm. *Head*: Integument pitchy; clothed at nape with narrow curved whitish scales, which extend between eyes, dividing a band of similar black scales along the eye margins; flat white scales laterally, partly divided by a patch of black scales; upright forked scales black. A pair of black vertical bristles and a row of 5-6 long mesially directed black ocular bristles with finer ones laterally. Torus dark with fine hairs and black scales mesially; basal  $\frac{1}{3}$  of first flagellar segment light brown, remainder of antenna dark. Clypeus dark. Palp a little more than  $\frac{1}{6}$  length of proboscis, black scaled. Proboscis  $1\frac{1}{3}$  times length of fore femur, black scaled; labella dark.

*Thorax*: Scutal integument reddish brown, darker on fossae and along lines of acrostichal and dorsocentral bristles. Scutal scales narrow curved, mixed dark and golden, with larger creamy scales above the wing roots and round the prescutellar bare area. Acrostichal, dorsocentral and prescutellar bristles dark, others on fossae and in front of and above wing root. Scutellum light brown with narrow curved creamy scales, 6 long bristles to each lobe. Postnotum light brown.

Pleural integument brown, *msp* and *meron* lighter. *Apn* with rather broad curved scales, dark above and white below and black bristles; similar black scales on *ppn* with 1 white below, and white and black on propleuron. Two patches of flat white scales on subspiracular and one on postspiracular area, a continuous patch from below prealar area over upper *stp* and lower posterior part of *stp*; almost confluent patches on upper and middle *msp*. Paratergite bare; 7 black *ppn*, 3-6 postspiracular, and 1 pale lower *msp* bristle. Metameron with 4 fine pale bristles, or 3 bristles and 1 white scale.

*Legs*: Dark scaling with purplish reflections. Fore coxa black scaled with a white patch above; mid coxa with elongate patch of white scales continuous with lower *stp* scaling; hind coxa with white scales. Fore femur dark except for posterior pale streak almost to apex; mid and hind femora pale posteriorly, narrowing towards apex, otherwise dark. Tibiae and tarsi of all legs dark. Claws of all legs equal with a strong tooth.

*Wings*: Purplish-black scaled, outstanding scales all long and narrow. Cell  $R_2$  2.4 times length of its stem, cell  $M_1$  1.6 times length of its stem, its base slightly proximal to that of cell  $R_2$ ; *r-m* its own length distal to base of  $M_{3+4}$ . Halteres with pale stem and dark and pale scales on knob.

*Abdomen*: Tergites purplish black scaled. Tergite I with a dark median patch flanked by white scales and white lateral border, II-VII dark mesially except for a narrow apical border of white scales on VI and VII; II-IV with basal and apical lateral white patches; these show dorsally on IV-VI and fuse to form a complete lateral white border on V-VII. Sternites dark scaled with basal and apical lateral white patches; these extend to form a complete lateral and apical white border on VI and VII. Segment VIII retracted; cerci long, dark.

*Type*: Holotype female, Forrestdale (about 15 m. S.E. Perth), W.A., 20.ix.1953, D. L. McIntosh. No other specimens are known. The specific name refers to the entirely purplish-black anterior surface of the hind femur, which distinguishes this from other Australian *Ochlerotatus*.

The holotype is in C.S.I.R.O. Division of Entomology, Canberra.

*Discussion*: *A. purpureifemur* appears closest to *Aedes purpuriventris* Edwards among Australian *Ochlerotatus*, but its relationships cannot be determined at present, since characters of male terminalia and larvae may show wide divergences between what seem on female characters to be similar species.

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