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Culicidae). VII. Four
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**THE SUBGENUS *OCHLEROTATUS* IN THE
AUSTRALIAN REGION (DIPTERA:
CULICIDAE). VII. FOUR NEW SPECIES**

Females of *Aedes linesi* sp. n. from South Australia and *Aedes phaecasiatus* sp. n. from northern Australia are described; the female and tentatively associated larva of *Aedes explorator* sp. n. from central Australia, and both sexes of *Aedes sapiens* sp. n. from inland eastern Australia, are described and figured. *Aedes sapiens* belongs to the Burpengaryensis Section, though superficially resembling species of the Stricklandi Section; affinities of the other three species are uncertain. Apical pale scaling on the hind tarsal segments is recorded for some specimens of *Aedes flavifrons* (Skuse).

The four new species described here are still very imperfectly known. Three of them are from areas of inland or northern Australia where few mosquito collections have been made, and they indicate the important contributions to knowledge of our fauna that even small collections from such areas can provide. The fourth, from a comparatively well-studied area in South Australia, exemplifies the need for many collections at different seasons and over a period of years before a thorough knowledge of the mosquito fauna of a particular locality can be obtained. The nomenclature used in descriptions follows that in earlier papers in this series (e.g. Marks, 1963); the grouping of species of Australian *Ochlerotatus* into sections is discussed in Marks (1957).

Aedes (Ochlerotatus) explorator* sp. n.**Distinctive Characters***

A medium sized species with wing scales mainly dark with slight mottling; mottled femora; hind tarsal segments 1-V with broad basal white bands (1/7-1/5 I, 1/2-3/5 IV and V); scutum with bare submedian stripes on anterior 2/3; scales on paratergite and subspiracular area; lower *msp* bristles present or absent; tergites with wide basal bands, some confluent with lateral patches.

Larva (presumed): Head setae 5 and 6 2 branched; lateral comb 16-20 fringed scales with longer denticle at apex; siphonal index about 2.0, pecten 13-16 spines on basal 1/3 siphon; valve seta 9 stout, hooked; saddle not a complete ring.

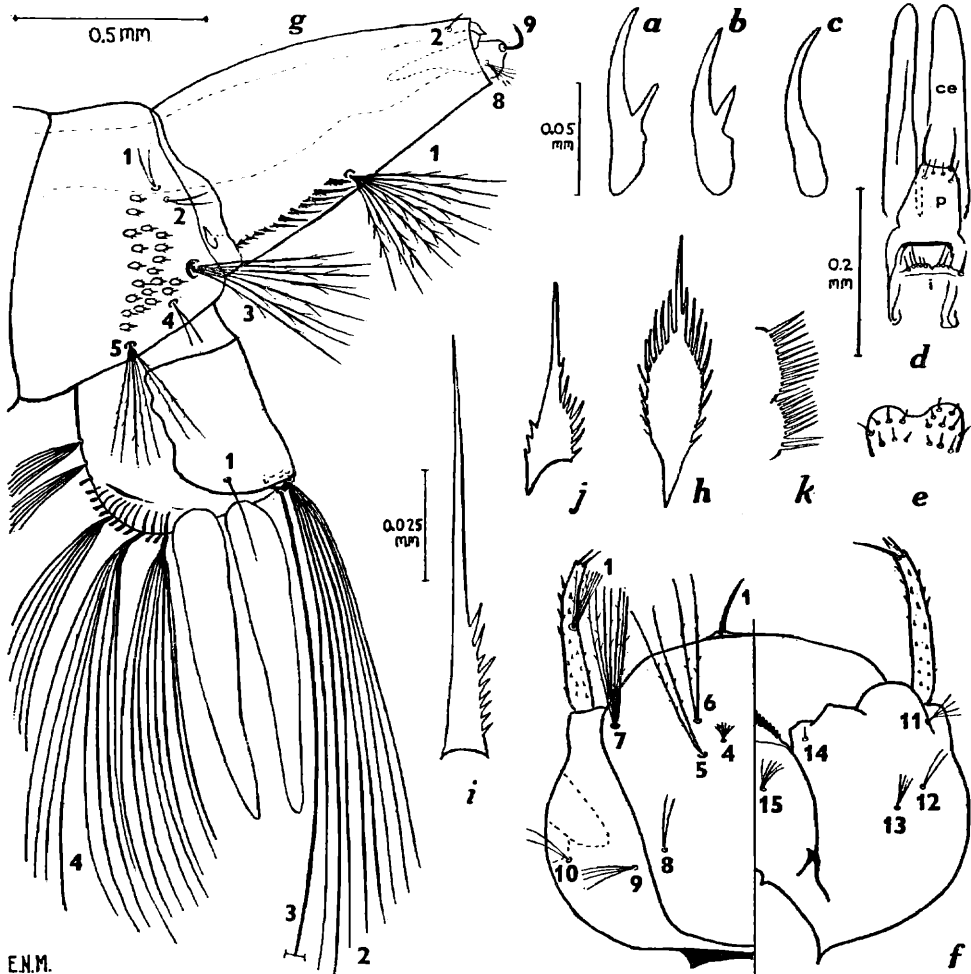


FIG. 1.—*Aedes explorator* sp.n.: a-c, ♀ tarsal claws—a, fore; b, mid; c, hind; d-e, ♀ terminalia—d, sternal view (ce, cercus; i, insula; p, postgenital plate); e, tergite IX; f-k, larva (presumed)—f, head; g, terminal segments; h, lateral comb tooth; i, preapical pecten tooth; j, tooth from near base of pecten; k, scale-like rows of spicules from apex of saddle.

b, c to same magnification as a; e to same magnification as d; f to same magnification as g; j, h, k to same magnification as i.

Holotype Female

Wing length 4.0 mm.

Head: Integument brown, clothed mesially with narrow curved, pale golden scales with a few dark behind the eye margin, and laterally with flat pale scales with an irregular patch of dark; upright forked scales all dark. Torus reddish brown, mesially slightly darker, with fine hairs and flat black and a few white scales; flagellar segments dark, the first with black and a few white scales mesially. Clypeus brown. Palp about 1/6 length of proboscis, dark scaled with some white scales basally. Proboscis about 1 1/3 times length of fore femur, dorsally dark scaled, ventrally mottled on basal 1/5, pale on following 2/5, and dark on apical 2/5; labella dark.

Thorax: Integument light reddish brown. Scutum with bare stripes between acrostichal and dorsocentral bristles on anterior 2/3, otherwise clothed with narrow curved golden scales, with fairly large patches of dark scales on and behind fossa; numerous dark acrostichal, dorsocentral, and supralar bristles. Scutellum clothed with narrow curved golden scales; 7 long bristles to mid lobe and 10 to lateral lobes. *Apn* and propleuron with broad white and a few narrow creamy scales; *ppn* clothed mainly with elongate flat white scales, a few dark below and a few narrow curved creamy above; no hypostigmal patch; broad white scales on postspiracular area, paratergite, below prealar knob, and on lower posterior margin of *stp*, and in large but not very dense patches on subspiracular area, upper *stp* and upper 1/2 *msp*; a few dark scales among white on upper and lower *stp*; 7-8 *ppn*, 6 postspiracular and 2 moderately strong, light brown, lower *msp* bristles.

Legs. Coxae white scaled, fore also with a patch of dark scales. Femora with complete basal pale band and prominent white kneespot, and posteriorly with pale scaling tapering ventrally to apex; anteriorly and dorsally fore and mid dark, mottled; hind pale anteroventrally to 3/4 length, mottled dorsally and apically. Tibiae with distinct white patch at base and some pale scales at apex, fore and mid dark anteriorly with an incomplete streak of pale or pale-reflecting scales posteriorly, hind slightly mottled anteriorly and posteriorly. Tarsal segments dark scaled with basal white bands or patches; on fore tarsus bands 1/6 I, 1/3 II, 1/2 III, patches 1/2 IV and V; on mid tarsus bands 1/6 I, 2/5 II, 1/2 III-V; on hind tarsus 1/7 I, 1/3 II, 2/5-1/2 III, 1/2 IV, 1/2-2/3 V. Fore tibial claw short, strong. Tarsal claws equal, fore and mid with a strong tooth, hind simple.

Wings. On both upper and lower sides dark scaled with a few scattered pale scales on C, Sc, and R1; fringe entirely dark; plume scales long and narrow; cell R2 2 1/5 times length of its stem, cell M1 1 1/7 times length of its stem, its base slightly proximal to that of cell R2; r-m its own length distal to base of M3+4. Halteres with pale stem, knob darker with mixed dark and pale scales.

Abdomen: Tergite I with mixed white and dark scales mesially, and white lateral border, II-VII dark scaled, II with broad basal median white patch, III-VII with fairly straight basal white band about 1/4 length, II-VII with large lateral basal white patches about 1/2 length of segment, the band confluent with the patches on IV-VII. Sternites pale scaled, III-V with dark apical band about 1/3 length, and some mottling basal to it, VI more extensively mottled on apical 1/2, VII dark. Cerci long, dark, exerted.

Paratype Females (Fig. 1, a - e)

Among 11 paratype females, the following differences from the holotype occur:

Wing length 3.7-4.1 mm.

Head: Very few dark narrow curved or flat scales, or fairly large submedian patches of dark narrow curved scales behind the eye margin; a few paler upright forked scales at nape; palp with only 1 or 2 pale scales or slightly or moderately mottled, including some pale scales at tip; proboscis mottled on basal 1/2 dorsally, pale on basal 2/3 ventrally.

Thorax: Only a few dark scales on fossa, but post fossal patch distinct. *Ppn* with no dark scales, or about 1/2 dark; scales on *apn* and *ppn* mainly narrow curved and lanceolate; no dark scales on *stp*; 6-10 *ppn*, 5-16 postspiracular bristles; 4 specimens have no lower *msp* bristles, 4 have 1 on one side only, and 3 have 1-3 on each side. Femora with complete dark preapical ring; fore and mid tibiae slightly and hind distinctly mottled, fore with a complete posterior pale streak; basal white bands on fore tarsal segments 2/5 II-III, 1/3-2/5 IV, V all dark, or with 1 or 2 white scales, or patch 1/3 length; on mid 3/5 III, 1/3 V; on hind 1/5 I, 2/5 II, 3/5 IV and V. Wing dark scaled except for a few pale scales on Sc, or with slight mottling on C, Sc and R1 and a few pale scales on Rs, M, Cu, and An; cell R2 1 1/2-2 1/4 times length of its stem, cell M1 9/10-1 1/3 times length of its stem, their bases level.

Abdomen: Tergite I white scaled mesially, basal bands 1/3-1/2 length II-VI, 1/3-2/5 VII, confluent with lateral patches on II-VII; VI with the band slightly produced mesially or a slight mottling beyond it or a couple of pale scales preapically; lateral patches 2/3 length of tergites. Sternites II-VI with slight mottling at apex, no complete band, VII pale on basal 1/3; or dark apical scaling produced in mid line on V and VI; or mottling extending from dark apical band to mid length on III-VI.

Terminalia (one specimen). Tergite IX bilobed with numerous scattered short setae; spermathecae triple; postgenital plate with truncated apex with 1 long seta at each lateral angle, and 4 fine setae proximal to these; insula bilobed with 4-5 setae to each lobe. Cerci dark, about 6 times as long as broad.

Larva (Fig. 1, *f-k*; association with *A. explorator* tentative)

Length about 7 mm; head, siphon, and saddle dark brown.

Head: $2/3$ as long as broad. Antenna dark, $2/5$ length of head, 6 times as long as broad, finely spiculate basally, strongly so on apical $2/3$; seta 1 arising slightly beyond mid length, 6 branched, frayed. Head seta 1 single, strong, tapering, almost $1/2$ length of antenna. Base of 7 slightly behind base of antenna, 6 arising level with it and little more than half way between it and mid line, 4 mesial to and slightly behind 6, 5 directly behind 6; 4 small, 7 branched; 5 and 6 2 branched, frayed, equal in length to antenna; 7 6 branched, frayed; 8-15 simple; 8 2 branched; 9 3-4 branched; 10 2-4 branched; 11 small, 4-5 branched; 12 2-3 branched; 13 4 branched; 14 single; 15 3-5 branched. Mentum with median and 9 lateral pointed teeth.

Thorax: Prothoracic setae 1-3 arising together from a small sclerotized base surrounded by a diffuse, darkly pigmented area; 1 single with 2 short side branches at mid length, or bifid from mid length, long, frayed; 2 single; 3 3 branched; 3 about $1/3$ length of 1, 2 slightly longer; seta 4 2-3 branched; setae 5-7 long, frayed; 5 1-2 branched; 6 single; 7 3-5 branched with base similar to setae 1-3; seta 14 3 branched.

Abdomen: Seta 6 on segments I-VI frayed, 2 branched, the branches often subdividing into 2 or 3 at some distance from base; on I seta 7 single, frayed, arising with 6 from a dark sclerotized base.

Segment VIII. Lateral comb a patch of 16-20 oval, fringed scales in 2-3 rows; one (sometimes 2-3) denticle of fringe at apex of scale produced to a slender spine $1/2$ - $2/3$ length of scale. Setae 1, 2, and 4 short, simple, 1 divided into 3 at mid length, or 2 branched, 2 and 4 2 branched; seta 3 long, plumose, 7-10 branched, arising from sclerotized base; seta 5 long, frayed, 7-8 branched.

Siphon tapering; acus present, incompletely sclerotized; index about 2.0; pecten extending over basal $1/3$, of 13-16 fairly evenly spaced spines; the more distal spines are long and taper from base to a slender tip, the most distal may be stronger (broken in specimen) with 1 strong tooth, but most have 2-3 slender denticles along lower margin at about $1/3$ length with a fine fringe basal to these, and may also have some fine denticles along upper margin near base of spine; seta 1 10-12 branched, plumose, arising at $2/5$ length of siphon; seta 8 4-6 branched; seta 9 strong, curved, with tip pointing forwards, single or (apparently) split at mid length.

Anal segment. Saddle $1/2$ length of siphon, covering dorsal $1/2$ of segment, apex with rows of fine spicules, the distal rows with fused bases, forming more or less distinct scales. Seta 1 single, simple, $1/2$ length of saddle; 2 8 branched; 3 single; 4 (ventral brush) of 16 tufts, 6-10 branched, 3 precratal, remainder arising from an incomplete grid. Anal papillae equal, tapering, twice length of saddle.

Described from a single larva from Mt. Olga in University of Queensland Collection.

Types

Holotype and 11 female paratypes, Mt. Olga, 300 miles S.W. Alice Springs, Northern Territory, Australia, 3.ix.1958, biting man by small stream 1000-1200 hrs, E. N. Marks. Holotype and 6 paratypes in University of Queensland Collection; one paratype each in Australian National Insect Collection, Canberra; School of Public Health and Tropical Medicine, Sydney; South Australian Museum, Adelaide; British Museum (Natural History); U.S. National Museum, Washington.

The specific name means "a diligent searcher", a seemingly necessary attribute of a mosquito which can survive this environment.

Biology

Mt. Olga consists of 28 domes of conglomerate with several small water courses between them. A heavy storm occurred there some weeks prior to this collection and there was still a slight flow between rock pools, some of which had green grass and green filamentous alga in them. Females of *A. explorator* were moderately numerous biting man along the largest watercourse, but larvae only of *Anopheles annulipes* Walker and *Culex australicus* Dobrotworsky and Drummond could be found in adjacent pools. A single *Aedes* larva was collected in another watercourse from a rock pool, 10 yards by 1-3 yards, and up to 18 inches deep, with a little grass and green alga, and in deep shade from high cliffs and overhanging trees; water temperature was 51°F; this has been tentatively associated with *A. explorator*. The forwardly curved, hook-like seta 9 on the siphon is reminiscent of, though less strongly developed

than, seta 9 in larvae of the Theobaldi Section, and suggests that it may do some of its feeding lying on its back at the bottom, when the hook could serve as an anchor.

Females of *A. explorator* showed that they are well adapted to the dry climate by surviving two days in a small cloth cage which was damped only very occasionally.

The nearest rainfall records are from Tempe Downs 100 miles S.W. Alice Springs where annual rainfall is about 9 inches.

Discussion

Affinities of *A. explorator* remain uncertain while the male is unknown and the larva not known with certainty. *A. explorator* bears some resemblance to *A. flavifrons* which has much more extensively mottled wings, no bare submedian stripes on scutum, and unbanded tergites in female; to *A. perkinsi* Marks which has no bare scutal stripes, and no mottling of wings and tibiae; and to *A. procax* (Skuse) and *A. inexpectatus* Bonne-Wepster, of the Vigilax Section, which have bare scutal stripes, but unmottled wings and femora. The larva tentatively associated with *A. explorator* might belong to the Vigilax, Flavifrons, Perkinsi, or Cunabulanus Sections, which cannot be separated on larval characters.

Aedes (Ochlerotatus) linesi sp. n.

Distinctive Characters

A fairly large species with dark scaled wings (except near base of C and R), mottled femora and tibiae, hind tarsal segments I-V with basal white bands (1/9 I, 1/3 IV and V), I-IV also with small apical white bands or patches; subspiracular scales present; female with palp white tipped, proboscis with patches of white and dark scales, lower *msp* bristle present, tergites with white basal bands widening laterally.

Holotype Female

Wing length 4.7 mm.

Head: Integument dark, clothed mesially with rather broad curved white scales with some narrower ones among them, and a border of several rows of light brown narrow curved scales along the eye margin; flat white scales laterally, partly interrupted by a conspicuous patch of flat black; upright forked scales numerous, mainly dark with some pale in mid line towards nape. Torus dark brown with flat pale and dark scales mesially; first flagellar segment with similar scales; flagellum dark with sparse dark verticillate hairs. Clypeus dark. Palp 1/5 length of proboscis, dark scaled with white tip and some white scales at base and mid length; proboscis 1 1/3 times length of fore femur, clothed with about equal amounts of white and dark scales scattered in irregular small patches rather than mottled; labella dark.

Thorax: Integument dull darkish brown. Scutum with 2 small bare submedian patches on anterior margin, elsewhere clothed with rather large white, creamy, light brown, and dark brown curved scales; scales on median 1/3 anteriorly appear finer; the colours are mingled and there is no distinctive pattern, but on anterior 1/3 scales are mainly light brown with some dark along lines of acrostichal and dorsocentral bristles and creamy posteriorly on the fossa; there is a large area of mainly dark scales mesially behind this and in front of extensive white scaling round the prescutellar bare area; white and creamy scales above and in front of the wing root. Numerous dark acrostichal, dorsocentral, and supraalar bristles, others on fossae and round margin. Scutellum lightish brown, clothed with large curved white scales; about 9 long dark bristles to lateral lobe (mid lobe obscured by pin). *Apn* with narrow curved white scales above, lanceolate creamy and a few dark below. *Ppn* fairly densely clothed with large curved scales, mixed light brown and dark, with a few lanceolate white below. Pleural scales white, curved and broad on propleuron, remainder broad (may be a few curved on sub- and postspiracular areas); no hypostigmal patch; large dense scale patches (forming an almost continuous band across pleuron) on subspiracular area, upper 1/2 *stp* (except bare anterior margin), prealar area, and upper 2/3 *msp*; patches also on postspiracular area, paratergite, and lower posterior margin of *stp*; metameron bare; 9-10 *ppn*, 13-14 postspiracular and 1 rather fine, pale lower *msp* bristle arising about mid length, close to anterior margin.

Legs. Coxae white scaled, a few dark also on fore coxa. Femora with narrow pale band at base, and small pale kneespot; dark with extensive mottling of pale scales anteriorly and dorsally, pale posteriorly except on about distal 1/4 which is mainly dark with some mottling; tibiae with narrow basal and almost complete apical pale bands, and mottled anteriorly; posteriorly fore tibia is pale, mid pale almost to apex, and hind dark with some pale-reflecting scales. Tarsi dark, with white bands.

Fore tarsal segments I–III with basal bands about 1/8 I, 1/4 II, 2/5 III, IV and V with basal patches; I and II also have apical white patches and I has a pale streak its whole length posteriorly, mid tarsus similar but with complete basal bands 2/5 IV and V. Hind tarsus with basal bands 1/9 I, 1/5 II, 1/4 III, 1/3 IV and V; I with a narrow white apical band and with posterior pale streak discontinuous preapically; II–IV with white apical patches. Fore tibial claw inconspicuous. Tarsal claws equal, fore and mid pairs each with a strong tooth; right hind claws simple with stout ventral bristle, the posterior claw of the left pair similar, the anterior with a distinct slender tooth.

Wings. Dark scaled except for numerous pale scales at base of C and R above and on C beneath (a few on R) scarcely extending beyond humeral crossvein; plume scales long and narrow; cell R2 2 2/5 times length of its stem, cell M1 1 1/5 times length of its stem, their bases about level; r-m 1/2 its length distal to base of M3+4. Halteres with pale stem and dark knob clothed with white scales.

Abdomen: Tergite I with mixed white and dark scaled patch mesially and white lateral border. II–VII dark scaled with fairly straight white basal bands about 1/3 length of tergites; lateral margins curved and hidden but the bands appear not to widen laterally on II–IV; on V–VII they widen laterally to about mid length of tergite, continuing along lateral border as a line of pale scales to apex on VII and partly so on VI. III–V have some white scales mesially along apical margin; VI and VII have a complete apical white margin and V–VII have a few pale scales scattered on the dark area. Sternites white scaled, basal median elongate dark patch on III–VI, mottled patch on VII; apical or preapical lateral dark patches on III–VII. Segment VIII narrow, unscaled; tergite IX bilobed; postgenital plate broadly rounded, with fine hairs; cerci long, dark.

Type

Holotype female, Robe, South Australia, 10.iii.1953, E. W. Lines, labelled "X.7" (a perfect specimen except for some scutellar bristles) deposited in Australian National Insect Collection, Canberra. The number "X.7" signified that there was a linked larval skin, but this has apparently been lost. No other specimens are known.

This species is named after its collector, Mr. E. W. Lines, in appreciation of his considerable contribution to knowledge of South Australian mosquitoes.

Biology

Nothing definite is known of the biology of *A. linesi*, but it is from the type locality of *A. calcariae* Marks which was found breeding in flooded rabbit burrows with *A. camptorhynchus* (Thomson), *A. clelandi* (Taylor), and *A. purpuriventris* Edwards (Marks, 1957).

Discussion

The only other known Australian species of *Ochlerotatus* with apical pale scaling on some tarsal segments are *A. calcariae*, *A. flavifrons* (in part, see p. 70), and an undescribed Western Australian species. *A. calcariae* has unmottled femora, hind tarsal segment V all white, and sparse pleural scaling; *A. flavifrons* has wings and abdominal tergites with mottled scaling; both species belong to the Flavifrons Section. The Western Australian species has narrow basal bands not more than 1/6 hind tarsal segments IV and V, or V all dark, and sparser pleural scaling, but the pale scaling at base of wing is similar to *A. linesi*. Until males and larvae are discovered it is impossible to judge the true relationships of *A. linesi*. The dense pleural scaling suggests it is unlikely to belong in the Vigilax Section.

A. calcariae and *A. camptorhynchus* share breeding places and were taken in large numbers where the type of *A. linesi* was collected. Since it shows many characters intermediate between these two species, the question was raised as to whether it might be a hybrid specimen; in the absence of any field or laboratory evidence of hybridization of Australian *Ochlerotatus*, this is considered to be only a very remote possibility.

***Aedes* (*Ochlerotatus*) *phaecasiatus* sp. n.**

Distinctive Characters

A medium sized species with dark scaled wings, unmottled femora, hind tarsal segments I–IV with broad basal white bands (1/5 I, 1/2 IV), V all white above (may be dark beneath on distal 1/2); no subspiracular scale patch; paratergite bare; female with palp white-tipped, proboscis pale on basal 2/3 beneath, lower *msp* bristles present, tergites with basal bands and with basal lateral patches which are broadest at their apex.

Holotype Female

Wing length 3.3 mm.

Head: Integument dark brown, clothed mesially with creamy narrow curved scales, with a band of dark ones anteriorly, and an incomplete line of creamy along eye margin; flat white scales laterally with a patch of black; upright forked scales numerous, black. Torus dark with fine hairs mesially but no scales; flagellar segments dark with sparse dark verticillate hairs. Clypeus brown. Palp 1/5 length of proboscis, dark scaled with some white scales at mid length and large white patch at apex; proboscis about 1 1/2 times length of fore femur, apical 1/3 dark scaled, basal 2/3 dark above with some mottling, creamy beneath except right at base; labella dark.

Thorax: Integument dark brown. Scutum with fine, narrow curved, dark and pale golden scales, apparently not forming a distinct pattern (the posterior 1/3 is discoloured by moisture); 2 small submedian bare patches on anterior margin; pale scales at humeral angle and anteriorly on fossa, above wing root, and scattered elsewhere; scutal bristles very numerous, black. Scutellum discoloured and denuded. *Apn* with a few mixed dark and pale narrow curved scales. *Ppn* fairly densely clothed with dark scales, mainly elongate flat, with several rows of narrow curved above, and a few narrow curved creamy posteroventrally. Smallish patches of broad flat white scales on propleuron, postspiracular area, below prealar knob, upper *stp*, lower posterior margin of *stp*, and a continuous or narrowly divided patch on upper 2/3 *msp*; subspiracular area, paratergite, and metameron bare. *Ppn* with 7 strong and 8 finer bristles, the latter mainly low down; about 10 postspiracular; 1 strong dark or pale lower *msp* bristle (on one side 3 fine ones also) high up near anterior margin.

Legs. Fore coxa black scaled with a few white above, mid with mixed black and white, and hind with white scales. Femora unmottled. Fore femur dark except for white dorsal patch at base and a fairly narrow stripe of pale scales from base to apex posteriorly. Mid femur similar but broadly pale posteriorly on basal 3/4, the dark scaling then widening to a complete apical band, with a small pale patch at tip. Hind femur largely pale on basal 1/2 but dark scaling extends dorsally almost to base, and widens on apical 1/2 to form a complete apical band (no pale scales at tip which may be slightly denuded posteriorly). Tibiae dark, posteriorly all with small basal white patches, fore and mid also with apical patches and fore with an incomplete pale streak. Tarsal segments dark with wide white basal bands. Fore tarsus with bands 1/5 I, 1/3 II, basal patch 1/4 III, IV and V dark, with, on one leg only, 1 or 2 scattered white scales. Mid tarsus similar but complete band 1/3 III, V all dark. Hind tarsus with bands 1/5 I, 1/3 II, 2/5 III, 1/2 IV, V all white. Fore tibial claw strongly developed. Tarsal claws equal, fore and mid with a strong tooth, hind simple with a stout ventral bristle.

Wings. Entirely dark scaled; plume scales long and narrow; cell R2 1 1/2 times length of its stem, cell M1 equal to its stem, its base slightly proximal to that of cell R2; r-m its own length distal to base of M3+4. Haltere with pale stem; knob dark (but partly denuded and possibly discoloured) with some pale scales.

Abdomen: Tergites I-V dorsally discoloured and denuded so that scaling cannot be determined; I with white scaled lateral border, II-V with elongate basal white lateral patches about 2/3 length of sclerite (their shape obscured by partial discoloration). Tergites VI, VII dark scaled; VI with basal white band about 1/4 its length, widest mesially, not reaching to basal lateral white patches which are narrowest at base, widen gradually, and extend almost to apex, and with some pale scales along apical border; VII with basal median triangular white patch, a couple of scattered white scales beyond it in mid line, basal lateral white patches extending to about mid length with some white scales beyond them on lateral border, and some pale scales along apical border. Sternites II-V white scaled on about basal 2/3, with dark apical band; IV and V with some white scales mesially along apical border; VI white with some scattered dark scales, and narrow dark preapical band; VII mainly dark with scattered white scales basally, and along apical border; segment VIII retracted; cerci long, dark.

Paratype Female

The paratype female shows the following differences or additional characters:

Wing length 2.9 mm.

Head: Torus brown; first flagellar segment pale basally, and with flat dark scales mesially; palp with white scales at apex only.

Thorax: Scutal integument dark reddish brown with darker stripes along lines of acrostichal and dorsocentral bristles; narrow curved creamy scales round prescutellar bare area and on scutellum; scutellar bristles dark, about 7 long ones to each lobe; postnotum light brown. Hind femur with small apical pale patch posteriorly. Mid tarsus with basal band 1/6 I, III with basal patch only; hind tarsal segment V with some dark scales ventrally on distal 1/2. Knob of haltere dark, with dark and pale scales.

Abdomen: Tergite I mesially dark scaled with few scattered white; tergites II-VI with straight basal white bands, on II confluent with white lateral basal patch, on III-VI separated by dark scaling

from the lateral white patches, which extend from base about 2/3 length of segment, and are widest distally; VI dark apically; VII dark with basal lateral patches, and a few pale scales along apical border. Sternites II–VI pale with apical dark bands; a few white scales among dark on VI; VII dark with some white scales basally.

Types

Holotype female, 5 miles from Maningrida (12° 03' S, 134° 13' E, alt. 20 ft), Arnhem Land, Northern Territory, Australia, 17.iii.1961, J. L. and P. Gressitt, taken in Malaise trap (a large stationary net); paratype female, Mitchell River Mission (15° 20' S, 141° 40' E, alt. 20 ft) Queensland, 1.iv.1960, E. N. Marks, biting man 1900–2100 hrs; both deposited in University of Queensland Collection.

The type is in perfect condition except for the dorsal discoloration and denudation indicated; the paratype has antennae and right mid tarsus incomplete, scutum denuded anteriorly.

The specific name, meaning "a wearer of white shoes", refers to the white fifth hind tarsal segment.

Discussion

Affinities of *A. phaecasiatus* are uncertain while the male and larva remain unknown. The only other known Australian species of *Ochlerotatus* with hind tarsal segment V all white is *A. calcariae* Marks in the Flavifrons Section, but it has scales on the subspiracular area and hind tarsal segments I–IV with apical pale patches and with narrower basal bands, particularly on I. *A. phaecasiatus* appears more likely to belong in the Vigilax Section, and on head and thoracic scaling it is similar to *A. vigilax* (Skuse) except for its bare paratergite but it differs markedly in leg and wing scaling. Possession of lower *msp* bristles need not exclude it from the Vigilax Section since they occur also in *A. inexpectatus* Bonne-Wepster. Another member of this Section, *A. edgari* Stone and Rosen from Tahiti, has similar leg markings to *A. phaecasiatus* but lacks basal white bands on tergites and sternites. In the lateral markings of the tergites, which are narrow towards the base of the sclerites, *A. phaecasiatus* resembles *A. vigilax* and also *A. nocturnus* (Theobald), and it is possible that it might belong in the same subgenus, *Aedimorphus* Theobald, as the latter species.

Aedes (*Ochlerotatus*) *sapiens* sp. n.

Distinctive Characters

A medium to large sized species with extensive mottling of wings, femora, tibiae, and tarsi; unbanded tarsi; proboscis of female dark or mottled, of male mottled; abdominal tergites with median, basal, white, elongate triangles or complete stripes, usually arising from basal white bands confluent with lateral basal white patches; scutal scaling light or bronzy brown with white scales on anterior margin and elsewhere; white subspiracular scale patch sometimes continuous with postspiracular scale patch, but separated from hypostigmal scale patch.

Male terminalia: Coxite with rounded basal lobe bearing fine, unmodified setae; no distinct apical lobe but 3 stout striated setae preapically near inner tergal margin; harpago stout, with strong preapical thumb bearing a seta; appendage broad, with blunt tip and sparse short fimbriations on distal margin.

Holotype Female (Fig. 2, a–c)

Wing length 4.0 mm.

Head: Integument dark; narrow curved white scales from nape to vertex and extending between eyes, narrow curved dark scales subdorsally behind eyes; numerous upright forked scales, pale mesially, dark laterally; lateral flat scales mainly white with a few dark above on eye margin; vertical bristles pale, ocular bristles dark. Torus dark, with flat white scales; flagellar segments dark, first with white scales. Clypeus dark. Palp a little more than 1/5 length of proboscis, dark scaled, sparsely mottled with white. Proboscis almost 1 1/3 times length of fore femur, dark scaled; labella dark.

Thorax: Scutal integument dark, scales narrow curved; small submedian bare patches on anterior margin, with white scales mesial and lateral to them; main scutal scaling light brown, with white scales along lateral margin of fossa, behind fossa, in front of and above wing root, lateral and mesial to prescutellar bristles, and in front of small prescutellar bare area; scutal bristles numerous,

dark; a few blunt-tipped pale ones in front of wing root. Scutellum light brown, with white narrow curved scales on all lobes; about 10 long and numerous shorter bristles to each lobe. Postnotum brown. *Apn* and *ppn* with mixed curved, lanceolate, and broad scales, white below, and mainly brown on upper 1/2-2/3 *apn* and upper 1/2 *ppn*. Propleuron white scaled. Subspiracular area with an elongate white patch of lanceolate and broad scales running above margin of *stp* and widening in middle to reach lower margin of *ppn*, and a separate hypostigmal patch of lanceolate and broad white scales. Postspiracular area and paratergite with extensive patches of lanceolate and broad white scales. White scaling on upper *stp* not dense, but practically confluent with patch at base of prealar knob, with lower posterior *stp* patch, and with white scaling on upper 3/4 *msp*. Metameron on one side with one white scale. 9-10 *ppn* and 7 postspiracular bristles; 7-8 fairly long, pale, lower *msp* bristles in an irregular double row about middle of anterior border and extending almost to upper *msp* bristles.

Legs: Coxae white scaled. Femora mottled anteriorly, mid with about equal proportions dark and pale, fore and hind predominantly pale, all with white kneespots; posteriorly fore and mid pale, to apex, hind pale on basal 4/5, mottled apically. Tibiae anteriorly mottled, posteriorly fore and mid pale, hind pale with sparse dark mottling, and mainly dark near apex. Tarsal segment I extensively mottled, posteriorly mainly pale; II with variable mottling, more extensive posteriorly; III dark or with a few pale scales; IV and V dark. Tarsal claws equal, fore and mid with a strong tooth, hind - 1 toothed, 3 with a stout bristle.

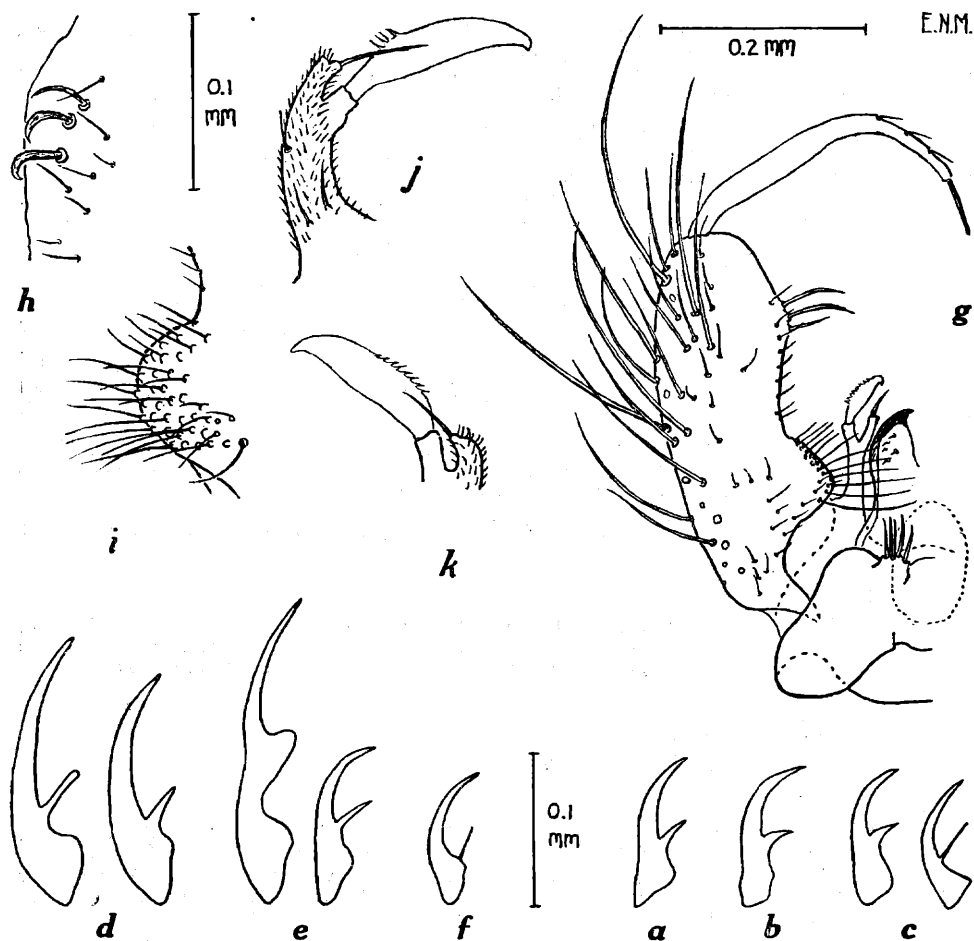


FIG. 2.—*Aedes sapiens* sp.n.: a-c, ♀ tarsal claws (holotype)—a fore; b, mid; c, hind; d-f, ♂ tarsal claws (allotype)—d, fore; e, mid; f, hind; g-j, ♂ terminalia (allotype)—g, left half, tergal aspect; h, i, inner lateral aspect of right coxite; h, preapical setae; i, basal lobe; j, right harpago, inner lateral aspect; k, left harpago, inner lateral aspect.

Wings. Upper surface with extensive mottling of white scales on all veins, except near apex of R2, R3, M1, and M2; white scales on Sc 2-2 1/2 times as long as broad; some plume scales broadened, broadest white scales on stem of cell M1 about 4 times as long as broad; basal fringe scales dark; lower surface with a little mottling on C, Sc, and R1. Cell R2 1 1/2 times length of its stem, cell M1 9/10 length of its stem, its base slightly proximal to that of cell R2; r-m its own length distal to base of M3+4. Halteres pale, knob mainly pale scaled with a few dark.

Abdomen: Tergite I with white scales only; tergites III-VII with a complete wide basal white band, continuous with large lateral basal white patches which extend almost to apex of sclerite; a narrow band on II, on one side not continuous with lateral patch; in mid line the basal band extends as narrow triangle with tip at apex of sclerite on II and IV, almost at apex on III, and as a broader median stripe to apex on V-VII. Sternites white scaled with some dark laterally at apex; cerci long, dark.

Paratype Females

The 17 paratype females from Wilcannia show the following variations from holotype:

Wing length 4.1-5.3 mm.

Head: Dark subdorsal scales on head may extend to nape, or be separated from eye margin by a row of narrow curved pale scales. Palp 1/4 length of proboscis, with only 1 or 2 pale scales, or extensively mottled. Proboscis 1 1/5 times length of fore femur, all dark, or (usually) with a few white scales on basal 1/2, or extensively mottled on basal 2/3 above and to apex beneath.

Thorax: Main scutal scaling may be bronzy brown; white scaling may be continuous round anterior margin and extend along line of acrostichal bristles and inner margin of fossa. *Ppn* may be dark scaled on upper 2/3. White scales in pleural patches usually mixed, broad and lanceolate; hypostigmal and postspiracular scale patches may be confluent, and may be entirely of narrow scales; there may be narrow scales on propleuron, *stp*, and *msp*; metameron bare in all specimens; 7-13 *ppn*, 5-9 postspiracular and 2-9 lower *msp* bristles. Fore femur anteriorly may be almost entirely pale; and hind femur posteriorly mainly dark on distal 1/5, or pale to apex; tibiae and tarsal segments I-II may be predominantly pale, III mottled, and there may be a few white scales on mid and hind tarsal segment IV. All hind claws may be toothed, or all simple with a strong bristle. In maximum mottling of wing it extends to apex of all veins except R2; in minimum, C, Sc, and R1 are sparsely mottled; there is no mottling on Rs, R2, R3, R4+5, only 2 or 3 white scales near base of M and An, and 2 or 3 scattered white scales on Cu; on underside there may be 1 or 2 white scales on Rs and M. Cell R2 1 1/5-1 4/5 times length of its stem, cell M1 4/5-1 1/4 times length of its stem, its base level with or proximal to that of cell R2; r-m 1/2-1 1/2 times its own length distal to base of M3+4.

Abdomen: Tergites may have a complete median stripe through II-VII, with bands complete on II-VII or only on V-VII; or median triangles, reaching apex only on VII, with some pale scales at apex of V and VI; VII may be pale except for small sublateral preapical dark patches.

One paratype female from Richmond generally lies within the above range of variation.

Wing length 4.1 mm.

Scutal scales mainly creamy with some light brown on fossae and mesial to dorsocentral bristles; fore and mid tibiae mottled posteriorly; tarsal segment II on all legs with few white scales; tergites II-III with basal band incomplete, II-V with broad median triangles 1/2 length of sclerite.

Allotype Male (Fig. 2, d-k)

Differs from the female as follows:

Wing length 4.0 mm.

Head: White scaled, except for a few dark upright forked scales laterally at nape. Tori obscured; verticillate hairs dense, light brown, lying in a vertical plane. Palp exceeding length of proboscis by more than length of segment V; segments I-IV mainly white scaled with some mottling, V with a few white scales at base and dark ones distally; dense long brown hairs ventrally on IV and V and on distal 1/3 III. Proboscis 1 1/5 times length of fore femur, dark scaled with mottling on basal 2/3.

Thorax: Scutum with extensive creamy and white scaling; brown scaling mainly between acrostichal and dorsocentral bristles, and some on fossae. *Apn* and *ppn* almost entirely white scaled, mostly lanceolate on *apn*, broad on *ppn*; 4-5 postspiracular and no lower *msp* bristles. Fore tarsal claws subequal, anterior with long, blunt tooth at 1/3, posterior with long, sharp tooth near base; mid tarsal claws unequal, anterior with a large swelling close to mid length, posterior shorter, toothed; hind claws equal, with bristle.

Wings: On upper side C, Sc, R1, Rs, Cu, and An with some scattered white scales, veins rather bare distally; on under side scattered white scales on C and Sc only; cell R2 $1\frac{1}{5}$ times length of its stem, cell M1 $\frac{3}{4}$ length of its stem.

Abdomen: Tergites II-III with median white stripe, widest at base, IV-VI with median stripe and complete basal band, VII cut, apparently similar; long hairs laterally on tergites, above which on II-III are 2-3 white scales forming basal patches, and on IV-VI narrow elongate white patches fused with basal bands.

Terminalia: Coxite cylindrical, about $3\frac{1}{3}$ times as long as broad at mid length, with distinct basal lobe but no distinct apical lobe; numerous dark scales laterally and sternally. Coxite bears tergally a few short fine setae, more numerous near base, laterally many long setae, and sternally numerous long setae including a row of 3 very strong ones towards inner aspect preapically, and some fine setae basally. Basal lobe rounded, bearing about 40 fine setae, the most basal and tergal a little longer than the rest. No distinct apical lobe but a preapical row of 3 stout striated setae near inner tergal margin. Style $\frac{2}{3}$ length of coxite, more slender and curved on distal third which bears 2-3 short setae; terminal appendage slender, blunt-tipped, $\frac{1}{5}$ length of style. Harpago about $\frac{1}{5}$ length of coxite, with strong, pilose, preapical thumb on its mesial side; apex of thumb extending to, or beyond (depending on angle from which it is viewed) apex of harpago, square-ended and bearing a single seta about half length of appendage; 3 other setae on mesial aspect of harpago; appendage about equal in length to harpago, broad, with curved bluntly pointed tip, its distal margin sparsely fimbriated. Paraproct with a single tooth. Phallosome simple, oval. Lobes of tergite IX with 5 stout setae; sternite IX with 5 setae.

Types

Holotype female, 20 miles N. Bourke, N.S.W., 29.viii.1960, in vehicle, F. H. Drummond; allotype male, same locality, date, and collector, roadside pool, pupa (no linked skin); 9 paratype females, Mt. Murchison Station, 20 miles N. Wilcannia, N.S.W., 13.iv.1963, M. J. Mackerras; 8 paratype females, same locality, 14.iv.1963, R. Mykutowicz; 1 paratype female, Richmond, Queensland, 7.v.1952, biting 1730 hrs, E. N. Marks. Holotype, allotype, and 10 paratypes in Australian National Insect Collection, Canberra; 4 paratypes in University of Queensland Collection; one paratype each in School of Public Health and Tropical Medicine, Sydney, National Museum of Victoria, Melbourne, British Museum (Natural History), and U.S. National Museum, Washington.

This species is named *sapiens*, meaning "wise", to suggest its affinities with *A. sagax* (Skuse).

Biology

The Richmond specimen was taken during a severe drought, beside temporary pools in depressions which had been filled from overflow of a damaged bore-drain and from which larvae of other species of *Ochlerotatus* were collected. At Wilcannia females were rising in clouds from flooded country, and biting by day. Average annual rainfall is 18 inches at Richmond, 12 inches at Bourke, and 9 inches at Wilcannia.

Distribution

Known only from Wilcannia and Bourke on the Darling River in western New South Wales, and Richmond about 650 miles N.N.W. of Bourke.

Discussion

The mottled wing scaling gives *A. sapiens* a superficial resemblance to species of the Stricklandi Section, but male terminalia characters place it in the Burpengaryensis Section; it is the undescribed species in the Burpengaryensis Section referred to by Marks (1963, p. 47). Other species of the Burpengaryensis Section have little or no mottling on wings. In pleural scaling *A. sapiens* resembles *A. nigrithorax* (Macquart) and *A. sagax*. *A. sagax* may have basal bands on tergites produced into median triangles or stripes, but the wings usually have pale scales limited to bases of C, Sc, and R1; the greatest extent of mottling observed in this species is in a male and female from Rand, N.S.W., the female has C mainly white to mid length, Sc extensively mottled to tip, a few white scales on basal half of R1, one white scale on Cu and two on An; the male has pale scales at base of C and R1, and scattered on basal $\frac{3}{4}$ Sc.

The only male of *A. sapiens* seen has distinct mottling on C, Sc, R1, Cu1, and An; the female (*Wilcannia*) with least pale scaling on wing has C mottled throughout its length, Sc with a few white scales near tip, R1 with sparse mottling to tip, a couple of white scales on Cu and at base of An. In both sexes of *A. sagax* the broad white scales on Sc are about 4 times as long as broad, whereas in *A. sapiens* they are 2–2 1/2 times as long as broad, and this may be a useful character where any doubt exists on the identity of a female.

The male of *A. sapiens* differs from all members of the Burpengaryensis Section except an undescribed species (figured by Mackerras (1927) as *A. sagax*) in having the thumb arising close to the apex of the harpago; the latter species has coxite with 2 rather fine setae near inner tergal margin preapically, a less developed basal lobe, and longer fimbriations on harpago appendage.

Aedes (Ochlerotatus) flavifrons (Skuse)

Culex flavifrons Skuse, 1889, *Proc. Linn Soc. N.S.W.* 3: 1735.

Culicada vandema Strickland, 1911, *Entomologist* 44: 202.

Culicada vandema var. *variegatans* Strickland, 1911, *Entomologist* 44: 204.

Dobrotworsky (1960) has described both sexes, larva and pupa of *A. flavifrons* from Victoria, but neither he nor other authors who have described this species (Skuse, 1889; Strickland, 1911; Taylor, 1914; Mackerras, 1927) have mentioned any apical pale scaling on the hind tarsal segments. I have briefly examined (1957) the type male from Blue Mts. in the Macleay Museum; all legs were missing except left mid femur and right hind leg on which the white tarsal bands were basal only.

I have examined (1960) in the British Museum (Natural History) 4 females labelled "Tasmania, Dr. Bancroft", "Pres. by F. V. Theobald 1911–27", presumably all belonging to the original series of 5 (or perhaps 6) examined by Strickland, viz.:

(1) Labelled "*Culicada vandema* Type ♀ 24/11/1910 E. H. S.". Both hind legs and left mid leg are missing; tarsal bands on the remaining legs do not extend on to the apices of the preceding segments; tergites are mottled.

(2) Labelled "*Culicada vandema* var. *variegatans* Type ♀ 30/11/1910 E. H. S.". Both hind legs and right fore leg are missing; tarsal bands on the remaining legs do not extend on to the apices of the preceding segments; tergites are mottled.

(3) Hind tarsal segment I with pale scales at apex, and a couple of pale scales at apex of II (II–V missing on one leg); tergites are mottled.

(4) Hind tarsal segment I with pale scales at apex (none seen on II but rather mouldy); tergites mainly dark, III–V with a few scattered pale scales, VI mottled, pale along apex of V and VI, VII largely pale.

Five additional females in the British Museum (Tasmania: Advent Bay and Strahan, Tonnoir; Wedge Bay, Littler. N.S.W.: Myall Lakes, and Woy Woy, Mackerras) have mottled tergites and pale scales at apex of hind tarsal segment I. In University of Queensland Collection one female (Russell Falls, Tas.) has an almost complete pale ring on hind tarsal segments I and II and some pale scales at apices of mid tarsal segments I and II; its tergites are extensively mottled, and scutal scaling agrees with the description of var. *variegatans*; another female (Eaglehawk Neck, Tas., Tonnoir) has pale scales at apex of I on all legs and II on hind leg, tergites mottled.

In one Victorian specimen (Richmond, Dobrotworsky) there are pale scales at apex of mid tarsal segments I and II and hind I–III; tergites III–VI are only sparsely mottled; some other Victorian specimens have apical pale scales on at least hind tarsal segment I.

Dobrotworsky (1960) has indicated the variability of *A. flavifrons*, and the above notes are given to show that this extends to the hind tarsal markings, bringing some specimens into the small group of Australian *Ochlerotatus* with apical pale scaling on hind tarsal segments. It seems that these markings tend to occur on females with

extensively mottled tergites and not on females with the more basal tergites entirely dark dorsally, but intermediate specimens are seen. Whether males show the same tarsal variation is not known. The paratergite, not mentioned in previous descriptions of *A. flavifrons*, bears small broad white scales in both sexes.

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I am indebted to Dr. J. L. Gressitt for making available the Northern Territory specimen of *A. phaecasiatus* and similarly to Drs. N. V. Dobrotworsky and M. J. Mackerras for New South Wales specimens of *A. sapiens*, and Mr. F. N. Ratcliffe for the unique specimen of *A. linesi*. The contribution of the collectors mentioned and of those who assisted them is gratefully acknowledged.

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