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XLIX.—*Notes on the Tabanidæ of the Australian Region.*
By GERTRUDE RICARDO.

TABANINÆ.

TABANUS, Linn.

This paper is based on the material in the Brit. Mus. Coll., on a small collection of flies sent me by Mr. Froggatt for identification, which he kindly allows me to retain and add to the National Collection, on a number of Tabanidæ sent me by Mr. Wainwright for identification, on a few Tabanidæ in Diptera sent me by Mr. French from the Melbourne Museum to work out, and, lastly, on the Tabanidæ belonging to the German Entomological Museum in Berlin sent me some months ago by Herr Schenkling, which I had promised to describe, the results to be published by him in his 'Supplementa Entomologica.' I had already received from him a proof of the MS. on the species of *Tabanus* from the Palæarctic Region in the above-mentioned museum just before the war broke out, which must, of course, be laid aside till the conclusion of peace. Meanwhile, the editors of the 'Annals' have kindly undertaken to publish these notes, in which will be included species from the Celebes eastward, including Tasmania and outlying islands; the species from New Guinea have already been dealt with in my paper in 'Résultats Expedition Sci. Néerlandaise Nouv. Guinée,' ix. (3) 1913. The New Zealand species I propose to describe separately, as they appear to have little affinity with those of the mainland.

Very little work has been done in this family from this region since Macquart and Walker's time (1838-1856). In 1911 Mr. Froggatt mentioned a few species in 'March Flies.' Mr. F. H. Taylor, in Austr. Inst. Trop. Med. 1911, published 1913, described several new species and Miss Summers others in the Ann. & Mag. Nat. Hist. (8) x. (1912). Several of these new species, however, prove to be synonyms of older species (see Mr. Austen on Mr. Taylor's paper in Ann. & Mag. Nat. Hist. (8) xiii. 1914). This is not surprising, as, unless one has access to the types, it is almost impossible to identify species from the descriptions by Macquart, Walker, and Bigot. Having been able to examine the majority of these authors' types in the British and Paris Museums and in the late Mr. Verrall's collection, I am

giving redescriptions of them, in the hope that they may prove of some service to workers in Australia and enable them to name new species with more certainty; there must be a great number of such species in the newer districts of Australia, such as Northern Queensland.

For the classification of groups see my paper on the *Tabanus* species of the Oriental Region in 'Indian Records,' iv. no. vi. (1911). The original pagination is used for Macquart's Dipt. Exot. Nomenclature of colours is taken in many instances from Ridgway's work on Colour Standards (1912). Where the eyes are not mentioned, they are bare and devoid of pubescence.

Group IV.

Forehead with no callus.

Tabanus nemotuberculatus, ♀, sp. n.

Type (female) in Mr. Froggatt's Coll. from Cape York, Queensland, 30. 2. (1906), and another female from S. Queensland (Dr. T. L. Bancroft), 1908, in Brit. Mus. Coll.

This type is not in very good condition, but may easily be recognized by the shading on veins of wings and by the absence of any frontal callus on forehead. Abdomen narrow, obscurely ferruginous. Antennæ and legs the same colour. Palpi short and stout.

Length 10 mm.

Face and forehead honey-yellow, the former with some greyish tomentum. Palpi a shade darker in colour, almost the same width throughout, ending in an obtuse point. Antennæ ferruginous, slender, with a very slight angle or tooth. Forehead parallel or almost wider anteriorly, about four times as long as it is broad anteriorly. Thorax darker than abdomen, covered with some greyish tomentum. Scutellum is identical. Abdomen (denuded) dull ferruginous. Legs same colour, a little darker on tarsi. Wings grey, fore border yellowish brown, and every longitudinal vein shaded brown; short appendix present.

The other female has the wings almost clear. Abdomen covered with greyish tomentum and with short yellowish hairs intermixed with black ones.

Tabanus nemopunctatus, ♀, sp. n.

Type (female) from Dunk Island, Queensland (Bunfield), 15. 1. 1902, in Mr. Froggatt's Coll.

A species at once distinguished by the absence of any calli on the forehead, which, together with the abdomen, legs, and palpi, is honey-yellow in colour.

Length 12 mm.

Face honey-yellow, with some greyish tomentum. *Palpi* same colour, long and slender, stouter at base. Beard yellow, very scanty. *Antennæ* ferruginous, the first two joints paler in colour, the third joint with a small angle or tooth. *Forehead* parallel, with golden-yellow pubescence, about five times as long as it is broad. *Thorax* dark, covered with short fulvous pubescence and tomentum of the same colour. *Abdomen* stout, short, honey-yellow, appearing darker at apex, as the pubescence at the sides is black, elsewhere golden-coloured. *Legs* honey-yellow, tarsi blackish, pubescence golden-yellow on femora, elsewhere chiefly black. *Wings* clear yellow on fore border; long appendix present.

Group VII.

Abdomen with one or more stripes, usually continuous.

Tabanus cinerescens, MacLeay, King's Survey Coast Australia, ii. p. 467 (1826); Austen, Ann. & Mag. Nat. Hist. (8) xiii. p. 265 (1914).

Tabanus cinerascens, King, see Kertész, Cat. Dipt. iii. p. 234 (1908); Wied. Auszweifl. Ins. ii. p. 647 (1830).

Tabanus tetralineatus, Taylor, Australian Institute Tropical Medicine Report for 1911, p. 68, pl. xiv. fig. 20 (1913).

In Brit. Mus. Coll. are specimens from New South Wales (*Hunter*); in German Ent. Museum females from Palmerston, N. Australia; in Mr. Wainwright's Coll. females from Port Darwin, S. Australia.

MacLeay's original description was of the vaguest and shortest kind, as follows:—

"Ashy grey, ferruginous, underneath whitish. Wings hyaline, towards the base subluteous. Abdomen with an ashy-grey median stripe and four ashy-grey spots on each side."

Fortunately the species is easily identified, even from the above few words. The following description is based on the fresh specimens:—

A large reddish-brown species, with reddish legs and antennæ and yellow palpi. Abdomen with a faint grey tomentose median stripe and grey tomentose side-spots.

Length 18–19½ mm.

Face covered with yellowish tomentum and with some

fine white hairs. Beard white. *Palpi* pale yellow, stout, ending in an obtuse point with black pubescence. *Antennæ* reddish, darker at apex, the first two joints with black hairs, the third with a distinct tooth situated about halfway up on the upper border of the first division. *Forehead* same colour as face, broad, about four times as long as it is broad, the frontal callus reddish brown, shining, large, nearly square, not reaching the eyes, posteriorly becoming narrow, with a short spindle-shaped extension. *Thorax* reddish brown, with darker stripes, and between these, yellowish-grey tomentose stripes with yellowish-grey pubescence, sides covered with grey tomentum. *Scutellum* lighter, reddish brown, with some yellowish-grey tomentum, and with black pubescence. *Abdomen* reddish brown, with black pubescence; the median narrow stripe composed of bluish-grey tomentum is often indistinct, the spots on each side are discernible on every segment except the first and last, and more distinct, being clothed with white hairs; apex of abdomen usually darker in colour; underside reddish yellow at base, becoming blackish on fore borders of the segments and yellowish on posterior borders, the whole covered with dense, short, whitish pubescence uniformly reddish with white hairs. *Wings* large, tinged yellow; veins brown.

Tabanus transversus, ♂ ♀, Walker, List Dipt. v. p. 256 (1854).

Type (male), type (female), and three other males presented by Col. Bolton.

A small brown species with a grey median stripe and segmentations on abdomen. Forehead with a small yellow callus. Antennæ and legs yellowish.

Length, ♂ 9, ♀ 10 mm.

♀. *Face* covered with yellowish-grey tomentum, a few pale hairs in centre. Beard pale yellow. *Palpi* very slender, nearly the same width throughout, pale yellow with rather thick black pubescence. *Antennæ* the same colour, blackish at apex, the first two joints with pubescence, the third with a distinct angle. *Forehead* same colour as face, about three times as long as it is broad anteriorly; it is narrowed at the vertex; frontal callus yellowish, small, not reaching eyes and with no lineal extension. *Thorax* cinnamon-brown with darker brown stripes. *Scutellum* same colour. *Abdomen* cinnamon-brown, with some darker irregular blotches of colour, the median stripe very distinct, composed of long cone-shaped spots, beginning from the second segment, covered with greyish tomentum, the segmentations narrowly

greyish, pubescence on dorsum chiefly composed of very short pale hairs; underside yellowish. *Legs* uniformly cinnamon-brown. *Wings* clear, very faintly shaded on cross-veins; stigma and veins yellowish; no appendix.

♂ is similar. Eyes with large facets on the upper two-thirds of their surface. Palpi composed of three joints, the last two almost equal in length, with long black hairs, larger and more slender than is usual in males.

Tabanus reducens, ♀, Walker, Proc. Linn. Soc. iv. p. 103 (1860); Ricardo, Records Indian Museum, iv. no. vi. p. 267 (1911).

Type (female), from Macassar, the other female from Celebes (Wallace Coll., 1857-1858).

A large blackish species, with a median well-marked grey stripe on abdomen, in general appearance not unlike *Tabanus mandarinus*, Schiner, but distinguished by the open first posterior cell of wings.

Length 20-23 mm.

Face covered with ashy-grey tomentum and with long whitish hairs. Beard white. *Palpi* stout at base, ending in a long obtuse point, pale yellowish, covered with grey tomentum and with black pubescence. *Antennæ* tawny at base, the third joint dusky, long, with a small tooth at base. *Forehead* covered with grey tomentum, narrow, about nine times as long as it is broad anteriorly; frontal callus dark chestnut-brown, long and narrow, not reaching the eyes, with a short lineal extension. *Thorax* blackish, with two fairly distinct grey tomentose stripes, hairs on shoulders black, posteriorly at sides white. *Scutellum* the same colour, covered with grey tomentum. *Abdomen* blackish, the grey tomentose median stripe very distinct, composed of elongated spots forming a united stripe; the seventh segment has no spot, traces of side-stripes are very apparent; formed of spots which do not coalesce; underside blackish, reddish at sides, with narrow grey segmentations. *Legs* blackish, the femora covered with grey tomentum; the tibiæ tawny; pubescence on femora white, elsewhere black. *Wings* large, clear; veins and stigma yellowish.

Tabanus similis, ♀, Macquart, Dipt. Exot., Suppl. iv. p. 335 (1849).

Type (female) in Verrall Coll., from Tasmania, in poor condition.

A medium-sized yellowish species, with a narrow grey median stripe on a wider darker stripe on the yellowish abdomen. Antennæ, palpi, and legs all yellowish.

Length $12\frac{1}{2}$ mm.

Face covered with ashy-grey tomentum and some long pale hairs. *Beard* white. *Palpi* pale yellow, with sparse black pubescence, rather stout, ending in a point. *Antennæ* reddish yellow, the third joint (which is incomplete) with a distinct tooth, the first two joints paler in colour, with black pubescence. *Forehead* broad, about four times as long as it is wide anteriorly, almost parallel; frontal callus large, square, not reaching eyes, reddish brown, with a short lineal extension. *Thorax* dark in colour, with traces of lighter tomentum. *Scutellum* is similar. *Abdomen* (faded) warm buff-colour, with a broad median mummy-brown stripe, on which appears a narrow grey tomentose stripe; the apex and sides are also mummy-brown; underside very similar, but no stripes are visible. *Legs* reddish yellow. *Wings* clear, stigma yellow; no appendix present.

No fresh specimens of this species occur in any of the collections to which I have had access.

Tabanus rufinotatus, Bigot, Mém. Soc. Zool. de France, v. p. 673 (1892) (*Atylotus*).

Tabanus elesteem, Summers, Ann. & Mag. Nat. Hist. (8) x. p. 224 (1912).

Tabanus designatus, Ricardo, Résultats Expedition Sci. Néerlandaise Nouv. Guinée, ix. (3) p. 390 (1913); id. Tijds. Ent. iv. p. 349 (1912).

Tabanus lineatus, Taylor, Austr. Inst. Trop. Med. 1911, p. 16 (1913); Austen, Ann. & Mag. Nat. Hist. (8) xiii. p. 265 (1913).

Since the publication of my description of *T. designatus* I have had the opportunity of examining Bigot's type in the late Mr. Verrall's collection, and establishing the identity of my species with it. Females of this species are in the Brit. Mus. Coll. from S. Queensland and S. Australia; in Mr. Froggatt's Coll. from New South Wales; in Mr. Wainwright's Coll. from Kuranda and Townsville, Queensland; in the German Ent. Museum from Herberton (*Dodd*), xii. 1900, 3700 ft.

Mr. Taylor records it from Queensland, Miss Summers from Port Darwin, S. Australia, and the specimens I named as *T. designatus* were collected in Dutch New Guinea. Bigot's type came from Australia.

The species is easily recognized by the presence of three greyish stripes on the reddish-brown abdomen.

Tabanus queenslandii, ♀, sp. n.

Type (a female) in Brit. Mus. Coll. from N.E. Queensland (*C. M. Kelsall*), 1910, 209; and another female from Ching Do, N. Queensland, 36. 1. 1913 (*F. H. Taylor*), 1914.

A blackish-brown species, not in very good preservation, but easily identified by the one well-marked median stripe on abdomen, composed of white tomentum.

Length 17 mm.

Face covered with greyish-yellow tomentum and with some white hairs. Beard white. Palpi yellow, very stout, ending in a short point, the pubescence black. Antennæ: the first two joints dusky yellow, with thick black pubescence, the third is broken off. Forehead rather broad, parallel, about five times as long as it is broad, covered with greyish-yellow tomentum, the frontal callus small, very narrow, pear-shaped, with short lineal extension. Thorax and scutellum denuded, reddish, with black stripes and some grey tomentum. Abdomen blackish brown, with median broad pale stripe; underside blackish, with ashy-grey tomentum on sides. Legs reddish, the femora with grey tomentum, the tarsi darker. Wings clear, stigma and veins yellowish brown.

This species bears a general resemblance to *Tabanus reducens*, Walker, from Celebes, but is smaller and has a broader forehead; the palpi also are less stout.

The female from Ching Do differs somewhat in the markings of the abdomen, the tomentose spots not being quite continuous; the first spot on the second segment reaches the anterior border, which is not the case with the two following spots; all of them are smaller and more triangular in shape. The third joint of antennæ is black, with a small tooth.

Tabanus strangmannii, ♀, sp. n.

Type (female) and others from Port Darwin, S. Australia (*Dr. Strangmann*), presented by London School of Tropical Medicine; another from Townsville, Queensland (*F. P. Dodd*); another from Port Essington, S. Australia (incorrectly labelled "*Tabanus brevivitta*, Walker"): all in Brit. Mus. Coll.; one female in Mr. Wainwright's Coll. from Rockhampton, Queensland (*Pilcher*). Type (male) from Townsville (*F. P. Dodd*).

A species easily distinguished in the group with stripes on

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the abdomen, reddish brown, with a median grey stripe on abdomen, which is blackish on the first two segments. Antennæ and legs yellowish.

Length 16–17 mm., ♀.

Face covered with greyish tomentum, becoming rather yellow in the centre, where some yellow hairs are apparent; cheeks with white hairs. Beard white. *Palpi* chamois-leather-coloured, stout, ending in an obtuse point, pubescence white or yellowish, short. *Antennæ* reddish yellow, darker at apex, the first two joints the same colour as palpi, with some blackish hairs, the third joint with an obtuse angle at base. *Forehead* parallel, darker in colour than the face, about six times as long as it is broad; frontal callus brownish black, pear-shaped, with a lineal extension; some yellow hairs on forehead. *Thorax* blackish brown, covered with grey tomentum, with two very distinct grey- or white-haired stripes; sides of thorax with the same coloured hairs; elsewhere the pubescence is dark but short, and not noticeable; shoulders reddish, with black hairs, sides and breast grey. *Scutellum* blackish brown, with grey tomentum on each side. *Abdomen* reddish yellow, in some specimens it is darker; the median stripe is black, narrow and ill-defined on the first two segments, afterwards composed of distinct grey tomentose connected spots, forming a stripe to the sixth segment, where it ends in a fine point; sides of abdomen paler, with pale hairs; underside reddish yellow, with pale pubescence. *Legs* reddish yellow, the fore coxæ covered with grey tomentum and with grey hairs, the fore femora brownish black with some white hairs, the other femora with grey tomentum, the fore tibiæ, at apex and the tarsi blackish, the hind tibiæ with yellow hairs, all tarsi a little darker in colour. *Wings* hyaline, tinged faintly brown near stigma; veins brown.

♂. Identical; eyes with the large facets occupying quite two-thirds of their surface, reaching to the middle of the frontal triangle, but posteriorly bordered by a narrow band of the small facets.

Tabanus parvicollus, ♀, sp. n.

Type (female), from Moreton Island, Moreton Bay, near Brisbane, in Brit. Mus. Coll. (*S. Diggles*), and another female in Mr. Froggatt's Coll. from Brisbane (May 1900).

A reddish-brown medium-sized species with a black stripe on the abdomen; antennæ, palpi, and legs yellowish.

Length 18 mm.

Face covered with greyish tomentum and with white hairs. *Beard* white. *Palpi* yellow, large, stout, ending in a short point, covered with short black pubescence, becoming thicker at the apices. *Antennæ* reddish, the first two joints yellow with black hairs, the third joint wide at its base, with a distinct tooth situated almost halfway up on the upper border, the apical half of joint dusky in colour. *Forehead* covered with yellowish-brown tomentum, slightly narrower anteriorly, about seven times as long as it is broad; the frontal callus small, pear-shaped, with a lineal extension, reddish brown. *Thorax* reddish brown, with indistinct blackish stripes, and with grey tomentum; pubescence chiefly black, short. *Scutellum* dusky, with grey tomentum. *Abdomen* reddish brown, the black median stripe composed of oblong black spots almost continuous, those on the first three segments most distinct, their posterior borders with a few yellow or white hairs; pubescence of dorsum otherwise black, at sides white; underside reddish, with the stripe appearing through. *Legs* reddish yellow, the fore coxæ covered with dense white pubescence and grey tomentum, the others the same but the pubescence less thick; tarsi dark in colour, the hind pair less so; the pubescence on tibiæ white, elsewhere black. *Wings* clear, large, veins yellow.

This species and *T. laticallosus* are distinguished from *Tabanus sordidus*, Walker, List Dipt. v. p. 256 (1854), from New Zealand, by the smaller, narrower, frontal callus and by the narrower forehead.

Tabanus laticallosus, ♀, sp. n.

Type (female) and two other females from Moreton Island, Moreton Bay, near Brisbane (Voyage 'Rattlesnake,' *Macgillivray*), in Brit. Mus. Coll.; and a male from Stradbroke Island, Queensland, 8. x. 1911 (*H. Hacker*).

A species nearly allied to *T. parviccallosus*, but distinguished by the black antennæ, larger frontal callus, darker legs, brownish wings, and by the less distinct black stripe, which hardly consists of more than a black oblong spot, on the second segment. *Beard* yellowish. *Palpi* reddish, with black pubescence and grey tomentum. *Forehead* parallel; frontal callus reddish brown, larger than that of *T. parviccallosus*. *Thorax* and *scutellum* darker. *Abdomen* reddish brown, darker at the apex, the posterior borders of segments

with yellow hairs, thickest at the sides and in the middle, not present on the last three segments, which are covered with black hairs; pubescence elsewhere on dorsum also black; underside with the yellow hairs on every segment. *Legs* blackish, the tibiæ on their basal two-thirds reddish yellow. *Wings* tinged with brown, yellowish on fore border, veins brown.

Length 16 mm. A female from Queensland only measures 13 mm.

Tabanus duplonotatus, ♀, sp. n.

Type (female) and a series from S. Queensland, Deception Bay, S. Queensland, and Burnett River District (*T. L. Bancroft*), 1907-1912; and from Brisbane, 1902 (*H. Tryon*).

A medium-sized species allied to *Tabanus innotabilis*, Wlk., but distinguished from it by the more slender palpi, the black femora, and by the markings of abdomen, a black stripe being present with median grey-haired spots superimposed on it.

Length 14-15 mm.

Face covered with yellowish-grey tomentum, with some brownish hairs on centre below antennæ and on borders of cheeks, with white hairs at base of these last. Beard white. *Palpi* slender, almost the same width throughout, apex obtuse, pale yellow, with scattered black hairs. *Antennæ* reddish yellow, the first two joints pale yellow, with black hairs, the third red, black at apex, with a distinct small tooth crowned with some black hairs; subcallus and forehead same colour as face. *Forehead* parallel or slightly narrower at the vertex, about five times as long as it is broad, the frontal callus reddish brown, pear-shaped, with a short extension, not reaching the eyes; pubescence on forehead black. *Thorax* blackish, with some grey tomentum and covered with recumbent yellowish pubescence; sides and shoulders with longer black hairs. *Scutellum* same as thorax. *Abdomen* reddish yellow, with a median blackish stripe; the spots, composed of dirty whitish-coloured hairs, are triangular in shape, apex of abdomen darker, the pubescence on dorsum and on sides black; underside yellowish, darker on apical half, with white pubescence, short but thick. *Legs* blackish, the femora with grey tomentum and chiefly whitish pubescence; the tibiæ pale yellow, darker at apices, with black hairs; the tibiæ reddish at base, becoming darker. *Wings* grey, very faintly tinged with brown at apex, yellow on fore border, veins yellow.

Tabanus pallipennis, Macq., Dipt. Exot., Suppl. i. p. 160 (1844), would probably belong to this group, being described as black, with three grey tomentose stripes on the abdomen. Legs black; tibiae reddish. Antennae yellowish.

Length 12 mm.

From New Holland.

The type is probably lost, and I have not seen any specimens identifiable with this species.

L.—*The Devonian Crinoid Cupressocrinus townsendi*
König, sp. By F. A. BATHER, M.A., D.Sc., F.R.S.

(Published by permission of the Trustees of the British Museum.)

THIS species was established by Charles D. E. König as No. 97 of his 'Icones Fossilium sectiles' (London, April 1825) under the name *Encrinus townsendi*, upon a "specimen ex Hispania allatum a Rev. Josepho Townsend." The species was said to be "articulis brachiorum angulatis et maximis distinctissima."

The holotype, preserved in the British Museum [E. 5264], consists of the five arms, from the articularia down almost to their extremities, each composed of 13 or possibly 14 brachials. The extreme length of the specimen is 79.6 mm., and its greatest diameter 57.7 mm. The specimen has, however, been crushed, so that its diameter at right angles to the preceding is only about 32 mm., a measurement which cannot be taken precisely because the specimen has been cut vertically in half. The mean of the two measurements is about 45 mm. The width of the articularia is about 23.5 mm., and this gives as the diameter of the cup about 37 mm. (fig. 1).

The brachials are all remarkable for their great relative width; the precise measurements are given later, in comparison with those of *C. elongatus*. There is a slightly rounded dorsal ridge, relatively more elevated in the distal half of the arm than in the proximal; the slope of the sides from this to the abutting margins is outwardly convex in the distal third, becomes gradually straight in the middle third, and tends to become concave in the proximal third. The greatest thickness (dorso-ventral) of the arm is about 14 mm.; the thickness of the proximal brachial is about 7.5 mm. In the thickness the cover-plates are not included.