

XXXVI.—*New African Phlebotomic Diptera in the British Museum (Natural History)*.—Part VIII. Tabanidæ (continued). By ERNEST E. AUSTEN\*.

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PANGONIINÆ.

Genus DORCALÆMUS, Austen.

*Dorcalæmus woosnami*, sp. n.

♀.—Length (6 specimens) 12·6 to 13·75 mm.; width of head 4·25 to 4·75 mm.; width of front at vertex 0·75 mm. to just under 1 mm.; distance from anterior margin of epistoma to anterior margin of eye (measured in a direction parallel to dorsal surface of base of labrum) 1·2 to 1·25 mm.; length of proboscis (beyond anterior margin of epistoma) 3·5 to 4·8 mm.; length of wing 11 to 12 mm.; greatest width of wing 4 to 4·6 mm.

*Closely allied to D. fodiens, Austen, but distinguishable from this species, as also from D. compactus, Austen, by the ochraceous † (tawny-ochraceous or tawny) area on the dorsum of the abdomen, beyond the first segment, being confined to the second segment instead of also including the third, and by the ventral surface of the third segment having a dark transverse band (usually more or less interrupted in the middle); agreeing with D. compactus and differing from D. fodiens in the absence of a tuft of black hair on the mesopleuræ.*—Face short; dorsum of thorax dull olive (yellowish-olive or greyish-olive) pollinose (ground-colour black), clothed with fine, erect, silky, Naples-yellow or pale straw-yellow hair, mixed with fine black hairs; first abdominal segment orange-buff, dorsum of second segment with a median black spot, dorsum of third to sixth segments inclusive shining black except their hind borders, which are greyish pollinose and clothed with silvery-white, ochre-yellow, or orange-ochraceous hair; wings with a distinct luteous tinge, though more hyaline than in *D. compactus* or *D. fodiens*; legs as in former species, though tips of tarsi usually brown or brownish.

Head light grey pollinose; upper half of front, except very narrow margin on each side, blackish, surrounding in median

\* See Ann. & Mag. Nat. Hist. ser. 8, vol. vi. p. 337 (1910).

† For names and illustrations of colours, see Ridgway, 'A Nomenclature of Colors for Naturalists' (Boston: Little, Brown, and Company, 1886).

line a shining black more or less triangular callus, apex of which is directed upwards, while its base rests on anterior boundary of infuscated area; lower part of sides of face clove-brown, clothed, at least in part, with black hair, central portion of face thinly clothed on each side with whitish hair; jowls and basioccipital region densely clothed with shining white hair; *palpi* greyish clove-brown, proximal joint clothed below with yellowish-white hairs, and on the outer side with blackish hairs; *proboscis* relatively short—as compared with that of *D. compactus*, Austen, shorter and stouter, the labella being also shorter and more curved downwards at the tips, while the part of the labium immediately preceding them is more distinctly swollen below; first joint of *antennæ* clove-brown, greyish pollinose, the sparse hairs on it black, second joint either agreeing with first in coloration or more or less greyish ochraceous-buff or greyish fawn-coloured, third joint dusky brownish chestnut. *Thorax*: pleuræ and pectus agreeing with dorsum in coloration, and clothed with yellowish hair. *Abdomen*: dorsum of first segment greyish pollinose on an orange-buff ground, with in centre a slate-grey blotch, which, however, does not project much beyond hind margin of scutellum; hairy covering of dorsum of first segment bright orange-buff, in some specimens paler (yellowish or yellowish white) in centre and immediately on each side of middle line; dorsum of second segment ochraceous, tawny-ochraceous, or tawny, with, in middle line, a larger or smaller greyish-black spot, usually more or less triangular in shape, with its base resting on front margin and its blunt apex extending scarcely if at all beyond middle of segment; on each side of dorsum of second segment is a larger or smaller blackish blotch, of irregular shape and scarcely if at all visible from above; dorsum of second segment clothed in front with minute, appressed, black hairs, and on hind margin, on posterior angles, and on more than posterior half of each lateral third with glistening, appressed, silvery-white hair, which in centre of hind border and anteriorly is interspersed with ochreous hairs; dorsum of third segment, though normally as described in diagnosis above, sometimes showing an irregular paler (chestnut) area on each admedian fifth; hind border of dorsum of third segment clothed with appressed silvery-white (in middle line sometimes pale ochre-yellow) hairs, forming a conspicuous band across posterior third of segment, or even in some instances rather more; hind border of dorsum of fourth segment clothed partly with ochre-yellow, partly with silvery-white hairs; hind margins of dorsum of fifth and

sixth segments clothed with bright orange-ochraceous or ochre-yellow hairs, which on fifth segment, on and towards posterior angles, are sometimes mixed with or replaced by white hairs; black area of dorsum of third and three following segments clothed with minute, appressed, black hairs; dorsum of seventh segment greyish black and clothed for most part with black hairs, sometimes mixed with yellowish hairs on hind margin and replaced by ochre-yellow hairs on each side; ground-colour of ventral surface of abdomen corresponding to that of dorsum, except in case of third segment, which is as described in diagnosis; ventral scutes of second and two following segments each with a transverse band of appressed silvery-white hairs\*, which may be replaced by ochreous hairs in and adjacent to centre line; on ventral scute of second segment this band of pale hairs occupies distal two-thirds of segment, but on ventral scutes of third and fourth segments the band of pale hairs is far less deep, occupying less than, or at any rate not more than, distal half of scute in each case; ventral scutes of fifth and following segments clothed with black hair, which, however, on the hind borders is usually replaced, entirely or in part, by ochreous or whitish hair. *Wings*: veins for most part ochraceous or tawny ochraceous, appendix to base of anterior branch of third longitudinal vein showing considerable individual variation in length, even frequently varying in this respect in the two wings of the same specimen; stigma, when developed, ochre-yellow, narrow, and elongate. *Squamae* cream-buff, porcelain-like. *Halteres*: stalks buff, brown at distal extremity on upper side; knobs yellowish cream-coloured, brownish at base. *Legs*: coxæ grey, clothed with yellowish or greyish hair; femora black and clothed with hair of same colour; tibiæ, tarsi, and extreme tips of femora cream-buff or buff, tibiæ dark brown or brownish at or close to distal extremities, last joint of all tarsi usually dark brown, at least with exception of extreme base, tips of other tarsal joints for most part brown or brownish; front and middle tibiæ clothed with short, appressed, and glistening, cream-coloured hair, hind tibiæ clothed with more outstanding and somewhat longer hair of the same colour.

\* In the case of one of the para-types of this species, the ventral scute of the third abdominal segment is entirely clothed with appressed ochre-yellow or pale yellow hair, while the ventral scutes of the second and fourth segments, with the exception of their fore borders, are similarly clothed; in this specimen, too, the hind margins of the ventral scutes of the fifth and sixth abdominal segments are clothed with orange-ochraceous hair at and near each extremity.

East Africa Protectorate: Athi Plains, alt. 5,000 ft., May, 1911 (*R. B. Woosnam*).

According to a note by the collector and donor, in whose honour the species is named, the type and para-types were "taken during the rainy season, in the Southern Game Reserve, near water and trees." One specimen was caught in the act of biting its captor.

In addition to the specimens here regarded as belonging to the typical form of this species, as described above, the National Collection possesses a ♀ from Makindu, East Africa Protectorate, 17. i. 1910 (*Dr. W. M. Aders*), which would appear to represent a variety of *D. woosnami*. In this example, which was caught on a zebra just after it had been shot, the third joint of the antennæ is much brighter in colour than in the typical form,—in fact it is orange-rufous, and therefore much as in *D. compactus*, Austen, while the dorsum of the third abdominal segment is partly tawny ochraceous instead of entirely black. On this segment the black area, indeed, consists of a median rhomboid spot, and on each side a transverse band, which is in contact with the anterior margin of the segment only at its lateral edge. The other characters, however, such as the short face and proboscis, white instead of yellowish-white hair on the jowls and basioccipital region, and the presence of a clove-brown transverse band on the ventral scute of the third abdominal segment, show that this specimen really belongs to *D. woosnami*, and prevent it from being regarded as an aberrant example of *D. compactus*. The markings on the third abdominal segment, the coloration of the hair on the jowls and basioccipital region, and the absence of a tuft of black hair on the mesopleuræ similarly distinguish the specimen from *D. fodiens*, Austen.

#### TABANINÆ.

Genus TABANUS, Linn.

*Tabanus sandersoni*, sp. n.

♂ ♀.—Length, ♂ (5 specimens) 13·4 to 14·5 mm., ♀ (4 specimens) 13·2 to 16 mm.; width of head, ♂ 4·8 to 5·5 mm., ♀ 4·75 to 5·4 mm.; width of front of ♀ at vertex 0·6 mm.; length of wing, ♂ 10·75 to 12·4 mm., ♀ 12·2 to 13·75 mm.

*Medium-sized or smallish, dark brown or dark reddish-brown species, with dorsum of abdomen marked with a median series of pale triangles clothed with short white (yellowish-white or greyish-white) hair, resting on similar hind borders to segments.*

—*Dorsum of thorax dark brown in ♂, dark sepia-coloured or slate-brown in ♀, in both sexes greyish in front, where rudiments of three grey stripes are usually visible when viewed at a certain angle, elsewhere entirely unstriped; wings slightly tinged with sepia, anterior branch of third longitudinal vein angulate, and provided with a conspicuous backwardly directed appendix of varying length.*

♂.—*Head*: frontal triangle dull olive brown or sepia-coloured, near its apex showing more or less distinctly a darker transverse band (part of the—in dried specimens—dark brown band crossing the eyes immediately below the large facets), face and occiput grey (former brownish grey next eyes and on greater part of median depressed area), basioccipital region, jowls, and sides of face clothed with blackish or dark brown hair; *eyes* with an area of large facets paler than and sharply contrasting with remainder, as usual not extending to hind border, but otherwise occupying more than upper half; *palpi* greyish cinnamon-coloured, clothed with black hair, shape of terminal joint roughly cylindrical-ovate or elongate-ovate, distal extremity usually pointed; first and second joints of *antennæ* greyish cinnamon-coloured, clothed with short black hair, third joint narrow and elongate, cinnamon-coloured or brownish cinnamon-coloured, terminal annuli sometimes darker. *Thorax*: dorsum viewed at a low angle from behind thinly greyish pollinose, clothed on greyish area in front with whitish hair, elsewhere clothed with fine, erect, clove-brown or black hair, mixed on scutellum with whitish hair; *pleuræ* and *pectus* grey, clothed partly with clove-brown or dark brown, partly with greyish hair. *Abdomen*: dorsum of first segment greyish brown, that of next three segments chestnut-brown, that of last three segments clove-brown; a median pale triangle (difficult to distinguish in rubbed specimens) on each segment from second to fifth inclusive; when abdomen is viewed from behind at a low angle, ground colour of triangles, as also that of pale hind borders to segments, appears greyish pollinose; on second and third segments triangles actually clothed with white hair, as described in diagnosis above, are often quite small, and usually do not extend forwards beyond middle of segments, if so far; on fourth and fifth segments the white-haired triangles are apparently larger, and apex of each triangle may reach hind margin of preceding segment; hind borders of fourth to sixth segments inclusive, viewed from above, dull isabella-coloured, those of second to fifth segments inclusive clothed like median triangles with short, white, yellowish white, or greyish-

white appressed hairs; hind margin of first segment fringed in centre and at each end with a row of yellowish-white hairs, elsewhere dorsum of abdomen, except as already stated, clothed with black hair; ventral surface of first four segments cinnamon, that of last three segments clove-brown, hind borders of ventral scutes of second to sixth segments inclusive cream-buff or isabella-coloured, clothed, except in case of sixth segment, with short, whitish (silvery-white or yellowish-white) hair; ventral surface of second segment clothed partly with short, appressed, whitish, partly with longer dark brown hairs; ventral surface of following three segments often clothed either entirely or for most part with short, appressed, whitish hairs. *Wings*: a faint sepiaaceous tinge sometimes slightly more distinct than elsewhere on costal border, beyond end of first longitudinal vein; *stigma* raw-umber-coloured, narrow and inconspicuous; veins dark brown, appendix to anterior branch of third longitudinal vein usually long and curved, occasionally differing in length in the two wings of the same specimen. *Squamæ* drab or isabella-coloured, borders sepia-coloured. *Halteres* seal-brown, bases of stalks paler (isabella-coloured). *Legs*: coxæ grey, clothed with blackish-brown or brownish hair, sometimes mixed with whitish hair, hind coxæ sometimes entirely clothed with whitish hair; femora clove-brown, greyish at base posteriorly, clothed with black hair (middle and hind pair towards base with whitish hair); front tibiæ burnt-umber-coloured, dark brown towards tips; middle and hind tibiæ burnt-umber-coloured, hind tibiæ shortly fringed on inner and outer sides with fine blackish hair; front tarsi clove-brown, second and two following joints somewhat expanded; middle and hind tarsi dark mummy-brown, first joint burnt-umber-coloured towards base.

♀.—*Head* brownish grey (occiput light grey), face clothed mainly with brownish or blackish hair, jowls and basioccipital region with greyish hair; *front* rather narrow (its length, as estimated by eye, more than eight times greater than its breadth at the lower extremity), inner margins of eyes bordering it converging slightly below, region adjacent to vertex clothed with short black hair and usually darker than elsewhere; *frontal callus* dark brown or dark mummy-brown, elongate, elliptical in outline, its upper extremity produced into a similarly coloured, lanceolate or acicular, median ridge; proximal joint and base and inner surface of terminal joint of *palpi* greyish fawn-coloured, outer surface of distal three-fourths of terminal joint slate-grey and clothed mainly with short black hairs; proximal

joint and under surface of base of terminal joint clothed with longer yellowish hairs, outer surface of base of terminal joint clothed with shorter glistening yellowish or whitish hairs mixed with some black hairs, distal extremity of terminal joint bluntly pointed; *antennæ*, except for their larger size and the greater breadth of the expanded portion of the third joint, resembling those of ♂. *Thorax*: dorsum clothed with short, erect, black hairs, which on scutellum and on greyish area in front are replaced by glistening greyish-white hairs; hairs of latter kind are also largely present on postalar calli and on region immediately in front of these, and are interspersed with the black hairs on the sides and anterior portion of the dorsum, and also immediately in front of scutellum; pleuræ and pectus grey, and clothed partly with grey, partly with dark brown or brownish hair. *Abdomen*: dorsum agreeing with that of ♂, as described above, except that the triangles on third, fourth, and fifth segments are larger and broader and the hind borders of those segments deeper, especially at each lateral extremity, where they are expanded and curve forward so much as almost to reach posterior angles of preceding segment; the pale hairs on the dorsum are also shorter and somewhat less fine than in ♂, and are set more closely together; ventral surface of first four segments greyish cinnamon-rufous, that of fifth segment (except hind margin) more or less dark brown or brownish, ventral surface of first five segments clothed with short, appressed, glistening whitish hairs, hind margins of ventral scutes of second to fifth segments inclusive cream-buff; ventral scutes of last two segments clove-brown, clothed with similarly coloured or blackish hair, hind border of penultimate segment isabella-coloured. *Wings* as in ♂; sepiceous tinge next distal extremity of costa, about tips of second longitudinal and anterior branch of third longitudinal veins, usually distinct. *Squamæ* and *halteres* as in ♂. *Legs* as in ♂, except that tibiæ are clothed with short, appressed, whitish hairs; hind tibiæ, especially on outer side, with a short fringe of somewhat longer whitish hairs; second, third, and fourth joints of front tarsi expanded.

Nyasaland Protectorate and North-Western Rhodesia: type of male, three other males, and one female (para-types) from the Kaninga Stream, Central Angoniland, Nyasaland Protectorate, alt. 1,760 to 2,500 ft., 21, 25. i. 1911 (*Dr. Meredith Sanderson*: presented by the Entomological Research Committee); type of female from Kasempa District, N.-W. Rhodesia, between 3,500 and 4,500 ft., 1903 or 1909 (*E. A.*

*Copeman*) ; additional specimens (para-types—presented by the Entomological Research Committee) as follows :—one male from the Chitala Stream, Central Angoniland, Nyasaland Protectorate, alt. 1,760 ft., 18. i. 1911 (*Dr. M. Sanderson*) ; two females from the Ruvo Valley, near Chiromo, Nyasaland Protectorate, April, 1910 (*S. A. Neave*).

Writing from the Dowa District, Nyasaland Protectorate, in February, 1911, Dr. Meredith Sanderson, in whose honour the species has been named, kindly supplied the following field-note with reference to *Tabanus sandersoni* :—“ Found in marshy ground, sandy plains, and hills, but always where there are trees or bush. Enters villages and houses ; does not bite immediately on settling, and may move about before biting. In the act of sucking blood the abdomen is elevated and the head lowered. Difficult to catch with the hand.”

So far as it is possible to judge from the material available for comparison, *Tabanus sandersoni* is perhaps allied to *T. quadriguttatus*, Ricardo, more nearly than to any other species of *Tabanus* yet described. *Tabanus quadriguttatus*, which is at present known only from German East Africa, exhibits, in the female sex at any rate, a decided resemblance to *T. sandersoni* in the coloration and markings of the dorsum of the abdomen, as also in the width of the front, and in the shape &c. of the frontal callus and its upward extension. Apart from other characters, however, the female of *T. quadriguttatus* differs from that of the new species in its much larger size, in the more slender shape and different coloration of the terminal joint of the palpi (the outer surface of which is uniformly dark slate-coloured, and apparently clothed exclusively with minute black hairs), in the presence of a border of ochre-yellow hair on each side of the dorsum of the thorax, in the ground-colour of the ventral surface of the abdomen (except the hind margins of certain segments) being entirely black, in the veins in the distal half of the wings being strongly suffused with mummy-brown, in the stigma being large, burnt-umber-coloured, and very conspicuous, and in the anterior branch of the third longitudinal vein not being angulate at the base nor provided with an appendix.

*Tabanus simpsoni*, sp. n.

♀.—Length (1 specimen) 15·6 mm. ; width of head 5·6 mm. ; width of front at vertex 0·75 mm. ; length of wing 14·4 mm.



*In general appearance resembling T. kingsleyi, Ricardo.*—*Front* moderately broad, scarcely (if at all) narrower below; expanded portion of third joint of antennæ orange-rufous, terminal annuli clove-brown or dark brown; dorsum of thorax (except scutellum) cream-buff, marked with three sharply defined clove-brown longitudinal stripes; dorsum of abdomen ochraceous-buff, with a conspicuous and sharply defined cream-buff median longitudinal stripe of nearly uniform width, and distal extremity and a pair of admedian stripes clove-brown; wings (except costal cells and stigma) nearly hyaline, though faintly tinged with drab; legs (except coxæ, tarsi, and tips of front tibiæ) cinnamon-coloured.

*Head*: front cream-buff, slightly darker on vertex, clothed with short ochreous hairs and about four and a half times as long as its width at the lower extremity; subcallus greyish cream-coloured; face, jowls, and basioccipital region light grey, clothed with white hair; occiput smoke-grey, posterior orbits light grey; frontal callus dark brown, shining, not in contact with eyes, roughly oblong in shape (nearly twice as long as broad and rather narrower at its upper extremity) and with its upper margin somewhat irregular and indistinctly connected with a short, median, clove-brown, linear or lanceolate extension, which occupies centre of front; proximal joint of palpi cream-buff and clothed with white hair, terminal joint cream-coloured, long and narrow (moderately swollen a little beyond base), clothed on outer side with minute, appressed, whitish or yellowish-white hairs: antennæ (at least third joint) relatively rather large, first and second joints greyish ochraceous-buff, upper distal angle of second joint not noticeably produced, third joint long, its expanded portion moderately broad and with a fairly prominent angle on its upper margin at end of proximal third, terminal annuli (at least the three proximal ones) large. *Thorax*: anterior extremity of dorsum olive-grey, cream-buff longitudinal dorsal stripe on each side of clove-brown median stripe rather broad, extending from olive-grey anterior border to hind margin, of absolutely uniform width throughout, and clothed with short Naples-yellow hair; clove-brown dorsal stripes clothed with black hair and about half as broad again as admedian cream-buff stripes, each outer clove-brown stripe diminishing in width in front of transverse suture; sides of dorsum clothed with yellowish hair, a fringe of black hair extending from base of each wing to front margin; pleuræ and pectus light grey, clothed with greyish-white hair; dorsum of scutellum grey and clothed with short, appressed, Naples-yellow hairs,

except a dark median stripe (a prolongation of the clove-brown median stripe on the main portion of the thorax) which is clothed with black hairs. *Abdomen*: cream-buff median dorsal stripe of about same width as admedian cream-buff stripes on dorsum of thorax and therefore relatively rather broad (slightly narrower than elsewhere on sixth segment and towards hind margin of fifth), clothed with short, appressed, Naples-yellow hair, and terminating abruptly on hind margin of sixth segment; clove-brown, admedian, dorsal stripes of nearly same width as median stripe, pale on first segment and interrupted on base of second, then becoming darker; dorsum of sixth and seventh segments, except lateral margins (and also median stripe in case of former segment), clove-brown, dorsum of fifth segment also with an ill-defined clove-br.wn longitudinal mark next lateral border, connected along hind margin with admedian stripe and anteriorly extending on to hind border of fourth segment; proximal dorsal angles of first segment greyish pollinose; ochraceous-buff area of dorsum of abdomen clothed with short, appressed, ochre-yellow hairs, posterior angles and extreme lateral margins of segments clothed with paler hairs; on first four segments, between admedian stripe and lateral border on each side, are traces of a faint and ill-defined dusky longitudinal stripe, connected with corresponding mark on fifth segment already described, and clothed, at least in part, with minute black hairs; the ochraceous-buff area between the admedian stripes and the ill-defined dusky longitudinal stripes just mentioned is light greyish pollinose (most noticeable when abdomen is viewed at a low angle from behind); venter ochraceous-buff and clothed with short, appressed, pale yellowish hairs, terminal segment slate-coloured and clothed, as usual, with coarse, erect, black hairs, penultimate segment slate-grey and clothed partly with black hairs, antepenultimate segment greyish. *Wings*: costal cells raw-umber-coloured; *stigma* mummy-brown, elongate and conspicuous; costa dark brown, other veins lighter or darker mummy-brown. *Squamæ* isabella-coloured, borders cream-buff. *Halteres*: stalks ochraceous-buff, knobs cream-coloured, buff at base. *Legs*: coxæ light drab-grey or smoke-grey, clothed with greyish-white hair; femora and tibiæ clothed for most part with short, appressed, glistening, ochreous or pale yellowish hair, posterior surface of middle femora clothed except at base with longer yellowish-white hair; inner surface of front femora cinnamon-rufous, except at base, where it is dark brown; base of middle and hind femora and of outer surface

of front femora more or less grey; tips of front tibiae, especially on inside, where they are clothed with short, appressed, black hair, dark brown; front tarsi clove-brown, not conspicuously expanded, middle and hind tarsi dark brown, first joints except distal extremities brownish cinnamon-rufous.

Northern Nigeria: Offa, 27. ix. 1910 (*J. J. Simpson*: presented by the Entomological Research Committee).

Although in general appearance *Tabanus simpsoni* presents a closer resemblance to *T. kingsleyi*, Ricardo (which belongs to Surcouf's "Ninth Group" of the genus *Tabanus*\*), than to any other of its congeners at present known, the affinities of this handsome new species, with which the author has much pleasure in connecting the name of its discoverer, are in reality with Surcouf's "Eighth Group," which includes *Tabanus taniola*, Pal. de Beauv., *T. distinctus*, Ricardo, and allied species. From all of these, however, the new species is distinguishable at once by its very conspicuous and sharply defined body-markings, as described above. From *T. kingsleyi*, Ricardo, *T. simpsoni* can be distinguished by, *inter alia*, the greater breadth of the front and of the median stripe on the abdomen, by the inner margins of the eyes bordering the front being parallel or practically so, instead of converging below, by the sharper definition of the cream-buff, admedian, thoracic stripes, by the terminal joint of the palpi being cream-coloured and clothed with whitish or yellowish-whitish hairs, instead of isabella-coloured and clothed mainly with black hairs, and by the pale legs and more hyaline wings.

Besides occurring in Northern Nigeria, *Tabanus simpsoni* is also found in the Gold Coast Colony: since the above description was drawn up, the National Collection has received a second female of this species, caught in the Hospital at Salaga, Northern Territories, Gold Coast, on July 5, 1910 (taken and presented by *Dr. F. J. A. Beringer*, *W.A.M.S.*).

*Tabanus besti*, Surcouf, var. *arbucklei*, var. n.

♀.—Length (7 specimens) 14 to 18.2 mm.; width of head 4.5 to 5.6 mm.; width of front at vertex rather less than 0.5 to 0.5 mm.; length of wing 11 to 13.2 mm.

*Differing from the typical form of the species in the third joint of the antennae being narrower, and in the paler portion (rather more than the proximal half) of the front tibiae being*

\* Cf. J. M. R. Surcouf, 'Étude Monographique des Tabanides d'Afrique', p. 16 (1909).

*cinnamon-rufous and clothed with similarly coloured hair, instead of cream-coloured and clothed with yellowish-white hair.*—Clove-brown, entirely devoid of markings; wings dark sepia (second basal, anal, and axillary cells, alula, and greater part of second submarginal cell paler); middle and hind tibiæ entirely cinnamon-rufous.

*Head* greyish clove-brown, face, jaws, and basioccipital region clothed with clove-brown hair; *front* long and very narrow, diminishing slightly in width towards the lower extremity, and clothed above callus with short blackish hairs; *frontal callus* dark mummy-brown or dark sepia, narrow and elongate, its upper extremity produced into a clove-brown median ridge, which gradually tapers away, and eventually disappears at a distance from the posterior margin of the vertex equal to about one-fourth of the total length of the front; *subcallus* protuberant, denuded and shining, agreeing with callus in colour; *palpi* clove-brown, proximal joint clothed with clove-brown hair, terminal joint long, of moderate width at base, bent and tapering gradually to a point, clothed on outer side with minute black hairs; first joint of *antennæ* greyish burnt-sienna-coloured, clothed above with minute black hairs, second joint cinnamon-rufous, clothed with minute black hairs and with its upper distal angle much produced, expanded portion of third joint cinnamon-rufous, brown or brownish towards distal extremity, narrow and elongate, its upper margin at a point from one-fourth to one-third of its length from base excavated so as to form a hook-like, forwardly-directed angle, lower margin bluntly angulate shortly before middle, terminal annuli clove-brown, short. *Thorax*: dorsum somewhat greyish, clothed with minute dusky ochreous hairs, mixed with short black hair, pleuræ and pectus slate-grey, clothed with black hair. *Abdomen* clothed above and below with minute black hairs, hind margins of ventral scutes of second, third, and fourth segments, and frequently also posterior angles of dorsal scutes of first and second segments, clothed with bright ochre-yellow hairs; dorsum of first segment, when abdomen is viewed from behind, appearing greyish on each side. *Wings*: veins dark brown (costa and first longitudinal vein clove-brown); *stigma* elongate, dark mummy-brown. *Squamæ* clove-brown. *Halteres* dark sepia, distal halves of knobs cream-buff. *Legs*: coxæ slate-grey, clothed with clove-brown or blackish hair; femora black or clove-brown, clothed with black hair, tips of middle and hind pairs cinnamon-rufous; distal extremities of front tibiæ clove-brown or dark brown; front tarsi black, not

conspicuously expanded, middle and hind tarsi dark brown, first joints more or less cinnamon-rufous, at least at base, hind tarsi occasionally entirely cinnamon-rufous, or at least tips of joints alone dark brown or brownish.

Sierra Leone; Sierra Leone Protectorate; Liberia; Gold Coast.

Type and twelve other specimens of the variety from Bo, Sierra Leone Protectorate, 1, 8, 9, 19. x. 1909 (*Dr. H. E. Arbuckle, W.A.M.S.*). The following are the data with reference to the other examples of this variety at present contained in the National Collection:—SIERRA LEONE: 2 specimens, Sherbro I., January 1909 (*Dr. C. B. Hunter, W.A.M.S.*); 1 specimen, Hill Station, Freetown, November 1909 (*Major A. Pearse, R.A.M.C.*). SIERRA LEONE PROTECTORATE: 1 specimen, Port Lokkoh Creek, April 1904 (*Major F. Smith, D.S.O., R.A.M.C.*); 8 specimens, Karina District, October–November 1906 (*Dr. H. E. Arbuckle*); 17 specimens, Tiama, 9. ix., Yonmbanna, 30. x., Makobo, 11. xi., Kogbutoma, 18. xi., Tembihun, 19. xi., Ebambatuck, 20. xi., Matassu, 22. xi., Benduma, 23. xi., Mossellulu, 30. xi. 1909, Matotoka, 26. i., Makonou, 27. i., and Maboon, 28. i. 1910—all localities in Ronietta District (*Dr. J. J. Moore, W.A.M.S.*); 2 specimens, Batkanu, Karina District, December 1909 (*Dr. J. C. Murphy, W.A.M.S.*); 1 specimen, Kennema, March 1910 (*Dr. H. E. Arbuckle, W.A.M.S.*). LIBERIA: 1 specimen, Gis-i, 27. iv. 1909 (*Major A. Pearse, R.A.M.C.*). GOLD COAST: 1 specimen, Wassau Territory, 1901 (*Dr. S. H. Jones*).

*Intermediate form* between *Tabanus besti*, var. *arbucklei*, Austen, and *T. besti*, Surcouf (syn. *T. obscurissimus*, Ricardo).—In addition to the foregoing specimens, which clearly belong to the var. *arbucklei*, as described above, the British Museum (Natural History) also possesses eight ♀♀ of *T. besti*, which may be regarded as representing a form intermediate between the var. *arbucklei* and normal *T. besti*. As compared with the var. *arbucklei*, this form is distinguished by the subcallus being if anything less prominent and always dull (clothed with brownish pollen, as in the typical race of the species), by the expanded region of the third joint of the antennæ being usually broader, and by the proximal portion of the front tibiæ, although cinnamon-rufous, being clothed with hair which is whitish or yellowish instead of the same hue as the ground-colour. The details as to localities, dates of capture, &c., of these eight specimens are as follows:—SIERRA LEONE PROTECTORATE: 3 specimens, Kennema, April–May 1910 (*Dr. H. E. Arbuckle, W.A.M.S.*);

2 specimens, Daru, 6. vi. 1911 (*Dr. J. C. Murphy, W.A.M.S.*).  
 LIBERIA: 2 specimens, Tappoima, 8. v. 1909 (*Major A. Pearse, R.A.M.C.*). GOLD COAST: 1 specimen, Hui Valley, Ashanti, 1. v. 1908, "caught in station, Gold Coast Government Railway, 11.0 P.M." (*Dr. W. M. Graham, W.A.M.S.*).

Genus *HÆMATOPOTA*, Meigen.

*Hæmatopota tumidicornis*, sp. n.

♀.—Length (5 specimens) 9 to 10 mm.; width of head 3 to 3.25 mm.; width of front at vertex 1.25 to 1.4 mm.; length of wing 8 to 8.5 mm.

*Dusky (clove-brown) species, with strongly swollen first antennal joint, two longitudinal rows of conspicuous, rounded, smoke-grey or yellowish-grey spots on dorsum of abdomen, and drab-coloured wings, in which the stigma usually stands out conspicuously.*

*Head:* front fairly broad, mouse-grey narrowly edged with light grey, frontal spots black, median spot inconspicuous, sometimes very small, lateral frontal spots variable in size, occasionally small and not connected with eyes, but usually large or fairly large, more or less triangular in outline and in contact with eye on each side; *frontal callus* clove-brown, of moderate depth, sparsely clothed at each extremity with pale yellowish hairs, which in preserved specimens are often wanting, its upper margin straight or nearly so; face and jowls light grey, clothed with pale yellowish hair, upper part of face on each side between eye and base of antenna with a dark brown band, which is clothed with blackish hair, and when viewed from certain angles appears more or less broken up into dots; *palpi* dusky grey, terminal joint not much or usually only moderately thickened towards base, and clothed on outer side with blackish mixed with yellowish hair; *antennæ* black (second joint and expanded portion of third really clove-brown), first joint shining black, very slightly greyish pollinose, clothed with black mixed on outer side with pale (whitish or yellowish) hair, first joint viewed from above or from side truncate elliptical-ovate in outline, its lower surface near distal extremity sometimes slightly flattened, upper angle of second joint only moderately produced, expanded portion of third joint near base, viewed from side, less than twice as deep as terminal annuli, which are usually of considerable relative depth. *Thorax:* dorsum, including scutellum, sparsely clothed with minute, shining, pale ochre-

yellow hairs; dorsum marked with three narrow, drab-grey or smoke-grey, longitudinal stripes, which in rubbed specimens are more or less indistinct except in front of the transverse suture, the median stripe in some cases very slender and much narrower than the paired stripes, the latter (sometimes also the median stripe) expanded on the front margin; continuation of each paired stripe marked by a spot behind transverse suture; the usual crescentic marks in front of presutural groove difficult to distinguish in rubbed specimens; pleuræ, pectus, and a longitudinal stripe on each side of dorsum behind transverse suture grey, pleuræ clothed partly with whitish or greyish, partly with dark brownish hair. *Abdomen*: dorsum clothed with minute, appressed, pale yellowish or pale ochre-yellow hairs, second and following segments each with a pair of rounded spots, as described in diagnosis, spots on second and third segments not in contact with front or hind margins, those on following segments in contact with front margin in each case, spots on seventh segment much smaller than remainder, which are usually relatively large, lateral extremities of dorsal scutes of all segments more or less grey, though the grey lateral extremities are palest and most distinct in the case of the first three segments, extreme hind margins of all segments narrowly yellowish grey; venter smoke grey, with a broad, median, clove-brown, longitudinal stripe; hairy covering of venter similar to that of dorsum. *Wings* drab or brownish drab, distinctly marked with the usual three rosettes and other pale markings, but with the *first basal cell* and also the *first posterior cell except its distal extremity semi-hyaline* and *usually entirely devoid of markings*, though the outlines of the portions of the rosettes falling within these cells are sometimes faintly discernible; first and second costal cells very lightly tinged with drab; portion of marginal cell on proximal side of stigma and anal cell as far as proximal rosette semi-hyaline and devoid of markings; sinuous pale mark at tip of wing clearly defined, running from costa, immediately beyond distal extremity of second longitudinal vein, to posterior branch of third vein, broadening out at its anterior extremity and sometimes sending out an offshoot in the shape of a streak running along the costa towards the stigma; in some specimens the apical sinuous mark is converted into an elongate loop by an additional mark beyond it, more irregular and less sharply defined, connecting its extremities; upper portion of distal rosette clearly defined, consisting of a single streak which is usually widely interrupted on the second longitudinal vein, so that the upper

extremity of the rosette forms the customary loop in the marginal cell immediately beyond the stigma; lower portions of proximal and median rosettes alone distinct; proximal and distal extremities of discal cell more or less distinctly occupied by portions of these rosettes; second basal cell with a more or less distinct pale loop at each end, the proximal loop, however, sometimes taking the form of an ill-defined pale blotch; posterior cells crossed by a series of disconnected, oblique, pale marks (the usual continuation of the apical sinuous mark); along posterior margin of wing light markings usually but not invariably present in distal angles of posterior cells; anal angle with a more or less distinct pale border (sometimes broad), proximal extremity of which is connected with usual loop in angle formed by axillary incision and sixth longitudinal vein, while to distal extremity is attached customary zigzag mark, which crosses anal cell (in some specimens pale border of anal angle is continued along hind margin to distal extremity of axillary cell); veins for most part mummy-brown; membrane immediately adjoining base of anterior branch of first longitudinal vein and that bordering veins or portions of veins bounding distal extremity of discal cell and posterior half of distal extremity of second basal cell *distinctly infuscated*; *stigma* usually dark brown or clove-brown and sharply defined (except its proximal extremity, which is somewhat paler); quadrate drab-coloured patch behind stigma (crossing marginal and first submarginal cells) inconspicuous. *Halteres*: knobs dark seal-brown, stalks cream-coloured. *Legs*: coxæ and femora slate-grey, sparsely clothed with fine yellowish hair; front tibiæ clove-brown, marked just beyond base with a fairly broad buff-coloured or cream-buff band, distal two-thirds conspicuously swollen; middle and hind tibiæ dark brown, each marked with two buff or cream-buff bands; tarsi clove-brown, first joints of middle and hind pairs, except distal extremities, cream-buff.

East Africa Protectorate: type and five other specimens from the Athi Plains Game Reserve, alt. 5,000 ft., May 1911 (*R. B. Woosnam*).

The species above described is not closely allied to any of its Ethiopian congeners hitherto discovered, from which the shining black coloration and elliptical-ovate outline of the first joint of the antennæ will at once serve to distinguish it. As regards the shape of the antennæ, the nearest approach to the present species among Ethiopian forms is perhaps made by *Hæmatopota inflaticornis*, Austen, which is as yet known only from Angola; in *H. inflaticornis*,



however, the first joint of the antennæ, though strongly swollen, is less elliptical in outline and more densely greyish pollinose, while, *inter alia*, the abdominal markings are very different from those of *H. tumidicornis* and the front tibiæ are more slender. As regards the wings, the absence or almost total absence of markings and coloration in the first basal cell and in the first posterior cell with the exception of its distal extremity is highly characteristic, and gives the wings when seen against a dark background a *longitudinally streaked* appearance, reminiscent of that presented by the wings of *H. copemani*, Austen, and certain of its allies; with the group represented by *H. copemani*, however, the present species has nothing beyond generic characters in common.

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## XXXVII.—On the Boring Mollusca of St. Andrews.

By B. LINDSAY, Gatty Marine Laboratory, St. Andrews.

[Plate VIII.]

PROFESSOR MCINTOSH, of St. Andrews, has always maintained that the main work of marine boring organisms is accomplished by mechanical means, and not necessarily by the aid of an acid secretion. The latter theory, however, has been advocated within comparatively recent years, and Professor McIntosh therefore requested me to make some fresh observations on the subject. No traces of acid secretion were found; but the details of mechanical boring, on the contrary, were observed, and the descriptions of it given by previous writers were confirmed and extended.

St. Andrews offers a good field for the study of this subject in its most important aspect—namely, in connection with coast erosion, which is undoubtedly much assisted by the work of marine borers. The types studied were *Zirphæa* (*Pholæ*) *crispata*, *Saxicava rugosa*, and *Tapes pullastra*.

Of the Boring Mollusca of St. Andrews, *Zirphæa* (*Pholæ*) *crispata* is far the most important in numbers and in activity. It removes vast quantities of shale and no inconsiderable amount of sandstone, and is undoubtedly a most important factor in the process of coast erosion.

At the East Rocks the boring-grounds of *Zirphæa* are two, and each is associated with serious encroachment of the sea. One is situated below a spur of rock which protects the bay