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AMERICAN BITING FLIES OF THE GENERA *CHLOROTABANUS* LUTZ AND *CRYPTOTYLUS* LUTZ (DIPTERA, TABANIDAE)¹

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The horse flies considered here form a distinctive group within the family Tabanidae, characterized by their predominantly greenish color in life due to green blood, bare subepaulets (basicostas), sclerotized labella, and mainly crepuscular habits. The group is principally Neotropical, ranging from Paraguay to Mexico, but one species occurs in the southeastern United States. The misassignment of certain names as well as new synonymy revealed by studies of the older described types of a number of species indicate the need for the systematic revision here provided. The respective authors were enabled to make some of the necessary type comparisons in European museums through the aid of generous grants from the American Philosophical Society and the National Academy of Sciences; other comparisons were made possible through the generosity of curators at various museums in loaning material under their care: Drs. Fr. K uhorn in Munich, Stone in Washington, Curran in New York, and Bequaert at Harvard, Professors Bertil Kullenberg of Uppsala, Fritz Peus of Berlin, S. L. Tuxen in Copenhagen, and H. Oldroyd in London. Other acknowledgments are included in the text.

The generic and suprageneric placement of this group by previous students has varied widely. In his tribe Tabanini, Enderlein (1925) placed species of the group in *Stenotabanus* Lutz, and in *Stigmatophthalmus* Lutz and *Omallia* End. of his tribe Dichelocerini (sic). He placed *Chlorotabanus* Lutz as a synonym of *Stenotabanus* and overlooked *Cryptotylus* Lutz entirely. Kr ober (1934) catalogued the species with a long antennal tooth under *Amphichlorops* Lutz in the tribe Dichelacerini; those without this development under *Chlorotabanus* as a subgenus of *Tabanus* in the Tabanini. Fairchild (1940) recognized the genera *Chlorotabanus* and *Cryptotylus* and provided a summary of the synonymy and keys to some of the species. He placed both genera (1942) in the tribe Dichelacerini. Philip (1941) had erected the tribe Chlorotabanini for the reception of the Nearctic *Chlorotabanus crepuscularis* Beq. Stone (1944) added two species to *Cryptotylus* and gave a key to the six species then known. Finally, Mackerras (1954), in revising the higher

categories based on a study of genitalia of both sexes, includes the present genera in a specialized group of an expanded tribe Diachlorini.

The species of *Chlorotabanus* are crepuscular or nocturnal, though sometimes taken during the day in heavy shade. Hine (1907), Snyder (1918), and others have noted the crepuscular habits of *C. crepuscularis* Beq. in the United States. Dunn (1929) collected *C. mexicanus* (Linn.) in Colombia at lights on shipboard and remarked on their crepuscular or nocturnal habits. Lane (1936) found *C. inanis* (Fabr.) predominantly crepuscular in Sao Paulo, Brasil, though occasionally taken in full daylight. In Panama, *C. mexicanus* and *inanis*, and the two species of *Cryptotylus* are mainly crepuscular and nocturnal, being frequently taken in light traps and in horse baited-mosquito traps operated only at night. Bouvier (1952) notes that *Cryptotylus unicolor* (Wied.) was taken only at nightfall in Campinas, S. Paulo, while Bequaert (1926) took *Cryptotylus innotescens* (Walk.) (syn. *aurora* of authors) flying in dense shade and at electric lights at night. The males of *Chlorotabanus crepuscularis* are commonly taken on flowers of chinquapin in Florida (Dozier, 1920).

Fairchild has reared *Chlorotabanus mexicanus* on several occasions in Panama. The larvae are green, mottled with blackish, and covered with a fine silky pubescence. The pupa is bright green, smooth and unremarkable. The thoracic spiracles are small, the rima curved and ear shaped. The pupal aster consists of two pairs of large dorsal spines, and a single pair of rather reduced ventral spines, but lacks the dorsolateral comb. Larvae have been taken among masses of wet dead leaves in shallow pools of forest streams in the dry season, when the flow is reduced to a trickle. Dunn (1934) reared *Cryptotylus unicolor* from larvae taken in floating plants of *Pistia stratiotes*, the water lettuce, in the Canal Zone, but gives no information on their appearance. The somewhat similar *Ancala fasciata* (Fabr.) from Africa also has green larvae which frequent *Pistia* (King 1926), and Philip has collected both this species and the green larvae of *Tabanus par* Wlk. from water lettuce in Nigeria.

Oldroyd (1954, pp. 94-95) develops the novel suggestion that the green pigment in *A. fasciata* may be due to the vegetable pigment chlorophyll

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which the larvae may use as a supplemental source of energy since he points out that it is difficult to explain how, isolated in floating *Pistia* plants, the larvae could be wholly carnivorous. This hypothesis would hardly explain the green blood in the adults and some other insects, however, which Hackman (1952), has summarized as due to blue and yellow chromatoid pigments, including chlorophyll.

A reassessment of characters indicates the logic of treating *Chlorotabanus* and *Cryptotylus* as subgenera under one genus, *Chlorotabanus*, with genotype species *Tabanus mexicanus* Linn. (monotypic and assigned by Bequaert, 1926). The genotype species of *Cryptotylus* is *Tabanus unicolor* Wied. (also monotypic and assigned by Borgmeier, 1933) and that of the synonym *Ommallia* End. is *O. viridis* End. (= *Crypt. unicolor* ♂ as confirmed by study of the loaned type by Philip) by original designation. Fairchild (1940) may be consulted for references to these generic names, as well as to certain specific names indicated below. The status and dates of Lutz' generic names have been discussed by both Fairchild (1950) and Barretto (1950).

Chlorotabanus, including subgenus *Cryptotylus*, may be characterized as follows: Moderately stout to robust flies from 11–20 mm. Blood green, giving the whole insect, or at least the thinner and less pigmented parts of the integument, a greenish tinge in life. Subepaulets (basicostas) without macrotrichiae. Eyes bare, unicolorous, glaucous greenish, or yellowish green to chocolate brown, often with a shifting pattern of dark spots in life. Proboscis with labella sclerotized, wholly or in part. Frons narrow to moderately broad, indexes of basal widths to heights from 1:4 to 1:7.5. Frontal callus often absent or when weakly developed always narrower than frons. Palpi of females stout to moderately inflated, never markedly slender, wholly pale haired in all but one species. Male palpi oval or slightly pointed, short, correct. Male eyes usually with areas of large facets extensive and well demarcated, occasionally otherwise. Ocelligerous tubercle absent or faintly indicated by a discolored spot in the females; tubercle absent or present in the vertical notch of the males. Wings hyaline, in some species with faint to prominent blackish clouds associated with vein forks and tips. Vestiture of body and legs mainly unicolorous, blackish or pale yellow. Antennae with first two segments short, not enlarged, third with an obtuse or acute dorsal angle, or with a moderately long distally directed tooth or spine.

The genus as here defined appears to be most closely related to *Phaeotabanus* Lutz and to *Stibasoma* Schiner, especially the subgenus *Rhabdotylus* Lutz. The aberrant *Lophoschelomyia notopleurale* Barr. (syn. *Tabanus fenestratus* Macq. not Fabr.) also appears to be related. From the

first it may be distinguished by the generally lesser development of the frontal callus, the more or less completely sclerotized labella, and always unbanded eyes. *Chlorotabanus* species are for the most part stout and chunky insects; the vestiture is unicolorous or at most paler below, generally yellow to orange brown, seldom blackish. In *Phaeotabanus* the bodies are usually more slender, the vestiture more variable, often showing an abdominal pattern. The wings of *Chlorotabanus* are glass clear with the costal cell always and the basal cells rarely yellowish tinged, but never with the wings smoky or extensively darkened, though in some species there are discrete rounded black spots on crossveins and tips of some veins. In *Phaeotabanus* the wings are always at least brownish tinged throughout, and usually bear more or less well defined brown bands, or may be almost wholly deep brown, but are never with small spots. Blood may also be green in other species, e.g., *Dichelacera* spp.

From the subgenus *Rhabdotylus* Lutz, which includes the greenish flies *planiventris* Wied., *viridiventris* Macq. and *venenatus* O.S., *Chlorotabanus* differs in lacking the well developed frontal calli, slightly incrassate fore tibiae, accentuated hind tibial fringes and tinted wings found in the former. In addition, the green coloring of *Rhabdotylus* is of a deeper, more bluish tone, and both the integument and vestiture are much darker, while the legs are, in part, bicolored.

Lophoschelomyia has head structures similar to *Chlorotabanus*, though the frontal callus is better developed than in most species of the latter. The fore tibiae are, however, strongly inflated, and the bicolored legs, heavily black marked wings and brown and orange coloration are distinctive.

Further consideration of the status of *Tabanus longiappendiculatus* Macq. (syn. *luteoflavus* Bell., syn. *limonus* Towns. not of authors) and *Stenotabanus atopus* Fchld. leads us to the conclusion that they are best placed in *Phaeotabanus* Lutz, the subepaulets of which are likewise bare and the labellae poorly sclerotized; from the other species they differ only in the denuded subcallus and almost unicolorous wings. The first was placed in *Cryptotylus* by Fairchild (1940) and Stone (1944) and syn. *luteoflavus* in *Chlorotabanus* by Kröber (1934), but its retention in this group can no longer be justified on structural grounds even though its general tinctorial resemblance is considerable. The synonymy relating to *longiappendiculatus* is as follows:

Phaeotabanus longiappendiculatus (Macquart)

Tabanus longiappendiculatus Macquart, 1855, Dipt. Exot. Suppl. V, p. 32. Type ♀, Honduras. Type in BMNH studied by both authors, 1953; lacks one antenna, and is broken and discolored.

Tabanus (Macrocornus) longiappendiculatus Macquart, Kröber, 1930, Zool. Anz. 87: 3; 1934, Rev. Ent., 4: 303.

Tabanus luteoflavus Bellardi, 1859, Sagg. Ditt. Messicana, I, p. 60. Type ♀, Mexico. Type in Bellardi's coll.,

Turin, studied by C.B.P., 1953; intact including antennae, but soiled.

Tabanus (Chlorotabanus) luteoflavus Kröber, 1934, Rev. Ent., 4: 297.

Cryptotylus luteoflavus (Kröber), Fairchild, 1940, Rev. Ent. 11: 718 (figs. ♀). Stone 1944, Bol. Ent. Venezolana, 3: 132.

Tabanus purus Walker, 1860, Trans. Ent. Soc. London, 5: 274. Type ♀, Mexico. Type in BMNH studied by both authors in 1953; specimen now headless but other characters, when taken with the original description, make synonymy certain.

Tabanus mexicanus var. *limonus* Townsend, 1897, Ann. Mag. Nat. Hist., 20: 21. Type ♂, Vera Cruz, Mexico. Type in BMNH studied by both authors in 1953; specimen greasy and broken, but essential structures intact.

Tabanus (Macrocornus) pallidus Kröber, 1930, Zool. Anz., 87: 4; 1934, Rev. Ent. 4: 303 (change of name to *Tabanus (Macrocornus) pallidulus*). Type ♀, Guatemala. Type in Vienna Mus. studied by C.B.P., 1953; specimen damaged by pests but head structures intact. Not *Tabanus pallidus* P. de B. 1821. The spelling *Macrocornus* was a deliberate but unnecessary emendation by Kröber, not perpetuated in his second reference.

Distribution: Known from Mexico, Guatemala, Honduras, Costa Rica, and Panama. Bequaert (1944) indicated that his previous (1940b) record for Trinidad was incorrect.

The following abbreviations are used in the text: BMNH—British Museum (Natural History), AMNH = American Museum of Natural History, MCZ = Museum of Comparative Zoology, Paris Museum = Muséum National d'Histoire Naturelle, Copenhagen Museum = Universitets Zoologiske Museum Kopenhagen (where the Kiel types of Fabricius are now on extended loan also), Uppsala Museum = Zoologiska Institutionen Uppsala, GBF and CBP the initials of the respective authors.

KEY TO SPECIES OF *CHLOROTABANUS**

**C. stonei* is not included in the Key. See Supplemental Note, pp. 323-4.

1. Female without frontal callosity; male with no visible vertical tubercle; basal plate of third antennal segment never with a spine or tooth, generally obtusely angled or sinuous above (subgenus *Chlorotabanus*)..... 2
- Female with frontal callosity, though sometimes weakly developed; male with visible though small tubercle in vertical notch (sometimes obscured by hairs); basal plate of third antennal segment with a strong angle or a weak to strong dorso-basal tooth or spine (subgenus *Cryptotylus*)..... 6
2. Wings with distinct dark spots on the cross-veins and fork of R_{4+5} 3
- Wings hyaline (except for yellow costal cells) or tinted but without spots..... 4
3. Wing spots dark, present also on tips of veins near wing margin (particularly of radial sector and axillary incision); all hind tibiae apically black haired (Neotropical)..... **mexicanus**
- Wing spots less prominent, absent at ends of veins; hind tibiae without black hairs apically (southern U. S.)..... **crepuscularis**
4. Basal plates of third antennal segment slightly and evenly excavated dorsally, but little longer than the annuli; fronts relatively wide (index 1:4), parallel-sided..... **ochreus**
- Antennal plates sinuous dorsally and about twice the length of the annuli; fronts variable..... 5

5. Tibiae with prominent black hairs on the distal one-fourth; antennal plates slender, usually nearly twice as long as broad; fronts of females relatively broad (index 1:4); upper facets of male eyes not greatly differentiated..... **parviceps**
- Tibiae wholly pale haired without prominent, apical black hairs; plates broader, usually about one-third longer than broad; fronts of females narrower (index 1:7.3); upper facets of male eyes sharply enlarged in upper two-thirds of eye area..... **inanis**
6. Basal plates deeply excised dorsally, with a strong forward-projecting tooth; body integument often greenish in life, fading to pale yellowish with age; base of vein R_4 often with a short spur or appendix..... 7
- Basal plates scarcely excised, with a prominent dorsal angle but not toothed; integument yellowish to dark brown; no spur-veins..... 9
7. Basal plates broad with a prominent angle below, the dorsal excision shallow, wider than deep; females with thoracic hair rather deep orange; rarely with short spurs at the base of vein R_4 , **unicolor**
- Basal plates more slender and rounded below but not angulate, the dorsal excision usually deeper and tooth longer; females with yellowish to golden thoracic pile; usually with spur-veins..... 8
8. Both sexes smaller (12-15 mm.); females with prominent, clavate frontal callosities extended above, about half the heights of the fronts, and some dorsal black hairs on hind tibiae; males with occipito-ocular margins even or gently waved..... **chloroticus chloroticus**
- Both sexes robust (15-16 mm.); females with small, narrow frontal keel and hind tibial fringes entirely orange haired; males with occipito-ocular margins viewed from above sinuous..... **chloroticus aeratus**
9. Large species, 16-20 mm.; subcallus pale pollinose; palpi, beard, pleura and venter white haired; frontal callosity an elongate brownish red keel; dorsal body vestiture orange rufous to blackish brown..... **innotescens**
- Smaller species, less than 15 mm.; subcallus yellow pollinose; palpi black haired; pleura and venter yellow haired; frontal callosity greatly reduced, not forming a long keel; dorsal body vestiture mainly dark brown..... **cauri**

Chlorotabanus (Chlorotabanus) mexicanus (Linnaeus)

TEXT FIG. II.

- Tabanus mexicanus* Linnaeus, 1767, Syst. Nat., 12th ed., I, pt. 2, p. 1000. (For figures and other early references, see Fairchild, 1940). Philip, 1952, Ann. Ent. Soc. Amer. 45: 310-314. Type ♀, S. America; studied by CBP, probably same specimen as type of *T. olivaceus* Degeer cited below.
- Tabanus (Chlorotabanus) mexicanus* Linnaeus, Kröber, 1930, Zool. Anz. 87: 15; 1934, Rev. Ent. 4: 297. Bequaert, 1940, Bull. Ent. Res. 30: 449; 1944, Psyche 51: 17.
- Chlorotabanus mexicanus* (Linnaeus), Kröber, 1930, Zool. Anz. 87: 18; 1931, Stettiner Ent. Zeit. 92: 91. Fairchild, 1940, Rev. Ent. 11: 715. Stone, 1944, Bol. Ent. Venezolana 3: 132. Bequaert and Renjifo-Salcedo, 1946, Psyche 53: 73. Fairchild, 1953, Psyche 60: 44.
- Tabanus olivaceus* Degeer, 1776, Mem. Serv. Hist. Ins. 6, p. 229. Type ♀, Surinam; seen and redescribed by Philip (1952) on loan from Riksmuseum, Stockholm.
- Tabanus punctatus* Fabricius, 1787, Mantissa Insect. 2, p. 355. Type, probably a female. Cayenne, seen by CBP, August, 1953; specimen in Kiel Collection, badly damaged, thorax and two wings remain. Nevertheless, the punctate wings confirm the synonymy.
- Tabanus tetrapunctus* Thunberg, 1827, Nova Acta Soc. Upsala 9: 57. Type (s?) ♀, Brazil and Islands of So.

America; Zool. Univ. Mus., Uppsala. Kröber (1934) questioned this as a synonym of *Dichelacera alcorni* Wied.

2 *Tabanus punctum* Rondani, 1848, in Baudi and Truqui, Studi Entom. 1, p. 105. Types, ♂ and ♀, Brazil; not seen by CBP with other Rondani types in Turin Museum, September, 1953; probably lost.

This genotype species has fortunately been correctly recognized over the years though *C. inanis* and *C. crepuscularis* formerly were on occasion confused with it. The characters given in the key easily differentiate it from any other species. Professor Kullenberg of Uppsala Museum writes that there is only one type female in poor condition of *T. tetrapunctus*. Thunberg so that the extensive locality given above must have been speculative (unless other specimens are missing). The wing spots on cross-veins are present though "not very distinct." This, nevertheless, confirms the synonymy.

Distribution: Material has been seen with the following data: *Mexico:* 4 ♀, Quintana Roo: Nohbec, 22 VIII, 1925; Kaiche, 3 X 1925; Sta. Cruz Chico, 25 VII, 1925, from mule at night; Tabi 12 VIII, 1925 at light. ♀, Salto do Agua, Chiapas, 29 IV, 1936; ♀, Esquipula, Chiapas, 2 XII, 1932; ♀, La Lucha, Campeche, 10 I, 1938; ♀, Coatepec, Vera Cruz, 21 April, 1942, Lassmann coll. *Nicaragua:* Rio Potecas, Jinotega, 10 August, 1953, J. Boshel coll. *Costa Rica:* Finca Suerre, 11-3-38, from horse. *Panama:* 7 ♂, 27 ♀, from 17 localities. *Ecuador:* No specific locality or date, L. Leon coll. *French Guiana:* Cayenne, March, 1917. *Venezuela:* ♂ ♀, Caripito, 18 and 26 IV, 1942. *Trinidad:* Tamana, August, 1942. Known also from Guatemala, Honduras, Colombia, and Surinam (Dutch Guiana).

Chlorotabanus (Chlorotabanus) crepuscularis (Bequaert)

Tabanus crepuscularis Bequaert, 1926, Harvard Inst. Trop. Biol. Med. 4: 234. Schwardt, 1936, Ark. Agr. Exp. Sta. Bull. No. 332, p. 62. Fairchild, 1937, Fla. Ent. 19: 62.

Tabanus (Chlorotabanus) crepuscularis Bequaert, Kröber, 1930, Zool. Anz. 87: 17; 1934, Rev. Ent. 4: 297. Bequaert, 1940, Rev. Ent. 11: 318.

Chlorotabanus crepuscularis (Bequaert), Kröber, 1934, Rev. Ent. 4: 296. Stone, 1938, U. S. Dept. Agr. Misc. Publ. No. 305, p. 27. Fattig, 1946, Emory Univ. Mus. Bull. No. 4, p. 14. Philip, 1947, Amer. Mid. Nat. 37: 286. McGregor and Schomberg, 1952, Jour. Econ. Ent. 45: 746.

Tabanus flavus Macquart, 1834, Hist. Nat. Dipt. I, p. 200. Percheron, in Guerin and Percheron, 1835, Genera des Insectes, 2^e Livr. No. 10, Dipt. Pl. III, des Etats Unis (colored fig.). Knab, 1916, Insec. Inscit. Menstr. 4: 98. Type ♀, United States; collection unknown; not seen in BMNH or Paris Museum in 1953, and not listed in portion of Macquart Collection in Ville de Lille. Not Wiedemann, 1828, Auss. Zweifl. Ins. I: 163.

Chlorotabanus inanis (Fabricius), Kröber, 1929, Ann. Naturhist. Mus. Wien 43: 246 (partim).

Tabanus mexicanus of Authors, not Linnaeus, 1767. Hine, 1907, La. Agr. Exp. Sta. Bull. No. 93, p. 52. Schwardt and Hall I, 1930, Ark. Exp. Sta. Bull. No. 256, p. 26.

The faint wing spots and Nearctic distribution readily distinguish this species from *C. mexicanus*, its nearest relative in the group. Its crepuscular habits have frequently been noted. Stone (1938) and Knab (1916), cited above, give good figures, and the latter includes drawings of the wings compared to *mexicanus*.

As Bequaert (1926) points out, Palisot's *T. sulphureus* was a composite species with the description and figure apparently only applying to his Santo Domingo specimen. Since no wing spots are described or figured, and leg markings are not mentioned, he apparently ignored his U. S. specimen. None of Palisot's types have ever been located and are presumed lost. It is, therefore, permissible to base *T. sulphureus* on the Caribbean description and figure, an area where *C. crepuscularis* has never been taken. No *Chlorotabanus* have ever been retaken in Santo Domingo, but they may eventually be found when the crepuscular habits are utilized, in which case a neotype can be established if and when the International Commission so authorizes. In the meantime, *T. sulphureus* can be removed from synonymy of *C. crepuscularis* and, following Bequaert (1940b), synonymized with *C. inanis* discussed below.

Distribution: *C. crepuscularis* has been reported around the eastern and southern United States from New Jersey to Arizona. It probably extends into northeastern Mexico as well.

Chlorotabanus (Chlorotabanus) inanis (Fabricius)

FIG. 1

Tabanus inanis Fabricius, 1794, Ent. Syst. IV, p. 368.

Knab, 1916, Ins. Inscit. Mens. 4: 99. Bequaert, 1926, Med. Rep. Exped. Amazonas, p. 232. Dunn, 1934, Psyche 61: 174. Bequaert, 1940, Bull. Ent. Res. 30: 450; 1940, Rev. Ent. 11: 318. Type, ♀, Cayenne; in Copenhagen Museum (Kiel Collection) there is a pinned label seen by CBP, August, 1953, but the specimen unfortunately has been completely destroyed. See remarks below.

Chlorotabanus inanis (Fabricius), Kröber, 1929, Ann. Nat. Mus. Wien 43: 246 (partim). Fairchild, 1940, Rev. Ent. 11: 714 (which see for additional figures and references omitted in synonymy below). Antunes, 1937, Rev. Facultad Medicina, 6: 8. Carrera and Lane, 1945, Arquivos Mus. Paranaense, 4: 135. Bequaert and Renjifo-Salcedo, 1946, Psyche 53: 73.

Tabanus (Chlorotabanus) inanis Fabricius Kröber, 1930, Zool. Anz. 87: 15; 1934, Rev. Ent. 4: 71. Bequaert, 1940, Rev. Ent. 11: 318.

Tabanus ochroleucus Meigen, 1804, Klass. u. Beschr. Europ. Zweifl. Ins. I, p. 172. Types, ♂, ♀, no locality; collection unknown; not seen with other Meigen types in Paris, August, 1953, nor in Vienna.

Tabanus sulphureus Palisot de Beauvois, 1813-1820, Ins. rec. en Afr. et en Amer., p. 222 (partim, see discussion under *C. crepuscularis* above). Type, ♀, "Saint Dominique, Etats-Unis d'Amerique;" probably lost.

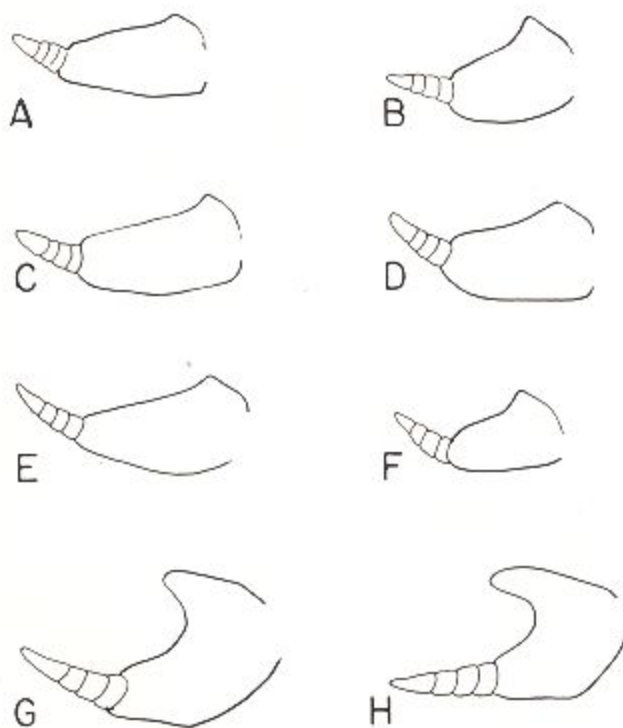
Tabanus sulphureus Macquart, 1847, Dipt. Exot. Suppl. II, p. 9 (partim). Types, 2 ♀♀ only (♂♂ are *C. unicolor* Wied.), Brazil; seen by both authors in BMNH, 1953. Not Palisot de Beauvois, 1813-1820 above.

Tabanus inconspicuum Walker, 1848, List Dipt. Brit. Mus. I, p. 171. Type ♀ intact except for missing antennae; locality doubtful; seen by Kröber (1930) and both authors in BMNH, 1953.

Tabanus viridiflavus Walker, 1850, The Zoologist, 8, Appendix p. 66. Type, ♀, Brazil; originally BMNH, not found by authors in 1953, apparently lost.

Tabanus and *Chlorotabanus mexicanus* of Authors not Linnaeus, 1767 (See Fairchild, 1940, for references).

As indicated above, the original pin and label of *inanis* are present in the Kiel Collection, but the type specimen from Cayenne has been destroyed. There is in the Copenhagen Museum Collection a female from "Am. Mer." in fair condition seen by CBP which was identified by Fabricius and which is proposed to be designated as neotype when that type category is officially sanctioned³; however, the specimen is not from the type locality. A pest has damaged both pleura, but the body is otherwise intact, and



TEXT FIG. 1. Comparison of female antennal variation in *Chlorotabanus* spp.; *inanis* (Fabr.) a, b (Pan.), c (Mex.), d (French Guiana), e (Brazil); *mexicanus* (L.) f (Pan.); and *unicolor* (Wied.) g (Pan.), h (Brazil).

one antenna is present minus only the annuli. Because of age, no evidence of green remains and all parts are yellow, but the specimen agrees with the present interpretation of narrow-fronted *Chlorotabanus inanis*. With the difference that the dorso-basal tooth is a little more prominent and sharper in the proposed neotype, Fairchild's (1940) figures for the front and antennal plate will illustrate this specimen. Moderate discoloration has occurred only on the last four tergites. A specimen in the collection of CBP from French Guiana is in close agreement with this "neotype."

³The Secretary of the International Commission has been officially notified of this designation, in accordance with the provisions of the Copenhagen Conference.

The fronts of the females of *C. inanis* are very narrow (index 1: 7.5), slightly convergent below to parallel-sided; the antennal plates are elongated, usually nearly twice as long as deep and over twice the length of the annuli, the dorsal margin is sinuous and the basal angle obtuse. Considerable variation occurs in the shapes of the plates as illustrated in text fig. 1. Unfortunately, in occasional specimens which cannot be separated otherwise, the plates are proportionately shorter and broader with more prominent dorsal angles. The wings are faintly yellow on the costal margin to subhyaline behind; the cross-veins are not clouded but the veins themselves have contrasting blackish sections.

Distribution: This is a common and widespread species which was reported by Fairchild (1940) from Paraguay to British Honduras but in view of the present restriction of characters, some of these localities should be rechecked. Material has been seen with the following data: *Mexico*: ♀, Teapa, Tabasco, 1 April, 1947, W. G. Downs coll. *Panama*: ♂, 21 ♀, from 8 localities. *Colombia*: Villavicencio, Dept. Meta, 15 December, 1941. *Venezuela*: ♀, Mt. Duida, X 15, 1938; ♀, Arabupu, Nov.-Dec., 1938, Pinkus coll. *French Guinea*: ♂, Mana River, June, 1917; ♀, Oyapok River, S. M. Klages (no date). *British Guiana*: 1908, K. S. Wise (no other data). *Brazil*: 2 ♀, Aura, Para, no date, R. G. Damasceno coll; 2 ♀, Ponce, Chapada, Matto Grosso, 660 m., Lane coll; and another ♀, Ponce, Matto Grosso, 23 August, 1934. Known also from Costa Rica and Paraguay.

***Chlorotabanus* (*Chlorotabanus*) *ochreus* n. sp.**
(FIG. 4)

A large, robust pale-yellowish-bodied fly without distinctive markings, and wide, parallel-sided frons but no callosity.

Holotype ♀, 15.5 mm. Head wider than thorax, eyes red, glabrous. Frons buff pollinose, rather wide and parallel-sided, index 1: 4.0; no basal callosity, a small irregular median yellow spot. Subcallus, face and cheeks also buff pollinose. Vestiture of genae, palpi and basal antennal segments pale yellow. Antennae as figured, yellow, the plates distinctly longer than broad, and but little longer than the annuli. Palpi pale yellow, rather elongate but not attenuated. Labellae rather small, shining red-sclerotized.

Thorax pale buff, the abdomen straw yellow. Legs and halteres yellow. Entire vestiture colorous, a few darker reddish hairs distally on the fore and hind tibiae. Wings slightly tinted, the costal cells a little darker; veins entirely yellow, no darkened sections, no spur veins on R_4 ; subepaulets bare. Halteres pale yellow.

"Bocaina [Brazil], II-1912, crepuscular, blood green, Ad. Lutz No. 48." In MCZ from Ad. Lutz as *T. inanis*.

In size and build this is larger than *C. parviceps*

or *C. inanis*, and resembles a pallid *C. chloroticus aeralus*. The wide, completely pollinose, parallel-sided frons, and distinctive antennae will readily separate this from related species.

Chlorotabanus (Chlorotabanus) parviceps Kröber

FIGS. 2(♂), 3(♀)

Tabanus (Chlorotabanus) microcephalus Kröber, 1930, Zool. Anz. 87: 17. Type, ♂, Brazil; Berlin Mus., studied by CBP on loan, March, 1954. Not Osten Sacken, 1887.

Chlorotabanus parviceps Kröber, 1934, Rev. Ent. 4: 297.

The type male lacks antennal flagella, but their presumed shapes and proportions may be interpolated from a male in AMNH from Santa Catharina, Brazil, which agrees closely in having reduced areas of enlarged ocular facets (about one-third the total area), no visible, vertical tubercle and in other characters. The male of *C. inanis* differs in having a larger, wider head, due to greater enlargement of the facets in the upper two-thirds of the eye area.

A female in the collection of CBP from Poco Preto (Santa Catharina), Brazil, 17-1-1936, appears to be associated with the above *parviceps* males and may be designated as allotype. It is 14 mm., has straw-yellow body color, clear wings without darkened cross-veins but a strong dark spot at the axillary excision, and costal cells hardly tinted; legs unicolorous, but the apical fourths of the tibiae with prominent black hairs. The front is relatively broad (index 1: 4.2) and convergent below. The length of the ocular margin from the inner angle at top of subcallus to lowest point on genae is subequal to the height of the frontal margins. The antennal plate is almost a third longer than wide with an obtuse dorso-basal angle, but is plainly less than twice as long as the annuli.

In other specimens from Salobra State, Brazil, the base of the plate is wider and the dorsal angle subrectangulate but the proportionate lengths to the annuli are the same. The frontal and other characters agree. The above allotype was compared with the proposed neotype of *C. inanis* Fabr. by CBP, August, 1953, in Copenhagen Museum, and found to be not in agreement in the same particulars given below.

Females of *C. inanis* from various localities differ from the above most noticeably in the narrower frons, but also in having the frontal margins of the eyes longer than the genal margins viewed from in front (the eyes thus appearing larger), wings, especially the costal cells, more definitely tinted with a tendency to darkening of the cross veins particularly at the apices of the discal cells, tibiae without black hairs on the distal fourths, and antennal plates more elongated, plainly over twice the length of the annuli.

Distribution: Specimens are at hand only from Brazil and Peru, though doubtless some records elsewhere of *C. inanis* should apply to this.

Data in addition to the allotype above, include ♂ 2 ♀, Corupa, Sta. Catharina in December and January, 1938; 3 ♀ "Zona da N.O.B.," Solobra, October 18-29, 1938; ♀, Tingo Maria, Peru, in January; ♀, Goiaz in May; and ♀, Matto Grosso in June. The type locality "Sao Joao" gives little specific information as there are numerous towns of that name in Brazil.

Chlorotabanus (Cryptotylus) unicolor (Wiedemann)

TEXT FIG. 1 g, h

Tabanus ferrugineus Thunberg, 1789, Mus. Nat. Acad. Upsala Dissert., 7: 91, (footnote); 1827, Nova Acta Soc. Sci. Upsala 9: 55. Type ♀, Cayenne; fragments including wings now in Uppsala Mus. Not *T. ferrugineus* Meigen 1804. Not Strom (1768).

Tabanus unicolor Wiedemann, 1828, Auss. Zweifl. Ins. 1, p. 141. Type ♀, Brasil; not seen in Vienna Museum by CBP, August, 1953, nor Copenhagen where other Wiedemann types are located. Not found in Berlin Mus. by Peus nor in Frankfurt Mus. by Franz.

Cryptotylus unicolor (Wiedemann), Lutz, 1909, Coll. Tabanidae Inst. Oswaldo Cruz Manguihos, p. 29. (See Fairchild, 1940, for other figures and subsequent early references.) Add: Stone, 1944, Bol. Ent. Venez. 3: 132 (key). Bequaert, 1944, Psyche 51: 17. Bequaert and Renjifo-Salcedo, 1947, Psyche 53: 73. Bouvier, 1952, Mem. Inst. Oswaldo Cruz. 50: 590.

Stigmatophthalmus unicolor (Wiedemann), Enderlein, 1925, Mitt. Mus. Berlin 9: 387.

Amphichlorops unicolor (Wiedemann), Kröber, 1929, Ann. Naturhist. Mus. Wien. 43: 245; 1934, Rev. Ent. 2: 90.

Gymnochela (Amphichlorops) unicolor (Wiedemann), Kröber, 1932, Rev. Ent. 2: 90.

Tabanus castaneus Macquart, 1834, Hist. Nat. Dipt. I, p. 198. Type ♂, Cayenne; location unknown; not seen by either author in European collections visited in 1953.

Tabanus ochraceus Macquart, 1838, Dipt. Exot. I, p. 149 (partim). Cotype ♀, Cayenne?; seen by both authors in Paris Museum, 1953 (a second cotype is the same as *Amphichlorops flavus* (Wied.), see later discussion).

Tabanus sulphureus Macquart, 1847, Dipt. Exot. Suppl. II, p. 9 (partim). Types 2 ♂♂, Brazil; seen by both authors in BMNH, 1953, antennae missing.

Tabanus princeps Brèthes, 1910, Ann. Mus. Buenos Aires 13: 478. Type ♀, Matto Grosso, Brazil; Mus. Hist. Nat., Buenos Aires. Type lacks antennae but synonymy is based on other characters reported by Dr. M. P. Barretto (correspondence).

Amphichlorops princeps (Brèthes), Kröber, 1934, Rev. Ent. 4: 271.

Omalia viridis Enderlein, 1925, Mitt. Mus. Berlin 11: 389. Kröber, 1930, Zool. Anz. 87: 17. Type ♂, Cordillera, Colombia; Berlin Mus., studied on loan by CBP, March, 1954.

EXPLANATION OF FIGURES

FIG. 1. Head and antenna of male *Chlorotabanus (Chlorotabanus) inanis* (Fabr.); antennal plates from Para. Brazil, above, and French Guiana, below. FIG. 2. Same, *Chlorotabanus (Chlorotabanus) parviceps* Krb. FIG. 3. Frons, antenna, and palpus of *Chlorotabanus (Chlorotabanus) parviceps* Krb. FIG. 4. Same, *Chlorotabanus (Chlorotabanus) ochreus*, n. sp. FIG. 5. Same, *Chlorotabanus (Cryptotylus) cauri* (Stone). FIG. 6. Same, *Chlorotabanus (Cryptotylus) innotescens* (Walk.). FIG. 7. Same, *Chlorotabanus (Cryptotylus) chloroticus*, n. sp. FIG. 8. Same, *Chlorotabanus (Cryptotylus) chloroticus* subsp. *aeralus*, nov.



Chlorotabanus inanis (Fabricius), Kröber, 1929, Ann. Naturhist. Mus. Wien 43: 246 (partim, ♂ fig.)
 NOT *Atylotus aurisquammatum* Bigot, 1892, Mem. Soc. Zool. France 5: 665. Type ♀ obviously wrongly labelled from Brazil; seen by both authors, 1953, in BMNH; this is the European *Atylotus fulvus* and can be removed from Neotropical synonymy where it has been placed by several previous authors.

This robust, rich orange rufous species is now well defined, and should be readily recognized by the distinctly shaped, hooked antennae, with a distinct angle on the lower margin. The male is discussed and compared to that of *C. chloroticus aeratus* below. The frontal indexes of females vary between 1: 5.5 and 1: 6.5. Kröber (1929, cited above, and 1930) figured the male antenna and palp of what he called *C. inanis*, but they are obviously *C. unicolor*. Kröber's (1930) description of the type male of *O. viridis* End. (= *C. unicolor*) as having small facets and dense white hairs on the eyes was erroneous, as this type was seen by CBP in 1954 and found to be in almost exact agreement, except for size and fresher, greenish condition, with a male each from British Guiana (16 mm., CBP collection) and from Panama -12 mm., GBF collection) with large upper, bare facets. The two males in the cotype series of *T. sulphureus* Macquart (not Palisot de Beauvois, 1813-1820) are apparently this species. Though the latter lack antennae for confirmation, the other characters including occipital tubercles agree. Macquart's male of *T. castaneus* (1934) appears to belong here, since it is said to have a prolonged antennal tooth, a green mediastinal vein and other characters which seem to fit.

Professor Bertil Kullenberg of Uppsala, Sweden, kindly sent a drawing of the antenna of one of two cotypes of *Tabanus ferrungineus* Thunberg which is readily recognizable as this species, plus length of 16 mm., and a rudimentary spur vein on one wing of only one specimen. Mr. H. Oldroyd (BMNH) however, has confirmed that *Tabanus ferrungineus* Strom (1768) is a valid prior homonym so that the well known *Cryptotylus unicolor* is fortunately still the applicable name.

Distribution: Material has been seen from Panama: 2♂, 22♀ from 10 localities. Trinidad: Tamana, August, 1942 (no date or coll.). French Guiana: Cayenne, October, 1954, H. Floch coll. British Guiana: ♂, A. W. Bartlett coll. (no other data). Brazil: 2♀, Zona da N.O.B., Salobra, 18-29 X 1938. Bolivia: ♀, Prov. del Sara, 450 m., November, 1909, Steinback. Known also from Peru.

Chlorotabanus (Cryptotylus) chloroticus n.sp.

FIG. 7

Cryptotylus limonus of authors (not Townsend 1897). Fairchild, 1940, Rev. Ent. 11: 720 (figs. ♂ ♀). Stone, 1944, Bol. Ent. Venezolana 3: 132. Bequaert, 1944, Psyche 51: 17. Bequaert and Renjifo-Salcedo, 1946, Psyche, 53: 73.

Chlorotabanus inanis (Fabricius), Kröber, 1930, Zool. Anz. 87: 15 (partim).
Tabanus (Ommallia) viridis Enderlein, Bequaert, 1940, Bull. Ent. Res. 30: 449.

A medium-sized pale to golden yellowish species with strongly toothed antennae and small basal callosity on the front of the female.

Holotype ♀, 14 mm. Eyes bare; front rather broad (index 1: 6.0), parallel-sided, golden yellow pollinose with short concolorous and brown hairs; a small, bare, yellow basal callosity present with a short, attenuated dorsal extension as figured. Subcallus, face, and cheeks dull, golden pollinose, and concolorous pilose below. Antennae greenish yellow, the plates rather slender, not angulate below, strongly excised dorsally to form basal thumbs or teeth which reach a little over half way to the annuli. Palpi golden yellow pilose and pollinose, rather slender and pointed as figured. Labellae shining black sclerotized.

Thorax, including scutellum, golden yellow pilose and pollinose, the pleura a little paler. Legs yellowish with concolorous hair, a few black ones at the apices of the hind tibiae. Wings hyaline, costal cells pale yellow, veins yellowish green without dark sections; spurveins at base of R₄ very short. Subepaulets bare. Halteres yellow.

Abdomen reddish orange, the vestiture golden yellow, a few scattered black hairs on the last three tergites.

Moja Pollo, Panama Prov., Rep. Pan. VI-12-40. In MCZ through courtesy of G. B. Fairchild.

Allotype ♂, 13 mm. Like the female except for sex differences, and readily associated, the thoracic vestiture more brassy yellow, and some greenish shades in basal abdomen, veins and halteres. Head wider than the thorax, eyes glabrous, area of enlarged facets occupying upper two-thirds with a downward dip outwardly (Fig. 7). The ocular margins are not sinuous across the occiput viewed from above as seen in *C. unicolor* and subsp. *aeratus*. Vertical tubercle small, compressed but visible about at eye level. Frontal triangle, face, cheeks, and antennae as in the female. Palpi yellow pilose and pollinose, the apical segments subovoid, hardly twice as long as thick, no nipples. Fore tarsal claws subequal. Spur veins longer than holotype and angled forward.

"Aguadulce, R. Pan., 7 Aug., '51, light trap." F. C. Blanton leg. In MCZ. A small male of *C. unicolor* taken in the same collection.

Paratypes: ♂♂, ♀♀, 12-15 mm. Both sexes agree closely with above types, though some have discolored darker areas in the abdominal integument, in others there are more greenish shades in the abdomen and some appendages. Wear sometimes accentuates the frontal callosity of the females, but the structure is always well separated from either ocular margin. Occasional males show a tendency toward sinuosity of the

occipito-ocular margins but not as marked as in the males of *unicolor* and *aeratus*. Spur-veins are variable in both sexes, but present in all material seen.

Panama: ♂, same data as allotype; ♂, Almirante, R. P., April, 1943; ♂, 23 ♀, Moja Pollo, R. P., V-27 to VI-24, 1940; 4 ♀, Ft. Kobbe, C. Z.—in horse trap, 10 Aug., 1950, 15 Aug., 1951, 18 June, 1952, and 15 July, 1952; ♀, Ft. Gulick, C. Z., in light trap, 20 May, 1954; 3 ♀, Gatun, C. Z., in horse trap, 1 7-18 May, 1954; 5♂, Aguadulec, R. P., in light trap, 7 Aug., 1951; ♀, Coco Solito, C. Z., in horse trap, 1 July, 1953; ♀, Old Panama, R. P., 17 August, 1943; 2 ♀, New San Juan, Chagres River region, R. P., 7 July, 1939; ♀, Utevey, nr. Pacora, R. P., 6 August, 1941. **Colombia:** 2 ♀, Villavicencio, Dept. Meta, 5 May and 1 June, 1942. **Trinidad,** B.W. I.: 5♂, St. Augustine: 23 May, 1935, N. A. Weber; 5 May, 1945, E. McCallum, at light; 10 May, 1945, R. G. Donold; and 11 May, 1945, I. E. Kirby; ♀, Port of Spain, 24 July, 1954, T. H. G. Aitken, ♀ Brusso, 18-VII-1932. ♂ ♀ Trinidad in BMNH as *Tabanus viridis* End. Other paratypes in collections of USNM, MCZ, Vienna Natural History Museum, Pechuman and the authors. **Brazil:** 2 ♀, S. Paulo, Salto de Avanhandava. "O. R. coll., 3-943" [March, 1943]. In collection of Barretto.

This species in series is noticeably smaller than *Cryptotylus unicolor* or subsp. *aeratus*. It also has a more northern distribution than *aeratus* which the antennal characters most closely resemble, plus a more evident frontal callosity in the females. The spur-vein is usually prominent and divergent forward, and there are usually some black hairs apically at least on the hind tibiae, whereas in *aeratus* the spur-veins are absent or if present are more often short and parallel to R_{4+5} , and there are no black hairs on hind tibiae in the limited number of females studied, a very few scattered ones on the only male seen. The differences from *C. unicolor* are more marked, especially in the shapes of the antennal plates which are consistently more compressed laterally and broader in both sexes of *C. unicolor*, with pronounced angles below, and the dorsal angles of excavation are wider open with shorter dorsal teeth. The frontal callosities of the females of *chloroticus* are always more prominent. It appears probable that some of the variants of *C. inanis* mentioned by Kröber (1930) with antennal teeth almost as long as the basal plate were this species, but it is odd that he did not mention the frontal callosities in these females.

The known distribution of *chloroticus* at present includes only Panama, Colombia, Brazil and Trinidad, though the occurrence on the latter island suggests that it at least is in intermediate localities on the mainland when suitable sampling is attempted for these crepuscular species.

Chlorotabanus (Cryptotylus) chloroticus

subsp. *aeratus* nov.

FIG. 8

Cryptotylus princeps of Authors. Not *Tabanus princeps* Brèthes (= *unicolor* Wied.).

Tabanus (Cryptotylus) princeps Brèthes, Bequaert, 1940, Psyche 51: 18.

Cryptotylus princeps (Brèthes) Fairchild, 1940, Rev. Ent. 11: 718 (with query). Stone, 1944, Bol. Ent. Venezolana 3: 132.

Chlorotabanus inanis (Fabricius), Kröber, 1930, Zool. Anz. 87: 15 (partim).

Information on Brèthes' type received in correspondence from Dr. M. P. Barretto indicates that *princeps* Brèthes is actually a synonym of *unicolor* Wied. The specimens determined as *princeps* by Bequaert (1940a), Fairchild (1940), and Stone (1941) appear best placed as a fairly well marked race of *chloroticus*. More adequate material is needed to substantiate its present assignment as only a subspecies, however.

Holotype ♀, 17 mm. Front subparallel, index 1: 6.5, yellow pollinose with mixed short yellow and black hairs; no tubercle or spot at vertex; a vestigial, linear basal callosity not as well developed even as in *chloroticus*. Subcallus, face, and genae bright yellow pollinose, and with a short concolorous beard. Antennae orange-yellow. Scapes not swollen, plates with a strong prorect dorsal tooth as in *chloroticus*, not reaching the annuli, no angle below, but a low hump at the distal two-thirds (see text fig. 1 f); annuli proportionately shorter (1: 1.5 in relation to the plate). Palpi bright yellow with concolorous hairs. Labellae largely sclerotized.

Body, legs, and vestiture bright brassy (hence the name) yellow, no dark hairs distally on the hind tibiae. Wings hyaline, costal cells yellow, a vestige of a spur-vein on one wing only. Cell R_5 wide open. Halteres yellow with greenish knobs. Subepaulets bare.

Maracaju, Matto Grosso, Brazil, April-May, 1937, Shannon and Fairchild coll. To be deposited in MCZ.

Allotype ♂, 16 mm. Head wider than thorax, enlarged facets occupying upper two-thirds of the upper eye area, a wide band of small facets with sinuous margin behind, across the occipit. A very small depressed tubercle in the occipital notch, covered with short yellow hairs. Frontal triangle, face, and cheeks pale yellow pollinose with concolorous hairs below. Antennae yellow with greenish shades on the flagellum, the plate more slender than in the ♀, the dorso-basal thumb not reaching the annuli but longer and more slender than in *C. unicolor* (the plate also in proportion to the annuli), and with a low hump but no angulation beneath, as in the female. Palpi yellow, ovoid, a little less than twice as long as thick with concolorous hairs. Thorax and scutellum covered with dense brassy yellow pile, paler on the pleura. Legs uniformly yellowish with some greenish shadows; no black

hairs at tips of the tibiae. Wings hyaline, costal cells pale yellow, veins yellow and green, spurveins short and parallel to R_{4+5} . Subepaulets bare. Halteres yellowish. Abdomen yellow, darker posteriorly, clothed mainly with pale brassy hairs, but with increasingly numerous scattered, longer black hairs on tergites 2 to 7.

"Paraguay, Coa Guazu Distr. Ss Facia Primera, 11 January, 1932. R. F. Hussey, at light." In Mus. Zool., Univ. Mich.

Paratypes, 4♀, same data as holotype ♀. In MCZ, USNM and authors' coll. Female from "Angelica 1. 1916." In Berlin Mus.

The few specimens seen of subsp. *aeratus* (or reported as "*princeps*") have been from Matto Grosso, Brazil, with the exception of the above male, and a female from Villa Rica, Paraguay.

The subspecies differs from *chloroticus* in larger size (16-18 mm.) somewhat brighter yellow vestiture, and, in the limited material seen, a less well defined frontal callus and usually shorter appendix at base of R_4 . The antennae of *aeratus* are of similar shape to those of *chloroticus* but somewhat stouter and with style proportionately shorter.

The shape of the head of the male including the sinuous hind margin and robust size is the same as for *C. unicolor* male from British Guiana but the general color is more yellowish; most *unicolor* lack even an angle at base of vein R_4 , and the shapes of the antennae differ as in the females. While *aeratus* females are similar in size to *unicolor*, the deeper rusty red of the latter and the hind tibiae with many black hairs, in addition to the difference in shapes of antennae, readily separate them.

Chlorotabanus (Cryptotylus) innotescens (Walker)

FIG. 6

Tabanus innotescens Walker, 1854, List Dipt. Brit. Mus. V, p. 327. Type, ♀, Tapajos, Brazil; studied by both authors in BMNH, 1953.

Cryptotylus pallidipalpis Stone, 1944, Bol. Ent. Venezolana 3: 131. Type ♀, Caura Valley, Venezuela; in MCZ. Fairchild, 1955, Novedades Cientificas. Contrib. Ocas. Mus. Hist. Nat. LaSalle, Apartado 681, no. 16, 7 pp.

Tabanus aurora of Authors, not Macquart, 1838. Kröber, 1929, Ann. Naturhist. Mus. Wien 43: 246 (♀ only). Bequaert, 1926, Med. Rep. Exped. Amazonas, p. 233.

This is the largest species of the group (16-20 mm.) and is readily separated from the others by the characters in the key. The combination of frontal callosity, lack of strong excavation of the antennal plate, creamy white palpi and white pilose and pollinose genae are distinctive. The frontal index is about 1:6. Male is unknown; that described and figured by Kröber (1929, cited above) as *T. "aurora"* is obviously a different species. Bequaert reports this species (as *T. "aurora"*) as having in life unbanded eyes, green blood, and crepuscular habits.

Variation in both size and coloration is rather

marked. We have examined two of the five specimens reported by Bequaert (1926) from Vista Alegre, Rio Branco, Amazonas. One of these was compared with Walker's type of *innotescens* by GBF and found to agree in detail. This specimen has the dorsum of thorax pale cinnamon brown, thinly grayish pollinose, clothed with appressed orange hairs and short erect black hairs, the latter sparse on the disc, longer and more numerous on the sides. There are small tufts of whitish hairs above wing bases and the pleura and sternum are thickly white pollinose and white haired. The abdomen has the integument yellow, thinly yellowish pollinose dorsally and with rather sparse mixed orange and blackish brown hairs. Beneath the abdomen is white pollinose and white haired. The other specimen from Vista Alegre has much sparser black hairs on thorax and abdomen, being almost wholly orange haired dorsally. A third specimen from S. Francisco de Guayo, Delta Amacuro, Venezuela, 27 Dec., 1952, Ortiz coll. is larger and with darker integument, the black hairs predominating on dorsum of thorax and almost wholly replacing the orange hairs of the abdomen. There seem no other differences among the three specimens. From the description, the type of *pallidipalpis* Stone, also from Venezuela, represents a condition intermediate between the above Amazonian and Venezuelan specimens in respect to the color of the vestiture.

Lutz *et al.* (1914), placed *T. aurora* in Lutz' *Chelotabanus* but later (1918) transferred it to a new genus *Odontotabanus*, of which Borgmeier (1933) made it the genotype. This was based, however, presumably on the same misidentification cited above and therefore leaves the status of *Odontotabanus* dependent on a ruling of the International Commission following precedents established in Opinions 65, 168, 169, 173, etc. Since *Cryptotylus* under *Chlorotabanus* as here treated and to which *innotescens* (syn. *aurora* of authors, not Macquart) is now assigned, has precedence, the outcome of such an official decision could at most only place *Odontotabanus* as a synonym of *Cryptotylus*, but more likely the name would apply to the tabanine element with hairy subepaulets to which the true *aurora* belongs.

In spite of its implied relationship here, the type female of *T. neo-innotescens* Kröber seen by CBP in Munich, August, 1935, has hairy subepaulets and belongs in the Tabanini. The type of *T. aurora* Macq. also has hairy subepaulets and a very narrow frons as checked in Paris Museum by both authors and is a very different insect from *C. innotescens* (Wlk.).

Chlorotabanus (Cryptotylus) cauri Stone

FIG. 5

Cryptotylus cauri Stone, 1944, Bol. Ent. Venezolana 3: 130. Type ♀, Caura Valley, Venezuela; in MCZ.

This is a small yellow-orange species with wide front (index about 1:3) and an indistinct callosity, the antennal plate distinctly excavated but no dorso-basal toothlike extension. The species is known at present only on basis of the type and two paratypes collected at the same time and place. The figure was drawn from a paratype in USNM.

DISCUSSION

Ommallia was erected by Enderlein (1925) with *viridis* End. (= ♂ *unicolor* Wied., *q.v.*) as genotype and with four other included species, *interrupta* End., *herculeana* End., *brevihamus* End., and *thiemeana* End. Kröber (1931, Rev. Ent. 1: 293) stated his belief that *viridis* was the male of *Chlorotabanus inanis*, and that *herculeana* was the male of *Tabanus trigonus* Coq. from Japan; he retained *Ommallia* only for the remaining three species. Borgmeier (1933) noted that the genotype of *Ommallia* was *viridis*, and that if the remaining species were in reality generically distinct as thought by Kröber, they would need a new generic name. This he proposed (1934) as *Alliomma* with genotype *Ommallia thiemeana* End. The types of *herculeana* End., *brevihamus* End., and *thiemeana* End., were studied on loan from Berlin Museum by CBP and found to have setose subepaulets; hence they belong in the Tabanini. *Alliomma* is closely related to *Chelommia* End. (genotype *T. cinnamomeus* Schin.), if indeed the two are separable, whereas, *Ommallia* becomes an exact synonym of subgenus *Cryptotylus* having the same genotype species. Bequaert and Renjifo-Salcedo (1946) have considered the fourth species, *interrupta* End. as synonymous with *thiemeana* End.

It is pertinent to establish lectotypes for certain synonyms cited in the previous text under respective species as listed.

Tabanus sulphureus Palisot de Beauvois (= *C. inanis* (Fabr.) from Santo Domingo and *C. crepuscularis* (Beq.) from the U. S. A.) is composite based on missing types of different species as discussed previously. The description and figure of a clear wing applies only to *C. inanis* to which "indication" the name *T. sulphureus* is now assigned by authority of Article 25A and Opinion 1 of the Rules, and the type locality thus becomes Santo Domingo (Hispaniola).

Tabanus sulphureus Macquart was described independently of Palisot de Beauvois above, based on two specimens of each sex in London from Brazil. Two different species also are represented as cited previously, namely, *C. inanis* females, and *C. unicolor* males. To establish unambiguous synonymy, a female with antennae is herewith designated as lectotype making *T. sulphureus* Macq. a synonym of *C. inanis* only.

Tabanus ochraceus Macquart is based on two specimens of different species in Paris Museum. One agrees with *C. unicolor* (Wied.) in shape of

antennae and other characters and is herewith designated as lectotype. The other syntype is probably a specimen of "*Tabanus flavus* Wied. (genotype species of *Amphichlorops* Lutz).

SUMMARY

Described as new are *Chlorotabanus (Chlorotabanus) ochreus* n. sp., holotype ♀ from Bocaina, Brazil, *C. (Cryptotylus) chloroticus* n. sp., holotype ♀ and allotype ♂ from Panama, and *C. (Cryptotylus) chloroticus* subsp. *aeratus* nov., holotype ♀ from Matto Grosso, Brazil, and allotype ♂ from Paraguay. *Cryptotylus* Lutz is considered as a subgenus of *Chlorotabanus*, and a key to nine contained species and one subspecies is provided, all but one of which are Neotropical. New information on synonymy includes: *T. sulphureus* Pal. equals *C. inanis* (Fabr.); *Ommallia viridis* End., *Tabanus castaneus* Macq., and *T. princeps* Brèthes equal *C. unicolor* (Wied.); *Tabanus limonus* of Authors (not Townsend) equals *C. chloroticus* n. sp.; *Cryptotylus pallidipalpis* Stone and *Tabanus aurora* of Authors (not Macq.) equal *C. innotescens* (Walker). *Atylotus aurisquammatulus* Big. is removed from synonymy of Neotropical *C. unicolor* and synonymized with Palearctic *A. fulvus* (Meig.). Lectotypes of *Tabanus sulphureus* Pal., *T. sulphureus* Macq. and *T. ochraceus* Macq. are established. *T. longiappendiculatus* Macq. (syns *T. luteoflavus* Bell. and *Macrocornus* [sic] *pallidus* Krb.) is removed from this group and transferred to *Phaeotabanus*.

SUPPLEMENTAL NOTE

While the foregoing review was in press, an additional species, *Cryptotylus stonei*, was described from Venezuela by Maldonado Capriles (1955, Proc. Ent. Soc. Washington, 57: 189) and should be included in the foregoing discussion of the subgenus *Cryptotylus*. This species is very close structurally to *C. chloroticus* described above, but is uniformly much darker reddish in appearance, including all appendages, this color being accentuated by black hairs over the entire dorsum of thorax and abdomen; the pleura and legs are predominantly, and apical palpal segments entirely brown to black haired. The dorsal tooth and apical annulus are shorter proportionately to the plate than in *chloroticus* and no spur veins are in evidence. Among the holotype and 12 paratypes seen by C.B.P. (3 of which were kindly provided the writers by Maldonado), these differences from *chloroticus* have been consistent, but there is unusual variation in the widths of fronts with indexes of 1: 2.9 to 1: 4.4 in 8 specimens, with mean of 1: 3.5. Total length varies from 12 to 14.5 mm.

While *C. atopus* Fchld. has the same dark reddish appearance, it differs from *C. stonei* in lack of basal teeth on the plate, a prominent yellowish line on the abdomen, and quite different frontal characters.

Chlorotabanus (Cryptotylus) stonei Maldonado will key out at couplet 7 in the preceding key where it can be separated on the combination of the dark vestiture, dark reddish appearance, short antennal teeth and no spur veins at bases of R_4 . The discovery of this species strengthens the possibility that *aeratus* also is distinct from *chloroticus* on a specific level.

REFERENCES CITED

- Barretto, M. P. 1950. Estudos sobre Tabanidas Brasileiros. XI. Sobre a validade nomenclatural dos nomes genéricos publicados em "Coleção de Tabanidas, Instituto Oswaldo Cruz em Mangueiras, Rio de Janeiro, 1909" (Diptera, Tabanidae). Papeis Avulsos Dept. Zool., Sec. Agric., S. Paulo, Brazil, 9: 61-68.
- Bequaert, H. 1926. Medical and Economic Entomology. Contrib. Harvard Inst. Trop. Biol. and Med. (4), pp. 155-257.
- 1940a. Tabanidae of the Island of Trinidad, B. W. I., Bull. Ent. Res. 30: 447-453.
- 1940b. The Tabanidae of the Antilles (Dipt.) Rev. Ent. 11: 253-369.
1944. Further studies of the Tabanidae of Trinidad, B. W. I. Psyche, 51: 12-21.
- Bequaert, J., and S. Renjifo-Salcedo. 1946. The Tabanidae of Columbia (Diptera) Psyche, 53: 52-88.
- Borgmeier, T. 1933. A propósito da nomenclatura dos Tabanidae da Região neotropical. Rev. Ent. 3: 286-303.
- in Kröber, O. 1934. Catalogo dos Tabanidae da America do Sul, e Central, incluindo o México e as Antilhas Rev. Ent. 4: 222-276, 291-333 (222, footnote, and 269).
- Bouvier, G. 1952. Notes sur les Tabanidae de la région de Campinas (Estado S. Paulo) Brazil. Mem. Inst. Osw. Cruz 50: 581-596.
- Dozier, H. L. 1920. An ecological study of hammock and piney woods insects in Florida. Ann. Ent. Soc. Amer. 13: 325-380.
- Dunn, L. H. 1929. Notes on some insects and other arthropods affecting man and animals in Colombia. Amer. J. Trop. Med. 9: 493-508.
1934. Entomological investigations in the Chiriquí Region of Panama. Psyche 41: 166-183.
- Enderlein, G. 1925. Studien an blutsaugenden Insekten. I. Grundlagen eines neuen systems der Tabaniden. Mitt. Zool. Mus. Berlin 11: 253-409.
- Fairchild, G. B. 1940. Notes on Tabanidae (Dipt.) from Panama. I. The genera *Chlorotabanus* and *Cryptotylus*. Rev. Ent. 11: 714-722.
1942. *Idem*. X. The genus *Tabanus* Linn., and resumé of the Tabanidae of Panama. Ann. Ent. Soc. Amer. 35: 441-474.
1950. The generic names for Tabanidae (Diptera) proposed by Adolfo Lutz. Psyche, 57: 117-127.
1953. Notes on Neotropical Tabanidae (Diptera) with descriptions of new species. Ann. Ent. Soc. Am. 46: 259-280.
- Hackman, R. H. 1952. Green pigments in the haemolymph of insects. Arch. Biochem. Biophysics, 41: 166-174.
- Hine, J. S. 1907. Second Report upon the horseflies of Louisiana. La. Agr. Exp. Sta. Bull. No. 93, 59 pp.
- King, H. H. 1926. A note on the Bionomics of *Tabanus fasciatus niloticus* Aust. Bull. Ent. Res. 16: 359.
- Knab, F. 1913. Gad-flies (Tabanidae) of the genus *Stibasoma*. Proc. U. S. Nat. Mus. 46: 407-412.
- Kröber, O. 1930. Die Untergattungen *Macrocornus* Lutz and *Chlorotabanus* Lutz. Zool. Anz. 87: 1-18.
1934. Catalogo dos Tabanidae da America do Sul e Central, incluindo o México e as Antilhas. Rev. Ent. 4: 222-276, 291-333.
- Lane, J. 1936. Notas sobre tabanideos. Folia Clinica et Biologica, 8: 70-71.
- Lutz, A. and A. Neiva. 1914. As Tabanidae do Estado do Rio de Janeiro. Mem. Inst. Osw. Cruz. 6: 3-14.
- Lutz, A., H. C. de Souza Araujo, and O. da, Filho Fonseca. 1918. Viagem científica no Rio Paraná e a Assuncion com volta par Buenos Aires, Montevideo e Rio de Janeiro. Mem. Inst. Osw. Cruz 10: 104-199.
- Mackerras, I. M. 1954. The classification and distribution of Tabanidae (Diptera). I. Australian Jour. Zool. 2: 431-454.
- Oldroyd, H. 1954. The horseflies of the Ethiopian Region. Volume II. Tabanus and Related Genera. British Museum, London, 341 pp.
- Philip, C. B. 1941. Comments on the supraspecific categories of Nearctic Tabanidae (Diptera). Canad. Ent. 73: 1-14.
1952. The Linnean and DeGeerian species of American Tabanidae (Diptera). Ann. Ent. Soc. Amer. 45: 310-314.
- Snyder, J. E. 1916. Notes on horseflies as a pest in Southern Florida. Proc. Ent. Soc. Washington 18: 208-211.
- Stone, A. 1938. The horseflies of the subfamily Tabaninae of the Neractic region. U. S. Dep. Agr., Misc. Publ. No. 305, 172 pp.
1944. Some Tabanidae from Venezuela. Bol. Ent. Venezolana 3: 125-138.
- Strom, H. 1768. Beskrivelse over Norske Insecter. Kongl. Norske Vidensk. Selsk. Skr. Trondheim IV, pp. 313-371.