

NEW OR LITTLE-KNOWN TIPULIDÆ FROM EASTERN
ASIA (DIPTERA), LVI

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FIVE PLATES

In this report I am considering species of the genus *Tipula* Linnæus from India, virtually all having been taken by Dr. Fernand Schmid in the Himalayas from Pakistan and Kashmir to Sikkim, with fewer from Assam. I again express my deepest thanks to him for this unparalleled series of Asiatic Tipulidæ, the types of the novelties being preserved in my personal collection.

Genus *TIPULA* Linnæus

Tipula LINNÆUS, Systema Naturæ, Ed. 10 (1758) 585.

The name *Tipula* was proposed by Linnæus as one of the ten genera that comprised the order Diptera which included 188 species as known to him at that time. *Tipula* contained 37 of these species but only a few belonged to the genus as presently recognized, the remainder comprising a heterogeneous series of other Tipulid genera and representatives of certain other families in the Nematocera. During the nineteenth century three additional names (*Pterelachisus*, *Anomaloptera*, and *Oreomyza*) were proposed as valid genera but now generally considered to represent subgenera. During the present century I instituted the practice of naming subgenera such as in the genus *Tipula* by proposing the name *Trichotipula* in 1915. All other groups defined prior to 1920 by Alexander, Edwards, Enderlein, and Matsumura had been proposed as valid genera and only the later were considered as more properly to be of subgeneric value. The first attempt to analyze these various names and to determine the characters of subgeneric value was by Edwards in 1931.

The genus *Tipula* as here considered includes somewhat fewer than 1,500 species of which approximately one-half are Eurasian, with a marked concentration in eastern Asia and the Himalayas. A second great center is the Neotropical region where virtually all of the hundreds of species presently known belong

to two subgenera, *Microtipula* and *Eumicrotipula*. A third prolific region is the Nearctic, likewise with some hundreds of species. The Ethiopian region has surprisingly few members of the genus as presently known, while the Australasian region is even more depauperate, with relatively few species in the Papuan subregion, New Guinea and satellite islands, with extreme northern Australia. No species occur in New Zealand or in the more remote Pacific islands, including Micronesia and Hawaii. While it is certain that many further species remain to be described it does not appear that the genus will prove to be as rich as is the other major genus in the Tipulidae, *Limonia* Meigen, which had been considered briefly in the preceding paper under this general title (Asia, Part IV).

Workers on the taxonomy of *Tipula* at present include Alexander, Mannheims and Savchenko, with a few others who are listed later. Particular attention is called to the following outstanding publications on the Eurasian species of the genus:

Mannheims, Bernhard. Die Fliegen der Palaearktischen Region (Lindner), Lief. 167, 170, 173, and 238 (1951-1963); to be continued.

Savchenko, E. N. (spelled Savtshenko in earlier papers)—in Russian. Fauna U.S.S.R., Vol. 79, Diptera II, No. 2; Tipulinae Part I (1961); vol. 89, Diptera II, No. 4; Tipulinae Part II (1961).

Two further volumes by Savchenko are in preparation that will complete the Tipulinae. The first two volumes total nearly 1,000 pages, with numerous maps and figures, and consider more than 600 species of *Tipula* from Palaearctic Eurasia, not including four groups that are listed herein as subgenera, *Anomaloptera* Lioy, *Brithara* Edwards, *Indotipula* Edwards, and *Tipulodina* Enderlein.

A paper by the writer on some western Nearctic species of *Tipula* will appear in "Pacific Insects," presumably in 1965, and includes six new subgenera that are in the accompanying list. In this paper, which covers the subgenera and various new species from California, particular attention is directed to the importance of the dististyles of the male hypopygium as subgeneric characters. It probably will be found that the structure of the phallosome, or internal organs of the hypopygium, will provide even more important and reliable characters for the definition of subgenera.

It may be noted that among the active workers in the genus *Tipula* at present there is some disagreement as to the exact limits of certain subgenera and concerning what species are to

be included therein. Particularly in question in this regard are *Acutipula*, *Lanatipula*, *Platytipula*, *Schummelia*, and *Yamato-tipula*. Savchenko (1961) refers to *Platytipula* a number of species that are considered herein to belong to *Schummelia* where they appear to me to be placed more correctly. However these species differ from the more typical members of the subgenus in such a manner as to suggest that eventually a still further group may be considered necessary to receive them. Also in this paper I have revived the name *Sinotipula* to include all Eurasian species that in recent years have been placed in *Bellardina* which now appears to be entirely an American and chiefly Neotropical group.

In addition to the students on the taxonomy of *Tipula* and allied Tipuline genera that have been mentioned above, there are some others, including in the United States, particularly George W. Byers who has studied especially the genera *Dolichopeza* and *Nephrotoma*. In Europe the principal students of taxonomy include Peder Nielsen, Ernst Pechlaner, Broeder Theowald (Theodorus Henri Ignatius Van Leeuwen), and Bo Tjeder. The more important work being accomplished on the biology and ecology of *Tipula* and allied groups is by European students, including Allan Brindle, E. S. Brown, Derek Bryce, J. R. Chiswell, J. C. Coulson, A. B. Duncan, A. M. Hemmingsen, W. Hennig, H. E. Hinton, L. N. Kidd, Eberhard Lindner, J. N. Oldham, and François Vaillant. In the United States comparable work on crane-fly biology and ecology has been done by Byers, B. A. Foote, R. E. Bellamy, and Dennis Hynes, all being former students of the late Dr. James Speed Rogers (1891-1955) who had accomplished the most important work on crane-fly biology in America. In Japan a small number of students are working on the species of the Tipulinae, including Hiroshi Ishida, Toshio Mishima, Mitsuo Takahashi, and Masaaki Tokunaga. Particular attention may be called to the monographic study of the rice crane fly (*Tipula aino* Alexander), by J. Masaki (1959).

THE SUBGENERA OF THE GENUS TIPULA LINNÆUS

- Acutipula* Alexander, 1921 (type, *guboonensis* Alexander)—Palæarctic, Ethiopian, Oriental.
Afrotipula Alexander, 1955 (type, *infracta* Alexander)—Ethiopian.
Angrotipula Savchenko, 1956 (type, *tumidecornis* Lundström)—Holarctic, Oriental.
Anomaloptera Lioy, 1861 (type, *nigra* Linnaeus)—Palæarctic, Oriental.
Arctotipula Alexander, 1933 (type, *besselsi* Osten Sacken)—Holarctic.

- Bellardina* Edwards, 1931 (type, *craverii* Bellardi)—Neotropical, Nearctic.
- Beringotipula* Savchenko, 1961 (type, *unca* Wiedemann)—Holarctic.
- Brithura* Edwards, 1961 (type, *imperfecta* Brunetti, as *conifrons* Edwards)—Eastern Palearctic, Oriental.
- Dendrotipula* Savchenko, 1964 (type, *flavolineata* Meigen)—Palearctic.
- Emodotipula* subgen. nov. (type, *marmoratipennis* Brunetti)—Palearctic, Oriental.
- Eremotipula* Alexander, 1965 (type, *impudica* Doane)—Western Nearctic.
- Eumicrotipula* Alexander, 1922 (type, *macrotrichiata* Alexander)—Neotropical, Southwestern Nearctic.
- Formotipula* Matsumura, 1916 (type, *holoserica* Matsumura)—Eastern Palearctic, Oriental.
- Hesperotipula* Alexander, 1917 (type, *streptocera* Doane)—Western Nearctic.
- Inlotipula* Edwards, 1931 (type, *walkeri* Brunetti)—Eastern Palearctic, Oriental, Australasian.
- Labiotipula* Alexander, 1965 (type, *macrolabis* Loew)—Holarctic.
- Lindneria* Mannheims, 1963 (type, *bistilata* Lundstrom)—Holarctic.
- Lunatipula* Edwards, 1931 (type, *lunata* Linnaeus)—Holarctic, Oriental.
- Mediotipula* Pierre, 1924 (type, *fulvoviridis* Pierre)—Western Palearctic.
- Microtipula* Alexander, 1912 (type, *amazonica* Alexander)—Neotropical.
- (Synonym—*Nephrotomodes* Alexander, 1946, type, *smilodon* Alexander).
- Neotipula* Alexander, 1940 (type, *pectinella* Alexander)—Neotropical.
- Nesotipula* Alexander, 1921 (type, *pribilovia* Alexander)—Nearctic (status uncertain).
- Nippotipula* Matsumura, 1916 (type, *coquillei* Enderlein)—Eastern Palearctic, Oriental, Nearctic.
- Nobilotipula* Alexander, 1942 (type, *nobilis* Loew)—Eastern Palearctic, Oriental, Nearctic.
- Odonatisca* Savchenko, 1956 (type, *junceae* Meigen)—Holarctic.
- Papuatipula* Alexander, 1935 (type, *novae-britanniae* Alexander)—Australasian.
- Pectinotipula* Alexander, 1920 (type, *argentina* van der Wulp)—Neotropical.
- Platytipula* Matsumura, 1916 (type, *moiwana* Matsumura)—Holarctic.
- Pterelachisus* Rondani, 1842 (type, *bertei* Rondani)—Holarctic.
- (?Synonyms—*Geotipula* Savchenko, 1964, type, *variipennis* Meigen; *Oreomyza* Pokorny, 1887, type, *glacialis* Pokorny).
- Savtshenkia* Mannheims, 1962 (type, *rufina* Meigen)—Holarctic, Ethiopian.
- Schummelia* Edwards, 1931 (type, *variicornis* Schummel)—Holarctic, Oriental, Ethiopian.
- Serratipula* Alexander, 1965 (type, *cylindrata* Doane)—Western Nearctic.
- Setitipula* Alexander, 1965 (type, *rusticola* Doane)—Western Nearctic.
- Sinotipula* Alexander, 1935 (type, *exquisita* Alexander)—Eastern Palearctic, Oriental.
- Sivatipula* Alexander, 1964 (type, *mitocera* Alexander)—Eastern Palearctic.
- Spinotipula* Alexander, 1963 (type, *spinimarginata* Alexander)—Ethiopian (Madagascar).

- Tipula* Linnaeus, 1768 (type, *oleracea* Linnaeus) palæarctic, Ethiopian, (Nearctic introduced).
Tipulodina Enderlein, 1912 (type, *maguicornis* Enderlein)—Eastern Palæarctic, Oriental, Australasian.
Tipulodinodes Alexander, 1965 (type, *lactipes* Alexander)—Western Nearctic.
Trichotipula Alexander, 1915 (type, *oropezoides* Johnson)—Eastern Palæarctic, Nearctic.
 (Synonyms—*Cinctotipula* Alexander, 1915, type, *algonquin* Alexander; *Nitidotipula* Alexander, 1942, type *pachyrhinoides* Alexander; *Odonotipula* Alexander, 1919, type, *unifasciata* Loew).
Triplixtipula Alexander, 1965 (type, *triplex* Walker)—Nearctic, Eastern Palæarctic.
Vestiplex Bezzi, 1924 (type *cisalpina* Riedel)—Holarctic, Oriental.
Yamatotipula Matsumura, 1916 (type *nova* Walker, as *nohiræ* Matsumura)—Holarctic, northern Neotropical.

SECOND LIST OF PATRONYMICS IN THE GENUS TIPULA

In Part LIII of this series of papers [Philip. Jour. Sci. 93 (1964) 78-81] I give a list of species in the genus *Tipula* that have been named in honor of students who have worked on the Tipulidæ and particularly on this genus. I am now providing a supplementary record to include the various species that have been described since the basic list was prepared, including those that are discussed in this paper and a few others that had been overlooked. It may be emphasized that only students of the Tipulidæ are included but workers on all branches of study are represented, as taxonomy, morphology, biology, ecology, cataloguing and listing of species, and other subjects. The numerous further species of *Tipula* that have been named for collectors or for workers in other groups are omitted.

- AUDCENT, H. L. F.—*Tipula* (*Indotipula*) *audcentiana* sp. nov. (this report).
 BELING, K. W. T.—*Tipula* (*Indotipula*) *belingana* sp. nov. (this report).
 COE, R. L.—*Tipula* (*Acutipula*) *coeana* sp. nov. (this report).
 COLE, F. R.—*Tipula* (*Sinotipula*) *coleomyia* Alexander, 1965.
 COUCKE, EDOUARD—*Tipula* (*Yamatotipula*) *couckeii* Tonnoir, 1921.
 COULSON, J. C.—*Tipula* (*Schummelia*) *coulsoni* sp. nov. (this report).
 CRAMPTON, G. C.—*Tipula* (*Schummelia*) *cramptoniana* sp. nov. (this report).
 FABRICIUS, J. C.—*Tipula* (*Emdotipula*) *fabriciana* sp. nov. (this report).
 FREEMAN, PAUL—*Tipula* (*Vestiplex*) *freemanana* Alexander, 1963.
 FROMMER, SAUL I.—*Tipula* (*Angarotipula*) *frommeri* sp. nov. (this report).
 KARIYA, SHOJIRO—*Tipula* (*Schummelia*) *kariyana* sp. nov. (this report).
 KIDD, L. N.—*Tipula* (*Schummelia*) *kiddana* sp. nov. (this report).
 LINNE, CARL VON—*Tipula* (*Acutipula*) *linneana* sp. nov. (this report).
 LUNDSTRÖM, C. A.—*Tipula* (*Yamatotipula*) *lundstroemi* Strand, 1913.
 MACQUART, P. J. M.—*Tipula* (*Sinotipula*) *macquartina* sp. nov. (this report).

- MEIGEN, J. W.—*Tipula* (*Sinotipula*) *meigeniana* sp. nov. (this report).
 MEIJERE, J. C. DE.—*Tipula meijeriana* Alexander, 1935 (new name for *dentata* de Meijere); *Tipula* (*Pterelachisus*) *meijerella* sp. nov. (this report).
 NIELSEN, PEDER—*Tipula* (*Savtshenkia*) *nielsenii* Mannheims, 1963.
 OLDHAM, J. N.—*Tipula* (*Schummelia*) *oldhamana* sp. nov. (this report).
 PAGAST, F.—*Tipula* (*Schummelia*) *pagastiana* sp. nov. (this report).
 PECHLANER, ERNST.—*Tipula* (*Savtshenkia*) *pechlaneri* Mannheims, 1963.
 PEUS, FRITZ—*Tipula* (*Indotipula*) *peusiana* sp. nov. (this report).
 POKORNY, EMANUEL.—*Tipula* (*Schummelia*) *pokornyana* sp. nov. (this report).
 SCHUMMEL, THEODORE E.—*Tipula* (*Tipulodina*) *schummeli* Brunetti, 1911.
 SÉGUY, EUGENE—*Tipula* (*Lanutipula*) *bispina seguyi* Mannheims, 1954.
 SNODGRASS, R. E.—*Tipula* (*Angarotipula*) *snodgrassiana* sp. nov. (this report).
 THEOWALD, BR.—*Tipula* (*Lanutipula*) *theowaldi* Savchenko, 1961.
 TJEDER, BO.—*Tipula* (*Formotipula*) *tjederana* sp. nov. (this report).
 VERRALL, G. H.—*Tipula* (*Schummelia*) *verrallana* sp. nov. (this report).
 WALKER, FRANCIS.—*Tipula* (*Indotipula*) *walkeri* Brunetti, 1912.
 WU, CHENFU F.—*Tipula* (*Pterelachisus*) *wuana* sp. nov. (this report).
 YAMAMURA, SHIOZABURO—*Tipula yamamuriana* Alexander, 1926.

In this report new species have been dedicated to Audcent, Beling, Coe, Coulson, Crampton, Fabricius, Frommer, Kariya, Kidd, Linnæus, Macquart, Meigen, de Meijere, Oldham, Pagast, Peus, Pokorny, Snodgrass, Tjeder, Verall, and Wu, all of whom have contributed to our knowledge of the Tipulidæ. I expect to continue this practice of so naming species in this genus in a succeeding part in this series of papers.

CHANGE OF NAME IN ORIENTAL SPECIES OF TIPULA

Tipula (*Acutipula*) *paria* Speiser; Kilimandjaro-Meru Report, 1905-1906, 10 Diptera, 4 Orthorapha, Orthorapha Nematocera (1909) 57 (footnote); new name for *Tipula vicaria* Walker, Ins. Suandersiana, Diptera (1856) 441, nec *Tipula Vicaria* Walker, List Diptera Brit. Mus. (1818) 444 (a *Nephrotoma*).

Synonym—*Tipula* (*Acutipula*) *munda* Brunetti, Fauna Brit. India, Diptera Nematocera (1912) 336-337.

TIPULA (SINOTIPULA) CALLICOMA sp. nov. Plate 1, fig. 1; Plate 2, fig. 25.

Size medium (wing of male about 17 millimeters); general coloration gray, præscutum with three darker gray stripes, the central one bordered laterally with brownish black; femora yellow, tips narrowly dark brown, claws of male simple; wings clouded and marbled with light gray, pale yellow and brown; abdomen dark brown, outer segments still darker; male hypopygium with each tergal lobe provided with a dense brush of very long erect setæ.

Male.—Length, about 15 to 17 millimeters; wing, 16 to 18; antenna, about 4.1 to 4.3.

Female.—Length, about 19 millimeters; wing, 20.

Frontal prolongation of head elongate, subequal to the remainder, light gray above, brown on sides; nasus relatively short and stout; palpi brownish black, sparsely pruinose. Antennæ with scape and pedicel yellow, basal flagellar segments light brown, the moderate basal enlargement a trifle darker, outer segments more uniformly brown; segments subequal to their longest verticils. Head light gray, slightly more darkened medially; anterior vertex with a low tubercle.

Pronotum light gray, vaguely patterned with pale brown. Mesonotal præscutum light gray with three darker gray stripes, median area with narrow brownish black margins, lateral pair with a darkened line along outer margin, inner border scarcely darkened; scutum light gray, each lobe with two separate brown areas, the mesal part with a darkened line; posterior sclerites gray, parascutella more yellowed, mediotergite with a vague central darkened line. Pleura light gray, posterior sclerites slightly more yellowed; dorsopleural membrane buffy. Halteres with stem yellowish brown, knob dark brown, tip slightly yellowed. Legs with coxæ light gray with long yellow setæ; trochanters fulvous yellow, narrowly darkened on lower face; femora and tibiæ yellow, tips narrowly and abruptly dark brown, the amount subequal on all legs; basitarsi light brown, outer segments black, claws of male simple. Wings (Plate 1, fig. 1) with restricted ground pale yellow, extensively clouded and marbled with light gray, with a further restricted brown pattern at origin of Rs, anterior cord, near outer end of basal section of Cu₁, in cell M, at near midlength of cell Cu, and as marginal clouds at ends of veins M₁ to 2nd A, inclusive, alternating with ground areas in cells R₅ to 2nd A, excluding cell Cu; veins brown. Longitudinal veins beyond cord with macrotrichia. Venation: Rs long, from about one and one-half to nearly twice m-cu; petiole of cell M₁ subequal to or shorter than m.

Abdomen chiefly dark brown, posterior and lateral borders of intermediate tergites obscure yellow; outer segments dark brown, dististyles yellow. Ovipositor with cerci relatively short, straight. Male hypopygium (Plate 2, fig. 25) with the tergite, *t*, transverse, its posterior border decurved into low lobes; central area with a triangular group of about 60 to 70 blackened spicules, those at base of group longer; each lobe with a dense

group of very long pale yellow setæ, delicate and forming a conspicuous brush that is directed caudad. Ninth sternite on either side with a comparable brush of longer and stouter yellow bristles. Dististyles, *d*, on either side unequal, as in the subgenus; outer style bilobed, outer part a more sclerotized scoop-like structure, surface with inconspicuous microscopic setulæ, inner arm longer, dilated outwardly into foot-shaped apex, pale, with abundant setæ of moderate length; inner style about equal in length but slender, beak a large flattened blade, apex broadly obtuse, with sparse inconspicuous setæ.

Habitat.—India (Kashmir); Pakistan.

Holotype, male, Dornel, *Kashmir*, May 23, 1954 (*Schmid*). Allotopotype, female, pinned with type. Paratopotype, male; paratypes, males and females, from Northwest Frontier Province, Pakistan-Besal, 10,760 feet, July 8 and 25, 1953; Kalarian Baihk, July 13, 1953; Salf-ul-Maluk Sur, 11,000 feet, July 2, 1953; Le Vallee, August 28, 1953 (*Schmid*).

Tipula (*Sinotipula*) *callicoma* is closely related and generally similar to the smaller *T. (S.) sindensis* Alexander, differing also in the hypopygial details, particularly the conspicuous setal brushes on the tergal lobes, these not present in the smaller species.

TIPULA (SINOTIPULA) MACQUARTINA sp. nov. Plate 1, fig. 2; Plate 2, figs. 26, 27.

Generally similar to *griseipennis* Brunetti and *hutchinsonæ* Alexander in the size and very pale darkened pattern of the wings, differing in the hypopygial structure.

Male.—Length, about 18 millimeters; wing, 20; antenna, about 4 mm.

Antennæ somewhat shorter than in *griseipennis*. Legs light brown, tips of femora not blackened. Wings (Plate 1, fig. 2) with darkened area at origin of Rs very restricted. Male hypopygium (Plate 2, fig. 26) with tergal lobe, *t*, large, convexly rounded, with abundant dense blackened spinoid setæ. Dististyles, *d*, distinctive; outer style larger, its outer blade large, elevated, lower blade very slender, beaklike, narrowed to a subacute point, margins smooth, lower angle not produced.

In *griseipennis* (Plate 2, fig. 27) the outer blade of the outer style, *d*, is relatively broad and somewhat less elevated, apex subtruncate, lower blade very stout, tip obtuse, margins roughened by obtuse teeth, lower angle strongly produced. Edwards [Ann. Mag. Nat. Hist. (10) 1 (1938) 687] has provided some further notes on the type specimen of *griseipennis*.

Habitat.—India (Kumaon).

Holotype, male, Ukhal, Pauri Garhwal, altitude 9,500 feet, in *Rhododendron* association, May 16, 1958 (*Schmid*).

The species is named for Pierre Justin Marie Macquart (1778–1855), student of the European and Exotic Diptera.

TIPULA (SINOTIPULA) MEIGENIANA sp. nov. Plate 1, fig. 3; Plate 2, fig. 28.

Size medium (wing about 18 millimeters); antennæ black, scape and pedicel yellow; mesonotal præscutum light gray with four brown stripes that are narrowly bordered by brown, posterior sclerites gray, patterned with brown; knobs of halteres yellow; femora brownish yellow, tips blackened, claws simple; wings yellow, heavily marmorate with pale and darker brown; basal abdominal segments dull orange, tergites darkened sublaterally, outer segments brownish black; male hypopygium with central lobe of tergite long, with abundant black spinoid setæ; dististyles yellow, outer style with four outer lobes.

Male.—Length, about 16 to 17 millimeters; wing, 18.5 to 19; antenna, about 4.

Female.—Length, about 18 millimeters; wing, 18.

Frontal prolongation of head dark brown, relatively long, exceeding the remainder, nasus lacking; palpi black. Antennæ with scape obscure yellow, pedicel clearer yellow, flagellum black; flagellar segments with small basal enlargements, subequal in length to the longest verticils. Head brown, more yellowed on front, suborbital region and a central line on vertex darker, orbits gray.

Pronotum chiefly dark brown. Mesonotal præscutum with restricted ground light gray, with four brown stripes that are narrowly bordered by darker brown, outer margins of intermediate pair wider and more blackened, interspaces more or less infuscated, restricting the ground color to humeral region and the area before suture; scutum gray, conspicuously patterned with brownish black, including an arc-shaped posterior area on each scutal lobe; scutellum darkened, narrowly gray on sides, parascutella dark brown; mediotergite gray, heavily patterned with brown on central and lateral parts, posterior fourth gray; anapleurotergite gray, katapleurotergite darker, heavily gray pruinose. Pleura dark brown, heavily gray pruinose, dorso-pleural membrane dusky. Halteres with stem obscure yellow, knob clearer yellow. Legs with coxæ gray, with long pale setæ; trochanters obscure yellow; femora brownish yellow, tips rather broadly blackened, the amount subequal on all legs; tibiæ

and tarsi brown; claws of male simple. Wings (Plate 1, fig. 3) with restricted ground yellow, more heavily patterned with pale and darker brown; darker areas in bases of cells R and M, origin of Rs, stigma and anterior cord, and at near midlength of cell Cu, the remaining darkened clouds somewhat paler; yellow ground areas include marginal spots in all outer cells, those in medial field oval; prearcular and costal fields yellow, cell Sc clearer; veins brown, Sc clear yellow. Outer veins with trichia. Venation: Petiole of cell M_1 subequal to or slightly exceeding m; m-cu relatively long, about two-thirds the distal section of Cu_1 .

Basal abdominal tergite brown, segments two to four dull orange yellow, darker sublaterally, borders yellow, gray pruinose; basal sternites more uniformly obscure orange; outer segments more uniformly brownish black, dististyles yellow. Ovipositor with cerci relatively long and slender, tips narrowly obtuse; hypovalvæ a little shorter, paling into membrane at outer ends. Male hypopygium (Plate 2, fig. 28) with posterior border of tergite, *t*, broadly decurved, with abundant black setæ, the central lobe elongate with setæ more numerous, black and spinoid, lobe about as long as its diameter across base. Dististyles, *d*, as figured, outer style extensive, with four outer lobes, the two larger ones obtuse; inner style smaller, margin before apex with a broad obtuse flattened flange.

Habitat.—India (Sikkim).

Holotype, male, Thomphyak, altitude 12,800 feet, in *Rhododendron* association, May 29, 1959 (Schmid). Allotopotype, female, pinned with type. Paratypes, 2 males, Theuchung, altitude 14,100 feet, in *Rhododendron* association, May 30, 1959 (Schmid).

The fly is dedicated to Johann Wilhelm Meigen (1764-1845), great pioneer student of the Diptera. The most similar species is *Tipula* (*Sinotipula*) *hypsistos* Alexander, likewise from high altitudes in the Sikkimese Himalaya. This has toothed claws in the male and with the hypopygial structure distinct, including the low broad tergal lobe and the distinctive outer dististyle.

Subgenus EMODOTIPULA novum

Nasus distinct. Claws simple. Squama of wing with long setæ. Male hypopygium (Plate 3, fig. 29) with tergite, *t*, variously modified in different species, more generalized in *saginata* where median region of posterior border elevated and fringed with long setæ. Other species have tergite with conspicuous

lateral lobes and somewhat more ventral intermediate or median lobes, all bearing long setæ or shorter spinoid bristles that are arranged differently in various species and furnish strong specific characters. Dististyles, *d*, dissimilar, outer style elongate, tipped with a single blackened point in *saginata* or with several blackened spinoid setæ in other species; inner style variously shaped in different species. Phallosome a depressed-flattened shield-shaped plate, broadest beyond base. Eighth sternite without lobes in *submarmoratipennis*, in most other species with an obtuse setiferous lobe on either side of posterior border, widely separated at midregion; in *saginata* the posterior margin of sternite is tumid, the large lateral lobes virtually glabrous. Ovipositor with cerci pale, feebly sclerotized, in outline broadly to more narrowly triangular, provided with numerous setæ to nearly acute tips; hypovalvæ shorter, setiferous, tips more obtuse.

Type of subgenus. *Tipula* (*Emodotipula*) *marmoratipennis* Brunetti, India.

Other included species—South Asiatic, chiefly Himalayan, Pakistan to Sikkim and Assam: *T. (E.) fabriciana* sp. nov.; *T. (E.) stylostena* Alexander; *T. (E.) submarmoratipennis* Alexander; *T. (E.) vaillantiana* Alexander. China and Corea: *T. (E.) multibarbata* Alexander (Corea); *T. (E.) multisetosus* Alexander (western China: Szechwan). Europe: *T. (E.) saginata* Bergroth.

I have chosen *marmoratipennis* to typify the subgenus rather than the older and better known European *saginata* since it is more representative of what evidently will prove to be an extensive group of species in the Himalayan region and elsewhere in Asia. The name is derived from the Greek word *emodos*—the Himalaya Mountains.

Savchenko [Fauna U.S.S.R., No. 89, Diptera II, No. 4 (1964) 256–259] has referred to this group also *naviculifer* and some allied species in Japan but it does not appear to me that these belong here and that probably a further new subgenus will be required for their reception. I consider the following species to be valid—*Tipula breviscapa* Alexander (1953), *T. holoteles* Alexander (1924), and *T. naviculifer* Alexander (1920). The status of *T. shogun* Alexander, still known to me only by the type female (Teshio, Hokkaido., Japan), remains in question. It is most closely related to *naviculifer*. For the present I would consider that the *naviculifer* group is best retained in *Lunatipula* Edwards until the species are better known.

TIPULA (EMODOTIPULA) FABRICIANA sp. nov. Plate 1, fig. 4; Plate 3, fig. 29.

Mesonotal præscutum whitish gray with four brownish yellow stripes that narrowly bordered by darker brown; posterior sclerites of notum with a continuous central dark brown vitta; pleura obscure yellow, virtually unpatterned; femora obscure yellow, tips narrowly infuscated, claws of male simple; wings marmorate with yellow and light brown; macrotrichia on veins R_{4+5} , M_1 and M_2 ; abdominal tergites fulvous, outer segments, including hypopygium, more infuscated; male hypopygium with tergite very narrowly transverse, posterior border with five lobes, outer pair bilobed; outer dististyle slender with a few apical spinoid setæ, inner style on outer half produced into three blackened projections; marginal lobes of eighth sternite low.

Male.—Length, about 17 millimeters; wing, 19; antenna, about 3.6.

Female.—Length, about 17 millimeters; wing, 21.5.

Frontal prolongation of head brownish yellow above, darkened apically beneath; nasus stout, with long yellow setæ; palpi with proximal two segments black, third and base of fourth brown, remainder black. Antennæ of moderate length; scape and pedicel light yellow, flagellum dark brown, the small basal enlargements of the more proximal segments slightly darker, outer segments brownish black; verticils much longer than segments. Front and anterior half of vertical tubercle very light yellow, remainder of vertex light brown with a central darker brown line, on either side of anterior vertex slightly more yellowed.

Pronotum light yellow, scutum with two nearly confluent brown areas and a more extended lateral darkening. Mesonotal præscutum with the ground laterally whitish gray, disk with four brownish yellow stripes that are narrowly bordered by darker brown; interspaces brownish yellow with very long white setæ; scutum whitish gray, each lobe with two confluent brownish yellow areas that are narrowly bordered by dark brown, outer posterior angle of lobe with a darkened cloud; scutellum and mediotergite whitish gray with a narrow dark brown central vitta that extends from suture virtually to abdomen, narrower at either end. Pleura and pleurotergite chiefly obscure yellow, katapleurotergite more silvery; a small brown spot on propleura; dorsopleural membrane light yellow, its posterior end light brown. Halteres with stem yellow, base of knob light brown, apex yellowed. Legs with coxæ yellow; trochanters yellow, fore pair tinted with green; femora obscure yellow, tips narrowly

infuscated; remainder of legs medium brown; claws of male simple. wings (Plate 1, fig. 4) with the ground light yellow, disk marbled with light brown, with restricted slightly darker brown areas, including a small postarcular darkening, cord and outer end of cell 1st M_2 ; stigma brownish yellow; obliterative area in cell 1st M_3 more whitened; veins brown, more yellowed in the pale interspaces. In the allotype female the wing pattern is much brighter and contrasted. Macrotrichia on veins R_{4+5} , M_1 and M_2 excepting the bases. Venation: Rs long, about two and one-half times m-cu; pitiole of cell M_1 about one-half m.

Basal abdominal tergites fulvous, posterior borders very narrowly yellowed; outer segments, including hypopygium, more yellowed. Male hypopygium (Plate 3, fig. 29) with tergite, *t*, very narrowly transverse, the concave posterior border with sublateral bilobed projections that are provided with abundant black setæ, with further median and lateral lobes at base of emargination; inner apical margin with a fringe of very long setæ that are decussate at midline. Outer dististyle, *d*, a slender boomeranglike blade, narrowed to apex which bears a few small spinoid setæ; outer margin of style with long erect setæ; inner style shorter but broader, apical half with three blackened projections, the inner a straight rod, near base of latter with a small blackened tooth; outer projection a small point; near base of style on mesal edge with an obtuse lobe that is provided with abundant yellow setæ. Phallosome, *p*, a broad shield-shaped structure. Eighth sternite with lateral lobes low, with relatively few long setæ; median lobe very low with dense shorter yellow setæ.

Habitat.—India (Sikkim).

Holotype, male, Chateng, altitude 8,700 feet, May 22, 1959 (*Schmid*). Allotype, female, Zema, altitude 8,900 feet, June 11, 1959 (*Schmid*).

Named for Johann Christian Fabricius, the first outstanding systematic entomologist, describer of exotic Tipulidæ, including species of *Tipula*.

The most similar regional species is *Tipula* (*Emodotipula*) *raillantiana* Alexander, which differs in coloration of the body and wings but particularly in the hypopygial structure, including the tergite, inner dististyle and eighth sternite.

TIPULA (SCHUMMELIA) COULSONI sp. nov. Plate 1, fig. 5; Plate 3, fig. 30.

Size above medium (wing of male 14 millimeters); mesonotal præscutum light yellow with three brown stripes that are insensibly bordered by darker brown, interspaces narrow; pleura light yellow with a short brown stripe from cervical region to anepisternum; femora and tibiæ brown, tips narrowly black; wings weakly infuscated, restrictedly patterned with darker brown and cream colored areas; male hypopygium with posterior border of tergite shallowly emarginate, lobes subacute, on either side with a blackened ventral tooth; inner dististyle with beak blackened, terminating in a small pale flange, lower beak obtuse, weakly blackened; dorsal crest elongate, higher posteriorly, with abundant pale delicate setæ.

Male.—Length, about 12 millimeters; wing 14; antenna, about 4.2.

Frontal prolongation of head above light yellow, including the slender nasus, sides brown, the outer margin brownish black, beneath obscure yellow; palpi with first segment brown, remainder black. Antennæ with scape yellow, pedicel very pale yellow, proximal two flagellar segments bicolored, the bases brownish black, outer parts obscure yellow, succeeding segments more nearly unicolorous, bases black, remainder dark brown, outer segments uniformly black; basal enlargements of segments poorly developed, longest verticils slightly exceeding the segments. Head with front and anterior vertex light yellow, posterior vertex very slightly more darkened; a conspicuous brown area on posterior vertex, extended cephalad to a narrow low tubercle.

Pronotum light yellow, scutum broadly brown medially. Mesonotal præscutum light yellow with three bright brown stripes that are very insensibly bordered by darker brown, lateral margin of præscutum broadly of the ground color, posterior interspaces narrowly yellow behind, infuscated on anterior half; scutal lobes extensively brown, median area obscure yellow, still darker on central part; scutellum testaceous yellow with a brown central line, parascutella infuscated; postnotum light brown, the cephalic half of pleurotergite light yellow, including most of the elevated katapleurotergite. Mesonotum with relatively conspicuous setæ, on mediotergite longer and directed forward. Pleura light yellow with a short brown stripe extending from cervical region across propleura onto anepisternum, becoming very pale posteriorly. Halteres infuscated, base of stem and broad apex of knob yellow. Legs with all coxæ

and trochanters light yellow; femora and tibiæ brown, tips narrowly blackened, tarsi black; claws of male toothed. Wings (Plate 1, fig. 5) weakly infuscated, restrictedly patterned with darker brown and cream colored areas, the latter most evident before and beyond the stigma, across cell 1st M_2 , at outer three-fourths of cell M , and as marginal spots at ends of the anal veins; a broad brown seam in cell M adjoining vein Cu , more expanded outwardly, including outer end of cell M and along vein Cu ; paler brown clouds in outer radial field and across outer end of cell 1st M_2 ; stigma dark brown; veins brown, more yellowed in costal field. Venation: Rs shorter than $m-cu$; cell M_1 deep, its petiole about one-third m ; $m-cu$ more than one-half the distal section of Cu_1 .

Abdomen yellowed, basal tergites vaguely patterned with brown, more conspicuous laterally; first tergite medially with a concentration of long dark colored setæ, the outer segments yellowed, eighth segment and ninth tergite darker. Male hypopygium (Plate 3, fig. 30) with the tergite, t , transverse, posterior border shallowly emarginate, forming triangular outer lobes; on either side of margin with a small blackened ventral tooth, these widely separated. Outer dististyle, d , pale, long and slender, at midlength about ten times as long as broad, upper margin with several very long setæ, those of the opposite side shorter; inner style with beak blackened, slender, the extreme tip above with a small pale flange; surface with a raised ridge across face terminating in a blackened tooth at lower angle; lower beak obtuse; dorsal crest very long and straight, becoming gradually more elevated behind where it is produced into the posterior crest, the surface with very abundant long setæ, pale in color and inconspicuous.

Habitat.—India (Assam).

Holotype, male, Natjang, Manipur, altitude 4,500 feet, August 19, 1960 (*Schmid*).

I name this species for Dr. J. C. Coulson, of the University of Durham, England, author of an important paper on the ecology of moorland Tipulidæ in Westmorland, Britain. The species is most similar to *Tipula* (*Schummelia*) *durga* Alexander, differing in the longer antennæ, coloration of the body, legs and wings and especially in the structure of the hypopygium, including the tergite and dististyles.

TIPULA (SCHUMMELIA) CRAMTONIANA sp. nov. Plate 1, fig. 6; Plate 3, figs. 31, 32.

Mesonotal præscutum yellow with four light brown stripes that are bordered by darker brown; wings pale brown, restrictedly patterned with white spots, including a narrow complete band at arculus; male hypopygium with posterior border of tergite produced into two divergent blackened horns; mesal face of basistyle with dense delicate setæ; inner dististyle blackened, the lower beak very extensive.

Male.—Length, about 12 millimeters; wing, 13; antenna, about 2.9.

Frontal prolongation of head yellowed above and beneath, weakly darkened on sides, nasus distinct; papi with proximal segments yellowed, the elongate terminal one brown, exceeding the others combined. Antennæ short; scape and pedicel yellow, basal flagellar segments weakly bicolored, obscure yellow with brown bases, outer segments uniformly dark brown; segments nearly equal in length to the longest verticils. Head brownish gray, orbits clearer gray; center of vertex with a large brown spot extended forward onto the narrowly compressed vertical tubercle.

Pronotum brown, restrictedly patterned with pale. Mesonotal præscutum with four light brown stripes that are bordered by darker brown, the anterior end of each intermediate stripe recurved to the humeral region, virtually isolating the narrow yellow interspaces; scutal lobes with brown areas that are bordered internally by darker brown; scutellum obscure yellow, darker on sides, parascutella yellow; postnotum light yellow, mediotergite with a pale brown area on either side of basal two-thirds. Pleura yellowed, more darkened on propleura and less evidently on the anepisternum. Halteres light brown, base of stem narrowly yellow, knob pale yellow. Legs with coxæ yellow, fore pair a little darker; trochanters yellow; femora brown, more yellowed basally, remainder of legs dark brown; claws of male toothed. Wings (Plate 1, fig. 6) pale brown, stigma darker brown; a very restricted whitened pattern including spots before and beyond stigma, before and beyond midlength of cell M adjoining vein Cu and in outer end of cell 1st A adjoining vein 2nd A; a narrow but very conspicuous white crossband at arculus, entirely crossing the wing, the included veins pale yellow, remaining veins light brown, with abundant long macrotrichia virtually back to the arculus, including also the prearcular section of vein 1st A, lacking on basal section of Cu, except at outer end. Venation: Rs shorter than m-cu; of cell M₁ subequal to m.

Abdomen of type chiefly destroyed by fungus, apparently light brown, posterior borders of segments darker; male hypopygium yellowed, tergal lobes and inner dististyle blackened. Male hypopygium (Plate 3, fig. 31) with posterior border of tergite, *t*, produced into two divergent blackened horns, the outer margins with abundant erect setæ. Basistyle with mesal face densely covered with long delicate setæ. Outer dististyle, *d*, long and slender, with abundant long setæ; inner style with beak slender, the entire outer half blackened, virtually glabrous; lower lobe extended backward across face of style, blackened, surface microscopically roughened. Aedeagus relatively stout, blackened.

Habitat.—India (Sikkim).

Holotype, male, Chateng, altitude 8,000 feet, July 28, 1959 (Schmid).

This species is dedicated to Dr. Guy Chester Crampton (1881–1951), one of the World's great students of insect morphology and phylogeny, who published numerous papers that concerned the Tipulidæ. I was privileged to be associated with Crampton at the University of Massachusetts from 1922 until his retirement in 1947 and owe him a great debt for aid and advice on problem of morphology.¹ The most similar species is *Tipula* (*Schummelia*) *continuata* Brunetti whose hypopygium has been shown for comparison (Plate 3, fig. 32). The dististyles, *d*, are somewhat the same but the tergite, *t*, and phallosome, *p*, are quite distinct. The narrow whitened band at the arculus of the wing in the present fly is noteworthy.

TIPULA SCHUMMELIA KARIYANA sp. nov.

Plate 1, fig. 7; Plate 3, fig. 33.

Mesonotal præscutum with four dark gray stripes, interspaces black, humeral region dull orange, scutellum and mediotergite yellowed, pleura obscure yellow, very heavily patterned with dark brown; antennal flagellum black; knobs of halteres yellow; legs black, femoral bases yellowed, claws simple; wings with the yellowed ground very restricted, disk extensively clouded with pale brown, costal border more uniformly yellow, stigma dark brown; abdomen obscure yellow, outer segments dark brown; male hypopygium with ventral armature of tergite including a

¹ Alexander, C. P. Guy Chester Crampton (1881–1951). Ent. News 63 (1952) 1–3.

Crampton, G. C. The external morphology of the Diptera. Connecticut Geol. Nat. Hist. Survey, Bull. 64 (1942) 10–165, 14 plates.

massive bilobed plate on either side; outer dististyle very long, inner style small, beak blackend; phallosome black, including two pendant oval lobes from a blackened pedicel.

Male.—Length, about 10.5 millimeters; wing, 12.5; antenna, about 3.

Frontal prolongation of head dark brown above, obscure yellow on sides, nasus stout, palpi black. Antennæ with scape obscure yellow, pedicel darkened basally, apex narrowly yellow, flagellum black; flagellar segments short, basal enlargement only feebly indicated, terminal segment much reduced; verticils shorter than segments. Head clove brown, orbits narrowly brownish yellow; vertical tubercle low and rounded.

Pronotum brownish yellow, scutum with a brown area on either side. Mesonotal præscutum almost covered by four dark gray stripes, humeral areas dull orange, interspaces, including the midline, dull brownish black; humeral region before the linear pseudosutural foveæ with a rounded brownish black area; scutum with each lobe dark gray, their inner margin narrowly infuscated, central area light yellow; scutellum dull yellow, narrowly darkened on either side, parascutella brown; medio-tergite yellow, posterior fourth darkened, pleurotergite yellowed, ventral edge of katapleurotergite weakly darkened. Pleura obscure yellow, extensively and conspicuously patterned with dark brown, including propleura and most of anepisternum, sternopleurite and meron, with more restricted darkenings on metapleura and dorsal pteropleurite. Halteres with stem light brown, knob light yellow. Legs with coxæ obscure yellow, bases of fore pair narrowly darkened; trochanters brownish yellow; remainder of legs dark brown to brownish black, femora yellowed basally, on fore legs including about the proximal half, narrower on remaining legs; claws simple. Wings (Plate 1, fig. 7) with the restricted ground yellow, very extensively clouded with pale brown, the yellow areas especially across cell 1st M_2 , near outer end of cell M and in cell 1st A adjoining vein 2nd A; cells C and Sc more uniformly yellow; stigma elongate, dark brown; veins brown, C, Sc, and R yellowed. Venation; R_s relatively long, straight; cell M_1 about one-half longer than m ; $m-cu$ long, oblique, about two-thirds the distal section of Cu_1 .

Abdomen obscure yellow, outer segments, including hypopygium, dark brown. Male hypopygium (Plate 3, fig. 33) with tergite, t , transverse, ventral armature including massive blackened plates, their posterior borders with two obtuse lobes and a further central ventral projection. Outer dististyle, d , elong-

ate, narrowed to the obtuse tip, with abundant setæ; inner style small, beak blackened, narrowly obtuse. Phallosome, *p*, distinctive, heavily blackened, including two pendant oval lobes from a blackened pedicel.

Habitat.—India (Sikkim).

Holotype, male, Yagtang, altitude 11,200 feet, in *Rhododendron* association, May 28, 1959 (Schmid).

Named for Shojiro Kariya, early capable student of the Japanese crane flies. The only other regional species having a somewhat comparable massive blackened phallosome is *Tipula* (*Schummelia*) *appendifera* Alexander, which has all details of coloration of body, antennæ and legs distinct and the hypopygium quite different. In this latter species the massive blackened lobes of the phallosome are directed caudal instead of hanging pendant as in *kariyana*.

TIPULA (SCHUMMELIA) KIDDANA sp. nov

Plate 1, fig. 8; Plate 3, fig. 34.

Mesonotal præscutum with three broad brown stripes, the interspaces obscured; scutellum yellow with a brown central line; femora obscure yellow, tips narrowly darker; wings weakly tinged with brown, very slightly patterned with darker brown and pale areas, cell *Sc* darkened; male hypopygium with posterior border of tergite blackened, decurved, with a median triangular point; outer dististyle long and slender, inner style with beak very narrow, on face of style near the outer basal lobe with a blackened rod that terminates in microscopic points.

Male.—Length, about 12 millimeters; wing, 12.5; antenna, about 4.5.

Frontal prolongation of head above obscure yellow, near tip with long yellow setæ, on either side with a narrow darkened line, brown beneath; palpi brownish yellow, terminal segment blackened. Antennæ with scape and pedicel yellow, flagellum light brown; segments longer than their verticils, the latter progressively shorter on outer segments. Head brownish yellow, vertex with a central brown vitta that extends onto the cervical region.

Pronotum brown. Mesonotum with præscutum yellow, including broad lateral and humeral regions, disk with three broad medium brown stripes, the interspaces obscured; scutum almost uniformly medium brown, including the central area; scutellum yellow with a brown central line, parascutella darker; mediotergite chiefly yellow, with sparse delicate yellow setæ. Pleura and pleurotergite yellow, mesepisternum weakly darkened.

Halteres with stem brown, base of knob darker, apex broadly yellow. Legs with coxæ and trochanters light yellow; femora obscure yellow, tips narrowly darker, tibiæ and tarsi brown; claws of male long, toothed. Wings (Plate 1, fig. 8) weakly tinged with brown, very slightly patterned with light brown and pale areas, the darker color including cell Sc and outer radial field; stigma darker brown; whitened marks relatively inconspicuous occurring before and beyond stigma and across cell 1st M_2 ; a scarcely apparent brightening near outer end of cell M; veins brown. Venation: Rs nearly straight, a little shorter than m-cu; petiole of cell M_1 slightly exceeding m; m-cu before fork of M_{3+4} .

Abdominal tergites brownish yellow, vaguely patterned with darker, especially on sides, the amount of dark color increasing outwardly, including most of the transverse eighth sternite, the dark color interrupted at the midline; hypopygium yellowed. Male hypopygium (Plate 3, fig. 34) with the decurved posterior border of tergite, *t*, blackened, with a triangular median point, its tip obtuse, and a lower elevation more basad. Outer dististyle, *d*, long and slender pale; inner style with beak very narrow, with a flange extending from its base to the subrectangular lower beak, the entire region heavily blackened; outer basal lobe relatively long, broadly obtuse, provided with delicate yellow setæ, from near its base extends a slender blackened rod that terminates in about four microscopic points, the surface of rod and near its base with strong setæ.

Habitat.—Pakistan.

Holotype, male, Kaghan, Northwest Frontier Province, altitude 6,688 feet, June 27, 1953 (*Schmid*).

The species is named for L. N. Kidd, author of various papers on the British Nematocera, including the Tipulidæ, especially of Lancashire and Cheshire. In its wing pattern, particularly the darkened cell Sc, the fly most resembles *Tipula* (*Schummelia*) *fusocellula* Alexander, likewise from Pakistan, which differs in the coloration of the body and wings and especially in the hypopygial structure. Particular attention is called to the blackened rodlike structure on the face of the inner dististyle in the present species.

TIPULA (SCHUMMELIA) OLDHAMANA sp. nov. Plate 1, fig. 9; Plate 3, fig. 35.

Mesonotal præscutum yellow with four brown stripes that are margined with darker; central area of scutum and scutellum brown; mediotergite yellow with pale brown sublateral

areas; femora brownish yellow, tips broadly blackened, on fore pair including about the outer third; wings pale brown, restrictedly patterned with darker brown and cream colored areas; abdominal tergites light brown, patterned with black, subterminal segments uniformly blackened to form a ring; male hypopygium with beak of inner dististyle slender, the outer end of blade broadly blackened.

Male.—Length, about 12.5 millimeters; wing, 13; antenna, about 3.3.

Frontal prolongation of head shorter than the remainder, light yellow above, including the long nasus, lower half dark brown; first palpal segment yellow, succeeding two segments brownish yellow, terminal segment black. Antennæ with scape and pedicel yellow, first flagellar segment brown, remainder black, the segments subequal to their longest verticils. Head yellow in front, light brown posteriorly, with a broad brown central area from between the antennal fossæ backward onto the otherwise yellow cervical region.

Pronotal scutum brown, yellowed laterally; scutellum yellow, narrowly dark brown on sides and again on anterior pretergites. Mesonotal præscutum with the ground light yellow, with four stripes, the intermediate pair paler on their central parts, broadly margined with darker, the sublateral stripes more uniformly dark brown, interconnected at anterior ends with the intermediate pair, isolating a narrow ground interspace; scutal lobes dark brown, confluent with the lateral præscutal stripes, central area and scutellum yellow with a continuous brown central line, parascutella dark brown; mediotergite yellow, broadly pale brown laterally, pleurotergite yellowed, the anapleurotergite more obscured, katapleurotergite not silvery. Pleura yellow, patterned with brown on anterior half, including the propleura, anepisternum, a darker spot on dorsopleural membrane and the base of the fore coxæ. Legs with coxæ yellow except as described; trochanters yellow; femora brownish yellow, tips broadly blackened, including about the outer third of fore pair, outer fifth of posterior; tibiæ brownish black; tarsi black; claws conspicuously toothed. Wings (Plate 1, fig. 9) pale yellow, restrictedly patterned with darker brown and cream colored areas cell C brownish yellow, Sc clearer yellow; stigma dark brown; the more conspicuous darker areas include broad seams over m-cu and along vein Cu₁; pale areas before and beyond stigma, across cell 1st M₂, near outer ends of cells M and Cu, and as a large marginal spot near vein

2nd A; veins brown, paler in the brightened areas. Venation: Rs shorter than m-cu; r-m short; petiole of cell M_1 subequal to m; m-cu at near midlength of M_{3+4} .

Basal abdominal tergites light brown, patterned with darker, including a spot on either side of first tergite, lateral areas on succeeding segments and darker median spots on segments one and two; intermediate tergites yellow, their posterior borders blackened; segments seven and eight black, forming a subterminal ring; sternites yellow, hypopygium more brownish yellow excepting the blackened tergite. Male hypopygium (Plate 3, fig. 35) with the tergite, *t*, transverse, posterior border gently emarginate, the rounded lateral lobes darkened, margins decurved and more heavily blackened. Outer dististyle, *d*, slender but relatively short, tip obtuse; inner style with body compact, beak slender, outer end of blade broadly blackened, as shown; from the region of the beak extends a blackened ridge that terminates basally in an acute black spine.

Habitat.—India (Sikkim).

Holotype, male, Chateng, altitude 8,700 feet, June 12, 1959 (*Schmid*).

Named for John N. Oldham, formerly of the London School of Hygiene and Tropical Medicine, author of important papers on crane-fly biology (1926–1928). The species somewhat resembles *Tipula* (*Schummelia*) *nannaris* Alexander, which has the hypopygial structure distinct, lacking the oblique ridge across the face of the inner dististyle, and with the costal border of the wing concolorous with the remainder.

TIPULA (SCHUMMELIA) PAGASTIANA sp. nov. Plate 1, fig. 10, Plate 4, fig. 36.

Size small (wing of male 12 millimeters), mesonotal praescutum brown with three obscure yellow stripes, the central one broader and brighter, pleura unpatterned; wings very brown, restrictedly marked with light yellow and darker brown; m-cu shortly before fork of M, cell 1st M_2 very small, m short; abdomen yellow, outer segments dark brown; male hypopygium with tergite produced medially into a depressed lobe, the apex with very long setae; inner dististyle with beak long and slender, at its base on outer margin with a conspicuous tubercle provided with about ten long setae; apex of gonapophysis a broad obtuse blade.

Male.—Length, about 10.5 to 11 millimeters; wing, 11 to 12; antenna, about 3.8 to 4.

Frontal prolongation of head obscure yellow, nasus lacking, its position represented by a long tufted tubercle; palpi brownish black, intermediate segments paler. Antennæ with scape and pedicel yellow, flagellum dark brown; flagellar segments subcylindrical subequal to their longest verticils, basal enlargements very small. Head yellow, more fulvous on the obtuse vertical tubercle, vertex behind extensively grayish brown.

Pronotal scutum brownish yellow, scutellum yellow. Mesonotal præscutum with the ground medium brown with three obscure yellow stripes, the central one broader and brighter, lateral yellow stripes poorly indicated, humeral region narrowly infuscated; scutum with central area pale, lobes pale brown; scutellum and mediotergite testaceous yellow; setæ of notum relatively abundant, more conspicuous on scutellum and mediotergite, the yellow pleurotergite glabrous. Pleura, including the dorsopleural membrane, yellow. Halteres with stem brownish yellow, knob brown. Legs with coxæ and trochanters yellow; remainder of legs brownish yellow, femoral bases clearer yellow, tarsi slightly darker; claws simple. Wing (Plate 1, fig. 10) very pale brown, restrictedly patterned with light yellow and darker brown; prearcular and costal fields, together with prestigmal and poststigmal areas, light yellow; a more whitened mark includes virtually all of cell 1st M_2 ; stigma long-oval, dark brown; paler brown seams on m-cu and outer section of Cu_1 ; veins light brown, more yellowed in the brightened fields, basal sections of M_{1+2} and M_3 very pale. Most longitudinal veins beyond arculus with macrotrichia, including also a few on m-cu. Venation: Sc_1 ending shortly before midlength of Rs, the latter slightly more than one-half the long m-cu, placed shortly before fork of M; cell 1st M_2 small, m very short.

Abdomen yellow, the margins of segments very narrowly darkened, this increasing in amount on outer segments, eight and nine uniformly dark brown. Male hypogium (Plate 4, fig. 36) with the tergite, *t*, transverse, posterior border produced medially into a depressed flattened lobe, the apex pale, shallowly emarginate, with very long and conspicuous yellow setoid outgrowths; lateral shoulders appearing as glabrous yellow triangular points. Outer dististyle, *d*, relatively slender, about four times as long as broad, apex obtuse, setæ relatively short and sparse; inner style distinctive, beak long and slender, blackened, apex slightly decurved, at its base on outer margin with a con-

spicuous tubercle whose apex bears about 15 long setæ; body of style obtuse, with relatively sparse setæ, the group of five near apex including stronger and more blackened setæ. Phallosome with gonapophyses, *g*, longer than the ædeagus, outer half dilated into a broad obtuse blade. Eighth sternite unmodified, posterior border subtruncate to feebly convex, provided with marginal black setæ and a linear series at the midline.

Habitat.—India (Sikkim).

Holotype, male, Lachen, altitude 8,930 feet, May 23, 1959 (*Schmid*). Paratypes, 2 males, Chateng, altitude 8,700 feet, June 12, 1959 (*Schmid*).

The species is named for the late Dr. F. Pagast, of Königsberg, posthumous author of one of the fascicles on Tipulidæ in Erwin Lindner's "Die Fliegen der Palaearktischen Region." The most similar regional species is *Tipula* (*Schummelia*) *lindneriana* Alexander, which differs in details of coloration and especially in the structure of the hypopygium, particularly the tergite, inner dististyle and gonapophyses.

TIPULA (SCHUMMELIA) POKORNYANA sp. nov.

Plate 1, fig. 11; Plate 4, fig. 37.

Mesonotal præscutum yellow, disk with four brown stripes, the intermediate pair separated by a capillary blackened vitta, posterior sclerites of notum with a central yellow line; frontal prolongation of head slightly longer than the remainder, yellowed; basal segments of flagellum bicolored; legs black, femoral bases yellowed, claws simple; wings light yellow, heavily patterned with brown; male hypopygium with tergite on either side beneath produced into a blackened bilobed structure, median area with a glabrous blackened transverse plate; inner dististyle with beak blackened, very slender, separated from smaller lower beak by a small oval emargination.

Male.—Length, about 12.5 millimeters; wing, 14; antenna, about 4.

Frontal prolongation of head relatively long, slightly exceeding the remainder, light yellow, the sides narrowly and vaguely more darkened; no nasus; palpi brown, terminal segment black. Antennæ with scape and pedicel yellow, succeeding four segments weakly bicolored, brownish black, base and tip of first brownish yellow, outer ends of succeeding segments obscure yellow, outer segments uniformly brownish black; segments slightly exceeding the longest verticils. Head brownish yellow, clear yellow on the rounded vertical tubercle, vertex with capillary dark brown vitta.

Cervical region orange. Pronotum yellow. Mesonotal præscutum yellow, the humeral and lateral portions broadly so; disk with four brown stripes, the intermediate pair confluent, separated by a capillary darker median vitta; lateral stripes crossing the suture to the darkened scutal lobes; posterior sclerites of notum paler brown with an obscure yellow central stripe from suture to posterior end of mediotergite; pleurotergite yellowed, the katapleurotergite silvery. Pleura yellow, the ventral anepisternum sternopleurite and meron more intensely so. Halteres yellow. Legs with coxæ yellow, trochanters orange yellow; remainder of legs black, femoral bases yellowed; claws simple. Wings (Plate 1, fig. 11) light yellow, very heavily patterned with brown, the costal region yellowed, cell Sc more intense; before cord the amount of brown and yellow color subequal, beyond cord the pale areas include most of cell M_1 and bases of cells R_2 , 2nd M_2 , M_3 and M_1 ; veins brown, those in costal region yellowed. Venation: Petiole of cell M_1 subequal to m.

Abdomen basally light yellow, outer segments more brownish yellow, tergites vaguely patterned with brown sublaterally, outer segments more uniformly darkened. Male hypopygium (Plate 4, fig. 37) with the tergite, *t*, on either side beneath produced into a blackened bilobed structure, the lower horn stouter; median area produced caudad into a glabrous transverse plate, its lateral angles extended into slender points. Basistyle without the excessively long black setæ found in *argentosigna* and some related species. Outer dististyle, *d*, gradually narrowed outwardly, tip obtuse; inner style with beak very slender, blackened, decurved, separated from the smaller lower beak by a small oval emargination; posterior crest developed, stout.

Habitat.—India (Sikkim).

Holotype, male, Chachu, altitude 9,950 feet, in *Rhododendron* association, May 17, 1959 (*Schmid*).

The fly is dedicated to Emanuel Pokorný (1837–1900), author of an important paper on the genus *Tipula* of the Austrian Alps (1887). The species is most similar to *Tipula* (*Schumelia*) *argentosigna* Alexander, differing in the simple claws of the male and in the structure of the hypopygium, particularly the tergite and inner dististyle.

TIPULA (SCHUMMEIJA) SPHAEROSTYLA sp. nov. Plate 1, fig. 12; Plate 4, fig. 38.

Allied to *notomelania*; antennæ with first flagellar segment black; vertical tubercle conspicuous; mesonotum dark brown, pleura yellow with an oblique brown stripe on anterior part; wings subhyaline, darkened pattern restricted; outer dististyle short and broad, inner style subglobular, beak slender, setæ of eighth sternite very long.

Male.—Length, about 10 millimeters; wing, 10.5; antenna, about 4.

Frontal prolongation of head short, about one-half the remainder, light yellow above, without a nasus, sides brown; palpi brownish black, terminal segment paling to light brown. Antennæ relatively long, about two-fifths the wing; scape and pedicel light yellow, flagellum black; segments longer than the verticils, with small basal enlargements. Front and anterior vertex light yellow, including the anterior end of the unusually high and conspicuous vertical tubercle; posterior part of head gray.

Pronotum infuscated. Mesonotum dark brown, the anterior third of præscutum paler brown, sides yellowed; vestiture of notum sparse but long and conspicuous, black. Pleura light yellow with an oblique dark brown longitudinal stripe from the cervical region across lateral ends of pronotum, becoming paler brown on the anterior anepisternum, not including the propleura or sternopleurite; metapleura dark brown. Halteres brownish black, base of stem paler. Legs with fore and middle coxæ light yellow, proximal half of posterior pair strongly infuscated; femora obscure yellow, tips blackened; fore tibiæ brownish yellow, tips darker, remaining tibiæ and all tarsi brownish black to black; claws simple. Wings (Plate 1, fig. 12) subhyaline, cell Sc and the stigma brown; narrow and inconspicuous brown seams behind vein Cu, over m-cu, and along vein 2nd A; restricted creamy obliterative areas before and beyond stigma and across cell 1st M_2 into the adjoining cells; veins brown. Venation: Rs short and straight, about one-half longer than basal section of R_{4+5} ; petiole of cell M_1 nearly twice m; m-cu long, at near midlength of M_{3+4} .

Abdominal tergites obscure yellow, the second extensively blackened, the succeeding segments with narrow black posterior borders; subterminal segments more extensively blackened; sternites yellow, hypopygium brown. Abdomen with abundant setæ, those of eighth sternite exceeding long, some nearly

two-thirds the segment. Male hypopygium (Plate 4, fig. 38) with posterior border of tergite, *t*, produced into a conspicuous median lobe, on microscope slide appearing dilated outwardly. Outer dististyle, *d*, short and broad, apex very obtuse; inner style with body subglobular, with relatively sparse setæ; beak relatively slender, apex slightly decurved; peglike spines on face or style above the beak present. Gonapophyses at tips extended into pale membrane.

Habitat.—India (Assam).

Holotype, male, Runikheng, United Khasi and Jaintia Hills, altitude 5,500 feet, March 24, 1960 (*Schmid*).

Tipula (*Schummelia*) *sphaerostyla* is most similar to *T. (S.) notomelania* Alexander, differing in coloration, wing pattern and venation, and in the structure of the hypopygium, including both dististyles.

TIPULA (SCHUMMELIA) VERRILLANA sp. nov. Plate 1, fig. 13; Plate 4, fig. 39.

Mesonotal præscutum yellow with four brownish gray stripes that are broadly margined with darker brown, posterior sclerites of notum yellowed medially; antennæ with proximal three segments yellow, succeeding segments bicolored, the outer ones blackened; femora yellow, tips broadly black, claws virtually simple; wings pale brown, restrictedly patterned with darker brown and cream colored areas; abdomen yellow, lateral tergal borders darkened, outer three segments black; male hypopygium with the inner dististyle a blackened cleaverlike structure.

Male.—Length, about 11.5 millimeters; wing, 12; antenna, about 3.5.

Frontal prolongation of head shorter than remainder, obscure yellow above and beneath, narrowly darkened on sides, nasus elongate; palpi with proximal three segments obscure yellow, terminal segment black, relatively short. Antennæ with proximal three segments yellow, pedicel paler; succeeding two flagellar segments bicolored, base brownish black, remainder obscure yellow, outer segments blackened, longer than their verticils. Anterior vertex yellowed, posterior vertex more obscured; a conspicuous brown central area extends from the low vertical tubercle to the occiput, constricted at near midlength.

Pronotal scutum light brown, with two darker brown spots at the midregion, scutellum yellow. Mesonotal præscutum with the restricted ground yellow, with four brownish gray stripes that are broadly margined with darker brown, on the lateral

edges the color being broader and more intense; scutum yellow medially, each lobe with two slightly darker areas, the anterior one bordered by darker brown; scutellum and much of mediotergite yellow, parascutella and sublateral marks on mediotergite pale brown; pleurotergite yellow, the katapleurotergite destroyed in pinning making it uncertain as to whether this is silvery as in various allied species; mediotergite with a few very long black erect setæ. Pleura yellowed, propleura and anepisternum weakly darkened; dorsopleural region chiefly darker brown, only a small dorsal area pale. Halteres obscure yellow, stem paler basally, knob orange. Legs with coxæ and trochanters yellow; femora yellow, tips broadly black, involving about the outer fourth; tibiæ and tarsi brown, the latter passing into black; claws of male virtually simple, with a very low obtuse tubercle only. Wings (Plate 1, fig. 13) with the ground pale brown, restrictedly patterned with darker brown and cream colored areas; prearcular and costal fields uniformly yellow; stigma long, dark brown; the chief pale areas lie before and beyond the stigma, across the base of cell 1st M_2 and on either side of a darkening at midlength of cell M ; veins brown, yellowed in the brightened fields. Trichia of wing veins shorter than in *continuata*. Venation: Rs shorter than m-cu, the latter on M_4 shortly beyond base.

Abdomen yellow, lateral tergal borders narrowly brownish black, outer three segments blackened. Male hypopygium (Plate 4, fig. 39) most similar to that of *continuata*, differing in all details. Ninth tergite, *t*, with posterior border gently concave, with erect black setæ; ventrally with a thickened black structure on either side and a narrow blackened median bar. Outer dististyle, *d*, elongate, basal half infuscated; inner style appearing as a blackened cleaverlike structure, the lower beak far basad. Basistyle without modified blackened setæ. Phallosome stout, blackened, not greatly expanded as in *continuata*.

Habitat.—India (Sikkim).

Holotype, male, Shingba, altitude 10,400 feet, June 30, 1959 (Schmid).

Named in honor of George Henry Verrall (1848–1911), a leading student of the British Diptera, including the Tipulidæ. The most similar species is *Tipula* (*Schummelia*) *continuata* Brunetti, which differs in the venation and coloration of the wings and especially in the hypopygial structure. The genitalia of *continuata* is shown (Plate 3, fig. 32), based on a paratype specimen received in an exchange with Brunetti (Darjiling, 7,000 feet, May 28, 1910, collector Brunetti).

TIPULA (ANGAROTIPULA) SNODGRASSIANA sp. nov. Plate 1, fig. 14; Plate 5, fig. 43.

Allied to *lætippennis*; proximal three antennal segments yellow, remainder black; vertex blackened medially; præscutum brownish gray with four poorly differentiated darker brown stripes; pleura yellow, patterned with light gray; wings yellowish brown, costal border broadly more darkened, veins yellow; abdomen yellow, tergites with a continuous brownish black central stripe; male hypopygium with tergal lobes rounded, the lateral margin not acute; outer dististyle long and narrow, parallel-sided; inner style with outer third unusually slender, without setæ, outer basal lobe not produced into a spine.

Male.—Length, about 11 millimeters; wing, 14; antenna, about 4.

Frontal prolongation of head, including the nasus, obscure yellow above, darkened beneath; palpi brown. Antennæ with proximal three segments yellow, remainder black; flagellar structure as in the subgenus. Front whitened; vertex infuscated medially, including a narrower central more blackened line that extends forward to between the antennal fossæ; posterior vertex more buffy on sides, orbits narrowly more whitened.

Pronotal scutum light brown, slightly patterned with yellow, scutellum yellow. Mesonotal præscutum brownish gray with four poorly differentiated darker brown stripes, the median vitta blackened, lateral borders gray; scutum with lobes brown, median area narrowly cinnamon brown, suture blackened; scutellum brownish gray with a narrow brownish black central vitta, parascutella yellow; mediotergite brownish gray, sides broadly light yellow, pleurotergite concolorous. Thoracic dorsum virtually glabrous. Pleura yellow, patterned with light gray an anepisternum, ventral sternopleurite and meron; dorsopleural membrane chiefly yellowed. Halteres infuscated, knob slightly darker. Legs with coxæ light gray; trochanters yellow; femora brownish yellow, tibiæ slightly darker brown, tarsi black; claws slender, toothed. Wings (Plate 1, fig. 14) yellowish brown, costal border broadly more darkened, including the stigma and much of cell R; veins yellow. Veins chiefly glabrous, including all outer medial veins and the anals. Venation: Petiole of cell M_1 about one-half m.

Abdomen yellow, tergites with a very conspicuous brownish black central vitta, continuous from the second through the seventh segments, reduced to a small spot on eighth tergite;

basal sternite with a blackened central area; hypopygium yellowed. Male hypopygium (Plate 5, fig. 43) with posterior border of tergite, *t*, gently emarginate, lobes rounded, narrowly bordered by black, lateral margins thickened but not produced into a point; marginal setae very short and delicate. Outer dististyle, *d*, long and narrow, the length about four and one-half times the diameter, parallel-sided, outer end narrowed and slightly curved, no protuberance on inner margin; inner style with base enlarged, with delicate pale setulae, at near midlength with a high blackened dorsal crest or flange, outer third unusually slender, slightly expanded and obtuse at apex, without setae; no spine region of outer basal lobe, as in various allied species.

Habitat.—India (Assam).

Holotype, male, Khamasson, Manipur, altitude 3,900 feet, June 24, 1960 (*Schmid*).

The species is dedicated to Robert Evans Snodgrass (1875–1962), a leading student of Arthropodan morphology. All students of the Tipulidae are indebted to him for his pioneer study of the male hypopygium in this family of flies that provided a firm basis for all subsequent work on this subject.² The fly is most similar to species such as *Tipula* (*Angarotipula*) *indica* (Edwards) and *T. (A.) laetipennis* Alexander, differing especially in the structure of the hypopygium, particularly the tergite and dististyles.

TIPULA (ANGAROTIPULA) FROMMERI sp. nov. Plate 1, fig. 15; Plate 5, fig. 44.

General coloration of mesonotal praescutum brown, the restricted ground obscure yellow; pleura light gray, the posterior sclerites abruptly light yellow; femora obscure yellow, tips narrowly blackened; wings brownish yellow, costal border and stigma darker brown; abdomen yellow, tergites with a broad continuous brownish black stripe; ovipositor with cerci small, fleshy, hypovalvae larger, appearing as broad flattened glabrous blades; male hypopygium with outer dististyle relatively broad, inner style with beak stout, without major setae but with abundant whitened punctures.

Male.—Length, about 11 millimeters; wing, 12; antenna, about 3.4.

² Snodgrass, R. E. The hypopygium of the Tipulidae. Trans. American Ent. Soc. 30 (1901) 179–236, 11 plates, with 161 figures.

Female.—Length, about 14 millimeters; wing, 13.5.

Frontal prolongation of head brownish yellow above, restrictedly dark brown beneath; nasus small, decurved; palpi light brown. Antennæ with scape and pedicel yellow, the former with abundant short black setæ above; first flagellar segment brownish yellow, remainder black; terminal segment small. Head with front and narrow orbits yellow, disk of vertex brownish gray, more blackened medially, the narrowed anterior end extended to between the fossæ.

Pronotal scutum light brownish gray, narrowly darkened medially, scutellum obscure yellow. Mesonotal præscutum with the restricted ground obscure yellow, humeral areas gray, disk with four brown stripes, the intermediate pair separated by a capillary blackened vitta; scutal lobes dark gray, central area paler gray, point of the suture blackened; scutellum brown, parascutella yellow; mediotergite brownish gray on central part, the sides and dorsal pleurotergite light yellow; katapleurotergite narrowly brownish gray, dorsum virtually glabrous. Pleura, including the meron, light gray, the pteropleurite and metapleura abruptly light yellow, dorsopleural region more obscure yellow. Halteres with stem yellowish brown, knob dark brown. Legs with fore and middle coxæ light gray, posterior coxæ more whitened; trochanters brownish yellow; femora obscure yellow, tips narrowly blackened; tibiæ light brown, tips more broadly black; tarsi black, claws long and slender, toothed in male. Wings (Plate 1, fig. 15) brownish yellow, costal border and stigma darker brown; veins brownish yellow. Venation: Petiole of cell M_1 subequal to or longer than m .

Abdominal tergites yellow, with a broad continuous brownish black central stripe, more expanded on posterior segments; hypopygium brownish yellow. Ovipositor with cerci very small, fleshy, hypovalvæ larger, appearing as compressed-flattened blades with setæ almost to the tips. Male hypopygium (Plate 5, fig. 44) with the tergite, t , transverse, posterior border shallowly emarginate, on either lobe with a low blackened flange. Outer dististyle, d , relatively broad, inner margin just before apex slightly protuberant; inner style with a broad blackened flange beyond midlength, the beak stout, tip slightly expanded, broadly obtuse; surface of style with numerous small whitened punctures but without setæ beyond the level of the flange.

Habitat.—India (Madras).

Holotype, male, Naduvatam, Nilgiri Hills, altitude 6,000 feet, September 1950 (*P. Susai Nathan*). Allotopotype, female, pinned with type.

The species is named for Mr. Sual I. Frommer, presently at the University of California, Riverside, author of an important study on the reproductive organs of both sexes of crane flies.³ The most similar species is *Tipula* (*Angarotipula*) *indica* (Edwards) which differs in the structure of the hypopygium and, especially, in the ovipositor, including both the cerci and the hypovalvae.

TIPULA (ANGAROTIPULA) XUTHOPTERA sp. nov. Plate 1, fig. 16; Plate 5, fig. 45.

General coloration of mesonotal praescutum brown, with four brownish gray stripes; tips of femora narrowly brownish black; wings strongly yellowish brown, costal border darker; ovipositor with cerci elongate, about four times as long as the hypovalvae, the latter subtriangular, tips obtuse; male hypopygium with outer dististyle very broad, inner style with outer end elongate, the outer margin with long setae that include the tip or virtually so.

Male.—Length, about 11 to 13 millimeters; wing, 13 to 15; antenna, about 3.8 to 4.

Female.—Length, about 14 to 16 millimeters; wing, 15 to 18.

Frontal prolongation of head relatively short, slightly more than one-half the remainder, obscure yellow above, brown beneath; nasus elongate; palpi brown. Antennae of male with proximal three or four segments obscure yellow, remainder black; basal enlargements of flagellar segment strongly developed. Head yellowish brown, ventral surface and orbits yellow; center of vertex infuscated, with a linear black stripe on anterior vertex, extended forward to between the antennal fossae.

Fronotal scutum brown, dark brown medially, lateral ends yellowed. Mesonotal praescutum brown with four poorly differentiated brownish gray stripes, with a further central capillary black vitta on anterior half; scutal lobes brownish gray, posterior ends and central area brownish yellow; scutellum light brown, parascutella yellow; mediotergite broadly gray on central portion, yellow on sides, with a barely indicated capillary darkening extending from suture to abdomen, pleurotergite yellowed; thorax nearly glabrous. Pleura obscure yellow, patterned with light gray on anepisternum and ventral sternopleurite, pteropleurite more whitened; dorsopleural membrane

³ Frommer, Saul I. Gross morphological studies of the reproductive system in representative North American crane flies (Diptera: Tipulidae). Univ. Kansas Science Bull. 44 (1963) 535-626, 4 text figures, 20 plates, with 127 figures.

obscure yellow. Halteres infuscated. Legs with coxæ gray; trochanters brownish yellow; femora brownish yellow, tips very narrowly brownish black; tibiæ very light brown, tarsi passing into black; claws of male toothed. Wings (Plate 1, fig. 16) strongly yellowish brown, centers of the cells paler, costal border broadly darker, concolorous with the stigma, veins yellowed. Venation: A blackened thickening on vein R at the arculus; prearcular section of vein Cu greatly incrassated, as in the subgenus; petiole of cell M_1 subequal to or shorter than m.

Abdominal tergites orange yellow, with a broad blackened central stripe, becoming wider posteriorly, ending on the seventh segment; sternites obscure yellow with a darkened central area on second segment; outer sternites with a vague median darkening, the subterminal sternite in female more pruinose. Ovipositor with cerci elongate, about four times as long as the hypovalvæ, appearing as compressed-flattened blades, narrowed to the rounded tips; hypopalvæ subtriangular, tips obtuse, surface with numerous setæ. Male hypopygium (Plate 5, fig. 45) with posterior border of tergite, *t*, gently emarginate, narrowly blackened, the decurved end of the dark portion produced into a short point on either side. Outer dististyle, *d*, unusually broad, inner margin before the short curved apex produced, with setæ; inner style with outer end elongate, not enlarged outwardly, at base of the narrowed part with an obtuse blackened flange; outer margin of style with long recurved yellow setæ, including some smaller ones almost to the tip.

Habitat.—India (Assam).

Holotype, male, Khangairim, Manipur, altitude 4,145 feet, June 29, 1960 (*Schmid*). Allotopotype, female, pinned with type. Paratopotypes, males and females. Paratypes, 2 males, 1 female, Denthring, Manipur, altitude 3,800 feet, April 16, 1960; 2 males, 1 female, Khamassom, Manipur, altitude 3,900 feet, June 24, 1960; 6 males and females, Ningthouklong, Manipur, altitude 2,500 feet, June 1, 1960; 4 females, Nungba, Manipur, altitude 500 feet, May 25, 1960; 5 males, Pushing, Manipur, altitude 6,000 feet, July 18, 1960; 1 male, 2 females, Leimatak, altitude 1,300 feet, May 1960; 1 female, Umlangshor, altitude 4,100 feet, April 18, 1960 (all *Schmid*); 1 male, Mount Japvo, Naga Hills, altitude 5,000 feet, May 1962 (*S. Sircar*).

The early material of this species had been determined as being *Tipula* (*Angarotipula*) *indica* (Edwards), still known definitely only from the type female preserved in the Paris

Museum, taken at Xieng Khovang, in former French Indo-China. As described, the latter fly is distinguished from the present species by the grayish wings and by evident differences in the ovipositor, especially the cerci.

TIPULA (FORMOTIPULA) TJEDERANA sp. nov. Plate 2, fig. 17; Plate 4, fig. 10.

Size small (wing of male to 12 millimeters); thorax and first abdominal segment uniformly clear orange yellow; head black; intermediate abdominal segments dull black ringed with light gray, outer three segments uniformly black; hypopygium with the dististyle terminal, beak slender.

Male.—Length, about 9.5 to 10 millimeters; wing, 11.5 to 12; antenna, about 3.1 to 3.2.

Female.—Length, about 9 millimeters; wing, 13.

Rostrum and palpi black. Antennae black, apex of pedicel narrowly paler; basal enlargements of flagellar segments very small to scarcely evident, verticils shorter than the segments. Head intense velvety black.

Thorax uniformly clear orange yellow; notal vestiture very small and sparse, most evident on mediotergite and pascutal interspaces. Halteres with stem light brown, base yellow, knob black. Leg with coxae and trochanters clear orange yellow; remainder black, femoral bases yellowed, including about the proximal fifth to seventh; claws of male toothed. Wings (Plate 2, fig. 17) strongly suffused with blackish, the base, cells C and Sc, and the stigma darker; obliterative areas from before stigma across cell 1st M_2 ; veins dark brown. Longitudinal veins beyond cord with macrotrichia, also on outer ends of M, Cu_1 and 2nd A, lacking on Rs and 1st A. Venation: Tip of R_{1+2} atrophied, entire on one wing of allotype; petiole of cell M_1 about three to four times m.

Abdomen with first segment orange yellow, second tergite with both ends dull black, the central third light gray; tergites three to six gray basally, with a black subterminal ring, the latter narrower on outer segments, margins brownish gray; segments seven to nine intensely black. Male hypopygium (Plate 5, fig. 40) with the tergite, *t*, narrowed outwardly, posterior border with a V-shaped emargination, the lobes broadly rounded. Dististyle, *d*, terminal, very large, its area only a little less than that of the tergite, beak long and slender.

Habitat.—India (Assam).

Holotype, male, Sirhoi Kashong, Manipur, altitude 7,500 feet, July 11, 1960 (*Schmid*). Allotopotype, female, July 12, 1960. Paratopotype, male, with the holotype.

I am pleased to name this fly for Bo Tjeder, critical student of the taxonomy and distribution of the Swedish Tipulidæ. This small attractive species is quiet distinct from previously described members of the subgenus, especially in the coloration of the abdomen and structure of the hypopygium. Other Indian species with the thorax orange include *Tipula* (*Formotipula*) *dikchuensis* Edwards, *T. (F.) ishana* Alexander, and *T. (F.) melanomera* Walker. In its general appearance it superficially suggests various regional species of *Hexatoma* (*Eriocera*), particularly in the conspicuous light gray or plumbeous rings on the abdomen.

TIPULA (ACUTIPULA) COEANA sp. nov.

Plate 2, fig. 18; Plate 4, fig. 41.

Size large (wing of male 22 millimeters); mesonotal præscutum with four virtually confluent discal brown stripes; pleura almost uniformly light yellow, dorsally with a medium brown stripe; antennæ weakly bicolored; femora light brown, tips brownish black; wings light brown, restrictedly patterned with darker brown and yellowed areas, veins unusually glabrous; male hypopygium with dististyle broad, inner style terminating in a flattened head that is produced into a long point, the disk with three unequal spines; eighth sternite with distinct lateral lobes that are provided with long yellow setæ.

Male.—Length, about 21 millimeters; wing, 22; antenna, about 3.

Female.—Length, about 24 millimeters; wing, 24.

Frontal prolongation of head uniform chestnut brown, nasus elongate; first segment of palpus dark brown, remainder black. Antennæ with scape yellowish brown, pedicel clear yellow, flagellum weakly bicolored, the small basal enlargement weakly infuscated, remainder brownish yellow, the bicolored condition including all segments, these shorter than their verticils. Head brown, without a vertical tubercle; anterior vertex narrow, about one-half wider than the diameter of scape.

Pronotal scutum light brown, scutellum yellowed. Mesonotal præscutum with four virtually confluent brown stripes on disk that are separated by narrow darker brown lines; scutum almost uniformly brown, posterior lateral parts paler; scutellum dark brown, parascutella pale; mediotergite light brown, posterior third yellowed, pleurotergite yellow with a brown stripe across the dorsal katapleurotergite, being a posterior extension of the pleural darkening; vestiture of præscutum and scutum very sparse to virtually lacking, of the mediotergite longer, appressed,

yellow. Pleura light yellow ventrally; dorsopleural region and a narrow adjoining area medium brown, forming a diffuse longitudinal stripe. Halteres dark brown. Legs with all coxæ and trochanters yellow; remainder of legs very long; femora light brown, tips brownish black; tibiæ and proximal tarsal segments light brown, their tips narrowly darker brown, outer tarsal segments darker; claws of male toothed. Wings (Plate 2, fig. 18) light brown, restrictedly patterned with slightly darker brown and more extensive yellow areas; prearcular and costal fields, with the stigma, darker brown; relatively small brown clouds near outer end of cell M adjoining vein Cu and before midlength of cell Cu; outer radial field slightly darker than the remainder of the ground; pale areas before and beyond the darkened clouds, less evident on either side of m-cu and at bases of veins M_1 , M_2 , and M_3 ; obliterative areas over anterior cord more whitened; veins dark brown, slightly paler in the obliterative parts. Veins unusually glabrous, even the distal section of R_{4+5} with very few trichia. Venation: Petiole of cell M_1 subequal to m; m-cu shortly before fork of M_{3+4} .

Basal abdominal tergites reddened, laterally patterned with darker, outer segments still darker, especially on the sides, extreme margins pale; basal sternites yellow; outer segments darker brown. Male hypopygium (Plate 5, fig. 41) with the tergite, *t*, narrowed outwardly, terminating in two compressed-flattened yellow blades lying parallel to one another, on microscope slides appearing more flattened, as illustrated, each blade with numerous blackened spicules. Ninth sternite with a close pencil of long reddish setæ. Outer dististyle, *d*, whitened, broad, the outline as shown; inner style distinctive, the outer part a flattened head, apically produced into a long point; on disk with three unequal spines, the largest near the apical point and only a little smaller, the other two on center of disk; beak relatively small; sensory area lying between the apical head and the beak. Eighth sternite, *8s*, narrowed apically, the outer lobes distinct, each provided with a brush of long yellow setæ.

Habitat.—India (Assam).

Holotype, male, Dawki, Manipur, altitude 200 feet, April 8, 1960 (*Schmid*). Allotopotype, female, pinned with type.

The species is named for R. L. Coe, co-author of one of the Handbooks for the Identification of British Insects, covering part of the Diptera and including the Tipulidæ. The most similar species is *Tipula* (*Acutipula*) *quadrinotata* Brunetti, with the hypopygium quite distinct, particularly the dististyles.

TIPULA (ACUTIPULA) LINNEANA sp. nov.

Plate 2, fig. 19; Plate 4, fig. 42.

Size above medium (wing of male about 20 millimeters); mesonotum gray, præscutum with four inconspicuous slightly darker gray stripes, humeral border darkened; legs light brown, tips of femora and tibiæ blackened, claws toothed; wings light brown, restrictedly patterned with darker brown; basal abdominal segments yellow, tips with narrow nearly lateral black stripes, outer five segments uniformly black; male hypopygium with tergal lobe broad, almost entire; outer dististyle very broad, inner style with its outer lobe a narrow flattened blade that is extended into a long spine, beak broad.

Male.—Length, about 20 millimeters; wing, 20; antenna, about 6.

Frontal prolongation of head medium brown, nasus elongate, blackened; palpi black. Antennæ long, scape and pedicel brownish yellow, flagellum brownish black, first segment paler apically; basal enlargements small, verticils exceeding the segments. Head gray, narrowly more darkened medially, orbits more yellowish gray.

Pronotal scutum conspicuously yellow, sides slightly more infuscated. Mesonotal præscutum gray with four inconspicuous slightly darker gray stripes, the intermediate pair narrowly and vaguely bordered by pale brown, anterior præscutal border darkened, more conspicuous in the humeral region; scutum gray, lobes patterned with darker; scutellum brownish gray, narrowly darker on sides, parascutella light brown; mediotergite yellowish gray, darker medially and with paired gray posterior areas. Pleura with mesepisternum light gray, propleura more yellowed; pteropleurite and pleurotergite light yellow pollinose; posterior pleural sclerites light yellow; dorsopleural membrane medium brown. Halteres brownish black throughout. Legs with coxæ yellowish gray; trochanters brownish yellow; femora and tibiæ light brown, tips narrowly blackened; tarsi brownish black to black; claws of male toothed. Wings (Plate 2, fig. 19) light brown, prearcular and costal fields more yellowed, especially cell Sc, stigma slightly darker brown; outer medial cells more whitened; a brown cloud at midlength of cell Cu; the whitened obliterative band very conspicuous, extending from before stigma into cells M_3 and M_4 ; veins brown, pale yellow to whitened in the obliterative areas. Macrotrichia on veins R_3 and R_{4+5} , sparsely on M_{1+2} , and bases of M_1 and M_2 ; before cord sparse trichia on M and both anals, lacking on Cu_1 . Venation: Rs

shorter than m-cu, slightly longer than R_{2+3} ; petiole of cell M_1 subequal to or shorter than m.

Basal abdominal tergites brownish yellow, with a conspicuous brownish black nearly lateral stripe, the extreme borders of segments two through four buffy; basal sternites uniformly yellow; fifth and succeeding segments, excepting the styles, uniformly black. Male hypopygium (Plate 4, fig. 42) with the tergal lobe, *t*, almost entire, short and broad, apex with a very small U-shaped emargination, the lobes with numerous short black spicules, lateral shoulders broad, vestiture sparse and delicate. Outer dististyle, *d*, very broad, the length less than twice the greatest width; a few long black setae on margin at base, remaining vestiture sparse and very inconspicuous, the marginal setae microscopic; inner style with beak broad, lower beak reduced; outer lobe a narrow flattened blade that tapers to a long straight spine; disk of blade with about 15 long reddish spines directed outwardly. Eighth sternite entirely black, margined with short setae but otherwise unmodified.

Habitat.—India (Sikkim).

Holotype, male, Zema, altitude 8,900 feet, May 21, 1959 (Schmid).

The fly is dedicated to the memory of Carl von Linné (1707–1778), originator of the binomial system of biological nomenclature, 1758. As indicated earlier in this paper this basic work included various species of Tipulidae. The species differs from other regional members of the subgenus in hypopygial structure, especially the tergite and inner dististyle. The tergal lobe is almost entire, somewhat as in *Tipula* (*Acutipala*) *fulvipennis* de Geer, but the dististyles are entirely different.

TIPULA (INDOTIPULA) AUDCENTIANA sp. nov. Plate 2, fig. 20; Plate 5, fig. 46.

General coloration of thorax orange; antennal flagellum black; legs brownish black, femoral bases paler, claws of male bidentate; wings strongly suffused with yellowish brown, obliterative areas before stigma and across cell 1st M_2 small but conspicuous, petiole of cell M_1 short; abdomen brownish yellow, subterminal segments brown; male hypopygium with outer dististyle expanded outwardly, inner style with dorsal crest high, compressed, outer basal lobe with the powerful spines.

Male.—Length, about 13 millimeters; wing, 14; antenna, about 4.

Frontal prolongation of head clear light yellow, lower half light brown; nasus slender, tipped with long yellow setæ; palpi brown, terminal segment black. Antennæ with scape light yellow, pedicel brownish yellow, flagellum black; flagellar segments long, with very small basal enlargments, longest verticils subequal to the segments. Head in front light yellow, dark orange behind.

Pronotum medially weakly darkened, sides light yellow. Mesonotal præscutum with disk almost uniformly orange, the two intermediate stripes more yellowed behind, lateral margins more yellowed; posterior sclerites of notum orange; notal vestiture sparse, very small, yellow. Propleura yellow; remainder of pleura more orange, especially on the anterior mesepisternum. Halteres with stem obscure yellow, knob dark brown. Legs with coxæ and trochanters yellow; femora obscure yellow, passing into brown on outer half; tibiæ and tarsi brownish black; claws of male long, bidentate. Wings (Plate 2, fig. 20) strongly suffused with yellowish brown, prearcular and costal fields and a line behind Cu_1 still darker; stigma light brown; small but conspicuous whitened oblitative areas before stigma and across base of cell 1st M_2 ; veins brown, more brownish yellow in costal region. Veins R_{2+3} , R_3 , R_{4+5} and outer half of M_1 with numerous trichia. Venation: Rs a trifle longer than m-cu; cell M_1 deep, its petiole from about one-half to two-thirds m; cell 2nd A narrow.

Abdomen brownish yellow, subterminal tergites brown, bases yellowed, eight sternite yellow; hypopygium brownish yellow. Male hypopygium (Plate 6, fig. 46) with the tergite, *t*, narrowed outwardly, terminating in two triangular lobes that are separated by a narrow emargination; lobes with black setæ and small black spicules, more concentrated on the produced outer angles; median region of emargination with two small glabrous blades. Ninth sternite, 9s, with two small subglobular lobes, each with a brush of very long yellow setæ. Outer dististyle, *d*, expanded outwardly, apex oblique, margins with very long black setæ; inner style with beak and outer crest forming a pale compressed glabrous blade, lower beak small, forming two small polished black points; outer basal lobe produced into two large blackened curved spines, the outer one larger. Phallosome, *p*, with gonapophyses pale, at tips dilated into large oval blades.

Habitat.—India (Assam).

Holotype, male, Thangrain, Khasi-Jaintia, altitude 3,000 feet, April 22, 1960 (Schmid).

The species is named for Henri Louis Felix Audcent (1875–1951), capable student of the Diptera of Bristol England, including the Ptychopteridæ and Tipulidæ. The most similar species are *Tipula* (*Indotipula*) *diacaena* Alexander and *T.* (*I.*) *sudra* Alexander which likewise have powerful spines on the outer basal lobe of the inner dististyle, differing in other structures of the hypopygium, including the tergite, both dististyles, and the phallosome.

TIPULA (INDOTIPULA) BELINGANA sp. nov. Plate 2, fig. 21; Plate 5, figs. 47, 48.

Allied to *sulaica*; mesonotal præscutum with four brown stripes, lateral borders broadly buffy; femora and tibiæ brownish yellow, tips narrowly infuscated; antennæ of male with flagellar segments very strongly incised, the outer lobes larger than the basal enlargements, strongly triangular in outline; wings tinged with brownish yellow, stigma light brown, veins beyond cord unusually glabrous; male hypopygium with tergal lobes triangular, inner dististyle with a conspicuous dorsal crest, along its base with seven unusually powerful yellow setoid bristles; gonapophyses appearing as broad plates.

Male.—Length, about 14 millimeters; wing, 16; antenna about 3.2.

Female.—Length, about 17 millimeters; wing, 17.

Frontal prolongation of head brownish yellow, nasus very long and slender; palpi light brown, terminal segment tipped with orange. Antennæ with scape yellow, apical third infuscated; pedicel brownish yellow; flagellar segments weakly bicolored, bases infuscated, remainder pale brown, the segments very strongly incised to form a triangular outer lobe that is larger than the basal enlargement (Plate 5, fig. 47); verticils very long, the longest about one-half longer than the segments. Anterior part of head pale yellow, including extensive areas surrounding the antennal fossæ; vertex light grayish brown, sending an extension forward between the antennæ onto the front; posterior vertex with a darker brown central area.

Pronotal scutum brown, scutellum with sides yellowed. Mesonotal præscutum with four brown stripes, lateral and humeral borders broadly buffy; median interspace obscure orange, lateral interspaces more obscured; scutum brownish gray, the lobes and a central line pale brown; scutellum light brown; mediotergite buffy yellow, on either side of midline with a longitudinal

dusky stripe, widened and more distinct behind, pleurotergite more whitened. Pleura yellow, mesepisternum variegated with pale brown on anepisternum and ventral sternopleurite. Halteres infuscated, base of stem pale yellow. Legs with coxæ yellow, fore and middle pairs darkened medially, hind extensively darkened; trochanters pale yellow; femora and tibiæ brownish yellow, tips narrowly infuscated; tarsi dark brown. Wings (Plate 2, fig. 21) tinged with light brownish yellow, stigma and cell Sc light brown; vein brown. Macrotrichia of veins beyond cord very sparse, with a series on outer two-thirds of distal section of R_{4+5} , none on medial veins. Venation: Sc_1 preserved; Rs shorter than R_{4+5} ; petiole of cell M_1 subequal to m; cell 2nd A narrow.

Abdominal tergites brown, posterior borders narrowly pale, subterminal tergites more extensively darkened; sternites and hypopygium more brownish yellow. Male hypopygium (Plate 5, fig. 48) with the tergite, *t*, produced into two triangular blackened lobes that terminate in two or three powerful teeth, with fewer blackened spines on disk, passing into setæ on inner margin. Outer dististyle, *d*, a simple flattened blade, narrowed very gradually to the tip; inner style with beak triangular, before apex with a small darkened appendage, tip obtuse; lower beak black; a conspicuous dorsal crest, anteriorly terminating abruptly in pale membrane, at base of the crest on the style with a row of seven unusually powerful yellow setoid bristles that are extended into hairlike points; region of outer basal lobe appearing as obtuse rounded lobes that are concolorous with the remainder of style. Gonapophysis, *g*, an unusually broad plate, both the base and apex obtuse, the former with low obtuse tubercles; ædeagus very slender. Eighth sternite unmodified.

Habitat.—India (Coorg).

Holotype, male, Ammatti, South Coorg, altitude 3,100 feet, November 1952 (*P. Susai Nathan*). Allotopotype, female, pinned with the type.

I name this species for Karl Wilhelm Theodor Beling (1816–1898), pioneer student of the immature stages of the Tipulidæ. An account of his life, with portrait, has been given in another paper.³ It is related to species such as *Tipula* (*Indotipula*) *sulaica* Walker, *T. (I.) palnica* Edwards, *T. (I.) yamata* Alexander, and various others in southern and eastern Asia. It

³ Alexander, C. P. Cornell Univ., Agr. Expt. Sta. Mem. 38 (1920) 692–693.

is best distinguished by the extreme incision of the flagellar segments and the structure of the male hypopygium, particularly the tergite and inner dististyle. The reduction in number of the modified setæ on the crest of the style to seven unusually powerful setoid bristles should be emphasized.

TIPULA (INDOTIPULA) PEUSIANA sp. nov. Plate 2, fig. 22; Plate 5, fig. 49.

Size large (wing of male 17 millimeters); general coloration of mesonotum orange brown, præscutum with four stripes of this color, the restricted ground light gray; femora light brown, tips narrowly brownish black; wings strongly tinged with brown, stigma darker, obliterative areas very restricted; basal abdominal segments obscure orange, outer segments dark brown; male hypopygium with tips of tergal lobes obtuse, provided with short black spicules, each lobe with a low lateral flange on outer margin; outer dististyle a simple flattened blade, outwardly with abundant black setæ; inner style with beak and lower beak blackened, both very short-triangular, almost identical in size and conformation; outer end of dorsal crest produced into a rounded lobe, the crest with about 18 long yellow setæ; region of outer basal lobe only slightly modified; phallosome with two yellowed blades on either side; eighth sternite simple, with unusually few setæ.

Male.—Length, about 15 millimeters; wing, 17; antenna, about 5.

Frontal prolongation of head obscure yellow, slightly darkened on sides; nasus very large, darkened; palpi light brown. Antennæ of male relatively long; scape and pedicel light yellow, flagellar segments passing into back; segments long-cylindrical with small basal enlargements, verticils very long, subequal to or exceeding the segments. Head above brown, with a capillary darker brown central line; front, anterior part of vertex behind the antennal fossæ and sides of occipital region more yellowed; no vertical tubercle.

Pronotal scutum chiefly dark brown, restrictedly patterned with obscure yellow, especially behind; scutellum yellowed. Mesonotal præscutum with the ground light gray, disk with four obscure orange-brown stripes that are very narrowly bordered by slightly darker brown, more distinct at the midline; posterior sclerites of notum obscure orange brown, scutellum with a scarcely apparent median pale line; notum glabrous. Pleura light brown dorsally, the broad ventral area, with the pteropleurite, pale yellow. Halteres with stem obscure yellow,

knob pale brown. Legs with coxæ and trochanters light yellow, femora yellow basally, passing into brownish yellow or light brown, tips rather narrowly brownish black; tibiæ light brown, tip darker, tarsi dark brown; claws of male bidentate, the basal tooth smaller. Wings (Plate 2, fig. 22) strongly tinged with brown, prearcular and costal regions more saturated, especially cell Sc; stigma darker brown, more yellowed at base above vein R_1 ; very restricted oblitative areas before stigma and across cell 1st M_2 , barely entering the adjoining cells; veins brown. Macrotrichia of veins beyond cord sparse, lacking on R_{2+3} , R_3 , M_2 , M_3 and M_4 ; a series of trichia on outer three-fourths of distal section of R_{4+5} . Venation: Petiole of cel M_1 from one-third to one-half longer than m; m-cu at or close to fork of M_{3+4} ; cell 2nd A narrow.

Basal abdominal segments obscure orange, outer segments dark brown, borders of segments pale, outer segments uniformly dark brown. Male hypopygium (Plate 5, fig. 49) with the tergite, *t*, transverse, narrowed outwardly, posterior border with two obtuse lobes that are broader than the emargination, tips obtuse, provided with short black spicules; lateral margin of each lobe farther produced into a low glabrous flange. Ninth sternite with a dense concentration of setæ that do not form a brush. Mesal face of basistyle with relatively few setæ. Outer dististyle, *d*, a simple flattened dark-colored blade, broadest at near one-third the length, thence narrowed gradually to the obtuse tip, the inner apical surface with long coarse black setæ, those of apical half of outer margin very abundant, gradually, decreasing in size toward base; inner style with beak and lower beak blackened, very stout-triangular, almost alike in size and conformation, the apex of beak a trifle decurved; outer apical end of dorsal crests produced into a rounded lobe; back from margin of crest with about 18 long yellow setæ, almost evenly spaced, those nearest beak stouter, the outer setæ slender; region of outer basal lobe a low setuliferous cushion, its outer end produced into a blackened lobe or blade. Phallosome, *p*, including the slender ædeagus (one-half shown in figure) and the longer and broader foot-shaped gonapophysis. Eighth sternite transverse, apex shallowly emarginate, the low lobes with very few scattered weak setæ.

Habitat.—India (Kumaon).

Holotype, male, Khumyara, Pauri Garhwal, altitude 4,300 to 5,000 feet, May 28, 1958 (*Schmid*).

Tipula (*Indotipula*) *peusiana* is named for Director Fritz Feus, of the Zoological Museum, West Berlin, author of important fascicles in Lindner's "Die Fliegen der Palaearktischen Region" covering the Tanyderidæ, Ptychopteridæ and Cylindrotominae. It is readily told by the large size and structure of the hypopygium, especially the distinctive inner dististyle. The more similar species include *T. (I.) elegantula* Brunetti, *T. (I.) walkeri* Brunetti, and some others.

TIPULA (ANOMALOPTERA) ACHLYPODA sp. nov

Female.—Length, about 16 millimeters; wing, 11.5; antenna, about 3.2.

Characters as in *bathroxantha* Alexander, differing conspicuously in the coloration of the antennæ and legs.

Generally as in *bathroxantha*, differing as follows: Antennal flagellum uniformly dark brown, with no evidence of brightening at bases of segments, the latter shorter than their longest verticils. Legs with femora uniformly black, tibiæ brown, tarsi black. Wings fully developed or virtually so; coloration, venation and trichiation of veins generally as in *bathroxantha*, with macrotrichia on outer ends of veins M_1 , M_2 and M_3 , abundant on distal section of Cu, but lacking on the basal section. Abdomen conspicuously dark brown, posterior borders of segments very narrowly pale; abdomen with conspicuous abundant erect black setæ.

Habitat.—India (Kashmir).

Holotype, female, Chhanter Gah, altitude 10,400 feet, August 7, 1954 (*Schmid*).

Despite the fact that the type of the present fly was taken at the same place and date as a specimen of *Tipula* (*Anomaloptera*) *bathroxantha*, I cannot consider it as being identical because of the conspicuous differences in coloration of the antennæ, legs and abdomen.

TIPULA PTERELACHISUS MEIJERELIA sp. nov.

Plate 2, fig. 23; Plate 5, fig. 50.

Size large (wing 18 millimeters or more); mesotal præscutum whitish yellow with four stripes; femora black with a yellow subterminal ring; wings light brown, marmorate with light yellow, wing tip uniformly darkened, vein R_{1+2} preserved; abdomen with proximal five segments yellow, the remainder black; male hypopygium with the basistyle produced caudad into a short flattened blade; inner dististyle complex, the region of the outer basal lobe produced into powerful arm

that protrudes from the genital chamber; ninth sternite protuberant.

Male.—Length, about 16 to 17 millimeters; wing, 18 to 21; antenna, about 4 to 4.2.

Frontal prolongation of head light brown, lined dorsally and on sides with darker brown, including the long slender nasus; palpi black, first segment a little paler. Antennæ with scape brownish yellow, pedicel clear yellow, flagellum black; flagellar segments very feebly incised, longer than their verticils. Head light yellow, slightly more darkened on genæ, occiput narrowly light brown.

Pronotal scutum yellowish gray with three dark brown areas, scutellum more fulvous yellow. Mesonotal præscutum whitish yellow with four stripes, the intermediate pair solidly darkened, separated by a capillary obscure line; sublateral stripes gray on outer edge, inner margin broadly more blakened; lateral borders of sclerite darkened, humeral region below the small pseudosutural foveæ deeply impressed, chestnut brown; scutum yellowish gray, each lobe with two brownish black areas more intense on their inner parts; scutellum of mediotergite yellowish gray with a narrow capillary dark brown line; scutellum with additional small spots on either side at posterior border; pleurotergite golden yellow pollinose. Pleura more olive gray restrictedly patterned; dorsopleural membrane light brown. Halteres with stem yellowed, knob dark brown, the apex light yellow. Legs with coxæ brownish gray; trochanters light brown; femora black, bases narrowly yellowed, on outer third with a broad obscure yellow subterminal ring that is nearly twice the black tip; remainder of legs black; claws toothed. Wings (Plate 2, fig. 23) light brown, marmorate with light yellow chiefly before cord, beyond the cord including a broad poststigmal band that extends from costa into cell 1st M_2 ; wing tip broadly of the ground color, not variegated; cell Sc light yellow; whitened areas before stigma and more extensively across cell 1st M_2 into bases of cells M_3 and M_4 ; prearcular field yellow; veins light brown, prearcular veins, Sc and Cu_2 yellowed. Longitudinal veins beyond cord with macrotrichia, lacking on outer third of R_{1+2} , all veins comprising cell 1st M_2 , and the bases of all outer medial veins; before cord with numerous trichia on outer half of vein 2nd A; squama naked. Venation; R_s long, about two and one-half times m-cu; vein R_{1+2} preserved; cell M_1 deep, its petiole from about one-third to one-half m.

Abdomen with proximal five segments yellow, lateral borders narrowly light gray, bordered internally by brownish black, medially the segments vaguely infuscated; all outer segments, including posterior border of the fifth tergite, black, proximal five sternites yellow. Male hypopygium (Plate 5, fig. 50) with the tergite, *t*, divided medially by yellow membrane; posterior border with a U-shaped notch, the lobes narrowly obtuse, their inner margins depressed and highly polished black. Region of ninth sternite protuberant, forming a pale oval shield-shaped structure. Basistyle, *b*, separated from sternite dorsally, produced caudad into a short flattened blade, its broad apex subtruncate to very obtuse, lower mesal part with long yellow setæ. Outer dististyle, *d*, narrowly clavate, setæ of moderate length; inner style large and complex; beak relatively slender, dorsal region black, expanded and highly polished; region of outer basal lobe produced caudad into a powerful arm that is directed caudad and finally dorsad, terminating in an acute spine, the structure protruding from the genital chamber. Eighth sternite small, margin unmodified.

Habitat.—India (Sikkim).

Holotype, male, Yedang, altitude 10,600 feet, in *Rhododendron* association, June 9, 1959 (Schmid). Paratopotypes, males, June 9–10, 1959.

The species is dedicated to Johannes Cornelis Hendrick de Meijere, outstanding student of the western Palaearctic and Oriental Diptera, including the Tipulidæ. In the structure of the male hypopygium the fly differs strikingly from other generally similar species that have vein R_{1+2} preserved, including *Tipula* (*Pterelachisus*) *cruciata* Edwards, *T. (P.) garuda* Alexander, *T. (P.) sharva* Alexander, *T. (P.) wardiana* Alexander, and others.

TIPULA PTERELACHISUS WUANA sp. nov.

Plate 2, fig. 21

Size medium (wing of female 13.5 millimeters); general coloration of mesonotal præscutum grayish brown with three conspicuous dark brown stripes, interspaces with brown setigerous punctures; head with vertical tubercle very large and conspicuous; halteres with stem light yellow, knob brownish black; femora brownish yellow, tips narrowly brownish black; wings whitish subhyaline, cell C and stigma pale brown, cell Sc more yellowed; a restricted but conspicuous brown pattern; macrotrichia on longitudinal veins beyond cord, lacking on the entire R_{1+2} ; abdominal tergites yellow with a continuous central brown stripe.

Female.—Length, about 14 millimeters; wing, 13.5; antenna, about 2.3.

Frontal prolongation of head above light brownish gray, including nasus, ventral half darker brown; palpi with first segment light brown, remainder black. Antennæ with proximal three segments yellow, the succeeding ones more orange, on about the eighth segment the bases slightly darker, outer two segments uniformly infuscated; segments about equal in length to the longest verticils. Head with front light yellow, brownish gray behind, with a central brown line, genæ dusky; anterior vertex with an unusually high and conspicuous hemispherical tubercle.

Pronotal scutum obscure yellow, variegated by brown, scutellum more brownish yellow, Mesonotal præscutum pale grayish brown, with three conspicuous dark brown stripes, the median one vaguely divided on posterior third; interspaces with numerous brown setigerous punctures, lacking on humeral region; posterior sclerites of notum gray, scutal lobes extensively dark brown; scutellum chiefly dark brown, parascutella brownish yellow; mediotergite with a narrow dark brown central vitta, posterior border on either side with a large gray area, margined anteriorly with brown, surface with long yellow setæ from brown punctures; pleurotergite brown, vaguely streaked with paler, katapleurotergite more pruinose. Pleura obscure yellow, vaguely patterned with brownish gray on ventral anepisternum and more evidently on the ventral sternopleurite and meron; dorsopleural membrane yellow with a blackened spot near posterior end of the pretergites. Halteres with stem light yellow, knob brownish black. Legs with coxæ yellow, with long yellow setæ; trochanters yellow with a brown spot beneath; femora brownish yellow, tips narrowly brownish black, bases very narrowly clearer yellow; tibiæ dark brown, tarsi brownish black; claws (female) very small, simple. Wings (Plate 2, fig. 24) whitish subhyaline, cell C and the stigma pale brown, cell Sc more yellowed; a restricted but conspicuous brown pattern, including darker areas at arculus, origin of Rs, anterior cord and at midlength of cell R₃; two paler brown clouds in outer half of cell M, with others in the anal cells, cell Cu virtually clear; narrow but conspicuous dark brown seams over medial and cubital veins, 2nd A and narrowly along the axillary border; veins brown, restrictedly yellow on R₃, R₄₊₅ and R₅. Squama naked; macrotrichia on longitudinal veins beyond cord, lacking on R₁₊₂; before cord with trichia on about the outer

two-thirds of M and 2nd A, more restricted on basal section of Cu₁ and 1st A, none on Rs. Venation: R₁₊₂ pale but preserved; Rs long, gently sinuous, nearly four times m-cu; cell M₁ about twice its petiole; cell 1st M₂ small, pentagonal, crossvein m the shortest element.

Basal abdominal tergites light brown, succeeding tergites yellow with a conspicuous continuous brown central stripe, sublateral darkenings much paler to virtually lacking, lateral borders narrowly yellow, sternites chiefly brownish yellow. Ovipositor with cerci slender, straight, blackened at bases, hypovalvæ broader, especially at bases.

Habitat.—India (Assam).

Holotype, female, Mawpyut, Khasi-Jaintia, altitude 4,000 feet, April 14, 1960 (*Schmid*).

The species is dedicated to Chenfu F. Wu, author of the invaluable *Catalogus Insectorum Sinensium* [Tipulidæ 5 (1939) 1-77]. The most similar species is *Tipula* (*Pterelachisus*) *striatipennis* Brunetti which has the general coloration somewhat the same, differing in the coloration of the antennæ, mesonotum and abdomen. The wing pattern suggests the condition in *striatipennis* but the quadrivittate darkened markings are less evident and vein R₁₊₂ is preserved. Particular attention is directed to the very large and conspicuous vertical tubercle.

Subgenus **TRIPLICITIPULA** Alexander

Tipula (*Triplitipula*) ALEXANDER, Pacific Insects (in press, 1965).

This subgenus was proposed for the so-called *triplex* group, formerly placed in *Lunatipula* Edwards, including many species in the Nearctic fauna, particularly in the West. With very slight modifications involving the male hypopygium, the subgenus may be extended to include the Asiatic *variipetiolaris* group, similarly placed in *Lunatipula*. The most recent discussion of the group is in a paper by the writer.⁴ As presently known it includes four species, all from unusually high altitudes in the mountains of western China, these being *Tipula* (*Triplitipula*) *barnesiama* Alexander, 1963—Southeastern Tibet, at 14,000 feet; *T.* (*T.*) *justa* Alexander, 1935—Western China

⁴ Alexander, C. P. Some Tipulidæ from Tibet and Upper Burma in the British Museum (Natural History) (Diptera). Bull. British Museum (Natural History) Ent. (7) 14 (1963) 319-340, 18 figs. (reference, pp. 330-331).

(Szechwan), at 15,200 feet; *T. (T.) minensis* Alexander, 1934—Western China (Kansu), at 9,850 feet; and *T. (T.) variipetiolaris* Alexander, 1933—China-Tibet border, at 14,000 feet.

The group agrees with *Triplicitipula* in the lack of a nasus and in certain important structures of the male hypopygium, including the ninth tergite, eighth sternite and especially the characteristic phallosome which is a depressed-flattened Y-shaped structure that is extended into flattened divergent arms, much as in the Nearctic species. The posterior border of the ninth tergite bears a pair of projecting intermediate lobules, as is found in many Nearctic species, while the structure of the eighth sternite similarly closely resembles the condition in several of the American species. It had been indicated that the squamal setæ were lacking in the present group but in the sparse Asiatic materials presently available to me they are present, as in the Nearctic species.

ILLUSTRATIONS

[Legend: *a*, aedeagus; *b*, basistyle; *d*, dististyle; *g*, gonapophysis; *id*, inner dististyle; *od*, outer dististyle; *p*, phallosome; *s*, sternite; *t*, tergite.]

PLATE 1

- FIG. 1. *Tipula* (*Sinotipula*) *callicoma* sp. nov.; venation.
2. *Tipula* (*Sinotipula*) *macquartina* sp. nov.; venation.
3. *Tipula* (*Sinotipula*) *meigeniana* sp. nov.; venation.
4. *Tipula* (*Emodotipula*) *fabriciana* sp. nov.; venation.
5. *Tipula* (*Schummelia*) *coulsoni* sp. nov.; venation.
6. *Tipula* (*Schummelia*) *cramptoniana* sp. nov.; venation.
7. *Tipula* (*Schummelia*) *kariyana* sp. nov.; venation.
8. *Tipula* (*Schummelia*) *kiddana* sp. nov.; venation.
9. *Tipula* (*Schummelia*) *oldhamana* sp. nov.; venation.
10. *Tipula* (*Schummelia*) *pagastiana* sp. nov.; venation.
11. *Tipula* (*Schummelia*) *pokornyana* sp. nov.; venation.
12. *Tipula* (*Schummelia*) *sphaerostyla* sp. nov.; venation.
13. *Tipula* (*Schummelia*) *verrallana* sp. nov.; venation.
14. *Tipula* (*Angarotipula*) *snodgrassiana* sp. nov.; venation.
15. *Tipula* (*Angarotipula*) *frommeri* sp. nov.; venation.
16. *Tipula* (*Angarotipula*) *xuthoptera* sp. nov.; venation.

PLATE 2

- FIG. 17. *Tipula* (*Formotipula*) *tjederana* sp. nov.; venation.
18. *Tipula* (*Acutipula*) *coeana* sp. nov.; venation.
19. *Tipula* (*Acutipula*) *limcana* sp. nov.; venation.
20. *Tipula* (*Indotipula*) *audcentiana* sp. nov.; venation.
21. *Tipula* (*Indotipula*) *belingana* sp. nov.; venation.
22. *Tipula* (*Indotipula*) *peusiana* sp. nov.; venation.
23. *Tipula* (*Pterelachisus*) *meijerella* sp. nov.; venation.
24. *Tipula* (*Pterelachisus*) *wuana* sp. nov.; venation.
25. *Tipula* (*Sinotipula*) *callicoma* sp. nov.; male hypopygium.
26. *Tipula* (*Sinotipula*) *macquartina* sp. nov.; male hypopygium.
27. *Tipula* (*Sinotipula*) *griseipennis* Brunetti; male hypopygium.
28. *Tipula* (*Sinotipula*) *meigeniana* sp. nov.; male hypopygium.

PLATE 3

- FIG. 29. *Tipula* (*Emodotipula*) *fabriciana* sp. nov.; male hypopygium.
30. *Tipula* (*Schummelia*) *coulsoni* sp. nov.; male hypopygium.
31. *Tipula* (*Schummelia*) *cramptoniana* sp. nov.; male hypopygium.
32. *Tipula* (*Schummelia*) *continuata* Brunetti; male hypopygium.
33. *Tipula* (*Schummelia*) *kariyana* sp. nov.; male hypopygium.
34. *Tipula* (*Schummelia*) *kiddana* sp. nov.; male hypopygium.
35. *Tipula* (*Schummelia*) *oldhamana* sp. nov.; male hypopygium.

PLATE 4

- FIG. 36. *Tipula* (*Schummelia*) *pagastiana* sp. nov.; male hypopygium.
37. *Tipula* (*Schummelia*) *pokornyana* sp. nov.; male hypopygium.
38. *Tipula* (*Schummelia*) *sphaerostyla* sp. nov.; male hypopygium.
39. *Tipula* (*Schummelia*) *verrillana* sp. nov.; male hypopygium.
40. *Tipula* (*Formotipula*) *tjederana* sp. nov.; male hypopygium.
41. *Tipula* (*Acutipula*) *cocana* sp. nov.; male hypopygium.
42. *Tipula* (*Acutipula*) *linneana* sp. nov.; male hypopygium.

PLATE 5

- FIG. 43. *Tipula* (*Angarotipula*) *snodgrassiana* sp. nov.; male hypopygium.
44. *Tipula* (*Angarotipula*) *frommeri* sp. nov.; male hypopygium.
45. *Tipula* (*Angarotipula*) *xuthoptera* sp. nov.; male hypopygium.
46. *Tipula* (*Indotipula*) *audcentiana* sp. nov.; male hypopygium.
47. *Tipula* (*Indotipula*) *belingana* sp. nov.; antenna of male.
48. *Tipula* (*Indotipula*) *belingana* sp. nov.; male hypopygium.
49. *Tipula* (*Indotipula*) *peusiana* sp. nov.; male hypopygium.
50. *Tipula* (*Pterelachisus*) *meijerella* sp. nov.; male hypopygium.

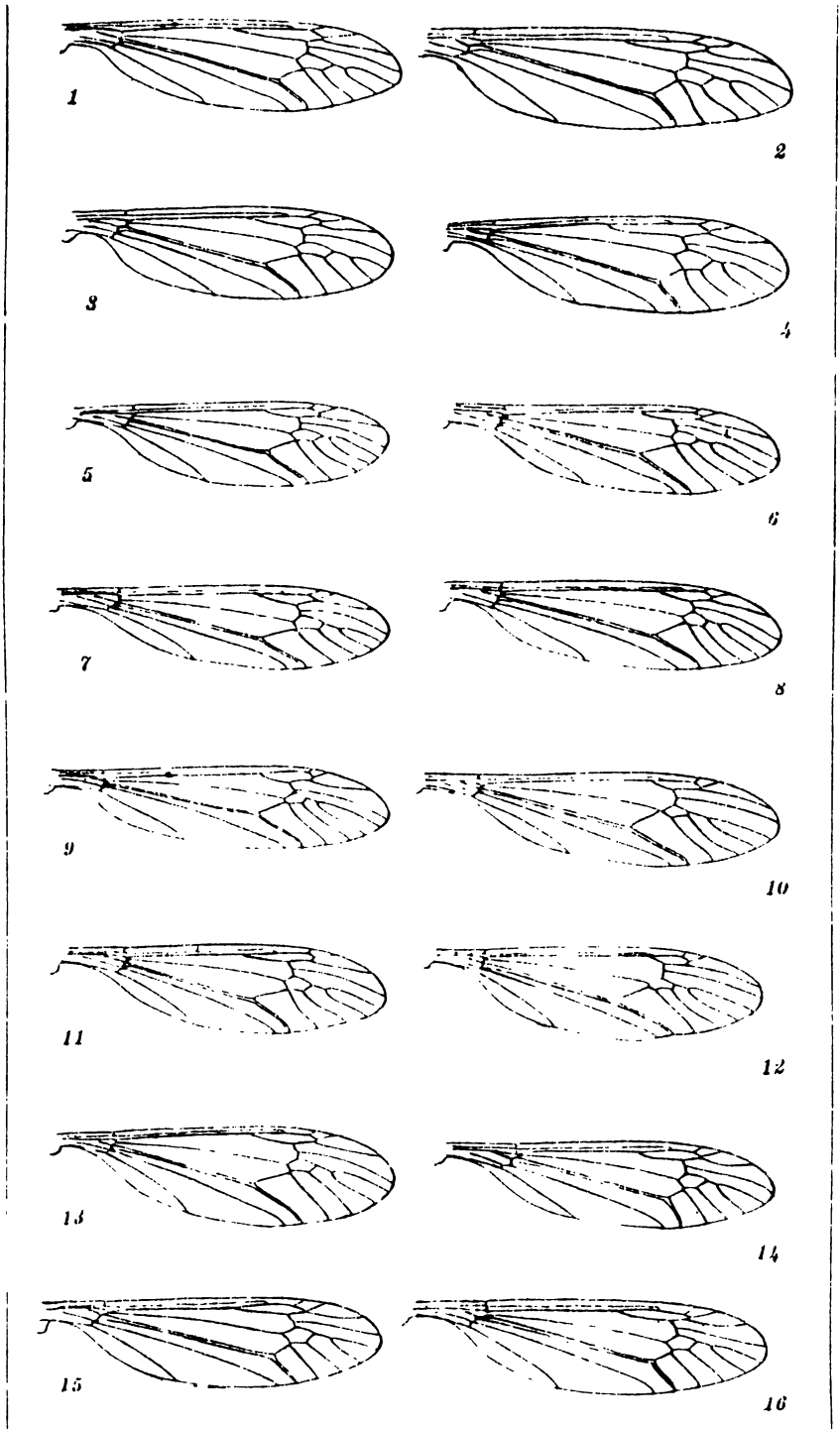
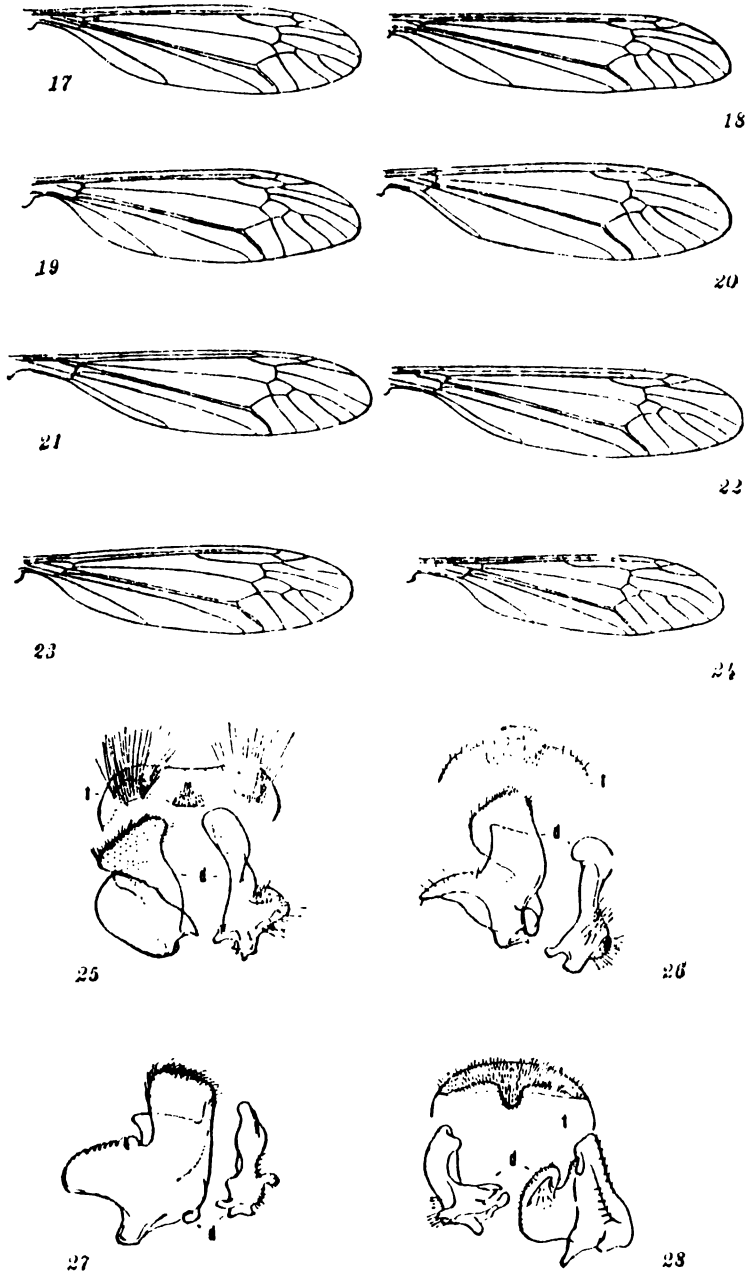


PLATE 1.



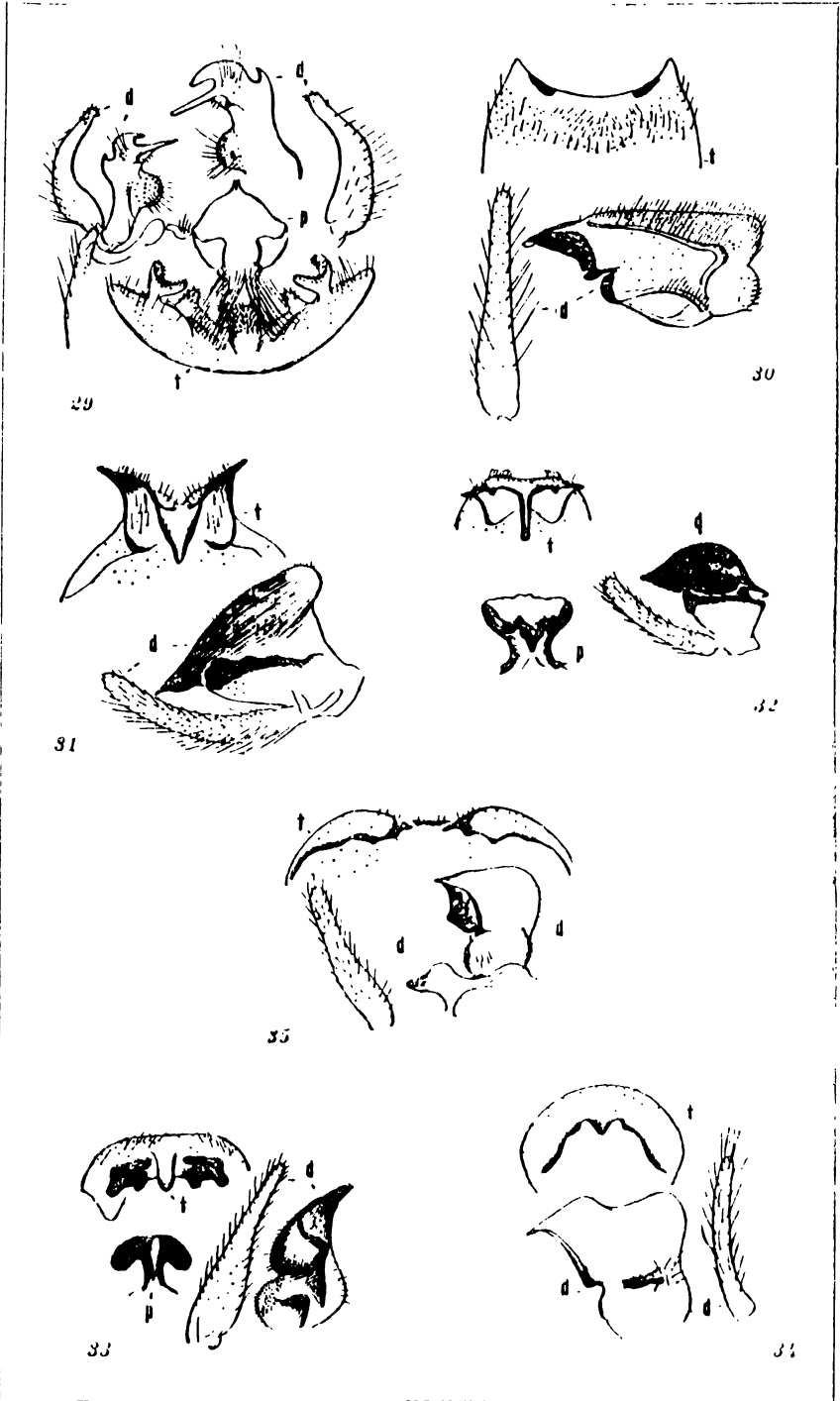


PLATE 3.

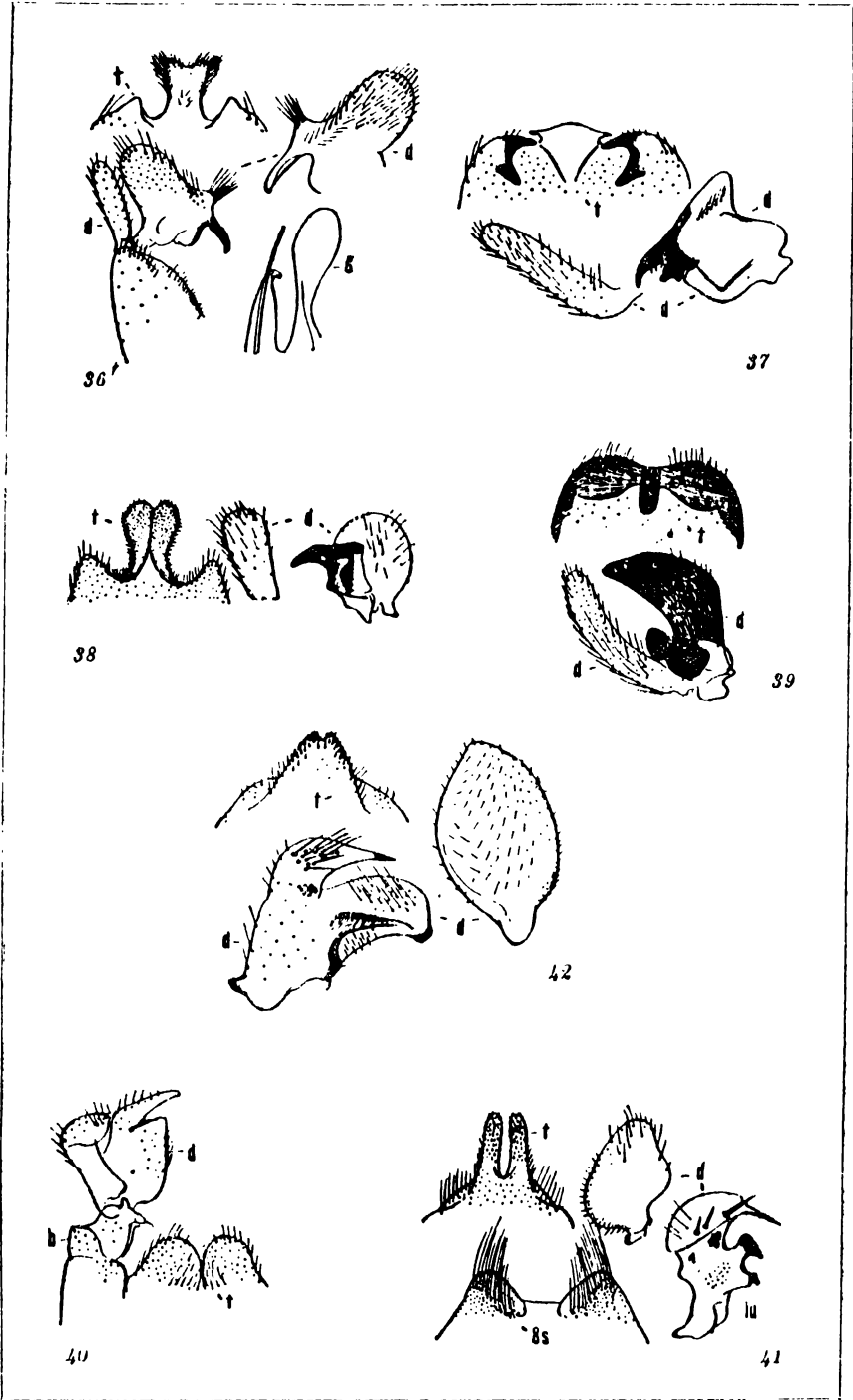


PLATE 4.

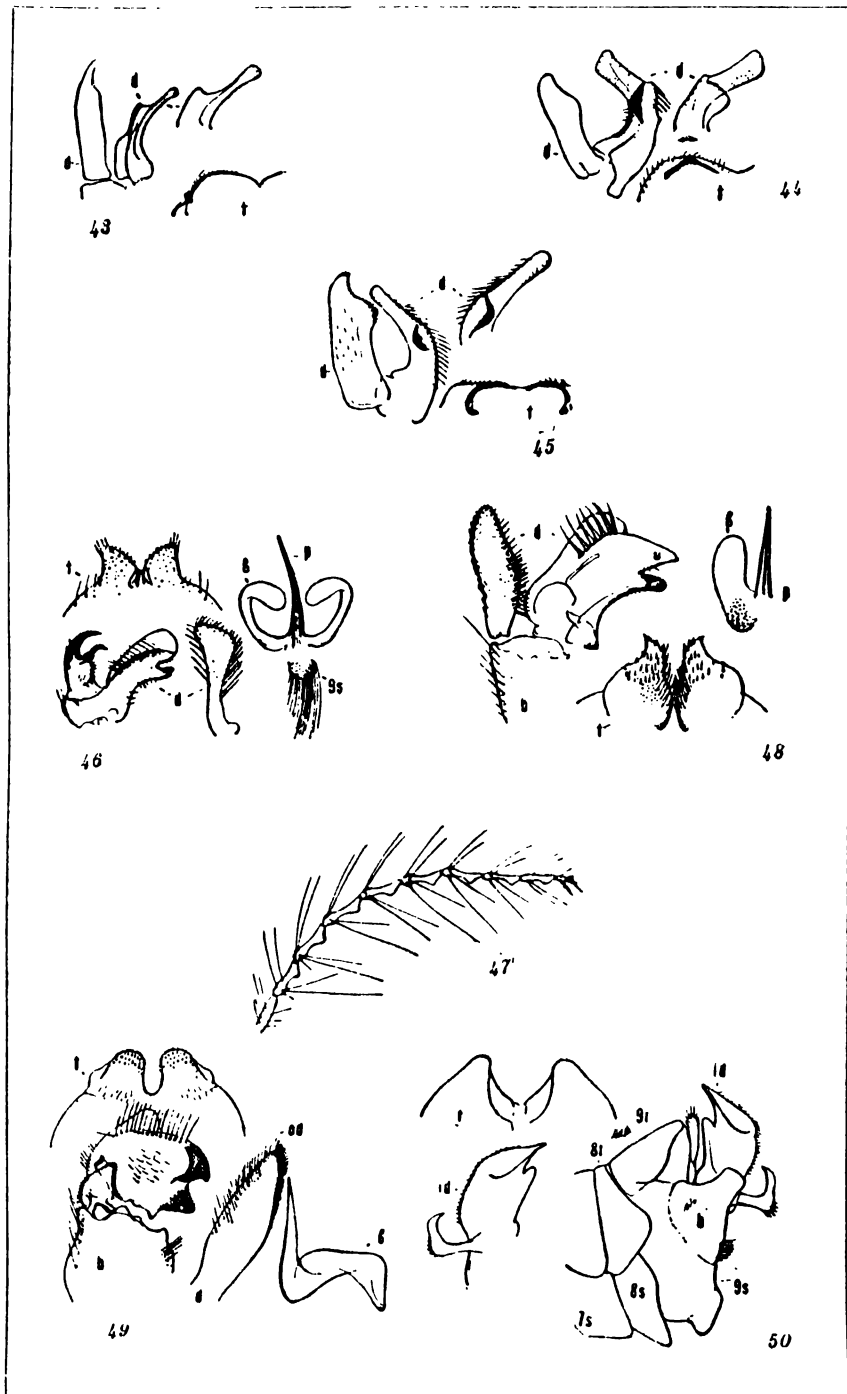


PLATE 5.