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NEW SUBGENERA AND SPECIES OF CRANE-FLIES FROM CALIFORNIA (Diptera: Tipulidae)

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Abstract: The paper is devoted to the major genus *Tipula* Linnaeus. Of the 42 subgenera presently recognized, 27 occur in the Nearctic fauna, 6 of which are characterized as new: *Eremotipula, Labiotipula, Serratipula, Setitipula, Tipulodinodes,* and *Triplicitipula.* A brief discussion of the male hypopygium in the genus is given, with a more detailed account of the clasping organs, or dististyles. All subgenera in the Nearctic fauna have been considered and dististyles of representative species illustrated.

The following 27 new species are defined, all being from California excepting *powelli* which is from Oregon. *Tipula (Beringotipula) donaldi*; *T. (B.) monoana*; *T. (Eremotipula) helferi*; *T. (E.) melanderiana*; *T. (E.) middlekauffi*; *T. (E.) schusteri*; *T. (Hesperotipula) arnaudi*; *T. (H.) chlorion*; *T. (H.) millardi*; *T. (Lindneria) shieldsi*; *T. (Lunatipula) biavicularia*; *T. (L.) kirkwoodiana*; *T. (L). lassenensis*: *T. (L.) macswaini*; *T. (L.) martini*; *T. (L.) powersi*; *T. (L.) raysmithi*; *T. (L.) schlingeri*; *T. (L.) yana*; *T. (Pterelachisus) cavagnaroi*; *T. (P.) jenseni*; *T. (Setitipula) esselen*; *T. (Sinotipula) coleomyia*; *T. (S.) powelli*; *T. (Trichotipula) kennedyana*; *T. (Triplicitipula) bellamyi*; and *T. (T.) idiotricha.*

For the past several years progress has been made on a study of the crane-flies of California, to be published as one of the Bulletins of the California Insect Survey. A number of new species have been discovered and are being described prior to the publication of the Bulletin in order to make the names available. At this time I am defining a number of subgenera and species, all belonging to the vast genus *Tipula* Linnaeus which is very greatly developed in western North America. In considering the proposed new subgenera it has seemed advisable to review briefly all such groups that are known to occur in America north of Mexico. In defining these subgenera particular emphasis has been placed on the structure of the male hypopygium and especially on the outer clasping organs or dististyles. These have been described briefly and a representative of each group has been figured to facilitate recognition. Twenty-seven new species are defined but these are not illustrated at this time since all are to be included in the forthcoming Bulletin. Specimens are deposited in the following institutions: Alexander Collection (Alexander coll.), California Academy of Science (CAS), California Insect Survey (CIS), and Kansas University (KU).

Field collecting in California by Mrs Alexander and myself began in 1946 and has been continued for many years, covering all sections of the state and at different seasons. In 1957, 1958 and 1959 such field work was supported by a grant from the National Science Foundation (G 5188), and in 1963 by a further grant (GB 740). This financial aid was most helpful and is gratefully acknowledged. In 1964, between January and July, I was

a member of the faculty in entomology at the University of California in Berkeley and much of the desk work and identifications of accumulated materials was done at that time. Detailed acknowledgements of assistance and cooperation by the many persons who have participated in the work will be made in the Bulletin. At this time I wish to express my thanks only to a few, including from the Berkeley campus, Dean E. Gorton Linsley, of the College of Agriculture, Dr Ray F. Smith, Chairman of the Department of Entomology and Parasitology, and Dr Dilworth D. Jensen, acting chairman of the Division of Entomology and Acarology. Very sincere appreciation is extended to Dr Robert L. Usinger, permanent chairman of the Division of Entomology and Acarology at Berkeley and President-elect of the Entomological Society of America. Dr Usinger first extended to Mrs Alexander and me the invitation to come to the University of California for the purposes indicated and so made possible the accomplishment of this work. During the course of the study assistance and advice concerning the preparation of the Bulletin were received especially from Drs Frank R. Cole, Paul D. Hurd, Jr, and Jerry A. Powell, of the University, and from Paul H. Arnaud, Jr, of the California Academy of Sciences in San Francisco. To all of these, and to many others to be acknowledged at a later date, my deepest thanks are extended.

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I THE MALE HYPOPYGIUM IN THE GENUS TIPULA

Although the structural characters found in the ♂ hypopyium have been used chiefly for species determination, some are of deeper significance and are available for the separation of subgenera. The characters most used in this connection are to be found in the 9th tergite (*9t*), 9th sternite (*9s*), basistyle (*b*), both dististyles (*d*), the phallosome (*p*) and the 8th sternite (*8s*). The dististyles are of primary importance and I am discussing and illustrating these structures for all of the Nearctic subgenera here recognized.

The dististyles. Figure 1 serves to indicate the location of these organs in relation to the remainder of the hypopygium. The major features of the inner style (*id*) are shown in figure 2 and may be considered briefly in conjunction with the remaining figures. The main body of the style extends anteriorly into a sclerotized lobe or point I have termed the *beak*, in cases very slender, in others stouter to very obtuse; on the anterior margin below the beak there is a comparable usually smaller projection, the *lower beak*. The outer or upper margin of the style back from the beak, in cases is elevated into a thin plate or blade, the *dorsal crest*, the end of which may be extended farther into the *posterior crest* (see figs 2, 7 and others). The base of the style on the outer margin commonly is developed into a variously modified lobe or spine that I had termed the *outer basal lobe* (*obl*) and which furnishes the single most important character for taxonomic purposes to be found in the hypopygium and therefore is considered in some detail.

Outer basal lobe. In some groups the lobe is not or scarcely developed (as in *Arctotipula*, figs 4, 5; *Platytipula*, fig 20; *Tipulodinodes*, fig 28). In *Labiotipula* (fig 13) it is re-

duced and crowded to the summit of the style, adjacent to posterior crest. The commonest appearance of the lobe is as a simple fleshy structure, provided variously with setae (as in figs 2, 14, 21, 22, 24, 25, 29 and 31). In *Angarotipula* (fig 3) and some others the lobe has been modified into a strong spine. In still other groups that do not appear to be closely related (as in *Tipula*, fig 27; some *Lunatipula*, fig 15, and the extra-limital *Tipulodina*), the lobe is divided into 2 arms or spines that I had designated as being the anterior and posterior arms or lobes. In still other subgenera (as *Yamatotipula*, fig 33), there is a comparable division of the outer basal lobe into separate smaller knobs or lobules. In a few groups, notably *Beringotipula* (fig 7) and *Eremotipula* (figs 8, 9) the outer basal lobe is very long and produced strongly backward. In *Beringotipula* this conspicuous structure almost invariably in the past had been interpreted as being an appendage of the 9th sternite, to which it adheres closely. I had considered it, as is done at this time, in 1942 (*Diptera of Connecticut*, p. 264) and in various later papers and believe the homologies as here stated to be correct. A somewhat comparable condition is found in *Eremotipula* (figs 8, 9) which includes several species in California.

The sensory area. A group of small hyaline pegs that is placed on or close to the base of the outer basal lobe and is of considerable importance in determining the location of this lobe when it has become complex or highly modified in structure. This area apparently is lacking or greatly reduced in several groups but in others, including the typical subgenus *Tipula*, is extensive and conspicuous, being comprised of numerous pegs (fig 27) which commonly are aggregated into a compact group but in others are long-extended or broken into isolated units. Too little use of this character has been made in past works. It has been illustrated for *Tipula paludosa* Meigen (Savchenko, 1961, Fauna USSR, p. 451, fig 276) and for *T. mediterranea* Lackschewitz (Mannheims, 1952, Die Fliegen **170**: 83, fig 43). In *Platytipula* (*moiwana* Matsumura, fig 20) the area appears as a disconnected series of pegs near the outer margin of the style before the reduced outer basal lobe.

The outer dististyle. This important structure is variously modified in the different groups, in some being a simple cylindrical lobe (*Hesperotipula*, figs 11, 12; *Lindneria*, fig 14; *Lunatipula*, figs 15, 16; *Setitipula*, fig 25, and others). In *Eremotipula* (figs 8, 9) it commonly is broadest at the base, conspicuously narrowed outwardly. In other subgenera the style is broader and more flattened, reaching an extreme in groups (such as *Arctotipula*, figs 4, 5; *Beringotipula*, fig 7; *Tipula*, fig 27; *Tipulodinodes*, fig 28). In 3 regional subgenera (*Bellardina*, fig 6; *Nippotipula*, fig 17, and *Sinotipula*, fig 26) the 2 dististyles are very unequal in size and irregular in outline, the outer style commonly being larger than the inner.

II The subgenera of the genus Tipula

During recent years and particularly since about 1915, the need for subdividing the vast and cumbersome genus *Tipula* became apparent and a small number of workers on the family, including particularly Alexander, Edwards, Mannheims, Matsumura and Savchenko, have proposed a considerable number of new subgeneric groups. Particular attention should be called to two outstanding series of publications by Mannheims and Savchenko on the Palearctic members of the genus. (Vide * on the next page.) Herewith I have provided a list of the more than 40 subgenera in *Tipula* as now recognized. It should be noted that Savchenko (*op. cit.*) considers that four of these groups deserve a higher rank and will be treated as genera in the Parts III and IV of his monographic treatment. The groups

in question are *Brithura* Edwards, *Tipulodina* Enderlein, *Anomaloptera* Lioy and *Indotipula* Edwards.

1. Nearctic subgenera

Angarotipula Savchenko, 1956	(type: *tumidecornis* Lundström)
Arctotipula Alexander, 1933	(type: *besselsi* Osten Sacken)
Bellardina Edwards, 1931	(type: *craverii* Bellardi)
Beringotipula Savchenko, 1961	(type: *unca* Wiedemann)
Eremotipula, n. subgen.	(type: *impudica* Doane)
Eumicrotipula Alexander, 1922	(type: *macrotrichiata* Alexander)
Hesperotipula Alexander, 1947	(type: *streptocera* Doane)
Labiotipula, n. subgen.	(type: *macrolabis* Loew)
Lindneria Mannheims, 1963	(type: *bistilata* Lundström)
Lunatipula Edwards, 1931	(type: *lunata* Linnaeus)
Nesotipula Alexander, 1921	(type: *pribilovia* Alexander)
Nippotipula Matsumura, 1916	(type: *coquilletti* Enderlein)
Nobilotipula Alexander, 1942	(type: *nobilis* Loew)
Odonatisca Savchenko, 1956	(type: *juncea* Meigen)
Platytipula Matsumura, 1916	(type: *moiwana* Matsumura)
Pterelachisus Rondani, 1842	(type: *bertei* Rondani)
Savtshenkia Mannheims, 1962	(type: *rufina* Meigen)
Schummelia Edwards, 1931	(type: *variicornis* Schummel)
Serratipula, n. subgen.	(type: *cylindrata* Doane)
Setitipula, n. subgen.	(type: *rusticola* Doane)
Sinotipula Alexander, 1935	(type: *exquisita* Alexander)
Tipula Linnaeus, 1758	(type: *oleracea* Linnaeus)
Tipulodinodes, n. subgen.	(type: *lacteipes* Alexander)
Trichotipula Alexander, 1915	(type: *oropezoides* Johnson)
Triplicitipula, n. subgen.	(type: *triplex* Walker)
Vestiplex Bezzi, 1924	(type: *cisalpina* Riedel)
Yamatotipula Matsumura, 1916	(type: *nova* Walker, as *Nohirae* Matsumura)

2. Extralimital subgenera

Acutipula Alexander, 1924	(type: *gaboonensis* Alexander)
Afrotipula Alexander, 1955	(type: *infracta* Alexander)
Anomaloptera Lioy, 1864	(type: *nigra* Linnaeus)
Brithura Edwards, 1916	(type: *imperfecta* Brunetti, as *conifrons* Edwards)
Dendrotipula Savchenko, 1964	(type: *flavolineata* Meigen)

* Mannheims, Bernhard. Die Fliegen der Palaearktischen Region (Lindner), Lief. 167, 170, 173 & 238 to date (1951–1963), concerning the Tipulinae of the western Palearctic region.

Savchenko, E. N. (spelled Savtshenko in earlier papers). (Russian title) Fauna U.S.S.R., No. 79, Diptera, II, no. 3 (1961, Part I); No. 89, no. 4 (1964, Part II). Parts III & IV to appear later will complete the Tipulinae. The two volumes now published include more than 600 Palearctic species in the genus *Tipula*.

Formotipula Matsumura, 1916	(type: *holoserica* Matsumura)
Indotipula Edwards, 1931	(type: *walkeri* Brunetti)
Mediotipula Pierre, 1924	(type: *fulvogrisea* Pierre)
Microtipula Alexander, 1912	(type: *amazonica* Alexander)
Neotipula Alexander, 1940	(type: *pectinella* Alexander)
Papuatipula Alexander, 1935	(type: *novae-britannicae* Alexander)
Pectinotipula Alexander, 1920	(type: *argentina* van der Wulp)
Sivatipula Alexander, 1964	(type: *mitocera* Alexander)
Spinitipula Alexander, 1963	(type: *spinimarginata* Alexander)
Tipulodina Enderlein, 1912	(type: *magnicornis* Enderlein)

3. Synonyms

Cinctotipula Alexander, 1915 (see *Trichotipula*)	(type: *algonquin* Alexander)
Geotipula Savchenko, 1964 (see *Pterelachisus*)	(type: *variipennis* Meigen)
Nephrotomodes Alexander, 1946 (see *Microtipula*)	(type: *smilodon* Alexander)
Nitidotipula Alexander, 1942 (see *Trichotipula*)	(type: *pachyrhinoides* Alexander)
Odontotipula Alexander, 1919 (see *Trichotipula*)	(type: *unifasciata* Loew)
Oreomyza Pokorny, 1887 (see *Pterelachisus*)	(type: *glacialis* Pokorny)

Subgenus **Angarotipula** Savchenko

Tipula (*Angarotipula*) Sav., 1961, Fauna U.S.S.R., Diptera II **3**: 347–53, figs. 206–13.

Type: *tumidecornis* Lundström, 1907 (Western Palearctic); [Original spelling *tumidecornis*; later (1915) emended to *tumidicornis* by Lundström and transferred to genus *Prionocera* Loew].

Nearctic species (including California)—*illustris* Doane (*fuscipennis* Loew, preoccupied).

Several species in southern and central Asia—*altivolans* Alexander, *indica* (Edwards), *rubzovi* Savchenko, *tokunagana* Alex., and others from India (*in press*, Alexander, Philip. J. Sci., Asia, Part 56).

The closest affinities appear to be with *Arctotipula* Alexander. Antenna with basal verticils lacking, as in *Prionocera* Loew, the vestiture consisting of abundant short erect setae; flagellar segments more dilated on proximal 1/2. All other subgenera in *Tipula* have strong verticils on the enlarged bases of the flagellar segments. Male hypopygium in some species (fig 3) with the outer basal lobe of inner dististyle modified into a strong curved spine, lacking in most Old World forms. Phallosome a central plate with the gonapophyses united with the aedeagus, their short free ends obtusely rounded.

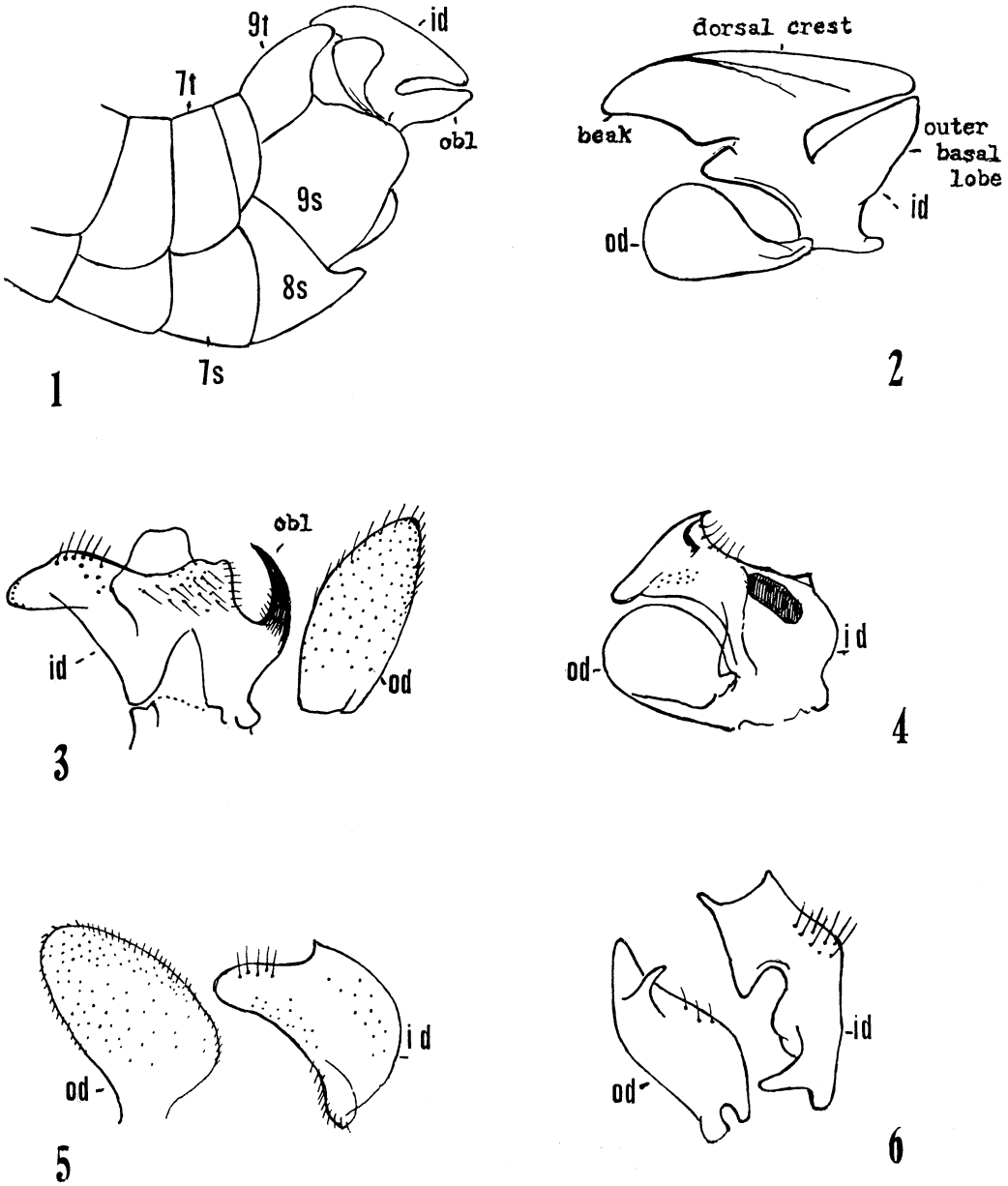
Subgenus **Arctotipula** Alexander

Tipula (*Arctotipula*) Alex., 1933, Philip. J. Sci. **52**: 410–11; 1935, *ibid.* **57**: 116–17.—Mannheims, 1953, Die Fliegen der Palaearktischen Region **173**: 113–16, fig. 66.—Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 311–47, figs. 187–205.

Type: *besselsi* Osten Sacken (Arctic North America).

Holarctic in distribution, with about 12 species in North America, in the east with one species reaching the mountains of Tennessee and South Carolina. One species, *plutonis*

Alexander, occurs in California, with various others in the Pacific Northwest, including *bakeriana* Alex., *kincaidi* Alex. and *semidea* Alex. Several species in subarctic Eurasia.



Figs. 1-6. 1, *Tipula* (*Lunatipula*) *bisetosa* Doane, lateral aspect of abdomen; 2, same, dististyles; 3, *T.* (*Angarotipula*) *illustris* Doane, dististyles; 4, *T.* (*Arctotipula*) *besselsi* Osten Sacken, dististyles; 5, *T.* (*Arct.*) *plutonis* Alexander, dististyles; 6, *T.* (*Bellardina*) *schizomera* Alex., dististyles (Symbols: *id*, inner dististyle; *obl*, outer basal lobe; *od*, outer dististyle; *s*, sternite; *t*, tergite).

Male hypopygium with outer dististyle very large, broad, its vestiture short and pale, inconspicuous. Inner dististyle (figs 4, 5) with beak distinct, obtuse, lower beak not developed. Several species have this simple condition much modified, especially the posterior and outer basal lobes, in the Pacific American species reaching an extreme in *bakeriana*. In *semidea* the sensory area is very large and conspicuous, including about 30 units. The Californian *plutonis* has the dististyles unusually simple (fig 5) and with the phallosomic gonapophyses rudimentary. The wing veins in virtually all species are unusually glabrous.

Subgenus **Bellardina** Edwards

Tipula (*Bellardina*) Edw., 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 82. For other references to *Bellardina* see under *Sinotipula* Alex.

Type: *craverii* Bellardi (erroneously spelled *cravieri* by Edwards) (Neotropical).

This subgenus, together with *Nippotipula* and *Sinotipula*, includes most of the large and showy members of the genus in the Nearctic region. All 3 groups have the wings conspicuously patterned, commonly marmorate or marbled, and all have both dististyles of the hypopygium complex and modified, including the outer style which elsewhere is small and simple.

As originally proposed by Edwards, and as here restricted, the group is entirely New World and chiefly Neotropical, with most species occurring in western South America, Central America and Mexico, with a few species being found in the southwestern United States. The only species found to date in California is *schizomera* Alexander, the other Nearctic species including *albimacula* Doane, *praelauta* Alex., *pura* Alex., and *rupicola* Doane. The other more numerous species that have been placed in *Bellardina* in the past now are referred to the subgenus *Sinotipula* Alex., including several in western North America and a host of species in Asia, particularly in the Himalayas and western China.

The most characteristic features of the ♂ hypopygium include the generalized nature of the principal sclerites, the tergite, sternite and basistyle, all of which are separated by deep sutures, and by a characteristic bilobed appendage borne by the 9th sternite. The dististyles of *schizomera* are shown (fig 6).

Subgenus **Beringotipula** Savchenko

Tipula (*Beringotipula*) Sav., 1961, Fauna U.S.S.R., Diptera II **3**: 471-80, figs. 290-95.

Type: *unca* Wiedemann (Palearctic).

When defining the subgenus Savchenko recognized a single Palearctic species, the type, with an eastern Asiatic subspecies, *unca amurensis* Alexander, 1925. In the Nearctic fauna there are numerous species that are listed in full (under the subgenus *Oreomyza*) in the forthcoming *Catalog of the Diptera of America north of Mexico*. The following species are known to occur in California—*coloradensis* Doane, *comstockiana* Alex., *donaldi* n. sp., *dorothea* Alex. *fallax* Loew (syn., *olia* Doane), *inyoensis* Alex., *madera* Doane, *monoana* n. sp., and *newcomeri* Doane.

The most distinctive subgeneric characters are found in the ♂ hypopygium, particularly the inner dististyle (fig 7). This style has the outer basal lobe, *obl*, extended posteriorly as a long blade that bears 2 or 3 lateral lobes, in some cases, at least, the most basal

one being heavily sclerotized. This blade is closely applied or partially confluent with the 9th sternite. Earlier workers, following Snodgrass (1904) had considered this posterior prolongation to represent an appendage of the 9th sternite (Dietz, Doane, Frommer and others) but in reality it appears to be the outer basal lobe of the inner dististyle and is so construed herewith. A somewhat comparable extension of the outer basal lobe is likewise found in certain specialized members of the subgenus *Eremotipula*, n. subgen. (figs 8, 9).

Alexander, C. P. 1942 Diptera or True Flies of Connecticut. **1**: 264-66.

Dietz, W. G. 1914 The *hebes* group of the Dipterous genus *Tipula* Linnaeus. Trans. Am. Ent. Soc. **40**: 345-63, 24 figs.

Doane, R. W. 1911 *Tipula fallax* and others. Psyche **18**: 160-66, 2 figs.

Frommer, Saul I. 1963 Gross morphological studies of the reproductive system in representative North American crane flies (Diptera: Tipulidae). Univ. Kansas Sci. Bull. **44**: 535-626, 3 text figs., pls. 1-20 with 127 figs.

Snodgrass, R. E. 1904 The hypopygium of the Tipulidae. Trans. Am. Ent. Soc. **30**: 179-236, pls. 8-18 with 161 figs. (reference, p. 223, figs. 133-135, 137, 138).

Subgenus **Eremotipula** Alexander, n. subgen.

Proposed for the *impudica* group, formerly placed in *Lunatipula* Edwards.

Type of subgenus: *Tipula* (*Eremotipula*) *impudica* Doane (Nearctic). Dietz, W. G., 1921, Ann. Ent. Soc. Am. **14**: 1-15, 10 figs.

All known species are western Nearctic, from Colorado westward, being especially characteristic of the Great Basin and adjacent semiarid regions, whence the suggested name. Californian species include *biproducta* Alexander, *carunculata* Alex., *helferi* n. sp., *leiocantha* Alex., *macracantha* Alex., *melanderiana* n. sp., *middlekauffi* n. sp., *pellucida* Doane, and *schusteri* n. sp. Other species are *albocincta* Doane, *coconino* Alex., *dimidiata* Dietz, *diversa* Dietz, *kaibabensis* Alex., *lyrifera* Dietz, *madina* Dietz, *mitrata* Dietz, *pellucida* Doane (synonyms, *clara* Doane, *pyramis* Doane), *sinistra* Dietz, *spaldingi* Dietz, *spernata* Dietz, *utahicola* Alex., and *woodi* Alex.

Frontal prolongation of head relatively long, subequal to or a little shorter than remainder; nasus either lacking or small; antenna short or of medium length. Tibial spur formula 1-2-2; claws of ♂ toothed. Wing with squama setose.

Male hypopygium with genital chamber as viewed from above widely open, due to posterior extension of basistyle and sternite, in conjunction with the unusually small 9th tergite. The latter structure distinctive, conspicuously incised medially above, more ventrally the posterior end with a central lobe, the *subtergal process* (Dietz 1921); on either side of midline with an acute to obtuse spine (*canthus* Dietz); lateral tergal margins produced into more or less spinous points. Outer dististyle narrowed outwardly. Inner dististyle with outer basal lobe (figs 8, 9) deeply incised or constricted at its origin, in some species (*biproducta*, *carunculata*, *diversa*, *lyrifera*) greatly lengthened, subequal to the remainder of style and directed posteriorly, evidently homologous with the comparable structure in *Beringotipula* (fig 7); sensory area at base of outer basal lobe. Basistyle in cases produced into an anterior spine and, in cases, with a posterior extension, long and conspicuous in *biproducta*. Phallosome produced into a central structure, apex more dilated, in various species bearing spines, some recurved, the basal sclerotized plates divergent. Eighth

sternite without lateral lobes, the median region in cases more or less produced, in *pellucida* with an additional more dorsal elongate tongue-like extension; posterior margin with elongate setae, in some species the lateral parts with more strongly modified bristles.

Subgenus **Eumicrotipula** Alexander

Microtipula (*Eumicrotipula*) Alex., 1922, Bull. Mus. Hist. Nat. Paris **1922**: 74–75.
Tipula (*Eumicrotipula*) Alex., 1946, Revista Ent. **17**: 172–201, 7 figs.

Type: *macrotrichiata* Alex. (Neotropical).

Eumicrotipula includes a vast aggregation of Neotropical crane-flies, with 2 species extending into the Nearctic region in Arizona—*chiricahuaensis* Alex. and *werneri* Alex. The most recent general discussion of the subgenus is by Alexander (1946). When adequately known this group may well prove to be the largest in number of species of all recognized subgenera in the genus. The only others of comparable extent would seem to be *Lunatipula* Edwards in the Holarctic region and *Microtipula* Alex. in the Neotropical.

Subgenus **Hesperotipula** Alexander

Tipula (*Hesperotipula*) Alex., 1947, Ent. News **58**: 63–64.

Type: *streptocera* Doane (Nearctic).

A relatively large group with virtually all of the known species restricted to California. *Tipula streptocera* and *fragmentata* have wider ranges; *trypetophora* Dietz is known from British Columbia, *coronado* Alexander from Arizona. The following species occur in California—*aitkeniana* Alex., *arnaudi* n. sp., *californica* (Doane), *chlorion* n. sp., *chumash* Alex., *circularis* Alex., *contortrix* Alex., *derbyi* Doane, *fragmentata* Dietz, *linsdalei* Alex., *linsdalei obispoensis* Alex., *micheneri* Alex., *mutica* Dietz, *opisthocera* Dietz, *ovalis* Alex., *sanctae luciae* Alex., *streptocera* Doane, *supplicata* Alex., and *sweetae* Alex.

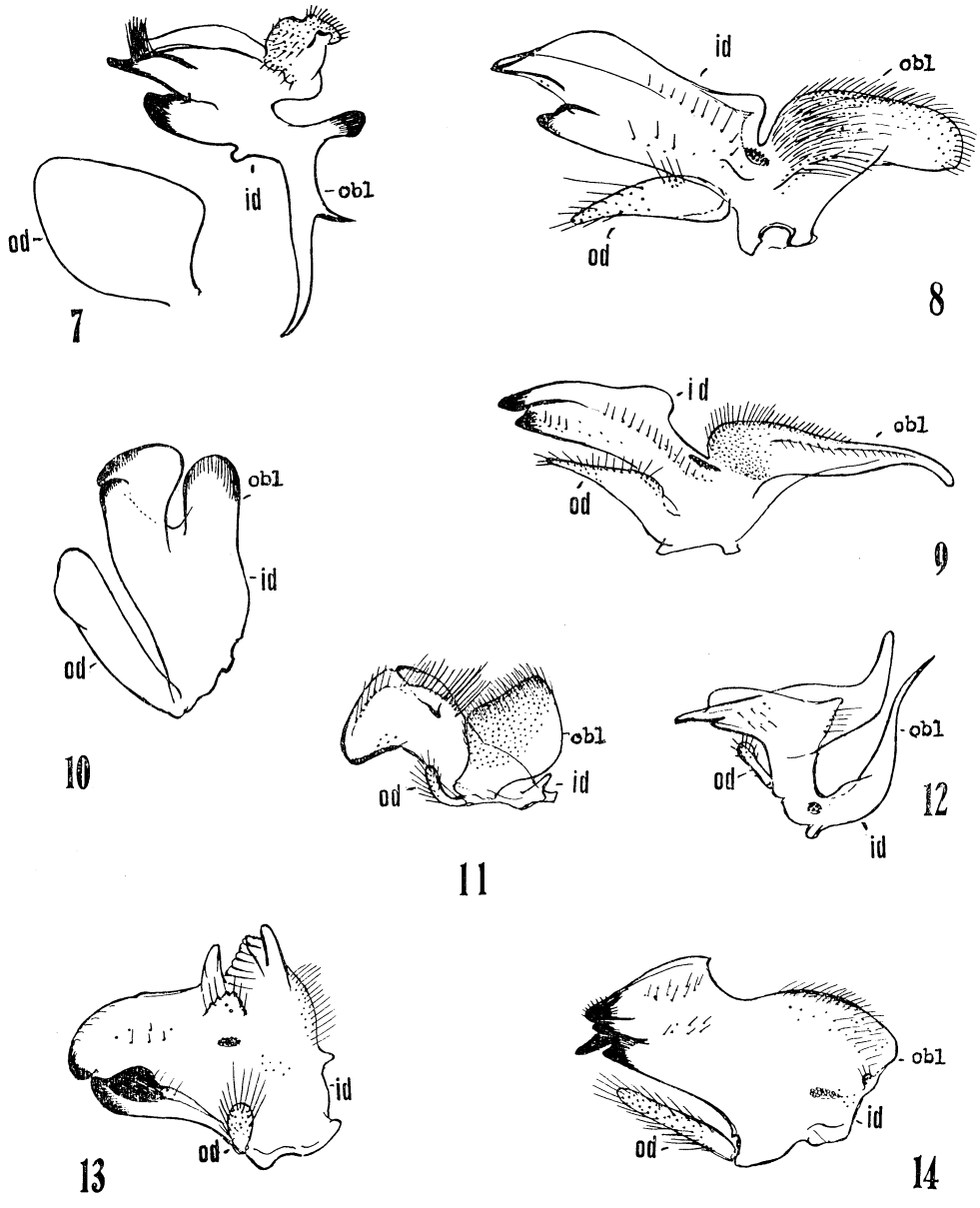
Frontal prolongation of head subequal to remainder; nasus small but distinct. Squama with setae. Wings with sparse trichia in stigma and outer cells. Male hypopygium with base of 8th tergite concealed by the 7th, the exposed part semicircular in outline. Ninth tergite relatively small, margin with 2 sets of lobes, a dorsal pair with a 2nd set beneath. Ninth sternite enlarged; basistyle with suture complete, in most species produced into elongate horns or blades, commonly flattened and twisted; in a few species (as the *californica* group, *derbyi*, *sanctae luciae*) shorter. Eighth sternite produced, more or less sheathing, narrowed outwardly and provided with setal cushions.

Outer dististyle (figs 11, 12) a small long-oval lobe, with elongate setae. Inner style distinctive for each species, with strongly differentiated beak, posterior crest and outer basal lobe.

The aberrant groups above mentioned include *californica*, *aitkeniana* and *sweetae*; *derbyi*; and *sanctae luciae*. In *derbyi* the tergite is elevated, the basistyle only slightly produced into a short subtriangular blade; in *sanctae luciae* the basistyle is large, its ventral angle produced into an acute point but not otherwise modified. The outer basal lobe of the inner dististyle is produced into a large sclerotized scoop-like blade that simulates an outer dististyle.

The ovipositor in the typical group has the cerci very small, the tips obtusely rounded.

In the *californica* group, with the 3 species above listed, the ovipositor is more as in *Lunatipula*, with both the cerci and hypovalvae elongate and sclerotized.



Figs. 7–14. 7, *T.* (*Beringotipula*) *comstockiana* Alex., dististyles; 8, *T.* (*Eremotipula*) *impudica* Doane, dististyles; 9, *T.* (*Erem.*) *carunculata* Alex., dististyles; 10, *T.* (*Eumicrotipula*) *chiricahuaensis* Alex., dististyles; 11, *T.* (*Hesperotipula*) *chumash* Alex., dististyles; 12, *T.* (*Hesp.*) *californica* (Doane), dististyles; 13, *T.* (*Labiotipula*) *macrolabis* Loew, dististyles; 14, *T.* (*Lindneria*) *neptun* Dietz, dististyles (Symbols: *id*, inner dististyle; *obl*, outer basal lobe; *od*, outer dististyle).

Subgenus **Labiotipula** Alexander, n. subgen.

Proposed for the *macrolabis* group, formerly placed in *Lunatipula* Edwards.

Type of subgenus: *Tipula* (*Labiotipula*) *macrolabis* Loew (northern North America and northeastern Asia).

Other species include *leechi* Alex., of California and northwards, and *youngi* Alex., of eastern North America. Savchenko (1964, Fauna U.S.S.R., Diptera II **4**: 269–72) retains the species in *Lunatipula* as the *macrolabis* group.

Based primarily on the structure of the ♂ hypopygium. Ninth tergite quadrate, the posterior border produced into broad triangular submedian blades, with a slender median lobe. Basistyle produced caudad into powerful blade-like arms, simple and paddle-like in *macrolabis* and *leechi*, the apices spinous in *youngi*. Outer dististyle (fig 13) small, oval, with very long setae that exceed the style; inner style with region of dorsal and posterior crests elevated and variously armed with small lobes and blades; outer basal lobe rudimentary or undeveloped; sensory area small but evident, near center of the disc of style. Phallosome with aedeagus a simple flattened blade, narrowed to slightly decurved tip, apophyses not developed. Eighth sternite narrowed outwardly, with lateral setal brushes, a few of which are more powerful and modified.

Subgenus **Lindneria** Mannheims

Tipula (*Lindneria*) Mann., 1963, Stuttg. Beitr. Naturk., **102**: 22.

Type: *bistilata* Lundström (Palearctic).

A small group of Holarctic distribution. In the Palearctic region, the type, *b. bistilata* and an eastern cline, *bistilata lundstroemiana* Alex., also *dershavini* Alex. and *subexcisa* Lundström. A few further species in the Nearctic region, including *shieldsi* n. sp., of California, together with *illinoisensis* Alex. (*versicolor* Loew), *neptun* Dietz, *senega* Alex. (*pallida* Loew), *serta* Loew (*albonotata* Doane, *discolor* Loew, *ignota* Alex.), and *subserta* Alex.

Because of the lack of squamal setae, Alexander (Diptera of Connecticut, 1942: 260–75) had referred the species to the subgenus *Oreomyza* Pokorny (now in *Pterelachisus* Rondani), within the limits of the *trivittata* group. Savchenko (Fauna U.S.S.R., Diptera II **4**: 328–35) placed the Palearctic species in *Lunatipula* Edwards as the *bistilata* group.

The oldest and best known species is *serta*, common and widely distributed throughout northern North America. The various species all are closely inter-allied and are most readily separated by the modified structure located on the 8th and 9th sternites of the ♂ hypopygium. This is a simple or bispinous appendage that is placed on the posterior margin of the 8th sternite or on the extreme anterior border of the 9th sternite.

Nasus lacking. Male hypopygium having the tergite with a characteristic armature on posterior border, including 2 widely separated dorsal spines and a larger more ventral pair of blades that are produced mesad into strong blackened points; median area with a strong central projection. Outer dististyle (fig 14) elongate, with strong setae. Inner style of characteristic form, the beak and lower beak crowded, produced into 3 or 4 blackened lobes or points; dorsal crest low, posteriorly terminating in a small pale triangular point; outer basal lobe very stout, its area subequal to body of style; sensory area placed far back on outer basal lobe. Aedeagus narrowed to an acute point, before apex with a

similar appressed recurved spine. Gonapophyses lacking, their position occupied by elongate pale lobes of the 9th sternite. Eighth sternite as described in the preceding paragraph. Ovipositor with both cerci and hypovalvae long and slender with smooth margins.

Subgenus **Lunatipula** Edwards

Tipula (*Lunatipula*) Ed., 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 81-82.—Alexander, 1935, Philip. J. Sci. **57**: 130-31.—Mannheims, 1963, Die Fliegen der Palaearktischen Region **238**: 137-76, figs. 84-127 (to be continued).—Savchenko, 1964, Fauna U.S.S.R., Diptera II **4**: 229-441, figs. 163-337.

Type: *lunata* Linnaeus (Palearctic).

Lunatipula, as presently restricted, still includes a host of species distributed throughout the Holarctic region with a sparse occurrence in the Oriental and extreme northern Neotropical regions. Savchenko (1964) distributes the Palearctic species in 25 groups with more than 150 species. Mannheims (1963) recognizes 18 groups in the western Palearctic fauna. There are fewer species in the Nearctic region, particularly after the removal of certain groups that formerly were assigned to *Lunatipula*, as follows:

Eremotipula n. subgen.-*impudica* group.
Hesperotipula Alexander-*streptocera* group.
Labiotipula n. subgen.-*macrolabis* group.
Triplicitipula n. subgen.-*triplex* group.

It is possible that still other subgenera will be required for certain groups still retained in *Lunatipula*.

The ♂ hypopygium shows a great range in complexity of the various structures, particularly the dististyles (figs 1, 2, 15, 16) and the 8th sternite. In several species the outer basal lobe of the inner dististyle is profoundly divided into 2 separate lobes (fig 15) as previously discussed.

Subgenus **Nesotipula** Alexander

Tipula (*Nesotipula*) Alex., 1921, Proc. Calif. Acad. Sci. ser. 4, **11**: 183-84.

Type: *pribilovia* Alexander (Nearctic).

The status of this group still is in question. The only known species is the type, described from the Pribilof Is., Alaska, and still known only from the types consisting of 2♀ specimens. As indicated in the original description the venation combines certain characters of both *Tipula* and of *Nephrotoma* Meigen. The present evidence indicates the possibility that the type materials refer to *Tipula* (*Yamatotipula*) *lionota coracina* Alex., described from northern Alaska and still known only from the ♂ sex. I am considering *coracina* as being at least subspecifically different from the Palearctic *lionota* Holmgren which still is known to me only from the literature. The figure by Savchenko (1961, Fauna U. S. S. R., Diptera II, **3**: 310, fig. 186) of the hypopygium of *lionota* shows slight differences in the tergite and in both dististyles. In typical *coracina* the tergal lobes are obtusely rounded and microscopically roughened, the central emargination not circular in outline. The apex of the inner dististyle is broadly obtuse, dorsal crest high, and the distal end of the outer basal lobe different in shape.

Subgenus **Nippotipula** Matsumura

Nippotipula Matsum., 1916, Thousand Insects of Japan, Add. **II**: 457–58.
Tipula (*Nippotipula*) Edwards, 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 77.—Alexander, 1935, Philip. J. Sci. **57**: 91–94.—Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 122–31, figs. 63–68.

Type: *coquilletti* Enderlein, as *nubifera* Coquillett (preoccupied).

A small group of large and conspicuous flies with handsomely patterned wings. There are 2 Nearctic species, both in eastern North America, and a few others in eastern and central Asia.

The ♂ hypopygium has the 2 dististyles very dissimilar in appearance, with the outer style much larger than the inner (fig 17), a condition suggestive of *Bellardina* Edwards and *Sinotipula* Alexander.

Subgenus **Nobilotipula** Alexander

Tipula (*Nobilotipula*) Alex., 1942, Diptera or True Flies of Connecticut **1**: 239–40.

Type: *nobilis* Loew (eastern Nearctic).

There are 2 species in the Nearctic region, the other being *collaris* Say. Two further species occur in eastern and central Asia.

Male hypopygium with outer dististyle (fig 18) elongate, more or less flattened. Inner style with both beak and lower beak well developed; a further blackened lobe or spine at base of beak, directed outwardly; in *collaris*, as figured, the outer basal lobe is developed as a powerful rod that is subequal in length to the outer style, lobe lacking in type, *nobilis*. Important subgeneric characters are to be found in the ovipositor where the valves are greatly reduced, the cerci appearing as oval setiferous cushions, the hypovalvae as similarly short flattened blades, their tips subtruncate. The wing veins posterior to *R* are virtually glabrous.

Subgenus **Odonatisca** Savchenko

Tipula (*Odonatisca*) Savc., 1956, Survey of the palaearctic species of crane-flies (Diptera, Tipulidae) of the *Tipula juncea* Meigen group. Kiiv. Derzhavnii Univ. *In* T. G. Shevchenko, Nauk. Zap. **15**(3): 129–48, 6 figs.; 1964, Fauna U. S. S. R., Diptera II **4**: 441–58, figs. 338–51.

Type: *juncea* Meigen (western Palearctic).

Besides the type there are a few other species and races in the northern Palearctic region. In the Nearctic fauna the only species in California is *optiva* Alex., with a few other more northern forms, including *breviligula* Alex., *pribilofensis* Alex., *subarctica* Alex., and *taenigaster* Alex.

The species of *Odonatisca* earlier had been included in *Vestiplex* Bezzi by Alexander, Hemmingsen and others but well deserve separate recognition. The ♂ hypopygium has the outer dististyle (fig 19) elongate, the inner style with the beak very slender and the outer basal lobe produced backward, in several species very conspicuously so. The posterior border of the 8th sternite is produced caudad into a depressed-flattened pale lobe. In the

♀ the abdomen is greatly lengthened and the valves of the ovipositor modified to facilitate deep boring egg laying in soil, as well discussed in a series of papers by Hemmingsen.

Hemmingsen, Axel M. 1952 The oviposition of some crane-fly species (Tipulidae) from different types of localities. Vidensk. Medd. fra Dansk naturh. Foren. **114**: 365-430, 6 figs.
1956 Deep-boring ovipository instincts of some cranefly species (Tipulidae) of the subgenera *Vestiplex* Bezzi and *Oreomyza* Pok. and some associated phenomena. *Ibid.* **118**: 243-315, 16 figs.
1959 A crane-fly larva (*Tipula juncea* Meigen) living in blown sand. Ent. Medd. **29**: 46-64, 7 figs.
1960 The function of some remarkable crane-fly ovipositors. *Ibid.* **29**: 221-47, 14 figs.

Subgenus **Platytipula** Matsumura

Platytipula Matsumura, 1916, Thousand Insects of Japan, Add. **II**: 488-89, plate 25, fig. 2 (♀).
Tipula (*Platytipula*) Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 49-97, figs. 13-32.

Type: *moiwana* Matsumura (eastern Palearctic).

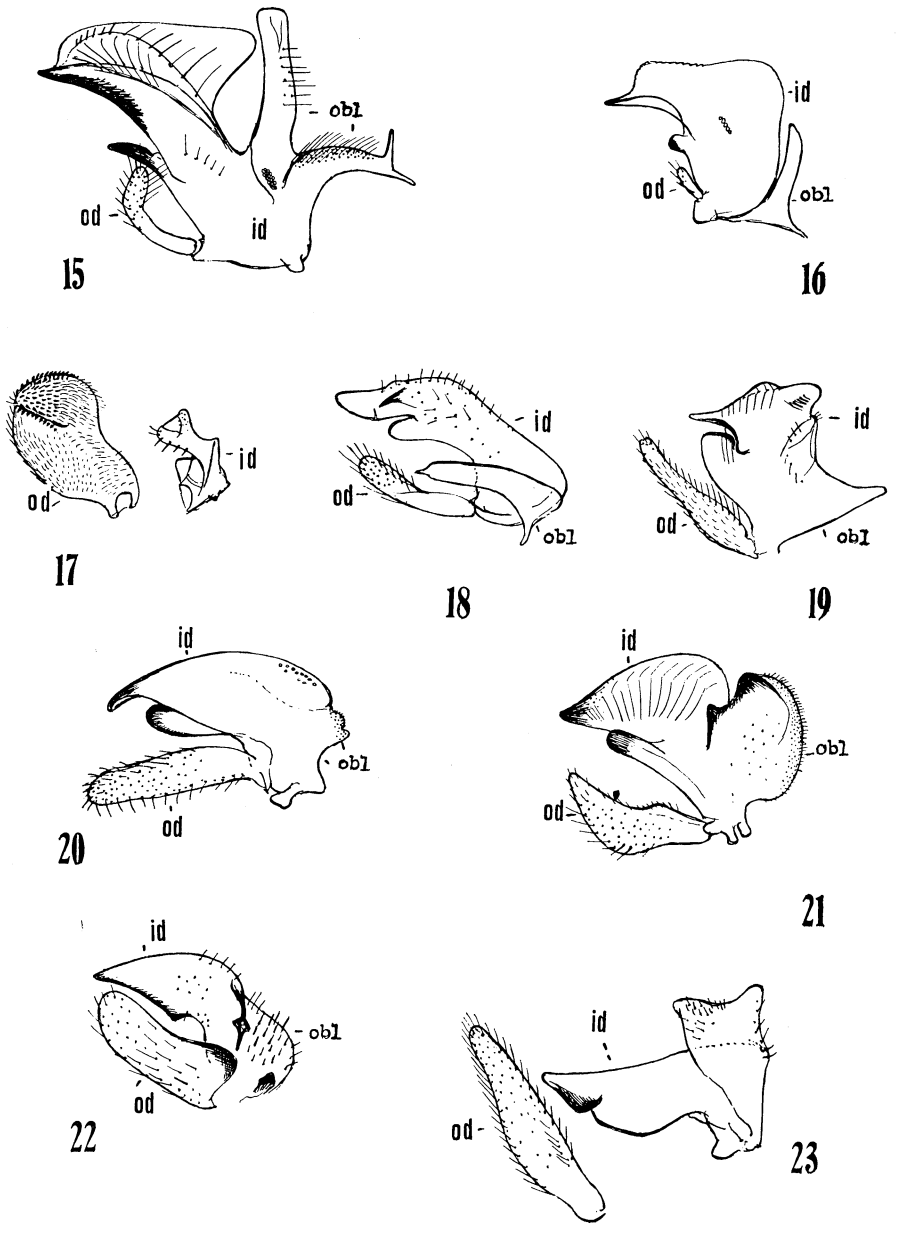
For a long period *Platytipula* was not considered as valid, being included in the typical subgenus *Tipula* Linnaeus by Edwards and followed therein by Alexander, Mannheims, Theowald and others. It now appears that the group is distinct. Eleven Nearctic species are currently recognized with two, *carinata* Doane and *spenceriana* Alex., being regional to California while not yet having been taken in the state.

In his original description of the subgenus *Schummelia*, Edwards (1931: 80-81) included a considerable number of species belonging to what he termed the *continuata* group, based on the Oriental *continuata* Brunetti. Savchenko (1961) has transferred this group of species to *Platytipula* but for the present at least it seems advisable to retain such flies in *Schummelia* although they disagree with the subgeneric characters of the latter in some regards, as discussed later under that group. It seems possible that a further new subgenus may be required for their reception.

The ♂ hypopygium of the type, *moiwana*, has the outer dististyle (fig 20) relatively long and moderately flattened; the inner style with the outer basal lobe reduced to a small irregular cushion. The long-extended sensory area lies along the extreme outer margin of the style immediately before the outer basal lobe, the individual elements being disconnected, not forming a compact group as is common in the genus. The typical subgenus *Tipula* similarly has the sensory area long-extended, occupying the expanded anterior blade of the inner style.

Subgenus **Pterelachisus** Rondani

Pterelachisus Rond., 1942, Rev. Zoolog. (Soc. Cuv.) **5**: 243.—Savchenko, 1961, Fauna U. S.S.R., Diptera II **3**: 149-226 (Type: *bertei* Rond., not *berteii*).—Riedel, 1913, Abh. Lehrerver. fur Naturkunde Crefeld, p. 53.—Mannheims, 1962, Bonner Zool. Beitrage **13**: 193-95).
Oreomyza Pokorny, 1887, Wien. Ent. Ztg. **6**: 50, figs. 1-4.—Edwards, 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 75-76.—Alexander, 1935, Philip. J. Sci. **57**: 120-30.—Savchenko, 1964, Fauna U.S.S.R., Diptera II **4**: 85-132, figs. 56-91 (Type: *glacialis* Pokorny).



Figs. 15–23. 15, *T.* (*Lunatipula*) *cladacanthodes* Alex., dististyles; 16, *T.* (*Lun.*) *splendens* Doane, dististyles; 17, *T.* (*Nippotipula*) *abdominalis* (Say), dististyles; 18, *T.* (*Nobilotipula*) *collaris* Say, dististyles; 19, *T.* (*Odonatisca*) *optiva* Alex., dististyles; 20, *T.* (*Platytipula*) *moiwana* (Matsumura), dististyles; 21, *T.* (*Pterelachisus*) *pseudotruncorum* Alex., dististyles; 22, *T.* (*Savtshenkia*) *graciae* Alex., dististyles; 23, *T.* (*Schummelia*) *magnifolia* Alex., dististyles (Symbols: *id*, inner dististyle; *obl*, outer basal lobe; *od*, outer dististyle).

Geotipula Savchenko, 1964, Fauna U.S.S.R., Diptera II **4**: 15-27, figs. 1-4 (type: *variipennis* Meigen).

An unfortunate series of circumstances has produced taxonomic confusion in this group. Rondani (1942) described as *Pterelachisus bertei* a species of crane-fly in which the wings of the ♀ were greatly reduced in size, the series of specimens available totalling 23 (14 ♂♂, 9 ♀♀). In 1913 Riedel examined a part of this type series, preserved in the Museo Zoologico de La Specola, Firenze (Florence), Italy, and among the wingless ♀♀ found a fully winged ♂ of *Tipula obsoleta* Meigen, which he assumed represented the ♂ of the species. He writes "Die ♂ sind typische *obsoleta* Meig." Savchenko (1961: 149), following Riedel, thus considered the species to belong to the *fragilis* (*marmorata* or *rufina*) group, with *obsoleta* as the type. Still later Mannheims (1962) considered the question and was able to review the total type series. He found that the ♂ properly associated with the subapterous ♀ actually was a member of the *variipennis* group, at that time generally placed in the subgenus *Oreomyza*, and determined that *Tipula rumpfi* Mannheims & Theowald and *T. castellanii* Mannheims & Theowald were synonyms of *bertei*. These discoveries have resulted in the synonymy as given. For the species *obsoleta* and other members of the group, Mannheims (1962: 195) proposed the subgenus *Savtshenkia*, as considered later in this paper. It does not appear that any later student has re-examined the specimen that had been determined as being *obsoleta* and which was responsible for the present confusion. The name *Geotipula* Savchenko, based on *variipennis*, thus falls as a synonym of *Pterelachisus*.

The supposed genus *Oreomyza* was erected by Pokorny (1887) for 3 species of high alpine flies from central Europe, the chief character available in defining the group being found in the antennae which were 15-segmented in the ♂, 14-segmented in the ♀, instead of the normal number of 13 for the genus. Edwards (1931) maintained the name for a subgenus of *Tipula* and in this was followed by subsequent students as cited above. The types of *Oreomyza* and *Pterelachisus* are so closely related that I believe the 2 groups cannot be maintained as distinct. Mannheims and Pechlaner (1963: 9) have used as a character for the separation of *Oreomyza* the presence of a darkened median vitta on the mesonotal praescutum but it seems to me that this and other suggested characters are insufficient for separation of the groups and I have placed *Oreomyza* in the synonymy.

The present subgenus is one of the largest in *Tipula*, with nearly 100 species being recognized by Savchenko from the Palearctic region, with fewer in the Nearctic. In California the following species belong here—*cavagnaroi* n. sp., *jenseni* n. sp., *pseudotruncorum* Alex. and *sequoicola* Alex. The following subgeneric names have been removed from this group.

Angarotipula Savchenko—*tumidecornis* and allies.
Beringotipula Savchenko—*unca* (*borealis*) group.
Geotipula Savchenko—*variipennis* group.
Lindneria Mannheims—*serta* (*bistilata*) group.
Savtshenkia Mannheims—*fragilis* (*marmorata*) group.
Serratipula n. subgen.—*cylindrata* group.

The ♂ hypopygium shows a considerable range in structure, as might be expected in such an extensive group. The posterior border of the tergite generally is emarginate with a smaller secondary basal notch which in some species is produced into a median lobe

or tooth. Outer dististyle (fig 21) large, more or less flattened. Inner style with both the beak and lower beak developed; dorsal crest often high and conspicuous; outer basal lobe varying greatly in the different species, in the case shown being large and complex.

Subgenus **Savtshenkia** Mannheims

Tipula (*Savtschenkia*) Mann., 1962, Bonner Zool. Beiträge **13**: 195.

Type not stated by Mannheims. Savchenko gives *obsoleta* (as the supposed ♂ of *Pterelachisus bertei*) but implies that *rufina* Meigen is preferred (Palearctic).

Based on the *fragilis* (*marmorata*) group, formerly placed in *Oreomyza* (see discussion under *Pterelachisus*). Relatively numerous species throughout the Holarctic region, with a few in eastern and southeastern Africa as far south as Natal. A single species in California-*graciae* Alex. Several others occur in northeastern North America and many in Europe. Most of the Holarctic species are late season forms, flying in September and October.

Wings with squama naked; 2nd section of vein M_{1+2} more or less arcuated, narrowing cell R_5 at this point. The ♂ hypopygium shows characteristic features in the tergite, basistyle, both dististyles, phallosome and 8th sternite. Tergite commonly with lateral lobes more or less produced into sclerotized points. Basistyle on mesal face with a conspicuous blackened plate or flange. Outer dististyle (fig 22) flattened, commonly about 4 or 5× as long as broad, in some species more slender; several species have inner margin of style at base expanded and blackened, in cases produced into an acute point. Inner style with outer basal lobe a small setiferous cushion, in cases scarcely evident. Phallosome with apophyses appearing as flattened blades provided with abundant setulae. Several species have the 8th sternite relatively small and normal but many have it strongly produced and modified to furnish strong specific characters.

Subgenus **Schummelia** Edwards

Tipula (*Schummelia*) Edw., 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 80-81.—Alexander, 1935, Philip. J. Sci. **57**: 101-2.—Mannheims, 1952, Die Fliegen der Palaearktischen Region **170**: 108-13, figs. 61-65.—Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 97-112, figs. 43-53.

Type: *variicornis* Schummel (Palearctic).

I am following Edwards in his placing of the so-called *continuata* group in the subgenus *Schummelia* Edwards, rather than placing it in *Platytipula* Matsumura as was done by Savchenko (1961), as previously discussed. In its restricted sense the subgenus includes only a few Nearctic species, with 2 occurring in California, *magnifolia* Alexander and *subtenuicornis* Doane.

The ♂ hypopygium in the local species has the outer dististyle (fig 23) relatively long and flattened, unmodified. Inner style with beak produced, the outer basal lobe extended backward into a modified lobe. Ninth sternite produced into a simple median lobe. Eighth sternite bearing 2 flattened divergent leaf-like blades, larger and more conspicuous in *magnifolia*,

Subgenus **Serratipula** Alexander, n. subgen.

Proposed for *cylindrata* and allies, formerly placed in *Oreomyza* Pokorny (see discussion under *Pterelachisus* Rondani).

Type of subgenus: *Tipula* (*Serratipula*) *cylindrata* Doane (Nearctic).

Besides the type, the following species are included—*barda* Alexander, *graminivora* Alex., *marina* Doane and *tristis* Doane, all occurring in California and virtually being restricted to the state as presently known. *Tipula graminivora* is one of the so-called 'Range craneflies' that is of some economic importance to pasture and range lands in the state. There are about 5 such species involved in the problem, all belonging to this subgenus (*graminivora*) or to *Triplicitipula* n. subgen. (*acuta* Doane, *quaylii* Doane, *simplex* Doane). The name is derived from Junipero Serra, Franciscan Padre, who, with his successors, founded more than a score of the Spanish missions in California. The known range of the various members of *Serratipula* corresponds roughly to the distribution of these missions within the state.

Nasus present. Antenna of ♂ with flagellar segments nodose, in cases very conspicuously so and including not only the basal enlargement but also the outer pedicel of the segment to produce a binodose appearance. Male hypopygium with tergite large, unusually glabrous, posterior margin without spicules, emarginate to form broad lobes. Outer dististyle (fig 24) slender. Inner dististyle of type with both beak and lower beak obtuse at tips, in some other species the lower beak more pointed and, in proportion to the beak, reduced in size; outer basal lobe an elongate densely setiferous lobe that is closely applied to body of style; dorsal crest appearing as a flattened cap, provided with abundant appressed setae, the more posterior ones longer; sensory area placed near base of outer basal lobe, concealed by setae in some species. Phallosome with aedeagus simple, relatively short and stout, narrowed outwardly, apex obtuse; gonapophyses appearing as narrow pale fleshy lobes or cushions. Ovipositor (of *graminivora*) with cerci appearing as large compressed blades, the apex of each with a U-shaped emargination, the upper angle produced into a slender point; hypovalvae lacking or virtually so.

In *tristis* both sexes are fully winged; in *barda*, *cylindrata*, *graminivora* and *marina*, apparently the ♂♂ are winged, the ♀♀ subapterous.

Subgenus **Setitipula** Alexander, n. subgen.

Type of subgenus: *Tipula* (*Setitipula*) *rusticola* Doane (Nearctic).

All of the known species are western Nearctic, including besides the type, also *esselen* n. sp. and *trichophora* Alexander, all species occurring in California. The type has a broader range to the north.

Formerly placed in *Trichotipula* Alexander, because of the presence of macrotrichia in the outer wing cells but based on other characters evidently closer to *Lunatipula* Edwards and *Serratipula*, n. subgen., especially to the latter.

Wing with abundant macrotrichia in cells beyond cord, additional to about a score in the stigma; squama with setae. Male hypopygium with posterior border of tergite broadly emarginate, the lateral angles produced, more strongly so in *trichophora*, with very sparse setae. Outer dististyle (fig 25) long and slender. Inner dististyle with beak cap-like or

hood-like, blackened, more or less emarginate and bilobulate at apex; lower beak heavily blackened; outer basal lobe a setiferous cushion, in all known species with a flattened pale leaf-like lobe or blade that is directed laterad at a right angle (not shown in figure). Phallosome including the simple aedeagus, its apex bifid and elongate, with setiferous basal lobes that are longer in *trichophora*. Eighth sternite near posterior border on either side with a narrow transverse row of long setae. Ovipositor with both cerci and hypovalvae straight, elongate, glabrous; cerci more slender, tips obtuse, hypovalvae broader, compressed-flattened, tips rounded.

Subgenus **Sinotipula** Alexander

Tipula (*Sinotipula*) Alex., 1935, Philip. J. Sci. **57**: 94–100.
Tipula (*Bellardina*) Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 131–49, figs. 69–78.

Type: *exquisita* Alexander (eastern Palearctic: western China).

In addition to the type numerous other species occur throughout the Himalayas and in western China, with fewer elsewhere in Asia. At present some 30 species are known from this region with several others remaining to be described. A second extensive group of species is found in western North America, including the following in California—*aspersa* Doane, *calaveras* Alex., *coleomyia* n. sp., *gothicana* Alex., *pacifica* Doane, *shastensis* Alex., and *umbra* Alex.

Because of their close general resemblance, for the past 30 years the present group had been placed in the synonymy of the earlier *Bellardina* Edwards and the numerous North American species had been considered under that name. It now appears advisable to maintain the two groups as distinct because of significant differences in the structure of the ♂ hypopygium. In *Bellardina* the hypopygium has the tergite, basistyle and sternite separated by sutures whereas in *Sinotipula* the basistyle is small and almost completely united with the sternite.

In all species the wings are handsomely patterned with pale yellow and brown of various shades to produce a marbled appearance. The outer radial veins with numerous macrotrichia, particularly the distal section of R_{4+5}. *Rs* longer than in *Bellardina*, exceeding *m-cu*, the latter commonly placed at fork of M_{3+4} or more distally on base of M_4.

Male hypopygium with the posterior margin of tergite produced beneath into armature of various types, in the local species consisting of paired fleshy or sclerotized lobes, in a few species (*coleomyia, gothicana, umbra*) with these lobes produced caudad and visible from above. In the Asiatic species this armature commonly includes dense blackened spinoid setae, in others glabrous sclerotized blades, in some species complex in structure. Dististyles (fig 26) very irregular in conformation and dissimilar, the outer style larger than the inner. Outer style pale, flattened, variously folded or rolled, in cases (*calaveras*) subdivided into 2 distinct lobes. Inner style small, the beak long-produced, the lower beak reduced or lacking; outer basal lobe more or less triangular in outline with the sensory area at its base.

Subgenus **Tipula** Linnaeus

Tipula Linn., 1758, Systema Naturae, ed. 10, p. 585.
Tipula (*Tipula*) Mannheims, 1952, Die Fliegen der Palaearktischen Region **170**: 74–96, figs.

39–51.—Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 438–58, figs. 263–80.

Type: *oleracea* Linnaeus (western Palearctic).

The subgenus is Holarctic and Ethiopian in distribution, with about 9 species in the Palearctic region and approximately the same number in eastern Africa, from Ethiopia to Cape Province. In the eastern Palearctic, *subcunctans* Alexander (1921) reaches Sakhalin and Japan and appears certainly to be the same as *czizeki* de Jong (1925) and is the prior name. There are no native New World species but the economically important *paludosa* Meigen presently is common and well established in Newfoundland and on the mainland of Canada in northern Nova Scotia. It evidently was brought to this country in ballast in the fishing vessels from Britain more than a century ago.

Male hypopygium distinctive, especially the dististyles (fig 27). Outer style very large and broad; inner style with beak large cleaver-shaped, lower beak smaller but well developed; outer basal lobe divided into 2 arms, the more anterior one a flattened blade that is expanded outwardly, the posterior arm a slender curved spine. The sensory area is larger and with more individual units than in other subgenera, situated on anterior arm of outer basal lobe, arranged in a more or less disconnected series and including in cases more than 30 individual units.

The subgenus *Tipula* is closest to *Acutipula* Alexander, *Indotipula* Edwards and *Yamatotipula* Matsumura and there is some disagreement among different students of the family as to the proper assignment of certain doubtful species.

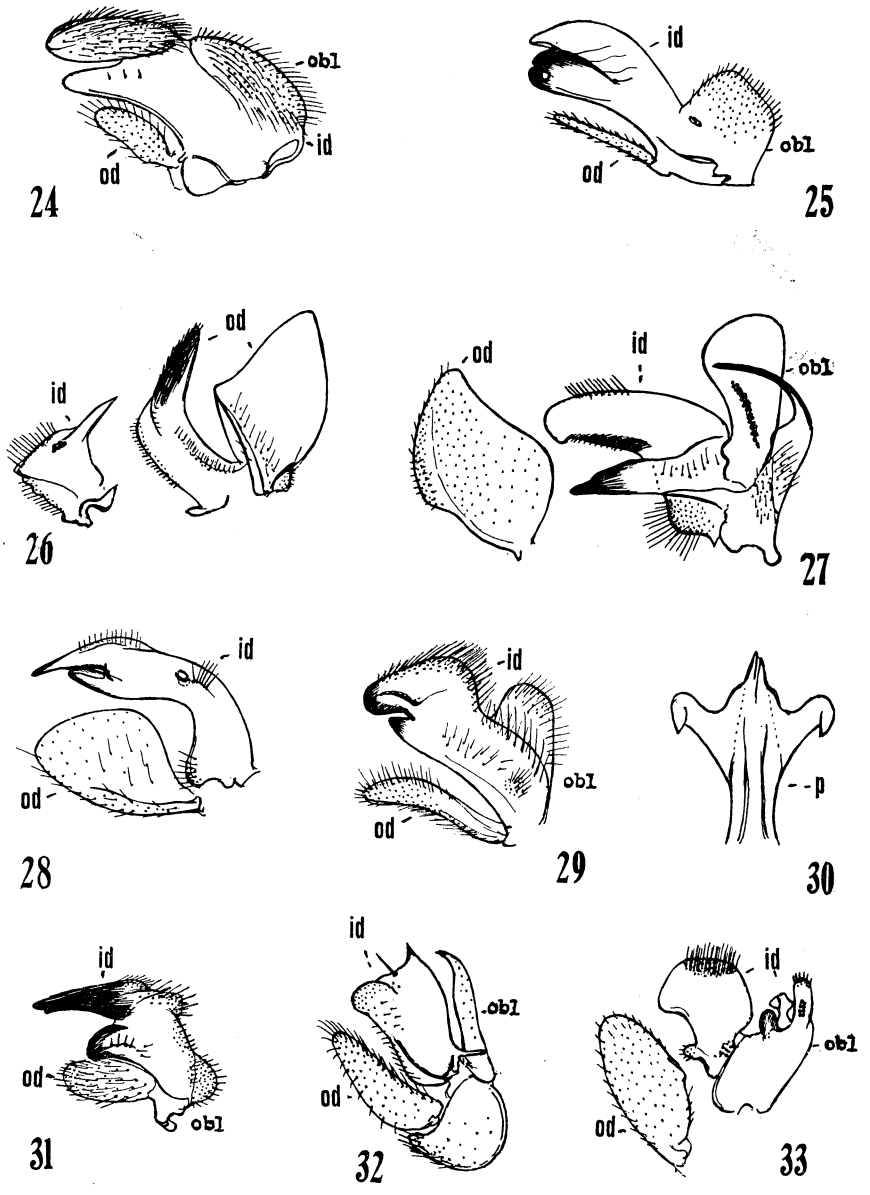
Subgenus **Tipulodinodes** Alexander, n. subgen.

Type of subgenus: *Tipula* (*Tipulodinodes*) *lacteipes* Alexander (Nearctic).

The type is the only member of the group so far made known. It still is known only from the type specimen from Yosemite National Park, California. With considerable question I originally assigned this isolated fly to the subgenus *Tipulodina* Enderlein (1912), an Oriental group with a few species extending northward into Japan and Korea and still fewer forms reaching the Papuan subregion to the east. The whitened tarsi suggest the condition commonly found in *Tipulodina* and differs from that occurring in all other subgenera in the Nearctic fauna. The leg coloration suggests *Tipulodina*, the venation *Odonatisca* Savchenko, the broad outer dististyle *Tipula* Linnaeus and the phallosome *Savtshenkia* Mannheims but all such resemblances do not appear to indicate relationships. The phallosome of *Tipulodinodes* seems particularly distinctive.

Nasus distinct. Antenna with flagellar segments moderately incised, subequal to the longest verticils. Tarsi extensively whitened; claws of ♂ toothed. Wing virtually unpatterned except for stigma, extreme apex and a longitudinal streak in cell *R*. Longitudinal veins with exception of basal section of Cu_1 with macrotrichia basally virtually to arculus. *Rs* about 1/4 longer than sinuous *m-cu*, the latter at midlength of M_{3+4}; outer medial veins not arcuated, 2nd and 3rd sections of M_{1+2} in direct alignment.

Male hypopygium relatively small and of simple structure. Tergite transverse, very narrow. Basistyle not produced into a spine or point. Outer dististyle (fig 28) very broadly spatulate, the length only slightly exceeding the greatest width; inner style unusually simple and unmodified, long and slender, sinuous, without a developed outer basal lobe; at near midlength on disc of style with an oval depression that possibly may be homologous with



Figs. 24–33. 24, *T.* (*Serratipula*) *cylindrata* Doane, dististyles; 25, *T.* (*Setitipula*) *rusticola* Doane, dististyles; 26, *T.* (*Sinotipula*) *calaveras* Alex., dististyles; 27, *T.* (*Tipula*) *paludosa* Meigen, dististyles; 28, *T.* (*Tipulodinodes*) *lacteipes* Alex., dististyles; 29, *T.* (*Triplicitipula*) *praecisa* Loew, dististyles; 30, same, phallosome; 31, *T.* (*Trichotipula*) *oropezoides* Johnson, dististyles; 32, *T.* (*Vestiplex*) *tacomicola* Alex., dististyles; 33, *T.* (*Yamatotipula*) *fulvilineata* Doane, dististyles (Symbols: *id*, inner distityle; *obl*, outer basal lobe; *od*, outer dististyle; *p*, phallosome).

the sensory area in other subgenera. Ninth sternite with ventral surface very extensive. Phallosome distinctive, including a simple blackened aedeagus and a basal densely setuliferous plate that appears to comprise the united gonapophyses.

Subgenus **Trichotipula** Alexander

Tipula (*Trichotipula*) Alex., 1915, Proc. Acad. Nat. Sci. Philadelphia **1915**: 468-69; 1935, Philip. J. Sci. **57**: 100-1; 1946, Bull. S. Calif. Acad. Sci. **45**: 1-16, 9 figs.—Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 41-49, figs. 8-12.

Cinctotipula Alex., 1915, Proc. Acad. Nat. Sci. Phila. **1915**: 469 (type: *algonquin* Alex.).

Odontotipula Alex., 1919, Cornell Univ. Agr. Expt. Sta. Mem. **25**: 939 (type: *stonei* Alex., 1965; new name for *unifasciata* Loew, 1863, nec *unifasciata* Schrank, 1803).

Nitidotipula Alex., 1942, Conn. Geol. Nat. Hist. Survey Bull. **64**: 240 (type: *pachyrhinoides* Alex.).

Type: *oropezoides* Johnson (eastern Nearctic).

Numerous species occur in the southwestern United States and Mexico, including California, being especially characteristic of dry to semidesert regions. A few others that appear to be subcongeneric are found in western China.

The species at present known from California include *beatula* Osten Sacken, *bituberculata* Doane, *cahuilla* Alex., *capistrano* Alex., *cazieri* Alex., *desertorum* Alex., *dorsolineata* Doane, *furialis* Alex., *gertschi* Alex., *kamia* n. sp., *macrophallus* (Dietz), *mayedai* Alex., *megalodonta* Alex., *powelli* n. sp., *repulsa* Alex., *sayloriana* Alex., and *subapache* Alex.

Most of the species have macrotrichia in the outer wing cells, as indicated by the name, but a number including some of the local species lack such trichia. The ♂ hypopygium is unusually simple and unmodified with virtually all parts generalized. Posterior border of 9th tergite with a broad V-shaped notch, the inner margins of the lobes in virtually all species with microscopic spinoid setae. Outer dististyle (fig 31) flattened; inner style with beak variously produced, lower beak obtuse; outer basal lobe poorly developed. The type, *oropezoides*, and the western *megalodonta* have the 9th sternite produced into 2 long fleshy lobes.

Subgenus **Triplicitipula** Alexander, n. subgen.

Proposed for the *triplex* group, formerly placed in *Lunatipula* Edwards.

Type of subgenus: *Tipula* (*Triplicitipula*) *triplex* Walker, 1848 (see Byers, G. W., 1963, J. Kans. Ent. Soc. **36**: 154-55, figs. 14, 15; ♂ hypopygium of lectotype of *triplex*) (Nearctic).

Other species, all Nearctic, include *acuta* Doane, *aequalis* Doane (synonym, *reesi* Alex.), *bellamyi* n. sp., *doaneiana* Alex. (new name for *californica* Doane, 1912, nec *californica* Doane, 1908), *flavoumbrosa* Alex., *idiotricha* n. sp., *lygropis* Alex., *occidentalis* Doane, *perlongipes* Johnson, *planicornis* Doane, *praecisa* Loew (synonym, *tingi* Alex.), *pubera* Loew, *quaylii* Doane, *sanctae ritae* Alex., *silvestra* Doane, *simplex* Doane, *subtilis* Doane, *sylvicola* Doane, *triplex colei* Alex., *triplex linearis* Alex., *umbrosa* Loew, *ungulata* Doane, *vestigipennis* Doane, and *williamsi* Doane.

Nasus lacking. Wing commonly fully developed, in California several species with ♀♀ subapterous, in *quaylii* and *vestigipennis* with wing reduced in both sexes. Male hypopy-

gium with tergite commonly produced into a median lobe that may be single or divided, a few species in California and elsewhere without this lobe. Inner dististyle (figs 29, 30) with outer basal lobe variously modified and furnishing strong specific characters, lacking in *simplex* and *quaylii*. The most important subgeneric character is in the phallosome (fig 30) which is a more or less spatulate structure with the gonapophyses far distad near apex of aedeagus. Eighth sternite commonly with well developed lateral lobes; median armature including an unusual development of lobes and setal brushes.

As is the case in the subgenus *Serratipula*, several of the Californian species in the present group are of some economic importance as being destructive to range vegetation and also to fields of alfalfa and grain. The more important of these economic species are *acuta*, *quaylii* and *simplex*.

The characteristic phallosome has been considered in some important papers, as follows:

Frommer, Saul I. 1963 Univ. Kansas Sci. Bull. **44**: 535-626, 127 figs. (*triplex*, figs. 9, 10, 92).

Rees, Bryant E., & G. F. Ferris. 1939 Microentomology **4** (6): 143-76, figs. 72-91 (*aequalis*, as *reesi* Alexander).

Snodgrass, R. E. 1904 Trans. Am. Ent. Soc. **30**: 215-16, figs. 89-93 (*triplex*, as *inermis* Doane, synonym); 212, figs. 112, 113, 115-117 (*acuta*); 212-213, figs. 78-79 (*aequalis*).

Subgenus **Vestiplex** Bezzi

Tipula (*Vestiplex*) Bezzi, 1924, Ann. Mus. Civ. Stor. Nat. Genova **51**: 230-31.—Edwards, 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 79-80.—Alexander, 1933, Philip. J. Sci. **52**: 396-98; 1935, *Ibid.* **57**: 117-19.—Mannheims, 1953, Die Fliegen der Palaearktischen Region **173**: 116-36, figs. 67-83.—Savchenko, 1964, Fauna U.S.S.R., Diptera II **4**: 132-228, figs. 92-162.

Type: *cisalpina* Bezzi (Palearctic).

Holarctic, with a marked concentration of species in the Himalayas and eastern Asia. Savchenko records some 65 species from Palearctic Eurasia, chiefly arctic and northern or in mountainous sections. In the Nearctic fauna about 16 species, with 3 species in the western United States, *leucophaea* Doane, *nigrocorporis* Doane (synonym, *alticola* Alex.), and *tacomico'a* Alex., with none known in California at this time. The species now placed in *Odonatisca* Savchenko formerly were included in *Vestiplex*.

Male hypopygium with posterior part of tergite forming a shallow saucer, commonly heavily sclerotized and blackened. In several species this saucer tends to be deflected ventrad and cephalad so only the anterior elevated rim is visible from above. In many Asiatic species this tergal saucer is further modified and broken to form definite dorsal and more ventral plates, a condition comparable to that found in *Hesperotipula* and some others. Some species of *Vestiplex* have the basistyle produced into a spine. In many Asiatic species there is a modified spine or blade on the 9th sternite, variously constructed in the different species and furnishing unusually strong specific characters. Dististyles variously modified, a regional species being illustrated (fig 32). Ovipositor with cerci very powerfully developed, heavily sclerotized, lying horizontally, and commonly with outer margins serrate, smooth in a few Asiatic species; hypovalvae small to rudimentary.

Subgenus **Yamatotipula** Matsumura

Yamatotipula Matsumura, 1916, Thousand Insects of Japan, Add. **II**: 461-62, plate 25, fig. 4 (♀).

Tipula (*Yamatotipula*) Edwards, 1931, Ann. Mag. Nat. Hist. ser. 10, **8**: 77-78.—Alexander, 1935, Philip. J. Sci. **57**: 107-8.—Mannheims, 1952, Die Fliegen der Palearktischen Region **170**: 96-101, figs. 52-53.—Savchenko, 1961, Fauna U.S.S.R., Diptera II **3**: 226-311, figs. 132-86.

Type: *nova* Walker (as *Nohirae* Matsumura) (eastern Asia).

Chiefly Holarctic in distribution, being well represented in eastern North America, with fewer species in the west, a total of about 45 species. Savchenko (1961) considers about 40 species in the Palearctic fauna. The following species occur in California—*cognata* Doane (synonyms, *alexandriana* Dietz, *edmundsi* Alex.), *fulvilineata* Doane, *jacintoensis* Alex., *lanei* Alex., *meridiana meridiana* Doane, *meridiana continentalis* Alex., *spernax* Osten Sacken and *tenuilinea* Alex.

Male hypopygium most resembling that of the closely related subgenus *Tipula* Linnaeus. Inner dististyle (fig 33) commonly with beak broad and obtuse, in cases pointed, lower beak lacking; outer basal lobe variously modified; sensory area usually well developed, placed near base of posterior lobe. Gonapophysis large, more or less paddle-shaped.

III New species of Tipula from California

Tipula (**Beringotipula**) **donaldi** Alexander, n. sp.

Size very large (wing of ♂ 21 mm or more); general coloration of mesonotal praescutum buffy yellow, striped with dark brown; a dorsal stripe on anterior thoracic pleura; antenna elongate, flagellar segments black, extreme bases yellowed; ♂ hypopygium with tergal armature small; outer basal lobe of inner dististyle bispinous, the upper blade obtuse, the lower an unusually long slender spine, terminal blade present but small and weak; gonapophysis small with more than basal 1/2 conspicuously dilated, outer end straight, tip obtuse; 8th sternite conspicuously trilobed.

♂. Length about 18.5-21 mm; wing 21-22.5 mm; antenna about 8-8.5 mm.

♀. Length about 24 mm; wing 22 mm.

Frontal prolongation of head light brown, very sparsely pruinose above, nasus elongate; palpi with basal 3 segments dark brown, the elongate terminal segment orange. Antenna elongate; scape and pedicel light yellow, flangellum black, the extreme base of each segment obscure yellow to produce a weak bicolored appearance. Head yellowish gray, clearer gray on posterior orbits; a linear brown central line on vertex.

Pronotal scutum brownish gray with 3 brown areas, the central one large. Mesonotal praescutum with ground buffy yellow, with 3 more grayish brown stripes that are conspicuously margined with brown, the lateral stripes more heavily so; central stripe with darkened border restricted to posterior 1/2, with 2 isolated internal dashes on cephalic 1/2; ground color of posterior sclerites gray, scutal lobes conspicuously patterned with brown, including a ∩-shaped posterior area; a capillary darkened vitta on scutellum, mediotergite with 3 paler brown marks on anterior 1/2, the posterior part more diffusely darkened.

Pleura obscure yellow, with a conspicuous dorsal brown stripe from cervical region on to mesepisternum, sternopleurite less evidently darkened. Haltere brownish yellow, base of stem clearer yellow, knob dark brown. Legs with coxae yellow, vaguely pruinose; trochanters yellow; remainder of legs light brown, tips of femora and tibiae very narrowly dark brown, outer tarsal segments blackened; claws of ♂ very weakly toothed. Wings with restricted ground yellowish white, with an extensive medium brown tesselated pattern, arranged about as in other members of the subgenus; cell *Sc* uniformly yellow, stigma more obscurely yellowed.

Abdominal tergites chiefly medium brown, posterior borders narrowly, lateral margins more broadly, grayish yellow; sternites and outer segments more uniformly brownish yellow; darkened impressed areas on bases of tergites conspicuous. Male hypopygium with 9th tergite gently narrowed outwardly, apex truncate, with a slightly ventral small sclerotized plate that is 4-spined, the lateral pair gently curved with obtuse tips, the central pair acute. Outer dististyle broad, tip obtuse. Beak of inner dististyle slender, blackened, without a brush of setae as common in the subgenus, lower beak broader; outer basal lobe extended backward, as in the subgenus, with 2 blackened projections, upper blade broader and obtuse, 2nd an unusually long slender spine, terminal blade or lowermost arm of lobe very small and weak, about 1/2 as long as spine. Gonapophysis unusually short, with more than basal 1/2 dilated, the straight outer part with apex obtuse. Eighth sternite extensive, apex broad, incised to form 3 low broad lobes of nearly equal size, all provided with dense relatively short setae.

Holotype ♂, Hastings Reservation, Monterey Co., California, along Finch Creek, 9.V. 1946, Jean Linsdale (Alexander Coll. through Linsdale). Allotype ♀, 5 km S of Camino, Eldorado Co., 23.VI.1948, J. W. MacSwain (CIS). Paratypes: 3♂♂, with the allotype; 1♂, Glen Ellen, Sonoma Co., 29. IV. 1950, H. B. Leech (CAS); 1♂, Taylor State Park, Marin Co., 8.V.1949, P. H. Arnaud (CAS); 1♂, Yorkville, Mendocino Co., 30.IV.1924, E. P. Van Duzee (CAS); 1♂, Trinity Co., near Del Loma, 20.VI.1959, G. W. Byers (KU).

Named for Dr Donald D. Linsdale who collected many Tipulidae in California. The only near relative is *Tipula* (*Beringotipula*) *madera* Doane, with which it had been confused in collections. The 2 species agree in the very large size, general coloration and structure of the ♂ hypopygium, differing in certain details of the latter, particularly the inner dististyle and the gonapophyses. In *madera* the two points on the outer basal lobe of the dististyle are massive and blackened while the terminal blade is lacking.

Tipula (Beringotipula) monoana Alexander, n. sp.

Allied to *doanei*; ♂ hypopygium with lateral tergal arms slender, their tips microscopically toothed; dorsal crest of inner dististyle low, with abundant coarse erect setae over entire length; outer basal lobe with 2 projections, terminal blade lacking; 8th sternite with posterior border trilobed, all lobes very low and obtuse, the central one broadest, all with unusually short setae.

♂. Length about 14 mm; wing 15 mm; antenna about 4.8 mm.

♀. Length about 16 mm; wing 15.5 mm.

Frontal prolongation of head brownish yellow, nasus black, very long and slender, exceeding 1/3 the remainder; palpi brown, outer segment brownish black. Antenna of ♂

with scape, pedicel and proximal 1/2 of 1st flagellar segment yellow, succeeding segments black, their basal enlargements obscure yellow, this color persisting through the 8th segment; flagellar segments gently incised, subequal to their longest verticils. Head brownish gray, with a darker central vitta on vertex, not reaching occiput, posterior orbits less evidently darkened.

Pronotal scutum brownish yellow, with 3 darker brown spots, scutellum yellowed. Mesonotal praescutum buffy yellow, with 4 more grayish stripes that are conspicuously bordered by brownish black, intermediate pair with anterior end and outer border of each stripe entirely blackened; scutum buffy yellow, lobes with 2 gray stripes that are incompletely ringed with brownish black, posterior calli yellowed; scutellum brownish yellow, more darkened medially at base, parascutella obscure yellow; mediotergite darkened, with a yellowed V-shaped area before paired brown spots at posterior border, pleurotergite more uniformly yellowed. Pleura brownish yellow, vaguely patterned with darker, especially on venter; a dark brown area on propleura and adjacent areas, including base of fore coxa; dorsopleural membrane light yellow. Haltere infuscated, base of stem light yellow. Legs with coxae yellow, fore pair darkened as described; trochanters yellow; femora brownish yellow, tips blackened; tibiae light brown, tips more narrowly darkened, tarsi passing into black. Wing with darkened pattern common in subgenus, the markings contrasting with whitened ground; outer ends of outer medial cells uniformly darkened.

Abdominal tergites of ♂ obscure yellow with 3 brown stripes, the broader central line almost entire, the narrower sublateral stripes beginning at posterior end of 2nd segment, more distinct outwardly, lateral borders pale; sternites almost uniformly light yellow; hypopygium chiefly darkened. In the ♀ the ground color of abdomen more obscure, median dark tergal stripe paler than sublaterals, the latter evident only on segments 2–6. Ovipositor with cerci slender, straight, tips obtuse, very narrowly blackened. Male hypopygium with tergal lobes separated, each with outer lateral angle produced into a slender rod, its apex narrowly toothed. Outer dististyle broad, setae short. Inner style with beak slender; dorsal crest low, with coarse erect yellow setae over whole extent; lower beak obtuse; outer basal lobe with 2 projections, the 1st with apex obliquely truncate to rounded, blackened, the 2nd a slender acute curved spine, terminal blade lacking. Gonapophysis flattened, outer 1/2 strongly bent, apex a small obtuse head. Eighth sternite broad, posterior border with 2 deep incisions to form 3 low obtuse lobes, the median one broader, all with unusually short dense setae, especially in incisures, those at apices of lobes more yellowed.

Holotype ♂, Leavitt Meadow, Sonora Pass, Mono Co., California, 2160 m, in flight trap, 13.VIII.1963, Hugh B. Leech (CAS). Allotopotype ♀, with the type.

This species is most similar to Rocky Mountain species such as *T.* (*B.*) *doanei* Dietz and *T.* (*B.*) *rohweri* Doane, differing in important hypopygial characters as indicated in the diagnosis.

Tipula (Eremotipula) helferi Alexander, n. sp.

General coloration of mesonotum light gray, praescutum with 4 slightly darker areas, sublateral pair broader; vertex and scutellum with a central brown line; wing faintly darkened, patterned with whitish; basal abdominal tergites obscure yellow, narrowly trivittate with brown, sternites and outer segments more uniformly yellow; ♂ hypopygium with posterior border of tergite gently emarginate, with a 2nd small transversely rounded

median incision bearing a small triangular point at its base; margin of basistyle produced into an elongate-triangular glabrous blade; outer dististyle moderately dilated, inner style with beak and lower beak rounded, blackened, outer basal lobe not broken or emarginate as in other species, its posterior end produced; 8th sternite without modified apical lobes, the tip and adjoining membrane with numerous long setae.

♂. Length about 12 mm; wing 11.5 mm; antenna about 4 mm.

Frontal prolongation of head brownish yellow, more pruinose above, nasus slender; 1st segment of palpus yellow, 2nd and 3rd brownish yellow to brown, terminal segment black. Antenna with scape and pedicel yellow, flagellum black; flagellar segments feebly incised, subequal to longest verticils. Head buffy gray, with a central darkened line extending from low vertical tubercle to occiput.

Pronotal scutum gray, vaguely patterned with brown, scutellum yellow above, weakly infuscated on sides. Mesonotum light gray, praescutum with 4 slightly darker areas that include broader sublateral stripes and capillary lateral borders to gray central area; scutum light gray, each lobe with 2 brown areas; scutellum more yellowed with a brown central line; mediotergite gray, more yellowed centrally and behind. Pleura light gray, pleurotergite and dorsopleural region more yellowed. Haltere with stem yellow, knob infuscated. Legs with coxae light gray; trochanters yellow; femora and tibiae obscure yellow, tips very narrowly and vaguely more darkened; tarsi passing into black; claws of ♂ toothed. Wing faintly darkened, patterned with whitish, especially before stigma and along cord and again beyond stigma; cubital and anal cells chiefly whitened, cell *2nd A* with a more darkened central area, its point directed basad; veins brown. Venation: *Rs* long, about 2.5× *m-cu*; petiole of cell M_1 longer than *m*.

Abdominal tergites obscure yellow, narrowly trivittate with brown, area broadly interrupted at posterior border of each segment, lateral margins light gray; basal sternites gray, remainder yellowed, segments beyond 4th more uniformly yellow. Male hypopygium with posterior border of tergite gently emarginate, with a 2nd median transversely rounded notch, at its base produced into a small triangular point, this apparently homologous with subtergal process of other members of subgenus; lateral tergal lobes thickened, with sparse setae. Lobe of 9th sternite very long and low, narrowest near phallosome, its margin with long yellow setae. Basistyle with margin produced into an elongate-triangular glabrous blade, tip narrowly rounded. Outer dististyle only moderately dilated, setae of dorsal margin very long. Inner style with beak and lower beak blackened, obtusely rounded, glabrous; outer basal lobe not broken or emarginate at origin, as in other members of subgenus, appearing as an oval pale lobe, its posterior end farther produced into a blade of nearly same size and shape as blade of basistyle. Phallosome simple, appearing as small flattened appressed blades. Eighth sternite without modified apical lobes, the apex and adjoining membrane with numerous long setae.

Holotype ♂, Short Canyon, 10 km W of Inyokern, Kern Co., California, 11. IV. 1954, J. W. MacSwain (CAS through CIS).

This interesting fly is named for Mr Jacques Helfer, student of the Orthoptera and the Buprestidae, to whom I am indebted for many interesting crane-flies from Mendocino County. The fly is among the more generalized members of the subgenus, as shown by the very slightly modified structure of the tergite and inner dististyle of the ♂ hypopygium. This latter structure readily separates the species from all others presently known, being

similar in some respects to *Tipula degeneri* Alex. which has been placed in *Lunatipula* Edwards, perhaps in error.

Tipula (Eremotipula) melanderiana Alexander, n. sp.

Allied to *utahicola*; antenna relatively long, flagellar segments conspicuously incised; general coloration of thorax gray, praescutum with 5 brown stripes, including a capillary median vitta; scutellum and mediotergite with a narrow brown central stripe; femora brownish yellow, tips narrowly dark brown; wing variegated light brown and whitish, the latter appearing as longitudinal streaks before cord; stigma and small spots at origin of *Rs* and tip of *Sc* darker brown; ♂ hypopygium with subtergal process of tergite dark brown, sclerotized, tip obtuse, canthi obtuse; dorsal crest of inner dististyle greatly developed, its outer margin produced into microscopic fimbriolae; 8th sternite large, outer lateral cushions each with 4 long flattened modified setae.

♂. Length about 15–15.5 mm; wing 15.5–16 mm; antenna about 5.2–5.3 mm.

Frontal prolongation of head relatively long, polished chestnut yellow; nasus distinct; palpi with 1st segment obscure yellow, remainder brownish black. Antenna unusually long, as shown by measurements; scape and pedicel light yellow, 1st flagellar segment brownish yellow beneath, darker above, remaining segments blackened, the conspicuous basal enlargements more intensely so, segments conspicuously incised. Head light brown, very vaguely pruinose, front more silvery; a capillary brown central stripe extending from low vertical tubercle to occiput.

Pronotal scutum brownish gray, with 3 vague light brown areas. Mesonotal praescutum with ground gray, disc with 4 light brown stripes and an additional capillary central brown line; posterior sclerites of notum gray, scutal lobes each with 2 light brown areas; a darker brown capillary central stripe on scutellum and mediotergite. Pleura light gray, dorsopleural region brownish yellow. Haltere with stem obscure yellow, base clearer yellow, knob dark brown. Legs with coxae light gray; trochanters yellow; femora brownish yellow, tips narrowly dark brown; tibiae and basitarsi brownish yellow, outer segments darkened. Wing variegated light brown and whitish, the latter appearing as longitudinal streaks before cord and as a post-stigmal brightening; cells beyond cord more uniformly light brown; stigma and smaller spots at origin of *Rs* and tip of *Sc* darker brown; veins brown. Squamal setae long. Venation: *Rs* nearly 2× *m-cu*; petiole of cell M_1 about 2/3 *m*.

Basal abdominal tergites obscure yellow with a capillary brown central stripe that is interrupted at grayish incisures; sublateral dark stripes even more broken into linear dashes, lateral margins yellowed; sternites beyond 2nd infuscated; outer segments, including large hypopygium, chiefly brownish yellow. Male hypopygium with tergite small, subtergal process darkened, sclerotized, tip obtuse, surface with 2 parallel longitudinal ridges; canthi obtuse, longer than subtergal process, on face of each with a more sclerotized blade, its tip obtuse; lateral margins less produced. Tergite of type more or less damaged and relative positions of the various parts may be slightly erroneous. Outer dististyle relatively broad, narrowed outwardly. Inner style with dorsal crest greatly developed into a blade that is nearly as extensive as body of style, the outer margin microscopically fimbriolate; outer basal lobe darkened, apex truncate, semitubular, surface with very long delicate silken setae, including a concentration near sensory area. Eighth sternite large, slightly narrowed outwardly; lateral lobes with small low cushions provided with about 12 setae,

inner pair flattened, longer and stouter, with 2 others that are somewhat more slender, these bent strongly toward midline, remaining setae small and normal; center of posterior border of sternite with a narrow area that is densely provided with long delicate yellow setae.

Holotype ♂, Sheep Creek Canyon, near Phelan, San Bernardino Co., California, 24.V. 1945, A. L. Melander (Alexander Coll. through Melander). Paratype ♂, Borego, San Diego Co., California, 23.IV.1955, R. A. Schuster (CIS).

The species is dedicated to Axel Leonard Melander, one of the World's outstanding Dipterologists, specialist on the Empididae and the micro-Bombyliidae of the genus *Mythicomyia* Coquillett. It is most similar to *Tipula* (*Eremotipula*) *mitrata* Dietz and *T.* (*E.*) *utahicola* Alex., differing especially in the structure of the antenna and ♂ hypopygium, particularly the tergite, inner dististyle and 8th sternite.

Tipula (**Eremotipula**) **middlekauffi** Alexander, n. sp.

Allied to *pellucida*; general coloration of thorax obscure buffy yellow, praescutum with 3 faintly indicated darker stripes that are delimited by narrow chestnut brown borders; antennal flagellum black; wing pale brown, stigma small, slightly darker; obliterative area in cell *1st* M_2 small and inconspicuous; abdomen fulvous yellow, not or scarcely patterned; ♂ hypopygium with tergal canthi broadly triangular, their mesal margins microscopically serrulate; 9th sternite with armature of inner lobe spinoid; outer dististyle broadly triangular, inner style with posterior crest small, membranous, outer basal lobe about 1/2 the area of remainder of style; 8th sternite with 4 separate groups of long setae, with a more ventral membranous tongue-like lobe.

♂. Length about 20 mm; wing 17 mm; antenna about 6 mm.

Frontal prolongation of head orange yellow, slightly darker outwardly; no nasus but with a concentration of black setae at this point; basal segments of palpi brownish yellow, outer segments broken. Antenna with proximal 3 segments yellowed, remainder of flagellum black, segments subequal to or slightly longer than verticils, basal enlargements small. Head brown, sparsely pruinose, with a capillary cinnamon brown central vitta over most of length, narrowed behind.

Pronotum brownish yellow. Mesonotal praescutum obscure buffy yellow, with 3 faintly indicated darker stripes that are delimited by narrow chestnut brown borders; posterior sclerites obscure yellow, centers of scutal lobes somewhat more brightened. Pleura buffy yellow, dorsopleural membrane more yellowed in front, darker behind. Haltere with stem brown, base orange, knob brownish black. Legs with coxae and trochanters obscure yellow; remainder of legs broken. Wing tinged with pale brown, prearcular and costal regions darker brownish yellow; stigma small, pale brown; obliterative area across base of cell *1st* M_2 small and inconspicuous; veins brown, more brownish yellow in prearcular and costal regions. Venation: Petiole of cell M_1 and *m* subequal.

Abdomen, including hypopygium, fulvous yellow, not or scarcely patterned. Male hypopygium large; tergite relatively small, subtergal process large, compressed-flattened, carinate above, produced apically into pale membrane; canthi broadly triangular, their mesal margin microscopically serrulate; lateral margins of tergite incurved to form a flattened plate, near mesal angle with a small lobe or point. Ninth sternite with a low outer lobe bearing

normal setae and a subcircular mesal lobe adjoining aedeagus provided with fewer spinoid setae. Outer dististyle broadly triangular, the outer angle more slender, with shorter setae, those of inner angle very long. Inner style with both beak and lower beak obtuse, blackened; posterior crest small, sclerotized, with a broad membranous flange; outer basal lobe long-oval, about 1/2 the remainder of style, apex rounded. Eighth sternite narrowed posteriorly, on either side with a narrow darkened flange that bears about 6 very long setae; more mesial in position 2 low oval lobes with more numerous but slightly shorter setae; a small more ventral membranous tongue-like lobe with microscopic vestiture only.

Holotype ♂, Truckee, Nevada Co., California, VIII.1948, collector unknown (Alexander Coll.).

The species is named for Woodrow W. Middlekauff, Assistant Dean of the College of Agriculture, University of California at Berkeley, and capable student of the Tenthredinoidea. In its general appearance the fly is much like *Tipula* (*Eremotipula*) *impudica* Doane and *T.* (*E.*) *pellucida* Doane, differing most evidently in the structure of the hypopygium, particularly the tergite, outer dististyle and 8th sternite.

Tipula (**Eremotipula**) **schusteri** Alexander, n. sp.

Size medium (wing 15 mm); mesonotal praescutum brownish gray with 4 narrow darker brown stripes, intermediate pair conspicuously narrowed behind; wings pale brown, rather conspicuously patterned with whitish; ♂ hypopygium with various tergal processes strongly developed, canthi very large, elevated, their tips decurved; median lobe elongate, tip membranous; inner dististyle with outer basal lobe narrowed posteriorly; 8th sternite with posterior border trilobed, all lobes with long yellow setae.

♂. Length about 14 mm; wing 15 mm; antenna about 4.5 mm.

Frontal prolongation of head chestnut brown, darker medially above, including elongate nasus; palpi brownish black, tips of intermediate segments narrowly pale. Antenna with scape and pedicel light yellow, flagellum black; flagellar segments rather conspicuously incised, subequal to longest verticils. Front buffy, anterior vertex and orbits gray, posterior vertex more yellowish gray; a conspicuous dark brown median vitta extending from low vertical tubercle to occiput.

Pronotal scutum brownish gray, vaguely patterned with brown. Mesonotal praescutum brownish gray with 4 narrow darker brown stripes, intermediate pair much narrowed and widely separate behind; scutum gray, each lobe with 2 separate brown areas; scutellum brownish yellow with a conspicuous brownish black median line; mediotergite gray, with a slightly darker central line and broader lateral darkenings. Pleura brownish gray, more yellowed posteriorly, mesepisternum vaguely patterned with darker; dorsopleural membrane yellowed. Haltere with stem light yellow, knob dark brown. Legs with coxae light brown; trochanters yellow; femora and tibiae obscure yellow, tips narrowly and vaguely more darkened, tarsi passing into black; claws of ♂ toothed. Wing pale brown, patterned with whitish areas, including a major brightening before stigma and cord and a small poststigmal area; cells *R*, *M*, *Cu* and bases of both anals chiefly whitened; the chief ground areas include the outer wing cells and a major triangular area in cell *1st A*, the point directed basad; stigma light brown, prearcular and costal regions pale yellow; veins brown. Venation: *Rs* nearly 2× *m-cu*; *m* oblique, subequal to petiole of cell M_1; *m-cu*

shortly before fork of M_{3+4}.

Abdominal tergites reddish brown with a narrow blackened central stripe, narrowly interrupted at posterior borders of segments; sternites more uniformly reddish brown; hypopygium chiefly yellowed. Male hypopygium with various processes of tergite strongly developed; subtergal process long, extended caudad beyond level of other elements, narrowed outwardly, distal 1/3 more membranous, without fimbriae; canthi very large, elevated, as in *macracantha*, broad-based, narrowed to subacute decurved tips, inner margin near apex with a few microscopic points; lateral process very large, incurved, terminating in a stout blade. Sternal lobe subglobular with short yellow setae, the 5 or 6 more lateral bristles stout, inner ones more delicate. Outer dististyle broad on basal 1/2, narrowed to obtuse tip. Inner style with outer basal lobe shorter than main body, narrowed and pointed posteriorly; posterior crest very small, pale, triangular; both beak and lower beak blackened. Eighth sternite with posterior border broad, trilobed, all lobes with long yellow setae, those of the broader central lobe more numerous, delicate, from smaller punctures; no major lateral setae as in some species of subgenus.

Holotype ♂, Victorville, San Bernardino Co., California, 1.V.1953, R. O. Schuster & G. A. Marsh (CIS).

The species is named for Mr Robert O. Schuster, of the University of California, Davis, student of the coleopterous family Pselaphidae. The most similar species is *Tipula* (*Eremotipula*) *macracantha* Alex., which suggests the present fly in antennal structure and wing pattern, differing conspicuously in the structure of the hypopygium, including the tergite, lobes of the 9th sternite, both dististyles and the vestiture of the 8th sternite.

Tipula (**Hesperotipula**) **arnaudi** Alexander, n. sp.

Size medium (wing about 15 mm); general coloration of thorax yellow, praescutum with 3 faintly indicated more ferruginous stripes; wing very faintly tinged with brown, stigma darker, with trichia in outer cells; ♂ hypopygium with tergal plates blackened, upper pair small, subtriangular, narrowly separated, lower plates large, surface microscopically roughened; horn of basistyle unusually long and slender, sinuous; outer dististyle unequally bilobed, setiferous; inner style with body elongate, gently curved, apex blackened and shallowly bidentate; 8th sternite with setae of lateral lobes abundant, yellow, those of median lobule more sparse.

♂. Length about 12.5–13 mm; wing 14–15 mm; antenna about 4–4.2 mm.

♀. Length about 12 mm; wing 15 mm.

Frontal prolongation of head polished fulvous yellow, base above pruinose, nasus small; palpi darkened outwardly. Antenna with scape and pedicel yellow, flagellum black, segments slender, longer than their verticils. Head dark brown, sparsely pruinose, orbits narrowly light gray, occiput brownish yellow.

Pronotum fulvous yellow, paler on sides. Mesonotal praescutum with restricted ground yellow, disc with 3 faintly indicated more ferruginous stripes, posterior sclerites clearer yellow. Haltere infuscated, base of stem narrowly yellowed, apex of knob more or less brightened. Legs with coxae and trochanters yellow; femora brownish yellow, tip darker brown; tibiae and tarsi brownish black; claws of ♂ toothed. Wing very faintly tinged with brown, stigma darker brown, inconspicuous, cell *Sc* more yellowed; small oblitera-

tive areas before and beyond stigma and across cell *1st* M_2; veins brown. Macrotrichia in centers of cells R_3 to *2nd* M_2, most numerous cell R_5; stigma with about 20 trichia. Venation: *Rs* about 2.5× *m-cu*; petiole of cell M_1 longer than *m*.

Abdomen polished yellow at base, more fulvous outwardly, sides of tergites 2–5 with an elongate blackened mark, more conspicuous in ♀; middorsal region with a nearly continuous brown stripe; sternites yellow, more or less patterned with darker. Ovipositor with cerci subglabrous, with yellow setae; hypovalvae longer, foliaceous. Male hypopygium with upper plates of tergite blackened, small, subtriangular, separated by a narrow notch; lower plates much larger, blackened, apex slightly oblique, surface microscopically roughened, the median incision nearly 1/2 as broad as plate. Horn of basistyle unusually long and slender, smooth, gently sinuous but not twisted, the tip a long spine. Dististyles with outer style unequally bilobed, setiferous; inner style with outer basal lobe a flattened scoop-like plate; body of style elongate, gently curved, apex blackened, shallowly bidentate, outer margin with a row of erect yellow setae. Eighth sternite sheathing, outer lobes relatively small with abundant yellow setae, median lobule small, setae sparse but long.

Holotype ♂, Taylor State Park, Marin Co., California, 20.IV.1947, P. H. Arnaud (CAS). Allotopotype ♀. Paratopotype ♂. Paratypes: 2 ♂♂, 1♀, Mill Valley, Marin Co., 30.IV. 1949, 17.V.1952, 8.V.1953, H. B. Leech; Lagunitas, Marin Co., 23.III.1927, E. H. Nast.

I name this species for Paul H. Arnaud, Jr, student of the Tachinidae, who has added many species of crane-flies to the California list. The closest relative is *Tipula* (*Hesperotipula*) *fragmentata* Dietz, which has the general conformation of the inner dististyle of the hypopygium somewhat the same but differing in details of shape and proportions.

Tipula (Hesperotipula) chlorion Alexander, n. sp.

Allied to *sweetae*; frontal prolongation of head and praescutal stripes polished black; antenna with scape and pedicel yellow, flagellum black; femora yellow, tips narrowly black, the amount subequal on all legs; ♂ hypopygium with major lobe of tergite subconical, tip obtuse, surface glabrous; inner dististyle with anterior blade of outer basal lobe very large; lobes of 8th sternite relatively small.

♂. Length about 14 mm; wing 10 mm; antenna about 4.1 mm.

Frontal prolongation of head polished black, nasus distinct; palpi black. Antenna with scape and pedicel yellow, flagellum black; flagellar segments weakly incised, slightly longer than verticils. Head black, sparsely gray pruinose, clear light gray surrounding antennal fossae and very narrowly on orbits.

Pronotal scutum polished brownish black, gray on sides, vaguely yellowed sublaterally; scutellum clear light yellow, posterior face weakly darkened. Mesonotal praescutum polished yellow with 3 black stripes, outer pair straight; scutum similarly yellowed, each lobe with a single polished black area; scutellum yellow, weakly darkened medially; postnotum yellow, mediotergite broadly more darkened on central portion. Pleura dull gray pruinose, variegated with obscure yellow on meron, metapleura, dorsal pteropleurite and dorsopleural membrane. Haltere with stem brown, more brightened basally, knob brown. Legs with coxae light brown, sparsely pruinose; trochanters yellow; femora yellow, tips narrowly black, subequal on all legs; tibiae and basitarsi brownish yellow, tips narrowly blackened, tarsi darker; posterior tibiae and tarsi black; claws with small tooth. Wing

pale brown, streaked longitudinally with whitish along veins; stigma short-oval, dark brown; a small paler brown cloud over anterior cord; extreme wing base yellowed; veins dark brown, more yellowed at wing base. Venation: *Rs* nearly 3× *m-cu*; vein R_2 long, erect; petiole of cell M_1 longer than *m*; *m-cu* at or close to fork of M_{3+4}.

Abdomen orange yellow, both tergites and sternites with a conspicuous black longitudinal stripe, very narrowly interrupted at posterior borders of segments; outer segments more extensively blackened, hypopygium extensively yellowed. Male hypopygium generally as in *sweetae*. Tergite unusually glabrous, posterior border subtruncate, the major lobe subconical, tip obtuse, surface glabrous. Inner dististyle with anterior blade of outer basal lobe very large, subequal in area to body of style. Eighth sternite with lobes smaller than in *sweetae*, setal fringes shorter.

Holotype ♂, Cuyama Valley, Kern Co., California, 10.IV.1932, on brush sunflower, E. P. Van Duzee (CAS).

The most similar species is *Tipula* (*Hesperotipula*) *sweetae* Alexander, which differs especially in hypopygial structure, particularly the tergite, inner dististyle, and 8th sternite. In *sweetae* the longer tergal lobes are nearly acute, with numerous setae; anterior blade of outer basal lobe smaller than body of style, and lobes of 8th sternite large, with abundant very long setae.

Tipula (Hesperotipula) millardi Alexander, n. sp.

Allied to *chumash*; mesonotum yellow, praescutum with 3 polished orange stripes; ♂ hypopygium with dorsal tergal lobes slightly divergent, tips obtuse; basistyle with lateral horns very long and slender; inner dististyle with beak very obtuse, near its base with a conspicuous triangular tooth; posterior section and dorsal crest slightly larger, outer basal lobe bilobed; 8th sternite with outer lateral lobes large, at apex with few short yellow setae.

♂. Length about 15 mm; wing 16 mm; antenna about 4.5 mm.

Frontal prolongation of head polished orange, nasus elongate, slender; palpi dark brown. Antenna with proximal 3 segments light yellow, remainder light brown; flagellar segments slender with small basal enlargements. Head dark brown, sparsely pruinose, the narrow orbits clearer gray.

Pronotum yellowish brown. Mesonotum yellow, praescutum with 3 polished orange stripes, scutal lobes similarly orange. Pleura yellow. Haltere brownish yellow, base of stem clearer, knob infuscated. Legs with coxae and trochanters light yellow; femora and tibiae yellow, tips narrowly darkened; tarsi light brown, outer segments darker; claws of ♂ toothed. Wing brownish yellow, prearcular field, cell *C* and stigma light brown, cell *Sc* yellow; *Rs* and veins beyond cord bordered by paler leaving center of cells of ground; veins brown, more yellowed in brightened areas. Stigma and outer ends of cells R_3 and R_5 with macrotrichia.

Abdomen yellow, tergites with a nearly entire central stripe and elongate sublateral darkenings on basal 1/2 of segments; hypopygium large, orange yellow. Male hypopygium with dorsal tergal lobes conspicuous, slightly divergent, tips obtuse, slightly oblique, with short pale setae; ventral shelf low and inconspicuous, median border emarginate, with a microscopic central tooth. Ninth sternite with large oval lobes, fringed apically

with long yellow setae. Basistyle with lateral horns long and very slender. Outer dististyle very small; inner style with beak very obtuse, with a conspicuous triangular tooth near base; posterior section and dorsal crest slightly larger than beak, very obtuse, fringed behind with long yellow setae; outer basal lobe conspicuously bilobed, outer or lateral lobe long-oval, its margins fringed with yellow setae. Eighth sternite sheathing, the outer lateral lobes very large, subtriangular, with relatively sparse short yellow setae at apex, ventral surface pale and depressed; no compact median group of setae but with a transverse row of scattered very long yellow setae, the longest only a little shorter than lobes.

Holotype ♂, Los Angeles Co., California, 4.V.1915, M. C. Van Duzee (CAS). Paratopotype ♂, 30.IV.1915, M. C. Van Duzee (Alexander Coll.).

I take great pleasure in dedicating this fly to Millard Carr Van Duzee (1860–1934), distinguished student of the Dolichopodidae, to whom I am indebted for many crane-flies taken at the same time as the present species (1915).

In the broadly obtuse beak of the inner dististyle the fly is most like *Tipula* (*Hesperotipula*) *chumash* Alexander, differing in all details of structure of the hypopygium, especially the 9th tergite, inner dististyle and 8th sternite.

Tipula (Lindneria) shieldsi Alexander, n. sp.

Allied to *neptun*; general coloration of body, including abdomen, dark gray; vertex with a dark brown central stripe; femora brown, tibiae and tarsi blackened; wing whitened, patterned with pale grayish brown clouds, cells *C*, *Sc* and *R* virtually clear; lateral borders of abdominal tergites 2–7 light gray, bordered internally by a blackened line; ♂ hypopygium brownish black, with median projection of tergite slender, blackened; 8th sternite with median blade terminating in 2 acute spines, on either side with a slender fleshy lobe provided with very long setae.

♂. Length about 16–17 mm; wing 16.5–18 mm; antenna about 4.8–5 mm.

♀. Length about 20–21 mm; wing 18–19 mm.

Frontal prolongation of head dark plumbeous gray; palpi black. Antenna with scape brown, pedicel brownish yellow, flagellum black. Head gray, vertex with a dark brown central line.

Thorax dark gray, praescutum with 4 brown stripes, scutal lobes with brown pattern paler. Pleura dark gray, dorsopleural region obscure brownish yellow. Haltere pale brown, knob dark brown. Legs with coxae gray; trochanters brown; femora dark brown, tips narrowly more blackened; tibiae and tarsi black. Wing with ground whitened, patterned with grayish brown clouds, most evident in cells *M*, *Cu* and *1st A* and beyond cord in outer radial field; outer medial veins seamed with pale brown; stigma and a cloud over anterior cord darker brown; cells *C*, *Sc* and *R* virtually unpatterned; veins brown.

Abdomen slightly longer than in *neptun*; tergites dark gray, lateral borders of segments 2–7 bordered internally by a blackened line; sternites uniformly blackish gray, hypopygium brownish black. Male hypopygium with spine on mesal edge of lateral tergal blade acute; median projection slender, blackened. Eighth sternite with median blade relatively narrow, terminating in 2 acute spines that are separated by a deep U-shaped emargination; lateral fleshy lobes slender, with strong setae, the terminal ones very long, slightly exceeding the lobes.

Holotype ♂, North slope of Mount Dana, Mono Co., California, 3300-3400 m, 4. VIII. 1964, Oakley Shields. Allotopotype ♀, pinned with type. Paratopotype 1♂, 1♀, with types. Paratypes: 1♂, S of Golden Trout lake, Glacier Divide, Fresno Co., Calif., 3400 m, 12.VIII.1963, Shields; 1♂, above 'L' lake near French Canyon, Fresno Co., Calif., 3450 m, 14.VIII.1963, Shields; 1♂, Piute Pass, Humphreys Basin, 3400 m, 11.VIII.1963, Shields; 1♂, Mono Pass, Inyo Co., Calif., 3600 m, 8.VIII.1961, C. D. MacNeill, D. C. Rentz, M. R. Lundgren (CAS), bearing label '*neptun* Dietz.' Type in Alexander Coll.

The species is named for the collector of the principal series, Mr Oakley Shields, to whom I am indebted for several interesting crane-flies from California. This high Sierran fly is most closely related to *Tipula* (*Lindneria*) *neptun* Dietz, of the Central Rocky Mountain region, which differs evidently in the coloration of the wing and especially in the very different slightly shorter yellow abdomen.

Tipula (**Lunatipula**) **biavicularia** Alexander, n. sp.

Allied to *unicincta*; general coloration of thorax gray, praescutum with 4 narrow cinnamon brown stripes; wings light brown, variegated by more whitened areas, including a conspicuous band at cord; ♂ hypopygium with tergal blades relatively narrow, phallosome with the major apophyses expanded beyond midlength; 8th sternite on either side with a single fasciculate bristle.

♂. Length about 16 mm; wing 16.5 mm; antenna about 3.5 mm.

♀. Length about 26 mm; wing 27 mm.

Frontal prolongation of head above yellowish brown, darker laterally, nasus short; palpi brown, terminal segment darker. Antenna with scape and pedicel yellow, flagellum black; flagellar segments feebly incised, subequal to their longest verticils. Head brownish gray, narrowly clearer gray on orbits.

Pronotum gray, vaguely patterned with light brown. Mesonotal praescutum brownish gray, with 4 narrow cinnamon brown stripes, the central interspace and broad borders to the laterals clearer gray and lacking the small setae that are abundant elsewhere; longer setae of interspaces erect; posterior sclerites of notum brownish gray, each scutal lobe with 2 cinnamon brown areas; posterior borders of mediotergite and pleurotergite more yellowed. Pleura yellowish gray, dorsopleural membrane more yellowed. Haltere with stem light brown, base narrowly yellowed, knob dark brown. Legs with coxae and trochanters brownish yellow; femora and tibiae brownish yellow, tips narrowly brownish black, the amount subequal on all legs, more extensive on femora; tibiae yellowish brown, passing into dark brown, tarsi blackened; claws of ♂ toothed. Wing light brown, variegated by more whitened areas, the single most conspicuous being a band from before stigma extending into base of cell M_3, lying proximad of cord; less conspicuous whitened streaks in centers of cells M_1 to *1st A* inclusive; stigma small, darker brown, cell *Sc* more yellowed; veins light brown. Venation: Petiole of cell M_1 subequal to *m*.

Abdomen brownish yellow, more or less gray pruinose, tergites with 3 medium brown stripes, hypopygium darker yellowish brown. Male hypopygium with tergal blades relatively narrow but broader than the deep U-shaped median emargination. Outer dististyle broadly dilated; inner style with beak narrowly obtuse, lower beak more broadly rounded, intensely black. Phallosome with unpaired element near apex with 2 divaricate slender spines; major apophyses slender at base, beyond midlength much expanded, thence nar-

rowed into a long beak-like spine. Eighth sternite on either side of border with a single broadly flattened fasciculate bristle, at tip produced into a hair-like point; central area of margin with a concentration of pale flattened setae.

Holotype ♂, Strawberry, Tuolumne Co., California, 14.VIII.1960, D. Q. Cavagnaro (CIS). Allotopotype ♀, 19.VIII.1960 (Cavagnaro).

There are numerous species in western North America belonging to this group of the subgenus, the most nearly allied to the present fly being *Tipula (Lunatipula) rainiericola* Alex. and *T. (L.) ruidoso* Alex. All are most readily separated by the structure of the hypopygium, particularly the phallosome. In the present fly the major gonapophyses are constructed so as to suggest the outline of a bird's head and slender beak, whence the specific name. The ♀ designated as allotype is very much larger than the type and there is the possibility that the two sexes are incorrectly associated.

Tipula (Lunatipula) kirkwoodiana Alexander, n. sp.

Allied to *sternata*; ground color of mesonotal praescutum almost uniformly opaque gray, the central area more yellowed; ♂ hypopygium with tergal arms slender, tips blackened, subacute; basistyle unarmed; inner dististyle with beak long and slender, acute, lower beak obtuse, outer basal lobe long and conspicuous; 8th sternite with outer margin of lateral lobe bearing a small peg-like spine and strong setae, median region with 2 brushes of very long golden yellow setae.

♂. Length about 16 mm; wing 15.5 mm; antenna about 4.3 mm.

Frontal prolongation of head subequal to remainder, light yellow, nasus distinct; palpi light brown, terminal segment black. Antenna with scape light yellow, pedicel orange, 1st flagellar segment relatively short, light brown, remainder of organ black; flagellar segments longer than verticils, the basal enlargements small. Head very light brown, more grayish pruinose on anterior vertex and orbits.

Pronotal scutum pale brownish yellow, scutellum clear yellow. Mesonotal praescutum with ground almost uniformly gray, opaque, central region broadly but vaguely more yellowed representing usual central stripe, lateral stripes scarcely indicated; remainder of notum chiefly obscure brownish yellow, mediotergite vaguely more pruinose, with a capillary pale brown central line. Pleura and pleurotergite pale buffy yellow, dorsopleural membrane clearer yellow. Haltere with stem obscure yellow, clearer at base, knob infuscated, apical margin narrowly pale. Legs with coxae buffy yellow, trochanters clearer yellow; remainder of legs obscure yellow, tarsi passing into brownish black; claws of ♂ elongate, slender, toothed. Wings almost uniformly brownish yellow, prearcular and costal fields clearer yellow, stigma very pale brown; veins brown. Venation: Petiole of cell M_1 longer than *m*.

Abdomen with basal segments yellow, mid-tergal region vaguely more darkened, posterior borders of segments narrowly, the lateral margins more broadly, light gray; outer segments, including massive hypopygium, more chestnut yellow. Male hypopygium generally as in *sternata*, differing in all details. Ninth tergite unusually glabrous, the lateral arms slender, tips narrowly subacute, blackened; central armature including 2 obtuse darkened knobs at lateral angles of a median plate. Basistyle very narrow, unarmed. Outer dististyle spatulate; inner style with beak long and slender, blackened, narrowed to acute

tip, lower beak oval, blackened; outer basal lobe unusually long and conspicuous, nearly equal to remainder of style, appearing as a flattened yellow blade, its tip obtuse. Phallosome relatively small, as compared with allied species, especially aedeagus which bears a pair of microscopic subterminal denticles. Eighth sternite moderately sheathing, the lateral lobes including an outer triangular tooth and an inner lobe that bears a few long yellow setae; outer margin of lobe at near midlength with a small darkened peg-like spine; lateral margins with microscopic tubercles bearing long appressed setae; posterior border of sternite with a low rounded cushion, on either side with a brush of very long sinuous golden yellow setae.

Holotype ♂, Ozena Forestry Camp, Ventura Co., California, 960 m, 25. VI. 1963, C. W. Kirkwood (Alexander Coll.).

Named for Carl W. Kirkwood, student of the Geometridae, to whom I am indebted for numerous crane-flies from Arizona and California. The species is most similar to *Tipula* (*Lunatipula*) *sternata* Doane, from which it differs in all details of the ♂ hypopygium, particularly the tergite and inner dististyle, including the long conspicuous outer basal lobe of the latter.

Tipula (**Lunatipula**) **lassenensis** Alexander, n. sp.

Allied to *splendens* and *tenaya*; general coloration of thorax yellowish gray, praescutal stripes scarcely differentiated; legs obscure yellow, outer tarsal segments darkened; wing grayish, stigma pale brown; abdomen yellow, the more proximal tergites with a conspicuous dark brown spot on either side near base; ♂ hypopygium with tergite broad, terminating in 2 widely separated blackened spines; inner dististyle with beak elongate, lower beak reduced to a very small blackened knob; 8th sternite broad, near apex with long yellow setae arranged in 2 contiguous groups.

♂. Length about 13 mm; wing 12 mm; antenna about 4.4 mm.

Frontal prolongation of head yellowed, nasus distinct; palpi pale brown. Antenna with scape, pedicel and proximal 2/3 of 1st flagellar segment yellow, remainder dark brown; flagellar segments exceeding their verticils in length, with small basal enlargements. Head brown.

Pronotum yellowish gray. Mesonotal praescutum and scutum almost uniformly of this color, the slightly more reddish praescutal stripes scarcely differentiated. Pleura pale yellowish gray. Haltere with stem brownish yellow, knob black. Legs with coxae yellow, very sparsely pruinose; trochanters yellow; remainder of legs obscure yellow, terminal tarsal segments darker. Wing grayish, prearcular and costal regions more yellowed, stigma pale brown; restricted obliterative areas before stigma and across cell *1st* M_2 into base of M_3; veins brown. Venation: Petiole of cell M_1 slightly shorter than *m*.

Abdomen yellowed, posterior borders of tergites very narrowly pale; a conspicuous circular dark brown spot at base of tergites near margin. Male hypopygium with tergite broad, posterior border with 2 widely separated blackened divergent spines, with a paler blade on either side. Basistyle with a conspicuous spine; more proximal setae long, yellow, more sparse outer ones blackened. Outer dististyle very small; inner style with beak elongate, lower face concave; lower beak reduced to a very small blackened knob at base of beak; outer basal lobe extensive, all setae yellow. Phallosome including a quadrate

central plate, aedeagus protruding from its posterior part. Eighth sternite sheathing, outer end very broad, apex subtruncate to slightly 4-lobed, the 2 inner lobes with uninterrupted series of long yellow setae.

Holotype ♂, Reflection Lake, Lassen Volcanic National Park, Shasta Co., California, 1770 m, 5.VIII.1958, C. P. Alexander (Alexander Coll).

Tipula (*Lunatipula*) *lassenensis* is most similar to *T.* (*L.*) *tenaya* Alexander, differing especially in the hypopygial structure, including the tergite, inner dististyle, phallosome and 8th sternite.

Tipula (**Lunatipula**) **macswaini** Alexander, n. sp.

Allied to *palmarum*; size medium (wing of ♂ about 13.5 mm); general coloration of thorax gray, praescutum with 4 entire brown stripes; antennal flagellum black; wing faintly tinged with brown, prearcular field and cell *Sc* yellowed, stigma medium brown, *m-cu* placed on the unusually short M_{3+4}; abdominal tergites chestnut brown, trivittate with black, central stripe broad and nearly entire; ♂ hypopygium with posterior border of tergite with a U-shaped emargination, lobes broad, the inner angle produced into a triangular lobe; basistyle produced into a flattened scoop-like blade; inner dististyle narrow, lower beak lacking; outer basal lobe bispinous; aedeagus a slender gently curved organ; posterior border of 8th sternite truncate, with a transverse row of long yellow setae on either side of midline.

♂. Length about 13 mm; wing 13.3 mm; antenna about 4.4 mm.

Frontal prolongation of head narrowly light gray above, including nasus, remainder obscure yellow; palpi brownish black, basal segments a little paler. Antenna with scape transversely corrugated, obscure yellow; pedicel brownish yellow, flagellum black, segments very feebly incised, longer than their verticils, provided with a short dense white pubescence. Head gray, center of vertex extensively pale brown.

Pronotal scutum gray, with a narrow brown central dash; scutellum buffy. Mesonotal praescutum light gray with 4 entire brown stripes, intermediate pair narrowed behind, subequal in diameter to central interspace; posterior sclerites of notum gray, each scutal lobe with 2 brown areas; scutellum with a capillary darker median line, posterior 1/2 paler brown. Pleura clear gray; dorsopleural region and membrane behind propleura yellow. Haltere with stem light brown, base restrictedly paler, knob dark brown. Legs with coxae light gray, tips restrictedly pale yellow; trochanters obscure yellow; a single broken leg remains, femora brownish yellow, tips narrowly and inconspicuously darkened, tibiae dark brown, basitarsi brownish black. Wing faintly tinged with brown, prearcular field and cell *Sc* yellowed; stigma medium brown; obliterative areas before stigma and across base of cell *1st* M_2 small and inconspicuous; veins brown. Venation: *Rs* nearly twice *m-cu*; R_2 short; *m-cu* just beyond fork of *M* on the unusually short M_{3+4}.

Abdominal tergites chestnut brown, conspicuously trivittate with black, central stripe broad, narrowly broken by pale posterior borders of segments; sublateral stripes narrow, reduced to longitudinal dashes on 4th and succeeding segments, lateral borders narrowly light yellow; only proximal 2 sternites visible, 1st light yellow, 2nd darker. Male hypopygium with tergite transverse, posterior border with a U-shaped emargination, lateral lobes broad, truncate, inner angles adjoining the emargination produced caudad into a sub-

triangular lobe; tergal setae relatively small and sparse, restricted to disc of each lobe. Lobe of 9th sternite short and compact, with numerous short stout setae. Basistyle produced outwardly into a flattened scoop-like blade, apex obtuse, outer face with numerous setae, inner surface glabrous. Outer dististyle apparently lacking or greatly reduced; inner style narrow, beak extended to obtuse tip, dorsal surface blackened; lower beak lacking; outer basal lobe conspicuous, bispinous, posterior spine larger, curved, narrowed to acute tip, outer end with long appressed setae, anterior spine smaller, nearly straight, tip acute. Aedeagus a slender gently curved organ, apophyses lacking or very reduced. Eighth sternite large, posterior border broad, with a thickened transverse ridge that bears long yellow setae, the row narrowly interrupted at midline, smaller at either end of individual row, none modified.

Holotype ♂, Auberry, Fresno Co., California, 13.IV.1949, R. Craig (CIS).

The species is named in honor of Dr J. W. MacSwain, of the Entomology staff at the University of California, Berkeley, specialist in the family Meloidae. The most similar species is *Tipula* (*Lunatipula*) *palmarum* Alex., being most readily distinguished by the hypopygial structure, particularly the tergite, dististyles and 8th sternite. Both species have the produced scoop-like basistyle and the bispinous outer basal lobe of the inner dististyle.

Tipula (Lunatipula) martini Alexander, n. sp.

Allied to *downesi*; mesonotum buffy, praescutum with 4 reddish brown stripes; wing faintly tinged with brown, prearcular and costal fields more yellowed, stigma darker brown; abdominal tergites yellow with a nearly continuous brown central stripe and sublateral brown dashes on basal 2/3 of segments; ♂ hypopygium with tergal lobes low; inner dististyle profoundly divided, beak portion long petioled, outwardly being dilated into a subquadrate blade, outer basal lobe almost as long as body of style; phallosome large and conspicuous, including 2 narrow divergent blades; apical lobes of 8th sternite with abundant long yellow setae on outer margin.

♂. Length about 16 mm; wing 16.5 mm; antenna about 5 mm.

Frontal prolongation of head relatively long, subequal to remainder, yellow, brownish gray above, including the long nasus; palpi with proximal 3 segments yellowish brown, terminal segment black, relatively short, about 2× the 3rd. Antenna with scape and pedicel light yellow, 1st flagellar segment light brown, succeeding 2 segments weakly bicolored, light brown, basal enlargement darker, remaining segments brownish black; flagellar segments feebly incised, a little shorter than verticils. Head light gray, sides of posterior vertex weakly infuscated and provided with numerous short porrect black setae.

Pronotum obscure yellow, slightly darker medially. Mesonotal praescutum buffy, somewhat more grayish on sides, disc with 4 reddish brown stripes, intermediate pair narrow, only a little wider than central interspace; scutum yellowed, lobes grayish, each with 2 pale brown areas; scutellum brownish yellow; mediotergite with anterior 1/2 grayish, posterior portion and sides light brown, with paired circular paler spots at posterior margin; pleurotergite yellow, vaguely patterned with more reddish areas. Pleura yellow, faintly pruinose. Haltere with stem yellow, knob dark brown. Legs with coxae grayish yellow; trochanters yellow; remainder of legs yellow, outer tarsal segments brown; claws of ♂ toothed. Wing faintly tinged with brown, stigma darker brown; prearcular and costal

fields more yellowed; obliterative areas before and beyond stigma and across cell *1st* M_2 extensive but inconspicuous against the ground. Venation: R_{2+3} about twice R_2; petiole of cell M_1 subequal to *m*.

Abdominal tergites yellow, with a nearly continuous brown central stripe beginning at near midlength of 2nd segment, narrowly interrupted by pale borders to segments; sublateral darkenings reduced to linear dashes on basal 2/3 or more of segment; basal sternites brown, outer segments and hypopygium more yellowed. Male hypopygium generally as in *downesi* and allies, differing in all details. Ninth tergite broad, posterior border subtruncate, with small lateral ears and very low obtuse inner lobes. Ninth sternite with lobes darkened, hemispherical, with long yellow setae. Basistyle narrowed at dorsal end, surface with numerous dark setae, especially behind. Outer dististyle inserted on stem of inner style, elongate, pale, with few setae; inner style with a long basal stem, outer 1/2 suddenly dilated into a subquadrate blade, the beak slender; dorsal and posterior crests slightly produced; outer basal lobe almost as long as body of style, its basal union small, lobe slightly dilated outwardly, produced into an outer lobe with a small marginal spine at its base. Phallosome large and conspicuous, blackened, including a central mass that divides into 2 narrow divergent blades, their tips acute. Eighth sternite strongly sheathing, narrowed outwardly, at apex with 2 slender divergent lobes or blades, the more darkened outer margin fringed with dense long yellow setae.

Holotype ♂, Lebec, Kern Co., California, 1200 m, 15.V.1928, J. O. Martin (CAS).

The species is named in honor of the collector. The most nearly allied species are *Tipula* (*Lunatipula*) *downesi* Alexander, *T.* (*L.*) *powersi*, n. sp., and *T.* (*L.*) *sequoiarum* Alexander, all generally similar to one another and separated chiefly by marked differences in the ♂ hypopygium, particularly the tergite, inner dististyle and phallosome.

Tipula (Lunatipula) powersi Alexander, n. sp.

Allied to *downesi*; size medium (wing of ♂ 15 mm or more); mesonotal praescutum brownish gray with 4 entire brown stripes; posterior sclerites of notum more grayish; wing weakly suffused, the whitened obliterative areas small and inconspicuous; abdominal tergites brownish yellow, trivittate with darker brown, stripes interrupted at posterior borders of segments; ♂ hypopygium large, posterior border of tergite very shallowly emarginate, each lateral angle with a small U-shaped notch; inner dististyle with outer basal lobe bifid into an inner spine and a broader outer blade; phallosome forking into 2 slender spines; 8th sternite long and sheathing, narrowed outwardly, at apex divided into 2 flattened white blades, their outer margins densely fringed with long golden yellow setae.

♂. Length about 16–17 mm; wing 15–16.5 mm; antenna about 5.5 mm.

♀. Length about 20–21 mm; wing 17.5–18 mm.

Frontal prolongation of head elongate, subequal to remainder, dark and pruinose above, yellow on sides, yellowish brown beneath; nasus elongate; palpi with proximal 3 segments light brown, terminal segment black. Antenna relatively long; scape and pedicel yellow, flagellum brownish black; flagellar segments slightly longer than verticils, basal enlargements small. Head brownish gray, clear light gray in front; a slightly darker brown central vitta; no vertical tubercle; vestiture of vertex short, setae black.

Pronotal scutum brownish gray, vaguely patterned with pale brown; scutellum light yel-

low. Mesonotal praescutum with ground brownish gray, capillary central vitta more yellowed; disc with 4 entire brown stripes, lateral pair broader, margined laterally with paler gray; scutum gray, each lobe with 2 more or less confluent brown areas, posterior one nearly 4× as extensive as anterior; scutellum and postnotum obscure grayish yellow, scutellum and mediotergite with indications of a dusky anterolateral marking. Pleura and pleurotergite pale gray, dorsopleural region more yellowed. Haltere with stem pale brown, yellowed basally, knob dark brown. Legs with coxae and trochanters pale yellowish gray; femora and tibiae obscure yellow, tips narrowly and vaguely infuscated, tarsi passing into dark brown; claws of ♂ toothed. Wing weakly suffused, prearcular and costal fields more yellowed; stigma oval, brown; a small darkened cloud over anterior cord; obliterative areas before and beyond stigma and across base of cell *1st* M_2 small and inconspicuous; veins pale brown, slightly more yellowed in costal field. Venation: Petiole of cell M_1 subequal to or shorter than *m*.

Abdominal tergites brownish yellow, trivittate with darker brown, stripes interrupted by light gray posterior borders, central line more distinct; sternites brownish yellow, posterior borders pale; hypopygium more uniformly infuscated. Ovipositor with cerci blackened, compressed-flattened, tips obtuse; hypovalvae shorter, pale, tips acute. Male hypopygium with posterior border of tergite very shallowly emarginate, lateral angles near margin with a small U-shaped notch, extreme outer angle produced into a point; tergal setae short and inconspicuous, especially those of lobes, lacking on median area. Ninth sternite with a bilobed cushion provided with setae. Basistyle entire, dorsal angle produced into a spine. Inner dististyle complex; main body narrow; apex of beak generally truncate; outer basal lobe conspicuously bifid, inner arm a more slender spine, its tip acute, outer blade somewhat shorter and broader, tip obtuse; sensory area placed near junction of outer basal lobe and body of style; outer dististyle relatively long and slender, its apex with long setae. Phallosome shaped more or less like a tuning fork, divided into 2 narrow flattened blades, each tapering into a long slender spine; base of phallosome between the blades microscopically produced. Eighth sternite long and sheathing, narrowed outwardly, at apex divided into 2 flattened divergent whitened blades, their outer margins fringed with dense long golden yellow setae.

Holotype ♂, Chino Canyon, Riverside Co., California, 19.IV.1960, J. R. Powers (CIS). Allotopotype ♀. Paratopotypes, 1♂, 3 ♀♀.

The species is named for Jack R. Powers, of Concordia College, Moorhead, Minnesota. The most similar species are the Californian *Tipula* (*Lunatipula*) *downesi* Alex., *T.* (*L.*) *martini*, n. sp., and *T.* (*L.*) *sequoiarum* Alex., all readily distinguished among themselves by hypopygial characters, especially of the tergite, inner dististyle and phallosome.

Tipula (Lunatipula) raysmithi Alexander, n. sp.

Allied to *mesotergata*; mesonotum gray, the praescutum with 4 light brown stripes; antenna with scape and pedicel yellow, flagellum black; wing grayish, prearcular field, cells *C* and *Sc*, and stigma light brown; abdominal tergites yellow, faintly trivittate with light brown; ♂ hypopygium with tergal lobes moderately produced; inner dististyle with outer basal lobe very large and complex, including 2 spinous points and a large flattened semicircular blade; phallosome with each gonapophysis including a narrow flattened point and a much larger blade that terminates in 2 major spines; 8th sternite on either side pro-

duced into a narrow flattened blade and a small cushion that bears long yellow setae.

♂. Length about 17 mm; wing 16 mm; antenna about 5 mm.

Frontal prolongation of head long, subequal to remainder, yellow, gray pruinose dorsally, nasus distinct; basal 2 segments of palpi brownish yellow, remainder black. Antenna with scape and pedicel yellow, flagellum black; flagellar segments weakly incised, subequal to or slightly longer than verticils. Head light gray, the low rounded vertical tubercle more buffy.

Pronotum light gray, with a central pale brown area. Mesonotal praescutum gray, with 4 light brown stripes, the intermediate pair narrowed to points behind; vestiture of interspaces very small, lacking on central line; remainder of mesonotum light gray, scutal lobes vaguely patterned with brown; a narrow capillary pale brown central line on posterior 1/2 of mediotergite, pleurotergite more yellowed. Pleura gray, dorsopleural region and metapleura yellowed. Haltere with stem light brown, base narrowly yellowed, knob dark brown. Legs with coxae pale brown, faintly pruinose; trochanters yellow; remainder of legs broken. Wing with a faint grayish tinge, prearcular field, cells *C* and *Sc* and the stigma light brown; obliterative areas scarcely indicated; veins brown. Venation: R_2 long, erect, about 1/4 R_{2+3}; petiole of cell M_1 longer than *m*.

Abdominal tergites yellow, faintly trivittate with light brown, posterior borders narrowly yellowed, sublateral stripes beginning at midlength of 2nd segment, becoming broader and more nearly marginal on outer segments; sternites and hypopygium more yellowed. Male hypopygium with tergal lobes only moderately produced, blackened, outer lateral angles obtuse. Outer dististyle moderately expanded; inner style with beak acute, blackened, posterior crest scarcely produced; outer basal lobe very large and complex, including 2 spinous points and a large flattened semicircular blade. Each gonapophysis including a narrow flattened point and a much larger flattened blade that terminates in 2 major spines. Eighth sternite on either side produced into a narrow flattened blade and a small cushion that bears long yellow setae, decussate across midline.

Holotype ♂, 5 km south of Dunsmuir, Siskiyou Co., California, 24. V. 1958, C. L. Rothmann (CIS).

I am pleased to dedicate this species to Dr Ray F. Smith, Chairman of the Department of Entomology and Parasitology, University of California, Berkeley. The nearest relative is *Tipula* (*Lunatipula*) *mesotergata* Alex., of southern California, which differs conspicuously in the details of structure of the ♂ hypopygium, particularly the tergite, outer basal lobe of inner dististyle, and phallosome.

Tipula (Lunatipula) schlingeri Alexander, n. sp.

Allied to *unicincta*; mesonotal praescutum gray with 4 narrow brown stripes; femora yellow, tips conspicuously blackened; wing grayish brown, restrictedly patterned with white, including a major area at cord; abdominal tergites yellowish gray with a narrow interrupted central brown vitta and sublateral darkened triangles; ♂ hypopygium with lobe of 9th sternite broad-based, narrowed outer portion short, terminating in a single spinoid seta; phallosome large and conspicuous, elements paired; 8th sternite with bases of lateral fasciculate bristles broadly expanded, central cushion transversely suboval, with abundant long yellow setae.

♂. Length about 17 mm; wing 18 mm; antenna about 4 mm.

♀. Length about 20–23 mm; wing 20–21 mm.

Frontal prolongation of head brownish gray above, yellowed on sides and beneath; nasus short and stout; palpi dark brown, terminal segment brownish black. Antenna with scape brownish yellow, clearer basally, pedicel yellow; flagellum black, segments subequal to their verticils, basal enlargements very small and inconspicuous. Head yellowish gray in front, including inconspicuous vertical tubercle, more brownish gray behind.

Pronotal scutum gray, more yellowed on sides; scutellum yellowed medially, sides weakly darkened. Mesonotal praescutum gray with 4 narrow brown to dark brown stripes, in cases narrower and less distinct, median gray area glabrous; scutum gray, each lobe with 2 brown areas, anterior one small; scutellum obscure brownish yellow, posterior 1/2 with 2 brown spots, parascutella pale; mediotergite brownish gray, posterior 1/3 more uniformly darkened. Pleura brownish gray, variegated with more yellowed areas, more evident on pleurotergite. Haltere with stem dark brown, its base yellowed, knob darker. Legs with fore coxae brownish gray, the posterior face yellowed, remaining coxae more uniformly yellowed; trochanters yellow; femora yellow, tips conspicuously blackened; tibiae yellow, tips narrowly and less evidently brownish black, tarsi passing into black; claws of ♂ toothed. Wing with ground grayish brown, restrictedly patterned with whitish, most evident as a major area at cord and into adjoining cells; less conspicuous whitened streaks in cells M_1 and M_2, end of vein *Cu* and at margin of cell *1st A* near vein *2nd A*; all cells immediately beyond arculus more vaguely whitened; stigma dark brown; veins brown. Venation: *Rs* about 1/2 longer than *m-cu*; petiole of cell M_1 subequal to or shorter than *m*.

Basal abdominal tergites obscure yellow, remainder gray pruinose, with a much interrupted narrow brown central vitta, areas narrowed behind; base of segment 2 and part of 4 more uniformly dark brown; sides of tergites with basal brown triangles, lateral borders narrowly pale, wider posteriorly; sternites more uniformly yellow to obscure yellow, in ♀♀ sparsely pruinose; ♂ hypopygium chiefly brownish yellow. Ovipositor with dorsal shield polished brownish black; cerci slender, hypovalvae shorter and broader. Male hypopygium with tergal lobes relatively broad, tips acute, median emargination relatively narrow. Lobe of 9th sternite broad-based, narrowed portion short, terminating in a single spinoid seta, with about 3 smaller similar setae at its base. Outer dististyle spatulate; inner style with beak slender, posterior crest elongate, its tip obtuse, outer basal lobe broader. Phallosome large and conspicuous, as compared with *unicincta*, elements pendant, paired, longer outer spines divergent. Eighth sternite with bases of lateral fasciculate bristles broadly expanded, inner margin with a series of about 10 strongly recurved setae; fasciculate bristles from a short base, at apex divided into 2 unequal hair-like setae; central cushion transversely suboval, posterior border truncate, surface with abundant long yellow setae.

Holotype ♂, Sugar Bowl Lodge, Placer Co., California, 19.VIII.1951, collector unspecified (CAS). Allotopotype ♀. Paratopotypes 2 ♀♀.

The species is dedicated to Dr Evert I. Schlinger, authority on the dipterous family Cyrtidae. The most similar species is *Tipula* (*Lunatipula*) *unicincta* Doane, which differs evidently in hypopygial characters, especially the appendage of 9th sternite, inner dististyle, phallosomic elements and 8th sternite. Other allied species, as *T.* (*L.*) *biavicularia*, n. sp.,

T. (*L.*) *bigeminata* Alex., *T.* (*L.*) *diacanthophora* Alex., *T.* (*L.*) *filamentosa* Alex., *T.* (*L.*) *sagittifera* Alex., and *T.* (*L.*) *spatha* Doane, have the phallosomic elements asymmetrical, with one element unpaired.

Tipula (Lunatipula) yana Alexander, n. sp.

Allied to *vittatipennis*, with wing pattern generally as in that species; ♂ hypopygium with tergal lobes blackened, subtruncate; lobe of 9th sternite oval, not produced; inner dististyle narrow, lower beak slender, apex narrowed to a point; spines of phallosome long and slender; 8th sternite with 4 modified fasciculate bristles on each lobe.

♂. Length about 15 mm; wing 16 mm; antenna about 4 mm.

Frontal prolongation of head brownish yellow, narrowly gray pruinose above; nasus short and stout, tufted with few long yellow setae; palpi brown, terminal segment black, about 1/2 longer than penultimate. Antenna with scape light brown, pedicel yellow, flagellum black, apices of more proximal segments yellowed; flagellar segments moderately incised, shorter than verticils. Head chiefiy light gray; vertex with a capillary brown median line, more expanded on center of posterior vertex; vertical tubercle low, more yellowed on sides, with a brown spot behind each antennal fossa.

Pronotal scutum brownish gray, narrowly more darkened anteriorly; scutellum light yellow. Mesonotal praescutum light gray, with 4 entire dark brown stripes, intermediate pair narrower on posterior 1/2; posterior sclerites of notum chiefly brownish gray. Pleura buffy yellow, ventral sternopleurite light gray; dorsopleural membrane light yellow. Haltere with stem brownish yellow, knob darker brown. Legs with fore coxa gray, remaining coxae more buffy; trochanters yellow; femora obscure yellow, tips narrowly brownish black; tibiae clearer yellow, tips more narrowly infuscated; tarsi brownish yellow, passing into dark brown; claws of ♂ toothed. Wing with ground color whitened, extensively patterned with brown, the latter more extensive than ground; darkened areas arranged almost as in *vittatipennis*, that is, without darkenings in base of cell *R* as is the case in *hastingsae*. In paratype with a linear darkened wash in cell *R* adjoining vein *R*.

Abdominal tergites obscure yellow, with 3 extensive but ill-defined light brown stripes, conspicuously interrupted by yellow posterior borders to the segments; sternites more uniformly yellow; hypopygium large, chiefly brownish yellow. Male hypopygium with tergal lobes blackend, broad, apices oblique to subtruncate, outer angle obtuse; median notch rectangular, dorsal furrow complete. Ninth sternite an oval or subtriangular lobe with a few long setae on lower 1/2, not long-produced as in allied species. Dorsal dististyle broadly expanded; inner style with beak slender, lower beak very slender, extended into a point, in type surface with abundant short black setulae, in paratype more glabrous; posterior crest elongate, pale, ending in an acute point; outer basal lobe narrow, basally with a brush of long yellow setae. Phallosome with spines recurved, pale, long and slender, narrowed very gradually to acute points. Eighth sternite with lateral lobes relatively small oval, each with 4 long fasciculate bristles in holotype, 3 in paratype, these much longer than in *vittatipennis*; remainder of lobe and inner margin with numerous long recurved pale setae; central cushion with rows of abundant yellow setae, outermost very long, those nearer midline progressively smaller.

Holotype ♂, Shasta Co., California, without more exact geographic data, 30.V.1921, R.

W. Doane (CAS). Paratype ♂, Mill Valley, Marin Co., Calif., 16.V.1926, E. P. Van Duzee.

The specific name, *yana*, is that of an extinct Amerind tribe belonging to the Hokan family of the Shastan group, formerly occupying the Upper Sacramento Valley in the vicinity of Rock Creek and Pit River. The species is most similar to *Tipula* (*Lunatipula*) *vittatipennis* Doane in its general appearance, differing chiefly in hypopygial structure, including tergite, 9th sternite, inner dististyle, phallosome and 8th sternite.

Tipula (Pterelachisus) cavagnaroi Alexander, n. sp.

Allied to *sequoicola*; head and thorax light gray, vertex and thoracic notum lined with brown, pleura clear gray; femora obscure yellow, tips restrictedly infuscated; claws of ♂ toothed; wing tinged with gray, outer radial field slightly infuscated; abdominal tergites brownish yellow, basal sternites conspicuously black; hypopygium large, brownish yellow; tergal lobes obtusely rounded to subtruncate, central emargination narrow; setuliferous lobe at posterior border of 8th sternite broad at base, the more narrowed outer part only about 4× as long as broad.

♂. Length about 11–11.5 mm; wing 9.5–11 mm; antenna about 2.9–3 mm.

♀. Length about 12.5–14 mm; wing 10.5–11.5 mm.

Frontal prolongation of head light castaneous; nasus conspicuous, with black setae; palpi brownish black, elongate, subequal to antennal flagellum. Antenna with scape elongate, yellow, pedicel light brown, flagellum brownish black; flagellar segments cylindrical, without distinct basal enlargement, a little longer than verticils. Head light gray with a capillary light brown central line from the low vertical tubercle to occiput.

Pronotal scutum light gray with a median brown area; scutellum obscure yellow. Mesonotum gray, praescutum with 4 narrow brown stripes; scutal lobes with 2 brown areas, in cases anterior one very small or lacking; mediotergite with a central darkened vitta; pleurotergite gray, light brown posteriorly. Pleura clear light gray, dorsopleural membrane pale yellow. Haltere short, stem brown, knob brownish black. Legs with coxae grayish brown; trochanters yellow; femora, tibiae and basitarsi obscure yellow, femoral tips restrictedly infuscated; outer tarsal segments dark brown; claws of ♂ toothed. Wing tinged with gray, outer radial field slightly infuscated; prearcular field and cells *C* and *Sc* more yellowed; stigma oval, darker brown; restricted whitened areas before and beyond stigma and across cell *1st* M_2, the last barely entering cell M_3; veins dark brown, *Sc* and *R* more brownish yellow. No squamal setae. Venation: *Rs* about 1.5× *m-cu*; vein R_{1+2} strongly preserved; petiole of cell M_1 subequal to or shorter than *m*.

Basal abdominal tergites brownish yellow, posterior borders narrowly pale yellow; sternites 2–7 conspicuously black, lateral borders narrowly yellowed, blackened area becoming narrower on outer segments, lateral borders more brownish yellow; outer tergites and large hypopygium brownish yellow. The allotype ♀ has sternites less evidently darkened. Ovipositor with cerci slender, narrowed to acute tips; hypovalvae nearly as long, narrow, tips obtuse. Male hypopygium with tergite large, brownish yellow; posterior border with 2 broadly rounded to more truncate lobes that are separated by a narrower U-shaped median emargination. Lobes of 9th sternite very small and inconspicuous, hairy. Outer dististyle long and slender, pale, with conspicuous setae; inner style with beak narrow, twisted, tip obtuse, the disc near its base more blackened; lower beak a globular blackened

knob; outer basal lobe a stout scoop-like structure provided with long pale setae. Eighth sternite very extensive, outer margin subtruncate, on either side of apex with an oval cushion of long yellow setae, outermost bristle longer; median region of posterior border produced into a pale broad based fleshy lobe, more narrowed apical part 2-4× as long as broad, with dense pale setulae.

Holotype ♂, Strawberry, Tuolumne Co., California, 19.VIII.1960, D. Q. Cavagnaro (CIS). Allotype ♀, pinned with type. Paratopotypes 5♂♂ and ♀♀, 12-14.VIII.1960. Paratypes: 8♂♂ and ♀♀, Leavitt Meadow, Sonora Pass, Mono Co., Calif., 2160 m, in flight trap, 13. VIII.1963, H. B. Leech (CAS); 1♂, 1♀, Truckee, Nevada Co., Calif., VIII.1948, at Agricultural Inspection Station (Alex. Coll.); 1♀, Webber Lake, Sierra Co., Calif., 24. VIII. 1939, Mont A. Cazier (Alexander Coll.).

The fly is named for Mr D. Q. Cavagnaro, former student at the University of California, Berkeley. It is allied to *Tipula* (*Pterelachisus*) *sequoicola* Alex. which differs evidently in the much longer and more slender tail-like extension of the 8th sternite. The unique type of *sequoicola* was somewhat teneral with the body not fully colored and it cannot be affirmed whether the abdominal sternites are blackened as in the present fly. A second related species is *T.* (*P.*) *bakeri* Alex. from the Wallowa Mountains, in eastern Oregon, which similarly differs particularly in the details of hypopygial structure.

Tipula (Pterelachisus) jenseni Alexander, n. sp.

Allied to *accurata* and *alcestis*; mesonotal praescutum brownish yellow with 4 narrow brown stripes; femora yellow, tips narrowly dark brown, the amount subequal on all legs; wing whitish yellow, patterned with pale brown, most conspicuous in outer radial field; abdomen yellow, tergites trivittate with brown, sternites with a broad median stripe; ♂ hypopygium with vestiture of lobe of 9th sternite darkened, conspicuous; outer dististyle very long and slender, inner style with dorsal crest very high, outer basal lobe elongate, with abundant long setae on proximal 1/2; 8th sternite with a single powerful scabrous bristle on either side, additional to abundant normal setae, median region produced into a depressed-flattened glabrous plate, its apex conspicuously emarginate.

♂. Length about 10.5-11 mm; wing 12-12.5 mm; antenna about 3.1-3.2 mm.

♀. Length about 13.5-14 mm; wing 11.8-12 mm.

Frontal prolongation of head obscure yellow, narrowly dark brown above, nasus conspicuous; palpi black. Antenna with scape and pedicel yellowed, flagellum brownish black, apices of proximal 2 segments obscure yellow; flagellar segments longer than their verticils, basal enlargements poorly indicated. Head light brown with a capillary darker brown central vitta, extending from low vertical tubercle to occiput, narrowed behind.

Pronotal scutum brownish yellow, darkened medially, scutellum more obscure yellow. Mesonotum opaque brownish yellow, praescutum with 4 darker brown stripes, intermediate pair narrowly separated; posterior sclerites brownish yellow, scutal lobes and a capillary median stripe on scutellum brown. Pleura light gray, posterior sclerites and dorsopleural membrane yellowed. Haltere with stem yellow, knob brown. Legs with coxae yellowed, bases narrowly more infuscated; trochanters yellow; femora yellow, tips narrowly dark brown, the amount subequal on all legs; tibiae brownish yellow, tarsi passing into black; claws of ♂ with a weak tooth. Wing with the very restricted ground whitish yellow,

patterned with pale brown, heavier and more conspicuous in outer radial field and in cell *1st A*; stigma darker brown; cell *Sc* light yellow; whitened obliterative areas including cell R_1 and adjoining parts of costal field, the poststigmal brightening and an area across base of cell *1st* M_2 into cell M_3; veins brown, more yellowed in prearcular and subcostal areas. No squamal setae. Venation: *Rs* about 2.5× R_{2+3}; petiole of cell M_1 subequal to or longer than *m*.

Abdomen yellow, in ♂ tergites trivittate with brown, lateral borders pale, sternites broadly darkened medially, yellow on sides; in cases the darkened tergal pattern paler and relatively inconspicuous, especially central stripe, the lateral pair broadly interrupted; 8th sternite brown, tergite paler; basistyles of large hypopygium whitened. In ♀ tergites about as in ♂, pale lateral borders narrower; sternites yellow with 3 blackened stripes, median vitta only a little wider than laterals, ending on 7th segment. Ovipositor with cerci and hypovalvae relatively slender, especially the latter, tips acute. Male hypopygium with 9th tergite transverse, narrowed posteriorly, with a deep narrow central emargination, lobes glabrous, their apices gently oblique. Ninth sternite with lobe simple, provided with very long dark brown setae. Outer dististyle very long and slender, its length about 10× the diameter, setae scattered, near base smaller but abundant; inner style with beak stout, dorsal crest very high; outer basal lobe an elongate blade, on proximal 1/2 with numerous long setae. Gonapophyses pointed at tips. Eighth sternite with 2 semi-detached lateral lobes on either side, one bearing a single very powerful scabrous bristle, the other fringed with long stout setae near base; median region produced into a depressed-flattened glabrous plate, its apex conspicuously emarginate.

Holotype ♂, Leavitt Meadow, Mono Co., California, 2160 m, in flight trap, 13.VIII.1963, H. B. Leech (CAS). Allotopotype ♀, with type. Paratopotypes 1♂, 2♀♀, with type.

I take unusual pleasure in dedicating this fly to Mr Steve Jensen, of the University of Utah, who has made a large number of illustrations of species of *Tipula* to be used in the forthcoming Bulletin covering the crane-flies of California. The most similar species are *Tipula* (*Pterelachisus*) *accurata* Alex. and *T.* (*P.*) *alcestis* Alex., which differ in all details of structure of the ♂ hypopygium. Other species that are more distantly related include *T.* (*P.*) *mono* Alex., and a group of flies that have the median lobe of the 8th sternite pale and setuliferous, including *T.* (*P.*) *bakeri* Alex., *T.* (*P.*) *cavagnaroi*, n. sp., and *T.* (*P.*) *sequoicola* Alex.

Tipula (**Setitipula**) **esselen** Alexander, n. sp.

Allied to *rusticola*; ♂ hypopygium with tergal lobes relatively long, central region convexly produced; lateral lobes of phallosome shorter than aedeagus, their vestiture relatively short and sparse.

♂. Length about 12.5–13 mm; wing 13–13.5 mm; antenna about 5 mm.

♀. Length about 15 mm; wing 12.5 mm.

Frontal prolongation of head chestnut brown above, more yellowed on lower 1/2; nasus short and stout; palpi with basal segments black, outer ones broken. Antenna with elongate scape yellow; remainder broken. Head with front yellowed, remainder gray, with a conspicuous central dark brown stripe extending from low vertical tubercle almost to occiput, posterior vertex behind slightly infuscated,

Pronotum brownish yellow, nitidous. Mesonotal praescutum with ground brownish yellow, disc with 4 poorly indicated stripes of nearly the same color, humeri and anterior border restrictedly more darkened, posterior interspaces less evidently infuscated; posterior sclerites of notum pale brown, the scutal lobes slightly patterned with darker, mediotergite paler. Pleura light brown, dorsopleural membrane buffy yellow. Haltere with stem obscure yellow, knob dark brown. Legs with coxae chestnut yellow, trochanters clearer yellow; femora brownish yellow, tips darker brown; tibiae similar with the darkened tips narrower; tarsi brownish black; claws of ♂ toothed. Wing brownish yellow, prearcular and costal fields clearer yellow; stigma pale brown; restricted whitened areas before stigma and across base of cell *1st* M_2; veins brown. Abundant macrotrichia in cells beyond cord from R_2 into M_4, becoming more sparse behind; stigmal trichia abundant; squamal setae long. Venation: *Rs* about 2.5× *m-cu*; petiole of cell M_1 shorter than *m*.

Abdominal tergites obscure yellow, clear yellow on proximal 2 segments, with a nearly continuous dark brown central stripe and darkened lateral areas at bases of segments, the outer lateral angles of segments broadly light gray; sternites and hypopygium brownish yellow. Male hypopygium with tergal lobes relatively long, the central region convexly produced, not emarginate medially as in *trichophora*. Outer dististyle elongate, slender; inner style with both beak and lower beak obtusely rounded, heavily blackened; outer basal lobe a fleshy cushion that bears a flattened blade-like extension at about a right angle, whitened and densely provided with delicate pale setulae. Aedeagus narrowed outwardly, terminating in small blades, one slightly decurved at tip; sternal lobes or apophyses shorter than aedeagus, vestiture short and sparse as compared with *rusticola* or *trichophora*. Eighth sternite broad, on either side before posterior border with an oblique row of long yellow setae, margin on either side of midline with 4 comparable setae.

Holotype ♂, Pfeiffer Big Sur State Park, Monterey Co., California, 16. VI. 1949, P. H. Arnaud (Alexander Coll. through Arnaud). Allotype ♀, Finch Creek, Hastings Natural History Reservation, Monterey Co., Calif., 26. V. 1945, Jean Linsdale (CIS). Paratypes 3 ♂♂, with allotype 29.V.1950, 24.VI.1948, 2.VII.1950, Linsdale (CIS & CAS).

The specific name, *esselen*, is that of an extinct Californian Amerind tribe belonging to the Hokan family, formerly occupying the drainage of the Carmel river. The species is most readily told from the two other known members of the subgenus by the structure of the ♂ hypopygium, particularly the tergite and phallosome. The lateral lobes or apophyses are much shorter than in *trichophora* Alexander being more as in *rusticola* Doane but with the vestiture shorter. The conformation of the tergite is different from that of both of these species.

Tipula (Sinotipula) coleomyia Alexander, n. sp.

Allied to *gothicana*; general coloration of mesonotal praescutum obscure yellow with 4 more cinnamon brown stripes that are encircled by the yellowed ground; wing pale grayish brown, inconspicuously patterned with darker brown and cream colored areas; ♂ hypopygium large, posterior border of tergite produced into a conspicuous depressed-flattened blade, its decurved apex microscopically bilobed; inner dististyle very large, narrowed at base, expanded outwardly into a massive triangular head.

♂. Length about 20 mm; wing 20 mm; antenna about 4 mm.

Frontal prolongation of head light brown above, obscure yellow on ventral 1/2, nasus

long and slender; palpi dark, brown, terminal segment relatively short, about equal to 2nd and 3rd combined. Antenna with the long scape and pedicel yellow; proximal 4 segments of flagellum yellow, basal enlargements weakly darkened, outer segments uniformly infuscated; flagellar segments somewhat shorter than their verticils, basal enlargements very small and inconspicuous. Front light gray; vertex brown, the anterior border of the low tubercle and the narrow orbits gray.

Pronotal scutum yellow, patterned with medium brown, including large central enlargement; scutellum more yellowed, lateral margins carinate or blade-like. Mesonotal praescutum with ground obscure yellow with 4 more cinnamon brown stripes that are very narrowly and vaguely bordered by slightly darker brown, entire area encircled by yellow ground; humeral and lateral regions darker brown; scutal lobes medium brown with a narrow U-shaped more yellowed area; scutellum testaceous yellow, weakly darkened on central part; mediotergite pale brown, the posterior 1/3 more yellowed; pleurotergite light brown, the katapleurotergite yellowed on ventral 1/2. Pleura light gray, vaguely patterned with more yellowed areas, dorsopleural membrane more brownish yellow. Haltere with stem yellow, more orange basally, knob darkened with apex obscure yellow. Legs with coxae brown basally, apices yellowish gray, more narrowly so on fore pair; trochanters testaceous yellow; femora and tibiae brownish yellow, tips narrowly dark brown, slightly more extensive on latter; tarsi passing into brownish black; claws of ♂ toothed. Wing pale grayish brown, inconspicuously patterned with darker brown and cream colored areas; brown markings include especially the stigma and a contiguous mark in cell *C* and a small spot at origin of *Rs*; paler brown more extensive areas on outer 1/2 of cell *M* and at near midlength of cell *Cu*; the pale markings are across cell *1st* M_2, beyond stigma, posteriorly crossing the basal parts of outer radial cells, and a spot at near the outer 4/5 of cell *M* adjoining vein *Cu*; single marginal pale spots in centers of cells R_5 to M_3, with 2 in cell *1st A*, lacking in cells M_4, *Cu* and *2nd A*; veins light brown. Numerous macrotrichia on outer radial veins, M_1, outer section of Cu_1 and outer end of basal section, base of vein *1st A* and most of *2nd A*. Venation: *Rs* less than 2× *m-cu*; cell R_3 strongly constricted at midlength; petiole of cell M_1 longer than *m*.

Abdominal tergites almost uniformly cinnamon brown, their borders narrowly and inconspicuously pale; basal sternites yellowed, outer segments more orange. Male hypopygium (described from the dry type) large. Ninth tergite large, sternite and basistyle fused, with a microscopic suture only. Tergite with median portion of border produced into a conspicuous depressed-flattened blade, the tip decurved and microscopically bilobed; dorsal surface of expanded blade with a long median groove, the sides tumid. Outer dististyle appearing as an elongate lobe that is densely covered with short pale yellow setae; inner style very large, broad at base, narrowed at central part, the apex expanded into a massive triangular head, its apex truncate. Ninth sternite with dense fringes of long yellow setae, directed dorsad toward a very small bright orange lobule; midregion of sternite with a slender pale yellow lobe that is directed ventrad. Eighth sternite sheathing, margin entire, subtruncate, provided with black setae, those at midregion somewhat longer but not forming tufts or brushes.

Holotype ♂, Mountain Home Canyon, San Bernardino Mts, San Bernardino Co., California, 16.VII.1922, F. R. Cole (CIS).

I take unusual pleasure in dedicating this fine species to my friend and co-worker in

the Diptera for nearly half a century, Dr Frank Raymond Cole, of the University of California, Berkeley. The most similar species is *Tipula* (*Sinotipula*) *gothicana* Alexander, which differs especially in the structure of the hypopygium, including the readily apparent expanded simple blade of the tergite.

Tipula (**Sinotipula**) **powelli** Alexander, n. sp.

Allied to *pacifica*; size large (wing more than 25 mm); mesonotal praescutum with the yellow ground very restricted, the disc with 4 brownish gray stripes that are margined with dark brown; wing pale brown, marbled with darker brown and cream-colored areas, the former including a postarcular mark in bases of cells *R* and *M*; ♂ hypopygium with ventral armature of tergite including a blackened bilobed plate; outer dististyle deeply bilobed, outer scoop-like blade with its outer margin clothed with dense black setae, innear blade smaller, outer part subrectangular, with microscopic blackened setae; inner style smaller than outer, beak and outer basal lobe subequal in length, the latter stouter.

♂. Length about 27 mm; wing 28 mm; antenna about 5 mm.

♀. Length about 34 mm; wing 26 mm.

Frontal prolongation of head a little shorter than remainder, light brownish yellow, faintly pruinose above, nasus reduced to a small tubercle; palpi with proximal 3 segments brown, incisures pale, terminal segment black. Antenna with scape light brown, pedicel yellow, flagellum brown, the segments much shorter than verticils, the latter longer on more proximal segments. Head yellowish gray, above with 3 conspicuous brown areas including lateral markings behind eyes and a long central stripe extending from the low vertical tubercle to occiput.

Pronotal scutum brown, yellow on sides. Mesonotal praescutum with ground light yellow, restricted to the narrow interspaces; disc with 4 brownish gray stripes that are margined with dark brown, lateral and humeral borders similarly darkened, interspaces with long yellow setae, smaller behind; scutal lobes brown, narrowly bordered laterally and along mesal edge by darker, median area yellow, including also 2 spots at base of scutellum, the latter brown with long yellow setae; mediotergite brown, sides and a pair of spots on disc yellowish gray; pleurotergite chiefly silvery and yellow, dorsal katapleurotergite darker. Pleura yellow, with a broad longitudinal dorsal stripe from cervical region to anepisternum; dorsopleural membrane light yellow. Haltere yellow, stem and base of knob vaguely more infuscated. Legs with coxae brown basally, tips grayish yellow; trochanters yellow; femora yellow, tips narrowly brown; tibiae and basitarsi brown, the outer tarsal segments black; claws of ♂ toothed. Wing with ground pale, with a restricted darker brown and yellow pattern, as is common in the subgenus; dark brown areas including a postarcular mark, origin and fork of *Rs*, a cloud in cells *M*, *Cu* and *1st A*, at near 2/3 length of vein *M*, and darkenings in outer radial field and along wing margin; darkened cloud in cell *M* single or narrowly divided into two; all outer cells variegated by yellow spots, larger in outer radial field, especially cell R_5 and in cell *2nd A*; no marginal darkenings at ends of longitudinal veins. Venation: Outer section of vein R_{4+5} arcuated beyond midlength, slightly constricting cell R_3 at this point; *m-cu* on M_4 just beyond base.

Basal abdominal tergites in ♂ cinnamon brown, lateral borders obscure yellow, broad-

est on 1st segment, remainder narrowly interrupted by darker on basal ring; outer segments, including hypopygium, darker; sternites paler brownish yellow. In ♀, abdomen more uniformly cinnamon brown, lateral borders of tergites broadly light gray, outer sternites slightly more pruinose. Ovipositor with cerci long and nearly straight, hypovalvae very reduced. Male hypopygium with decurved posterior border of 9th tergite with 2 slender black spines separated by a shallow emargination; behind this on lower surface with a bilobed heavily blackened plate separated only by a narrow space. Outer dististyle much larger than inner, deeply bilobed, outer scoop-like blade with narrowly infolded outer margin provided with dense black setae; inner lobe smaller, outer portion subrectangular, apex and outer margin with microscopic black setae. Inner style with beak slender, outer basal lobe subequal in length but stouter, subtriangular in outline, provided with long erect setae, those of outer margin blackened, laterally more yellowed and longer.

Holotype ♂, Alsea, Benton Co., Oregon, 23. V. 1931, H. A. Scullen (Alexander Coll.). Allotype ♀, Brookings, Curry Co., Oregon, 9.VII.1925, H. A. Scullen. Not presently known from California but regional along the coastal mountains.

I name this fly for Dr Jerry A. Powell, of the Department of Entomology, Berkeley, in charge of the California Insect Survey. The most similar species include *Tipula* (*Sinotipula*) *calaveras* Alex., *T.* (*S.*) *pacifica* Doane, and *T.* (*S.*) *shastensis* Alex., all readily separated among themselves by differences in the ♂ hypopygium.

Tipula (Trichotipula) kennedyana Alexander, n. sp.

♂. Length about 10 mm; wing 10.5 mm; antenna about 3.5 mm.

Generally similar to *Tipula* (*Trichotipula*) *dorsolineata* Doane in body coloration, differing from this and some other allied species as *T.* (*T.*) *furialis* Alex. and *T.* (*T.*) *sayloriana* Alex., chiefly in hypopygial characters. Wing without macrotrichia in outer cells, as is also the case in *dorsolineata* and *desertorum* Alexander; stigma with about 9 trichia, all in cell R_1. Male hypopygium with posterior emargination of tergite deep and narrow, apices of lobes slightly farther produced; spinoid marginal setae relatively sparse, the outer group of smaller setae especially so. Inner dististyle very short, subequal in length to outer style, stem stout, outer 1/3 expanded into a head; outer basal lobe unusually large but relatively narrow, extending nearly to 2/3 length of style, blackened basal tooth small. Eighth sternite with unusually long and conspicuous black setae, more evident at midline.

Holotype ♂, Convict Creek, Mono Co., California, 2160 m, VII. 1961, H. D. Kennedy (Alexander Coll.).

I dedicate this species to Dr Harry D. Kennedy, author of two outstanding papers on the Mountain Midges, Deuterophlebiidae, of California.

Tipula (Triplicitipula) bellamyi Alexander, n. sp.

General coloration of mesonotal praescutum brownish yellow, with 4 narrow brown stripes that are bordered vaguely by slightly darker brown; wing almost uniformly light brown, stigma and a small spot at end of vein *Sc* darker; abdominal tergites obscure orange with a central brown vitta, lateral darkenings not evident; ♂ hypopygium with central emargination of tergite bearing 2 acute closely approximated spines; inner dististyle with sparse setae, most evident at posterior end of dorsal crest; outer basal lobe slender, its basal at-

tachment narrow; 8th sternite with lateral lobes short and compact, with about 7 or 8 conspicuous flattened modified setae that are extended into long points, their surface microscopically spinulose.

♂. Length about 17–18.5 mm; wing 17–20 mm; antenna about 5.5–5.6 mm.

Frontal prolongation of head brownish yellow; palpi with proximal 2 segments yellow, remainder brownish black. Antenna with scape and pedicel yellow, 1st flagellar segment brownish yellow, slightly darkened near outer end beneath and provided with short erect setulae; remaining segments black, with conspicuous short-oval basal enlargements, subequal in length to longest verticils. Head brownish gray, front more yellowed, orbits narrowly light gray, occipital region obscure yellow.

Pronotum brownish yellow. Mesonotal praescutum brownish yellow with 4 narrow brown stripes that are bordered vaguely by slightly darker brown, the median interspace about 1/3 as wide as either intermediate stripe; humeral region weakly darkened; setae of interspaces short, black, conspicuous; posterior sclerites of notum gray, scutal lobes extensively darker brown, the areas confluent; a capillary darkened central line on scutellum and mediotergite. Pleura obscure yellow, dorsopleural membrane weakly infuscated. Halteres broken. Legs with coxae obscure yellow; trochanters yellow; femora and tibiae obscure yellow, their tips very narrowly and vaguely darker; tarsi brownish yellow, passing into brown. Wing almost uniformly light brown, costal border very slightly darker; stigma and a smaller spot at end of *Sc* darker brown; obliterative areas before stigma and across cell *1st* M_2 interconnected; veins light brown. Venation: *Rs* about 1/2 longer than *m-cu*, the latter just before fork of M_{3+4}.

Abdominal tergites obscure orange with a central brown stripe, very narrow and ill-defined on proximal 2 segments, broad and nearly continuous on succeeding segments, sublateral stripes not evident, lateral borders narrowly pale; sternites more uniformly obscure orange; hypopygium brownish yellow. Male hypopygium most similar to that of *doaneiana*; tergite transverse, posterior border U-shaped, with 2 acute intermediate projections separated only by a linear split, placed so close together as to appear almost entire; lateral lobes simple, without flattened margins. Ninth sternite with lobe elongate, with a concentration of long setae at lower end, before this with a conspicuous obtuse accessory lobe. Outer dististyle darkened, broadest at midlength, tip narrowly obtuse; inner style with both beak and lower beak obtusely rounded, dorsal region thickened, with a sparse brush of brownish yellow setae at posterior end, these becoming progressively smaller, very reduced near beak; lateral setae stout, arranged in a narrow row; outer basal lobe slender, basal attachment narrow, apex produced laterad into a short point, posterior margin with long erect setae, shorter at either end. Base of aedeagus with a flaring plate that bears 2 small darkened lobes near its lower edge; arms of aedeagus divergent, spines darkened, broad-based. Eighth sternite with outer portion semidetached; lateral lobes short and compact, with a crowded row of 7 or 8 conspicuously flattened modified setae that are extended into long points, their surface microscopically spinulose; 2 inner setae from large basal tubercles, lower one larger and strongly sinuous; central region between lobes with long setae in pale membrane, behind which on margin of sternite with a small oval sclerotized lobe or blade on either side of a wide central space.

Holotype ♂, Lucas Creek, Kern Co., California, 18. IV. 1962, R. E. Bellamy, No. 5138 (Alexander Coll.). Paratype ♂, Potter's Valley, Mendocino Co., Calif., 1. V. 1929, E. H.

Nast (CAS).

Tipula (*Triplicitipula*) *bellamyi* is named for Dr Richard E. Bellamy, capable student of the Tipulidae of Florida and California. In the hypopygial structure the fly is most similar to *T.* (*T.*) *doaneiana* Alexander, differing in all details of the hypopygium and in the virtually unpatterned wings. The other species having median teeth on the 9th tergite of the hypopygium differ more evidently in the structure of the latter.

Tipula (**Triplicitipula**) **idiotricha** Alexander, n. sp.

Allied to *aequalis*; general coloration of praescutum obscure yellow, disc with 4 slightly indicated reddish brown stripes; femora uniformly obscure yellow; wing brownish yellow, base and costal region clearer yellow, obliterative areas reduced; abdominal tergites obscure orange, basal sternites blackened; ♂ hypopygium with margins of tergite smooth, intermediate lobes very broad, tips truncated; 8th sternite generally as in *aequalis*, the proximal 2 setae of each lateral lobe modified as described.

♂. Length about 20 mm; wing 20 mm; antenna about 6.5 mm.

Frontal prolongation of head fulvous orange; palpi with basal 2 segments reddish brown, outer segments dark brown, especially the last. Antenna with scape and pedicel yellow, 1st flagellar segment obscure yellow, outer 1/3 weakly darkened; remaining segments black with tips of proximal 2 or 3 narrowly and vaguely paler; basal enlargements small, longest verticils exceeding segments. Head dark brown, front and occiput more orange.

Pronotum brownish yellow, vaguely patterned with pale brown. Mesonotal praescutum obscure yellow, clearer on sides, disc with 4 slightly indicated reddish brown stripes, intermediate pair narrow; scutal lobes and base of scutellum weakly darkened, remainder of notum more yellowed. Pleura yellow, sparsely white pruinose; dorsopleural membrane light yellow. Haltere with stem yellow, knob dark brown. Legs with coxae and trochanters orange; a single leg remains, broken before tip of tibia, obscure yellow, tips of femora undarkened. Wing brownish yellow, base and costal region clearer yellow; stigma relatively small; pale brown; obliterative areas before cord and stigma very reduced and inconspicuous.

Abdominal tergites obscure orange, 1st segment darkened medially, 2nd and 3rd darkened sublaterally; basal sternites blackened, outer segments more uniformly yellow, including large hypopygium. Male hypopygium with intermediate lobes of tergite very broad, narrowly separated, glabrous, with truncated tips, margins without roughenings such as are present in *aequalis*; lateral margins broadly infolded, glabrous, tips truncated. Lobe of 9th sternite very small with a low darkened swelling; appendage of sternite small, suboval, basal 1/2 with short strong setae, apex glabrous. Outer dististyle slender, club narrowly obtuse; inner style with beak obtuse, posterior crest moderately produced, with a concentration of long delicate yellow setae; outer basal lobe elongate, its basal attachment narrow, tip obtuse, outer 1/2 with numerous delicate setae. Eighth sternite with semidetached outer part strongly armed, including lateral lobes that bear about 7 or 8 modified setae, basal pair of unique conformation, each pointed at tip, before apex farther produced at a right angle into a very long roughened setoid structure, outer setae large but normal; median lobe conspicuous, tip obtuse, outer 1/2 with abundant strong reddish setae; at base of outer part with 2 brushes of exceedingly long yellow setae, their delicate tips in-

curved (in figure to appear in later *Bulletin* shown as being directed cephalad so not to complicate other parts shown).

Holotype ♂, Mill Creek Canyon, San Bernardino Mts, San Bernardino Co., California, 10.VII.1922, F. R. Cole (CIS).

The closest relative of the present fly is *Tipula* (*Triplicitipula*) *aequalis* Doane, which agrees in the general coloration and in hypopygial structure, differing conspicuously in the structure of the 9th tergite and 8th sternite, including the peculiarly modified setae of the latter which have suggested the species name.