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Some Suggestions on the Classification of the Genus Tipula (*Diptera*, Tipulidæ).

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Tipula is one of the largest genera of Diptera, with about a thousand described species occurring in all parts of the world except New Zealand, temperate Australia, and most of the smaller islands. In view of the immense number of species to be dealt with, various attempts have been made to divide the genus into species-groups or subgenera, but these have not been altogether successful, and have applied, in the main, to species of one region only. European writers have defined species-groups mainly on the pattern of the wings and thorax ; Alexander has arranged the American species into numerous groups defined partly on the colour-pattern and partly on the male hypopygium and antennæ. All these characters are open to objection as a basis for classification, either because of their trivial nature or as being applicable to one sex only. Hypopygial characters are no doubt valuable indices of natural affinities, but this organ is sometimes so differently constructed in closely related species that the significant features are not easy to appreciate.

In the hope of discovering some more satisfactory basis for the subdivision of the genus, I have made a rather close study of the British Museum Collection, which includes examples of about 360 species. The results of this scrutiny are somewhat disappointing, but are given here for what they are worth. I will first indicate some features which have been but little used hitherto, but are applicable to both sexes, and seem to me valuable for purposes of classification, and then proceed to discuss the applicability of the various published names which are or might be used as subgenera.

I.—Little-used Taxonomic Characters, applicable to both Sexes.

1. *Length of Radial Sector.*—This is fairly constant through whole groups of species, although all intermediate lengths can be found between the long and short types. I find the most satisfactory way of defining the length of this vein is in terms of the length of the *m–cu* cross-vein ; this ratio can easily be estimated roughly by eye under a low-power lens. A "short" sector is about equal to *m–cu* ; a "long" sector about twice as long as *m–cu*.

2. *Shape of Discal Cell.*—This depends chiefly on the position of origin of the vein M_4, whether close to or even just before the base of the cell (as in the genus *Nephrotoma* = *Pachyrrhina*), or well removed from the base (as in most *Tipula*). Again all intermediate conditions occur, but some groups are constant in this respect. Usually when M_4 arises close to the base, the discal cell is long and parallel-sided.

3. *Presence or Absence of Macrotrichia on Veins at Tip of Wing.*—In some groups all the veins beyond the cord are hairy, in others the branches of the media, and sometimes also the cubitus, are bare. The hairs, when present, vary in length, and may require a fairly high magnification for their detection, but under a binocular their bases are visible as dark dots.

4. *Presence or Absence of Hairs on the Squama.*—In some groups a distinct tuft of hairs is present on the angle of the squama, in others there is no trace of these hairs. A few species are intermediate, with the hairs present but very short and inconspicuous.

5. *Number of Tibial Spurs.*—Normally the full number of spurs is present (formula 1. 2. 2), but in certain groups and species the middle tibia has only one spur (formula 1. 1. 2), and in one group the front tibia has no spur, and a short mid-tibial spur may be present or absent (formula 0. 0. 2 or 0. 1. 2). The spurs are rather easily broken off, and in ascertaining their number care must be taken to examine perfect specimens.

6. *Pubescence of Thorax.*—The pubescence on different parts of the thorax varies in amount in different species, but in too indefinite a manner to be of much use in taxonomy. One group is rather sharply marked off from the rest by the presence of anepisternal hairs, and the presence or absence of sternopleural hairs is sometimes noteworthy, though these hairs are of rather sporadic occurrence. For example, *T. cheethami*, Edw., has numerous sternopleural hairs, though the closely related *T. alpium*, Bergr., has few or none.

7. *Verticillate Hairs of Antennæ.*—In some groups these hairs are subequal in length, in others the hairs of the under surface are very much shorter than the dorsal hairs; the latter condition is found in those groups which approximate to the genus *Nephrotoma*.

II.—Published Synonyms and Subgenera of *Tipula*.

In the following notes all the published synonyms and subgenera of *Tipula* are discussed, including two (*Tipulodina* and *Brithura*) which have sometimes been treated as distinct genera. Other closely related genera (such as *Longurio*, *Holorusia*, *Prionocera*, *Ctenacroscelis*) are not dealt with, as they are commonly accepted as distinct:—

1. *Tipula*, Linn., 1758 (type, *oleracea*, Linn.).—It is, perhaps, fitting that the species of the *oleracea* group should occupy a somewhat intermediate position between several other groups of the genus. They show the following characters: *Rs* moderately long (about 1·5 times *m–cu*). M_4 arising near middle of discal cell. Branches of *M* with a variable number of very short macrotrichia, sometimes almost bare. Squama with a very few short hairs, which may be present or absent even in the same species. Spurs 1. 2. 2. Claws of ♂ with basal tooth. Few or no sternopleural hairs. Hairs of under surface of flagellar segments rather long.

2. *Pterelachisus*, Rond., 1842 (type, *bertei*, Rond.).—Founded on a subapterous female with ovipositor of normal type. Until the male is certainly known the affinities of the sub-genotype cannot be decided; it is clearly a true *Tipula*, and may be related to *T. pagana*, Mg.

3. *Anomaloptera*, Lioy, 1864 (type, *nigra*, Lioy = *nigra*, Linn.).—*T. nigra* is a rather isolated species, probably deserving subgeneric rank, and showing quite as much affinity to *Nephrotoma* as to *Tipula*. *Rs* short, scarcely longer than *m–cu*. M_4 arising at base of discal cell. Cell M_1 often sessile (but variable, sometimes with short stalk). Branches of *M* bare or almost so, also *An*, but not tip of *Cu*. Squama quite bare. Spurs 1. 2. 2. Claws of ♂ simple. Antennæ inserted well above base of rostrum (as in *Nephrotoma*; in most *Tipula* the antennæ are inserted close to base of rostrum). The chief distinctions from *Nephrotoma* are the somewhat longer *Rs* (in *Nephrotoma* it is nearly always shorter than *m–cu*) and the bare branches of *M*.

4. *Oreomyza*, Pok., 1887 (type, *glacialis*, Pok.).—Founded solely on the possession of 15 segments in the male antenna instead of the usual 13. *Rs* moderately long; base of M_4 well beyond base of discal cell; all veins beyond cord sparsely setose; squama quite bare; spurs 1. 2. 2; claws of ♂ simple; no sternopleural hairs; ovipositor of the normal type, with slender cerci and long styli. The abnormal

antennæ of *T. glacialis* do not constitute a sufficient reason for recognizing *Oreomyza* as a distinct subgenus, and the other characters, apart from the marmorate wings, are much as in *Tipula*, s. str. If the group is recognized at all it might include the species of the *varipennis* and *marmorata* groups, which are essentially similar.

5. *Tipulodina*, End., 1911 (type, *magnicornis*, End.).—*Rs* very short, usually shorter than *m–cu*, rarely slightly longer; M_4 arising well beyond base of discal cell; all veins beyond cord quite bare; squama quite bare; R_{4+5} more curved down than usual, ending below instead of at or above wing-tip as in most other *Tipula*; spurs normal in number (1.2.2), but very short; legs nearly always with white rings. This is a very well-marked group with numerous Oriental species; it has been treated as a distinct genus, but I should prefer to regard it as a subgenus of *Tipula* related to the *Acutipula* group.

6. *Trichotipula*, Alex., 1915 (type, *oropezoides*, Alex.).—*Rs* short, equalling *m–cu*; M_4 arising near base of discal cell; wing-tip with numerous hairs on membrane as well as on veins; cell M_4 deeper than usual, approximating to the condition found in *T. variicornis*, Schum., and related species; squama quite bare; spurs 1.2.2; no sternopleural hairs. Probably a valid subgenus; the general appearance is very suggestive of *Oropeza*, and the two groups may be more nearly related than has been supposed.

7. *Cinctotipula*, Alex., 1915 (type, *algonquin*, Alex.).—Characters practically as in *Trichotipula*, under which subgenus *T. algonquin* and related species should be included. *Cinctotipula* was based on the lengthened antennæ of the male, an unimportant feature.

8. *Brithura*, Edw., 1916 (type, *conifrons*, Edw. = *imperfecta*, Brun.).—Founded on the presence of vein Sc_1, a very unusual feature in this subfamily. Although proposed as a distinct genus, it is, perhaps, better regarded as a subgenus of *Tipula*. *Rs* hardly longer than *m–cu*; M_4 arising near middle of discal cell; branches of *M* and *Cu* bare; squama with a patch of short hairs; spurs 1.1.2; dorso-central hairs of thorax more numerous than usual, and sternopleural hairs also numerous, but no anepisternal hairs. Only two species are certainly referable here; *T. pulcherrima*, Brun., and related species were placed in *Brithura* by Alexander, but, as noted below, they belong rather to *Nippotipula*.

9. *Nippotipula*, Mats., 1916 (type, *nubifera*, Coq.).—As in the case of the other generic names introduced by Matsumura, no adequate reasons were given for the separation from *Tipula*, but *T. nubifera* possesses some very distinctive features which are certainly of subgeneric, if not generic, value. *Rs* long, at least twice as long as *m–cu*; M_4 arising near or beyond middle of discal cell, and *m–cu* meeting discal cell before base of M_4 (very unusual in *Tipula*); few or no hairs on branches of *M* (except M_1); squama with a patch of short hairs; spurs 1.2.2; dorso-central hairs of thorax numerous, in 3–4 irregular rows; sternopleural hairs numerous; anepisternal hairs present and fairly numerous (a unique feature of this group); markings of scutum of unusual type, each dark area being divided into two. In addition to *T. nubifera*, this group includes the North American *T. abdominalis*, Say, and the Oriental *T. pulcherrima*, Brun., *T. anastomosa*, Edw., and *Brithura phædina*, Alex., all of which resemble the genotype in all important respects. Alexander has associated *T. cravieri*, Bell., and related South American species with *T. abdominalis*, but these belong, in my opinion, to quite another group.

10. *Formotipula*, Mats., 1916 (type, *holoserica*, Mats.).—*Rs* short or of moderate length (1–1·5 times *m–cu*); M_4 arising near middle of discal cell; hairs on branches of *M* usually very few or absent (but occasionally quite numerous); squama quite bare; spurs 1.1.2 (in all species examined, including *T. holoserica*); claws of ♂ toothed; thorax nearly bare and uniformly dull black or red; abdomen short, ovipositor always short and fleshy. This is rather a distinct group, which might be admitted as a subgenus; in addition to the subgenotype, the following Oriental species are represented in the British Museum: *cinereifrons*, de Meij., *hypopygialis*, Alex., *lipophleps*, Edw., *melanomera*, Walk., *melanopyga*, Edw., *rufiventris*, Brun., *rufizona*, Edw., and some undescribed species.

11. *Yamatotipula*, Mats., 1916 (type, *nohiræ*, Mats. = *nova*, Walk.).—*Rs* long (nearly twice *m–cu*); M_4 arising close to base of discal cell; branches of *M* more or less setose; squama bare; tibial spurs (in typical species) 1.1.2; claws of ♂ toothed; sternopleural hairs absent, flagellum short-haired beneath; wings more or less vittate. This group differs from *Tipula*, s. str., chiefly in the more basal position of *m–cu*. The absence of one of the mid-tibial spurs is not constant throughout the group: *T. nova* and the related Japanese *T. aino*, Alex., have only one mid-tibial spur, but

T. caloptera, Lw., and *T. eluta*, Lw., which are evidently nearly related, have the normal number of two spurs, and in *T. tricolor*, Lw., another member of the same group, some specimens have two mid-tibial spurs and some only one. If the group is recognized as a subgenus it might include the European species allied to *T. lateralis*, Mg., but no precise definition can be given.

12. *Platytipula*, Mats., 1916 (type, *moiwana*, Mats.).—*Rs* moderately long; M_4 arising well beyond base of discal cell; branches of *M* setose; squama bare; spurs 1.2.2; claws of ♂ toothed; flagellum long-haired beneath. There seems to be no important distinction between this and *Tipula*, s. str.

13. *Togotipula*, Mats., 1916 (type, *pulverosa*, Mats.).—I am indebted to Prof. C. P. Alexander for a specimen of *T. pulverosa*, which, as he points out, is not a *Tipula*, but is closely related to *Longurio fulvus*, Edw., and *L. rubriceps*, Edw. In all these species, it may be noted, the tibial spurs are absent or very minute (not more than one-third as long as the tibial diameter), and the squama is bare. The New Zealand species which I have referred to *Longurio* (*L. dux*, Hudson, and *L. legatus*, Edw., since placed in the genus *Austrotipula* by Alexander) have well-developed tibial spurs and a tuft of hairs on the squama. I am not acquainted with *L. testaceus*, Lw. (genotype of *Longurio*); it will be of interest to ascertain whether it shows more resemblance to the Oriental or to the New Zealand species in regard to the two characters mentioned. In the latter case *Togotipula* might be recognized as a distinct subgenus of *Longurio*.

14. *Odontotipula*, Alex., 1919 (type, *unifasciata*, Lw.).—*Rs* short (about equal to *m–cu* or slightly less); M_4 arising at base of discal cell; wing-membrane slightly hairy at tip; cell M_4 deep; squama quite bare; spurs normal (?); no sterno-pleural hairs. This does not appear to differ from *Trichotipula* in any important feature; the shining yellowish body is hardly a sufficient distinction.

15. *Nesotipula*, Alex., 1921 (type, *pribilovia*, Alex.).—Based chiefly on the reduction of the media, only two branches reaching the margin (cell M_1 absent); this may be connected with the reduction of the wings of the female, and, until the male is known, the subgenus cannot be adequately defined. *Rs* "equal to R_{1+2}"; *m–cu* at or before fork of *M*; legs short, tarsi shorter than tibiæ; ovipositor with "tergal valves greatly exceeding the relatively short sternal valves."

16. *Acutipula*, Alex., 1924 (type, *gaboonensis*, Alex.).—*Rs* short (about equal to *m–cu* or slightly longer); M_4 arising near middle of discal cell; R_2 always present and very oblique; R_{4+5} ending in wing-tip; branches of *M* and *Cu* bare; squama bare; spurs 1.2.2, those on middle tibia equal and well developed; claws of ♂ toothed; pleuræ bare. In introducing the name *Acutipula*, Alexander laid stress on the toothed claws of the male and the pointed cell R_2, but there is nothing distinctive in either of these characters; most species of *Tipula*, including those of the *oleracea* group, have toothed claws in the male. I believe, nevertheless, that *Acutipula* might be recognized as a subgenus, chiefly on the short *Rs* and bare veins. The numerous plain-winged African species referred here by Alexander evidently form a natural group which may be known as the *pomposa*-group, *T. pomposa*, Bergr., being the first described species. The rather numerous European and Oriental species related to *T. maxima*, Poda, and *T. fulvipennis*, DeG., are essentially similar, and should, in my opinion, be referred to *Acutipula*; these may be known as the *fulvipennis*-group, which would include *T. maxima*, Poda, and its allies (*T. triangulifera*, Lw., *T. corsica*, Pierre, etc.), as well as *T. fulvipennis*, DeG., and its allies (*T. shirakii*, Edw., *T. princeps*, Brun., *T. robusta*, Brun., *T. fumifascipennis*, Brun., *T. interrupta*, Brun., *T. atuntzuensis*, Edw., &c.). All these are characterized by possessing a dark spot in the middle of cell *Cu*. In *T. princeps*, Brun., and *T. demeijerei*, Edw., the squama possesses a few short hairs, and the latter also differs from other members of the group in having setæ on the branches of *M*, but, nevertheless, seems to belong here. Some Oriental species referred here by Alexander are better placed in a new subgenus, as stated below.

17. *Vestiplex*, Bezzi, 1924 (type, *cisalpina*, Riedel).—Founded chiefly on the reduction of the halteres, as well as the wings, of the female, the male of the sub-genotype having normal wings and halteres. Reduction of the wings occurs in a number of unrelated species of *Tipula*, and cannot be regarded as a subgeneric character; the reduction of the halteres also in one sex is merely an accentuation of this tendency. I am indebted to Herr M. P. Riedel for the loan of specimens of *T. cisalpina*, and also of the related *T. hemapterandra*, Bezzi, and note the following characters as common to both: *Rs* long (fully 1·5 times *m–cu*), with dark spot at base; R_2 long; M_4 arising near middle of discal cell; squama quite bare; branches of *M* with short

macrotrichia; spurs 1.2.2; claws of ♂ simple; pleuræ bare; nasus absent; ovipositor with the cerci very strong and thick, horizontally placed, with the external edge serrate, styli rudimentary or absent. All the above characters, and especially the remarkably specialized structure of the ovipositor, are found in the species of the *arctica* group, and it seems to me that the subgeneric name *Vestiplex* might well be used to designate this group. Although the group is not very easy to define in the male sex, the characters noted above will assist in its recognition. A few species (e.g., *T. scripta*, Mg., *T. himalayensis*, Brun., &c.) have a well-developed nasus, but otherwise the diagnosis will apply, and certain details of coloration are also common to most of the species—*e.g.*, the marmorate or submarmorate wings and the tendency of the præscutal stripes to have narrow dark margins. The form of the male antennæ is very variable, but is certainly of small importance; in the subgenotype they are short and thick, with extremely short verticils, while at the other extreme is *T. excisa*, Schum., with its long serrate antennæ. (It may be remarked that *T. subexcisa*, Lundst., in which the male antennæ are similar to those of *T. excisa*, does not belong to this group.) The following species belong to *Vestiplex* in the sense here defined, and have been examined by me:—Palæarctic Region: *excisa*, Schum., *intermixta*, Ried., *nubeculosa*, Mg., *pallidicosta*, Pierre, *rubripes*, Schum., *scripta*, Mg. Oriental Region: *biserra*, Edw., *himalayensis*, Brun., *inequidentata*, Alex., *nigro-apicalis*, Brun., *reposita*, Walk., *scandens*, Edw., *subscripta*, Edw. Nearctic Region: *arctica*, Curt. (=*glomerata*, Walk.), *platymera*, Walk. (=*labradorica*, Alex.).

III.—Proposed new Subgenera.

In addition to those described above, a few other groups of *Tipula*, for which no subgeneric names are at present available, appear sufficiently distinct to deserve recognition as subgenera:—

1. *Schummelia*, subgen. nov. (type, *variicornis*, Schum.).—Rather well distinguished from most other subgenera by the shape of cell M_4, which is unusually deep and much wider at base than on margin; *m–cu* is very oblique (usually near the base of the small discal cell), and the distal portion of *Cu* continues the direction of the basal portion, instead of forming a slight angle with it as in nearly all other *Tipula*. Additional characters found in most or all of the species are: *Rs* short (not or scarcely longer than *m–cu*); R_2 always complete, but short; R_3 straight; squama with a small tuft of hairs; all veins beyond cord distinctly setose; cell M_1 often with very short stalk or even sessile; spurs 1.2.2 (rarely 1.1.2); flagellum short-haired beneath; nasus usually short. Two groups of species may be recognized: the *variicornis*-group (including *variicornis*, Schum.; *zonaria*, Goet., *yerburyi*, Edw., *butzi*, Edw., *robinsoni*, Edw., *klossi*, Edw., *pumila*, de Meij., *insulicola*, Alex., *hermannia*, Alex., and *annulicornis*, Say), with claws of male simple and ninth tergite with compressed median projection; and the *continuata*-group (including the Oriental *continuata*, Brun., *nipponensis*, Alex., *cylindrostylata*, Alex., *xanthopleura*, Edw., *hampsoni*, Edw., *sessilis*, Edw., *chumbiensis*, Edw., etc.), with toothed male claws and median projection of ninth tergite reduced or bent inwards so that the tergite appears to have a large V-shaped median excavation. A somewhat similar venation is possessed by the subgenus *Trichotipula*, Alex., which differs in the conspicuously hairy wing-tip and bare squama.

2. *Indotipula*, subgen. nov. (type, *walkeri*, Brun.=*tenuipes*, Brun.=*fulvipennis*, Walk.).—Distinguished from all other subgenera by the spur-formula, which is 0.0.2 or 0.1.2; the mid-tibial spur, even when present, is minute, and the outer spur on the hind tibia is shorter than the inner. *Rs* short, often shorter than *m–cu*; cell R_2 narrow; no distinct anal angle to wing, the axillary area being much reduced in size, and *Ax* running parallel and close to the hind margin; veins beyond cord usually devoid of macrotrichia; squama quite bare; claws of ♂ toothed; pleuræ bare. This is almost exclusively an Oriental group, a few species extending into the tropical parts of the Australasian region. It has some points in common with the subgenus *Acutipula*, and several of the species have been referred to that subgenus by Alexander, but the two subgenera are quite sharply separable. The following species are represented in the British Museum collection: *demarcata*, Brun., *divisa*, Brun., *elegantula*, Brun., *korinchiensis*, Edw., *sulaica*, Walk., *vilis*, Walk. In addition to these, the descriptions of the following indicate that they are to be placed in *Indotipula*: *gedehicola*, Alex., *riverai*, Alex., *fuscoangustata*, Alex.

3. *Lunatipula*, subgen. nov. (type, *lunata*, L.=*ochracea*, Mg.).—*Rs* of moderate length, 1·5 times as long as *m–cu* or more; R_2 complete and long, cell R_2 not specially narrow; anal angle of wing well developed as usual; veins beyond cord with numerous macrotrichia; squama with a distinct tuft of longish hairs at the angle; spurs 1.2.2; claws of ♂

toothed ; pleuræ usually bare. This includes most of the European and North American species with unicolorous or subunicolorous wings, such as the following :—Palæarctic Region : *affinis*, Schum., *annulicornuta*, Alex., *brevispina*, Pierre, *bullata*, Lw., *cava*, Riedel, *fascipennis*, Mg., *helvola*, Lw., *limitata*, Schum., *livida*, v. d. W., *mellea*, Schum., *peliostigma*, Schum., *pustulata*, Pierre, *plagiotoma*, Alex., *selene*, Mg., *selenitica*, Schum., *trispinosa*, Lundst. Nearctic Region: *bicornis*, Forbes, *duplex*, Walk. (=*mingwe*, Alex.), *filipes*, Walk., *flavibasis*, Alex., *flavumbrosa*, Alex., *mallochi*, Alex., *morrisoni*, Alex., *submaculata*, Lw., *translucida*, Doane, *triplex*, Walk. (=*umbrosa*, Lw.), *valida*, Lw. Among plain-winged European species which do *not* belong here may be noted *flavolineata*, Mg., and *juncea*, Mg., which have the squama bare and veins beyond cord almost or quite bare ; the former also has the spur-formula 1. 1. 2.

4. *Bellardina*, subgen. nov. (type, *cravieri*, Bellardi).—*Rs* short, about equal to *m–cu* or very little longer ; *Rs* and R_{4+5} usually wavy ; often approximated in middle ; veins beyond cord bare ; squama with a group of short hairs ; spurs 1. 1. 2 ; pleuræ bare ; wing-markings of rather distinctive type. This is a purely neotropical group, including, in addition to the sub-genotype, *T. theobromina*, Edw., and some other related species, four of which (undetermined) are represented in the British Museum Collection.