187ME FASCICULE DIPTERA

GENERA INSECTORUM

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P. WYTSMAN

DIPTERA

FAM. TIPULIDÆ

SUBFAM. CYLINDROTOMINÆ

By CHARLES P. ALEXANDER

WITH 2 PLAIN PLATES

1927

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THE Cylindrotominæ is the smallest of the three subfamilies of Crane-Flies constituting the family Tipulidæ. The flies of this group early attracted the attention of Entomologists because of certain remarkable features of the larvæ, which differ from all other Tipulidæ in their curious, spinous, eruciform appearance, green coloration, and habits of feeding upon the leaf-tissues of various Bryophytic and Spermatophytic plants.

The first genus to be described, *Cylindrotoma,* was created by Macquart (1834) for the *Limnobia distinctissima* of Meigen. As conceived by Macquart, the genus was based chiefly on the elongate, cylindrical antennal segments, an artificial character that induced the author to add to the group two other species that are only distantly related to the Cylindrotominæ and are now placed with the Hexatomine Limoniinæ (*Ula macroptera* Macquart and *Limnophila* (*Lasiomastix*) *macrocera* Say). Great confusion regarding the natural affinities of the group prevailed until 1863 when Schiner proposed the new generic terms *Phalacrocera* (for *Tipula replicata* Linnæus) and *Triogma* (for *Limnobia trisulcata* Schummel), at the same time pointing out the relationships with *Cylindrotoma.* Osten-Sacken (1869) completed the group of four Holarctic genera by proposing the name *Liogma* for the American *nodicornis* Osten-Sacken, and the European *glabrata* Meigen. The Oriental-Australasian group of genera constituting the Stibadoceræ have all been described within the past fifteen years.

There is still a great diversity of opinion as to what value this peculiar group of crane-flies should receive. Some recent authorities still recognize only the tribe Cylindrotomini. On the other hand, several European students give to the group full family rank, while one student, Bengtsson (1897) has even proposed a section of the Diptera, the Erucæformia, from which he would derive the higher Polyneura and the Oligoneura.

In the present paper, the Comstock-Needham-Tillyard system of wing-venation is used. The terminology of the male hypopygium is that of Crampton (1923).

The writer would express his deep appreciation for help in making the wing-drawings in this paper to Professor and Mrs. J. Speed Rogers.

Geographical distribution. — The recent genera of the Cylindrotominæ number but seven of which the typical group (Cylindrotomæ), including the four genera, *Cylindrotoma*, *Phalacrocera*, *Liogma* and *Triogma*, is characteristic of the Holarctic Region. The only species that is known to occur south of these limits is *Phalacrocera formosæ* Alexander, from the high mountains of Taiwan, where the conditions are typically Holarctic. Vicarious representatives of the above four genera occur in the Western Palæarctic Region (Europe), the Eastern Palæarctic Region (Japan) and the Eastern Nearctic Region (Eastern North America). But two of the four (*Cylindrotoma* and *Phalacrocera*) have been taken in the Western Nearctic Region (Western North America).

The second group, the Stibadoceræ, is characteristic of the Oriental and Australasian Regions, two of the three genera (*Stibadocera* and *Stibadocerella*) occurring in the Oriental Region from India to Java. The two known species of *Stibadocerodes* occur in the Australasian Region, from New South Wales to Tasmania. The Cylindrotominæ are apparently quite lacking from the Neotropical and Ethiopian Regions (1).

Geological distribution. — The fossil genus *Cyttaromyia* Scudder is the only one of several names proposed that seems to be correctly referable to this subfamily. The genus is very characteristic of the White River (Eocene) and Florissant (Miocene) deposits but was apparently quite absent in the warmer Oligocene.

Biology. — The adult Flies of the Cylindrotominæ are sluggish in their habits, being found on vegetation in cool, usually shaded spots. *Triogma* prefers open mossy meadows where there is no woody vegetation whatsoever. The immature stages of this subfamily differ from those of all other Tipulidæ so far made known in being spent on various Bryophytic and Spermatophytic plants, on the leaves of which the larvæ feed. These larvæ are usually green in color and strongly suggest a Lepidopterous caterpillar in their general form. Most of them simulate their host plants to an astonishing degree. The immature stages of *Cylindrotoma* are terrestrial, occurring on the leaves of several scattered genera of Spermatophytic plants. *Liogma*, likewise, is terrestrial but occurs on various species of mosses, especially *Hypnum* and related genera. *Triogma* varies from semi-aquatic to aquatic, living on various species of mosses. *Phalacrocera* is strictly aquatic in its habits. The habits of the known Cylindrotominæ have been summarized by the writer (Cornell Univ., Agr. Expt. Sta., Mem. Nr. 38, p. 959 [1920]).

Cylindrotoma is the best known genus, the larvæ feeding on a variety of higher plants, including both monocotyledons and dicotyledons. The life-history of *C. splendens* Doane, has been well described by Cameron (Ann. Ent. Soc. Amer. Vol. 11, p. 67 [1918]), his account being summarized here as being representative of the subfamily.

The adults first appear on the wing about the middle of May (in British Columbia). Without food they do not live longer than five or six days, but in breeding cages, where they were supplied with food in the nature of a sugar solution, they lived as long as from seven to nine days. In nature, the adults were found on the wing during a period of about three weeks.

Soon after emergence the adults begin to copulate, and one male may have intercourse with more than one female. Copulation often takes place in a vertical position, the female above, the male below, with the tips of the abdomens interlocked. In nature the act of copulation is generally undertaken in the

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(1) Since the above was written, a new genus and species of Cylindrotominæ has been discovered in Southern Chile by Edwards and Shannon, December, 1926. The fly belongs to the Stibadoceræ and is somewhat intermediate in its characters between *Stibadocerella* and *Stibadocerodes*.

deep shade of the large leaves of the insect's food plants. The eggs are of a dull glistening white, elongate-oval in shape. In nature they are almost invariably found on the under surface of the food plant, *Trautvetteria grandis* Nuttall (Ranunculaceæ), inserted beneath the incised epidermis. They are usually deposited in series along and just within the margin of the serrate leaf. The eggs are only partly hidden beneath the epidermis, being exposed dorsally, the margins of the slit overlapping the egg laterally. In ovipositing, the female rests on the under side of the leaf, with the tip of the abdomen directed toward the leaf edge. The abdomen is slightly flexed ventrally, and the margin of the leaf is held between the bifurcated valves of the ovipositor, which is applied to the upper surface of the leaf, while the paired cutting valves, with their blades, are applied against the under surface. The blades are then moved to and fro, cutting a slit in the leaf in which the egg is deposited.

The indoor duration of the egg stage is from 14 to 18 days but in nature as long as three weeks may be required. When first deposited, the eggs are translucent, grayish white, spindle-shaped, with the chorion unornamented, measuring approximately 0.84 by 0.303 mm. The larvae require about three hours to emerge from the egg and begin to feed upon the leaf tissue at once. The first-stage larvae are grayish white in color, translucent, and measure 1.19 by 0.37 mm. They feed on both the upper and lower surfaces of the leaf, burrowing through the epidermal layer with their mandibles and feeding on the parenchymatous tissue within. The young larvae are very sluggish. At the end of nine days the larvae have increased in length to 5.84 mm., and show all the characteristic behavior of the full-grown larvæ. Growth is very slow, and before the first molt the larvae become covered with particles of their excrement which adheres readily to the skin. The first larval molt occurs after a period of from 18 to 21 days. The second-stage larvae gradually assume a leaf-green color as they continue to feed. Toward the end of July, coincident with the dying-off of their food plant, the larvae, which have now reached a length of from 8.32 to 9 mm., become quiescent and cease to feed. Feeding and movement gradually cease completely and the larvae remain clinging motionless to the leaves. Later the larvae generally fall among the dead leaves on the ground and under these pass the winter in a dormant condition. The overwintering larvæ first show signs of activity in March of the following spring, when the food plant sends up its new shoots. Growth then proceeds rapidly until pupation in the middle of May. There seems to be one molt before hibernation and two after, the last being the casting of the larval skin, previous to pupation. The fully grown larvæ measure 17 mm. in length. They are invariably found on the upper surface of the leaf. Before pupation the larvæ attach themselves firmly to the surface of the leaf, or to the leaf petiole, by means of their anal pseudopodia. The skin splits transversely behind but is only partially sloughed off. The head, the thorax, and the first four abdominal segments of the pupa are exposed, but the apex of the abdomen remains encased in the larval skin, the terminal portion of which remains attached to the leaf surface. In the breeding cages the pupal duration varies from 6 to 10 days. From one and one-half to two hours are required for the adult to emerge from the pupal hull.

Liogma occurs in woods where its food plants grow. The life-history of *L. glabrata* (Meigen), requires one year, the egg stage lasting from 8 to 10 days and the pupal stage from 11 to 12 days, the larval stage requiring the greater part of the remaining time.

Triogma is eminently characteristic of wet mossy meadows, unprotected by the shade of woody plants. The very sluggish larvæ live and feed in the moss-cushions in such habitats.

The larvæ of *Phalacrocera* occur among aquatic plants where they feed chiefly on mosses. The larva is extremely sluggish, progressing slowly through the mats of submerged vegetation by alternately grasping with the mandibles and the large anal hooks. The larval habitat is in ponds in which a moss vegetation flourishes and in which currents keep the water in constant motion. The female deposits the eggs in the axils of the leaves of submerged mosses. The eggs, about 60 in number, are laid singly,

adhering lightly to the moss. Normally the egg stage requires from 8 to 12 days, the larval stage approximately 11 months and the pupal duration 7 or 8 days. During the larval development there are at least eight molts. Upon emergence from the egg, the young larva measures from 2 to 2.25 mm. in length and about 0.5 mm. in diameter, excluding the body projections. The pupa is comparatively active, moving about by flexion of the abdomen. In a position of rest, the body is usually held in a vertical position with the tips of the breathing horns just reaching the surface of the water. When the adult emerges, the cast pupal skin is left attached to a moss leaf by means of the dorsal abdominal projections.

Nothing is known of the habits of the Oriental and Australasian genera constituting the Stibadoceræ, except in the case of *Stibadocerodes australiensis* Alexander, which the collector, Mr. G. H. Hardy, found resting sluggishly near a small waterfall in New South Wales.

Characters of the adult Flies. — The adult Flies of the Cylindrotominæ have a characteristic form, the relatively long abdomen, with the venational peculiarity of an *apparent* fusion of vein R_1 with R_{2+3} back from the wing-margin, being especially characteristic of these flies.

The head is always large, with the vertex between the eyes very broad, wider than the diameter of an eye, the ommatidia of the latter usually delicate. Rostrum short to very short, with faint indications of a nasus; palpi short, the terminal segment short but still much longer than the penultimate. Antennæ 16-segmented, of various forms in the different genera; in *Cylindrotoma* the segments are cylindrical or nearly so, a condition that reaches its greatest extreme in the three genera of the Stibadoceræ where the organ in the male sex is longer than the entire body, with the flagellar segments provided with an abundant erect pubescence. The flagellar segments in *Liogma* and *Triogma* are more or less produced on the ventral margin to produce a serrated appearance. Pronotum moderately large, not disk-like as in the Tipulinæ. Mesothorax as in the family; meron very small, the middle and hind coxæ thus being approximated. Surface of the head and thoracic interspaces with conspicuous deep furrows and foveæ in the genera *Triogma* and *Stibadocera*, more nearly smooth in the other genera. Legs moderately elongate, relatively slender; tibial spurs present, microscopically setiferous; ungues smooth; empodia distinct.

Wings generally ample, with a characteristic venation. Within the limits of this small subfamily of crane-flies, we find a range of venation that is almost, if not quite, as extensive as that found in the great subfamily Limoniinæ. It is a far cry, indeed, from the venation of *Cyttaromyia* to that of the most specialized genus *Stibadocerella*. From a study of all of the genera and most of the known species it is possible to reconstruct a hypothetical type for the subfamily that does not differ strikingly from the fossil genus *Cyttaromyia*, except in the details of the radial field. The prime tendency in the subfamily is the *apparent* fusion of vein R_1 with vein R_{2+3} to produce a long fusion back from the wing-margin. This can readily be seen from an examination of virtually all of the figures. As the writer has demonstrated in an earlier paper (Cornell Univ., Agr. Expt. Sta., Mem. Nr. 25, p. 863 [1919]), this fusion is merely apparent and results from the atrophy of the distal tips of veins R_1 and R_2. The behavior of the various fields of the wing is now considered (**Pl. 1, Fig. A-H**):

Subcosta (*Sc*). In the primitive condition, both branches of *Sc* are preserved, Sc_1 apparently being the first to atrophy.

Radius (*R*). The vein R_1 is elongate, with the extreme tip atrophied in the great majority of the species. It is preserved in *Cylindrotoma nigriventris* Loew (**Pl. 2, Fig. 2**), *Triogma exculpta* (Osten-Sacken) (**Pl. 1, Fig. E**), *Stibadocera metallica* Alexander (**Pl. 1, Fig. F**) and others. The remainder of R_1 is always in perfect alignment with the radial crossvein (*r*), bending gently caudad toward vein R_{2+3} which it meets immediately beyond the stigma and usually at the fork of R_{2+3}. In almost all cases, the distal section of vein R_2 is entirely atrophied but persists in some species of *Phalacrocera*, as

P. replicata (Linnæus), *P. neoxena* Alexander (**Pl. 2, Fig. 6**), and in some specimens of *P. mikado* Alexander (**Pl. 2, Fig. 5**). This last case is peculiar in that *r* connects with R_2+_3 far before the fork of the latter. From the persistence of the free tips of R_1 and R_2 in the above cases, it is fully warranted to add them to the hypothetical type (**Pl. 1, Fig. A**). The radial sector (*Rs*) is almost always very long, arising before midlength of the wing, gently arcuated at origin. The behavior of the posterior branch of the sector (R_4+_5) is extremely various. In the more primitive condition (*Cyttaromyia*, *Cylindrotoma*, most *Phalacrocera*, and the Stibadoceræ), the radial-medial crossvein (*r-m*) is present and elongate, but in the genera *Liogma* and *Triogma*, the tendency is distinctly to obliterate this crossvein by the fusion of the adjacent veins, R_4+_5 on M_1+_2 (See **Pl. 1, Fig. E; Pl. 2, Fig. 8-13**). In the more primitive genera, *r-m*, or its position, is distad of the fork of *Rs* but in the more specialized members *r-m* is at, or close to, the fork of *Rs* (*Stibadocera metallica* Alexander, **Pl. 1, Fig. F**) or before it, as in *Stibadocerodes australiensis* (Alexander) (**Pl. 1, Fig. G**) culminating in the very curious condition found in *Stibadocerella albitarsis* (de Meijere) (**Pl. 1, Fig. H**), where *r-m* lies before midlength of the extremely long sector which forks beyond the level of cell *1st* M_2; in this latter genus, R_2+_3 is perpendicular in position and simulates in appearance the apparent radial crossvein (R_2) in the Limoniine crane-flies.

Media (*M*). In the primitive condition (*Cyttaromyia*, *Cylindrotoma*) all four branches of media are present, cell *M* being very short-petiolate to sessile. In *Cyttaromyia*, vein *M* is united with vein R_4+_5 by a supernumerary crossvein to form an apparent second « discal cell » immediately above the primary one (**Pl. 1, Fig. B**). In this subfamily, the reduction in the number of branches of *M* appears to have been brought about by the atrophy of vein M_3, a condition that is well illustrated in the genus *Phalacrocera*. In *P. occidentalis*, nov. sp. (**Pl. 1, Fig. D**), the base of this vein persists but the apex is entirely atrophied. In other species of the genus (as *P. neoxena* Alexander, **Pl. 2, Fig. 6**), the vein has entirely atrophied, the apparent medial crossvein (*m*) in this case being a linear composite of *m* and the basal deflection of M_3 in perfect alignment. In the more highly specialized members of the genus *P. mikado* Alexander (**Pl. 2, Fig. 5**), *P. formosæ* Alexander (**Pl. 2, Fig. 7**), cell M_1 has become broadly sessile. The condition obtaining in these two latter cases is that found in all the more specialized members of the subfamily where vein M_3 is interpreted as being entirely atrophied. Cell *1st* M_2 is closed in all cases except *Stibadocerodes australiensis* Alexander.

Cubitus (*Cu*). The medial-cubital (*m-cu*) crossvein (the basal deflection of Cu_1 of the Comstock-Needham system of venation) is always well preserved, placed before the fork of *M* in some species of *Liogma*, beyond the fork and beneath cell *1st* M_2 in the majority of species. The semi-atrophied second branch of *Cu* is always well preserved, being usually persistent to opposite the *m-cu* crossvein.

Anal Veins (*A*). Two anal veins are present except in the genus *Stibadocerella* where a single one is preserved.

The abdomen is conspicuously elongated, especially in the male sex. The male hypopygium, as a rule, is powerfully constructed, the basistyles being very large, bearing at their outer ends the single powerful dististyle (**Pl. 1, Fig. 9**). In *Stibadocerodes australiensis* (Alexander), the basistyles are very stout, their mesal faces grooved to receive the two dististyles when in a position of rest. The outer dististyle is more slender, gradually narrowed to the apex. The inner dististyle is a broadly flattened blade. Ædeagus terminating in three points or prongs, a condition that suggests the family Tanyderidæ. The ovipositor of the Cylindrotominæ is very remarkable (**Pl. 1, Fig. 8**). The valves are fleshy, the dorsal valve being deeply furcate, the depth of the fork varying in different species. The ventral valves each have two cutting edges, an internal serrate blade and an external plane blade. Ventrad of these and arising apparently from the eighth sternite lies a valve that is shaped like a ploughshare which functions in guiding the emerging egg into a slit in the leaves of plants that has been

made by the cutting valves. For a more complete discussion of the details of structure of the ovipositor and the methods of oviposition in the typical genus *Cylindrotoma*, the following papers are recommended : Cameron, A. E. Life-history of the Leaf-eating Crane-fly. *Cylindrotoma splendens* Doane (Ann. Ent. Soc. America, Vol. 11. p. 67, f. 1-18 [1918]); Lenz, Fr., Die Eiablage von *Cylindrotoma distinctissima* (Mg). (Arch. f. Naturg. 87 Jahrg. Abt. A, p. 128, f. 1-7 [1921]).

Characters of the Larvæ. — Body relatively short, the integument covered with tubercles, leaf-like or filiform appendages; head completely retractile within the body; body with green tints.

Characters of the Pupæ. — Pupa within the last larval skin, which attaches it to the host plant; integument generally with filiform or leaf-like appendages.

Phylogeny. — At the present time it is virtually impossible to indicate the past relationships of the Cylindrotominæ. At the beginning of the Eocene, the group was already a large and flourishing one in cold, Northern climates, and the few isolated genera now persisting seem to be scattered relics.

The Stibadoceræ are the more specialized group and have apparently been derived directly from *Cylindrotoma* or a closely related form. *Liogma* and *Triogma* have likewise been derived from an ancestor that was very close to our recent *Cylindrotoma*. *Phalacrocera* is much more isolated in both its larval and imaginal characters but presumably came off the main stem before or almost coincidently with *Cylindrotoma*.

Subfam. CYLINDROTOMINÆ

Limnobinæ Cylindrotomæformes Schiner, Fauna Austriaca, Dipt. Vol. 2, p. 560 (1864).

Cylindrotomina Osten-Sacken, Mon. Dipt. N. Amer. Vol. 4, p. 289 (1869).

Cylindrotomini Scudder, Proc. Amer. Philos. Soc. Vol. 32, p. 189 (1894).

Erucæformia Bengtsson, Kongl. Fysiogra. Sällskapets i Lund Handl. (n. s.) Vol. 8, p. 110 (1897).

Cylindrotomidæ Kértesz, Cat. Dipt. Vol. 2, p. 327 (1902).

Cylindrotomini Brunetti, Fauna Brit. India, Dipt. Nemat. p. 358 (1912).

Cyttaromini Meunier, Zeitschr. Deutschen Geol. Ges. Vol. 67, p. 229 (1916).

Cylindrotominæ Alexander, Cornell Univ. Agr. Expt. Sta. Mem. Nr. 38, p. 959 (1920).

TABLE OF GENERA

Adults.

(Note. — The female sex is not known in the majority of the genera of the Stibadoceræ, necessitating the usage of sexual characters.)

1. Antennæ of both sexes short, not exceeding the combined head and thorax . . . . . Group Cylindrotomæ. 2.
   Antennæ of the male as long as, or longer than, the body, the flagellar segments provided with long, erect verticils . . . . . Group Stibadoceræ. 6.
2. Four branches of *M* reach the wing-margin . . . . . 3.
   Three branches of *M* reach the wing-margin . . . . . 4.
3. A supernumerary crossvein connects vein R_4+5 with M_1 near its origin, to produce two so-called « discal cells » . . . . . 8. Genus Cyttaromyia, Scudder (fossil).
   No supernumerary crossvein as above . . . . 1. Genus Cylindrotoma, Macquart.

4. Head and intervals of mesonotal præscutum with numerous deep punctures and foveæ; body-coloration dull . . . . . 4. Genus TRIOGMA, Schiner.

Head and intervals of mesonotal præscutum with the punctuation indistinct or ill-defined; body-coloration shiny (Genus *Liogma*) or dull . . . . . 5.

5. Antennæ subserrate in both sexes, the ventral face of the basal and intermediate flagellar segments more or less produced; body coloration shiny or subshiny . . . . . 3. Genus LIOGMA, Osten-Sacken.

Antennæ not serrate, the flagellar segments subcylindrical with a conspicuous basal swelling that is short-verticillate; body coloration, at least in part, dull . . . . . 2. Genus PHALACROCERA, Schiner.

6. *Rs* of normal length, *r-m* being at or close to the fork; two Anal veins present . . . . . 7.

Rs very long, forking near mid-distance between *r-m* and the wing-tip; a single Anal vein present. 7. Genus STIBADOCERELLA, Brunetti.

7. Tip of vein R_1 preserved; præscutal interspaces deeply punctured; no macrotrichiæ in cells of wing; tarsi concolorous with the remainder of legs. . . . . 5. Genus STIBADOCERA, Enderlein.

Tip of vein R_1 entirely atrophied; præscutum entirely impunctate; sparse macrotrichiæ in apices of cells R_5 and M_2; tarsi white . . . 6. Genus STIBADOCERODES, nov. gen.

Larvæ.

1. Body appendages very long and filiform; aquatic. 2. Genus PHALACROCERA, Schiner.

Body appendages short, leaf-like or tuberculate . . . . . 2.

2. Dorsal appendages all simple, on the terminal abdominal segments in a single row; terrestrial on spermatophytic plants . . . . . 1. Genus CYLINDROTOMA, Macquart.

Dorsal appendages with teeth on anterior convex side . . . . . 3.

3. Some of the dorsal appendages with three or four teeth on anterior face; aquatic or semi-aquatic on mosses . . . . . 4. Genus TRIOGMA, Schiner.

Dorsal appendages with one (*nodicornis*) or two (*glabrata*) teeth; terrestrial in mosses . . . . 3. Genus LIOGMA, Osten-Sacken.

Pupæ.

1. Basal abdominal tergites without spines . . . . . 2.

Basal abdominal tergites with acute spines . . . . . 3.

2. Mesonotum unarmed; segments 6 and 8 of abdomen each with two powerful dorsal hooks; abdo-

minal segment 7 with a pair of strong ventral spines; pronotal breathing horns elongate, directed backward	2. Genus PHALACROCERA, Schiner.
Mesonotum with two flattened erect lobes; abdominal segments 6, 7 and 8 unarmed; pronotal breathing horns small, directed slightly forward.	1. Genus CYLINDROTOMA, Macquart.
3. Abdominal spines branched	3. Genus LIOGMA (pars); 4. TRIOGMA, Schiner.
Abdominal spines simple	3. Genus LIOGMA (pars).

1. GENUS CYLINDROTOMA MACQUART

Cylindrotoma Macquart, Hist. Nat. Dipt. p. 107 (1834).

Remarks. — The adult flies of *Cylindrotoma* occur on rank vegetation in cool, boggy and swampy woods. The occurrence and habits of the larvæ are discussed elsewhere in this paper.

Characters of Adults. — Vertex between the eyes broad, much wider than the diameter of a single eye. Rostrum short, highly arched dorsally; palpi relatively short. Antennæ of moderate length but always much shorter than the body, 16-segmented; flagellar segments subcylindrical, narrowed at the incisures, densely provided with a delicate white pubescence and with a few longer, scattered verticils. Eyes with relatively small ommatidia.

Thorax as in the subfamily. Legs normal, relatively slender; tibial spurs approximately equal, sparsely setiferous. Wings (**Pl. 2, Fig. 1-3**) with venation as in the subfamily, distinguished from all other recent genera by the presence of four branches of media reaching the wing-margin; cell M_1 sessile or very short-petiolate. Tips of veins R_1 and R_2 entirely atrophied; *m-cu* beneath cell *1st* M_2.

Abdomen relatively long and slender. Male hypopygium (**Pl. 1, Fig. 9**) relatively large and prominent; caudal margin of ninth tergite with a broad, deep notch, the lobes thus formed rounded at their apices. Basistyle conspicuous, the inner margin at the tip produced caudad into a small flattened blade, the dorsal face with a densely hairy lobe; dististyle single, large. Ninth sternite small, deeply split on the midventral line by a very acute angle. Aedeagus trifid, the inner edge of the lateral arms with numerous appressed teeth. Ovipositor (**Pl. 1, Fig. 8**) as in the subfamily; valves fleshy, with two of the sternal valves provided with inner serrated margins that function in oviposition.

Characters of Larvæ. — Body covered with simple tubercles, a median dorsal row and a double ventral row. Spiracular disk large, surrounded by small lobes. Head capsule compact. Mentum with about 15 teeth.

Characters of Pupæ. — Pronotal breathing horns short, cylindrical, directed strongly ventrad. Mesonotum with two flattened lobes directed cephalad. Abdomen unarmed with spines or lobes.

Type species : *Cylindrotoma distinctissima* Meigen.

Geographical distribution.

1. *C. americana* Osten-Sacken, Proc. Ent. Soc. Philad. Vol. 4, p. 236 (1865). Eastern North America.
2. *C. distinctissima* Meigen, Syst. Beschr. Zweifl. Ins. Vol. 1, p. 131 [1818] (*Limnobia*). Europe.

C. brevicornis Zetterstedt, Ins. Lappon. Dipt. p. 846 [1838] (*Tipula*).

3. *C. japonica* Alexander, Ann. Ent. Soc. Amer. Vol. 12, p. 344 (1919). Japan. [Region.
4. *C. nigriventris* Loew, Stett. Ent. Zeit. Vol. 10, p. 342 (1849). Northern Palæarctic
5. *C. splendens* Doane, Journ. New York Ent. Soc. Vol. 8, p. 197, pl. 8, f. 21 (1900). Western North America.
   C. juncta Coquillett, Proc. Wash. Acad. Sc. Vol. 2, p. 401 (1900).
6. *C. tarsalis* Johnson, Psyche, Vol. 19, p. 2, f. 4 (1912). Eastern United States.
   C. anomala Johnson, ibidem, Vol. 19, p. 2, f. 3 (1912).

2. Genus PHALACROCERA Schiner

Phalacrocera Schiner, Wien. Ent. Monatschr. Vol. 7, p. 224 (1863).

Remarks. — The adult flies of *Phalacrocera tipulina* Osten-Sacken, are most commonly found in close proximity to sphagnum bogs. The habits of the larvæ of the genotype, *P. replicata* Linnæus, have been discussed elsewhere in this paper.

Characters of Adults. — Vertex between the eyes broad; head rather strongly narrowed behind. Rostrum short, feebly arched dorsally, the apex terminating in a microscopic nasus; palpi short, the terminal segment feebly clavate. Antennæ of moderate length, in the male about equal in length to the combined head and thorax, 16-segmented; flagellar segments generally similar to those found in the genus *Tipula*, consisting of relatively elongate, subcylindrical segments, the base slightly enlarged and set with a whorl of about four stout verticillate setæ that are shorter than the segments. Eyes with small, delicate ommatidia.

Thorax as in the subfamily. Legs relatively slender, with delicate appressed setæ; tibiæ with two long, microscopically setiferous spurs. Wings in the primitive condition with a venation that is not strikingly different from *Cylindrotoma* (Compare **Pl. 1, Fig. C** and **D**). The radial field is peculiar in that some of the species, as *P. replicata* (Linnæus) and *P. neoxena* Alexander, have retained the distal section of vein R_2 (**Pl. 2, Fig. 6**). In some specimens of *P. mikado* Alexander, what appears to be the free tip of vein R_2 is present (**Pl. 2, Fig. 5**) but lies far beyond r so the latter crossvein connects with R_{2+3} far before its fork. The extreme tip of R_1 is atrophied but in most of the known species its base is preserved a short distance beyond the end of vein *Sc* (**Pl. 2, Fig. 4** and **5**). The medial field presents a transition between the primitive condition found in *Cyttaromyia* and *Cylindrotoma* (**Pl. 1, Fig. B, C**) and all the remaining members of the subfamily. Vein M_3 is more or less atrophied in all the species known, so but three branches of the vein (M_1, M_2 and M_4) attain the margin. In some species (*P. replicata* Linnæus; *P. tipulina* Osten-Sacken; *P. neoxena* Alexander and *P. occidentalis*, nov. sp.) cell M_1 is short-petiolate to nearly sessile; in other cases (*P. formosæ* Alexander, *P. mikado* Alexander) the cell becomes broadly sessile, in the extreme case, the basal section of vein M_2 being equal in length to the posterior element that closes cell *1st* M_2 (the composite vein M_3 plus the medial crossvein). This latter case is similar to that found in all higher members of the subfamily.

Abdomen elongate, the male hypopygium relatively large, the structure not essentially different from the common type of the subfamily. Ovipositor with four nearly fleshy valves, approaching the normal Limoniine or Tipuline type.

Characters of Larvæ. — Body covered with numerous, elongate, trachea-bearing filaments, the posterior pair on dorsal segments deeply forked, the others simple. Spiracular disk with dorsal pair of lobes, formed by rudimentary posterior branch of branched filaments of eighth abdominal segment. Head capsule compact. Mentum with about 15 teeth (**Pl. 1, Fig. 3**).

Characters of Pupæ. — Cephalic crest low, not setiferous. Pronotal breathing horns long, almost straight. Dorsal abdominal segments with tubercles, those of sixth and eighth segments enlarged into spinous hooks; two pointed tubercles on seventh sternite (**Pl. 1, Fig. 4**).

Type species : *Phalacrocera replicata* Linnæus.

Geographical distribution.

1. *P. formosæ* Alexander, Philipp. Journ. Sc. Vol. 22, p. 479 (1923).	Taiwan.
2. *P. mikado* Alexander, Ann. Ent. Soc. Amer. Vol. 12, p. 346 (1919).	Japan.
3. *P. neoxena* Alexander, Proc. Acad. Nat. Sc. Philad. p. 603, pl. 25, f. 10 (1914).	Eastern North America.
4. *P. occidentalis,* nov. sp. (1).	Western North America.
5. *P. replicata* Linnæus, Syst. Nat. (ed. 10), p. 587 [1758] (*Tipula*). *P. brevirostris* Zetterstedt, Ins. Lappon. Dipt. p. 844 [1838] (*Tipula*). *P. nudicornis* Schummel, Beitr. Ent. Pt 1, p. 122, pl. 1, f. 8; pl. 5, f. 7-9 [1829] (*Limnobia*).	Europe.
6. *P. tipulina* Osten-Sacken, Proc. Ent. Soc. Philad. Vol. 4, p. 241 (1865).	Eastern North America.

3. Genus LIOGMA Osten-Sacken

Liogma Osten-Sacken, Mon. Dipt. N. Amer. Vol. 4, p. 298 (1869).

Remarks. — The very sluggish adult Flies of the species of *Liogma* may be swept from rank vegetation in cool, shaded woodlands. As indicated before, the immature stages are spent in relatively dry moss cushions.

Characters of Adults. — Vertex between the eyes broad. Rostrum very short, arched dorsally; palpi short. Antennæ of moderate length, 16-segmented, but appearing 17-segmented because of the very long terminal segment, which, in some cases, appears to be binodose; flagellar segments (**Pl. 1, Fig. 6**) with the lower or ventral face strongly produced to give the organ a marked serrate appearance; individual segments densely covered with a pale, erect pubescence and with a few powerful black bristles that are somewhat longer and more slender on the dorsal side of the segments. Eyes with relatively small ommatidia.

Head and thorax nearly smooth and subshiny. Legs relatively long and slender, covered with relatively numerous subappressed setæ; tibial spurs relatively slender, setiferous. Wings with the venation variable in several regards. *Sc* long, ending beyond the fork of *Rs*, Sc_1 atrophied or tending to atrophy; *Rs* long, the origin arcuated; tip of R_1 atrophied, in most cases with no indication of its point of leaving the main vein; tip of R_2 atrophied; *r-m* present in some cases, in others obliterated by the short to long fusion of vein R_4+5 on M_1+2 (**Pl. 2, Fig. 8-10**); *m-cu* variable in position, in the *L. glabrata* figured being nearly its own length before the fork of *M*, in other cases a short distance beyond the fork of *M* and beneath cell *1st* M_2.

Abdomen relatively long and slender (**Pl. 1, Fig. 1**), as in the subfamily. Male hypopygium large, having the general structure of the subfamily; basistyles and dististyles large and massive. Aedeagus large, in some cases very powerful, trifid at apex, as in the subfamily. Ovipositor with fleshy valves of the same general type as in the typical genus *Cylindrotoma*.

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(1) **Phalacrocera occidentalis,** nov. sp. — Male. Length about 12 mm. Wing 11 mm. General coloration black, gray pruinose; wings pale brown, the stigma oval, slightly darker brown; distal section of vein R_2 entirely atrophied, as in *P. tipulina* Osten-Sacken; distal section of vein M_3 persistent basally.

Holotype, ♂, Mt. Rainier, Washington, June 10th (in Alexander Collection).

Characters of Larvæ. — Body covered with elongate, leaf-like projections, the dorsal ones with one or two teeth on anterior convex face. Spiracular disk surrounded by four lobes. Head capsule compact. Mentum with about 14 teeth (**Pl. 1, Fig. 2**).

Characters of Pupæ. — Metanotum and abdominal tergites with elongate spines, branched in *L. glabrata* (Meigen), simple in *L. nodicornis* (Osten-Sacken).

Type species : *Liogma nodicornis* Osten-Sacken (**Pl. 1, Fig. 5**).

Geographical distribution.

1. *L. glabrata* Meigen, Syst. Beschr. Zweifl. Ins. Vol. 1, p. 142 [1818] (*Limnobia*). Europe.
2. *L. nodicornis* Osten-Sacken, Proc. Ent. Soc. Philad. Vol. 4, p. 239 [1865] (*Triogma*). North-Eastern North America.
2a. *L. nodicornis flaveola* Alexander, The Canad. Ent. Vol. 51, p. 195 (1919). South-Eastern United
3. *L. serraticornis* Alexander, Ann. Ent. Soc. Amer. Vol. 12, p. 345 (1919). Japan. [States.

4. Genus TRIOGMA Schiner

Triogma Schiner, Wien. Ent. Monatschr. Vol. 7, p. 223 (1863).

Remarks. — The adult Flies of *Triogma* occur in wet, mossy meadows, where they may be found walking and fluttering about among the rank growth of sedges and mosses. The immature stages are spent in these moss cushions.

Characters of Adults. — Vertex between the eyes broad, the entire head, as well as the thoracic interspaces deeply and conspicuously roughened and pitted. Rostrum very short; palpi small, the terminal segment short but about twice as long as the very short penultimate segment. Antennæ 16-segmented, of moderate length; flagellar segments (**Pl. 1, Fig. 7**) strongly narrowed at base, widened distally into a clavate structure but scarcely more produced on the lower or ventral face; shorter and slightly more produced in the female than in the male. Eyes with ommatidia moderately large and coarse.

Thorax as in the subfamily. Legs relatively short and stout, especially the tarsi; tibial spurs setiferous, except at the extreme tips. Wings with *Sc* long, ending nearly opposite or some distance beyond the fork of *Rs*, Sc_1 tending to atrophy; *Rs* moderately elongate, shorter and more arcuated in *T. exculpta* Osten-Sacken; tip of vein R_1 preserved in *T. exculpta* Osten-Sacken, atrophied in the other species; tip of vein R_2 entirely atrophied; *r-m* obliterated by the fusion of vein R_4+5 on M_{1+2}, this fusion variable and sometimes very extensive; vein M_3 entirely atrophied so but three branches of *M* attain the wing-margin; *m-cu* beyond the fork of *M*, beneath cell *1st* M_2.

Male hypopygium and ovipositor almost as in *Liogma*, differing only in minor details.

Characters of Larvæ. — Body covered with elongate, leaf-like projections, some of the dorsal ones with as many as four teeth on anterior convex face. Spiracular disk with four primary lobes and an additional smaller median dorsal lobe.

Characters of Pupæ. — Dorsum of abdomen with elongate branched spines.

Type species : *Triogma trisulcata* Schummel.

Geographical distribution.

1. *T. exculpta* Osten-Sacken, Proc. Ent. Soc. Philad. Vol. 4, p. 239 (1865). Eastern North America.

2. *T. kuwanai* Alexander, The Canad. Ent. Vol. 45, p. 321, pl. 4, f. 4; pl. 10, f. 13-15 [1913] (*Liogma*). Japan.
3. *T. trisulcata* Schummel, Beitr. Ent. Pt. 1, p. 105, pl. 1, f. 3 [1829] (*Limnobia*). Europe.

5. Genus STIBADOCERA Enderlein

Stibadocera Enderlein, Zool. Jahrb. Syst. Vol. 32, p. 83, f. A 2 (1912).

Characters of Adults. — Antennæ 16-segmented; in the male longer than the entire body, the flagellar segments provided with long, conspicuous, erect, delicate setæ. Head smooth.

Interspaces and margins of the mesonotal præscutum punctate. Wings (**Pl. 2, Fig. 14**) with *Sc* moderately long, ending beyond three-fourths the length of *Rs*, Sc_1 preserved (*S. bullans* Enderlein) or indistinct; tip of R_1 preserved; *r* very short, usually not longer than the free part of R_1 (a little longer in *S. metallica* Alexander); *Rs* long, the long basal section arcuated at origin; *r-m* at (*S. quadricellula* Brunetti) or before the fork of *Rs*, in *S. bullans* Enderlein, a distance before that is approximately equal to *r-m*; cell *1st* M_2 elongate-hexagonal; cell M_1 lacking; three branches of *M* reaching the wing-margin.

Abdomen slender; genitalia relatively small.

Type species : *Stibadocera bullans* Enderlein.

Geographical distribution.

1. *S. bullata* Enderlein, Zool. Jahrb. Syst. Vol. 32, p. 84, f. A 2 (1912). Sumatra.
2. *S. metallica* Alexander, Proc. U. S. Nat. Mus. Vol. 49, p. 178, pl. 45, f. 30 (1915). Java.
3. *S. quadricellula* Brunetti, Rec. Indian, Mus. Vol. 6, p. 268 [1911] (*Cylindrotoma*); Fauna Brit. India Dipt. Nematocera, p. 361, pl. 7, f. 1-2 [1912] (*Cylindrotoma*). India.

6. Genus STIBADOCERODES, nov. gen.

Characters of Adults. — Characters as in *Stibadocera* Enderlein, differing as follows : Head and thorax quite impunctate. Antennæ of male very elongate, as in this group of genera. Wings (**Pl. 2, Fig. 15, 16**) with a few macrotrichiæ in apices of cells R_5 and M_2. Venation : Crossvein *r-m* at (*S. tasmaniensis* Alexander) or before (*S. australiensis* Alexander) the fork of *Rs*; Sc_1 and Sc_2 present but in some cases subobsolete, Sc_1 ending before midlength of *Rs* (*tasmaniensis*) or beyond (*australiensis*); tip of R_1 atrophied; cell *1st* M_2 closed (*tasmaniensis*) or open by the atrophy of the combined outer deflection of M_3 and *m*; *m-cu* beneath cell *1st* M_2. Male hypopygium with the tergite feebly concave medially; basistyles very stout, the mesal face longitudinally grooved for the reception of the dististyles; dististyles two, the inner more flattened and blade-like than the slender, apically curved outer style; ædeagus terminating in three branches.

Type species : *Stibadocerodes australiensis* Alexander.

Geographical distribution.

1. *S. australiensis* Alexander, Proc. Linn. Soc. N. S. Wales, Vol. 47, p. 586 [1922] (*Stibadocerella*). New South Wales.
2. *S. tasmaniensis* Alexander, Rec. S. Austral. Mus. Vol. 2, p. 250 [1922] (*Stibadocerella*). Tasmania.

7. Genus STIBADOCERELLA Brunetti

Stibadocerella Brunetti, Rec. Indian Mus. Vol. 15, p. 283 (1918).

Agastomyia de Meijere, Bijdr. Dierk. Amsterdam, Vol. 21, p. 17 (1919).

Remarks. — The *Stibadocera* group of genera fall in two distinct divisions, depending on the position of *r-m* in relation to the fork of *Rs*, and the number of Anal veins. In *Stibadocera* and *Stibadocerodes*, this crossvein is at or close to this fork, whereas in *Stibadocerella* the fork of the sector is approximately at mid-distance between *r-m* and the wing-tip, a very unusual character in the family.

Characters of Adults. — Anterior vertex moderately broad, scarcely swollen; front almost flat, rather short, not produced into a rostrum; palpi moderately elongate, the terminal segment not prolonged. Antennæ of male very long, filiform, 16-segmented; basal segment of scape very short; flagellum very long, nearly twice the length of the entire body, all flagellar segments strongly elongated, rod-like, the terminal segments shortest but still six times as long as thick; flagellar segments provided with long, outspreading setæ that arise from microscopic tubercles. In the female, the antennæ are less than one-half the length of those of the male and are only shortly and inconspicuously hairy. Head impunctate.

Thorax of normal Cylindrotomine structure. Legs normal, the tibial spurs small. Wings (**Pl. 2, Fig. 17**) with *Sc* moderately elongate, extending to beyond midlength of the basal section of *Rs*, both Sc_1 and Sc_2 preserved and subequal in length; tip of R_1 entirely atrophied; R_1, *r* and distal section of R_{2+3} in direct longitudinal alignment; *Rs* very long, divided into two sections by *r-m*, the basal section relatively short, arcuated, less than the long, straight distal section, *r-m* being before midlength of *Rs*; R_{4+5} shorter than the distal section of *Rs*; R_{2+3} simulating *r* in appearance, transverse in position, appearing to connect R_1 with the end of *Rs*; free distal portion of R_{2+3} (possibly representing R_3 alone) about three times the basal section; cell *1st* M_2 large, closed; cell M_1 lacking, there being three simple medial veins issuing from the cell; *m-cu* before midlength of cell *1st* M_2; vein *2nd A* completely lacking. Wing-veins extremely distinct and well-defined.

Abdomen relatively slender, the hypopygium somewhat enlarged, with relatively small styli.

Type species : *Stibadocerella pristina* Brunetti.

Geographical distribution.

1. *S. albitarsis* de Meijere, Bijdr. Vol. 21, p. 17, pl. 2, f. 7 [1919] (*Agastomyia*). Sumatra.
2. *S. pristina* Brunetti, Rec. Indian Mus. Vol. 15, p. 283 [1918] (written erroneously *Cylindrotoma latefurcata*; Brunetti, ibidem, p. 280). Assam.

FOSSIL CYLINDROTOMINÆ

Remarks. — The only fossil genus that has been ascribed to this subfamily that would appear to really belong here is *Cyttaromyia* Scudder, discussed below. The genus *Oryctogma* Scudder, was proposed in 1894 (Proc. Amer. Philos. Soc. Vol. 32, p. 194) for the single species, *O. sackenii* Scudder, from the Florissant. The present writer cannot detect Cylindrotomine features in this fly and would prefer to ascribe the group to one of the other subfamilies of the Tipulidæ. In 1916, Meunier (Zeitschr. Deutschen Geol. Gesellsch. for 1915, 67 : 229-230; fig.) erected the new genus *Cyttaromyella* from the Siebengebirge Aquitanien, based on the new species, *C. bastini* Meunier. This genus was based upon a misconception on the part of Meunier as to what *actually* constitutes the so-called second discal cell that is characteristic of *Cyttaromyia*. A study of the rather numerous species of the latter genus shows

that the group is very close to the recent genus *Cylindrotoma* Macquart, differing chiefly in the possession of a supernumerary crossvein in cell R_5, connecting vein R_{4+5} with vein M_1 a short distance beyond the origin of the latter. This crossvein is so constant that in some cases it seems to persist even after the atrophy of the basal deflection of M_1, giving us a case exactly comparable to that found in the true discal cell (*1st* M_2), where this cell may be open by the atrophy of either of the two veins closing its outer end. Such a persistence of the vein is found in *Cyttaromyia fuscula* (Cockerell), referred to under this genus. Meunier's description and figure of his new genus *Cyttaromyella*, however, shows a typical Eriopterine or Hexatomine venation with a supernumerary crossvein in cell R_5, connecting with vein M_{1+2} immediately beyond its origin. There is a difference between these two that should not be misunderstood. In the opinion of the writer, *Cyttaromyella* is a Limoniine crane-fly, possibly an *Eriocera*, with an adventitious or supernumerary crossvein in the cell indicated. In this same paper, Meunier erects the new tribe Cyttaromini (Cyttaromyini) for the two genera, *Cyttaromyia* and *Cyttaromyella*. As has been indicated above, *Cyttaromyia* is so close to *Cylindrotoma* that it is certain that no group higher than the genus is required and the new tribal name has consequently been placed in the synonymy of the Cylindrotominæ.

Besides the new genera mentioned above, Cockerell (Proc. U. S. Nat. Mus. Vol. 57, p. 247, pl. 34, f. 3 [1920]) has described as new a *Cylindrotoma veterana* which may actually belong to this genus or may be an aberrant *Cyttaromyia* in which the supernumerary crossvein diagnostic of the genus has been lost by atrophy or obscured in the type specimen. The writer has included this species in the genus *Cyttaromyia* until the point can be decided. If the species should prove to be a true *Cylindrotoma*, the status of the genus *Cyttaromyia* would appear to the writer to be very questionable.

8. Genus CYTTAROMYIA Scudder

Cyttaromyia Scudder, Bull. U. S. Geol. Surv. Vol. 3, p. 751 (1877).

Asilopsis Cockerell, Proc. U. S. Nat. Mus. Vol. 57, p. 250 (1920).

Remarks. — The genus *Cyttaromyia* is very close to *Cylindrotoma* Macquart. Scudder states that the tibial spurs are lacking, and if this is true, it would constitute a marked difference between this genus and the recent Cylindrotominæ.

The venation is so very close to that of *Cylindrotoma* in all regards that the only point of difference that can be indicated is the supernumerary crossvein in cell R_5, connecting posteriorly with vein M_1 not far from the origin of the latter, and producing the so-called « secondary discal cell » above the primary one that is characteristic of the genus (**Pl. I, Fig. B**).

Type species : *Cyttaromyia fenestrata* Scudder.

Geological distribution.

1. *C. cancellata* Scudder, Proc. Amer. Philos. Soc. Vol. 32, p. 193, pl. 1, f. 7 (1894).	Miocene (Florissant).
2. *C. clathrata* Scudder, ibidem, Vol. 32, p. 194, pl. 1, f. 8 (1894).	Miocene (Florissant).
3. *C. fenestrata* Scudder, Bull. U. S. Geol. Surv. Vol. 3, p. 751 (1877).	Eocene (White River).
4. *C. fuscula* Cockerell, Proc. U. S. Nat. Mus. Vol. 57, p. 250, text-fig. 7, pl. 35, f. 3 [1920] (*Asilopsis*).	Eocene.
5. *C. oligocena* Scudder, Proc. Amer. Philos. Soc. Vol. 32, p. 193, pl. 1, f. 2 (1894).	Miocene (Florissant).
6. *C. princetoniana*, Scudder, ibidem, Vol. 32, p. 192, pl. 1, f. 1 (1894).	Miocene (Florissant).
7. *C. reclusa* Cockerell, Proc. U. S. Nat. Mus. Vol. 64, p. 7, pl. 2, f. 1 (1924).	Eocene.
8. ?*C. veterana* Cockerell, ibidem, Vol. 57, p. 247, pl. 34, f. 3 [1920] (*Cylindrotoma*).	Eocene.

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EXPLANATION OF PLATES

PLATE 1

Venation of the Cylindrotominæ. (Interpreted according to the Comstock-Needham-Tillyard System.)

Symbols : *A* = Anal vein; *Cu* = Cubitus; *M* = Media; *m-cu* = Medial-cubital crossvein; *R* = Radius; *Rs* = Radial sector; *S* = Supernumerary crossvein; *Sc* = Subcosta.

Fig. A. Hypothetical type of Cylindrotomine wing.
— B. *Cyttaromyia oligocena* Scudder (after Scudder).
— C. *Cylindrotoma splendens* Doane.
— D. *Phalacrocera occidentalis*, nov. sp.
— E. *Triogma exculpta* Osten-Sacken.
— F. *Stibadocera metallica* Alexander.
— G. *Stibadocerodes australiensis* Alexander.
— H. *Stibadocerella albitarsis* de Meijere (after de Meijere).

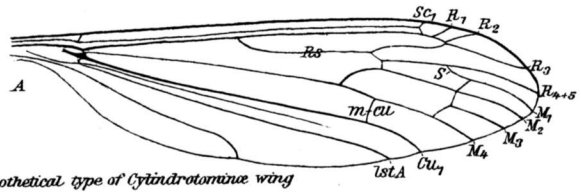
Fig. 1. *Liogma nodicornis* Osten-Sacken, lateral aspect of adult male.
— 2. *Liogma nodicornis* Osten-Sacken, dorsal aspect of larva.
— 3. *Phalacrocera replicata* Linnæus, lateral aspect of larva.
— 4. *Phalacrocera replicata* Linnæus, lateral aspect of pupa.
— 5. *Liogma nodicornis* Osten-Sacken, dorsal aspect of pupa.
— 6. *Liogma nodicornis* Osten-Sacken, basal six segments of antenna of male.
— 7. *Triogma exculpta* Osten-Sacken, basal six segments of antenna of male.
— 8. *Cylindrotoma splendens* Doane, lateral aspect of ovipositor (after Cameron).
— 9. *Cylindrotoma splendens* Doane, ventral aspect of male hypopygium (after Cameron).

PLATE 2

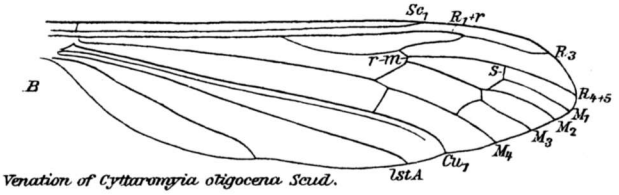
Wings of Cylindrotominæ.

Fig. 1. *Cylindrotoma tarsalis* Johnson.
— 2. *Cylindrotoma nigriventris* Loew.
— 3. *Cylindrotoma japonica* Alexander.
— 4. *Phalacrocera occidentalis*, nov. sp.
— 5. *Phalacrocera mikado* Alexander.
— 6. *Phalacrocera neoxena* Alexander.
— 7. *Phalacrocera formosæ* Alexander.
— 8. *Liogma glabrata* Meigen.
— 9. *Liogma nodicornis* Osten-Sacken.
Fig. 10. *Liogma serraticornis* Alexander.
— 11. *Triogma exculpta* Osten-Sacken.
— 12. *Triogma kuwanai* Alexander.
— 13. *Triogma trisulcata* Schummel.
— 14. *Stibadocera metallica* Alexander.
— 15. *Stibadocerodes tasmaniensis* Alexander.
— 16. *Stibadocerodes australiensis* Alexander.
— 17. *Stibadocerella albitarsis* de Meijere (after de Meijere).

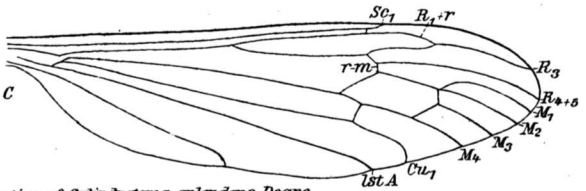
Amherst, Mass. U. S. A. 15 July, 1925.



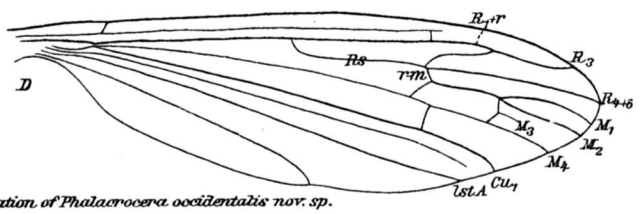
Hypothetical type of Cylindrotominae wing



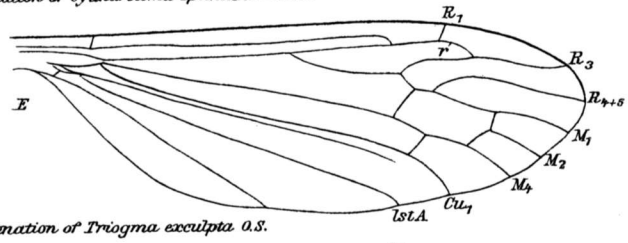
Venation of Cyttaromyia otigocena Scud.



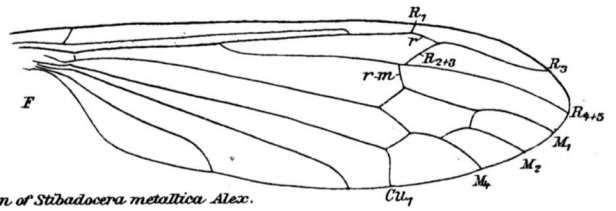
Venation of Cylindrotoma splendens Doane



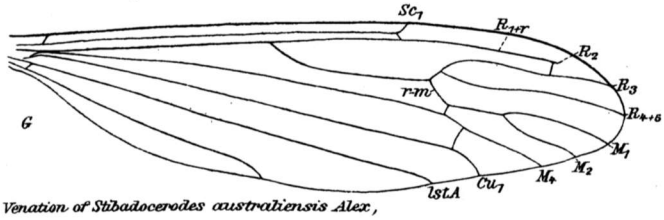
Venation of Phalacrocera occidentalis nov. sp.



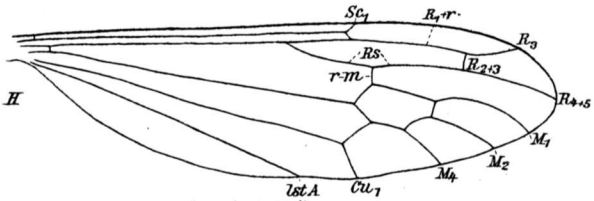
Venation of Triogma exculpta O.S.



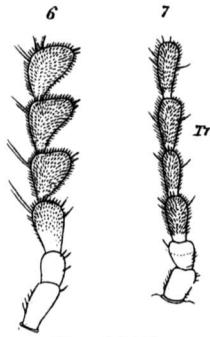
Venation of Stibadocera metaltica Alex.



Venation of Stibadocerodes australiensis Alex,

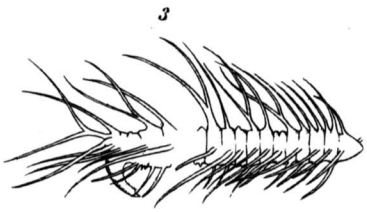


Venation of Stibadocerella albitarsis de Meij.



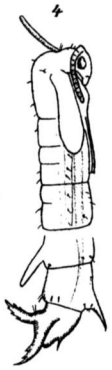
Triogma exculpta ♂, O.S. antenna

Liogma nodicornis ♂, O.S. antenna



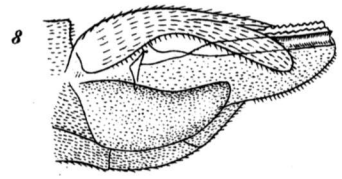
Phalacrocera replicata L. larva

Liogma nodicornis O.S. larva

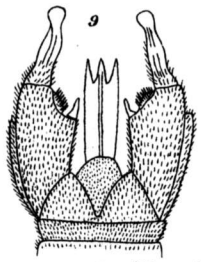


Phalacrocera replicata L. pupa

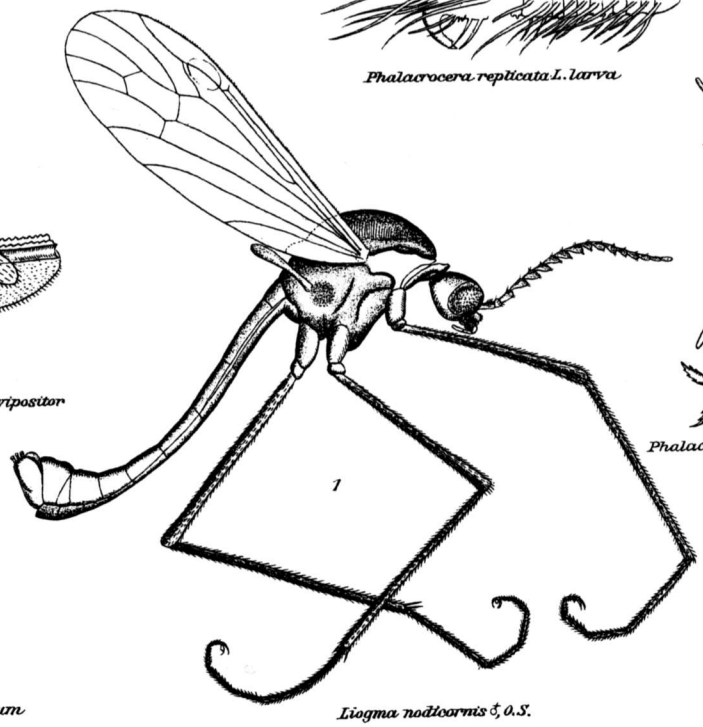
Liogma nodicornis O.S. pupa



Cylindrotoma splendens Doane, ovipositor



Cylindrotoma splendens ♂, Doane, hypopygium



Liogma nodicornis ♂, O.S.

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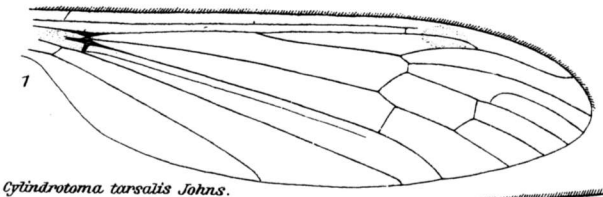
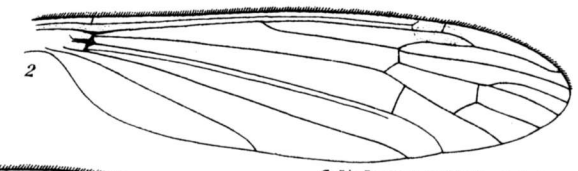
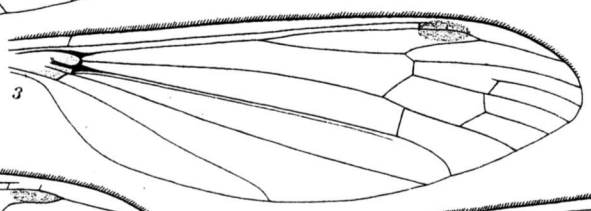


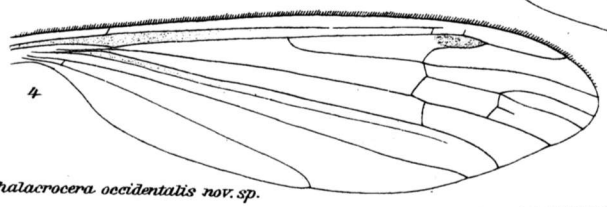
1 *Cylindrotoma tarsalis Johns.*



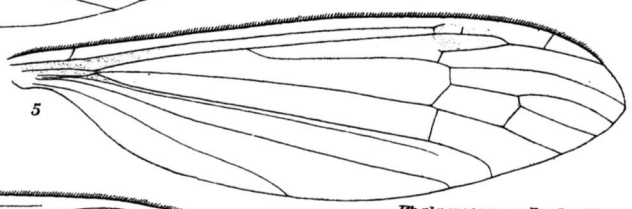
2 *Cylindrotoma nigriventris Loew.*



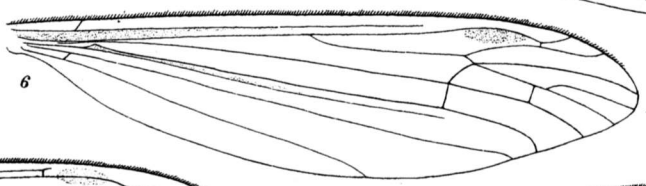
3 *Cylindrotoma japonica Alex.*



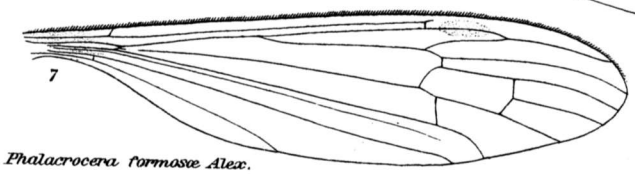
4 *Phalacrocera occidentalis nov. sp.*



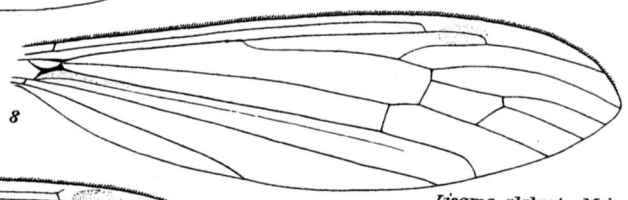
5 *Phalacrocera mikado Alex.*



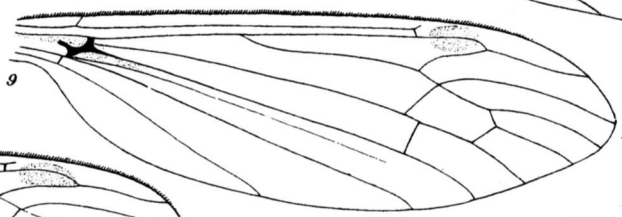
6 *Phalacrocera neoxena Alex.*



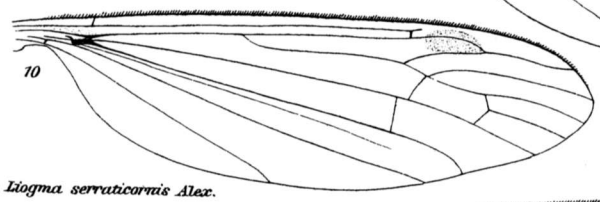
7 *Phalacrocera formosæ Alex.*



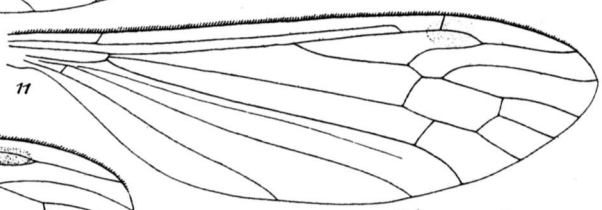
8 *Liogma glabrata Meig.*



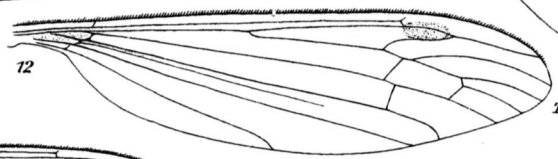
9 *Liogma nodicornis O.S.*



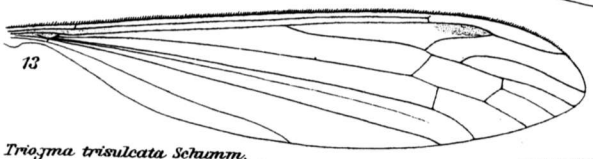
10 *Liogma serraticornis Alex.*



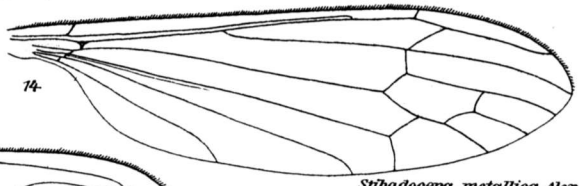
11 *Triogma exculpta O.S.*



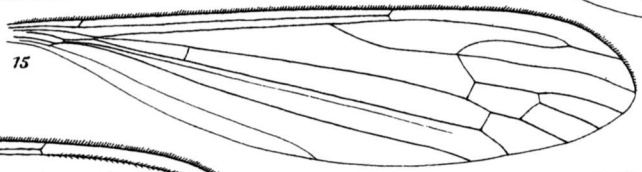
12 *Triogma kuwanai Alex.*



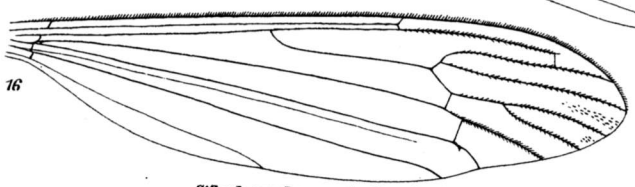
13 *Triogma trisulcata Schumm.*



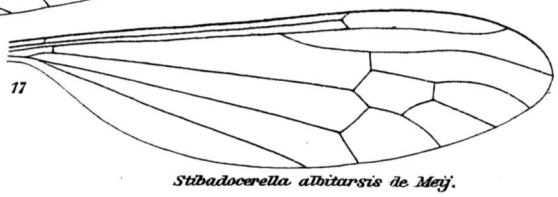
14 *Stibadocera metallica Alex.*



15 *Stibadocerodes tasmaniensis Alex.*



16 *Stibadocerodes australiensis Alex.*



17 *Stibadocerella albitarsis de Meij.*

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SUBFAM. CYLINDROTOMINÆ.