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AGRICULTURAL EXPERIMENT STATION

THE CRANE-FLIES OF NEW YORK
PART I. DISTRIBUTION AND TAXONOMY
OF THE ADULT FLIES

CHARLES PAUL ALEXANDER

21



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THE CRANE-FLIES OF NEW YORK

PART I. DISTRIBUTION AND TAXONOMY OF THE ADULT FLIES

THE CRANE-FLIES OF NEW YORK

PART I. DISTRIBUTION AND TAXONOMY OF THE ADULT FLIES¹

CHARLES PAUL ALEXANDER

The crane-fly fauna of New York State may be considered as representative of that of northeastern North America. For more than half a century New York has been one of the favorite collecting grounds for students of this neglected group of insects. The original plan of the present paper was to include only the species that are actually known to occur in this State. However, it should be understood and appreciated that in groups of insects which have been long ignored by almost all students of entomology, such as the group under consideration, it is still impossible to give the exact range of any particular species, and forms that seem to be confined to certain sections of the country upset all calculations by reappearing in distant regions which had been considered as far outside the range of the species. Thus it is possible that almost any species occurring in northeastern America may be found within the limits of this State, altho some species are now known only from localities so distant as to make it seem improbable that they may be found here also. For this reason the scope of the present paper has been extended to include the northeastern United States and eastern Canada — Labrador and Newfoundland, south to Virginia and Kentucky, west to Iowa, Minnesota, and Manitoba. It is believed that this area includes about all of the local probabilities, but there are undoubtedly new species yet to be discovered and lost species to be recognized.

The number of species of crane-flies that should occur in New York State is probably not less than three hundred, and this figure seems similarly applicable to many areas of equal extent and equal diversity of ecological conditions in the North Temperate Zone.

The student of this group of flies will find that there is still very much to be done in determining the exact seasonal and geographical distribution

¹This study was conducted in the entomological laboratory of Cornell University, under the direction of Dr. James G. Needham, Dr. J. Chester Bradley, and Dr. O. A. Johannsen, to whom the writer is indebted for many helpful criticisms and suggestions.

of the species here included. Present knowledge of the biology and ecology of these species, and exact data on the duration of the different periods of the immature stages, are still very meager, and it is this field more than any other that offers the greatest opportunities for research.

The classification herein adopted is that of Osten Sacken, but it may be well to state that very many fundamental changes are to be expected when the immature stages are better known.

In the course of the author's studies on the local Tipulidae, it was necessary for him to visit and examine most of the important collections in the East. In some cases in which it was impracticable to visit the museums, specimens were lent by the authorities in charge. The writer wishes to express his gratitude to the persons who kindly assisted in this manner. Among the collections studied were those contained in the following institutions:

United States National Museum, Washington, D. C. This museum contains probably the largest collection of crane-flies in the New World, including the types of Coquillett and the Limnobiinae described by Doane, as well as much of the material determined by the author. The collection was examined on several occasions thru the kindness of the late Mr. Frederick Knab, custodian of the Diptera.

United States Biological Survey, Washington, D. C. The collections here, examined thru the kindness of Mr. W. L. McAtee, are extensive, and are particularly rich in local forms and in material from the Pribilof Islands.

Museum of Comparative Zoology, Cambridge, Massachusetts. These collections, examined on several occasions thru the kindness of the Director, Mr. Samuel Henshaw, include the types of Osten Sacken and Loew and are of the greatest importance on that account. The material is in a fine state of preservation because of the constant care given to it.

Boston Society of Natural History, Boston, Massachusetts. These collections, examined thru the kindness of the Curator, Mr. Charles W. Johnson, are very fine, almost complete as far as the New England fauna is concerned, and of great value to the student. The type of *Chionea valga* Harris, as well as many of Say's species and the specimens determined by him, are to be found here.

Academy of Natural Sciences, Philadelphia, Pennsylvania. The material here includes the collections of the American Entomological Society. The collections were examined thru the kindness of Mr. E. T. Cresson, jr. They include the type of *Triogma exculpta* Osten Sacken, and cotypes of many of the other Sackenian species as well as a good representation of other forms.

American Museum of Natural History, New York City. This rather considerable collection, examined thru the kindness of Dr. F. E. Lutz, includes many of Williston's cotypes and is especially rich in Antillean and South American forms.

Museum of the Brooklyn Institute, Brooklyn, New York. This collection was examined thru the kindness of the custodian, Mr. Charles Shaeffer. It is a rather small local collection, but the specimens have been authoritatively determined by Johnson and they form a good nucleus for future work.

New York State Museum, Albany, New York. This is a good local collection, examined on several occasions thru the kindness of the State Entomologist, Dr. E. P. Felt, and the assistant entomologist, Mr. D. B. Young. \

Cornell University, Ithaca, New York. This collection is under the direction of Dr. James G. Needham and Dr. J. Chester Bradley. It is a very complete collection, including many specimens taken in the seventies by Professor J. H. Comstock and the late Mr. H. H. Smith and determined by Osten Sacken. The type of *Rhabdomastix flava* is here.

Maine Agricultural Experiment Station, Orono, Maine. This is a very good local collection, made in large part by the author in 1913, under the employment of the Director, Dr. Charles D. Woods, and the Station Entomologist, Dr. Edith M. Patch.

Department of Entomology of North Carolina, Raleigh, North Carolina. This collection was examined thru the kindness of the State Entomologist, Mr. Franklin Sherman, and Mr. R. W. Leiby. It is a good collection of local material.

Ohio State University, Columbus, Ohio. This collection was examined thru the kindness of Professor James Hine, who collected the greater part of the material.

University of Minnesota, St. Paul, Minnesota. This is a good local collection, including most of the material mentioned in Washburn's *Diptera of Minnesota*. It was sent to the writer by Mr. Simon Marcovitch. Considerable additional material from the region of Lake Itasca was given to the writer for determination by the collector, Mr. Samuel A. Graham.

Washington State Agricultural College, Pullman, Washington. This collection is very important, as it contains many of the Tipulinae described by Doane. The writer was unable to visit the collection, but Dr. Axel L. Melander very kindly sent him the cotype specimens of three or four eastern species that were needed in the preparation of this paper.

Canadian National Museum, Ottawa, Ontario. This collection was sent to the writer for naming, thru the kindness of the Dominion Entomologist, Dr. C. Gordon Hewitt. It is a rather extensive collection, from most parts of the Dominion.

University of Toronto, Toronto, Ontario. This is a small collection, mostly taken by Dr. E. M. Walker and including the types of *Phalacrocera neozena*. It contains also a few additional specimens collected by Dr. W. A. Clemens and including the type of *Tipula algonquin*.

New Brunswick Experiment Station, Fredericton, New Brunswick. This is a good local collection, taken by the Station Entomologist, Mr. John D. Tothill.

Nova Scotia Experiment Station, Truro, Nova Scotia. This is a very good local collection, taken by Dr. Robert Matheson. It is now in the collection at Cornell University.

In addition to the public collections listed above, there are in the United States a few private collections of great value, as follows:

The collection of Dr. W. G. Dietz, Hazleton, Pennsylvania. This is a very considerable collection of North American species, including the types of the species described by the owner.

The collection of Mr. C. W. Johnson, Boston, Massachusetts. This is an exceptionally fine collection, and includes the types of many of the species described by the owner.

The collection of Dr. J. G. Needham, Ithaca, New York. This is a good local collection, mounted in balsam. It includes the types of *Dicranomyia whartoni* and *Dolichozepe americana*.

The collection of Mr. M. C. Van Duzee, Buffalo, New York. This collection is very rich in local and Floridian species, and includes the type of *Geranomyia vanduzeei*.

The collection of the author, Urbana, Illinois. This includes a good representation of local forms and many extra-limital species. The types of many of the species described by the author are in this collection.

In addition to those named above, there have been examined several collections made by students in systematic entomology at Cornell University during the past few years. The more notable of these are the collections of Dr. W. T. M. Forbes, and Messrs. J. T. Lloyd, S. W. Frost, E. A. Richmond, W. C. Woods, and Hachiro Yuasa. The following very considerable collections, made in different parts of the country, have been of great value in determining the range of North American species:

The two Beutenmüller collections, one in the American Museum and the other in the collection of Dr. Dietz, from the Black Mountains, North Carolina.

The Nathan Banks collections, from the same locality and from northern Virginia.

The Karl P. Schmidt collection, made in Louisiana.

The J. Chester Bradley collections, made in Georgia, New York, and the West.

The R. C. Shannon collections, from the vicinity of Washington, D. C.

The Axel Olsson collections, from North Carolina and New York.

The H. H. Knight collections, from western New York.

The H. M. Parshley collections, from Maine and Massachusetts.

The Cordelia Stanwood collections, from Hancock County, Maine.

Collections made in the vicinity of Georgian Bay, Ontario, by Dr. W. A. Clemens in 1912, by Mrs. John D. Tothill in 1914, and especially by Mr. H. S. Parish in 1915.

The Bryant Newfoundland specimens in the collection of Mr. Johnson.

Material from near Washington, D. C., and from Maine, collected by Mr. W. L. McAtee.

The Ely (Connecticut) and Weidt (New Jersey) material in the collection of Dr. Dietz.

The extensive collections made in Bergen County, New Jersey, by Mr. M. D. Leonard.

Specimens collected by Oslar (Colorado), Munz (Colorado), and Woodgate (New Mexico), and other material in the collection of the author.

To all the above-mentioned persons the author expresses his sincere gratitude for the privilege of seeing these specimens and obtaining the records.

In addition to the collections that the writer has been able to visit, there are several others of high repute — the collection in the Carnegie Museum (Pittsburg, Pennsylvania), the private collection of Mr. Charles Dury (Cincinnati, Ohio), the collections of the Illinois State Laboratory of Natural History and the University of Michigan, and others —

which unquestionably will supply many new, chiefly local, records when their contents are made known.

SYSTEMATIC POSITION OF THE SPECIES

The families that make up the insects known as crane-flies are four in number — the Tanyderidae, the Ptychopteridae, the Rhyphidae, and the Tipulidae. All but the last-named of these families are very limited in number of species, the total number of described forms being not far in excess of threescore. Crane-flies belong to the division Nematocera of the suborder Orthorrhapha. They are characterized by having six or more segments in the elongated antennae. The only families of flies with which crane-flies might be confused are the Bibionidae and the Dixidae.

Crane-flies are very often of large size. They are the largest of the Nematocera and are among the largest of all Diptera. The differences in size found in the family Tipulidae are very great, ranging from the giants of the family, *Ctenacroscelis praepotens*, *Tipula brobdinagia*, and others, down to such species as *Erioptera parva* and *Molophilus ursinus*, veritable pygmies. In the area considered in this paper, the largest species found are *Longurio testaceus* and *Tipula abdominalis*, and the smallest is *Molophilus ursinus*.

In appearance crane-flies may be described as mosquito-like and they are very often mistaken for mosquitoes, the larger species often causing great alarm. There are no crane-flies, however, that have the biting habits of the Culicidae. The legs of all crane-flies are long and slender, in some cases being exceedingly so, and this feature has given most of the common names that are applied to these insects — crane-flies, daddy longlegs, and the like. The wings are many-veined (polyneura), and in most species they possess a completely inclosed discal cell (*1st M*₂). In all Tipulidae and in the trichocerine Rhyphidae there are two anal veins, a character never possessed by the more specialized Nematocera. On the mesonotum there is a distinct, more or less transverse, V-shaped suture separating the prescutum from the scutum. In the Tanyderidae, the Ptychopteridae, and the Rhyphidae this suture is rather poorly defined. Ocelli are found only in the Rhyphidae. The large size, the inclosed discal cell, the presence of two anal veins, and the V-shaped suture, are sufficient to distinguish the local species of Tipulidae.

ECONOMIC IMPORTANCE

Economically, crane-flies are found to play a relatively important rôle. The adult flies are entirely harmless, but the larvae of many species are destructive to various crops. In Europe the best-known of such species is *Tipula oleracea* Linn. In eastern North America the smoky crane-fly, *T. cunctans* Say (called *T. infuscata* Loew by Hyslop, 1910²), working principally on leguminous species, and *T. bicornis* Forbes working largely on grasses, often become serious pests; in the West the alfalfa crane-fly, *T. simplex* Doane (Essig, 1913), is often of exceedingly great importance, working on various legumes and grass species. Other species, as *T. derbyi* Doane and *T. aspidoptera* Alex., often do considerable local damage. In Japan, *T. longicauda* Mats. and a species that has been determined as *T. parva* Loew do very considerable damage to rice and sugar cane. It is to be noted that all these more destructive species belong to the tribe Tipulini, comprising the larger species of crane-flies, and the damage is done by the larvae's feeding on the roots and thus causing the death of the plants.

The species of Tanyptera live in logs or stumps that are fairly sound and free from decay. The larvae of some species of Rhipidia, Limnobia, Trichocera, and other genera, affect stored roots and tubers. The species of Ula and some species of Limnobia live in fungi (Boletus, Armillaria, Hypomyces, and others), and in some cases may be of economic importance in mushroom culture.

As an element of food for vertebrates, crane-flies occupy a prominent position. The records of Dr. Dallas Hanna and those of the Whitneys, in the possession of the United States Biological Survey, state that larvae representing an unknown species of Tipula are abundant everywhere thruout the summer season on St. Paul Island, of the Pribilof group in Bering Sea. These larvae are found around the roots of grasses and herbs, and especially under beds of moss, on the roots of which they feed, killing the moss over considerable areas. Under such a moss bed as many as twenty larvae to the square foot have been collected. The larvae must be of considerable ecological importance because of their food value to birds and foxes. Foxes will dig over large areas of moss beds to feed on them. Thruout the arctic regions the family Tipulidae

² Dates in parenthesis refer to *References cited*, page 959.

seems very abundant, both in number of species and in number of individuals, and the larvae are exceedingly numerous.

The Biological Survey has kept a very careful record of the food of birds and other vertebrates, based on the examination of stomach contents, and thru the kindness of Messrs. W. L. McAtee and E. R. Kalmbach the writer has obtained a record of the species known to feed on crane-flies. Over a hundred species of birds, representing almost all the bird families, have been found to feed on the adult flies. The more notable and general of these birds are sandpipers, flycatchers, vireos, swallows, wood warblers, and thrushes. The species feeding on the larvae consist for the most part of ducks, shore birds, and thrushes. Dr. Alice A. Noyes has found in the stomach of a Wilson's snipe twenty-three head capsules of a small *Tipula* (possibly *T. dejecta* Walker), showing the importance of the larvae as food at certain seasons. Similarly the food of toads (*Bufo*) and of frogs (*Rana*) often includes an abundance of larval and adult crane-flies (Needham, 1905).

The larvae of crane-flies are very tempting to many species of fishes. Certain of the larger larvae, such as those of *Tipula abdominalis* and *Eriocera spinosa*, furnish one of the best of baits for black bass and other game fish, being even more tempting in many cases than the better-known dobson (*Corydalis*). The skin of these larvae is very tough and leathery, hence their common name *leather-jacket*. The fishhook is run thru the body of the larva at about midlength, leaving the two ends wriggling. Studies made by Needham (1908:172-188) on the food of the bullhead, the sunfish, and the red-bellied minnow, showed that crane-flies were not eaten by these species, and the same is true of the brook trout in ponds (Needham, 1903a). But the habitat of the larvae is not in the haunts of these fishes. They live in the leaf drift caught in the eddies, in the mud and gravel at the sides and the bottom of the stream, and in similar situations which are not readily accessible to the fish. It seems probable that it is due to the fact that the larvae furnish such choice titbits, that they cannot exist in the same haunts with the fish. Some species, as those of *Eriocera*, live in the chutes of the Mississippi River, and they are the only crane-flies known from such a habitat. The remains of crane-flies, such as wings, legs, and heads, are often found in fish stomachs, these being from adult flies that have fallen into the water and been snapped up by the fish.

DISTRIBUTION

GEOLOGICAL DISTRIBUTION

The source of origin of the crane-flies is still largely problematical, but the preponderance of evidence now seems to indicate that they came from some neuropteroid ancestor far back in Mesozoic times. This is expressed by Needham (1908:221) as follows: "The suggestion has been made before by others, and I think it very possible, that some Panorpidlike neuropteroid mutant got its center of gravity hitched forward, its hind wings reduced, and started the dipterous line of evolution."

The first insects that can be definitely referred to the Tipulidae appeared rather suddenly in late Mesozoic times. They belong almost entirely to the subfamily Tipulinae, but the records are very scanty and for the most part unsatisfactory. The evidence that specimens of Tanyderidae, Ptychopteridae, or Linnobiinae occurred at that time is very doubtful. In the Tertiaries, however, the group was extraordinarily developed and it seems quite possible that the family reached its maximum of diversity in the Miocene period or a little later and is now a waning group. From the Oligocene period of British Columbia, Handlirsch (1910) has recorded a curious tanyderid under the name *Etoptychoptera*. The Florissant beds of Colorado were laid down in a lake that is supposed to be of the late Oligocene or the early Miocene age. There have been taken from these beds hundreds if not thousands of specimens, representing about seventy-five species, indicating the extreme richness of the crane-fly fauna during that age. On one slab of the deposit Scudder found a specimen of his *Dicranomyia inferna* which was partly overlain by a specimen of his *D. fontainei*, a condition very suggestive of the remarkable richness of this fauna. The abundance of species in the amber fauna, likewise of the Tertiaries, was indicated by Loew in 1850 and more recently elaborated by Meunier. The present knowledge of the Florissant fauna is due to the work of Scudder, Cockerell, and Wickham.

GEOGRAPHICAL DISTRIBUTION

A summary of the crane-fly fauna of the world

The four families comprising the crane-flies are represented in almost every part of the world where life is possible. Apparently the range of the group is restricted only by great extremes of temperature.

The lesser oceanic islands (the Seychelles, the Fiji, the Hawaiian, and others) that have been at all studied are quite devoid of species of the subfamily Tipulinae, these species being of large size and often possessing considerable powers of flight; while the much smaller species in the Limnobiinae are often very numerous and may include a considerable range of species. Crane-flies in the arctic regions are very abundant and are represented by a few genera of Limnobiinae and many species of Tipula. Many of the latter have the wings atrophied so that they are incapable of flight. This condition is particularly true of forms along the coast or on wind-swept islands adjoining the mainland, and may be confined to the female sex alone or may be found in both sexes. It must be understood, however, that reduction of the wings is by no means confined to such environments or to the genus Tipula, since it occurs in almost all the major groups of crane-flies — in Limnobiini (*Zalusa* End.), Eriopterini (*Platylimnobia* Alex., *Chionea* Dalm.), Limnophilini (*Zaluscodes* Lamb, *Alfredia* Bezzi, *Limnophila aspidoptera* Coq.), Pediciini (*Tricyphona hannai* Alex.), and many others—and is found in many different parts of the world tho usually in arctic, oceanic, or mountainous situations. *Tipula besselsi* O. S., described from Polaris Bay, northern Greenland, is found above the 80th degree of north latitude and within a few hundred miles of the North Pole.

The four families of crane-flies include, respectively, the following numbers of genera, subgenera, and species:³

| | Genera | Subgenera | Species |
|-----------------------|--------|-----------|---------|
| TANYDERIDAE..... | 2 | | 8 |
| PTYCHOPTERIDAE: | | | |
| Ptychopterinae..... | 1 | | 12 |
| Bittacomorphinae..... | 2 | | 4 |
| RHYPHIDAE: | | | |
| Trichocerinae..... | 2 | 2 | 22 |
| Rhyphinae..... | 3 | | 26 |
| Mycetobiinae..... | 2 | | 7 |
| TIPULIDAE: | | | |
| Limnobiinae: | | | |
| Limnobiini..... | 10 | 5 | 365 |
| Antochini..... | 15 | 1 | 160 |
| Eriopterini..... | 28 | 10 | 410 |
| Limnophilini..... | 16 | 10 | 290 |

³ This table is dated June 1, 1916.

| | Genera | Subgenera | Species |
|-----------------------------------|--------|-----------|---------|
| TIPULIDAE (<i>continued</i>): | | | |
| Linnobiinae (<i>continued</i>): | | | |
| Hexatomini..... | 4 | | 125 |
| Pediini..... | 7 | 3 | 75 |
| Cylindrotominae..... | 5 | | 16 |
| Tipulinae: | | | |
| Dolichopezini..... | 9 | 2 | 45 |
| Ctenophorini..... | 7 | | 50 |
| Tipulini..... | 21 | 3 | 900 |
| Total..... | 134 | 36 | 2,515 |

The Tanyderidae have two living genera, one antipodal and the other (Protoplasa) with two Nearctic species.

The Ptychopteridae have three genera. One of these, Ptychoptera, is found in most parts of the world excepting Australasia, while the other two, Bittacomorpha and Bittacomorphella, are Nearctic.

The Rhyphidae have seven genera, arranged in three subfamilies. The species, with few exceptions, are from the North Temperate Zone.

Among the Tipulidae, the tribes Linnobiini, Antochini, Eriopterini, Linnophilini, Dolichopezini, Ctenophorini, and Tipulini are almost cosmopolitan. The tribe Hexatomini has the genus Hexatoma dominant in Europe, and the genus Eriocera cosmopolitan except for the Palaearctic and Australasian regions. The tribe Pediini reaches its greatest development in the North Temperate Zone. The Cylindrotominae are holartic, with one genus (Stibadocera) occurring in the Oriental region.

Lists of the species of adjoining States and provinces

The following lists of species are given to supplement the data on the New York fauna.

Maine

The data for Maine are based largely on the results obtained by the author from a study of the group during a period of fifteen weeks, under the direction of Dr. Charles D. Woods and Dr. Edith M. Patch. Very valuable collections in this State have been made by Mr. Charles W. Johnson, Miss Cordelia J. Stanwood, Dr. H. M. Parshley, Professor Herbert Osborn, Professor A. P. Morse, and others.

- Ptychoptera rufocincta* O. S.
Bittacomorpha clavipes (Fabr.)
Bittacomorphella jonesi (Johns.)
Trichocera regelationis (Linn.)
Discobola argus (Say)
Dicranomyia badia (Walk.)
 gladiator O. S.
 globithorax O. S.
 haeretica O. S.
 hallerata O. S.
 immodesta O. S.
 liberta O. S.
 longipennis (Schum.)
 morioides O. S.
 pubipennis O. S.
 pubica O. S.
 rostrifera O. S.
 simulans (Walk.)
Geranomyia diversa O. S.
 rostrata (Say)
Limnobia cinctipes Say
 hudsonica O. S.
 immatura O. S.
 indigena O. S.
 parietina O. S.
 solitaria O. S.
 triocellata O. S.
 tristigma O. S.
Rhipidia bryanti Johns.
 maculata Meig.
Antocha saxicola O. S.
Elephantomyia westwoodi O. S.
Rhamphidia mainensis Alex.
Toxorhina muliebris (O. S.)
Cladura flavoferruginea O. S.
Cryptolabis paradoxa O. S.
Erioptera armata O. S.
 armillaris O. S.
 caloptera Say
 chlorophylla O. S.
 chrysocoma O. S.
 needhami Alex.
 septemtrionis O. S.
 stigmatica (O. S.)
 straminea O. S.
 venusta O. S.
 vespertina O. S.
Gnophomyia tristissima O. S.
Gonomyia florens Alex.
 subcinerea O. S.
Molophilus comatus (Doane)
 hirtipennis (O. S.)
 pubipennis (O. S.)
Ormosia monticola (O. S.)
 nigripila (O. S.)
 nubila (O. S.)
 pygmaea (Alex.)
 rubella (O. S.)
Helobia hybrida (Meig.)
Adelphomyia americana Alex.
 cayuga Alex.
 minuta Alex.
Epiphragma fascipennis (Say)
Limnophila adusta O. S.
 areolata O. S.
 brevifurca O. S.
 fasciolata O. S.
 fuscovaria O. S.
 inornata O. S.
 lenta O. S.
 lateipennis O. S.
 macrocera (Say)
 montana O. S.
 munda O. S.
 nigripleura A. & L.
 novae-angliae Alex.
 noveboracensis Alex.
 osborni Alex.
 quadrata O. S.
 recondita O. S.
 rufibasis O. S.
 stanwoodae Alex.
 tenuicornis O. S.
 tenuipes (Say)
 toxoneura O. S.
 ultima O. S.
 unica O. S.
Ula elegans O. S.
Utomorpha pilosella (O. S.)
Eriocera longicornis (Walk.)
 spinosa (O. S.)
Pedicia albivitta Walk.
Rhaphidolabis cayuga Alex.
 flavola O. S.
 tenuipes O. S.

Tricyphona autumnalis Alex.
calcar (O. S.)
inconstans (O. S.)
katahdin Alex.
vernalis (O. S.)

Cylindrotoma americana O. S.

Liogma nodicornis (O. S.)

Phalacrocera tipulina O. S.

Dolichopeza americana Needm.

Oropeza dorsalis Johns.

obscura Johns.

sayi Johns.

venosa Johns.

Ctenophora apicata O. S.

Nephrotoma eucera (Loew)

ferruginea (Fabr.)

incurva (Loew)

lugens (Loew)

pedunculata (Loew)

punctum (Loew)

sodalis (Loew)

tenuis (Loew)

vitula (Loew)

xanthostigma (Loew)

Stygeropis fuscipennis Loew

Tipula abdominalis (Say)

algonquin Alex.

angulata Loew

angustipennis Loew

apicalis Loew

bella Loew

bicornis Forbes

caloptera Loew

cayuga Alex.

cunctans Say

fragilis Loew

hebes Loew

hermannia Alex.

longiventris Loew

macrolabis Loew

mainensis Alex.

nobilis (Loew)

oropezoides Johns.

parshleyi Alex.

penobscot Alex.

sayi Alex.

senega Alex.

serta Loew

streps Loew

submaculata Loew

sulphurea Doane

tephrocephala Loew

trivittata Say

ultima Alex.

valida Loew

New Brunswick

(The collections of the New Brunswick Experiment Station, made by Mr. John D. Tothill and others)

Bittacomorpha clavipes (Fabr.)

Dicranomyia morioides O. S.

Geranomyia canadensis (Westw.)

Limnobia cinctipes Say

Erioptera armata O. S.

Limnophila adusta O. S.

imbecilla O. S.

inornata O. S.

quadrata O. S.

recondita O. S.

rufibasis O. S.

Eriocera longicornis (Walk.)

Liogma nodicornis (O. S.)

Oropeza sayi Johns.

venosa Johns.

Ctenophora apicata O. S.

Nephrotoma eucera (Loew)

ferruginea (Fabr.)

incurva (Loew)

lugens (Loew)

occipitalis (Loew)

pedunculata (Loew)

tenuis (Loew)

xanthostigma (Loew)

Tipula abdominalis (Say)

angulata Loew

angustipennis Loew

caloptera Loew

eluta Loew

hebes Loew

latipennis Loew

macrolabis Loew

parshleyi Alex.

Tipula strepens Loew
sulphurea Doane
tephrocephala Loew
ternaria Loew

Tipula trivittata Say
ultima Alex.
valida Loew

Nova Scotia

(The collections of Dr. Robert Matheson, of Cornell University)

Ptychoptera rufocincta O. S.
Bittacomorpha clavipes (Fabr.)
Trichocera bimacula Walk.
Dicranomyia haeretica O. S.
halterata O. S.
immodesta O. S.
liberta O. S.
Rhipidia maculata Meig.
Limnobia solitaria O. S.
tricellata O. S.
Discobola argus (Say)
Antocha saxicola O. S.
Elephantomyia westwoodi O. S.
Erioptera armata O. S.
armillaris O. S.
caloptera Say
chlorophylla O. S.
septemtrionis O. S.
Gonomyia mathesoni Alex.
sulphurella O. S.
Rhabdomastix flava (Alex.)
Cryptolabis paradoxa O. S.
Limnophila adusta O. S.
lenta O. S.
macrocera (Say)
noveboracensis Alex.
recondita O. S.
tenuicornis O. S.
toxoneura O. S.

Pedicia albivitta Walk.
confermina Walk.
Tricyphona inconstans (O. S.)
vernalis (O. S.)
Eriocera longicornis (Walk.)
spinosa (O. S.)
Liogma nodicornis (O. S.)
Tanyptera frontalis (O. S.)
Nephrotoma eucera (Loew)
ferruginea (Fabr.)
incurva (Loew)
lugens (Loew)
macrocera (Say)
pedunculata (Loew)
tenuis (Loew)
Tipula abdominalis (Say)
angustipennis Loew
apicalis Loew
bella Loew
caloptera Loew
cayuga Alex.
fragilis Loew
hebes Loew
hermannia Alex.
parshleyi Alex.
sayi Alex.
submaculata Loew
tephrocephala Loew
tricolor Fabr.
trivittata Say
ultima Alex.
valida Loew

Quebec

The published list for Quebec (Winn and Beaulieu, 1915) has been revised, certain species being dropped, a few others added, and certain parts of the synonymy corrected. The record for *Dicranomyia distans* O. S., an Austral species ranging as far north as Washington, D. C., is evidently erroneous. The species of *Trichocera* and *Tanyptera* are

given as determined by C. W. Johnson. Our knowledge of the crane-flies of Quebec is due to the work of Beaulieu, Beaulne, Chagnon, Couper, Fyles, Winn, and others.

Ptychoptera rufocincta O. S.

Bittacomorpha clavipes (Fabr.)

Trichocera maculipennis (Fabr.)
regelationis (Linn.)

Dicranomyia immodesta O. S.
liberta O. S.
longipennis (Schum.)
pubica O. S.

Limnobia cinctipes Say
indigena O. S.
solitaria O. S.
tristigma O. S.

Rhipidia maculata Meig.

Discobola argus (Say)

Antocha saxicola O. S.

Elephantomyia westwoodi O. S.

Rhamphidia flavipes Macq.

Chionea valga Harr.

Ormosia monticola (O. S.)

Erioptera armata O. S.
armillaris O. S.
caloptera Say
chlorophylla O. S.
chrysocoma O. S.
septentrionis O. S.
venusta O. S.
vespertina O. S.

Molophilus pubipennis (O. S.)

Gonomyia subcinerea O. S.

Gnophomyia tristissima O. S.

Helobia hybrida (Meig.)

Epiphragma fascipennis (Say)

Limnophila adusta O. S.
areolata O. S.
brevifurca O. S.
contempta O. S.
fuscovaria O. S.
imbecilla O. S.
macrocera (Say)
montana O. S.

Limnophila munda O. S.

quadrata O. S.

rufbasis O. S.

tenuipes (Say)

toxoneura O. S.

ultima O. S.

Pedicia albivitta Walk.

Tricyphona autumnalis Alex.
inconstans (O. S.)

Liogma nodicornis (O. S.)

Oropeza albipes Johns.
obscura Johns.

Ctenophora apicata O. S.

Tanyptera atrata (Linn.)
dorsalis (Walk.)
fumipennis (O. S.)
topazina (O. S.)

Nephrotoma eucera (Loew)

ferruginea (Fabr.)

incurva (Loew)

lineata (Scop.)

lugens (Loew)

occipitalis (Loew)

sodalis (Loew)

tenuis (Loew)

xanthostigma (Loew)

Stygeropsis fuscipennis Loew

Tipula abdominalis (Say)
angulata Loew
angustipennis Loew
bella Loew
bicornis Forbes
caloptera Loew
cincticornis Doane
collaris Say
dejecta Walk.
eluta Loew
grata Loew
hebes Loew
hermannia Alex.
iroquois Alex.
latipennis Loew
macrolabis Loew
mcgaura Doane
retorta v. d. W.

Tipula sayi Alex.
senega Alex.
serta Loew
sulphurea Doane
tephrocephala Loew

Tipula trivittata Say
ultima Alex.
umbrosa Loew
valida Loew
vitrea v. d. W.

Newfoundland

(The Owen Bryant collections in the cabinet of C. W. Johnson)

Bittacomorpha clavipes (Fabr.)
Erioptera chlorophylla O. S.
Limnophila rufibasis O. S.
terrae-novae Alex.
Tricyphona inconstans (O. S.)
Nephrotoma vittula (Loew)

Tipula abdominalis (Say)
hermannia Alex.
mainensis Alex.
trivittata Say
umbrosa Loew
valida Loew

Labrador

(Many of the types of Loew and Alexander, collected by Packard, Schneider, and Bryant)

Dicranomyia halterata O. S.
Tricyphona hyperborea (O. S.)
Dolichoheza americana Needm.

Tipula angustipennis Loew
imperfecta Alex.
labradorica Alex.
septentrionalis Loew

Washington, D. C., and vicinity

This remarkable local list is added here to indicate the southern species that may range into our limits. The pioneer collecting of Osten Sacken has been thoroly supplemented by that of W. L. McAtee, R. C. Shannon, Frederick Knab, and some others.

Ptychoptera rufocincta O. S.
Bittacomorpha clavipes (Fabr.)
Bittacomorphella jonesi (Johns.)
Trichocera sp.
Discobola argus (Say)
Dicranomyia badia (Walk.)
brevivena O. S.
distans O. S.
diversa O. S.
floridana O. S.
gladiator O. S.
globithorax O. S.
haeretica O. S.
immodesta O. S.
liberta O. S.

Dicranomyia macateei Alex.
morioides O. S.
pubipennis O. S.
rara O. S.
simulans (Walk.)
Geranomyia canadensis (Westw.)
rostrata (Say)
Limnobia cinctipes Say
immatura O. S.
indigena O. S.
triocllata O. S.
tristigma O. S.
Rhipidia bryanti Johns.
domestica O. S.
fidelis O. S.
maculata Meig.
shannoni Alex.

- Antocha saxicola* O. S.
Atarba picticornis O. S.
Elephantomyia westwoodi O. S.
Dicranoptycha sobrina O. S.
 winnemana Alex.
Rhamphidia flavipes Macq.
 mainensis Alex.
Teucholabis compleza O. S.
 lucida Alex.
Toxorhina muliebris (O. S.)
Cladura flavoferruginea O. S. •
Erioptera armata O. S.
 armillaris O. S.
 caloptera Say
 chlorophylla O. S.
 chrysonoma O. S.
 graphica O. S.
 needhami Alex.
 noctivagans Alex.
 parva O. S.
 septentrionis O. S.
 venusta O. S.
 vespertina O. S.
Gnophomyia luctuosa O. S.
 tristissima O. S.
Gonomyia blanda O. S.
 cognatella O. S.
 manca (O. S.)
 subcinerea O. S.
 sulphurella O. S.
Helobia hybrida (Meig.)
Molophilus hirtipennis (O. S.)
 nova-caesariensis Alex.
 pubipennis (O. S.)
 ursinus (O. S.)
Ormosia holotricha (O. S.)
 innocens (O. S.)
 nigripila (O. S.)
 nubila (O. S.)
Trimicra anomala O. S.
Adelphomyia americana Alex.
Epiphragma fascipennis (Say)
 solatrix (O. S.)
Limnophila adusta O. S.
 aprilina O. S.
 arcolata O. S.
- Limnophila brevifurca* O. S.
 contempta O. S.
 cnemelina Alex.
 fuscovaria O. S.
 lenta O. S.
 luteipennis O. S.
 macrocera (Say)
 montana O. S.
 mundoides Alex.
 nigripleura A. & L.
 quadrata O. S.
 recondita O. S.
 rufibasis O. S.
 tenuipes (Say)
 terebrens Alex.
 toxoneura O. S.
 ultima O. S.
Ula paupera O. S.
Eriocera cinerea Alex.
 fuliginosa O. S.
 longicornis (Walk.)
 tristis Alex.
 wilsonii O. S.
Hexatoma megacera (O. S.)
Penthoptera albitarsis O. S.
Dicranota eucera O. S.
 noveboracensis Alex.
 rivularis O. S.
Pedicia albivitta Walk.
Rhaphidolabis tenuipes O. S.
Tricyphona inconstans (O. S.)
 vernalis (O. S.)
Liogma nodicornis (O. S.)
Brachypremna dispellens (Walk.)
Oropeza albipes Johns.
 dorsalis Johns.
 obscura Johns.
 sayi Johns.
 subalbipes Johns.
Tanyptera frontalis (O. S.)
Longurio testaceus Loew
Nephotoma euccra (Loew)
 ferruginea (Fabr.)
 incurva (Loew)
 macrocera (Say)
 occipitalis (Loew)
 polymera (Loew)
 tenuis (Loew)

Nephrotoma virescens (Loew)
xanthostigma (Loew)

Tipula abdominalis (Say)
annulicornis Say
australis Doane
bella Loew
bicornis Forbes
caloptera Loew
collaris Say
cunctans Say
dejecta Walk.
dietziana Alex.
eluta Loew
fragilis Loew
fraterna Loew
fuliginosa (Say)

Tipula hebes Loew
hermannia Alex.
ignobilis Loew
iroquois Alex.
johnsoniana Alex.
longiventris Loew
mingwe Alex.
morrisoni Alex.
perlongipes Johns.
sayi Alex.
submaculata Loew
tricolor Fabr.
triton Alex.
trivittata Say
tuscarora Alex.
ultima Alex.
umbrosa Loew

The crane-flies of New York

The fact that New York has a known crane-fly fauna which is larger and better-developed than that of any other State in the Union, is due, in large part, to the diversity of natural conditions, which range from high mountains to sea level and include lakes, rivers, swamps, bogs, woodlands, gorges, ravines, and most other haunts that attract these insects. Another reason for this exceptional list is the fact that the State has long been a favorite collecting ground for many students of crane-flies, and a large number of species were first characterized from material taken in New York. These include species described by Osten Sacken, Loew, Doane, Johnson, Needham, Dietz, and Alexander. The pioneer collector, Baron Osten Sacken, did much of his collecting in this State, especially in the Adirondacks at Trenton Falls, in the Schoharie Valley at Sharon Springs, in the vicinity of New York City, and later in the Catskills. His work furnished the basis for Needham's preliminary list (Needham, 1908:203-211), which includes one hundred and four species known from New York at that time. Subsequent collecting in various parts of the State has considerably increased the number of species, so that comparatively few additions may be expected. The more probable of these have been indicated in the following list under the heading *Regional species*.

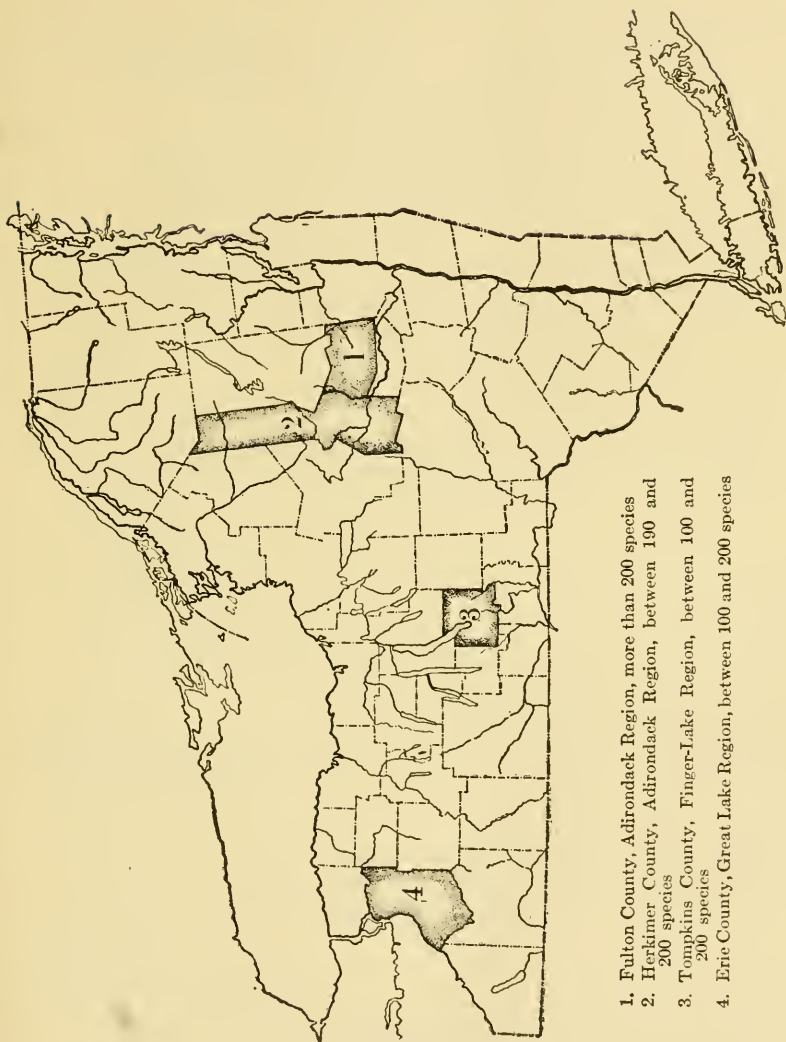
In this list the type localities are designated by the initials *T. L.* The published records of Needham (1908:203-211) and of Alexander (1910 and 1912) have been largely included, altho some of the records for

common and widely distributed species have been omitted. Similarly, many records for Erie, Fulton, and Tompkins Counties have been abbreviated or omitted, since their inclusion would but lengthen the paper and add little to the data; such records are indicated by "etc."

Fulton County, with a known crane-fly fauna of more than two hundred species, probably has the largest local list as known for any region of similar size in the world. The other counties that are well known are Tompkins, Cortland, Herkimer (Osten Sacken, Needham, and Alexander), Albany (Young), and Erie (Van Duzee). Considerable data from Hamilton County (Young), Genesee County (Knight), and Chenango County, are likewise available. The region around New York City is not completely known, the most valuable collections from that section being those made by Frost in Westchester County and by Banks in Nassau County.

The following abbreviations to express collectors are used in this list:

| | | | |
|----------|--------------------|-------------|----------------------|
| A. C. C. | A. C. Coutant | J. G. N. | J. G. Needham |
| A. D. M. | A. D. MacGillivray | J. L. Z. | J. L. Zabriskie |
| A. H. M. | Miss A. H. Morgan | J. S. | J. Silver |
| A. L. M. | Axel L. Melander | J. T. L. | J. T. Lloyd |
| A. M. | A. MacDonald | L. W. C. | Mrs. W. A. Clemens |
| A. M. N. | A. M. Nadler | M. C. VD. | M. C. Van Duzee |
| A. O. | Axel Olsson | M. D. L. | M. D. Leonard |
| A. P. M. | A. P. Morse | M. M. A. | Mrs. C. P. Alexander |
| C. H. K. | C. H. Kennedy | N. B. | Nathan Banks |
| C. I. | Carl Ilg | O. A. J. | O. A. Johannsen |
| C. O. H. | C. O. Houghton | O. S. | Osten Sacken |
| C. P. A. | C. P. Alexander | P. W. C. | P. W. Claassen |
| C. R. C. | C. R. Crosby | R. C. S. | R. C. Shannon |
| C. R. P. | C. R. Plunkett | R. F. P. | R. F. Pearsall |
| D. B. Y. | D. B. Young | R. H. P. | R. H. Pettit |
| E. M. | Miss E. Moore | R. H. T. | Mrs. J. D. Tothill |
| E. T. W. | Mrs. W. C. Woods | S. A. G. | S. A. Graham |
| F. K. | Fritz Kahn | S. C. B. | S. C. Bishop |
| F. N. H. | F. N. Harvey | S. W. F. | S. W. Frost |
| H. E. S. | H. E. Schradieck | W. A. C. | W. A. Clemens |
| H. H. K. | H. H. Knight | W. A. H. | W. A. Hoffman |
| H. H. S. | H. H. Smith | W. A. R. | W. A. Riley |
| H. Y. | Hachiro Yuasa | W. D. F. | W. D. Funkhouser |
| J. A. L. | J. A. Lintner | W. P. A. | W. P. Alexander |
| J. C. B. | J. Chester Bradley | W. S. | W. Sheffield |
| J. C. F. | J. C. Faure | W. T. M. F. | W. T. M. Forbes |



- 1. Fulton County, Adirondack Region, more than 200 species
- 2. Herkimer County, Adirondack Region, between 100 and 200 species
- 3. Tompkins County, Finger-Lake Region, between 100 and 200 species
- 4. Erie County, Great Lake Region, between 100 and 200 species

FIG. 121. COUNTIES IN NEW YORK STATE IN WHICH CONSIDERABLE COLLECTIONS OF CRANE-FLIES HAVE BEEN MADE

Family Tanyderidae

Genus *Protoplasa* Osten Sacken*Protoplasa fitchii* O. S.

Fulton County: Sport Island, Sacandaga River, altitude 750 feet, June 6-19
(C. P. A.).

(Fitch's type locality is New York State.)

Family Ptychopteridae

Subfamily Ptychopterinae

Genus *Ptychoptera* Meigen*Ptychoptera rufocincta* O. S.

Chautauqua County: Dunkirk, July 5.

Dutchess County: Poughkeepsie, May 24 (D. B. Y.).

Erie County: Hamburg, June 6 to July 10 (M. C. VD.); Colden, June 7 (M. C. VD.); East Aurora, June 11 to August 21 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 11 to August 24 (C. P. A.).

Genesee County: Batavia, June 19 (H. H. K.).

Nassau County: Sea Cliff (N. B.).

Onondaga County: Manlius, August 29 (H. H. S.).

Suffolk County: Yaphank, May 20.

Tompkins County: Ithaca, May 31 to July 5 (C. P. A.).

Westchester County: Dobbs Ferry (O. S.), T. L.

Wyoming County: Portage Falls, July 27 (H. H. K.).

Subfamily Bittacomorphinae

Genus *Bittacomorpha* Westwood*Bittacomorpha clavipes* (Fabr.)

Cattaraugus County: Little Valley, August 7 (M. C. VD.).

Cayuga County: North Fair Haven, May 17 (E. M. and J. G. N.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Dutchess County: Poughkeepsie, July 18 (S. W. F.).

Erie County: Colden, May 23-30 (M. C. VD.); Hamburg, June 6 (M. C. VD.); etc.

Fulton County: Sacandaga Park, etc., June 13 to September 13 (C. P. A.).

Herkimer County: Indian Castle, June 9 (C. P. A.); Old Forge, August 21
(J. G. N.).

Nassau County: Sea Cliff (N. B.).

Oneida County: McMullen's Brook, May 20 (W. A. C.).

Onondaga County: Manlius, September 23 (H. H. S.).

Suffolk County: Yaphank, May 29-30; Bellport, August 9.

Tompkins County: Ithaca, May 20 to September 28 (C. P. A.); etc.

Warren County: Paradise Bay, Lake George, August 24.

Genus *Bittacomorphella* Alexander*Bittacomorphella joncsi* (Johns.)

Albany County: Karner, June 19 (D. B. Y.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.).

Fulton County: Sacandaga Park, June 11-28 (C. P. A.); Mountain Lake, June
13-24 (C. P. A.); etc.

Tompkins County: Ithaca, Bool's, July 13-19 (C. P. A.).

Family Rhyphidae

Subfamily Trichocerinae

Genus *Trichocera* MeigenSubgenus *Trichocera* Meigen*Trichocera bimaculata* Walk.

Erie County: Gowanda, October 4 (M. C. VD.); East Aurora, October 20 (M. C. VD.).

Fulton County: Gloversville, September 15 (C. P. A.); etc.

Tompkins County: Ithaca, May 20, October 15 (C. P. A.); etc.

T. brumalis Fitch

Fulton County: Gloversville, September 25 to October 15 (C. P. A.); etc.

Tompkins County: Ithaca, September 30 to October 30 (C. P. A.); etc.

Subgenus *Diazosma* Bergroth*Trichocera subsinuata* Alex.

Fulton County: Woodworth's Lake, altitude 1650 feet, June 15 (C. P. A.), T. L.

Subfamily Rhyphinae

Genus *Rhyphus* Latreille*Rhyphus alternatus* Say

Albany County: Albany.

Erie County: East Aurora, May.

Franklin County: Axton, June.

Tompkins County: Ithaca, May to June (O. A. J.).

R. fenestralis (Scop.)

Erie County: Hamburg, April.

Oneida County: New Hartford, April.

Tompkins County: Ithaca, April to May (O. A. J.).

R. punctatus (Fabr.)

Erie County.

Fulton County: Johnstown.

Tompkins County: Ithaca, May to October (O. A. J.).

Subfamily Mycetobiinae

Genus *Mycetobia* Meigen*Mycetobia divergens* Walk.

Albany County: Albany.

Tompkins County: Ithaca, May (O. A. J.).

Family Tipulidae

Subfamily Limnobiinae

Tribe Limnobiini

Genus *Dicranomyia* Stephens*Dicranomyia badia* (Walk.)

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Holland, May 21 (M. C. VD.); Boston, July 10 (M. C. VD.); East Aurora, September 20 (M. C. VD.); etc.

Fulton County: Gloversville, June 3 (C. P. A.); Sacandaga Park, June 5 (C. P. A.); etc.

Genus *Dicranomyia* Stephens (*continued*)*Dicranomyia badia* (Walk) (*continued*)

Hamilton County: Augur Flats, July 17 (D. B. Y.); Wells, July 29 (D. B. Y.).

Herkimer County: Trenton Falls (O. S.).

Nassau County: Sea Cliff, April (N. B.).

Niagara County: Niagara Falls, October 9 (M. C. VD.).

Schoharie County: Sharon Springs (O. S.).

Tompkins County: Ithaca, May 4 to November 10 (C. P. A.); etc.

D. brevivena O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Lancaster, June 22 (M. C. VD.); Buffalo, September 30 (M. C. VD.).

Fulton County: Sulphur Spring Junction, September (C. P. A.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

New York: (O. S.), T. L.

Niagara County: Niagara Falls, October 9 (M. C. VD.).

D. gladiator O. S.

Fulton County: Woodworth's Lake, August 22 (C. P. A.).

D. globithorax O. S.

Erie County: Boston, September 3 (M. C. VD.).

Fulton County: Woodworth's Lake, August 4-22 (C. P. A.); etc.

Tompkins County: Ellis Hollow, May 14 (C. P. A.); Ithaca, September 28 (J. G. N.).

D. haeretica O. S.

Erie County: Buffalo, October 14 (M. C. VD.).

New York: On salt marshes near New York (O. S.), T. L.

Suffolk County: Cold Spring Harbor, July 15 (A. L. M.); Bellport, August 19 (C. P. A.).

D. halterata O. S.

Fulton County: Johnstown, September 15 (C. P. A.); Mud Lake, September 18 (C. P. A.).

D. immodesta O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Buffalo, October 3-15 (M. C. VD.).

Fulton County: Gloversville, June 9 (C. P. A.); Johnstown, September 15 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 9-13 (C. P. A.); Old Forge, August (J. G. N.).

Tompkins County: Ithaca, June 20 (C. P. A.); McLean, September 28 (C. P. A.); etc.

D. liberta O. S.

Albany County: Karner, May 22 (D. B. Y.); Albany, June 2-19 (D. B. Y.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Holland, May 21 (M. C. VD.); Hamburg, May 28 to September 11 (M. C. VD.); Lancaster, June 4 to August 14 (M. C. VD.); Buffalo, June 12 to August 25 (M. C. VD.); etc.

Fulton County: Gloversville, June 10 to September 20 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.).

Nassau County: Sea Cliff (N. B.).

New York: (O. S.), T. L.

Onondaga County: Green Lake, June 8 (C. P. A.).

Suffolk County: Bellport, July 1.

Tompkins County: Ithaca, May 22 to June 20 (C. P. A.); etc.

Westchester County: Tarrytown, June 25 (S. W. F.).

Genus *Dicranomyia* Stephens (continued)*D. longipennis* (Schum.)

Erie County: Hamburg, September 11 (M. C. VD.).

Fulton County: Hillside Park, August 4 (C. P. A.); Sacandaga Park, August 24 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.).

Nassau County: Sea Cliff (N. B.).

Rockland County: West Nyack, June 15 (W. S.).

Tompkins County: Ithaca, June 20 to August 1 (C. P. A.); McLean, September 28 (C. R. C.).

D. macatcei Alex.

Fulton County: Sylvan Lake, June 15 (C. P. A.); Mountain Lake, July 7 (C. P. A.).

D. moniliformis Doane

Suffolk County: Long Island, T. L.

D. monticola (Alex.)

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Gloversville, June 24 (C. P. A.).

Hamilton County: Wells, July 23-30 (D. B. Y.).

Tompkins County: Ithaca, reared June 3 (C. P. A.).

D. morioides O. S.

Erie County: Hamburg, May 3 (M. C. VD.).

Fulton County: Mayfield Mountain, June 21 (C. P. A.); Northampton, June 25 (D. B. Y.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.); Trenton Falls, July (O. S.), T. L.

Tompkins County: McLean, May 13 (C. P. A.); Ithaca, May 18 to August 26 (C. P. A.).

D. pubipennis O. S.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Holland, May 21 (M. C. VD.); Buffalo, June 9 (M. C. VD.); Boston, September 3 (M. C. VD.); etc.

Fulton County: Mountain Lake, June 17 to July 7 (C. P. A.); Gloversville, September 16 (C. P. A.); etc.

Hamilton County: Wells, July 7-25 (D. B. Y.).

Nassau County: Sea Cliff, June (N. B.).

Tompkins County: Ithaca, August 1 (C. P. A.); etc.

Westchester County: Tarrytown, June 9-16 (S. W. F.).

D. pudica O. S.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: North Evans, May 14 (M. C. VD.); East Aurora, May 18 (M. C. VD.); Lancaster, May 31 (M. C. VD.); Boston, July 10 (M. C. VD.); etc.

Fulton County: Sylvan Lake, June 15 (C. P. A.).

Schenectady County: Schenectady, June 14 (C. P. A.).

Tompkins County: Ithaca, June.

D. rara O. S.

Genesee County: Batavia, September 28 (H. H. K.).

New York: (O. S.), T. L.

Westchester County: Tarrytown, June 9 (S. W. F.).

D. rostrifera O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Genus *Dicranomyia* Stephens (continued)*D. rostrifera* O. S. (continued)

Fulton County: Sacandaga Park, June 27 to August 28 (C. P. A.); Sammons ville, September 22 (C. P. A.); etc.

New York: (O. S.), T. L.

D. simulans (Walk.)

Albany County: Helderbergs, July 3 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Lancaster, June 23 (M. C. VD.); South Wales, June 23 to July 9 (M. C. VD.); etc.

Fulton County: Dolgeville, May 16 (C. P. A.).

Herkimer County: Trenton Falls (O. S.); Old Forge, July 16 (J. G. N.).

Nassau County: Sea Cliff, July (N. B.).

Oneida County: Tannery Brook, July 12 (W. A. C.).

Tompkins County: Ithaca, May 30 to November 14 (C. P. A.); etc.

Westchester County: Tarrytown, August 1 (S. W. F.).

D. stulta O. S.

Fulton County: Mountain Lake, June 14 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.

Tompkins County: Ithaca, reared from larvae, June 1 (C. P. A.); abundant along Cascadilla Creek, June 13-18 (C. P. A.).

Genus *Geranomyia* Haliday*Geranomyia canadensis* (Westw.)

Erie County: Lancaster, June 8 to August 15 (M. C. VD.); East Aurora, August 24 (M. C. VD.); Hamburg, September 11 (M. C. VD.); etc.

Fulton County: Canada Lake, June 23 (C. P. A.).

Herkimer County: Indian Castle, June 13 (C. P. A.); Old Forge, August (J. G. N.).

Onondaga County: Manlius, August 20 (H. H. S.).

Tompkins County: Ithaca, May 7 to October 13 (C. P. A.).

G. diversa O. S.

Erie County: Springville, August 12 (M. C. VD.).

Herkimer County: Trenton Falls (O. S.), T. L.

Tompkins County: Ithaca, May 12 to August 26 (C. P. A.).

G. rostrata (Say)

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Holland, May 21 (M. C. VD.); Colden, May 30 to August 9 (M. C. VD.); Gowanda, August 22 (M. C. VD.); etc.

Fulton County: Mount Buell, June 15 (C. P. A.); Sacandaga Park, August 24 (C. P. A.).

New York: (O. S.).

Tompkins County: Ithaca, August 27 (A. C. C.).

Genus *Rhipidia* MeigenSubgenus *Rhipidia* Meigen*Rhipidia bryanti* Johns.

Erie County: East Aurora, June 15 (M. C. VD.).

R. maculata Meig.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Essex County: Wilmington, August 24 (J. C. B.).

Fulton County: Woodworth's Lake, September 2 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.); Old Forge, July 6-20 (J. G. N.).

Tompkins County: McLean, June 5 (C. P. A.).

Genus *Rhipidia* Meigen (*continued*)Subgenus *Monorhipidia* Alexander*Rhipidia fidelis* O. S.

- Albany County: Albany, July 1 (D. B. Y.).
 Cortland County: Cincinnatus, July 21 (C. P. A.).
 Erie County: Gowanda, June 15 (M. C. VD.).
 Fulton County: Sacandaga Park, June 15-27 (C. P. A.); etc.
 Schoharie County: Sharon Springs (O. S.), T. L.
 Tompkins County: Ithaca, May 15 (C. I.); McLean, June 5 (C. P. A.).

Genus *Limnobia* Meigen*Limnobia cinctipes* Say

- Cattaraugus County: Little Valley, June 30 (M. C. VD.).
 Chenango County: Lower Cincinnatus, July 21 (C. P. A.).
 Erie County: East Aurora, May 7 (M. C. VD.).
 Essex County: New Russia, August (J. C. B.); Keene Valley, August 14 (J. A. L.).
 Fulton County: Dolgeville, May 16 (A. O.); Mount Buell, June 13 (C. P. A.); etc.
 Hamilton County: Saranac Inn, June 17 (J. G. N.); Augur Flats, July 17 (D. B. Y.).
 Herkimer County: Old Forge, July 29 (J. G. N.).
 Onondaga County: Green Lake, June 8 (C. P. A.).
 Tompkins County: Ithaca, May 4 (C. P. A.).
 Warren County: Lake George, August 29 (J. L. Z.).

L. fallax Johns.

- Genesee County: Batavia, May 22 (H. H. K.).
 Tompkins County: Ithaca, reared July 21 (O. A. J.).

L. immatura O. S.

- Albany County: Albany, June 4 (D. B. Y.).
 Erie County: South Wales, July 9 (M. C. VD.).
 Fulton County: Sacandaga Park, June 18 (C. P. A.).
 Herkimer County: Old Forge, June 17 (J. G. N.).
 Tompkins County: McLean, July 27 (H. H. K.).

L. indigena O. S.

- Cattaraugus County: Rock City, June 6 (J. C. B.); Little Valley, June 30 (M. C. VD.).
 Erie County: Gowanda, June 27 (M. C. VD.); North Evans, July 4 to October 22 (M. C. VD.); etc.
 Fulton County: Sacandaga Park, June 13 (C. P. A.); Mayfield Mountain, September 20 (C. P. A.); etc.
 Hamilton County: Mount Buell, June 13 (C. P. A.).
 Herkimer County: Old Forge, June 17 to August (J. G. N.).
 New York: (O. S.), T. L.
 Niagara County: Niagara Falls, June 9 (M. C. VD.).
 Onondaga County: Manlius, September 1 (H. H. S.).
 Saratoga County: Corinth, June 22 (D. B. Y.).
 Tompkins County: Ithaca, May 24-29 (C. P. A.); etc.
 Westchester County: Tarrytown, June 9 (S. W. F.).
- L. parietina* O. S.
- Erie County: Boston, September 3 (M. C. VD.).
 Fulton County: Woodworth's Lake, August 20 (C. P. A.).
 Hamilton County: Silver Lake, September 2 (C. P. A.); Big Notch Mountain, Hope Township, September 12 (C. P. A.).
 Herkimer County: Old Forge, August 15 (J. G. N.); Trenton Falls, September (O. S.), T. L.
 Tompkins County: Needham's Glen, Ithaca, September 17 (J. G. N.).

Genus *Limnobia* Meigen (*continued*)*L. solitaria* O. S.

Erie County: (M. C. Van Duzee records *L. hudsonica* from Spring Brook, June 26, 1911. In the absence of specimens this record should be questioned, inasmuch as this is a variable species and close to *solitaria*.)

Essex County: Keene Valley, July 17 (J. A. L.).

Fulton County: Gloversville, June 9 (C. P. A.); Pinnacle Mountain, August 5 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 9 (C. P. A.).

Tompkins County: Ithaca, May 6 to June 20 (C. P. A.).

Ulster County: Catskills, July (O. S.).

L. triocellata O. S.

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Gowanda, June 13-14 (M. C. VD.); Hamburg, August 10 (M. C. VD.); etc.

Fulton County: Woodworth's Lake, August 22 (C. P. A.); etc.

Hamilton County: Elm Lake, August 7 (D. B. Y.).

Herkimer County: Trenton Falls (O. S.), T. L.

Onondaga County: Manlius, September 1 (H. H. S.).

Putnam County: Highlands, October 3 (J. S.).

Rockland County: West Nyack, June 15 (W. S.).

Tompkins County: Ithaca, August 25 (W. D. F.).

L. tristigma O. S.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Essex County: Elizabethtown, August 12 (D. B. Y.).

Fulton County: Gloversville, July 3 (C. P. A.); Woodworth's Lake, August 24 (C. P. A.); etc.

Hamilton County: Dug Mountain, August 8 (D. B. Y.).

Herkimer County: Old Forge, August 15 (J. G. N.).

Niagara County: Niagara Falls, July 20 (M. C. VD.).

Rensselaer County: Brookview, July 13 (M. M. A.).

Warren County: County-Line Flow, Griffin, July 26 (C. P. A.).

Genus *Discobola* Osten Sacken*Discobola argus* (Say)

Albany County: Karner, October 17 (D. B. Y.).

Cattaraugus County: Little Valley, July 31 (M. C. VD.).

Chenango County: Near Lower Cincinnatus, July 21 (C. P. A.).

Erie County: East Aurora, June 11-22 (M. C. VD.); Gowanda, October 4 (M. C. VD.); Hamburg, October 16 (M. C. VD.); etc.

Essex County: New Russia, August (J. C. B.); Mount Whiteface, altitude 4800 feet, August 24 (C. R. C. and W. T. M. F.).

Fulton County: Green Lake, June 25 (C. P. A.); Gloversville, September 20 (C. P. A.); etc.

Genesee County: Batavia, June 18 (H. H. K.).

Hamilton County: Saranac Inn, July 30 (J. G. N.); Wells, August 3 (D. B. Y.).

Herkimer County: Trenton Falls (O. S.); Old Forge, August 23 (J. G. N.).

Monroe County: Rochester, October 10 (M. C. VD.).

Nassau County: Sea Cliff, May (N. B.).

Tompkins County: Ithaca, August 7 to October 3 (C. I.); etc.

Yates County: Keuka Park, October 29 (C. R. C.).

Regional species: *Dicranomyia brunnea* Doane, *D. diversa* O. S., *D. isabellina* Doane, *Geranomyia distincta* Doane, *Limnobia sociabilis* O. S., *Rhipidia domestica* O. S., *R. shannoni* Alex.

Tribe Antochini

Genus *Rhamphidia* Meigen

Rhamphidia flavipes Macq.

Albany County: Albany, July 19 (D. B. Y.).

Erie County: Buffalo, May 28 (M. C. VD.).

Fulton County: Sacandaga Park, June 2 to August 24 (C. P. A.); etc.

New York: (O. S.).

Queens County: Flushing, June 22 (C. R. P.).

Tompkins County: Ithaca, May 29 to August 7 (C. P. A.); etc.

R. mainensis Alex.

Tompkins County: Larch Meadows, Ithaca, reared May 14 (C. P. A.).

Genus *Elephantomyia* Osten Sacken

Elephantomyia westwoodi O. S.

Cortland County: Lower Cincinnatus, July 21 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.); Hamburg, July 10 (M. C. VD.);

Springville, July 12 (M. C. VD.).

Fulton County: Mountain Lake, June 24 to August 13 (C. P. A.); etc.

Hamilton County: Wells, July 30 (D. B. Y.).

Herkimer County: Trenton Falls (O. S.), T. L.; Old Forge, August 3 (J. G. N.).

Ulster County: Catskills, July, 1874 (O. S.).

Genus *Toxorhina* Loew

Toxorhina muliebris (O. S.)

Erie County: Hamburg, July 10 (M. C. VD.).

Fulton County: Sacandaga Park, June 21-28 (C. P. A.).

Suffolk County: Yaphank, June 28 (A. M. N.).

Tompkins County: Ithaca (R. H. T.); McLean, July 3 (A. D. M.).

Genus *Dicranoptycha* Osten Sacken

Dicranoptycha germana O. S.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.).

Fulton County: Sacandaga Park, June 21-28 (C. P. A.).

Hamilton County: Augur Flats, July 17 (D. B. Y.); Wells, July 30 (D. B. Y.).

Herkimer County: Trenton Falls, July (O. S.), T. L.; Old Forge, July 6-24 (J. G. N.).

Onondaga County: Manlius, July 25 (H. H. S.).

Tompkins County: Ithaca, July 13 (C. P. A.).

Warren County: County-Line Flow, Griffin, July 26 (C. P. A.).

D. sobrina O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Fulton County: Mayfield Mountain, September 20 (C. P. A.).

Tompkins County: Ithaca, August 30 (J. G. N.).

Genus *Antocha* Osten Sacken

Antocha saxicola O. S.

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Lancaster, June 2 (M. C. VD.); Buffalo, June 15 (M. C. VD.).

Fulton County: Sacandaga Park, June 11 to July 3 (C. P. A.); etc.

Genus *Antocha* Osten Sacken (continued)*Antocha saxicola* O. S. (continued)

- Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 9 (C. P. A.);
Newport, June 9 to July 27 (D. B. Y.); Old Forge, July 16
(J. G. N.).
- Monroe County: Honeoye Falls, May 15 (M. D. L.); September 1 (C. R. C.).
- Oneida County: Tannery Brook, July 12 (W. A. C.).
- Onondaga County: Manlius, August 20 (H. H. S.).
- Rensselaer County: Brookview, July 16 (M. M. A.).
- Tioga County: Willseyville, May 25 (W. A. H.).
- Tompkins County: Ithaca, May 13 to September 25 (C. P. A.); McLean, June 5
(C. P. A.).
- Westchester County: Tarrytown, June 9 (S. W. F.).
- Wyoming County: Portage, May 24 (H. H. K.).

Genus *Atarba* Osten Sacken*Atarba picticornis* O. S.

- Cortland County: Taylor, July 20 (C. P. A.).
- Erie County: South Wales, July 9-13 (M. C. VD.).
- Fulton County: Sacandaga Park, June 28 (C. P. A.).
- Herkimer County: Trenton Falls, July (O. S.).
- Suffolk County: Bellport, July 5.

Genus *Teucholabis* Osten Sacken*Teucholabis complexa* O. S.

- Herkimer County: Trenton Falls, June (O. S.), T. L.

Regional species: *Dicranoptycha nigripes* O. S., *D. winnemana* Alex., *Teucholabis lucida*
Alex., *Toxorhina magna* (O. S.).

Tribe Eriopterini

Genus *Ormosia* Rondani*Ormosia apicalis* Alex.

- Fulton County: Mountain Lake, June 17 (C. P. A.).
- Tompkins County: Ithaca, August 8 (J. G. N.).

O. arcuata (Doane)

- Erie County: Hamburg, May 7 (M. C. VD.).
- Tompkins County: Ithaca, T. L.

O. bilineata Dietz

- Erie County: Holland, May 21-25 (M. C. VD.), T. L.

O. deviata Dietz

- Cayuga County: North Fair Haven, September 12 (C. P. A.).
- Erie County: Hamburg, May 26 (M. C. VD.), T. L.
- Fulton County: Mountain Lake, June 1-18 (C. P. A.).
- Herkimer County: Indian Castle, June 9 (C. P. A.).
- Onondaga County: Green Lake, June 8 (C. P. A.).
- Tompkins County: McLean, June 5 (C. P. A.).
- Westchester County: Tarrytown, June 9 (S. W. F.).

O. holotricha (O. S.).

- Fulton County: Johnstown, May 14 (C. P. A.).
- Tompkins County: Ithaca, April 27 to May 22 (C. P. A.); Taughannock, May 4
(C. P. A.).

O. innocens (O. S.).

- Albany County: Albany, May 8 (D. B. Y.).
- Erie County: Hamburg, May 28 (M. C. VD.).

Genus *Ormosia* Rondani (*continued*)*O. innocens* (O. S.) (*continued*)

Nassau County: Sea Cliff (N. B.).

Tompkins County: Ithaca, April 24 to May 25 (C. P. A.); McLean, May 13 (C. P. A.).

O. megacera Alex.

Fulton County: Gloversville, June 22 (C. P. A.), T. L.

O. meigenii (O. S.)

Erie County: Colden, May 29 (M. C. VD.).

Fulton County: Johnstown, May 14 (C. P. A.); Gloversville, June 3 (C. P. A.); etc.

Tompkins County: Ithaca, April 26 to May 12 (C. P. A.); McLean, May 13 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

O. mesocera Alex.

Essex County: Uphill Creek and Opalescent River, foot of Mount Marcy, July 10 (C. R. C.).

Fulton County: Gloversville, June 22 (C. P. A.), T. L.

O. monticola (O. S.)

Erie County: Colden, August 7 (M. C. VD.).

Fulton County: Pinnacle Mountain, August 5 (C. P. A.); Sacandaga Park, August 24 (C. P. A.).

Hamilton County: Speculator, August 5 (D. B. Y.).

Herkimer County: Old Forge, August (J. G. N.).

Tompkins County: Ithaca, August 26 (C. P. A.).

O. nigripila (O. S.)

Fulton County: Mountain Lake, June 13 (C. P. A.); Pinnacle, August 5 (C. P. A.).

Nassau County: Sea Cliff, May (N. B.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: McLean, May 22 (H. E. S.); Ithaca, May 31 (R. H. T.).

Westchester County: Tarrytown, June 9 (S. W. F.).

O. nimbipennis Alex.

Fulton County: Woodworth's Lake, August 13 (C. P. A.), T. L.

Hamilton County: Wells, July 29 (D. B. Y.).

O. nubila (O. S.)

Albany County: Albany, May 8 (D. B. Y.).

Erie County: Colden, August 7 (M. C. VD.); Boston, September 3 (M. C. VD.);

Lancaster, September 24 to October 18 (M. C. VD.); etc.

Fulton County: Johnstown, May 14 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.), T. L.

Nassau County: Sea Cliff, May (N. B.).

Tompkins County: Ithaca, April 24 to May 16 (C. P. A.); McLean, May 13 (C. P. A.).

O. parallela (Doane)

Tompkins County: Ithaca, T. L.

O. perplexa Dietz

Erie County: Waverly, May (M. C. VD.), T. L.

O. pygmaea (Alex.)

Erie County: Hamburg, May 28 (M. C. VD.).

Fulton County: Woodworth's Lake, August 22 (C. P. A.), T. L.

Tompkins County: Ithaca, May 28 (W. S.).

O. rubella (O. S.)

Erie County: Colden, August 7 (M. C. VD.); Lancaster, September 24 to October 18 (M. C. VD.); etc.

Genus *Ormosia* Rondani (*continued*)*O. rubella* (O. S.) (*continued*)

Fulton County: Mayfield Mountain, September 20 (C. P. A.); etc.

Niagara County: Niagara Falls, September 8 to October 17 (M. C. VD.).

Orange County: West Point (O. S.), T. L.

Genus *Erioptera* MeigenSubgenus *Erioptera* Meigen*Erioptera chlorophylla* O. S.

Albany County: Albany, June 28 (D. B. Y.).

Erie County: Gowanda, June 15 (M. C. VD.); South Wales, July 13 (M. C. VD.); Hamburg, July 27 (M. C. VD.); etc.

Franklin County: Saranac Inn, July 4 (J. G. N.).

Fulton County: Sacandaga Park, June 15 to August 24 (C. P. A.); etc.

Herkimer County: Old Forge, July 29 (J. G. N.).

Queens County: Flushing, June 22 (C. R. P.); Little Ferry, August 15 (C. R. P.).

Tompkins County: Ithaca, July 10-13 (C. P. A.).

E. chrysocoma O. S.

Fulton County: Mountain Lake, June 15 to July 7 (C. P. A.); Sacandaga Park, June 18 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

E. megophthalma Alex.

Fulton County: Sacandaga Park, June 18 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9-13 (C. P. A.).

Tompkins County: Ithaca, May 28 to June 13 (C. P. A.), T. L.

Westchester County: Tarrytown, June 9 (S. W. F.).

E. septentrionis O. S.

Erie County: Gowanda, June 7 (M. C. VD.); East Aurora, June 11 (M. C. VD.).

Essex County: Uphill Creek and Opalescent River, foot of Mount Marcy, July 10 (C. R. C.).

Fulton County: Mount Buell, June 5-18 (C. P. A.); Mountain Lake, August 13 (C. P. A.); etc.

Herkimer County: Old Forge, July 17-21 and in August (J. G. N.).

Madison County: Canastota (J. C. F.).

Oneida County: Lee Center, July 24 (W. A. C.).

Schoharie County: Sharon Springs (O. S.), T. L.

Tompkins County: Ithaca, April 26 to July 13 (C. P. A.); McLean, May 13 to June 5 (C. P. A.).

E. straminea O. S.

Erie County: Gowanda, June 14-27 (M. C. VD.); Grand Island, June 26 (M. C. VD.).

Fulton County: Sacandaga Park, June 18 (C. P. A.).

E. vespertina O. S.

Cattaraugus County: Chipmunk Swamp, Vandalia, June 9 (C. R. C.).

Erie County: Hamburg, June 20 (M. C. VD.).

Fulton County: Sacandaga Park, June 5-28 (C. P. A.); etc.

Tompkins County: Ithaca, May 15 to July 13 (C. P. A.); etc.

E. villosa O. S.

Erie County: Holland, May 21 (M. C. VD.); North Evans, May 29 (M. C. VD.); Buffalo, June 23 to July 9 (M. C. VD.); Spring Brook, June 25 (M. C. VD.); Gowanda, June 27 (M. C. VD.).

Genus *Erioptera* Meigen (*continued*)Subgenus *Acyphona* Osten Sacken*Erioptera armillaris* O. S.

Chenango County: Near Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Lower Cincinnatus, July 21 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.); Elma, August 24 (M. C. VD.).

Fulton County: Sacandaga Park, June 11-18 (C. P. A.); Mountain Lake, June 17 to July 7 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.

Tompkins County: McLean, June 5 (C. P. A.); Ithaca, August 30 (C. P. A.).

E. graphica O. S.

Tompkins County: Ithaca, July 13 (H. Y.), August 2-7 (C. P. A.).

E. venusta O. S.

Albany County: Helderbergs, June 12 (C. P. A.); Albany, June 26 to September 20 (D. B. Y.).

Erie County: Gowanda, June 7-27 (M. C. VD.); Hamburg, June 18-20 (M. C. VD.); Colden, August 16 (M. C. VD.); etc.

Fulton County: Gloversville, June 3 to September 20 (C. P. A.); etc.

Genesee County: Batavia, July 25 (H. H. K.).

Herkimer County: Indian Castle, June 9 (C. P. A.); Newport, June 18 (D. B. Y.); Old Forge, August (J. G. N.).

Monroe County: Rochester Junction, June 1 (M. D. L.).

Oneida County: Lee Center, July 26 (W. A. C.).

Queens County: Flushing, June 22 (C. R. P.).

Schenectady County: Schenectady, June 14 (C. P. A.).

Tompkins County: Ithaca, May 23 to August 12 (C. P. A.); etc.

Westchester County: Tarrytown, June 9 (S. W. F.).

Subgenus *Hoplotabis* Osten Sacken*Erioptera armata* O. S.

Erie County: Hamburg, May 14 to September 5 (M. C. VD.); East Aurora, May 18 (M. C. VD.); Buffalo, May 22 (M. C. VD.); Lancaster, June 19 to August 14 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 1 to August 24 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9-13 (C. P. A.).

Monroe County: Rochester Junction, June 1 (M. D. L.).

Tompkins County: Ithaca, May 12-15 (C. P. A.); McLean, September 28 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

Subgenus *Mesocyphona* Osten Sacken*Erioptera caloptera* Say

Albany County: Helderbergs, July 3 (C. P. A.).

Cayuga County: North Fair Haven, September 14 (C. P. A.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Gowanda, June 7 (M. C. VD.); Buffalo, June 23-25 (M. C. VD.); East Aurora, August 21 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 15 to August 24 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.).

Queens County: Flushing, June 14 (C. R. P.).

Tompkins County: Ithaca, May 13 to June 19 (C. P. A.); McLean, June 5 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

Genus *Erioptera* Meigen (*continued*)Subgenus *Mesocyphona* Osten Sacken (*continued*)*E. needhami* Alex.

Cortland County: Cincinnatus, July 21 (C. P. A.).

Fulton County: Sacandaga Park, June 11-18 (C. P. A.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: Ithaca (R. H. T.).

E. parva O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Colden, August 7 (M. C. VD.).

Fulton County: Johnstown, September 15 (C. P. A.).

Tompkins County: Ithaca, August 2 (C. P. A.).

Subgenus *Empeda* Osten Sacken*Erioptera nyclops* Alex.Fulton County: Mountain Lake, June 13 (C. P. A.), T. L.; Mount Buell,
June 18 (C. P. A.).*E. stigmatica* (O. S.)

Albany County: Helderbergs, June 12 to July 3 (C. P. A.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Holland, May 21-28 (M. C. VD.); East Aurora, June 1 (M. C.
VD.); Lancaster, September 24 (M. C. VD.).

Fulton County: Sacandaga Park, June 5-24 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.), T. L.

Tompkins County: Ithaca, May 12 to June 20 (C. P. A.); McLean, Septem-
ber 28 (H. H. K.).Genus *Molophilus* Curtis*Molophilus forcipula* (O. S.)

Erie County: East Aurora, August 21 (M. C. VD.).

Fulton County: Gloversville, July 16 (C. P. A.).

Niagara County: Niagara Falls, October 9 (M. C. VD.).

M. fulltonensis Alex.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Mountain Lake, July 7 (C. P. A.), T. L.

M. hirtipennis (O. S.)

Albany County: Helderbergs, July 3 (C. P. A.).

Erie County: Hamburg, May 28 (M. C. VD.); Gowanda, June 8 (M. C. VD.);
Elma, August 20 (M. C. VD.).Fulton County: Johnstown, June 3-30 (C. P. A.); Mountain Lake, June 17
(C. P. A.).Herkimer County: Indian Castle, June 9 (C. P. A.); Old Forge, July and August
(J. G. N.).

Oneida County: North Brook, June 22 (W. A. C.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: Ithaca, May 29 to June 18 (C. P. A.); McLean, June 5
(C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

M. pubipennis (O. S.)

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Lancaster, June 19 (M. C. VD.); South Wales, July 9 (M. C. VD.).

Genus *Molophilus* Curtis (continued)*M. pubipennis* (O. S.) (continued)

Essex County: Uphill Creek and Opalescent River, foot of Mount Marcy, July 10 (C. R. C.).

Fulton County: Sacandaga Park, June 3 to August 11 (C. P. A.); etc.

Hamilton County: Wells, July 7-29 (D. B. Y.).

Herkimer County: Indian Castle, June 13 (C. P. A.); Old Forge, August (J. G. N.).

Oneida County: Potash Creek, July 24 (W. A. C.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: Ithaca, May 29 to July 13 (C. P. A.); etc.

Westchester County: Tarrytown, June 9 (S. W. F.).

M. ursinus (O. S.)

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Fulton County: Mayfield Mountain, June 21 to July 7 (C. P. A.); etc.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Genus *Trimicra* Osten Sacken*Trimicra anomala* O. S.

Erie County: Hamburg, May 28 (M. C. VD.); South Wales, July 9 (M. C. VD.).

Westchester County: New Rochelle (O. S.), T. L.

Genus *Helobia* St. Fargeau et Serville*Helobia hybrida* (Meig.)

Albany County: Clinton Heights, April 9 (D. B. Y.); Karner, June 5 (D. B. Y.).

Erie County: Buffalo, March 4 to October 3 (M. C. VD.); Lancaster, May 9 (M. C. VD.); etc.

Fulton County: Johnstown, June 30 (C. P. A.); etc.

Hamilton County: Elm Lake, August 7 (D. B. Y.).

Herkimer County: Newport, June 18 (D. B. Y.); Old Forge, July 20-24 (J. G. N.).

Madison County: Canastota (J. C. F.).

Queens County: Flushing, June 22 (C. R. P.).

Tompkins County: Ithaca, March 25 to August 7 (C. P. A.); etc.

Genus *Gnophomyia* Osten Sacken*Gnophomyia tristissima* O. S.

Albany County: Albany, September 11 (D. B. Y.).

Dutchess County: Poughkeepsie, June 8 (D. B. Y.).

Erie County: Gowanda, June 15 (M. C. VD.); Buffalo, June 25 to August 25 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 6 to August 24 (C. P. A.); Johnstown, September 20 (C. P. A.); etc.

Nassau County: Sea Cliff, September 3-5 (N. B.).

Niagara County: Niagara Falls, July 30 to October 9 (M. C. VD.).

Rensselaer County: Rensselaer, June 3 (D. B. Y.).

Suffolk County: O. S., in the type series at Cambridge.

Tompkins County: Ithaca, May 30 to June 10 (J. G. N.); Norton's Landing, June 19 (H. H. S.); etc.

Westchester County: Tarrytown, June 16-25 (S. W. F.).

Genus *Gonomyia* MeigenSubgenus *Leiponeura* Skuse*Gonomyia alexanderi* (Johns.)

Fulton County: Sacandaga Park, June 11 to August 24 (C. P. A.), T. L.

Herkimer County: Indian Castle, June 13 (C. P. A.).

G. manca (O. S.)

Fulton County: Sacandaga Park, August 26 (C. P. A.).

Genus *Gonomyia* Meigen (*continued*)Subgenus *Leiponeura* Skuse (*continued*)*G. sacandaga* Alex.

Fulton County: Sacandaga Park, June 11 to August 24 (C. P. A.), T. L.

Subgenus *Gonomyia* Meigen*Gonomyia blanda* O. S.

Albany County: Albany, June 26 (D. B. Y.).

Cortland County: Taylor, July 20 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.

Tompkins County: Ithaca, July 19 (C. P. A.).

G. cognatella O. S.

Erie County: Gowanda, June 8 (M. C. VD.).

Fulton County: Sacandaga Park, June 18 to August 26 (C. P. A.).

Herkimer County: Indian Castle, June 10-13 (C. P. A.).

G. florens Alex.

Fulton County: Sacandaga Park, June 18 (C. P. A.); Gloversville, June 22 (C. P. A.).

Herkimer County: Indian Castle, June 9-13 (C. P. A.), T. L.

Tompkins County: McLean, June 5 (C. P. A.).

G. mathesoni Alex.

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Sacandaga Park, June 12-16 (C. P. A.), T. L.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Tompkins County: Ithaca, August 24 (C. P. A.).

G. noveboracensis Alex.

Fulton County: Sacandaga Park, June 11 (C. P. A.), T. L.

G. subcinerea O. S.

Albany County: Helderbergs, June 12 (C. P. A.); Albany, June 26 (D. B. Y.).

Erie County: Lancaster, June 4 (M. C. VD.); Hamburg, July 10 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 1 (C. P. A.); Gloversville, June 3 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 9-13 (C. P. A.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Rensselaer County: Brookview, July 13 (M. M. A.).

Rockland County: West Nyack, June 15 (W. S.).

Tompkins County: Ithaca, May 13 to August 7 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

G. sulphurella O. S.

Clinton County: Peru, June 10 (C. R. C.).

Erie County: Lancaster, June 2 to August 14 (M. C. VD.); Buffalo, June 25 (M. C. VD.); Elma, August 27 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 11 to August 24 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 13 (C. P. A.).

Nassau County: Sea Cliff, August (N. B.).

Tompkins County: Ithaca, May 13 to August 24 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

Genus *Rhabdomastix* SkuseSubgenus *Sacandaga* Alexander*Rhabdomastix flava* (Alex.)

Fulton County: Sacandaga Park, June 11-28 (C. P. A.), T. L.

Hamilton County: Wells, July 6 (D. B. Y.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Genus *Cryptolabis* Osten Sacken*Cryptolabis paradoxa* O. S.

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Sacandaga Park, June 18 to July 27 (C. P. A.).

Oneida County: Brown Brook, July 13 (W. A. C.).

Tompkins County: Ithaca, June 19-21 (C. P. A.); Enfield Falls, July 12.

Genus *Cladura* Osten Sacken*Cladura delicatula* Alex.

Fulton County: Mayfield Mountain, October 1 (C. P. A.).

Hamilton County: Middle Lake, Hope Township, September 12-13 (C. P. A.).

C. flavoferruginea O. S.

Erie County: East Aurora, September 20 (M. C. VD.); Lancaster, September 24 (M. C. VD.); Hamburg, September 25 to October 16 (M. C. VD.); North Evans, October 22 to November 4 (M. C. VD.); etc.

Fulton County: Pinnacle Mountain, August 5 (C. P. A.); Mayfield Mountain, September 20 (C. P. A.).

Genesee County: Batavia, September 28 (H. H. K.).

Hamilton County: Middle Lake, Hope Township, September 12 (C. P. A.).

Herkimer County: Trenton Falls, September (O. S.), T. L.

Monroe County: Rochester, October 10 (M. C. VD.).

Nassau County: Sea Cliff (N. B.).

Niagara County: Niagara Falls, October 9 (M. C. VD.).

Onondaga County: Manlius, October 1 (H. H. S.).

Putnam County: Highlands, October 3 (J. S.).

Tioga County: Owego, October 24 (H. H. K.).

Tompkins County: McLean, September 28 (C. R. C. and H. H. K.); Ithaca, October 3-15 (C. P. A.).

Genus *Chionea* Dalman*Chionea gracilis* Alex.

Tompkins County: Ithaca, December 15, T. L.

C. noveboracensis Alex.

Tompkins County: Ithaca, Coy Glen, February 25 (R. C. S.), T. L.

C. primitiva Alex.

Cayuga County: Cascade, Owasco Lake, November 15 (S. C. B. and C. R. C.), T. L.

C. valga Harris

Cattaraugus County: Otto, March 18.

Erie County: Lancaster (M. C. VD.), on snow.

Onondaga County: Manlius, October 1 (H. H. S.).

Steuben County: Lake Keuka, December (C. R. C.).

Tompkins County: Ithaca, November 18 (R. H. P.); December 15 (W. A. R.).

Regional species: *Molophilus nova-caesariensis* Alex.

Tribe Limnophilini

Genus *Adelphomyia* Bergroth*Adelphomyia americana* Alex.

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Woodworth's Lake, August 22 (C. P. A.), T. L.; Johnstown, September 15-23 (C. P. A.); etc.

Hamilton County: Wells, July 29 (D. B. Y.).

Tompkins County: Ithaca, September 10 (C. P. A.).

Genus *Adelphomyia* Bergroth (*continued*)*A. cayuga* Alex.

Tompkins County: Vanishing Brook, Ithaca, August 16 (C. P. A.), T. L.

A. minuta Alex.

Fulton County: Sacandaga Park, June 1-15 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.).

Tompkins County: Ithaca, May 12-23 (C. P. A.), T. L.; McLean, June 5 (C. P. A.).

Genus *Limnophila* MacquartSubgenus *Lasiomastix* Osten Sacken*Limnophila macrocera* (Say)

Albany County: Karner, June 19 (D. B. Y.); Pine Hills, July 1 (D. B. Y.).

Cattaraugus County: Little Valley, July 18 to August 7 (M. C. VD.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Lancaster, May 31 (M. C. VD.); Gowanda, June 14 (M. C. VD.); etc.

Franklin County: Axton, June (A. D. M.).

Fulton County: Sacandaga Park, June 11 to August 24 (C. P. A.); etc.

Hamilton County: Wells, July 20 (D. B. Y.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Onondaga County: Manlius, August 18 (H. H. S.).

Suffolk County: Yaphank, May 29.

Tompkins County: Ithaca, May 23-26 (C. P. A.); McLean, June 5 (C. P. A.); etc.

Westchester County: Tarrytown, June 9 (S. W. F.).

L. sublenuicornis (Alex.)

Tompkins County: McLean, May 31 (C. P. A.); Ithaca, June 4-13 (C. P. A.), T. L.

L. tenuicornis O. S.

Fulton County: Mountain Lake, June 17-19 (C. P. A.); Gloversville, June 24 (C. P. A.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Tompkins County: Ithaca, May 20-29 (C. P. A.); McLean, June 5 (C. P. A.).

Subgenus *Idioptera* Macquart*Limnophila fasciolata* O. S.

Albany County: Albany, June 17 (D. B. Y.).

Tompkins County: McLean, June 5 (C. P. A.).

Subgenus *Limnophila* Macquart*Limnophila adusta* O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Lancaster, May 31 (M. C. VD.); Buffalo, June 10-12 (M. C. VD.); etc.

Essex County: Wilmington, August 24 (J. C. B.).

Fulton County: Mount Buell, June 5 to July 7 (C. P. A.); etc.

Genesee County: Batavia, August 6 (H. H. K.).

Onondaga County: Green Lake, June 8 (C. P. A.); Manlius, September 6 (H. H. S.).

Schenectady County: Schenectady, June 14 (A. O.).

Tompkins County: Ithaca, May 21 to June 5 (C. P. A.); etc.

L. albipes Leon.

Fulton County: Mountain Lake, altitude 1590 feet, July 7 (C. P. A.).

Westchester County: Tarrytown, June 16 (S. W. F.).

Genus *Limnophila* Macquart (*continued*)Subgenus *Limnophila* Macquart (*continued*)*L. alleni* Johns.

- Albany County: Karner, June 19 (D. B. Y.).
 Fulton County: Gloversville, June 9-22 (C. P. A.).
 Tompkins County: Ithaca, June 20 (A. H. M.); etc.

L. areolata O. S.

- Albany County: Helderbergs, June 12 (C. P. A.); Albany, June 26 (D. B. Y.).
 Cattaraugus County: Rock City, June 6 (J. C. B.).
 Erie County: Gowanda, June 14 (M. C. VD.); Hamburg, June 18 (M. C. VD.);
 etc.

Essex County: Uphill Creek and Opalescent River, foot of Mount Marcy,
 July 10 (C. R. C.).

Fulton County: Mountain Lake, June 3-29 (C. P. A.); etc.

Hamilton County: Mount Buell, June 13 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.; Old Forge, June 20 (J. G. N.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: Ithaca, May 20 to June 5 (C. P. A.); etc.

L. brevifurca O. S.

Erie County: Holland, May 21 (M. C. VD.); Colden, May 23 (M. C. VD.).

Fulton County: Sacandaga Park, June 1-17 (C. P. A.); Gloversville, June
 3-15 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.); Old Forge, August
 (J. G. N.).

Tompkins County: MeLean, May 13 to June 5 (C. P. A.); Ithaca, May 14-21
 (C. P. A.); etc.

L. contempta O. S.

Fulton County: Sacandaga Park, July 3 (C. P. A.).

L. edwardi Alex.

Fulton County: Gloversville, June 22 (C. P. A.), T. L.

L. emmelina Alex.

Fulton County: Mount Buell, altitude 1600 feet, June 18 (C. P. A.).

L. fratria O. S.

Erie County: East Aurora, May 18 (M. C. VD.). (Van Duzee, auct.)
 (The type-locality for *L. fratria* was supposed by Osten Sacken to be
 New York State.)

L. imbecilla O. S.

Erie County: Gowanda, June 7-14 (M. C. VD.); Buffalo, June 12-15
 (M. C. VD.).

Fulton County: Sacandaga Park, June 26 (C. P. A.).

Genesee County: Batavia, August 1 (H. H. K.).

Herkimer County: Trenton Falls (O. S.), T. L.

Westchester County: Tarrytown, June 9 (S. W. F.).

L. inornata O. S.

Fulton County: Sacandaga Park, June 1-11 (C. P. A.).

Herkimer County: Old Forge, August (J. G. N.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Oswego County: Oswego, July 17.

Tompkins County: Ithaca, reared May 25 (C. P. A.).

L. laricicola Alex.

Fulton County: Canada Lake, June 20 (C. P. A.), T. L.

L. lenta O. S.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Genus *Limnophila* Macquart (continued)Subgenus *Limnophila* Macquart (continued)*L. lenta* O. S. (continued)

Erie County: Hamburg, May 26 (M. C. VD.); South Wales, July 9 (M. C. VD.); etc.

Fulton County: Johnstown, June 26 to September 2 (C. P. A.); etc.

Hamilton County: Wells, July 29 (D. B. Y.); Dug Mountain, August 8 (D. B. Y.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Saratoga County: Corinth, June 23 (D. B. Y.).

Tompkins County: Ithaca, May 26 to August 12 (C. P. A.).

L. lutea Doane

Tompkins County: McLean, May 31 (F. K.).

L. luteipennis O. S.

Albany County: Karner, June 13 (D. B. Y.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Colden, May 23 (M. C. VD.); Hamburg, May 26 (M. C. VD.).

Fulton County: Sacandaga Park, June 1 to August 24 (C. P. A.); etc.

Greene County: New Baltimore, September 17 (D. B. Y.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Nassau County: Sea Cliff (N. B.).

Tompkins County: Ithaca, May 7 to June 5 (C. P. A.); etc.

L. nigripleura A. & L.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Mountain Lake, June 17 to August 13 (C. P. A.); etc.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Nassau County: Sea Cliff (N. B.).

Tompkins County: Ithaca, May 31 (R. H. T.); etc.

L. niveitarsis O. S.

Fulton County: Mount Buell, altitude 1400 feet, June 18-29 (C. P. A.).

Herkimer County: Old Forge, July 20 (J. G. N.).

L. noveboracensis Alex.

Albany County: Albany, June 26 (D. B. Y.).

Cortland County: Taylor, July 20 (C. P. A.).

Fulton County: Sacandaga Park, June 21-28 (C. P. A.), T. L.; etc.

Rockland County: West Nyack, June 15 (W. S.).

Tompkins County: Ithaca, July 11-12 (C. P. A.).

L. quadrata O. S.

Albany County: Albany, June 7 (D. B. Y.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Erie County: Hamburg, May 22 to June 6 (M. C. VD.); Buffalo, June 15 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 5 to July 7 (C. P. A.); etc.

Genesee County: Batavia, June 6 (H. H. K.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: Ithaca, May 21-29 (C. P. A.), July 25 (H. Y.); McLean, June 5 (C. P. A.); Ringwood Hollow, July 14 (H. Y.).

Westchester County: Tarrytown, June 9 (S. W. F.).

L. recondita O. S.

Albany County: Albany, June 15 (D. B. Y.).

Erie County: Buffalo, June 10 (M. C. VD.).

Fulton County: Sacandaga Park, June 21-28 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.).

Genus *Limnophila* Macquart (continued)Subgenus *Limnophila* Macquart (continued)*L. recondita* O. S. (continued)

Rockland County: West Nyack, June 15 (W. S.).

Tompkins County: Ithaca, May 26-29 (C. P. A.); McLean, June 5 (C. P. A.).
(Osten Sacken's T. L. is New York State.)*L. similis* Alex.Fulton County: Johnstown, June 10-26 (C. P. A.), T. L.; Sacandaga Park,
June 29 (C. P. A.).

Hamilton County: Wells, July 7 (D. B. Y.).

L. stanwoodae Alex.

Fulton County: Sacandaga Park, June 11 (C. P. A.), T. L.

L. subcostata (Alex.)Fulton County: Sacandaga Park, June 1 (C. P. A.); Gloversville, June 3-9
(C. P. A.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Tompkins County: Ithaca, May 7-31 (C. P. A.), T. L.; etc.

L. sylvia Alex.

Fulton County: Mountain Lake, altitude 1590 feet, June 13 (C. P. A.), T. L.

L. tenuipes (Say)

Albany County: Albany, June 26 (D. B. Y.).

Cortland County: Cincinnatus, July 21 (C. P. A.).

Erie County: Hamburg, May 28 (M. C. VD.); Colden, June 7 (M. C. VD.);
Elma, August 27 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 15 to August 24 (C. P. A.).

Onondaga County: Manlius, September 6 (H. H. S.).

Rockland County: West Nyack, June 15 (W. S.).

Tompkins County: Ithaca, May 20 to August 12 (C. P. A.); McLean, June 5
(C. P. A.).*L. toxoneura* O. S.

Albany County: Helderbergs, July 3 (C. P. A.).

Cattaraugus County: Little Valley, June 30 (M. C. VD.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Fulton County: Mount Buell, June 13-29 (C. P. A.); Gloversville, June 14-24
(C. P. A.); etc.

Hamilton County: Mount Buell, June 13 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 9
(C. P. A.); Old Forge, August (J. G. N.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Rensselaer County: Brookview, July 9 (M. M. A.).

L. ultima O. S.

Albany County: Albany, May 15, October 4-7 (D. B. Y.).

Cattaraugus County: Olean, September 5 (C. R. C.).

Erie County: Colden, August 7 (M. C. VD.).

Fulton County: Woodworth's Lake, August 12 (C. P. A.); Gloversville,
September 15-17 (C. P. A.).

Hamilton County: Middle Lake, Hope Township, September 12 (C. P. A.).

Monroe County: Rochester, October 10 (M. C. VD.).

Tompkins County: May 8, October 12 (C. P. A.).

Subgenus *Ephelia* Schiner*Limnophila aprilina* O. S.

Albany County: Karner, June 15 (D. B. Y.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Genus *Limnophila* Macquart (continued)Subgenus *Ephelia* Schiner (continued)*Limnophila aprilina* O. S. (continued)

Erie County: Gowanda, June 27 (M. C. VD.); South Wales, July 9 (M. C. VD.).

Fulton County: Mountain Lake, June 15 to July 7 (C. P. A.).

Hamilton County: Wells, July 29 (D. B. Y.).

Tompkins County: Ithaca, May 12-29 (C. P. A.).

L. johnsoni Alex.

Fulton County: Mount Buell, June 15 (C. P. A.); Mountain Lake, altitude 1600 feet, June 17 (C. P. A.), T. L.

Tompkins County: Coy Glen, Ithaca, May 23 (C. P. A.).

Subgenus *Dicranophragma* Osten Sacken*Limnophila fuscovaria* O. S.

Albany County: Karner, June 13 (D. B. Y.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Hamburg, June 6-20 (M. C. VD.); Gowanda, June 7 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 15 to August 24 (C. P. A.); etc.

Hamilton County: Wells, July 23 (D. B. Y.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Queens County: Flushing, June 22 (C. R. P.).

Tompkins County: Ithaca, May 17 to August 12 (C. P. A.); Norton's Landing, June 24 (H. H. S.).

Westchester County: Tarrytown, June 9 (S. W. F.).

Wyoming County: Portage, May 24 (H. H. K.).

Subgenus *Prionolabis* Osten Sacken*Limnophila munda* O. S.

Cattaraugus County: Mix Creek Valley, June 11 (J. C. B.).

Essex County: Uphill Creek and Opalescent River, foot of Mount Marey, July 10 (C. R. C.).

Fulton County: Mount Buell, June 13-29 (C. P. A.); Gloversville, June 16 (C. P. A.); etc.

L. rufibasis O. S.

Albany County: Albany, May 26 to June 5 (D. B. Y.).

Clinton County: Peru, June 23 (C. R. C.).

Erie County: Holland, May 21 (M. C. VD.); Lancaster, May 31 (M. C. VD.); etc.

Fulton County: Gloversville, May 20 to June 3 (C. P. A.); Mount Buell, June 13-17 (C. P. A.); etc.

Hamilton County: Mount Buell, June 13 (C. P. A.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Oneida County: Remsen, June 5 (W. A. C.).

Tompkins County: Ithaca, May 4-31 (C. P. A.); Norton's Landing, June 2 (H. H. S.); McLean, June 5 (C. P. A.).

Wyoming County: Portage, May 24 (H. H. K.).

L. simplex Alex.

Fulton County: Woodworth's Lake, June 17 (C. P. A.).

Subgenus *Dactylolabis* Osten Sacken*Limnophila cubitalis* O. S.

Cattaraugus County: Rock City, June 6-10 (J. C. B. and H. H. K.).

Tompkins County: Ithaca, May 7-30 (C. P. A.); Taughannock Falls, May 19 (C. P. A.).

Genus *Limnophila* Macquart (continued)Subgenus *Dactylolabis* Osten Sacken (continued)*L. montana* O. S.

- Albany County: Helderbergs, June 12 (C. P. A.).
 Cattaraugus County: Little Valley, June 30 (M. C. VD.).
 Erie County: Spring Brook, June 25 (M. C. VD.).
 Fulton County: Mount Buell, June 13-18 (C. P. A.); etc.
 Herkimer County: Little Falls, June 9 (C. P. A.).
 New York: (O. S.), T. L.
 Niagara County: Niagara Falls, June 9 (M. C. VD.).
 Tompkins County: Ithaca, May 5-24 (C. P. A.).

Genus *Epiphragma* Osten Sacken*Epiphragma foscipennis* (Say)

- Albany County: Helderbergs, June 12 (C. P. A.); Albany, June 19-25 (D. B. Y.).
 Cattaraugus County: Rock City, June 6-7 (J. C. B. and H. H. K.); Vandalia, June 9 (C. R. C.).
 Erie County: Colden, May 23 to June 7 (M. C. VD.); Buffalo, June 10-23 (M. C. VD.); etc.
 Fulton County: Sacandaga Park, June 1-21 (C. P. A.); etc.
 Herkimer County: Indian Castle, June 9 (C. P. A.); Old Forge, June 20 (J. G. N.).
 Nassau County: Sea Cliff (N. B.).
 Oneida County: Cincinnati Creek, May 26 (W. A. C.).
 Onondaga County: Green Lake, June 8 (C. P. A.).
 Queens County: Flushing, June 22 (C. R. P.).
 Tompkins County: Ithaca, May 14-30 (C. P. A.); McLean, June 5 (C. P. A.).
 Westchester County: Tarrytown, June 9 (S. W. F.).
E. solatrix (O. S.)
 Nassau County: Sea Cliff, June (N. B.).

Genus *Ula* Haliday*Ula elegans* O. S.

- Fulton County: Pinnacle Mountain, September 16 (C. P. A.); etc.
 Herkimer County: Old Forge, August (J. G. N.).
 Tompkins County: Ithaca, May 13 to June 20 (C. P. A.).

U. paupera O. S.

- Erie County: Holland, May 21 (M. C. VD.); East Aurora, June 22 to August 24 (M. C. VD.).
 Fulton County: Johnstown, May 13 (C. P. A.); etc.
 Tompkins County: Ithaca, May 13 (C. P. A.).

Genus *Ulomorpha* Osten Sacken*Ulomorpha pilosella* (O. S.).

- Chenango County: Lower Cincinnatus, July 21 (C. P. A.).
 Cortland County: Taylor, July 20 (C. P. A.).
 Erie County: East Aurora, June 11 (M. C. VD.); South Wales, July 9 (M. C. VD.); Boston, July 10 (M. C. VD.).
 Fulton County: Gloversville, June 3-9 (C. P. A.); Mountain Lake, June 13-17 (C. P. A.).
 Herkimer County: Trenton Falls (O. S.), T. L.; Indian Castle, June 9 (C. P. A.).
 Oneida County: Cyrus Brook, July 10 (W. A. C.).
 Schoharie County: Sharon Springs (O. S.), T. L.
 Tompkins County: McLean, June 5 (C. P. A.); Ithaca, June 20 (L. W. C.).

Regional species: *Limnophila irrorata* Johns., *L. marchandi* Alex., *L. mundoides* Alex., *L. novae-angliae* Alex., *L. osborni* Alex., *L. poetica* O. S., *L. unica* O. S.

Tribe Hexatomini

Genus *Penthoptera* Schiner

Penthoptera albitarsis O. S.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.); Hamburg, July 10 (M. C. VD.); Boston, July 10 (M. C. VD.).

Fulton County: Sacandaga Park, June 27 (C. P. A.); Woodworth's Lake, July 19 (C. P. A.).

Tompkins County: Ithaca, July 11 to August 12 (C. P. A.), September 17 (J. G. N.).

Genus *Eriocera* Macquart

Eriocera brachycera O. S.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Near Lower Cincinnatus, July 21 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.); Colden, July 25 (M. C. VD.).

Fulton County: Pinnacle Mountain, altitude 2000 feet, August 4 (C. P. A.).

Herkimer County: Old Forge, July 12-16 (J. G. N.).

E. cinerea Alex.

Fulton County: Woodworth's Lake, June 15 (C. P. A.).

Tompkins County: Ithaca, reared from larvae, May 16 (C. P. A.); Bear Creek, Freeville, May 16 (C. P. A.); Norton's Landing, May 25 (H. H. S.).

E. fuliginosa O. S.

Erie County: North Evans, May 25 to July 4 (M. C. VD.); Colden, May 31 (M. C. VD.); etc.

(Determined by Van Duzee; species not seen by writer.)

E. fulltonensis Alex.

Fulton County: Sport Island, Sacandaga River, altitude 750 feet, June 15-27 (C. P. A.).

Tompkins County: Ithaca, reared May 30 to June 6 (J. T. L.), June 13 (C. P. A.), June 23 (H. Y.).

E. longicornis (Walk.)

Albany County: Albany, May 6 (D. B. Y.).

Erie County: North Evans, May 14 (M. C. VD.).

Fulton County: Fish-House, May 28 (C. P. A.); etc.

Herkimer County: Trenton Falls (O. S.); Dolgeville, May 16 (C. P. A.).

Tompkins County: Ithaca, May 1-30 (C. P. A. and J. G. N.); etc.

E. spinosa (O. S.)

Cortland County: Lower Cincinnatus, July 21 (C. P. A.).

Fulton County: Sacandaga Park, June 5 (C. P. A.).

Herkimer County: Trenton Falls (O. S.), T. L.

Oneida County: Tannery Brook, September 9 (larvae) (W. A. C.).

Tompkins County: Ithaca, May 17 to August 5; etc.

E. tristis Alex.

Tompkins County: Ithaca, August 1 (C. P. A. and C. I.), T. L.

Genus *Hexatoma* Latreille

Hexatoma megacera (O. S.)

Fulton County: Johnstown, May 24 (C. P. A.); Sport Island, Sacandaga River, June 15 (C. P. A.); etc.

Tompkins County: Ithaca, May 15 (C. P. A.); North Lansing, June 1 (S. C. B.); etc.

Regional species: *Eriocera wilsonii* O. S.

Tribe **Pediciini**

Genus *Pedicia* Latreille

Pedicia albivittata Walk.

Albany County: Indian Ladder, Helderbergs, July 3 (C. P. A.).

Broome County: Binghamton.

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: South Wales, July 9 (M. C. VD.); East Aurora, August 15 to September 11 (M. C. VD.); etc.

Fulton County: Gloversville, June 11 (A. O.); Mountain Lake, August 22 (C. P. A.); etc.

Hamilton County: Middle Lake, September 12 (C. P. A.).

Herkimer County: Trenton Falls (O. S.).

Onondaga County: Manlius, August 27 (H. H. S.); Baldwinsville, September

Tompkins County: Ithaca, August 1-12 (C. P. A.); etc.

Ulster County: Big Indian Valley, May 24 to August 23 (R. F. P.)

Westchester County: Mosholu.

P. contermina Walk.

Tompkins County: McLean, May 13 (C. P. A.); Ithaca, June 1 (C. R. P.); June 6 (S. A. G.).

Genus *Tricyphona* Zetterstedt

Tricyphona auripennis (O. S.)

Herkimer County: Indian Castle, June 10-13 (C. P. A.).

T. autumnalis Alex.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Grand Island, September 6 (M. C. VD.).

Essex County: Mount Marcy, July 30 (D. B. Y.).

Fulton County: Pinnacle Mountain, August 5 (C. P. A.); Woodworth's Lake, September (C. P. A.), T. L.

Hamilton County: Elm Lake, August 2 (D. B. Y.); Dug Mountain, August 8 (D. B. Y.).

(Needham's record for *T. calcar*, Old Forge, August, probably belongs here.)

T. calcar (O. S.)

Cattaraugus County: Four-Mile, altitude 2300 feet, June 6 (J. C. B.).

Erie County: Colden, May 23 (M. C. VD.).

Essex County: Uphill Creek and Opalescent River, foot of Mount Marcy, July 10 (C. R. C.).

Fulton County: Sacandaga Park, June 1; Gloversville, June 3 (C. P. A.); etc.

Herkimer County: Newport, June 6 (D. B. Y.).

Tompkins County: McLean, May 22 to June 5 (C. P. A.); etc.

T. inconstans (O. S.)

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Columbia County: Claverack, September 28 (J. S.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Hamburg, May 31 to June 20 (M. C. VD.); Boston, September 3 (M. C. VD.); etc.

Essex County: Uphill Creek and Opalescent River, foot of Mount Marcy, July 10 (C. R. C.).

Fulton County: Gloversville, June 10-27 (C. P. A.); Sacandaga Park, June 16 to August 24 (C. P. A.); etc.

Genesee County: Batavia, June 6 (H. H. K.).

Hamilton County: Mount Buell, June 13 (C. P. A.).

Genus *Tricyphona* Zetterstedt (continued)*T. inconstans* (O. S.) (continued)

- Herkimer County: Indian Castle, June 9 (C. P. A.); Old Forge, August (J. G. N.); Newport, August 31 (D. B. Y.).
 Onondaga County: Manlius, September 10 (H. H. S.).
 Monroe County: Rochester, October 10 (M. C. VD.).
 Nassau County: Sea Cliff (N. B.).
 Queens County: Rockaway Beach, June 26.
 Schenectady County: Schenectady, June 14 (A. O.).
 Tompkins County: Ithaca, May 12 to September 28 (C. P. A.); etc.
 Westchester County: Tarrytown, June 9 (S. W. F.).
 Wyoming County: Portage, May 24 (H. H. K.); Portageville, June 13 (C. R. C.).

T. paludicola Alex.

- Tompkins County: McLean, May 13-20 (C. P. A. and P. W. C.), T. L.; Bear Creek, Freeville, May 16 (C. P. A.).

T. vernalis (O. S.)

- Fulton County: Mountain Lake, June 13-15 (C. P. A.); Mount Buell, June 15 (C. P. A.).
 Herkimer County: Indian Castle, June 13 (C. P. A.).
 Nassau County: Sea Cliff, April (N. B.).
 Tompkins County: Forest Home, May *7 (S. W. F.); Taughannock, May 8 (R. H. T.).

Genus *Dicranota* Zetterstedt*Dicranota noveboracensis* Alex.

- Fulton County: Dolgeville, May 16 (C. P. A.), T. L.
 Tompkins County: Ithaca, April 24 (S. W. F.); May 8 (C. P. A.); etc.

D. rivularis O. S.

- Tompkins County: Ithaca, April 21 (C. R. P.).

Genus *Rhaphidolabis* Osten SackenSubgenus *Rhaphidolabina* Alexander*Rhaphidolabis faveola* O. S.

- Chenango County: Lower Cincinnatus, July 21 (C. P. A.).
 Erie County: Hamburg, May 28 (M. C. VD.).
 Fulton County: Gloversville, June 3-15 (C. P. A.); Mount Buell, June 13-17 (C. P. A.); Woodworth's Lake, August 22 (C. P. A.).
 Hamilton County: Wells, July 9 (D. B. Y.).
 Herkimer County: Indian Castle, June 9 (C. P. A.); Old Forge, August (J. G. N.).
 Tompkins County: Ithaca, May 30-31 (C. P. A.); etc.

Subgenus *Rhaphidolabis* Osten Sacken*Rhaphidolabis cayuga* Alex.

- Fulton County: Johnstown, August 19 (C. P. A.); Mountain Lake, September 2 (C. P. A.).
 Tompkins County: Ithaca, April 22 (J. G. N.); McLean, May 13 (C. P. A.), T. L.

R. rubescens Alex.

- Fulton County: Gloversville, altitude 900 feet, June 22 (C. P. A.), T. L.

R. tenuipes O. S.

- Albany County: Indian Ladder, Helderbergs, July 3 (C. P. A.).
 Cattaraugus County: Little Valley, June 30 (M. C. VD.).
 Erie County: North Evans, May 14 (M. C. VD.); Holland, May 21 (M. C. VD.).

Genus *Rhaphidolabis* Osten Sacken (*continued*)Subgenus *Rhaphidolabis* Osten Sacken (*continued*)*R. tenuipes* O. S. (*continued*)

Fulton County: Gloversville, May 13 to August 5 (C. P. A.); etc.

Herkimer County: Indian Castle, June 13 (C. P. A.); Old Forge, August 6 (J. G. N.).

Oneida County: Field's Brook, August 30 (W. A. C.).

Saratoga County: Saratoga Springs (O. S.), T. L.

Tompkins County: Ithaca, May 1 to August 12 (J. G. N.).

Subgenus *Plectromyia* Osten Sacken*Rhaphidolabis modesta* (O. S.)

Erie County: Holland, May 21 (M. C. VD.). (Van Duzee, auct.)

Fulton County: Mountain Lake, altitude 1600 feet, June 13 (C. P. A.).

Regional species: *Dicranota eucera* O. S., *D. pallida* Alex., *Tricyphona hyperborca* (O. S.)
T. katahdin Alex.

Subfamily Cyliindrotominae

Genus *Cylindrotoma* Macquart*Cylindrotoma tarsalis* Johns.

Fulton County: Gloversville, June 9 (C. P. A.); Woodworth's Lake, altitude 1650 feet, June 17 to August 19 (C. P. A.), T. L.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Genus *Liogma* Osten Sacken*Liogma nodicornis* (O. S.)

Erie County: Hamburg, May 28 to June 20 (M. C. VD.); Colden, June 7 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 15-26 (C. P. A.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Tompkins County: North Lansing, June 1 (C. R. C.); Ithaca, June 10-14 (C. P. A.).

Westchester County: Tarrytown, June 9 (S. W. F.).

Genus *Phalacrocera* Schiner*Phalacrocera neoxena* Alex.

Cayuga County: North Fair Haven, May 17, dead in lake drift (J. G. N. and E. M.), T. L.

P. tipulina O. S.

Essex County: Lake Tear of the Clouds, Mount Marcy, July 10 (C. R. C.).

Fulton County: Near Sacandaga Park, June 18 (C. P. A.); Canada Lake, June 23 to July 10 (C. P. A.); etc.

Herkimer County: Old Forge, July, August 3 (J. G. N.).

Tompkins County: Ringwood Hollow, July 3 (H. Y.).

Regional species: *Cylindrotoma americana* O. S., *Triogma exculpta* O. S.

Subfamily Tipulinae

Tribe Dolichopezini

Genus *Dolichopeza* Curtis*Dolichopeza americana* Needm.

Cattaraugus County: Little Valley, June 30 (M. C. VD.).

Fulton County: Sacandaga Park, June 1-15 (C. P. A.); Mountain Lake, June 13-17 (C. P. A.).

Genus *Dolichozepe* Curtis (continued)*Dolichozepe americana* Needm. (continued)

Herkimer County: Old Forge, August (J. G. N.), T. L.

Queens County: Flushing, June 22 (C. R. P.).

Genus *Oropeza* Needham*Oropeza albipes* Johns.

Cattaraugus County: Four-Mile, July 4 (H. H. K.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: Colden, July 3 (M. C. VD.); South Wales, July 9 (M. C. VD.);

Boston, July 10 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 28 (C. P. A.).

Herkimer County: Old Forge, June 20 (J. G. N.).

Suffolk County: Bellport, August 9.

Westchester County: Tarrytown, June 9 (S. W. F.).

O. obscura Johns.

Albany County: Helderbergs, July 3 (C. P. A.).

Cattaraugus County: Little Valley, June 30 (M. C. VD.); Four-Mile, July 4 (H. H. K.).

Chenango County: Lower Cincinnatus, July 21 (C. P. A.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: East Aurora, June 16 (M. C. VD.); South Wales, June 23 to July 9 (M. C. VD.).

Fulton County: Woodworth's Lake, June 15 to August 20 (C. P. A.); etc.

Hamilton County: Wells, July 30 (D. B. Y.).

Tompkins County: Ringwood Hollow, July 6 (H. Y.).

Warren County: County-Line Flow, Griffin, July 26 (C. P. A.).

O. sayi Johns.

Erie County: South Wales, July 9 (M. C. VD.); Boston, July 10 (M. C. VD.).

Herkimer County: Old Forge, August (J. G. N.).

Niagara County: Niagara Falls, June 23.

Tompkins County: Ithaca, August (J. G. N.).

O. similis Johns.

Erie County: Gowanda, June 7-14 (M. C. VD.); Elma, August 20 (M. C. VD.).

O. subalbipes Johns.

Erie County: South Wales, July 9 (M. C. VD.).

Westchester County: Tarrytown, June 9 (S. W. F.).

O. venosa Johns.

Cattaraugus County: Little Valley, June 30 (M. C. VD.).

Cortland County: Lower Cincinnatus, July 21 (C. P. A.).

Erie County: South Wales, June 23 (M. C. VD.).

Fulton County: Mountain Lake, June 15-17 (C. P. A.); Northampton, June 25 (D. B. Y.); etc.

Herkimer County: Indian Castle, June 9 (C. P. A.).

Tompkins County: MeLean, June 5 (C. P. A.).

Regional species: *Brachypremna dispellens* (Walk.), *Oropeza dorsalis* Johns.

Tribe Ctenophorini

Genus *Tanyptera* Latreille*Tanyptera frontalis* (O. S.)

Cattaraugus County: Rock City, June 16 (J. C. B. and W. T. M. F.).

Fulton County: Mountain Lake, June 13 (C. P. A.).

Tompkins County: Ithaca, May 30-31 (C. I.).

Genus *Tanyptera* Latreille (*continued*)*T. fumipennis* (O. S.)

Erie County: Colden, May 30 (M. C. VD.).
 Tompkins County: Ithaca, May 30-31 (C. I.).

T. topazina (O. S.)

Erie County: Lancaster, May 31 (M. C. VD.).
 Tompkins County: Ithaca, May 31.

Genus *Ctenophora* Meigen*Ctenophora apicata* O. S.

Fulton County: Mount Buell, altitude 1400 feet, June 29 (C. P. A.).
 Suffolk County: Long Island, July.

Tribe Tipulini

Genus *Longurio* Loew*Longurio testaceus* Loew

Chenango County: Near Lower Cincinnatus, July 21 (C. P. A.).
 Cortland County: Lower Cincinnatus, July 21 (C. P. A.).
 Fulton County: Gloversville, altitude 1000 feet, June 27 (C. P. A.).
 Nassau County: Sea Cliff (N. B.).

Genus *Stygeropsis* Loew*Stygeropsis fuscipennis* Loew

Albany County: Albany, August 6 (D. B. Y.).
 Erie County: East Aurora, June 11 (M. C. VD.).
 Fulton County: Sacandaga Park, June 29 (C. P. A.); Mountain Lake, August 13 (C. P. A.).
 Tompkins County: Ithaca, July 10 (C. P. A.); Ringwood Hollow, larvae in November and May (C. H. K.).

Genus *Nephrotoma* Meigen*Nephrotoma breviorcornis* (Doane)

Fulton County: Sacandaga Park, June 29 (C. P. A.).

N. calinota (Dietz)

Fulton County: Sacandaga Park, June 19 (C. P. A.).

N. eucera (Loew)

Fulton County: Sacandaga Park, June 11-16 (C. P. A.).

Onondaga County: Manlius, June 12 (H. H. S.).

Suffolk County: Long Island.

Tompkins County: Ithaca, June 29 to July 21.

N. ferruginea (Fabr.)

Albany County: Albany, June 7 (D. B. Y.); Helderbergs, July 3 (C. P. A.).

Cortland County: Gee Brook, July 20 (A. O.); Cincinnatus, July 21 (C. P. A.).

Erie County: Hamburg, May 28 (M. C. VD.); Buffalo, June 26 (J. G. N.);
 June 27 to November 11 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 1 to August 24 (C. P. A.); etc.

Genesee County: Batavia, September 3 (H. H. K.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Jefferson County: Alexandria Bay, September 3.

Monroe County: Honeoye Falls, July 4 to September 1 (C. R. C.).

Onondaga County: Baldwinsville, June 14; Manlius, August 18 (H. H. S.).

Ontario County: Clifton Springs, August 23.

Suffolk County: Astoria; Maspeth, June 1; Bellport, June 2; North Beach,
 September 18.

Sullivan County: White Lake, August 21 (J. L. Z.).

Tompkins County: Ithaca, May 7 to September 20 (C. P. A.); etc.

Genus *Nephrotoma* Meigen (*continued*)*N. gracilicornis* (Loew)

Onondaga County: Manlius, August 8 (H. H. S.).

N. incurva (Loew)

Albany County: Albany, July 1 (D. B. Y.).

Cortland County: Taylor, July 20 (C. P. A.).

Erie County: East Aurora, June 12 to August 25 (M. C. VD.); South Wales, July 9-13 (M. C. VD.).

Essex County: Keene Valley, July 26 (J. A. L.).

Fulton County: Sacandaga Park, June 1-11 (C. P. A.); etc.

Genesee County: Batavia, July 22 (H. H. K.).

Greene County: New Baltimore, May 29 (D. B. Y.).

Hamilton County: Lake Placid, August 7 (J. A. L.).

Niagara County: Niagara Falls, June 9 (M. C. VD.).

Onondaga County: Manlius, August 24 (H. H. S.).

Tompkins County: Ithaca, June 18 to August 4 (C. P. A.); etc.

N. lugens (Loew)

Albany County: Karner, June 26 (D. B. Y.).

Cattaraugus County: Rock City, June 16 (H. H. K.).

Essex County: Elizabethtown, June 8 (D. B. Y.); Keene Valley, June 17 (J. A. L.).

Fulton County: Sacandaga Park, June 5-16 (C. P. A.); etc.

Genesee County: Batavia, July 19 (H. H. K.).

Herkimer County: Newport, May 29 (D. B. Y.); Indian Castle, June 13 (C. P. A.).

Steuben County: Lake Keuka, June 15 (C. R. C.).

Tompkins County: Ithaca, May 25 to June 29 (C. P. A.); Norton's Landing, June 2 (H. H. S.).

N. macrocera (Say)

Fulton County: Sacandaga Park, June 11-29 (C. P. A.); etc.

Westchester County: Tarrytown, June 16 (S. W. F.).

N. pedunculata (Loew)

Cattaraugus County: Four-Mile, July 4 (H. H. K.).

Cortland County: Taylor, July 20 (C. P. A.).

Essex County: Keene Valley, July 30 (J. A. L.).

Fulton County: Sacandaga Park, June 15 (C. P. A.).

Genesee County: Batavia, June 27 (H. H. K.).

Suffolk County: Long Island, July.

N. polymera (Loew)

Fulton County: Sacandaga Park, June 11-29 (C. P. A.).

Niagara County: Niagara Falls, June 9 (M. C. VD.).

Rensselaer County: Brookview, July 16 (M. M. A.).

Tompkins County: Ithaca, June 29.

N. sodalis (Loew)

Onondaga County: Baldwinsville, June 13.

N. tenuis (Loew)

Cattaraugus County: Rock City, June 16 to July 4 (H. H. K.).

Cortland County: Cincinnatus, July 21 (C. P. A.).

Dutchess County: Poughkeepsie, June 4 (D. B. Y.).

Erie County: Colden, July 10 (M. C. VD.); East Aurora, July 23 to August 21 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 11-27 (C. P. A.); etc.

Genesee County: Batavia, June 22 (H. H. K.).

Sullivan County: August (Dietz collection).

Tompkins County: Ithaca, July 4 to August 2.

Westchester County: Tarrytown, June 16 (S. W. F.).

Genus *Nephrotoma* Meigen (*continued*):*N. virescens* (Loew)

Fulton County: Mountain Lake, altitude 1500 feet, August 13 (C. P. A.).
 Tompkins County: Cascadilla Creek, near Ithaca, July 11 (H. Y.).

N. xanthostigma (Loew)

Erie County: Colden, August 7 (M. C. VD.); Lancaster, September 13 (M. C. VD.); etc.
 Suffolk County: Yaphank, June 28 (A. M. N.); Cold Spring Harbor, July 15 (A. L. M.); Bellport, August 1.
 Sullivan County: August, 1912 (Dietz collection).

Genus *Tipula* LinnaeusSubgenus *Cinctotipula* Alexander*Tipula algonquin* Alex.

Essex County: Keene Valley, July 29 (J. A. L.); Elizabethtown, August 25 (D. B. Y.).

T. unimaculata (Loew)

Essex County: New Russia, August (J. C. B.)
 Fulton County: Sacandaga Park, August 24 (C. P. A.).
 Hamilton County: Hope Township, September 12-13 (C. P. A.).
 Onondaga County: Manlius, September 6 (H. H. S.).
 Tompkins County: Norton's Landing, September 6 (H. H. S.).
 Wayne County: Sodus, August 15.

Subgenus *Odonotipula* Alexander*Tipula unifasciata* (Loew)

Onondaga County: Manlius, August 29 (H. H. S.).
 Tompkins County: Norton's Landing, August 12 (H. H. S.).

Subgenus *Trichotipula* Alexander*Tipula oropezoides* Johns.

Erie County: Hamburg, May 28 (M. C. VD.).
 Fulton County: Sacandaga Park, June 1 (C. P. A.); Gloversville, June 6-28 (C. P. A.).
 Herkimer County: Indian Castle, June 13 (C. P. A.).
 Tompkins County: McLean, May 22 to June 5 (H. E. S.). Ithaca, May 29 to June 10 (C. P. A.).

Subgenus *Tipula* Linnaeus*Tipula abdominalis* (Say)

Albany County: Coeymans, August 5.
 Delaware County: Arkville, August (F. N. H.). (In Kansas University collection.)
 Erie County: Gowanda, June 7-14, August 30 (M. C. VD.).
 Essex County: Keene Valley, July 1 (J. A. L.); Lake Placid, August 19; New Russia, September 12-30 (J. C. B.).
 Franklin County: Saranac Inn (J. G. N.).
 Fulton County: Gloversville, July 29 to August 20 (Bromme).
 Herkimer County: Old Forge, August 4 (J. G. N.).
 Livingston County: Hemlock Lake, August 29 (C. R. C.).
 Monroe County: Rochester Junction, June 9 (M. D. L.).
 Oneida County: Brown Brook, July 14 (larvae) (W. A. C.).
 Schoharie County: Sharon Springs (O. S.).
 Suffolk County: Long Island, July.
 Sullivan County: August (Dietz collection).
 Tompkins County: Ithaca, August 30 to September 10.
 Ulster County: Catskills, July (O. S.); Ellenville, August 10 (A. M. N.).
 Wayne County: Newark, May 14.
 Wyoming County: Portage, May 24 (H. H. K.).

Genus *Tipula* Linnaeus (*continued*)Subgenus *Tipula* Linnaeus (*continued*)*T. afflicta* Dietz

Erie County: South Wales, July 9 (M. C. VD.).

T. angustipennis Loew

Albany County: Karner, May 22 to June 13 (D. B. Y.); Albany, June 25 (D. B. Y.).

Erie County: Holland, May 21 (M. C. VD.).

Fulton County: Sacandaga Park, June 1-11 (C. P. A.); etc.

Herkimer County: Ilion, May 17 (D. B. Y.); Indian Castle, June 13 (C. P. A.).

Tompkins County: Ithaca, April 26 to June 20 (C. P. A.); etc.

T. apicalis Loew

Albany County: Albany, June 26 (D. B. Y.).

Essex County: Keene Valley, July 13 (J. A. L.).

Fulton County: Sacandaga Park, June 5-16 (C. P. A.).

Tompkins County: Ithaca, May 24-29; McLean, May 31 to June 5 (C. P. A.).

Westchester County: Dobbs Ferry (O. S.), T. L.

T. bella Loew

Albany County: Albany, June 7 (D. B. Y.).

Broome County: Binghamton (Dietz collection).

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: North Evans, May 24 (M. C. VD.); East Aurora, August 21 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 1 to September 28 (C. P. A.); etc.

Genesee County: Batavia, September 1 (H. H. K.).

Greene County: New Baltimore, August 16 (D. B. Y.).

Monroe County: Honeoye Falls, September 1 (C. R. C.).

Nassau County: Sea Cliff, May (N. B.).

Oneida County: Remsen, July 5 (W. A. C.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Queens County: May 16 to July.

Suffolk County: Bellport.

Tioga County: Willseyville, May 25 (W. A. H.).

Tompkins County: Ithaca, May 1 to September 10 (C. P. A.); etc.

T. bicornis Forbes

Erie County: East Aurora, June 11-16 (M. C. VD.); Lancaster, June 19 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 29 (C. P. A.).

Orange County: West Point (O. S.).

St. Lawrence County: Potsdam, June.

Tompkins County: McLean, May 31 (C. P. A.); Ithaca, June 5-12; July 3 (H. Y.); etc.

T. caloptera Loew

Erie County: North Evans, May 14 to June 28 (M. C. VD.); Colden, May 23 (M. C. VD.); etc.

Fulton County: Gloversville, May 18 to June 30 (C. P. A.); Sacandaga Park, June 1 (C. P. A.); etc.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Niagara County: Niagara Falls, June 23 (M. C. VD.).

Oneida County: Mill Creek, July 7 (W. A. C.).

Rensselaer County: Brookview, July 16 (M. M. A.).

Suffolk County: Yaphank, June 28 to September 2 (A. M. N.); Bellport, September.

Tompkins County: Ithaca, May 5-30 (C. P. A.); McLean, June 5 (C. P. A.); etc.

Wyoming County: Wyoming, June 25 (H. H. K.).

Genus *Tipula* Linnaeus (*continued*)Subgenus *Tipula* Linnaeus (*continued*)*T. cayuga* Alex.

Fulton County: Gloversville, June 9 (C. P. A.); T. L.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Tompkins County: Ithaca, May 13-30 (C. P. A.).

T. collaris Say

Albany County: Albany, May 8 (D. B. Y.).

Cattaraugus County: Little Valley, June 30 (M. C. VD.).

Erie County: Colden, May 23 to July 1 (M. C. VD.); Gowanda, June 8 (M. C. VD.); etc.

Fulton County: Gloversville, June 9-24 (C. P. A.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Nassau County: Sea Cliff, May 20 (N. B.).

Tompkins County: Ithaca, May 3 to June 20 (C. P. A. and L. W. C.); etc.

T. cunctans Say

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Hamburg, September 11 to October 25 (M. C. VD.); Buffalo, September 25 to October 2 (M. C. VD.); etc.

Genesee County: Batavia, September 12-28 (H. H. K.).

Jefferson County: Alexandria Bay, September 3.

Kings County: Flatbush, September 13.

Niagara County: Niagara Falls, September 17 (M. C. VD.); Grand Island, October 4 (M. C. VD.).

Ontario County: Clifton Springs, September 12.

Tioga County: Owego, October 24 (H. H. K.).

Tompkins County: McLean, September 28 (C. R. C.); Ithaca, October 4.

T. dejecta Walk.

Albany County: Karner, April 25 (D. B. Y.); Albany, May 3 (D. B. Y.).

Erie County: Hamburg, May 14-22 (M. C. VD.); Colden, May 23-29 (M. C. VD.).

Fulton County: Gloversville, May 14 (C. P. A.).

Nassau County: Sea Cliff, May 1 (N. B.).

Tompkins County: Ithaca, April 26 to May 31 (C. P. A.).

T. eluta Loew

Dutchess County: Rhinebeck, July 27 (C. R. C.).

Erie County: Lancaster, May 31 (M. C. VD.); Elma, August 27 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 11-29 (C. P. A.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Tompkins County: Ithaca, May 24 (E. T. W.); etc.

Ulster County: Ellenville, July 20 (A. M. N.).

T. fragilis Loew

Erie County: Lancaster, September 24 (M. C. VD.); Buffalo, October 3 (M. C. VD.); etc.

Essex County: Lake Placid, altitude 2000 feet (Johnson collection).

Fulton County: Gloversville, September 7-20 (C. P. A.); etc.

Greene County: New Baltimore, September 17 (D. B. Y.).

Hamilton County: Big Notch Mountain, Hope Township, September 12 (C. P. A.).

Tompkins County: Ithaca, September 29 to October 9 (C. P. A.); Taughannock Falls, October 25 (C. R. C.).

T. fuliginosa (Say)

Albany County: Helderbergs, July 3 (C. P. A.).

Cattaraugus County: Rock City, June 16 (H. H. K.).

Genus *Tipula* Linnaeus (continued)Subgenus *Tipula* Linnaeus (continued)*T. fuliginosa* (Say) (continued)

Erie County: Lancaster, June 4 (M. C. VD.); East Aurora, June 11 (M. C. VD.); Colden, July 3 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 13-27 (C. P. A.).

Hamilton County: Mount Buell, June 13 (C. P. A.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Livingston County: Conesus Lake, June 22 (H. H. K.).

Tompkins County: McLean, June 5 (C. P. A.); Ithaca, June 20 to July 4 (C. P. A.).

Wyoming County: Portage, June 13-22 (H. H. K.).

T. fultonensis Alex.

Fulton County: Mount Buell, Sacandaga Park, altitude 1500 feet, June 15 (C. P. A.), T. L.

T. georgiana Alex.

Westchester County: New Rochelle (O. S.), T. L.

T. grata Loew

Erie County: Buffalo, August 5 (M. C. VD.).

Herkimer County: Old Forge, July 6 (J. G. N.).

Western New York: (O. S.), T. L.

T. hebes Loew

Cortland County: Taylor, July 20 (C. P. A.); Cincinnati, July 21 (C. P. A.).

Erie County: Colden, August 3 (M. C. VD.); Hamburg, August 10 (M. C. VD.); East Aurora, August 21 (M. C. VD.).

Fulton County: Sacandaga Park, June 29 (C. P. A.); Johnstown, July 31 (C. P. A.).

Genesee County: Batavia, August 10 (H. H. K.).

Herkimer County: Old Forge, July 20 (J. G. N.).

Suffolk County: Cold Spring Harbor, July 15 (A. L. M.).

Tompkins County: Ithaca, August 2-26 (C. P. A.).

Warren County: County-Line Flow, Griffin, July 26 (C. P. A.); Lake George, August 17 (J. L. Z.).

T. helderbergensis Alex.

Albany County: Indian Ladder, Helderbergs, July 3 (C. P. A.), T. L.

Hamilton County: Wells, July 31 (D. B. Y.).

T. hermannia Alex.

Albany County: Albany, July 1 (D. B. Y.).

Cortland County: Taylor, July 20 (C. P. A.); Cincinnati, July 21 (C. P. A.).

Essex County: Keene Valley, July 14 (J. A. L.); New Russia, August (J. C. B.).

Fulton County: Sacandaga Park, June 11 to August 24 (C. P. A.); etc.

Greene County: New Baltimore, August 16 (D. B. Y.).

Hamilton County: Wells, July 30 to August 31 (D. B. Y.); Speculator, August 27 (D. B. Y.).

Herkimer County: Indian Castle, June 13 (C. P. A.); Old Forge, August (J. G. N.).

Livingston County: Hemlock Lake, August 29 (C. R. C.).

Niagara County: Niagara Falls, June 28 (M. C. VD.).

Rockland County: Palisades (O. S.).

Schoharie County: Sharon Springs (O. S.), T. L.

Tompkins County: Ithaca, June 17 (J. G. N.); etc.

Ulster County: Catskills, July (O. S.).

Westchester County: Tarrytown, June 9 (S. W. F.).

T. hirsuta Doane

Fulton County: Mayfield Mountain, June 19 (C. P. A.).

Genus *Tipula* Linnaeus (continued)Subgenus *Tipula* Linnaeus (continued)*T. ignobilis* Loew

Albany County: Helderbergs, July 3 (C. P. A.).

Tompkins County: Ithaca, reared from larvae, May 21-26 (C. P. A.).

Ulster County: Catskills, July (O. S.).

T. iroquois Alex.

Fulton County: Mountain Lake, June 13 (C. P. A.); Gloversville, June 24 (C. P. A.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Tompkins County: Ithaca, May 3 to June 20 (C. P. A.); Ludlowville, May 4 (E. M.).

Wyoming County: Portage, May 24 (H. H. K.).

T. latipennis Loew

Erie County: Buffalo, June 26 (M. C. VD.); Grand Island, June 26 (M. C. VD.).

Fulton County: Sacandaga Park, July 3 (C. P. A.).

Genesee County: Batavia, August 1 (H. H. K.).

Niagara County: Grand Island, June 26 (M. C. VD.).

Rensselaer County: Brookview, July 15 (M. M. A.).

T. longiventris Loew

Cattaraugus County: Rock City, June 6 (W. T. M. F.).

Erie County: East Auburn, June 11 (M. C. VD.).

Fulton County: Sacandaga Park, July 29 (C. P. A.); Woodworth's Lake, August (C. P. A.).

Suffolk County: Bellport, May 27, July 6. (Part of the type material was collected in New York State by Edwards.)

T. macrolabis Loew

Albany County: Helderbergs, July 3 (C. P. A.).

Fulton County: Mount Buell, June 18-27 (C. P. A.); etc.

Herkimer County: Indian Castle, June 13 (C. P. A.).

T. margarita Alex.

Tompkins County: Ithaca, June 12 (C. P. A.), T. L.

T. mingwe Alex.

Fulton County: Sacandaga Park, August 24 (C. P. A.).

Genesee County: Batavia, July 22 (H. H. K.).

Hamilton County: Bennett Lake, Hope Township, September 12 (C. P. A.), T. L.

Onondaga County: Manlius, August 20 (H. H. S.).

Schoharie County: Sharon Springs (O. S.).

Tompkins County: Ithaca, August 1 (C. P. A.).

Wayne County: Sodus, July 9.

T. monticola Alex.

Cattaraugus County: Rock City, June 16 (H. H. K.).

Fulton County: Woodworth's Lake, June 18 (C. P. A.), T. L.; etc.

Hamilton County: Wells, July 23 (D. B. Y.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Tompkins County: Ithaca, June 3 (S. A. G.); McLean, June 5 (C. P. A.).

T. nobilis (Loew)

Albany County: Karner, June 19 (D. B. Y.).

Fulton County: Sacandaga Park, June 17 (C. P. A.); Woodworth's Lake, June 23 (C. P. A.).

Tompkins County: McLean, June 5 (C. P. A.).

Wyoming County: June 25 (H. H. K.).

Genus *Tipula* Linnaeus (*continued*)Subgenus *Tipula* Linnaeus (*continued*)*T. parshleyi* Alex.

Franklin County: Axton, June 12-22 (A. D. M. and C. O. H.).

T. penobscot Alex.

Fulton County: Mount Buell, altitude 1800 feet, June 18 (C. P. A.).

T. perlongipes Johns.

Fulton County: Canada Lake, altitude 1500 feet, June 20 (C. P. A.).

Queens County: Flushing, June 22 (C. R. P.).

T. rohweri Doane

Erie County: East Aurora, May 18 (M. C. VD.); Elma, August 20 (M. C. VD.).

(Mr. Van Duzee records this species, but the record seems very doubtful to the writer since typical *rohweri* is western in its distribution.)

T. sackeniana Alex.

Tompkins County: Ithaca, August 26 (C. P. A.), T. L.

T. sayi Alex.

Cattaraugus County: Olean, September 5 (C. R. C.).

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Erie County: Elma, August 20 (M. C. VD.); Hamburg, September 11-25 (M. C. VD.); Buffalo, September 21 (M. C. VD.); etc.

Fulton County: Gloversville, September 17-25 (C. P. A.); etc.

Genesee County: Batavia, September 11 (H. H. K.).

Herkimer County: Old Forge, August 23 (J. G. N.).

New York: August 5 to September 23.

Orange County: Goshen, September 7; West Point, September 8 (O. S.).

Sullivan County: August (Dietz collection).

Tompkins County: Ithaca, August 26-28 (C. P. A.); etc.

Warren County: County-Line Flow, Griffin, July 26 (C. P. A.).

T. senega Alex.

Albany County: Helderbergs, June 12 (C. P. A.).

Erie County: Holland, May 21 (M. C. VD.); East Aurora, June 11 (M. C. VD.).

Fulton County: Mountain Lake, June 13-23 (C. P. A.); Mount Buell, June 15-29 (C. P. A.).

Tompkins County: Ithaca, May 7 to June 20 (L. W. C.); McLean, June 5 (C. P. A.).

T. serti Loew

Erie County: Holland, May 21 (M. C. VD.); Lancaster, May 31 (M. C. VD.); Buffalo, June 5 (M. C. VD.).

Fulton County: Gloversville, June 6-20 (C. P. A.); etc.

Tompkins County: Ithaca, May 31 to June 20 (C. P. A.); etc.

T. strepens Loew

Cortland County: Taylor, July 20 (C. P. A.); Cincinnatus, July 21 (C. P. A.).

Fulton County: Sacandaga Park, June 6-20 (C. P. A.); etc.

Herkimer County: Indian Castle, June 13 (C. P. A.).

Niagara County: Niagara Falls, June 24 (M. C. VD.).

Rockland County: Palisades (O. S.).

Saratoga County: Corinth, June 22 (D. B. Y.).

Tioga County: Willseyville, May 25 (W. A. H.).

Tompkins County: Ithaca, May 20-29 (C. P. A.); McLean, June 5 (C. P. A.).

T. submaculata Loew

Albany County: Albany, June 26 (D. B. Y.); Helderbergs, July 3 (C. P. A.).

Cattaraugus County: Four-Mile, July 4 (H. H. K.).

Genus *Tipula* Linnaeus (continued)Subgenus *Tipula* Linnaeus (continued)*T. submaculata* Loew (continued)

Cortland County: Cincinnatus, July 21 (C. P. A.).

Erie County: North Evans, July 4 (M. C. VD.).

Fulton County: Sacandaga Park, June 20 to July 4 (C. P. A.); Gloversville, June 27 (C. P. A.); etc.

Genesee County: Batavia, July 14-25 (H. H. K.).

Saratoga County: Corinth, June 23 (D. B. Y.).

Tompkins County: Ithaca, June 20 (L. W. C.); etc.

(Part of the type material was collected in New York State.)

T. sulphurca Doane

Onondaga County: Green Lake, June 8 (C. P. A.).

T. taughannock Alex.

Albany County: Helderbergs, June 12 (C. P. A.).

Fulton County: Mount Buell, altitude 1800 feet, June 13 (W. P. A. and C. P. A.), T. L.

Tompkins County: Taughannock Falls, May 19 (C. P. A.).

T. tephrocephala Loew

Albany County: Karner, June 5 (D. B. Y.).

Fulton County: Sacandaga Park, June 16-28 (C. P. A.); etc.

Genesee County: Batavia, June 1 (H. H. K.).

Herkimer County: Indian Castle, June 9 (C. P. A.).

Rockland County: Palisades (O. S.), T. L.

Schenectady County: Schenectady, June 14 (C. P. A.).

Tompkins County: Ithaca, May 16-29 (C. P. A.); McLean, June 5 (C. P. A.).

T. tricolor Fabr.

Columbia County: Niverville, August 24 (A. P. M.).

Cortland County: Cincinnatus, July 21 (C. P. A.).

Fulton County: Gloversville, August 18 to September 12 (C. P. A.); etc.

Genesee County: Batavia, June 19 (H. H. K.).

Herkimer County: Indian Castle, June 9-13 (C. P. A.); Trenton Falls, July (O. S.).

New York: (Hy. Edwards collection.)

Suffolk County: July.

Tompkins County: Ithaca, May 29 to August 28 (C. P. A.); etc.

T. trivittata Say

Albany County: Albany, June 11 (D. B. Y.); Helderbergs, June 12 (C. P. A.).

Cattaraugus County: Mix Creek Valley, June 11 (J. C. B.).

Cortland County: Blodgett Mills, June 29 (A. O.).

Erie County: Lancaster, May 31 to June 2 (M. C. VD.); South Wales, July 9 (M. C. VD.); etc.

Fulton County: Sacandaga Park, June 11 (C. P. A.); etc.

Genesee County: Batavia, June 22-23 (H. H. K.).

Niagara County: Niagara Falls, June 24 (M. C. VD.).

Schenectady County: Schenectady, June 14 (C. P. A.).

Tompkins County: Ithaca, May 17 to July 2 (C. P. A.); etc.

T. ultima Alex.

Cayuga County: North Fair Haven, September 12 (C. P. A.).

Delaware County: Delhi, September 21 (A. M.).

Erie County: Hamburg, September 11-25 (M. C. VD.); Lancaster, September 13 (M. C. VD.); etc.

Fulton County: Gloversville, September 15-20 (C. P. A.); etc.

Genesee County: Batavia, September 12-28 (H. H. K.).

Hamilton County: Middle Lake, Hope Township, September 13 (C. P. A.).

Genus *Tipula* Linnaeus (*continued*)Subgenus *Tipula* Linnaeus (*continued*)*T. ultima* Alex. (*continued*)

Kings County: Flatbush, September 28.

Suffolk County: North Beach, September 18.

Tompkins County: Ithaca, September 29 to October 10 (C. P. A.).

Westchester County: Peekskill, September 15 (Van Atta).

T. umbrosa Loew

Essex County: Keene Valley, August 10 (J. A. L.).

Fulton County: Sacandaga Park, June 24-29 (C. P. A.).

Hamilton County: Long Lake, August 9 (J. A. L.).

Herkimer County: Old Forge, July 25 (J. G. N.).

Tompkins County: Ithaca, July 20 (L. W. C.).

T. valida Loew

Albany County: Helderbergs, June 12 (C. P. A.).

Cattaraugus County: Rock City, June 16 (H. H. K.).

Erie County: Lancaster, June 2-4 (M. C. VD.); North Evans, July 4 (M. C. VD.); etc.

Fulton County: Woodworth's Lake, May 30 to June 15 (C. P. A.); Sacandaga Park, June 1-21 (C. P. A.).

Herkimer County: Indian Castle, June 13 (C. P. A.).

Onondaga County: Green Lake, June 8 (C. P. A.).

Saratoga County: Corinth, June 22 (D. B. Y.).

Tompkins County: Ithaca, May 26 to June 20 (C. P. A.).

T. vicina Dietz

Erie County: Lancaster, May 31 (M. C. VD.), T. L.; Hamburg, June 7 (M. C. VD.).

Regional species: *Aeshnasoma rivertonensis* Johns., *Nephrotoma approximata* (Dietz), *N. cingulata* (Dietz), *N. festina* (Dietz), *N. hirsutula* (Dietz), *N. obliterata* (Dietz), *N. occipitalis* (Loew), *N. penumbra* Alex., *N. punctum* (Loew), *N. stigmatica* (Dietz), *N. teneraria* (Dietz), *N. vitula* (Loew), *N. wyalusingensis* (Dietz), *Tipula angulata* Loew, *T. annulicornis* Say, *T. aprilina* Alex., *T. centralis* Loew, *T. cincticornis* Doane, *T. conspicua* Dietz, *T. fraterna* Loew, *T. huron* Alex., *T. johnsoniana* Alex., *T. mainensis* Alex., *T. megaura* Doane, *T. morrisoni* Alex., *T. pachyrhinoides* Alex., *T. ternaria* Loew.

Distribution of the Tipulidae and related families by life zones

North America may be divided into seven roughly parallel belts, or zones, termed life zones, which extend more or less completely across the continent and are distinguished from one another by peculiarities of their fauna and flora, by the annual precipitation, and by other characteristics. Beginning with the treeless Arctic-Alpine zone in northern Canada and passing southward, they comprise the Hudsonian, the Canadian, the Transition, the Upper Austral, the Lower Austral, and finally the Tropical zone, the last-named being found in the United States only in southern Florida and Texas.

These belts are by no means regularly parallel. In certain localities they run north or south at right angles to their usual course and encroach

on the adjacent zones. Thus the Canadian life zone of southern Canada and the northern United States extends southward in the mountains as far as Georgia, the same faunal and floral conditions prevailing in the high Alleghenies of Virginia and the Great Smoky Mountains of western North Carolina as are found at much lower levels in the northern parts of the United States. By this it is seen that the same result is obtained by climbing these mountains as by a long journey from south to north, a rise of a few feet in altitude being equivalent to many miles of latitude. Similarly there are extensions of the Upper Austral zone northward into the Transition zone, these being produced by favorable conditions of warmth and moisture. In New York State is found an extensive Austral belt along the southern shores of Lake Ontario, altho the country due southward is Transitional or even Canadian in its tendencies. Such isolated islands are by no means infrequent.⁴

The crane-fly fauna seems to be fairly well distributed in these zones, and in the following pages the various species are arranged in their respective places. As has already been stated, crane-flies are notable lovers of rich vegetation, usually near running or standing water. Definite groups of crane-fly species may be expected to occur in certain floral communities, this relationship being often well marked. In cold Canadian woods, such as are found in the Adirondacks and Catskills and as isolated islands in the bogs and gorges thruout the State, definite plant associations are found, each of which supports an equally well-defined society of crane-flies. As a correlation and aid in checking these various species, the plants that the writer believes to be characteristic of the different life zones are herewith included.

The Boreal region

The Arctic-Alpine zone.—“The Arctic or Arctic-Alpine zone lies above the limit of tree growth and is characterized by such plants as the arctic poppy, dwarf willow, and various saxifrages and gentians. . . .

⁴ The following papers refer to this subject:
 Bray, William L. The development of the vegetation of New York State. New York State Coll. Forestry, Syracuse Univ., Tech. pub. 3:1-186. 1915.
 Eaton, Elon Howard. Life zones of New York State. *In* Birds of New York. New York State Museum, Memoir 12:19-42. 1910.
 Merriam, C. Hart. The geographic distribution of life in North America. Smithsonian Inst., Ann. Rept. Bd. Regents 1891:365-415. 1893.
 Merriam, C. Hart. Life zones and crop zones of the United States, Part II. U. S. Dept. Agr., Div. Biol. Survey, Bul. 10:18-53. 1898.
 Miller, Gerrit S., jr. Life zones of New York. *In* Preliminary list of the mammals of New York. New York State Museum, Bul. 6²⁹:280-292. 1899.

Within the United States the Arctic-Alpine zone is restricted to the area above timber-line on the summits of high mountains." (Merriam, 1898:18-19.)

The crane-flies in this zone are considered in connection with those in the Hudsonian zone.

The Hudsonian zone.—"The Hudsonian zone comprises the northern part of the great transcontinental coniferous forest — a forest of spruces and firs stretching from Labrador to Alaska — and . . . In the eastern United States the Hudsonian zone is restricted to the cold summits of the highest mountains, where it occurs in the form of a chain of widely separated islands reaching from northern New England to western North Carolina." (Merriam, 1898:19.)

The following plants may be considered as Hudsonian species:

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|--|--|
| <i>Hierochloë alpina</i> (Sw.) R. & S. | <i>Ranunculus lapponicus</i> L. |
| <i>Poa laxa</i> Haenke | <i>Empetrum nigrum</i> L. |
| <i>Scirpus caespitosus</i> L. | <i>Rhododendron lapponicum</i> (L.) Wahlenb. |
| <i>Carex capillaris</i> L. | <i>Cassiope hypnoides</i> (L.) D. Don. |
| <i>rariflora</i> Smith | <i>Arctostaphylos alpina</i> (L.) Spreng. |
| <i>rigida</i> Good. | <i>Vaccinium caespitosum</i> Michx. |
| <i>capitata</i> L. | <i>uliginosum</i> L. |
| <i>Juncus trifidus</i> L. | <i>Vitis-Idaea</i> L., var. <i>minus</i> Lodd. |
| <i>Salix herbacea</i> L. | <i>Diapensia lapponica</i> L. |
| <i>Uva-ursi</i> Pursh | <i>Primula mistassinica</i> Michx. |
| <i>Betula glandulosa</i> Michx. | <i>Pinguicula vulgaris</i> L. |
| <i>Arenaria groenlandica</i> (Retz.) Spreng. | <i>Prenanthes nana</i> (Bigel.) Torr. |
| <i>Saxifraga aizoides</i> L. | <i>Solidago Cutleri</i> Fernald |

The following species of crane-flies may be considered as Arctic-Alpine species finding their southern limit in the Hudsonian zone:

| | |
|--------------------------------------|------------------------------|
| <i>Rhabdomastix caudata</i> (Lundb.) | <i>Tipula centralis</i> Loew |
| <i>Tricyphona hannai</i> Alex. | <i>labradorica</i> Alex. |
| <i>hyperborea</i> (O. S.) | <i>loewiana</i> Alex. |
| <i>Tipula aperta</i> Alex. | <i>piliceps</i> Alex. |
| <i>appendiculata</i> Loew | <i>septentrionalis</i> Loew |
| <i>arctica</i> Curt. | <i>serrulata</i> Loew |
| <i>balioptera</i> Loew | <i>subfasciata</i> Loew |
| <i>besselsi</i> O. S. | <i>ternaria</i> Loew |
| <i>canadensis</i> Loew | |

The Canadian zone.—"The Canadian zone comprises the southern part of the great transcontinental coniferous forest of Canada, the northern parts of Maine, New Hampshire, and Michigan, . . . and the greater part of the high mountains of the United States and Mexico." (Merriam, 1898:19.)

The following plants may be considered as Canadian species:

- | | |
|---|---|
| <i>Carex exilis</i> Dewey | <i>Dalibarda repens</i> L. |
| <i>tenuiflora</i> Wahlenb. | <i>Oxalis Acetosella</i> L. |
| <i>diandra</i> Schrank | <i>Ilex monticola</i> Gray |
| <i>pauciflora</i> Lightf. | <i>Acer spicatum</i> Lam. |
| <i>leptalea</i> Wahlenb. | <i>Rhamnus alnifolia</i> L'Hér. |
| <i>livida</i> (Wahlenb.) Willd. | <i>Viola Selkirkii</i> Pursh |
| <i>oligosperma</i> Michx. | <i>lanceolata</i> L. |
| <i>Calla palustris</i> L. | <i>Epilobium molle</i> Torr. |
| <i>Clintonia borealis</i> (Ait.) Raf. | <i>Circaea alpina</i> L. |
| <i>Smilacina trifolia</i> (L.) Desf. | <i>Panax quinquefolium</i> L. |
| <i>Streptopus amplexifolius</i> (L.) DC. | <i>Cornus canadensis</i> L. |
| <i>Trillium undulatum</i> Willd. | <i>Ledum groenlandicum</i> Oeder |
| <i>Habenaria macrophylla</i> Goldie | <i>Kalmia polifolia</i> Wang. |
| <i>bracteata</i> (Willd.) R. Br. | <i>Andromeda glaucophylla</i> Link. |
| <i>Arethusa bulbosa</i> L. | <i>Chamaedaphne calyculata</i> (L.) Moench |
| <i>Calypso bulbosa</i> (L.) Oakes | <i>Arctostaphylos Uva-ursi</i> (L.) Spreng. |
| <i>Salix rostrata</i> Richards | <i>Chiogenes hispidula</i> (L.) T. & G. |
| <i>candida</i> Flüggé | <i>Menyanthes trifoliata</i> L. |
| <i>Populus balsamifera</i> L. | <i>Galium labradoricum</i> Wiegand |
| <i>Betula alba</i> var. <i>papyrifera</i> (Marsh.) Spach. | <i>Lonicera oblongifolia</i> (Goldie) Hook. |
| <i>Stellaria borealis</i> Bigel. | <i>Linnæa borealis</i> L., var. <i>americana</i> (Forbes) |
| <i>Coptis trifolia</i> (L.) Salisb. | Rehder |
| <i>Actæa rubra</i> (Ait.) Willd. | <i>Viburnum alnifolium</i> Marsh. |
| <i>Mitella nuda</i> L. | <i>Solidago macrophylla</i> Pursh |
| <i>Ribes triste</i> Pall. | <i>uliginosa</i> Nutt. |
| <i>Pyrus americana</i> (Marsh.) DC. | <i>Senecio Robbinsii</i> Oakes |
| <i>Potentilla tridentata</i> Ait. | |

The following species of crane-flies may be considered as Canadian species:

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|---|--------------------------------------|
| <i>Bittacomorphella jonesi</i> (Johns.) | <i>Limnophila tenuicornis</i> O. S. |
| <i>Dicranomyia halterata</i> O. S. | <i>toxoneura</i> O. S. |
| <i>Limnobia hudsonica</i> O. S. | <i>unica</i> O. S. |
| <i>parietina</i> O. S. | <i>Eriocera brachycera</i> O. S. |
| <i>solitaria</i> O. S. | <i>Rhaphidolabis flavola</i> O. S. |
| <i>tristigma</i> O. S. | <i>modesta</i> (O. S.) |
| <i>Dicranoptycha germana</i> O. S. | <i>rubescens</i> Alex. |
| <i>Toxorhina mulicbris</i> (O. S.) | <i>Dicranota pallida</i> Alex. |
| <i>Erioptera chrysocoma</i> O. S. | <i>Tricyphona auripennis</i> (O. S.) |
| <i>megophthalma</i> Alex. | <i>calcar</i> (O. S.) |
| <i>nyctops</i> Alex. | <i>katahdin</i> Alex. |
| <i>stigmatica</i> (O. S.) | <i>Cylindrotoma americana</i> O. S. |
| <i>straminea</i> O. S. | <i>tarsalis</i> Johns. |
| <i>Ormosia monticola</i> (O. S.) | <i>Phalacrocerca neoæna</i> Alex. |
| <i>pygmaea</i> (Alex.) | <i>tipulina</i> O. S. |
| <i>Adelphomyia cayuga</i> Alex. | <i>Nephrotoma penumbra</i> Alex. |
| <i>minuta</i> Alex. | <i>vittula</i> (Loew) |
| <i>Limnophila allenii</i> Johns. | <i>Tipula angulata</i> Loew |
| <i>johnsoni</i> Alex. | <i>cayuga</i> Alex. |
| <i>munda</i> O. S. | <i>macrolabis</i> Loew |
| <i>osborni</i> Alex. | <i>mainensis</i> Alex. |
| <i>stanwoodae</i> Alex. | <i>monticola</i> Alex. |
| <i>subcostata</i> (Alex.) | <i>penobscot</i> Alex. |
| <i>subtenuicornis</i> (Alex.) | <i>scrtæ</i> Loew |

The Canadian-Transition zone.—A great many species occur in both the Canadian and the Transition life zone, and these for the most part find their northern or southern limit in one or the other of these belts. The floral constituents of this border zone are numerous and varied, a large number of the Canadian forms finding their southern limit in the Transition zone, and, conversely, many of the more southern species extending their range into, and finding their northern limit in favorable situations in, the Canadian zone. The more notable plants that seem to fall within this category are:

Maianthemum canadense Desf.
Streptopus roseus Michx.
Medeola virginiana L.
Cypripedium arietinum R. Br.
 hirsutum Mill.
Habenaria lacera (Michx.) R. Br.
Laportea canadensis (L.) Gaud.
Arceuthobium pusillum Peck
Asarum canadense L.
Polygonum amphibium L.
Caltha palustris L.
Actaea alba (L.) Mill.
Caulophyllum thalictroides (L.) Michx.
Corydalis sempervirens (L.) Pers.
Pyrus arbutifolia (L.) L. f.
 melanocarpa (Michx.) Willd.
Potentilla palustris (L.) Scop.

Rubus hispidus L.
Sanguisorba canadensis L.
Nemopanthus mucronata (L.) Trel.
Acer pennsylvanicum L.
Hypericum canadense L.
Trientalis americana (Pers.) Pursh
Gentiana linearis Froel.
Diervilla Lonicera Mill.
Viburnum cassinoides L.
Lobelia Kalmii L.
Solidago latifolia L.
 rugosa Mill.
 graminifolia (L.) Salisb.
Aster umbellatus Mill.
Anaphalis margaritacea (L.) B. & H.
Erechtites hieracifolia (L.) Raf.

The majority of the crane-flies of the northeastern United States seem to belong here. There are many species which are strongly Canadian in their associations but still seem to range outside the Canadian zone. In the following list these species are designated by the letter *C*, in parenthesis. It must be understood that many of these species are about as typically Canadian as those given in the preceding list, but slight extensions of their range make it appear more desirable to include them in this qualified list.

The few species which are Transitional but range into the Canadian zone are here designated by the letter *T*.

Protoplasma fitchii O. S.
Trichocera subsinuata Alex. (C)
Rhyphus alternatus Say
Dicranomyia gladiator O. S. (C)
 globithorax O. S. (C)
 haeretica O. S.
 immodesta O. S.

Dicranomyia macateei Alex. (C)
 monticola (Alex.) (C)
 morioides O. S.
 pubipennis O. S. (C)
 prudica O. S.
Limnobia triocellata O. S.
Rhipidia fidelis O. S.

- Rhipidia maculata* Meig.
Atarba picticornis O. S.
Elephantomyia westwoodi O. S. (C)
Rhamphidia mainensis Alex.
Ormosia apicalis Alex. (C)
 holotricha (O. S.)
 innocens (O. S.)
 meigenii (O. S.)
 nigripila (O. S.)
 nubila (O. S.)
 rubella (O. S.)
Erioptera armata O. S.
 armillaris O. S.
 villosa O. S. (C)
Molophilus fulltonensis Alex. (C)
 hirtipennis (O. S.)
 pubipennis (O. S.)
 ursinus (O. S.)
Gnophomyia tristissima O. S.
Gonomyia alexandri (Johns.)
 blanda O. S. (C)
 cognatella O. S. (T)
 florens Alex. (C)
 mathesoni Alex.
 noveboracensis Alex. (T)
 sacandaga Alex. (T)
 subcinerea O. S.
 sulphurella O. S. (T)
Rhabdomastix flava (Alex.) (T)
Cryptolabis paradoxa O. S.
Chionea valga Harr.
Cladura delicatula Alex. (C)
 flavoferruginea O. S.
Adelphomyia americana Alex. (C)
Limnophila albipes Leon. (C)
 aprilina O. S. (C)
 areolata O. S. (C)
 brevifurca O. S. (C)
 edwardi Alex. (C)
 emmelina Alex. (C)
 fuscovaria O. S. (C)
 imbecilla O. S.
 inornata O. S.
 laricicola Alex. (C)
 lenta O. S.
 montana O. S.
 mundoides Alex.
 nigripleura A. & L. (C)
 niveitarsis O. S. (C)
 noveboracensis Alex. (C)
 quadrata O. S.
 rufibasis O. S. (C)
 sylvia Alex. (C)
 ultima O. S. (C)

Ula elegans O. S. (C)
Ulomorpha pilosella (O. S.) (C)
Eriocera fulltonensis Alex.
 longicornis (Walk.)
 spinosa (O. S.)
 tristis Alex.
Hexatoma megacera (O. S.)
Dicranota eucera O. S.
 noveboracensis Alex.
 rivularis O. S.
Rhaphidolabis cayuga Alex.
 tenuipes O. S.
Pedicia albivitta Walk.
 contermina Walk. (C)
Tricyphona paludicola Alex.
 vernalis (O. S.) (C)
Liogma nodicornis (O. S.) (C)
Triogma exculpta O. S.
Dolichopeza americana Needm. (C)
Oropeza albipes Johns.
 obscura Johns. (C)
 venosa Johns. (C)
Ctenophora apicata O. S.
Nephrotoma eucera (Loew)
 incurva (Loew)
 lugens (Loew) (C)
 pedunculata (Loew) (C)
 polymera (Loew)
 tenuis (Loew)
 xanthostigma (Loew)
Stygeropsis fuscipennis Loew
Longurio testaceus Loew (C)
Tipula algonquin Alex.
 angustipennis Loew (C)
 apicalis Loew (C)
 bicornis Forbes
 caloptera Loew
 collaris Say (C)
 cunctans Say (T)
 dejecta Walk. (C)
 fragilis Loew (C)
 fuliginosa (Say) (T)
 hebes Loew (C)
 hermannia Alex. (C)
 hirsuta Doane
 iroquois Alex. (C)
 latipennis Loew (C)
 longiventris Loew
 megaura Doane (C)
 mingue Alex.
 nobilis (Loew) (C)
 orozeoides Johns. (C)
 parshleyi Alex. (C)
 perlongipes Johns. (T)
 senega Alex.

Tipula strepens Loew
submaculata Loew
sulphurea Doane (C)
taughannock Alex. (C)

Tipula tephrocephala Loew
ultima Alex. (T)
unimaculata (Loew)
valida Loew (C)

The Austral region

The Transition zone.—"The Transition zone . . . is the transcontinental belt in which Boreal and Austral elements overlap. From New England to the northern Rocky Mountains its course is fairly even and regular." (Merriam, 1898:20.)

The following plants may be considered as Transition species:

Schizaea pusilla Pursh
Chamaecyparis thyoides (L.) BSP.
Trillium grandiflorum (Michx.) Salisb.
cernuum L.
Aletris farinosa L.
Smilax hispida Muhl.
Juglans nigra L.
Ulmus racemosa Thomas

Sassafras variifolium (Salisb.) Ktze.
Crotalaria sagittalis L.
Polygala Nuttallii T. & G.
Nyssa aquatica L.
Asclepias verticillata L.
Datura Stramonium L.
Pentstemon hirsutus (L.) Willd.
Dianthera americana L.

The crane-flies of this area include the following species:

Dicranomyia rara O. S.
Limnobia fallax Johns.
Dicranoptycha sobrina O. S.
Gonomyia manca (O. S.)
Limnophila cubitalis O. S.
fasciolata O. S.
irrorata Johns.
Aeshnasoma rivertonensis Johns.

Tipula annulicornis Say
eluta Loew
fraterna Loew
georgiana Alex.
sayi Alex.
tricolor Fabr.
tuscarora Alex.
umbrosa Loew

Limnophila cubitalis perhaps might be better included in the list preceding this. *Tipula umbrosa* ranges from the Austral to the Canadian zone, but seems most numerous in the Transition zone.

The Upper Austral zone.—"The Carolinian faunal area [of the Upper Austral zone] . . . occupies the larger part of the Middle States, except the mountains." (Merriam, 1898:30.)

The following plants may be considered as Upper Austral species:

Pinus virginiana Mill.
echinata Mill.
Commelina communis L.
Saururus cernuus L.
Quercus falcata Michx.
marilandica Muench.
phellos L.
Nelumbo lutea (Willd.) Pers.

Cabomba caroliniana Gray
Asimina triloba Dunal
Corydalis flavula (Raf.) DC.
Liquidambar styraciflua L.
Desmodium laevigatum (Nutt.) DC.
Lespedeza repens (L.) Bart.
Ptelea trifoliata L.⁵
Evonymus americanus L.

⁵ Species characteristic of this zone but running into the Transition zone.

Ascyrum stans Michx.
Aralia spinosa L.
Ipomoea pandurata (L.) G. F. W. Mey.

Paulownia tomentosa (Thunb.) Steud.
Lonicera sempervirens L.
Viburnum nudum L.

The following species of crane-flies belong to this zone:

Dicranoptycha minima Alex.
nigripes O. S.
tigrina Alex.
winnemana Alex.
Toxorhina magna (O. S.)⁶
Gnophomyia luctuosa O. S.⁶
Epiphragma solatrix (O. S.)
Eriocera aurata Doane
wilsonii O. S.

Brachypremna dispellens (Walk.)⁶
Nephrotoma okefenoke (Alex.)
virescens (Loew)⁷
Tipula australis Doane
dictziana Alex.
flavibasis Alex.
morrisoni Alex.

The Lower Austral zone.—“The Lower Austral zone occupies the southern part of the United States, from Chesapeake Bay to the great interior valley of California.” (Merriam, 1898:41.)

This is a region characterized by a great number of southern plants, of which the cabbage palmetto (*Sabal palmetto* Lodd.), the Venus’s fly-trap (*Dionaea muscipula* Ellis), and the crape myrtle (*Lagerstroemia indica* L.) may be cited as typical. The following species of crane-flies belong to this zone:

Dicranomyia distans O. S.
floridana O. S.
Diotrepha mirabilis O. S.⁸
Gonomyia pleuralis (Will.)⁸
puer Alex.⁸
slossonae Alex.⁸
Polymera georgiae Alex.

Tipula aspidoptera Alex.
comanche Alex.
costaloides Alex.
gusa Alex.
ludoviciana Alex.
seminole Alex.
texensis Alex.

The Tropical region

The Tropical zone.—“The Tropical region within the United States is of small extent and is restricted to three widely separated localities — southern Florida, extreme southeast Texas . . . , and the valley of the lower Colorado River in Arizona and California. The Florida area is genuine humid tropical.” (Merriam, 1898:51-52.)

The following species of crane-flies pertain to this zone:

Dicranomyia reticulata Alex.
Rhipidia schwarzi Alex.
Geranomyia virscens Loew

Erioptera immaculata Alex.
Mcgisticera longipennis (Macq.)

⁶ Southern species reaching their northern limit in this zone.

⁷ Species characteristic of this zone but running into the Transition zone.

⁸ Tropical species reaching their northern limit in this zone.

SEASONAL DISTRIBUTION

Like many other groups of insects, the Holarctic crane-flies have a remarkably constant seasonal distribution, there being vernal, early summer, midsummer, and autumnal species, as well as forms that range over a much longer period. The vernal species appear soon after the melting of the ice in spring, and are on the wing for a month or two. Some few of these species reappear in late summer, and these are presumably double-brooded species. In New York, New England, and southern Canada the great majority of crane-flies are on the wing during the month of June. Among these are represented the last of the vernal forms and the first of the extensive midsummer fauna. In late summer a few additional species appear, and these are closely followed in September and October by about the same number of autumnal forms. The winter crane-flies, so-called, include species of *Trichocera* and *Chionea* which appear at other seasons of the year as well but are more easily detected during the mild, sunny days of winter.

In general it may be stated that the crane-flies of eastern America which fly in spring and summer come out later and disappear earlier in the northern part of their range — New York, New England, and southern Canada — than in the southern part — the Middle Atlantic and Southern States. The late summer and the autumnal species, however, come out earlier in the former regions than they do farther south, and disappear correspondingly early in the season, their period being restricted by the date of the first killing frost.

The dates as here given apply to the Transition areas of New York and New England. They should be considered as earlier in the vicinity of Washington — from one to three weeks or even more, depending on the situation — and later as one goes northward, with the exceptions given above. It must be understood and expected that considerable deviation from these dates and figures will be found, but it is believed that in most cases they are fairly accurate, being based on a vast number of records extending over many years.

The following are early to late spring species — from April 1 thru May, disappearing about the first of June but many of them reappearing in August and September. Most of these species appear for the first time about April 20. *Helobia* appears much earlier, in March or even in February. The species of *Ormosia*, *Dicranota*, and *Rhaphidolabis* are

especially characteristic of the early spring fauna, appearing in small swarms soon after the breaking up of the winter's snow and ice. Practically all the species have disappeared by June 1, but *Tipula trivittata* is found thruout the summer.

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| <i>Ormosia innocens</i> (O. S.) | <i>Rhaphidolabis tenuipes</i> O. S. |
| <i>meigenii</i> (O. S.) | <i>Pedicia contermina</i> Walk. |
| <i>nubila</i> (O. S.) | <i>Tricyphona paludicola</i> Alex. |
| <i>Helobia hybrida</i> (Meig.) | <i>Tipula angustipennis</i> Loew |
| <i>Limnophila subcostata</i> (Alex.) | <i>collaris</i> Say |
| <i>Dicranota eucera</i> O. S. | <i>dejecta</i> Walk. |
| <i>noveboracensis</i> Alex. | <i>iroquois</i> Alex. |
| <i>rivularis</i> O. S. | <i>tephrocephala</i> Loew |
| <i>Rhaphidolabis cayuga</i> Alex. | <i>trivittata</i> Say |

In Europe the following species appear to be characteristic early spring forms:

| | |
|-------------------------------|---------------------------------|
| <i>Tipula macrocera</i> Zett. | <i>Tipula variipennis</i> Meig. |
| <i>maxima</i> Poda | <i>vittata</i> Meig. |
| <i>pabulina</i> Meig. | |

Late spring to midsummer species — June, some persisting into July and a few reappearing in late summer — are as follows. *Limnophila brevifurca* appears in early May but is not common until June. It will be seen from this list that the majority of the local *Limnophilas* appear in the month of June.

| | |
|-------------------------------------|--------------------------------------|
| <i>Protoplasa fitchii</i> O. S. | <i>Limnophila johnsoni</i> Alex. |
| <i>Toxorhina muliebris</i> (O. S.) | <i>munda</i> O. S. |
| <i>Dicranoptycha germana</i> O. S. | <i>niveitarsis</i> O. S. |
| <i>Atarba picticornis</i> O. S. | <i>poctica</i> O. S. |
| <i>Rhamphidia mainensis</i> Alex. | <i>quadrata</i> O. S. |
| <i>Erioptera nyctops</i> Alex. | <i>rufibasis</i> O. S. |
| <i>vespertina</i> O. S. | <i>sylvia</i> Alex. |
| <i>Gnophomyia tristissima</i> O. S. | <i>tenuicornis</i> O. S. |
| <i>Gonomyia florens</i> Alex. | <i>toxoneura</i> O. S. |
| <i>mathesoni</i> Alex. | <i>unica</i> O. S. |
| <i>noveboracensis</i> Alex. | <i>Adclphomyia minuta</i> Alex. |
| <i>subcinerea</i> O. S. | <i>Utomorpha pilosella</i> (O. S.) |
| <i>sulphurella</i> O. S. | <i>Hexatoma megacera</i> (O. S.) |
| <i>Limnophila alleni</i> Johns. | <i>Eriocera cinerea</i> Alex. |
| <i>aprilina</i> O. S. | <i>longicornis</i> (Walk.) |
| <i>arcolata</i> O. S. | <i>spinosa</i> (O. S.) |
| <i>brevifurca</i> O. S. | <i>Tricyphona auripennis</i> (O. S.) |
| <i>cubitalis</i> O. S. | <i>calcar</i> (O. S.) |
| <i>edwardi</i> Alex. | <i>vernalis</i> (O. S.) |
| <i>emmelina</i> Alex. | <i>Rhaphidolabis flaveola</i> O. S. |
| <i>fasciolata</i> O. S. | <i>modesta</i> (O. S.) |
| <i>fuscovaria</i> O. S. | <i>rubescens</i> Alex. |

| | |
|-------------------------------------|----------------------------------|
| <i>Liogma nodicornis</i> (O. S.) | <i>Tipula oropezoides</i> Johns. |
| <i>Dolichopeza americana</i> Needm. | <i>penobscot</i> Alex. |
| <i>Nephrotoma lugens</i> (Loew) | <i>senega</i> Alex. |
| <i>Tipula apicalis</i> Loew | <i>serta</i> Loew |
| <i>cayuga</i> Alex. | <i>submaculata</i> Loew |
| <i>maerolabis</i> Loew | <i>sulphurea</i> Doane |
| <i>monticola</i> Alex. | <i>taughanmock</i> Alex. |

Early summer to midsummer species — from June 21 to August 10 — are as follows:

| | |
|---|-------------------------------------|
| <i>Bittacomorphella jonesi</i> (Johns.) | <i>Rhabdomastix flava</i> (Alex.) |
| <i>Dicranomyia globithorax</i> O. S. | <i>Cryptolabis paradoxa</i> O. S. |
| <i>macatei</i> Alex. | <i>Limnophila albipes</i> Leon. |
| <i>pubipennis</i> O. S. | <i>inornata</i> O. S. |
| <i>Limnobia triocellata</i> O. S. | <i>nigripleura</i> A. & L. |
| <i>tristigma</i> O. S. | <i>noveboracensis</i> Alex. |
| <i>Elephantomyia westwoodi</i> O. S. | <i>stanwoodae</i> Alex. |
| <i>Ormosia monticola</i> (O. S.) | <i>Pentoptera albitarsis</i> O. S. |
| <i>nigripila</i> (O. S.) | <i>Eriocera fultonensis</i> Alex. |
| <i>rubella</i> (O. S.) | <i>tristis</i> Alex. |
| <i>Erioptera armillaris</i> O. S. | <i>Cylindrotoma americana</i> O. S. |
| <i>chlorophylla</i> O. S. | <i>tarsalis</i> Johns. |
| <i>chrysocoma</i> O. S. | <i>Phalacropera ncozana</i> Alex. |
| <i>graphica</i> O. S. | <i>tipulina</i> O. S. |
| <i>straminea</i> O. S. | <i>Longurio testaceus</i> Loew |
| <i>Molophilus fultonensis</i> Alex. | <i>Nephrotoma cucera</i> (Loew) |
| <i>hirtipennis</i> (O. S.) | <i>xanthostigma</i> (Loew) |
| <i>pubipennis</i> (O. S.) | <i>Tipula fuliginosa</i> (Say) |
| <i>ursinus</i> (O. S.) | <i>hebes</i> Loew |
| <i>Gonomyia alexanderi</i> (Johns.) | <i>hermannia</i> Alex. |
| <i>blanda</i> O. S. | <i>tricolor</i> Fabr. |
| <i>manca</i> (O. S.) | <i>valida</i> Loew |
| <i>sacandaga</i> Alex. | |

In Europe the following species seem to have this seasonal distribution:

| | |
|--------------------------|--------------------------------|
| <i>Tipula eava</i> Ried. | <i>Tipula trifasciata</i> Loew |
| <i>livida</i> v. d. W. | <i>vernalis</i> Meig. |

Midsummer to late summer species — from August 10 to September 10 — are as follows:

| | |
|---|------------------------------------|
| <i>Dicranomyia longipennis</i> (Schum.) | <i>Tricyphona autumnalis</i> Alex. |
| <i>Limnobia solitaria</i> O. S. | <i>katahdin</i> Alex. |
| <i>Erioptera parva</i> O. S. | <i>Tipula abdominalis</i> (Say) |
| <i>Adelphomyia americana</i> Alex. | <i>sayi</i> Alex. |
| <i>cayuga</i> Alex. | <i>unimaculata</i> (Loew) |

In Europe the following species seem to have this seasonal distribution:

| | |
|----------------------------------|--------------------------------|
| <i>Tipula bifasciculata</i> Loew | <i>Tipula fulvipennis</i> DeG. |
| <i>dilatata</i> Schum. | <i>hcbvola</i> Loew |

Autumnal species — from September 10 to snowfall — are as follows. *Limnophila ultima* is sometimes vernal but is commoner in late summer and autumn. *Discobola argus* is found at other seasons but is more numerous in September. *Cladura flavoferruginea*, *Limnophila ultima*, and *Tipula cunctans* have a longer flight-period than most of the others listed.

Dicranomyia brevivena O. S.
Limnobia parietina O. S.
Discobola argus (Say)
Cladura delicatula Alex.
flavoferruginea O. S.
Limnophila osborni Alex.
ultima O. S.

Tricyphona autumnalis Alex.
Tipula cunctans Say
fragilis Loew
ultima Alex.
unifasciata (Loew)

The following European species seem to have this seasonal distribution:

Tipula anonyma Bergr.
autumnalis Loew
interserta Ried.
luteipennis Meig.
marmorata Meig.

Tipula melanoceros Schum.
obsoleta Meig.
pagana Meig.
rufina Meig.
signata Staeg.

IMMATURE STAGES

THE EGG

The egg stage is generally of short duration, usually lasting from one to three weeks. In *Tipula sayi* it is eight days. The number of eggs laid, so far as is known, ranges from about forty-five in *Styringomyia didyma* to about two thousand in the larger species of Eriocera. The eggs are deposited in different ways according to the species, the details of which are discussed elsewhere (page 881).

The eggs are without an intricate sculpturing, but may be finely punctured or striate. They are black, with a heavy chorion in the Tipulinae and in the tribe Hexatomini. In most of the Limnobiinae and the Cylindrotominae they are white and pellucid, or even a light orange-red in some cases, as in the genus *Dicranomyia*.

THE LARVA

The larval, or feeding, stage is the longest in the life of a crane-fly, in the known cases requiring the greater part of the year. Some of the smaller forms are presumably double-brooded, since they appear in the spring, are absent during most of the summer, and reappear in the late

summer and early fall. In such cases the larval existence is, of course, greatly shortened. The larval habitat is exceedingly varied and may be summarized as follows:⁹

Tanyderidae.— Nothing whatever is known of the immature stages of this group of flies, and it is very desirable that some of the forms should be reared. They are very rare, however, and even the adults are uncommon in collections. It is very probable that the larvae of species of *Protoplasa*, the only genus in the Northern Hemisphere, will be found to be amphibious, such a larval habitat often characterizing primitive forms.

Ptychopteridae.— Semi-aquatic or amphibious (*Ptychoptera*, *Bittacomorpha*, *Bittacomorphella*).

Rhyphidae.— In decaying vegetable and animal matter (*Trichocera*, *Mycetobia*, *Rhyphus*).

Tipulidae.— *Limnobiini*: Aquatic, in silken cases or tubes among submerged mosses (*Dicranomyia simulans*); semi-aquatic or in moist earth (*Limnobia fallax*, and probably *L. solitaria* and *L. parietina*); in decaying vegetable matter (*Limnobia indigena*, *Rhipidia domestica*); in decaying wood and under the bark (*Dicranomyia rara*, *D. macateei*, *D. dumetorum*, *Discobola*, *Limnobia cinctipes*, *L. annulus*, *Rhipidia bryanti*, *R. fidelis*, and others); in fungi (*Limnobia xanthoptera*, *L. triocellata*, and sometimes *L. cinctipes*). The Hawaiian species *Dicranomyia foliocuniculator* Swezey mines in the leaves of gesneriaceous plants (*Cyrtandra*), forming long, tortuous tunnels.

Antochini: Aquatic, very similar to habitat of *Dicranomyia simulans* as described above, in silken cases on rocks that are thoroly wet (*Elliptera*); in submerged stems of *Rumex aquaticus* (*Rhamphidia longirostris*); in slow or rapid water on stones (*Antocha*); in moist earth or mud (*Toxorhina mulicbris*); under the bark of decaying trees (*Elephantomyia westwoodi*, *Teucholabis complexa*).

Eriopterini: In moist earth or mud in close proximity to water (most species of the tribe — *Ormosia nubila*, *O. innocens*, *O. meigenii*, *O. nigripila*, *Erioptera chlorophylla*, *E. vespertina*, *E. septentrionis*, *Molophilus pubipennis*, *Helobia hybrida*, *Gonomyia sulphurella*, and others); in earth of a somewhat drier nature (*Chionea*); in wet sandy soil (*Gonomyia alexanderi*); under the bark of decaying trees (*Gnophomyia tristissima*). The tropical species of *Trentepohlia* live in decaying vegetable matter, or, as in the case of the two American species *T. bromeliadicola* and *T. leucoxena*, in the water gathered in the axils of bromeliaceous plants.

Limnophilini: Aquatic (*Limnophila luteipennis* and others); in wet or saturated organic mud in close proximity to running or standing water (most species of the tribe — *Limnophila macrocera*, *L. tenuicornis*, *L. tenuipes*, *L. recondita*, *L. adusta*, *Adelphomyia*, and others); in decaying wood and under the bark (*Epiphragma fascipennis*, *E. solatrix*, *E. picta*, *Limnophila unica*, and others); in fungi (*Ula elegans*, *U. macroptera*, and others).

Hexatomini: Aquatic in the early larval stages, going to land only when fully grown and ready to transform to the pupal condition; in sandy soil in close proximity to rather large streams or rivers (*Eriocera spinosa*, *E. longicornis*, *E. fultonensis*, *E. tristis*, *Hexatoma megacera*, and others); in organic earth and rich humus (*Pentoptera albitarsis*). As stated elsewhere, the larvae of this tribe are carnivorous, the larger species feeding on organisms as large as the nymphs of dragon-flies.

Pediciini: Aquatic or amphibious (probably all the species of the tribe — *Pedicia albivitta*, *P. rivosa*, *Tricyphona*, *Raphidolabis tenuipes*, *R. flaveola*, *Dicranota bimaculata*, and others). As stated elsewhere, the larvae of this tribe are carnivorous, those of the species of *Dicranota* feeding on worms of the genus *Tubifex*.

Cylindrotominae: Aquatic, on submerged plants and similar places (*Phalacrocera replicata*); in mountain torrents on the aquatic moss *Fontinalis* (*Trigma trisulcata*). Terrestrial, on leaves of flowering plants, as species of *Anemone*, *Stellaria*, *Viola*, and other genera (*Cylindrotoma distinctissima*); on mosses of the genus *Hypnum* and related species (*Liogma*

⁹ The following entomologists have kindly supplied the writer with specimens or data on certain species as follows: Johannsen, *Limnobia fallax*; Greene, *L. indigena*; Shannon and Knab, *Rhipidia bryanti*; Mrs. Tothill, *Toxorhina*; Johnson and Shannon, *Elephantomyia*; Hyslop, *Oropeza* and *Longurio*.

glabrata, *L. nodicornis*). The larvae of this group are usually bright green in color, are variously armed with spines and filaments, and bear a striking resemblance to the caterpillars of certain Lepidoptera.

Dolichopezini: In decaying wood (*Brachypremna dispellens*); underneath the moss *Hedwigia albicans*, but also in moist earth (Oropeza).

Ctenophorini: In decaying wood (*Ctenophora apicata* and others); in wood that is but slightly decayed (Tanyptera). The species of the latter genus bore into the wood of Acer and other hardwood trees while it is still in a good state of preservation, and represent the maximum development of the wood-boring habit in this family so far as is known to the writer.

Tipulini: Aquatic, but going to the land for pupation (*Tipula abdominalis*, *T. cayuga*, *T. leprocephala*, and others); semi-aquatic or amphibious (*Holorusia rubiginosa*, Longurio, *Tipula bella*, *T. sayi*, *T. strepens*, *T. tricolor*, and others); under moss growing on moist earth (*Tipula nobilis*, *T. collaris*, and others); in drier soil feeding on the tissue of plants (*Tipula ultima*, *T. bicornis*, *T. cunctans*, *Nephrotoma ferruginea*, and others); under bark of prostrate trees in an advanced state of decay (*Tipula usitata*, *T. trivittata*, and others). The green larvae of an undetermined *Tipula* (possibly *T. iroquois*) live in submerged mosses (*Hypnum*, sens. lat.) in rapid-flowing streams where the current is very strong; here they are associated with a society which is characteristic of such places — may-flies (*Iron fragilis*), black-flies (*Simulium*), net-winged midges (*Blepharocera*), Stratiomyiidae, Anthomyiidae, *Limnophora torreyae*, and a host of other forms.

The larva of the crane-fly has a segmented body, with about twelve apparent segments; the head is a composite of several small sclerites. The larva is wormlike in appearance and is legless, and the head is capable of retraction within the body except in the Ptychopteridae and the Rhyphidae. At the caudal end of the body is the disk bearing the two spiracles, or stigmata. Except in the Limnobiini this disk is surrounded by a varying number of fleshy lobes — two in the Pediciini (fig. 122, E), four in many of the Tipulinae, the Cylindrotominae (fig. 122, G), the Antochini, and the Hexatomini (fig. 122, F), five in the Eriopterini, the Limnophilini (fig. 122, D), and many of the Tipulinae, and six or eight in other species. Beneath the spiracular disk are the gills, usually four or six in number. These are long and filiform in the aquatic species (fig. 122, I), and correspondingly reduced or entirely absent in the less aquatic and the terrestrial species. In the Ptychopteridae (fig. 122, A) the spiracles are borne at the tip of a long, extensile tube, which is raised above the surface film while the larva feeds at will beneath the water; the gills, two in number, are about midlength of the tube. The larva of *Trichocera* has a pair of thoracic stigmata in addition to the caudal spiracles.

In many crane-fly larvae the body is provided with fleshy transverse folds, which are armed with chitinized points and roughened areas to assist in locomotion. These are best developed in the Pediciini (fig. 122, E), in which they resemble pseudopodia. The larvae of the Cylindrotominae (fig. 122, H) are covered with spines and thorns of various shapes.

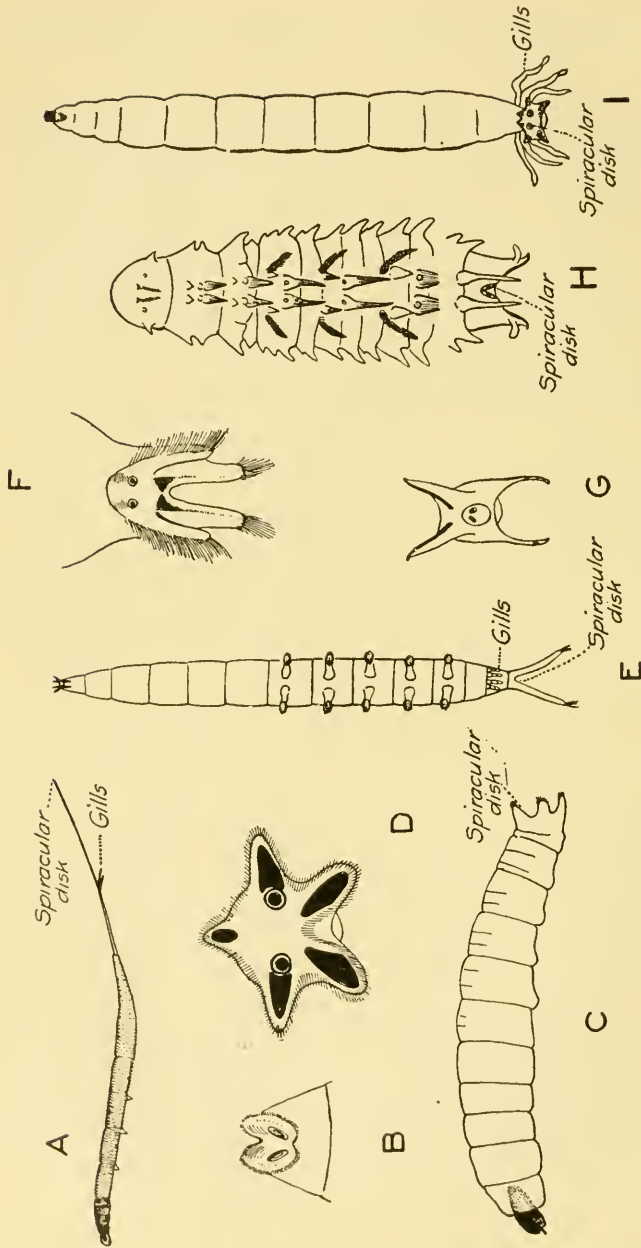


FIG. 122. LARVAE OF VARIOUS SPECIES OF CRANE-FLIES

A, *Bittacomorpha clavipes* (Ptychopteridae), lateral aspect; after Hart. B, *Dicranomyia similans* (Limnobiini), spiracular disk; after Needham. C and D, *Uta elegans* (Limnophilini), lateral aspect and spiracular disk. E, *Diceranola bimaculata* (Pedicini), ventral aspect; after Miall. F, *Hexatoma megacera* (Hexatomini), spiracular disk. G and H, *Liogma nodicornis* (Cylindrotominae), spiracular disk and dorsal aspect. I, *Tipula* sp., *tricolor* group (Tipulini), dorsal aspect

THE PUPA

The pupal stage is of short duration, usually a week or two, and is spent in or near the larval habitat. In the case of aquatic species the pupal existence is passed in the earth adjoining the water in which the larva lived, except perhaps in the case of *Antocha*, which may pupate directly in the water. The larvae of many species of *Limnobiini*, of *Antochini*, and in a slightly lesser degree of most other groups, spin a silken case, or cocoon, in which to spend the pupal period. The pupae are more or less active and often wriggle about with great agility.

On the thoracic dorsum the pupa bears the two breathing horns (fig. 123), which are variously formed in the different groups. They are short, blunt, and flattened in the *Limnobiini* (fig. 123, B), moderately elongate and cylindrical in the *Eriopterini*, the *Limnophilini* (fig. 123, C and D), and the *Tipulini* (fig. 123, H), short and truncated at their apices in the *Pediciini* (fig. 123, E). In the *Ptychopteridae* (fig. 123, A), one of the two horns is atrophied, while the other is enormously elongated and serves the same function as the extensile breathing tube of the larva. In addition to the thoracic spiracles, the pupae of the *Hexatomini* (fig. 123, F), the *Eriopterini*, and some others have conspicuous lateral abdominal stigmata.

The abdominal segments generally have rows of spines or chitinized points arranged transversely around the caudal margin (fig. 123, H), which help the insect in moving about and serve to keep the tender part of the abdomen from contact with the earth. In the *Hexatomini* (fig. 123, F) similar spines are developed on the thorax, on the head, and even on the face of the compound eye. In the *Cylindrotominae* (fig. 123, G) these spines are very highly developed. Smooth-bodied pupae, such as are found in the *Limnobiini*, are usually inclosed in a silken tube which keeps them from contact with the soil.

When the insect is ready to transform to the final, or adult, stage, the pupa makes its way to the surface of the earth, to which it remains attached by the caudal part of the abdomen. The thoracic notum then splits down the mid-dorsal region in a straight line, and thru this opening the adult fly emerges. Before the chitin of the body hardens, the insect is very weak and pallid, but in a short time the body expands to its full size and becomes hardened and fully colored, and the dangerous period of transformation is over.

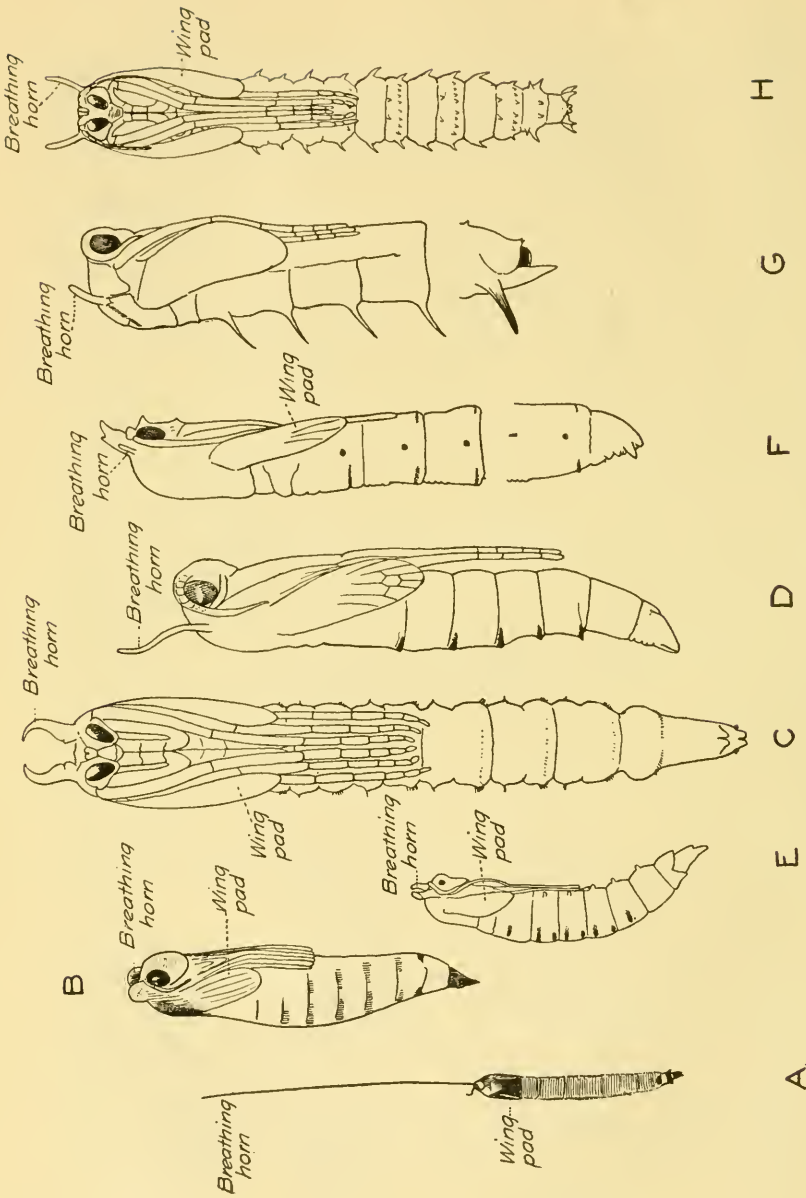


FIG. 123. PUPAE OF VARIOUS SPECIES OF CRANE-FLIES

A, *Bittacomorpha clavigipes* (Ptychopteridae), dorsal aspect; after Hart. B, *Limnobia cinetipes* (Limnobiini), lateral aspect. C, *Epipterygma fascipennis* (Limnophilini), ventral aspect; after Needham. D, *Ula elegans* (Limnophilini), lateral aspect. E, *Dicranota bimaculata* (Pediicini), lateral aspect; after Miall. F, *Hexatoma megacera* (Hexatomini), lateral aspect. G, *Liogma nodicornis* (Cylindrotominae), lateral aspect. H, *Tipula ultima* (Tipulini), ventral aspect; after Needham

REARING THE IMMATURE STAGES

As has been stated elsewhere, the author believes the most important work yet to be done in entomology is the study of the immature stages of the various groups of insects. In most cases it is necessary to rear the immature stages thru to the adult in order to be certain of the species, and this process of bringing the larva to the perfect condition is often attended with many difficulties. The author has spent several years in rearing the local Tipulidae, and a general statement of the methods adopted is here given.

It should be borne in mind that the bringing of the larvae from their natural habitat into the warmth of the laboratory accelerates their development, and the adults emerge in the breeding cages a week or two earlier than in nature.

Aquatic forms

The aquatic forms are among the most difficult to rear, especially the species living in rapid, well-aërated water. It must be understood at the start that practically all crane-flies require earth, sand, or a similar solid material in which to pupate, and it is often very difficult to provide rushing torrents for the larval life together with solid earth for the pupal existence. Breeding cages, consisting of wire cylinders the ends of which are covered with cheesecloth, have been used with considerable success. The mesh must be of sufficient fineness to retain the larvae inside, but not so small as to exclude the food that is carried in the current; however, since this food is microscopic or very small, a fine mesh is sufficient to allow its entry into the cage. The whole cage can be transferred to the natural haunt of the larva and kept under observation until the adult insect emerges. The main difficulties with this method are the danger of smothering the insect by deposition of silt during high water, the washing away of the entire outfit during storms, and the inconvenience, in most cases, of having to make many long trips to the scene of rearing before the final result is obtained. In almost all cases when the species could be reared by the use of such breeding cages, the writer has been able to get adult flies by placing the full-grown larvae in medium-sized (four-ounce) shell vials together with some earth from their natural habitat. In order to prevent evaporation, small caps of cheesecloth may be fas-

tened over the ends of the vials by means of rubber bands, sufficient water being added every day or two to restore the balance lost by evaporation. If the specimens are fully grown or nearly so, they soon pupate and finally emerge.

Species that live in extremely rapid waters (as the tipuline larva described on page 839) are almost impossible to rear. The best results have been obtained by placing the fully grown larvae in the folds of a saturated piece of cheesecloth in a jar, the jar being corked to prevent any evaporation — which is here, as elsewhere, the most frequent source of danger and death to the larvae. Several specimens of crane-fly larvae may be placed in a single vial except in the case of the carnivorous forms (Hexatomini, Pediciini), in which case care should be taken to isolate single specimens lest they kill one another and the decaying of their bodies destroy the remaining life in the vials.

Mud-inhabiting forms

The majority of crane-fly larvae are mud-inhabiting forms. Most of these belong to the small and inconspicuous Linnobiinae, and are rarely seen by the collector. To procure them it is necessary to sift the mud of their haunts and examine the contents of the sieve with great care. A small-mesh wire sieve is about the most satisfactory form to use, and the mud can be washed in small quantities and the remaining contents of the sieve easily scrutinized. As they are found, the larvae can be placed in water in small watch crystals and finally removed to individual breeding jars. The methods of breeding described above are applicable to these, and if the larvae are large and nearly grown it is not difficult to rear them.

Fungus-inhabiting forms

The forms inhabiting fungi (species of Linnobia and Ula, and some others) are easily reared by placing the whole fungus in a large pint or quart jar about one-fourth filled with pure sand. This sand takes up the juices as the fungus decays, and at the same time furnishes a good place for pupation of the species. The jars should be kept air-tight to retain a balance in moisture conditions.

Wood- and bark-inhabiting forms

The forms inhabiting wood and bark (Ctenophora, Tanyptera, and others) may be reared by placing pieces of their natural habitations in a large closed jar and leaving them undisturbed. Pupation takes place in the burrows of the larvae.

THE ADULT FLIES

STRUCTURE

The head

The head is the first, or anterior, region of the body. It bears the mouth parts, the antennae, the compound eyes, and, when they are present, the simple eyes, or ocelli.

The sclerites

The sclerites, or segments, composing the head are approximately the same as in other insects, consisting of a prominent dorsal sclerite which surrounds the compound eyes, the *epicranium*. This is further divided into regions which may be located generally as follows: The *fronto-clypeus* is located on the dorso-cephalic aspect of the head, between the labrum and the region of the vertex. It consists of the united front and clypeus, the suture between them having disappeared. The *labrum*, or upper lip, is often present as a chitinized linear structure lying anterior to the fronto-clypeus and attached to the ventral margin of the clypeal region of the latter. The *vertex* occupies the dorsal region between the compound eyes, and, when they are present, includes the ocelli, or simple eyes. On or near its anterior part it bears the antennae (page 848), inserted in depressions, the *antennal fossae*. In many species with elongate antennae, especially in Eriocera, Macromastix, and some other genera, the vertex bears a distinct tubercle, the *vertical tubercle*, which is often deeply bifid. In *Geranomyia cornigera* Alex. (Philippine Islands) the vertex bears a curious elongate fleshy lobe. Very rarely this sclerite bears three simple eyes, or ocelli, which are discussed elsewhere (page 854). The *genae*, or cheeks, occupy the sides, or lateral parts, of the head, ventrad and mesad of the compound eyes. The ventro-caudal region of the head is made up of the *postgenae*. The dorso-caudal region is the *occiput*.

The mouth parts

In many species in widely separated tribes, the anterior, or frontal, part of the head is produced into a short, cylindrical rostrum, which is in most cases nearly if not quite as long as the head itself. Such a frontal prolongation occurs in Rhamphidia (fig. 124, B and C), in some tropical species of Teucholabis (Antochini), in Opifex (Eriopterini) and Ornithodes (Pediini), and in most Tipulini (fig. 124, E). In these

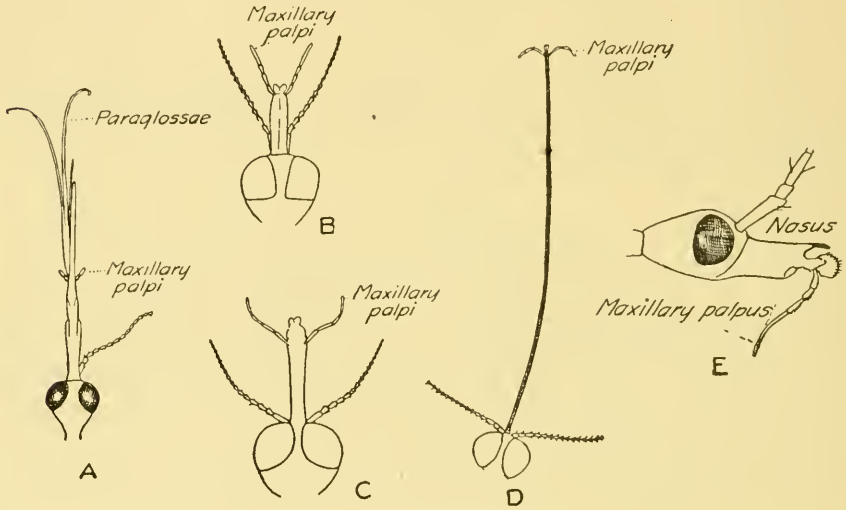


FIG. 124. MOUTH PARTS OF VARIOUS SPECIES OF CRANE-FLIES

A, *Geranomyia canadensis*, male, ventral aspect. B, *Rhamphidia flavipes*, male, ventral aspect. C, *Rhamphidia mainensis*, male, ventral aspect. D, *Elephantomyia westwoodi*, male, ventral aspect. E, *Tipula apicalis*, male, lateral aspect

cases the mouth parts are borne at or near the tip of the prolongation. In the Tipulini there often appears near the end of the prolongation, on the dorsal side, a small tubercle bearing a brush of long hairs (fig. 124, E). This is the *nasus*, or "nose." The most generalized condition of the mouth parts in this group of flies is seen in certain members of the primitive group Tanyderidae, in which the labrum, the maxillae, the labium, and possibly the mandibles, are distinct and styliform (Alexander, 1913 a:332-333).

The mouth parts and the head capsule of the Diptera have been studied recently by Peterson (1916). The following summary of the mouth parts is taken largely from his paper:

The *maxillae* are the paired organs lying below the labrum and above the labium, one on either side. In generalized forms, such as Trichocera, they consist of a small triangular *cardo*, an elongate *stipes* bearing the needle-like *galea*, and the *palpus*. The maxillary palpi are primitively five-segmented but in almost all crane-flies only four segments are apparent; in certain cases the reduction in segments is rather extreme; this is discussed more in detail below. In the Linnobiini (Linnobia, Geranomyia) the stipites are entad of the postgenae and have their proximal ends united. In the Tipulini (Tipula) the two stipites are completely united along their inner margin to form a single median plate. The galeae are prominent in Trichocera, but are very reduced in Geranomyia and are entirely lacking in Tipula.

The *labium*, or lower lip, is the ventral, or posterior, unpaired organ. It consists of a basal immovable part, made up of the *mentum* and the *submentum*, and a movable part, or *ligula*, the basal sclerites of which are called by Peterson the *thecae*, the *furcae*, and so on, and the distal parts the *glossae* and the *paraglossae*.

The *epipharynx* lies behind the labrum and fuses with it to form the *labrum-epipharynx*. The *hypopharynx* is the prolonged cuticular lining of the opposite side of the mouth cavity. In such genera as Trichocera, Linnobia, and Tipula, studied by Peterson, the labrum-epipharynx and the hypopharynx are short, but in Geranomyia, which has an elongate rostrum, these parts are correspondingly elongated.

There are two tribes containing one or more genera in which the mouth parts are greatly elongated, being in many instances longer than the remainder of the body. In the tribe Linnobiini the genus Geranomyia is thus characterized, and in the tribe Antochini the genera Elephantomyia, Rhampholinnobia, Ceratocheilus, and Toxorhina. These may be discussed briefly.

In Geranomyia (fig. 124, A) the most evident parts of the beak are styliform and greatly elongated, consisting of the labrum-epipharynx, the hypopharynx, and the conspicuous divergent lips, the paraglossae, which extend far beyond the other elements; the maxillary palpi are located far back on the organ at about one-third its length, and are reduced in

number of segments from four in the generalized subgenus *Tetraphana* to one in the subgenus *Monophana*. In *Elephantomyia* (fig. 124, D), *Rhampholinobia*, *Ceratocheilus*, and *Toxorhina*, the rostrum consists of a much elongated tube which bears the reduced mouth parts and the maxillary palpi at the extreme apex; in *Elephantomyia* the maxillary palpi are three-segmented, while in *Toxorhina* they are apparently single-segmented.

Those species of *Geranomyia*, *Elephantomyia*, and *Toxorhina* whose feeding habits are known, all feed on the nectar of tubular flowers, such as the *Compositae*, the *Apocynaceae*, the *Ericaceae*, the *Umbelliferae*, the *Rhamnaceae*, and the *Lauraceae*.

The maxillary palpi are generally four-segmented; in the primitive group *Tanyderidae* they are five-segmented. By reduction there are found one, two (fig. 124, A), three, or four segments, respectively, in the four subgenera of *Geranomyia*; there are three in *Elephantomyia* (fig. 124, D), and apparently only one in *Toxorhina*. The segments in most *Limnobiinae* are approximately subequal in size, but in the genus *Pedicia* and in the subfamily *Tipulinae* (fig. 124, E) the fourth segment is greatly elongated, whiplash-like, and usually longer than the three preceding segments taken together. The labial palpi are two-segmented and conspicuous in species of *Trentepohlia*.

The antennae

The antennae of crane-flies present many interesting conditions, both in the number of the segments of which they are composed and in their structure, and many generic names have been based on these conditions — *Trichocera*, *Rhipidia*, *Trimicra*, *Rhabdomastix*, *Sigmatomera*, *Ctedonia*, *Polymera*, *Hexatoma*, *Eriocera*, *Cylindrotoma*, *Phalacrocer*, *Megistocera*, *Ctenophora*, and others.

The antennae are inserted on the vertex between the compound eyes. The diversity in their structure is considerable, and consists of great elongation of the organ, constriction of the segments, and the appearance of pectinations and flabellate formations. These are sexual characters only and are confined to the male sex. Elongation of the antennae occurs in many widely-separated tribes; moderate elongation is found in a wide range of native *Ptychopteridae*, in *Trichocera*, and in the tipuline genera *Atarba*, *Ormosia*, *Molophilus*, *Limnophila*, *Penthoptera*, *Dicranota*,

Nephrotoma, and Tipula; great elongation, in which the organ may be two or more times as long as the whole body, is found in a few native species of Eriocera (fig. 125, F), and in some exotic genera, as Rhabdomastix, *sens. str.*, the Old World species of Megistocera, and a few species of Macromastix. The flagellar segments are constricted at their middle in the genus Polymera, producing the multi-segmented appearance which gives the genus its name; in Sigmatomera some of the flagellar segments are reniform or shaped like a recumbent S. In many species of Ormosia (*O. monticola*, *O. divergens*, *O. megacera*, *O. mesocera*) the elongated antennae are subnodulose and strongly suggest the beadlike condition obtaining in the Cecidomyiidae. In Trimiera the three terminal segments are abruptly smaller than the remainder of the flagellum; in some species of Stygeropsis it is the terminal segment only that is so reduced. Pectinations and flabellate formations are found in the antennae in many genera — Rhipidia (fig. 125, A and B), Gynoplistia, Cerozodia, Ctedonia, most of the genera of the tribe Ctenophorini (fig. 125, L and M), and several genera of the tribe Tipulini, such as Ptilogyna and Ozodicera.

The two basal segments of the antennae are quite different in shape from those that follow, and are called the *scapus*, or *scape*. The scape is often considerably enlarged, especially in those species with elongate antennae — in the genera Rhabdomastix, Eriocera (fig. 125, F), Megistocera, and others. The second segment of the scape is usually shorter than the first, and in the species with elongate antennae it is usually short and cup-shaped (fig. 125, F, G, and H), a condition known as cyathiform. The whiplike part beyond the scape is the *flagellum*. The flagellum is almost always clothed with a pubescence of varying character, from straight to uncinata, from appressed to outspreading and divergent, from short to long, and often longer in the male sex than in the female. In addition to these delicate hairs there are usually strong, bristle-like hairs arranged in a more or less complete whorl, or verticil (fig. 125, J and O). The Tipulinae (fig. 125, L-O) have a more or less complete whorl of these strong hairs, which are absent in Stygeropsis (fig. 125, N) and in Holorusia and form good generic characters in a difficult group of the family. In many species of Gonomyia (*G. sulphurella* [fig. 125, E], *G. manca*, *G. pleuralis*, *G. amazona*, and others), and in some species of Erioptera (subgenus Empeda), the verticillate hairs on the male antennae are exceedingly elongated and conspicuous.

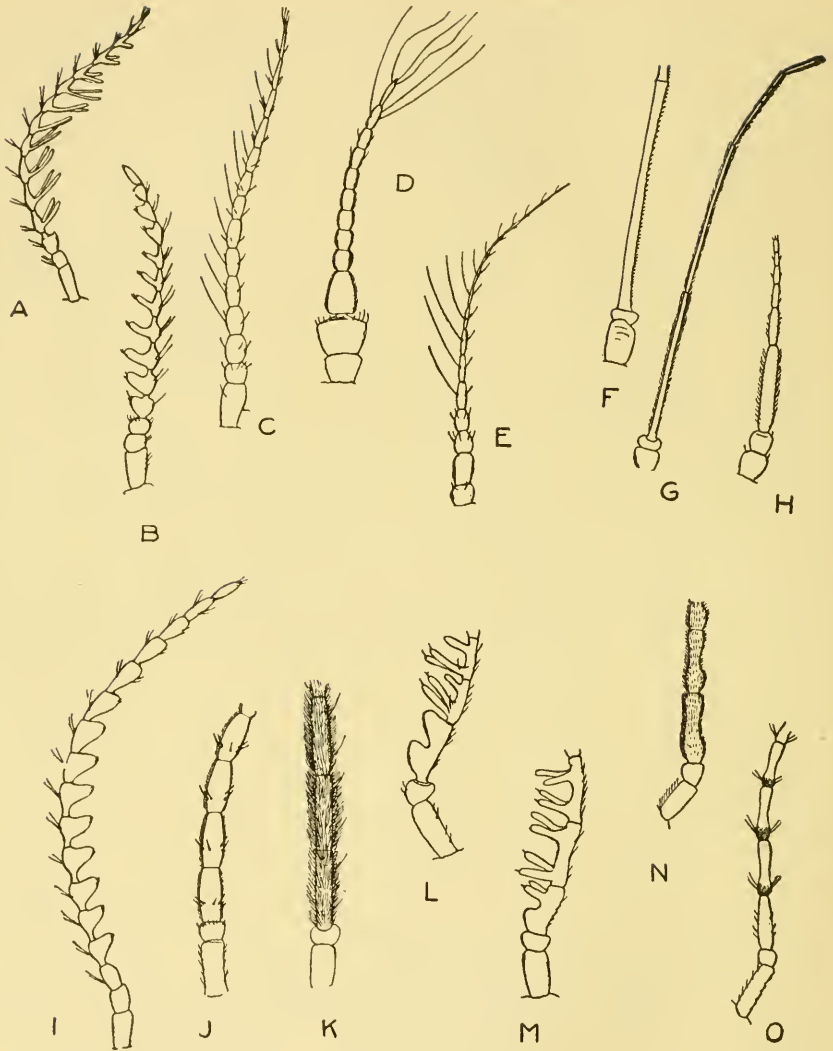


FIG. 125. ANTENNAE OF VARIOUS SPECIES OF CRANE-FLIES

Limnobiinae: A, *Rhipidia maculata*, male; B, *Rhipidia fidelis*, male; C, *Limnobia tristigma*, male; D, *Toxorhina brasiliensis*, male; E, *Gonomyia sulphurella*, male; F, *Eriocera spinosa*, male, three basal segments; G, *Hexatoma megacera*, male; H, *Hexatoma megacera*, female

Cylindrotominae: I, *Liogma nodicornis*, male; J, *Phalacrocer tipulina*, male, six basal segments; K, *Cylindrotoma torsalis*, male, five basal segments

Tipulinae: L, *Tanyptera frontalis*, male, five basal segments; M, *Ctenophora angustipennis*, male, five basal segments; N, *Stygeropsis fuscipennis*, male, four basal segments; O, *Tipula mainensis*, male, six basal segments

The following additional notes on chiefly local species are presented: *Tanyderidae*: In *Protoplasa fitchii*, of the family Tanyderidae, the antennae are 16-segmented; the scape is enlarged, and the flagellar segments are elongate-oval with a dense pubescence and verticillate bristles. In other Tanyderidae the number of segments ranges from 15 to 25.

Ptychopteridae.—In the genus *Bittacomorpha* of the family Ptychopteridae, the antennae are apparently 20-segmented. In the males they are elongated; the scape segments are short, the second one being short-cyathiform; the flagellar segments are greatly elongated, with a long outstretched pubescence and no bristles. In Ptychoptera the antennae are 16-segmented, with distinct scattered bristles and a short, somewhat uncinata, pubescence.

Rhyphidae.—In the genus *Trichocera* of the family Rhyphidae, the antennae are almost hairlike, tho finely pubescent.

Tipulidae, Limnobiinae.—Limnobiini: In the tribe Limnobiini the antennae are 14-segmented. In *Limnobia* (fig. 125, c) the segments have numerous bristles and a close, dense pubescence; the terminal segment is usually much attenuated, about as long as the two preceding segments taken together, often presenting a biarticulate appearance. In *Rhipidia* a curious modification of the organ is found, the flagellar segments being bipectinate in the subgenus *Rhipidia* (fig. 125, A), unipectinate in the subgenus *Monorhipidia* (fig. 125, B), and from subpectinate to almost normal in the subgenus *Arhipidia*.

Antochini: As a rule the antennae are 16-segmented in the tribe Antochini. The first scape segment is rather elongated, the second is oval, not markedly cyathiform. The flagellar segments are rounded-oval or elongate (in the males of most species of *Atarba*), with bristles and a short, dense pubescence. The antennae are of this normal structure in the genera *Rhamphidia*, *Antocha*, *Dicranoptycha*, *Atarba*, and *Teucholabis*. In *Elephantomyia* there are 15 segments; the first segment of the scape is only a little larger than the second; the first flagellar segment is apparently formed by the fusion of two segments, and bears three strong hairs on the lower face in a line; the remaining segments of the flagellum are elongate-cylindrical, with strong verticils. In the genera *Toxorhina* (fig. 125, D) and *Ceratocheilus* there are but 12 segments; the second scape segment is larger than the first; the first flagellar segment is obconical, and is apparently formed by the fusion of five segments,

altho the segment is very short and is destitute of verticils; the seven succeeding flagellar segments are short-cylindrical, without verticils; the terminal two segments are more elongated and each bears about three very long hairs.

Eriopterini: Normally there are 16 antennal segments in the tribe Eriopterini. In some genera both elongate and short antennae are found in the same group, as in *Ormosia*, *sens. str.* In *Chionea*, *Cladura*, *Pterochionea*, and *Crypteria* the number of antennal segments is reduced, due to the fusion of several segments to make up the basal segment of the flagellum—as in the case of *Toxorhina*, already discussed—this fusion segment including usually five segments.

Limnophilini: In the tribe Limnophilini the antennae are normally 16-segmented; in the genus *Ula* they are 17-segmented. In *Limnophila* and *Epiphragma* are found some species with elongate and others with short antennae. In *Limnophila macrocera* and some other species, the segments of the flagellum are provided with abundant outstretched hairs. In *Adelphomyia cayuga* the basal segments of the flagellum are fused into an indistinct fusion-segment; the other local species of this genus have normal antennae.

Hexatomini: In *Hexatoma megacera* (fig. 125, G) the antennae of the male are 6-segmented, the flagellar segments being elongate; in the female (fig. 125, H) the antennae are apparently 8-segmented. In *Eriocera* there are many species with short antennae (*Eriocera brachycera*, *E. fuliginosa*, *E. fultonensis*, and others), species with the antennae intermediate in length (such as *E. eriophora*), and numerous species with greatly elongated antennae (*E. spinosa*, *E. californica*, *E. longicornis*, and others). In *E. spinosa* (fig. 125, F), *E. longicornis*, and others, the lower surface of the basal flagellar segment is provided with numerous spines, regularly spaced, pointing toward the tip of the organ; the manner in which these spines are used in extricating the organ from the antennal sheath of the pupa is described by Alexander and Lloyd (1914). In *E. wilsonii* the antennae are likewise elongated in the male sex, but are provided with a strong pubescence, the spines being quite lacking. Most species of *Eriocera* have short antennae in both sexes.

Pediciini: In the genera *Pedicia* and *Tricyphona* of the tribe Pediciini, the antennae are 16-segmented; in the genus *Dicranota* and the subgenera

Plectromyia and Rhabdrolabis, they are 13-segmented; and in the subgenus Rhabdrolabina they are 15-segmented.

Tipulidae, Cyndrotominae.—The antennae are apparently 16-segmented in the genus *Cyndrotoma* of the subfamily *Cyndrotominae*, and 17-segmented in the genera *Phalacrocer* and *Liogma*. In *Cyndrotoma tarsalis* (fig. 125, κ) the flagellar segments in the male are elongate-cylindrical, with a dense erect pubescence and a very few scattered bristles. In *Phalacrocer tipulina* (fig. 125, ι) the condition is fairly similar, but there is a distinct verticil of stiff bristles near the bases of the segments, a condition strongly suggesting that found in the genus *Tipula*. In *Liogma nodicornis* (fig. 125, ρ) the intermediate flagellar segments are rather strongly pectinate, with a dense, pale pubescence and several long bristles on the back face of each segment, and with shorter, weaker bristles at the apex of the pectination.

Tipulidae, Tipulinae.—*Dolichopezini*: The antennae in *Dolichopeza*, *Oropeza*, *Brachypremna*, and other genera of the tribe *Dolichopezini*, are normally 13-segmented; in the American species of the genus *Megistocera* the antennae are 8-segmented. The organ is often considerably elongated, exceedingly so in Old World species of *Megistocera*. In *Brachypremna* the antennae are correspondingly short and tiny.

Ctenophorini: In the tribe *Ctenophorini* the antennae are 13-segmented. In the male sex they are curiously pectinated or fanlike, tho differing in construction from those in *Rhipidia* already discussed (page 851). In *Ctenophora angustipennis* (fig. 125, μ) the first segment of the flagellum bears a basal pectination and two apical pectinations, each tipped with a bristle; the second and succeeding segments have a basal pair of pectinations, each tipped with a bristle, and a pair of apical appendages, untipped. In *Tanyptera frontalis* (fig. 125, λ) the first segment of the flagellum bears a basal and an apical pectination; the second and succeeding segments have a basal pair of pectinations, each tipped with a bristle, and the single shorter apical pectination is not thus protected.

Tipulini: Normally the antennae in the tribe *Tipulini* are 13-segmented; in some species of *Nephrotoma* there are 16 or 19 segments in the male. In most species of this tribe each flagellar segment has a strong basal swelling armed with a verticil of strong bristles; this knobbed condition reaches its maximum development in the species of the *monilifera* group (of tropical America), in which a beadlike form is produced. Other

species of *Tipula* and some species of *Nephrotoma* have the segments deeply incised on the under face, producing a serrated appearance. In *Stygeropis* (fig. 125, n) and *Holorusia*, and to a lesser extent in *Longurio*, the verticils are lacking. *Tipula mainensis* (fig. 125, o) is a typical *Tipula* and illustrates this verticillate condition.

The eyes

On either side of the head, in all crane-flies, are the large compound eyes, made up of numerous facets, or *ommatidia*. In generalized forms the facets are large and coarse, so that the eye presents a coarsely granulated appearance; in other species the ommatidia are so small and abundant that the surface of the eye appears very smooth and regular. In most species of *Tipulidae* the eyes are separated by a narrow strip of the front (*dichoptic*), but in the males of some they are contiguous (*holoptic*) or nearly so, as in certain species of *Rhipidia* and allied groups. In some species of *Erioptera* (*Erioptera macrophthalma*, *E. vespertina*, *E. nyctops*, and others) the eyes of the males are much larger than those of the females and are contiguous beneath.

In most genera the eyes are large and extend backward onto the caudal part of the head. In *Trichocera* and *Ischnothrix* the vertex bears three simple eyes, or *ocelli*.

The thorax

The thorax is the second region of the body and lies between the head and the abdomen. This part of the body bears the legs, and, when they are present, the wings also. It is divisible into three subregions, as follows: the prothorax, or first segment, which bears the fore legs; the mesothorax, or second segment, which bears the middle legs and the wings; and the metathorax, or third segment, which bears the hind legs and the halteres. The upper, or dorsal, sclerites of these subregions are called the *tergites*, the *notum*, or the *dorsum*; the lateral sclerites, those on the sides of the body, are the *pleura*, or *pleurites*; those on the lower, or ventral, parts of the body are the *sternites*, or *sternum*. Each subregion has its own terminology, the prothorax having its pronotum, propleurites, and prosternum, the mesothorax its mesonotum, mesopleurites, and mesosternum, and so on. The legs borne by these respective segments likewise have the corresponding prefix applied to their parts — as the precoxa (or fore coxa), the mesocoxa (or middle coxa), the pre-

femora, the mesotibia, and so on. In addition to the thoracic segments there are some tiny sclerites between the head and the prothorax, called the *cervical sclerites* and comprising the *neck*, or *microthorax*.

The prothorax.—In the Tipulidae the pronotum, or dorsal sclerite of the prothorax, consists of two regions which are usually interpreted as being homologous to the scutum and the scutellum of the mesonotum, described and illustrated below. In this paper these regions are called the *pronotal scutum* and the *pronotal scutellum*. The propleurites are made up of the usual pleural plates, which are discussed in the description of the mesothorax; these are termed the *proepisternum* and the *proepimeron*. The sternal region of the prothorax is the *prosternum*. In the family Tipulidae the sclerites of the pronotum are usually small and insignificant, being encroached upon by the sclerites of the mesothorax. In some exotic genera, such as the tropicopolitan genus *Styringomyia*, the prothorax is large and of a generalized structure. In entomological literature the pronotum is usually spoken of as the “neck” or the “collare.”

The mesothorax.—The mesothorax is the principal region of the thorax in the Tipulidae. The mesonotum, or upper part, is divided into two sclerites, which are again divided so as to appear as four — the prescutum, the scutum, the scutellum, and the postnotum.

The *prescutum* is the anterior, or first, subdivision. In crane-flies it is the largest single region of the thorax, lying behind the pronotum and before the transverse, or V-shaped, suture. It may be very flat and depressed, as in the South African genus *Platylinnobia*, or very high and gibbous, as in *Dicranomyia globithorax*, *D. gibbera*, and other species; or it may jut far cephalad over the pronotum, as in *Conosia* and in many species of *Trentepohlia*. In the subgenus *Conorhipidia* of the genus *Rhipidia*, which includes two species from tropical America, the prescutum is elevated into a high conical point, which is very remarkable but is suggested in other species of the same genus, as, for instance, *Rhipidia domestica*. The prescutum is usually striped in various ways, a common pattern being three stripes, one in the middle and two shorter ones on the sides. The spaces between these stripes often bear setigerous punctures, with setae of various forms and sizes. In many genera the prescutum bears two shiny dots, called *tuberculate pits* (fig. 126, B). In certain groups,

as in many species of *Limnophila* and in the eriopterine series allied to *Gonomyia* (*Gonomyia*, *Rhabdomastix*, and other genera), these pits lie one on either side of the median line of the prescutum, at the extreme cephalic margin; in other groups, as in the eriopterine series allied to *Erioptera* (*Erioptera*, *sens. str.*, *Empeda*, and other genera), they are found on the dorsum of the prescutum, about midlength of the segment. These pits are the double, or paired, dots of Osten Sacken.

The *pseudosutural foveae* (fig. 126, B) are prominent depressions on the sides of the prescutum, in front, lying just above the anterior spiracles,

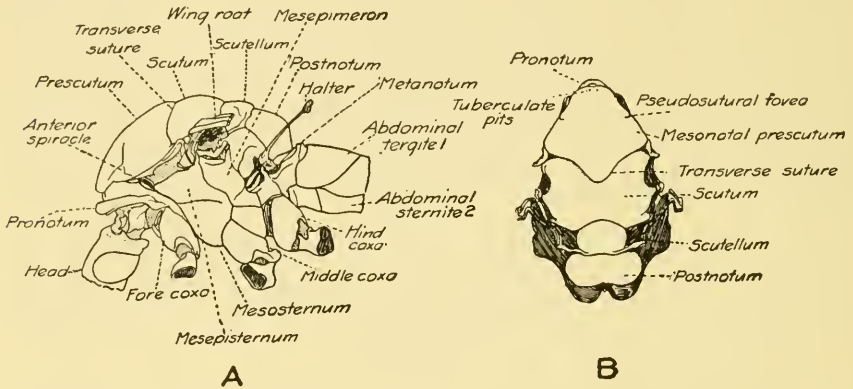


FIG. 126. THORAX OF TIPULA

A, Lateral aspect; B, dorsal aspect. Adapted from Snodgrass

usually in the area before the ends of the short lateral stripes and at the sides of the longer median stripe. These structures have been called the *humeral pits*.

The *scutum* is the second subdivision of the mesonotum. It lies just behind the V-shaped suture and is usually divided into two lateral lobes by a shallow median depression.

The *scutellum* is the third subdivision of the mesonotum. It is a small transverse segment, lying just behind the lobes of the scutum and before the postnotum.

The *postnotum* is the fourth and last subdivision of the mesonotum. It is a large and prominent sclerite situated behind the scutellum, appearing

almost vertical in position. The dorsal part of the postnotum lies between the halteres, and the lateral part between the wings and the scutellum in front and the halteres and the metapleura behind. This region is often erroneously considered as being the metanotum.

The *pleuron* of the mesothorax (fig. 126, A) consists of the mesepisternum and the mesepimeron. The *mesepisternum* is the plate making up the anterior part of the pleuron. It is bounded caudad by the mesepimeron and ventrad by the mesosternum. Its dorso-cephalic angle is close to the mesothoracic spiracle. The *mesepimeron* is the plate making up the posterior part of the pleuron. It is a long sclerite, lying underneath the wing base and bordered behind by the mesonotal postnotum and the metepisternum.

The *sternum* of the mesothorax is usually prominent, lying beneath the pleura and bearing the middle legs.

The mesothorax bears the wings of the insect, as well as the middle legs. The details of the wing venation are discussed under a separate caption (page 860). The wings are always present in crane-flies, but they are very tiny and reduced in the genus *Chionea*, and in many genera and species they are so reduced as to be useless for flight. This atrophy of the wing may consist of a reduction in width only, the length being unaffected and the organ taking on a straplike appearance (as in *Tipula pribilofensis*); or there may be a reduction in both the length and the width, the wing in extreme cases (such as *Tipula chionoides*, *Platylimnobia*, and others) being a mere pad which is shorter than the halteres. As a result of the distortion of the wing shape there is a corresponding reduction and atrophy of the venation. In the northeastern United States and eastern Canada, all the crane-flies are full-winged except the nearly wingless *Chionea*, mentioned above.

The wing surface is usually provided with a microscopic pubescence, to which are due many of the opalescent reflections in crane-flies (as in *Antocha*, *Dicranoptycha*, and other genera). In addition to this microscopic pubescence there is also found, in many scattered groups of genera, a strong pubescence, which is apparent with a hand lens. The writer regards the retention of this coarse pubescence as being a primitive character. Its nature varies. In some genera it covers the whole surface of the wing—as in *Ormosia*, *Ula*, and *Ulomorpha*; in many species it is confined to certain of the apical cells of the wings—as in *Dicranomyia*

pubipennis, *Erioptera* (*Empeda*) *pubescens*, *Gnophomyia luctuosa*, species of *Adelphomyia*, the subgenus *Lasiomastix* of *Limnophila*, *Bittacomorphella*, certain *Ptychoptera*, and some species of *Dolichocheza* (*Trichodolichocheza*), *Tipula* (*Trichotipula*, *Cinctotipula*), and so on. In most crane-flies the wing veins likewise bear long hairs, which in some genera, such as *Molophilus*, are very long; in some species, however, the hairs are so short as to be scarcely noticeable.

The metathorax.—The only part of the metanotum, or dorsal sclerite of the metathorax, which is visible is the postnotum. This appears as a narrow, transverse sclerite between the mesonotal postnotum and the first segment of the abdomen. The pleural sclerites consist of the *metepisternum*, a very small sclerite between the metathoracic spiracle and the hind coxae, and the *metepimeron*, a small sclerite behind the halteres.

The metathorax bears the hind legs and the *halteres*, or *balancers*. The halteres are usually considered as being reduced hind wings, and serve an important function in flight. They lie just behind the wings and are of various shapes, in some species (as *Dicranomyia halterata* and *Gonomyia filicauda*, for example) being very long and slender and in other cases being short with prominent swollen knobs. In some groups with reduced wings (such as *Platylimnobia*) the halteres also are reduced and straplike. The halteres are retained even when the wings have been practically lost, as shown by the genus *Chionea*.

The legs

The legs of crane-flies are as a rule excessively elongated, which gives to the group all or almost all of its common names — *crane-fly* (from a comparison with the crane), *daddy longlegs* (the British name for the group), and so on. The leg is made up of nine segments, designated, respectively, from the body outward, as the *coxa*, the *trochanter*, the *femur*, the *tibia*, and the five *tarsal segments*.

The coxa.—The coxa is the enlarged basal segment of the leg, that of the fore leg being called the fore coxa, *precoxa*, or *procoxa*, and those of the middle and hind legs having the corresponding prefixes. In the groups with great powers of flight (*Megistocera*, *Trentepohlia*, and others) the coxae are very small, while in the species with reduced wings and consequent need of walking (as in the genera *Platylimnobia*, *Chionea*,

and others) they are very large and powerful. The coxae are often provided with a dense covering of long silky hairs.

The trochanter.—The second segment of the leg, called the trochanter, lies between the coxa and the femur and serves as a pivot between these two major segments. In *Dicranoptycha*, the distal margin is armed with a sharp blackened tooth which is directed inward.

The femur.—The femur is the third segment of the leg, corresponding to the thigh of higher animals. It is the largest and most powerful single element of the leg, being in many cases greatly elongated and

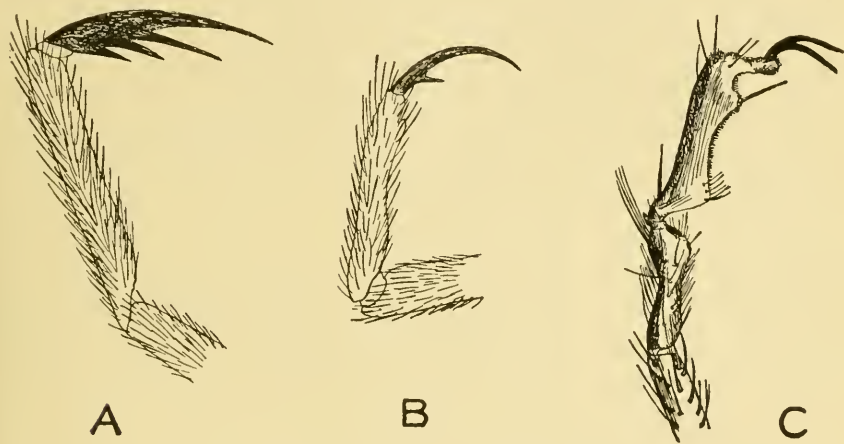


FIG. 127. FEET OF CRANE-FLIES

A, *Linnobia indigena*, male, last tarsal segment and claw. B, *Dicranomyia morioides*, male, last tarsal segment and claw. C, *Rhabdomastix flava*, male, last two segments and claw

incrassated. In some groups (as *Ctenacroscelis*, for example) it bears a comb of approximated spines near the distal end. In other genera, especially in *Trentepohlia*, the femur is often armed with groups or rows of stiff bristles or short spines, which furnish valuable specific characters.

The tibia.—The tibia is the fourth segment of the leg, situated between the femur and the first (metatarsal) segment of the tarsus. Next to the femur it is the longest single element of the leg. In many groups a pair of spines, or spurs, are borne at the tip, called the *tibial spurs*, and these

are of great importance in classification. These spurs are lacking in the tribes Limnobiini, Antochini, and Eriopterini, but are present in the remainder of the Tipulidae tho in some cases they are so small as to require a low-powered microscope for their detection.

The tarsal segments.—The tarsus, or foot of the fly, is made up of the terminal five segments. The first of these segments is the longest and is called the *metatarsus*. The remaining segments gradually decrease in length to the last, which bears the *claws*, or *ungues*, and, when it is present, the *empodium* between the claws. In Bittacomorpha the metatarsus is swollen and bladder-like. In one species of Lecteria the metatarsus bears a group of three stout spines at the extreme base. The claws of most crane-flies are quite smooth (fig. 127, c, Rhabdomastix), but those of species of the tribe Limnobiini have teeth on the ventral side (fig. 127, A, Limnobia; fig. 127, B, Dicranomyia). A similar condition is found in certain Dolichoepzini, such as Brachypremna and Tanypremna, but not in Megistocera.

The transverse suture

The transverse suture is considered one of the important characters for use in distinguishing the Tipulidae from related families of flies, such as the Dixidae, the Mycetophilidae, and others. It is in the shape of a low V, and separates the mesonotal prescutum from the scutum.

The wings and their venation

The wings of crane-flies, with their remarkably constant venation and pattern, furnish the easiest and best characters for recognition of the various forms. In the great majority of cases a glance at the wing is sufficient for the determination of the species, and it is for this reason that considerable emphasis is here placed on these organs. This paper discusses only in a rather elementary way the essentials of the wing venation, but Needham (1908) has made a critical survey of the character in all the genera of the Tipulidae known at the time his work was prepared, and his paper is absolutely essential to the student of this group of insects.

The wing is made up of a series of longitudinal veins running from the base to the outer margin and bound together at various points by cross-veins and by deflections of the longitudinal veins which produce

strong fusions at these places. The more specialized forms have an unusually strong series of cross-veins and deflections running transversely or obliquely across the wing at about two-thirds its length and generally in line with the ending of the radial sector and the inner end of the cell *1st M*₂ (discal). This strong fusion is called the *cord*, and a glance at almost any wing will enable one to pick it out immediately. The genus *Pedicia* (Plate XLII, 175) has the elements of the cord in almost perfect alinement, but very oblique, and here the principal parts entering in are the basal deflection of *Cu*₁, the basal deflection of *M*₁₊₂, and the *r-m* cross-vein; in most crane-flies the deflection of *R*₄₊₅ adds another strong element to the cord, while in many genera (as *Antocha*, Plate XXXIII, 48, and *Teucholabis*, Plate XXXIII, 52 and 53) the radial cross-vein is so placed as to become still another strong element. Very often the radial sector enters in as the part nearest to the main radial vein (*R*₁), and here the stress falls either on the sector or on *R*₂₊₃, or on both. As has been pointed out by Needham, in many species the closed cell of the wing (*1st M*₂) is swung directly across the path of the cord, interrupting it like a ring on a line; the medial cross-vein and the outer deflection of *M*₃ are quite necessary to complete this ring, and they are always present in such cases. It is only when the inner end of the closed cell gets into alinement with the other elements of the cord, so that the ring formed by the cell is no longer needed to strengthen the wing disk, that the medial cross-vein is lost by atrophy.

The longitudinal veins.— There are six or seven longitudinal veins, named, respectively, from the front margin backward, the *costa*, the *subcosta*, the *radius*, the *media*, the *cubitus*, and the *anal veins*.

The *costa* (*C*, fig. 128, A) forms the anterior margin of the wing. It is usually much thickened, but thins out before reaching the wing apex. It is strongly united with the vein beneath it, the *subcosta*, by the humeral cross-vein at the base of the wing. More distally other veins end in the *costa*, such as *Sc*₁, *R*₁, and usually other elements of the radial field.

The *subcosta* (*Sc*, fig. 128, A), a weak vein lying between the *costa* and the *radius*, is often difficult to detect due to foldings and flexings of this part of the wing. In generalized forms it is forked, the anterior branch, *Sc*₁, going to the *costa*, and the posterior branch, *Sc*₂ (the *subcostal cross-vein* of the older authors), connecting with *R*₁. In the subfamily *Limnobiinac*, *Sc*₁ is usually present, and *Sc*₂ may be close to its tip as in

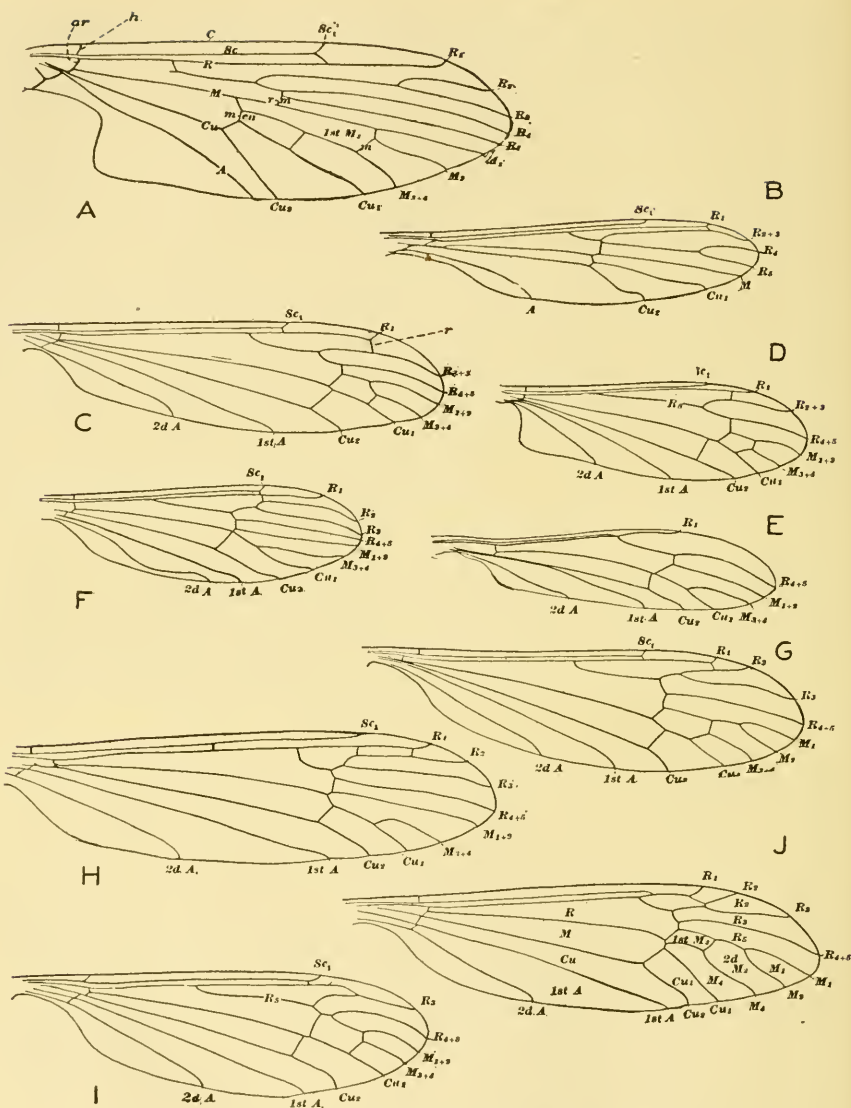


FIG. 128. WING VENATION

A, *Protoplasa fitchii*. B, *Bitacomorpha clavipes*. C, *Dicranomyia pubipennis*. D, *Antocha saxicola*. E, *Toxorhina muliebris*. F, *Erioptera septentrionis*. G, *Limnophila subcostata*. H, *Dicranota rivularis*. I, *Liogma nodicornis*. J, *Tipula unifasciata*

most Limnophilini (Plates XXXVIII–XLI), or it may tend to retreat proximad toward the base of the wing as in many Eriopterini (Plates XXXIV–XXXVII), or it may be very far removed from the tip so that it lies before the base of the sector (as in the tribe Pekiciini, Plates XLI, XLII, and in the genus *Ula*, Plate XLI, 164). In some Antochini it is apparently lost by atrophy. In the subfamily Tipulinae only the more generalized species retain Sc_1 (Plate XLIII, 188 and 189), but Sc_2 is present and is bent strongly into R_1 at its tip, thus forming a good subfamily character.

The *radius* (R , fig. 128, A) is the strongest vein of the wing, and, with its sector, one of the most plastic. R_1 runs straight to the wing margin, but usually at about midlength of the wing it forks, sending off the radial sector (R_s). This is primitively twice forked, being forked and the branches forked again, dichotomously. These branches of the sector are numbered from 2 to 5, the upper fork carrying with it R_2 and R_3 and the lower fork carrying with it R_4 and R_5 . The full complement of branches of the radial sector is found only in the Tanyderidae (Plate XXX, 1). In the Ptychopteridae (Plate XXX, 2–4) the upper fork, R_{2+3} , is fused to the margin; in the Tipulidae (Plates XXX–XLVIII) it is almost always the lower of the dichotomous forkings, R_{4+5} , that is fused to the margin.

The various ways in which the full complement of veins has been lost, by the fusing together of adjacent veins or else by the atrophy or dropping out of one or more of the branches, may be here discussed. In the Cylindrotominae (Plate XXX, 5–8) the appearance suggests the fusion of the upper fork of the sector (R_{2+3}) with R_1 , forming a long, backward fusion of R_{1+2+3} from the wing margin. As suggested by the author in an earlier paper (Alexander, 1914 b:604–605) and later proved by the discovery of the Oriental genus *Stibadocera* Enderlein (Alexander, 1915 c: 178–179), the loss of these veins is by atrophy rather than by fusion, and the vein that simulates R_{1+2+3} is, in reality, R_3 alone and corresponds exactly to this vein in other tribes of crane-flies. In the subgenus *Leiponeura* of the genus *Gonomyia* (Plate XXXVI, 86–88), the vein R_{2+3} is fused to the wing margin, or, possibly, R_3 is atrophied after the fusion has proceeded almost to the margin. In the more generalized species of *Gonomyia* (Plate XXXVI, 89 and 90), the fork of R_{2+3} is

relatively deep, but it gradually becomes shallower until in such forms as *G. sulphurella* (Plate XXXVI, 91) it is very small and only a step removed from the condition obtaining in the subgenus *Leiponeura*. The venation in the genus *Cladolipes*, of the tribe Hexatomini, is similar. The genus *Paratropeza* of the tribe Antochini is the only member of that tribe with R_2 and R_3 separate at the wing margin, and in keys to the Tipulidae this genus runs down to the Eriopterini; the species are all exotic and are evidently the most generalized members of this aberrant tribe. In a few species of *Gonomyia* related to *G. blanda* (Plate XXXVI, 89 and 90), R_2 is very close to R_1 at the wing margin, in some cases being actually fused with it; this is likewise the condition in the Neotropical group *Psaronius*, where the fusion is most emphatic. The fork of R_{2+3} is often very deep, this cell being in many instances sessile or with R_2 even retreated back onto the radial sector (as in *Molophilus*, Plate XXXIV, 65-70; *Tricyphona*, Plate XLII, 178-185; *Limnophila emmelina*, Plate XL, 151; *Rhaphidolabis*, Plate XLI, 172-174), in which cases the anterior branch of the sector is simple and the posterior branch is forked, as in the Ptychopteridae already mentioned. These shiftings of the elements of the fork of the radial sector have been critically studied by Needham (1908). The radial cross-vein apparently is lost only by atrophy; the *Cylindrotominae*, discussed above, which appear to lose this vein by the fusion upon it of adjacent veins, in reality have it present and elongated, but simulating a section of vein R_1 . In *Eurhamphidia* and *Rhampholimnobia*, of the East Indies, the fork of the radial sector occurs far beyond the line of the cord, while in most other crane-flies it is before or at this line. The radial-medial cross-vein ($r-m$) is usually present, but if lacking it is accounted for, apparently, only by the fusion of R_{4+5} on M_{1+2} (fig. 128, 1); this fusion may be slight or extensive, and occurs in scattered genera in all the subfamilies of the Tipulidae. The radial-medial cross-vein lies distad of the medial cross-vein in *Conosia* and in some species of *Rhamphidia*. In many *Dolichopezini* (Plate XLIII, 186 and 187), *Tipulini* (Plate XLVIII, 247 and 248), and *Cylindrotominae* (Plate XXX, 5-8), the whole tip of R_2 is atrophied. In the remarkable genus *Toxorhina* (Plate XXXIII, 45 and 46), the radial sector is unbranched but the branch that persists is undoubtedly R_{4+5} alone, R_{2+3} having retreated back toward

the base of the sector and finally being lost by atrophy or by fusion with R_1 ; the exotic genus *Ceratocheilus* shows this intermediate condition very remarkably, and indicates clearly the manner in which this extreme reduction of the sector in *Toxorhina* was brought about.

The *media* (M , fig. 128, A), or medial vein, like the radial sector, in the hypothetical type of an insect wing is twice dichotomously forked, the closed cell, *1st* M_2 , lying in the first fork. There are no known crane-flies that show this condition except the doubtful fossil genus *Rhabdinobrochus*, which is apparently based on an abnormal and imperfectly preserved specimen, and occasionally freak specimens of *Tipula* which indicate this condition by spurs of varying length. These specimens show that the single posterior branch of the *media* which persists is M_4 , the spur always lying on the cephalic side and representing the atrophied M_3 . Comstock (1918:349, fig. 360) has interpreted the venation of *Protoplasa fitchii* as showing all four branches of *media*, M_4 being fused with Cu_1 distally. That this is not the true interpretation is indicated by a study of the other species of *Protoplasa*. The vein in cell M_3 which Comstock interprets as being the downward deflection of M_4 is a supernumerary cross-vein. In this remarkable family of flies, such cross-veins are very often found in different cells of the wings. That the presence of a vein in cell M_3 is a specific character only is shown by the fact that it is lacking in the related *Protoplasa vipio* O. S. M_1 and M_2 , comprising the anterior fork of the vein, are either separate or fused at the wing margin; such genera as *Limnophila* (Plates XXXVIII–XL) show a perfect succession, from deep forks as in the exotic *Limnophila epiphragmoides* (Alexander, 1913 b:543), thru less deep forks as in *L. montana* (Plate XL, 148), to *L. brevifurca* (Plate XXXVIII, 125), which has a very shallow fork that is sometimes fused clear to the wing margin, and further to the numerous species of the genus (Plate XL, 150–157) in which there is a permanent and constant fusion between these veins extending entirely to the wing margin and obliterating the cell M_1 . In all except the most generalized species, including nearly all of the *Limnobiinae*, the medial-cubital cross-vein (*m-cu*) is obliterated by the fusion of M_{3+4} with the upward deflection of Cu_1 ; this fusion may be short or long, and is discussed in connection with the cubitus. After breaking away from the cubitus, M_3 generally runs free to the wing margin, but in some cases (as in *Styringomyia* and *Phalacrocer*a, Plate XXX, 8 and 9) it

unites with M_{1+2} for a short distance, obliterating the medial cross-vein. In some genera — Bittacomorpha (Plate XXX, 3), Bittacomorphella (Plate XXX, 4), Hexatoma (Plate XXXVII, 112), Diotrepha, and many species of Trentepohlia — but one branch of the media reaches the wing margin, and in these cases the posterior branch has either fused with the cubitus (as in Hexatoma) and reaches the margin by this fusion, or has been lost by atrophy. Needham (1908:227-229) believes the posterior branch of the media is lost only by atrophy, and undoubtedly this is true in most instances; the series of Polymera, however, a tropical, American genus studied by the author (Alexander, 1913 b:526-535), showed an interesting condition indicating that the veins may be united by fusion, and similar conditions may exist in the genus Rhapsidolabis and in the South African species *Gonomyia brevifurca*. The entire end of M_3 is lost by atrophy in four known species of Dieranomyia, one of these being *D. whartoni* (Plate XXXI, 15). The cell 1st M_2 (discal) is in many cases opened by the atrophy of part of M_3 , leaving the tip of M_3 attached to the medial cross-vein (as in Ornosia, Plate XXXIV, 59-64, and in Gonomyia, Plate XXXVI, 92 and 93); in other cases it is the medial cross-vein (*m*) that is atrophied, opening the cell (as in Dieranomyia, Plate XXXI, 14 and 16, in Cryptolabis, Plate XXXVII, 101, and in many genera of the Pediciini, Plate XLI, 172-174).

The *cubitus* (*Cu*, fig. 128, A), lying between the media and the anal veins, is the most constant and, after the radius, the most powerful vein of the wing. There are always two branches, which are never lost. At the fork, the anterior branch, Cu_1 , is directed strongly forward, so that in all but the most generalized forms it simulates a cross-vein and from its conspicuous size it has long been termed the *great cross-vein*; this deflection is the basal deflection of Cu_1 of the Comstock-Needham system, and the *pars ascendens* of Bergroth. In the more generalized groups, such as Tanyderidae (Plate XXX, 1), Ptychopteridae (Plate XXX, 2-4), a very few Limnobiinae — as some species of *Tricyphona* (Plate XLII, 184 and 185) — and many of the Tipulinae (Plate XLIII, 195-197), the medial-cubital cross-vein (*m-cu*) is persistent, but in the great majority of cases it is lost by the fusion of Cu_1 and M_{3+4} . As already stated, this fusion may be very short — merely a point of contact (punctiform), as in most species of *Tipula* (Plate XLVI, 222) — or it may be subequal in length to the cell 1st M_2 , the deflection of Cu_1 entering the media at

its fork and breaking away from M_3 at the distal end of the cell; this long fusion with M_3 is the rule in the subfamily Limnobiinae, but is very unusual in the Tipulinae, the South African genus *Leptotipula* being almost the only instance known. In some groups the deflection lies far before the fork of the media, as in the transient fusions of *Nephrotoma* (Plate XLIV, 198 and 202) and *Dolichocheza* (Plate XLIII, 187) or the longer fusions of many *Gonomyia* (Plate XXXVI, 89 and 90) and other genera. In the highly specialized condition obtaining in *Orimarga* and even more accentuated in the tropical-American genus *Diotrepha*, the deflection of Cu_1 is retreated far toward the wing base, so that in the latter genus the fusion of Cu_1 with M is about half the length of the entire wing. On the other hand, Cu_1 may unite with M_3 far out toward the tip of the wing, (as in *Trichocera*, Plate XLI, 165 and 166), so that Cu_1 extends beyond M and is connected with it by the *m-cu* cross-vein, which here runs longitudinally and simulates a section of one of the longitudinal veins. In the great majority of crane-flies, the fork of the cubitus is so deep that the branch Cu_2 is longer than the deflected part of Cu_1 ; in some species of *Limnophila* (Plate XXXVIII, 113), however, and also and especially in the tribe Hexatomini (Plate XXXVII, 104 and 105), the condition is usually reversed and it is Cu_2 that is the shorter element of the fork. Cu_2 is usually free at the wing margin, but in most Old World species of *Trentepohlia* and in one species of *Dicranomyia* it is fused with the first anal vein for a varying distance back from the tip.

The *anal veins* (1st A, 2d A, fig. 128) comprise in the generalized wing three simple veins, as apparently shown in the fossil genus *Cladoneura*; a single anal vein is found in the Ptychopteridae and in most of the Tanyderidae, and there are two in all the Tipulidae and in the fossil tanyderid genus *Etoptychoptera* Handlirsch. The anal veins are simple in all native forms; the second one is forked in the South African genus *Podoneura*, in some species of *Styringomyia*, and in abnormal specimens of *Helobia*. As indicated by Needham (1908), if the second anal vein found in *Helobia* (Plate XXXVII, 98) and that in *Trichocera* (Plate XLI, 165) were united, the condition would be remarkably like what is found in *Podoneura*, and the condition in these genera may have been brought about by the loss of the anterior branch of the fork in *Trichocera* and the posterior branch in *Helobia*. In the Tipulini and some other tribes there is a strong vein lying close beneath *Cu* and often quite removed

from it. This probably represents the first anal vein in these species, in which case all three anal veins would be accounted for.

The cross-veins.—The usual cross-veins of the wing have been indicated, for the most part, in the foregoing discussion of the longitudinal veins. The humeral cross-vein (*h*) is almost always present and forms a strong union between *C* and *Sc* near the wing base; it is of little systematic importance. The radial cross-vein (*r*) lies entirely in the radial field, and connects R_1 with either R_2 or R_{2+3} , or it may lie exactly at the fork of the last-named vein. The radial-medial (*r-m*) cross-vein connects either R_{4+5} with M_{1+2} as in most crane-flies, or R_5 with M_{1+2} as in *Molophilus* (Plate XXXIV, 65-70), or R_5 with M_{1+2} as in *Tricyphona kuwanai* of Japan and in the genus *Rhampholimnobia* discussed above. The medial cross-vein (*m*) lies entirely in the medial field and connects either M_2 or M_{1+2} with M_{3+4} . The medial-cubital cross-vein (*m-cu*) connects either *M* or M_{3+4} with Cu_1 . The arculus (*ar*) is a strong cross-vein connecting *M* with *Cu* at the base of the wing.

Supernumerary cross-veins and spurs are frequently found in crane-flies and furnish convenient characters for defining genera, subgenera, and species. In *Tanytremna regina*, of the Colombian Andes, there is an abundance of cross-veins and spurs in the basal cells of the wings; in the related species *Tanytremna columbiana* there is a single strong cross-vein in cell *M*. These supernumerary cross-veins are very constant in their occurrence and position, and may be found in almost any cell of the wing. Needham (1908:220) drew a primitive crane-fly wing and indicated on it all the supernumerary cross-veins that are known to occur in the group, and the composite resulting was remarkably like the wing of a neuropteroid scorpion fly, thus providing additional confirmation for the belief that the Panorpidae or some closely allied group gave rise to the dipterous line of evolution. *Epiphragma* (Plate XLI, 158) has the cross-vein in cell *C*; *Geranomyia* (Plate XXXI, 10-13) and many *Rhupidia* in cell *Sc*; *Helobia* (Plate XXXVII, 98) and *Dieranophragma* (Plate XXXIX, 139) in cell R_2 ; *Ephelia* (Plate XXXIX, 137 and 138) and *Idioptera* (Plate XXXVIII, 115) in cell *M*; *Dieranota* (Plate XLI, 167-169) in cell R_1 , alongside of the *r* cross-vein; *Discobola* (Plate XXXII, 41) in the first anal cell, forming a strong union between the two anal veins; and so on in great variety. Strong spurs are frequently found at the origin of the radial sector (Plate XXXVIII, 115 and 116), or in a

few cases in other parts of the wing, as in *Hoplolabis* (Plate XXXV, 83), where a strong spur juts into cell *1st M*₂ from its outer end.

Adventitious cross-veins, or veins which are inconstant and of sporadic occurrence within a species, being in some cases present in one and absent in the other of the two wings of a single individual, are rather frequent in the Tipulidae, the most notable cases being the genus *Cladura* (Plate XXXVII, 102) as noted by Alexander and Leonard (1912), and the species *Tricyphona inconstans* (Plate XLII, 177) as noted by Johnson (1901).

The cells.—The cells of the wing take their names respectively from the veins lying immediately before or above them; in the case of fused veins the cell takes its name from the last element of the fusion. Thus the cell behind vein *R*₃ is cell *R*₃, that behind vein *M*₁ is cell *M*₁, that behind vein *R*₄₊₅ is cell *R*₅, and so on (fig. 128, j). When the cells of a field are cut by cross-veins, either primary such as *r* and *m* or super-numerary, the proximal cell is the first and the distal cell is the second. Thus in many crane-flies the discal cell is present, being cut off by the *m* cross-vein at its outer end; and since both cells lie behind vein *M*₁₊₂, both are cell *M*₂, the proximal cell (discal) thus becoming *1st M*₂ and the outer cell becoming *2d M*₂. The same thing is true of the cell *R*₁, which in some cases (as in *Dicranota*, Plate XLI, 167–169) is divided into three cells, numbered outward from the proximal (*1st R*₁) to the distal (*3d R*₁). In most cases the wing cells lying proximad of the arculus are so small and reduced that they cannot be readily homologized; but in the tropical-American genus *Peripheroptera* they attain a remarkable development, occupying in the males of some species from one-third to one-half of the entire wing length. The anal angle of the wing is variously developed, being usually prominent in the family Tanyderidae (Plate XXX, 1), the genus *Antocha* (Plate XXXIII, 48), and the subgenus *Sacandaga* of the genus *Rhabdomastix* (Plate XXXVI, 97), and on the other hand being lacking or nearly so in some exotic Limnobiini, such as *Thrypticomysia* and the males of *Peripheroptera*.

The stigma.—The stigma is a dark spot or area usually situated near the end of vein *R*₁ and often bisected by the radial cross-vein. It may be either present or lacking in the various species of a genus, and in some cases is very large and pubescent, as in the males of the genus *Empedomorpha* Alexander.

The abdomen

The abdomen, the third and last region of the body, lies behind the thorax and is attached to the caudal parts of the metathorax. It is composed of nine apparent segments, or annuli, numbered from the basal (first) to the terminal (ninth). Each of these segments consists of three regions — a dorsal sclerite, the *tergite*; a ventral sclerite, the *sternite*; and a lateral region on either side, the *pleurites*, these being either integumentary or chitinized. The abdominal spiracles are located in this pleural conjunctiva. There is but little modification of the general type in the various groups of crane-flies.

The first segment is very short and appears as a narrow ring closely attached to the metathorax; the second is the longest of the segments; the remaining segments are subequal in size, or, in the male sex especially, shortened and crowded toward the end of the abdomen. In many species of Tipulinae there are present on the abdominal segments rectangular areas of impressed punctures on either side of the median line, which on the second tergite are about midlength of the sclerite and on the succeeding tergites are on the basal part; often there are smaller areas of punctures nearer the caudal margin of the sclerites. These areas are usually present on the sternites as well as on the tergites. The sexual organs are borne at the end of the abdomen in both sexes.

The male hypopygium.—The hypopygium, or propygium, of the male sex is of extreme importance in the determination of species. In many groups and genera (*Gonomyia*, *Molophilus*, *Tipula*, and others) it is almost impossible to identify the species without considering the details of structure of the male genitalia, and in these groups the hypopygium is of paramount importance in specific determination.

The structure of the hypopygium is relatively uniform and homologous thruout the crane-fly series. The organ has been discussed in considerable detail by previous authors, especially by Snodgrass (1904), whose terminology is adopted in this paper. The European authors still adhere largely to the cumbersome terminology of Westhoff (1882).

In the generalized species the hypopygium shows but little complexity and enlargement, the terminal segments of the abdomen being of approximately the same size and diameter as the preceding segments. In the specialized species of many genera (*Gonomyia*, *Limnophila*, *Tipula*,

and others), the hypopygium is enlarged and complicated in structure, the enlargement often involving the terminal two or three segments. The modifications of the eighth and ninth segments are almost inconceivable in their variety, and only the more important types can be mentioned here.

The Tipulinae: In the tipuline forms the pleura are intimately attached to the sternites, and their appendages lie parallel to each other,

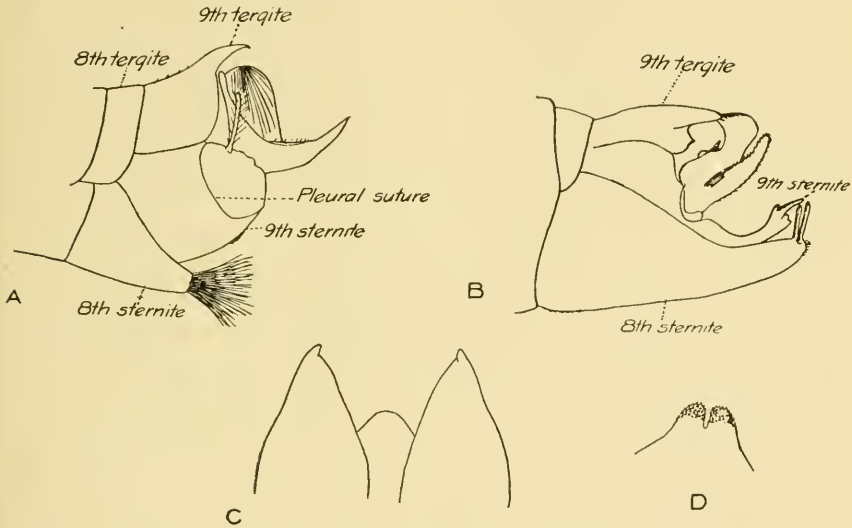


FIG. 129. MALE HYPOPYGIUM, TIPULINAE

A, *Tipula monticola*, lateral aspect. B, *T. parshleyi*, lateral aspect. C, *T. monticola*, ninth tergite, dorsal aspect. D, *T. sulphurea*, ninth tergite, dorsal aspect

work longitudinally, and act as claspers by jutting into the notch of the ninth tergite.

The ninth tergite (fig. 129, c and d) is the terminal dorsal plate of the abdomen. It is of various shapes, but usually rectangular, and may be very large or correspondingly reduced. The caudal margin is variously modified (Plates XLIX-LII), being in some cases nearly straight across and in others notched by V- or U-shaped incisions, with the lateral lobes often produced into long-extending arms, and the appendages of the ninth pleurite jutting into the notch in a position of rest. In some cases the

caudal margin is produced into a strong median lobe (Plate L, 287), or into two slender lobes (Plate XLIX, 271 and 272), one on either side of the median line. The writer regards the ninth tergite as offering the surest and easiest characters for identifying the species of *Tipula*, and its various forms are accordingly illustrated in this paper.

The ninth sternite may be either prominent or insignificant. It bears on its caudal part the ninth pleurites, or pleural region. In primitive forms the pleurites are distinct, being cut off by the *pleural suture* (fig. 129, A); in other forms the suture is obliterated to a greater or less degree and the pleural region is thus immovably attached to the sternite. In very many Tipulinae (as in most species of *Nephrotoma* and many species of *Tipula*), the pleural suture is represented only by a short, curved impression on the ventral side of the fused ninth sterno-pleurite. In the genus *Longurio* the ninth sterno-pleurite is exceedingly elongated, the pleural region being situated at the caudal end and bearing at its apex the pleural appendages, which, in a position of rest, lie in the dorsal concavity of the elongate sterno-pleurite. In some species — *Tipula parshleyi* (fig. 129, B, and Plate LV, 354), *T. trinidadensis*, *T. macrosterno*, *T. gladiator*, and others — it is the eighth sternite that is so greatly enlarged, the ninth sternite being comparatively small and often lying in the dorsal concavity of the eighth sternite. The ninth sternite is usually more or less incised on the mid-ventral line by a deep notch, which in some cases seems to bisect it; such deep notches are spoken of as *profound incisions*.

The only paired element of the hypopygium consists of the ninth pleurites, there being one pleurite on either side of the organ. Usually the pleurites are small and oval, but in some cases they are greatly produced, as in *Tipula macrolabis* and *T. macrolaboides* (Plate LIII, 322 and 323); in other species they are curiously twisted and semi-coiled, as in *T. streptocera*; while in many species an intermediate condition is found in which the pleurite is produced in a moderate degree only (as in *T. loewiana*, *T. mandan*, and others). The pleural appendages are usually two in number. The outer one is more or less fleshy and is of various shapes and sizes in the different groups. In the genus *Nephrotoma* it is broadly oval to elongate-oval and usually pointed, in many species the tips being greatly produced and attenuated. In the genus *Tipula* it may be very tiny, cylindrical, and tending to be reduced, as in the

bicornis group (*Tipula parshleyi*, *T. morrisoni*, *T. bicornis*, *T. megaura*, *T. johnsoniana*); moderate in size and more or less cylindrical, as in the *valida* group (*T. valida*, *T. hirsuta*) and the *umbrosa* group (*T. umbrosa*, *T. monticola*, *T. triton*, *T. mingwe*, *T. tuscarora*); or broad, rectangular, and very flattened, as in the *oleracea* group (*T. perlongipes*, *T. kennicotti*, *T. sulphurea*) and the *tephrocephala* group (*T. tephrocephala*, *T. cayuga*). The inner pleural appendage varies in shape, but usually it has a heavily chitinized, split apex jutting cephalad into the notch of the ninth tergite. The penis guard and the gonapophyses vary in size and shape. In some species, as *Tipula tuscarora*, they are small and shaped like a trident; in other species (*T. triton*, *T. johnsoniana*) the gonapophyses are very large and prominent, and subtend the penis guard. The central vesicles from which the penis arises are often very large. In many species the penis is very long and slender, and when exerted is equal to half the length of the entire abdomen.

In many species the eighth sternite is not at all produced and is unarmed (*Tipula angustipennis*, *T. senega*, *T. sarta*, *T. perlongipes*, *T. kennicotti*, *T. sulphurea*); in other species it is provided with prominent chitinized spines on either side, which are decussate (*T. tuscarora*, Plate LIII, 328), or with large to small tufts of silvery hairs on either side of the median line, these often surrounding one or two small bristles (*T. monticola*, *T. triton*, *T. mingwe*, *T. submaculata*), or with fleshy lobes (*T. australis*, Plate LIII, 326, *T. umbrosa*, *T. valida*). In the generalized members of the South American *monilifera* group (*T. exilis*, *T. andalgala*, and others) the sternite bears a prominent tripartite appendage.

In several species the ninth tergite is fused with the ninth sterno-pleurite so that the entire ninth segment forms a continuous ring, as in *Tipula ultima* (Plate LIII, 333), *T. perlongipes*, *T. kennicotti*, *T. sulphurea*.

The Limnobiinae: In the limnobiine forms the pleurites are prominent and have their appendages elevated above the level of the ninth sternite and the ninth tergite; these appendages are very often decussate or contiguous, work transversely across the genital chamber, and act as claspers by direct, pincer-like contact. In the genus *Geranomyia* (fig. 130, A) and others, the ventral pleural appendages are generally soft and fleshy, and the dorsal pleural appendages are sharp, more or less curved, chitinized hooks. In *Gonomyia* (fig. 130, B) the appendages are very complex in the

specialized forms, and are difficult to homologize even in species that are unquestionably closely related. This condition occurs in several other groups, as in the mycetophilous genus *Sciophila* and related groups, according to Dr. Johannsen, who has studied the family. In *Acyphona* and other genera the hypopygium is asymmetrical in relation to the remainder of the abdomen, the ninth abdominal segment being twisted half around. In some limnophiline forms (*Phyllolabis*, *Oromyia*, *Limnophilina mundoides*) the hypopygium is enlarged and complex, suggesting the condition found in many species of *Tipula*; in *Phyllolabis* the eighth

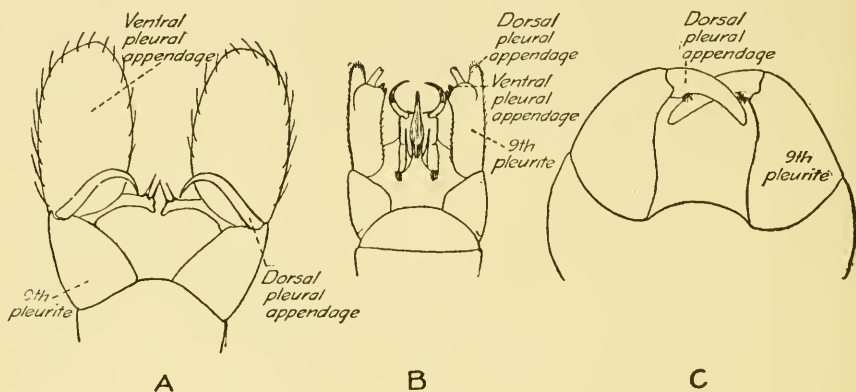


FIG. 130. MALE HYPOPYGIUM, LIMNOBIINAE

A, *Geranomyia rostrata*, dorsal aspect. B, *Gonomyia amazona*, ventral aspect. C, *Chionea primitiva*, dorsal aspect

sternite bears a pale foliaceous appendage, while in *Oromyia* the ninth sternite is produced into a conspicuous lyriform plate. In *Chionea* (fig. 130 c), *Cladura*, and *Pterochionea*, there is a single powerful pleural appendage on each side.

The normal type of structure in the Limnobiinae consists of short to elongate pleurites, bearing at or near the apices two or three appendages which are usually chitinized and decussate in a position of rest. The penis guard occupies the ventral area of the genital chamber, the anal tube the dorsal area.

The female hypopygium.—The female hypopygium, or ovipositor, is characteristic in many species of the Tipulidae. In most cases it consists

of four horny or chitinized pointed valves, which are paired — there being two dorsal (*tergal*) and two ventral (*sternal*) valves. These valves are often acicular and are used for the insertion of the eggs in oviposition. In most species they are curved upward so that the concavity is on the dorsal side, but in the genus *Trichocera* (fig. 131, A) and some of its near allies the ovipositor bends downward, the concavity being on the ventral side.

As wide a range in structure of this usually homogeneous organ as occurs in the group, is found in the genus *Tipula*. The tergal valves

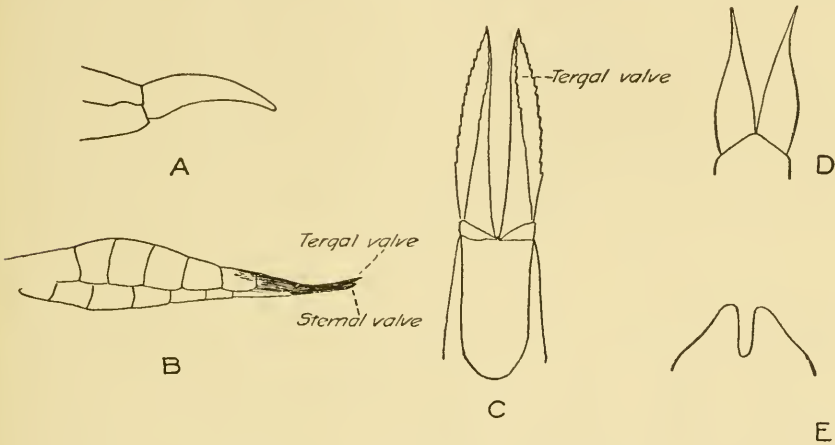


FIG. 131. FEMALE HYPOPYGIUM, OR OVIPOSITOR

A, *Trichocera bimaculata*, lateral aspect. B, *Tanyptera frontalis*, lateral aspect. C, *Tipula longiventris*, dorsal aspect. D, *Tipula piliceps*, dorsal aspect. E, *Tipula parshleyi*, dorsal aspect

are usually longer than the sternal valves (fig. 131, c), and both tergal and sternal valves assume a variety of shapes. They are often slender to subacicular; the tergal valves may be sharply serrated on their outer faces, as in many Arctic and North Temperate species — *Tipula arctica*, *T. longiventris* (fig. 131, c), *T. labradorica*, *T. serricauda*; all the valves may be short and fleshy, superficially resembling the male genitalia but being smaller — as in the *Cylindrotominae* and *Styringomyiini*, and in *Tipula bicornis*, *T. megaura*, *T. parshleyi* (fig. 131, e), *T. morrisoni*, *T. nobilis*, and other species; all the valves may be short and truncated across their tips but strongly chitinized, as in *Tipula mandan*; or the sternal

valves may be very much reduced, as in *Tipula serricauda*. The ovipositor in Tanyptera (fig. 131, B) is normal, but the terminal abdominal segments are greatly narrowed and produce a saber-like appearance.

SEXUAL DIMORPHISM

Besides the differences between the two sexes in the shape of the antennal segments, already discussed, there are many other structural differences. In some species the eyes of the female are much smaller than those of the male, and in the latter the eyes may be contiguous (*holoptic*) or approximated. In species with elongated rostra, such as in the genus *Geranomyia*, the rostrum of the female is often much shorter than that of the male. The legs of the female are in some cases shorter than those of the male. The wings of the females of many species in widely separated tribes are often reduced so as to be incapable of flight; in some forms (*Empedomorpha*) the stigma of the male is much larger than that of the female; in *Tipula armatipennis* of southern Brazil, the wing of the male is armed with an acute spur above the stigma; many other species have the costal region strongly incrassated; in the genus *Peripheroptera*, with the greatly enlarged cells before the arculus described elsewhere, these cells are much smaller in the female than in the male, and the anal angle of the wing is more prominent.

Color dimorphism is found in the species of *Ctenophora* and *Tanyptera*, the specific limits of which are very poorly understood at present. In at least three eastern-American species of *Tipula* (*Tipula fuliginosa*, *T. annulicornis*, and *T. taughanock*), the males are light yellow, while the females are from dark brown to brownish black and appear to be very different insects.

As a rule the females are larger than their mates, but in some species (*Teucholabis*, *Eriocera longicornis*, and others) the male sex is the larger.

HAUNTS

The various species of *Tipulidae* are, within rather broad limits, confined to certain definite haunts or ecological situations. Some species are very closely restricted by their habitat, while others occur in a great diversity of situations. There is no crane-fly that can be called cosmopolitan; *Helobia hybrida* is nearly so, ranging, as it does, over most of the New World, the Palaearctic region, and southward into the Oriental

region. *Conosia irrorata* is another wide-ranging species, being found in almost all of eastern Africa, in southern Asia as far north as Japan, and thence eastward to Australia. *Nephrotoma ferruginea*, one of the commonest of the local forms, ranges over the whole North American continent. The majority of species, however, have a very much more restricted range, the crane-fly fauna of eastern America being largely confined to that region, while the crane-flies found west of the Rocky Mountains are almost all distinct from those of eastern America. Natural barriers, such as large bodies of water, deserts, and mountains, serve to limit and restrict the range of the species.

The presence of moisture is almost a necessity in crane-fly development, and consequently the species as adults occur in the vicinity of water, either running, standing, stagnant, permanent, or temporary. No species confined to sandy or arid conditions are known to the writer, the nearest approach being in *Helobia*, *Trimicra*, and *Empedomorpha*. A few typical situations are here outlined and the more constant inhabitants of these haunts listed:

1. Species inhabiting swampy (helophytic) situations: either grass swamps with little woody elements entering in — *Dicranomyia longipennis*, *Erioptera graphica*, *E. parva*, *Stygeropsis fuscipennis*, *Tipula sayi*, *T. tricolor*; or bush swamps with a certain shrubby element such as *Alnus*, *Spiraea*, and the like — *Bittacomorpha clavipes*, *Ptychoptera rufocincta*, *Adelphomyia cayuga*, *Limnophila fasciolata*, *Rhamphidia mainensis*, *Tipula dejecta*, *T. sulphurea*, *Tricyphona inconstans*, *T. paludicola*.

2. Species inhabiting wet meadows or grasslands, and found along the (usually) grassy banks of streams not necessarily in deep shade — *Protoplasma fitchii*, *Geranomyia canadensis*, *G. rostrata*, *Antocha saxicola*, *Toxorhina muliebris*, *Rhamphidia flavipes*, *Atarba picticornis*, *Erioptera chlorophylla*, *E. straminea*, *E. vespertina*, *E. caloptera*, *E. armata*, *E. venusta*, *Gnophomyia tristissima*, *Gonomyia sacandaga*, *G. alexandert*, *G. sulphurella*, *G. cognatella*, *G. subcinerea*, *G. noveboracensis*, *G. mathesoni*, *Rhabdomastix flava*, *Cryptolabis paradoxa*, *Epiphragma fascipennis*, *Limnophila macrocera*, *L. unica*, *L. tenuipes*, *L. recondita*, *L. imbecilla*, *L. luteipennis*, *L. inornata*, *L. quadrata*, *L. lenta*, *L. noveboracensis*, *Hezatomia megacera*, *Eriocera fultonensis*, *E. longicornis*, *Nephrotoma ferruginea*, *N. incurva*, *N. pedunculata*, *N. tenuis*, *N. xanthostigma*, *N. eucera*, *Tipula angustipennis*, *T. bella*, *T. caloptera*, *T. strepens*, *T. cluta*, *T. fraterna*, *T. cunctans*, *T. bicornis*, *T. parshleyi*, *T. tephrocephala*, *T. umbrosa*.

3. Species living under bog conditions (oxylophytic), in proximity to Sphagnum — *Limnophila laricicola*, *Phalacrocerca tipulina*.

4. Species inhabiting rocky (lithophytic) situations, usually clinging to the vertical faces of cliffs, hiding in crevices of the rocks, or resting on vegetation growing in such haunts — *Bittacomorphella jonesi*, *Cercnomyia canadensis*, *G. diversa*, *Dicranomyia badia*, *D. stulta*, *D. simulans*, *Limnophila montana*, *Tricyphona auripennis*, *Oropeza*, *Dolichocheza americana*, *Tipula macrolabis*, *T. senega*; the species of *Oropeza* and *Dolichocheza* also lurk beneath dark bridges and under culverts.

5. Species inhabiting open gorges, found on the usually luxuriant vegetation of the talus slopes and along the floor of the ravines — *Dicranomyia morioides*, *D. monticola*, *Geranomyia diversa*, *Limnophila cubitalis*, *Adelphomyia minuta*, *Ula elegans*, *Tipula collaris*, *T. senega*, *T. taughanock*, *T. fuliginosa*, *T. valida*.

6. Species inhabiting shaded, cold Canadian woodlands (mesophytic), usually found on rank vegetation in the shade of hemlock, beech, yellow birch, sugar and red maples, and the like; they occur in close proximity to water, on herbage such as ferns, horsetails, *Taxus*, *Streptopus*, *Clintonia*, *Smilacina*, *Medeola*, *Laportea*, *Coptis*, *Dalibarda*, *Impatiens*, and *Viola*, from which they may be swept with a net — *Dicranomyia immodesta*, *D. gladiator*, *D. halterata*, *D. pubipennis*, *D. globulithorax*, *D. macatei*, *Rhipidia maculata*, *Limnobia solitaria*, *L. indigena*, *L. parietina*, *L. triocellata*, *L. tristigma*, *Elephantomyia westwoodi*, *Toxorhina muliebris*, *Dicranoptycha germana*, *Atarba picticornis*, *Ormosia apicalis*, *O. monticola*, *Erioptera armillaris*, *E. megophthalma*, *E. stigmatica*, *E. nyctops*, *Molophilus pubipennis*, *M. fultonensis*, *M. hirtipennis*, *M. comatus*, *M. ursinus*, *Gonomyia florens*, *G. blanda*, *Cladura delicatula*, *C. flavoferruginea*, *Limnophila albipes*, *L. niveitarsis*, *L. tenuicornis*, *L. toxoneura*, *L. areolata*, *L. adusta*, *L. nigripleura*, *L. subcostata*, *L. alleni*, *L. brevifurca*, *L. aprilina*, *L. johnsoni*, *L. fuscovaria*, *L. rufbasis*, *L. munda*, *L. sylvia*, *L. stanwoodae*, *L. osborni*, *L. noveboracensis*, *L. enmelina*, *L. edwardi*, *Adelphomyia americana*, *A. minuta*, *A. cayuga*, *Ulomorpha pilosella*, *Pedicia albivitta*, *P. contermina*, *Tricyphona vernalis*, *T. katahdin*, *T. calcar*, *Rhaphidolabis rubescens*, *R. tenuipes*, *R. flavola*, *R. modesta*, *Cylindrotoma americana*, *C. tarsalis*, *Liogma nodicornis*, *Longurio testaceus*, *Tipula orepzoides*, *T. algonquin*, *T. senega*, *T. hermannia*, *T. fragilis*, *T. macrolalis*, *T. mingwe*, *T. monticola*, *T. hirsuta*, *Trichocera bisinuata*, *Bittacormorphella jonesi*.

7. Species inhabiting shaded Transitional woodlands (mesophytic), often quite open, in shade of hornbeam, basswood, hickory, butternut, ash, and other trees, usually near running water, occurring on a variety of rank herbage and low vegetation such as *Thalictrum*, *Podophyllum*, *Menispermum*, *Nepeta* — *Dicranomyia immodesta*, *D. pudica*, *D. rostrifera*, *D. brevivena*, *D. liberta*, *D. haeretica*, *D. morioides*, *Rhipidia fidelis*, *Limnobia fallax*, *L. indigena*, *L. cinctipes*, *L. immatura*, *L. triocellata*, *Discobola argus*, *Rhamphidia flavipes*, *Dicranoptycha sobrina*, *D. winnemana*, *Atarba picticornis*, *Teucholabis complexa*, *Ormosia nubila*, *O. innocens*, *O. nigripila*, *O. rubella*, *O. meigeni*, *Erioptera septentrionis*, *E. chrysocoma*, *E. chlorophylla*, *E. armata*, *Molophilus hirtipennis*, *M. pubipennis*, *Gonomyia alexanderi*, *G. sulphurella*, *G. cognatella*, *Cladura flavoferruginea*, *Limnophila macrocera*, *L. tenuipes*, *L. adusta*, *L. subcostata*, *L. ultima*, *L. fuscovaria*, *L. cubitalis*, *L. quadrata*, *L. lenta*, *Epiphragma fascipennis*, *Adelphomyia americana*, *Dicranota noveboracensis*, *D. rivularis*, *Rhaphidolabis cayuga*, *R. tenuipes*, *Nephrotoma ferruginea*, *N. incurva*, *N. lugens*, *N. macrocera*, *N. tenuis*, *Tipula unimaculata*, *T. angustipennis*, *T. senega*, *T. apicalis*, *T. strepens*, *T. hermannia*, *T. collaris*, *T. nobilis*, *T. grata*, *T. hebes*, *T. longiventris*, *T. morrisoni*, *T. taughannock*, *T. fuliginosa*, *T. submaculata*, *T. lephrocephala*, *T. ultima*.

8. Species found in the immediate vicinity of streams and rivers, on the rocks or on trees and bushes near by — *Dicranomyia immodesta*, *D. badia*, *D. stulta*, *D. morioides*, *D. simulans*, *Geranomyia diversa*, *G. canadensis*, *Antocha saxicola*, *Cryptolabis paradoxa*, *Hexatoma megacera*, *Eriocera brachyera*, *E. spinosa*, *E. longicornis*, *E. cinerea*, *E. fultonensis*, *E. tristis*, *Dicranota noveboracensis*, *D. rivularis*, *Tipula bella*, *T. caloptera*, *T. cluta*, *T. strepens*.

9. Species found in southern gum swamps, where the forest cover is largely bald cypress (*Taxodium*), sweet gum (*Liquidambar*), sour gums (*Nyssa aquatica* and *N. sylvatica*), and the like, and the herbage consists largely of lizard's-tail (*Saururus*) — *Gonomyia puer*, *G. manca*, *Limnophila recondita*, *L. luteipennis*, *L. irrorata*, *Pentoptera albitarsis*, *Eriocera wilsonii*, *Brachypremna dispellens*, *Tipula tricolor*, *T. perlongipes*, *Nephrotoma okesenoke*, *N. virescens*.

ACTIVITIES

Feeding habits

The species with elongate rostra (*Geranomyia*, *Toxorhina*, *Elephantomyia*, and others) feed on the nectar of tubular flowers, the Compositae being chosen by most of the species, at least in eastern America. Knab's

(1910) very valuable paper cites in detail the feeding habits of the local species of *Geranomyia*, which sip the nectar from various composite flowers (*Eupatorium*, *Solidago*, *Aster*, *Erigeron*, *Silphium*, *Rudbeckia*, *Verbesina*, *Cacalia*, and others). A few other plant families (*Apocynaceae*, *Ericaceae*, *Umbelliferae*, *Rhamnaceae*, *Lauraceae*) are fed upon by various species of crane-flies. The food of the majority of crane-flies, or, indeed, their duration of existence in an adult state, is very little understood. Many species are presumed to be comparatively short-lived and would not require food before the essential functions of reproduction and oviposition were completed; other forms, however, are on the wing for so long a time that it is probable that some sort of food is taken during this period.

Resting habits

The Tipulidae vary in their resting habits and in the positions assumed, according to the species and to the habitats frequented. Some (as *Molophilus* and *Erioptera*) rest on the vertical or inclined surfaces of trees, cliffs, or buildings, with all the legs far outstretched like those of a spider. Many others habitually rest on the upper or the lower surfaces of leaves. In such positions of rest the wings are usually held outspread, or divaricate, in the Tipulinae, and folded over the abdomen in the Limnobiinae. But such broad generalizations break down even within a single genus. Thus, in *Limnophila* such species as *munda*, *areolata*, and *niveitarsis* have the wings folded over the back, while *L. toxoneura* and the related *Epiphragma fascipennis* hold the wings divaricate; in the genus *Tipula*, most species of which rest with outspread wings, the species of the *marmorata* group (*fragilis*, *ignobilis*, and others), as well as those of the related genus *Longurio*, hold the wings incumbent over the abdomen. Some exotic crane-flies (as the genus *Thrypticomyia*, *Dicranomyia saltens*, and several species of *Trentepohlia*) habitually rest on spiders' webs. All these species have conspicuously white feet; *Dicranomyia saltens* has a curious horizontal dance along a transverse strand. Species of *Dolichopeza* and *Oropeza* living in caves and beneath dark culverts, hang suspended from the roof by one or two pairs of legs. *Limnophila montana*, *Dicranomyia badia*, *D. simulans*, and some other species that live on cliffs, rest flat against the rock with all the legs on the support. Many species of Limnobiini (*Geranomyia canadensis*,

G. diversa, *Dicranomyia simulans*, *D. badia*, *D. stulta*) practice a curious up-and-down bobbing while at rest or while feeding, their long, slender legs acting as springs.

Swarming and mating

Swarming usually takes place during the early hours of twilight or in the late afternoon. The swarming of the Limnobiinae is a familiar performance. The number of individuals participating varies from two or three to a dozen or twenty in *Rhabdomastix flava*, *Uta elegans*, *Limnophila brevifurca*, *L. ultima*, and *Epiphragma fascipennis*, several hundreds in most species of *Ormosia* and *Erioptera*, and vast swarms in species of *Trichocera* and in *Eriocera longicornis*, in which many thousands of individuals are involved. In practically all cases the start of the swarm is the same. It begins with one or two individuals and is gradually augmented by the arrival of newcomers. Usually the flight is not far above the ground, that of the smaller species (as in the genera *Ormosia*, *Limnophila*, *Dicranota*, and *Rhaphidolabis*) taking place under the low branches of a tree or the inclined trunk of a fallen log. In *Eriocera*, however, mating usually takes place in the open, often over the broad expanse of a river or a stream. The vertical height covered by the dance varies from a few inches in some species to many feet in *Brachypremna dispellens*, the "king of the dancing crane-flies." Mating takes place during the swarming, and the united pair generally leaves the main body of the swarm and flies away to a resting place.

The tipuline forms and some of the Limnobiinae (several species of *Dicranomyia*, species of *Hexatoma*, *Tipula macrolabis*, *T. fragilis*, *T. fuliginosa*, *T. taughanock*, and others) seem to mate without the preparatory operation of swarming, the males searching diligently and unceasingly for their mates, walking and fluttering about until they encounter the hiding female and then engaging in copulation. As stated by Needham (1908:215) in the case of *Dicranomyia simulans*, the males of this species seem to be very short-sighted and apparently unable to see their mates even when very close to them; they seem to rely mainly on the tactile nature of their long, filiform feet, which, the instant they come in contact with any part of the female, apprise the male of its proximity.

In some groups (*Discobola*, *Liogma*, *Cylindrotoma*, *Tipula ultima*, and others) the males mate with the females while the latter are still callow and teneral, in some cases even waiting beside the pupal case for the female to emerge, when she is at once engaged in copulation. In most cases, however, the female is fully developed and mature before mating takes place. When in copula most species rest quietly on some support, but nearly all species are quite capable of flying while still mated if disturbed; in such cases the larger sex takes the initiative — the female in the Tipulinae, the male in *Eriocera longicornis* and *Teucholabis*. Cases of mating between different species are rare, but in one instance the writer has noted the copulation of *Phalacrocera tipulina* with *Liogma nodicornis*.

Oviposition

The method of oviposition varies with the species and according to the structure of the ovipositor. In the forms with aquatic larvae (*Eriocera*, *Hexatoma*, and others) the eggs are laid directly in the water, the fly dipping during its flight. Many *Tipula*, such as *T. iroquois*, *T. bella*, and others, deposit their eggs regularly and methodically in algal beds at the edge of a stream. *Tipula nobilis*, one of the species having soft, blunt valves in the ovipositor, lays its eggs in soft mud or in moss. Many species of *Limnophila* deposit their eggs with great precision. The author has observed females of *Limnophila alleni* flying about low over the earth in cold, dark woods. They flutter along slowly and silently until a suitable place for egg-laying is found, consisting of a moss-covered, rotten log and the mud beneath it. The eggs are pushed firmly into their position by the acicular tergal valves of the ovipositor, considerable effort being made to place them securely. The rate of oviposition is not more than eight or ten eggs a minute, the female often pausing to rest for several seconds during the operation. When engaged in oviposition the fly is quite unconcerned with other agencies and may be picked up by hand.

The species of *Tipula* with a serrated ovipositor, as described on page 875, undoubtedly have a specialized method of egg-laying, tho what this may be is not yet known.

Photophilism

Many species of crane-flies, in widely separated groups, are attracted to light, such species being termed *photophilous*, or light-loving. It is

probable that this characteristic is fairly general among crane-flies. An interesting fact is that the great majority of specimens of photophilous species taken are either females, or males and females still in copulation, indicating a nocturnal or a crepuscular oviposition or mating habit for these species. There are many of these species, among them being *Erioptera septentrionis*, *Limnophila adusta*, *Pedicia contermina*, *Nephrotoma ferruginea*, *Tipula apicalis*, *T. trivittata*, and *T. collaris*. It is these photophilous species that are so commonly found in houses, they being for the most part species that came to the lights at some earlier time.

ENEMIES

At all stages of their existence crane-flies are beset by enemies. The larvae and adults are preyed upon by a great variety of insect-eating birds and amphibia, and by many predacious insects such as beetles, asilid and empidid flies, Odonata, and the like. The larvae are parasitized by certain tachinid flies (*Siphona*, *Admontia*), and many internal parasites (*Gregarinidae*, *Bacteria*) and fungous diseases (*Entomophthora* [*Empusa*]) often prove fatal to crane-flies in their early stages. It is at their periods of transformation and while still soft and teneral that they are most susceptible to attack and injury of all kinds. The adult flies often serve as carriers of little red mites of the genera *Trombidium* and *Rhyncholophus*. This condition is very general and a great range of species are affected.

Many species of the family (*Geranomyia*, *Dicranomyia*, *Limnophila*, and others) live on the faces of vertical cliffs which are often wet with percolating and dropping water, and this results in a certain mortality due to the insects' being struck by the falling drops and dashed into the mud. During heavy rainfalls the smaller crane-flies rest on the underside of the leaves of trees, while the larger forms escape injury by hiding in crevices of the rock or the bark or by remaining closely pressed against the trunks of trees.

KEYS TO THE CRANE-FLIES OF NORTHEASTERN NORTH AMERICA

The species of crane-flies found in northeastern North America are included in four families, which may be separated according to the following key:

1. Five branches of the radius reaching the wing margin; a single anal vein
 Less than five branches of the radius reaching the wing margin; one or two
 anal veins TANYDERIDAE (p. 883) 2
2. Ocelli present RHYPHIDAE (p. 886) 2
- Ocelli lacking 3
3. A single anal vein PTYCHOPTERIDAE (p. 884) 3
- Two anal veins (both running to the wing margin in all North American species; in some
 Old World forms the first anal vein fused with the second cubitus for a distance back-
 ward from the tip) TIPULIDAE (p. 889)

FAMILY *Tanyderidae*

The remarkable primitive family *Tanyderidae* includes but two living genera — *Tanyderus*, of the antipodal regions, and *Protoplasa*, of the United States.

Genus *Protoplasa* Osten Sacken

1859 *Protoplasa* O. S. Proc. Acad. Nat. Sci. Phila., p. 252.

There are but two species of *Protoplasa*. The eastern species, *P. fitchii*, is discussed below. The western species, *P. vipio*, ranges from Colorado to California.

Protoplasa fitchii O. S.

1859 *Protoplasa fitchii* O. S. Proc. Acad. Nat. Sci. Phila., p. 252.

The species *Protoplasa fitchii* is of medium size and bears a curious superficial resemblance to the common tipulid *Epiphragma fascipennis*. It is a very rare insect, there being scarcely a score of specimens in the various collections, most of them from the Adirondacks of New York State and the Black Mountains of North Carolina. The fly is brownish gray, the wings being marked with an ocellate pattern of spots and bands (Plate XXX, 1). The anal angle of the wing, which is almost square, is very prominent. The immature stages are unknown but the writer surmises that they occur in wet wood in the same situations as the larvae and pupae in the genus *Epiphragma*.

FAMILY Ptychopteridae

The family Ptychopteridae has generally been understood to include the tanyderid flies, as well as the three genera herein considered as constituting it. The resemblance between the Tanyderidae and the Ptychopteridae seems to be superficial only, however, and the differences are very considerable.

The immature stages of the Ptychopteridae are very remarkable. The larva lives in an aquatic or a semi-aquatic habitat, and its caudal extremity is provided with an extensile elongated breathing tube which bears the spiracles at the end. The pupa has one of the two thoracic breathing horns enormously elongated, while the other is considerably atrophied. Both these elongated processes in the immature stages serve to provide the insect with air while the body is submerged beneath the mud and water. The larvae of *Bittacomorpha* are of a peculiar rust-red color; those of *Bittacomorphella* are almost black, with the short breathing horns yellow; those of *Ptychoptera* are more yellowish brown.

The following key divides the family into its genera:

1. Antennae 20-segmented; wings with cell M_2 lacking; legs banded with black and white. (Subfamily *Bittacomorphinae*).....2
- Antennae 16-segmented; wings with cell M_2 present; legs not banded with black and white. (Subfamily *Ptychopterinae*).....*Ptychoptera* Meig. (p. 884)
2. Apex of the wing not pubescent; metatarsi swollen.....*Bittacomorpha* Westw. (p. 884)
- Apex of the wing pubescent; metatarsi not swollen.....*Bittacomorphella* Alex. (p. 885)

SUBFAMILY Ptychopterinae

Genus *Ptychoptera* Meigen

1803 *Ptychoptera* Meig. Illiger's Mag., vol. 2, p. 262.

Ptychoptera rufocincta O. S.

1859 *Ptychoptera rufocincta* O. S. Proc. Acad. Nat. Sci. Phila., p. 252.

Ptychoptera rufocincta is the only eastern species of *Ptychoptera*. It is deep black, with rusty-red bands on the abdominal segments; the wings (Plate XXX, 2) have brown crossbands, presenting an appearance superficially very like that of *Limnophila macrocera*.

SUBFAMILY Bittacomorphinae

Genus *Bittacomorpha* Westwood

1835 *Bittacomorpha* Westw. London and Edinburgh Phil. Mag., vol. 6, p. 281.

There are two described species of *Bittacomorpha* inhabiting the Neartic region, one, *Bittacomorpha clavipes* (Fabr.), in the East, and one, *B. occidentalis* Ald., in the West. *B. clavipes* has been reported from Brazil but the record needs confirmation.

Bittacomorpha, or the "phantom crane-fly," is among the most interesting of the local genera. The larger and commoner eastern species, *B. clavipes*, is one of the most abundant and widely distributed of the North American crane-flies, and inhabits wet swales, swamps, margins of ponds, and similar situations. The legs are curiously banded with black and white. The thoracic dorsum is deep velvety black with a white median line. The swollen metatarsi are unique among the local crane-flies. The wing is shown in Plate XXX, 3. The larva of this species is very similar in structure to that of species of *Ptychoptera*, but is easily distinguished by the rust-red tomentum which completely covers the body. Both these genera have the extensile breathing tube in the larva, and the single enormously produced breathing spiracle in the pupa. The larvae are common in rotting organic vegetable matter which is percolated and saturated with running water. The adult flies are very conspicuous and attract considerable attention even among persons who are not greatly interested in insects. The long, swollen legs, radiating out from the body like the spokes from the hub of a wheel and conspicuously banded with black and white, make the flies noticeable as they drift slowly thru the air, apparently as light as bits of down.

Genus *Bittacomorphella* Alexander

1916 *Bittacomorphella* Alex. Proc. Acad. Nat. Sci. Phila., p. 545.

The genus *Bittacomorphella* includes two known species, both of the Neartic region. Of these, *Bittacomorphella jonesi* (Johns.) is eastern, and the larger species, *B. sackenii* (Röder), is western. The better-known of the two species, *B. jonesi*, is locally common in cold, shaded situations, as along dark ravines, near running water, or beneath dark bridges and culverts. The curious black larva is found in mud or moist earth, in haunts similar to those described for the adult. The flies are readily distinguished from those of the larger and somewhat similar *Bittacomorpha clavipes* by the metatarsi, which are not swollen and have no white near the base but are marked with more or less white at the tips, these white markings being broadest on the fore legs and narrowest on the hind legs.

The tibiae are black, with a broad white band beyond the base. The second and third tarsal segments are pure white. The apically pubescent wings (Plate XXX, 4) are characteristic of the genus.

FAMILY Rhyphidae

The family Rhyphidae includes an apparently heterogeneous group of three subfamilies which, until a very recent date, were placed in three widely separated families of the nematocerous Diptera. The Rhyphidae comprise about fifty species, arranged in some seven genera. The family has long been held to contain only the genus Rhyphus and one or two closely allied exotic genera. In 1916, Edwards (1916) removed the genus *Mycetobia* from the family Mycetophilidae and placed it with the Rhyphidae. A critical study of the immature stages of the genus *Trichocera* now demonstrates that this group, likewise, should be placed in very close proximity to the Rhyphinae. In general appearance the three groups or subfamilies herein considered as comprising the Rhyphidae differ greatly, but the larvae of all members are so unmistakably related that there can be no question of the close phylogenetic relationship.

The Trichocerinae have the more generalized wing venation, there being three branches to the sector and three to the media, and two distinct anal veins. The local species of *Trichocera* have the *m-cu* cross-vein punctiform or obliterated by a slight fusion of Cu_1 on M_3 . *Trichocera trichoptera* O. S., of the Western States, has the cross-vein very long and conspicuous. The second anal vein is long and subsinuate in the subgenus *Diazosma* Bergr., but very short and recurved in the typical subgenus, in *T. trichoptera* being very short and reduced and narrowing the second anal cell.

Edwards (1916) and Knab (1916) have recently shown the probable evolution of *Mycetobia* from the more generalized Rhyphidae such as *Rhyphus* and *Olbiogaster*. The most important venational feature to be considered is the reduction of the media in the Mycetobiinae, but two branches persisting in *Mycetobia* and the vein tending to be evanescent in the Ethiopian genus *Mesoehria*. Species of *Olbiogaster* in some cases have the posterior branch of the media less strongly chitinized than the anterior fork, and probably indicate the manner in which the vein is reduced. An entirely comparable case is seen in the related family Ptychopteridae (comparing *Ptychoptera* and *Bittacomorpha*). In the

Rhyphidae, the Trichocerinae are the most generalized, the Mycetobiinae the most specialized, of the groups.

The subfamilies may be separated by the following key:

1. Two distinct anal veins; radial sector three-branched..... Trichocerinae (p. 887)
A single distinct anal vein; radial sector two-branched..... 2
2. Cell *1st M*₂ present..... Rhyphinae (p. 888)
Cell *1st M*₂ lacking..... Mycetobiinae (p. 888)

SUBFAMILY Trichocerinae

The subfamily Trichocerinae includes but two genera—Trichocera, and Ischnothrix Bigot of Cape Horn.

Genus Trichocera Meigen

1800 *Petaurista* Meig. *Nouv. Class. Mouch.*, p. 15 (*nomen nudum*).

1803 *Trichocera* Meig. *Illiger's Mag.*, vol. 2, p. 262.

1911 *Paracladura* Brun. *Rec. Indian Mus.*, vol. 6, p. 286.

In the genus *Trichocera* there are about twenty described species, of which the majority are Holarctic in their distribution but a few are from India and the antipodes. The species of this genus are in a very chaotic condition taxonomically, and it seems difficult to remedy this until the European and American forms can be critically studied and compared. There can be little doubt that many of the species are Holarctic in their distribution and the three or four evident species within the limits here considered may be conspecific with the European forms. The larvae, so far as known, live in decaying vegetable matter (Johannsen, 1910). The adult flies are common in autumn and early spring, and appear in small swarms on warm, sunny days in winter. During the winter months they are often found in cellars, resting on the windows. They are also to be found in mines, and the writer has seen specimens from a Colorado silver mine taken at a very considerable depth by Dr. H. B. Hungerford. Some of the swarms of these flies number many thousands of individuals.

The following key divides the local species of *Trichocera*:

1. Second anal vein subsinuate; veins long-hairy; ovipositor fleshy. (Subgenus *Diazosma* Bergr.) [Journ. N. Y. Ent. Soc., vol. 24, p. 124-125, pl. 8, fig. 10. 1916.] (Plate XLI, 166.)..... *T. subsinuata* Alex.
Second anal vein short, incurved to the anal angle; veins not long-hairy; ovipositor chitinized, turned downward, the concavity being on the lower face. (Subgenus *Trichocera* Meig.)..... 2
2. Wings with two brown clouds. [List Dipt. Brit. Mus., vol. 1, p. 84. 1848.]
T. bimacula Walk.Wings unicolorous. [Winter Insects of New York, p. 9. 1848.] (Plate XLI, 165.)
 ▶ *T. brumalis* Fitch

Certain European species of Trichocera, such as *T. maculipennis* (Fabr.) and *T. reglotionis* (Linn.), have been recorded from the Northern States and Canada; these records may be correct, since, as stated above, it is very probable that many species of the genus are Holarctic in their distribution. If such is the case, the names used in the preceding key are very probably synonyms of the European species.

SUBFAMILY Rhyphinae

The subfamily Rhyphinae includes but three genera. The two which are represented by North American species are Rhyphus, with about a score of principally Holarctic species, and Olbiogaster, a tropical group of five species. Within the limits of this paper three species occur, two of which — *Rhyphus fenestralis* and *R. punctatus* — are very widespread over the North Temperate Zone.

Genus Rhyphus Latreille

1805 *Rhyphus* Latr. Hist. Nat. Crust. et Ins., vol. 14, p. 291.

The adult flies of the genus Rhyphus are often found resting on the trunks of trees or on near-by vegetation. The immature stages are spent in decaying vegetable matter, manure, sewage, and similar situations. The venation of a typical Rhyphus is shown in figure 132, A.

Baerg (1918) has recently published a key for the separation of the adult flies of the three eastern-North-American species of the genus. This key is here modified to conform with the other keys in this paper:

1. Basal deflection of M_2 as long as, or longer than, m (that is, veins M_1 , M_2 , and M_3 about equidistant from one another at cell 1st M_2) 2
 Basal deflection of M_2 much shorter than m ; eyes of male holoptic; no yellowish spot near midlength of costal margin of wing *R. punctatus* (Fabr.)
 2. Wing with a distinct yellowish spot near midlength of costal margin; subapical hyaline spots sharply defined; eyes of male holoptic; median prescutal stripe split by a narrow gray line, more distinct in the female *R. alternatus* Say
- Wing with the yellow and hyaline spots less distinct and more diffuse; eyes of both sexes dichoptic; median prescutal stripe only indistinctly divided, if at all.
R. fenestralis (Scop.)

SUBFAMILY Mycetobiinae

The subfamily Mycetobiinae, so far as known, includes only the genus Mycetobia, discussed below, and the genus Mesochria of the Seychelles Islands. Other genera have been associated with Mycetobia in the Mycetophilidae, but so far as is known their larvae are quite normal for

the latter family and quite unlike the amphipneustic larvae of the Rhyphidae. Until additional data are forthcoming they should be considered as being Mycetophilidae.

Genus *Mycetobia* Meigen

1818 *Mycetobia* Meig. Syst. Besch., vol. 1, p. 229.

Johannsen (1909) recognizes six recent species of *Mycetobia*, and five others as fossil in Baltic amber (Eocene). The larvae are found in decaying

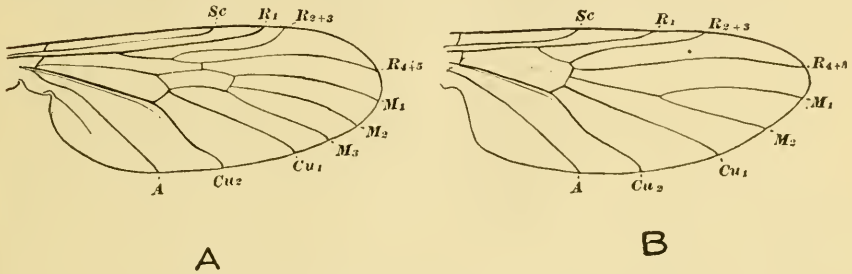


FIG. 132. WING VENATION IN RHYPHIDAE
 A, Venation of typical Rhyphus. B, Venation of Mycetobia

trees and in fermented sap in the wounds of trees. A single species is known from New York State, *Mycetobia divergens* Walk. The characteristic venation of the genus is shown in figure 132, B.

FAMILY Tipulidae

The family Tipulidae includes almost all of the local crane-flies. It is divided into three subfamilies, two of which are further separable into nine tribes — six belonging to the Limnobiinae and three to the Tipulinae. The tribes may be separated as follows:

1. Last segment of the palpi elongate, whiplash-like; nasus usually distinct; antennae usually with 13 segments; *Sc* almost always ending in *R*; *m-cu* cross-vein present or obliterated by the usually slight fusion of *Cu*₁ on *M*₃₊₄. In the dolichoepezine genus *Brachypremna* (p. 928) *Sc* is very long and ends in the costa, and the fusion of *Cu*₁ and *M*₃₊₄ is often extensive; but the antennae are 13-segmented, the palpi are elongated, the nasus is distinct, and the whole appearance of the fly is decidedly tipuline. (Subfamily Tipulinae.) 2
- Last segment of the palpi short; no distinct nasus; antennae usually 14- or 16-segmented; *Sc* usually ending in costa but connected with *R* by *Sc*₂; *m-cu* cross-vein obliterated by the long fusion of *Cu*₁ on *M*₃₊₄. In *Pedicia* (p. 923) the palpi are elongated, but all other characters are limnobiine. (Subfamilies Limnobiinae, *Cylindrotominae*.) . . . 4

2. Vein R_2 obliterated by atrophy (this is also the case to a lesser extent in *Tipula subfasciata* and *T. penobscot*), or else (as in *Brachypremna*) the second anal vein very short, not more than one-third the length of the first anal vein; legs very slender, filiform. *Dolichopezini* (p. 928)
 Vein R_2 present for its entire length (except in *Tipula subfasciata*, *T. penobscot*, and other species); second anal vein longer, one-half the length of first anal vein; legs stouter and usually shorter than in *Dolichopezini*. 3
3. Antennae without verticils (see *Stygeropsis*, below); flagella of the male antennae pectinate. *Ctenophorini* (p. 930)
 Antennae verticillate (except in *Stygeropsis* and most species of *Holorusia*); flagella of the male antennae not pectinate (in some species of *Nephrotoma* and *Tipula* the ventral face of the segments is often deeply incised, producing a serrate appearance, but the antennae in the northern forms are never pectinate). *Tipulini* (p. 932)
4. Four branches of radius reaching the margin (see note on *Gonomyia blanda*, below). 5
 Two or three branches of radius reaching the margin. 9
5. Tibiae spurred at tip. 6
 Tibiae without spurs at tip. (*Gonomyia blanda*, p. 905, has R_2 in close proximity to R_1 at the wing margin, so that but three branches of the radius appear to reach the wing margin; the tropical antochine genus *Paratropeza* will also run to here, and has been mistaken by some authors for a *Gnophomyia*; the investigator must always be on the lookout for such aberrant genera and species, especially when dealing with tropical material.) *Eriopterini* (p. 901)
6. Antennae with from 6 to 10 segments. *Hexatomini* (p. 920)
 Antennae with more than 10 segments. 7
7. Sc_2 beyond the origin of R_s *Limnophilini* (p. 913) (except genus *Ula*)
 Sc_2 before the origin of R_s 8
8. Antennae 17-segmented; wings pubescent. Genus *Ula*, tribe *Limnophilini* (p. 913)
 Antennae 13- to 16-segmented; wings glabrous. *Pediciini* (p. 923)
9. Tibiae spurred; an apparent fusion of R_{1+2+3} to the wing margin so that but two branches of the radius are present (except in *Phalacrocera neoxena*, in which three branches are present). The European hexatomine genus *Cladolipes* runs to here but has only eight antennal segments; the South American species *Psaronius abnormis* also comes here, but may be readily separated by the very elongate subcosta.
 Subfamily *Cylindrotominae* (p. 926)
 Tibiae without spurs; no contiguity of R_1 and R_{2+3} at their tips. 10
10. Antennae 12-, 15-, or 16-segmented; claws usually without teeth on their lower side. 11
 Antennae 14-segmented; claws with teeth on their lower side. *Limnobiini* (p. 890)
11. Cross-vein r lacking; Sc ending before the origin of the short R_s ; R_{2+3} upcurved at the end, R_{1+2} bent strongly toward the apex of the wing producing a trumpet-shaped cell R_3 ; cell *1st* M_2 , when present, pointed at the inner end.
 Subgenus *Leiponeura*, genus *Gonomyia*, tribe *Eriopterini* (p. 905)
 Cross-vein r present or lacking; if lacking, Sc ends far beyond the origin of R_s ; R_{2+3} not strongly upcurved at end, and R_{1+2} not bent strongly toward the apex of the wing; inner end of cell *1st* M_2 not pointed. *Antochini* (p. 897)

The nearly wingless snow fly, *Chionea*, belongs to the tribe *Eriopterini* (page 902).

SUBFAMILY *Limnobiinae*

Tribe *Limnobiini*

The genera of the tribe *Limnobiini* may be separated by the following key:

1. Rostrum elongated, longer than head and thorax together. *Geranomyia* Hal. (p. 891)
 — Rostrum not elongated, shorter than the head. 2

2. A supernumerary cross-vein in cell *1st A*, connecting the two anal veins.
Discobola O. S. (p. 892)
 No supernumerary cross-vein in cell *1st A* 3
3. Often with a supernumerary cross-vein in cell *Sc*; antennae of the male bi-, uni-, or sub-pectinated. *Rhipidia* Meig. (p. 892)
 No supernumerary cross-vein in cell *Sc* (excepting a weak one in *Dicranomyia simulans*); antennae of the male not pectinated. 4
4. *Sc* usually short, ending opposite the origin of *Rs*; claws usually with but a single tooth on the lower side; ventral pleural appendage of the male hypopygium a fleshy lobe.
Dicranomyia Steph. (p. 893)
Sc always elongate, ending far beyond the origin of *Rs*; *r* often considerably removed from the tip of *R*; claws usually with two or three teeth on the lower side; ventral pleural appendage of the male hypopygium horny. *Limnobia* Meig. (p. 895)

Genus *Geranomyia* Haliday

- 1833 *Geranomyia* Hal. Ent. Mag., vol. 1, p. 154.
 1835 *Limnobiorhynchus* Westw. Ann. Soc. Ent. France, vol. 4, p. 683.
 1838 *Aporosa* Macq. Dipt. Exot., vol. 1, p. 62.
 1865 *Plettusa* Phil. Verh. Zool.-Bot. Ges. Wien, p. 597.

The genus *Geranomyia* includes about seventy described forms, the species being most numerous in the Neotropical and Oriental regions. The species are readily distinguished from all other crane-flies by the curious elongate rostrum (fig. 124, A, page 846). The four species occurring within the limits considered in this paper are common and widely distributed; further notes on their distribution have been given by the writer in an earlier paper on the genus (Alexander, 1916:486-496). Nothing is known concerning their immature stages, this being one of the most conspicuous gaps in the whole family. It is probable that *G. rostrata*, at least, is partly aquatic, living in moist earth or possibly in wet moss.

The following key divides the local species of the genus:

1. Wings heavily spotted with dark brown; tips of the tibiae black. [*Limnobia rostrata* Say. Journ. Acad. Nat. Sci. Phil., vol. 3, p. 22. 1823.] (Plate XXXI, 10.) . . . *G. rostrata* (Say)
 Wings unmarked or with only pale indistinct seams along the cord. 2
2. *Sc* short, ending opposite or just beyond the origin of *Rs*; cross-veins and deflections of veins faintly seamed with darker. [Proc. Acad. Nat. Sci. Phil., p. 207. 1859.] (Plate XXXI, 13.) . . . *G. diversa* O. S.
Sc long, ending at about midlength of the sector; wings unmarked except for the stigmal spot. 3
3. Body coloration yellow; wings with the stigma pale; legs dull yellow, the femora not darkened at their tips. [Journ. N. Y. Ent. Soc., vol. 8, p. 186, pl. 7, fig. 13. 1900.] (Plate XXXI, 12.) . . . *G. distincta* Doane
 Body coloration yellowish brown, darkest on the scutal lobes and the postnotum; wings with the stigma oval, dark brown, well-defined; legs brownish yellow, the femora brown at the tips. [*Limnobiorhynchus canadensis* Westw. Ann. Soc. Ent. France, vol. 4, p. 684. 1835.] (Plate XXXI, 11.) . . . *G. canadensis* (Westw.)

G. canadensis is most commonly found along small streams near cliffs; *G. diversa*, resting on vegetation along running water or clinging to vertical wet banks; *G. rostrata*, on rich vegetation in damp places, where it is often extremely abundant (Alexander, 1912:67-68). The habits of the adult flies are discussed on page 878.

Genus *Discobola* Osten Sacken

1865 *Discobola* O. S. Proc. Ent. Soc. Phil., p. 226.

1869 *Trochobola* O. S. Mon. Dipt. N. Amer., part 4, p. 98.

The genus *Discobola* is a well-defined group including eight described species with a curious discontinuous distribution — two species occurring in North America, two in Europe, and four in New Zealand. The species are readily distinguished by the presence of a strong supernumerary cross-vein between the two anal veins. The only local species is *D. argus*.

Discobola argus (Say)

1824 *Limnobia argus* Say. Long's Exped., App., p. 358.

1865 *Discobola argus* O. S. Proc. Ent. Soc. Phil., p. 226.

The species *Discobola argus* is a curious fly, with ocellate markings on the yellowish white wings (Plate XXXII, 41). The body coloration is yellowish, the thorax with three brown stripes, each femur with a brown subterminal ring. The immature stages of the American species are unknown but are probably spent in decaying pine stumps, as are those of the European *D. caesarea*; specimens of *D. argus* have been observed mating on the bark of stumps (in Ithaca, New York, October 3, 1912, by Ilg and Alexander). The fly is uncommon in May and June but becomes more numerous from August to October.

Genus *Rhipidia* Meigen

1818 *Rhipidia* Meig. Syst. Besch., vol. 1, p. 153.

In the genus *Rhipidia* there are about twenty-eight described species, most numerous in the tropics of the New World. The character of the pectination of the antennae (page 851) varies in the different groups or subgenera as follows:

Rhipidia Meig. (*maculata*, *bryanti*) — antennae of the male bipectinate.

Monorhipidia Alex. (*fidelis*) — antennae of the male unipectinate.

Arhipidia Alex. (*domestica*, *shannoni*) — antennae of both sexes subpectinate to simple.

The immature stages of the known species are spent in decaying vegetable matter, manure, or decaying fungi (*R. maculata*, *R. domestica*), in decaying wood or beneath the loose bark of trees (*R. uniseriata*, *R. fidelis*, *R. bryanti*), or perhaps in aquatic situations (*R. maculata*, according to Needham).

The following key divides the local species of the genus:

1. Wings with an abundant pale brown or gray dotting in all the cells. 2
Wings with the markings larger and confined to the vicinity of the veins. 3
2. Body coloration grayish, the prescutum with a broad black median line; postnotum gray; wings with a heavy brown pattern along the costal margin, the marks about equal to the interspaces; legs brown; male antennae bipectinate. [Syst. Besch., vol. 1, p. 153, pl. 5, fig. 11. 1818.] (Plate XXXII, 36.) *R. maculata* Meig.
Body coloration yellowish brown, the prescutum without a broad black median line; postnotum black; wings with small black spots at the base, the subcostal cross-vein, the origin of the sector, and the stigma, these marks much smaller than the interspaces; legs yellow; male antennae subpectinate. [Proc. Acad. Nat. Sci. Phila., p. 581, pl. 27, fig. 23. 1914.] (Plate XXXII, 39.) *R. shannoni* Alex.
3. Prescutum reddish brown with narrow black lines; pleura dull yellow with two narrow blackish longitudinal stripes; antennae with segments 12 and 13 light yellowish; basal deflection of *Cu*₁ usually far before the fork of *M*; antennae of the male subpectinate. [Proc. Acad. Nat. Sci. Phila., p. 208, pl. 3, figs. 8, 9. 1859.] (Plate XXXII, 40.) *R. domestica* O. S.
Prescutum gray with a broad black median line; pleura grayish or plumbeous, unstriped; antennae black throat; basal deflection of *Cu*₁ at the fork of *M*; antennae of the male not subpectinate. 4
4. Wings with the dark pattern beyond the origin of the sector only, a large rounded cloud at the origin and fork of the sector, the large rectangular stigma and the radial cells largely darkened; abdomen dark brown, the genitalia reddish yellow; antennae of the male unipectinate. [Proc. Acad. Nat. Sci. Phila., p. 209. 1859.] (Plate XXXII, 38.) *R. fidelis* O. S.
Wings with a series of about five large grayish brown blotches along the costal margin, two before the origin of the sector; abdominal tergites yellow, the caudal half of each segment dark brown; antennae of the male bipectinate. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 123, 124, pl. 16, fig. 20. 1909.] (Plate XXXII, 37.) *R. bryanti* Johns.

R. domestica and *R. shannoni* are more southern in their distribution, *R. fidelis* and *R. maculata* more northern. Some of the species have a very extensive geographical range, *R. domestica* and its races occurring from Alaska to Argentina, and *R. maculata* being found thruout northern Europe and North America.

Genus *Dicranomyia* Stephens

1829 *Dicranomyia* Steph. Cat. Brit. Ins., vol. 2, p. 243.

1830 *Siagona* Meig. Syst. Besch., vol. 6, plate 65, fig. 7.

1854 *Numantia* Bigot. Ann. Soc. Ent. France, ser. 3, vol. 2, p. 470.

Dicranomyia is one of the largest of the crane-fly genera, there being from one hundred and eighty to one hundred and ninety described species,

found on all the continents and on many of the oceanic islands. The species are rather small, are dull-colored, and are often difficult of exact determination.

The immature stages are spent in a wide range of habitats, described on page 838

The local species of the genus *Dicranomyia* may be separated according to the following key:

1. Wings with but one free branch of the media reaching the margin. [23d Rept. N. Y. State Ent., p. 211-212, pl. 27, fig. 5. 1908.] (Plate XXXI, 15.)... *D. whartoni* Needm. Wings with two free branches of the media reaching the margin..... 2
2. Wings narrow, lanceolate; cell *1st M₂* open; thoracic pleura with a brown longitudinal stripe. [*Limnobia longipennis* Schum. Beitr. zur Ent., vol. 1, p. 104, pl. 1, fig. 2. 1829.] (Plate XXXI, 14.)..... *D. longipennis* (Schum.) Wings broad..... 3
3. *Sc* ending opposite, or before or slightly beyond the origin of the sector..... 4
Sc ending far beyond the origin of the sector..... 20
4. Antennae with at least the basal segments pale..... 5
Antennae with the segments dark thruout..... 9
5. Cell *1st M₂* open (cross-vein *m* lacking)..... 6
Cell *1st M₂* closed..... 7
6. Prescutum with a single brown stripe; dorsal pleural appendage of the male hypopygium a short hook. [Proc. Acad. Nat. Sci. Phila., p. 211. 1859.]..... *D. immodesta* O. S.
Prescutum with three brown stripes; dorsal pleural appendage of the male hypopygium a long, saber-like hook, which is contiguous with its mate on the opposite side. [Proc. Acad. Nat. Sci. Phila., p. 212, pl. 3, fig. 5. 1859.]..... *D. gladiator* O. S.
7. Pale yellowish thruout, only the tips of the tarsi and the eyes darker; in life the abdominal segments somewhat greenish. [Proc. Acad. Nat. Sci. Phila., p. 212. 1859.] (Plate XXXI, 22.)..... *D. pudica* O. S.
Brownish yellow, the antennae darkened at the tips; halteres brownish..... 8
8. Halteres pale, the knobs infuscated; abdomen brownish yellow. [Journ. N. Y. Ent. Soc., vol. 8, p. 183, pl. 7, fig. 5. 1900.]..... *D. isabellina* Doane
Halteres and abdomen brown. [Proc. Acad. Nat. Sci. Phila., p. 212. 1859.]..... *D. diversa* O. S.
9. Cell *1st M₂* open; *Sc* far before the origin of *Rs*, due to the shortness of the latter which is about equal to the basal deflection of *R₄₊₅*..... 10
Cell *1st M₂* closed; *Sc* nearly opposite the origin of *Rs*, which is much longer than the basal deflection of *R₄₊₅*..... 11
10. Rostrum elongated, nearly as long as the head, brown; prescutum with a single dark brown stripe. [Mon. Dipt. N. Amer., part 4, p. 65. 1869.] (Plate XXXI, 16.)..... *D. rostrifera* O. S.
Rostrum much shorter than the head, light yellow; prescutum with three dark brown stripes. [Mon. Dipt. N. Amer., part 4, p. 66. 1869.]..... *D. brevivena* O. S.
11. Thorax shining black, the pleura with a grayish pruinosity. [Proc. Acad. Nat. Sci. Phila., p. 17. 1860.] (Plate XXXI, 23.)..... *D. morioides* O. S.
Thorax not shining black; gray, brown, or yellowish brown..... 12
12. Femora brown with the tips broadly yellow; wings marked with brown. [*Limnobia badia* Walker. List Dipt. Brit. Mus., vol. 1, p. 46. 1848.] (Plate XXXI, 20.)..... *D. badia* (Walk.)
Femora not banded with yellow; wings unmarked or nearly so..... 13
13. *Sc₁* much longer than *Sc₂*, being nearly if not quite the length of the stigma..... 14
Sc₁ short, not more than one-half the length of the stigma..... 16

14. Halteres elongated (northern species). [Mon. Dipt. N. Amer., part 4, p. 71. 1869.] (Plate XXXI, 18.)..... *D. halterata* O. S.
Halteres short, of normal length..... 15
15. Prescutum reddish brown, with a narrow paler median line. [Journ. N. Y. Ent. Soc., vol. 8, p. 184, pl. 7, fig. 6. 1900.]..... *D. brunnea* Doane
Prescutum dark brown with yellow and brown stripes. [Proc. Acad. Nat. Sci. Phila., p. 211. 1859.]..... *D. distans* O. S.
16. Coloration gray, the prescutum with a broad median brown stripe; a narrow brown seam on cross-vein *r*. [Proc. Acad. Nat. Sci. Phila., p. 209, pl. 3, figs. 4, 4a. 1859.] (Plate XXXI, 21.)..... *D. liberta* O. S.
Coloration brown or yellowish brown; no narrow brown seam on cross-vein *r*..... 17
17. Basal deflection of M_{1+2} , forming the inner end of cell 1st M_2 , arcuated so that cells 1st M_2 and R_3 are almost on a line. [Proc. Acad. Nat. Sci. Phila., p. 210. 1859.]..... *D. stulta* O. S.
Basal deflection of M_{1+2} not conspicuously arcuated, cell 1st M_2 being conspicuously more distant from the wing base than cell R_3 18
18. Thorax brown, with three blackish stripes on the prescutum which are confluent, the lateral ones running caudad onto the scutal lobes; wings hyaline, unmarked. [*Furcomyia monticola* Alex. Psyche, vol. 18, p. 201-202, pl. 16, fig. 7. 1911.] (Plate XXXI, 19.)..... *D. monticola* (Alex.)
(*Dicranomyia monticola* may not be distinct from *D. stulta*, which appears to be a somewhat variable species.)
Thorax not so marked; wings with a grayish or brownish tinge..... 19
19. Thorax brownish yellow, with a darker brown median stripe; antennae black. [Mon. Dipt. N. Amer., part 4, p. 70-71, pl. 1, fig. 3. 1869.] (Plate XXXI, 17.)..... *D. haeretica* O. S.
Thorax light brown without a distinct darker median stripe; antennae reddish brown. [Journ. N. Y. Ent. Soc., vol. 8, p. 184, pl. 7, fig. 8. 1900.].... *D. moniliformis* Doane
20. Wings spotted with darker..... 21
Wings unmarked, except for the stigmal spot when it occurs..... 22
21. Wings with brown dots in all the cells; femora with a yellowish ring before the tip. [*Limnobia simulans* Walk. List Dipt. Brit. Mus., vol. 1, p. 45. 1848.] (Plate XXXI, 24.)..... *D. simulans* (Walk.)
Wings with three large brown spots along the costa, the first at the origin of the sector, the second at the tip of *Sc*, and the third at the tip of R_1 ; wings grayish brown, paler near the stigma; cord and outer end of cell 1st M_2 seamed with dark brown; femora without a yellowish ring before the tip. [Mon. Dipt. N. Amer., part 4, p. 75. 1869.] (Plate XXXI, 25.)..... *D. rara* O. S.
22. Wings with a distinct pubescence in the apical cells. [Proc. Acad. Nat. Sci. Phila., p. 211. 1859.] (Plate XXXI, 28.)..... *D. pubipennis* O. S.
Wings glabrous on all the cells..... 23
23. No stigmal spot nor brown seams to the veins; R_1 strongly curved toward R_{2+3} at the tip; tarsi brown. [Mon. Dipt. N. Amer., part 4, p. 74. 1869.] (Plate XXXI, 27.)..... *D. globithorax* O. S.
Stigma evident, dark brown; paler brown seams to the cord and the outer end of cell 1st M_2 ; R_1 not incurved toward R_{2+3} ; tarsi whitish. [Can. Ent., vol. 48, p. 42-43. 1916.] (Plate XXXI, 26.)..... *D. macateei* Alex.

Genus *Limnobia* Meigen

- 1800 *Amphinome* Meig. Nouv. Class. Mouch., p. 15 (*nomen nudum*).
1803 *Limonia* Meig. Illiger's Mag., vol. 2, p. 262.
1818 *Limnobia* Meig. Syst. Besch., vol. 1, p. 116.
1856 *Limnomyza* Rond. Prodromus, vol. 1, p. 185.

Limnobia is a rather small genus of usually handsome flies, including about thirty-five described species. The species are most numerous in Europe and North America, but a very few range into the tropics of both hemispheres. Most of the crane-flies described as species of Limnobia before the partition of the genus, do not belong here at all.

The haunts of the immature stages, so far as known, include a considerable range of habitats, from possibly aquatic forms (*L. parietina*) to those living in moist earth near streams (*L. fallax* and probably *L. solitaria*), in decaying vegetable matter (*L. indigena*, according to Greene), in decaying leaves (*L. nigropunctata*, *L. flavipes*, *L. tripunctata*), in rotten wood (*L. cinctipes*, *L. annulus*, *L. dumetorum*, and others), and in fungi (*L. triocellata*, *L. xanthoptera*, and often *L. cinctipes* and *L. annulus*).

The local species of Limnobia may be separated according to the following key:

1. Cross-vein *r* at the tip of *R*₁ 2
 Cross-vein *r* removed from the tip of *R*₁ 7
2. Knob of the halteres black 3
 Knob of the halteres pale at the apex 6
3. Femora yellow, the extreme tips narrowly dark brown; wings yellowish, with three eye-like markings. [Proc. Acad. Nat. Sci. Phila., p. 216. 1859.] (Plate XXXII, 34.)
 L. triocellata O. S.
 Femora with one or more dark brown rings before the dark tips; wings without an ocellate pattern 4
4. Wings with four large dark brown spots in cell *R* that are about equidistantly spaced. [Proc. Acad. Nat. Sci. Phila., p. 289. 1861.] *L. hudsonica* O. S.
 Wings not with four large brown equidistant spots in cell *R* 5
5. Small, wing of female about 9.5 mm.; wings narrow, with a distinct dark brown pattern; spots in cell *R* small, clear-cut, dark brown. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 125. 1909.] (Plate XXXII, 32.) *L. fallax* Johns.
 Larger, wing of female about 11 mm.; wings broader, with the pattern paler brown, more diffused; spots in cell *R* larger, often poorly defined and sometimes confluent, medium brown. [Proc. Acad. Nat. Sci. Phila., p. 215, pl. 3, fig. 6. 1859.] (Plate XXXII, 31.)
 L. solitaria O. S.
6. Femora with three brown bands. [Proc. Acad. Nat. Sci. Phila., p. 214. 1859.]
 L. immatura O. S.
 Femora with two brown bands. [Journ. Acad. Nat. Sci. Phila., vol. 3, p. 21. 1823.] (Plate XXXII, 29.) *L. cinctipes* Say
7. Wings with brown clouds and seams 8
 Wings nearly clear, at most with three or four small brown dots along the costal margin 9
8. Large species, wing 15 mm.; wing apex very blunt; all the cells clouded and marbled medially with gray and brown. [Proc. Acad. Nat. Sci. Phila., p. 289. 1861.] (Plate XXXII, 30.) *L. parictina* O. S.
 Small species, wing under 12 mm.; wing apex normal; apical cell with the markings confined to the region near the veins. [Proc. Acad. Nat. Sci. Phila., p. 215, pl. 3, fig. 3. 1859.] (Plate XXXII, 33.) *L. indigena* O. S.

9. Wings with three small brown dots along the costal margin; head dark; antennae darkened toward the tips. [Proc. Acad. Nat. Sci. Phila., p. 216. 1859.] (Plate XXXII, 35.)
L. tristigma O. S.
 Wings yellowish, unspotted; head yellow, excepting the front; antennae yellow. [Mon. Dipt. N. Amer., part 4, p. 95. 1869.].....*L. sociabilis* O. S.

Limnobia cinctipes runs very close to *L. immatura* and apparently cannot always be distinguished from it; the character of an ocellate, yellow, brown-encircled mark at the stigma in *L. cinctipes* and a solid brown one in *L. immatura* does not hold in a series. *L. hudsonica*, *L. solitaria*, and *L. fallax* represent another group of closely related species. *L. sociabilis* is very rare and its exact status is still not well understood.

Tribe Antochini

The genera of the tribe Antochini may be classified in accordance with the following key:

1. Rostrum elongated, at least as long as the head.....2
 Rostrum shorter than the head.....4
2. Rostrum about as long as the head or a very little longer....*Rhamphidia* Meig. (p. 897)
 Rostrum about as long as the body.....3
3. *Rs* with two branches reaching the wing margin.....*Elephantomyia* O. S. (p. 898)
Rs with a single branch reaching the wing margin.....*Toxorhina* Loew (p. 898)
4. Cross-vein *r* lacking.....*Atarba* O. S. (p. 899)
 Cross-vein *r* present.....5
5. Anal angle of the wing prominent, almost square; *Rs* very elongate, straight; basal deflection of *Cu*₁ before the fork of *M*.....*Antocha* O. S. (p. 899)
 Anal angle of the wing feeble; *Rs* shorter, more arcuated; basal deflection of *Cu*₁ at or beyond the fork of *M*.....6
6. *R*₁ beyond the tip of *Sc* long, longer than the sector alone; veins issuing from cell 1st *M*₂ very long.....*Dicranoptycha* O. S. (p. 900)
*R*₁ beyond the tip of *Sc* short, less than the length of the sector alone; veins issuing from cell 1st *M*₂ short.....*Teucholabis* O. S. (p. 901)

The author's key to the Antochini given in *Psyche* (volume 20, pages 40-41, 1913) is erroneous in the disposition of *Dicranoptycha*, which runs down into the couplet with *Atarba* as having the radial cross-vein lacking. The key was based on material that was not normal and should be emended as above.

Genus *Rhamphidia* Meigen

1830 *Rhamphidia* Meig. Syst. Besch., vol. 6, p. 281.

About eighteen species of the genus *Rhamphidia* are known, and they are distributed thruout all the major regions of the world. The larva of *Rhamphidia longirostris* (Palacaretic) has been found in the stems of

Rumex aquaticus. The two local species live in organic mud in swamps, and both the larvae and the pupae are decidedly eriopterine in appearance.

The local species of the genus *Rhamphidia* may be separated in accordance with the following key:

- Rostrum short; legs yellow, tips of femora and tibiae black; wings tipped with dusky. [Dipt. Exot., 5th supp., p. 17. 1855. Osten Sacken, Mon. Dipt. N. Amer., part 4, p. 105-106. 1869.] (Plate XXXIII, 42.) *R. flavipes* Macq.
 Rostrum long; legs uniformly dark brown; wings uniformly subhyaline, not tipped with dusky. [Proc. Acad. Nat. Sci. Phila., p. 498-499, pl. 25, fig. 14. 1916.] (Plate XXXIII, 43.) *R. mainensis* Alex.

Genus *Elephantomyia* Osten Sacken

1859 *Elephantomyia* O. S. Proc. Acad. Nat. Sci. Phila., p. 220.

The genus *Elephantomyia* includes about eight species, found in North America, Europe, Africa, and eastern Asia. The complete wing venation separates the flies from all other genera with an elongate rostrum, except the Oriental genus *Rhampholimnobia* Alex. The immature stages of the known species are spent in decaying wood.

Elephantomyia westwoodi O. S.

1869 *Elephantomyia westwoodi* O. S. Mon. Dipt. N. Amer., part 4, p. 109, pl. 1, fig. 5.

The species *Elephantomyia westwoodi* is a curious fly inhabiting cold Canadian woods and bogs, where it is found on the wing from late June into August. R. C. Shannon collected larvae at Washington in late November of 1912, and again on May 2, 1913, and reared the fly. It had been bred before by Johnson.

The adult is yellow with the abdominal segments ringed caudally with brown and the wings having a distinct brown stigma. The large square cell 1st M_2 is a conspicuous feature of the venation (Plate XXXIII, 44).

Genus *Toxorhina* Loew

1835 *Limnobiaorhynchus* Westw. Ann. Soc. Ent. France, vol. 4, p. 683.

1851 *Toxorhina* Loew. Linnaea Entomol., vol. 5, p. 400.

1869 *Toxorhina* O. S. Mon. Dipt. N. Amer., part 4, p. 109-114.

The small genus *Toxorhina* includes about nine described species, most of which are from tropical America. The exceedingly reduced radial sector is the most interesting characteristic of the adult. The larval

life is spent presumably in damp earth, a very different habitat from that of the closely related genus *Elephantomyia*. The following key divides the local species:

Cell *1st M*₂ closed; body coloration brownish yellow; size, wing 6.5 mm. [*Toxorhina magna* O. S. Proc. Ent. Soc. Phila., vol. 4, p. 232. 1865.] (Plate XXXIII, 45.)

Cell *1st M*₂ open by the atrophy of the medial cross-vein (closed in abnormal specimens only); body coloration gray; size smaller, wing less than 5.5 mm. [*Toxorhina muliebris* O. S. Proc. Ent. Soc. Phila., p. 233. 1865.] (Plate XXXIII, 46.) . . . *T. muliebris* (O. S.)

The small *T. muliebris* is northern in its distribution, while the larger *T. magna* is much more southern.

Genus *Atarba* Osten Sacken

1869 *Atarba* O. S. Mon. Dipt. N. Amer., part 4, p. 127-128.

A small number of species (about eight) are included in the genus *Atarba*, most of them belonging to tropical South America. In many of the species, including the local *A. picticornis*, the antennae of the male are elongated and beautifully annulated with yellow and brown. As has already been pointed out by the author a number of times, many of the species of crane-flies described by various workers as species of *Atarba* are in reality members of the aberrant eriopterine genus *Gonomyia*, subgenus *Leiponeura* (Alexander, 1916:508-509).

Atarba picticornis O. S.

1869 *Atarba picticornis* O. S. Mon. Dipt. N. Amer., part 4, p. 128-129, pl. 1, fig. 13.

Atarba picticornis is a rather common species, in suitable localities, flying in late June and July. The adult is reddish yellow; the antennae are yellow with the apical half of each flagellar segment dark brown; the abdomen is yellow with a black ring before the tip; the wings are pale yellow. *Sc* is short, the cross-vein *r* lacking; cell *1st M*₂ is small, with the basal deflection of *Cu*₁ inserted at its base (Plate XXXIII, 47).

Genus *Antocha* Osten Sacken

1859 *Antocha* O. S. Proc. Acad. Nat. Sci. Phila., p. 219.

The small genus *Antocha* includes about seven described species in the Northern Hemisphere. The immature stages are strictly aquatic, the pupae having branched pronotal breathing horns as in *Simulium*.

Both larvae and pupae live in cases on rocks, often in very rapid water, and the larvae are very pedicine in appearance. Mating takes place on the stones along the streams in which the larvae live.

Antocha saxicola O. S.

- 1859 *Antocha saxicola* O. S. Proc. Acad. Nat. Sci. Phila., p. 219.
 1859 *Antocha opalizans* O. S. Proc. Acad. Nat. Sci. Phila., p. 220.

Antocha saxicola is a common fly, which may be mistaken only for a *Dicranomyia* but is readily distinguished by the very prominent anal angle of the wings (Plate XXXIII, 48), an uncommon feature in crane-flies. The milky-white color of the wings, and the very long, straight sector, are noteworthy characters. There are two distinct color phases which may represent distinct species when better known. The gray form has been described as *A. saxicola*, the red form as *A. opalizans*.

Genus *Dicranoptycha* Osten Sacken

- 1818 *Marginyomyia* Meig. Syst. Besch., vol. 1, p. 147.
 1859 *Dicranoptycha* O. S. Proc. Acad. Nat. Sci. Phila., p. 217.

There are about nine described species of *Dicranoptycha*, six from North America, two from Europe, and one from Africa. *D. signaticollis* v. d. W. (of Java) is a Libnotes. The immature stages are spent in rather dry soil in open woods.

The following key separates the local species of *Dicranoptycha*:

1. Large, wing over 10 mm.; wings deep reddish brown, the veins with short golden hairs; *Rs* elongate, nearly twice the length of cell *1st M*₂. [Proc. Acad. Nat. Sci. Phila., p. 217. 1859.] (Plate XXXIII, 49.)..... *D. germana* O. S.
 Smaller, wing under 9 mm.; wings light gray or yellowish subhyaline; *Rs* shorter, about as long as or only slightly longer than cell *1st M*₂.....2
2. Body coloration brownish gray; wings suffused with gray. [Proc. Acad. Nat. Sci. Phila., p. 218, pl. 4, fig. 13. 1859.] (Plate XXXIII, 51.)..... *D. sobrina* O. S.
 Body coloration pale yellow; wings pale yellow. [Proc. Acad. Nat. Sci. Phila., p. 500-501, pl. 25, fig. 12. 1916.] (Plate XXXIII, 50.)..... *D. winnemana* Alex.

There are three additional Austral species that may occur within the faunal limits considered by this paper. Of these, *Dicranoptycha nigripes* O. S. and *D. minima* Alex. have the tips of the femora blackened; *D. tigrina* Alex. resembles *D. sobrina*, but has the abdomen conspicuously cross-banded with brown and yellow, not uniformly brown as in *sobrina*.

A conspicuous feature occurring in the flies of this genus is the presence of a fold in the first anal cell of the wing, which is most evident if the wing is held against the light.

Genus *Teucholabis* Osten Sacken

1859 *Teucholabis* O. S. Proc. Acad. Nat. Sci. Phila., p. 222.

There are about forty-five described species in the genus *Teucholabis*, two-thirds of which are from tropical America, the center of distribution for the group. The larvae of *T. complexa* are found underneath decaying bark, a habitat very like that of the related genus *Elephantomyia*.

The local species of *Teucholabis* may be separated according to the following key:

Wing over 6 mm.; wings broad; *Sc* long, ending beyond two-thirds the length of the sector; *r* inserted on R_{2+3} ; vein R_{2+3} not upturned at its tip, the end of cell $2d R_1$ being much broader than the end of cell R_3 ; prescutum reddish with three black stripes. [Proc. Acad. Nat. Sci. Phila., p. 223, pl. 3, fig. 10. 1859.] (Plate XXXIII, 52.) *T. complexa* O. S.
 Smaller, wing under 5 mm.; wings narrow; *Sc* short, ending before midlength of the sector; *r* inserted at or near the end of R_3 ; vein R_{2+3} upturned at the tip, the end of cell R_3 being broader than the end of cell $2d R_1$; prescutum shiny black, only the humeral parts of the sclerite light yellow. [Can. Ent., vol. 48, p. 43. 1916. Proc. Acad. Nat. Sci. Phila., p. 498, pl. 25, fig. 16. 1916.] (Plate XXXIII, 53.)..... *T. lucida* Alex.

The vigorous, broad-winged *T. complexa* is the northernmost local species.

Tribe Eriopterini

The genera of the tribe Eriopterini may be separated in accordance with the following key:

1. Wings very much reduced, microscopic, very much smaller than the halteres. *Chionea* Dalman (p. 902)
2. Wings normally developed, much longer than the halteres.....2
3. Three branches of the media reaching the wing margin.....*Cladura* O. S. (p. 903)
- Two branches of the media reaching the wing margin.....3
4. R_2 shorter than R_{2+3}4
- R_2 longer than R_{2+3}7
5. Radial cross-vein present.....5
- Radial cross-vein lacking.....6
6. R_3 elongate, longer than R_{4+5} alone; tuberculate pits on the anterior part of the prescutum.....*Rhabdomastix caudata* (Lundb.) (p. 904)
- R_3 shorter, not so long as R_{4+5} ; tuberculate pits retreated back on the prescutum. *Erioptera*, subgenus *Empeda* (p. 908)
7. *Sc* very long, extending to the end of the sector; basal deflection of Cu_1 at the fork of *M* or beyond.....*Rhabdomastix* Skuse (p. 904)
- Sc* short, not extending beyond midlength of the sector; if *Sc* projects beyond the base of the sector, the basal deflection of Cu_1 is far before the fork of *M*. *Gonomyia* Meig. (p. 904)

7. *Rs* long, normal in position; cell *1st R*₁ elongated. 8
Rs shortened, its first fork with vein *R*₂₊₃ at an angle to the end of the sector so that cell *1st R*₁ is equilateral or nearly so. *Cryptolabis* O. S. (p. 906)
8. *Rs* ending in cell *R*₂. *Molophilus* Curt. (p. 906)
Rs ending in cell *R*₃. 9
9. A supernumerary cross-vein in cell *R*₂; second anal vein strongly bisinuate.
Helobia St. Farg. (p. 907)
 No supernumerary cross-vein in cell *R*₂; second anal vein not bisinuate. 10
10. *Cu*₁ tending to turn toward the wing apex; forks of the longitudinal veins very long and deep. *Erioptera* Meig. (p. 908)
*Cu*₁ straight or tending to turn away from the wing apex. 11
11. Sides of the long cell *1st M*₂ parallel; *Sc*₂ not far removed from the tip of *Sc*₁; coloration of the local species black; basal deflection of *Cu*₁ beneath the middle of cell *1st M*₂.
Gnophomyia O. S. (p. 909)
 Sides of cell *1st M*₂ more or less divergent distad; *Sc*₂ retreated toward the wing base so that *Sc*₁ is usually more than two-thirds the length of the sector. 12
12. Deflection of *Cu*₁ meeting *M* far before the fork of the latter; *Rs* long and straight at its origin; the terminal three segments of the antennae abruptly smaller than the other segments of the flagellum; wings glabrous. *Trimicra* O. S. (p. 910)
 Deflection of *Cu*₁ meeting *M* usually at the fork or on *M*₃₊₄ underneath cell *1st M*₂; *Rs* shorter, tho straight; flagellar segments of the antennae gradually and uniformly smaller toward the tip of the organ; wings pubescent. *Ormosia* Rond. (p. 911)

Genus *Chionea* Dalman

1816 *Chionea* Dalman. K. Vet. Akad. Handl., vol. 1, p. 102.

Chionea is a peculiar genus of subapterous crane-flies. There are about five European and six American species so far described. The possible evolution of the group from winged ancestors (*Pterochionea* Alex., *Crypteria* Berg.) has been discussed by the author in another paper (Alexander, 1916:529-530).

The immature stages of the known species are spent in the soil. The adult flies are usually found crawling about on the snow, being more conspicuous when snow is on the ground than at other seasons. In the spring and fall they are occasionally found in leaf mold. An interesting paper on the genus has been written by Johnson (1907). Dr. Dietz has in his collection a female specimen which was taken at Aweme, Manitoba, in September, when the temperature was below zero.

All the earlier authors describe this fly as being wingless. This is not exactly true, however, the wings being present tho reduced to mere knobs, much smaller than the halteres. The generalized species have the normal number of antennal segments for this tribe of flies, this being sixteen — the two scapal segments, a basal fusion segment of the flagellum made up of five segments, and nine free flagellar segments beyond. In the

specialized forms the number of free segments beyond the fusion segment is reduced to four or five, making a total of eleven or twelve segments.

The following key separates the local species of *Chionea*:

1. Color of the body grayish. [Can. Ent., vol. 49, p. 205-206. 1917.]
C. noveboracensis Alex.
 Color of the body reddish yellow or yellow. 2
2. Form long and slender, length of male less than 4 mm., diameter across thorax about 0.6 mm.; legs all very long and slender, not incrassated. [Can. Ent., vol. 49, p. 206. 1917.] *C. gracilis* Alex.
 Form stouter, length of male over 4 mm., diameter across thorax over 1 mm.; male with at least the posterior legs incrassated. 3
3. Antennae with 12 segments, there being 9 flagellar segments beyond the 1st, or fusion, segment; all the femora incrassated; size larger, length of male about 5.5 mm., diameter across thorax 1.5 mm. [Can. Ent., vol. 49, p. 204-205. 1917.] *C. primitiva* Alex.
 Antennae with 7 segments, there being 4 flagellar segments beyond the 1st, or fusion, segment; only the hind femora incrassated; size smaller, length of male about 5 mm., diameter across thorax 1 mm. [Ins. Injur. to Veget., 3d ed., p. 601, fig. 260. 1841.]
C. valga Harr.
 (*C. scita* Walk. and *C. aspera* Walk. are probably synonymous with *C. valga*.)

Genus *Cladura* Osten Sacken

1859 *Cladura* O. S. Proc. Acad. Nat. Sci. Phila., p. 229.

There are but two described species of *Cladura*, both occurring within the limits considered in this paper. *Cladura fuscula* Loew (of Europe) is *Adelphomyia senilis* (Hal.); *C. flavescens* Brun. (of India) is doubtfully a member of this genus. It should be noted here that the antennae of *Cladura* have the basal segments of the flagellum united into a fusion-segment so that the antenna seems to have less than sixteen segments. The immature stages are quite unknown but are presumably spent in the soil.

The two species of *Cladura* are separated by the following key:

- Large species, wing of female over 7 mm.; reddish yellow, the thoracic pleura spotted with brown; wings yellowish, the cross-veins and deflections of veins clouded with brown; *Sc* long, ending opposite the base of R_2 , Sc_2 being about opposite the fork of R_{2+3} ; *r* at or beyond one-third the length of R_2 ; petiole of cell M_1 short, not much longer than *m*. [*C. flavoferruginea* O. S., Proc. Acad. Nat. Sci. Phila., pl. 4, fig. 34, 1859. *C. indivisa* O. S., Proc. Acad. Nat. Sci. Phila., p. 291, 1861.] (Plate XXXVII, 102.)
C. flavoferruginea O. S.
- Smaller species, wing of female under 6 mm.; pale yellow, no spots on the thoracic pleura; wings hyaline without dark markings on the cross-veins and deflections of veins; *Sc* short, ending about opposite midlength of R_{2+3} , Sc_2 being nearly opposite the fork of the sector; *r* at about one-fourth the length of R_2 ; petiole of cell M_1 long, about twice the length of *m*. [Proc. Acad. Nat. Sci. Phila., p. 589-590, pl. 27, fig. 27. 1914.] (Plate XXXVII, 103.)
C. delicatula Alex.

These species are characteristic late summer and autumnal crane-flies, very common in some localities thruout September and October. They

frequent open woodlands and shrubbery often remote from running water. *C. delicatula* is apparently a more local species than *C. flavoferruginea*, being more frequently found in mountainous localities.

It should be noted that *C. indivisa* is a synonym of *C. flavoferruginea* O. S. The remarkable variation in the venation of this species has been discussed by Alexander and Leonard (1912).

Genus *Rhabdomastix* Skuse

1889 *Rhabdomastix* Skuse. Proc. Linn. Soc. N. S. Wales, ser. 2, vol. 4, p. 829, pl. 22, fig. 15.

(Subgenus *Sacandaga* Alexander)

1911 *Sacandaga* Alex. Ent. News, vol. 22, p. 349-351.

Rhabdomastix is a small genus, including seven described species. The group is close to *Gonomyia*, but the male hypopygium has a very different structure and is of a distinctly primitive type. The subgenus *Rhabdomastix*, *sens. str.*, which occurs in Australia and South America, has greatly elongated antennae in the male sex; the subgenus *Sacandaga*, with four species and a race, has the antennae short in both sexes.

A key to the local species of *Rhabdomastix* follows:

- Cross-vein *r* present tho weak; veins issuing from the small pentagonal cell *1st M*₂ sub-parallel; basal deflection of *Cu*₁ at the fork of *M*₁; body coloration grayish; arctic species. [*Gonomyia* (*Empeda*) *caudata* Lundb. Vidensk. Meddel. fra den naturh. Foren., p. 267, pl. 6, fig. 18. 1898.] (Plate XXXVI, 96.) *R. caudata* (Lundb.)
- Cross-vein *r* lacking; veins issuing from the hexagonal cell *1st M*₂ arcuated; basal deflection of *Cu*₁ under the middle of cell *1st M*₂; body coloration yellowish. [*Sacandaga flava* Alex. Ent. News, vol. 22, p. 351-352, figs. 1-3. 1911.] (Plate XXXVI, 97.) . . . *R. flava* (Alex.)

Genus *Gonomyia* Meigen

1818 *Gonomyia* Meig. Syst. Besch., vol. 1, p. 146.

1869 *Gonomyia* O. S. Mon. Dipt. N. Amer., part 4, p. 176.

In the genus *Gonomyia* there are about seventy-five described species, which are well distributed thruout the world, being found on all the continents and on many of the oceanic islands. The writer places the species in four subgenera — *Gonomyella* Alex., *Gonomyia* Meig., *Ptilostena* Bergr., and *Leiponeura* Skuse, the second and the fourth occurring within the limits considered in this paper. The coloration of many of the species is often contrasted brown and yellow, the pleura of the thorax being striped longitudinally. The immature stages of the species so far as

known are spent in wet earth or sand, and the larvae are of the usual elongate type of the Eriopterini.

The local species of *Gonomyia* may be separated according to the following key:

1. Two branches of the radial sector reaching the wing margin. (Subgenus *Leiponeura* Skuse.) 2
 Three branches of the radial sector reaching the wing margin.) Subgenus *Gonomyia* Meig.) 4
2. Outer deflection of vein M_3 absent, the cell *1st M*₂ being open; costa conspicuously china-white; legs banded with white. [*Elliptera alexanderi* Johns. Psyche, vol. 19, p. 3, fig. 6. 1912.] (Plate XXXVI, 86.) *G. alexanderi* (Johns.)
 Outer deflection of vein M_3 present, closing the cell *1st M*₂; costa not china-white; legs not banded with white. 3
3. Pleural stripes conspicuous; stigma of the wings distinct; femora tipped with dark brown. [Proc. Acad. Nat. Sci. Phila., p. 587-588; pl. 27, fig. 25, wing; pl. 26, fig. 21, hypopygium. 1914.] (Plate XXXVI, 87.) *G. sacandaga* Alex.
 Pleural stripes lacking; no stigmal spot on the wings; femora not tipped with brown. [*Gonomyia manca* O. S. Mon. Dipt. N. Amer., part 4, p. 178-179. 1869.] (Plate XXXVI, 88.) *G. manca* (O. S.)
4. Basal deflection of Cu_1 far before the fork of M ; subcosta long, ending beyond the origin of the sector. 5
 Basal deflection of Cu_1 at or beyond the fork of M ; subcosta short, ending opposite or before the origin of the sector. 6
5. Wings clear, unspotted. [Ent. News, vol. 26, p. 170-172, figs. 1-3. 1915.] (Plate XXXVI, 89.) *G. mathesoni* Alex.
 Wings spotted. [Proc. Acad. Nat. Sci. Phila., p. 231, pl. 4, fig. 16. 1859.] (Plate XXXVI, 90.) *G. blanda* O. S.
6. Antennae orange at the base, the flagellum dark. 7
 Antennae black thruout. 9
7. Cell *1st M*₂ closed; femora with a dark brown subterminal ring. [Proc. Acad. Nat. Sci. Phila., p. 230. 1859.] (Plate XXXVI, 91.) *G. sulphurella* O. S.
 Cell *1st M*₂ open; femora without a dark subterminal ring. 8
8. Male hypopygium with the dorsal angle of the pleurite stout, with numerous (about 15) slender hairs; ventral appendage simple, stout, tipped with a blunt black spine; second appendage a powerful, curved, subchitinized arm directed proximad. [Can. Ent., vol. 48, p. 316-317. 1916.] (Plate XXXVI, 92.) *G. florens* Alex.
 Male hypopygium with the dorsal angle of the pleurite slender, with a few (about 10) stout hairs; ventral appendage bifid, the arm with a long, slender, black spine at the tip; second appendage a slender, pale arm that is almost straight, and with two hairs at the tip. [Proc. Acad. Nat. Sci. Phila., p. 230, pl. 4, fig. 17. 1859.] (Plate XXXVI, 93.) *G. cognatella* O. S.
9. Subcosta short, ending before the origin of the sector, the distance between its tip and the origin of the sector being about equal to the *r-m* cross-vein; vein R_2 oblique, a little longer than the *r-m* cross-vein; male hypopygium with the gonapophyses and the penis guard fused into a large, prominent, cylindrical tube; thoracic pleura indistinctly striped. [Can. Ent., vol. 48, p. 319-320. 1916.] (Plate XXXVI, 94.) *G. noveboracensis* Alex.
 Subcosta longer, ending about opposite the origin of the sector; vein R_2 elongate; male hypopygium with the gonapophyses and the penis guard not fused into a cylindrical tube; thoracic pleura without stripes. [Proc. Acad. Nat. Sci. Phila., p. 231. 1859.] (Plate XXXVI, 95.) *G. subcinerea* O. S.

The above key is adapted from a revision of the American species of the genus by the author (Alexander, 1916: 508-528).

Genus *Cryptolabis* Osten Sacken1859 *Cryptolabis* O. S. Proc. Acad. Nat. Sci. Phila., p. 224.

Cryptolabis is a small but well-defined genus, including three species, of which two are Nearctic and one is Neotropical. Nothing is known of the immature stages, but those of *C. paradoxa*, at least, are probably spent in moist earth.

Cryptolabis paradoxa O. S.1859 *Cryptolabis paradoxa* O. S. Proc. Acad. Nat. Sci. Phila., p. 225, pl. 4, figs. 14, 15, 15 a.

The species *Cryptolabis paradoxa*, a curious little fly, is dark brown, with the dorso-pleural membranes and the root of the wings more yellowish; the whitish wings, with the apical cells pubescent and the sector short and straight or even slightly convex (Plate XXXVII, 101), easily distinguish the species. It is often rather common on rank herbage growing along wide creeks or on river banks. In these situations it may be swept in numbers from late June thruout July.

Genus *Molophilus* Curtis1833 *Molophilus* Curt. Brit. Entomol., p. 444.

The genus *Molophilus* includes about forty-five described species, found in most parts of the world but better represented, apparently, in the temperate regions of both hemispheres. The immature stages so far as known are spent in moist earth.

The local species of *Molophilus* may be separated according to the following key:

1. Size very small, wing about 2.5 mm.; basal deflection of R_{2+3} short, perpendicular, about as long as the radial cross-vein; basal deflection of Cu_1 far before the fork of M . [*Erioptera ursina* O. S. Proc. Acad. Nat. Sci. Phila., p. 228. 1859.] (Plate XXXIV, 70.) *M. ursinus* (O. S.)
- Size larger, wing over 2.6 mm.; basal deflection of R_{2+3} longer, oblique; basal deflection of Cu_1 near the fork of M (as in *M. nova-caesariensis*) or beyond it on M_{3+4} ... 2
2. Wings with a brown spot on the basal deflection of M_3 . [*Erioptera comata* Doane. Journ. N. Y. Ent. Soc., vol. 8, p. 188, pl. 7, fig. 20. 1900.] (Plate XXXIV, 69.) *M. comatus* (Doane) 3
- Wings without such a brown spot..... 3
3. Antennae of the male elongated; coloration largely yellowish..... 4
- Antennae short in both sexes; coloration brown or blackish..... 5

4. Size small, wing under 5 mm.; bright yellow, the abdomen yellow; antennae of the female short. [*Erioptera pubipennis* O. S. Proc. Acad. Nat. Sci. Phila., p. 228. 1859.] (Plate XXXIV, 66.) *M. pubipennis* (O. S.)
Size larger, wing over 5.3 mm.; abdomen dark brown; antennae of the female longer. [Proc. Acad. Nat. Sci. Phila., p. 505-506, pl. 27, fig. 37. 1916.] (Plate XXXIV, 67.)
M. fullonensis Alex.
5. Size small, wing under 3.5 mm.; basal deflection of Cu_1 near the fork of M . [Proc. Acad. Nat. Sci. Phila., p. 506-507, pl. 27, fig. 38. 1916.] (Plate XXXIV, 68.)
M. nova-caesariensis Alex.
6. Antennae dark-colored; body coloration grayish brown. [*Erioptera hirtipennis* O. S. Proc. Acad. Nat. Sci. Phila., p. 228. 1859.] (Plate XXXIV, 65.)
Antennae with the basal segments pale; body coloration pale brown. [*Erioptera forcipula* O. S. Mon. Dipt. N. Amer., part 4, p. 163. 1869.] *M. hirtipennis* (O. S.)
M. forcipula (O. S.)

The species identified above as being *M. comatus* may not belong to this species, which was described from western North America. The writer has seen only females (from Maine), but he has compared this material with Doane's types (also females) and cannot separate the material on the female sex.

Genus *Helobia* St. Fargeau et Serville

- 1825 *Helobia* St. Farg. et Serv. Encyclop. Method., Ins., vol. 10, p. 585.
1830 *Symplecta* Meig. Syst. Besch., vol. 6, p. 282.
1865 *Idioneura* Phil. Verh. Zool.-Bot. Ges. Wien, vol. 15, p. 615.
1886 *Symplectomorpha* Mik. Wien. Ent. Zeitung, vol. 5, p. 318.

In the genus *Helobia* there are four described species, one of which, the local *H. hybrida*, is probably the most widely distributed of all crane-flies, ranging from India over Europe and Asia, thruout North America, and southward along the Andes to Chile and Argentina. Future collecting will undoubtedly extend the range even more. The immature stages are spent in moist earth and sand.

Helobia hybrida (Meig.)

- 1804 *Limonia hybrida* Meig. Klass., vol. 1, p. 57, pl. 3, fig. 17.
1818 *Limnobia punctipennis* Meig. Syst. Besch., vol. 1, p. 147, pl. 5, figs. 2, 3, 7.
1848 *Limnobia cana* Walk. List Dipt. Brit. Mus., vol. 1, p. 48.

Helobia hybrida is a grayish fly, with three brown stripes on the prescutum; the wings are whitish, with a supernumerary cross-vein in cell R_2 and the second anal vein curiously bisinuate (Plate XXXVII, 98). The species is common everywhere. It is the earliest of the vernal

crane-fly fauna, appearing on the wing in March. It is seen most commonly in spring and autumn, and is less numerous in July. It is presumably double-brooded.

Genus *Erioptera* Meigen

- 1800 *Polymeda* Meig. Nouv. Class. Mouch., p. 14 (*nomen nudum*).
 1803 *Erioptera* Meig. Illiger's Mag., vol. 2, p. 262.
 1856 *Chemalida* Rond. Prodrumus, vol. 1, p. 180.
 1856 *Limnaea* Rond. Prodrumus, vol. 1, p. 181.
 1861 *Linnoica* Rond. Prodrumus, vol. 4, Corrigenda, p. 11.

The rather extensive genus *Erioptera* includes about ninety described species, most numerous in the Northern Hemisphere. The immature stages of the known species are spent in damp earth. The local species are distributed in five subgenera, separated by the following key:

1. Second anal vein arcuated so that cell *1st A* is as broad at the middle as, or broader than, at the margin; cross-vein *m* absent, cell *1st M*₂ opening into cell *M*₂. *Erioptera* Meig.
 Anal veins divergent, cell *1st A* being broadest at the margin; cell *1st M*₂ closed, if open the outer deflection of *M*₃ lacking, cell *1st M*₂ opening into cell *M*₃ (except in *Empeda*). 2
2. Fork of cell *R*₂ short, about as long as its petiole (*R*₂₊₃); *Sc*₁ short. *Empeda* O. S.
 Fork of cell *R*₂ long, at least four times as long as its petiole (*R*₂₊₃); *Sc*₁ longer. 3
3. Cell *1st M*₂ open, the outer deflection of *M*₃ atrophied; if closed, the cross-vein *m* and the deflection of *M*₃ about on a line. *Mesocyphona* O. S.
 Cell *1st M*₂ closed. 4
4. A spur from the outer deflection of *M*₃ jutting into cell *1st M*₂. *Hoplolabis* O. S.
 No spur from *M*₃ jutting into cell *1st M*₂. *Acyphona* O. S.

The following key divides the local species of *Erioptera*:

1. Cell *1st M*₂ open by the atrophy of the outer deflection of *M*₃. (Subgenus *Mesocyphona*). 2
 Cell *1st M*₂ closed; if open, it is by the atrophy of the medial cross-vein 4
2. Wings pale gray, with small brown dots at the tips of the veins along the margins. [Proc. Acad. Nat. Sci. Phila., p. 227. 1859.] (Plate XXXV, 79). *E. parva* O. S.
 Wings grayish or brown, with white dots and spots. 3
3. Wings with abundant white dots in all the cells; each femur with two brown rings. [Journ. Acad. Nat. Sci. Phila., vol. 3, p. 17. 1823.] (Plate XXXV, 77).
E. caloptera Say
 Wings with about twenty large spots that are confined to the region of the veins; each femur with a single brown ring before the tip. [Can. Ent., vol. 50, p. 383-384. 1918.] (Plate XXXV, 78). *E. needhami* Alex.
4. Cell *1st M*₂ open by the atrophy of *m*; second anal vein arcuated, before its tip bent strongly toward the first so that cell *1st A* at its middle is about as broad as or broader than at the margin. (Subgenus *Erioptera*.) (See also *E. [Empeda] stigmatica*, below.) 5
 Cell *1st M*₂ closed; anal veins divergent. 10
5. Knobs of the halteres dark brown. [Proc. Acad. Nat. Sci. Phila., p. 226. 1859.] (Plate XXXV, 72). *E. septentrionis* O. S.
 Knobs of the halteres pale. 6

6. Body and wings dark brown. [Proc. Acad. Nat. Sci. Phila., p. 226. 1859.] (Plate XXXV, 71.)..... *E. villosa* O. S.
 Body and wings yellow or green. 7
7. Wings yellowish, the cross-veins and deflections of veins with tiny brown dots. [Proc. Acad. Nat. Sci. Phila., p. 226. 1859.] (Plate XXXV, 74.)..... *E. chrysocoma* O. S.
 Wings yellowish or green, unmarked. 8
8. Thorax reddish, the humeral parts of the mesonotum yellow; eyes of the male conspicuously enlarged. [Proc. Acad. Nat. Sci. Phila., p. 226, pl. 4, fig. 19. 1859.] (Plate XXXV, 73.)..... *E. vespertina* O. S.
 (*E. megophthalma* Alex. [Can. Ent., vol. 50, p. 60-61, 1918], described since the above was written, is entirely reddish without the yellow humeral angles to the thorax.)
 Thorax pale green or yellow; eyes of both sexes normal. 9
9. Coloration of body and wings pale green. [Proc. Acad. Nat. Sci. Phila., p. 226. 1859.] (Plate XXXV, 75.)..... *E. chlorophylla* O. S.
 Coloration of body and wings pale yellow. [Mon. Dipt. N. Amer., part 4, p. 157. 1869.] (Plate XXXV, 76.)..... *E. straminea* O. S.
10. Cell R_2 short, about as long as R_{2+3} alone. (Subgenus *Empeda*.)..... 11
 Cell R_2 deep, much longer than R_{2+3} alone. 12
11. Cell $1st M_2$ closed. [Proc. Acad. Nat. Sci. Phila., p. 503-505, pl. 27, fig. 36. 1916.] (Plate XXXV, 84.)..... *E. nyctops* Alex.
 Cell $1st M_2$ open. [*Empeda stigmatica* O. S. Mon. Dipt. N. Amer., part 4, p. 184. 1869.] (Plate XXXV, 85.)..... *E. stigmatica* (O. S.)
12. A stump of a vein in cell $1st M_2$; no brown bands on the femora. (Subgenus *Hoptolabis*.)
 [Proc. Acad. Nat. Sci. Phila., p. 227, pl. 4, figs. 20, 21. 1859.] (Plate XXXV, 83.)
E. armata O. S.
- No stump of a vein in cell $1st M_2$; femora banded with brown. (Subgenus *Acyphona*.) . . . 13
13. Wings with a broad brown band at the cord and a large brown basal spot. [Proc. Acad. Nat. Sci. Phila., p. 227, pl. 4, fig. 23. 1859.] (Plate XXXV, 80.)..... *F. venusta* O. S.
 Wings not so marked. 14
14. Coloration of body and wings more yellowish; an uninterrupted brown band along the cord; brown bands on the femora less extensive, the yellow area between them broad; basal deflection of Cu_1 at the fork of M . [Mon. Dipt. N. Amer., part 4, p. 158. 1869.] (Plate XXXV, 81.)..... *E. armillaris* O. S.
 Coloration of body and wings more brownish, the markings on the wings less extensive and the band on the cord interrupted; bands on the femora very extensive, the yellowish area between them very narrow; basal deflection of Cu_1 before the fork of M . [Proc. Acad. Nat. Sci. Phila., p. 227. 1859.] (Plate XXXV, 82.)..... *E. graphica* O. S.

Erioptera (*Empeda*) *noctivagans* Alex. (Alexander, 1917:200-201), from Virginia, has been described since the completion of the above key. It is closest to *E. stigmatica*, but is larger and darker, the wing veins are dark brown with an indistinct darker seam along the cord, and the three pleural appendages of the male hypopygium are very unequal in length, the shortest being less than two-thirds the length of the longest and conspicuously bifid at its apex. The very long verticils of the antennae in the subgenus *Empeda* are present, but are less conspicuous than in *E. stigmatica*.

Genus *Gnophomyia* Osten Sacken

- 1859 *Gnophomyia* O. S. Proc. Acad. Nat. Sci. Phila., p. 223.
 1867 *Furina* Jaenn. Abhandl. Senkenb. Ges., vol. 6, p. 313.

The genus *Gnophomyia* includes about twenty-eight species of medium-sized to comparatively large flies, mostly from tropical America. The immature stages so far as known are spent beneath the decaying bark of deciduous trees (*Liriodendron*, *Populus*, *Acer*, and others).

Gnophomyia tristissima O. S.

1859 *Gnophomyia tristissima* O. S. Proc. Acad. Nat. Sci. Phila., p. 224, pl. 4, fig. 18.

Gnophomyia tristissima is a rather small blackish fly, with dark wings and the knobs of the halteres bright yellow. The venation is as shown in Plate XXXVII, 100.

A second species of the genus, *Gnophomyia luctuosa* O. S. (Proc. Acad. Nat. Sci. Phila., p. 224, 1859), has recently been taken near Washington, D. C., by Mr. Shannon. It is a southern species, with a wide range over Central America and northern South America. It may be readily distinguished from *G. tristissima* by its stouter build, entirely black halteres, and apically pubescent wings.

Genus *Trimicra* Osten Saeken

1861 *Trimicra* O. S. Proc. Acad. Nat. Sci. Phila., p. 290.

The genus *Trimicra* includes about fourteen described species of rather inconspicuously colored flies of medium size. The species are found in all the principal regions of the globe, including many of the oceanic islands. The genotype, *Trimicra anomala*, was later considered by its describer as being the same as the European *T. pilipes* Fabr., but the two should be regarded as being distinct species until the question can be settled by the study of ample material. The immature stages are spent in moist earth.

Trimicra anomala O. S.

1861 *Trimicra anomala* O. S. Proc. Acad. Nat. Sci. Phila., p. 290.

Trimicra anomala is a brownish gray fly. The prescutum has three dark brown stripes, and the abdominal segments are margined laterally and caudally with paler. The wings (Plate XXXVII, 99) are suffused with pale brown, the cross-veins being a little darker. The legs and the body are clothed with long, erect hairs. The species is more numerous southward and westward.

Genus *Ormosia* Rondani

- 1856 *Ormosia* Rond. Prodrumus, vol. 1, p. 180.
- 1856 *Ilisomyia* Rond. Prodrumus, vol. 1, p. 180.
- 1860 *Rhypholophus* Kol. Wien. Ent. Monatschr., vol. 4, p. 393.
- 1863 *Dasyptera* Schin. Wien. Ent. Monatschr., vol. 7, p. 221.

The genus *Ormosia* includes about sixty-two described species, of temperate zones, almost all occurring in the temperate regions of Europe and North America. The immature stages are spent in mud and damp earth.

The local species of *Ormosia* may be separated in accordance with the following key:

1. Wings spotted or clouded with darker..... 2
 Wings unicolorous or nearly so, the stigma only being darker..... 5
2. Anal veins divergent; wing markings produced by actual dark brown spots and blotches..... 3
 Anal veins convergent, the second anal vein before its tip bent strongly toward the first; wing markings produced by dark-colored hairs on pale brown clouds..... 4
3. Wings with brown dots in all the cells. [*Rhypholophus innocens* O. S. Mon. Dipt. N. Amer., part 4, p. 142. 1869.] (Plate XXXIV, 56.)..... *O. innocens* (O. S.)
 Wings with three brown costal spots, the cord margined with brown, the base and the apex of the wing darkened. [Psyche, vol. 18, p. 200-201, pl. 16, fig. 6. 1911.] (Plate XXXIV, 55.)..... *O. apicalis* Alex.
 (*O. atriceps* Dietz [Trans. Amer. Ent. Soc., vol. 42, p. 136-137, pl. 10, figs. 1 and 2, 1916] is apparently too close to *O. apicalis* to be separated therefrom.)
4. An indistinct crossband along the cord. [*Erioptera fascipennis* Zett. Ins. Lapponica, Dipt., p. 831. 1838.]..... *O. fascipennis* (Zett.)
 Wings with three or four indistinct grayish crossbands. [*Erioptera nubila* O. S. Proc. Acad. Nat. Sci. Phila., p. 227. 1859.] (Plate XXXIV, 54.)..... *O. nubila* (O. S.)
5. Cell *1st M*₂ closed..... 6
 Cell *1st M*₂ open..... 10
6. Anal veins divergent..... 7
 Second anal vein arcuated, before its tip bent strongly toward the first. [*Rhypholophus arcuatus* Doane. Ent. News, vol. 19, p. 201. 1908.]..... *O. arcuata* (Doane)
7. Antennae entirely brown; thorax reddish brown, shining; basal deflection of *Cu*₁ under the middle of cell *1st M*₂. [Trans. Amer. Ent. Soc., vol. 42, p. 137-138, pl. 10, fig. 3. 1916.]..... *O. abnormis* Dietz
 Not colored as above; basal deflection of *Cu*₁ before or at the fork of *M*₂..... 8
8. Entire thorax and coxae yellowish red; antennae pale yellowish, darkened toward the tip. [Trans. Amer. Ent. Soc., vol. 42, p. 138-139, pl. 10, fig. 4. 1916.]
O. luteola Dietz
 Thorax not colored as above..... 9
9. Mesonotum reddish with a median brown line which in some cases is indistinct; antennae pale thruout or with only the extreme tip darkened. [*Trimicra pygmaea* Alex. Psyche, vol. 19, p. 166, pl. 13, fig. 3. 1912.] (Plate XXXIV, 58.)..... *O. pygmaea* (Alex.)
 (*O. pilosa* Dietz is the same as *O. pygmaea*.)
 Mesonotum brownish gray; the four basal antennal segments yellow. [*Rhypholophus nigripilus* O. S. Mon. Dipt. N. Amer., part 4, p. 142. 1869.] (Plate XXXIV, 57.)
O. nigripila (O. S.)
10. Medial cross-vein lacking, cell *1st M*₂ confluent with cell *M*₂..... 11
 Outer deflection of *M*₂ lacking, cell *1st M*₂ confluent with cell *M*₃..... 12

11. Second anal vein arcuated, before its tip bent strongly toward the first. [*Erioptera holotricha* O. S. Proc. Acad. Nat. Sci. Phila., p. 226. 1859.]...*O. holotricha* (O. S.)
Anal veins divergent. [Trans. Amer. Ent. Soc., vol. 42, p. 140, pl. 10, fig. 6. 1916.]
O. palpalis Dietz
12. Antennae of both sexes shorter than the thorax.....13
Antennae of the male approximately as long as the whole body, beadlike in structure.....19
13. Second anal vein arcuated, before its tip bent strongly toward the first.....14
Anal veins divergent.....18
14. Thorax reddish.....15
Thorax not reddish.....16
15. Mesonotum with a dark median line; male hypopygium with two pleural appendages which are almost straight; gonapophyses elongate, black, profoundly bifid; penis guard not trifold. [*Rhypholophus rubellus* O. S. Mon. Dipt. N. Amer., part 4, p. 144, pl. 1, fig. 15. 1869.] (Plate XXXIV, 60.).....*O. rubella* (O. S.)
Mesonotum without a dark median line; male hypopygium with the pleural appendage a single curved hook; gonapophyses strongly curved, entire hooks; penis guard trifold at apex. [Can. Ent., vol. 49, p. 24-25. 1917.] (Plate XXXIV, 59.)
O. nimbipennis Alex.
16. Stigma distinct, dark brown, the marking continued down onto the cord. [*Erioptera meigenii* O. S. Proc. Acad. Nat. Sci. Phila., p. 226. 1859.] (Plate XXXIV, 61.)
O. meigenii (O. S.)
Stigma indistinct or lacking.....17
17. Thorax and antennae light yellow. [*Rhypholophus parallelus* Doane. Ent. News, vol. 19, p. 202. 1908.].....*O. parallela* (Doane)
Thorax brown, with a grayish pruinosity and a rather broad darker stripe; antennae brown. [Trans. Amer. Ent. Soc., vol. 42, p. 141. 1916.].....*O. perplexa* Dietz
18. Mesonotum with a darker line on either side; ninth sternite produced into a median spatulate lobe. [Trans. Amer. Ent. Soc., vol. 42, p. 142-143, pl. 10, fig. 8. 1916.]
O. bilineata Dietz
Mesonotum reddish brown with a median brown stripe; ninth sternite produced into two flattened lobes that project far caudad. [Trans. Amer. Ent. Soc., vol. 42, p. 143-144, pl. 10, fig. 9. 1916.].....*O. deviata* Dietz
19. Anal veins convergent.....20
Anal veins divergent.....21
20. Segments of flagellum shorter, without pale apices. [Can. Ent., vol. 49, p. 25. 1917.] (Plate XXXIV, 63.).....*O. mesocera* Alex.
Antennal segments elongated, the segments attenuated and the apices pale. [*Rhypholophus monticola* O. S. Mon. Dipt. N. Amer., part 4, p. 145. 1869.] (Plate XXXIV, 62.).....*O. monticola* (O. S.)
21. Reddish brown; mesonotum with an indistinct brown median stripe. [Trans. Amer. Ent. Soc., vol. 42, p. 144-145, pl. 10, fig. 10. 1916.].....*O. divergens* Dietz
Dark brown; mesonotum with three darker brown stripes. [Can. Ent., vol. 49, p. 26. 1917.] (Plate XXXIV, 64.).....*O. megacera* Alex.
(*O. megacera* is probably the same as *O. divergens*, the latter name preoccupied by *O. divergens* Coq. [1905].)

The small flies that make up this characteristic genus are very common, appearing in small swarms under overhanging ledges, along the lower face of an inclined tree, or in similar situations. The early spring species are *Ormosia innocens*, *O. nubila*, *O. meigenii*, *O. holotricha*, and others; *O. apicalis*, *O. megacera*, and *O. mesocera* occur in early summer; *O. nigripila*, *O. nimbipennis*, *O. monticola*, and *O. abnormis* are late

summer species. *O. rubella* has a long flight period, from June to September, and some of the early spring species (as *O. nubila* and *O. meigenii*) reappear in the late summer and in the autumn, apparently being double-brooded.

Tribe **Limnophilini**

The genera of the tribe Limnophilini may be separated according to the following key:

1. Sc_2 before the origin of the sector; antennae 17-segmented; wings pubescent. *Ula* Hal. (p. 913)
- Sc_2 beyond the origin of the sector; antennae 16-segmented (apparently with fewer segments in *Adelphomyia cayuga*).....2
2. Wings pubescent, at least apically.....3
- Wings glabrous or with microscopic pubescence only.....3
3. Pubescence including the entire wing; cell M_1 absent.....5
- Pubescence only on the apical cells of the wing; cell M_1 present or lacking.....4
4. Small species, wing less than 5.5 mm.; male antennae short. *Adelphomyia* Bergr. (p. 914)
- Larger species, wing over 6 mm.; male antennae elongated. *Limnophila*, subgenus *Lasiomastix* O. S. (p. 916)
5. A supernumerary cross-vein in cell C*Epiphragma* O. S. (p. 914)
- No. supernumerary cross-vein in cell C*Limnophila* Macq. (p. 915)

Genus **Ula** Haliday

1833 *Ula* Hal. Ent. Mag., vol. 1, p. 153.

1864 *Macroptera* Lioy. Atti dell' Institut Veneto, ser. 3, vol. 9, p. 224.

The small genus *Ula* includes about six described species, all being Holarctic except one species from Java. The larval stages of the known species are spent in fungi (Alexander, 1915 a: 1-8). The species are subject to considerable variation in the wing pattern, but it now seems that in eastern America there are at least two species, which are divided by the following key:

- Antennae elongate in the male; wings dusky, but without a heavy brown pattern. [Mon. Dipt. N. Amer., part 4, p. 277. 1869.].....*U. paupera* O. S.
- Antennae short in both sexes; wings with the cord and outer end of cell 1st M_2 seamed with brown. [Mon. Dipt. N. Amer., part 4, p. 276. 1869.] (Plate XLI, 164.)
U. elegans O. S.

Genus **Ulomorpha** Osten Sacken

1869 *Ulomorpha* O. S. Mon. Dipt. N. Amer., part 4, p. 232.

In the genus *Ulomorpha* there is but a single described species, agreeing superficially with *Ula* in the entirely pubescent wings but with Sc_2 close at the tip of Sc_1 . The immature stages are in rich organic earth, and are

very different from those of *Ula* and closer to those of the subgenus *Lasiomastix* in the genus *Linnophila*.

Ulomorpha pilosella (O. S.)

1859 *Linnophila pilosella* O. S. Proc. Acad. Nat. Sci. Phila., p. 241.

1869 *Ulomorpha pilosella* O. S. Mon. Dipt. N. Amer., part 4, p. 233.

Ulomorpha pilosella is a shiny, reddish brown fly, with the wings faintly darkened. The sessile or subsessile cell R_2 is a well-marked feature of the venation (Plate XLI, 163). The insect is common in cold Canadian woods thruout northeastern North America.

Genus *Adelphomyia* Bergroth

1891 *Adelphomyia* Bergr. Mittheil. Naturf. Ges. Bern, 1890, p. 134.

The species of the genus *Adelphomyia* are among the smallest of the *Linnophilini*. The immature stages of the American species are spent in rich, saturated, organic earth in shady situations. There are two European and three American species thus far described. *Adelphomyia cayuga* and *A. americana* are commonest in late summer; *A. minuta* is a species of late spring and early summer, fairly common in rich Canadian woods, in gorges, and near wooded bogs.

A recent study of the larval head in this genus shows a decided relationship with the tribe *Pediciini*, and it seems probable that the genus will have to be placed in that tribe despite the very *linnophiline* appearance of the adults.

The local species of *Adelphomyia* may be separated by the following key:

1. Cell M_1 of wings lacking; coloration of body dark brown; antennae with less than 16 segments, the basal segments of the flagellum fused together. [Pomona Journ., vol. 4, p. 831, fig. B. 1912.] (Plate XLI, 162.).....*A. cayuga* Alex.
Cell M_1 of wings present; coloration of body yellow or light yellowish brown; antennae with the basal flagellar segments distinct.....2
2. Pubescence in cells of wings sparse; cross-vein r not evident; cross-vein m short or obliterated by fusion of M_3 on M_{1+2} ; color of body light yellow. [Can. Ent., vol. 43, p. 287-288. 1911.] (Plate XLI, 161.).....*A. minuta* Alex.
Pubescence in cells of wings conspicuous; cross-veins r and m usually distinct, the former in some cases little evident; color of body yellowish brown. [Pomona Journ., vol. 4, p. 829-830, fig. A. 1912. Ent. News, vol. 22, p. 353-354, fig. 4, as *A. senilis* Hal. of Europe. 1911.] (Plate XLI, 160.).....*A. americana* Alex.

Genus *Epiphragma* Osten Sacken

1859 *Epiphragma* O. S. Proc. Acad. Nat. Sci. Phila., p. 238.

Epiphragma is a small genus of handsome flies including about eighteen described species, which are most abundant in the tropics of America. The flies are of medium size and are among the most beautiful in the family, their wing pattern of ocellate spots and bands producing a striking effect. The immature stages are amphibious, the larval life being spent in saturated decaying wood such as ash (*Fraxinus*) and buttonbush (*Cephalanthus*), in swampy situations, and in similar habitats.

The following key divides the local species:

- Wings with pale brown crossbands which are margined with darker; a brown annulus at the tip of each femur. [*Limnobia fascipennis* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 19. 1823.] (Plate XLI, 15S.)..... *E. fascipennis* (Say)
- Wings with an irregular pattern of brown and tawny; a brown annulus before the tip of each femur. [*Limnophila solatrix* O. S. Proc. Acad. Nat. Sci. Phila., p. 23S. 1859.] (Plate XLI, 159.)..... *E. solatrix* (O. S.)

In many specimens of *Epiphragma fascipennis* the wing bands are more continuous than in the wing shown, there being usually three such bands, the last lying across the wing tip distad of the cord. The wing pattern is strongly suggestive of that of the rare primitive tanyderid *Protoplasa fitchii*, and most of the specimens of the latter that have been located in museums were found pinned among series of *Epiphragma fascipennis*.

Genus *Limnophila* Macquart

- 1834 *Limnophila* Macq. Suit. à Buff., vol. 1, Hist. Nat. Ins., Dipt., p. 95.
 1861 *Limnomya* Rond. Prodrömus, vol. 4, Corrigenda, p. 11.
 1888 *Pilaria* Sintonis. Sitzber. Nat.-Ges. Dorpat., vol. 8, p. 398.

Limnophila is one of the largest of the crane-fly genera, the number of described species being between one hundred and ninety and two hundred, of which a quarter occur within the geographical limits considered in this paper. The subgenera into which the genus is divided are here recognized largely for convenience only, some of them being poorly definable. The larval and pupal characters will be found to be much more valuable in delimiting these groups. *Limnophila mundoides* and *L. emmelina* both represent groups which are as well defined as the sub-genera here recognized. Most of the forms of northeastern North America fly during the month of June and are to be found in cold Canadian woodlands. The immature stages of most species of *Limnophila* are spent in rich, saturated mud or earth.

The local species of *Limnophila* may be separated in accordance with the following key:

1. Cell M_1 of the wings present. 2
 Cell M_1 of the wings lacking. 41
2. A supernumerary cross-vein in cell R_2 or in cell M 3
 No supernumerary cross-vein in cell R_2 or in cell M 6
3. A supernumerary cross-vein in cell M 4
 A supernumerary cross-vein in cell R_2 . (Subgenus *Dicranophragma* O. S.) [Proc. Acad. Nat. Sci. Phila., p. 240. 1859.] (Plate XXXIX, 139.) *L. fuscovaria* O. S.
4. Wings interruptedly crossbanded with brown; costal region without equidistant brown blotches; R_s spurred at the bend; antennae of male elongated. (Subgenus *Idioptera* Macq.) [Mon. Dipt. N. Amer., part 4, p. 206. 1869.] (Plate XXXVIII, 115.)
 L. fasciolata O. S.
 Wings hyaline or spotted with brown; R_s slightly or not at all spurred at the bend; antennae of male short. (Subgenus *Ephelia* Schin.) 5
5. Wings hyaline. [Proc. Acad. Nat. Sci. Phila., p. 591, pl. 25, fig. 2. 1914.] (Plate XXXIX, 138.) *L. johnsoni* Alex.
 Wings spotted; a series of about 6 or 7 large brown blotches along the costal margin. [Proc. Acad. Nat. Sci. Phila., p. 235, pl. 4, fig. 25. 1859.] (Plate XXXIX, 139.)
 L. aprilina O. S.
6. Apical cells of wings pubescent; antennae of male elongated. (Subgenus *Lasiomastix* O. S.) 7
 Apical cells of wings not pubescent. 8
7. Thorax shiny black; wings banded with brown. [*Limnobia macrocera* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 20. 1823.] (Plate XXXVIII, 113.)
 L. macrocera (Say)
 Thorax dark gray; wings unmarked. [Mon. Dipt. N. Amer., part 4, p. 208. 1869.] (Plate XXXVIII, 117.) *L. tenuicornis* O. S.
 (*L. subtenuicornis* Alex. [Can. Ent., vol. 50, p. 61-62, 1918], described since this key was made, has cell M_1 lacking. It is a member of the subgenus *Lasiomastix* and is readily distinguished by the combination of pubescent wings and lack of cell M_1 . There can be no doubt that *L. tenuicornis* and *L. subtenuicornis* should be coupled with *L. macrocera* in the subgenus *Lasiomastix*, both being notable by the distinct pubescence in the apical cells of the wings.)
8. Thorax shiny black. 9
 Thorax not shiny black. 10
9. Wings with a brownish tinge; femora dull brownish yellow, narrowly tipped with dark brown; legs stout, conspicuously hairy; male hypopygium of the normal simple limnophiline structure. (Subgenus *Prionolabis* O. S.) [Mon. Dipt. N. Amer., part 4, p. 226. 1869.] (Plate XL, 144.) *L. munda* O. S.
 Wings hyaline or nearly so; femora dark brown, only the extreme bases paler; legs slender, not conspicuously hairy; male hypopygium complex in structure. [Journ. N. Y. Ent. Soc., vol. 24, p. 120-121, pl. 8, fig. 3. 1916.] (Plate XL, 145.)
 L. mundoides Alex.
10. Hind tarsi white; antennae of male elongated. 11
 Hind tarsi not white. 12
11. Thorax black with a gray bloom; R_{2+3} about equal to or slightly longer than the basal deflection of Cu_1 . [Mon. Dipt. N. Amer., part 4, p. 209. 1869.] (Plate XXXVIII, 118.) *L. niveitarsis* O. S.
 Thorax reddish yellow; R_{2+3} about twice as long as the basal deflection of Cu_1 . [Ent. News, vol. 24, p. 248-249, fig. 1913.] (Plate XXXVIII, 119.) *L. albipes* Leon.

12. Cross-vein r removed some distance from the tip of R_1 , so that this distance is from one and one-half to two times the length of the radial cross-vein; tuberculate pits present.....13
 Ultimate segment of R_1 curved to the costa and scarcely longer than the cross-vein r itself; tuberculate pits lacking in all species except *fratria*.....22
 (*L. marchandi* should be interpreted as coming in this division, from the evident relationship with *L. alleni*.)
13. Cell $1st M_2$ very much elongated, the inner end lying far inside the level of the cord. [Proc. Acad. Nat. Sci. Phila., p. 237. 1859.] (Plate XXXVIII, 124.)
L. areolata O. S.
 Cell $1st M_2$ not greatly elongated, the inner end at the level of the cord.....14
14. R_{2+3} longer than cell R_2 alone. [Proc. Acad. Nat. Sci. Phila., p. 238, pl. 4, fig. 26. 1859.] (Plate XXXVIII, 127.).....*L. brevifurca* O. S.
 R_{2+3} not longer than cell R_2 alone.....15
15. Cell M_1 very short, not longer than the basal deflection of Cu_1 . [Proc. Acad. Nat. Sci. Phila., p. 237. 1859.] (Plate XXXVIII, 125.).....*L. brevifurca* O. S.
 (Specimens of *L. brevifurca* are rather frequently found in which the fusion of M_{1+2} is continued to the wing margin, in which case the species would run down to couplet 41; such abnormal specimens are rare, however, and usually have one of the wings normal.)
 Cell M_1 long, more than twice as long as the basal deflection of Cu_116
16. Head narrow, prolonged behind; cells R_3 and $1st M_2$ longer than cell R_3 , so that the cord is not in a straight line; radial and medial veins long, slender, arcuated; second anal vein incurved at the tip. (Subgenus *Pseudolimnophila* Alex.).....17
 Head broad, not narrowed behind; cells R_3 , R_5 , and $1st M_2$ with their inner ends about on a level; radial and medial veins stout and straight; second anal vein not incurved at the tip. (Subgenus *Eulimnophila* Alex.).....20
17. Wings with small brown dots on the cross-veins and at the forks. [Proc. Acad. Nat. Sci. Phila., p. 236, pl. 4, fig. 24. 1859.] (Plate XXXIX, 135.).....*L. luteipennis* O. S.
 Wings clear, unspotted.....18
18. Thorax clear blue-gray. [Mon. Dipt. N. Amer., part 4, p. 219. 1869.] (Plate XXXIX, 134.).....*L. inornata* O. S.
 Thorax brownish without gray color.....19
19. Pleura of thorax grayish, unmarked; size small. [Mon. Dipt. N. Amer., part 4, p. 218. 1869.].....*L. contempta* O. S.
 Pleura of thorax dull yellow, with a conspicuous dark brown stripe extending from the cervical sclerites to the postnotum; size larger. [Proc. Acad. Nat. Sci. Phila., p. 592, pl. 25, fig. 3. 1914.] (Plate XXXIX, 136.).....*L. nigripleura* A. & L.
 (In the writer's key to the species of the *luteipennis* group [Proc. Acad. Nat. Sci. Phila., p. 593, 1914], in couplet 4 *L. contempta* is given as being a larger species than *L. nigripleura*. This is erroneous, *L. contempta* being the smallest species of the group. It is more southern in its distribution than *L. nigripleura*.)
20. Wings narrow, grayish; stigma distinct, hairy; antennae of male elongated. [*Limnobia tenuipes* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 21. 1823.] (Plate XXXVIII, 121.).....*L. tenuipes* (Say)
 Wings broader, more yellowish brown; stigma not distinct; antennae of male short....21
21. Body opaque; front gray. [Proc. Acad. Nat. Sci. Phila., p. 237. 1859.] (Plate XXXVIII, 122.).....*L. imbecilla* O. S.
 Body shiny reddish yellow; front yellowish red. [Mon. Dipt. N. Amer., part 4, p. 212. 1869.] (Plate XXXVIII, 123.).....*L. recondita* O. S.
22. Very large species, wing over 18 mm. (Subgenus *Eutonia* v. d. W.).....23
 Smaller species, wing under 15 mm.....24

23. Large, wing of female 21.5 mm.; thoracic dorsum reddish brown with three velvety brown stripes, the middle one narrowly split by a line of the ground color; ground color of wings yellowish and brown; basal abdominal tergites yellow without prominent setigerous punctures; cross-vein r close to the tip of R_1 . [Proc. Boston Soc. Nat. Hist., vol. 34, p. 126-127, pl. 16, fig. 18. 1909.] (Plate XXXIX, 140.)... *L. allenii* Johns.
Smaller, wing of female 20 mm.; thoracic dorsum gray with three narrow velvety-brown stripes, the middle one split by a broad pale line; ground color of wings hyaline; basal abdominal tergites gray with prominent setigerous punctures; cross-vein r more distant from the tip of R_1 . [Journ. N. Y. Ent. Soc., vol. 24, p. 118-120, pl. 8, fig. 2. 1916.] (Plate XXXIX, 141.)... *L. marchandi* Alex.
24. R_{2+3} very elongated, nearly twice the length of R_2 alone; cross-vein r on R_{2+3} . [Proc. Acad. Nat. Sci. Phila., p. 238, pl. 4, fig. 26. 1859.] (Plate XXXVIII, 127.)
L. ultima O. S.
(*L. ultima* is included in both sections of couplet 12 because the character of the position of the cross-vein r is slightly variable and there is a possibility of misinterpretation.)
 R_{2+3} shorter, not longer than R_2 alone; cross-vein r on R_2 25
25. Basal deflection of Cu_1 at the inner end of cell 1st M_2 . (Subgenus *Dactylolabis* O. S.)... 26
Basal deflection of Cu_1 near the middle of cell 1st M_2 27
26. Wings spotted with brown. [Proc. Acad. Nat. Sci. Phila., p. 240, pl. 3, figs. 28, 28a. 1859.] (Plate XL, 148.)... *L. montana* O. S.
Wings unspotted. [Mon. Dipt. N. Amer., part 4, p. 229. 1869.] (Plate XL, 147.)
L. cubitalis O. S.
27. Wings spotted with brown or distinctly seamed along the cross-veins and deflections of veins..... 28
Wings clear, or with only the stigmal spot (in *L. poetica* with a tiny cloud at the origin of R_3 and the basal deflection of R_{3+5})..... 35
28. Wings heavily irrorate with brown over the entire surface. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 127-128, pl. 16, fig. 17. 1909.] (Plate XXXIX, 133.)... *L. irrorata* Johns.
Wings not heavily irrorate over the entire surface, the markings appearing as broad seams to the veins or as dark tips to the wings..... 29
29. R_{2+3} short or very short, much less than R_2 alone; cross-vein r at about midlength of R_2 ; petiole of cell M_1 longer than or subequal to this cell; brown seams to the veins more extensive; antennae of male short..... 30
 R_{2+3} very long, subequal to R_2 alone; cross-vein r just beyond the fork of R_{2+3} ; petiole of cell M_1 distinctly shorter than this cell; brown seams on the wings limited to $r-m$ and the deflection of R_{4+5} ; antennae of male elongated. [Mon. Dipt. N. Amer., part 4, p. 205. 1869.] (Plate XXXVIII, 114.)... *L. unica* O. S.
30. Radial sector short, arcuated to almost square at its origin; cross-vein r situated at [about midlength of vein R_2 , which is oblique; outer end of cell R_2 very broad due to the oblique nature of vein R_2 ; species with the cross-veins seamed with brown have the tip of the wings more or less infuscated. (Subgenus *Phylidorea* Bigot.)..... 31
Radial sector longer; vein R_2 not oblique and the cell R_2 not strikingly broadened at its apex; broad grayish brown seams to the cross-veins, deflections of veins, and along Cu_1 , but the wing apex only slightly darkened if at all..... 33
31. Coloration of the body yellowish or reddish, the thoracic notum light yellow. [Proc. Acad. Nat. Sci. Phila., p. 235. 1859.] (Plate XXXIX, 128.)... *L. adusta* O. S.
Coloration of the body dark brown to almost black, the thoracic notum concolorous..... 32
32. Legs yellow with the brown apices to the segments narrow; costal cell of the wing yellow. [Psyche, vol. 18, p. 195-196, pl. 16, figs. 4, 8. 1911.] (Plate XXXIX, 129.)
L. similis Alex.
Legs with the femora brown, only a little brightened basally; costal cell of the wings brown. [Journ. N. Y. Ent. Soc., vol. 24, p. 123, pl. 8, fig. 7. 1916.] (Plate XXXIX, 130.)... *L. terrae-novae* Alex.

33. Large species, wing of male over 9 mm.; male with the pleural appendage of the hypopygium pectinated. (Subgenus *Prionolabis* O. S.)..... 34
 Smaller species, wing of male under 8.5 mm.; male with the pleural appendage of the hypopygium not pectinated, rather sharply pointed. [Journ. N. Y. Ent. Soc., vol. 24, p. 121-122, pl. 8, fig. 5. 1916.] (Plate XL, 146.)..... *L. terebrans* Alex.
34. Large, wing of male about 13 mm.; costal and subcostal cells of the wings rich yellow; stigma dark brown; bases of femora bright yellow; anterior apical appendage of male hypopygium bifurcate. [Proc. Acad. Nat. Sci. Phila., p. 239, pl. 4, figs. 27, 27a, 27b. 1859.] (Plate XL, 142.)..... *L. rufibasis* O. S.
 Smaller, wing of male about 11.5 mm.; wings uniform light yellowish gray; stigma rather indistinct, grayish; bases of femora brownish yellow; anterior apical appendage of male hypopygium simple. [Psyche, vol. 18, p. 198-199, pl. 16, fig. 10. 1911.] (Plate XL, 143.)..... *L. simplex* Alex.
35. R_s elongated and spurred at its origin; antennae of male elongated. [Mon. Dipt. N. Amer., part 4, p. 207. 1869.] (Plate XXXVIII, 116.)..... *L. poetica* O. S.
 R_s usually shorter, if elongated not spurred at origin; antennae of male short except in *L. laricicola*..... 36
36. R_{2+3} elongated, more or less arcuated, longer than the basal deflection of Cu_1 37
 R_{2+3} not conspicuously arcuated, short, little if any longer than the basal deflection of Cu_1 38
37. R_s and R_{2+3} strongly arcuated; cell $1st M_2$ very broad; antennae of male short. [Proc. Acad. Nat. Sci. Phila., p. 236. 1859.] (Plate XXXVIII, 126.)... *L. toroneura* O. S.
 R_s almost straight; R_{2+3} feebly arcuated but elongate; cell $1st M_2$ narrow; antennae of male elongated. [Psyche, vol. 19, p. 167, pl. 13, fig. 4. 1912.] (Plate XXXVIII, 120.)..... *L. laricicola* Alex.
38. Coloration gray; wings with the base strongly yellow, this including Sc for its entire length; hind legs with the apical third of femora dark brown, fore femora with the apical two-thirds dark brown; R_s rather elongate and somewhat angulated at its origin. [*Phylidorea subcostata* Alex. Can. Ent., vol. 43, p. 288-289. 1911.] (Plate XL, 149.)..... *L. subcostata* (Alex.)
 Coloration not gray; wings with the base not strongly yellow; legs with the femora yellow, the tips narrowly brown..... 39
39. Coloration yellowish brown; tuberculate pits distinct; R_s nearly straight; antennae of male moniliform. [Mon. Dipt. N. Amer., part 4, p. 220. 1869.]..... *L. fratria* O. S.
 Coloration yellow to reddish yellow; tuberculate pits not evident; R_s short, strongly arcuated; antennae of male not moniliform. (Subgenus *Phylidorea* Bigot.)..... 40
40. Large species, wing of male 9.5 mm.; abdomen of male without a black subterminal annulus. [Journ. N. Y. Ent. Soc., vol. 8, p. 191. 1900.] (Plate XXXIX, 132.)
L. lutea Doane
 Smaller species, wing of male less than 7.5 mm.; abdomen of male with a black subterminal annulus. [Proc. Acad. Nat. Sci. Phila., p. 594, pl. 25, fig. 4. 1914.] (Plate XXXIX, 131.)..... *L. novae-angliae* Alex.
41. Cell R_2 of the wings broadly sessile. [Proc. Acad. Nat. Sci. Phila., p. 597, pl. 27, fig. 28. 1914.] (Plate XL, 151.)..... *L. emmclina* Alex.
 Cell R_2 of the wings petiolate..... 42
42. Bases of cells R_3 and $1st M_2$ conspicuously nearer the wing root than cell R_2 ; petiole of cell R_2 less than half the length of vein R_2 ; vein R_2 not short, oblique; veins issuing from cell $1st M_2$ about twice the length of the cell..... 43
 Bases of cells R_3 , R_2 , and $1st M_2$ about on a level; petiole of cell R_2 more than half the length of vein R_2 ; vein R_2 short, oblique; veins issuing from cell $1st M_2$ about equal to or a little longer than the cell, if longer (as in *L. edwardi*) not twice this length... 44
43. Prescutal stripes not well-defined; tuberculate pits present; r far removed from the tip of R_1 ; basal deflection of Cu_1 usually at from one-third to one-half the length of the cell $1st M_2$. (Subgenus *Pseudolinnophila* Alex.) [Psyche, vol. 18, p. 196-198, pl. 16, fig. 3. 1911.] (Plate XL, 150.)..... *L. noveboracensis* Alex.

- Prescutal stripes dark brown; tuberculate pits lacking; *r* at the tip of *R*₁; basal deflection of *Cu*₁ usually at or close to the fork of *M*₁. [Proc. Acad. Nat. Sci. Phila., p. 534-535, pl. 27, fig. 46. 1916.] (Plate XL, 157.).....*L. sylvia* Alex.
44. *Rs* short, about equal to vein *R*₂ of the wings. [Proc. Acad. Nat. Sci. Phila., p. 241. 1859.] (Plate XL, 152.).....*L. lenta* O. S.
Rs elongate, equal to about twice the length of vein *R*₂ of the wings.....45
45. Mesonotum and pleura yellowish or brownish yellow; wings pale yellow. [Proc. Acad. Nat. Sci. Phila., p. 593-596, pi. 25, fig. 5. 1914.] (Plate XL, 155.)
L. stanwoodae Alex. 46
- Mesonotum and pleura not yellow.....46
46. Pleura and mesonotum clear bluish black with a gray bloom, only the coxae conspicuously light yellow; wings with a yellowish tinge; cross-vein *r* beyond the fork of *R*₂₊₃ on *R*₂. [Proc. Acad. Nat. Sci. Phila., p. 241. 1859.] (Plate XL, 153.).....*L. quadrata* O. S.
Pleura and mesonotum not so colored; cross-vein *r* at or before the fork of *R*₂₊₃.....47
47. Pleura of thorax with a conspicuous black dorsal stripe; mesonotum rich brown; wings with a brown suffusion; antennae of male short. [Proc. Acad. Nat. Sci. Phila., p. 596, pl. 25, fig. 6. 1914.] (Plate XL, 154.).....*L. osborni* Alex.
Pleura of thorax without a black dorsal stripe; mesonotum dull yellowish with three confluent dark brown stripes; wings without a distinct dark brown suffusion; antennae of male elongated. [Proc. Acad. Nat. Sci. Phila., p. 533-534, pl. 27, fig. 45. 1916.] (Plate XL, 156).....*L. edwardi* Alex.

Tribe Hexatomini

The genera of the tribe Hexatomini may be separated in accordance with the following key:

1. Cell 1st *M*₂ open; but one free branch of the media reaching the wing margin; cell *R*₂ tiny.....*Hexatoma* Latr. (p. 920)
Cell 1st *M*₂ closed; two or three free branches of the media reaching the wing margin; cell *R*₂ larger, more elongate.....2
2. Feet (in the local species) white; stigma small; cell *M*₁ present.
Pentoptera Schin. (p. 921)
Feet not white; stigma large; cell *M*₁ present or absent.....*Eriocera* Macq. (p. 921)

Genus *Hexatoma* Latreille

- 1809 *Hexatoma* Latr. Gen. Crust. et Ins., vol. 4, p. 260.
1818 *Anisomera* Meig. Syst. Besch., vol. 1, p. 210.
1818 *Nemalocera* Meig. Syst. Besch., vol. 1, p. 209.
1836 *Peronecera* Curt. Brit. Ent., p. 589.

The small genus *Hexatoma* includes seventeen described species, about all of which are European. They are mostly small species, with a reduced medial venation that is at first sight difficult to interpret; the manner in which this genus has been evolved from *Eriocera* is well shown in some of the plastic species of the latter genus, notably *E. austera* Doane, in which all gradations in venation between *Eriocera* and *Hexatoma* may be found in a small series. From species such as these it is seen that the elimination of the posterior branch of the media is brought about by

fusion rather than by atrophy. The larvae are carnivorous, and live in wet sand and gravel along the margins of streams (Alexander, 1915 a: 141-148).

Hexatoma megacera (O. S.)

1859 *Anisomera megacera* O. S. Proc. Acad. Nat. Sci. Phila., p. 242.

1909 *Hexatoma megacera* Johns. Proc. Boston Soc. Nat. Hist., vol. 34, p. 126.

Hexatoma megacera is a small, blackish gray fly, the mesonotum having three darker stripes and the male antennae being somewhat elongated and filiform. The characteristic venation is shown in Plate XXXVII, 112.

Genus *Penthoptera* Schiner

1863 *Penthoptera* Schin. Wien. Ent. Monatschr., vol. 7, p. 220.

In the genus *Penthoptera* there are seven species — four from Europe, two from tropical America, and one local species. The immature stages are spent in rich organic earth, a very different habitat from that of the larvae of the related genera *Eriocera* and *Hexatoma*. The larva is carnivorous (Alexander, 1915 a:152-157). In the native species, *Penthoptera albitarsis*, the feet are pure snowy white, which makes the insect a conspicuous one.

Penthoptera albitarsis O. S.

1869 *Penthoptera albitarsis* O. S. Mon. Dipt. N. Amer., part 4, p. 257.

Penthoptera albitarsis is a brownish fly, with the thorax bluish gray, the wings slightly tinged with dusky, and the feet pure snowy white. The flies occur in cool, shady situations and are often very common. In the South (North Carolina) they are frequent in gum swamps. The venation is shown in Plate XXXVII, 104.

Genus *Eriocera* Macquart

1830 *Caloptera* Guer. Voyage de la Coquille, Zool., Ins., pl. 20, fig. 2.

1838 *Eriocera* Macq. Dipt. Exot., vol. 1, p. 74.

1838 *Evanioptera* Guer. Voyage de la Coquille, Zool., vol. 2, p. 287.

1848 *Pterocosmus* Walk. List Dipt. Brit. Mus., vol. 1, p. 78.

1850 *Allarithmia* Loew. Bernstein und Bernsteinafauna, p. 38.

1857 *Oligomera* Dolesch. Natuurk. Tijdschr. Nederl. Indie, vol. 14, p. 387.

1859 *Arrhenica* O. S. Proc. Acad. Nat. Sci. Phila., p. 242.

1859 *Physecrania* Bigot. Ann. Soc. Ent. France, ser. 3, vol. 7, p. 123.

1912 *Androclosma* Enderlein. Zool. Jahrb., vol. 32, part 1, p. 34.

1916 *Globericera* Matsumura. Thous. Ins. Japan, add. 2, p. 471.

Eriocera is one of the larger genera of crane-flies, including about one hundred described species which are most numerous in the tropics of both hemispheres. The larvae are carnivorous. They live in streams, and pupate in sand or gravel (Alexander and Lloyd, 1914). The habits of the common local species *E. longicornis* have been described by the author in another paper (Alexander, 1915 a:149-152). The following key divides the local species of Eriocera:

1. Cell M_1 present 2
 Cell M_1 lacking 3
2. Antennae of male greatly elongated, more than twice the length of the whole body; wings grayish brown; vertical tubercle prominent, brownish on the sides. [*Arrhenica spinosa* O. S. Proc. Acad. Nat. Sci. Phila., p. 244, pl. 4, fig. 30. 1859.] (Plate XXXVII, 105.)
E. spinosa (O. S.)
 Antennae short in both sexes, extending about to the wing root or a little beyond; wings darker brown; vertical tubercle low, grayish. [Bul. U. S. Geol. Survey, vol. 3, p. 205. 1877.] (Plate XXXVII, 106.) *E. brachycera* O. S.
3. Color of body yellow or yellowish red 4
 Color of body brown, gray, or black 5
4. Antennae of male elongated, longer than the body; a blackish spot on the scutal lobes above the wing root. [Mon. Dipt. N. Amer., part 4, p. 255. 1869.] (Plate XXXVII, 109.) *E. wilsonii* O. S.
 (*E. antennaria* Doane [Journ. N. Y. Ent. Soc., vol. 8, p. 194, pl. 8, fig. 12, 1900] is the same as *E. wilsonii* O. S.)
 Antennae short in both sexes; no blackish spot on the scutal lobes above the wing root. [Journ. N. Y. Ent. Soc., vol. 8, p. 194, pl. 8, fig. 13. 1900.] *E. aurata* Doane
5. Thoracic dorsum gray; antennae of male elongated 6
 Thoracic dorsum brown or black; antennae short in both sexes 7
6. Vertical tubercle of male very large and high, greater than length of eye; first segment of antennal scape uniformly dark; prescutal stripes broad, dark brown, the median stripes about confluent and continued cephalad to the pronotum; cell *1st M*₂ of wings short, pentagonal, usually with a spur into cell *R*; valves of ovipositor short, blunt, sub-fleshy. [*Anisomeru longicornis* Walk., List Dipt. Brit. Mus., vol. 1, p. 82. 1848.] (Plate XXXVII, 107.) *E. longicornis* (Walk.)
 (*E. gibbosa* Doane [Journ. N. Y. Ent. Soc., vol. 8, p. 193, pl. 8, fig. 10, 1900] is a doubtful species; in its coloration and, especially, in its venation, it is strikingly like *E. longicornis* [Walk.], but there is no mention in the original description of the size of the antennae.)
 Vertical tubercle of male moderate in size, not so high as length of eye; first segment of antennal scape pale beneath; prescutal stripes narrow, pale brown, the two middle stripes separate, becoming obliterated at about the level of the tuberculate pits; cell *1st M*₂ of wings long, hexagonal; valves of ovipositor elongated, pointed, chitinized. [Psyche, vol. 19, p. 169-170, pl. 13, fig. 9. 1912.] (Plate XXXVII, 108.) *E. cinerea* Alex.
7. Cell R_2 short, cross-vein *r* inserted on R_{2+3} . [Psyche, vol. 19, p. 168-169, pl. 13, fig. 7. 1912.] (Plate XXXVII, 111.) *E. fulltonensis* Alex.
 Cell R_2 deep, cross-vein *r* inserted on R_2 8
8. Wings brown, the stigma small, rounded, brown; abdominal tergites brown. [Proc. Acad. Nat. Sci. Phila., p. 243, pl. 3, fig. 31. 1859.] *E. fuliginosa* O. S.
 Wings blackish brown, the stigma oval, dark brown; abdominal tergites black. [Proc. Acad. Nat. Sci. Phila., p. 602. 1914.] (Plate XXXVII, 110.) *E. tristis* Alex.

Eriocera longicornis, *E. cinerea*, and *E. spinosa* are on the wing in late April and May, the last-named species flying in July. *E. brachycera*, *E. fultonensis*, *E. fuliginosa*, and *E. tristis* are on the wing during the summer months.

Tribe **Pediciini**

The genera of the tribe Pediciini may be separated in accordance with the following key:

1. Antennae with 16 segments 2
 Antennae with 13 or 15 segments 3
2. Cord oblique; cell *1st M*₂ very short, pentagonal; size large, wing over 20 mm.; palpi elongated *Pedicia* Latr. (p. 923)
 Cord transverse; cell *1st M*₂ elongate; size smaller, wing under 18 mm.; palpi short. *Tricyphona* Zett. (p. 924)
3. A supernumerary cross-vein in cell *R*₁ *Diceranota* Zett. (p. 925)
 No supernumerary cross-vein in cell *R*₁. (Genus *Rhaphidolabis* O. S.) 4
4. Cell *M*₁ absent Subgenus *Plectromyia* O. S. (p. 925)
 Cell *M*₁ present 5
5. Antennae 15-segmented; cell *1st M*₂ closed Subgenus *Rhaphidolabina* Alex. (p. 925)
 Antennae 13-segmented; cell *1st M*₂ open Subgenus *Rhaphidolabis* O. S. (p. 925)

The recent accession of several curious new venational types in this tribe indicates that the vein herein held to be the radial cross-vein is in reality the upward deflection of *R*₂, which, in most species, is short and transverse or but slightly oblique and is fused distally with *R*₁. A detailed account of this venational peculiarity may be consulted elsewhere (Alexander, 1918 d).

Genus **Pedicia** Latreille

1809 *Pedicia* Latr. Gen. Crust. et Ins., vol. 4, p. 255.

1916 *Daimiotipula* Matsumura. Thous. Ins. Japan, add. 2, p. 463.

Pedicia is a small genus including six species, four of which are North American. The species are among the largest of the Limnobiinae, and with their conspicuous brown-and-white wings attract considerable attention. The larvae are carnivorous, living beneath moss in percolating water and in cold springs (Needham, 1903 b:285-286). There are two regional species, both of which were originally described from Nova Scotia by Walker. The following key divides the local species of *Pedicia*:

- Wings with the costal margin brown; vein *Cu*₂ seamed with dark brown. [List Dipt. Brit. Mus., vol. 1, p. 37. 1848.] (Plate XLII, 175.) *P. albivitta* Walk.
- Wings with the costal margin brownish yellow; no brown seam on vein *Cu*₂. [List Dipt. Brit. Mus., vol. 1, p. 38. 1848.] (Plate XLII, 176.) *P. contermina* Walk.

Genus *Tricyphona* Zetterstedt

- 1838 *Tricyphona* Zett. Ins. Lapponica, Dipt., p. 851!
 1856 *Amalopsis* Hal. Ins. Brit., Dipt., vol. 3, add., p. xv.
 1860 *Crunobia* Kol. Wien. Ent. Monatschr., vol. 4, p. 393.
 1869 *Amalopsis* O. S. Mon. Dipt. N. Amer., part 4, p. 260.

There are about forty known species in the genus *Tricyphona*. Almost all of these are Holarctic in their distribution, but two occur in the Australasian region. The carnivorous larvae live in moist earth. The following key divides the local species:

1. Cell *M* with a supernumerary cross-vein; wings heavily clouded and marbled with gray. [*Amalopsis hyperborea* O. S. Proc. Acad. Nat. Sci. Phila., p. 292. 1861.] (Plate XLII, 182.)..... *T. hyperborea* (O. S.)
 Cell *M* without a supernumerary cross-vein; wings with the markings sparse, confined to the region of the veins..... 2
2. Cell *R*₂ short-petiolate; costal margin of wings infuscated. [*Amalopsis inconstans* O. S. Proc. Acad. Nat. Sci. Phila., p. 247, pl. 3, fig. 32. 1859.] (Plate XLII, 177.)
T. inconstans (O. S.)
 Cell *R*₂ sessile; costal margin of wings not infuscated..... 3
3. Wings subhyaline or hyaline, unspotted..... 4
 Wings spotted or marked with darker..... 5
4. Stigma of wings brown; male hypopygium conspicuously hairy; wings of female sub-atrophied. [Can. Ent., vol. 49, p. 30-31. 1917.] (Plate XLII, 179, 180.)
T. autumnalis Alex.
 Stigma of wings pale; male hypopygium small, not conspicuously hairy; wings of female normally developed. [*Amalopsis calcar* O. S. Proc. Acad. Nat. Sci. Phila., p. 247. 1859.] (Plate XLII, 178.)..... *T. calcar* (O. S.)
5. Fusion of *Cu*₁ with *M*₃ extensive, subequal to the part of *M*₃ before the cross-vein *m*. [*Amalopsis auripennis* O. S. Proc. Acad. Nat. Sci. Phila., p. 247. 1859.] (Plate XLII, 181.)..... *T. auripennis* (O. S.)
 Fusion of *Cu*₁ with *M*₃ transient if present at all, usually less than one-half of the part of *M*₃ before the cross-vein *m*..... 6
6. Coloration of body light brown; *m-cu* obliterated by the fusion of *Cu*₁ on *M*₃. [Proc. Acad. Nat. Sci. Phila., p. 598-599, plate, fig. 1914.] (Plate XLII, 183.)
T. katahdin Alex.
 Coloration of body gray; *m-cu* present..... 7
7. Scape of antenna yellowish or brownish yellow, the flagellum much darker, brown; abdominal tergites brown, the margins of the segments pale producing a banded appearance; wings with large rounded clouds at the tips of the longitudinal veins and along the cross-veins. [*Amalopsis vernalis* O. S. Proc. Acad. Nat. Sci. Phila., p. 291. 1861.] (Plate XLII, 185.)..... *T. vernalis* (O. S.)
 Scape of antenna dark brown, concolorous with the flagellum; abdominal tergites brown, unbanded; wings with the pattern almost obsolete, reduced to tiny dots and seams. [Proc. Acad. Nat. Sci. Phila., p. 538-540 pl. 28, fig. 53. 1916.] (Plate XLII, 184.)
T. paludicola Alex.

In the local fauna, *T. vernalis* and *T. paludicola* are early spring species, *T. auripennis* and *T. calcar* late spring species, and *T. katahdin* and *T. autumnalis* late summer species.

Genus *Dicranota* Zetterstedt1838 *Dicranota* Zett. Ins. Lapponica, Dipt., p. 851.

In the genus *Dicranota* there are about fifteen known species, restricted to the northern Holarctic region. The species are readily distinguished from those of *Rhaphidolabis* by the supernumerary cross-vein in cell R_1 of the wings. The larvae are carnivorous, feeding largely on Tubifex worms (Miall, 1893). The local species of *Dicranota* may be separated according to the following key, which is adapted from a key to the North American species already published by the author (Alexander, 1914 b:601).

1. Cell M_1 absent.....2
Cell M_1 present.....3
2. Halteres with the knobs darkened; antennae of male much longer than the thorax. [Mon. Dipt. N. Amer., part 4, p. 281-282. 1869.].....*D. eucera* O. S.
Halteres pale; antennae of male short. [Proc. Acad. Nat. Sci. Phila., p. 249. 1859.]
(Plate XLI, 169.).....*D. rivularis* O. S.
3. Cell 1st M_2 present; color of body yellowish. [Proc. Acad. Nat. Sci. Phila., p. 599-600,
pl. 27, fig. 31. 1914.] (Plate XLI, 167.).....*D. pallida* Alex.
Cell 1st M_2 absent; color of body gray. [Proc. Acad. Nat. Sci. Phila., p. 600. 1914.]
(Plate XLI, 168.).....*D. noveboracensis* Alex.

Genus *Rhaphidolabis* Osten Sacken1869 *Rhaphidolabis* O. S. Mon. Dipt. N. Amer., part 4, p. 284.1869 *Plectromyia* O. S. Mon. Dipt. N. Amer., part 4, p. 282.

The genus *Rhaphidolabis* includes about fourteen described species found in the Holarctic region and in the mountainous sections of the Oriental region. The larvae are carnivorous, and live in rich organic mud or in the streams near by. Needham (1908:212-214) has given a description of the larva of the species *R. tenuipes*. The following key, adapted from a key to the North American species of *Rhaphidolabis* already published by the author (Alexander, 1916:541-542), divides the local species of the genus:

1. Antennae 15-segmented; cross-vein m present. (Subgenus *Rhaphidolabina* Alex.) [Mon. Dipt. N. Amer., part 4, p. 288. 1869.] (Plate XLI, 170.).....*R. flaveola* O. S.
Antennae 13-segmented; cross-vein m absent.....2
 2. Cell M_1 absent. (Subgenus *Plectromyia* O. S.) [*Plectromyia modesta* O. S. Mon. Dipt. N. Amer., p. 284. 1869.] (Plate XLI, 174.).....*R. modesta* (O. S.)
Cell M_1 present. (Subgenus *Rhaphidolabis* O. S.).....3
 3. Cell R_2 petiolate. [Mon. Dipt. N. Amer., p. 287. 1869.] (Plate XLI, 171.)
R. tenuipes O. S.
- Cell R_2 sessile.....4

4. Coloration grayish brown, the prescutum with three dark brown stripes; abdomen dark brown with paler caudal margins to the segments; wings very pale brown, the radial sector very short, arcuated, angulated, or spurred. [Proc. Acad. Nat. Sci. Phila., p. 543-544, pl. 28, fig. 57. 1916.] (Plate XLI, 173.) *R. cayuga* Alex.
 Coloration reddish brown, the prescutum with three indistinct stripes; abdomen yellowish brown, the hypopygium bright yellow; wings nearly hyaline, the radial sector somewhat elongated, slightly arcuated. [Proc. Acad. Nat. Sci. Phila., p. 544-545, pl. 28, fig. 58. 1916.] (Plate XLI, 172.) *R. rubescens* Alex.

SUBFAMILY *Cylindrotominae*

The genera of the subfamily *Cylindrotominae* may be separated in accordance with the following key:

1. Head and intervals of the prescutum with numerous deep punctures. *Triogma* Schin. (p. 926)
 Head and intervals of the prescutum smooth 2
2. Three branches of the radius reaching the wing margin. *Phalacrocera* Schin. (species *noxena* Alex.) (p. 927)
 Two branches of the radius reaching the wing margin, caused by an apparent fusion of R_{1+2+3} 3
3. Three branches of the media reaching the wing margin. *Cylindrotoma* Macq. (p. 927)
 Two branches of the media reaching the wing margin 4
4. Cross-vein *r-m* present; cross-vein *m* obliterated by the fusion of M_3 on M_{1+2} ; antennae of male tipuline in structure. *Phalacrocera* Schin. (species *tipulina* O. S.) (p. 927)
 Cross-vein *r-m* usually obliterated by the fusion of R_{4+5} on M_{1+2} ; cross-vein *m* present; antennae of male subpectinate, the individual flagellar segments almost cordate. *Liogma* O. S. (p. 927)

Genus *Triogma* Schiner

1863 *Triogma* Schin. Wien. Ent. Monatschr., vol. 7, p. 223.

There are but two known species of *Triogma*, one occurring in Europe and the other in northeastern North America. The larval life of the European species, the only one that is known, is spent on aquatic mosses growing in mountain torrents. The insects closely resemble the species of *Liogma* in all their stages.

Triogma exculpta O. S.

1865 *Triogma exculpta* O. S. Proc. Ent. Soc. Phila., vol. 4, p. 239.

Triogma exculpta is a rather small, dull brown fly, with the wings suffused with brown. The head and the sides of the thorax are deeply punctured. The fly is rare and is insufficiently known. The venation is very much like that in the genus *Liogma*. (Johnson, 1909:131.)

Genus *Phalacrocera* Schiner1863 *Phalacrocera* Schin. Wien. Ent. Monatschr., vol. 7, p. 224.

The small genus *Phalacrocera* includes but three described species — two North American and one European. They are of especial interest because of certain venational features which they possess and which aid materially in explaining the remarkable venation of the more specialized species of *Cylindrotominae* (p. 863). The larva is aquatic, living on submerged plants. It is greenish brown in color, and the body is provided with numerous long, flexible filaments which are quite unlike the spiny armature of the more specialized members of the subfamily. The species are northern in their distribution and are most frequently found in bogs and boggy meadows. The local species may be separated by the following key:

Vein R_2 present and persistent to the wing margin; wings dark brown. [Proc. Acad. Nat. Sci. Phila., p. 603-605, pl. 25, fig. 10. 1914.] (Plate XXX, 9.) . . . *P. neozeana* Alex.
 Vein R_2 lost by atrophy; wings grayish brown. [Proc. Ent. Soc. Phila., vol. 4, p. 241. 1865.] (Plate XXX, 8.) *P. tipulina* O. S.

Genus *Cylindrotoma* Macquart1834 *Cylindrotoma* Macq. Suit. à Buff., vol. 1, Hist. Nat. Ins., Dipt., p. 107.

The genus *Cylindrotoma* forms a small group of crane-flies, including two European and three North American species. They are all similar in color, being usually bright yellow with black stripes on the thorax, in this respect suggesting some species of *Nephrotoma*. The larvae live on the lower side of the leaves of various monocotyledonous and dicotyledonous plants such as *Allium*, *Anemone*, *Trautvetteria*, *Stellaria*, and *Viola*, the insect feeding on the leaf tissue. The larvae are green in color and are usually provided with fleshy points and processes.

The following key divides the local species of *Cylindrotoma*:

Tarsi dark brown. [Proc. Ent. Soc. Phila., vol. 4, p. 236. 1865.] (Plate XXX, 6.)
C. americana O. S.
 Tarsi yellow. [*C. tarsalis* Johns., Psyche, vol. 19, p. 2, fig. 4, 1912. *C. anomala* Johns.,
 Psyche, vol. 19, p. 2-3, fig. 3, 1912.] (Plate XXX, 7.) *C. tarsalis* Johns.

Genus *Liogma* Osten Sacken1869 *Liogma* O. S. Mon. Dipt. N. Amer., part 4, p. 298.

In the genus *Liogma* there are three described species, all occurring in the North Temperate Zone. The coloration of the adult flies is

sordidly yellow and black, with the surface shiny. The antennae of the male are submoniliform with the segments heart-shaped, as shown in figure 125, 1 (page 850). The larva, which has been discussed by the writer in another paper (Alexander, 1914 a), lives in certain terrestrial mosses (as Hypnum). It is bright green in color, with darker stripes on the sides, and closely simulates the appearance of its host plant, the illusion being heightened by the spines and exerescences that cover the body.

Liogma nodicornis (O. S.)

1865 *Triogma nodicornis* O. S. Proc. Ent. Soc. Phila., vol. 4, p. 239.

1887 *Liogma nodicornis* O. S. Berl. Ent. Ztschr., vol. 31, p. 226.

Liogma nodicornis is a common fly in Canadian conditions thruout North America. In color it is mainly yellow, the head black and shiny, the thorax yellow with three more or less confluent shiny black stripes on the dorsum, the pleura with one or two large black blotches. The venation (Plate XXX, 5) is somewhat variable, especially in the fusion of R_{4+5} on M_{1+2} , these being in some cases broadly fused (as shown in figure 128, 1, page 862), in other cases with the cross-vein $r-m$ apparent.

SUBFAMILY Tipulinae

Tribe Dolichopezini

The genera of the tribe Dolichopezini may be separated in accordance with the following key:

1. Tip of vein R_2 atrophied; R_s very short, transverse, simulating a cross-vein; second anal vein long, about two-thirds the length of the first; Sc moderate in length, ending in R2
 Tip of vein R_2 present, the vein almost perpendicular to R_{2+3} at its origin; R_s long, strongly arcuated at its origin; second anal vein very short, about one-third the length of the first; Sc very long, ending in costa.....*Brachypremna* O. S. (p. 925)
2. Cell 1st M_2 lacking; basal deflection of Cu_1 in a long fusion with M_1 , breaking away before the fork of M*Dolichopeza* Curt. (p. 929)
 Cell 1st M_2 present; basal deflection of Cu_1 in punctiform contact with M_{3+4} beyond the fork of M*Oropceza* Needm. (p. 929)

Genus *Brachypremna* Osten Sacken

1886 *Brachypremna* O. S. Berl. Ent. Ztschr., vol. 30, p. 161.

The genus *Brachypremna* includes but seven described species, all of which are tropical American. A single species, *B. dispellens*, ranges

into the southern limits of the territory here considered. This is a curious fly which is common all over the South, where in some sections it is called "weaver." The flies of this species have a remarkable dance over a vertical height of several feet, and have been aptly termed "the kings of the dancing crane-flies." The larval life is spent in decaying wood.

Brachypremna dispellens (Walk.)

1860 *Tipula dispellens* Walk. Trans. Ent. Soc. Lond., n. ser., vol. 5, p. 334.

1886 *Brachypremna dispellens* O. S. Berl. Ent. Ztschr., vol. 30, p. 162.

Brachypremna dispellens is a large, brownish fly. The pleura is silvery white with narrow brown stripes. The legs are very long, and the tibiae and tarsi are pale yellowish white. The venation is shown in Plate XLIII, 188.

Genus *Dolichozepea* Curtis

1825 *Dolichozepea* Curt. Brit. Ent., p. 62.

1830 *Leptina* Meig. Syst. Besch., vol. 6, pl. 65, fig. 10.

1846 *Apeilexis* Macq. Dipt. Exot., Suppl. 1, p. 8.

The genus *Dolichozepea* includes about eighteen described species, only one of which occurs in the New World. The immature stages are spent in or beneath moist mosses.

Dolichozepea americana Needm.

1908 *Dolichozepea americana* Needm. 23d Rept. N. Y. State Ent., p. 211, pl. 16, fig. 5.

Dolichozepea americana is a curious fly usually found beneath bridges and culverts, or in similar darkened situations. The adults hang suspended from the roof by the anterior two pairs of feet, the wings being spread wide apart and the long, white-tipped hind legs dangling conspicuously. The dark color of the body and the pure white tarsi easily serve to distinguish the species from the forms of *Orozepea* that may be found with it. The wing venation is shown in Plate XLIII, 187.

Genus *Orozepea* Needham

1908 *Orozepea* Needm. 23d Rept. N. Y. State Ent., p. 211.

In the genus *Orozepea* there are seven described species, all occurring within the limits of this paper. While they are closely related to one another, most of them are apparently valid species. They occur in the

same type of situations as does the preceding species — beneath bridges, culverts, in crannies of cliffs, on the inclined sides of boulders along mountain streams, and in similar places. Their position when at rest is very different from that of *Dolichopeza americana*, as they hang from the roof by the front pair of feet only, the other legs dangling and the wings being folded over the abdomen. In this last-named feature they differ conspicuously from the often-associated *Dolichopeza*. The immature stages are spent in moist earth, or (in the case of *O. obscura*) in a dry moss, *Hedwigia albicans*, where they were first discovered by Hyslop. The larvae are sluggish and of a rather dark green color. The following key is adapted from one given by Johnson (1909:117-118):

1. Tarsi, at least, entirely white. 2
Tarsi yellow or brownish. 3
2. Digitiform appendages of male genitalia short or rudimentary; ventral margin deeply and narrowly emarginate. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 121, pl. 15, fig. 12. 1909.] *O. albipes* Johns.
Digitiform appendages of male genitalia moderate in length; ventral margin broadly emarginate. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 121-122, pl. 15, figs. 5, 11. 1909.] *O. subalbipes* Johns.
3. Halteres with the knobs dark brown. 4
Halteres entirely yellow. 7
4. Stripes of thorax distinct; ventral margin deeply emarginate. 5
Stripes of thorax obscure; ventral margin but slightly emarginate. 6
5. Pleura yellow, unspotted. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 119-120, pl. 15, fig. 6. 1909.] *O. dorsalis* Johns.
Pleura yellow, spotted. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 120, pl. 15, fig. 9. 1909.] *O. venosa* Johns.
6. Thorax opaque. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 122, pl. 15, figs. 7, 10. 1909.] (Plate XLIII, 186.) *O. obscura* Johns.
Thorax shining. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 122-123, pl. 15, fig. 8. 1909.] *O. obscura polita* Johns.
7. Ventral margin of male genitalia deeply and narrowly emarginate. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 118-119, pl. 15, figs. 2, 3, 1909. New name for *Tipula annulata* Say, Journ. Acad. Nat. Sci. Phila., vol. 3, p. 25 (1823), preoccupied.] *O. sayi* Johns.
Ventral margin broadly emarginate. [Proc. Boston Soc. Nat. Hist., vol. 34, p. 119, pl. 15, fig. 4. 1909.] *O. similis* Johns.

Tribe Ctenophorini

The following key separates the two genera of the tribe Ctenophorini:

- Antennae of male with three pectinations on the flagellar segments, each segment with a single pectination on the apical half in addition to the usual basal pair; ovipositor of female greatly elongated, saber-like. *Tanyptera* Latr. (p. 931)
- Antennae of male with two pairs of pectinations on the flagellar segments, one pair being subbasal and the other subapical; ovipositor of female short and of the normal tipuline structure. *Ctenophora* Meig. (p. 931)

Genus *Tanyptera* Latreille

- 1805 *Tanyptera* Latr. Hist. Nat. Crust. et Ins., vol. 14, p. 286.
 1832 *Xiphura* Brulle. Ann. Soc. Ent. France, vol. 1, p. 206.

In the genus *Tanyptera* there are supposedly twelve described species, of which three or four are from eastern North America and the remainder are from the Palaearctic region. The remarkable variation in color, however, is strongly indicative that the number of species is very much less than that given, and it is possible that there is but a single species within the limits of this paper. The question can be definitely settled only by the wholesale breeding of larvae to the adult stage. Until more is known about these flies it is best to recognize the full number of forms, always keeping in mind, however, the foregoing remarks.

The larvae live in the wood of deciduous trees, often in prostrate trunks that are fairly sound. The adult flies are easily distinguished from all other crane-flies by the tripectinate antennal segments of the male and the elongated acicular ovipositor in the female. The flies are shiny, and often are brilliantly colored with black and reddish yellow, simulating Ichneumonidae and other hymenopterous insects.

The following key divides the local species of *Tanyptera*:

1. Wings smoky black; body coloration black, the male with feet and abdomen also black, the female with legs and base of abdomen reddish yellow. [*Ctenophora fumipennis* O. S. Proc. Ent. Soc. Phila., vol. 3, p. 47. 1864.] *T. fumipennis* (O. S.)
 Wings not black. 2
2. Wings tinged with topazine yellow, the stigma dark brown; body coloration varying from black to yellow, the feet reddish yellow. [*Ctenophora topazina* O. S. Proc. Ent. Soc. Phila., vol. 3, p. 47-48. 1864.] *T. topazina* (O. S.)
 Wings hyaline, the stigma brown; head black; body coloration varying from black to yellow. [*Ctenophora frontalis* O. S. Proc. Ent. Soc. Phila., vol. 3, p. 48-49. 1864.] (Plate XLIII, 191.) *T. frontalis* (O. S.)

Genus *Ctenophora* Meigen

- 1800 *Flabellifera* Meig. Nouv. Class. Mouch., p. 13 (*nomen nudum*).
 1803 *Ctenophora* Meig. Illiger's Mag., vol. 2, p. 263.
 1910 *Phoroctenia* Coq. Proc. U. S. Nat. Mus., vol. 37, p. 589.

In the genus *Ctenophora* a condition exists which is similar to that in *Tanyptera*, there being fifteen described species which are very closely related and many of which are undoubtedly synonymous. Two forms are here recognized, and even these may represent but one species. A number of larvae of *Ctenophora* were found in a decaying tree by Johannsen (1910), who reared from them a considerable number of adults

which showed well the dimorphic nature of the flies of this group. Some of the specimens of each sex were entirely black, while others were reddish yellow with the wings tipped with darker. Specimens having hyaline wings are often taken.

The larvae live in decaying wood. The adult flies are easily distinguished by the double bipectinate antennae of the male (fig. 125, M, page 850), and the serrate antennae and relatively short ovipositor in the female.

The local species of the genus may be separated by the following key:

- Wings with the entire apex beyond the cord tinged with blackish; thorax yellowish brown with darker spots. [Proc. Ent. Soc. Phila., vol. 3, p. 45-46. 1864.] (Plate XLIII, 189, normal form; 190, black form, the wing not shaded in this drawing.) *C. apicata* O. S.
 Wings nearly hyaline, with a large brown cloud between the cord and the wing tip but not reaching the apex; thorax yellow with a wedge-shaped median brown stripe. [Proc. Ent. Soc. Phila., vol. 3, p. 46. 1864.] *C. nubecula* O. S.

Tribe Tipulini

The genera of the tribe Tipulini may be separated in accordance with the following key:

1. Flagellar segments of antennae not verticillate. *Stygeropsis* Loew (p. 932)
- Flagellar segments of antennae verticillate. 2
2. Abdomen greatly elongated in both sexes, much longer than the wing alone; the male hypopygium simple in structure, the ninth sternite very long with the pieurites lying in this concavity. 3
- Abdomen not greatly elongated in the male sex, rarely so in the female sex (*Tipula longiventris*), not longer than the wing; the male hypopygium more complicated in structure, if simple the ninth sternite not shaped as described above. 4
3. Cell M_1 sessile; wings strongly suffused with reddish brown. *Aeshnasoma* Johns. (p. 933)
- Cell M_1 petiolate, long-petiolate in *Longurio minimus*, short-petiolate in *L. testaceus*; wings grayish, the subcostal cell brown. *Longurio* Loew (p. 933)
4. R_s usually very short, almost transverse, simulating a cross-vein; cell M_1 sessile or short-petiolate; basal deflection of Cu_1 or the $m-cu$ cross-vein joining M at or before its fork; coloration usually yellow and black, shiny. 5
- R_s usually longer, not simulating a cross-vein; cell M_1 always petiolate; basal deflection of Cu_1 or the $m-cu$ cross-vein joining M at its fork or underneath the middle of cell $1st M_2$; coloration usually dull brown, yellow, or gray. (Genus *Tipula* Linn.) 6
5. Cells of wings glabrous. *Nephrotoma* Meig. (p. 934)
- Apical cells of wings pubescent. Subgenus *Odontotipula* Alex. (p. 943)
6. Cells of wings glabrous. Subgenus *Tipula* Linn. (p. 942)
- Apical cells of wings pubescent. 7
7. Apical cells of wings with an abundant short pubescence; body coloration dull brown, as in species of *Oropeza*. Subgenus *Trichotipula* Alex. (p. 942)
- Apical cells of wings with a sparse short pubescence; thoracic dorsum dark-colored with paler stripes. Subgenus *Cinctotipula* Alex. (p. 943)

Genus *Stygeropsis* Loew

- 1844 *Prionocera* Loew. Stett. Ent. Ztg., vol. 5, p. 170; preoccupied.
 1863 *Stygeropsis* Loew. Berl. Ent. Ztschr., vol. 7, p. 298.

The genus *Stygeropis* includes about ten species, all confined to the temperate and arctic regions. The species of *Stygeropis* are readily distinguished from those of *Tipula* by the lack of verticils on the antennae (fig. 125, N, page 850). The immature stages are spent in rich organic mud. The pupae have a peculiar character in their elongate unequal breathing horns.

Stygeropis fuscipennis Loew

1865 *Stygeropis fuscipennis* Loew. Berl. Ent. Ztschr., vol. 9, p. 129.

Stygeropis fuscipennis is a medium-sized fly, with the thorax grayish brown, the pleura clearer gray, the abdomen brownish yellow, and the wings strongly tinged with brown. The wing venation is shown in Plate XLIII, 194, the ninth tergite of the male hypopygium in Plate XLIX, 255. These singular flies are characteristic inhabitants of marshy (helophytic) situations, and appear on the wing in July and August.

Genus *Aeshnasoma* Johnson

1909 *Aeshnasoma* Johns. Proc. Boston Soc. Nat. Hist., vol. 34, p. 115-116.

Aeshnasoma is a monotypic genus which is close to *Longurio* but probably separable from it. The fly is known only from the type station, New Jersey, where it is apparently not uncommon. Larvae were found in a cold stream near Riverton, New Jersey, by Johnson. They were not reared, but the striking resemblance to the larva of *Longurio* leaves no doubt as to their identity.

Aeshnasoma rivertonensis Johns.

1909 *Aeshnasoma rivertonensis* Johns. Proc. Boston Soc. Nat. Hist., vol. 34, p. 116, pl. 16, figs. 13-15.

Aeshnasoma rivertonensis is a large fly, nearly resembling *Longurio testaceus* but with the body coloration strongly reddish brown, including the wings, and with cell M_1 sessile. The abdomen of the male is 30 mm. in length, the wing 22 mm. The ninth tergite of the male hypopygium is shown in Plate XLIX, 257.

Genus *Longurio* Loew

1869 *Longurio* Loew. Berl. Ent. Ztschr., vol. 13, p. 3.

The small genus *Longurio* includes about six described species from widely separated areas of the earth, two being from eastern North America. It is probable that the species recently described by Edwards from Formosa is not a *Longurio*, as its hypopygium is very different from the peculiar type characteristic of this group (Plate LIII, 329). The immature stages are spent in sand or gravel near running water, usually in mountainous conditions. The bulky, semi-transparent larvae of *L. testaceus* are probably the largest crane-fly larvae to be found in eastern America; the writer is indebted to Mr. Hyslop for specimens which, altho not bred, can scarcely belong to any other species. The pupae are remarkable in their elongate breathing horns, these being nearly 20 mm. in length. The adult fly of *L. testaceus* is the largest crane-fly in eastern America, in the female sex even excelling the better-known *Holorusia grandis* of the West. It is found in cool, shaded woods, near streams, and is very wary and difficult to capture, usually alighting in the midst of a pile of brush or similar débris from which it cannot be swept with a net.

The following key divides the local species of *Longurio*:

- Large, wing of male about 25 mm., abdomen 36 mm.; cell *M*₁ with its petiole very short [Berl. Ent. Ztschr., vol. 13, p. 3. 1869.] (Plate XLIII, 192, wing; Plate XLIX, 256, ninth tergite; Plate LIII, 329, lateral aspect of male hypopygium.) *L. testaceus* Loew
 Small, wing of male about 15 mm., abdomen 18 mm.; cell *M*₁ with its petiole elongated. [Proc. Acad. Nat. Sci. Phila., p. 605-606, pl. 27, fig. 32. 1914.] (Plate XLIII, 193.)
L. minimus Alex.

Genus *Nephrotoma* Meigen

- 1800 *Pales* Meig. Nouv. Class. Mouch. p. 14 (*nomen nudum*).
 1803 *Nephrotoma* Meig. Illiger's Mag., p. 262.
 1834 *Pachyrrhina* Macq. Suit. à Buff., vol. 1, Hist. Nat. Ins., Dipt., p. 88.

The large genus *Nephrotoma* includes about one hundred and twenty-five species of medium-sized flies, which present a great uniformity of size and color but a considerable diversity in the structure of the male antennae. In many instances the species run close to those of *Tipula*, and the two genera are undoubtedly very close together. The writer (Alexander, 1915 b:466) has removed about six of the North American species of *Nephrotoma* from this genus and placed them in *Tipula*. As a rule the species of *Nephrotoma* are brilliantly colored with red, yellow, orange, or black, the body being shiny; in *N. macrocera* and to a lesser extent in the *tenuis* group, however, the body is dull. In the genus *Tipula* the colors are brown, gray, and yellow, and are dull, the only shiny species

being the ones that have been removed from *Nephrotoma* and referred to *Tipula* on other characters. The immature stages of the known species are spent in moist earth and in decaying wood.

The local species of *Nephrotoma* may be separated in accordance with the following key:

1. Thoracic stripes black or largely black 2
 Thoracic stripes, if present, brownish or reddish 8
2. Prescutum with the anterior lateral angles of the lateral stripes and the ends of the V-shaped suture deep velvety black; pleura with faint reddish markings. [*Pachyrrhina virescens* Loew. Berl. Ent. Ztschr., vol. 8, p. 62. 1864.] *N. virescens* (Loew)
 Prescutum with the stripes uniform black thruout 3
3. Wings with the ground color hyaline 4
 Wings strongly tinged with brown or dusky, at least basally 6
4. Lateral stripes on prescutum curved laterad at their anterior ends. [*Pachyrrhina incurva* Loew. Berl. Ent. Ztschr., vol. 7, p. 293. 1863.] (Plate XLIV, 204.) *N. incurva* (Loew)
 Lateral stripes on prescutum straight 5
5. A small black spot on the vertex between the antennal bases; wings tipped with brown; abdominal segments banded with black. [*Pachyrrhina pedunculata* Loew. Berl. Ent. Ztschr., vol. 7, p. 293. 1863.] (Plate XLIV, 203.) *N. pedunculata* (Loew)
 No small black spot between the antennal bases; wings not tipped with darker; abdominal segments trivittate, the lateral stripes interrupted, the median stripe continuous. [*Pachyrrhina vittula* Loew. Berl. Ent. Ztschr., vol. 8, p. 63. 1864.] *N. vittula* (Loew)
6. Lateral stripes on prescutum curved laterad at their anterior ends. [*Tipula lineata* Scop. Ent. Carniol., p. 320. 1763.] *N. lineata* (Scop.)
 Lateral stripes on prescutum straight 7
7. Prescutum with the ground color orange-yellow; scutellum and pleura mostly black; abdomen with black dorsal spots. [*Pachyrrhina lugens* Loew. Berl. Ent. Ztschr., vol. 8, p. 63. 1864.] (Plate XLIV, 202.) *N. lugens* (Loew)
 Prescutum with the ground color obscure yellow; scutellum and pleura mostly yellow; abdomen with a black dorso-median stripe. [Proc. Acad. Nat. Sci. Phila., p. 467-468, pl. 16, fig. 1. 1915.] (Plate XLIV, 205.) *N. penumbra* Alex.
8. Thoracic dorsum dull, opaque; antennae of male very elongated, the flagellum black. [*Tipula macrocera* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 24. 1823.] (Plate XLIV, 200.) *N. macrocera* (Say)
 Thoracic dorsum more or less shiny; if at all opaque, the antennae of both sexes very short 9
9. Antennal segments uniform in color 10
 Antennal segments bicolorous 17
10. A velvety black spot at the anterior end of the lateral prescutal stripe. [*Pachyrrhina punctum* Loew. Berl. Ent. Ztschr., vol. 7, p. 294. 1863.] *N. punctum* (Loew)
 No velvety black spot at the anterior end of the lateral prescutal stripe 11
11. Occiput opaque with a shining triangular spot in the middle 12
 Occiput shining 14
12. A black spot at each end of the V-shaped suture. [*Tipula ferruginea* Fabr. Syst. Antl., p. 28. 1805.] (Plate XLIV, 198.) *N. ferruginea* (Fabr.)
 No black spots at the ends of the V-shaped suture 13
13. Stigma pale, brownish yellow. [*Pachyrrhina occipitalis* Loew. Berl. Ent. Ztschr., vol. 8, p. 65. 1864.] *N. occipitalis* (Loew)
 Stigma dark, blackish brown. [*Pachyrrhina gracilicornis* Loew. Berl. Ent. Ztschr., vol. 8, p. 66. 1864.] *N. gracilicornis* (Loew)

14. Head with a shining triangular spot. [*Pachyrrhina occipitalis* Loew. Berl. Ent. Ztschr., vol. 8, p. 65. 1864.]..... *N. occipitalis* (Loew)
 Head unicolorous.....15
15. Wings strongly tinged with brown, especially along the costal region. [*Pachyrrhina okefenoke* Alex. Wash. Univ. Studies, p. 97-98. 1915.]..... *N. okefenoke* (Alex.)
 Wings not strongly brown along the costal region.....16
16. Head and thorax yellowish, almost opaque; color in life strongly greenish. [*Pachyrrhina tennis* Loew. Berl. Ent. Ztschr., vol. 7, p. 297. 1863.] (Plate XLIV, 199.)
N. tennis (Loew)
 Head orange except the lateral margins of the vertex; thorax shining. [*Pachyrrhina sodalis* Loew. Berl. Ent. Ztschr., vol. 8, p. 64. 1864.]..... *N. sodalis* (Loew)
17. Segments of flagellum black at the base.....18
 Segments of flagellum yellow at the base.....20
18. Wings strongly tinged with yellow; occiput without a clear, shining triangle. [*Pachyrrhina xanthostigma* Loew. Berl. Ent. Ztschr., vol. 8, p. 65. 1864.] (Plate XLIV, 201.)..... *N. xanthostigma* (Loew)
 Wings not strongly tinged with yellow; occiput with a clear, shining triangle.....19
19. Costal region hyaline; stigma dark brown. [*Pachyrrhina abbreviata* Loew. Berl. Ent. Ztschr., vol. 7, p. 295. 1863.]..... *N. abbreviata* (Loew)
 Costal region darker; stigma yellowish brown. [*Pachyrrhina suturalis* Loew. Berl. Ent. Ztschr., vol. 7, p. 295. 1863.]..... *N. suturalis* (Loew)
20. Antennae with 13 segments. [*Pachyrrhina breviorcornis* Doane. Ent. News, vol. 19, p. 178-179. 1908.]..... *N. breviorcornis* (Doane)
 Antennae with more than 13 segments.....21
21. Stigma yellowish brown; wing apex not darker; antennae of male 19-segmented. [*Pachyrrhina eucera* Loew. Berl. Ent. Ztschr., vol. 7, p. 296. 1863.]..... *N. eucera* (Loew)
 Stigma dark brown; wing apex distinctly darkened; antennae of male 16-segmented. [*Pachyrrhina polymera* Loew. Berl. Ent. Ztschr., vol. 7, p. 297. 1863.]
N. polymera (Loew)

After the above key was completed, Dietz (1918) published an extensive revision of the American species of the genus. A number of his new species are found within the faunal limits of this paper. The more salient characters of the regional species are here briefly summarized, and these species should be considered in addition to the key.

Nephrotoma perdita (Dietz). (Pages 116-117 of reference cited.)

Yellow; mouth parts and palpi yellow; occiput with a shiny brown pentagon; thoracic stripes black, narrowly margined with rusty, the lateral stripes curved outward and ending in an opaque black spot; wings grayish subhyaline, stigma brownish black. Wing of female, 14.5 mm. (Manitoba, August.)

N. hirsutula (Dietz). (Pages 118-119 of reference.)

Very closely resembling *N. macrocera*, but with the wings sparsely pubescent. Eighth sternite of male deeply emarginate behind and with a digitiform lobe from the base of the notch. Wing of male, 12.5 mm. (Pennsylvania, May.)

N. urocera (Dietz). (Pages 119-120 of reference.)

N. cornifera (Dietz). (Pages 120-121 of reference.)

These two species are close to *N. okefenoke* but are easily separated by the male genitalia. They are from Virginia and North Carolina.

N. calinota (Dietz). (Pages 121-122 of reference.)

Yellow; antennal flagellum bicolorous; frontal prolongation of head dark brown medially; occiput opaque with a brown line; thoracic stripes silvery gray pruinose, the lateral stripes

outcurved and ending in a velvety black spot; wings grayish subhyaline, more yellowish basally, costal region brownish yellow. Wing of male, 11 mm. (Michigan and Maryland, June and July.)

N. opacivitta (Dietz). (Page 123 of reference.)

Similar to *N. calinota*, but with the antennae stout, the flagellum beyond the first segment blackish, the segments deeply incised beneath. Mesonotal prescutum with a median velvety black stripe; wings broad, tinged with brown; abdomen with a broad dark brown lateral stripe. Wing of male, 12 mm. (Manitoba.)

N. evasa (Dietz). (Pages 124–125 of reference.)

Yellow; antennae entirely yellowish; occiput with a shiny, broadly triangular spot; prescutum with an anterior median black mark; abdominal tergites margined posteriorly with yellowish brown. Wing of female, 13.5 mm. (Michigan, July.)

N. festina (Dietz). (Pages 126–127 of reference.)

Pale yellow; antennae very slender, the flagellar segments yellow, the outer ones more yellowish brown; occiput shiny; wings tinged with yellowish, the costal area pale yellow, the stigma brown; abdomen on either side with a row of black dashes. Wing of male, 12.5 mm. (Pennsylvania and Maryland, July and August.)

N. teneraria (Dietz). (Page 128 of reference.)

Yellow; antennae entirely yellowish; occiput opaque with a narrow shiny brown line; wings faintly tinged with grayish yellow, the costal area and along the veins more yellowish, the stigma brown; abdomen with a broad, pale brown, dorsal stripe, and with a row of black dashes along each lateral margin of the tergum. Wing of female, 13 mm. (Michigan, July.)

N. cingulata (Dietz). (Pages 131–133 of reference.)

Close to *N. xanthostigma*. Antennae of male elongated, the flagellar segments bicolorous, dark brown at base; thoracic dorsum highly polished, testaceous, the stripes poorly defined; wings strongly tinged with yellow as in *N. xanthostigma*, the costal region and along vein *Cu* more saturated, the stigma pale brown. Wing of male, 11 mm. (Pennsylvania, July and August.)

N. obliterated (Dietz). (Pages 133–134 of reference.)

Close to *N. xanthostigma*. Flagellar segments of antennae bicolorous, the segments dusky, blackish at base; occiput shiny; thorax sulfur yellow, the stripes rusty, the transverse suture black medially; wings grayish subhyaline, stigma yellowish; abdomen with a dark brown dorsal stripe and lateral rows of spots. Wing of male, 12.5 mm. (Ottawa, Michigan, and Pennsylvania, July and August.)

N. wyalusingensis (Dietz). (Pages 134–135 of reference.)

Close to *N. obliterated*. Head dark testaceous; flagellar segments of antennae bicolorous, yellowish brown, black at base; occiput shiny, a small brown spot at base; prescutum shiny yellow, the stripes dark rusty; wings pale brown, the costal region yellowish; abdomen dark testaceous, the lateral margins of tergites and the posterior margins of segments bordered with black. Wing of male, 12.5 mm. (Pennsylvania, August.)

N. approximata (Dietz). (Pages 136–137 of reference.)

Closely resembling *N. cingulata*, but with the flagellar segments brown, rusty at base. Antennae of male long, slender; occiput shiny with a dark brown stripe; thoracic stripes rusty brown; wings grayish, stigma brownish yellow; abdomen with black lateral stripes, the segments margined posteriorly with brown. Wing of male, 12 mm. (Pennsylvania, August.)

N. stigmaticea (Dietz). (Pages 137–138 of reference.)

Close to *N. breviorcornis*. Honey yellow; antennae of male short, the flagellar segments bicolorous, segments brown, yellow at base; thoracic stripes dark rusty; wings yellowish subhyaline, the costal area and along *Cu* more saturated, the stigma dark; abdomen with a brown dorsal stripe and more or less complete lateral stripes, a mid-ventral row of small black spots on the sternites. Wing of male, 12.5 mm. (Pennsylvania, August.)

Genus *Tipula* Linnaeus1758 *Tipula* Linn. Syst. Natur., vol. 10, p. 585.1864 *Anomaloptera* Lioy. Atti dell' Institut Veneto, ser. 3, vol. 9, p. 218.1887 *Orcomyza* Pokorny. Wien. Ent. Ztg., vol. 6, p. 50.

Tipula is the largest genus of crane-flies. It includes some six hundred and fifty described species, found in most parts of the world and very abundant on most of the continental areas but rare or lacking on many of the smaller oceanic islands. Obviously such a group of very closely related species presents considerable difficulty in classification. The keys to the species of any region are so cumbersome as to be almost unworkable, and yet it is very difficult to lessen this problem. In the present paper the geographical area has been considerably restricted and the number of included species is thus reduced. It is further reduced by the omission of species that have not been definitely recognized since their original characterization, thus eliminating species described by Walker, Macquart, and others; the inclusion of these species in keys is altogether guesswork, and it is far better to omit them until their types can be examined and the determination made final. The species described by Say, Doane, and Loew are fairly well known and very few of these are in doubt.

In order to supplement the keys, practically all the species are figured. In those forms having a characteristic wing pattern, it is the wing that is shown; while in those that evince notable characters of the male hypopygium, various parts of this organ are figured. In this genus, as in many others, it is almost impossible to separate the females unless they have been taken in copulation with the males.

The life histories of species in this genus are diverse, ranging from strictly aquatic forms to those occurring in wet mud, in moist soil, and in decaying wood.

An attempt is herein made to divide the local species into groups, the following characters being considered in making this division:

Color characters, as in the *collaris* group, in which the body coloration is strikingly like that in *Nephrotoma*, and the dimorphic groups (*T. fuliginosa*, *T. annulicornis*), with light-colored males and brown or black females.

Antennae, whether longer in the male than in the female, or short in both sexes.

Wings: pubescence in the apical cells, as in the subgenera *Trichotipula*, *Cinctotipula*, and *Odontotipula*; the features of wing venation, such as the atrophy of the tip of vein R_2 ; the retention of the *m-cu* cross-vein and its position in regard to the fork of *M*; the shape of the cell *1st M*₂; the wing pattern, which divides the species into three groups, as follows:

striatae, wings streaked longitudinally;

marmoratae, wings cross-banded or spotted in various ways;

subunicolores, wings hyaline or unicolorous.

Male hypopygium, whether the sclerites of the ninth segment are separate, or the tergite is fused with the sternite, or all the sclerites are fused into a continuous ring. The primitive character is to have a separate tergite, pleurite, and sternite, and specialization in the organ is shown by the fusion of these parts. The pleurite is first lost, by fusing with the sternite, but a part of the pleural suture is retained in all except the most specialized forms. The culmination of the organ in this genus is the fusion of the tergite with the already fused sterno-pleurite so as to form a continuous ring. The eighth sternite shows many curious modifications, which have already been discussed (p. 873).

Female hypopygium, which is much more homogeneous than the male hypopygium but which still shows many peculiar modifications and tendencies. There may be a sudden narrowing of the organ, as in *T. besselsi*, or the valves may be shortened and fleshy, and feebly chitinized, as in the *collaris* and *bicornis* groups. The most striking modification apparently is that seen in the *arctica* group, in which the ovipositor has two valves lying transversely and with the outer margins variously serrated.

Four subgenera are included in the genus, classified as follows:

A. Subgenus *Trichotipula* Alex.—Apical cells of the wings with abundant short hairs; coloration dull, as in *Oropeza*, but vein R_2 persistent for its entire length.

Tipula (Trichotipula) oropezoides Johns.

B. Subgenus *Cinctotipula* Alex.—Apical cells of the wings with a sparse, short pubescence; coloration dark brown, the mesonotum with pale stripes; ninth tergite with the caudal margin concave; antennae of the male elongated.

Tipula (Cinctotipula) algonquin Alex.

Tipula (Cinctotipula) unimaculata (Loew)

Tipula (Cinctotipula) dorsolineata Doane

C. Subgenus *Odontotipula* Alex.—Apical cells of the wings with a very sparse, short pubescence, most evident in cell R_5 ; coloration bright shiny yellow and red, as in species of *Nephrotoma*; antennae of the male short.

Tipula (Odontotipula) unifasciata (Loew)

D. Subgenus *Tipula* Linn.—No pubescence in the apical cells of the wings. This subgenus is divided into twenty-two groups, as follows:

1. The *collaris* group.—Coloration shiny black and yellow, as in species of *Nephrotoma*; wings with the *m-cu* cross-vein beneath the middle of cell $1st M_2$; female ovipositor with the valves short and fleshy.

Tipula collaris Say

T. nobilis (Loew)

2. The *pachyrhinoides* group.—Similar to the preceding in coloration; wings with the *m-cu* cross-vein nearer to the fork of *M* than to the medial cross-vein; female ovipositor with the valves elongate and chitinized.

T. pachyrhinoides Alex.

3. The *bicornis* group.—Nasus very short to indistinct; coloration dull yellow to brownish yellow, with the thoracic stripes usually distinct; venation with cell $1st M_2$ very small and pentagonal; male hypopygium with the ninth tergite usually tumid; female ovipositor with the valves short, blunt, subfleshy.

T. bicornis Forbes

T. megaura Doane

T. morrisoni Alex.

T. parshleyi Alex.

T. johnsoniana Alex.

4. The *valida* group.—A heterogeneous collection of subgroups, as follows:

a. The *valida* subgroup.—Very large species; the eighth sternite with prominent lateral lobes and a depressed median lobe.

T. valida Loew

T. hirsuta Doane

b. The *umbrosa* subgroup.— Large species; the eighth sternite provided with conspicuous lateral lobes, and the caudal area between with two chitinized points.

T. umbrosa Loew
T. flavoumbrosa Alex.

c. The *australis* subgroup.— Medium-sized species; the lateral lobes of the eighth sternite (*T. australis*) tending to disappear (*T. dietziana*) and pass into the fourth subgroup.

T. australis Doane
T. dietziana Alex.

d. The *submaculata* subgroup.— A great assemblage of forms, including the majority of the *subunicolors*. Wing practically unicolorous (except in *T. huron*) but the oblitative streak well marked; ninth tergite variously notched medially; eighth sternite provided with tufts of short to long hairs, in the specialized forms (*T. tuscarora*) passing into a single powerful bristle on either side.

T. mainensis Alex.
T. mingue Alex.
T. georgiana Alex.
T. monticola Alex.
T. translucida Doane
T. cincticornis Doane
T. penicillata Alex.
T. trilon Alex.
T. submaculata Loew
T. tuscarora Alex.
T. huron Alex.

5. The *besselsi* group.— A small group of high arctic species; coloration blue-gray; head, thorax, and coxae with abundant long white hair; valves of the ovipositor suddenly narrowed, weak.

T. besselsi O. S.
T. piliceps Alex.

6. The *aperta* group.— A reduced species, with the venation in process of atrophy, the medial cross-vein lacking.

T. aperta Alex.

7. The *apicalis* group.— An isolated species that has probably come from the *valida* group; wing broadly tipped with brown; ninth tergite deeply notched medially. This species is possibly closer to *T. mainensis* than this grouping would indicate.

T. apicalis Loew

8. The *hermannia* group.— Wings sparsely blotched with darker; ninth tergite with a prominent, compressed, median lobe; antennae of the male elongate; not dimorphic.

T. hermannia Alex.

9. The *annulicornis* group.— Dimorphic, the males light-colored, the females dark brown, the wings practically unicolorous; male antennae elongate to very elongate (*T. taughanock*); ninth tergite with a conspicuous median lobe and more or less prominent lateral lobes.

T. annulicornis Say
T. taughanock Alex.

10. The *fuliginosa* group.— Dimorphic, the males light-colored (*T. speciosa*), the females very dark brown (*T. fuliginosa*) with white markings; ninth tergite asymmetrical, the right pleurite produced caudad in a prominent two-cleft arm; ninth tergite deeply notched medially.

T. fuliginosa (Say)

11. The *trivittata* group.— Wings conspicuously cross-banded, an uninterrupted white band beyond the cord; ninth tergite notched, with a small tooth at the base of the notch.

T. trivittata Say
T. angulata Loew
T. entomophthorae Alex.

12. The *subfasciata* group.—Wings conspicuously cross-banded, an uninterrupted white band beyond the cord; tip of vein R_2 atrophied. The species of this group are evidently derived from the last preceding group, being reduced forms.

T. subfasciata Loew

T. penobsco Alex.

13. The *hebes* group.—A well-marked group of species, including forms with elongate antennae in the male sex and those with the antennae short in both sexes; hypopygium elongated and curiously upturned at an angle with the remainder of the abdomen; eighth sternite three-lobed, the margins clothed with golden-yellow hairs; wing pattern a peculiar spotting and blotching of browns, grays, and whites.

T. hebes Loew

T. latipennis Loew

T. grata Loew

T. afflicta Dietz

T. helderbergensis Alex.

14. The *macrolabis* group.—Ninth pleurite greatly produced caudad into finger-like lobes; wing pattern spotted, the costal region with four larger blotches.

T. macrolabis Loew

T. macrolaboides Alex.

T. loewiana Alex. may be considered as coming close to this group, the ninth pleurite being produced caudad as a short, subspatulate lobe.

15. The *arctica* group.—A well-defined group of species; female ovipositor with but two functional valves, which are strongly serrated along their outer margins; ninth tergite showing two distinct types, in one of which (*T. arctica*, *T. alticola*) the sclerite is very small and the caudal margin is evenly concave and heavily chitinized, in the second (*T. longiventris*, *T. caroliniana*) the tergite is feebly chitinized and the sclerite has a small dorsal transverse knob at about midlength.

T. arctica Curt.

T. labradorica Alex.

T. serrulata Loew

T. septentrionalis Loew

T. longiventris Loew

T. caroliniana Alex.

T. fultonensis Alex.

T. alticola Alex.

16. The *angustipennis* group.—A large group of species; wings spotted with white on a brown or a grayish ground; eighth sternite usually unarmed, but in some species (*T. sert*) with a small median lobe, in others (*T. senega*) with prominent fleshy lateral lobes; ninth tergite variously shaped; outer pleural appendage broad and fleshy; female ovipositor with the valves usually elongated, much shorter and sublyriform in *T. senega*, never serrated.

T. balioptera Loew

T. centralis Loew

T. canadensis Loew

T. ternaria Loew

T. angustipennis Loew

T. ignota Alex.

T. sert Loew

T. senega Alex.

17. The *marmorata* group.—Wing pattern pale, marmorate gray, brown, and hyaline; *m-cu* cross-vein usually distinct and rather close to the fork of *M*.

T. fragilis Loew

T. ignobilis Loew

18. The *abdominalis* group.—An extensive group of large flies, including some of the largest in the genus. The species are more numerous in the West and thence southward (*T. oblique-fasciata*, *T. craverii*, *T. commiscibilis*, *T. abluta*, *T. rupicola*, *T. albimacula*, and

others). Wing pattern characteristic, with whitish or hyaline spots at the ends of the veins at the wing margin; ninth tergite tending to be notched, and often rather massive.

T. abdominalis (Say)

19. The *dejecta* group.—Ninth tergite with two lobes on the caudal margin, in *T. iroquois* slender and lying parallel, in *T. dejecta* more divergent; ninth tergite strongly fused with the sternite in *T. dejecta*, the condition found in the remaining groups to be considered.

T. iroquois Alex.

T. dejecta Walk.

T. aprilina Alex.

20. The *tephrocephala* group.—Sclerites of the ninth segment fused into a continuous ring; ninth tergite with two slender parallel lobes on the caudal margin.

T. tephrocephala Loew

T. cayuga Alex.

21. The *tricolor* group.—Species with striate wings. This group is divisible into the following two subgroups, which pass readily into each other:

a. The *tricolor* subgroup.—Wings with a heavy striate pattern.

T. sayi Alex.

T. tricolor Fabr.

T. caloptera Loew

T. bella Loew

T. fraterna Loew

T. strepens Loew

T. elula Loew

T. conspicua Dietz

T. ludoviciana Alex.

T. sackeniana Alex.

T. vicina Dietz

b. The *perlongipes* subgroup.—Wings subhyaline.

T. perlongipes Johns.

T. sulphurea Doane

T. kennicotti Alex.

The *tricolor* group has the sclerites of the ninth segment fused into a continuous ring; the ninth tergite has a single broad, depressed, median lobe, which in some species is indistinctly cut in two by a median split.

22. The *cunctans* group.—Sclerites of the ninth segment fused into a continuous ring; ninth tergite with a conspicuous median notch.

T. cunctans Say

T. ultima Alex.

The local species of the genus *Tipula* may be separated in accordance with the following key:

1. Wings with a distinct pubescence in the apical cells. 2
- Wings without pubescence in the apical cells. (Subgenus *Tipula* Linn.) 5
2. Pubescence of wings abundant, including all the apical cells from R_1 to M_4 ; coloration dull as in species of *Oropeza*; antennae black, the scape light yellow; thorax brownish gray, the prescutum with three darker brownish gray stripes; basal deflection of Cu_1 and the $m-cu$ cross-vein at or near the fork of M ; male hypopygium with each caudo-ventral angle of the ninth sternite prolonged caudad into a pale, slender, finger-like lobe. [Proc. Boston Soc. Nat. Hist., vol. 34, no. 5, p. 131. 1909.] (Plate XLIII, 195, wing; Plate XLIX, 258, ninth tergite; Plate LIII, 330, lateral aspect of male hypopygium.) (Subgenus *Trichotipula* Alex.) *T. orozeoides* Johns.
- Pubescence of wings less abundant, not extending beyond cells R_2 , R_5 , M_1 , and M_2 and confined to the centers of the cells; coloration usually bright as in *Nephrotoma*, or else the prescutum dark-colored with pale stripes. 3

3. Coloration bright shiny yellow, reddish, and black; vertex shiny, with a black spot along the inner margin of each eye and a linear dark brown median area; thorax yellow with three shiny reddish stripes, the middle one narrowly divided; male antennae very short, not attaining the wing base; pubescence of the wings confined to cell R_5 ; male hypopygium with the ninth sternite produced caudad in two powerful tooth-like lobes. [*Pachyrrhina unifasciata* Loew. Berl. Ent. Ztschr., vol. 7, p. 294. 1863.] (Plate XLIV, 206, wing; Plate XLIX, 262, ninth tergite.) (Subgenus *Odontotipula* Alex.)..... *T. unifasciata* (Loew)
- Coloration dull brown and yellow; vertex opaque without black marks; prescutum dull, dark-colored with paler stripes, the median one at least well indicated; male antennae elongate, reaching about to the base of the abdomen; pubescence of the wings more extensive, from cell R_3 to M_2 . (Subgenus *Cinctotipula* Alex.)..... 4
4. Antennae with the flagellum bicolorous, the basal swelling of each segment black, the elongate pedicel dull yellow; abdomen without distinct crossbands to the segments. [*Pachyrrhina unimaculata* Loew. Berl. Ent. Ztschr., vol. 8, p. 64. 1864.] (Plate XLIII, 196, wing; Plate XLIX, 259, ninth tergite.)..... *T. unimaculata* (Loew)
- Antennae with the flagellum unicolorous; abdomen with the caudal half of the segments dark brown, the basal half more yellowish producing a banded appearance. [Proc. Acad. Nat. Sci. Phila., p. 469-471, pl. 16, fig. 2. 1915.] (Plate XLIII, 197, wing; Plate XLIX, 260, ninth tergite; Plate LIII, 324, eighth sternite.)... *T. algonquin* Alex.
5. Coloration as in *Nephrotoma* — shiny, contrasting blacks, yellows, and reddish browns. 6
Coloration dull brown, gray, or blackish, not at all shiny..... 8
6. Head with a linear black median mark extending from between the antennal bases to the occiput, sides of the abdomen without patches of light silvery gray; female ovipositor, elongate, pointed, the valves chitinized. [Proc. Acad. Nat. Sci. Phila., p. 471-472, pl. 16, fig. 3. 1915.] (Plate XLIV, 209, wing.)..... *T. pachyrrhinoidea* Alex.
- Head without a black median line; sides of the abdomen with patches of light silvery, gray pruinosity; female ovipositor very blunt, truncate, the valves not chitinized, simulating the hypopygium of the male (*collaris* group)..... 7
7. Head orange-yellow, the occiput with a grayish black spot; prescutum orange-yellow with three dull gray-black stripes; posterior margin of the postnotum, and the apical half of the first abdominal segment, light gray. [Journ. Acad. Nat. Sci. Phila., vol. 3, p. 25. 1823.] (Plate XLIV, 207, wing.)..... *T. collaris* Say
- Head orange-yellow, with a large brownish orange spot on each side of the vertex touching the inner margin of the eye; prescutum shiny, light honey-yellow, with three shiny jet-black or reddish black stripes; posterior margin of the postnotum, and the apical half of the first abdominal segment, not light gray; wings yellowish, the cord and the apex narrowly seamed with brown. (*Pachyrrhina nobilis* Loew. Berl. Ent. Ztschr., vol. 8, p. 62. 1864.) (Plate XLIV, 208, wing; Plate XLIX, 261, ninth tergite.)
T. nobilis (Loew)
8. Wings striped or streaked longitudinally with brown or reddish brown, thus including the costal region and along Cu ; cell M usually hyaline or nearly so; male hypopygium with the sclerites of the ninth segment fused into a continuous ring (*tricolor* group)..... 9
Wings not striped nor streaked as above, the costal margin in some cases darkened but if so with no brown seams on the other veins..... 14
9. Wings with cell R_5 hyaline or nearly so, at least on its apical half, thus being continuous or nearly so with the area in cell M 10
Wings with cell R_5 infuscated, concolorous with cells R_3 and M_1 13
10. Large species, wing of male over 20 mm.; base of cell R_5 darkened..... 11
Smaller species, wing of male under 18 mm.; cell R_5 hyaline..... 12
11. Large, wing of male 25 mm., and darker-colored; prescutal stripes heavily margined with dark brown; antennae short, not attaining the wing base, dark brown throat; abdominal tergites with a dark brown sublateral stripe; wings with the pattern clear-cut, a bright yellow spot in cell $1st R_1$; cells M_1 , M_2 , M_4 , and Cu_1 infuscated; male

hypopygium with the ninth tergite (Plate XLIX, 267) having a slender median lobe; truncated at the apex, with a conspicuous chitinized claw on either side of the tergal region. [Berl. Ent. Ztschr., vol. 7, p. 292. 1863.] (Plate XLV, 214, wing.)

T. caloptera Loew

(Two species are apparently confused under this name; true *caloptera* has the bases of cells M_1 , M_2 , and M_3 pale, as figured, and the male hypopygium lacks the clawlike appendage on either side of the median lobe of the ninth tergite.)

Smaller, wing of male 23 mm. or less, and paler-colored; prescutal stripes not heavily margined with brown; antennae longer, extending nearly to the base of the abdomen, bicolorous; abdominal tergites without a dark brown sublateral stripe; wings without a conspicuous yellow spot in cell $1st R_1$; cells M_1 , M_2 , M_3 , and Cu_1 hyaline basally; male hypopygium with the ninth tergite (Plate XLIX, 264) having a broad median lobe, rounded at the apex; no lateral claws on the tergal region. [Berl. Ent. Ztschr., vol. 7, p. 291. 1863.] (Plate XLV, 215, wing.)..... *T. strepens* Loew

12. Antennae short, with only the basal segments of the flagellum distinctly bicolorous; wing pattern more clear-cut, the costal stripe broader and darker brown, vein Cu and the basal deflection of Cu_1 with a broad dark brown seam. [Berl. Ent. Ztschr., vol. 7, p. 291. 1863.] (Plate XLV, 216, wing; Plate XLIX, 265, ninth tergite.)

T. bella Loew

Antennae longer, with all except the terminal segments of the flagellum distinctly bicolorous; wing pattern less distinct and rather poorly defined, the brown stripes and seams much paler. [Berl. Ent. Ztschr., vol. 7, p. 290. 1863.] (Plate XLV, 217, wing.)..... *T. eluta* Loew

13. White obliterative streak before the wing cord passing beyond cell $1st M_2$ and almost reaching the wing margin; male hypopygium having the region of the ninth tergite without a brush of bristles on its lateral part. [Berl. Ent. Ztschr., vol. 8, p. 56. 1864.]

T. fraterna Loew

White obliterative streak before the wing cord ending in the extreme base of cell M_3 ; male hypopygium having the region of the ninth tergite (Plate XLIX, 263) with a brush of long, stiff, reddish bristles on its lateral part. [Ent. Syst., vol. 4, p. 235. 1794.] (Plate XLV, 218, wing.)..... *T. tricolor* Fabr.

(*Tipula vitrea* v. d. W. [Tijd. Ent., vol. 24, p. 150, pl. 15, fig. 5, 1881] is very close to *T. tricolor* but may be a good species. The description of *T. vitrea* calls for a testaceous abdomen with a brown lateral stripe, while in *T. tricolor* the abdomen is colorous thruout.)

14. Costal margin of wings dark brown; male hypopygium with the sclerites of the ninth segment fused into a continuous ring..... 15
 Costal margin of wings not dark brown..... 16
15. Wings with the brown costal margin including the base and the cephalic parts of cells R and R_1 ; male hypopygium with the ninth tergite (Plate XLIX, 266) having a low, broad, depressed, median protuberance (*tricolor* group). [*T. sayi* Alex., Psyche, vol. 18, p. 194, 1911. *T. costalis* Say, prooccupied, Journ. Acad. Nat. Sci. Phila., vol. 3, p. 23, 1823.] (Plate XLV, 219, wing.)..... *T. sayi* Alex.
 Wings with the brown costal margin including cells C and Su only; male hypopygium with the ninth tergite (Plate L, 274) having a median notch. [Journ. Acad. Nat. Sci. Phila., vol. 3, p. 23. 1823.] (Plate XLV, 220, wing; Plate LIII, 332, lateral aspect of male hypopygium.)..... *T. cunctans* Say
16. Wings strongly tinged with yellow; a brownish cloud at the end of vein $2d A$; male hypopygium with the sclerites of the ninth segment fused into a continuous ring and the tergal region (Plate L, 273) notched medially. [*T. ultima* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. flavicans* Fabr., Syst. Antl., p. 24, 1805; written *flavescens*.] (Plate XLVII, 232, wing; the figure of the wing reproduced far too dark to give an idea of the pattern in this species. Plate LIII, 333, lateral aspect of male hypopygium.)..... *T. ultima* Alex.
 Wings not strongly tinged with yellow, or if so without a brown cloud at the end of vein $2d A$ 17

17. Wings spotted, banded, clouded, or tipped with brown or gray. 18
 Wings unicolorous — hyaline, yellowish, or dark brown, in many cases, however, with the stigmal spot present; usually with a pale vitreous obliterative streak at or before the cord, extending from before the stigma to the region of cell *1st M*₂ or beyond; in some cases the costal region a little darkened, and perhaps a vitreous spot beyond the stigma in the base of cell *R*₂. 68
18. Tip of vein *R*₂ atrophied. 19
 Tip of vein *R*₂ present, reaching the wing margin. 20
19. Wings long and narrow, in the male 14 mm. long; cell *1st M*₂ elongate, as long as or longer than cell *M*₁; blotch at the origin of the sector connected with the blotches in cell *R*. [Berl. Ent. Ztschr., vol. 7, p. 282. 1863.] (Plate XLVIII, 248, wing.)
T. subfasciata Loew
 Wings short and broad, in the male 11.6 mm. long; cell *1st M*₂ short and broad, about two-thirds the length of cell *M*₁; a small brown spot at the origin of the sector; a dark spot at the base of the wing. [Proc. Acad. Nat. Sci. Phila., p. 472-474, pl. 16, fig. 4. 1915.] (Plate XLVIII, 247, wing; Plate L, 275, ninth tergite; Plate LIII, 334, lateral aspect of male hypopygium.) *T. penobscot* Alex.
20. Wings with the apex broadly dark brown, extending from the outer end of cell *R*₂ to the end of cell *M*₂; no brown markings proximad of the cord; body coloration yellowish brown; scape of the antennae bright yellow; wing under 15 mm. [Berl. Ent. Ztschr., vol. 7, p. 277. 1863.] (Plate XLVIII, 254, wing; Plate LI, 302, ninth tergite; Plate LIV, 342, lateral aspect of male hypopygium.) *T. apicalis* Loew
 Wings with the dark markings not confined to the apex, or if the tip is darkened the coloration of the body is gray and the scape of the antenna is dark brown (*T. iroquois*) or the size of the fly is larger (*valida* group, wings over 18 mm.) 21
21. Wings banded brown and white, with a broad, uninterrupted white crossband beyond the stigma, extending from the end of cell *2d R*₁ to the middle of cell *M*₄, or beyond to the wing margin. 22
 Wings without an uninterrupted white crossband beyond the stigma. 23
22. Smaller species, wing of male less than 15 mm.; antennal flagellum bicolorous; thorax gray with four broad brownish stripes; wings with the white fasciae narrow; male hypopygium with the ninth tergite (Plate LI, 291) narrowly notched medially. [Berl. Ent. Ztschr., vol. 8, p. 61. 1864.] (Plate LIV, 340, lateral aspect of male hypopygium.) *T. angulata* Loew
 Larger, wing of male over 15 mm.; antennal flagellum unicolorous; thorax gray with an interrupted pattern of dots and narrow brown lines; wings with the white fasciae broad, the basal one especially broad; male hypopygium with the ninth tergite (Plate LI, 291) broadly and shallowly notched caudally, bearing a more or less bifurcate median tooth. [Journ. Acad. Nat. Sci. Phila., vol. 3, p. 26. 1823.] (Plate XLVI, 226, wing.) *T. trivittata* Say
23. Large, length of male over 25 mm.; vertex light yellow; thoracic dorsum with a velvety black pattern margined with paler, producing an ocellate appearance; abdominal tergites bright orange with a broad brownish black stripe on either side; segments 7 to 9 dark brownish black. [*Ctenophora abdominalis* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 18. 1823.] (Plate XLV, 210, wing; Plate LI, 299, ninth tergite.)
T. abdominalis (Say)
 Smaller, length of male under 20 mm.; not colored as above. 24
24. Males (as known) 25
 Females (as known) 49
25. Coloration bright orange, the thoracic dorsum without darker stripes; wings yellowish basally, more clouded with brown apically; a small brown spot at the base of the wing and another at the origin of the sector; antennae bicolorous; male hypopygium asymmetrical, the right pleurite produced caudad into a prominent two-cleft arm. [*Ctenophora fuliginosa* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 18. 1823.] (Plate XLVIII, 245, wing of male; Plate LI, 289, ninth tergite.) *T. fuliginosa* (Say)
 Coloration not as above. 26

26. Male hypopygium with the ninth tergite (Plate L, 287) produced caudad into a compressed median lobe; antennae elongate, bicolorous; wings with an extensive brownish gray blotch before the cord, occupying the ends of cells *R* and *M* and the lower basal angle of cell *Cu*₁; a broad cloud on the petiole of cell *M*₁; prescutum light gray, with four broad dark gray stripes. [*T. hermannia* Alex., Proc. Acad. Nat. Sci. Phila., p. 480, 1915. *T. fasciata* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 279, 1863.] (Plate XLV, 211, wing; Plate LIV, 343, lateral aspect of male hypopygium.)
T. hermannia Alex.
- Male hypopygium not as above. 27
27. Wings with a pale gray tinge, more brownish in cell *M* along vein *Cu*; hyaline spots in the anal cells, at two-thirds the length of cell *M*₁, before the stigma, and an interrupted band before the cord extending to cell 1st *M*₂; body coloration gray, the prescutum with four dark brown stripes; male hypopygium small, not conspicuously elongated or enlarged (*marmorata* group). 28
- Wings brown or dark gray, with a pattern of white or hyaline spots and blotches. 29
28. Stripes on the prescutum ending at the level of the pseudosutural foveae, the median pair blunt at their anterior ends; apical tergites of the abdomen not conspicuously darkened. [Berl. Ent. Ztschr., vol. 7, p. 279, 1863.] (Plate XLVIII, 250, wing; the figure is much darker than in normal specimens. Plate LI, 297, ninth tergite.)
T. fragilis Loew
- Median stripes of the prescutum extending about to the anterior margin of the sclerite, deeply bifid at the anterior end; apical segments of the abdomen largely blackish. [Berl. Ent. Ztschr., vol. 7, p. 280, 1863.] (Plate LI, 298, ninth tergite.)
T. ignobilis Loew
29. Male hypopygium with the ninth segment elongate-cylindrical, strongly upturned; eighth sternite with the caudal margin tripartite and clothed with yellow hairs; wings with a variegated brown, gray, and white pattern (*hebes* group). 30
- Male hypopygium with the ninth segment not strongly upturned. 33
30. Antennae elongated in the male, extending about to the base of the abdomen. 31
- Antennae short in both sexes, extending about to the wing root. 32
31. Antennal flagellum bicolorous; bladelike processes of the male hypopygium not elongated nor spiraliform. [Berl. Ent. Ztschr., vol. 7, p. 285, 1863.] (Plate XLVIII, 249, wing.) *T. hebes* Loew
- Antennal flagellum uniform dark brown, at least apically; bladelike processes of the male hypopygium elongate, spiraliform. [Berl. Ent. Ztschr., vol. 8, p. 60, 1864.] (Plate LI, 293, ninth tergite.) *T. latipennis* Loew
(*T. ottawacensis* Dietz is the same as *T. latipennis* Loew.)
32. Antennal flagellum yellowish brown; appendiculate process of the male hypopygium slender and pointed apically. [Berl. Ent. Ztschr., vol. 7, p. 281, 1863.] (Plate LI, 292, ninth tergite.) *T. grata* Loew
- Antennal flagellum dark brown; appendiculate process of the male hypopygium broad, obtusely pointed at the apex. [*T. afflicta* Dietz, Trans. Amer. Ent. Soc., vol. 40, p. 351-352, pl. 13, figs. 5, 6, pl. 14, fig. 2, 1914, as *T. suspecta* Dietz.]. *T. afflicta* Dietz
(*T. afflicta* Dietz is close to *T. grata* Loew but apparently separable from it.)
33. Wing with four large brown subequidistant blotches along the radial vein, the second at the origin of the sector, the fourth on vein *R*₃; male hypopygium with the ninth pleurite greatly produced into slender, chitinized, digitiform processes (*macrolabis* group). 34
- Wings variously marked but without four large brown subequidistant blotches along the radial vein; male hypopygium with the ninth pleurite not greatly produced. 35
34. Ninth tergite (Plate LI, 295) rather squarely truncated across the caudal margin, with a sharp median tooth; apex of the ninth pleurite ending in acute teeth (Plate LIII, 322). Northeastern North America. [Berl. Ent. Ztschr., vol. 8, p. 58, 1864.] (Plate XLVII, 233, wing; the brown blotches along *R* do not show clearly in the figure.) *T. macrolabis* Loew

= youngi

- Ninth tergite (Plate LI, 296) not square across the caudal margin; the sharp median tooth subtended on either side by a flattened divergent lobe; apex of the ninth pleurite rounded and blunt, not toothed (Plate LIII, 323). Western North America. [Can. Ent., vol. 50, p. 69-70. 1918.] *T. macrolaboides* Alex.
35. Wings with the apex narrowly and irregularly darkened; narrow brown seams along the cord; antennae dark brown thruout; prescutum gray, with darker gray stripes which are narrowly margined with dark brown; pleura clear light gray; male hypopygium with the ninth tergite large (Plate LI, 300), the caudal margin produced into two short, parallel lobes, one on either side of the median line. [*T. iroquois* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. cincta* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 288, 1863.] (Plate XLVIII, 252, wing; Plate LIV, 344, lateral aspect of male hypopygium.) *T. iroquois* Alex.
- Wings not colored as above 36
36. Wing apex infuscated; a dark spot at the origin of the sector; male hypopygium with the ninth tergite (Plate LII, 317) prominent, deeply notched, the lateral lobes acute; medium-sized, wing 18 mm. or less; antennae bicolorous. [Berl. Ent. Ztschr., vol. 7, p. 288. 1863.] (Plate XLVII, 239, wing.) *T. submaculata* Loew
- Not as above; if the wing pattern is as described (*valida* group), the size is much larger — wing of male 20 mm. 37
37. Large, wing of male 20 mm.; wings with the apices light or dark brownish gray; male hypopygium greatly enlarged (*valida* group) 38
- Smaller, wing of male under 18 mm.; wings with a heavy brown and white or grayish brown and white pattern 39
38. Ninth tergite (Plate LI, 303) with the lateral lobes more slender and pronounced; eighth sternite without a long brush of hairs; wing apex darker, brownish. [Berl. Ent. Ztschr., vol. 7, p. 287. 1863.] (Plate XLVII, 237, wing; the reproduction of the figure is much too dark.) *T. valida* Loew
- Ninth tergite (Plate LI, 304) with the lateral lobes shorter and less evident; eighth sternite with a tuft of long yellow hairs; wing apex light gray, scarcely darker than the basal part of the wing. [Journ. N. Y. Ent. Soc., vol. 9, p. 113. 1901.] (Plate LIV, 345, lateral aspect of male hypopygium.) *T. hirsutula* Doane
39. Ninth tergite of the male with a dorsal black chitinized projection lying transversely at about midlength of the sclerite (in *T. longiventris* and others); remainder of the sclerite not chitinized. 40
- Ninth tergite of the male not chitinized, or else variously chitinized, either on the caudal margin, on the lateral margins, or with a conical tooth on the dorsal surface — in which case (*T. balioptera*) the cephalic and lateral margins are heavily chitinized and toothed. 41
40. Antennae bicolorous, the basal swelling of the flagellar segments black, the pedicels yellow; prescutum fawn-colored, with four light gray stripes partly margined with dark brown; prescutal interspaces with abundant brown dots; lateral margins of the abdominal segments broadly pale grayish silvery; male hypopygium with the ninth tergite (Plate L, 285) having the lateral lobes rounded, the median caudal notch indistinct. [Berl. Ent. Ztschr., vol. 7, p. 278. 1863.] (Plate XLVI, 229, wing.)
T. longiventris Loew
- Antennae unicolorous, the flagellar segments nearly uniform thruout; prescutum dull gray, with four dark brown stripes; lateral margins of the abdominal segments narrowly silvery; male hypopygium with the ninth tergite (Plate L, 286) having a deep U-shaped notch on the caudal margin. [Can. Ent., vol. 48, p. 46-48. 1916.]
T. caroliniana Alex.
41. Ninth tergite small, the caudal margin evenly rounded by a broad concavity which is very heavily chitinized; flagellar segments of antennae very deeply incised beneath, producing a serrated appearance. 42
- Ninth tergite not as above. 43

42. Coloration bluish gray, including the abdomen; ninth tergite (Plate L, 284) with the caudal margin bluntly toothed. [Ross's Voyage to the Arctic Regions, p. 77, pl. A, fig. 15. 1831.]..... *T. arctica* Curt.
- Coloration brown, the abdomen dull brownish yellow with an interrupted dorsal stripe; ninth tergite (Plate L, 283) short and broad, the caudal margin heavily chitinized, deeply concave, and slightly roughened in places, the lateral angles produced into conspicuous chitinized points. [Berl. Ent. Ztschr., vol. 7, p. 278. 1863.] (Plate LIV, 338, lateral aspect of male hypopygium.)..... *T. septentrionalis* Loew
43. Ninth tergite (Plate L, 280) small, heavily chitinized, shiny black, the caudal margin with a deep U-shaped notch, a second tooth on either side, subbasal in position; wing of male 17.5 mm.; head light gray, with a narrow, impressed median line; antennae with the first three flagellar segments indistinctly bicolorous, the remainder uniformly dark brown; abdomen orange, with an interrupted dorso-median stripe. [Berl. Ent. Ztschr., vol. 8, p. 60. 1864.] (Plate LIV, 339, lateral aspect of male hypopygium.)
T. centralis Loew
- Ninth tergite larger, not as above..... 44
44. Ninth tergite (Plate L, 279) heavily chitinized, black, hollowed out in a shallow saucer, the dorsal surface near the caudal margin with a prominent median tooth that is directed backward; margin of the saucer denticulate, more strongly behind; wing 16.8 mm.; head light gray; thorax dull gray, the prescutal stripes margined with brown. [Berl. Ent. Ztschr., vol. 7, p. 284. 1863.] (Plate XLVI, 227, wing; Plate LIV, 337, lateral aspect of male hypopygium.)..... *T. batioptera* Loew
- Ninth tergite not as above..... 45
45. Ninth tergite (Plate L, 282) very large and extensive, narrowed slightly toward the apex, which consists of a flattened yellowish margin bearing a deep tho small median notch, the broad adjacent lobes with about three tiny teeth, the outermost one the largest; the part of the tergite behind the yellow caudal margin elevated, black, and including the basal two-thirds of the segment; wing 15 mm.; antennae blackish; prescutum light grayish brown, with about five dark brown stripes; abdominal segments dark brownish black, the caudal margin of each segment bright yellow, the lateral margins broadly gray; wings with a heavy pattern; a conspicuous dark spot at the base of the wing. [Berl. Ent. Ztschr., vol. 8, p. 57. 1864.]... *T. ternaria* Loew
- Ninth tergite not as above..... 46
46. Ninth tergite (Plate L, 281) telescoped beneath segments 7 and 8; the sclerite not chitinized, very broad and short, the caudal margin broadly concave and provided with a uniform fringe of long yellow hairs; wing 15.7 mm.; antennae somewhat bicolorous, the basal enlargement of the flagellar segments dark brown, the remainder of each segment a little paler; prescutum whitish gray, with broad dull gray stripes narrowly and indistinctly margined with brown; abdomen dull yellow, with an indistinct dorso-median stripe which broadens out on segments 6 to 8; less distinct submarginal stripes on the sides of the abdomen. [Berl. Ent. Ztschr., vol. 8, p. 59. 1864.] (Plate LIV, 341, lateral aspect of male hypopygium.)..... *T. canadensis* Loew
- Ninth tergite not as above..... 47
47. Ninth tergite (Plate L, 276) large, pale, not chitinized, with two rounded lobes separated by a narrow, deep notch; antennae elongate, the segments of the flagellum not incised beneath; ventro-caudal angle of each pleurite bearing a prominent, pale, fleshy lobe. [Berl. Ent. Ztschr., vol. 7, p. 286. 1863.] (Plate XLV, 212, wing.)
T. angustipennis Loew
- Ninth tergite not as above, more or less chitinized caudally; antennae shorter, the flagellar segments deeply incised beneath..... 48
48. Ninth tergite (Plate L, 277) with a broad median chitinized tooth on the caudal margin; adjacent lateral lobes terminating in small, acute, chitinized points; antennae moderate in length, extending slightly beyond the wing root; prescutum fawn-colored, with four broad grayish brown stripes narrowly margined with brown; abdomen dull yellow with a rather indistinct brownish median stripe which is clearer behind. [Berl. Ent. Ztschr., vol. 7, p. 283. 1863.]..... *T. sarta* Loew

- Ninth tergite (Plate L, 278) with a very broad, pale, median lobe; adjacent lateral lobes very prominent, directed caudad and slightly inward, the tips truncated and chitinized; coloration pale, yellowish, the lateral prescutal stripes and the scutal lobes grayish; the median prescutal stripe paler, more brownish; abdomen without distinct darker stripes; wing pattern pale. [*T. senega* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. pallida* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 284, 1863.] (Plate XLV, 213, wing.) *T. senega* Alex.
49. Wing pattern dark brown sparsely marked with white, the dark brown including the wing apex and the anal and cubital cells, the white as a broad band before the cord and a blotch beyond the stigma; antennae bicolorous; prescutum with four stripes, the middle pair bifid at the anterior end; abdomen with three broad brown stripes; femora broadly tipped with dark brown (*fuliginosa* group). [*Ctenophora fuliginosa* Say. Journ. Acad. Nat. Sci. Phila., vol. 3, p. 18. 1823.] (Plate XLVIII, 246, wing of female.) *T. fuliginosa* (Say)
- Wing pattern paler, brown or gray with the white more extensive 50
50. Only the tergal valves of the female ovipositor present, these lying transversely conspicuously serrated along their outer edge (*arctica* group) 51
- All four valves of the ovipositor present, not serrated along their outer edge 54
51. Abdomen gray or brownish gray 52
- Abdomen orange or orange-yellow on the basal tergites 53
52. Coloration blue-gray; wing pattern pale, the brown and gray markings diffuse and ill-defined; length 24 mm. [Ross's Voyage to the Arctic Regions, p. 77, pl. A, fig. 15. 1831.] *T. arctica* Curt.
- Coloration light gray, the abdomen grayish brown with three indistinct brown stripes; wing pattern heavy, tessellated white and brown; antennae dark brown; head dark gray with a narrow brown median line; prescutum with three broad gray stripes margined with brown; length 27 mm. [*T. labradorica* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. tessellata* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 277, 1863.] (Plate XLVI, 228, wing.) *T. labradorica* Alex.
53. Abdomen very elongated; length of female over 30 mm.; antennae bicolorous; thoracic interspaces with tiny blackish dots. [Berl. Ent. Ztschr., vol. 7, p. 278. 1863.] (Plate XLVI, 229, wing.) *T. longiventris* Loew
- Abdomen short, normal; length of female 25 mm.; wing pattern pale. [Berl. Ent. Ztschr., vol. 8, p. 58. 1864.] *T. serrulata* Loew
54. Large species, wing over 22 mm. (*valida* group). [Berl. Ent. Ztschr., vol. 7, p. 287. 1863.] *T. valida* Loew
- [Journ. N. Y. Ent. Soc., vol. 9, p. 113. 1901.] *T. hircuta* Doane
- Smaller, wing under 20 mm. 55
55. Wings gray, the apex darker; a broad white obliterative streak before the cord extending into the base of cell *M*₁; a brown spot at the origin of *R*₅; antennae bicolorous; shiny basal plate of the dorsal tergal valves of the ovipositor very elongate, as long as the valves themselves and longer than the seventh and eighth tergites taken together. [Berl. Ent. Ztschr., vol. 7, p. 288. 1863.] (Plate XLVII, 239, wing.) *T. submaculata* Loew
- Wings not so colored 56
56. Wings light gray, with a dark brown oval stigma and a broad grayish brown crossband extending from *R*₅ across the wing; antennae bicolorous, at least basally; thoracic pleura with two longitudinal brown stripes. [*T. hermannia* Alex., Proc. Acad. Nat. Sci. Phila., p. 480, 1915. *T. fasciata* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 279, 1863.] (Plate XLV, 211, wing.) *T. hermannia* Alex.
- Wings not so colored 57
57. Wings grayish subhyaline, the apex narrowly and irregularly dark brown, the cord seamed with dark grayish brown; antennae dark brown thruout; thorax light gray, with four dark gray stripes which are margined with dark brown; thoracic pleura clear light gray, dorso-pleural membrane yellowish. [*T. iroquois* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. cincta* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 288, 1863.] (Plate XLVIII, 252, wing.) *T. iroquois* Alex.
- Wings not so colored 58

58. Wings with about four large dark brown blotches along the radial vein, the second at the origin of the sector, the third at the stigma; wing apex narrowly light brown; wing about 16.5 mm.; antennae bicolorous; head dark gray, with a narrow, impressed, median line; prescutum dull gray with four clearly defined bright brown stripes; abdomen dull yellow with three dark brown stripes; tergal valves of ovipositor acicular. [Berl. Ent. Ztschr., vol. 8, p. 58. 1864.] (Plate XLVII, 233, wing.)
T. macrolabis Loew
- Wings not so colored. 59
59. Thorax with the prescutal stripes concolorous with the ground color of the thorax, the lateral stripes broadly margined in front and on the sides with dark brown; median stripe broadly margined on the sides; wings with a variegated brown, gray, and white pattern (*hebes* group) 60
 Thorax not so colored. 62
60. Antennae bicolorous, at least basally. [Berl. Ent. Ztschr., vol. 7, p. 285. 1863.] (Plate XLVIII, 249, wing.) *T. hebes* Loew
 Antennae unicolorous. 61
61. Cell *R*₂ of wings usually white or largely so; antennae shorter. [Berl. Ent. Ztschr., vol. 7, p. 281. 1863.] *T. grata* Loew
 Cell *R*₂ of wings infuscated except basally; antennae longer. [Berl. Ent. Ztschr., vol. 8, p. 60. 1864.] *T. latipennis* Loew
62. Wings with a pale gray and hyaline pattern; cell *Sc* uniformly dark brown; *m-cu* cross-vein close to the fork of *M* (*marmorata* group) 63
 Wings with the pattern darker gray and brown; if the pattern is pale, the cell *Sc* is not dark brown and the *m-cu* cross-vein is not close to the fork of *M* (*angustipennis* group) 64
63. Stripes on the prescutum ending at the level of the pseudosutural foveae, the median pair blunt at their anterior ends. [Berl. Ent. Ztschr., vol. 7, p. 279. 1863.] (Plate XLVIII, 250, wing.) *T. fragilis* Loew
 Median stripes of the prescutum extending about to the anterior margin of the sclerite, deeply bifid at their anterior ends. [Berl. Ent. Ztschr., vol. 7, p. 280. 1863.]
T. ignobilis Loew
64. Abdominal tergites dark slate gray, narrowly margined caudally with bright orange-yellow; length 24 mm.; wing 18 mm.; antennae dark brownish black thruout; head dark gray with a narrow brown median stripe; prescutum brownish gray, the stripes darker brown, not clear-cut; thoracic pleura clear gray; wing pattern heavy; a distinct dark brown spot at the base of the wing. [Berl. Ent. Ztschr., vol. 8, p. 57. 1864.]
T. ternaria Loew
- Coloration not as above. 65
65. Valves of ovipositor short, about as long as the fifth tergite. [*T. senega* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. pallida* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 284, 1863.] (Plate XLV, 213, wing.) *T. senega* Alex.
 Valves of ovipositor elongate, acicular, much longer than the fifth tergite alone 66
66. Abdomen orange, with three dark brownish black stripes; no basal gray ring on the abdominal tergites. [Berl. Ent. Ztschr., vol. 7, p. 286. 1863.] (Plate XLV, 212, wing.) *T. angustipennis* Loew
 Abdomen not so colored; a narrow basal ring on the abdominal tergites, grayish and destitute of the scattered hairs found on the remainder of the segment. 67
67. Abdomen long and slender, indistinctly trivittate with brown, the stripes interrupted by the smooth basal areas of the segments. [Berl. Ent. Ztschr., vol. 7, p. 283. 1863.]
T. sarta Loew
 Abdomen with the lateral stripes broad, continuous; lateral margins of the segments broadly pale grayish. [*T. ignota* Alex., Insec. Inscit. Menst., vol. 3, p. 128, 1915. *T. discolor* Loew, preoccupied, Berl. Ent. Ztschr., vol. 7, p. 282, 1863.]
T. ignota Alex.

68. Cell *1st M*₂ open by the atrophy of the medial cross-vein; wing of female 10.5 mm.; coloration grayish brown, the thoracic stripes indistinct. [*Tipula aperta* Alex., Can. Ent., vol. 50, p. 62, 1918. *T. imperfecta* Alex., preoccupied, Proc. Acad. Nat. Sci. Phila., p. 484-485, pl. 16, fig. 9, 1915.] (Plate XLVII, 235, wing.)... *T. aperta* Alex.
 Cell *1st M*₂ closed.....69
69. Color of wings almost uniformly dark brown (females only).....70
 Color of wings hyaline, pale grayish, or yellowish.....71
70. Size small, wing of female about 8 mm.; abdominal tergites uniformly dark brown thruout; cell *1st M*₂ pointed at its outer end, due to the extreme shortening of the medial cross-vein. [Journ. Acad. Nat. Sci. Phila., vol. 6, p. 151. 1829.]..... *T. annulicornis* Say
 Size larger, wing of female over 10 mm.; abdominal tergites dark brown, with broad, bright yellow, median triangles, the points directed forward; cell *1st M*₂ not pointed at its distal end, the medial cross-vein of normal length, nearly as long as the petiole of cell *M*₁. [Proc. Acad. Nat. Sci. Phila., p. 476-479, pl. 16, figs. 7, 8. 1915.] (Plate XLVIII, 244, wing.)..... *T. taughanock* Alex.
71. Color of thorax light gray or blue-gray, with distinct clear-cut brown or black stripes; body clothed with long, pale hair; wing over 14 mm. Northern species.....72
 Color of thorax brown, yellow, or gray; if grayish (*T. dejecta*), the wing is under 12 mm. and the body is not clothed with long, pale hair.....73
72. Color of thorax dull light gray, with four light brown stripes; median vitta of the head indistinct; dorsal abdominal vitta narrow; eighth abdominal tergite of female with the margins flattened and conspicuously expanded; tergal valves of the ovipositor long, pale. [Proc. Acad. Nat. Sci. Phila., p. 482-484, pl. 21, fig. 85. 1915.]
T. piliceps Alex.
 Color of thorax blue-gray, with the stripes almost black, broad, the median pair tending to become confluent; median vitta of the head distinct; dorsal abdominal vitta broader, more diffuse; eighth abdominal tergite of female with the margins not conspicuously expanded; tergal valves of the ovipositor smaller; wing pale gray, stigma dark brown; antennae black thruout; ninth tergite of male deeply notched medially, the adjacent lateral lobes broad, truncated, pale; outer pleural appendages broad, pale; wing of male 14 mm. [Proc. Boston Soc. Nat. Hist., vol. 19, p. 42. 1876.]
T. besselsi O. S.
73. Males (as known).....74
 Females (as known).....103
74. Caudal margin of ninth tergite (Plate L, 288) with a compressed median lobe projecting caudad of the short lateral lobes; distal end of cell *1st M*₂ pointed, cross-vein *m* very short; size very small, wing of male under 8 mm.; antennae elongated, bicolorous; thoracic stripes indistinct. [Journ. Acad. Nat. Sci. Phila., vol. 6, p. 151. 1829.] (Plate XLVIII, 243, wing; Plate LIII, 335, lateral aspect of male hypopygium.)
T. annulicornis Say
 Caudal margin of ninth tergite without a compressed median lobe projecting beyond the lateral lobes; distal end of cell *1st M*₂ not pointed; size larger, wing of male over 10 mm.....75
75. Sclerites of ninth segment fused into a nearly complete ring; caudal margin of the tergite truncate with a broad, depressed, median lobe or with two approximated slender, parallel lobes, one on either side of the median line.....76
 Sclerites of ninth segment not fused, at least the tergite distinct; ninth tergite without median lobes on the caudal margin.....80
76. Ninth tergite with two slender, finger-like lobes on the caudal margin (*tephrocephala* group).....77
 Ninth tergite with a single broad median lobe or with two short blunt lobes on the caudal margin (*perlongipes* group).....78
77. Antennal flagellar segments bicolorous, the basal swelling of each segment yellow, the pedicel dark. [Berl. Ent. Ztschr., vol. 8, p. 62. 1864.] (Plate XLVI, 221, wing, Plate XLIX, 271, ninth tergite.)..... *T. tephrocephala* Loew

- Antennal flagellar segments bicolorous, the basal swelling of each segment black, the pedicel yellow. [Proc. Acad. Nat. Sci. Phila., p. 485-487, pl. 16, fig. 10. 1915.] (Plate XLVI, 222, wing; Plate XLIX, 272, ninth tergite; Plate LIII, 325, eighth sternite.)..... *T. cayuga* Alex.
78. Size small, wing 12 mm.; thoracic dorsum dull gray, with four brownish stripes; antennae unicolorous, dark brown; pleura clear light gray; sides of postnotum light yellow; ninth tergite (Plate XLIX, 270) with two broad lobes, the notch between deep. [Journ. N. Y. Ent. Soc., vol. 9, fig. 99. 1901.] (Plate XLVI, 225, wing.)
T. sulphurea Doane
- Size larger, wing 14 mm. or over; thoracic dorsum not colored as above. 79
79. Antennae bicolorous; thoracic dorsum dull yellow with three brown stripes, the lateral pair less distinct than the median one; legs long; male hypopygium with the median lobe of the ninth tergite (Plate XLIX, 268) entire or the bifid nature barely indicated. [*T. perlongipes* Johns., Proc. Boston Soc. Nat. Hist., vol. 34, p. 131, 1909. *T. filipes* Walk., preoccupied, List Dipt. Brit. Mus., p. 65, 1848.] (Plate XLVI, 223, wing.) *T. perlongipes* Johns.
- Antennae unicolorous or nearly so; thorax gray, with three broad, more or less distinct stripes, the median one with a delicate dark brown line; legs short; male hypopygium with the median lobe of the ninth tergite (Plate XLIX, 269) bifid. [Proc. Acad. Nat. Sci. Phila., p. 480-482, pl. 16, fig. 6. 1915.] (Plate XLVI, 224, wing; Plate LIII, 331, lateral aspect of male hypopygium.)..... *T. kennicotti* Alex.
80. Ninth tergite (Plate LII, 309) large, the caudal margin with a small rounded notch on either side of a small acute median tooth; eighth sternite with broad, fleshy, lateral lobes directed proximad and with the ventral inner angle produced into a chitinized point and clothed with long yellow hairs; median area of the sternite with a prominent chitinized tooth on either side of the median line, broadly separated by a distance greater than the diameter of one tooth; size large, wing 18-20 mm.; antennae bicolorous. [Berl. Ent. Ztschr., vol. 7, p. 292. 1863.] (Plate XLVII, 236, wing.)
T. umbrosa Loew
- Ninth tergite not as described; eighth sternite, if with fleshy lateral lobes (*T. australis*, *T. valida*, and others), without two chitinized teeth on the caudal margin of the sternite. 81
81. Size large, wing over 20 mm.; male hypopygium greatly enlarged; eighth sternite with elongate lateral lobes and a flattened median lobe (*valida* group; included also in the section with marked wings, because the tips of the wings are usually of a darker gray than the basal part). 82
- Size smaller, wing under 18 mm.; male hypopygium not greatly enlarged; eighth sternite not as above. 83
82. Ninth tergite (Plate LI, 303) with the lateral lobes more slender and pronounced; eighth sternite without a long brush of hairs. [Berl. Ent. Ztschr., vol. 7, p. 287. 1863.] (Plate XLVII, 237, wing.) *T. valida* Loew
- Ninth tergite (Plate LI, 304) with the lateral lobes shorter and blunter; eighth sternite with a brush of long yellow hairs. [Journ. N. Y. Ent. Soc., vol. 9, p. 113. 1901.]
T. hirsuta Doane
83. Wing apex a little grayer than the basal cells of the wings; a brown spot at the origin of the sector; male hypopygium with the ninth tergite (Plate LII, 317) large, deeply split by a broad V-shaped notch, the lateral lobes acutely pointed. (This species is included also in the section with marked wings, because the tips of the wings are usually of a darker gray than the basal part.) [Berl. Ent. Ztschr., vol. 7, p. 288. 1863.] (Plate XLVII, 239, wing.) *T. submaculata* Loew
- Wing apex unicolorous or nearly so; ninth tergite not as described. 84
84. Antennae unusually elongated, if bent backward extending to the base of the fifth abdominal segment; ninth tergite (Plate LI, 290) with the lateral lobes subacute, the median lobe situated in a deep, shield-shaped depression; eighth sternite unarmed; antennae unicolorous; abdominal tergites bright yellow, with three distinct brownish

- black stripes which are confluent across the bases and less distinctly across the apices of tergites 2 to 5; wing 15 mm.; cell *1st M*₂ elongate; wings yellowish subhyaline, the obliterative streak very reduced, appearing as a spot before the stigma and a linear dash in the base of cell *1st M*₂ and the end of cell *R*. [Proc. Acad. Nat. Sci. Phila., p. 476-479, pl. 16, figs. 7, 8. 1915.] (Plate LIII, 336, lateral aspect of male hypopygium.) *T. taughannock* Alex.
- Antennae shorter, not extending beyond the base of the abdomen; ninth tergite not as described; if at all similar (*T. monticola*), the eighth sternite armed with brushes of hairs or bristles. 85
85. Ninth tergite (Plate LI, 301) small, with the caudal margin bearing a blunt median lobe and with a prominent divergent horn on either side; thoracic pleura clear light gray; eighth sternite unarmed; size small, wing 11.5 mm.; antennae uniform dark brown. [Ins. Saunders., vol. 1, Dipt., p. 442. 1856.] (Plate XLVIII, 251, wing.) *T. dejecla* Walk.
- Ninth tergite not as above. 86
86. Ninth tergite (Plate LII, 308) small, the caudal margin with a broad V-shaped notch; ninth pleurite produced caudad into a short, flattened, subspatulate lobe; eighth sternite extensive, narrowed behind, the caudal margin broadly U-shaped and bearing a row of prominent white hairs; color light gray, the thorax marked with brown; wing about 16 mm. [Proc. Acad. Nat. Sci. Phila., p. 488-490, pl. 16, fig. 12. 1915.] (Plate XLVII, 234, wing.) *T. loewiana* Alex.
- Hypopygial characters not as above. 87
87. Coloration of thoracic pleura light gray; thoracic dorsum gray or grayish, with brown stripes. 88
- Coloration of thoracic pleura yellow, in some cases whitish pollinose; dorsum yellow or brown. 90
88. Ninth sternite with a stout pendulous lobe directed ventrad, bearing a dense tuft or pencil of long reddish hairs; eighth sternite large, prominent, extending far caudad and its concavity forming a sheath for the base of the ninth sternite, the lateral angles bearing dense tufts of long, reddish-silvery hairs which are decussate; between these lobes a broad median projection, the lateral angles of which are slightly recurved and the caudal margin is broadly concave; color grayish, with distinct dark brown thoracic stripes; wings light brown, the tips a little darker; a large vitreous spot before and beyond the stigma; wing of male 12.6 mm. Arctic species. [Proc. Acad. Nat. Sci. Phila., p. 496-497. 1915.] (Plate LII, 314, ninth tergite.) *T. penicillata* Alex.
- Hypopygial characters not as above. Austral species. 89
89. Antennae short, the flagellar segments deeply constricted beyond the basal enlargement; six brown stripes on the mesonotal prescutum; male hypopygium with the ninth tergite (Plate LII, 305) almost straight across the caudal margin, with a deep and narrow impressed median furrow; lobes of the caudo-lateral angles of the ninth sternite pendulous, directed ventrad, the apices clothed with short golden hairs; eighth sternite (Plate LIII, 326) with four conspicuous lobes, the outer pair very broad and flattened, their apices oblique, the inner pair being the divaricate ends of a median process on the caudal margin of the sternite, their apices clothed with a dense brush of golden-yellow hair. [Journ. N. Y. Ent. Soc., vol. 9, p. 104-105. 1901.] *T. australis* Doane
- Antennae longer, the flagellar segments not constricted beyond the basal enlargement; three brown stripes on the mesonotal prescutum; male hypopygium with the ninth tergite (Plate LII, 306) having the caudal margin deeply and broadly notched medially; lobes of the caudo-lateral angles of the ninth sternite not pendulous, directed inward; eighth sternite (Plate LIII, 327) without lobes on the caudal margin. [Proc. Acad. Nat. Sci. Phila., p. 501-504, pl. 17, fig. 19. 1915.] (Plate XLVII, 238, wing.) *T. dietziana* Alex.
90. Coloration bright brownish yellow, the thorax with dark brown stripes; pleura dull yellow, whitish pollinose; male hypopygium with the ninth tergite (Plate LII, 307) broadly concave caudadly, the lateral angles not prominent; antennae with the three

- basal segments light yellow, the remainder of the organ more or less distinctly bicolorous; abdomen dull yellow, the tergites with a conspicuous dark brown stripe; wing 12 mm. [Proc. Acad. Nat. Sci. Phila., p. 475-476, pl. 16, fig. 5. 1915.] (Plate XLVIII, 253, wing; Plate LIV, 346, lateral aspect of male hypopygium.) *T. mainensis* Alex.
- Coloration not as above, the thoracic stripes not dark brown; hypopygium not as above. 91
91. Nasus short; cell 1st M_2 of wings very small and pentagonal; male hypopygium with the ninth tergite usually tumid, unarmed or provided with horns; in species in which the tergite is not conspicuously swollen and tumid (*T. parshleyi*), the cell 1st M_2 is small and pentagonal, as above; in species in which the cell 1st M_2 is longer (*T. johnsoniana*), the ninth tergite is tumid tho unarmed (*bicornis* group) 92
- Nasus usually longer; cell 1st M_2 of wings not small and pentagonal; male hypopygium with the ninth tergite not tumid (*translucida* group) 96
92. Ninth tergite (Plate LII, 321) not tumid; eighth sternite very long, sheathing the ninth sternite beneath, the tip with two chitinized points on either side. [Proc. Acad. Nat. Sci. Phila., p. 510-512, pl. 17, fig. 23. 1915.] (Plate LV, 354, lateral aspect of male hypopygium.) *T. parshleyi* Alex.
- Ninth tergite tumid; eighth sternite shorter, not closely applied to ninth sternite for the entire length of the latter, the apex without chitinized points 93
93. Ninth tergite (Plate LII, 320) with four lobes or horns. [Journ. N. Y. Ent. Soc., vol. 9, p. 112-113. 1901.] (Plate XLVI, 231, wing; Plate LV, 353, lateral aspect of male hypopygium.) *T. megaura* Doane
- Ninth tergite with two horns or without horns. 94
94. No horns on the tergite (Plate LII, 318). [Proc. Acad. Nat. Sci. Phila., p. 505-506, pl. 17, fig. 20. 1915.] (Plate LV, 351, lateral aspect of male hypopygium.) *T. johnsoniana* Alex.
- Horns on the tergite 95
95. Horns on tergite (Plate LII, 319) directed upward. [16th Rept. State Ent. Ill., p. 78, pl. 6, fig. 4. 1891.] (Plate XLVI, 230, wing; Plate LV, 350, lateral aspect of male hypopygium.) *T. bicornis* Forbes
- Horns on tergite directed caudad or slightly ventrad. [Proc. Acad. Nat. Sci. Phila., p. 507-508, pl. 17, fig. 21. 1915.] (Plate LV, 352, lateral aspect of male hypopygium.) *T. morrisoni* Alex.
96. Caudal margin of ninth tergite (Plate LII, 315) with three prominent lobes, the median lobe acute; antennae bicolorous; body coloration light yellow, the thoracic stripes reddish brown; abdomen with a series of about four conspicuous, rounded, brown spots along the sides; wing 13.5 mm. Southern species. [Proc. Acad. Nat. Sci. Phila., p. 487-488, pl. 16, fig. 11. 1915.] (Plate XLVII, 240, wing.) *T. triton* Alex.
- Caudal margin of ninth tergite not trifid. 97
97. Caudal margin of ninth tergite (Plate LII, 316) deeply notched, the lateral lobes produced into long, slightly curved horns; outer pleural lobe a conspicuous curved hook; antennae bicolorous; body coloration yellowish, the thoracic stripes very indistinct; wings yellowish; wing 17.2 mm. [Proc. Acad. Nat. Sci. Phila., p. 493-495, pl. 16, fig. 15. 1915.] (Plate XLVII, 241, wing; Plate LIII, 328, eighth sternite; Plate LV, 349, lateral aspect of male hypopygium.) *T. tuscarora* Alex.
- Male hypopygium not as above. 98
98. Lateral lobes of ninth tergite (Plate LII, 310) broad, squarely truncated; antennae more or less distinctly bicolorous; coloration brownish yellow; wing 18 mm. [Proc. Acad. Nat. Sci. Phila., p. 490-492, pl. 16, fig. 13. 1915.] (Plate XLVII, 242, wing.) *T. mingwe* Alex.
- Lateral lobes of ninth tergite not squarely truncated, more or less pointed or rounded. 99
99. Lateral lobes of ninth tergite pointed. 100
- Lateral lobes of ninth tergite rounded. 102

100. Inner pleural appendage produced caudad into an elongate, subacute, pale, fleshy lobe. 101
 Inner pleural appendage complex, consisting of a slender caudal lobe which is directed backward and pointed, and a cephalic lobe which is compressed, black, and heavily chitinized along the margin; coloration yellowish; antennae bicolorous; head light gray; thoracic stripes rather indistinct, brownish orange; ninth tergite (Plate LII, 312) with the lateral angles tipped with a cylindrical, conical point; median lobe prominent, convex, rounded; eighth sternite large, prominent, projecting caudad, the posterior margin with a rounded notch bearing a dense tuft of long, silvery hairs on each side of the mid-line; wing of male 18–19 mm. [Proc. Acad. Nat. Sci. Phila., p. 492–493, pl. 16, fig. 14. 1915.] (Plate LV, 347, lateral aspect of male hypopygium.) *T. monticola* Alex.
101. Antennal flagellum dark brown; body coloration light gray; ninth tergite with the lateral angles subangular, not approximated; median lobe not prominent, shiny; thorax with three broad brown stripes; wing 12.5 mm. Southern species. [Insec. Inscit. Menst., vol. 3, p. 134–136. 1915.] *T. catwaba* Alex.
- Antennal flagellum bicolorous; body coloration yellowish, the thoracic stripes indistinct; ninth tergite (Plate LII, 313) with the acute lateral lobes approximated, the space between narrow. [Journ. N. Y. Ent. Soc., vol. 9, p. 109. 1901.]
T. translucida Doane
102. Abdominal tergites 2 to 5 with a brown subbasal spot on the lateral margin; ninth tergite of male with a deep rectangular notch, the median area not convex; antennae indistinctly bicolorous; thorax brownish yellow without distinct stripes; wing 12.6 mm. Southern species. [Proc. Acad. Nat. Sci. Phila., p. 495–496, pl. 16, fig. 16. 1915.] (Plate LV, 348, lateral aspect of male hypopygium.) *T. seminole* Alex.
- Abdominal tergites without a brown subbasal spot on the lateral margin; ninth tergite of male (Plate LII, 311) with the lateral angles conspicuous, the apices bluntly rounded; median area broad, highly convex to obtusely pointed, shiny chestnut brown to yellow; antennae usually bicolorous; thorax light brownish yellow, the stripes a little darker, pale brown; wing about 13 mm. [Insec. Inscit. Menst., vol. 3, p. 134–135. 1915.] *T. georgiana* Alex.
103. Lobes of ovipositor blunt, unchitinized *bicornis* group
 Lobes of ovipositor pointed, chitinized . . . Females of other species with unmarked wings
 No attempt is made here to separate the females of the species with unmarked wings; many of the species have not been definitely associated with their mates and are not really known. In all cases in which pairs of flies are taken in copula, the two sexes should be pinned on the same pin, the male above. In many groups of the genus it is quite impossible to separate the females on the characters known at present.

Since the above key was completed a few additional species of *Tipula* have been described. These are briefly diagnosed here in order to complete the data.

Tipula aprilina Alex. (Alexander, 1918 a:63–64.)

Dejecta group; close to *T. dejecta*. Male hypopygium with the ninth tergite large, the posterior margin with the lateral angles produced caudad into prominent blunt lobes which are blackened and furnished with small tubercles, the caudal margin truncated; between these lateral lobes two parallel, usually longer and slightly pointed, lobes which are directed slightly ventrad, one on either side of the median line; outer pleural appendage very small and inconspicuous, elongate-cylindrical, yellowish; inner pleural appendage elongate, narrow; margins of ninth sternite not widely separated beneath, carinate, and with a narrow V-shaped posterior notch bearing a pair of small, fleshy lobes. Wing of male, 11.5 mm. (Virginia, April.)

T. conspicua Dietz. (Dietz, 1917:149-150.)

Tricolor group; close to *T. eluta*. Grayish white; antennal flagellum distinctly bicolorous; thoracic stripes margined with brown, the median stripe divided by a dark line; hyaline vitta of wings reaching the outer margin; abdomen yellow, unstriped; ninth tergite with lateral pencils of hairs. Wing of male, 17 mm. (North Carolina, September.)

T. sackeniana Alex. (Alexander, 1918 a:62-63.)

Tricolor group; close to *T. tricolor*. Coloration reddish brown; antennae bicolorous; male hypopygium without a pencil of hairs on either side of median lobe of tergite. Wing of male, 15.5 mm. (New York, Maryland, Virginia, and Georgia, July and September.)

T. vicina Dietz. (Dietz, 1917:148-149.)

Tricolor group; close to *T. eluta*. Grayish brown; antennal flagellum unicolorous brown; mesonotal stripes margined with brown, the median stripe divided by a blackish line; hyaline vitta of wings extending thru cells *1st M*₂ and *R*₅ to margin; abdomen striped laterally. Wing of male, 13 mm. (New York, May; Michigan, July.)

T. entomophthorae Alex. (Alexander, 1918 c:385-386.)

Trivittata group; close to *T. angulata*. Mesonotal prescutum gray with three brown stripes; wings gray with a broad white crossband beyond the cord; vein *R*₂ persistent for its entire length; male hypopygium with the ninth tergite deeply notched medially, the lateral angles obliquely truncated. Wing of male, 15.8 mm. (North Carolina.)

T. flavibasis Alex. (Alexander, 1918 c:411-412.)

Valida group. A small, pale brownish species, easily distinguished from all its relatives by the bicolorous antennae, the basal enlargements of the segments being light yellow and the remainder black. Antennae of male long and slender, if bent backward extending to beyond base of abdomen. In coloration of antennae the species in the faunal limits of this paper is approached only by *T. tephrocephala*, a very different fly. Wing of male, 12 mm. (Kansas, July.)

T. huron Alex. (Alexander, 1918 a:66-67.)

Valida group; close to *T. submaculata*. Wings with a heavy brown pattern resembling *T. trivittata* or *T. angulata*. Wing of male, 15.6 mm. (Wisconsin, June.)

T. margarita Alex. (Alexander, 1918 b:243-244.)

General coloration of head and thorax light gray; antennae short, black, the three basal segments orange-yellow; femora with a broad subterminal yellow ring, most distinct on the fore legs; wings with four brown crossbands; abdomen yellow, the tergites with a broad dark brown median stripe and narrow sublateral stripes, the lateral margin of the tergites broadly light gray; male hypopygium with the ninth tergite large, subquadrate, with a deep median split, the ninth pleurite complete, the eighth sternite with a large tuft of yellow hairs on either side of the median line. Wing of male, 14.4 mm. (New York, June.)

T. fultonensis Alex. (Alexander, 1918 a:67.)

Arctica group; close to *T. longiventris*. Abdomen of female about one-half inch shorter than in the female of *longiventris* (16 mm.). Wing of female, 18.5 mm. (New York, June.)

T. helderbergensis Alex. (Alexander, 1918 a:64-65.)

Hebes group; close to *T. latipennis*. General color very dark; antennal flagellum uniformly brown; male hypopygium with the eighth sternite densely fringed with long golden hairs. Wing of male, 14 mm. (New York, July.)

It will be noted that many names are not included in this key to the genus *Tipula*, and this is because most of them are synonymous with species that are included. The principal synonymy is as follows:

| | | |
|---------------------------------------|---|-------------------------------------|
| <i>T. apache</i> Alex. | = | <i>T. dorsolincata</i> Doane |
| <i>T. calva</i> Doane | = | <i>T. valida</i> Loew |
| <i>T. casta</i> Loew | = | <i>T. cunctans</i> Say |
| <i>T. cincta</i> Loew | = | <i>T. iroquois</i> Alex. |
| <i>T. costalis</i> Say | = | <i>T. sayi</i> Alex. |
| <i>T. cuspidati</i> Doane | = | <i>T. submaculata</i> Loew |
| <i>T. decora</i> Doane | = | <i>T. angulata</i> Loew |
| <i>T. discolor</i> Loew | = | <i>T. ignota</i> Alex. |
| <i>T. fasciata</i> Loew | = | <i>T. hermannia</i> Alex. |
| <i>T. filipes</i> Walk. | = | <i>T. perlongipes</i> Johns. |
| <i>T. flavicans</i> Fabr. | = | <i>T. ultima</i> Alex. |
| <i>T. fumosa</i> Doane | = | <i>T. dejecta</i> Walk. |
| <i>T. illinoiensis</i> Alex. (female) | = | <i>T. senega</i> Alex. (male) |
| <i>T. illustris</i> Doane | = | <i>Stygeropsis fuscipennis</i> Loew |
| <i>T. imperfecta</i> Alex. | = | <i>T. aperta</i> Alex. |
| <i>T. inermis</i> Doane | = | <i>T. umbrosa</i> Loew |
| <i>T. infuscata</i> Loew | = | <i>T. cunctans</i> Say |
| <i>T. jejuna</i> Johns. (female) | = | <i>T. annulicornis</i> Say |
| <i>T. ottawaensis</i> Dietz | = | <i>T. latipennis</i> Loew |
| <i>T. pallida</i> Loew | = | <i>T. senega</i> Alex. |
| <i>T. speciosa</i> Loew (male) | = | <i>T. fuliginosa</i> (Say) |
| <i>T. spectabilis</i> Doane | = | <i>T. macrolabis</i> Loew |
| <i>T. suspecta</i> Dietz | = | <i>T. afflicta</i> Dietz |
| <i>T. suspecta</i> Loew | = | <i>T. fragilis</i> Loew |
| <i>T. tessellata</i> Loew | = | <i>T. labradorica</i> Alex. |
| <i>T. versicolor</i> Loew (female) | = | <i>T. senega</i> Alex. (female) |
| <i>T. winnemana</i> Alex. | = | <i>T. johnsoniana</i> Alex. |

In addition the following species, which are not recognizable from the descriptions, are omitted:

T. borealis Walk.
T. duplex Walk.
T. maculipennis Say
T. platycra Walk.
T. puncticornis Macq.
T. resurgens Walk.
T. retorta v. d. W.
T. triplex Walk.
T. vitrea v. d. W.

T. albonotata Doane is probably a good species, close to *T. trivittata* Say but with the thoracic pattern different, the prescutum with three broad brown stripes.

T. cincticornis Doane is likewise a good species, rather similar to *T. translucida* Doane (page 955) but with the outer pleural lobe longer and the pendulous appendage of the ninth sternite shorter. It differs from *T. monticola* Alex. (page 955) in the structure of the eighth sternite, the yellow head, the yellow thoracic pleura, and other characters.

T. maculipennis Say is probably *T. angustipennis* Loew but the species is in doubt. Specimens in the Harris collection of the Boston Society of Natural History are determined by Say, tho not of the original series, and these are *T. angustipennis* or close to it. However, the description of the species shows that it differs in several important respects from all specimens of *T. angustipennis* that the writer has seen, and it seems that the species must for the present remain in doubt.

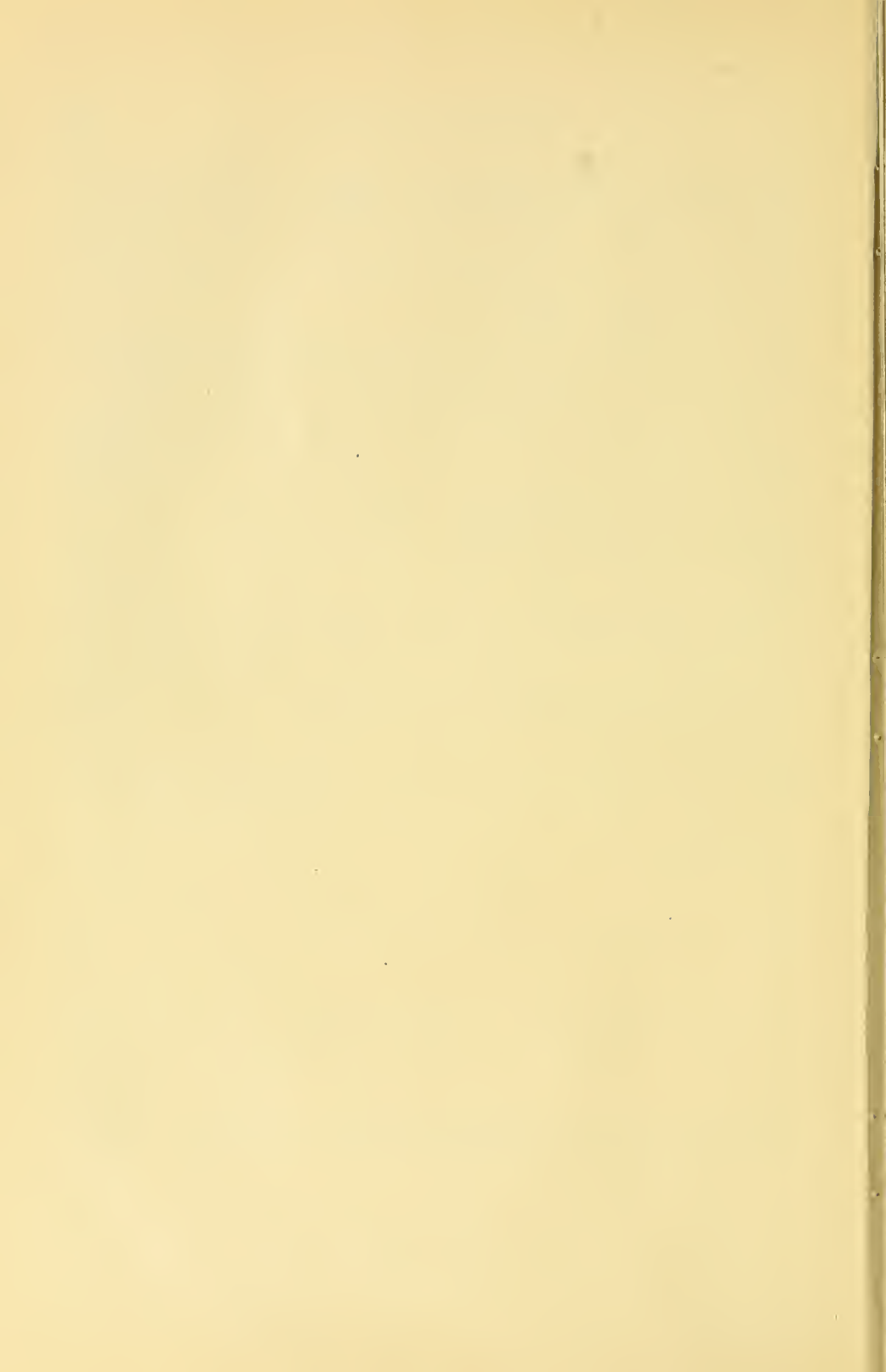
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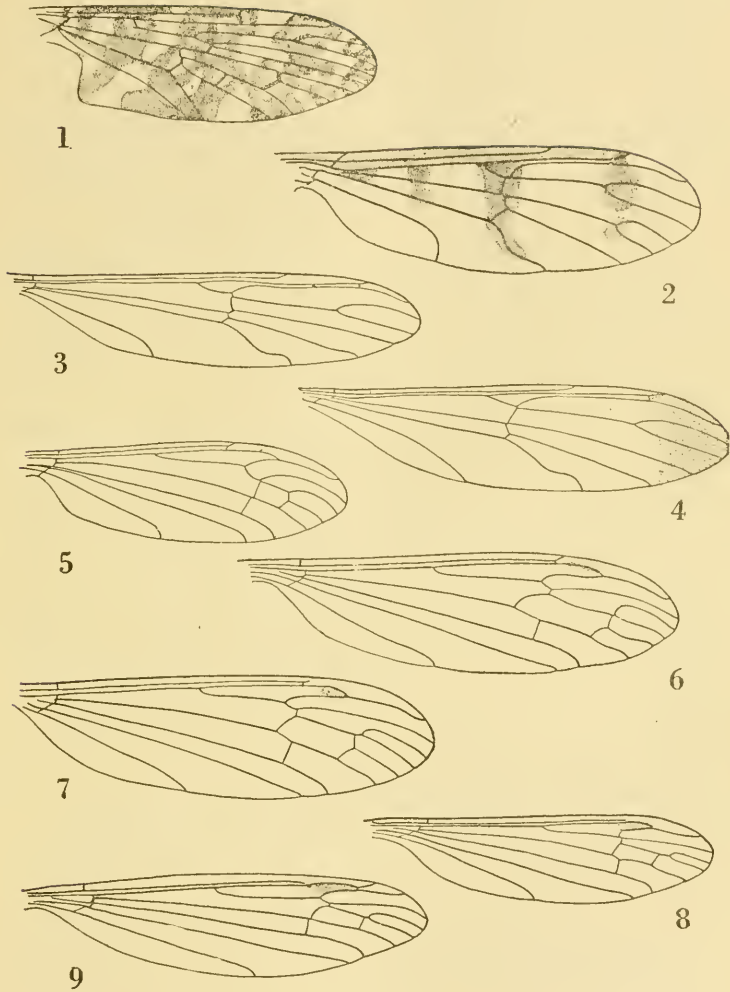
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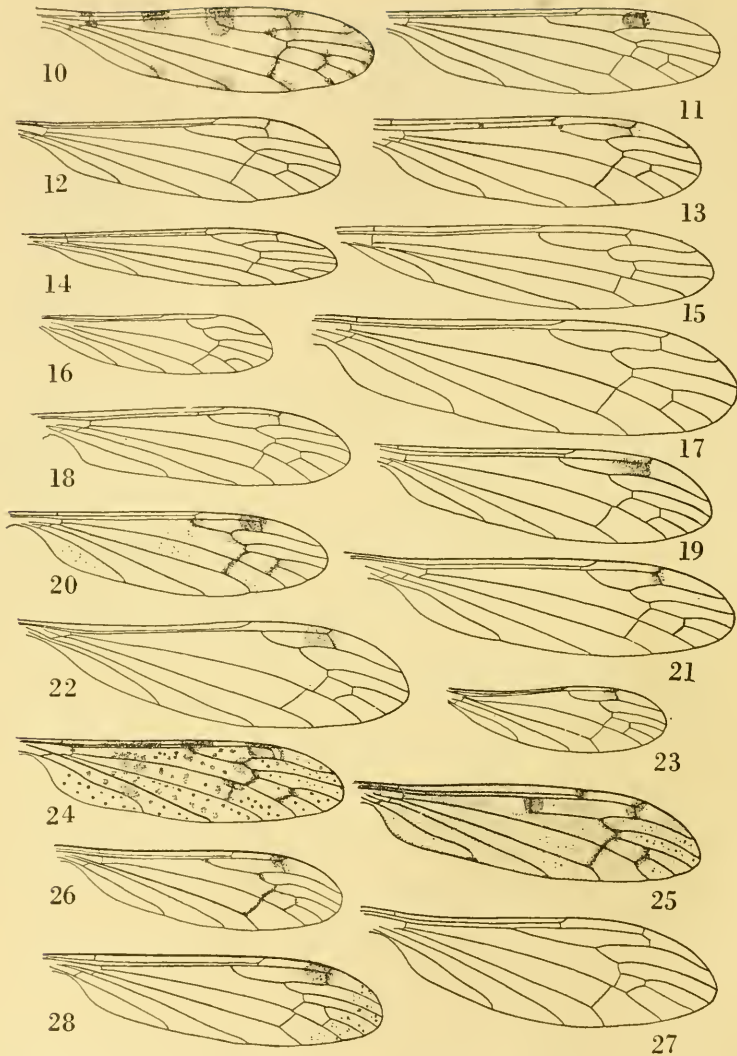
Memoir 23, *The Inheritance of the Weak Awn in Certain Arena Crosses and Its Relation to Other Characters of the Oat Grain*, the second preceding number in this series of publications, was mailed on July 12, 1919.





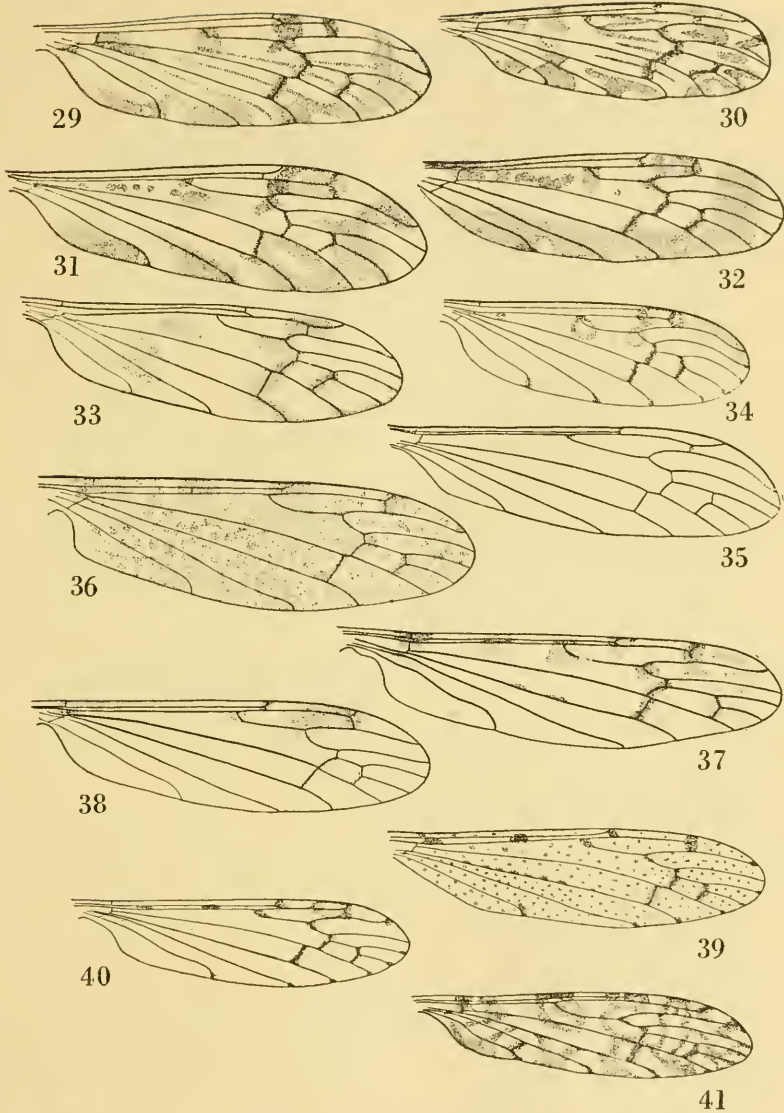
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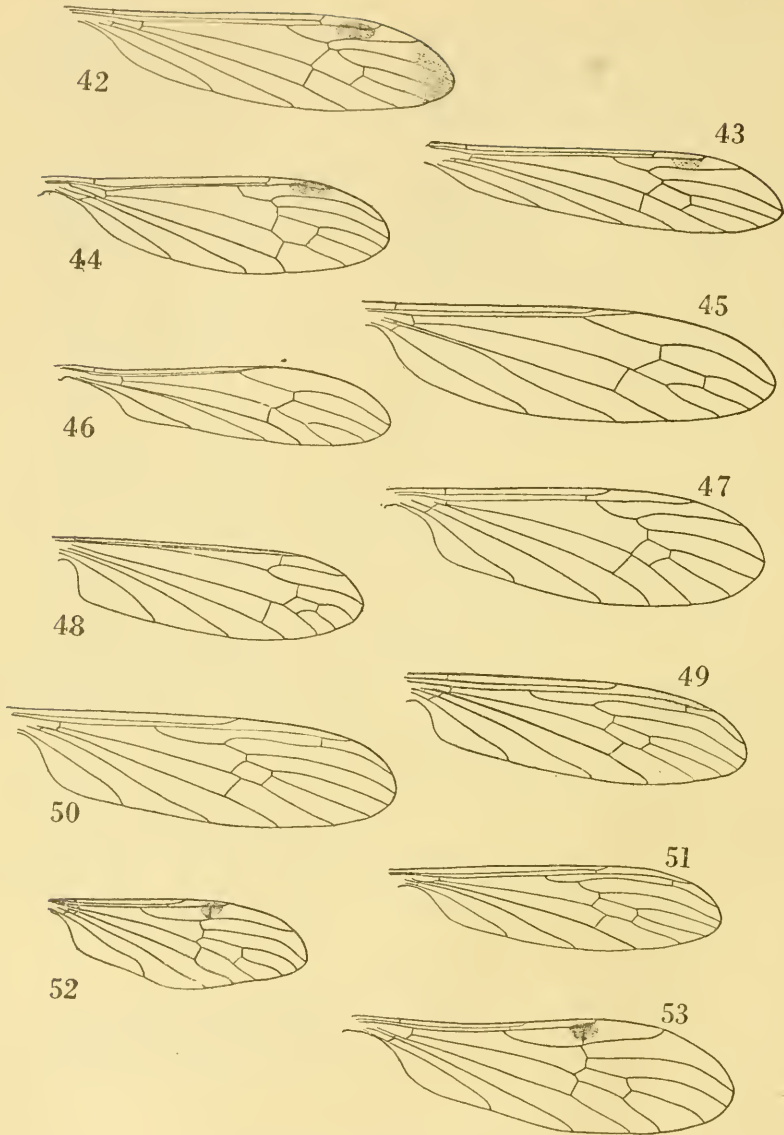
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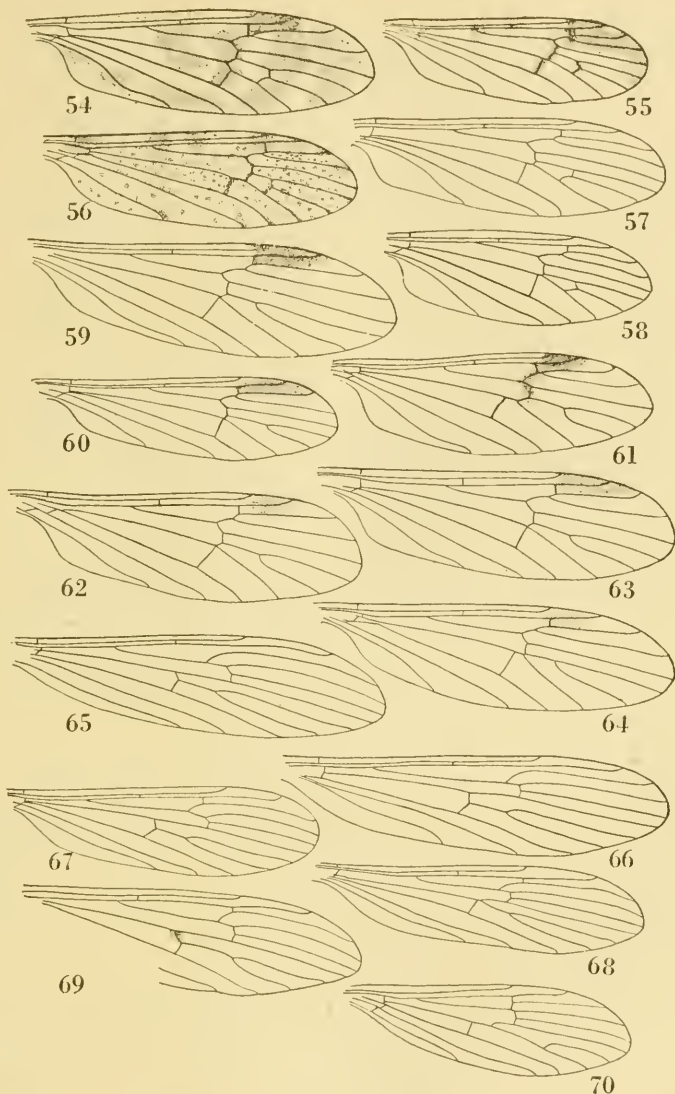
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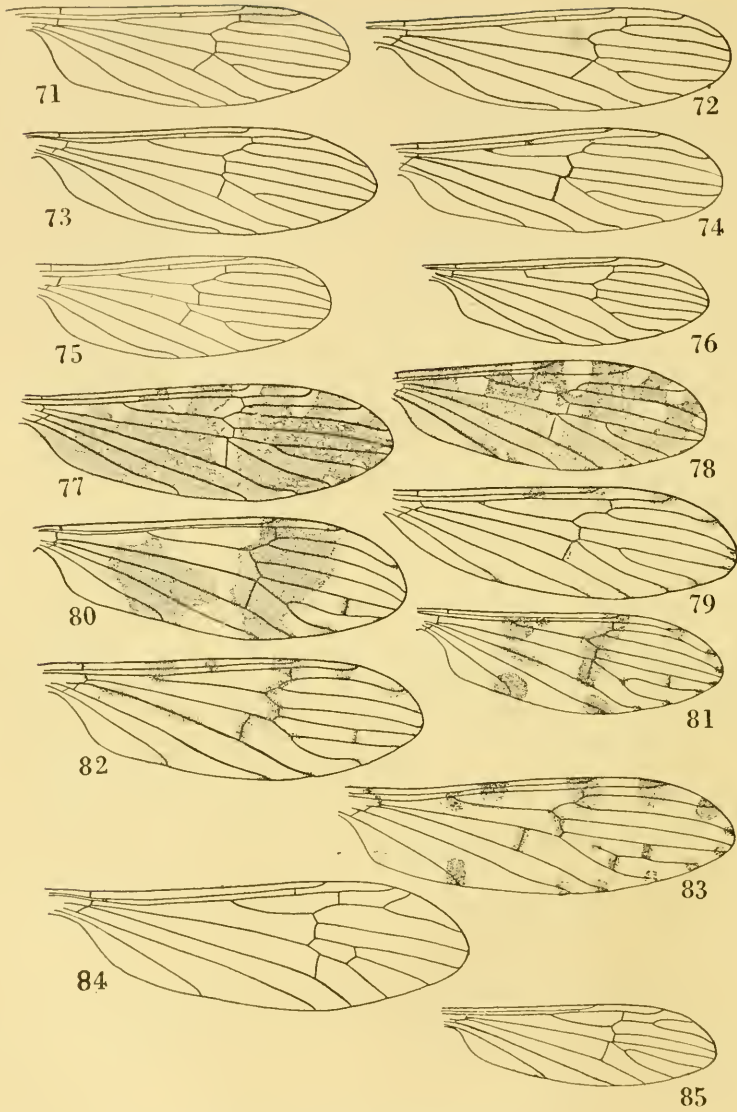
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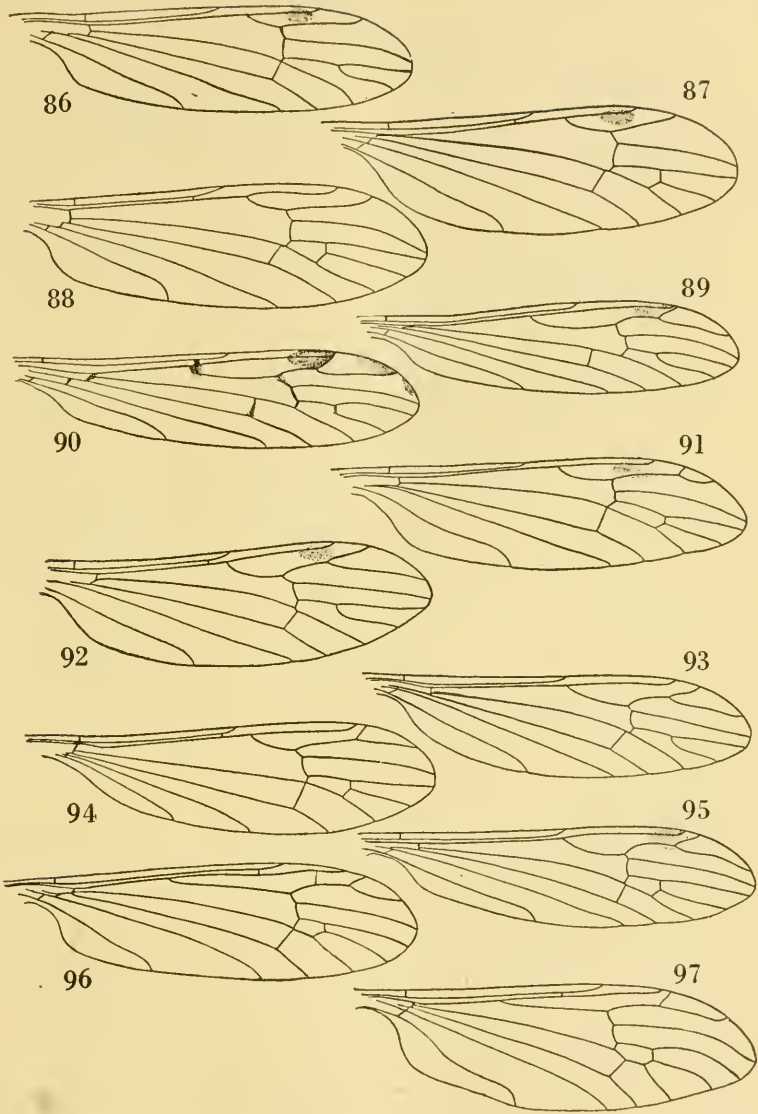
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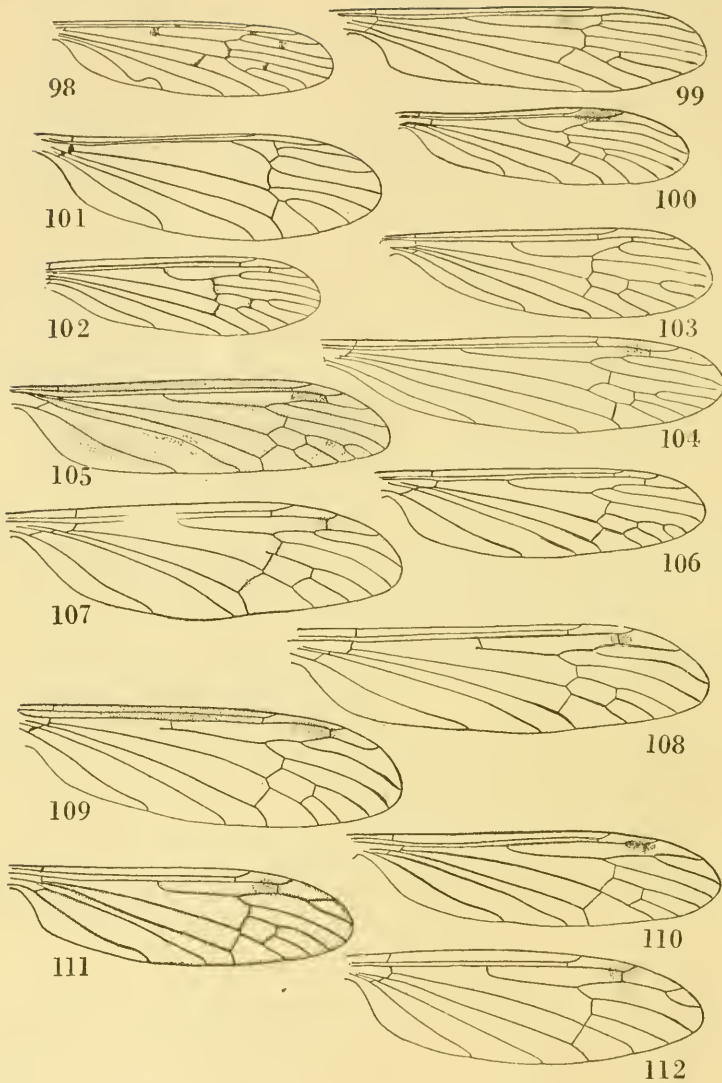
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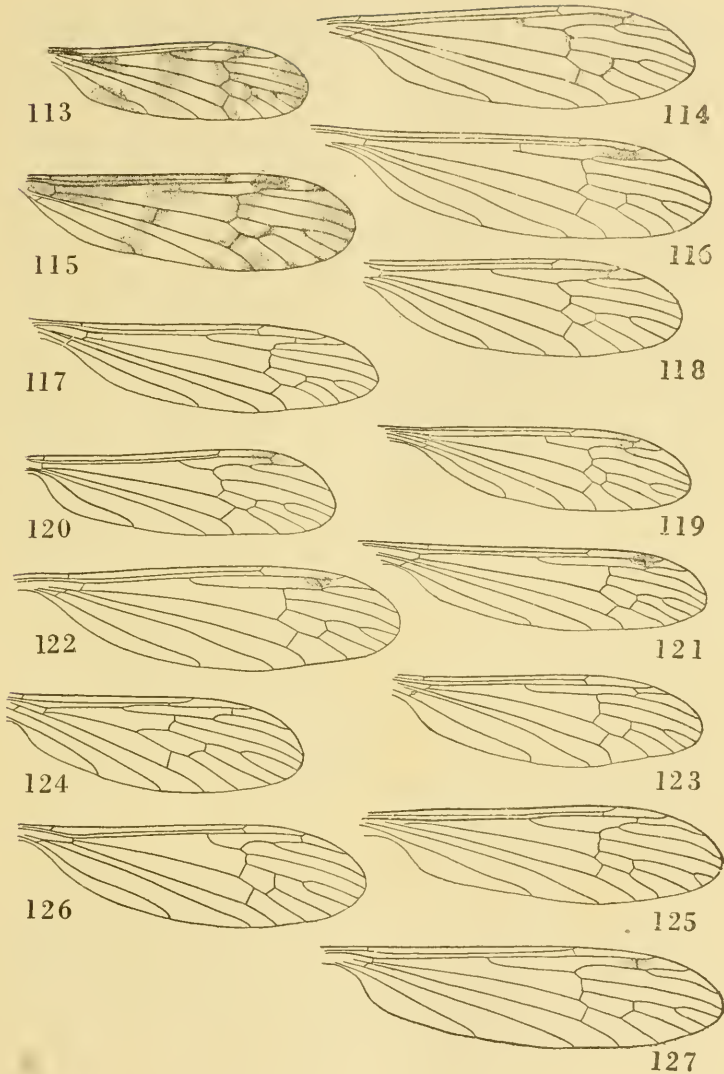
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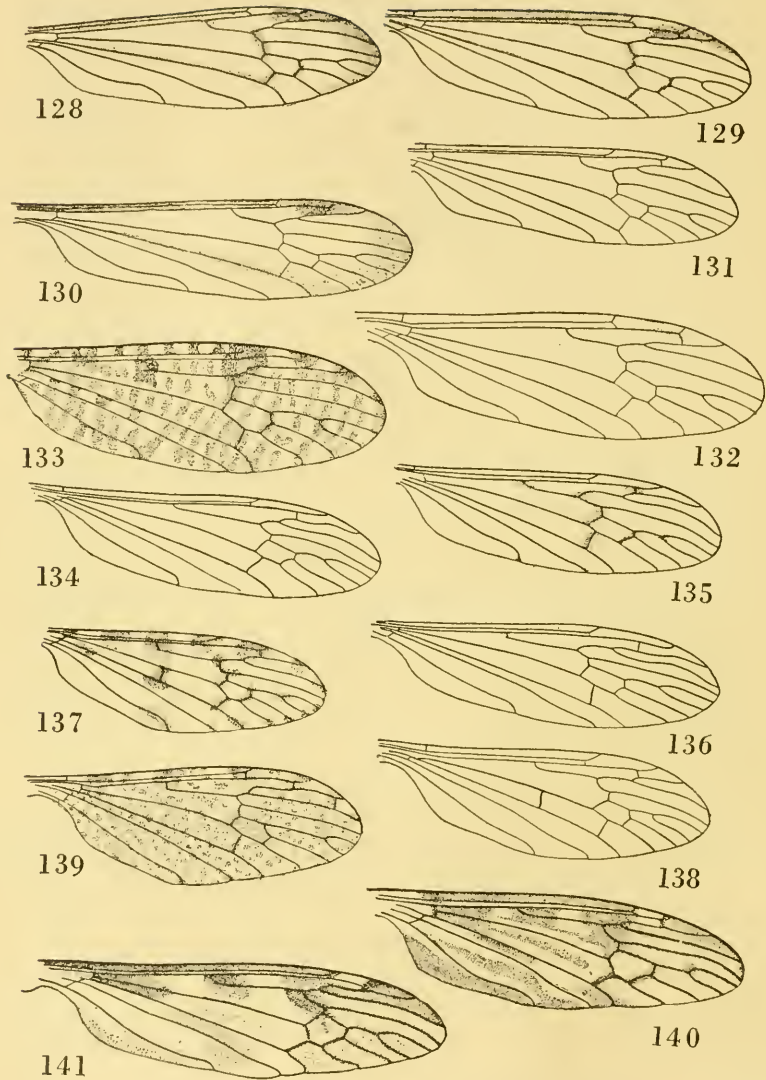
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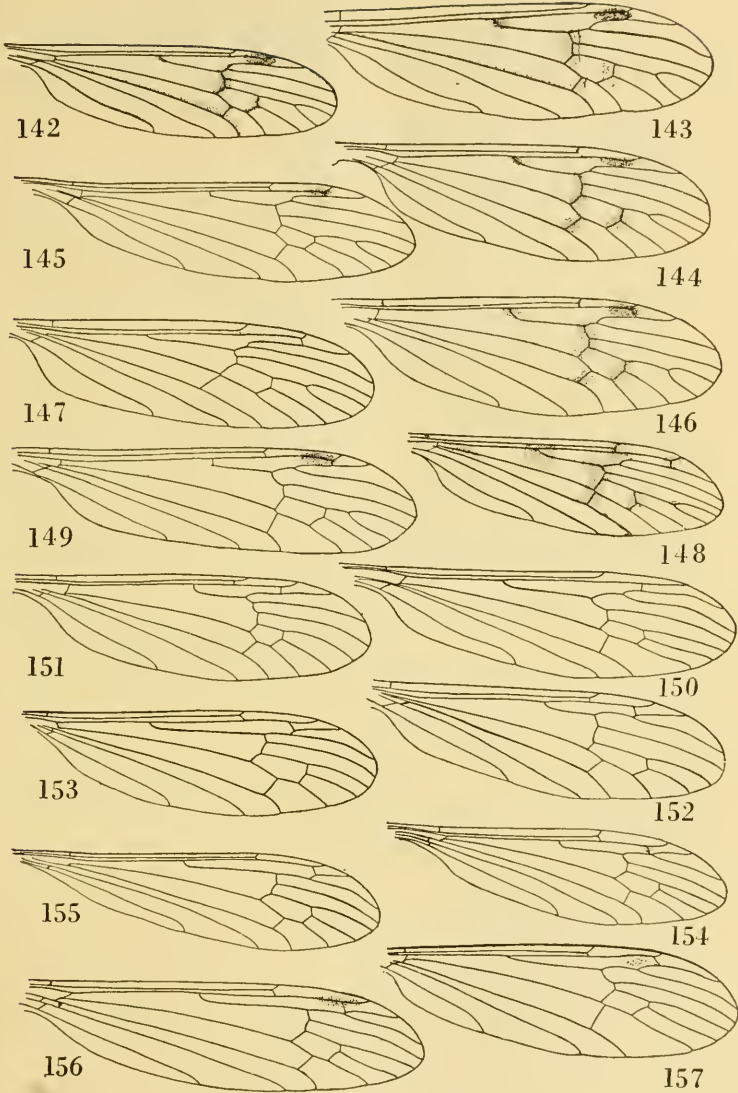
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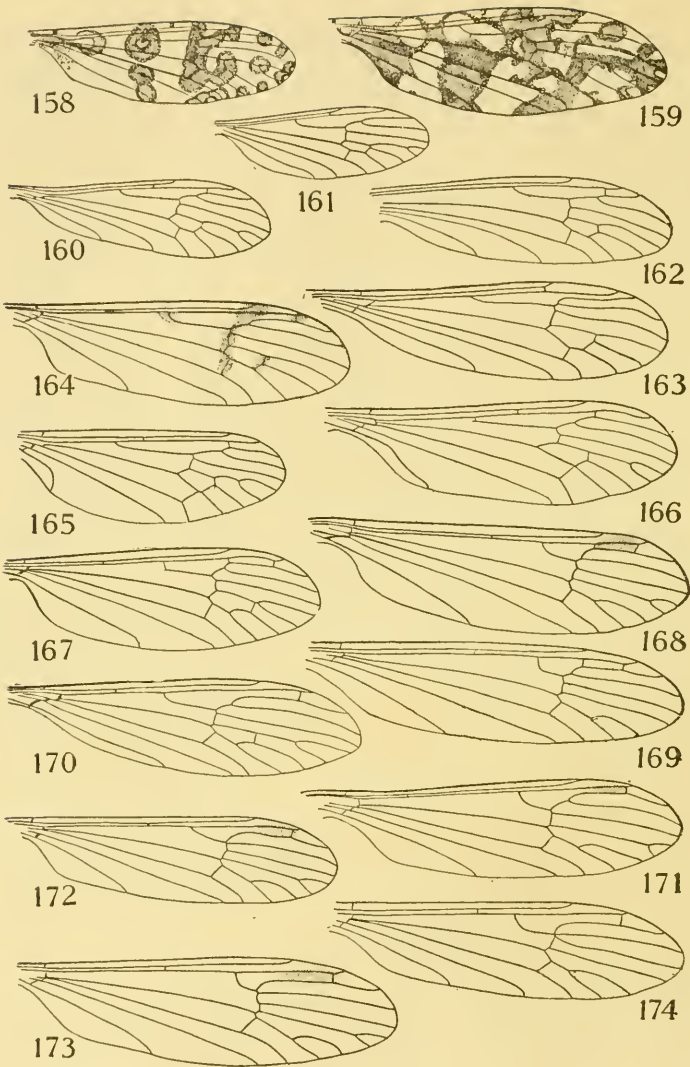
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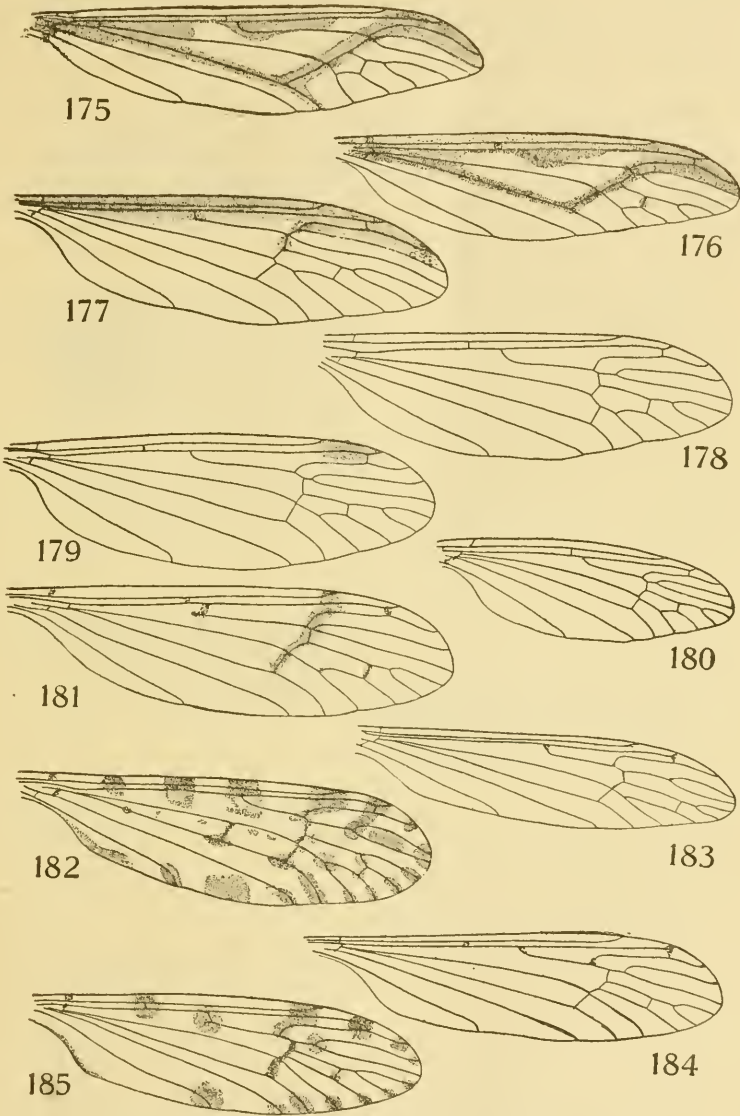
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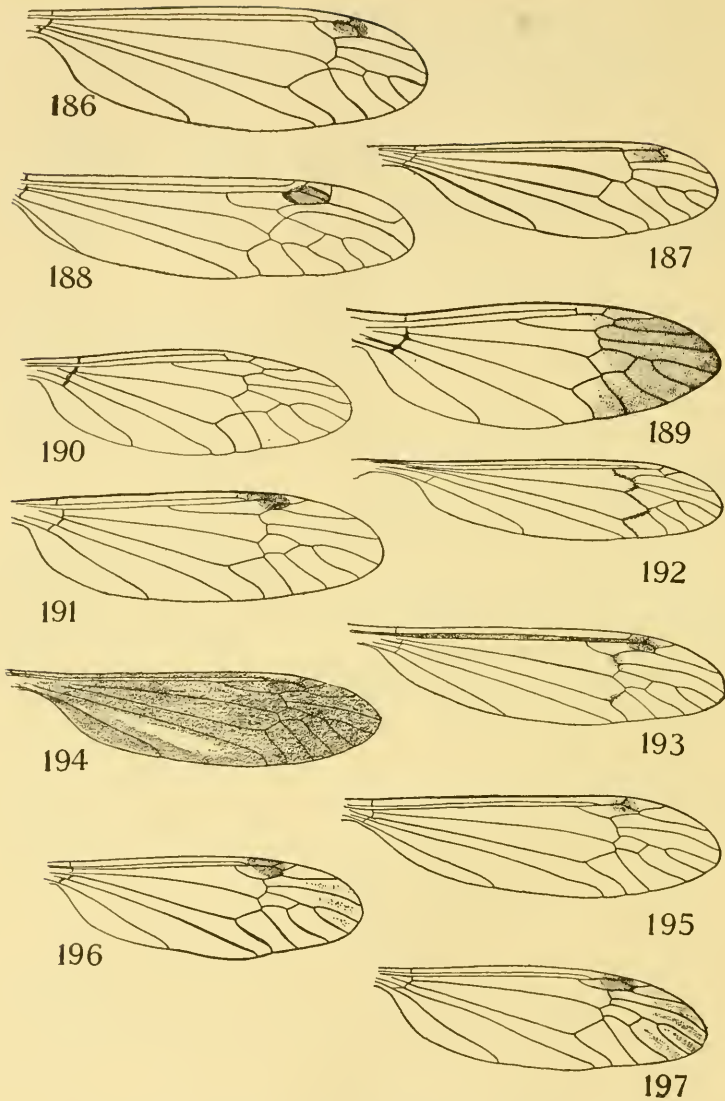
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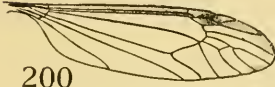
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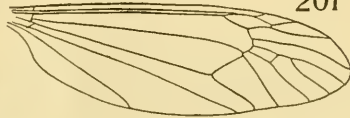
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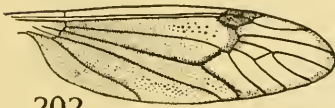
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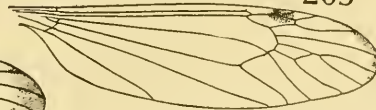
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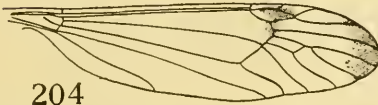
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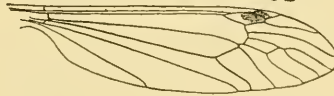
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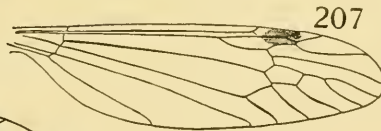
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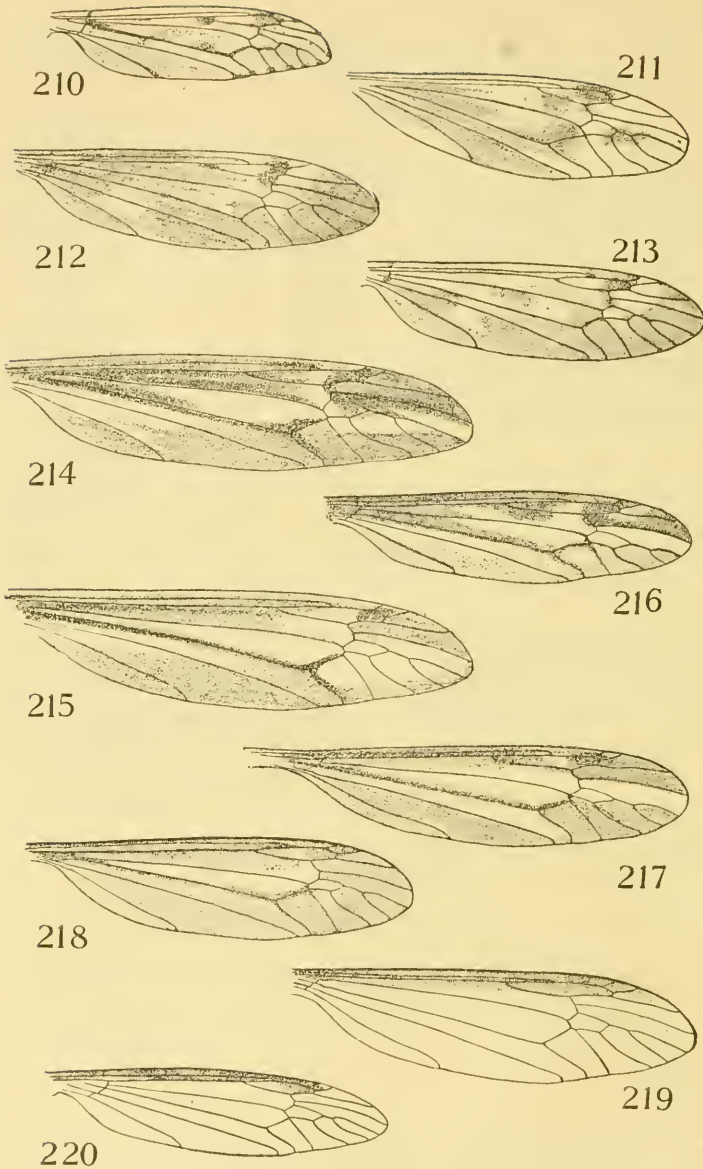
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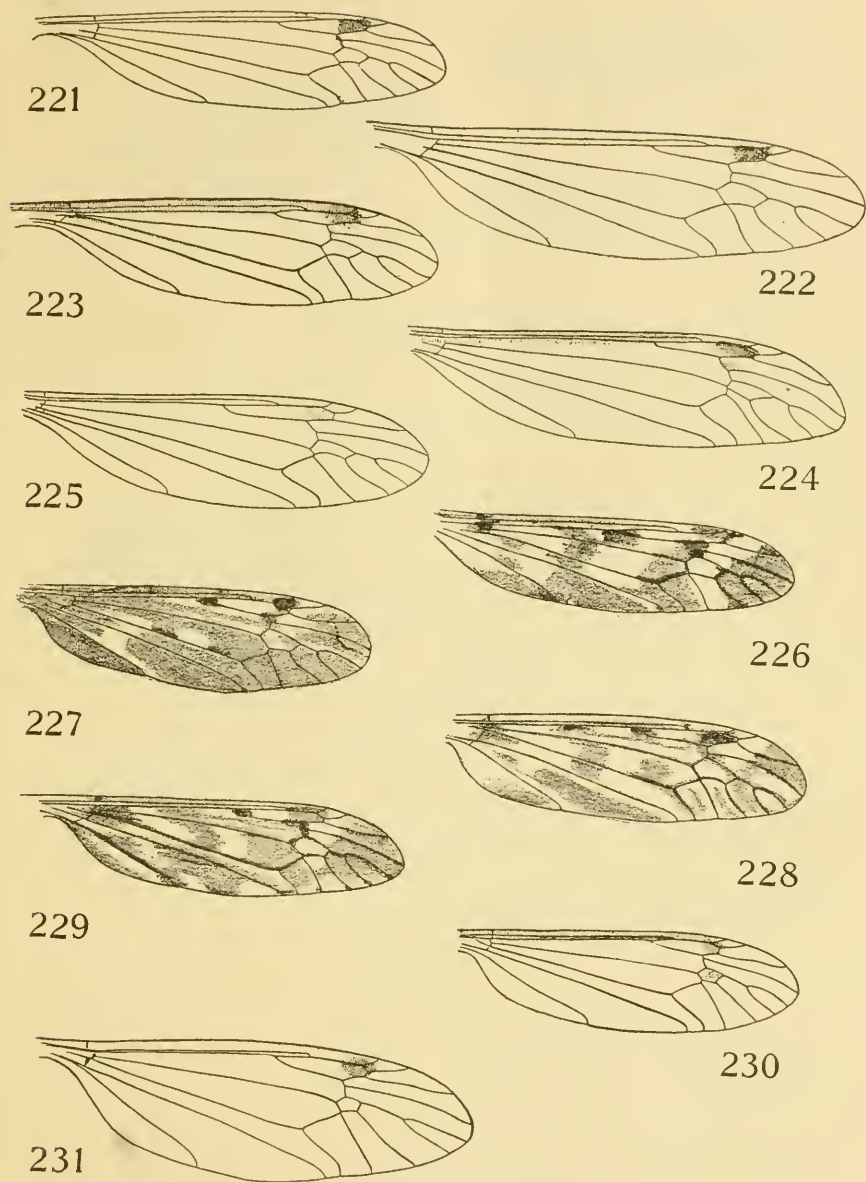
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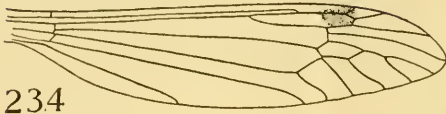
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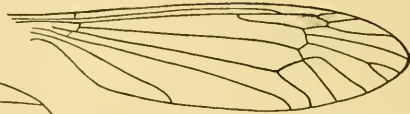
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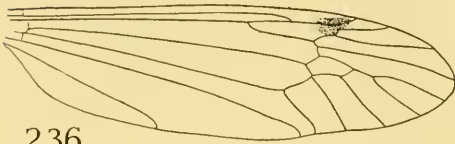
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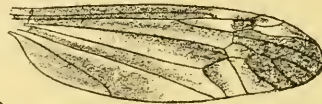
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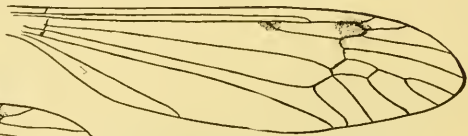
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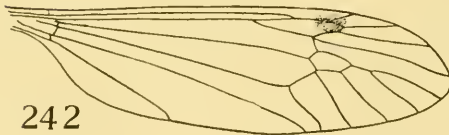
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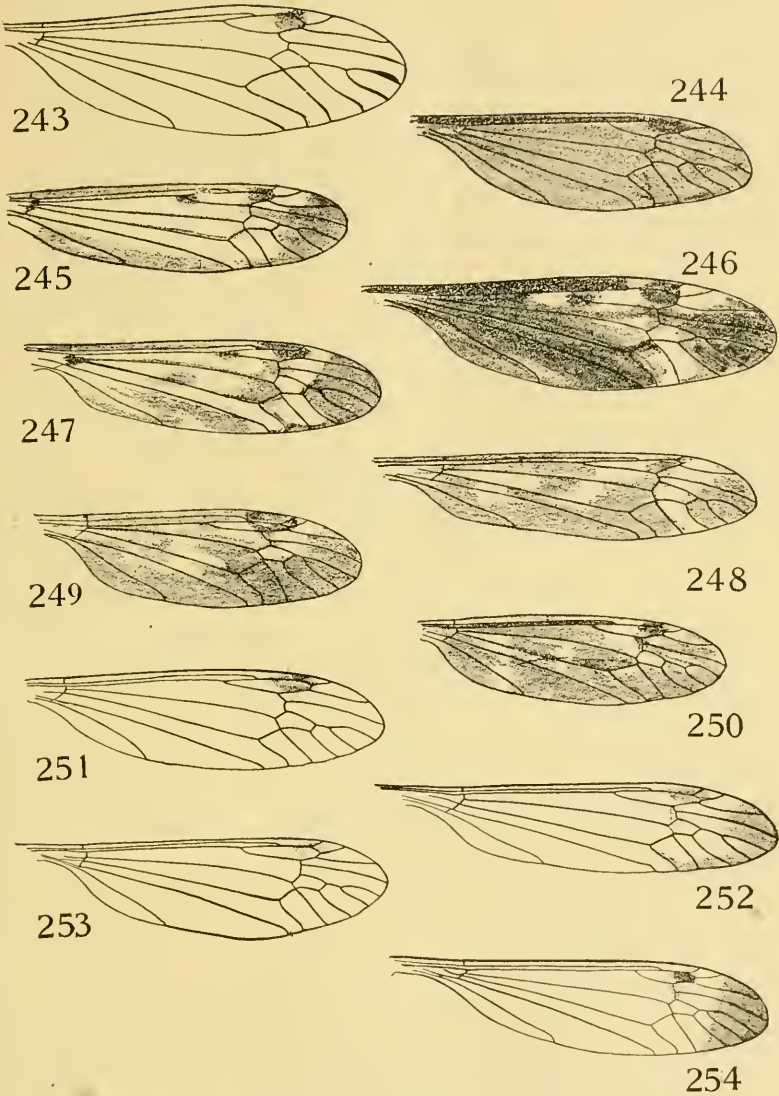
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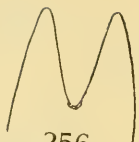


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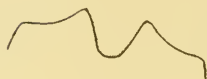
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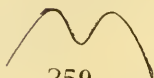
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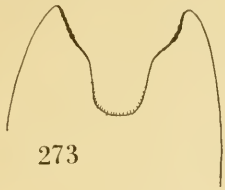


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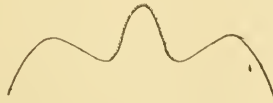
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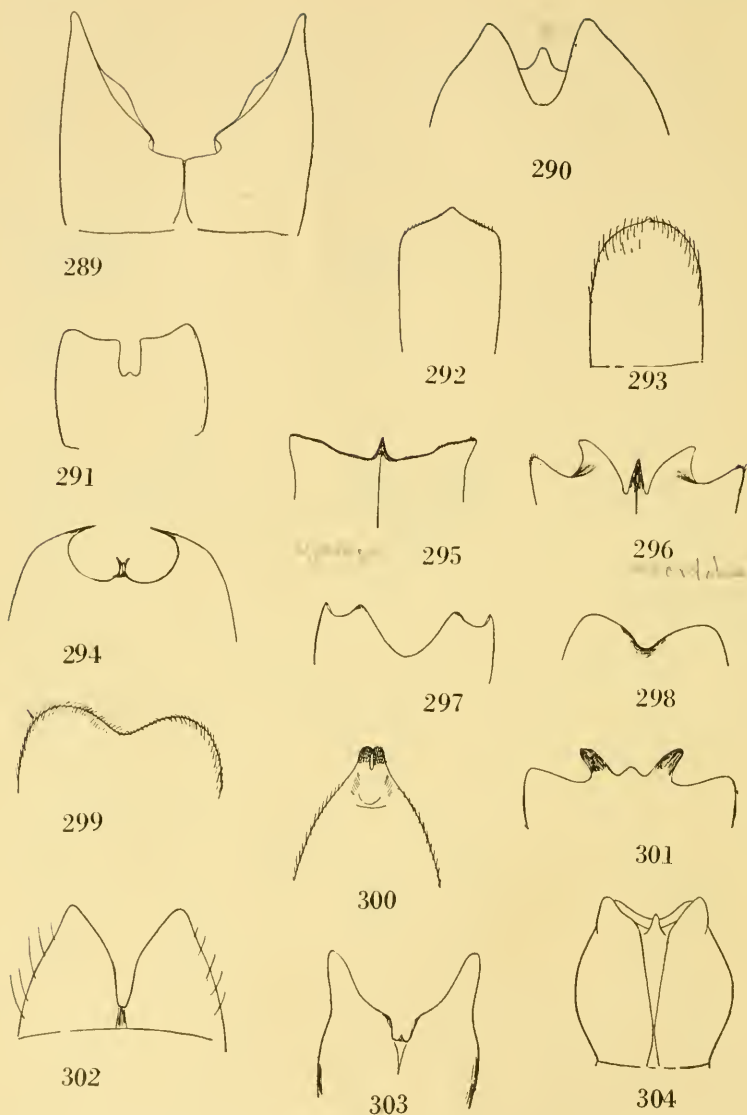
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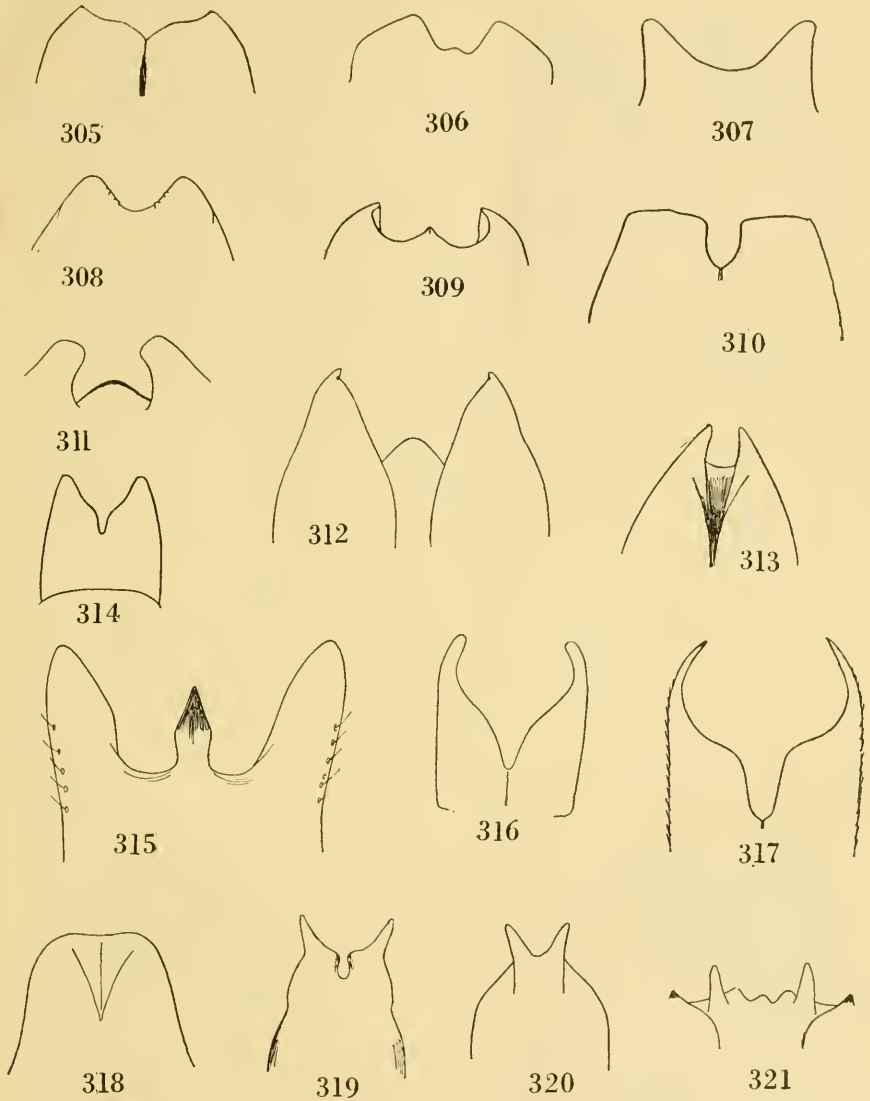
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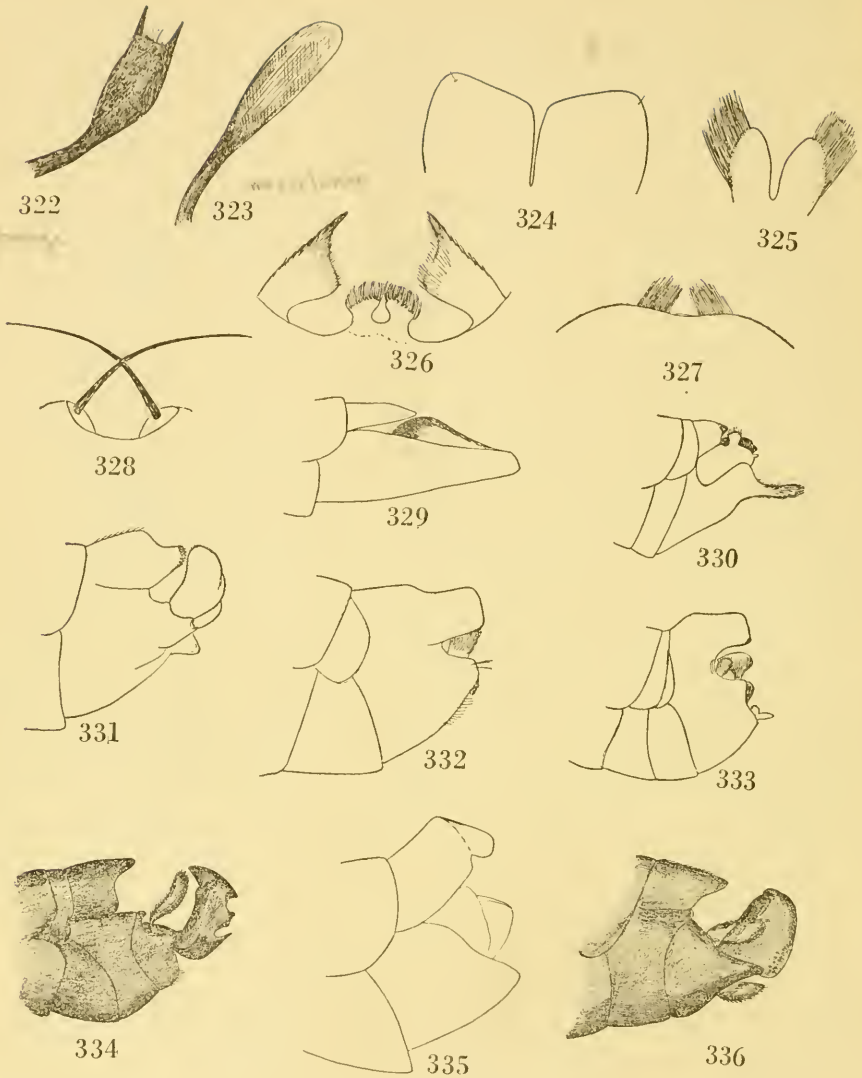
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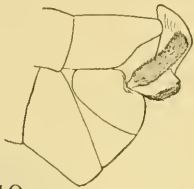
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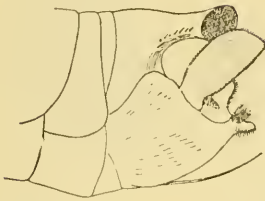
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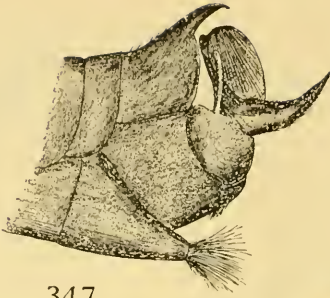
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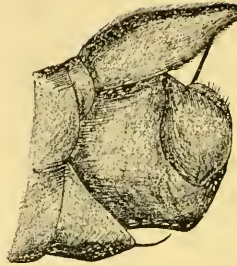
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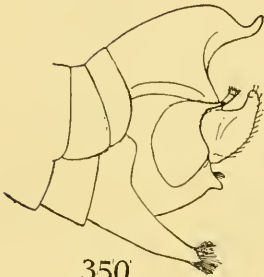
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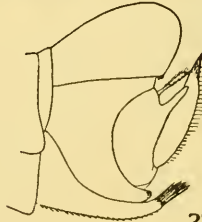
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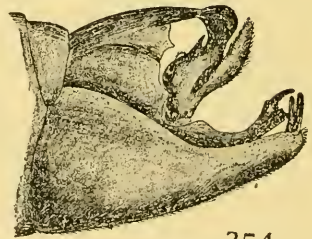
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