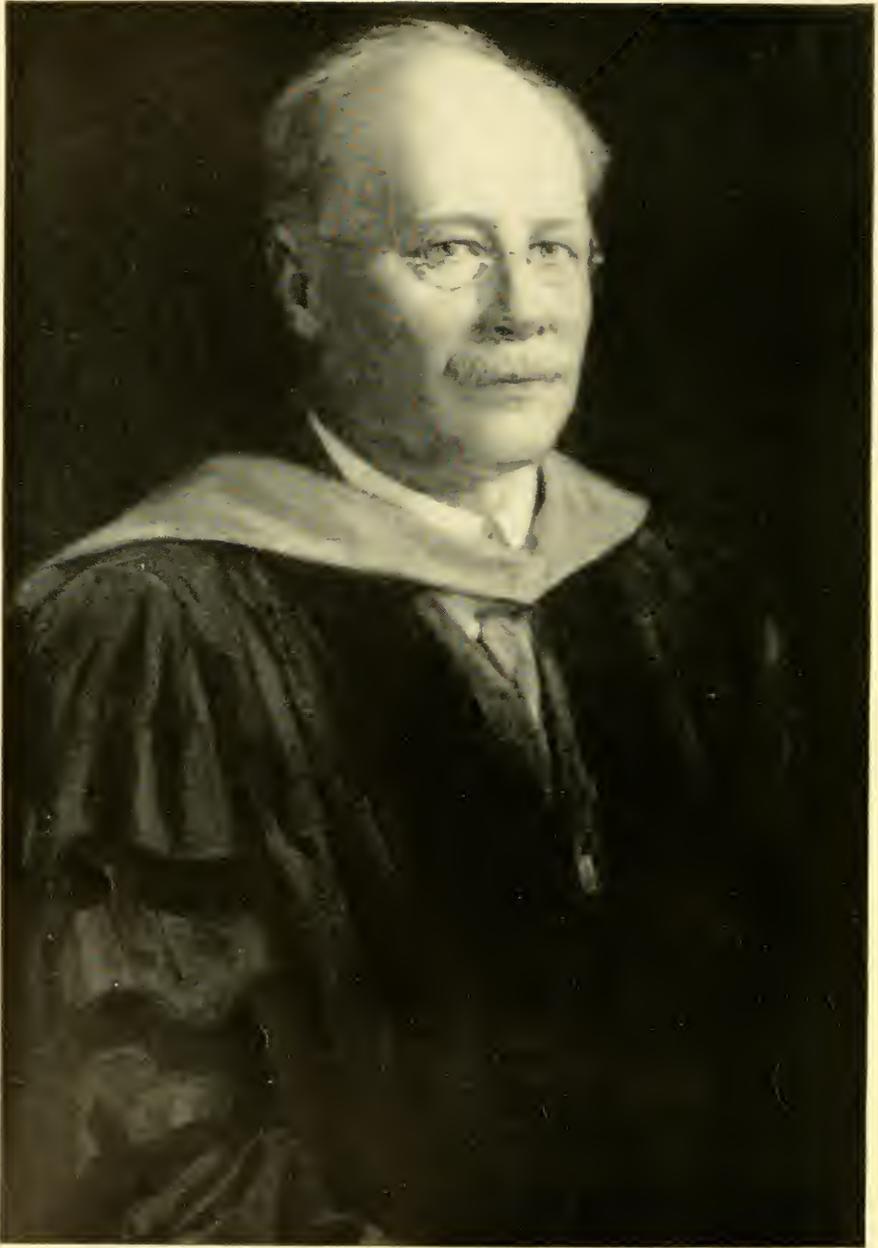


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The Families and Genera
of
North American Diptera

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New York, N. Y.

C. H. CURRAN
1934

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Errata

p. 22. add the following line:

Wings rounded at the apex, almost always with crossveins....31.

p. 76. *Isocacta* Garrett = *Alluaudomyia*, and not *Dasyhelea*.

p. 82. third line, for *Amopheles* read *Anopheles* and for *Algypti* read *egypti*.

p. 274. for "29" in middle of page read 24.

pp. 286, 288, 290, 292, 294 and 295. for Trypaneidæ read Trupaneidæ.

p. 405. second line, for *Sacrophaga* read *Sarcophaga*.

p. 395, couplet 4, for 104 read 140.

p. 499. Cephocera, for 47 read 447.



Preface

Twenty-five years ago Williston's Manual of North American Diptera (third edition), was offered to the public and in the interim it has held the esteem of students of Dipterology in every quarter of the globe. Williston's first synopses of families and genera appeared in 1884 and following years in the Bulletin of the Brooklyn Entomological Society and in 1888 the first edition of the "Manual" appeared. This "pamphlet", as it was modestly termed by its author, contained 88 pages, excluding as it did, the Nematocera and Muscoidea. The second edition appeared in 1896, and included the Nematocera but omitted the Tachinidæ and Dexiidæ. The third edition contained all the families, fifty-eight in number.

The present attempt at a classification of the genera of North American Diptera is the result of many years of study but it is inconceivable that this work should be uninfluenced by such a masterpiece as that of Williston. That a new synopsis is urgently needed becomes obvious when one considers the enormous number of new genera described since the appearance of Williston's Manual, the realignment of genera, the application of newly discovered characters and the increased importance of the study of flies in relation to human welfare.

Knowing, as I do, the excellent quality of Dr. Williston's work it is with temerity that I offer this contribution to a critical public. Even though great pains have been taken in its preparation and every effort has been made to make the keys as complete and simple as possible I fear that some few errors have crept in. That is inevitable. Where they occur I do not know, nor do I offer excuses for them other than to admit an utter ignorance in regard to the characters of thousands upon thousands of Diptera, even though I have had available for study the excellent collections of the Smithsonian Institution, Canadian National Collection and the American Museum of Natural History and the generous assistance of various specialists. If mention is not made of those who have contributed to this work, either wittingly or unwittingly (through their synoptic revisions), it is only because the body of the paper has increased to such proportions that a complete acknowledgment must be omitted.

A few innovations will be found. Where reasonably complete specific keys occur these are referred to in footnotes and the same is true in the case of family revisions. The synonymy has increased so greatly that some indication of it must be given, especially where old familiar names have been changed; this is indicated in the index and while it is far from complete it is hoped that some help may be derived from such an arrangement.

It is my hope that those who may discover errors or omissions may be kind enough to call them to my attention, indicating the manner in which the corrections may be made. Owing to the numerous footnotes it has not been possible to indicate the genera which have been included from description only. Such genera naturally weaken a key as it is impossible to use characters which may be available for a more suitable arrangement. Any specimens representing genera improperly placed, or not common, would be most greatly valued by the author.

Finally I wish to express my unbounded admiration for the late Samuel Wendell Williston. To him I owe, as do very many others, an everlasting gratitude for his kindly encouragement, while he lived, and real inspiration from his printed works. I know of no Dipterologist who has so clearly set forth the facts or who has been so great an inspiration to others. And as a slight token of my appreciation I respectfully dedicate this book to his memory.

C. H. CURRAN.

American Museum of Natural History,
New York City, 1933.

Introduction

Acknowledgments

It is impossible to express fully my appreciation of the generous cooperation of all those who have assisted in the preparation of this work. It is most fitting that I should mention first the generosity of Mrs. S. W. Williston for not only permitting me to use the illustrations from Williston's "Manual of North American Diptera", but for her offer to furnish the cuts themselves. Needless to say this offer was accepted and many of the illustrations are reproduced from cuts used in the Manual. Unfortunately, due to a rearrangement of many genera and their transfer to different families, it has not been possible to use all of the cuts. Further, in this connection, I owe much to Mrs. George Shor, a daughter of Dr. and Mrs. Williston, for her assistance in this matter, and for her sympathy in the work. It might not be out of place to mention here that, according to Mrs. Shor, her father, upon the completion of the manuscript of the third edition of his Manual, dropped it upon his desk and remarked: "Well, that's finished. When it is revised again, it will be by someone else."

Every request for the loan of specimens and for the review of keys met with a wholehearted response and as a result the value of this book has been greatly enhanced. Dr. C. P. Alexander is deserving of especial thanks for the preparation of the manuscript dealing with the Tipuloidea and the preparation of the illustrations for that superfamily. Drs. Jos. Bequaert, C. T. Brues, O. A. Johannsen, Robert Matheson, J. M. Root and Mr. Marston Bates have assisted very materially in checking over keys and suggesting changes. Dr. E. P. Felt suggested the use of illustrations from his papers published in the Bulletins of the New York State Museum on the Cecidomyidæ (Itonididæ) and Dr. C. C. Adams very generously furnished the cuts. Drs. J. M. Aldrich, F. H. Benjamin and Mr. Marston Bates, and others have loaned specimens not found in the American Museum collection and Dr. Matheson has given permission to use illustrations from his "Handbook of the Mosquitoes". I wish also to express my appreciation to all those Dipterologists of the past and present whose works have been so freely drawn upon.

The preparation of a work of this kind entails a large amount of stenographic and routine work and for the careful typing of the manuscript I am indebted to Miss Ethel Olsen. Mr. Adolph Klein has contributed the excellent colored plate of several typical forms, while my wife has assisted with the illustrations and in many other ways.

For the encouragement he has given during the preparation of the manuscript I shall always feel a deep sense of gratitude to Dr. Frank E. Lutz. The American Museum of Natural History is deserving of particular mention, since the work has been done in this institution without any limitations as to time devoted to it.

If the book should be found useful and helpful, full credit should be given to the Museum as well as to all those who have so generously given of their time and knowledge.

Collection and Care of Diptera

So much has been written about the ease with which collections of insects may be cared for that I feel a word of warning to be not amiss. It is true the Lepidoptera and Odonata may be "papered", Hymenoptera, Hemiptera and Coleoptera may be packed between layers of cotton and Coleoptera may be collected in alcohol but most of the other Orders require more care. With the exception of Coleoptera and the small insects normally collected in alcohol and intended for study in this liquid, or for slide preparation, all insects are much better pinned while fresh. Packing Diptera between layers of cotton may result in recognizable specimens and a small percentage of really good specimens may be secured but the majority can never be made to look attractive.

With small flies pinning should take place within four or five hours of the time of capture and all specimens should be mounted within eight hours. In cold or damp weather a greater time may be allowed to elapse and the time should be shortened in hot, dry weather.

Mounting Diptera should not be a slipshod process and care should be taken to have the flies an even height on the pins. An excellent practice is to have the mesonotum about one-third the distance from the top of the pin. This permits of careful handling of the specimen and reduces danger of damage to a minimum. Many Entomologists pin Diptera less than a fourth the distance from the head of the pin with the result that the specimens are quickly damaged and ultimately cease to have value. *Double mounts* should never be used for Diptera. If a specimen is too small to be pinned through the thorax it should be fastened to the side of the pin by first circling it (the pin) with a narrow ring of white shellac and touching it to the side of the insect. In this way the specimen may be handled in the usual manner and all parts may be readily seen. If possible, the wings should be arranged so that they extend over the back of the insect in an upright position. Pins of suit-

able size should be used and it will be found that good, steel No. 00 pins may be used for quite small insects for pinning through the thorax. Some collectors seem to have a craze for double mounts, not realizing that the value of their collection is greatly lessened due to the increased risk during shipping and many of them place the accessory mount much too high on the pin. Another practice, that of placing specimens (nicely spread, it is true) on a circular or oval mount of cardboard by use of minute pins, is to be condemned as the characters available on the under side of the specimen are concealed.

Labelling is an important detail and insufficiently labelled specimens are of little more value than none at all. The fact that a proud collector knows exactly when and where he captured a certain prize is of no value to the student who must needs study the specimen in the absence of the collector. Every specimen should be labelled with the locality, date and name of the collector. Labels should be small and neat and should be placed on the pin along the long axis of the insect, the locality on the right hand side. Labels should never be placed crosswise as they are liable to damage adjacent specimens when the insect is being removed for examination. One guide to labelling all insects is to remember that the label should afford protection to the specimen and not be so large that the collection looks like a collection of locality labels rather than one of insects. The labels should be printed, either by machine or by hand and the month should always be in Roman numerals.

In various places in the following pages will be found instructions for the care of those flies which require special attention. No doubt there are many people who will neglect to read the instructions here but to those who do I offer a few pertinent hints. Never place Diptera in vials or bottles with other insects. Never cram a vial full of flies. Shake them loose occasionally so that the wings will not become folded. Never place small flies in a vial with large ones and be careful not to place more than a few specimens of flies which rub easily in a vial. Always keep mating pairs together: a good plan is to have a vial for this purpose and to put only different species in it.

Collecting outfits need not be elaborate. I usually carry six to eight test tubes and a bottle about an inch across and four inches long. If the collecting is to be general a bottle two inches across may be carried. Such an outfit will suffice for a half day of very good collecting and if the trip be an all-day one the catch may be transferred to a box and stored in a cool place. Empty match boxes are convenient receptacles for the transference of fragile specimens and pairs.

The making of the bottle is a simple affair. Get some fine sawdust, place in the vial or bottle a small amount of sodium or potassium cyanide

and add about half an inch of sawdust; wedge this in with a ball of cotton, place in the sun for half an hour and the bottle is ready for use. The cyanide should be broken into small lumps but need not be particularly fine. It must be remembered that *cyanide is a deadly poison* and extreme care is necessary in handling it. Do not use it unless you are properly instructed, and if you do, be sure to destroy by burning or burying all paper, pieces of wood, etc., which the cyanide might have touched and wash thoroughly in running tap water hammers, etc. used in crushing the material, as well as your hands. Never handle cyanide if there is an open sore upon the hands. A little extra care may be worth a lot. It might not be amiss to note here that the most efficient antidote for cyanide poison is the intra-venous injection of methelyne blue, one of the best known aniline dyes.

Flies and Disease

As agents in the spread of diseases of mammals the Diptera undoubtedly rank first in importance among the insects. The chief carriers of diseases are, of course, the biting flies belonging to the families Psychodidæ, Simuliidæ, Culicidæ, Tabanidæ, Glossinidæ, Ceratopogonidæ and Muscidæ. Species of *Flebotomus* carry papataci fever, verruga or oroya fever, kala-azar and oriental sore. Other names are applied to these diseases. The mosquitoes carry blackwater fever, yellow fever, dengue, filariasis and malaria. Onchocereiasis is carried by species of *Eusimulium*. A form of filariasis is believed to be carried by a species of *Culicoides* and species of *Chrysops* are known to transmit the disease. Tularamia, anthrax and trypanosomiasis are other diseases transmitted by Tabanids. The stable-fly, *Stomoxys calcitrans*, is known to carry a number of species of trypanosomes and may also be responsible for the spread of poliomyelitis (infantile paralysis), although no definite proof has been obtained. Sleeping sickness is carried by the Tse-tse flies.

In addition to carrying diseases the biting flies themselves cause a great deal of irritation by their bites, especially in the vicinity of water. Life is often made miserable in northern regions by the hordes of mosquitoes and black flies while the sportsman is plagued by almost all the biting forms while in the woods and bathers come in for much undesired attention from no-see-ums, mosquitoes and Tabanids, particularly the so-called "green-heads", along the coastal regions.

The house fly carries on its body the germs causing typhoid fever, dysentery, cholera, anthrax and conjunctivitis, while a few other flies carry other diseases. Considerable has been written about myiasis caused by the larvæ of flies living in the human body. If we except the

bot-flies, I think that we may regard the occurrence of fly larvæ in the body of man as entirely accidental and dismiss the matter as being a subject of academic interest rather than one calling for serious consideration. There are, of course, the bot-flies, belonging to three distinct families and they are serious pests. In the tropics one species commonly attacks man, but the greatest damage is done to domestic animals. Hides are frequently so greatly riddled with "warble" holes as to be almost valueless.

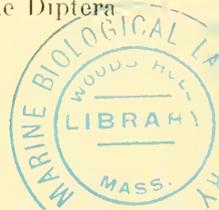
The bird and bat parasites, as well as the so-called bee-louse (*Braula cacca*), are probably not serious pests although the sheep tick, belonging to the Hippoboscidae, is often sufficiently numerous to cause serious damage and some species of *Hippobosca* bite humans in addition to their attacks on horses, camels, etc.

In many places the so-called blow-flies cause serious loss to sheep owners by "blowing" the wool.

I have given just a very brief summary of some of the injury caused by flies to animal life, as it affects human welfare, and a very great deal that is of interest has been omitted. One frequently receives inquiries as to the diseases carried by flies, and these few paragraphs may serve to answer the questions. In the following pages, under the families mentioned, additional information is given, particularly concerning diseases carried by flies in North America. If the student desires further information on this important subject he should secure a copy of one of the better books on Medical Entomology.

Flies and Crops

It is impossible to enumerate all the flies attacking field, horticultural and garden crops, but mention might be made of the various root maggots, the leaf miners, gall makers, fruit flies, grass stem flies and the Hessian fly. The amount of damage done by the groups of insects mentioned must be enormous but it must be remembered that there can be no actual measure of crop damage from a financial point of view. A large crop invariably means lower prices and a small crop higher prices. It is only when individuals or limited communities suffer serious loss in the volume of their produce that there is any real loss, and then it is of a local nature and not national for the producers of the crop affected. It so happens in such cases that one man's loss proves to be another man's gain. While flies undoubtedly do a great deal of damage to our crops and flowers, they are of less importance in this respect than some of the other orders of insects and the Diptera are, in actual fact, much more beneficial than injurious.



Beneficial Flies

No group of insects, except, perhaps, the Hymenoptera, are so important to mankind as are the flies. In these two groups are man's best friends among the insects. It would be useless to argue about the relative merits of the two orders because we know so little about them that no one is in a position to make any authoritative statement. It is sufficient to say that flies play an extremely important part in the pollination of flowers, but they undoubtedly occupy second position to the bees. It is in the field of predaceous and parasitic members that these two groups render the greatest service to mankind. If the world should suddenly find itself without flies and bees it would quickly revert to a sphere lacking animal and plant life, so important are these insects in maintaining the "balance of nature".

I believe that the majority of flies, in relation to the number of known species, are either predaceous or parasitic on other insects. Such large families as the Asilidæ, Empidæ and Dolichopidæ are all predaceous in the adult and probably in the larval stage, while the Bombyliidæ, Nemestrinidæ, Conopidæ and Tachinidæ are insect parasites. Other families or groups can be added to the list and we might also include forms which are predaceous in the larval stage. More about the habits of flies will be found in the following pages.

Flies are also beneficial as scavengers and examples of their effectiveness may be found everywhere. They dispose of carcasses, decaying vegetation and waste animal products and in this way do much to keep the air pure and wholesome.

Anent the Insect War

I am aware that there has been some sensational propaganda about "the war against insects" and I cannot forego a few remarks. Insects are our best friends and we owe a great deal to them. They are also our worst enemies but this fact should not be proclaimed from the housetops without at the same time crying much louder of the benefits they give us—flowers, fruits, vegetable, clothes, food, pure air, beauty. The stressing of the danger of the "insect menace" may do entomology a great deal of harm and I think it has already done some. It has taught people to dislike all insects and the fact that the "menace" has not developed perceptibly has resulted in some loss of faith in entomologists.

The Diptera contain some of our worst enemies. The public should be made aware of this and steps taken to eliminate the pests in so far as possible. Every effort must be made to keep people suffering from

insect-carried diseases out of the country, if such diseases do not occur here and if there are any known carriers of the disease among our insect population. Yellow fever is an excellent example. We have the yellow fever mosquito and if persons suffering from this disease should enter any part of the country where the mosquito occurs the disease might well become established. Every effort should be made to reduce the numbers of the house-fly, stable-fly, and other pests. On the other hand the introduction of parasites, particularly of imported pests, should be encouraged and people should learn to differentiate at least the more beneficial of their insect friends.

Morphology of Diptera

It is not my intention to go into detail concerning the structure or morphology of flies since I have appended a glossary of terms used in this and other works. However, a few remarks on the subject may not be amiss. In Williston's manual a simple system of nomenclature is used and I follow the same system. During recent years attempts have been made to homologize the parts of the various orders of insects and as a result many long and unfamiliar terms have been proposed. To my mind the homologies of the parts are much less important to the systematist than a simple, easily followed and long used terminology. Nevertheless it is important to know the origin of the various parts, especially so to a zoologist, if he deigns to study that group which comprises three-fourths of the animal kingdom. In each order of insects a simple terminology has long been in use and such terms should be employed because the average student can understand them without difficulty. After all, some one has said that "Nature is an open book, and you have but to study nature to understand." Perhaps those are not the exact words, but they will do.

The determination of genera is based upon structure and it is therefore necessary to be acquainted with these parts. The average student will find no difficulty on this score if he will follow the simple expedient of using the keys and consulting the glossary. In this way the terms used will soon be mastered and the student will find little difficulty in tracing out specimens.

The student who desires to delve into the anatomy of Diptera should obtain a bibliography of the works on this subject, particularly those by Crampton and Snodgrass. Many references will be found in Imms' "Recent Advances in Entomology" and "Biological Abstracts"

It will be found that authorities differ as to the origin and homology of different organs. A comparison of the Comstock-Needham system as used by Dr. Alexander in this work and that of Comstock will

show certain differences while others disagree in the terminology as applied to the veins in other families of Diptera as well as in other orders of Insects. It must be pointed out that the Comstock-Needham terminology of wing venation is very widely used, probably by more students of Diptera than any other system, and if American students desire to study exotic flies they must familiarize themselves with this system as well as the system used by many Europeans. Explanations of these systems will be found in the glossary.

Classification of Diptera

The classification of any group of animals is a complex problem having its basis in the morphology, histology, embryology and general biology of the phylum, and without a knowledge of these "ologies" no satisfactory classification can be obtained. In addition we must also turn our attention to palæontology, although it must be confessed that very little is known concerning the Diptera of the past ages. In the present work we deal almost entirely with morphology of the adult flies, not from any desire to ignore the other phases of study, nor from any lack of interest in them, but because our space is so limited and each field is so vast that a lifetime of study would leave any field almost untouched. The truth is that we know practically nothing about the biology of flies although we may say, in a general way, that we are acquainted with their mass biology and that we can usually place a species biologically by associating it with some related form.

The taxonomist, however, is forced to deal with adult structures, to classify the creatures by characters he may select and to leave to some one else the pleasure of working out the biology of the insects studied. If you are at heart a taxonomist and are informed that you know nothing of biology unless you study life histories, do not be discouraged. Instead, feel rather strongly inclined to turn a deaf ear to your adviser, taking solace in the fact that even though you may spend all your available time at the systematic study of the adult insects, and glean what you may from the writings of others on biology and life history studies, you will never be able to fully master the field you have chosen. There are so many flies that no one can ever truly profess to know them all and their very numbers preclude a thorough survey of the order tending to a complete classification.

It is well, and necessary, to warn against too great specialization, and at the same time it is realized that many students with limited time are unable to study more than one or two families. The great trouble with the intensive specialist is that he loses his sense of proportion and relatively minor details are liable to assume the greatest importance in

his mind. In order to overcome this intra-specialization the student should enlarge his outlook by collecting in other families and also in other orders, even though no time be available for a study of his complete catch. The collector who studies a single family may produce a monumental work providing he is painstaking and accurate while the general worker is less liable to accomplish lasting results.

I hope I may be excused if I wander a little aside from a technical discussion of classification to discuss lighter but equally important matters. The real object of this work is not the classification of the Diptera but the presentation of keys to enable the student to place his specimen in the proper genus—or, in short, the generic identification of flies. Nevertheless, we must glance below the generic classification and find out something about species, and it is about the description of species of which I wish to say a few words here.

There is nothing more pleasing than a good description and nothing more aggravating than a poor one. All of us, in our ignorance, may offer poor descriptions at times but we should always strive to make them clear and concise. We should try to step beyond ourselves and look at the description from the viewpoint of another student. If two animals are different, in our estimation, we should clearly express the differences, laying special stress upon the outstanding characters. A description should not be too long, nor should it be brief and stilted. I can do no better than recommend that every Dipterist read the descriptions contained in Williston's "Synopsis of North American Syrphidae" and pattern descriptions after those. The elimination of words and the excessive use of abbreviations is scarcely to be condoned, even on the ground that it is "scientific". If "science" is to be measured by a stilted language and a lack of consideration for others, it deserves little consideration from humanity as a whole and we should divorce "science" and study insects just for the fun of the thing.

Today the student need not worry a great deal about some one "stealing his thunder". Most eminent entomologists are only too glad to be of assistance to the young student and to leave to him the description of new species. This does not mean that the specialist is willing to name large collections and return all the material. If he were he would be so swamped with work that he would have no time for his other duties. Most specialists name material on the understanding that they may retain what they wish, and as a rule they desire very little. The beginner should be only too glad to assist the specialist by filling in gaps in his collection, because every species added makes his work that much easier in future. It must also be remembered that many specialists are employed by institutions having large collections of unworked

material and that every collection named means less time for institutional work and, to make a blunt statement, it is only fair to expect the institution to look for some return from the labor of its employees. However, I do not know of anyone who is not happy to verify a student's findings and to give opinions and suggestions concerning the distinctness of specimens, and, of course, in such cases they are returned if desired.

I cannot condemn too strongly the professor who permits a student to work on a systematic or biological paper and to allow or even urge that the results be published unless the material has been examined by a specialist, or the species of which the biology is being studied has been identified by one in authority. Each year many students are given such problems and the results are frequently very unsatisfactory. Too much care can not be exercised in the preparation of scientific descriptions of either genera or species and it should be realized that a good collection must be available before any work can be faithfully undertaken.

The preparation of keys is a very important matter and their incorporation in a contribution adds greatly to its value. Some authors attempt, in their keys, to portray what they term a "natural classification", but it should be borne in mind that this is impossible. We know too little about the insects with which we are dealing to produce any such result. In preparing keys we arbitrarily accept one or more characters for the separation of groups and, if the key is to be useful, the characters used for each separation must be clean-cut. In any large group it will be found to be very difficult to find clean-cut characters in every case, some forms apparently going into either group although the character used may serve for the vast majority. In cases of this kind the doubtful forms should be run through both categories. In the so-called "natural" grouping it is very frequently necessary to employ characters which are not conspicuous and such keys are liable to prove very difficult to use. Characters expressing a degree of variation should be avoided wherever possible, i. e. front produced vs. front less produced. These characters may be obvious to the maker of a key but are certainly not recognizable to other students whose collections may be limited. It is usually easy to use a key if you know most of the forms but often difficult or impossible otherwise.

All keys should be dichotomous and the use of more than two alternatives should always be avoided. In a short key one may use the "a" and "aa" system but it is not to be recommended in any case. Keys so constructed are more time consuming than such as are used in the present work. In the present case an attempt has been made to

produce simple keys, amply illustrated. It must be remembered, however, that the illustrations will not serve for all species in a genus but represent, as a rule, typical forms.

No use has been made, in general, of subfamilies or subgenera. The use of such almost always calls for many exceptions and also unnecessarily encumbers the literature. A sub-family is supposedly a distinct entity within a family, a group separable upon certain characters, but that such classification is unnecessary is evidenced by the exceptions. As an example—the Tachinidæ have been divided into many sub-families, or even families, upon such characters as the absence of abdominal bristles, shape of head, etc., etc., but there is not a single character, nor for that matter group of characters, upon which any of these groupings may be retained. Many of the characters in this family are excellent up to a certain point, but every character falls down, not once, but in many instances throughout the family. It is entirely impossible to separate the Tachinidæ and Dexiidæ, just as it is to separate the Muscidæ, Anthomyidæ and Scatophagidæ.

Subgenera are superfluous. They are proposed as a rule because the author hopes that some day some character may be found upon which a distinct genus may be based. It is well to remember that in nature there is no such thing as a subgenus, genus or family. Their use is a human creation made possible because links connecting the groups have either entirely disappeared or have not been discovered by man. Genera are therefore artificial and the answer to the question of "what is a genus?" is that it is something limited in some way by some one. This may sound facetious but it is not meant to be so. The truth is that certain arbitrary characters have been set up, all the species falling within the limits set forth constituting a genus (or a species or family). It is presumed, but by no means certain that connecting links do not exist.

Many people describe sub-species, varieties, races, forms, etc., especially in the Lepidoptera, but, fortunately, the fad has not become extensive in Dipterology and it is to be hoped that it may never do so. In actual fact there is no difference in a sub-species, race or variety. A variety is something which differs from the typical or first described form in some definite way. They are explained as potential species, ignoring the fact that no two specimens are exactly alike and that if two extremes of similar type should mate a new race would be formed. In each batch of eggs there are produced forms possessing characters somewhat different from the parents. But the species does not change because the average is maintained by the resultant mating. It is only when forms become more or less isolated that a definite trend occurs and

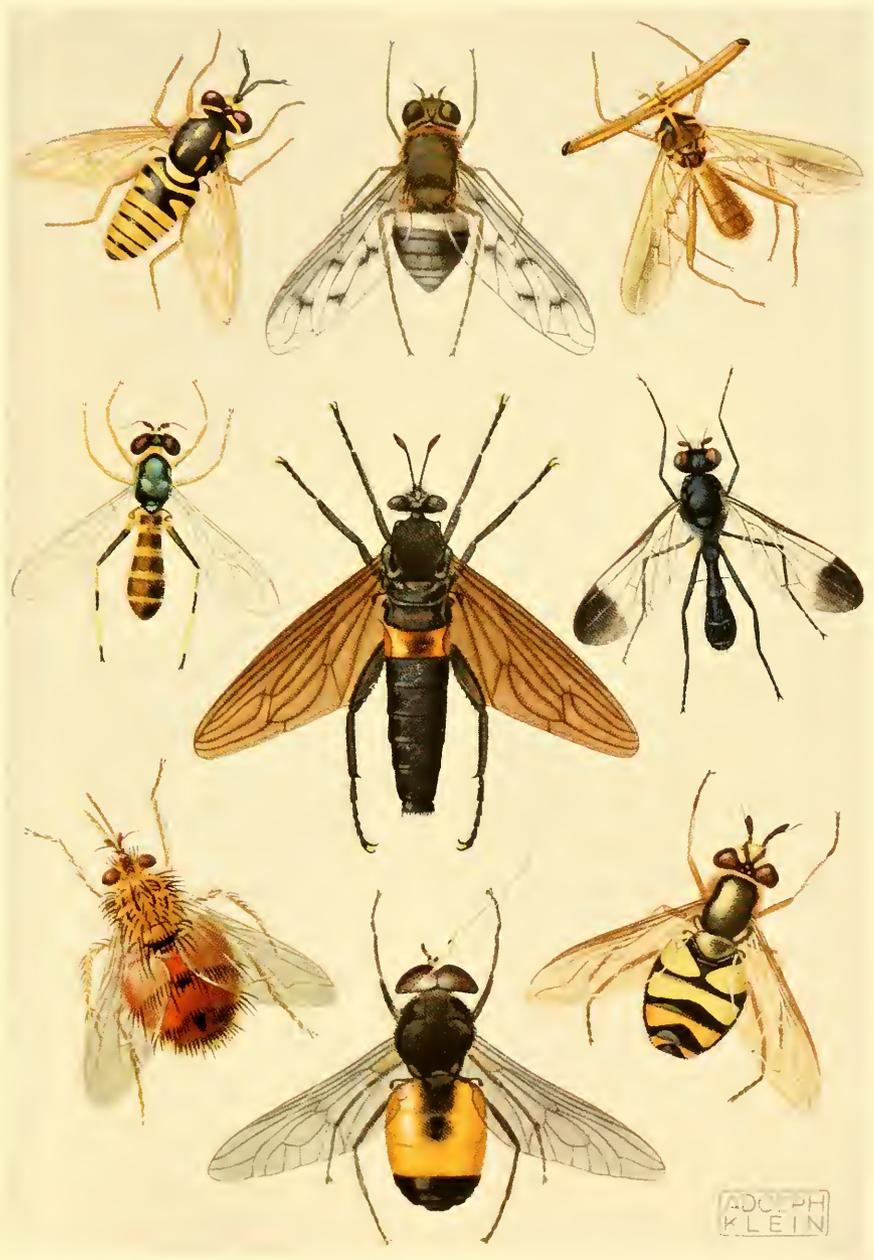
so-called races (supposedly geographic forms) are developed. In such cases connecting or transition forms usually occur and it is almost always true that the races, say northern and southern, are connected in the intervening region by a perfect transition of the characters of the two races. Races are interesting but it is not necessary to give them names. Moreover, "variety" was used in the same sense long before people thought of "races" for biological classification and I think we may extend the law of priority and use it in this sense, thus eliminating "race" and "sub-species".

The naming of aberrations, transition forms and such things should be beyond the pale in true science and such a practice must eventually result in ridicule of the science as a whole. It is, of course, very necessary to call attention to these forms but to name them is utterly needless. Knowledge of them is essential in tracing out the relationship and development of species, and of great interest, too, but we should not lose our perspective and attach exaggerated importance to names.

How to Use the Keys

The use of keys is not a difficult matter but there may be some who have not had experience with them. Some keys may not be altogether simple and may not run as smoothly as others. To find the genus to which your specimen belongs turn to the table of families (on the following page) and read over couplet 1. Two alternatives are given: the insect must go in either section. If it has large wings you go to couplet 2 and you repeat the process until it is found that your specimen comes to a section where it agrees with the diagnosis ending in a family name. You have now found the "family", but to be sure read over the other alternative so that the characters in both may be checked. Now turn to the family indicated and continue in the same way until the genus is reached.

It should be remembered that keys are merely guides and the fact that a species traces out to a certain place in a key is no guarantee that it actually belongs there. If one is familiar with the genera of a family he may be reasonably certain either that the insect belongs where it traces or that it is quite different; in either case he should check with descriptions of genera not included in the key or with the genus included, either by means of determined specimens or with the generic description. If a specimen does not seem to agree with the genus to which it traces check back and try one of the other alternatives since there may have been an error in interpretation of the characters used or the specimen may be one that is somewhat aberrant.



Sphcomomyia vittata Wied.
(Syrphidae)

Alophia cingulata Schiner.
(Stratiomyidae)

Dejeania vezatrix O. S.
(Tachinidae)

Hyperalonia helva Eriehs.
(Bombyliidae)

Mydas claratus Fabr.
(Mydidae)

Tabanus cinctus Drury.
(Tabanidae)

Richardia telescopica Gerst.
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Superfamily Tipuloidea

These are the "Crane Flies" and include the families Tanyderidæ, Ptychopteridæ, Trichoceridæ, Tipulidæ and Anisopodidæ. The first four mentioned families are characterized by the presence of a V-shaped suture on the mesonotum, and have, until recent years constituted the family Tipulidæ. In the Ptychopteridæ this suture is more or less obsolete posteriorly where it extends into the precutellar depression but its form is always very well marked. The inclusion of the Anisopodidæ with the Crane-Flies may be questioned by some students of the Order. I think the question is a debatable one: at any rate, the family seems to form more or less of a connecting link between the Tipulids and Mycetophilids.

The manuscript for the Tipuloidea has been prepared by Dr. C. P. Alexander and this fact assures the student of thorough and accurate keys together with the latest views on generic limits and classification. The study of this group might almost be said to be a "world apart" in the study of Diptera and I cannot fully express my gratitude to Dr. Alexander for the service he has rendered in preparing this part of the work.

Family Tanyderidæ—The Primitive Crane Flies

Generalized flies of medium size, usually with a handsomely banded wing-pattern. Mouthparts often produced. Antennæ with from 15 to 25 segments; flagellar segments simple, cylindrical. Eyes with erect setæ between ommatidia; ocelli lacking. Latero-cervical sclerites sometimes greatly elongated, short in the local species. Wings with five branches of Radius reaching the margin (*Fig. 11); most genera with one or two supernumerary crossveins in the outer radial or medial fields, these never exceeding two in any one genus, usually with a single such element. Male hypopygium with a single dististyle, usually simple, weakly bifid in the two regional genera. Aedeagus trifid.

The immature stages occur in sandy soil at margins of major streams, the larva being aquatic or nearly so.

There are 23 recent species of Tanyderidæ, distributed in 10 genera, chiefly Australasian in distribution. Two genera with three species occur in North America.

KEY TO GENERA

1. A supernumerary crossvein in cell M_3 of the wing (*Fig. 11).

Protoplasa Osten Sacken

Wings without supernumerary crossveins.....*Protanyderus* Handlirsch

The most important recent literature is as follows:

Alexander, C. P.

1919. The crane-flies of New York. Part I. Distribution and taxonomy of the adult flies. Cornell Univ. Agr. Expt. Sta., Mem. 25: p. 883, 1 fig.

1927. Diptera. Fam. Tanyderidæ. Genera Insectorum, Fasc. 189.

1930. Observations on the Dipterous family Tanyderidæ. Proc. Linn. Soc. New South Wales, lv, pp. 221-230, 2 pls., 1 fig. (larva and pupa).

Crampton, G. C.

1925. A phylogenetic study of the thoracic sclerites of the non-Tipuloid Nematocerous Diptera. Ann. Ent. Soc. America, xviii, pp. 49-74, 5 pls.

1926. The external anatomy of the primitive Tanyderid Dipteran *Macrochile spectrum* Læw, preserved in Baltic Amber. Bull. Brooklyn Ent. Soc., xxi, pp. 1-14, 2 pls.

- 1930a. Some anatomical details of the pupa of the archaic Tanyderid Dipteran *Protoplasa fitchii* O. S. Proc. Ent. Soc. Washington, xxxii, pp. 83-98, 3 pls.

- 1930b. A comparison of the more important structural details of the larva of the archaic Tanyderid Dipteran *Protoplasa fitchii*, with other Holometabola, from the standpoint of phylogeny. Bull. Brooklyn Ent. Soc., xxv, pp. 239-258, 4 pls.

Williams, Inez

1933. The external morphology of the primitive Tanyderid Dipteran *Protoplasa fitchii* O. S., with notes on the other Tanyderidæ. Journ. N. Y. Ent. Soc., xli, pp. 1-36, 7 pls. (anatomy of adult; comparative wing-figures of all genera of Tanyderidæ).

Family Ptychopteridæ—The False Crane Flies

Antennæ elongate, with 16 (Ptychopterinæ) to 20 segments (Bittacomorphinæ); flagellar segments cylindrical. Suture between prae-scutum and scutum obsolete—posteriorly. Wings with R_2 preserved as a distinct element, lying far distad, subequal in length to R_{3+4} ; three branches of Radius reach margin; two or three branches of Media; a single Anal vein (*Fig. 12).

The immature stages occur in saturated organic earth, the larvæ with an elongate caudal breathing-tube, the pupæ with a single greatly elongated pronotal breathing-horn.

There are two subfamilies, with 3 genera, *Ptychoptera* with 24 species, *Bittacomorphella* with 3 species, *Bittacomorpha* with 2 species. In the New World, the family is found only in the Neartic region, all genera being found on the eastern and western coasts but rare or lacking in the plains region.

KEY TO GENERA

1. Antennæ 16-segmented; wings with cell M_1 present (*Fig. 12); (Ptychopterinæ) **Ptychoptera** Meigen
Antennæ 20-segmented; wings with cell M_1 lacking; (Bittacomorphinæ) .. 2
2. Wings with macrotrichia in distal ends of radial and medial cells; basitarsi of legs not dilated **Bittacomorphella** Alexander
Wings without macrotrichia in cells; basitarsi of legs conspicuously dilated **Bittacomorpha** Westwood

The latest literature on the family:

Alexander, C. P.

1919. The crane-flies of New York. Part I. Distribution and taxonomy of the adult flies. Cornell Univ. Agr. Expt. Sta., Mem. 25, pp. 884-886, figs. 2-4.
1920. The same, Part II. Biology and Phylogeny. Ibid., Mem. 38, pp. 772-787, pls. 14-18, incl. (larva and pupa).
1927. Diptera. Fam. Ptychopteridæ. Genera Insectorum, Fasc. 188, pp. 1-12, 1 pl.

* Plate II, Tipuloidea.

Family Trichoceridæ—The Winter Crane Flies

Small or medium-sized flies of slender build, the antennæ elongate, setaceous. Three ocelli. Wings with m-cu lying far distad; two complete Anal veins, 2nd A very short, incurved to anal angle, slightly longer and more extended in *Diazosma*. Male hypopygium with a single dististyle, this cylindrical or with a variously developed lobe on basal portion of mesal face. Ovipositor with cerci upcurved, the convexity being on the ventral surface.

The so-called "winter crane flies" are most numerous in Spring and Fall, though sometimes abundant during mild days of Winter. They are usually found in large to small swarms in the open, but may be found in cellars, mines and similar places. The immature stages occur in decaying vegetable matter.

There are 4 valid genera with about 45 described species. *Trichocera* is essentially a genus of the northern Hemisphere; *Diazosma* is represented only by 2 species, with a wide distribution in the Holarctic region. *Paracladura* has several species in New Zealand and Chile, with a few others in eastern Asia; a single species (*trichoptera* O.S.) is found on our Pacific coast.

KEY TO GENERA

1. Wings with vein 2nd A subsinuate, not short and curved abruptly into the anal angle; north temperate.....*Diazosma* Bergroth
Wings with vein 2nd A short, curved abruptly into the anal angle..... 2
2. Tibial spurs present; tarsi with basitarsus longer than segments 2 and 3 taken together; (* fig. 13); north temperate to arctic. *Trichocera* Meigen
Tibial spurs lacking; basitarsus very short, only two or three times as long as wide, shorter than the third tarsal segment; western. *Paracladura* Brunetti

The most important recent literature:

Alexander, C. P.

1919. The crane-flies of New York. Part I. Distribution and taxonomy of the adult flies. Cornell Univ. Agr. Expt. Sta., Mem. 25, pp. 887-888, figs. 165, 166.
1920. The same. Part II. Biology and Phylogeny. Ibid. Mem. 38, pp. 789-791, pl. 19 (larva and pupa).
1926. The Trichoceridæ of Australia (Diptera). Proc. Linnean Soc. New South Wales, 51, pp. 299-304, 11 figs. (key to genera).

* Plate II, Tipuloidea.

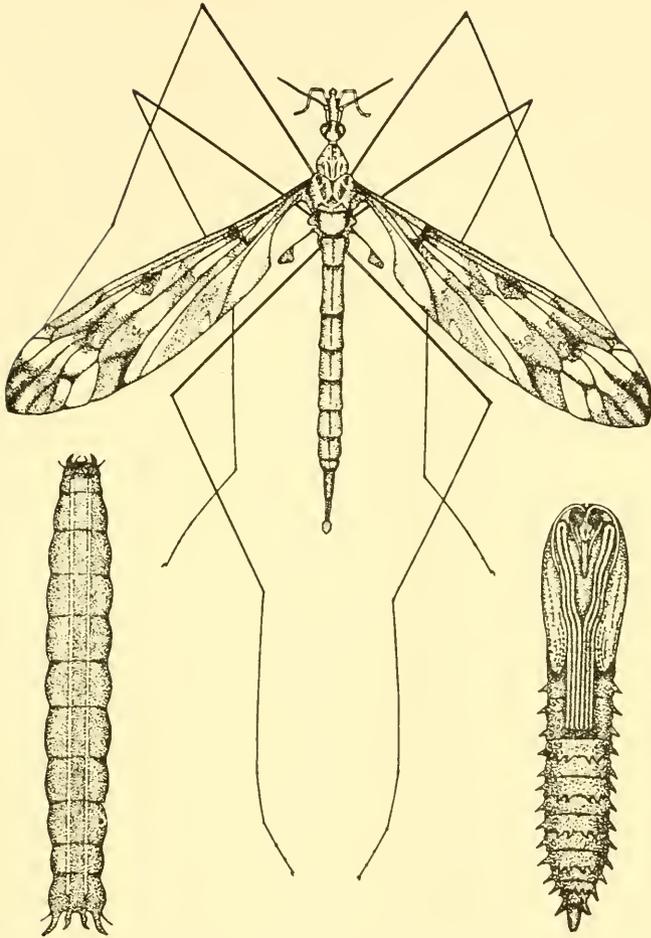
Edwards, F. W.

1928. Diptera. Fam. Protorhyphidæ, Anisopodidæ, Pachyneuridæ, Trichoceridæ. Genera Insectorum, Fasc. 190, pp. 1-41, 2 pls.

Rhynehart, J. G.

1925. The larva and pupa of *Trichocera regelationis* L. Proc. Belfast Nat. Hist. and Phil. Soc., sess. 1922-1923, pp. 3-14, pls. 1-3.

Family Tipulidæ—The Crane Flies

*Tipula trivittata*—adult, larva, pupa.

The present family, commonly called "crane flies", includes slender-bodied flies, having long to very long, unusually brittle legs that break readily between the trochanter and femur. From allied families of Nematocera, they are readily told by the lack of ocelli, two Anal veins, and the presence of the so-called V-shaped suture between the mesonotal praescutum and scutum. In many species there is a closed discal (1st M_2) cell. In size, the various species show a range almost as great as that found in the entire order, from tiny flies with a wing-

length of about 2 millimeters (as *Dasymolophilus*) to gigantic forms with a wing-length in excess of 45 millimeters (*Ctenacrosscelis*).

Rostrum sometimes greatly elongated, in some (*Elephantomyia: Toxorhina*) produced by a great lengthening of the front, the reduced mouthparts being at the extreme tip; in others (*Limonia: Geranomyia*) the similarly greatly lengthened mouthparts consist chiefly of the labial palpi. In most Tipulidæ the rostrum is short to very short. In many Tipulinæ it is further tipped by a small nose-like point, the *nusus*. Maxillary palpi ranging in number of segments from 1 (some *Limonia* and *Hexatoma: Conosia*) to the normal number of 4. Antennæ ranging in number of segments from 6 (*Hexatoma*) to 39 (*Gynoplistia: Cerozodia*); sometimes very greatly lengthened in males, being one or more times the length of the entire body (*Megistocera: Macromastix; Hexatoma: Eriocera; Rhabdomastix*); sometimes with branched flagellar segments (many Tipulinæ; some Cylindrotominæ; a few Limoniinæ, as *Limonia: Rhipidia* and *Gynoplistia*); pedicel shorter than scape (except in some Eriopterine Claduraria); sometimes the basal flagellar segments united into a fusion-segment (Claduraria, Toxorhinaria). Eyes with ommatidia variable in size and coarseness; sometimes holoptic (*Limonia*), usually broadly dioptic. Pedicini with short erect setæ between ommatidia.

Pronotum sometimes lengthened (some *Limonia, Toxorhina*). Præscutum sometimes produced cephalad over pronotum (*Conosia, Trentepohlia*). Paired double dots, the *tuberculate pits*, often present, one on either side of midline on cephalic half of præscutum. *Pseudosutural foveae* often present as shiny depressions on humeral portion of præscutum. Postnotal pleurotergite sometimes produced into a tubercle (some Tipulinæ). Halteres long to very long. Legs with trochanters short, rarely lengthened (*Atarba, Rhabdomastix*); tibiæ with or without terminal spurs; claws simple or variously toothed (*Limonia, Tipula*). Wings of various shapes, sometimes long and narrow, the anal angle correspondingly reduced (some *Limonia*), sometimes with the region squarely developed (*Antocha*). In cases, a pale longitudinal fold in cell Cu of wings (*Dicranoptycha*). The details of venation are not discussed here, having been thoroughly considered by the present writer in recent papers that are cited in the morphological bibliography at end of paper and which may be consulted for details. The chief premise of the interpretation of the radial field is that the so-called radial cross-vein, r, of the Comstock-Needham system, has never been developed in the Diptera, the vein that has been so interpreted in the few families where it is found being the transverse free portion of R₂. The anterior branch of the radial field is labelled R₁₊₂, except in the subtribe Limoni-

aria, where the free tip of vein Se_2 has migrated along vein R_1 to occupy the extreme tip of the vein. A series of diagrams (Figs. 3 to 10) indicates this tendency, which involves many hundreds of species in the vast genus *Limonia*. The medial and cubital fields are interpreted according to the Tillyard modification of the Comstock-Needham system.

Male hypopygium usually simple, the basistyles (coxites) bearing the dististyles (styles) at or near apex. Aedeagus and its subtending gonapophyses furnishing characters of paramount importance for specific determination. A dorsal lobe of the basistyle, the interbase, sometimes present. Ovipositor with the tergal valves (cerci) lengthened, heavily sclerotized, usually gently to strongly upcurved, exceeding the short, straight sternal valves (hypovalvæ); in a few cases (as some Tipulinæ; *Cylindrotomina*; *Styringomyia* and others), the valves of the ovipositor are short and fleshy.

Tipulidæ are great lovers of moist conditions, being chiefly restricted by humidity. Species have been taken within 600 miles of the North Pole, while others occur at altitudes of over 17,000 feet in Thibet. The majority of the species occupy the intermediate zone, the family being very numerous in species in all temperate parts of the World and similarly numerous in the subtropical and temperate portions of the mountainous regions of the Tropics. Lowland tropical species are fewer in number and are apt to have a very wide distribution. The lesser oceanic islands are practically devoid of the larger crane flies (Tipulinæ) while having numbers of species of the small fragile Limoniinæ (as *Limonia*, s.l.; *Styringomyia*; *Gonomyia*; *Lipophleps*; *Trentepohlia*). Under rigorous conditions, as the arctic, wind-swept coasts, high mountains and the like, species with reduced wings are frequently found, being most numerous in the female sex. The greatest reduction of wings is found in *Chionca*, which is virtually apterous in both sexes.

The Tipulidæ of the World now include more than 6000 species, arranged in 283 genera and subgenera (Tipulinæ, 76, *Cylindrotomina*, 9; Limoniinæ, 198, the latter further distributed in the following tribes: Lechriini, 4; Limoniini, 37; Pedicini, 12; Hexatomini, 70, and Eriopterini, 75). Representatives of all three subfamilies and of all tribes with the exception of the Lechriini occur in the area under consideration.

Keys available for the identification of the adult flies are very few in number. The writer's preliminary study on the "Crane flies of New York", is now seriously out-of-date due to the great additions made in intervening years. The forthcoming volume on Diptera in the "Insects of Connecticut" series will largely supersede the earlier work. Both of these reports are restricted to the area embraced in northeastern

North America. No keys are available for most of the groups in other regions of the continent, with the exception of the papers listed in the bibliography on certain groups of Tipulidæ, which are lessened in value due to the great additions that have been made in later years.

KEYS TO SUBFAMILIES AND TRIBES, GENERA, ETC.

1. Terminal segment of maxillary palpus elongate, whiplash-like; nasus usually distinct; antennæ usually with 13 segments; wings with Sc_1 usually atrophied; vein Cu_1 constricted at m-cu, the latter usually at or close to fork of M_{3+4} (1, 17 to 20); body-size usually large. (Tipulinæ) 2
- Terminal segment of maxillary palpus short; no distinct nasus; antennæ usually with 14 or 16 segments; wings with Sc_1 present, its extreme tip atrophied in some *Cylindrotomina*; vein Cu_1 straight, not constricted at m-cu, the latter placed far before the fork of M_{3+4} , usually at or close to fork of M (21 to 44); body-size usually small or medium. 19
2. Legs unusually long and filiform; wings with vein R_{1+2} atrophied and with Sc_2 ending in Sc close to origin of Rs (*Dolichozepeza*, 19), when R_{1+2} is preserved (*Brachypremna*, 18; *Tanypremna*; *Megistocera*, 17), vein Sc is very long, Sc_1 reaching C as a distinct element some distance beyond fork of Rs and with cell 2nd A usually very narrow (*Dolichozepezaria*) 3
- Legs of normal stoutness for the family; wings with vein R_{1+2} preserved (20); when atrophied (a few species of *Tipula*) with Sc of moderate length, Sc_1 atrophied before fork of Rs and Sc_2 ending at or near midlength of Rs (exception, some species of *Longurio*); cell 2nd A of normal width. 8
3. Wings with origin of vein M_4 basad of that of M_{1+2} ; R_{2+3} angularly bent at near midlength (17); tropical, subtropical.

Megistocera Wiedemann

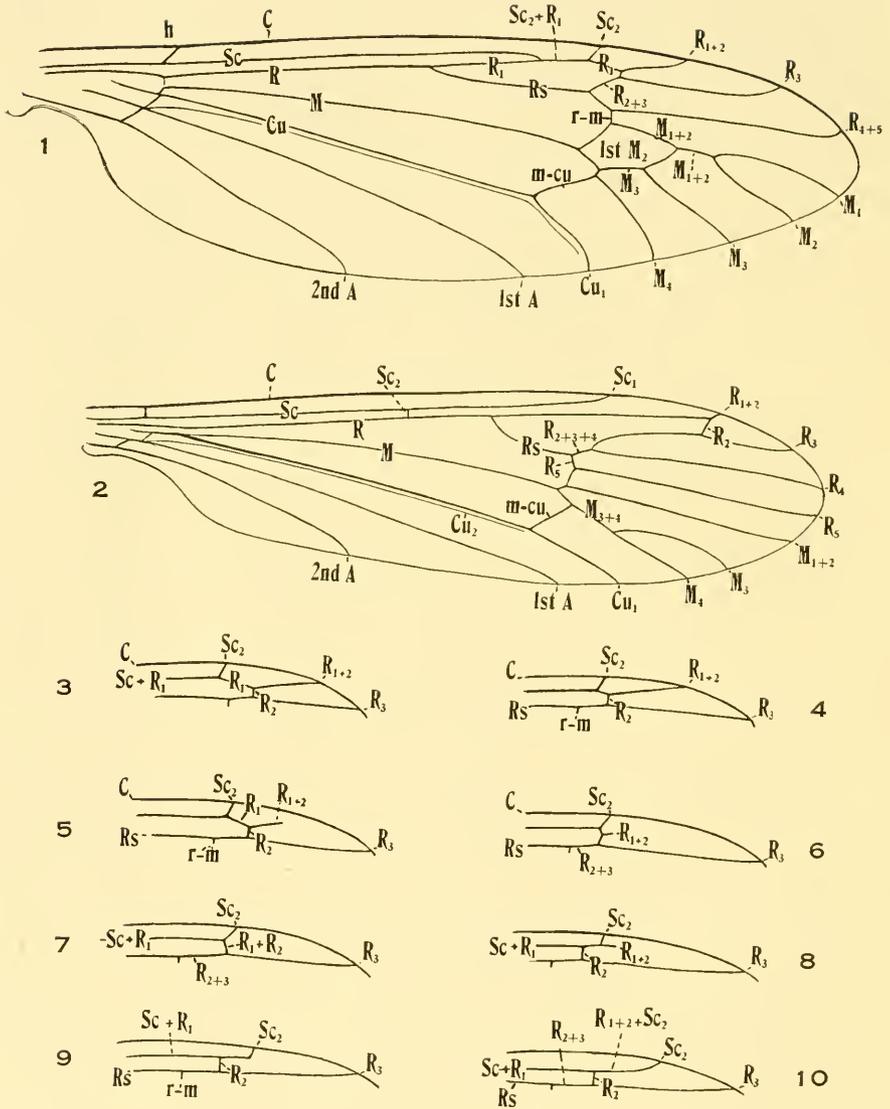
Wings with origin of vein M_4 distad of that of M_{1+2} , usually far beyond; R_{2+3} straight or nearly so, not angulated. 4
4. Wings with R_{1+2} pale, perpendicular to R_{2+3} ; Rs strongly arcuated at origin (18).....*Brachypremna* Osten Sacken
- Wings with R_{1+2} , when present, oblique; Rs straight or gently arcuated throughout length, sometimes very short and transverse. 5
5. Rs of moderate length, subequal to m-cu; Sc long, Sc_1 preserved, ending beyond fork of Rs ; R_{1+2} pale but preserved; tropical.

Tanypremna Osten Sacken

Rs short, transverse, simulating a crossvein, about equal in length to one-half m-cu; Sc unusually short, Sc_1 atrophied, Sc_2 entering Sc before to just beyond origin of Rs ; R_{1+2} atrophied. (*Dolichozepeza*) 6
6. Wings with cell 1st M_2 open by atrophy of basal section of M_3 , the outer medial field thus appearing pectinately branched (19); temperate*Dolichozepeza: Dolichozepeza* Curtis
- Wings with cell 1st M_2 closed. 7
7. Cells beyond cord with abundant macrotrichia; tropical.

Dolichozepeza: Megistomastix Alexander

Cells beyond cord glabrous; temperate....*Dolichozepeza: Orozepeza* Needham



Tipuloidea, Plate I.

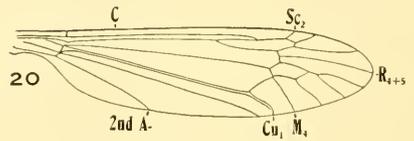
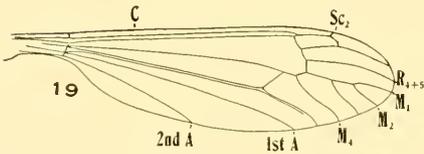
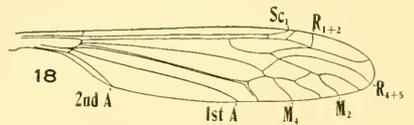
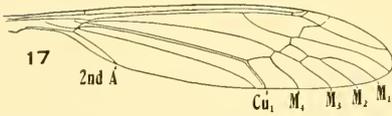
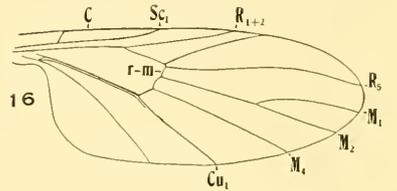
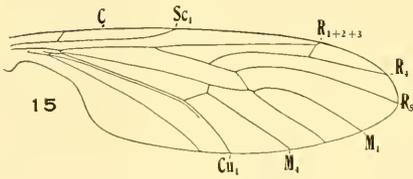
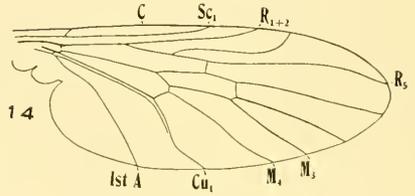
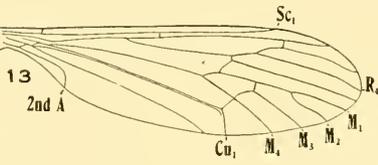
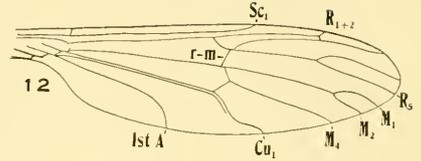
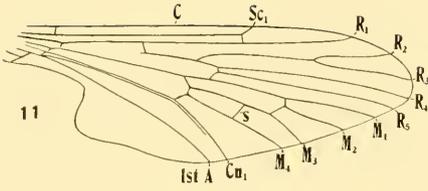
EXPLANATION OF PLATE

1. *Tanyptera fumipennis*, venation.
2. *Dicranota (Plectromyia) modesta*, venation.
- 3-10. A series of diagrams to illustrate the modification of the outer subcostal and radial fields of the wing, as found in the Tipulinæ, *Cylindrotominæ*, *Lechriini* and *Limoniini*.
3. The type found in the *Orimargaria*: Sc_2 preserved, R_{1+2} complete, attaining the wing-margin.
4. A further development of 3. Sc_2 has moved distad, shortening R_1 ; R_{1+2} still entire.
5. Condition as in 4 but with tip of R_{1+2} atrophied. Found in several *Orimargaria*, *Limoniaria*.
6. An accentuation of 5. The atrophy of R_{1+2} is still greater, R_1 more shortened and more or less in transverse alignment with the free tip of Sc_2 . Condition found in numerous *Limoniaria*.
7. A still further modification of 5. The atrophy of R_{1+2} is now complete and R_1 is in direct transverse alignment with R_2 , both in turn being in transverse alignment with the free tip of Sc_2 . This is the commonest type in the *Limoniaria*, being found in most members of the following subgenera of *Limonia*,—*Dicranomyia*, *Geranomyia* and *Rhipidia*, as well as in some *Limonia*, s.s.
8. A type that reverts back to condition 5, with a long spur of R_{1+2} persisting, with the free tip of Sc_2 migrated distad along this spur to lie beyond the level of R_2 . A condition found in several subgenera of *Limonia*, as *Peripheroptera*, *Limonia* and *Libnotes*.
9. A further modification of 8, where Sc_2 has migrated to the extreme tip of the spur of R_{1+2} but still forms a rectangular bend. *Limonia*: *Libnotes*.
10. The culmination of the series, where the free tip of Sc_2 has migrated to the extreme tip of the spur of R_{1+2} and then bends to the costal margin at a gently oblique angle. This condition is common in many *Limonia* of the subgenera *Limonia* and *Discobola*.

EXPLANATION OF SYMBOLS

Comstock-Needham system, as modified by Alexander and Tillyard

C = Costa; Cu = Cubitus; 1st M_2 = cell 1st M_2 ; M = Media; m-cu = medial-cubital crossvein; R = Radius; r-m = radial-medial crossvein; Rs = Radial sector; s = supernumerary crossvein; Sc = Subcosta; A = Anal veins.



Tipuloidea, Plate II.—11. *Protoplasma fitchii*, venation; 12. *Ptychoptera rufocincta*, venation; 13. *Trichocera colei*, venation; 14. *Anisopus alternatus*, venation; 15. *Axymyia furcata*, venation; 16. *Mycteboia divergens*, venation; 17. *Megistocera longipennis*, venation; 18. *Brachypremna dispellens*, venation; 19. *Dolichopeza (Dolichopeza) americana*, venation; 20. *Tipula (Tipula) dorsomacula*, venation.

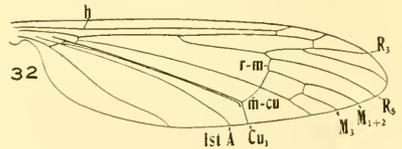
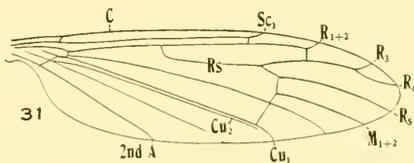
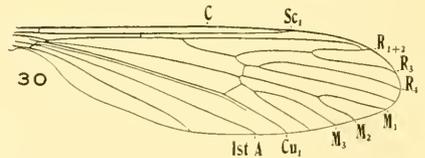
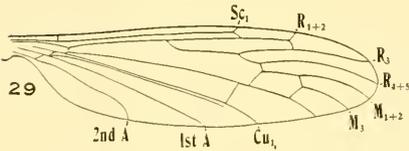
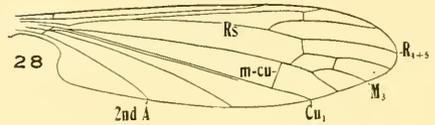
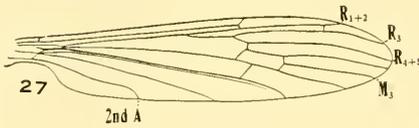
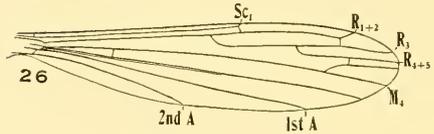
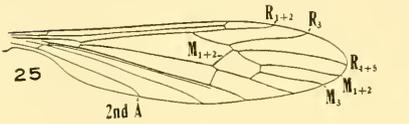
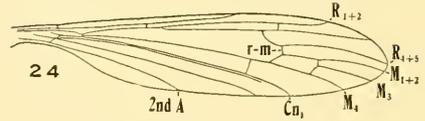
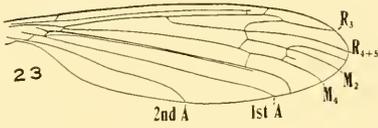
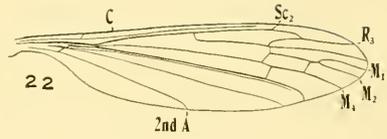
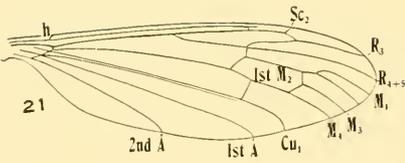
18. Wings with macrotrichia in apical cells...**Tipula: Trichotipula** Alexander
 Wings with cells glabrous.....**Tipula: Tipula** Linnæus
19. Wings with tip of R_{1+2} atrophied, giving the appearance of a long fusion back from margin of veins R_1 and anterior branch of R_s ; free tip of Sc_1 preserved (21, 22, 23) (*Cylindrotominæ*)..... 20
 Wings sometimes with tip of R_{1+2} atrophied (some *Limoniini*) but not giving the appearance of a long fusion backward from margin of veins R_1 and anterior branch of R_s ; free tip of Sc_2 preserved in many species of tribe *Limoniini*, lacking in other tribes in this fauna (24 to 44) (*Limoniinæ*)..... 24

CYLINDROTOMINÆ: GENERA

20. Head and intervals of mesonotal præscutum with numerous deep punctures; a deep median groove on præscutum... **Triogma** Schiner
 Head and intervals of mesonotal præscutum smooth; no median præscutal groove 21
21. Three branches of Radius reach the margin, R_{1+2} being preserved as a distinct element **Phalacrocera** Schiner
 Two branches of Radius reach the margin, R_{1+2} being entirely atrophied, giving the appearance of a long backward fusion of veins R_1 and anterior branch of R_s (21-23)..... 22
22. Four branches of Media reach the margin (21)..**Cylindrotoma** Macquart
 Three branches of Media reach the margin..... 23
23. Wings with crossvein r-m present; outer end of cell 1st M_2 almost always closed by a single transverse vein, cell M_1 being present, sessile to short-petiolate; cells 2nd M_2 and M_3 confluent by atrophy or partial atrophy of distal section of vein M_3 ; antennæ nearly simple, the lower face of individual segments not produced (22, 23)**Phalacrocera** Schiner
 Wings with crossvein r-m usually shortened to quite obliterated by the approximation or fusion of veins R_{1+3} and M_{1+2} ; outer end of cell 1st M_2 closed by two transverse veins, these being M and the basal section of M_3 ; cell M_1 lacking, cells 2nd M_2 and M_3 distinct; antennæ strongly nodulose, especially in male, the individual flagellar segments nearly cordate.....**Liogma** Osten Sacken

TRIBES OF LIMONIINÆ

24. Eyes hairy; wings with vein Sc_1 very long, Sc_2 lying basad of origin of R_s (2, 30). (*Pediciini*)..... 41
 Eyes glabrous; wings with Sc_1 short or of moderate length, when long (some *Eriopterini*), Sc_2 lying distad of origin of R_s ; where Sc_2 lies basad of origin of R_s (some *Limoniini*, *Eriopterini*), the entire vein Sc_1 is shortened..... 25
25. Wings with free tip of Sc_2 often present; veins R_1 and R_5 fused to margin, only two branches of R_s being present; antennæ usually with 14 (*Limoniaria*) or 16 segments; (1-10, 24-29) (*Limoniini*).. 27
 Wings with free tip of Sc_2 atrophied; veins R_1 and R_5 separate, the former usually transferred to the upper branch, R_{2+3} , to form a distinct element R_{2+3+4} ; usually with three branches of R_s present (except in *Atarba*, *Elephantomyia*, *Styringomyia*, *Teucholabis*, *Gonomyia* and *Toxorhina*, where R_1 is captured by R_{2+3} , as above); antennæ usually with 16 segments; (31-41)..... 26

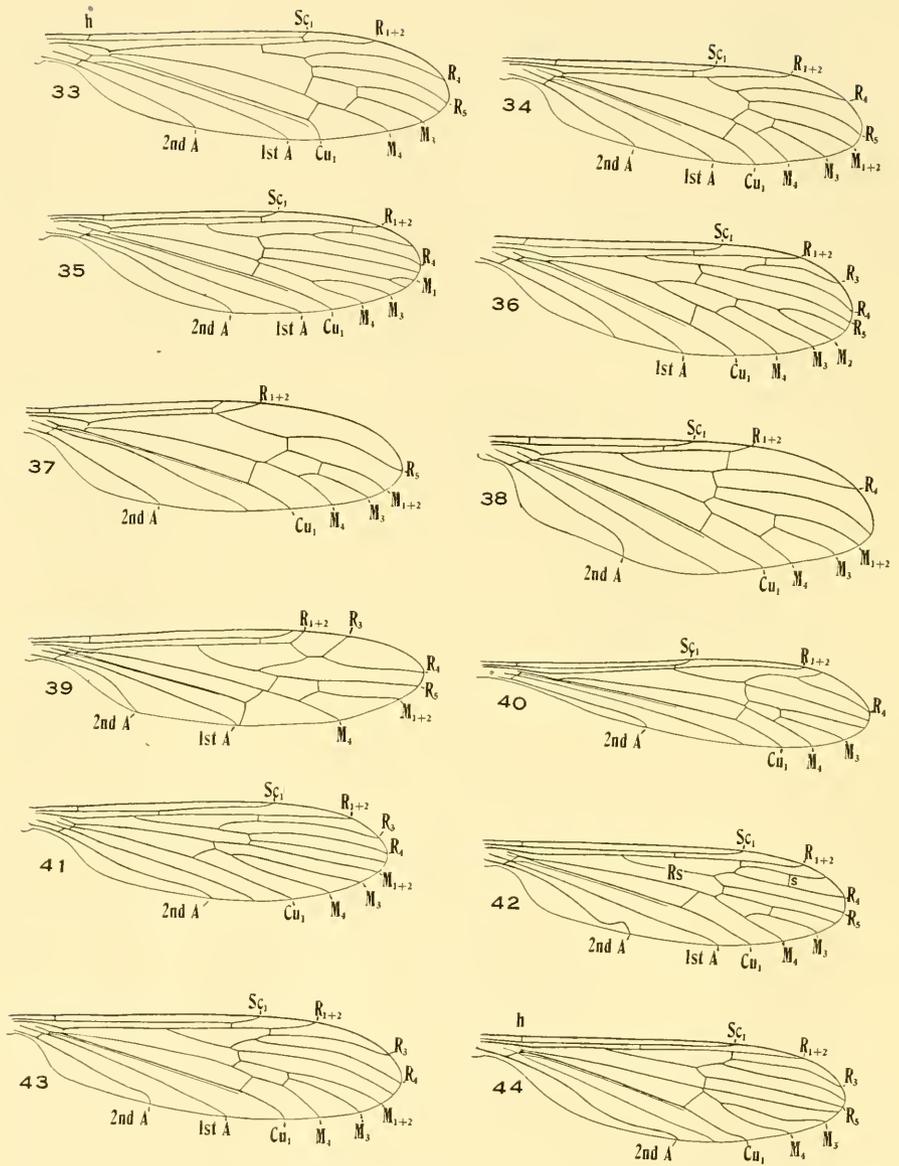


Tipuloidea. Plate III.—21. *Cyldrotoma tarsalis*, venation; 22. *Phalacrocera tipulina*, venation; 23. *Phalacrocera occidentalis*, venation; 24. *Elliptera tennessa*, venation; 25. *Helius flavipes*, venation; 26. *Orimarga (Diotrepha) mirabilis*, venation; 27. *Dicranoptycha tigrina*, venation; 28. *Antocha saxicola*, venation; 29. *Limonia (Limonia) inmaturna*, venation; 30. *Pedicia (Tricyphona) protea*, venation; 31. *Hexatoma (Hexatoma) megacera*, venation; 32. *Hexatoma (Eriocera) longicornis*, venation.

26. Tibial spurs present. (Hexatomini)..... 51
 Tibial spurs lacking. (Eriopterini)..... 78

LIMONIINI: SUBTRIBES, GENERA, SUBGENERA

27. Wings with vein R_2 lacking (25)..... 28
 Wings with vein R_2 present (24, 26, 29)..... 29
28. Rostrum short and inconspicuous; R_s long and straight, running close to R_1 and in alignment with R_{2+3} ; r-m distinct. (Ellipteraria).
 Elliptera Schiner
 Rostrum of moderate length, about equal in length to remainder of head; R_s short, gently arcuated, not in alignment with R_{2+3} ; r-m often shortened or obliterated by approximation of adjoining veins (25). (Heliaria) **Helius** St. Fargeau
29. Wings with m-cu more than three, (and usually much more), times its own length before the fork of M (26). (Orimargarina, Orimarga) 30
 Wings with m-cu close to or beyond the fork of M, if before, the distance not or scarcely exceeding the length of the vein itself (24, 27, 29) 31
30. Wings with three branches of Media reaching margin, cell M_3 being present; m-cu beneath R_s **Orimarga: Orimarga** Osten Sacken
 Wings with two branches of Media reaching margin, cell M_3 lacking; m-cu far before origin of R_s (26)..... **Orimarga: Diotrepha** Osten Sacken
31. Wings with vein R_2 lying far distad, beyond level of outer end of cell 1st M_2 ; m-cu beyond fork of M (27) (Dicranoptycharia).
 Dicranoptycha Osten Sacken
 Wings with vein R_2 in almost transverse alignment with r-m and basal half of cell 1st M_2 ; m-cu at or slightly before fork of M (24, 28, 29) 32
32. Wings with R_s long and straight (24, 28); antennæ 16-segmented... 33
 Wings with R_s shorter and more arcuated (21); antennæ 14-segmented. (Limoniaria, Limonia)..... 34
33. Anal angle of wing very prominent, almost square; R_s long, diverging at an acute angle from R_1 , ending approximately between the branches of R_s or in alignment with R_{4+5} (28) (Antocharia).
 Antocha Osten Sacken
 Anal angle of wing normally rounded; R_s long, lying very close to R_1 and nearly parallel to it, its end in alignment with R_{2+3} ; basal section of R_{4+5} short and arcuated, diverging from the end of R_s at nearly a right angle (24) (Ellipteraria)..... **Elliptera** Schiner
34. Wings with M and both sections of M_3 lacking, cell M_3 thus entirely obliterated **Limonia: Alexandriaria** Garrett
 Wings with at least the distal section of M_3 preserved and usually with both sections, together with m, cell M_3 thus usually present (29) 35
35. Supernumerary crossveins present in certain cells of wing..... 36
 No supernumerary crossveins in cells of wing (excepting a weak element sometimes evident in cell Sc) (29)..... 37



Tipuloidea, Plate IV.—33. *Elephantomyia westwoodi*, venation; 34. *Atarba (Atarba) picticornis*, venation; 35. *Polymera (Polymera) rogersiana*, venation; 36. *Prolimmophila areolata*, venation; 37. *Toxorhina (Toxorhina) muliebris*, venation; 38. *Teucholabis (Teucholabis) complexa*, venation; 39. *Trentepohlia (Paramongoma) bromeliadicola*, venation; 40. *Gonomyia (Gonomyia) subciurea*, venation; 41. *Molophilus nitidus*, venation; 42. *Helobia hybrida*, venation; 43. *Gnophomyia tristissima*, venation; 44. *Erioptera (Erioptera) septentrionis*, venation.

47. Cell 1st M_2 closed; eastern.....**Dicranota: Eudicranota** subg. n.
Cell 1st M_2 open by atrophy of m..... 48
48. Cell M_1 lacking**Dicranota: Paradicranota** subg. n.
Cell M_1 present**Dicranota: Dicranota** Zetterstedt
49. Cell 1st M_2 closed; eastern**Dicranota: Amalopina** Brunetti
Cell 1st M_2 open by atrophy of m..... 50
50. Cell M_1 lacking (2).....**Dicranota: Plectromyia** Osten Sacken
Cell M_1 present**Dicranota: Rhaphidoiabis** Osten Sacken

HEXATOMINI: SUBTRIBES, GENERA, SUBGENERA

51. Antennæ with not more than 12 segments (**Hexatomaria**, **Hexatoma**). 52
Antennæ with more than 14 segments 54
52. Cell 1st M_2 open; two branches of M reach the wing-margin (31);
eastern.....**Hexatoma: Hexatoma** Latreille
Cell 1st M_2 closed; three or four branches of M reach the wing-
margin (32)..... 53
53. Feet snowy-white; eastern and tropical..**Hexatoma: Pentoptera** Schiner
Feet not white (32).....**Hexatoma: Eriocera** Macquart
54. Wings with only two branches of R_s present; vein R_2 lacking..... 55
Wings with three branches of R_s present; vein R_2 preserved (except
in **Phyllolabis**) 56
55. Rostrum elongate, exceeding one-half the length of the entire body
(33); (**Elephantomyia**).....**Elephantomyia** Osten Sacken
Rostrum short and inconspicuous, not exceeding the remainder of head
(34); eastern and tropical (**Atarbaria**).
Atarba: Atarba Osten Sacken
56. Apical cells of wing with macrotrichia 57
Cells of wing without macrotrichia (excepting in stigmal area)..... 61
57. A supernumerary crossvein in cell M; eastern (**Limnophilaria**).
Limnophila: Trichephelia Alexander
No supernumerary crossvein in cell M 58
58. Cell R_3 of wings sessile, subsessile or short-petiolate; R_{2+3+4} lacking
or much shorter than m-cu. (**Limnophilaria**) 59
Cell R_3 of wings long-petiolate, R_{2+3+4} being as long as or longer than
m-cu. 60
59. Wings with macrotrichia abundant, involving the cells basad of cord.
Ulomorpha Osten Sacken
Wings with sparse macrotrichia in cells beyond cord only.
Limnophila: Lasiomastix Osten Sacken
60. Small species (wing, ♂, less than 5 mm.); cell M_1 usually present; an-
tennæ short in both sexes (**Adelphomyia**)...**Adelphomyia** Bergroth
Larger flies (wing, ♂, over 6 mm.); cell M_1 lacking; antennæ of male
very long; tropical (**Limnophilaria**)**Shannonomyia** Alexander
61. A supernumerary crossvein in cell C (**Epiphragmaria**).
Epiphragma Osten Sacken
No supernumerary crossvein in cell C (35)..... 62

62. Wings with vein R_2 lacking; m-cu at outer end of cell 1st M_2 ; western.
Phyllolabis Osten Sacken
 Wings with vein R_2 present; m-cu at or before two-thirds the length
 of cell 1st M_2 , when the latter is present (35, 36)..... 63
63. Wings with cell 1st M_2 open by atrophy of m (35); male with
 elongate nodulose antennæ; tropical and subtropical.
Polymera: *Polymera* Wiedemann
 Wings with cell 1st M_2 closed; antennæ of male not nodulose..... 64
64. Wings with Sc very long, Sc_1 , R_{1+2} and R_3 all ending close together
 at costal margin; tropical *Psaronius* Enderlein
 Wings with Sc short, widely separated from either R_{1+2} or R_3 (36)... 65
65. Wings with m-cu at or close to fork of M ; anterior arculus lacking.
 (*Dactylolabaria*) *Dactylolabis* Osten Sacken
 Wings with m-cu beyond the fork of M , at from one-third to about
 one-half the length of cell 1st M_2 ; where close to fork of M (some
Pseudolimnophila) the arculus complete..... 66
66. Wings with the anterior arculus lacking (36) (*Pseudolimnophilaria*,
 in part) 67
 Wings with the anterior arculus present 68
67. Cell 1st M_2 of wings very large, its inner end lying far proximad of
 the other elements of the cord (36)..... *Prolimnophila* Alexander
 Cell 1st M_2 of wings of normal size, its inner end straight and in ap-
 proximate alignment with the elements of the anterior cord.
Archilimnophila, g. n.
68. Wings with Sc relatively short, Sc_1 ending before the level of the fork
 of R_3 ; where slightly longer (*Limnophila albipes* Leonard) the pos-
 terior tarsi snowy-white. (*Limnophilaria*, in part)..... 69
 Wings with Sc longer, Sc_1 ending opposite or beyond the fork of R_3 ;
 (compare some species of *Pilaria*, distinguished by having the an-
 tennal verticils of unusual length) 70
69. Antennæ with long conspicuous verticils; tuberculate pits present,
 small, placed at extreme cephalic end of præscutum; R_s elongate,
 exceeding vein R_3 ; cell M_1 present or lacking..... *Pilaria* Sitenis
 Antennæ with short verticils; tuberculate pits lacking; R_s short and
 strongly arcuated or angulated at origin; cell M_1 lacking.
Shannonomyia Alexander
70. Head strongly narrowed and prolonged behind; radial and medial
 veins beyond cord long and sinuous; vein R_3 extending generally
 parallel to vein R_1 , not diverging markedly at tips; vein 2nd A
 strongly curved to margin (*Pseudolimnophilaria*, in part).
Pseudolimnophila Alexander
 Head broad, not conspicuously narrowed behind; radial and medial
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ERIOPTERINI: SUBTRIBES, GENERA, SUBGENERA

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SUPPLEMENTARY KEY TO THE SUBAPTEROUS TIPULIDÆ

- 1. Frontal prolongation of head with nasus (Tipulinae).....**Tipula** Linnæus
 Frontal prolongation of head (or rostrum) without nasus..... 2
- 2. Eyes with numerous short erect setæ between ommatidia (Pedicini).
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 Tibial spurs lacking. (Eriopterini).....**Chionea** Dalman

TYPE SPECIES OF THE NEW GENERA AND SUBGENERA PROPOSED

- Dicranota: Eudicranota**; type, **Dicranota notabilis** Alexander.
- Dicranota: Paradicranota**; type, **Dicranota rivularis** Osten Sacken.
- Archilimnophila**; type, **Limnophila unica** Osten Sacken.
- Limnophila: Idiolimnophila**; type, **Limnophila emmelina** Alexander.

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Brachypremna (Alexander, 1912b)
Tanypremna (Alexander, 1914b)
Dolichopeza: *Oropeza* (Alexander, 1919c; Johnson, 1909)

Cylindrotominae

- Phalacrocera* (Alexander, 1919c)
Cylindrotoma (Alexander, 1919c)

Limoniinae

Limoniini

- Limonia*: *Limonia* (Alexander, 1919c; Osten Sacken, 1869)
Dicranomyia (Alexander, 1912c, 1919c; Doane, 1908a; Osten Sacken, 1869)
Alexandriaria (Garrett, 1922)
Peripheroptera (Alexander, 1913c)
Rhipidia (Alexander, 1912a, 1919c; Osten Sacken, 1869)
Geranomyia (Alexander, 1919c; Osten Sacken, 1869)
Orimarga: *Orimarga* (Alexander, 1913a)
Dicranoptycha (Alexander, 1919a, 1919c)
Helius (Alexander, 1919c)

Pediiciini

- Pedicia*: *Pedicia* (Alexander, 1919c, 1929; Hine, 1903)
Tricyphona (Alexander, 1919c; Osten Sacken, 1869)
Dicranota: *Dicranota* (Alexander, 1919c)
Rhaphidolabis (Alexander, 1916c, 1919c)
Plectromyia (Alexander, 1919c)
Ula (Alexander, 1919c)

Hexatomini

- Adelphomyia* (Alexander, 1919c)
Epiphragma (Alexander, 1913b, 1919c)
Polymera (Alexander, 1913b, 1920b)
Dactylolabis (Alexander, 1919c; Osten Sacken, 1869)
Pseudolimnophila (Alexander, 1919c)
Limnophila, s.l. (Alexander, 1919c; Osten Sacken, 1869)
Prionolabis (Alexander, 1916a, 1919c; Osten Sacken, 1869)
Eutonia (Alexander, 1919c)
Lasiomastix (Alexander, 1919c; Osten Sacken, 1869)
Phylidorea (Alexander, 1919c)
Elæophila (Alexander, 1919c, 1927; Osten Sacken, 1869)
Idioptera (Alexander, 1919c)
Dicranophragma (Alexander, 1919c)
Pilaria (Alexander, 1919c)
Ulomorpha (Alexander, 1920a)

Psaronius (Alexander, 1914c)

Hexatoma: *Eriocera* (Alexander, 1914a, 1915, 1916b, 1919c;
Osten Sacken, 1869, 1886)

Penthoptera (Alexander, 1914a)

Atarba: *Atarba* (Alexander, 1926a)

Eriopterini

Chionea (Alexander, 1919c)

Cladura, s.l. (Alexander, 1919c)

Lecteria (Alexander, 1913b)

Sigmatomera (Alexander, 1914c, 1930)

Trentepohlia: *Paramongoma* (Alexander, 1913b, 1914c, 1919b)

Teucholabis: *Teucholabis* (Alexander, 1914c, 1919c)

Paratropesa (Alexander, 1913c)

Gonomyia, s.l. (Alexander, 1916c, 1919c; Osten Sacken, 1869)

Progonomyia (Alexander, 1916c)

Lipophleps (Alexander, 1914c, 1916c, 1919c)

Gonomyia (Alexander, 1913b, 1916c, 1919c, 1926b; Osten Sacken,
1869)

Ptilostena (Alexander, 1916c)

Gnophomyia, s.l. (Alexander, 1913b, 1919b)

Rhodomastix: *Sacandaga* (Alexander, 1919c)

Erioptera, s.l. (Alexander, 1919c; Osten Sacken, 1869)

Erioptera (Alexander, 1919c; Osten Sacken, 1869)

Mesocyphona (Alexander, 1913b, 1919c; Osten Sacken, 1869)

Ilisia (Alexander, 1919c)

Empeda (Alexander, 1917, 1919c)

Cryptolabis (Alexander, 1913b)

Ormosia (Alexander, 1919c; Dietz, 1916; Doane, 1908c; Osten Sacken,
1869)

Molophilus (Alexander, 1913c, 1919c)

Toxorhina: *Toxorhina* (Alexander, 1913a, 1919c)

Family Anisopodidæ

Moderately small, elongate flies with long legs and three ocelli.

Head subspherical or hemispherical, the eyes of the males holoptic or dichoptic, usually rounded. Proboscis moderately prominent, with small labella; palpi long, four segmented. Antennæ usually about as long as the thorax, cylindrical, composed of twelve to sixteen segments. Thorax convex, without distinct transverse suture; scutellum semi-circular, short and broad, the metanotum well developed. Abdomen more or less cylindrical, flattened below, the genitalia small. Legs slender, without spines; anterior coxæ and the basal segment of the tarsi elongated; tibiæ with or without apical spurs; pulvilli absent, the empodia pad-like. Wings rather large, lying flat on the abdomen when at rest; auxiliary vein present; radius with 3 or 4 (*Axymyia*, Fig. 15*) branches; cell 1st M_2 closed or open (Figs. 14, 16*); a single anal vein reaches the margin.

The adults are frequently common, particularly those belonging to the genus *Anisopus* which sometimes occur in small swarms near the edges of woods in the vicinity of swamps and also on the trunks of trees. The other genera occur in moist places, particularly upon foliage. The members of this family, insofar as known, breed in wet or moist decaying organic matter, as fermenting sap, rotten wood and similar situations.

There are about 80 described species, distributed in 6 genera and 3 subfamilies, all of the latter being found in the North American fauna.

* Plate II, Tipuloidea.

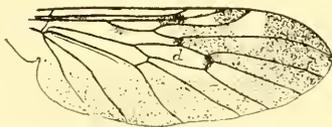


Fig. 1. *Anisopus* species.

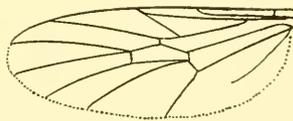


Fig. 2. *Olbiogaster* species.

KEY TO GENERA

1. Wings with cell 1st M_2 present. (Anisopodinae)..... 2
 Wings with cell 1st M_2 open by the atrophy of basal section of M_3 3
2. Wing-membrane with macrotrichia (14*; also 1); posterior tibia with a comb of spinous setæ *Anisopus* Meigen
 Wing-membrane without macrotrichia; posterior tibia without spinous comb; tropical (2)..... *Olbiogaster* Osten Sacken
3. Wings with vein R_3 present as a nearly transverse element, connecting with vein R_{4+5} at margin (15*); eastern (*Axymyiinae*).. *Axymyia* McAtee
 Wings with vein R_3 lost by atrophy, there being only two branches of R_3 (16*); north temperate (*Mycetobiinae*)..... *Mycetobia* Meigen

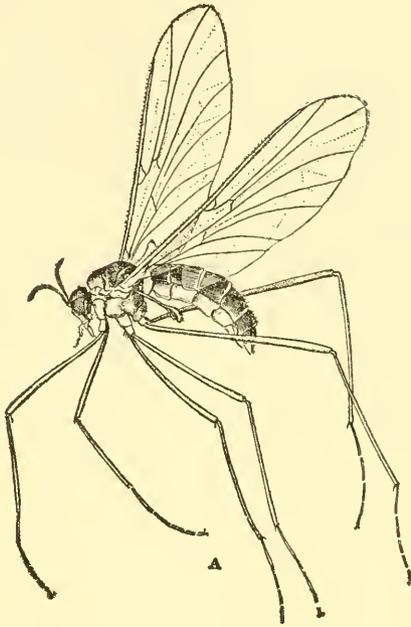
The most important paper:

Edwards, F. W.

1928. Diptera. Fam. Protorhyphidæ, Anisopodidæ, Pachyneuridæ, Trichoceridæ. Genera Insectorum, Fasc. 190, pp. 1-41, 2 pls.

* Plate II, Tipuloidea.

Family Blephariceridæ—The Net-Winged Midges



Agathon elegantula.

Moderate sized, elongate, nearly bare species with long legs and rather wide, delicate wings.

Eyes sometimes holoptic in one or both sexes and usually bisected below the middle by a narrow, unfaeted line below which the facets are smaller; three ocelli present. Antennæ slender, composed of nine to fifteen segments and clothed with pubescence. Mouth parts more or less elongate, the females with slender, flattened elongate serrate mandibles. Mosontum with distinct, broadly interrupted transverse suture. Legs rather slender, the posterior pair longer than the others; tibia with or without spurs; pulvilli and empodium absent or nearly so. Wings broad, bare, the anal angle projecting, almost always with a network of delicate lines due to the creasing of the folded wings in the pupal case.

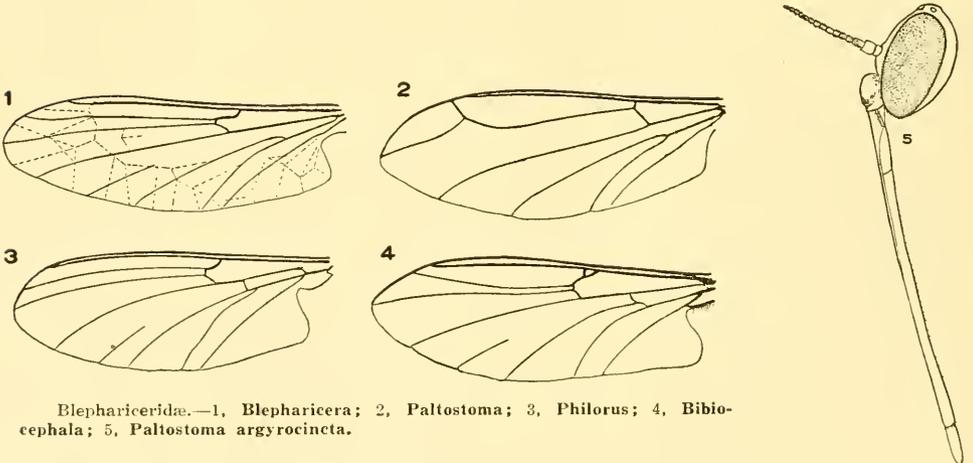
The adults are not common in most collections but are often found in large numbers near fast-flowing streams. I have found them chiefly on the foliage of evergreens or on the sides of cliffs or rocks.

The larvæ live in swift water, clinging to the rocks or stream bed by a series of ventral suckers, pupation taking place in the stream. The immature stages are even more easily identified than the adults. The latest revision of the family is contained in Williston's Manual of North American Diptera, 3rd edition.

KEY TO GENERA

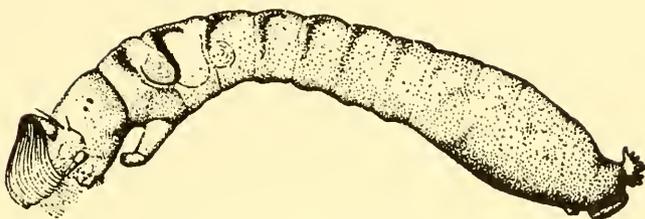
1. An incomplete longitudinal vein between the fourth and fifth longitudinals (1) 3
 No incomplete vein between these veins (2)..... 2
2. Proboscis long; palpi but little developed (2, 5)..... *Paltostoma* Schiner
 Proboscis not longer than the vertical diameter of the head; palpi well developed, four-segmented *Kelloggina* Williston
3. Second basal cell closed apically..... 4
 Second basal cell open apically (1)..... *Blepharicera* Macquart
4. Second longitudinal vein branched, the branch either simulating a cross-vein near the base of the second vein, or elongate..... 5
 Second vein not branched (3)..... *Philorus* Kellogg
5. Pleura pilose or haired (4)..... **Bibiocephala* Osten Sacken
 Pleura bare *Agathon* Röder

* *Bibionus* Curran is a synonym but the two species upon which the genera were based are distinct.



Blephariceridæ.—1, *Blepharicera*; 2, *Paltostoma*; 3, *Philorus*; 4, *Bibiocephala*; 5, *Paltostoma argyrocincta*.

Family Simuliidæ—The Black Flies



Larva of *Simulium venustum* showing the mouth fans (left) used for securing food. (After Metcalf and Sanderson).

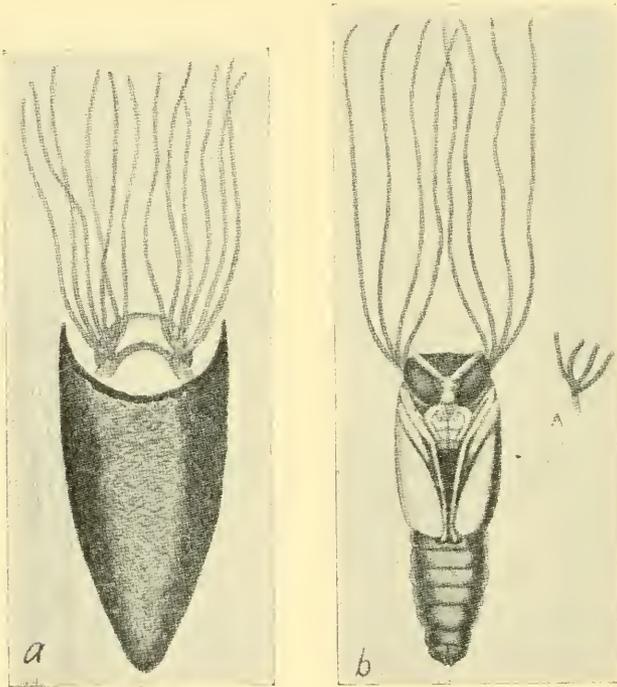
Small, usually dark colored flies, rarely over 5 mm. in length, with short, thick legs.

Head rather hemispherical; face short, eyes round or reniform, holoptic in the males; ocelli absent. Proboscis rather short, with small, horny labellæ, palpi incurved, four segmented, the basal segment short, the two following of equal length, the fourth longer and more slender than the preceding. Thorax arched, without transverse suture; scutellum small. Abdomen rather cylindrical, tapering in the males, composed of seven or eight segments; genitalia concealed. Legs short and strong, the femora broad and flat; tibiæ usually with terminal spurs; basal segment of the tarsi elongate, the apical segment small. Wings large and broad, with distinct allulæ, the anterior veins thickened, the others weak. Auxiliary vein ending in the costa near the middle of the wing, the second vein absent, the first and third approximate; anterior cross-vein very short; fourth vein curved, forked nearly opposite the anterior cross-vein, the branches terminating near the apex of the wing.

The Black-Flies, Buffalo Gnats, Turkey Gnats, to use some of the common names for these pests, need no introduction to the hunter or fisherman. To most people they are extremely annoying and as they frequently occur in enormous numbers in the neighborhood of streams fishermen are only too well acquainted with them. As a rule their bites do not attract immediate attention but after a short time they cause painful swellings and, if in sufficient numbers, may result in the serious illness of the sufferer and even death. The adults attack all warm blooded animals and are known from all parts of the world, being particularly abundant in the north temperate and subarctic zones.

In addition to the irritation caused by their bites some members of the family carry disease. In Africa *Onchocerciasis*, a disease caused by a worm (*Onchocerca volvulus* Leuckart) of the family Filariidæ is transmitted by *Eusimulium damnosum* Theobald. In man the disease takes the form of small to rather large, subcutaneous swellings and may or may not be apparent without careful examination. From 40 to 50 per cent of the natives of Sierra Leone were said by Blacklock to be infected in 1926.*

* Ann. Trop. Med. & Parasit., xx, pp. 1-48, 203-218.



(a) pupa of *Simulium venustum* in pupal cocoon and
(b) pupa of *S. bracteatum*, with cocoon removed. (After Metcalf and Sanderson).

In Central America three species of *Simulium* have been shown to carry a disease displaying various symptoms and sometimes resulting in blindness. The causative agent is related to the form described above and was named *Onchocerca cæcutirus* by Brumpt. In some cases of infection there are no clinical symptoms but in others there are erysipelas-like swellings, the name *coastal erysipelas* being applied to the disease in such cases. Nodular swellings may occur on the head, shoulder blades, ribs iliac crests, etc. In the eye the microfilaria may cause *conjunctivitis*, *keratitis* and *iritis*, blindness sometimes resulting.

Both the fly and man are necessary for the development of the disease. After being ingested by the fly the microfilaria pass from the intestine to the muscles of the thorax where further development takes place. The infective stages occur in the proboscis of the fly and are transferred to man during feeding by the insect. Strong has discussed *Onchocerciasis* in Guatemala.*

The larvæ live in streams where they attach themselves to stones, plants, etc. and collect their food from the flowing water. Pupation takes place within the larval cocoon, the adults emerging under water and, quickly reaching the surface, fly away. Under favorable conditions many thousands of larvæ may be found together, being so numerous as to entirely conceal the surface to which they are attached.

The latest revision of the North American species is by Dyar and Shannon.† Unfortunately these authors apparently took greater pains to find fault with the work of others than to clarify their own conclusions and only a study of their material and amplification of the descriptions will result in a clear understanding of the specific limits. In some cases the drawings were evidently made from freshly prepared slides and these show characters which gradually disappear, with the result that the same characters cannot be found in old slides and may not even be present in freshly prepared ones made from old specimens. Just what effect this will have on the validity of several of the forms recognized by the authors it is impossible to say. Malloch‡ has also revised the family: the two contributions should be used together.

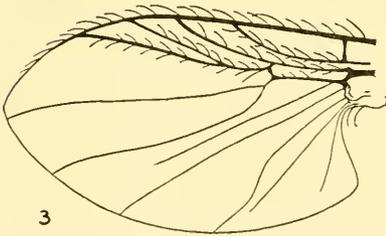
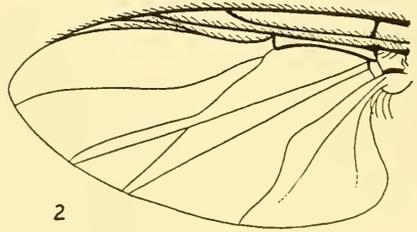
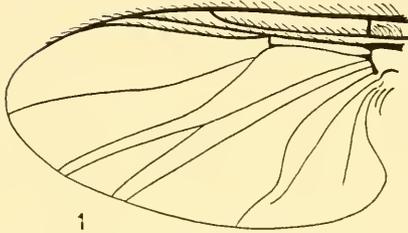
* 1931, *Science*, N. S., lxxiii, pp. 593-594.

† 1927, Dyar and Shannon, *Proc. U. S. N. M.*, lxi, Art. 10, pp. 1-54, 7 plates.

‡ 1914, Malloch, *Bull. U. S. Dept. of Agric., Bur. Ent., Tech. Ser.*, No. 26.

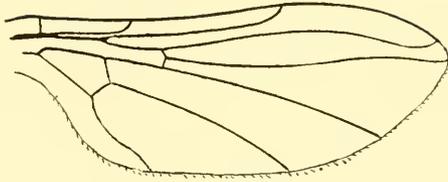
KEY TO GENERA

- 1. Third vein forked 3
- Third vein simple 2
- 2. Petiole of the second and third veins setulose above... *Eusimulium* Roubaud
- Petiole of the second and third veins bare (1).....*Simulium* Latreille
- 3. Fifth vein not forked (3).....*Parasimulium* Malloch
- Fifth vein forked (2).....*Prosimulium* Roubaud



Simuliidæ.—1, *Simulium*; 2, *Prosimulium*;
3, *Parasimulium*

Family Thaumaleidæ



Thaumalea species.

Small, bare, obscurely reddish yellow or brownish flies of peculiar appearance.

Head small, round; eyes holoptic in both sexes; ocelli absent; proboscis short; palpi longer than the antennæ, composed of five segments, the first short, the second thickest; antennæ situated near the oral margin, composed of a scape, pedicel and flagellum, the latter very compact and arista-like, but composed of ten distinct segments, the basal two rather large and globose. Thorax robust, strongly convex, without transverse suture, somewhat depressed before the rather large, obtusely triangular scutellum; metanotum arched. Abdomen narrower than the thorax, cylindrical, composed of seven segments; male genitalia large, the basal piece swollen, bladder-like; ovipositor with broad, rounded lamellæ. Legs simple, comparatively short; coxæ short; tibiæ without spurs; tarsi of moderate length, the anterior pair about as long as the tibiæ, the penultimate segment short; empodia vestigial; claws small. Wings longer than the abdomen; auxiliary vein short, terminating in the costa; second longitudinal vein curved; the third and fourth veins simple; basal cell short; anal angle rounded.

There are about three dozen described species belonging to this family, most of them occurring in the Old World. The adults are found along the edges of streams, particularly those with mossy banks, and are not common in collections. They are small flies, under 6 mm. in length, and the wings bend sharply near the base in death, folding downward as in the Psychodidæ.

The larvæ, which resemble those of the Chironomidæ, are found in small brooks and streams where the clear water flows very thinly over the rocks, so that the back of the larva is always exposed above the surface. They feed on detritus and diatoms, and move about in search

of food. The pupæ are found in the bottom of the stream between stones, etc.

The following key will separate the described genera, two of which occur in America. The family has been revised by Edwards.*

KEY TO GENERA

1. Subcostal vein ending in the costa or first vein..... 2
 Subcostal vein obsolete apically, ending free. (North America, *pluvialis*
 Dyar & Shannon).....*Trichothaumalea* Edwards
2. Subcostal vein ending in the first vein, very short (Australia, N. Zea-
 land, S. America).....*Austrothaumalea* Tonnoir
 Subcostal vein ending in the costa..... 3
3. Basal segment of ♂ palpi greatly swollen, the second and third segments
 not much longer than broad; subcosta weak apically (Europe).
Androprosopa Mik
 Palpi rather stout, alike in both sexes, somewhat longer than the an-
 tennæ (N. America, Europe).....*Thaumalea* Ruthé

North American Species of *Thaumalea*

1. Thorax and abdomen brown or blackish..... 2
 Thorax reddish yellow, the abdomen brown.....*elnora* Dyar & Shannon
2. Male clasper with two terminal claws.....*americana* Bezzi
 Male clasper with about six terminal claws.....*johannis* Dyar & Shannon

* Edwards, 1929, Zool. Anzeiger, pp. 121-142.

Family Chironomidæ—The Midges

Small, slender flies, rarely over 10 mm. in length, thorax large, the legs slender, antennæ of males plumose.

Head small, more or less spherical, partly concealed from dorsal view by the projecting thorax. Antennæ slender, with five to fourteen segments, the basal segment enlarged and globular, plumose in the males, more or less haired in the females. Eyes reniform or oval, the ocelli absent or rudimentary. Proboscis short, not adapted for piercing; palpi with three or four segments. Thorax sub-ovate, or moderately long, more or less projecting in front, without a transverse suture but with a wide, longitudinal impression in front of the scutellum; metanotum with a more or less distinct longitudinal groove in the middle; scutellum small and hemispherical. Legs slender and rather long, especially the front pair; the tarsi often very long; empodium and pulvilli present or absent. Wings bare or haired, long and narrow, usually with a strong anal angle; anterior veins strong; auxiliary vein complete though slender; second longitudinal vein weak or absent, the third vein often forked and connected with the first by a crossvein; fourth vein often with two branches which may or may not be petiolate basally, the fifth vein usually furcate; second basal cell open or closed apically; costa usually ending at the termination of the third vein, usually well before the tip of the wing. Abdomen narrow and long, especially in the males, shorter and more robust in the females, the hypopygium exposed; ovipositor short.

The Certatopogonidæ, formerly included in this family by most authors, have been recognized as a distinct family by Malloch and Edwards, and are so treated here. They may be distinguished by the shape of the thorax and absence of the metanotal depression.

The midges bear little resemblance to mosquitoes when viewed by a careful observer, but to the layman they show no differences and are not differentiated. Many people believe that they are "young" mosquitoes and that they will "grow up", but there is, of course, no justification for such a belief. In mosquitoes the costa extends entirely around the wing and the wing veins and costa are usually scaled.

The family is a very large one and comprises close to two thousand described species. Midges are found almost everywhere, but since the larvæ are aquatic their distribution is limited to the vicinity of water, although they are frequently found in large numbers at a considerable distance from any visible water supply. While they are not strong

fliers they can remain in the air for long periods of time and they often occur in large numbers. Williston states that in the Rocky Mountains he has observed them dancing in the air in incredible numbers and producing a noise like a distant waterfall. As a rule they swarm in the evening, but swarms are not uncommon in sheltered places during the day. For the most part only the males swarm, although an occasional female may be found with them. While, as a rule, only one species will be found in a swarm it is not unusual to find other species among them. The females are found mostly on foliage, where they rest on the under surface during the day. Some forms occur commonly on tree trunks, logs, and in grass. They are attracted to light, frequently in very large numbers.

Since many of the Chironomids are very small they must be handled with care. The larger ones may be pinned in the usual manner, provided fine pins are used; the smaller should be attached to the side of a pin by a ring of shellae, care being taken to leave one wing and the tarsi free. Specimens without front tarsi are almost useless and, since the insects dry quickly, they must be mounted within an hour or two.

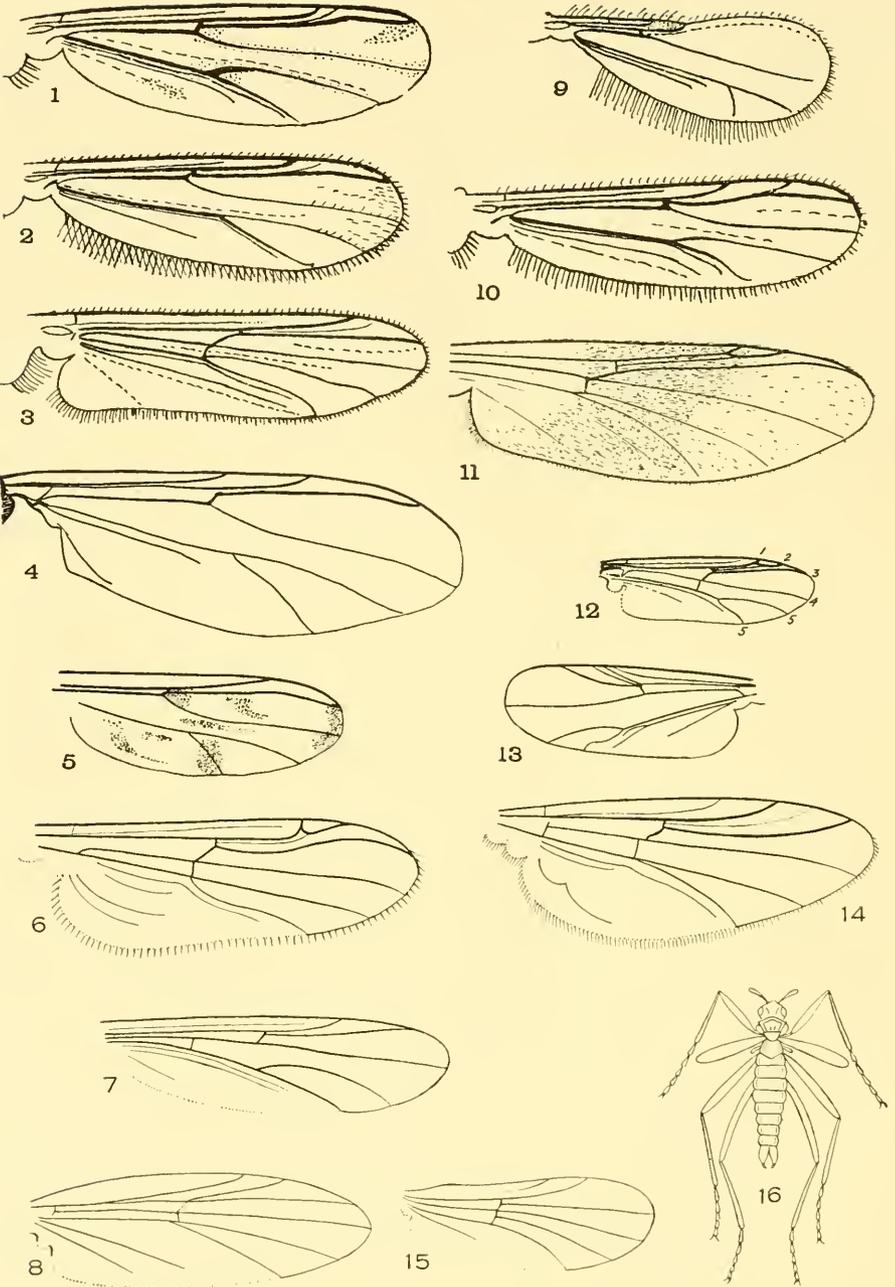
The larvæ are elongate, cylindrical, slender and curved more or less downward, particularly when preserved. The head and legs are conspicuous and there may be one or more pairs of leg-like pads posteriorly. They are scavengers and live in water everywhere, also in mud and have been dredged from a depth of nearly a thousand feet in Lake Superior. Some are also found in decaying vegetation, in moss, etc. Many of them are free-living while others make mud cases on stones, leaves and pieces of wood and I have found one undetermined species building almost colorless cases in *Spirogyra*. Many of the larvæ contain hæmoglobin and are red in color, the name "blood-worms" being applied to these.

The classification of the family is not entirely satisfactory and characters for the limitation of genera are few. Edwards* has utilized the tibial spurs and combs for the separation of genera, in addition to other characters. However, the classification must be considered as very artificial, although losing nothing on that account. Since the object of taxonomy is the identification of species the means of obtaining the end is not important. Many papers dealing with the American species have been published since the appearance of Johannsen's monographic revision† in 1905, by Kieffer, Malloch,‡ Johannsen, etc. Some of the more important are listed below.

* 1929. British non-biting midges, Tr. Ent. Soc. London, Dec. 1929.

† 1905. New York State Museum Bulletin No. 86.

‡ 1915. Bull. Ill. State Lab. Nat. Hist., x, Art. 6.



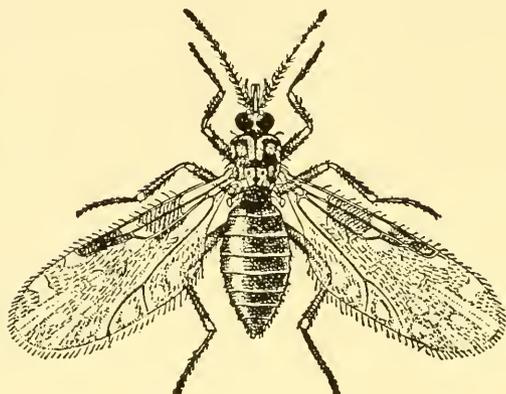
Chironomidae.—1, *Pentapedilum*, hairs omitted; 2, *Tanytarsus*; 3, *Diamesa*; 4, *Crictopus insolitus*; 5, *Chironomus*; 6, *Anatopynia*; 7, *Trichotanypus*; 8, *Heptagyia*; 9, *Corynoneura*; 10, *Orthocladius*; 11, *Pentaneura algens*; 12, *Procladius*; 13, *Metrocnemus*; 14, *Prodiamesa*; 15, *Podonomus*; 16, Eretmoptera.

15. Third vein fused with the costa and not reaching beyond the apical three-fourths of the wing; a false vein running close to anterior margin of wing (9).....*Corynoneura* Winnertz
Third vein free, no false vein.....16
16. Wings with hairs.....17
Wings bare20
17. The thick crossvein joining the third and fourth vein very long and appearing as the base of the third vein..... 18
The crossvein short19
18. Mesonotum conically produced in front; wings spotted..*Eurynemus* Wulp
Mesonotum not produced; wing unicolorated.....*Brillia* Kieffer
19. Pulvilli absent; wing hairs decumbent (13).....*Metricnemus* Wulp
Pulvilli present though small; wing hairs suberect (*Spaniotoma* Edwards) (10).....*Orthocladus* Wulp
20. Mesonotum with a longitudinal fissure; wings black with white markings in most species*Chasmatonotus* Lœw
Mesonotum without longitudinal fissure.....21
21. Claws cleft; large marine species (*Telmatogeton* Coquillett, not Schiner)*Paraclunio* Kieffer
Claws not cleft22
22. Palpi porrect, 3 segmented (*Symbiocladius*).....*Trissocladius* Kieffer
Palpi flexible, 4 segmented.....23
23. Fourth segment of at least the hind tarsi cordiform, shorter than the fifth (*Thalassomyia* Johannsen, not Schiner).....*Cardiocladius* Kieffer
Fourth tarsal segment linear.....24
24. Dorsocentral hairs minute and decumbent; tibiæ usually banded with white; genitalia in most cases in part pure white (4)...*Criktopus* Wulp
Dorsocentral hairs larger and suberect; tibiæ not banded (*Spaniotoma Philippi*) Edwards, *Psectrocladius*, *Trichocladius*, *Dactylocladius*, *Camp-tocladius*) (10)**Orthocladus* Wulp
25. Wing disc with hairs at least at tip.....26
Wings quite bare, the anterior crossvein distinct and oblique.....27
26. Squamæ fringed; anterior crossvein distinct and oblique (1).
Pentapedilum Kieffer
Squamæ quite bare, anterior crossvein longitudinal in position or indistinct (2)*Tanytarsus* Wulp
27. Eyes widely separated, reniform; all tibiæ with long conspicuous spurs; pronotal collar large; basal segment of anterior tarsus not longer than the tibiæ.....*Pseudochironomus* Malloch
Eyes with dorsal projection; front tibial spur indistinct or absent; basal segment of anterior tarsus longer than the tibia (5).
Chironomus Meigen

The genus *Chirocladius* Picado, represented by a species from Costa Rica, and which seems to belong among the Chironominae, is too briefly described to place in the key.

* *Pseudochironomus* Malloch, with widely separated reniform eyes and very large pronotal collar, in spite of short basal segment of the anterior tarsi and the tibial spurs, belongs with the next section.

Family Ceratopogonidæ—The Biting Midges



Culicoides species.

Very small, slender flies, rarely 5 mm. in length.

Head small, spheroidal and rounded behind or hemispherical and flattened behind; ocelli absent or practically so; antennæ slender, usually with fourteen segments and a fifteenth microscopic one, the apical three to five segments lengthened, the basal swollen; mouth parts complete, adapted for biting. Thorax rather oval, shorter than in the Chironomidæ; pronotum never prominent; metanotum rather rounded, never with a longitudinal groove; scutellum small, hemispherical, usually bearing distinct bristles. Wings of moderate width, folded flat over the back when at rest; second vein absent, fourth vein generally furcate; alula very narrow; squamæ never completely fringed. Legs moderately long, the posterior pair longest; femora and tibiæ sometimes swollen, the former sometimes with spines beneath; pulvilli present or absent. Abdomen elongate; genitalia exposed; ovipositor small.

The Ceratopogonidæ may be readily distinguished from the Chironomidæ by the characters enumerated above. They are minute or quite small flies and are often serious pests, especially along the seashore, in the tropics and along our rivers and lakes, but are not limited in distribution to large bodies of water. The adults are either predaceous or externally parasitic although no real differentiation can be made. The larger species are known to prey upon small insects while the small

forms suck blood and they have been observed more than once attached to "mantids" or "walking sticks", upon which they feed. Warm blooded animals are freely attacked by representatives of the genera *Culicoides*, *Lasiohelca* and *Leptocouops* and the tiny creatures sometimes make man miserable by their unceasing attention. They are known commonly as "punkies" and "no-see-ums", the latter name because of their small size, and they are unwitting jokers since almost any large insect is liable to be blamed for the bites of these lilliputians. They are attracted to light in large numbers and are difficult to keep from houses owing to their small size.

In Africa *Culicoides austeni* is known to be the intermediate host of a parasitic worm (*Acanthocheiloncurea perstans*), a form occurring also in South America, but the worm is not known to cause any specific disease. Further study may link the members of this family with the transmittal of diseases of a specific nature.

The larvæ are aquatic or semi-aquatic being found in moist places, in mud, sand, decaying vegetation and in tree-holes. It seems likely that most of the marine species live within the tide-zone and for that reason there is no practical means of control, while those living in decaying vegetation form an equally serious problem. The species living in tree holes are seldom abundant and the elimination of their breeding places is a simple matter. It is not known whether the larvæ are scavengers or predators and it may be that they include both groups.

The insects are difficult to capture and require special care in handling. Those which bite may be captured by placing a bottle over them as they suck blood, but the collector will no doubt find it necessary to exercise great self control during the process owing to the numbers which begin feeding at the same time. Specimens seem best when mounted on the side of a pin but some may be kept in alcohol and mounted on slides. Owing to the delicate nature of the hairs on the wings they are easily abraded and the characteristic wing pattern disappears. For this reason dried specimens should always be preserved. Edwards* has dealt with the British species and his paper will be found invaluable. Malloch†, Johannsen‡, Root, Hoffman and others have published on the North American forms and a great deal of research is being conducted at the present time by the last two mentioned authors. I am indebted to Drs. Johannsen and Root for checking and revising the key to this family.

* 1926, Trans. Ent. Soc. London, pp. 389-426.

† 1915, Bull. Ill. State Lab. Nat. Hist., x, Article vi; id, xi, Article 4.

‡ 1905, N. Y. State Mus. Bull. #86.

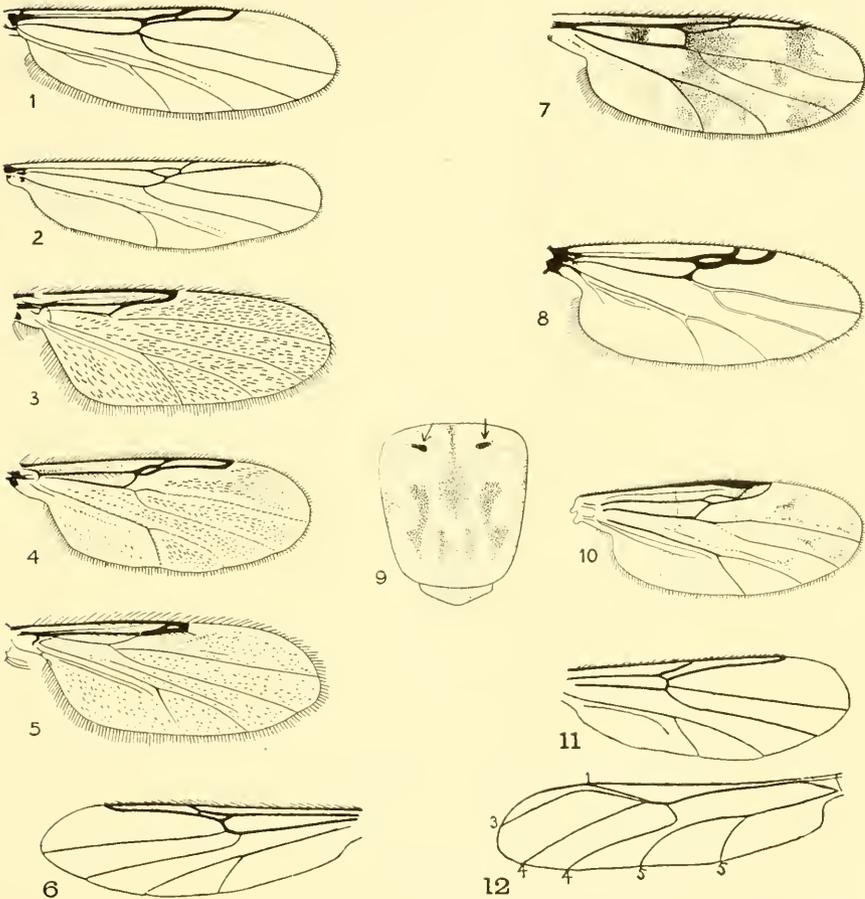
KEY TO GENERA

1. Empodium as long as claws..... 2
Empodium very short or absent..... 3
2. Costa extending to about middle of wing; wings with dense macrotrichia all over (*Euforecipomyia* Malloch) (3)..... *Forcipomyia* Meigen
Costa extending well beyond middle of wing; macrotrichia sparser, sometimes absent (4)**Atrichopogon* Kieffer
3. A fold looking like a simple vein between third and fourth veins; first and third veins indistinct, more or less fused. (*Tersesthes* Townsend).
Leptoconops Skuse
No vein-like fold between third and fourth veins..... 4
4. Costa extending to about middle of wing; second radial cell short and square-ended, first radial cell obliterated; macrotrichia usually dense (*Pseudoculicoides* Malloch, *Isocacta* Garrett) (5).... *Dasyhelea* Kieffer
Costa extending well beyond middle of wing; radial cells usually otherwise 5
5. Humeral pits present and conspicuous; microtrichia of wings distinct; claws of female small and equal; at least some macrotrichia present. (*Æcacta* Poey) (9, 10)..... †*Culicoides* Latreille
Either humeral pits absent or else microtrichia absent or else claws of female very unequal..... 6
6. The two radial cells small and equal or one or both of them obliterated; wings finely punctuate but without distinct microtrichia; legs not thickened 7
Either second radial cell much longer than broad or else wings with distinct microtrichia or else legs modified..... 8
7. Wings with at least one dark spot and with some macrotrichia; female claws unequal (*Neoceratopogon* Malloch)..... *Alluaudomyia* Kieffer
Wings whitish, without dark markings, and without macrotrichia; female claws equal (8)..... *Ceratopogon* Meigen
8. Hind femora noticeably thicker than the others..... 9
Hind femora not thickened..... 10
9. Hind femora much thickened and spinose beneath; hind tibiæ not thickened (*Ceratolophus* Kieffer) (1)..... *Serromyia* Meigen
Hind femora not spinose; both hind femora and hind tibiæ moderately thickened (7) *Monohelea* Kieffer
10. First and third veins connected by a crossvein, 2 radial cells..... 11
First and third veins not connected, one long radial cell..... 15
11. Front femora spinose beneath..... 12
Front femora not spinose beneath..... 13
12. Front femora conspicuously swollen..... *Heteromyia* Say
Front femora not conspicuously swollen..... *Palpomyia* Meigen
13. The branches of the fourth vein petiolate basally (*Hartomyia* Malloch).
Stilobezzia Kieffer
The branches of the fourth vein arise at or before the cross vein..... 14
14. Last segment of front tarsi much swollen (2)..... *Clinohelea* Kieffer
Last segment of front tarsi not swollen (6)..... *Johannsenomyia* Malloch

* Malloch, 1915, Bull. Ill. State Lab. Nat. Hist., x, p. 304 (*Ceratopogon*).

† Hoffman, 1925, Amer. Journ. Hygiene, v, pp. 274-301.

- 15. Branches of fourth vein petiolate basally.....16
- Branches of fourth vein arise at or before the crossvein.....17
- 16. At least one pair of femora with spines beneath.....*Pseudobezzia* Malloch
- Femora without spines beneath.....*Parabezzia* Malloch
- 17. Posterior branch of the fourth vein elbowed basally in the female (12).
- Posterior branch of fourth vein not elbowed..... 18
- 18. At least one pair of femora with spines beneath (11).....*Bezzia* Kieffer
- Femora without spines beneath.....*Probezia* Kieffer



Ceratopogonidæ.—1, *Serromyia*; 2, *Clinohelea*; 3, *Forcipomyia*; 4, *Atrichopogon*; 5, *Dasyhelea*; 6, *Johannsenomyia*; 7, *Monohalea*; 8, *Ceratopogon*; 9, *Culicoides*, thorax; 10, *Culicoides cockerelli*; 11, *Bezzia*; 12, *Stenoxenus*.

Family Psychodidæ—The Moth Flies

Thickly haired, small flies, rarely exceeding 5 mm. in length, the wings clothed with hairs or scales and folded roof-like over the back.

Head small; ocelli absent. Antennæ usually as long as the head and thorax together, the segments usually bead-like and sometimes so densely haired as to appear very thick; composed of from twelve to sixteen segments, the basal segments usually short and cylindrical. Proboscis usually short but more or less elongate and rigid in *Flebotomus*; palpi composed of four segments, hairy. Thorax without transverse suture, not very convex; scutellum rounded. Abdomen rather cylindrical, composed of six to eight segments; male genitalia prominent, the female ovipositor usually projecting. Wings large, ovate, often pointed, when at rest lying roof-like over the abdomen, the base being bent at more than a right angle, the veins and border densely haired, the integument often with hairs or scales; veins strong, usually concealed by the dense hair; crossveins restricted to the basal third of the wing; two or three of the veins furcate. Legs rather short, elongate in *Flebotomus* and usually thickly haired.

The adults occur commonly in shady places in the vicinity of water and may often be found in large numbers on dense foliage in swamps, where they crawl about on the under surface of leaves, occasionally alighting on the upper surface after a short flight. I have seen them in thousands on tree-trunks after a heavy rain and they are not rare on logs and fallen trees where they walk about in a peculiar, jerky manner or remain perfectly still. One or more species of *Psychoda* breeds in drain pipes and they often cause uneasiness by appearing in the bath room. Their presence should incite interest rather than fear as the larvæ survive hot water and soap alike, and do no harm. The adults are not common in collections, chiefly because they are so easily damaged. The hairs brush off and they become useless unless unusual care is taken of the specimens. No recent revision of the family has appeared and the synonymy is badly mixed and is not to be trusted. The male genitalia offer excellent characters. There are dozens of species and the family offers an excellent opportunity for a thorough, monographic work.

In America two diseases are known to be carried by species of *Flebotomus*. The disease known as *Verruga Peruviana*, *Oroya Fever* or *Carrion's Disease* has been found only in narrow valleys on the western slopes of the Peruvian Andes. *Verruga* is said not to be serious but *Oroya Fever* (*Carrion's Disease*), the malignant form, is responsible for many deaths annually. *Local Leishmaniasis* or *Espundia*

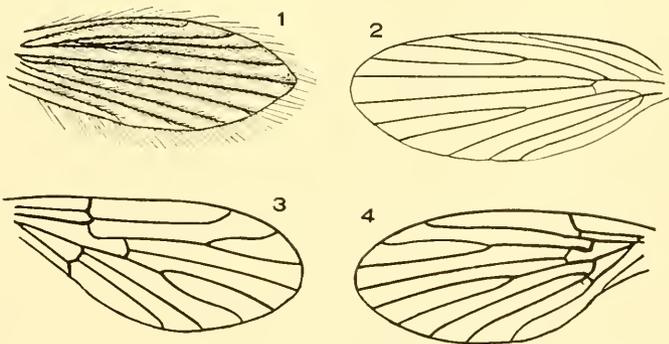
occurs in South and Central America. The causative organism is *Leishmania braziliensis* but it is not known definitely which species of *Flebotomus* carry the disease. It is possible that most of them are capable of doing so. The statement has been made that the adults of *Flebotomus* are nocturnal and that protection against disease may be obtained by remaining indoors at night. Most of the nocturnal blood-sucking flies may be found on the wing on dull cloudy days.

The larvæ live in decaying vegetable matter, dung, or water and are peculiar in possessing both open spiracles and tracheal gills; the head bears eye-spots; in the aquatic forms there are sucking discs on the segments behind the head, but no feet.

KEY TO GENERA

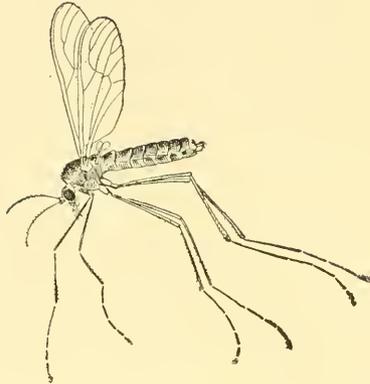
- 1. Two longitudinal veins behind the posterior forked vein..... 2
 Three longitudinal veins behind the posterior forked vein..... 3
- 2. Two forked veins in front of the middle of the wing.**Flebotomus* Rondani
 One forked vein in front of the middle of the wing (3)...*Maruina* Müller
- 3. Wings with scales or scale-like hairs on the veins or membrane..... 4
 Wings with hairs only 5
- 4. Wing membrane with broad scales over most of the surface.
Parabrunettia Brunetti
 Wings with scales on the veins only.....*Brunettia* Annandale
- 5. Two longitudinal, unforked veins between the anterior and posterior
 furcate veins 6
 Only one longitudinal vein between the anterior and posterior furcate
 veins (4)*Trichomyia* Haliday
- 6. The second simple vein behind the anterior furcate vein ends in the
 tip of the wing (1).....*Psychoda* Latreille
 The second simple vein ends behind the tip of the wing (2).
Pericoma Walker

* *Phlebotomus* of authors.



Psychodidæ.—1, *Psychoda*; 2, *Pericoma*; 3, *Maruina*; 4, *Trichomyia*. Hairs omitted from figures 2-4.

Family Dixidæ



Dixa species.

Rather small, slender, nearly bare species occurring near running water.

Proboscis somewhat projecting; palpi four-segmented; antennæ long, the basal segments swollen, the flagellar segments hair-like and poorly separated; ocelli absent; eyes round. Thorax strongly convex, without transverse suture; metanotum arched; scutellum transverse. Abdomen long and slender, composed of seven or eight segments, thickened posteriorly in the male, pointed in the female. Legs long and slender, the coxæ somewhat elongated; tibiæ without terminal spurs. Wings rather large; auxiliary vein present, ending in costa before the middle of the wing; two complete basal cells.

This family may be readily recognized by the wing venation. The adults often dance in swarms at a height of a few inches to a few feet above the surface of small streams in swampy or wooded areas and occur also along the edges of ponds.

The larvæ are aquatic and resemble those of mosquitoes but the thorax is not broadened. They are cylindrical, somewhat flattened beneath, and n-shaped.

There are but two known genera, *Ncodixa* occurring only in New Zealand, and *Dixa*, which is cosmopolitan. I present a key, adapted from Edwards, to the genera and subgenera of the world.

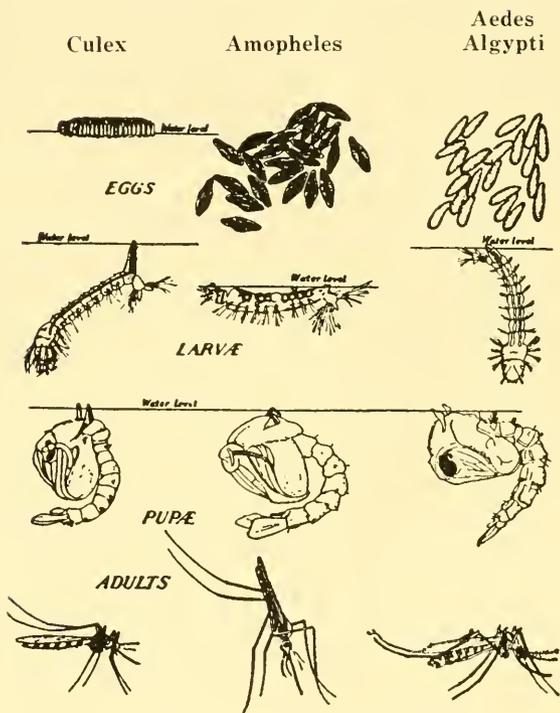
KEY TO GENERA

1. Second vein branched **Dixa** Meigen
 Second vein simple (New Zealand) **Neodixa** Tonnoir

Subgenera of **Dixa**

1. Hind margin of the wing evenly rounded 2
 Hind margin of wing produced at end of fifth vein; all veins in apical
 part of wing parallel..... **Dixapuella** Dyar & Shannon
2. Crossvein connecting the fourth vein and anterior branch of the fifth
 vein strong 3
 Crossvein connecting anterior branch of the fifth vein and the fourth
 vein faint **Dixella** Dyar & Shannon
3. First flagellar segment fusiform or oval 4
 First flagellar segment cylindrical, five times as long as wide.
 Paradixa Tonnoir
4. First flagellar segment oval, about two and one-half times as long as
 wide **Nothodixa** Edwards
 First flagellar segment fusiform; at least three times as long as wide.
 Dixa Meigen

LIFE STAGES OF MOSQUITOES



The life stages of three different genera of mosquitoes showing characteristic types of each and resting position of the adults (After Pieper and Beauchamp, from Metcalf and Sanderson).

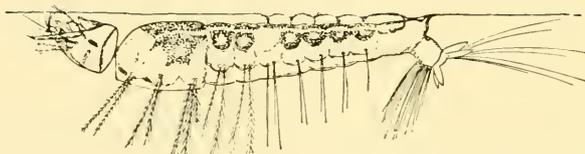
Family Culicidæ—The Mosquitoes



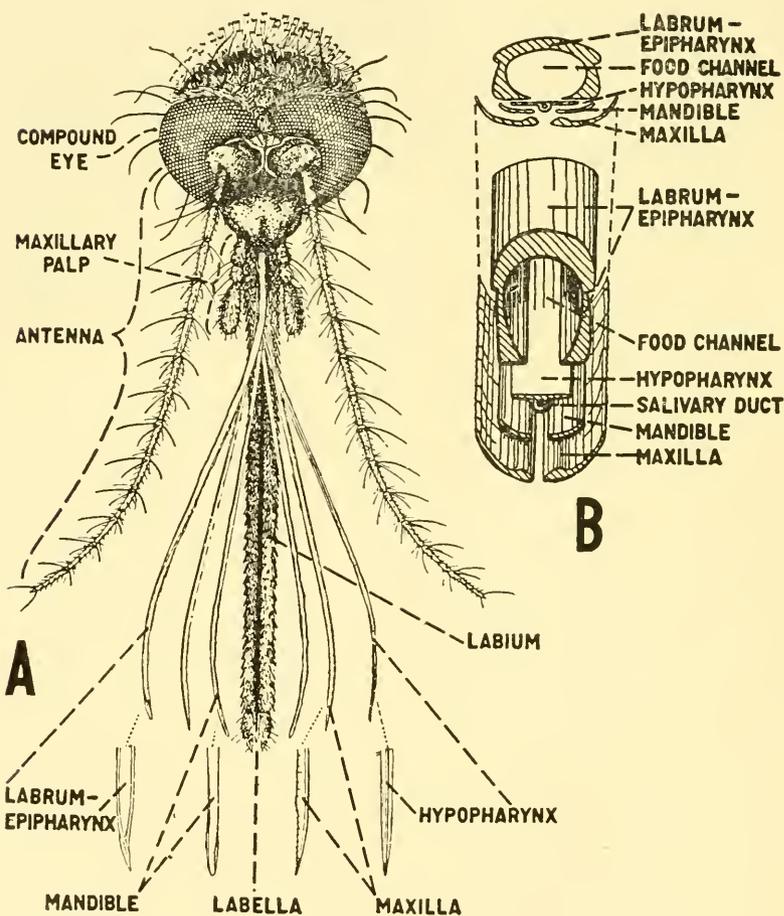
Aedes larvæ. Note position at surface of water characteristic of the Culicini. (After Matheson, courtesy C. C. Thomas).

Slender, delicate flies, with slender legs and usually with scales upon the body and appendages.

Head small, subspherical; eyes reniform; ocelli absent. Antennæ slender, elongate, composed of fourteen or fifteen segments, densely plumose in the males; first segment reduced to a narrow ring, second globose, the following elongated, nearly or quite cylindrical and with whorls of hairs, in the male the apical two segments elongated and nearly bare. Thorax ovate, arched but not projecting over the head, without transverse suture; scutellum short, evenly rounded or trilobate; metanotum usually arched. Abdomen long and narrow, somewhat arched, composed of nine or ten segments; male genitalia prominent but not large; ovipositor short. Legs long and slender, the coxæ not elongate; tarsi long, the claws often denticulate. Wings long and narrow, at rest lying flat over the abdomen, with six fully developed longitudinal veins reaching the margin, the posterior margin fringed with hairs or scales, the costal vein extending around the wing; venation as in figure; two basal cells, the veins usually clothed with scales.



Anopheles larva. Compare position at surface of water with that of Aedes. (After Matheson, courtesy C. C. Thomas).



Head and mouth-parts of a mosquito. (After Metcalf and Sanderson).

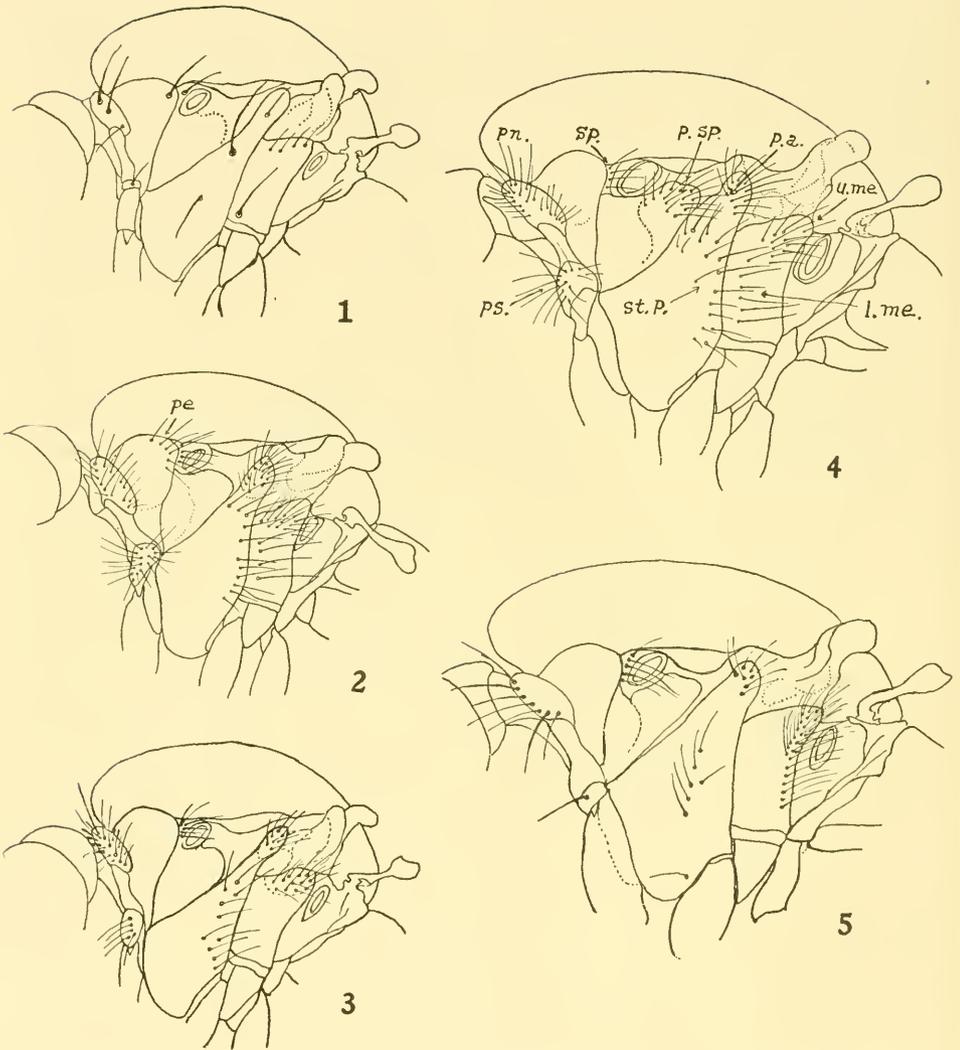
The mosquitoes are too well known to require hints as to where they may be found although it may be well to remark that a "swatted" mosquito does not make a suitable study specimen. Despite the fact that these flies are not altogether fragile it is nevertheless true that most specimens in collections are in poor condition because the preservation of the insects in good state depends upon care in handling immediately after capture. Few specimens should be placed in a killing bottle and they should be mounted while fresh. All but the very small species should be pinned on fine steel pins and not mounted on points; the small ones should be fastened on the sides of pins, using a ring of white shellac. With careful collecting, care in pinning and proper preservation, a collection of these insects may be very attractive. Many of the adults are extremely beautiful although it must be admitted that most of those in the Nearctic region do not go in for fine colors; in the tropics many of the species are clothed in nature's most beautiful colors.

All mosquitoes are not injurious and many of them do not bite. Some are predaceous upon other mosquitoes in the larval stage and this is true of the Chaoborinæ, which should, perhaps, be ranked as a distinct family, since they almost entirely lack scales. Their larvæ are called "Phantoms" because they are practically colorless.

So much has been written about mosquitoes during the present century that it would be impossible to review the entire literature in the space available but mention may be made of two books which will furnish a basis for intensive study for anyone interested. Matheson's "Handbook of the Mosquitoes of North America" deals with most of the species occurring in the United States and Canada and gives a thorough resumé of the medical and control aspects of the subject. Dyar's "The Mosquitoes of the Americas" deals entirely with the taxonomy of the group, but the descriptions are too brief and often omit important details; nevertheless it is an indispensable work and with careful study and use of the figures will be found fairly satisfactory.

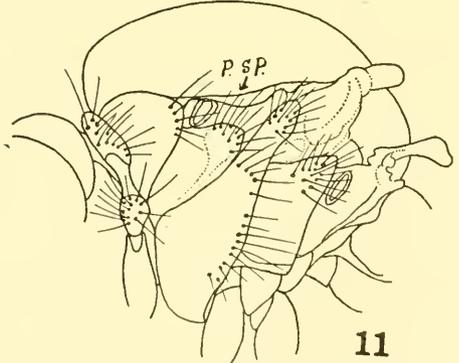
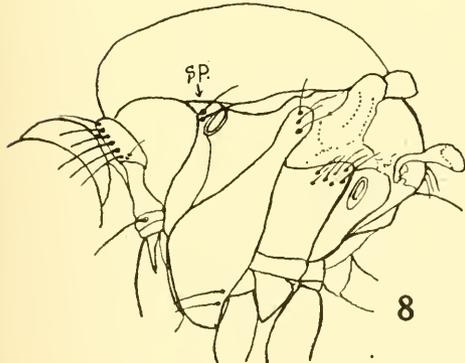
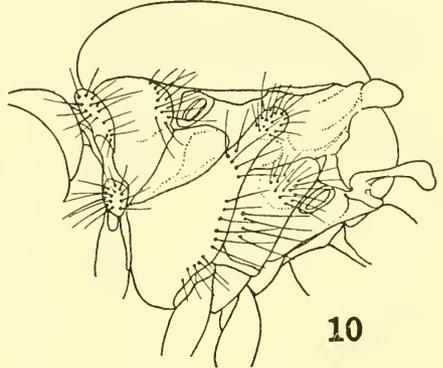
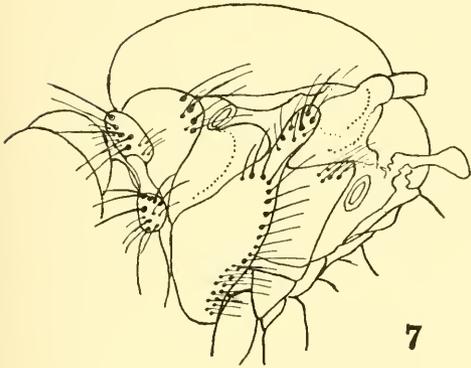
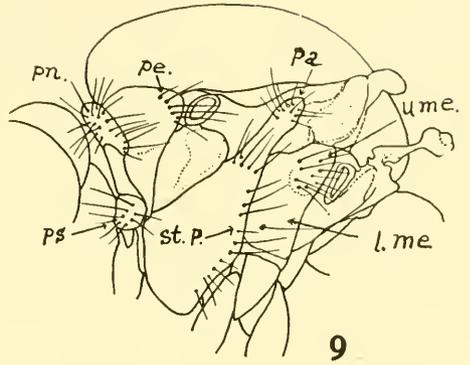
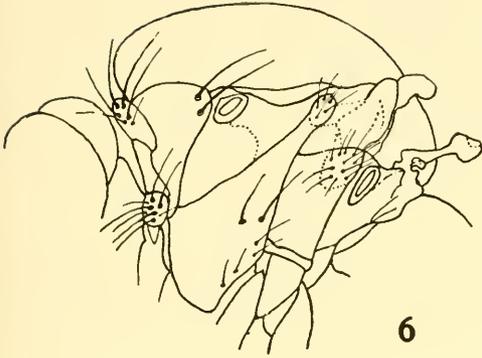
I may say that the Culicidæ are one of the most important families of the Diptera insofar as human welfare is concerned. The diseases carried by them are not only lethal but cause extreme suffering and agony. Without doubt a much more extensive account of these insects might well be included in this work but space does not permit.

The diseases known to be transmitted by mosquitoes are *Malaria*, *Blackwater Fever*, *Yellow Fever*, *Dengue*, *Filariasis*, *Bird Malaria* and *Fowl-pox*. Of these *Malaria* and *Yellow Fever* are the most widely distributed and much has been written about them. In at least the first five both the mosquito and man are essential in the life cycle of the



Culicidæ I.—Lateral view of thorax of: 1, *Uranotenia læwii*; 2, *Theobaldia morsitans*; 3, *Anopheles punctipennis*; 4, *Psorophora ciliata*; 5, *Megarhinus septentrionalis*. (After Matheson, courtesy C. C. Thomas).

l.m.e., lower mesepimeral bristles; pa., prealar bristles; pe., prothoracic bristles; pn., pronotal bristles; p.sp., postspiracular bristles; ps., prosternal or propleural bristles; sp., spiracular bristles; st.p., sternopleural bristles; u.me., upper mesepimeral bristles.



Culicidæ II.—Lateral view of thorax of: 6, *Orthopodomyia signifer*; 7, *Deinocerites pseudes*; 8, *Wyeomyia smithii*; 9, *Culex pipiens*; 10, *Mansonia perturbans*; 11, *Aedes vexans*. (After Matheson, courtesy C. C. Thomas).

causative organism, although other warm blooded animals may take the place of man. If the mosquitoes essential for the development of the organisms causing the disease were destroyed the disease would disappear entirely and it is because of this that such vigorous steps have been taken to stamp out mosquitoes in various parts of the world. The complete destruction of all disease carrying mosquitoes is scarcely possible but it has been demonstrated in the Panama Canal Zone that they can be kept under control to such an extent that the diseases they carry are no longer a serious menace to residents of the region. It is now so well known that the construction of the Panama Canal was made possible only by the control of mosquitoes that no more than mention of the fact need be made here.

Malaria is still a common disease in many parts of the United States. Many of us think of it as a tropical or subtropical disease, but nothing could be further from the truth. *Malaria* has raged at one time or another over rather large areas of the northern states and may do so again if patients suffering from the disease in its active stage should be bitten by our native *Anopheles* mosquitoes and they have the opportunity of developing and injecting the protozoan causing the fever into the blood stream of uninfected persons.

The North American *Anopheles* known to transmit the disease are *quadrifasciatus*, *maculipennis*, *punctipennis*, *crucians*, and *atropus* in the United States, *albimanus*, *pseudopunctipennis* and *quadrifasciatus* in Mexico, and *albimanus* and *tarsifasciatus* in Central America and the West Indies. The last three species named for the United States are not considered important vectors of the disease.

The causative organisms of *Malaria* are *Plasmodium vivax* for tertian, *P. malariae* for quartan, and *P. falciparum* for the pernicious type. Tertian is our commonest type, being approximately three times as prevalent as the other two combined, while the pernicious form is almost twice as prevalent as the quartan.

An idea of the essential part played by insects which act as intermediary hosts for parasites causing human diseases, may be obtained from a brief outline of the life cycle of *Plasmodium vivax*. The organism passes an asexual stage in man, developing and multiplying in the red corpuscles, causing them to enlarge. In a little less than two days the *trophozoites* are mature, having absorbed the contents of the cell and the term *schizont* is now applied to them. These divide into from 15 to 24 *merozoites* and are discharged into the blood stream by rupturing of the cell wall. The cycle now begins over again and the same process is repeated, but after a time certain of the *merozoites* develop into male (*microgametocytes*) and female (*macrogametocytes*) which

remain in the red blood cells, no further development taking place. From this point on the mosquito becomes an essential factor since, unless they are ingested by a mosquito, the *gametocytes* are capable of no further development.

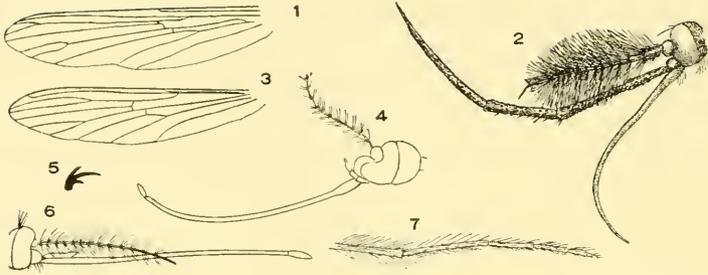
When the *gametocytes* are taken into the mosquito further development occurs, commencing in the stomach of the host. The female (*macrogametocytes*) mature into what is called a *macrogamete*, corresponding to a ripened but unfertilized ovule, while the *microgametocytes* give off a number of thin, elongate, worm-like bodies, the male elements or *microgametes*. These travel about by a lashing motion until they come in contact with a *macrogamete*, when they penetrate the cell wall and fertilization takes place, producing a *zygote*, a round body which soon elongates into an *ookinete* which becomes active, penetrates the wall of the stomach and establishes itself between the epithelial and muscular layers. In this position it absorbs food from the surrounding tissue, becomes spherical and very large, and in this stage is termed an *oocyst*. In this stage the spores (corresponding to eggs) are developed, and are called *sporozoites*. They escape by the breaking of the *oocyst* and enter the body cavity, where they are carried to all parts of the body by the free-flowing blood, many of them finding their way to the salivary glands and into the blood streams of human beings where they penetrate the red blood cells and develop into *schizonts*.

It will be seen from this that the sexual stage occurs in the mosquito, occupying from eight to fourteen days, and probably results in no ill effects to its host, since it is a cold-blooded creature.

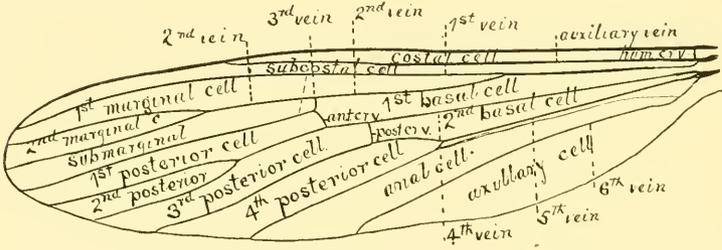
In *tertian malaria* a chill is produced about every three days, followed by fever, while in *quartan malaria* the chill occurs every four days, due to the longer incubation period of the *merozoites*, while in *pernicious malaria* the chills and fever are irregular.

Blackwater Fever is now believed to be the result of numerous attacks of malaria or a more or less continuous infection and derives its name from the fact that the patient's urine is of a dark mahogany color due to the presence of broken down red corpuscles.

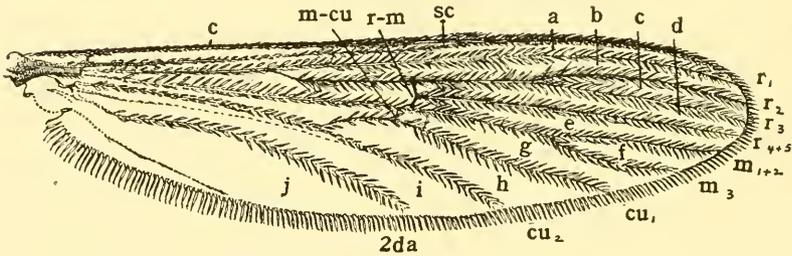
Yellow Fever may be carried by at least three species of mosquitos in America *Aedes (Stegomyia) aegypti*, *Aedes fluviatilis* and *Aedes scapularis*. Possibly other species might carry the disease as well but we fortunately do not have it in the United States, even though *A. aegypti* is common in the south. With present facilities for rapid transportation there is danger of travellers from yellow fever areas entering the country and developing the disease after arrival. If we were sure that the disease would be quickly diagnosed and the patient isolated in a mosquito-proof room we might feel much more certain



Culicidæ III.—1, Megarhinus; 2, Megarhinus, ♂ head; 3, Aedes, wing venation; 4, Hæmagogus; 5, Hæmagogus, front claws of ♂; 6, Wyeomyia, ♀; 7, Chaoborus, posterior tarsus.



Venation of Aedes.



Venation of Anopheles, giving Comstock-Needham terminology and that of Schiner, etc. (in brackets). Veins.—C, costal; Sc., subcostal (auxiliary); R, (first longitudinal); R₂, R₃, (second longitudinal); R₁₊₃, (third longitudinal); M₁₊₂, M₃ (fourth longitudinal); Cu₁, Cu₂ (fifth longitudinal); 2 da., (sixth longitudinal); r-m, radio-medial crossvein (anterior crossvein); m-cu, medio-cubital crossvein (posterior crossvein). Cells.—a, Sc., (subcostal); b, R₁, (first marginal); c, R₂ (second marginal); d, R₃ (submarginal); e, R₅ (first posterior); f, M₂, (second posterior); g, M₃ (third posterior); h, Cu, (fourth posterior); i, Cu₂ (anal); j, 2a, (axiliary). (After Matheson, courtesy C. C. Thomas).

that the disease would not become established in this country, but, unfortunately, few doctors are familiar with the symptoms of yellow fever and there is grave danger of the disease remaining undiagnosed until it is too late to take precautionary measures. Even though steps have been taken to quarantine all persons coming from known yellow fever areas the danger of introduction of the disease is an ever present menace.

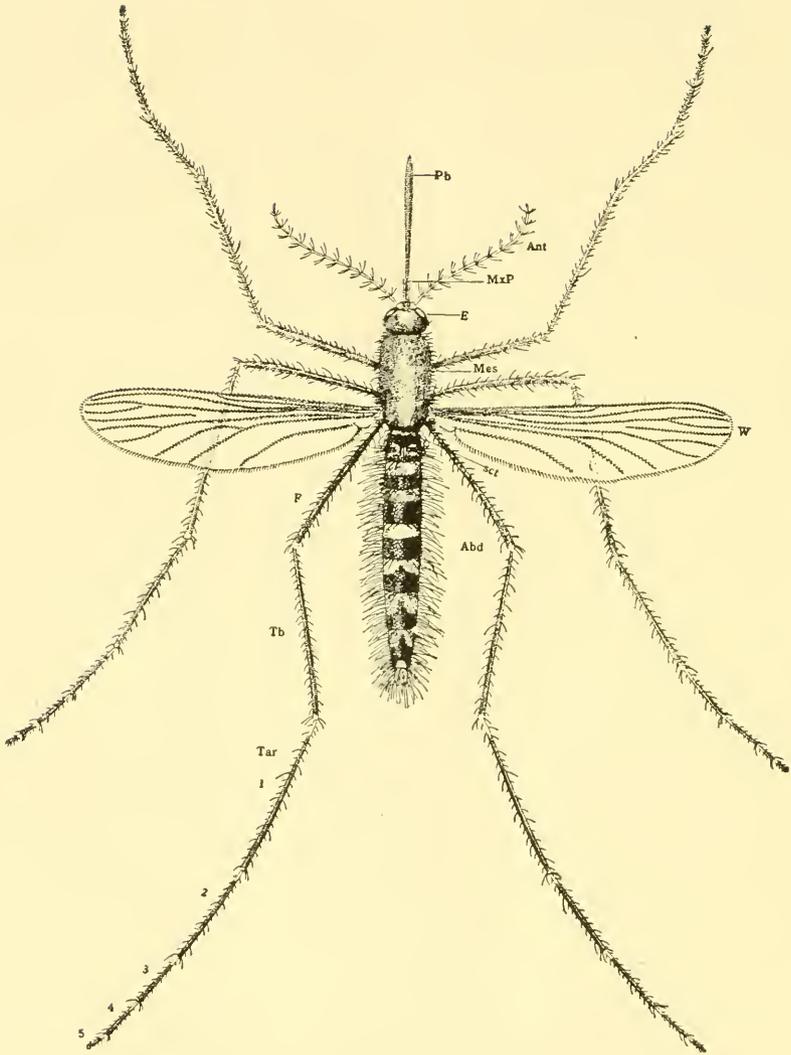
Dengue or Break-bone Fever is another disease carried by the *Yellow Fever* mosquito (*Aedes aegypti*). It is a common tropical and subtropical disease and there are occasional outbreaks in the Southern States, corresponding to the distribution of the mosquito. After biting a patient it requires from eight to eleven days before the mosquito is capable of transmitting the disease.

The microfilariae of *Wuchereria bancrofti* Cobbold are taken up (in America) by *Culex fatigans* Wiedemann and undergo development in the muscles of the mosquito, in much the same way as described for *Malaria* but there is no increase in numbers and they do not become sexually mature until they have been returned to the human body. The worms occur in the lymphatic system and may be responsible for a number of organic disturbances. The region about Charleston, South Carolina is the only area in the United States where *Filariasis* is prevalent but it is common in the tropics of both hemispheres.

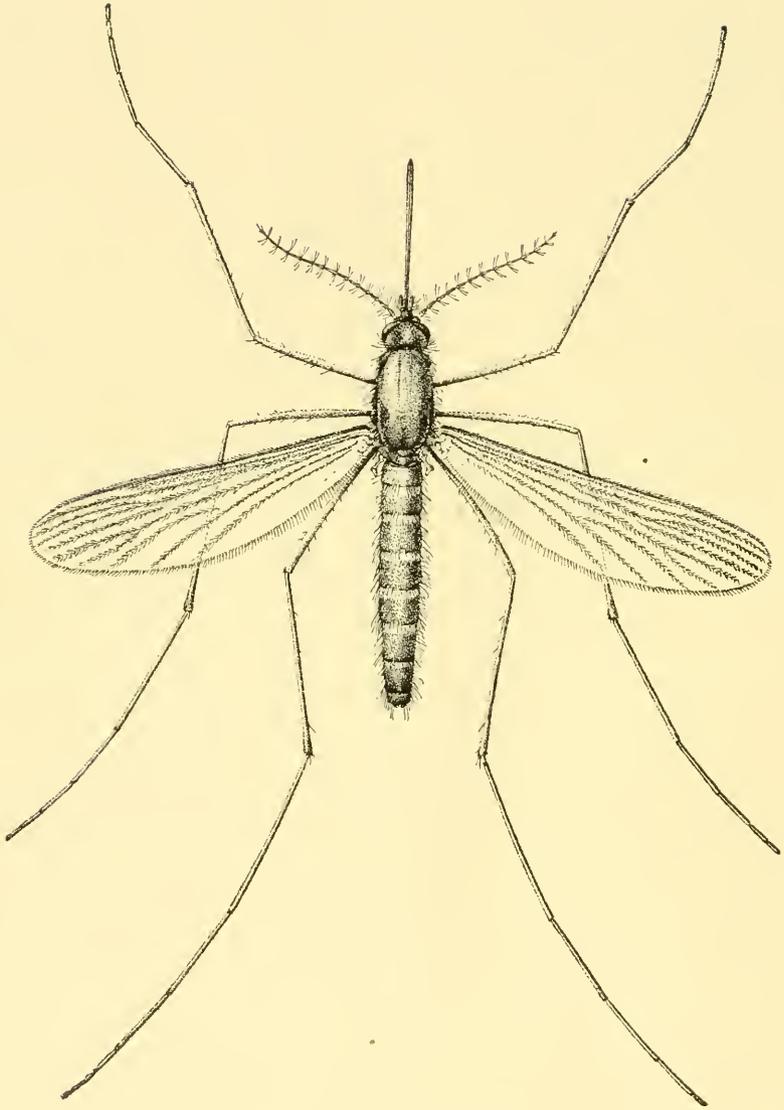
Since writing the foregoing and preparing the following key, Edwards' fascicle in the "Genera Insectorum" (194), has appeared. In this work the Dixidae are included as a subfamily of the Culicidae, a course I do not follow. An examination of this important fascicle of "Genera Insectorum" will disclose the fact that Edwards makes free use of subgenera. My views on this question are expressed elsewhere in this work. With the author's view that genera should be limited to groups readily characterized in both sexes I most heartily agree. The quality of the scientific work of this author is of too high a standard to warrant criticism except of a most favorable nature and one can disagree with him only on questions of minor importance. The question of subgenera is really one of likes and dislikes, and I prefer to keep as close as possible to a binomial system of nomenclature.

Most of the cuts used to illustrate this family are from "A Handbook of the Mosquitoes of North America" by Dr. Robert Matheson and I wish to express my indebtedness to him and to Mr. C. C. Thomas, the publisher, for furnishing them, and also my appreciation of their wholehearted cooperation.





Aedes vexans. (After Matheson, courtesy C. C. Thomas).

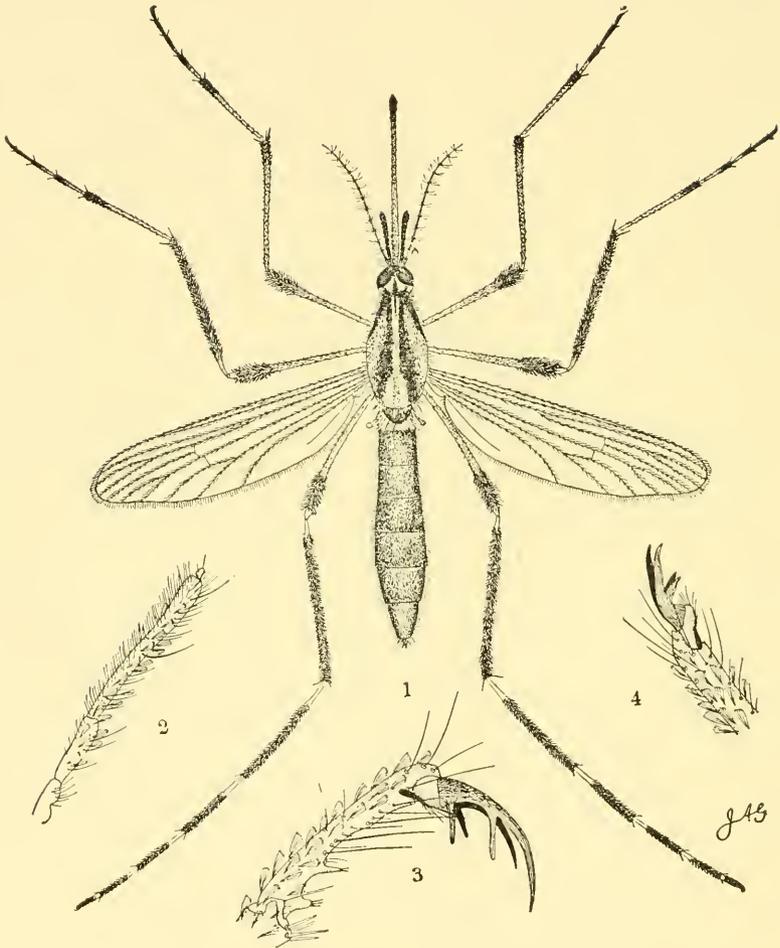


Culex pipiens. (After Matheson, courtesy C. C. Thomas).

14. Clypeus with setæ.....**Joblotia** Blanchard
Clypeus without setæ..... 15
15. Lower sternopleural setæ extending above the upper margin of the
metasternal sclerite**Gøeldia** Theobald
Lower sternopleural setæ not extending above the upper margin of
the metasternal sclerite (I-1).....**Isostomyia** Coquillett
16. Anal vein ending opposite or before the fork of the fifth vein.
Uranotaenia Arribalzaga
Anal vein ending well beyond the fork of the fifth vein..... 17
17. Prescutellar setæ and postspiracular setæ absent (III-4, III-5).
Hæmagogus Williston
Prescutellar setæ present 18
18. Postspiracular setæ present 19
Postspiracular setæ absent 21
19. Spiracular setæ absent 20
Spiracular setæ present (I-4 and text figure).....**Psorophora** Desvoidy
20. Wing scales narrow (rarely broad) or the base of first vein with setæ
posteriorly on the upper side (II-11, III-3, and text figs.)**Aedes** Meigen
Wing scales broad; base of first vein bare (II-10)....**Mansonia** Blanchard
21. Spiracular setæ present (I-2).....**Theobaldia** Neveu-Lemaire
Spiracular setæ absent 22
22. First vein without setæ basally on upper side; wing scales broad..... 23
First vein with setæ basally on upper side; wide scales narrow..... 25
23. Fourth segment of front tarsi at least as broad as long (II-6).
Orthopodomyia Theobald
Fourth segment of front tarsi longer than wide..... 24
24. Antennal segments little longer than wide.....**Aedeomyia** Theobald
Antennal segments much longer than wide (II-10)....**Mansonia** Blanchard
25. Antennæ much longer than the length of the proboscis (II-7).
Deinocerites Theobald
Antennæ not longer than the length of the proboscis..... 26
26. Wings yellowish, spotted with black.....**Lutzia** Theobald
Wings never black-spotted (II-9 and text figure).....**Culex** Linnaeus

KEY TO THE GENERA OF THE WORLD

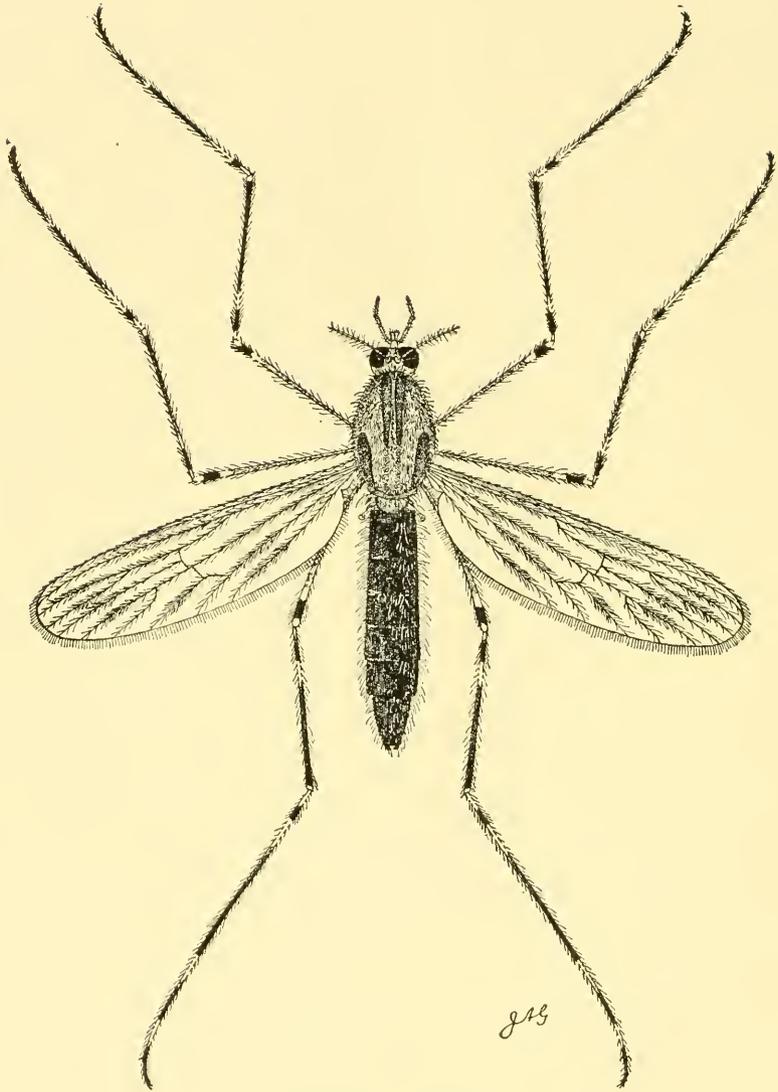
1. Scales almost confined to the wing-fringe; mouth-parts short, the
palpi incurved (Chaoborinæ)..... 2
Wing-veins and legs scaled; proboscis long; palpi not incurved
(Culicinæ) 7
2. Clypeus large and hairy; R₁ ending close to tip of R₂..... 3
Clypeus small and nearly bare; R₁ ending far from tip of R₂.
Corethrella Coquillett
3. First tarsal segment much shorter than the second..... 4
First tarsal segment longer than the second..... 6
4. Tibiæ spurred 5
Tibiæ not spurred; metapleural hairs absent.....**Mochlonyx** Lœw



Psorophora ciliata.

5. Tibial spurs 1-2-2*; metapleural hairs present.....**Cryophila** Edwards
Tibial spurs 1-1-1; metapleura bare.....**Promochlonyx** Edwards
6. Clypeus as long as the head; claws larger and toothed.
Eucorethra Underwood
Clypeus shorter than the head; claws small and simple.
Chaoborus Lichtenstein
7. Abdomen without scales; or at least with the sternites largely bare
(Anophelini) 8
Abdomen with both tergites and sternites completely clothed with
scales 10
8. Scutellum slightly trilobed**Chagasia** Cruz
Scutellum evenly rounded 9
9. Stem of median fork wavy.....**Bironella** Theobald
Stem of median fork straight.....**Anopheles** Meigen
10. Proboscis not rigid, of uniform thickness (unless swollen at tip), outer
half not bent backwards (Culicini)..... 11
Proboscis rigid, outer half slender and bent backwards (Megarhinini).
Megarhinus Desvoidy
11. Squama fringed (fringe usually complete, rarely interrupted); vein An
reaching well beyond base of cubital fork..... 12
Squama bare or rarely with 1-4 short hairs..... 30
12. Pulvilli present; pleural chaetotaxy well developed, but spiracular and
post-spiracular bristles absent 13
Pulvilli absent or rudimentary..... 14
13. Second antennal (first flagellar) segment short in both sexes; antennæ
of ♂ nearly always plumose.....**Culex** Linnæus
Second antennal (first flagellar) segment elongate in both sexes; an-
tennæ of ♂ not plumose.....**Deinocerites** Theobald
14. Post-spiracular bristles absent; claws of ♀ simple (except in **Leices-
teria**, **Hæmagogus**, and **Heizmannia**)..... 15
Post-spiracular bristles present, even if only one or two; claws of ♀
usually toothed; dorsocentral and upper sternopleural bristles nearly
always well developed..... 25
15. Spiracular bristles present (sometimes only one or two)..... 16
Spiracular bristles absent..... 19
16. Several upper sternopleural bristles; stem-vein usually hairy beneath.
Theobaldia Neveu-Lemaire
At most one or two upper sternopleural bristles; stem-vein bare be-
neath 17
17. Postnotum nearly always bare (Oriental and Australasian).
Tripteroides Giles
Postnotum with bristles (Neotropical)..... 18
18. Clypeus with setæ.....**Trichoprosopon** Theobald
Clypeus bare**Gœldia** Theobald

* Posterior four tibiæ each with two apical spurs.

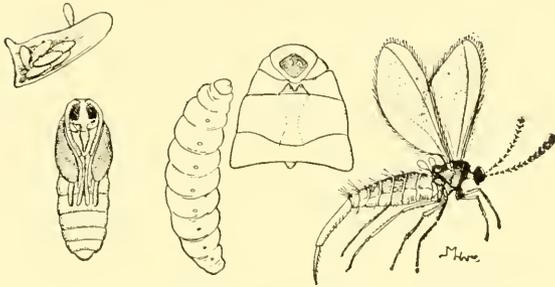


Corethra cinctipes.

19. Dorsocentral and pre-scutellar bristles absent; pronotal lobes approximated 20
 Dorsocentral and pre-scutellar bristles well developed; pronotal lobes well separated 21
20. Postnotum usually bare (Neotropical).....*Hæmagogus* Williston
 Postnotum usually with bristles (Oriental).....*Heizmannia* Ludlow
21. Post-spiracular area scaly; ♀ claws usually toothed; ♀ palpi more than half as long as proboscis.....*Armigeres* Theobald
 Subgen. *Leicesteria* Theobald
 Post-spiracular area bare; ♀ claws simple..... 22
22. All segments of ♀ antenna, and last two of ♂ antenna short and thick; middle femora with scale-tuft.....*Aèdeomyia* Theobald
 Antennæ normal, slender; middle femora without scale-tuft..... 23
23. First segment of front tarsi longer than the last four together; fourth very short in both sexes.....*Orthopodomyia* Theobald
 First segment of front tarsi not longer than last four together; fourth not shortened in ♀..... 24
24. Proboscis of ♂ much swollen apically, of ♀ slightly so, or else cell R₂ shorter than its stem.....*Ficalbia* Theobald
 Proboscis not swollen apically; cell R₂ at least as long as its stem.
Mansonia Blanchard
25. Head with numerous short hairs on vertex in addition to the orbital row; antennæ thick in both sexes, not plumose in ♂.....*Opifex* Hutton
 Head without hairs on vertex apart from the orbital row; antennæ slender in ♀, nearly always plumose in ♂..... 26
26. Spiracular bristles present, even if few (American)..*Psorophora* Desvoidy
 Spiracular bristles absent..... 27
27. Eyes widely separated, space between them clothed with metallic silvery scales (Ethiopian).....*Eretmopodites* Theobald
 Eyes less widely separated (sometimes touching), space between them not covered with metallic silvery scales..... 28
28. Wing-scales generally mostly narrow (when, rarely, all are broad, the ♀ claws are toothed); usually a few hairs on upper surface of stem-vein 29
 Wing scales all very broad; ♀ claws simple; stem-vein bare.
Mansonia Blanchard
29. Proboscis more slender, not recurved at tip in repose; ornamentation various*Aedes* Meigen
 Proboscis rather stout, recurved at tip in repose; dark species with flat scales on vertex and scutellum.....*Armigeres* Theobald
30. Wing-membrane without microtrichia (or these only visible under a high magnification); cell R₂ shorter than its stem; An ends about opposite base of cubital fork.....*Uranotania* Arribalzaga
 Wing-membrane with distinct microtrichia (visible under a magnification of 50)..... 31
31. Postnotum bare; An (except in some species of *Topomyia*) ending little if at all beyond base of cubital fork; two or more posterior pronotal bristles present (Palæotropical)..... 32

- Postnotum with bristles; An ending well beyond base of cubital fork; posterior pronotal bristles usually absent; spiracular bristles present (except in *Limatus*) (Neotropical)..... 35
32. Spiracular bristles absent; clypeus normal..... 33
Spiracular bristles present (one or more); clypeus rather small and narrow; cell R₂ longer than its stem..... 34
33. Cell R₂ shorter than its stem; several posterior pronotal bristles; wing scales normal.....*Zeugomyia* Leicester
Cell R₂ longer than its stem; two posterior pronotal bristles; wing-scales emarginate at tips.....*Hodgesia* Theobald
34. Proboscis very hairy, much enlarged at tip.....*Harpagomyia* de Meijere
Proboscis not hairy, rarely enlarged at tip.....*Topomyia* Leicester
35. Middle legs with "paddles" formed of very long erect scales.
Sabethes Desvoidy
Middle legs without "paddles"..... 36
36. Clypeus with hairs; large species with long ♂ palpi.
Trichoprosopon Theobald
Clypeus bare, or with scales only..... 37
37. Hind tarsi with long suberect scales; large species with long ♂ palpi.
Gældia Theobald
Hind tarsi with appressed scales only; smaller species with short ♂ palpi 38
38. No bristles on subalar knob; pronotal lobes large and almost in contact; mesonotal scales all metallic.....*Sabethoides* Theobald
Bristles present on sub-alar knob; pronotal lobes more widely separated; mesonotal scales rarely metallic..... 39
39. Spiracular area with scales only; hind tarsus with one claw.
Limatus Theobald
Spiracular area with 1-4 bristles, no scales; hind tarsus with two claws.
Wyeomyia Theobald

Family Cecidomyidæ—The Gall Midges

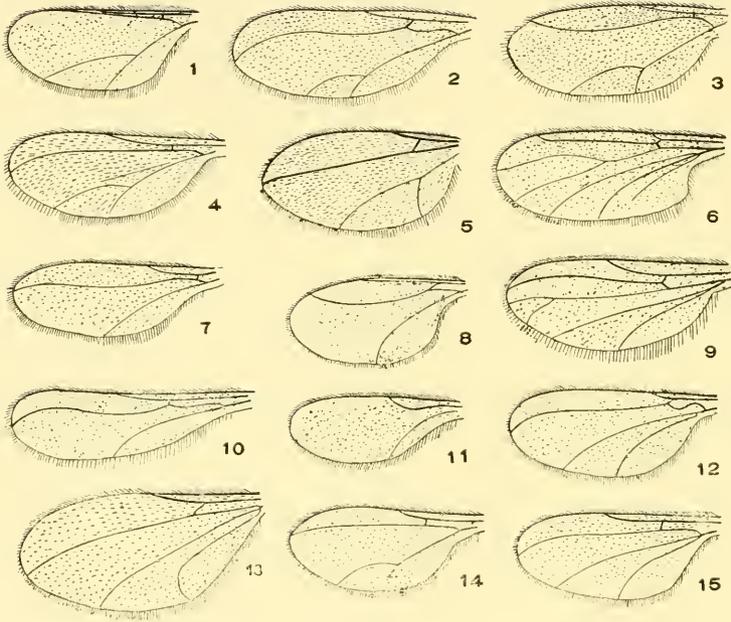


Cecidomyidæ—*Thecodiplosis piniradiatæ* Snow and Mills. Eggs, pupa, larva, "breast-bone" and imago. (Williston).

Small, delicate flies with broad wings and long antennæ and legs.

Head small; eyes round or reniform, sometimes holoptic; ocelli usually absent; antennæ long, cylindrical, the segments usually with bead-like swellings, ten to thirty-six in number; proboscis short, rarely elongated; palpi with one to four segments. Thorax ovate, more or less convex, without transverse suture; abdomen composed of eight segments; hypopygium small but projecting; ovipositor sometimes very long. Legs long and slender; coxæ rather short; tibiæ without terminal spurs, basal tarsal segment sometimes very short. Wings large, usually hairy, narrowed basally and without alula; three to five longitudinal veins, usually with only the first, third and fifth; humeral crossvein indistinct or absent; costal vein extending around the entire wing, the veins all weak, the fifth usually furcate; anterior crossvein situated very near the base of the wing, often appearing as the beginning of the third vein, the base of the third vein having the appearance of a crossvein; only one basal cell present.

These small flies may be found everywhere but the most satisfactory means of collecting them is to rear them. The larvæ of most of the species live in living plants where they form galls, or deformities of various kinds, in the axils of the leaves, etc. Others live under bark, in decaying vegetation and in fungi while a few live upon plant lice, being found for the most part under the colony of aphids or in axils of the leaves during the day. Many of the species are inquiline in the galls formed by other members of the family or even by other orders of insects. The galls occur on all parts of plants, on the flowers, leaves,



Cecidomyiidae I.—1, *Lasioptera*; 2, *Porricondyla*?; 3, *Cecidomyia*; 4, *Hormomyia*; 5, *Trichopteromyia*; 6, *Lestremia*; 7, *Miastor*; 8, *Spaniocera*?; 9, *Catocha*; 10, *Colpodia*; 11, *Heteropeza*; 12, *Asynapta*; 13, *Winnertzia*; 14, *Lestodiplosis*; 15, *Winnertzia*.

stems and roots and are usually characteristic for each species. The larvæ may be recognized by the presence of a "breast bone" or chitinized process lying within the thorax and terminating behind the head. The phenomenon of paedogenesis occurs in some species belonging to the genus *Miastor*, that is the larvæ produce eggs from ovary-like organs, the eggs hatch within the body and the young larvæ devour the parent, later escaping and completing their development externally; several generations may be produced in this way, before the development of adult insects occurs.

The classification of the family is difficult and I have merely emended the key given by Dr. Felt.* For the most part little can be done without preparing slides of the adults, the whole insect being mounted. It is advisable to preserve dried specimens as well as the mounts, and the galls should always be kept along with the adults. Study of the group should not be attempted by anyone who is not prepared to spend years of painstaking work on his hobby. Such a study would prove of inestimable value and would fully repay the student for the time spent. Many of the species are serious pests, the chief among these being the Hessian fly.

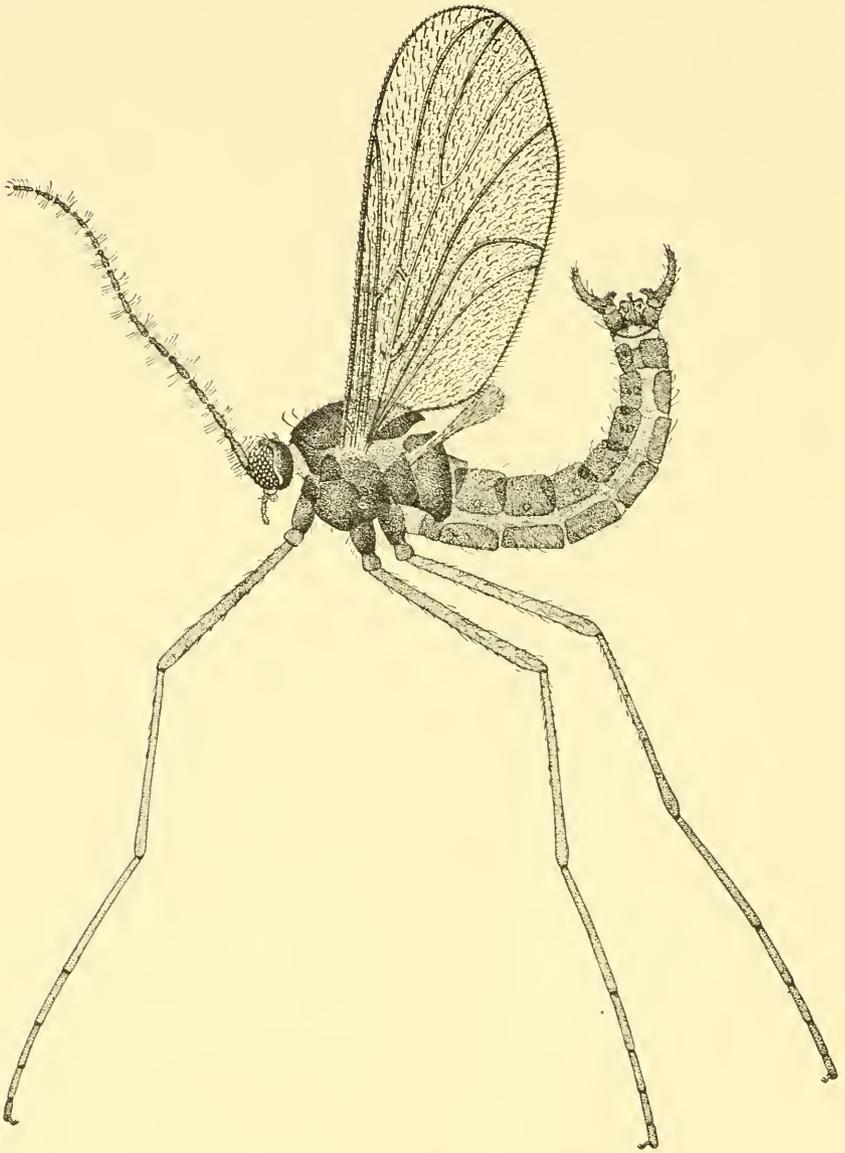
I may add that the study of the galls themselves constitutes a fascinating past-time and Dr. Felt has given us an excellent treatise on this subject† and is, I believe, preparing a new and enlarged edition. The series of papers published by Dr. Felt is copiously illustrated and I have made free use of these illustrations. In connection with their use I cannot help but call attention to the splendid cooperation of Dr. C. C. Adams, of the New York State Museum, in furnishing the cuts used for this family and of Dr. Felt for assistance and suggestions. Most of the illustrations of *Cecidomyida* are from cuts furnished by the New York State Museum.

KEY TO GENERA

1. <i>Circumfila</i> present	23
<i>Circumfila</i> absent	2
2. Wings with four longitudinal veins.....	3
Wings with at most three longitudinal veins.....	17
3. Fourth vein forked.....	4
Fourth vein simple.....	10
4. Second antennal segment greatly enlarged.....	5
Second antennal segment normal.....	7

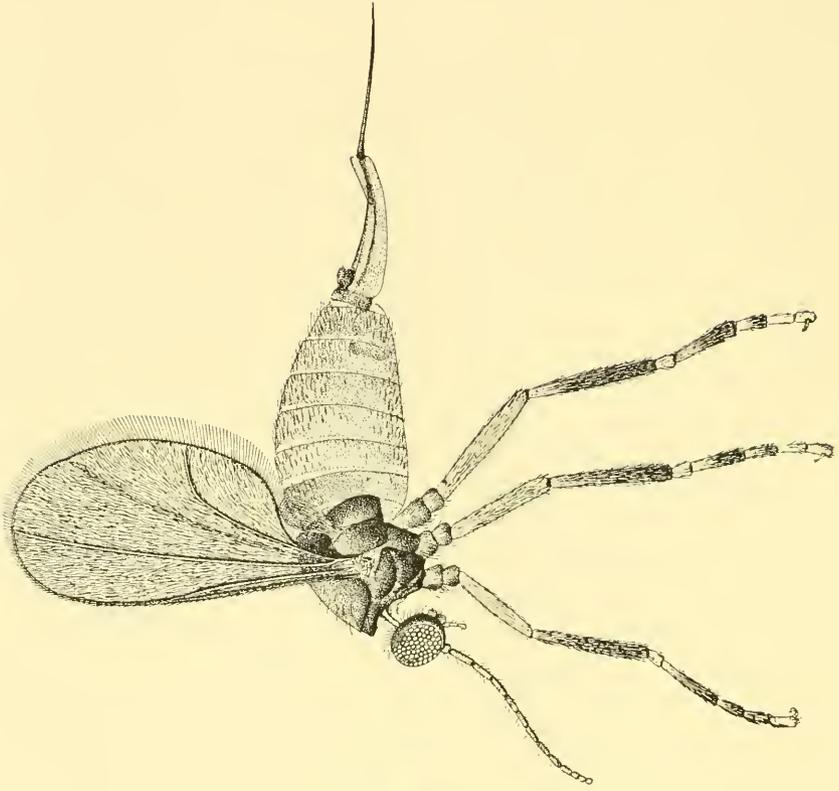
* 1925. Key to Gall Midges (A resume of Studies, i-vii, Itonididæ), N. Y. State Mus. Bull. No. 257. References to Parts i-vii will be found in this Bulletin.

† 1918. Key to American Gall Insects, N. Y. State Mus. Bull. No. 200.

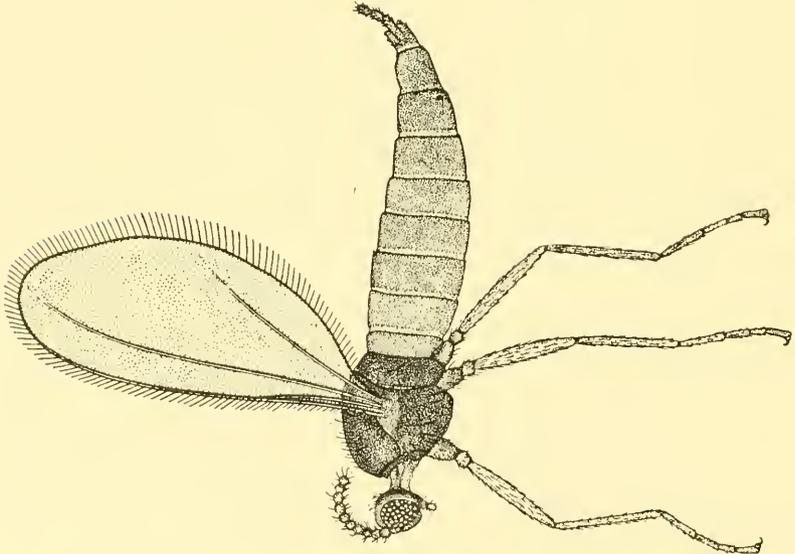


Cecidomyiidae II. 16. *Catocha Americana*.
(Courtesy New York State Museum, Albany, N. Y.)

5. Subcosta and third vein united as though by a very short crossvein.
Microcerata Felt
 Subcosta and third vein separate and with no trace of a crossvein... 6
6. Branches of the fork of the fourth vein even.....*Konisomyia* Felt
 Branches of the fork of the fourth vein irregular (22)...*Tritozyga* Løw
7. Flagellate antennal segments sessile, with a length only a little
 greater than their diameter.....*Neocatocha* Felt
 Antennal segments not sessile, more elongate..... 8
8. Antennæ with not more than ten segments.....*Neptunimyia* Felt
 Antennæ with at least eleven segments..... 9
9. Costa ending at or a little beyond the tip of the third vein (6, 26).
Lestremia Meigen
 Costa extending beyond the apex of the wing (9, 16)...*Catocha* Haliday
10. Third vein usually well separated from the costa and frequently
 uniting with it at or beyond the apex..... 11
 Third vein rarely extending to the apex of the wing; flagellate anten-
 nal segments subsessile in female, ornamented with crenulate whorls
 or structures more complex than irregular whorls of simple hairs.. 14
11. Flagellate antennal segments globose, stemmed in both sexes, or the
 second enlarged 12
 Flagellate antennal segments cylindrical, sub-sessile, the second not
 enlarged (23).....*Mycophila* Felt
12. Fourth vein absent 13
 Fourth vein present (28)*Joannisia* Kieffer
13. Antennal segments stemmed (5).....*Trichopteromyia* Williston
 Antennal segments sessile, the second enlarged.....*Ceratomyia* Felt
14. Flagellate antennal segments with a more or less distinct subapical
 collar forming a more or less cup-shaped cavity; claws denticulate.
Prionellus Kieffer
 Flagellate segments with subapical whorl of stemmed disks or spines. 15
15. Flagellate segments with subapical whorl of stemmed disks; claws
 with minute apical tooth*Monardia* Kieffer
 Flagellate segments with spines 16
16. Flagellate segments with short, stout, usually recurved spines (24,
 27)*Cordylomyia* Felt
 Flagellate segments with short, stout, curved spines (32).
Corinthomyia Felt
17. First segment of the tarsi shorter than the second..... 19
 First segment of the tarsi longer than the second..... 18
18. Tarsi with four segments; three longitudinal veins (7, 18).
Miastor Meinert
 Tarsi with three segments; two longitudinal veins (11).
Heteropeza Winnertz
19. Tarsi with five segments 20
 Tarsi with two segments.....*Oligarces* Meinert
20. Wing membrane finely haired..... 21
 Wing membrane scaled*Kronomyia* Felt

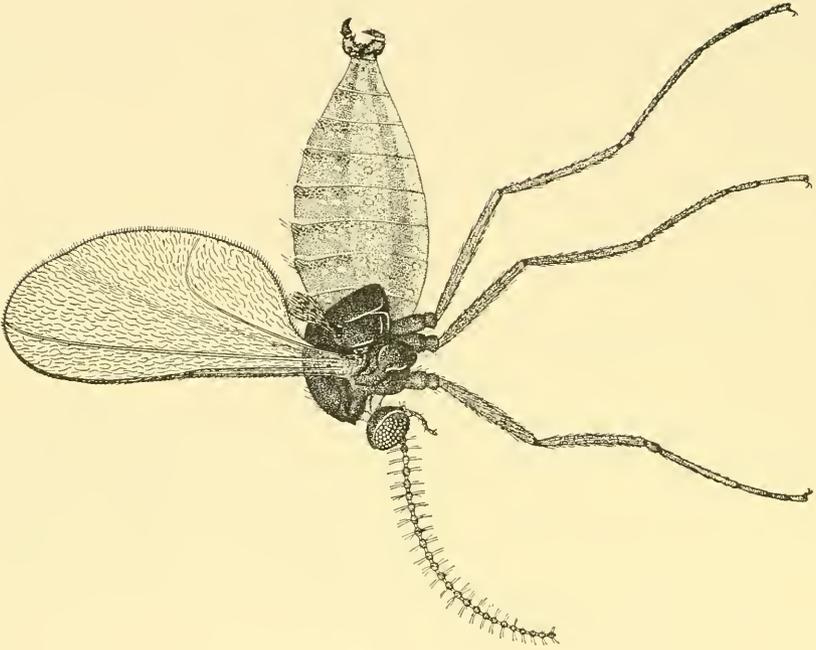


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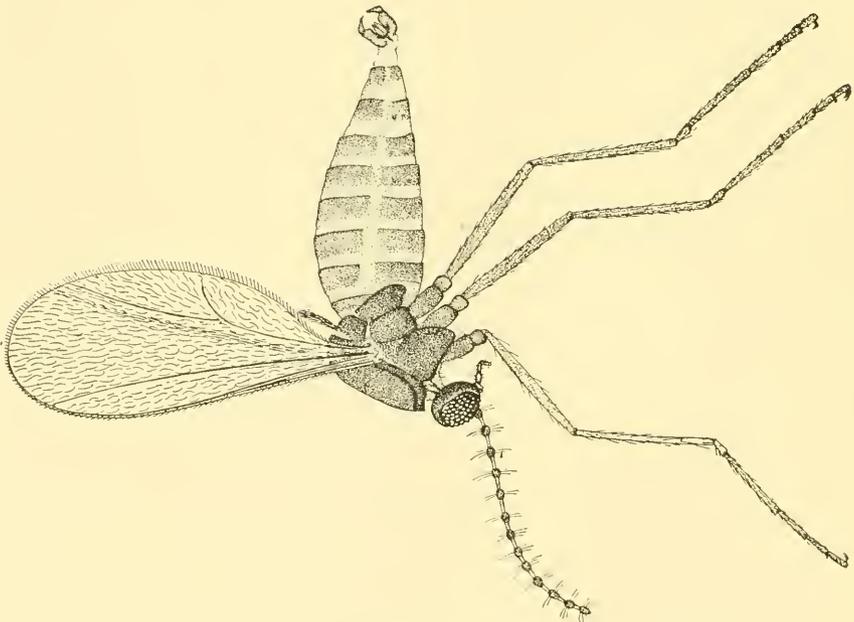


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Cecidomyiidae III.—17, *Asphondylia monacha*; 18, *Miastor americana*.
 (Courtesy New York State Museum, Albany, N. Y.)



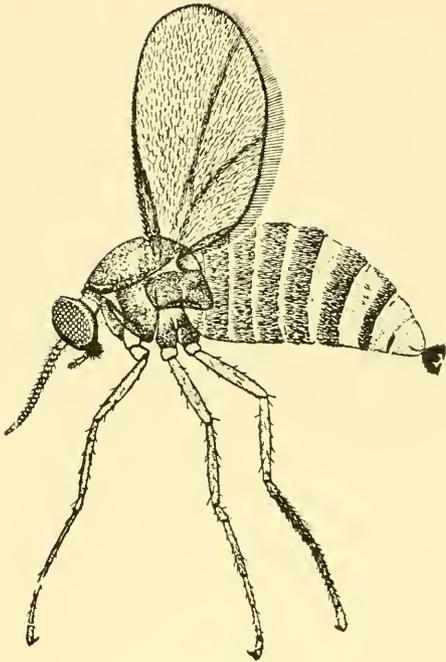
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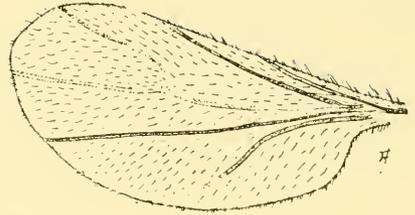
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Cecidomyiidae IV.—19, *Rhabdophaga* sp.; 20, *Dasyneura gibsoni*.
(Courtesy New York State Museum, Albany, N. Y.)

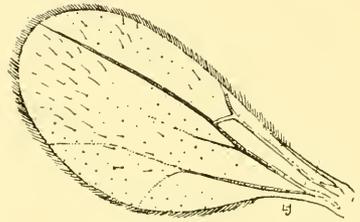
39. Antennæ with fourteen or more segments..... 40
 Antennæ with ten to thirteen, rarely with fourteen segments..... 43
40. Third vein uniting with the costa at or near the apex of the wing.... 41
 Third vein uniting with the costa well before the apex of the wing... 42
41. Ovipositor not chitinized apically; claws with one strong tooth (19).
Rhabdophaga Westwood
 Ovipositor chitinized apically, blade-like, the claws weakly toothed.
Procystiphora Felt
42. Wing veins scaled, the membrane more or less brownish.
Lasiapteryx Stephens
 Veins not distinctly scaled, the membrane hyaline (20).
Dasyneura Rondani
43. Third vein uniting with the costa near the apex of the wing..... 44
 Third vein uniting with the costa well before the apex of the wing.
Neuromyia Felt
44. Antennæ with thirteen or fourteen segments.....Cystiphora Kieffer
 Antennæ with twelve segments, genital harpes sickle-shaped, greatly
 producedHarpomyia Felt
45. Palpi with two or three segments..... 46
 Palpi with only one segment.....Ficiomyia Felt
46. Palpi with three segments..... 48
 Palpi with two segments..... 47
47. Antennæ with twelve segments.....Coccidomyia Felt
 Antennæ with fourteen to eighteen segments....Diarthronomyia Felt
48. Claws with a single tooth..... 49
 Claws pectinate.....Ctenodactylomyia Felt
49. Ovipositor with apical spine; male clasper short, swollen.
Cystiphora Kieffer
 Ovipositor without apical spine; pulvilli nearly three times as long
 as the claws.....Allomyia Felt
50. Flagellate antennal segments cylindrical, not greatly elongated, usu-
 ally stalked in the male; ovipositor not aciculate..... 51
 Flagellate segments cylindrical, elongate, sessile; ovipositor usually
 aciculate 56
51. Palpi with one to three segments..... 53
 Palpi with four segments..... 52
52. Third vein joining the costa at or near the apex of the wing (34).
Phytophaga Rondani
 Third vein joining the costa well before the apex of the wing.
Janetiella Kieffer
53. Ovipositor distinctly chitinized, aciculate or cultriform.
Sackenomyia Felt
 Ovipositor not chitinized..... 54
54. Palpi with only one or two segments..... 55
 Palpi with three segments.....Oligotrophus Latreille
55. Pulvilli nearly twice as long as the empodium.....Walshomyia Felt
 Pulvilli shorter than the empodium.....Rhopalomyia Rübsaamen



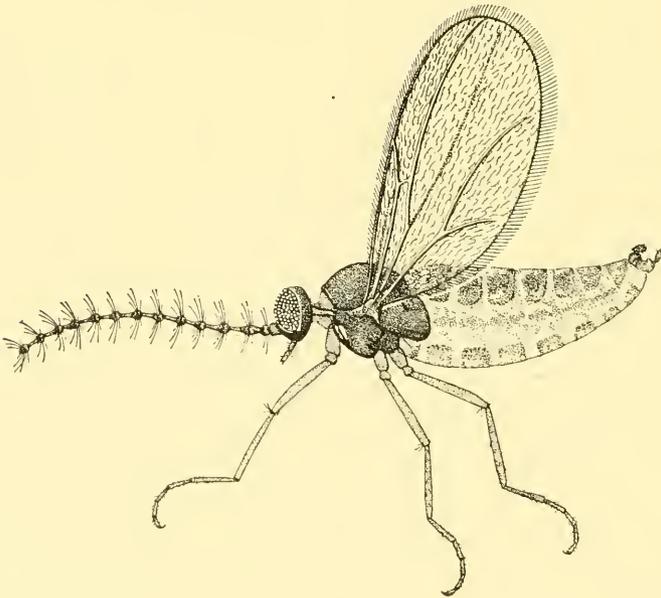
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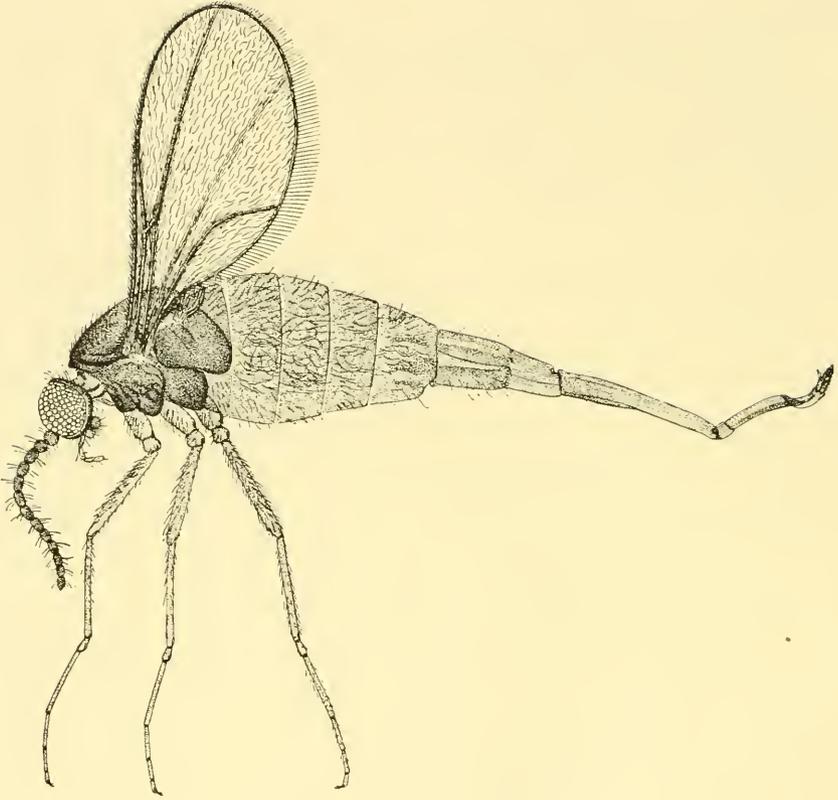


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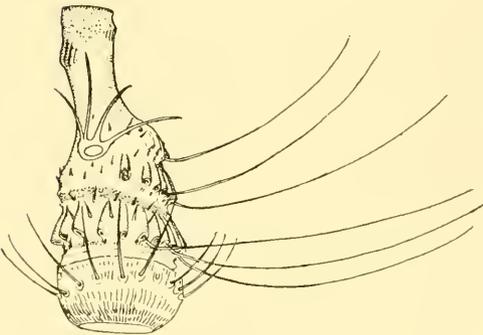


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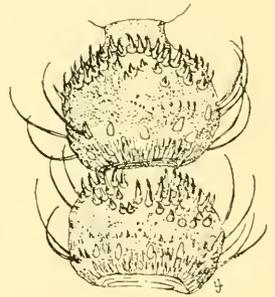
Cecidomyiidae V.—21, *Lasioptera veroniae*; 22, *Tritozyga sackeni*; 23, *Mycophila fungicola*; 24, *Cordylomyia coloradensis*.
(Courtesy New York State Museum, Albany, N. Y.)



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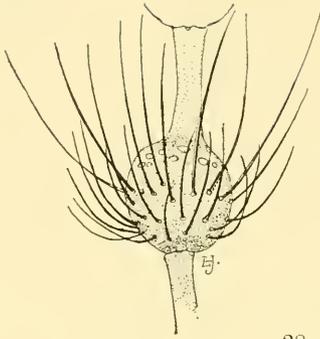


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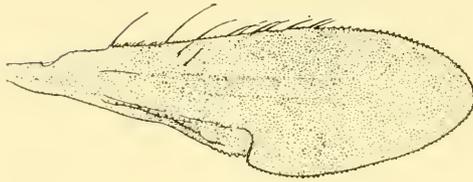
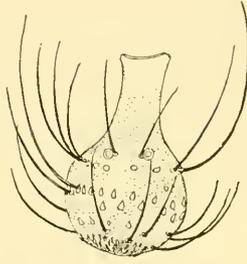


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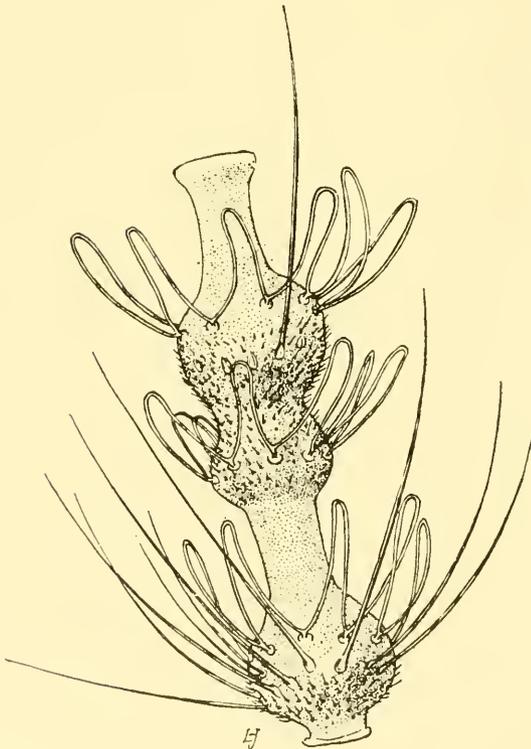
Cecidomyiidae VI.—25, *Winnertzia pectinata*; 26, *Lestremia pini*, fifth antennal segment of ♂; 27, *Cordylomyia brevicornis*, fourth and fifth antennal segments of ♂.
(Courtesy New York State Museum, Albany, N. Y.)



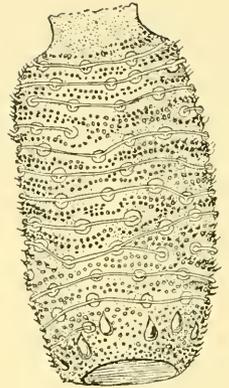
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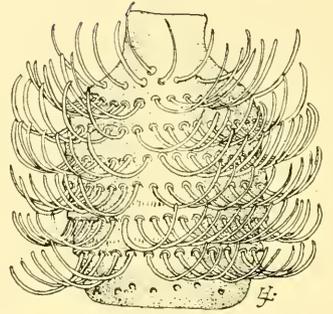
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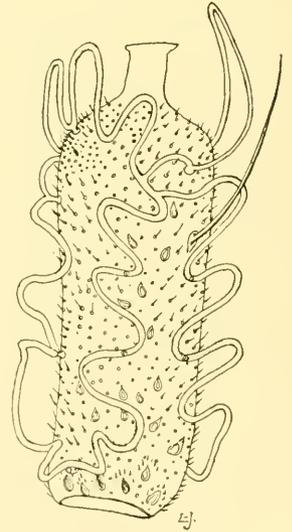
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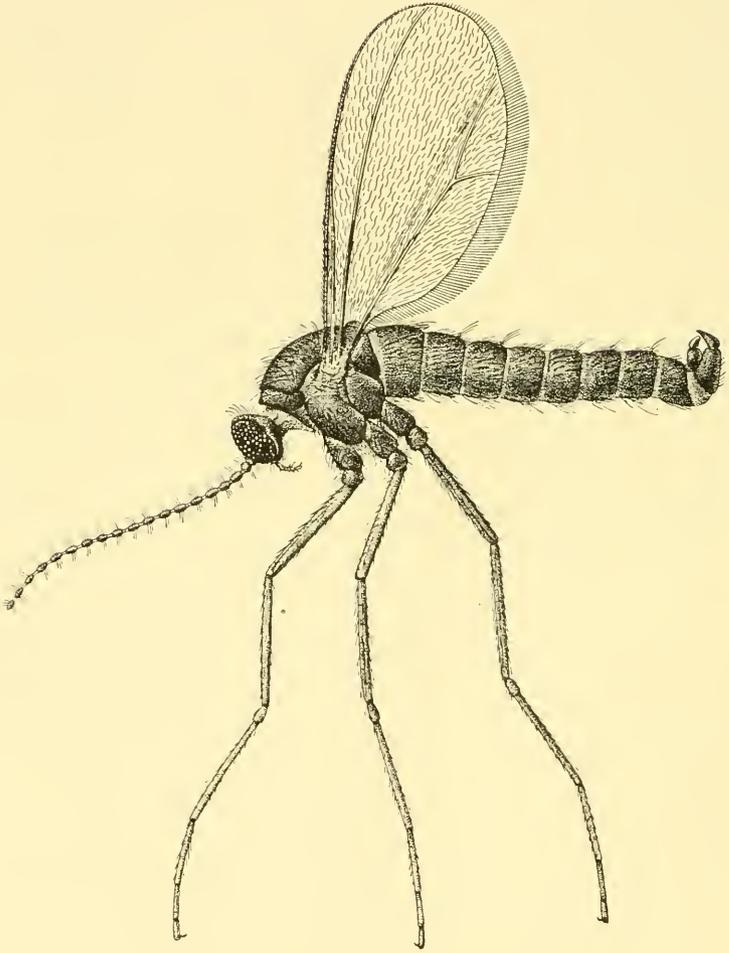


33

88. Ventral plate or harpes strongly chitinized.....*Coquillettomyia* Felt
 Ventral plate or harpes not chitinized.....*Feltiella* Rübсаamen
89. Terminal clasp segment sub-fusiform, distinctly dilated; harpes strongly chitinized and very complex (30).....*Karschomyia* Felt
 Not as above 90
90. Claws curved at nearly right angles.....*Clinodiplosis* Kieffer
 Claws not curved at nearly right angles..... 91
91. Ventral plate almost linear, straight and much longer than the dorsal plate*Acaroletes* Kieffer
 Ventral plate not greatly produced.....*Mycodiplosis* Rübсаamen
92. Palpi with fewer than four segments.....108
 Palpi with four segments..... 93
93. Third vein uniting with the costa behind the apex of the wing..... 94
 Third vein uniting with the costa before the apex of the wing.
Arthrocnodax Rübсаamen
94. Circumfila with short bows or wanting..... 95
 Circumfila well developed and not conspicuously irregular, the loops mostly as long as or longer than the diameter of the enlargement.. 97
95. Some of the flagellate antennal segments cylindrical..... 96
 Flagellate antennal segments binodose in the male or presumably so.
Caryomyia Felt
96. Circumfila rudimentary or wanting; tenth to fourteenth segments cylindrical; harpes somewhat inflated.....*Prodiplosis* Felt
 Circumfila distinct though low, all the flagellate or only the distal segments cylindrical; ovipositor short.....*Caryomyia* Felt
97. Claws bent at nearly right angles..... 98
 Claws not bent at right angles..... 99
98. Ventral plate long, slender, slightly expanded and roundly emarginate apically; dorsal plate short, triangularly emarginate..*Giardomyia* Felt
 Ventral plate long, broad, very deeply and broadly emarginate; dorsal plate deeply and roundly emarginate.....*Hyperdiplosis* Felt
99. Basal clasp segment lobed.....100
 Basal clasp segment not lobed.....103
100. The lobe apical101
 The lobe basal102
101. The lobe very long, curved, setose; terminal clasp segment swollen basally*Epidiplosis* Felt
 The lobe triangular; terminal clasp segment short, greatly constricted near the middle and enormously swollen and recurved apically*Metadiplosis* Felt
102. Wings spotted*Lestodiplosis* Kieffer
 Wings not spotted*Coprodiplosis* Kieffer
103. Antennal segments plainly trinodose.....*Obolodiplosis* Felt
 Antennal segments not plainly trinodose.....104

Cecidomyiidae VII.—28, *Joannisia photophila*, fifth and tenth antennal segments of male; 29, *Leptosyna quercivora*; 30, *Karschomyia viburni*, fifth antennal segment of ♂; 31, *Cincticornia transversa*, sixth antennal segment of ♂; 32, *Corinthomyia cincinnati*, fourth antennal segment of ♂; 33, *Schizomyia macroila*, sixth antennal segment of ♂.

(Courtesy New York State Museum, Albany, N. Y.)

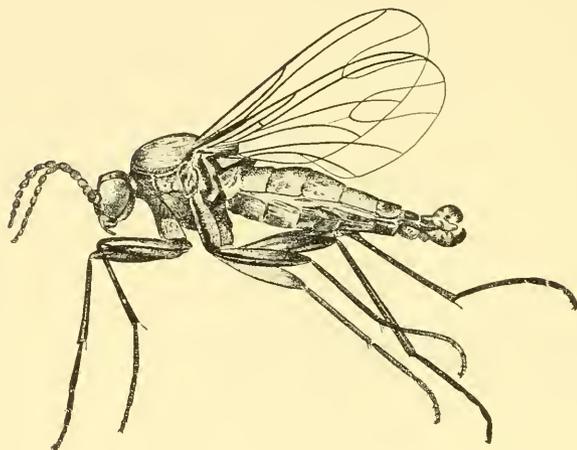


34

Cecidomyiæ VIII.—34, *Phytophaga destructor*.
(Courtesy New York State Museum, Albany, N. Y.)

104. Antennal segments short, thick, the stems transverse, the enlargements short and broad; circumfila fine, rather short, each with about twenty loops.....**Retinodiplois** Kieffer
 Antennæ of normal form.....105
105. Ventral plate linear or long and spatulate.....106
 Ventral plate broad and broadly or triangularly emarginate.....107
106. Ventral plate linear, rounded apically; dorsal plate shorter than the ventral, the lobes truncate.....**Parallelodiplois** Rùbsaamen
 Ventral plate spatulate, the dorsal plate moderately long, deeply and triangularly emarginate, the lobes broad, obliquely and roundly emarginate**Hypodiplois** Kieffer
107. Dorsal plate deeply incised, the lobes narrowly rounded; terminal clasp segment with serrate margin.....**Paradiplois** Felt
 Dorsal plate not incised or very narrowly emarginate; terminal clasp segment smooth (3).....**Cecidomyia** Meigen
108. Palpi with three segments.....109
 Palpi with only one or two segments.....113
109. Circumfila with short bows or loops, their length being one-half the diameter of the enlargement or less.....110
 Circumfila loops with a length equal to the diameter of the enlargement or longer.....112
110. Thorax plainly extending over and concealing the head to a certain extent111
 Thorax not produced over the head to a marked degree.. **Caryomyia** Felt
111. Males with fifteen to at least twenty-seven antennal segments; female with fourteen or more antennal segments; ovipositor short (4).
Hormomyia Lœw
 Male and female with fourteen or fifteen antennal segments, the fifteenth rudimentary; ovipositor moderately long.
Trishormomyia Kieffer
112. Basal clasp segment lobed.....**Odontodiplois** Felt
 Basal clasp segment simple.....**Adiplois** Felt
113. Palpi with two segments.....**Dishormomyia** Kieffer
 Palpi with one segment.....114
114. Wings hyaline115
 Wings marked with black and yellow.....**Astrodipllois** Felt
115. Fourteen antennal segments in both sexes.....116
 Thirteen segments in female, the third and fourth fused, the basal and distal nodes in the male flagellate antennal segments globose and ovoid respectively; dorsal and ventral plates bilobed; ovipositor short, chitinous, aciculate.....**Cystodiplois** Kieffer & Jorg
116. Both dorsal and ventral plates deeply emarginate; ovipositor short, chitinous, falcate.....**Monarthropalpus** Rùbsaamen
 Ventral plate not deeply emarginate.....117
117. Dorsal plate deeply and ventral plate broadly emarginate; ovipositor stout, half as long as the abdomen, the distal part thickly clothed with long, silky hairs.....**Onodiplois** Felt
 Dorsal plate deeply, broadly and roundly emarginate, the lateral margin extended ventrally; ventral plate broadly emarginate; ovipositor stout, about two-thirds as long as the abdomen.
Horidiplois Felt

Family Sciariidæ—The Dark Winged Fungus Gnats



Sciara ♂.

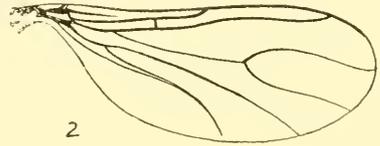
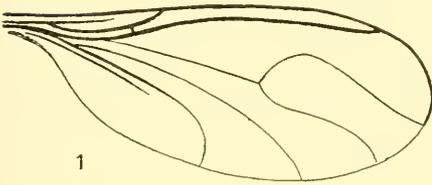
Usually small, blackish, brownish or testaceous species, the abdomen cylindrical and tapering, especially in the females.

The insects belonging to this family are related to the Mycetophilidæ, with which they have, until recently, been united. They differ in having the eyes produced toward each other above the antennæ, instead of being regularly convex in outline, and in having shorter coxæ. As a general rule the wing venation is typical although a very few genera of the Mycetophilidæ have similar venation.

The adults inhabit moist places or any place where fungus growth occurs, particularly manure. The larvæ frequently become pests, in mushroom cellars, feeding upon the mycelium of the fungi. The females are difficult to determine, the classification being based mainly on the male genitalia although the ovipositors of the females also offer good characters. The larvæ, like those of the Mycetophilidæ, have some very interesting habits, some of them sometimes travelling over the ground in snake-like masses. The family is treated by Johannsen in the reference given under the Mycetophilidæ.

KEY TO GENERA

- 1. Proboscis longer than the thorax (2).....*Eugnoriste* Coquillett
 Proboscis not greatly elongate 2
- 2. Wings conspicuously hairy; claws never denticulate...*Trichosia* Winnertz
 Wings with microscopic setulæ but not hairy..... 3
- 3. Claws toothed 4
 Claws not toothed 5
- 4. Forks of the fourth vein arcuate.....*Metangela* Rübsaamen
 Forks of the fourth vein not arcuate.....*Phorodonta* Coquillett
- 5. Face strongly produced.....*Rhynchosciara* Rübsaamen
 Face not produced 6
- 6. Forks of the fourth vein arcuate; antennæ of the male pedicellate and
 with whorls of hair (1).....*Zygoneura* Meigen
 Forks of the fourth vein not arcuate; antennæ never pedicellate
 (*Neosciara*) (6, 7, *Mycetophilidæ*).....*Sciara* Meigen



Sciaridæ.—1, *Zygoneura*; 2, *Eugnoriste*.

Family Mycetophilidæ—The Fungus Gnats

Moderately small, rather delicate, slender flies with elongated coxæ.

Head small, rounded or somewhat elongate, usually closely applied to the thorax. Eyes round, rather prominent; ocelli three, two or none, the median one often small, the lateral ones frequently close to the orbits; front broad in both sexes. Antennæ elongated, composed of twelve to seventeen segments, the two basal segments large or differentiated, the others cylindrical, flattened or petiolated. Proboscis usually short, rarely greatly lengthened; palpi rarely absent, composed of three or four segments, usually inflexed. Thorax distinctly to strongly arched, without transverse suture; scutellum small; metanotum large. Abdomen composed of six or seven segments, cylindrical or compressed either laterally or dorsoventrally, sometimes narrowed basally; male genitalia projecting; ovipositor pointed, usually with two terminal lamellæ. Legs more or less elongated, the femora usually thickened; coxæ elongated; tibiæ with spurs and usually with series of short or conspicuous bristles. Wings large; auxiliary vein present though sometimes very short; second longitudinal vein absent, or simulating a crossvein; third vein arising from the first vein, usually at such an angle as to simulate a crossvein, the crossvein sometimes appearing to form the base of the third vein; fourth and fifth veins usually furcate, sometimes simple; sixth vein sometimes rudimentary, never furcate; the seventh usually short, often rudimentary or entirely absent; discal cell absent, the second basal cell often open apically.

The adults are found in moist places, especially about decaying wood, on mossy rocks or moist humus, and prefer dark places. Many of the species are quite small only a few being large and conspicuous. They occur in a variety of habitats and some species are very restricted in habitat although occurring over a very wide geographical range. They may be collected throughout most of the year and when encountered often occur in large numbers. The larvæ live in moist soil, wood, fungi, etc., and probably feed upon fungus growth. Pupation takes place outside the larval skin, some species spinning cocoons. The habits of the larvæ are particularly interesting and their investigation should provide an entertaining and profitable field of study to some one interested in pure science for the fun of the thing. Johannsen* has monographed the family and only a small number of North American species have been described since.

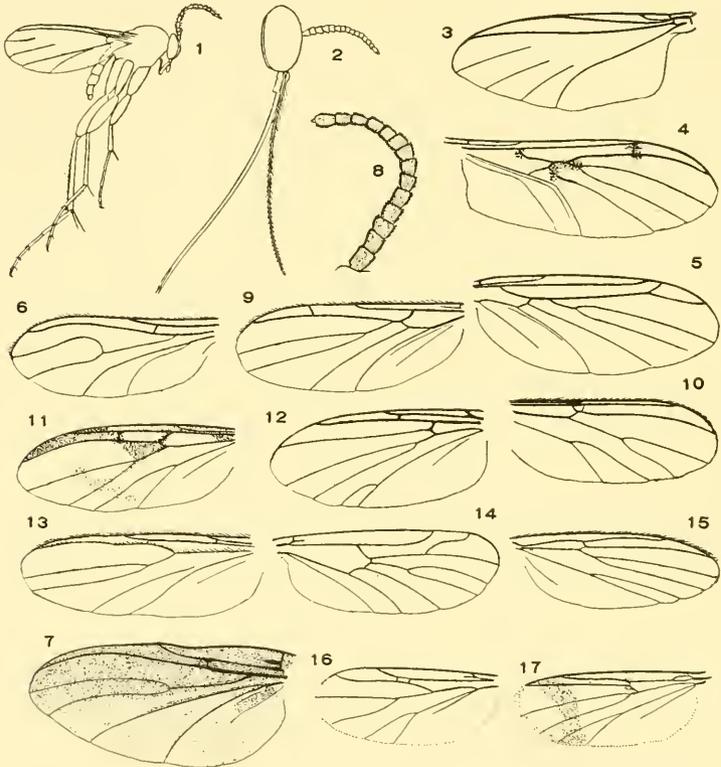
* Maine Agric. Exp. Sta. Bulls. 172, 180, 196, 200, 1909-12.

KEY TO GENERA*

1. Second basal cell closed apically..... 2
Second basal cell open apically..... 12
2. Anterior branch of third vein at least half as long as posterior branch;
auxiliary vein short, ending free; posterior divisions of pronotum with
one or more long bristles (*Ditomyiinae*)..... 11
Anterior branch of third vein less than half as long as posterior
branch, in some cases vestigial or absent; auxiliary vein in most
cases long and ending in the costa; posterior divisions of pronotum
without long bristles 3
3. The second basal cell much shorter than the first; first and second basal
cells separated (*Bolitophilinae*) (18).....*Bolitophila* Meigen
The second basal cell almost as long as the first or the basal sections of
the third and fourth veins fused for a short distance..... 4
4. Both crossveins closing the basal cells present, nearly in a straight
line; basal section of fourth vein lacking (*Diadocidinae*) (19).
Diadocidia Ruthé
Basal sections of third and fourth veins fused for a short distance ex-
cept in *Palæoplatyura* in which basal section of fourth vein is present 5
5. Antennæ long and slender, in most cases longer than the body (*Macro-
cerinae*) (4)*Macrocera* Meigen
Antennæ more robust, in some cases distinctly thickened and flattened
(*Ceroplastinae*) 6
6. Proboscis prolonged into a snout.....*Asindulum* Latreille
Proboscis not prolonged into a snout..... 7
7. Antennæ conspicuously flattened; palpi porrect (*Heteropterna*, *Cerote-
lion*, *Euceroplatus*) (5)*Ceroplastus* Bosc
Antennæ not conspicuously flattened, palpi curved..... 8
8. The anterior crossvein not obliterated by the fusion of the bases of the
third and fourth veins (20).....*Palæoplatyura* Meunier
The anterior crossvein not obliterated by the fusion of the base of the
third and fourth veins..... 9
9. Basal section of fourth vein absent (*Isoneuromyia*, *Neoplatyura*, *Procero-
platus*, *Lapyruta*, *Micrapemon*) (9).....*Platyura* Meigen
Basal section of fourth vein present..... 10
10. Ocelli wanting; anterior branch of third vein ending in the costa.
Hesperodes Coquillett
Ocelli present, anterior branch of third vein ending in the first vein
(21)*Apemon* Johannsen
11. Fork of fourth vein distal of fork of third vein (22)...*Ditomyia* Winnertz
Fork of fourth vein basal of fork of third vein (14)...*Symmerus* Walker
12. First and third veins arising separately at base of wing; venation de-
fective; proboscis elongate (*Lygistorrhinae*) (*Probolaus*) (2, 3).
Lygistorrhina Skuse
First and third veins arising from a common stem well beyond base
of wing 13

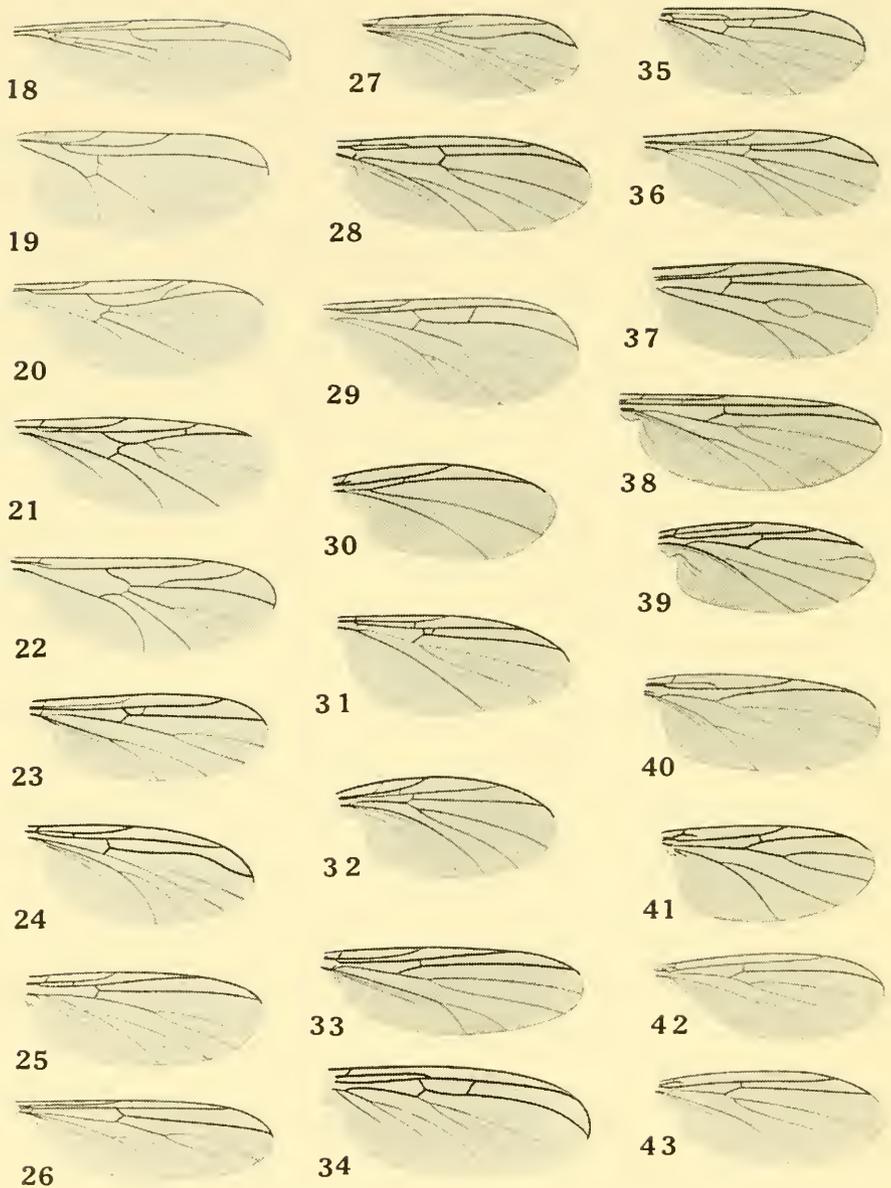
* Checked by Dr. O. A. Johannsen.

13. Eyes joined above the antennæ by a narrow bridge; anterior crossvein long, appearing like the base of the third vein, the latter short and transverse, resembling a crossvein.....See Sciaridæ
 Eyes not joined by a narrow band above the antennæ; base of third vein and the anterior crossvein in most cases oblique..... 14
14. Prothorax without long bristles, antennæ inserted above the middle of the head, occiput flat or concave, venation defective (Manotinæ) (1).
 Manota Williston
 Prothorax with long bristles, occiput convex, antennæ inserted at or below the middle of the head..... 15
15. Microtrichia of wings irregularly arranged or absent; auxiliary vein usually long; lateral ocelli in most cases far from margin of compound eyes (Sciophilinæ Edwards = Sciophilinæ Johannsen + Series I of Mycetophilinæ Johannsen 1911)..... 16
 Microtrichia in more or less definite longitudinal lines; auxiliary vein usually short; lateral ocelli touching compound eyes (Mycetophilinæ Edwards, Mycetophilinæ Johannsen 1911, Series II)..... 44

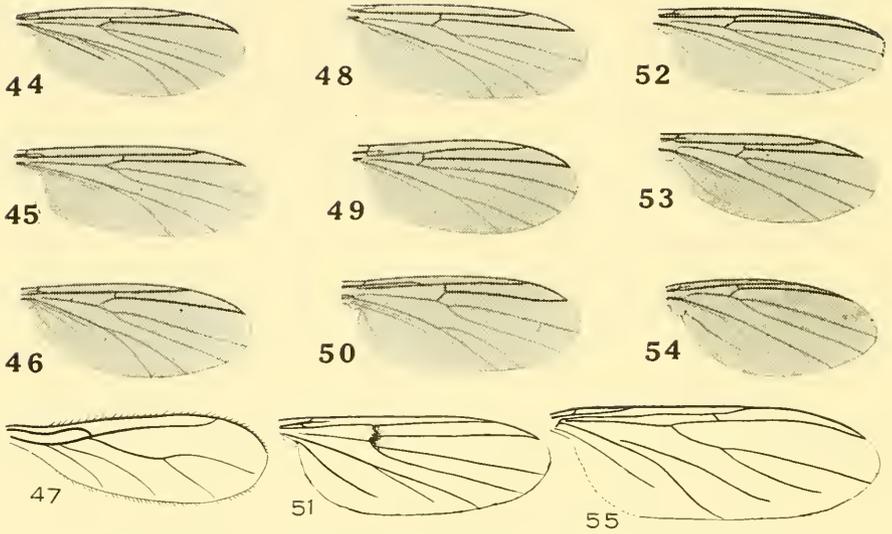


Mycetophilidæ I.—1, *Manota defecta*; 2, 3, *Lygistorrhina singularis*; 4, *Macrocera concinna*; 5, *Ceroplatys longimana*; 6, 7, 8, *Sciara* (Sciariidæ); 9, *Platyura ignobilis*; 10, *Sciophila diluta*; 11, *Neompheria maculipennis*; 12, *Phthinia fraudulenta*; 13, *Leia nitens*; 14, *Symmerus*; 15, *Mycetophila insipiens*; 16, *Tetragonura sylvatica*; 17, *Dynatosoma fuscicornis*.

16. Ocelli two, approximated; wings without macrotrichia (hairs) on membrane; auxiliary vein reaching at least the base of the third vein; fine tibial setæ in regular longitudinal rows..... 19
 Ocelli three, if but two (in *Eudierana*) they are close to the eye margin. 17
17. Wing with macrotrichia (hairs) on membrane..... 20
 Wing without macrotrichia on membrane..... 18
18. Apical segment of first vein several times longer than the anterior crossvein; branches of fourth vein longer than the petiole..... 32
 Apical segment of first vein short, in most cases not much longer than the crossvein, or if longer the branches of fourth vein scarcely longer than the petiole 38
19. Costa not produced beyond tip of third vein; no spurious vein between third and fourth veins; wing not banded (23).....*Mycomya* Rondani
 Costa produced beyond tip of third vein; spurious vein usually present between third and fourth veins; wing banded or spotted (11).
Neoempheria Osten Sacken
20. Ocelli two, contiguous to eye margin.....*Eudierana* Læw
 Ocelli three, remote from compound eyes..... 21
21. Fork of fifth vein situated nearer to wing base than is the fork of fourth vein 22
 Fork of fifth vein, if present, situated beyond fork of fourth vein.... 27
22. Postnotum with hairs or bristles..... 23
 Postnotum bare 26
23. Anterior branch of fourth vein complete or nearly so..... 24
 Anterior branch of fourth vein faint or defective at base; third vein undulate (*Odontopoda*). (24).....*Neuratelia* Rondani
24. Subcostal crossvein before middle of auxiliary vein (25)...*Allocotocera* Mik
 Subcostal crossvein beyond middle of auxiliary vein..... 25
25. Third vein straight; costa not produced beyond its tip (*Diomonus*) (26).
Leptomorphus Curtis
 Third vein undulate; costa produced beyond its tip (27).
Polylepta Winnertz
26. Metapleura hairy; auxiliary vein ending in first vein; body stout (28).
Syntenna Winnertz
 Metapleura bare; auxiliary vein ending in the costa; body long and slender (29)*Paratinia* Mik
27. Legs slender and extremely long; basal tarsal segment of anterior legs twice as long as the tibia; fourth vein forks broadly (12).
Phthinia Winnertz
 Legs normal; fork of media pointed 28
28. Second branch of fourth vein complete..... 29
 Second branch of fourth vein detached, present only as a short element on the wing margin (30).....*Azana* Walker



Mycetophilidae II.—18, *Bolitophila*; 19, *Diadocidia*; 20, *Paleoplatyura*; 21, *Apemon*; 22, *Ditomya*; 23, *Mycomya*; 24, *Neuratelia*; 25, *Allocotocera*; 26, *Leptomorphus*; 27, *Polylepta*; 28, *Syntenna*; 29, *Paratinia*; 30, *Azana*; 31, *Monoclona*; 32, *Acnemia*; 33, *Cœlosia*; 34, *Hadroneura*; 35, *Dziedzickia*; 36, *Gnoriste*; 37, *Synapha*; 38, *Boletina*; 39, *Rondaniella*; 40, *Docosia*; 41, *Megophthalmidia*; 42, *Anatella*; 43, *Exechia*.



Mycetophilidae III.—44, *Rhymosia*; 45, *Brachypeza*; 46, *Allodia*; 47, *Pnyxia scabei*; 48, *Cordyla*; 49, *Phronia*; 50, *Trichonta*; 51, *Mycetophila dominicana*; 52, *Epicypa*; 53, *Zygomyia*; 54, *Sceptonia*; 55; *Boletina* incompleta.

44. Mesopleural and hypopleural bristles absent; hind coxa with a fairly strong bristle at base..... 45
 Mesopleural bristles present; hind coxa usually without basal bristle... 49
45. Costa produced beyond tip of third vein (42).....*Anatella* Winnertz
 Costa ends at tip of third vein..... 46
46. Fifth vein forks beyond fork of fourth (43).....*Exechia* Winnertz
 Fifth vein forks below or before fork of fourth 47
47. Second anal vein strong and distinct (44).....*Rhymosia* Winnertz
 Second anal vein weak or absent..... 48
48. First anal vein very long and distinct, attaining the middle of the fork of the fifth vein (45).....*Brachypeza* Winnertz
 First anal vein shorter and less distinct (46).....*Allodia* Winnertz
49. Pteropleural bristles present; tibial bristles long and strong..... 53
 Pteropleural bristles absent 50
50. Tibial bristles long and strong; auxiliary vein ends in first vein (= *Johannsenia*) (17)*Dynatosoma* Winnertz
 Tibial bristles small, at most a little longer than the diameter of the tibia 51
51. Second palpal segment greatly thickened (48).....*Cordyla* Meigen
 Second palpal segment normal 52
52. Fifth vein forks beyond fork of fourth; auxiliary vein ends free (including *Telmaphilus*) (49).....*Phronia* Winnertz
 Fifth vein forks below or before fork of fourth; auxiliary vein ends normally in the first (50).....*Trichonta* Winnertz
53. Fifth vein forked 54
 Fifth vein simple 56
54. Anterior branch of fifth vein slightly divergent apically from second branch of fourth but parallel with or convergent towards second branch of fifth; hypopleura and pteropleura generally quite large (including *Mycothera* and *Opistholoba*) (15, 51)....*Mycetophila* Meigen
 Anterior branch of fifth parallel with second branch of fourth but slightly divergent from second branch of fifth..... 55
55. Pronotal lobes with long bristles; fifth vein forks scarcely if any before the anterior crossvein (82).....*Epicypsa* Winnertz
 Pronotal lobes without long bristles; fifth vein forks well before the anterior crossvein*Delopsis* Skuse
56. Second branch of fourth and first branch of fifth vein slightly divergent; hypopleura and pteropleura large; middle tibia with ventral bristles (53)*Zygomia* Winnertz
 Second branch of fourth and first branch of fifth vein parallel; hypopleura and pteropleura small; middle tibia without ventral bristles (54)*Sceptonia* Winnertz

Family Bibionidæ—The March Flies

Slender flies of small to medium size, ranging from four to twelve millimeters in length.

Head usually somewhat flattened; eyes of the males approximate or contiguous, of the females, broadly separated; face rather short, sometimes elongate in *Dilophus*; eyes round; ocelli large. Antennæ composed of eight to twelve segments, cylindrical or somewhat flattened, the segments rather closely united. Proboscis short, with thickened, hairy labellæ; palpi with two to five segments, usually short, sometimes long. Thorax without transverse suture; scutellum hemicircular. Abdomen composed of seven to nine segments, more or less flattened, the male genitalia rather small. Legs moderately long, the anterior femora usually thickened, sometimes greatly swollen, the other femora usually somewhat swollen; anterior tibiæ usually modified, often greatly swollen in *Biblio*; legs slender in *Plecia*. Pulvilli and usually the empodium distinct. Wings large, the anterior veins stout, the others usually considerably weaker; costa ending at or before the wing-tip; second vein present or absent; fourth vein furcate; basal cells complete; anal cell rarely closed; posterior crossvein absent.

The larvæ feed upon decaying vegetable matter, especially upon the roots of grass, and pupation takes place in the soil. The adults are frequently very common and may be found almost anywhere in the open. The name "March Flies" has been given the family in this country because of the frequent occurrence of *Biblio albipennis* Say in large numbers during this month. "Harlequin Flies" is used in England, while "March Flies" is applied to other flies in Australia. The family has been reviewed by MacAtee*.

KEY TO GENERA

- | | |
|--|----------------------------------|
| 1. Third vein furcate (6, 7)..... | 2 |
| Third vein not furcate (5)..... | 5 |
| 2. Fourth and fifth veins forked..... | 3 |
| These veins not forked | <i>Eupeitenus</i> Macquart |
| 3. Antennæ with not more than 12 segments..... | 4 |
| Antennæ with 16 segments (7)..... | † <i>Cramptonomyia</i> Alexander |

* 1921. Proc. U. S. N. M. lx, Art. 11.

† For a discussion of the position of this genus and its allies see Alexander, 1931, Bull. Brooklyn Ent. Soc. xxvi, pp. 7-11.

4. Distance between the fork of the fourth vein and the anterior cross-vein more than twice the length of the crossvein (4).

Hesperinus Walker

Distance between fork of fourth vein and anterior crossvein much less than twice the length of the crossvein (6).....*Plectia* Wiedemann

5. Anterior tibiæ produced apically to form two spurs (3)..... 6
Anterior tibiæ without such spurs but with two or three series of teeth (2)

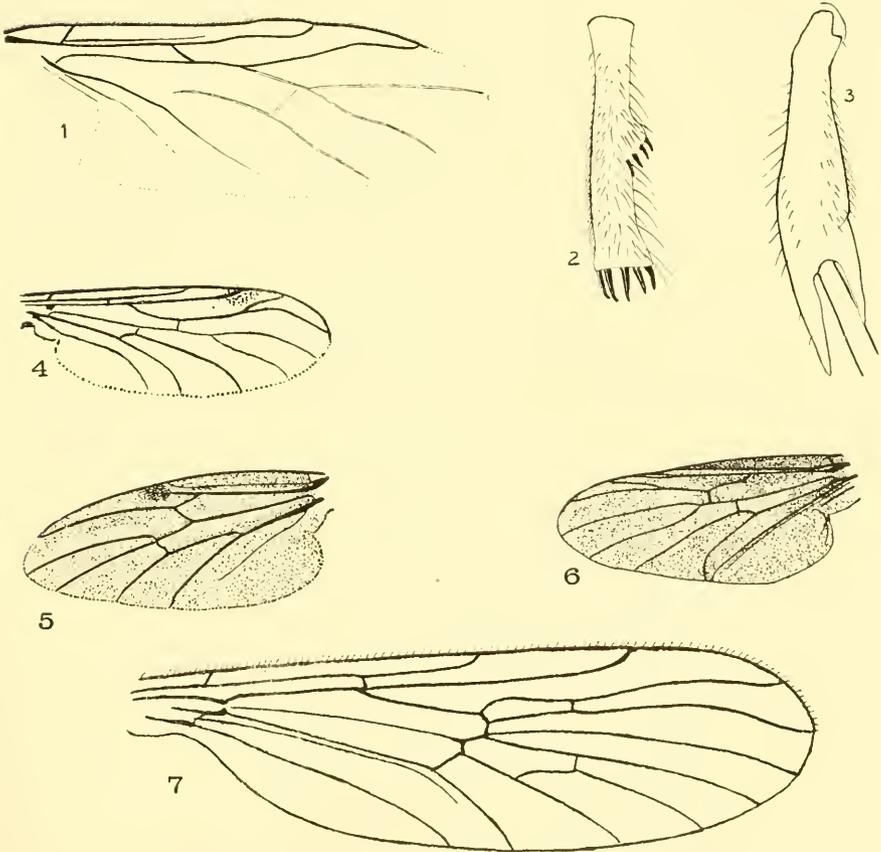
Dilophus Meigen

6. Third and fourth longitudinal veins coalescent for a short distance (1)

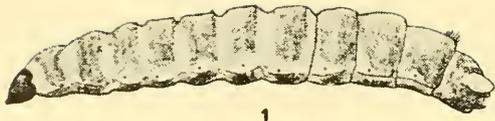
Bibiodes Coquillett

Third and fourth veins not coalescent, joined by the anterior cross-vein (3, 5)

Bibio Latreille



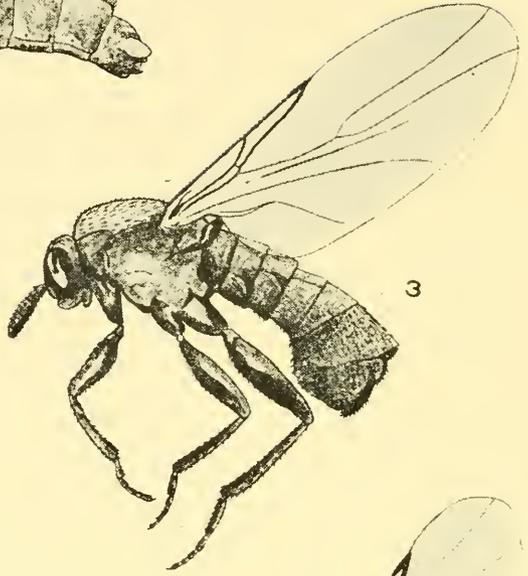
Bibionidæ.—1, *Bibiodes*; 2, *Dilophus*, front tibia; 3, *Bibio*, front tibia; 4, *Hesperinus*; 5, *Bibio*; 6, *Plectia*; 7, *Cramptonomyia*.



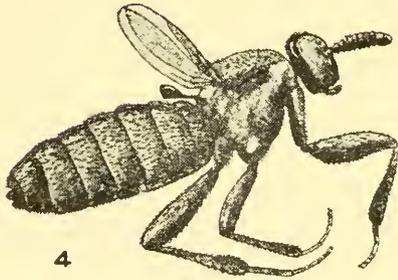
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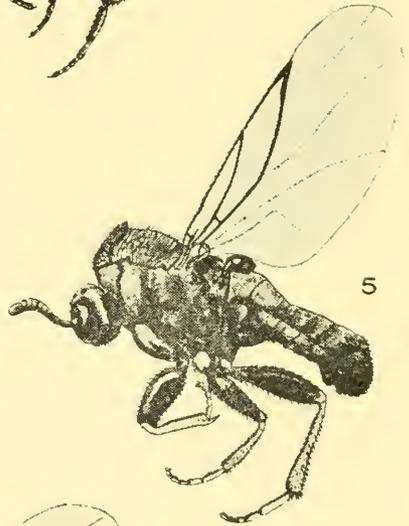
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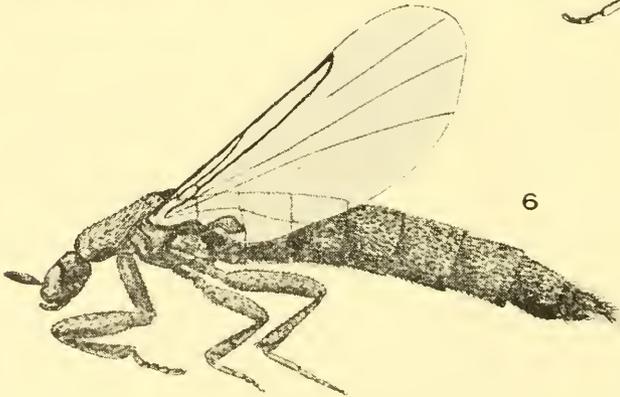
3



4



5



6

Scatopsidae L.

Family Scatopsidæ—The Minute Black Scavengers

Small black or brownish flies, the appendages and thorax often partly yellowish.

Head more or less orbicular—subquadrate or elongate oval; antennæ composed of seven to twelve segments; usually slightly longer than the head; three ocelli; proboscis short and stout. Thorax gently convex, rarely flattened. Legs short, the femora robust. Wings with the veins thin, the first and third strong, the second simulating a crossvein, the fourth vein fureate or simple. Abdomen subcylindrical, composed of six or seven segments, the male genitalia large.

The Scatopsidæ breed in decaying vegetable and animal matter and excrement. They often breed in sewers and privies and frequently become very numerous in houses, where they cause more anxiety than harm. In the autumn they are frequently common on windows, when they are most easily collected. The species range in size from .75 to 3 mm. in length and the family may be readily recognized by the wing venation. Melander* has revised the North American species.

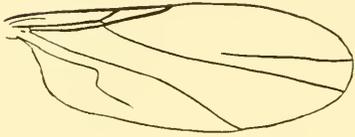
KEY TO GENERA

- | | |
|--|--------------------------|
| 1. Wings of normal size..... | 2 |
| Wings about half normal size, the adults flightless (4). | |
| | Cobaldia Melander |
| 2. Front tibiæ ending in a spur (5)..... | Aspistes Meigen |
| Front tibiæ without apical spur..... | 3 |
| 3. Anterior branch of the fourth vein without appendage..... | 4 |
| Anterior branch of the fourth vein with an appendage near the base
on the anterior side (12)..... | Scatopse Geoffroy |
| 4. Anterior branch of the fourth vein not disconnected at the base (10).. | 5 |
| Anterior branch of the fourth vein disconnected basally (7)..... | 7 |
| 5. Petiole of the fourth vein more than twice as long as the anterior
branch (10) | Swammerdamella Enderlein |
| Petiole of the fourth vein at most a little longer than the anterior
branch | 6 |

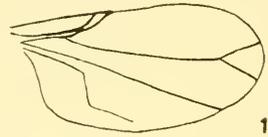
* 1916, Bull. 130, State Coll. Wash., Agric. Exp. Station.

Scatopsidæ I.—1, 2, 3, *Rhagoeclema atrata*, larva, pupa, adult; 4, *Cobaldia formicarum*; 5, *Aspistes berolinensis*; 6, *Psectrosciara californica*.

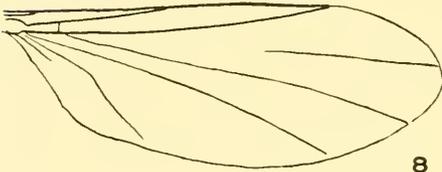
6. Third vein ending well beyond the middle of the wing (9).
Reichertella Enderlein
 Third vein ending before or at the middle of the wing (1, 2, 3, 11).
Rhegmoclema Enderlein
7. Third vein ending at or near the middle of the wing (7).
Aldrovandiella Enderlein
 Third vein ending at the apical fourth of the wing (6, 8).
Psectrosiara Kieffer



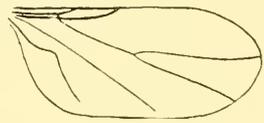
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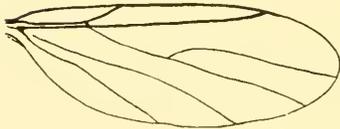
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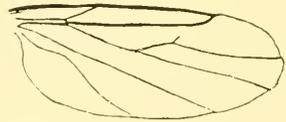
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11



9



12

Scatopsidae II.—7, *Aldrovandiella*; 8, *Psectrosiara*; 9, *Reichertella uncinata*; 10, *Swammerdamella brevicornis*; 11, *Rhegmoclema aterrima*; 12, *Scatopse notata*. (All figures after Melander.)

Family Rachiceridæ

Flies of medium size, elongated, very thinly pilose, resembling saw-flies.

Males dichoptic. Empodium developed pulvilliform, the pulvilli present. Antennæ composed of twenty to thirty-eight segments, often strongly serrate. Squamæ small or rudimentary. Veins strong; discal cell three times as long as wide; fourth posterior cell closed and petiolate; anal cell closed apically. Legs moderately long.

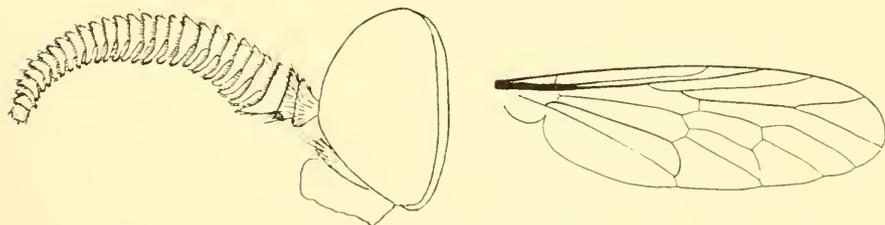
The only genus belonging to this family is *Rachicerus* Walker of which only about a score of species are known. Six species have been described from the Nearctic region, but one is unrecognizable.

The larvæ are found in decaying wood and are presumed to be predaceous.

Rachicrus has usually been placed in the Rhagionidæ (s. l.) but should no doubt be isolated since the large number of antennal segments, all of which are freely articulate, indicates a more primitive condition than that accorded even the Cænomyiidæ of the present work.

KEY TO NEARCTIC SPECIES OF RACHICERUS

1. Antennæ reddish toward the base, pectinate below, the lower processes conspicuously longer than the upper.....*obscuripenis* Læw
Antennæ not reddish basally, the lower processes on the segments short, at most slightly longer than the upper..... 2
2. Mesonotum brownish yellow, sometimes with brown vittæ, never blackish 4
Mesonotum black or brownish black..... 3
3. Halteres yellow; wings hyaline with a dark median cloud in front; mesonotum shining black.....*nitidus* Johnson
Halteres brownish; wings tinged with brown; mesonotum shining dark brown*niger* Leonard
4. Mesonotum without brown vittæ; ♀ antennæ serrate, with 21 or 22 segments, ♂ antennæ sub-pectinate below, with 28 to 35 segments.
fulvicollis Haliday
Mesonotum with two broad brown vittæ; antennæ sub-pectinate below, with 22 or 23 segments.....*honestus* Osten Sacken



Rachicerus, head and wing.

Family Stratiomyidæ—The Soldier Flies



Cyphomyia species.

Small to moderately large, nearly bare or thinly pilose flies, without bristles.

Head usually short, sometimes produced either at or below the antennæ, usually wider than the thorax; ocelli present; eyes dichoptic in the females, usually holoptic in the males; proboscis short, never longer than the headheight, palpi two segmented or rudimentary. Antennæ with three to ten segments, the third always annulate and usually bearing an apical style or arista or a dorsal arista. Thorax never strongly convex, often elongate; scutellum often with spines, tubercles or projections on the margin. Abdomen composed of five to seven segments, variable in shape, sometimes short and very broad or long and narrow, rarely petiolate. Legs thinly soft haired; pulvilli and empodium pad-like, the tibiæ without spurs. Costal vein not reaching beyond the tip of the wing, the veins crowded anteriorly, the

posterior ones weak; discal cell present and of characteristic shape; four or five posterior cells and one or two submarginals; anterior branch of third vein short and often indistinct or wanting.

The name "soldier flies" has been given to this family because of their conspicuous markings. Most of the species may be found on flowers, some of them hover, while others may be found on foliage and in long grass near water.

The larvæ are predaceous or live in decaying vegetation, under bark, in rotting fruit, etc. A few species are confined to the sea coast while others occur in fresh water or mud.

I have adopted a number of changes in the nomenclature, and, as I do not use the names proposed in Meigen's "1800" paper *Eulalia* does not replace the well-known *Odontomyia*. The name *Stratiomyia* is an emendation of the original spelling, *Stratiomys*, and not only

changes the spelling but also the meaning. I suspect that Geoffroy had in mind the mouse-like character of the typical species of the family when he proposed the name, and that he was better aware of his intentions in this connection than those who have followed the spelling of Maequart. It is unfortunate that such a well known name as *Clitellaria* Meigen must be replaced by *Adoxomyia* for the American species previously listed under *Clitellaria*. The other changes are mostly a return to the original spellings or the realignment of genera based upon structural characters.

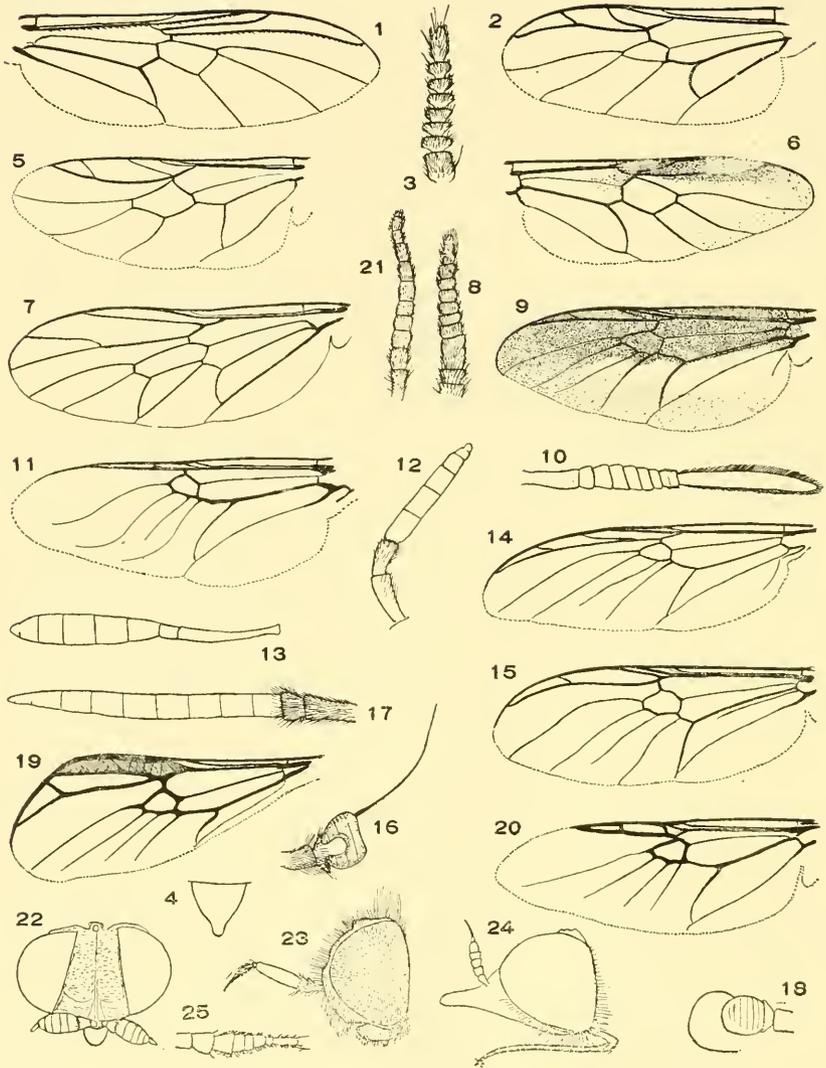
The family is a difficult one, the generic limits being, often, difficult to define if they actually exist. Unfortunately I lack representatives of a few of the genera and must rely upon descriptions, so that some characters which might be used have, of necessity, been omitted.

There is great need of a monograph of the American species of this family: my synopsis of the Canadian species* may prove helpful but it contains only keys and these are incomplete for most of the genera.

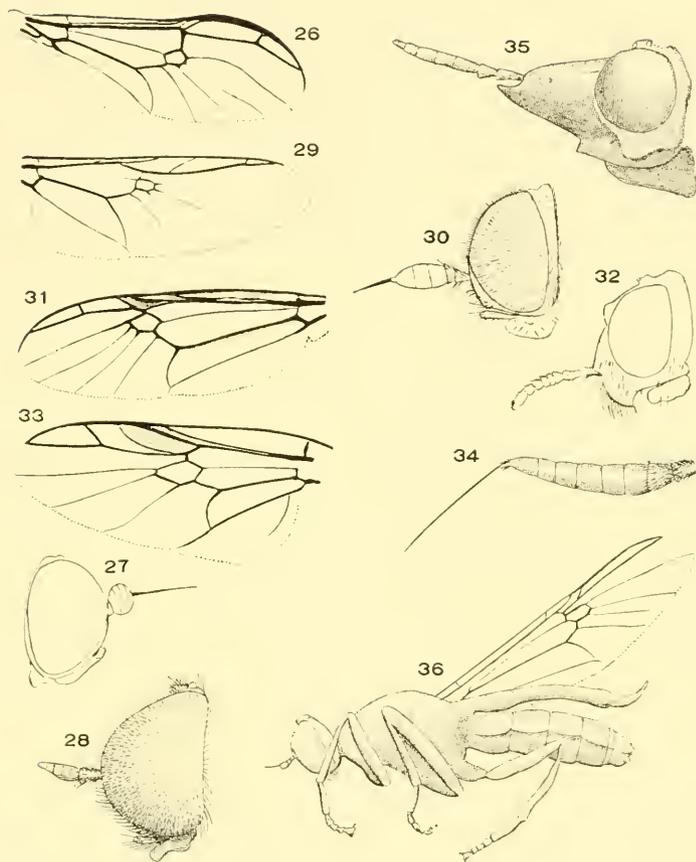
KEY TO GENERA

- 1. Abdomen with seven visible dorsal segments 2
 Abdomen with five or six segments 9
- 2. Three posterior veins or stumps of veins, the third usually arising from the discal cell 4
 Four posterior veins or vestiges of them, all arising from the discal cell 3
- 3. Posterior femora thickened *Neœxaireta* Osten Sacken
 Posterior femora but little thickened, the posterior tibiæ noticeably thickened (82) *Actina* Meigen
- 4. Scutellum with spines or denticulations 6
 Scutellum without spines 5
- 5. Third vein branched (33) *Allognosta* Osten Sacken
 Third vein not branched (1, 87) *Chiromyza* Wiedemann
- 6. Scutellum with fewer than ten spines 7
 Scutellum with ten or twelve spines or teeth 8
- 7. Head hemispherical; antennæ situated near the middle of the head (2, 3) *Beris* Latreille
 Head not hemispherical; antennæ situated well below the middle of the head *Berismyia* Giglio-Tos.
- 8. Scutellar spines long *Heteracanthia* Macquart
 Scutellum with about twelve short teeth *Antissops* Enderlein
- 9. Three posterior veins, all arising from the discal cell 10
 Four posterior veins, the first and third sometimes vestigial but at least represented by angulations of the discal cell 22

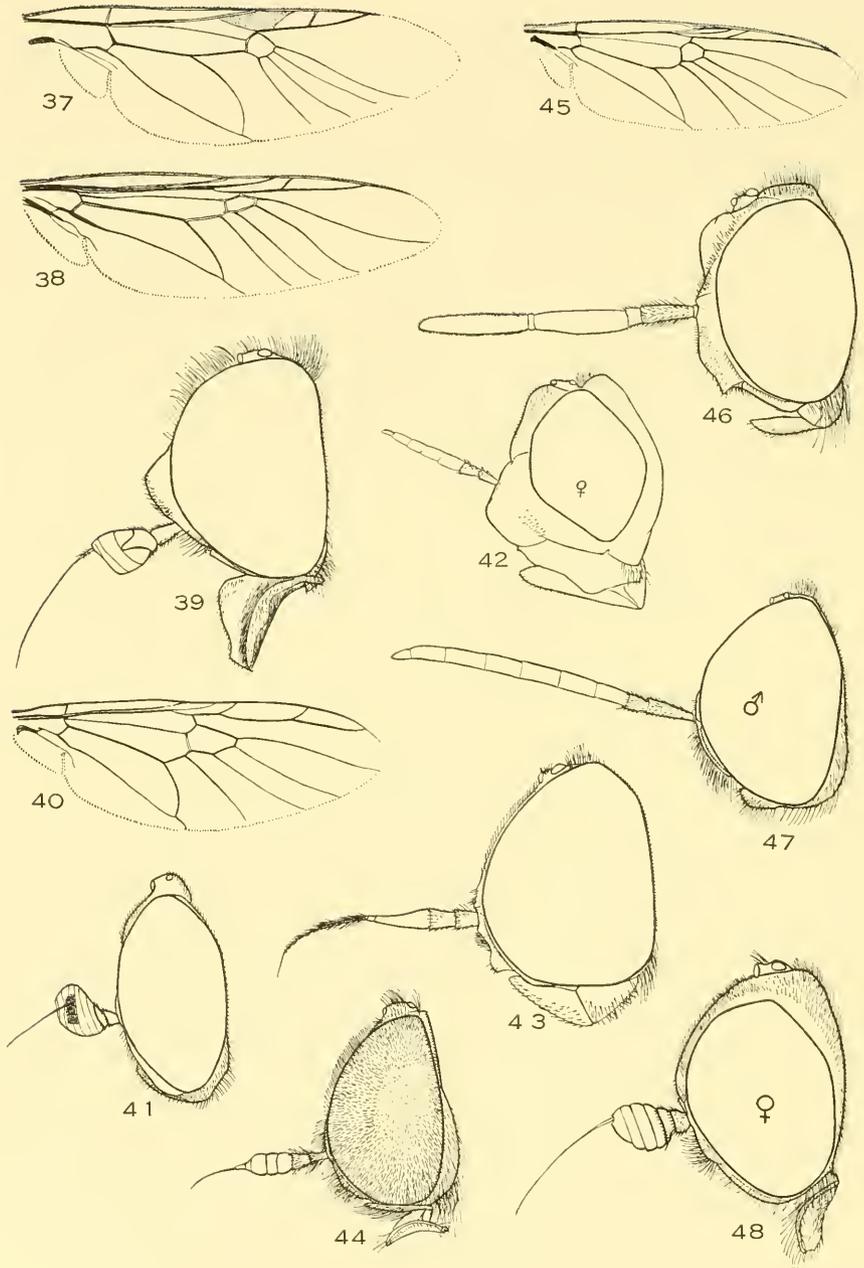
* Curran, 1927, Tr. Roy. Soc. Can., Sec. v, 1927, pp. 191-228.



Stratiomyidae I.—1, *Chiromyza*; 2, *Beris*; 3, *Beris*, antenna; 4, *Psephiocera*, scutellum; 5, *Psephiocera*, wing; 6, *Acanthinomyia*; 7, 8, *Solva aterrima* (Coenomyidae); 9, *Hermetia*; 10, *Hermetia*, antenna; 11, *Odontomyia*; 12, *Odontomyia*, antenna; 13, *Stratiomys*, antenna; 14, *Pedicella*, antenna; 15, *Ptecticus*; 16, *Ptecticus*, antenna; 17, *Cyphomyia*, antenna; 18, *Merosargus*, antenna; 19, *Histiodroma*; 20, *Euparyphus*; 21, *Euparyphus*, antenna; 22, *Euryneura*, head from in front; 23, *Pelagomyia*; 24, *Nemotelus*; 25, *Aochletus*, antenna.



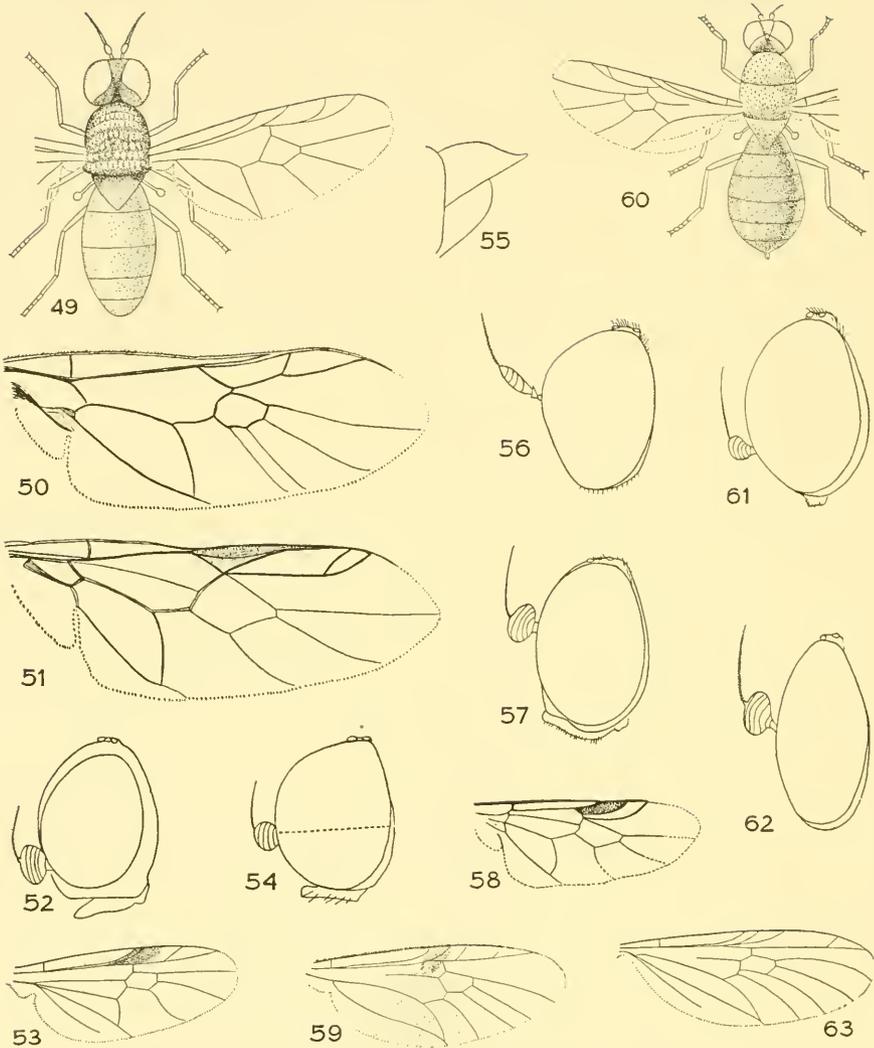
Stratiomyidæ II. 26, *Analcocerus*, wing; 27, *Neopachygaster*; 28, *Scoliopelta*; 29, *Microchrysa*; 30, *Euclitellaria*; 31, *Rhaphiocera*; 32, *Myxosargus*; 33, *Allognosta*; 34, *Chrysochloa*, antenna; 35, *Rhingiopsis*; 36, *Dicranophora* (Brazil).



Stratiomyidae III.—37, *Oxycera albovittata*; 38, *Rhingiopsis rostrata*; 39, *Ptecticus testaceus*; 40, *Neorondania chalybea*; 41, *Gowdeyana mirabilis*; 42, *Odontomyia* (sp. Panama); 43, *Cacosis*; 44, *Euelitellaria*; 45, *Chrysochroma nigricornis*; 46, *Hermetia* (n. sp. Panama); 47, *Cyphomyia*; 48, *Microchrysa polita*.

- 10. Antennæ situated at most a little below the middle of the head in profile; scutellum never with two spines13
 Antennæ situated far below the middle of the head, near the lower edge of the eyes; scutellum with at least a pair of spines.....11
- 11. Third antennal segment not furcate; scutellum bispinose.....12
 Third antennal segment furcate, the upper branch with a terminal arista and a lateral process (72, 78).....*Neochauna* Williston
- 12. Eyes bare*Pseggomma* Enderlein
 Eyes pilose (6, 86)*Acanthinomyia* Hunter
- 13. Third vein branched15
 Third vein simple14
- 14. Third antennal segment elongate (55, 56).....*Berkshiria* Johnson
 Third antennal segment short, as broad as long (54, 58).
Zabrachia Coquillett
- 15. Third antennal segment elongate.....16
 Third antennal segment as wide as long or nearly so.....17
- 16. Scutellum prolonged and obtusely pointed, without conspicuous rim on lower edge*Cynipimorpha* Brauer
 Scutellum broadly rounded apically and with a strong rim on the lower margin (55, 56).....*Berkshiria* Johnson
- 17. Scutellum prolonged, its sides more or less parallel apically or triangular with a very broad preapical depression, the lower edge not margined (4, 5, 60).....*Psephiocera* Enderlein
 Scutellum rounded apically, its lower edge sometimes very strongly margined18
- 18. Arista short plumose or with very long pubescence of isolated hairs (49)*Lophoteles* Læw
 Arista short pubescent or bare.....19
- 19. Antennæ arising at most slightly below the middle of the head.....20
 Antennæ arising conspicuously below the middle of the head (61).
Pachygaster Meigen
- 20. Scutellum with a strong marginal rim below.....21
 Scutellum with at most a very weak rim below (27, 57).
Neopachygaster Austen
- 21. Rim of scutellum strongly serrate (62).....**Eupachygaster* Kertesz
 Rim of scutellum so finely serrate as to appear smooth except under high magnification (41, 51).....*Gowdeyana* Curran
- 22. All the posterior veins arise from the discal cell.....23
 The fourth posterior vein arises from the second basal cell.....39
- 23. Scutellum with spines24
 Scutellum without spines, sometimes denticulate.....32

* I have not seen the type of this European genus and it may be that the species described by Malloch as belonging here belongs to *Vittiger* Kertesz.



Stratiomyidae IV.—49, *Lophoteles pallidipennis*, after Williston; 50, *Neurota tricolor*; 51, *Gowdeyana mirabilis*; 52, *Zabrachia polita* ♀; 53, *Berisomyia nigrofemorata*; 54, *Zabrachia polita* ♂; 55, *Berkshiria*, scutellum; 56, *Berkshiria*; 57, *Neopachygaster maculicornis*; 58, *Zabrachia polita*; 59, *Gyneuryptera lasiophthalmus*; 60, *Psephocera minuta*, after Williston; 61, *Brachygaster pulcher*; 62, *Eupachygaster punctifer*; 63, *Merosargus bulbifrons*.

24. Antennæ short, with a sub-terminal arista (37, 81).....*Oxycera* Meigen
 Antennæ more or less elongate.....25

25. Antennæ inserted near the middle of the head.....27
 Antennæ inserted close to the oral margin.....26

26. Eyes bare (22, 68).....*Euryneura* Schiner
 Eyes pilose (30).....*Euclitellaria* Kertesz

27. Antennal style not differentiated.....28
 Antennal style distinctly differentiated.....30

28. Antennæ with eight distinct segments.....29
 Antennæ with three segments, the third annulate (28).
Scoliopelta Williston

29. Second antennal segment twice as long as the first.....*Glaris* Kertesz
 Second antennal segment not longer than the first (20, 21, 90).
Euparyphus Gerstæcker

30. Eyes bare (*Clitellaria* auct.).....*Adoxomyia* Kertesz
 Eyes pilose31

31. Third vein branched (44, 65).....*Euclitellaria* Kertesz
 Third vein simple (25).....*Aochletus* Osten Sacken

32. Face conically produced.....33
 Face not conically produced.....34

33. Males holoptic (24, 64).....*Nemotelus* Geoffroy
 Males dichoptic*Akronia* Hine

34. Antennal style almost as long as the third antennal segment, quite flat
 and shining; the thin sides densely fringed with long pubescence
 (9, 10, 46)*Hermetia* Latreille
 Antennal style different in structure or the antennæ with an arista...35

35. Eyes pilose on practically the whole surface.....36
 Eyes bare, or very thinly pubescent on the upper half only.....38

36. Antennæ with a bristle-like style (23).....*Pelagomyia* Williston
 Antennal style not well differentiated.....37

37. Face produced*Lasiopa* Brullé
 Face receding (50, 66)*Neurota* Curran

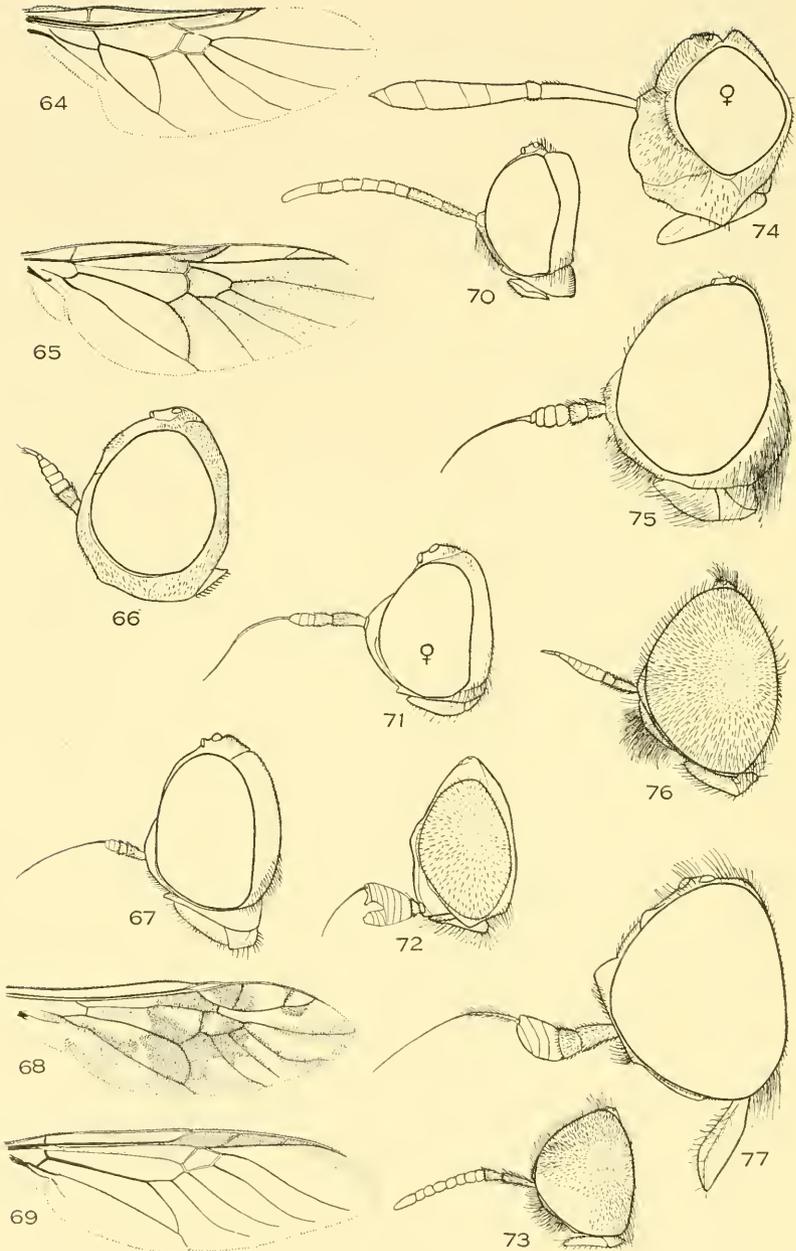
38. Arista apical and densely plumose on basal half or more (43, 81).
Cacosis Walker
 Arista apical but bare (34, 91).....**Chrysochlora* Latreille

39. Third antennal segment without an arista, the style absent or but
 poorly differentiated, rarely short and bristly40
 Third antennal segment with an arista.....51

40. Third vein with an anterior branch.....41
 Third vein without anterior branch.....44

41. Head strongly produced anteriorly and with a porrect spine or pro-
 tuberance below the antennæ (35, 38, 83).....†*Rhingiopsis* Röder
 Head not produced, the face sometimes produced conically downward...42

* Curran, 1929, Amer. Mus. Novitates No. 339, p. 2.
 † Curran, 1932, Amer. Mus. Novitates No. 526, p. 1.

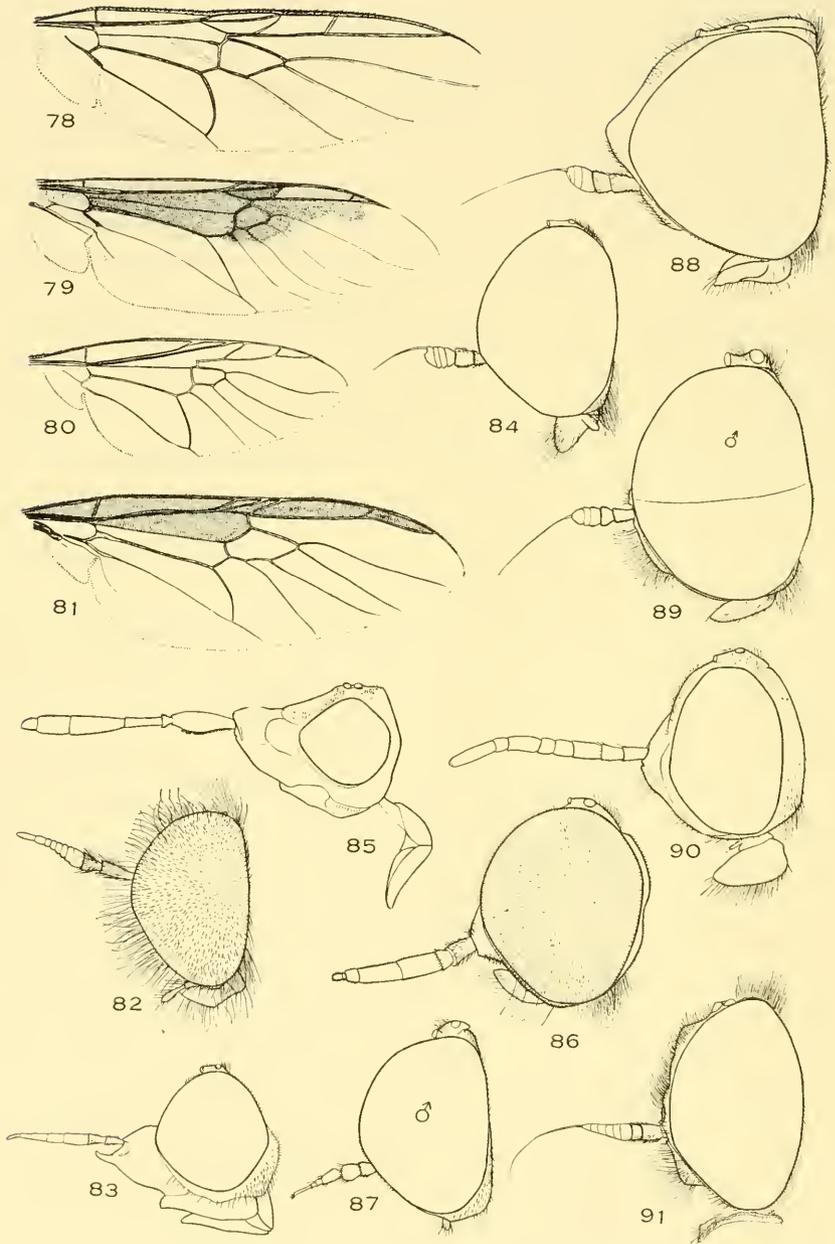


Stratiomyidæ V.—64, *Nemotelus arator*; 65, *Euclitellaria subulata*; 66, *Neurota tricolor*; 67, *Rhaphiocera armata*; 68, *Euryneura panamensis*, n. sp.; 69, *Premeranosa nasuta*; 70, *Analcocerus*; 71, *Histiodroma inermis*; 72, *Neochauna*; 73, *Chordonota*; 74, *Stratiomys mutabilis*; 75, *Nothomyia calopus*; 76, *Gyneuryparea lasiophthalmus*; 77, *Aloipha cingulatus*.

42. Eyes bare43
 Eyes thickly pilose in the ♂, pilose on lower half in ♀ (59, 76).
Gyneuryparia Enderlein
43. Antennæ situated near the lowest level of the eyes (32).
 **Myxosargus* Brauer
 Antennæ situated near the middle of the eyes in profile (17, 47).
Cyphomyia Wiedemann
44. Scutellum without spines45
 Scutellum with spines.....46
45. Third antennal segment with eight annuli (73, 80)..*Chordonota* Gerstæcker
 Third antennal segment with five or six annuli (11, 12, 42).
Odontomyia Meigen
46. Costa not thickened distally47
 Costa strongly thickened distally (26, 70).....*Analcocerus* Loew
47. Third antennal segment composed of seven or eight annuli.....50
 Third segment composed of not more than six annuli.....48
48. Head very strongly produced forward, the face strongly receding (69, 85).
Promeranisa Walker
 Head rarely produced forward, if so the antennal prominence not con-
 stricted49
49. First antennal segment three times as long as the second (13, 74, 79).
 †*Stratiomys* Geoffroy
 First segment less than three times the length of the second (11, 12, 42).
Odontomyia Meigen
50. First antennal segment two or three times as long as the second.
Campeprosopa Macquart
 First antennal segment but little longer than the second, the third ter-
 minating in a bristle (40).....*Neorondania* Osten Sacken
51. Scutellum with spines52
 Scutellum without spines53
52. Third vein not furcate (75).....*Nothomyia* Lœw
 Third vein furcate (31, 67).....*Raphiocera* Macquart
53. Space between the second vein and the costa chitinized, the costa ex-
 panded on the apical half (19, 71).....*Histiodroma* Schiner
 Wing normal54
54. Arista terminal, thick and long pubescent on the basal fourth.
Acrochaeta Wiedemann
 Arista terminal or dorsal, normal in shape and practically bare.....55
55. Lower lobe of the squamæ with a strap-like prolongation near the outer
 end58
 Lower lobe of squamæ transverse apically.....56

* Curran. 1929. Amer. Mus. Novitates No. 378.

† In a forthcoming contribution Mr. M. T. James will propose a new genus for *S. constans*, *mutabilis*, etc.



Stratiomyidae VI.—78, *Neochauna*; 79, *Stratiomys mutabilis*; 80, *Chordonota carbonaria*; 81, *Cacosis nigra*; 82, *Actina viridis*; 83, *Rhingiopsis rostrata*; 84, *Oxycera albovittata*; 85, *Promerania nasuta*; 86, *Acanthinomyia*; 87, *Chironyza*; 88, *Pedicella lucens*; 89, *Chrysochroma nigricornis*; 90, *Euparyphus*; 91, *Chrysochlora*.

56. Third vein with a branch near the end of the first vein.....57
 Third vein without the basal branch (77).....*Aloipha* Enderlein
57. Second antennal segment subtriangularly produced into the third on the
 inner side (15, 16, 39).....*Ptecticus* Lœw
 Second antennal segment at most moderately convex on its inner end,
 never subtriangular (18, 63).....**Merosargus* Lœw
58. Ocellar triangle situated far from the vertex and almost or quite twice
 as long as wide (14, 88).....*Pedicella* Bigot
 Ocellar triangle not or but little longer than wide, in the female partly
 behind the upper angles of the eyes, in the male usually somewhat in
 front of this point.....59
59. Ocellar triangle in female lying almost all in front of the posterior
 angle of the eyes, the males without the eyes divided into definite
 zones of differently sized facets; anal cell much narrower than the
 combined basal cells (45, 89).....*Chrysochroma* Williston
 Ocellar triangle in female lying mostly behind the posterior angles of
 the eyes; males with the facets enlarged on the upper half; anal cell
 quite as wide as the combined basal cells (29, 48)....*Microchrysa* Lœw

* Curran, 1932, Amer. Mus. Novit. No. 534.

Family Cœnomyiidae

Flies of medium to large size, the antennæ elongate, with the third segment annulate and more or less clearly subdivided.

Males holoptic or dichoptic. Antennæ never with a distinctly differentiated style although the terminal annulus may resemble one to a certain extent. Empodium developed pulvilliform, the pulvilli present. Squamæ small. Wing venation well developed, the discal cell always present, the fourth posterior cell sometimes closed.

As here defined this family includes insects of diverse structure but there seems to be no good character for their separation. The genus *Cœnomyia* has been placed in various families, including the Rhagionidae, Tabanidae and Stratiomyidae. It appears, however, because of the facial structure, to be best placed between the two last mentioned families. Upon general structure alone *Cœnomyia* might well be isolated from the remainder of the other included genera except that *Arthropeas magnus* Johnson is very similar in appearance, differing only in having bare eyes and in lacking the scutellar spines.

The adults are found in woods, especially near moist places, while the larvæ mostly occur in decaying wood, under the bark of trees or in the soil and are carnivorous and predaceous. The opinion has been expressed that the larvæ of *Cœnomyia* may live upon the immature stages of Cicadas. A revision of the North American species will be found in Leonard* "Revision of the Rhagionidae in the United States and Canada."

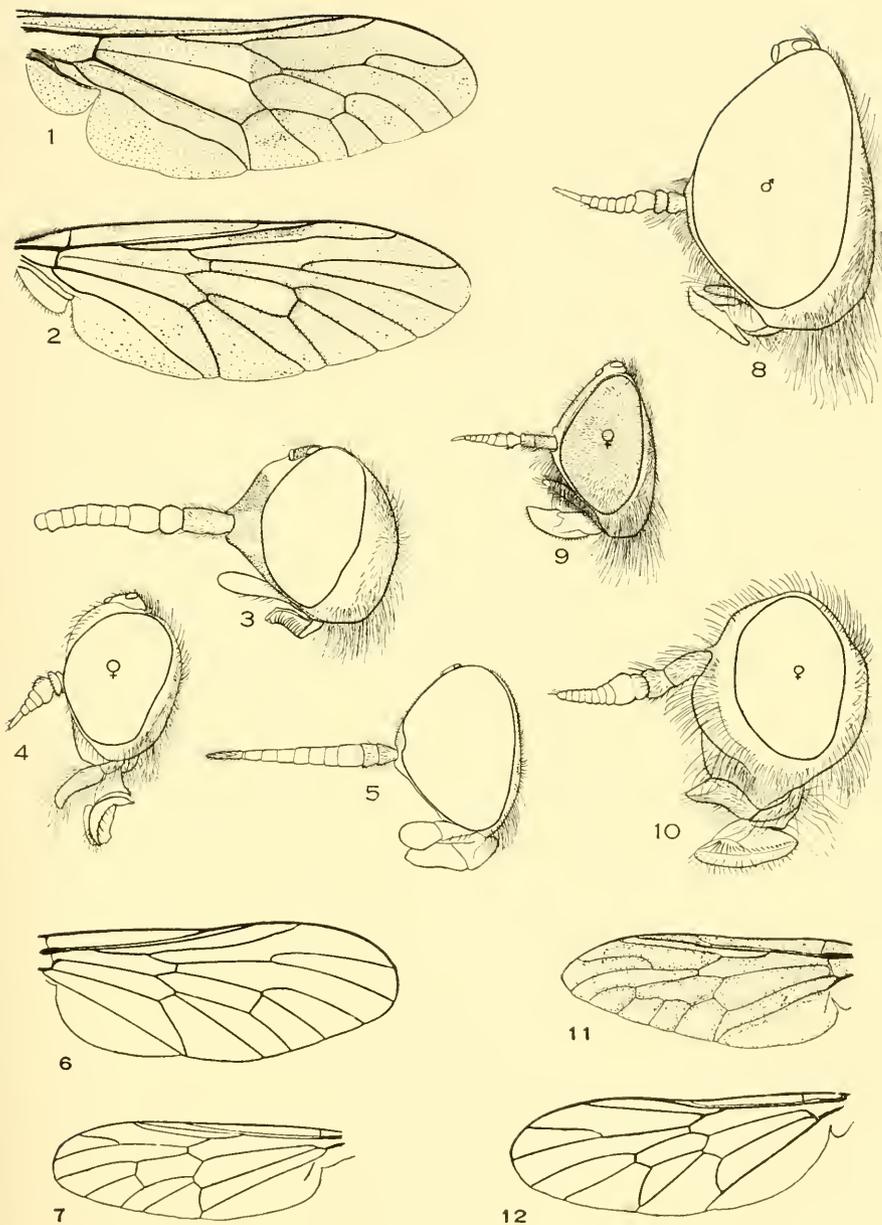
I might add that I cannot agree that the genus *Solva* Walker belongs to the Stratiomyidae although there is no doubt that there is some relationship. Both the facial shape and wing venation exclude it from that family.

KEY TO GENERA

1. Eyes bare 2
 Eyes pilose (9, 11) *Cœnomyia* Latreille
2. Anterior tibiæ with one terminal spur..... 3
 Anterior tibiæ without terminal spur..... 4
3. Antennæ acute at the tip, the apical annulus elongate (1, 8).
 Arthropeas Lœw
 Antennæ obtuse at the tip, the apical annulus short and broad (3, 7).
 †*Xylophagus* Meigen
4. Fourth posterior cell open 5
 Fourth posterior cell closed (5, 12)..... *Solva* Walker
5. Face with a very large, prominent pilose swelling on either side (2, 10).
 Glutops Burgess
 Face not strongly swollen laterally, bare (4, 6)..... *Arthroceras* Williston

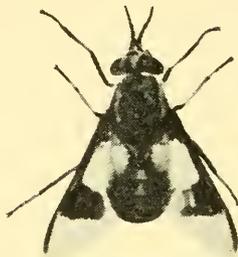
* 1930. Mem. Amer. Ent. Soc., No. 7.

† Curran, 1933, Amer. Mus. Novitates No. 673, p. 1.



Cœnomyiidae.—1, *Arthropeas magnus*; 2, *Glutops singularis*; 3, *Xylophagus laceyi*; 4, *Arthroceras leptis*; 5, *Solva aterrima*; 6, *Arthroceras*; 7, *Xylophagus*; 8, *Arthropeas magnus*; 9, *Cœnomyia pallida*; 10, *Glutops singularis*; 11, *Cœnomyia pallida*; 12, *Solva*.

Family Tabanidæ—The Horse Flies



Chrysops species.

Bristleless flies of medium to large size, the eyes usually bi-colored in life.

Head large, the occiput flattened or concave. Eyes large, short pilose or bare, usually holoptic in the males and often with some of the facets much larger than the others; ocelli present or absent. Proboscis projecting, sometimes longer than the body; palpi with two segments, the second segment variable in different genera and sometimes in the two sexes. Antennæ porrect, composed of three segments, the third composed of three to eight annuli. Thorax and abdomen clothed with fine hairs. Abdomen broad, composed of seven visible segments; genitalia never prominent. Legs moderately stout, the tibiæ sometimes much dilated; middle tibiæ always with two spurs at the tips; empodium developed pulvilliform, the pulvilli always present. Wings with two submarginal and five posterior cells; basal cells large; anal cell usually closed near the wing margin; costa extending around the entire wing. Squamæ large.

The Tabanids are common in all parts of the world. They have been given various common names, such as Horse Flies, Deer Flies, Greenheads, Bullheads, etc. The adults of most species are serious pests of mammals and man is not excepted. One type of filariasis is transmitted by the adults and both the fly and host are essential in the life cycle of the parasite causing the disease. One of the best ways of collecting these insects is to capture those causing irritation during collecting trips. Since the larvæ of many species are aquatic the adults may usually be found near water and in the case of some species the males are rare except adjacent to the breeding places, and, as this sex does not suck blood they must be looked for in places other than in the vicinity of warm blooded animals, the same being true for most of the genera of the Pangoniinæ, although the genus *Chrysops* of this

subfamily contains some of the most serious pests of man. The males of some species feed upon pollen and nectar and may be found upon most melliferous flowers, hovering over streams or pools or even along paths. The sexes are frequently very different in appearance and difficult to associate.

The transmittal of disease by Tabanids may be a purely mechanical operation or the flies may serve as intermediate hosts of the parasitic organisms causing disease. *Tularæmia* is spread mechanically and is transmitted by *Chrysops discalis* Williston. Normally it is a disease of rodents (particularly rabbits) but man sometimes develops the disease after being bitten by the fly. It has also been demonstrated that *Anthrax* may be carried on the proboscis of Tabanids and cause infection as a result of the bite of the fly and various species of trypanosomes are transmitted. In Africa a filarial disease caused by *Loa loa* Cobbold, and known by that name, is transmitted by two species of *Chrysops*. The details have been worked out by A. and S. A. Connal (Trans. Roy. Soc. Trop. Med. Hyg., xv, pp. 131-134, 1913).

The eggs are laid, as a rule, in large masses on leaves and stems of plants overhanging water and are usually brown or black in color. They show characteristic generic arrangement and sometimes specific characters but too little is known about them to permit of their identification. The larvæ are predaceous. Larvæ have been found in rotten wood, under stones, in mud, etc. Pupation takes place near the surface of the soil. There are many papers dealing with the biology of North American Tabanidæ, but most of them are quite short. Papers by Cameron* and Marehand† on the immature stages are the most comprehensive.

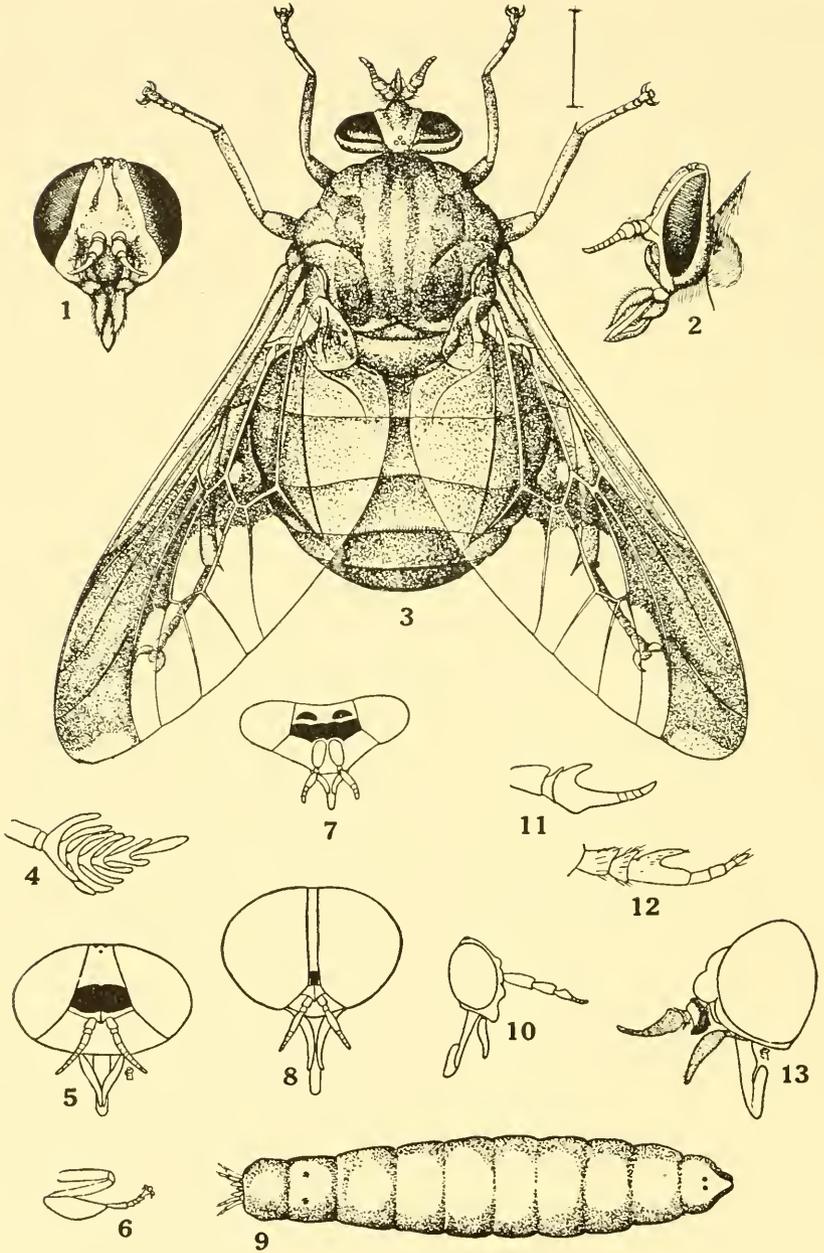
The number of species of Tabanidæ is large, the genus *Tabanus* alone containing about 1200 described species. The first (and only) North American monograph of the family was published by Osten Sacken in 1875 and 1878. Since that time the number of species has greatly increased and the difficulty of identifying specimens is relatively greater. Hine has published on the Tabanidæ of Ohio‡, while there are numerous short papers scattered through the literature.

Fascicle 175 of "Genera Insectorum", by Dr. J. Surcouf, deals with this family but the treatment has been rather unfavorably criticized by other workers in the field. Several American students are now studying the family and excellent revisions of the nearctic species may be expected to appear in the near future.

* Cameron, 1926, Bull. Ent. Res., xvii, pp. 1-42, 5 plates.

† Marehand, 1920, Mon. Rockefeller Inst. Med. Res., No. 13, pp. 1-203, 15 plates.

‡ Hine, 1903, Ohio State University Bulletin, Ser. 7, No. 19.



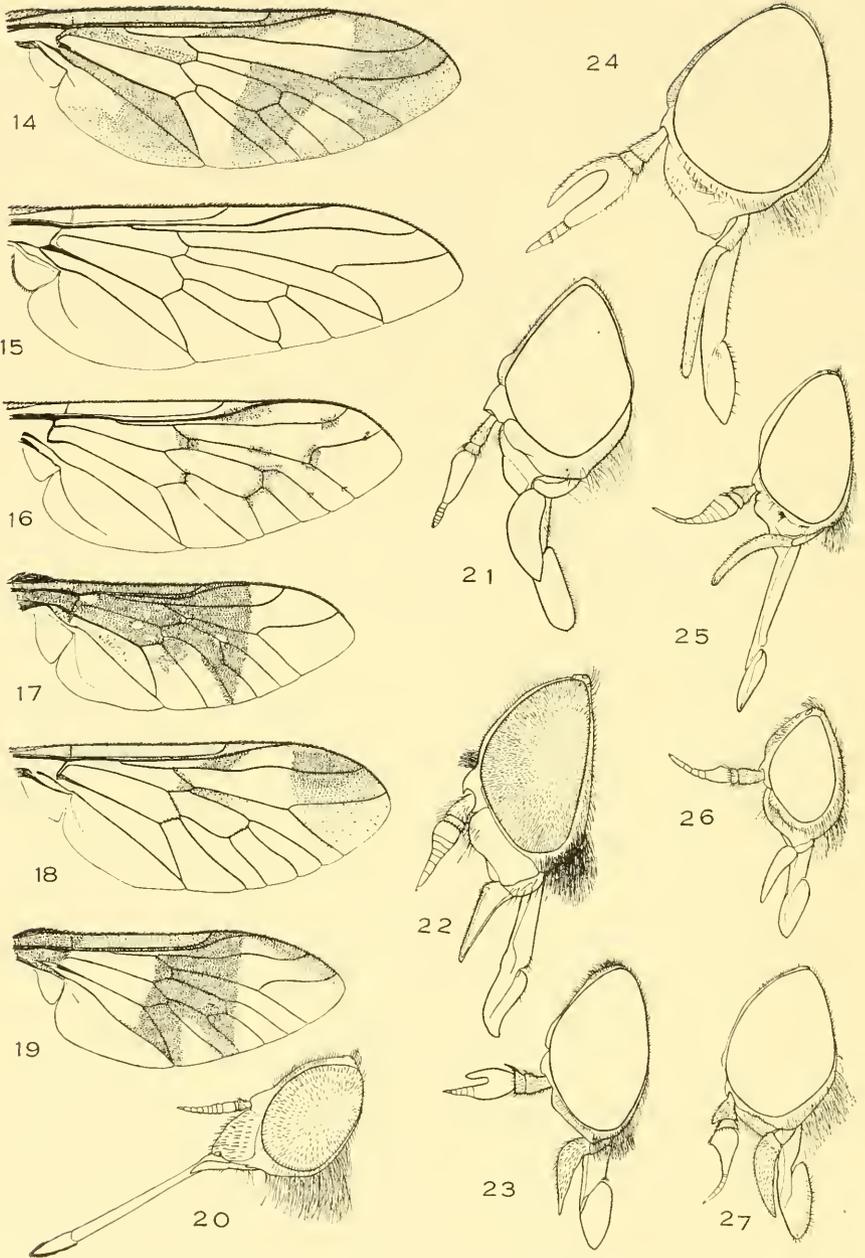
Tabanidae I.—1, 2, 3, *Goniops chrysochroma*; 4, *Pityocera*, antenna; 5, *Apatolestes*; 6, *Lepiselaga crassipes*; 7, *Hæmatopota punctulata*; 8, *Diachlorus*; 9, *Goniops chrysochroma*, larva; 10, *Chrysops*; 11, 12, *Tabanus*, antenna; 13, *Snowiellus*.

KEY TO GENERA*

1. Hind tibiæ with apical spurs, which may be quite small (Pangoniinæ) 2
Hind tibiæ without apical spurs (Tabaninæ) 15
2. Eyes with distinct pile 3
Eyes bare 9
3. First posterior cell open..... 4
First posterior cell closed..... 5
4. Face not produced, at most slightly convex (Osca Walker) (22).
Scaptia Walker
Face much produced, snout-likeNeopangonia Ad. Lutz
5. Fourth posterior cell closed (15, 20).....Scione Walker
Fourth posterior cell open..... 6
6. Third antennal segment furcate..... 7
Third antennal segment not branched..... 8
7. Third antennal segment branched dorsally and ventrally (4).
Pityocera Giglio-Tos
Third antennal segment branched only dorsally.....Elaphella Bezzi
8. Coxæ and femora slightly hairy.....Fidena Walker
Coxæ and femora densely covered with long pile (Erephopsis Rondani)
(34, 35)Melpia Walker
9. First posterior cell closed; face merely convex, not snout-like; ocelli
present; palpi long, sabre-shaped (25, 29).....Esenbeckia Rondani
First posterior cell open..... 10
10. Third antennal segment composed of at least seven annuli..... 11
Third antennal segment composed of not more than five annuli; proboscis short 13
11. Posterior border of eye acutely angulate in female; proboscis very short; fork of third longitudinal vein without appendix; wings brownish in front, hyaline behind (1, 2, 3, 9).....Goniops Aldrich
Eyes of female not acutely angulate above; wings not so marked.... 12
12. Proboscis but little longer than palpi; frons of female very wide below; fork of third longitudinal vein with appendix (5)....Apatolestes Williston
Proboscis much longer than palpi; frons of female narrow and almost parallel-sided (31, 33)Buplex Austen
13. Second antennal segment only half as long as the first (16, 26).
Silvius Meigen
Second antennal segment much more than half as long as the first.... 14
14. Abdomen inflated, much wider than thorax; fork of third longitudinal vein with long appendix.....Neochryrops Walton
Abdomen normal, depressed, not much wider than thorax; fork of third longitudinal vein without appendix (10, 19).....†Chryrops Meigen

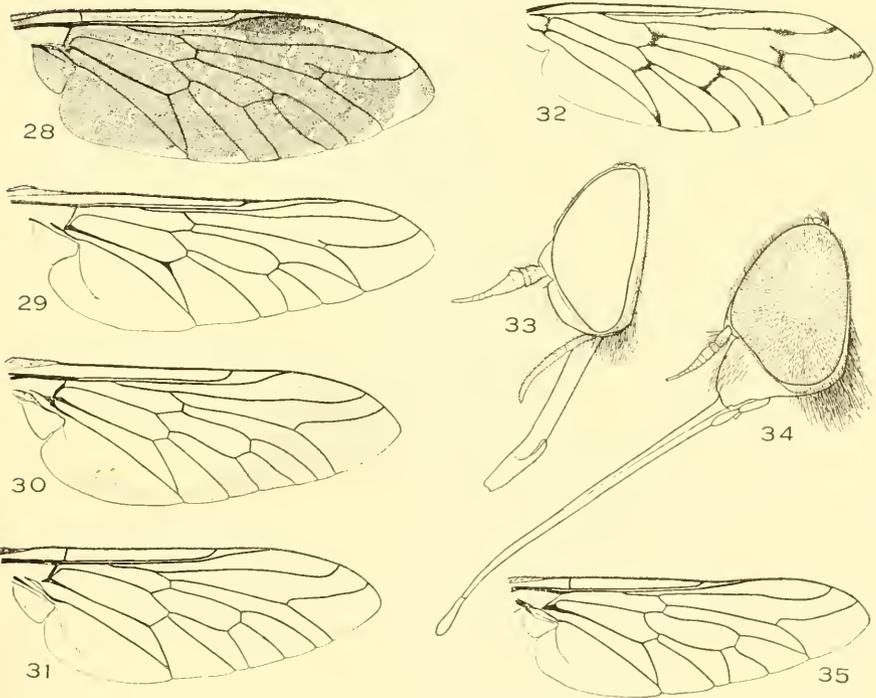
* Checked by Dr. J. Bequaert.

† Kröber, 1926, Stett. Ent. Zeitung, lxxxvii, pp. 211-353, two plates; and, Neotropical, 1925, Konowia, iv, pp. 210-375, five plates.



Tabanidae II.—14, *Dichelacera analis*; 15, *Scione aurulans*; 16, *Silvius pollinosus*; 17, *Lepiselaga crassipes*; 18, *Diachlorus ferrugatus*; 19, *Chrysops melena*; 20, *Scione aurulans*; 21, *Lepiselaga crassipes*; 22, *Scaptia*; 23, *Stibasoma theotenia panamensis*; 24, *Dichelacera analis*; 25, *Esenbeckia prasiniventris*; 26, *Silvius gigantulus*; 27, *Tabanus albocirculus*.

- 15. Third antennal segment with four annuli; frons of female wide; fork of third longitudinal vein with appendix (7, 28) . . . *Hæmatopota* Meigen
Third antennal segment usually with five annuli; when with less the frons of female is narrow and the fork of third longitudinal vein bears no appendix 16
- 16. Third antennal segment not at all or barely angulated above 17
Third antennal segment with distinct angle or process near the base above; ocelli rudimentary or absent 20
- 17. Ocelli present and of normal size; all tibiæ not or hardly swollen.
Merycomyia HineOcelli absent; at least fore tibiæ swollen 18
- 18. Fore tibiæ swollen; mid and hind tibiæ normal; palpi swollen at base, pointed at apex (8, 18) *Diachlorus* Osten Sacken
All tibiæ swollen, the fore pair most; palpi flat and broad 19
- 19. Third antennal segment broad and flat; subcallus divided by a median line *Selasoma* Macquart
Third antennal segment narrow and slender; subcallus not divided medially (6, 17, 21) *Lepiselaga* Macquart



Tabanidæ III.—28, *Hæmatopota punctulata*; 29, *Esenbeckia prasiniventris*; 30, *Stibasoma fulvohirtum*; 31, *Buplex rasa*; 32, *Tabanus nervosus*; 33, *Buplex rasa*; 34, *Melpia venosa*; 35, *Melpia*.

- 20. Dorsal process of third antennal segment unusually long, extending to third annulus 21
 Dorsal process moderately long or forming a tooth, sharp edge, or weak angle 22

- 21. Fore tibiæ strongly swollen; hind tibiæ ciliate with long hairs (23, 30).
Stibasoma Schiner
 Fore tibiæ not or hardly swollen; hind tibiæ not ciliate (14, 24).
Dichelacera Macquart

- 22. Subcallus strongly swollen; first antennal segment much enlarged.... 23
 Subcallus normal; first antennal segment not or slightly enlarged (11, 12, 27, 32).....*Tabanus* Linnæus

- 23. First antennal segment subglobular as well from above as from the sides; all tibiæ strongly swollen.....*Bolbodimyia* Bigot
 First antennal segment much produced downward (in side view), but not widened seen from above; tibiæ not or hardly swollen (13).
Snowiellus Hine

Family Pantophthalmidæ



Pantophthalmus sp., natural size.

Very large, usually broad, bristleless flies.

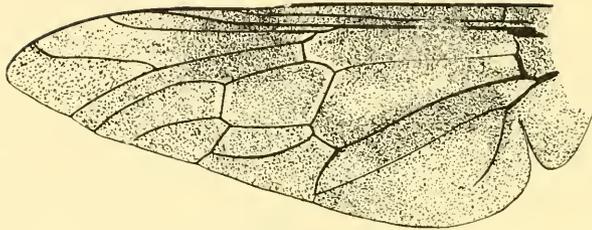
Eyes large, contiguous above the antennæ in the male; face rather short but often produced below into a distinct beak. Proboscis short, not adapted for piercing, with fleshy labellæ; palpi three-segmented, the basal segment short; ocelli present. Antennæ elongate, the third segment annulate and with a style-like apical section which may or may not be well differentiated. Squamæ small. Wings with two submarginal and five posterior cells, the fourth posterior cell and the anal cell closed. Tibiæ without apical spurs; posterior femora usually with a strong spur on the under surface beyond the middle; empodia pad-like.

The three genera placed in this family are closely related and there has always been much doubt concerning the validity of *Rhaphiorhynchus* which is undoubtedly but poorly separated from *Pantophthalmus* (*Acanthomera* Wiedemann). The genus *Atopomyia* Austen contains one species which is readily recognized by its slender, *Mydas*-like form. Austen* has revised the family but does not present keys to the species.

The Pantophthalmidæ occur only in the American tropics. The larvæ bore in solid wood (often in living trees) and the rasping sound made by them may be audible for a distance of several feet.

* 1923, Proc. Zool. Soc. London, pp. 551-593.

KEY TO GENERA



Pantophthalmus species.

1. Abdomen not or scarcely more than twice as long as wide, short and broad 2
 Abdomen three times as long as wide, long and narrow; *Mydas*-like species *Atopomyia* Austen

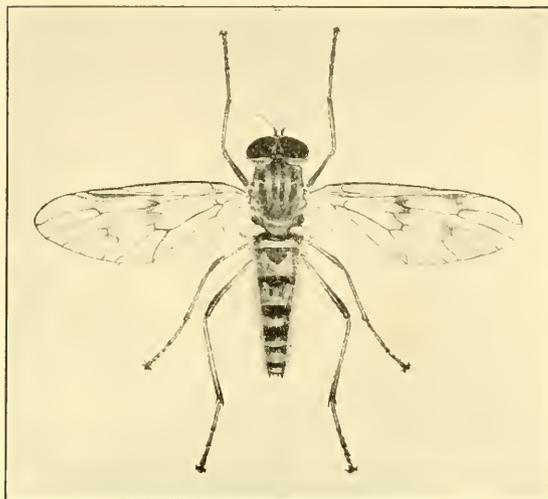
2. Third palpal segment almost always cylindrical, even when somewhat swollen and more or less pointed below, usually obtuse apically; facial beak, if present and fairly long, strongly tapering and the ventral spur on the posterior femora greatly reduced or almost absent.

Pantophthalmus Thunberg

 Third palpal segment broadened and laterally compressed, especially in the female, pointed below; face with a long, narrow beak and the posterior femora with a strong ventral spur.

Rhaphiorhynchus Wiedemann

Family Rhagionidæ—The Snipe Flies

*Rhagio mystacea.*

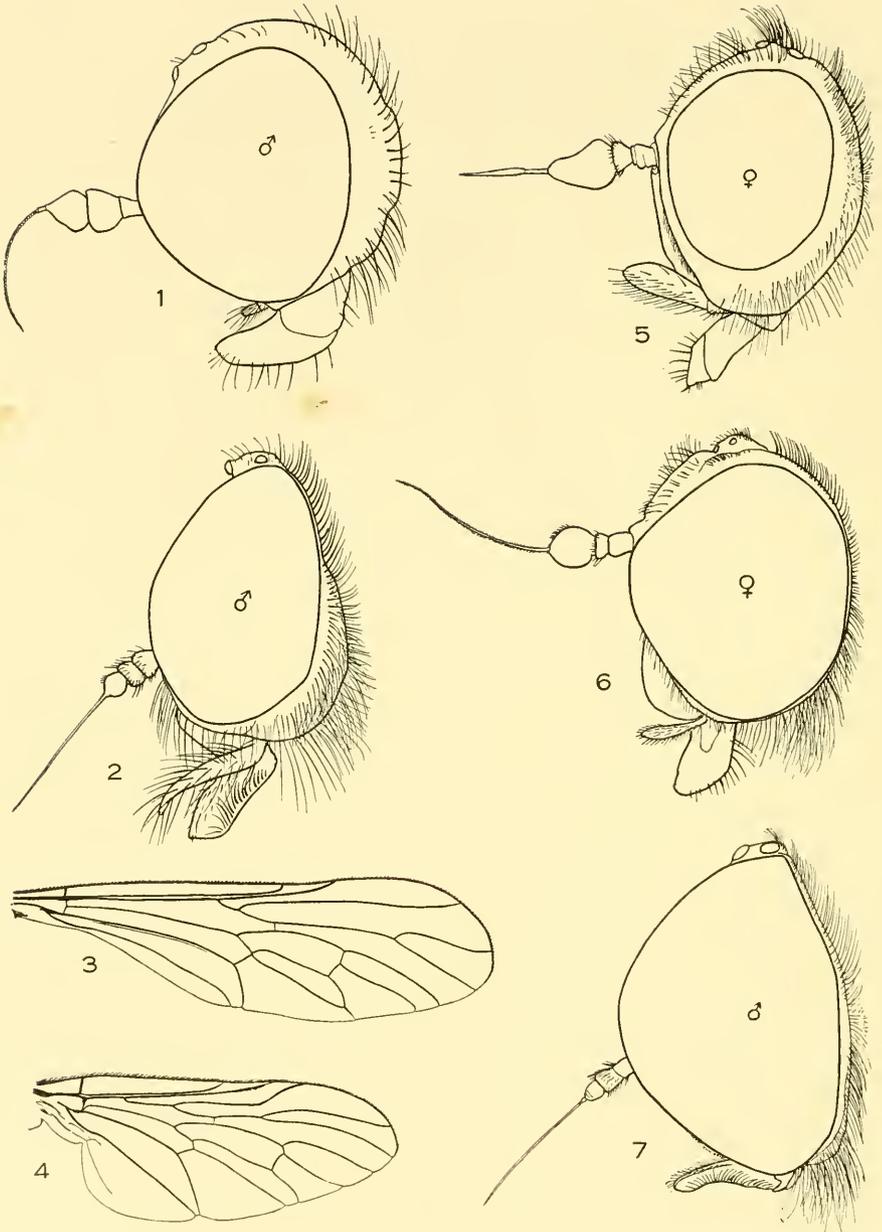
Small to medium sized, nearly bare or thinly pilose flies.

Face very strongly receding, the middle convex but lying much below the level of the eyes in profile; males holoptic or the eyes very narrowly separated. Antennæ composed of three segments, the third bearing a terminal or dorsal arista or rather slender style. Scutellum unarmed. Legs long; empodium developed pulvilliform (but slightly developed in *Hilarimorpha*). Wing venation strong; four or five posterior cells, the discal cell absent only in *Hilarimorpha*. Abdomen long and usually tapering.

The Snipe Flies are common in woods, especially near moist places and may be found on foliage, in long grass and on tree trunks. They are predaceous in both the adult and larval stages. Leonard* has revised the Nearctic species.

There has been much confusion in regard to the limits of this family, those genera which I have placed in the Cœnomyiidæ being included by Williston. *Hilarimorpha* has been placed in the Empidæ, and Bombyliidæ but from its general structure I feel certain that it belongs here, despite the poorly developed empodium. The shape of the face excludes it from both families mentioned and the wing venation cannot be considered of prime importance.

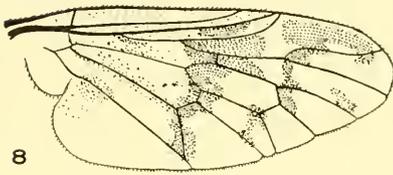
* 1930. Mem. Amer. Ent. Soc. No. 7.



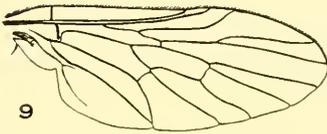
Rhagionidae I.—1, *Vermileo*; 2, *Rhagio punctipennis*; 3, *Vermileo*; 4, *Symphoromyia pleuralis*; 5, *Ptiolina majuscula*; 6, *Chrysopilus quadratus*; 7, *Dialysis elongata*.

KEY TO GENERA

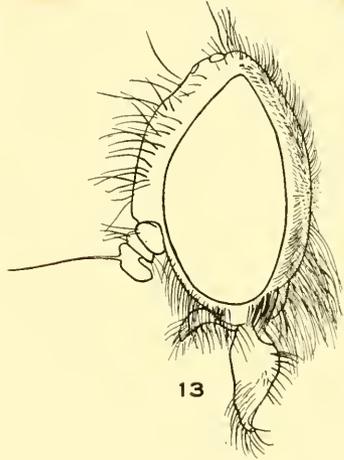
1. Anterior tibiæ without terminal spur..... 4
 Anterior tibiæ with one or two terminal spurs..... 2
2. Antennæ with a long terminal arista or style which is very much longer than the antenna proper (1); alula present or absent... 3
 Antennæ with a short, thick terminal style; alula present.
Bolbomyia Lœw
3. Alula present; scutellum haired; males holoptic (7, 14) (*Triptotricha* Lœw) *Dialysis* Walker
 Alula absent; scutellum bare; males dichoptic (1, 3) (*Pheneus* Walker).
Vermileo Macquart
4. Discal cell present; five posterior cells..... 5
 Discal cell absent; four posterior cells (11)... ..*Hilarimorpha* Schiner



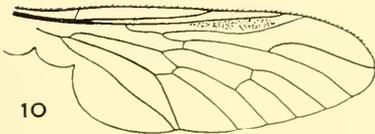
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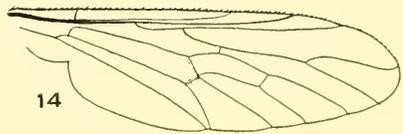
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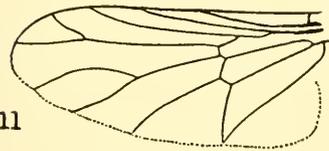
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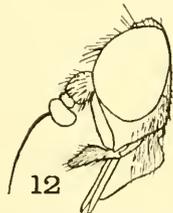
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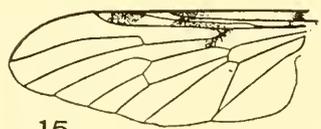
14



11



12



15

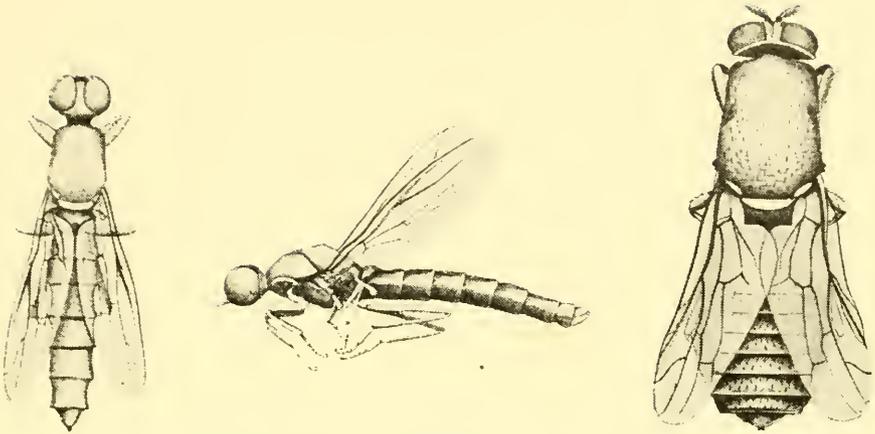
Rhagionidæ II.—8, *Atherix variegatus*; 9, *Ptiolina majuscula*; 10, *Rhagio incisus*; 11, *Hilarimorpha*; 12, *Symphoromyia*; 13, *Atherix variegatus*; 14, *Dialysis elongata*; 15, *Chrysopilus*.

5. Third antennal segment round, oval or conical..... 7
 Third antennal segment kidney-shaped, with dorsal or subdorsal arista. 6
6. Posterior tibiæ with two terminal spurs (8, 13).....*Atherix* Meigen
 Posterior tibiæ with one terminal spur (4, 12)..*Symphoromyia* Frauenfeld
7. Posterior tibiæ with one terminal spur 8
 Posterior tibiæ with two terminal spurs (2, 10).....*Rhagio* Fabricius
8. Antennæ bearing a terminal style..... 9
 Antennæ with a long, slender terminal arista which is decidedly longer
 than the basal three segments combined (6, 15)..**Chrysopilus* Macquart
9. Style situated near the middle of the third antennal segment (5, 9).
†*Ptiolina* Zetterstedt
 Style situated at the lower end of the third antennal segment.
Spania Meigen.

* Curran, 1931, Amer. Mus. Novit. No. 462 (Tropical).

† Curran, 1931, Can. Ent., lxiii, p. 249.

Family Scenopinidæ—The Window Flies



Pseudotrichia longurio, dorsal and lateral view, and *Scenopinus fenestralis* (right), dorsal view.

Flies of moderate or small size, usually blackish in color.

Front not excavated; face bare, short and broad; ocelli present; males usually holoptic; proboscis concealed; palpi cylindrical, bristly at the apex. Antennæ approximated at the base, the basal two segments short, the third elongate, simple, without style or arista. Thorax rather long, moderately convex above, the head situated low on the thorax; scutellum broad and short, convex apically and unarmed. Abdomen flattened or cylindrical, composed of seven segments. Legs short; empodia absent. Wing venation simple, the third vein branched; apical cell open or closed; basal cells long, the first much longer than the second.

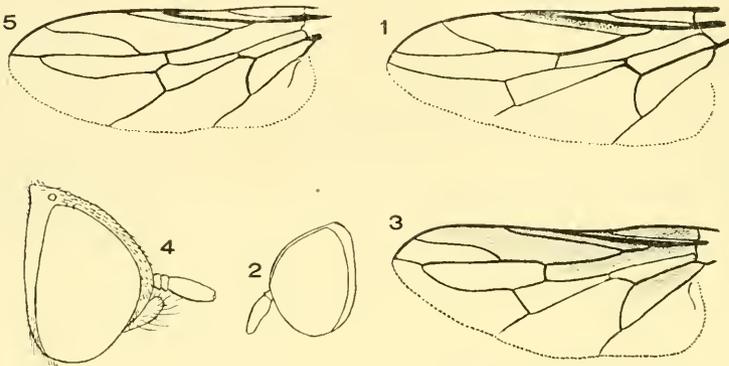
The adults, with the exception of *Scenopinus fenestralis* Linnaeus, are not common in collections. The larvæ have been recorded as living in decaying fungi and wood and under carpets. *S. fenestralis* is sometimes common on windows and is said to live upon carpet beetle larvæ, being predaceous. The common name of the family is derived from the window-frequenting habit.

Some authors have used the name *Omphrale* Meigen instead of *Scenopinus* Latreille, but I do not recognize Meigen's "1800" names. The family has been treated by Kröber in *Genera Insectorum** and keys to the species are given.

* Fascicle 161, 1914.

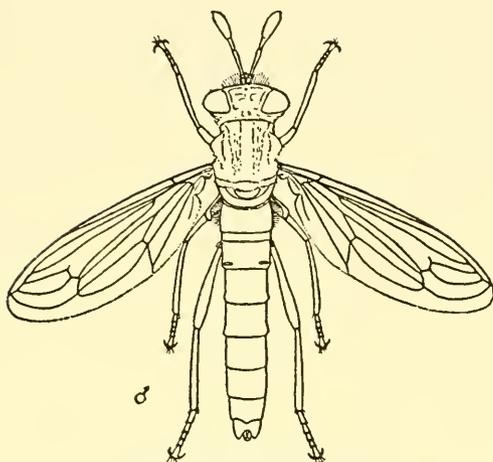
KEY TO GENERA

1. Antennæ longer than the width of the head (Brazil)..*Cerocatus* Rondani
Antennæ at most half as long as the width of the head..... 2
2. Apical cell closed and petiolate 3
Apical cell open (1, 2).....*Scenopinus* Latreille
3. Body with metallic scales (3, 4).....*Metatrichia* Coquillett
Body without metallic scales (5).....*Pseudatrichia* Osten Sacken



Scenopinidæ.—1, 2, *Scenopinus fenestralis*; 3, 4, *Metatrichia*; 5, *Pseudatrichia*.

Family Mydaidæ—The Mydas Flies



Nemomydas pantherinus.

Large to very large, thinly haired or nearly bare, elongated flies.

Venation complicated, the basal cells long, the fourth vein always ending at or before the tip of the wing. Antennæ composed of four segments, the fourth always elongate. Both sexes dichoptic, the front excavated between the eyes; ocelli, except the anterior one, absent. Proboscis with fleshy labellæ, or rudimentary; palpi usually absent or extremely small, rarely long and slender. Empodia not developed pulvilliform.

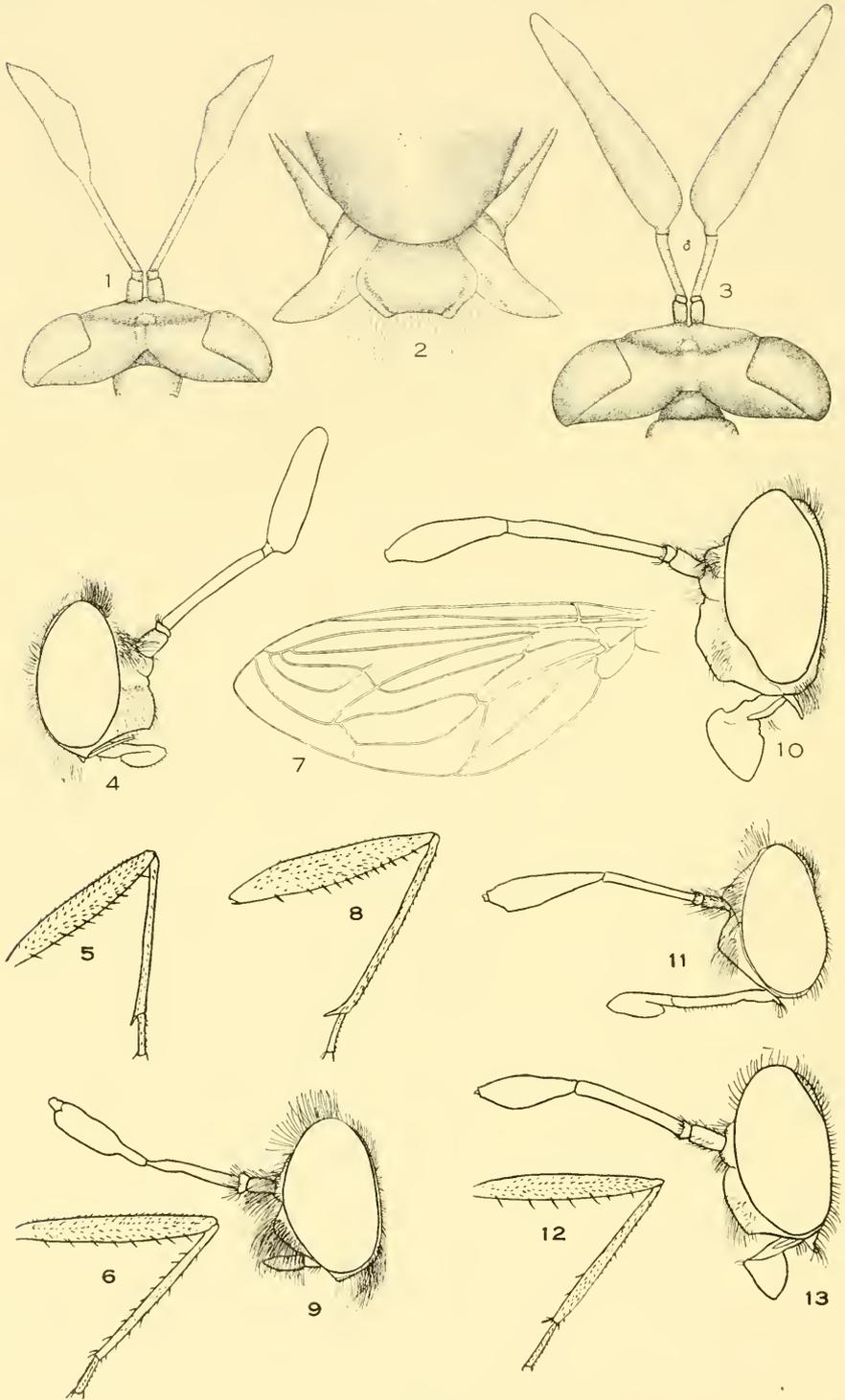
The Mydas flies are easily recognized by the shape of the head, four-segmented antennæ and peculiar venation. The majority of the species are tropical in distribution and it is probable that the larvae of all live in decaying wood.

The generic limits in the family are but poorly understood and only an abundance of material will enable one to properly limit the genera. Johnson* has dealt with the Nearctic forms, while papers by Bezzi† and Seguy‡ must receive attention in any attempt to deal with the family.

* Johnson, 1926, Proc. Bost. Soc. Nat. Hist., xxxviii, pp. 131-145.

† Bezzi, 1924, Ann. S. Afr. Mus., xix, pp. 191-234.

‡ Seguy, 1928, Encycl. Ent., Diptera, iv, pp. 129-156.



KEY TO GENERA

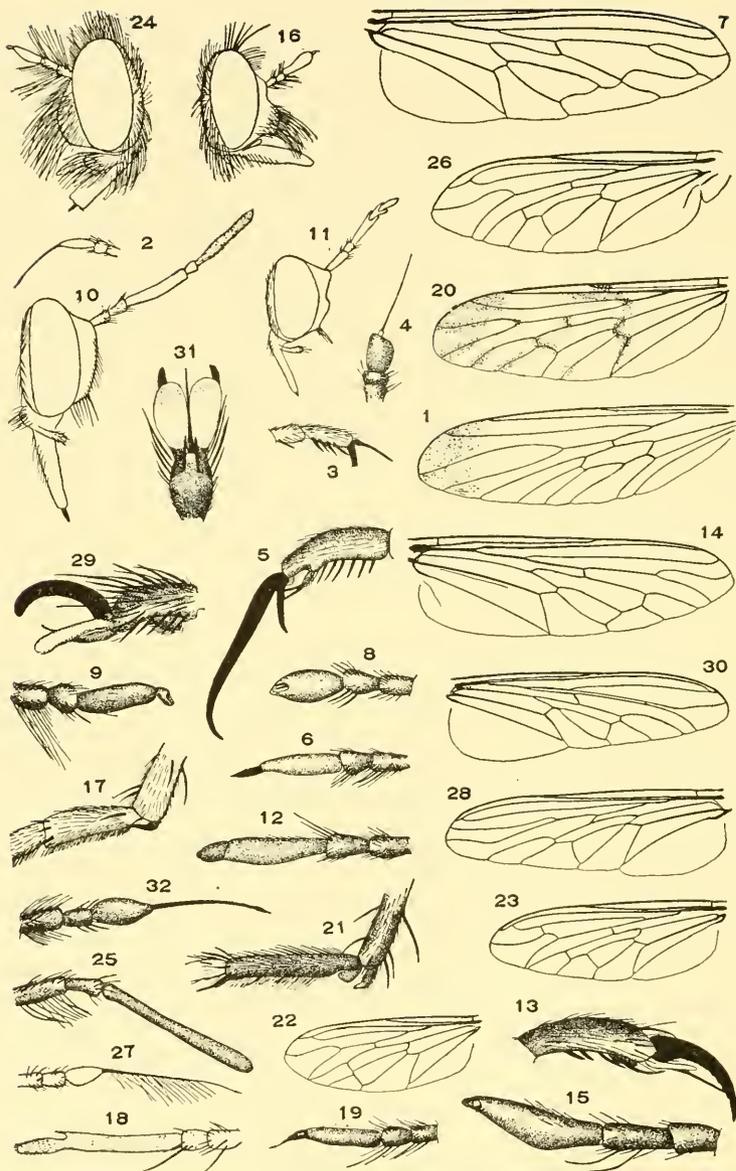
1. Posterior tibiæ ending in a spur (5, 8)..... 2
 Posterior tibiæ without spur (6) 5
2. Spur of the posterior tibiæ longer than the width of the first tarsal segment, giving the tibiæ an arcuate appearance, the terminal bristle shorter than the spur; antennæ (always?) similar in both sexes.... 3
 Spur small and straight, shorter than the tarsal thickness or the terminal bristle; antennæ differing in the two sexes; palpi absent (1, 2, 3, 5, 7) *Phyllomydas* Bigot
3. Palpi wholly absent or represented by a bulbous swelling (8, 10; see colored plate).....*Mydas* Fabricius
 Palpi well developed, slender and sometimes half as long as the proboscis 4
4. Posterior femora rather strongly swollen; posterior trochanters without bristles (13).....**Lampromydas* Seguy
 Posterior femora not swollen; posterior trochanters bearing short, stout bristles (4, 12).....†*Opomydas*, n. g.
5. No vein reaching the posterior border between the anal cell and tip of the wing 6
 A vein (the fifth) extends to the wing margin (4, 12)....‡*Opomydas*, n. g.
6. Proboscis extending well beyond the oral opening (6, 11).
 ‡*Nomoneura* Bezzi
 Proboscis small, not extending beyond the oral opening (9).
 ‡*Nemomydas*, n. g.

* *Lampromydas* was based on specimens in which there is no vein extending to the wing margin between the anal vein and the tip of the wing but the character is not generic in this case. Of two specimens of (*Mydas*) *luteipennis* Lœw, one has a vein in one wing while the other specimen has none. This species and *maculiventris* Westwood, as well as two unidentified species before me, belong to *Lampromydas* unless the genotype of *Lampromydas* lacks palpi.

† *Ectyphus* Gerstæcker is not known from North America but apparently occurs in South America. The three described North American species belong to *Opomydas* of which *E. limbatus* Williston is the genotype.

‡ *Leptomydas* Gerstæcker is not known from America. The genus is distinguished by the hairy pleura, both the above genera having pile only on the pteropleura and supraspiracular convexities. The genotype of *Nemomydas* is *Leptomydas pantherinus* Gerstæcker.

Mydaidæ.—1, *Phyllomydas phyllocerus*, ♀; 2, *Phyllomydas phyllocerus*, ♀ genitalia from below; 3, *Phyllomydas phyllocerus*; ♂; 4, *Opomydas limbatus*; 5, *Phyllomydas phyllocerus*, hind leg; 6, *Nomoneura*, hind leg; 7, *Phyllomydas phyllocerus*; 8, *Mydas clavatus*, hind leg; 9, *Nemomydas pantherinus*; 10, *Mydas clavatus*; 11, *Nomoneura panamensis*; 12, *Opomydas townsendi*, hind leg; 13, *Lampromydas maculiventris*.



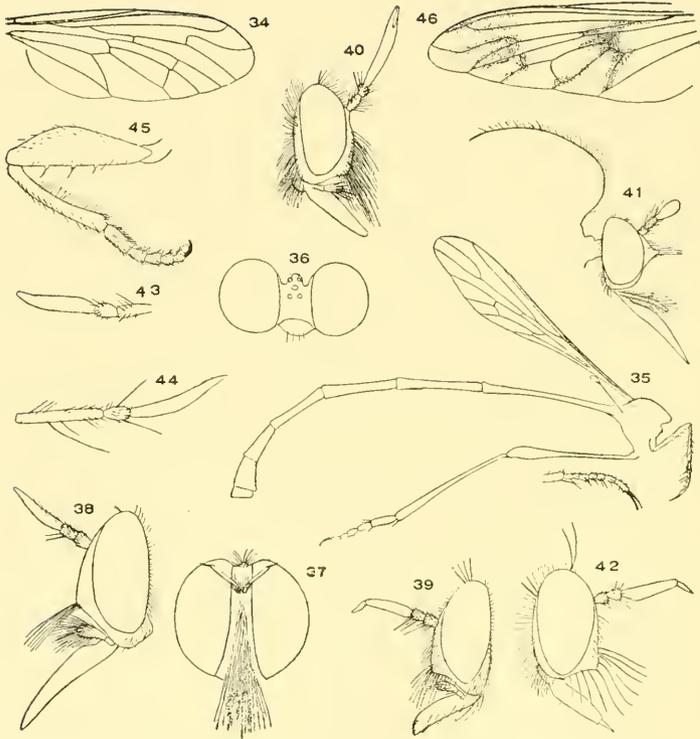
Asilidæ I.—1, *Leptogaster*; 2, *Leptogaster*, antenna; 3, *Leptogaster*, end of tarsus; 4, *Damalis*, antenna; 5, *Dicranus*, claw; 6, *Seleropegon*, antenna; 7, *Microstylum galactoides*; 8, *Psilocurus*, antenna; 9, *Laphystia*, antenna; 10, *Ceraturgus cruciatus*; 11, *Myelaphus melas*; 12, *Dioctria*, antenna; 13, *Blepharepium coarctatum*, claw; 14, *Diogmites winthemia*; 15, *Diogmites*, antenna; 16, *Lestomyia fraudigera*; 17, *Taracticus*, end of tibia; 18, *Taracticus*, antenna; 19, *Buckellia*, antenna; 20, *Nicoles rufus*; 21, *Pseudorus*, tibial spur; 22, *Atomosia puella*; 23, *Pogonosoma dorsata*; 24, *Dasylechia atrox*; 25, *Bombomima*, antenna; 26, *Laphria*, Lampria; 27, *Ommatius*, antenna; 28, *Eecritosia*; 29, Mallophora, claw; 30, *Promachus*; 31, *Promachus*, claws; 32, *Promachus*, antenna.

Family Asilidæ—The Assassin Flies

Species of moderate to large size, rarely small, usually rather elongate in form, often thickly hairy and always with bristles, entirely predaceous in habit.

Head flattened, broad and short, separated from the thorax by a neck (the prothorax) and freely movable. Front excavated above, usually broad in both sexes, rarely narrow. Ocelli present, usually situated upon a rounded tubercle; front with bristles. Antennæ porrect, usually composed of three simple segments, the third more or less elongate and with or without a terminal style or arista, the latter very rarely pectinate, the style rarely strongly thickened and forming one or two additional segments. Proboscis of moderate length, horny and adapted for piercing, directed downward or forward; labellæ never fleshy; palpi composed of two segments, the basal one often small and not freely articulated with the second. Thorax variable in shape, convex, usually bearing bristles. Abdomen composed of eight segments, the hypopygium and ovipositor usually prominent. Legs strong, usually bristly, of moderate length, the femora often, the posterior tibiæ sometimes thickened, the legs sometimes very long and rather slender; empodium present or absent; the puvilli rarely absent or greatly reduced. Wings lying parallel over the abdomen when at rest; basal cells long; two or three submarginal cells, five posterior cells (four in a very few genera); first and fourth posterior cells and the anal cell either open or closed.

The members of this family have usually been termed "Robber Flies" but I adopt "Assassin Flies" as much more suitable as a common name. All the Asilidæ are predaceous in the adult and probably in the larval stages. The adults are found everywhere but many groups of genera are restricted in habitat. Some will be found in clearings in and around the edges of woods, some on sand near water, others in open fields or on fallen trees or fenceposts. Some of the species are found almost entirely on tree trunks while others sit on the tips of dead branches of trees or the tops of dead weeds. The species of *Leptogaster* prefer long grass, particularly in moist places. Sandy beaches will usually yield a few species. The species of *Laphria* and *Bombomima* will usually be found resting upon leaves in the sun in or at the edges of woods while the genera related to *Asilus* mostly frequent open fields.



Asilidæ II.—34, *Psilocurus caudatus*; 35, *Leptopteromyia gracilis* (Brazil); 36, *Holcocephala*, head from in front, 37, *Scleropogon turquii*; 38, *Archilestris magnificus*; 39, *Chrysocercia pictarsis*; 40, *Dizonias*; 41, *Pseudorus bicolor*; 42, *Atonia mikii*; 43, *Atomosia macquartii*, antenna; 44, *Cerotainia*, antenna; 45, *Lampria*, hind leg; 46, *Andrenosoma*.

Many of the Asilids resemble bees and are quite powerful. They devour insects of all kinds, catching them during flight, and bees form the principal article of diet of some species although the variety of food is usually limited only by the intended victim's ability to escape. The prey is pierced by the powerful proboscis and the juices sucked out, the digestion taking place by the injection into the victim of a powerful "enzyme" which breaks down the muscular tissue. The collector should be careful in handling the larger species as they not infrequently bite, resulting in a painful, if not serious, wound.

The family is a large and popular one and includes many fine species. For the most part the classification is simple but in some genera it is difficult to separate the species by means of the available literature. There has been no monograph of the Nearetic species although Back* has dealt with about half the family. However, since the appearance of his contribution very many additional species have been described. Otherwise the literature is scattered although not difficult to obtain.

In the key will be found many references to keys to species which should prove very helpful in tracing out the species. I have not followed the practice of recognizing subfamilies as the characters previously used obviously separate related genera and some genera are difficult to place where the system is followed. For Cuban species see Bromley "The Asilidæ of Cuba," (Ann. Ent. Soc. Amer., xxii, pp. 272-294); also Texas Asilidæ by the same author.†

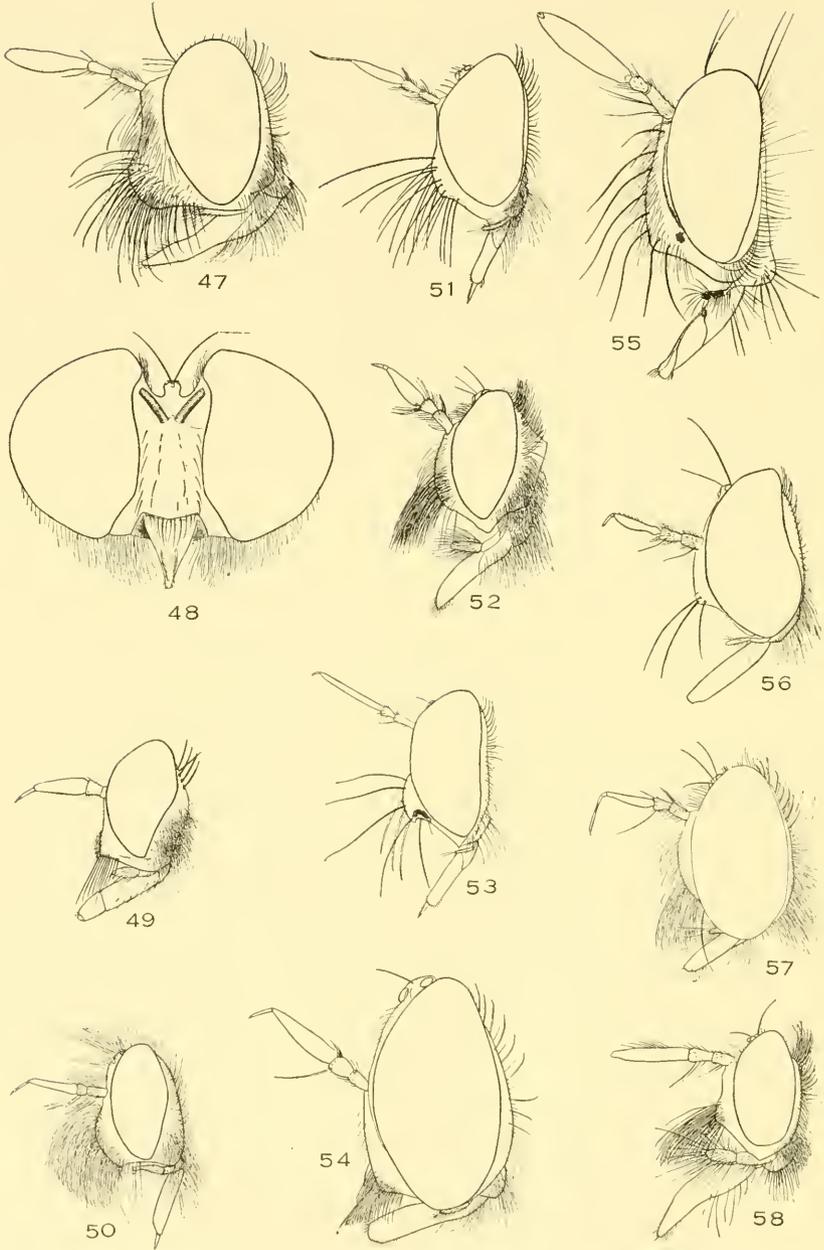
KEY TO GENERA

1. Anterior tibiæ with a terminal, sharply curved, ventral spur..... 2
Anterior tibiæ with only straight or gently curving apical bristles.... 17
2. Marginal cell closed and petiolate (121) 3
Marginal cell open 4
3. Face bare except for a very few hairs on the oral margin (121, 122).
Doryclus Jaenicke
Face with strong hairs and many on the oral margin (21, 41).
Pseudorus Walker
4. Middle of mesonotum raised and bearing a crest of long, dense hairs
(50, 86).....‡Comantella Curran
Mesonotum never with crest of dense hair..... 5
5. Antennæ with distinct, two-segmented apical style..... 13
Antennæ either with a short, broad, one-segmented style bearing a
spine in the depression, without style, or excised and bearing a spine
above 6

* 1909, Tr. Amer. Ent. Soc., xxxv, pp. 137-400, plates II-XII.

† Bromley, 1934, Ann. Ent. Soc. Amer., xxvii, pp. 74-114.

‡ Curran, 1926, Can. Ent., lviii, p. 311.



Asilidae III.—47, *Pilica* sp. (Panama); 48, *Atomesia tibialis*, head from in front; 49, *Neopogon*; 50, *Comantella falli*; 51, *Cerdistus dolichomerus*; 52, *Callinicus calanus*; 52, *Senoprosopis* (Panama); 54, *Hodophylax aridus*; 55, *Panamasilus xylota*; 56, *Plesioma*; 57, *Heteropogon macerinus*; 58, *Lastaurus*.

6.	Third antennal segment with an apical depression or style in which is inserted a small short spine	8
	Third antennal segment excised above beyond the middle and bearing a short spine	7
7.	Pulvilli present and large (17, 18, 71, 142).....*	Taracticus Læw
	Pulvilli absent	Parataracticus Cole
8.	Posterior pulvilli not more than one-third as long as the claws, (13, 96, 123)	Blepharepium Rondani
	Posterior pulvilli more than half as long as the claws.....	9
9.	Abdomen thickly pilose, at least laterally.....	10
	Abdomen almost bare	11
10.	Face convex, pilose on lower two-thirds (Brazil)	Lastaurina, n. g.
	Face flat above, pilose on less than lower half (58, 95).....	Lastaurus Læw
11.	Fourth posterior cell closed and petiolate at apex.....	12
	Fourth posterior cell open or closed in the wing margin (88, 102). ‡Saropogon Læw	
12.	Abdomen clavate; scutellum without bristles (138, 153) Senobasis Macquart	
	Abdomen not clavate; scutellum with bristles (14, 15, 150). Diogmites Læw	
13.	Face gibbous in the middle, leaving a flattened space immediately below the antennæ (16, 94).....	‡Lestomyia Williston
	Face evenly convex or prominent below	14
14.	The dense mystax occupies the lower half of the face (81, 87). Aphamartania Schiner	
	The dense mystax is limited to the lowest fourth	15
15.	Scutellum without bristles or hair.....	Cophura Osten Sacken
	Scutellum with bristles or hair	16
16.	Scutellum with fine hair on the disc (20, 97).....	Nicocles Jænnicke
	Scutellum with bristles only (19, 83, 98).....	§Buckellia Curran
17.	Marginal cell open or closed in the costa	18
	Marginal cell closed and petiolate	59
18.	Pulvilli vestigial or wanting	19
	Pulvilli normal, the posterior pair sometimes shortened.....	25
19.	Third antennal segment with a terminal arista or arista-like style, very slender species	22
	Third antennal segment with or without terminal style, if stylate the abdomen robust	20
20.	Claws very long and with an elongated tooth at the base of each claw (5)	Dicranus Læw
	Claws normal	21

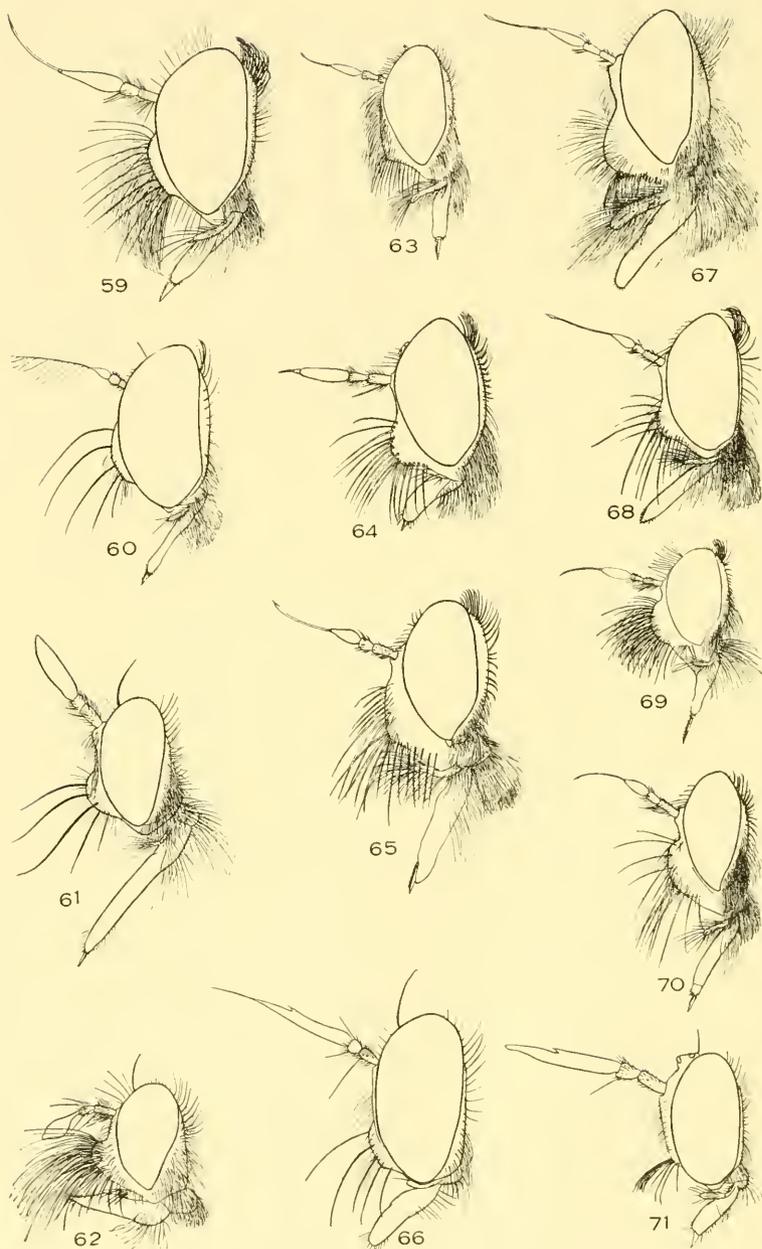
* Curran, 1930, Amer. Mus. Novit. No. 425, p. 4.

† Curran, 1931, Amer. Mus. Novit. No. 487, p. 1.

‡ Curran, 1931, Amer. Mus. Novit. No. 487, p. 3.

§ Curran, 1931, (Cophura), Amer. Mus. Novit. No. 487, p. 5; Melander, 1923, (Cophura),

Psyche, xxx, p. 208 (includes Cophura).

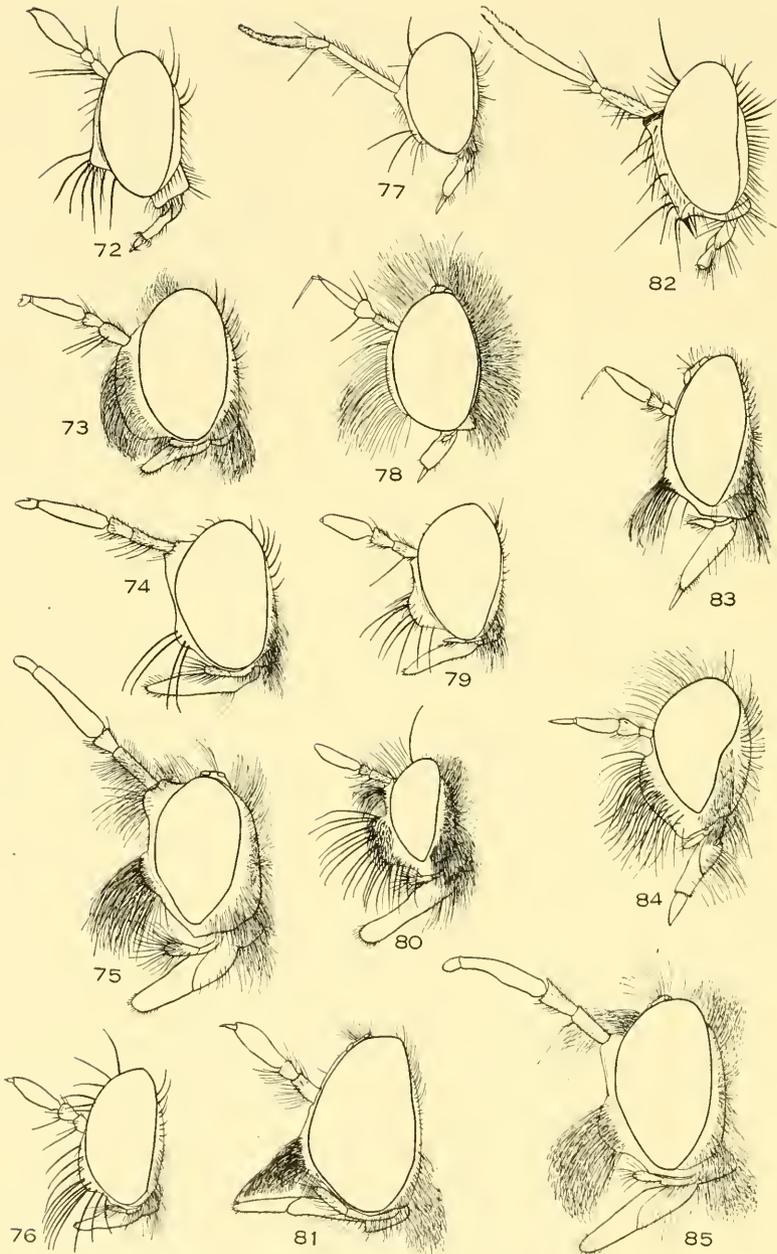


Asilidae IV.—59, *Neoitamus flavofemoratus*; 60, *Ommatius*; 61, *Lampria mexicana*; 62, *Pogonosoma melanoptera*; 63, *Mallophorina clausicella*; 64, *Negasilus belli*; 65, *Proctacanthus micans*; 66, *Atractia dispar*; 67, *Mallophora orcina*; 68, *Pachychœta copulata*; 69, *Machimus occidentalis*; 70, *Erax* (Panama); 71, *Taracticus octopunctatus*.

21. Face wholly thickly pilose *Ablautus* Læw
 Mystax limited to the lowest fourth of the face, the face sparsely
 haired above (54, 100) *Hodophylax* James
22. Anal cell absent, the wings extremely narrow at the base (140).
Eurhabdus Aldrich
 Anal, cell present 23
23. Mesonotum without dorsocentrals in front of the middle..... 24
 Mesonotum with a pair of dorsocentrals in front of the middle.
Schildia Aldrich
24. Empodia entirely absent (147) *Psilonyx* Aldrich
 Empodia present, about half as long as the claws (1, 2, 3; 148, 149).
Leptogaster Meigen
25. Antennæ with a slender terminal arista (4, 89)..... **Damalis* Fabricius
 Antennæ with or without a terminal style 26
26. Only four posterior cells (93) *Townsendia* Williston
 Five posterior cells 27
27. Head slightly higher than broad; face narrow above, swollen and
 broadened below 28
 Head obviously broader than high 30
28. Antennæ with a terminal style 29
 Antennæ without visible style; fourth posterior cell closed before the
 border of the wing (118)..... *Ospricerus* Læw
29. Metapleura bare (6, 37, 130)..... †*Stenopogon* Læw
 Metapleura with hair or bristles (6, 37, 130)..... †*Scleropogon* Læw
30. Antennæ apparently five segmented, the segments of the style simu-
 lating antennal segments 31
 Antennal style usually strongly differentiated from the third antennal
 segment, absent, or the fifth segment longer than the second..... 33
31. Third and fourth antennal segments very deeply emarginate apically
 (11) *Myelaphus* Bigot
 Third and fourth segments not concave apically 32
32. Fifth antennal segment not longer than the second (103).
Ceraturgopsis Johnson
 Fifth antennal segment about as long as the third (10, 132).
Ceraturgus Wiedemann
33. Fourth posterior cell closed 34
 Fourth posterior cell open, rarely almost closed..... 40
34. Face haired above the mystax 36
 Face bare except along the oral margin..... 35
35. Metanotal callosities bare (38, 136) *Archilestris* Læw
 Metanotal callosities with hair or short bristles (7, 101)
Microstylum Macquart
36. First posterior cell closed and long petiolate (109)..... *Trielis* Læw
 First posterior cell open or closed in the wing margin..... 37

* Curran, 1930, Amer. Mus. Novit. No. 425, p. 5.

† Bromley, 1931, Amer. Ent. Soc. Amer., xxiv, pp. 427-428.

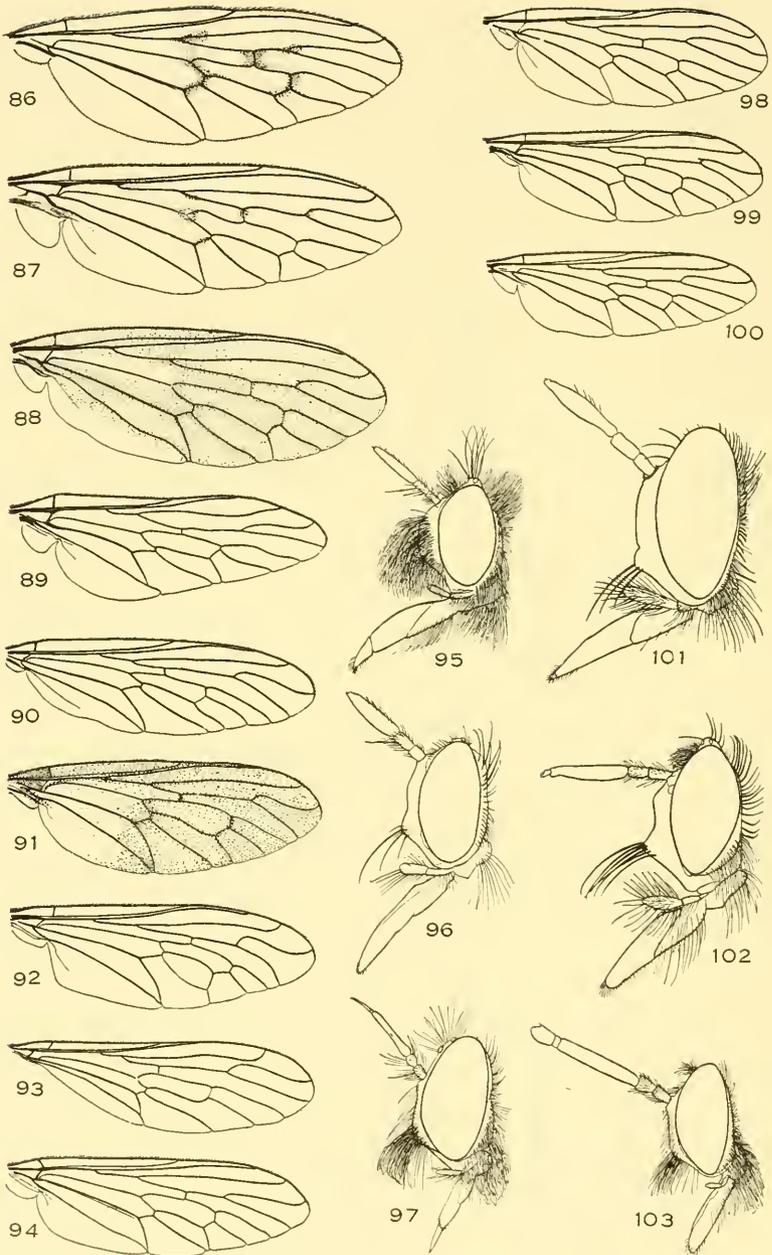


Asilidae V.—72, *Eumecosoma shropshirei*; 73, *Laphystia sexfasciata*; 74, *Dioctria baumhaueri*; 75, *Dicolonus simplex*; 76, *Metapogon*; 77, *Cerotainia propinqua*; 78, *Holopogon guttula*; 79, *Psilocurus birdi*; 80, *Bombomima flavicollis*; 81, *Aphamartania*; 82, *Bathropsis basalis*; 83, *Buckellia stylosa*; 84, *Laisopogon opaculus*; 85, *Echthodopa*.

37. Antennæ without distinct style 38
 Antennæ with the style short and broad, two-segmented, easily distinguishable (9, 73, 92).....‡*Laphystia* Læw
38. Anterior femora on the basal half of the under side with a large patch of dense, very short bristles.....*Sphageus* Læw
 Anterior femora without such bristles..... 39
39. Third antennal segment very much longer than the basal two combined (40, 124)*Dizonias* Læw
 Third antennal segment not or scarcely longer than the basal two combined, elongate oval, swollen (8, 34, 79).....**Psilocurus* Læw
40. Antennal style as broad as the third antennal segment and simulating a segment, sometimes closely appressed and not easily differentiated. 41
 Antennal style narrower than the third segment or absent..... 44
41. Lateral slopes of the metanotum bare..... 42
 Lateral slopes of the metanotum with pile (75, 91).....*Dicolonus* Læw
42. Face bare except below..... 43
 Face haired between mystax and antennæ (103)....*Ceraturgopsis* Johnson
43. Posterior femora with very short, stout bristles below on the apical half (85)*Ethodopa* Læw
 Posterior femora without short, stout bristles below, but with short, erect pile on the whole length (12, 74, 90).....‡*Dioctria* Meigen
44. Front narrowed posteriorly 45
 Front not narrowed posteriorly..... 46
45. Ocelli situated far forward on the front (56, 133).....*Plesioma* Macquart
 Ocelli situated near the vertex.....*Dolichodes* Macquart
46. Face bare except on the oral margin (cf. *Holcocephala*)..... 47
 Face with hair between the mystax and antennæ, or evenly haired.... 49
47. Third antennal segment swollen, about twice as wide as the second.
Willistonina Back
 Third antennal segment elongate, more or less tapering from the base or only slightly wider than the second..... 48
48. Third antennal segment elongate, longer than the basal two combined (49)*Neopogon* Bezzi
 Third antennal segment oval, not as long as the basal two combined.
Lissoteles Bezzi
49. Head very wide, the face with a deep, transverse groove above the oral margin and with only two to six hairs above the mystax (36, 141).
Holcocephala Jænnicke
 Head narrower, the face without the transverse depression..... 50
50. Mesonotum with the dorsocentral bristles strong and extending in front of the suture, if rather weak anteriorly there are no acrostical hairs 51
 Dorsocentrals absent or not strongly differentiated; mesonotum hairy, the acrostical hair always present..... 52

* Curran, 1931, Amer. Mus. Novit. No. 487, p. 8.

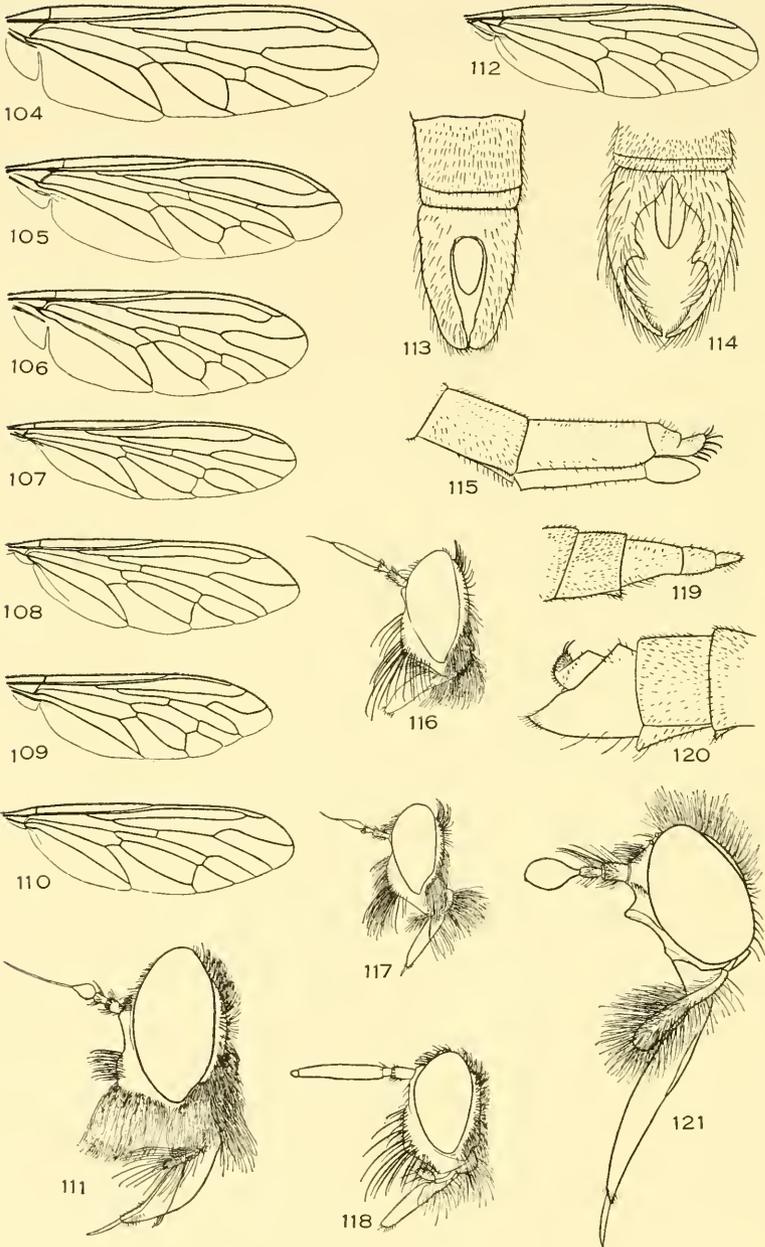
† Melander, 1923, Psyche, xxx, p. 212.



Asilidae VI.—86, *Comantella falli*; 87, *Aphamartania murina*; 88, *Saropogon luteus*; 89, *Danalis*; 90, *Diectria baumhaueri*; 91, *Dicolonus simplex*; 92, *Laphystia sexfasciata*; 93, *Townsendia argyrata*; 94, *Lestomyia sabulonum*; 95, *Lastaurus*; 96, *Blepharepium secabilis*; 97, *Nicoles politus*; 98, *Buckellia pollinosa*; 99, *Lasiopogon tetragrammus*; 100, *Hodophylax aridus*; 101, *Microstylum galactoides*; 102, *Saropogon birdi*; 103, *Ceraturgopsis cornutus*.

51. No acrostical hairs (76, 112).....**Metapogon* Coquillett
Acrostical hairs present, usually abundant but short (84, 99).
†*Lasiopogon* Læw
52. Mesonotum with the hair appressed and usually with distinct, sub-
appressed dorsocentral bristles posteriorly..... 53
Mesonotal hair erect, the bristles, if present, very fine and erect..... 56
53. No trace of dorsocentral bristles (type *Lasiopogon terricola* Johnson)
(84, 99)*Alexiopogon*, n. g.
Distinct, though weak dorsocentrals posteriorly..... 54
54. Abdomen elongate, more or less narrowed basally in the males..... 55
Abdomen short and broad, rather strongly tapering in both sexes; hair
rather abundant but short.....*Pycnopogon* Læw
55. Disc of scutellum with hairs toward either side (52, 126)..*Callinicus* Læw
Scutellum with marginal bristles and hairs only (39).
Chrysoceria Williston
56. Face decidedly gibbous, the swelling clearly limited above..... 57
Face flat or evenly, gently convex..... 58
57. The third vein branches before the apex of the discal cell; style long
(129, 151).....‡*Eucyrtopogon* Curran
The third vein branches conspicuously beyond the apex of the discal
cell; style short (128, 152).....§*Cyrtopogon* Læw
58. Posterior tibiæ strongly swollen, about twice as large as the anterior
ones (78, 143).....*Holopogon* Læw
Posterior tibiæ not enlarged (57, 127).....*Heteropogon* Læw
59. Antennæ with a terminal arista..... 77
Antennæ with or without a terminal style which is never bristle-like.. 60
60. Wing with only two submarginal cells..... 61
Wing with three submarginal cells (23, 62).....*Pogonosoma* Rondani
61. Third antennal segment with an apical style, which is rarely difficult
to discern 62
Third antennal segment without style..... 66
62. Third antennal segment excised and bearing a very short bristle be-
yond the middle on the upper side, the style slender (66, 108).
Atractia Macquart
Third antennal segment not excised above..... 63
63. Face with strong, isolated bristles and short, fine hair..... 65
Face with soft hair, which may be long and contain some coarse ones.. 64
64. Face perpendicular, more prominent above or almost evenly convex;
mesonotum not with dense, long yellow pile (9, 73, 92).
¶*Laphystia* Læw
Face most prominent below the middle, strongly convex; mesonotum
with dense, long yellow pile (24).....*Dasylechta* Williston

* Melander, 1923, *Psyche*, xxx, p. 210.† Melander, 1923, *Psyche*, xxx, p. 136.‡ Curran, 1923, *Can. Ent. Iv*, p. 95.§ Curran, 1923, *Can. Ent. Iv*, p. 123; Melander, 1923, *Psyche*, xxx, p. 102.¶ Curran, 1931, *Amer. Mus. Novit. No. 487*, p. 11.



Asilidæ VII.—104, *Proctacanthella cacopilogus*; 105, *Mallophorina laphroides*; 106, *Negasilus belli*; 107, *Protichisma albibarbis*; 108, *Atractia dispar*; 109, *Tricis tagax*; 110, *Atonia* (n. sp. Brazil); 111, *Eccritosia barbata*; 112, *Metapogon*; 113, *Heligmonera*; 114, *Philonicus albiceps*; 115, *Proctacanthella cacopilogus*; 116, *Asilus sericeus*; 117, *Proctacanthella cacopilogus*; 118, *Ospricerus abdominalis*; 119, *Heligmonera rubicunda*; 120, *Philonicus fuscus*; 121, *Doryclus distendens*.

65. First antennal segment less than twice as long as the second; style strongly differentiated (42, 110).....*Atonia* Williston
 First antennal segment more than three times as long as the second; style poorly differentiated (82, 145).....*Bathropsis* Hermann
66. Third antennal segment at least three times as long as the basal two combined*Aphestia* Schiner
 Third antennal segment not more than twice as long as the first two combined 67
67. Metanotal slopes or callosities bearing pile or short, stout bristles.... 68
 Metanotal callosities without pile or bristles..... 73
68. Mesonotum evenly clothed with dense pile, most of which is yellow, some erect and some appressed; no bare areas outside the dorso-central area; large species (25, 80).....**Bombomima* Enderlein
 Mesonotum without dense hair concealing the ground color..... 69
69. Front at least slightly widening above, never narrowed..... 70
 Front narrowed above (22, 43, 48).....†*Atomosia* Macquart
70. First antennal segment at least three times as long as the second.... 71
 First antennal segment not twice as long as the second..... 72
71. Seventh abdominal segment elongate (107).....*Protichisma* Hermann
 Seventh abdominal segment short, three or four times as wide as long, or apparently absent (44, 77, 146).....‡*Cerotainia* Schiner
72. Face strongly gibbous below and with rather abundant hair above (47)*Pilica* Curran
 Face weakly gibbous below and with only a row of hairs on either side (72, 144).....§*Eumecosoma* Schiner
73. Face with a strong swelling occupying the lower half, most prominent in the middle..... 75
 Face very gently convex or concave and most prominent just above the oral margin..... 74
74. Scutellum with long marginal bristles; large, elongate species (55).
Panamasilus Curran
 Scutellum with extremely short, upturned marginal hair; smaller, robust species (135).....*Cerotainiops* Curran
75. Proboscis laterally compressed..... 76
 Proboscis dorsoventrally compressed (46).....¶*Andrenosoma* Rondani
76. Metasternum with long hairs (26, 45, 61).....*Lampria* Macquart
 Metasternum bare (26).....||*Laphria* Meigen
77. Arista pectinate below (27, 60).....°*Ommatius* Wiedemann
 Arista not pectinate..... 78

* This name replaces *Dasyllis*, a strictly South American genus. Unless the presence of metanotal hairs is a valid character the genus does not differ from *Laphria*. For key see Banks, 1917 (*Dasyllis*) Bull. Brooklyn Ent. Soc., xii, p. 52.

† Curran, 1930, Amer. Mus. Novit. No. 425, p. 15.

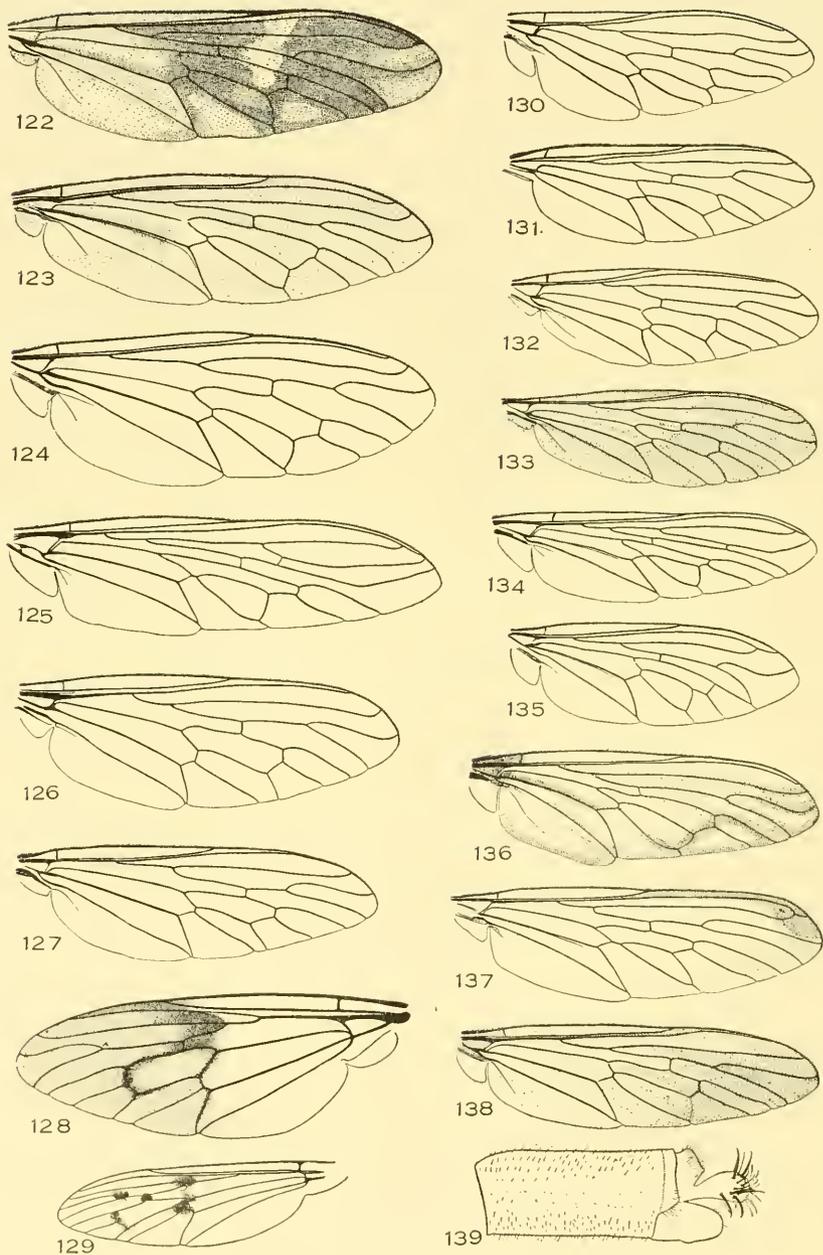
‡ Curran, 1930, Amer. Mus. Novit. No. 425, p. 11.

§ Curran, 1930, Amer. Mus. Novit. No. 425, p. 8.

¶ Curran, 1931, Amer. Mus. Novit. No. 487, p. 19.

|| McAtee, 1918, Ohio Journ. Sci., xix, p. 143.

° Curran, 1928, Amer. Mus. Novit. No. 327.



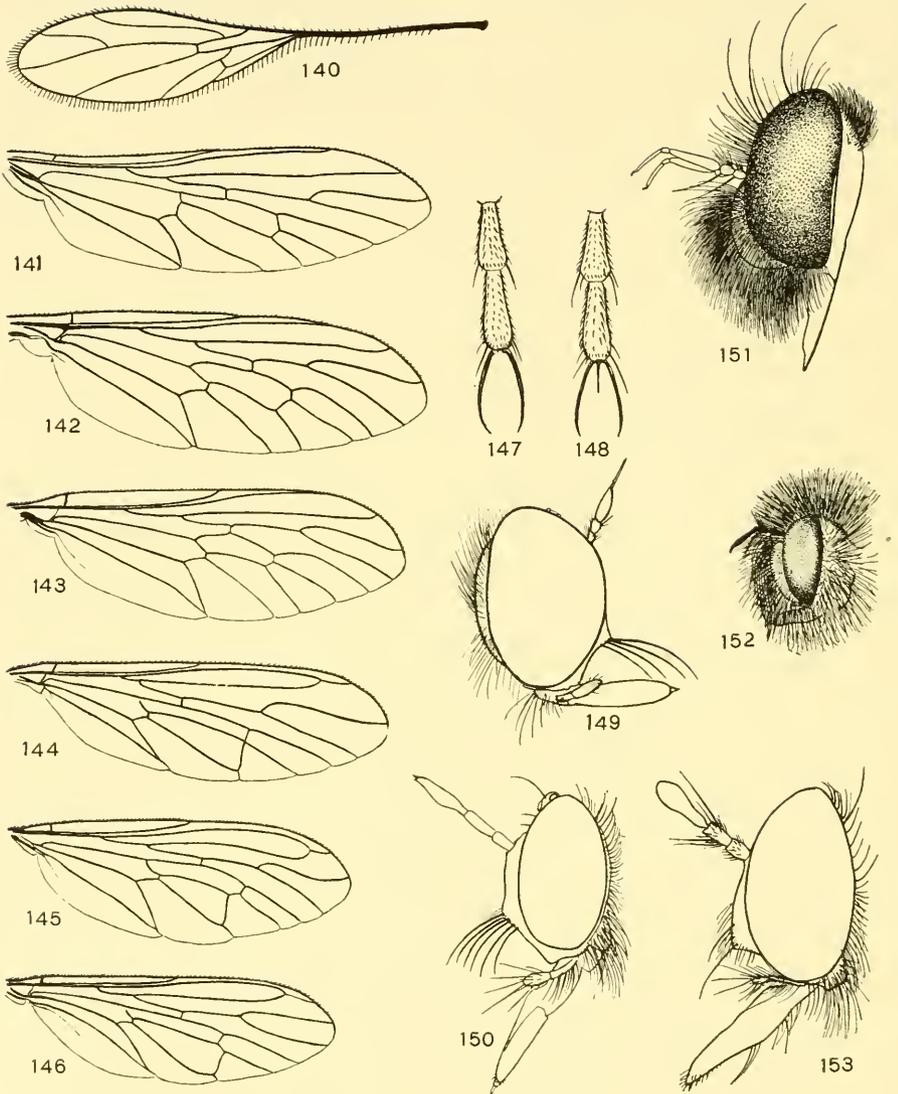
Asilidae VIII.—122, *Doryelus* (n. sp.); 123, *Blepharepium secabilis*; 124, *Dizonias lucasi*; 125, *Erax anomalus*; 126, *Callinicus calanus*; 127, *Heteropogon* sp. (Utah); 128, *Cyrtopogon curtistylus*; 129, *Eucyrtopogon*; 130, *Scleropogon*; 131, *Neopogon*; 132, *Ceraturgus nigripes*; 133, *Plesioma lineata*; 134, *Promachina nimius*; 135, *Cerctainiops*; 136, *Archilestris magnificus*; 137, *Senoprosopis*; 138, *Senobasis mendax*; 139, *Proctacanthus micans*.

78. Third antennal segment long, with a bristle-bearing excision above (66, 108).....*Atractia* Macquart
Third antennal segment usually short, never with a bristle-bearing concavity above 79
79. Slopes or lateral swellings of the metanotum pilose..... 92
Slopes or lateral swellings of the metanotum bare..... 80
80. Third antennal segment very long and narrow, tapering, with a short, thick arista; face very narrow (53, 137).....*Senoprosopis* Macquart
Third antennal segment short, with long arista; face not unusually narrow 81
81. Claws acute apically 84
Claws obtuse apically, thick almost to the apex..... 82
82. Front and face wide; space between antennæ and posterior ocelli strongly transverse 83
Front and face narrow; space between the antennæ and posterior ocelli as great as the width or practically so (134).....*Promachina* Bromley
83. Face evenly, gently convex, evenly pilose, the oral margin with bristles (63, 105).....**Mallophorina*, n. g.
Face more or less strongly gibbous below, not uniformly pilose (29, 67).
†*Mallophora* Macquart
84. Third antennal segment strikingly haired above.....*Anarmostus* Lœw
Third antennal segment bare or with only a few short hairs above.... 85
85. Three submarginal cells 86
Two submarginal cells..... 87
86. The crossvein separating the second and third submarginal cells is situated well beyond the apex of the discal cell (30, 31, 32).
†*Promachus* Lœw
This crossvein is situated well before the apex of the discal cell (70, 125)
‡*Erax* Scopoli
87. The posterior branch of the third vein meets the costa before the apex of the wing 88
The posterior branch of the third vein reaches the wing margin behind the apex of the wing..... 90
88. The ♀ ovipositor ends in a circlet of spines; abdomen of males longer than the wings (65, 139).....*Proctacanthus* Macquart
The ♀ ovipositor is laterally compressed or bears many short spines above; wings reaching beyond the tip of the abdomen in males.... 89
89. Female ovipositor with many short, stout spines above; upper ocelli situated on the front slopes of the ocellar swelling (28, 111).
†*Eccritosisia* Schiner
Female ovipositor laterally compressed; upper ocelli on the top of the ocellar swelling (70, 125).....‡*Erax* Scopoli

* See page 183. Key, Curran, 1931, (*Mallophora*), Amer. Mus. Novit. No. 487, p. 21.

† Curran, 1930, Amer. Mus. Novit. No. 415, p. 12.

‡ Hine, 1919, Ann. Ent. Soc. Amer., xii, pp. 103-154.



Asilidæ IX.—140, *Eurhabdus zephyrea*; 141, *Holcocephala calva*; 142, *Taracticus octopunctatus*; 143, *Holopogon guttula*; 144, *Eumecosoma gibbus*; 145, *Bathropsis basalis*; 146, *Cerotainia propinqua*; 147, *Psilonyx*, front tarsal claws; 148, *Leptogaster*, front tarsal claws; 149, *Leptogaster*; 150, *Deromyia litoralis*; 151, *Eucyrtopogon varipennis*; 152, *Cyrtopogon willistoni*; 153, *Senobasis analis*.

90. Face with a strong gibbosity occupying the lower half or more (70, 125).....**Erax* Scopoli
Face only weakly gibbous..... 91
91. *Mystax* dense, extending to above the middle of the face (104, 115, 117).
Proctacanthella Bromley
Mystax sparse, composed of bristles (68).....*Pachychœta* Bigot
92. Abdomen without bristles 93
Abdomen with bristles laterally before the segmental apices..... 96
93. Facial gibbosity shining black.....*Rhadiurgus* Lœw
Facial gibbosity pollinose, weakly developed..... 94
94. Scutellum with at least two bristles..... 95
Scutellum without bristles (64, 106).....*Negasilus*, n. g.
95. *Mystax* composed of bristles only (116).....†*Asilus* Linnaeus
Mystax composed mostly of very fine hair.....*Antiplirrisson* Lœw
96. Occipital cilia abundant, rather long and curved at almost right angle at or near the apical third (59).....†*Neoitamus* Osten Sacken
Occipital cilia shorter and stouter, not strongly curved..... 97
97. Facial gibbosity strongly developed and reaching at least to slightly above the middle of the face (*Tolmerus* Lœw) (69)....†*Machimus* Lœw
Facial gibbosity weakly developed, not extending above the lower third of the face 98
98. Dorsocentrals extending in front of the suture (51).....†*Cerdistus* Lœw
Dorsocentrals not extending in front of the suture..... 99
99. Female ovipositor armed at the apex with four or six stout, short bristles; forceps of male genitalia strongly curved and leaving a large open space on the apical half (114, 120).....†*Philonicus* Lœw
Female ovipositor without bristles; male genitalia compact, never leaving a large open space from dorsal view (113, 119).
†*Heligmoneura* Bigot

Alexiopogon, new genus

Distinguished from *Lasiopogon* Lœw by the absence of dorsocentral bristles. The figures of *Lasiopogon* will serve also for this genus. Genotype:—*Lasiopogon terricola* Johnson.

Mallophorina, new genus

Claws robust, obtuse apically; marginal cell closed and petiolate, the first posterior cell open or closed; antennæ with long, terminal arista-like style; face evenly gently convex or almost flat, and with almost uniform hair; front and face wide; body rather thickly pilose. Genotype.

* Hine, 1919, Ann. Ent. Soc. Amer. xii, pp. 103-154.

† Hine, 1909, (*Asilus*), Ann. Ent. Soc. Amer., ii, pp. 136-170.

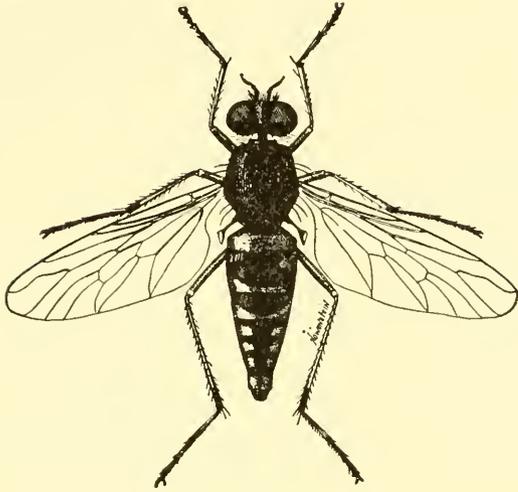
—*Mallophora guildiana* Williston. Species included: *laphroides* Wiedemann, *clausicella* Macquart, *acra* Curran, all previously placed in *Mallophora*.

Negasilus, new genus

Related to *Asilus* Linnæus but at once distinguished by the absence of scutellar bristles. Antenna short and style-like; face moderately convex on the lower half, the mystax composed of bristles only; occipital bristles straight; four pairs of dorsocentrals on the posterior half of the mesonotum; mesonotal hair all short and appressed; abdomen elongate and without bristles on the second and following segments. Genotype:—*N. belli*, n. sp.

N. belli is black, cinerous-yellowish pollinose, the male genitalia, apices of the femora and the tibiæ reddish.

Family Therevidæ—The Stiletto Flies



Thereva species.

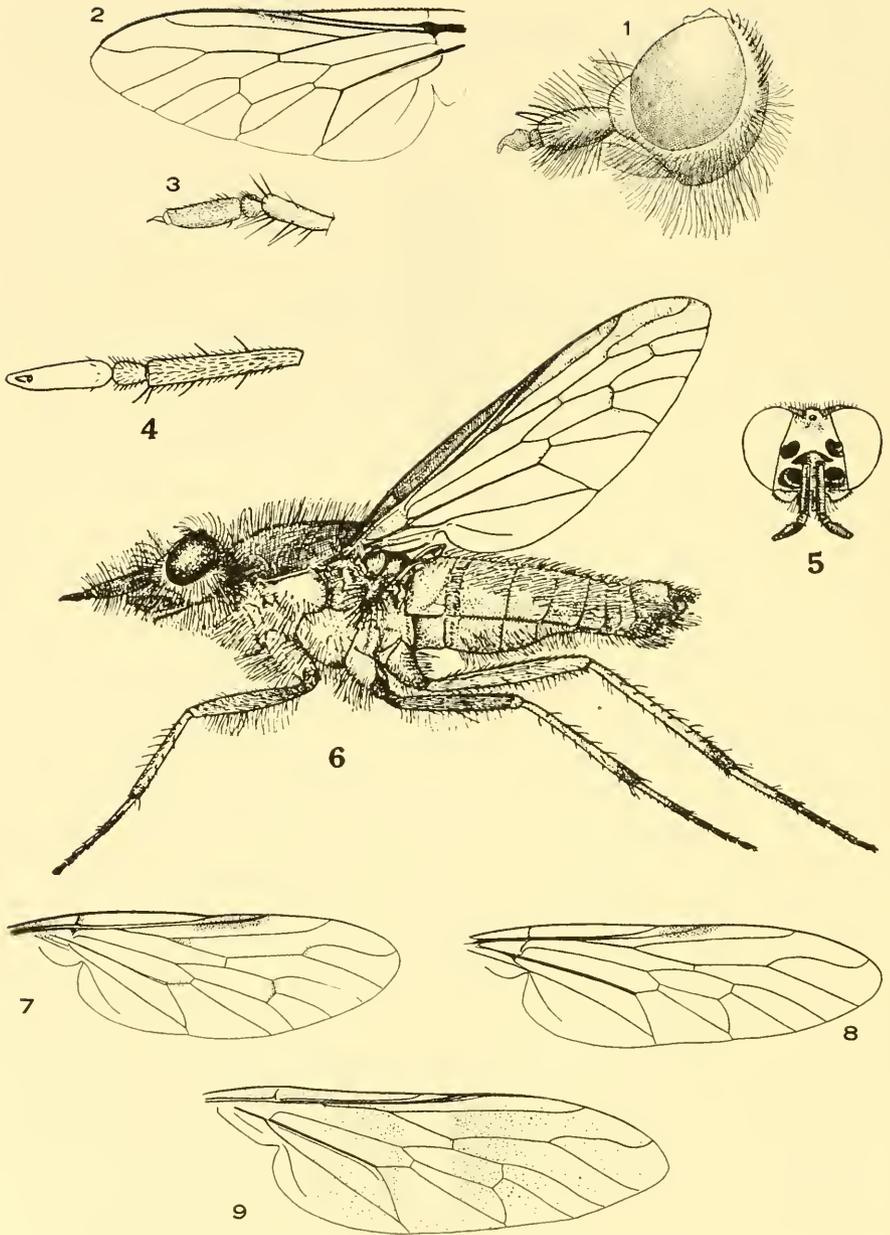
Flies of moderate size, more or less bristly and often pilose, with predaceous habits.

Front not excavated, the eyes of the males usually holoptic or nearly so; proboscis projecting, the labellæ broad; palpi two-segmented; ocelli present. Antennæ with three segments and usually a sharp terminal style. Abdomen elongate, the genitalia small but exposed, the ovipositor with a circle of spines. Legs with bristles; empodia absent; pulvilli usually present. Third vein furecate; five posterior cells, the fourth sometimes closed; anal cell closed toward the margin of the wing or narrowly open.

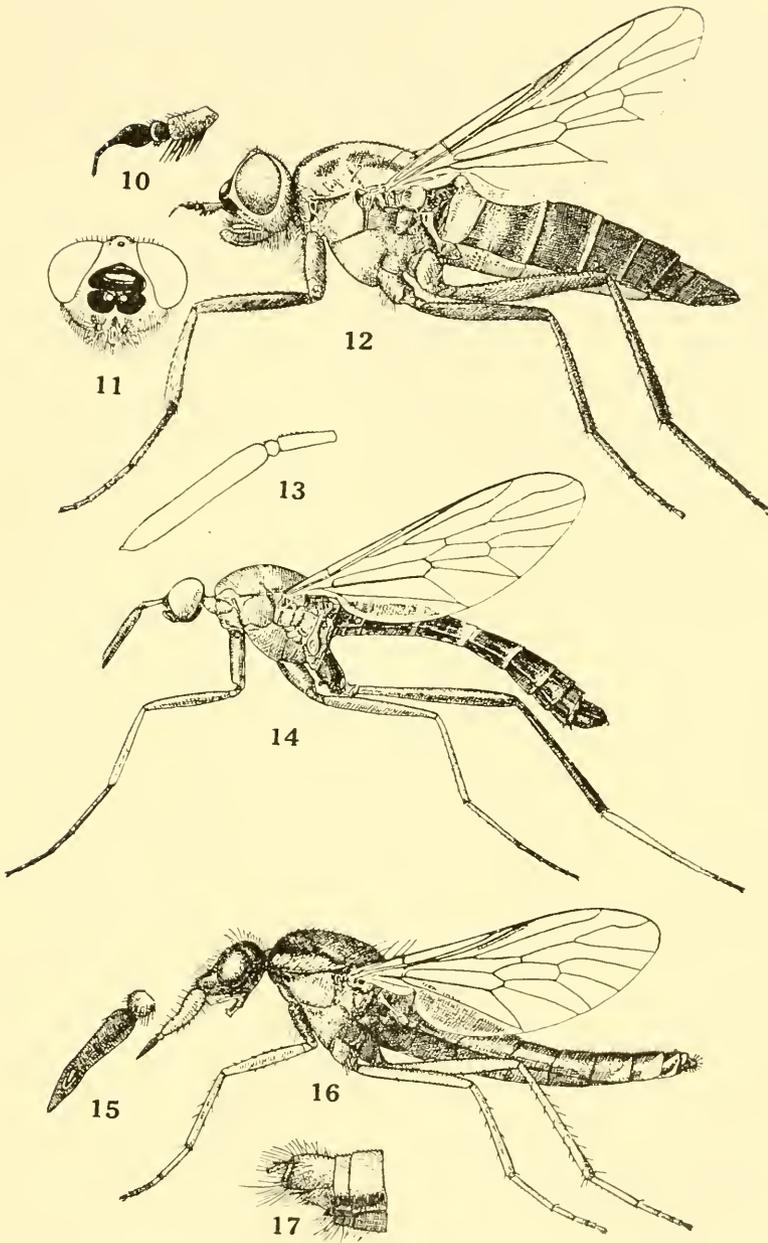
The adults are found in various places but are most abundant in dry areas, such as meadows, pastures and along sandy beaches. They often occur in considerable numbers in burnt-over areas and are always most abundant during hot weather. Cole* has revised the family and given keys to the North American species. A number of species have been described during recent years but most of the species will be found in Cole's paper.

The larvæ are not well known but are all believed to be predaceous and they may prove to be of considerable importance in the control of certain insects.

* 1923. Proc. U. S. N. M., lxii, Art. 4, pp. 1-140.



Therevidæ I.—1, *Tabuda*; 2, *Psilocephala*; 3, *Psilocephala*, antenna; 4, *Chromolepida bella*, antenna; 5, *Chromolepida bella*, head from above; 6, *Metaphragma planiceps*; 7, *Tabuda fulvipes*; 8, *Thereva melancura*; 9, *Epomyia sumichrasti*.



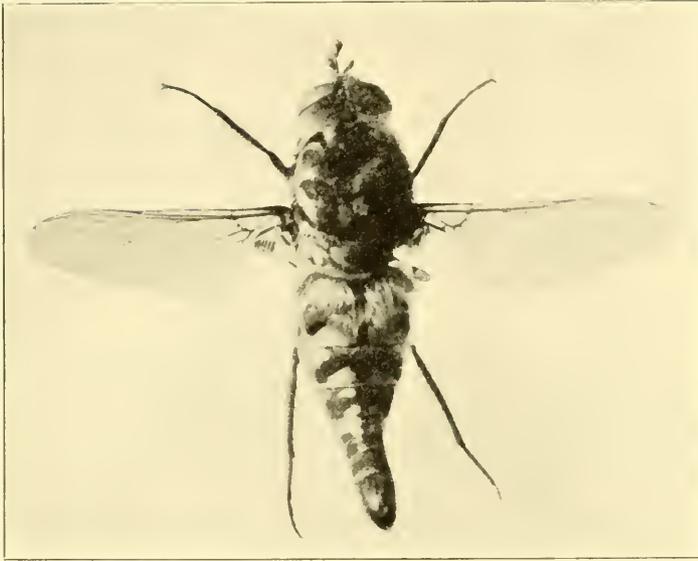
Therevidæ II.—10, 11, 12, *Pherocera signatifrons*; 13, 14, *Henicomomyia hubbardi*; 15, 16, *Nebritus pellucidus*; 17, *Nebritus pellucidus*, ♂ genitalia.

KEY TO GENERA

1. Body largely clothed with scales (4, 5).....**Chromolepida** Cole
Body with tomentum but never with iridescent scales..... 2
2. Third antennal segment appearing annulated; labrum narrow (Mexico).
Ozodiceromyia Bigot
Third antennal segment not annulated, usually with a terminal style
or short spine 3
3. First antennal segment longer than the head and bristled (Mexico;
cf. **Metaphragma** Coq.)**Euphycus** Kröber
First antennal segment rarely as long as the head..... 4
4. Five posterior cells 5
Four posterior cells (Bombyliidæ)**Cænotus** Cole
5. Parafacials bare 8
Parafacials with pile 6
6. Basal antennal segment long and greatly swollen, much larger than
the second and third combined (1, 7).....***Tabuda** Walker
Basal antennal segment not unusually large, never greatly swollen.. 7
7. Third and fourth veins connected by a crossvein beyond the furcation
of the third vein (6)**Metaphragma** Coquillett
Wings without such crossvein (8)**Thereva** Zetterstedt
8. Third antennal segment not more than twice as long as the first.... 9
Third antennal segment at least two and a half times as long as the
first (Southern) (13, 14)**Henicomylia** Coquillett
9. Basal antennal segment large and shining (15, 16, 17)..**Nebritis** Coquillett
Basal antennal segment pollinose 10
10. Basal antennal segment swollen and hairy (1)..... 11
Basal antennal segment not strongly swollen..... 12
11. Males dichoptic; lower front pilose (1, 7).....***Tabuda** Walker
Males holoptic or nearly so; lower front bare of pile..**Dialineura** Rondani
12. Intercalary and fifth veins reaching the wing margin..... 13
Intercalary and fifth veins not reaching the wing margin (10, 11, 12).
Pherocera Cole
13. Antennal style projecting from under the tip or from the apex of the
third segment 14
Style arising from a hollow near the apex of the third segment (9).
Epomyia Cole
14. Antennal style projecting from under the tip of the third segment.
Furcifera Kröber
Antennal style apical (2, 3)**Psilocephala** Zetterstedt

* *Tabuda fulvipes* Walker, 1852, is a synonym of *Thereva nervosa* Walker, 1848. The latter becomes the genotype.

Family Apioceridæ

*Apiocera* species.

Large, elongate flies, with three-segmented antennæ and rather thinly pilose.

Antennæ with or without a short, terminal style. Front not excavated, wider in the female; ocelli present; face short; proboscis longer than the length of the head, not adapted for piercing, the labellæ not horny. Empodia wanting. Third vein usually furecate; basal cells long; five posterior cells, the fourth closed. Male forceps enlarged.

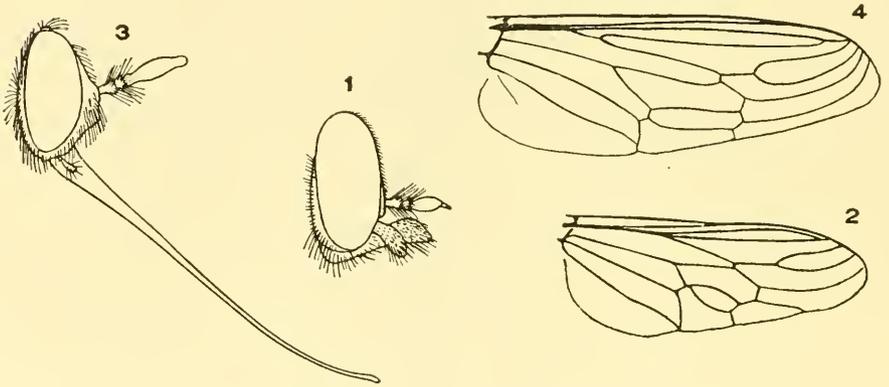
These flies are apparently restricted to arid or semi-arid regions and are not at all common in collections. Like the Nemestrids they are great hoverers and make a loud noise while in flight. The immature stages are unknown.



KEY TO GENERA

- 1. Proboscis more than twice as long as the head-height 2
- Proboscis not longer than the head-height (1, 2)...* *Apiocera* Westwood.
- 2. Anal cell closed before the wing margin (3, 4).
Rhaphiomidas Osten Sacken
- Anal cell open.....*Apomidias* Coquillett

* Painter, 1932, Ann. Ent. Soc. Amer., xxv, p. 351.



Apioceridæ.—1, 2, *Apiocera haruspex*; 3, 4, *Rhaphiomidas acton*.

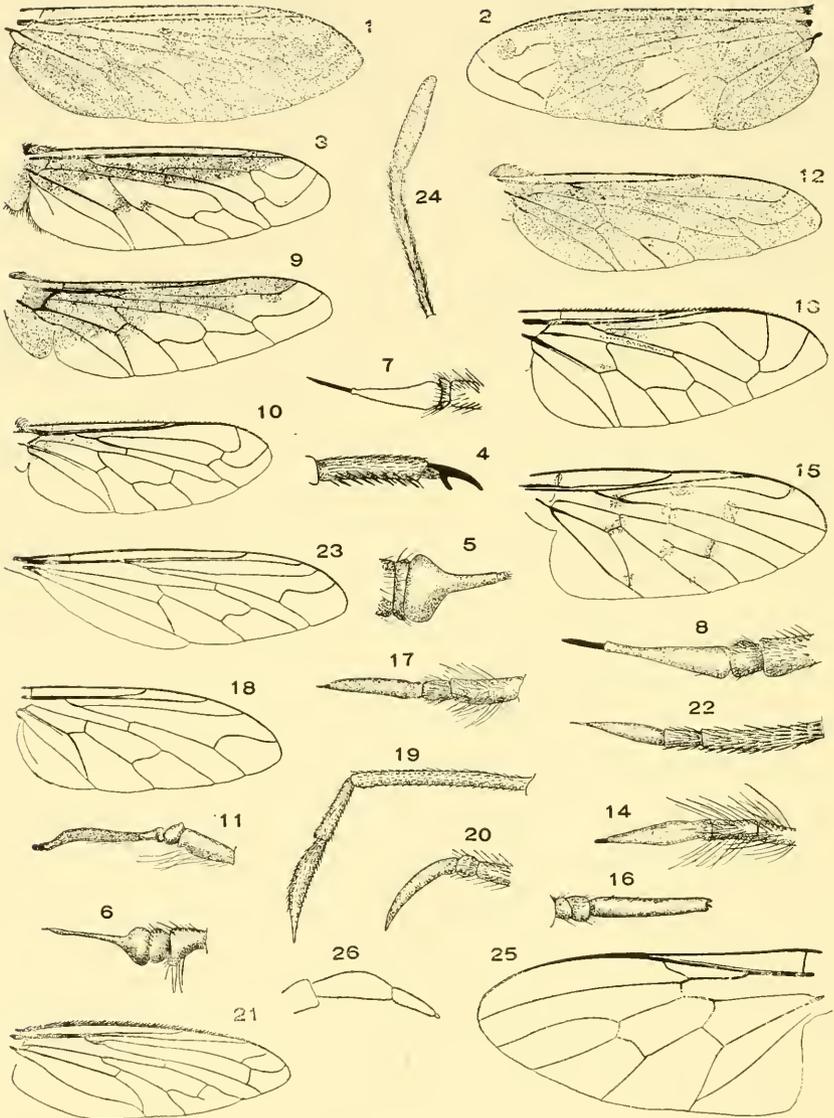
Family Bombyliidæ—The Bee Flies

Small to moderately large flies, often with pictured wings and frequently clothed with abundant, delicate hairs or scales which are easily abraded, rarely with conspicuous bristles.

Head narrower than or as broad as the thorax, more or less hemispherical in shape; usually closely applied to the thorax. Face variable, usually short, often prominent below. Eyes large, often contiguous in the male, rarely so in the female. Antennæ three-segmented, porrect, rarely long, usually of moderate length, sometimes small; third segment simple; style usually small, never more than two-segmented, sometimes absent. Ocelli present. Proboscis sometimes short and with broad labellæ, usually more or less elongate and projecting from the oral cavity. Thorax convex above, sometimes strongly so, usually with bristles. Abdomen composed of six to eight segments, slender in a few genera, usually depressed but often cylindrical and more or less tapering. Legs moderately long and weak, usually with short, weak bristles or spines; pulvilli sometimes rudimentary, the empodia usually absent. Squamæ small. Wings often pictured; two to four submarginal cells (rarely with only one) discal cell almost always present (absent in some genera occurring outside North America); anal cell closed or narrowly open.

The family comprises almost two thousand described species and occurs throughout the world, being most abundantly represented in the tropical and subtropical regions. They are found particularly in warm spots, a relatively small number occurring in woods, and I have taken none in heavy shade. They like the warmest time of the day and most of them rest upon the dry soil, dried grass or upon grass in sandy places when not visiting flowers. Some species are found mostly at bloom, others but rarely. They are (mostly) great hoverers and generally very rapid fliers although they frequently fly but a short distance when disturbed. In the tropics I found many species in sunny places near the trees at the edge of the beach and along the trails in the forest, and similar places are productive in the north. Many of the species buzz persistently when captured.

Taxonomically the family is (in North America) in almost hopeless condition, the literature being extremely scattered. Only a few of the described species have been properly figured and without illustrations and usable keys the student is greatly handicapped. In addition to this unfortunate state of affairs the flies themselves present an obstacle, as the hairs are easily abraded and great care must be exercised in collecting them. Only a very few specimens should be placed



Bombyliidae 1.—1, Genus incertæ; 2, *Hyperalonia*; 3, *Litorhynchus*; 4, *Exoprosopa*, hind claw; 5, *Anthrax*, antenna; 6, *Villa*, antenna; 7, 8, *Exoprosopa*, antenna; 9, *Bombylius major*; 10, *Pantarbes*; 11, *Pantarbes*, antenna; 12, *Systechus*; 13, *Lordotus*; 14, *Lordotus*, antenna; 15, *Phthiria*; 16, *Phthiria*, antenna; 17, *Sparnopolius*, antenna; 18, *Geron*; 19, 20, *Geron*, antenna; 21, *Toxophora*; 22, *Toxophora*, antenna; 23, *Systropus*; 24, *Systropus*, antenna; 25, *Mythicomyia*, wing; 26, *Mythicomyia*, antenna.

in the killing bottle and they must never be placed with other insects else they be ruined for all practical purposes. Without the hairs they are of no value and cannot be properly identified.

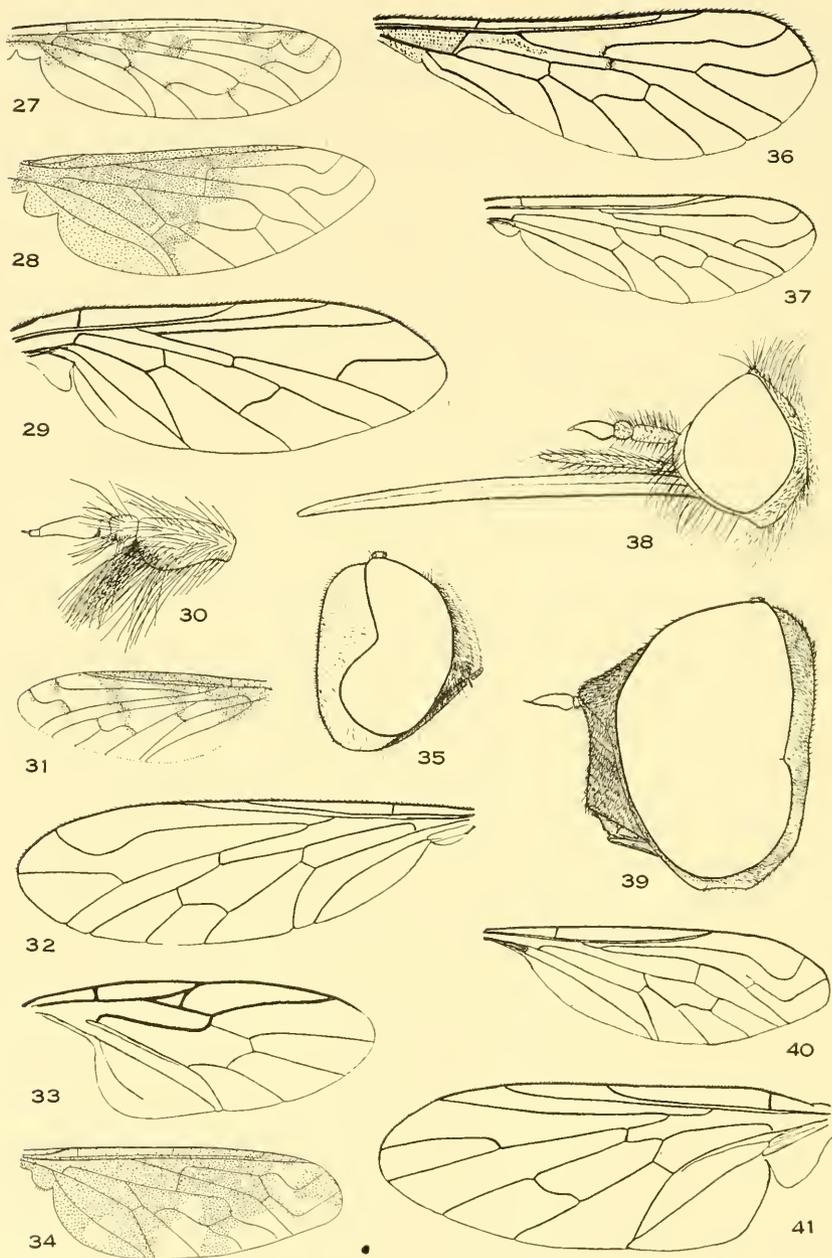
The larvæ are parasitic upon bees, wasps, grasshoppers and certain Lepidoptera, but not a great deal is known about most of the genera.

KEY TO GENERA

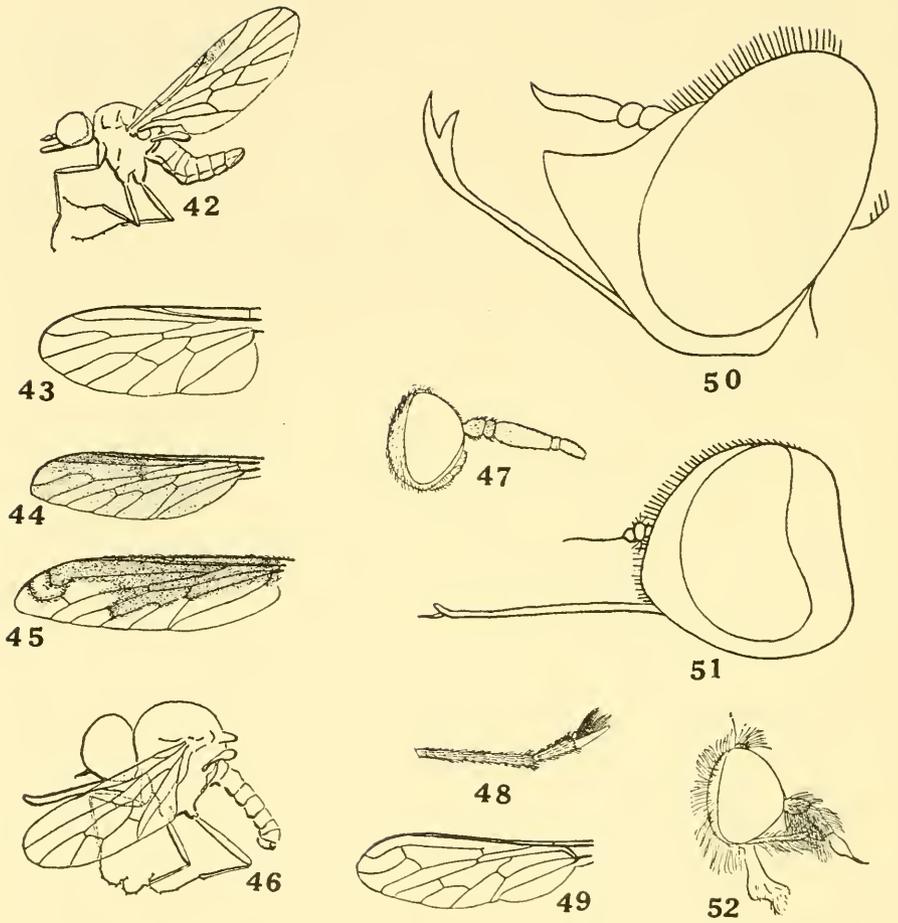
1. The second vein arises transversely opposite or almost opposite the anterior crossvein 2
 The second vein arises at an angle at a considerable distance from the anterior crossvein 19
2. Antennal style separated from the third segment by a distinct suture, sometimes short 3
 Antennal style not separated from the third segment..... 7
3. Antennal style terminating in a pencil of hairs (5, 54, 64).
 * *Anthrax* Scopoli
 Antennal style not terminating in a pencil of hairs..... 4
4. Pulvilli vestigial or absent..... 5
 Pulvilli large (49, 52).....*Aldrichia* Coquillett
5. Four submarginal cells (2).....*Hyperalonia* Rondani
 Three submarginal cells 6
6. Proboscis projecting more than the length of the labellæ beyond the anterior oral margin (3).....† *Litorhynchus* Macquart
 Proboscis projecting less than the length of the labellæ (4, 7, 8, 57).
 † *Exoprosopa* Macquart
7. Anal cell open; eyes of ♂ not contiguous..... 8
 Anal cell closed; eyes of ♂ contiguous at the vertex.
 Astrophanes Osten Sacken
8. Anal cell widest at the middle..... 9
 Anal cell widest at the wing margin (36).....*Mancia* Coquillett
9. Second vein strongly contorted and  shaped at the apex..... 10
 Second vein not strongly contorted..... 11
10. Three submarginal cells*Dipalta* Osten Sacken
 Two submarginal cells.....*Neodiplocampta*, n. g.
11. Two submarginal cells 13
 Three submarginal cells..... 12
12. Proboscis extending but little beyond the oral opening (6)....*Villa* Lioy
 Proboscis extending far beyond the anterior oral margin (34, 51).
 Stonyx Osten Sacken
13. Face wholly without scales; labellæ long and narrow.
 Pœcilanthrax Osten Sacken
 Face with scales..... 14
14. Anterior tibiæ with spicules in regular rows..... 16
 Anterior tibiæ with at most two or three very small spicules..... 15

* Curran, 1927, Can. Ent. lxx, p. 84 (partial key).

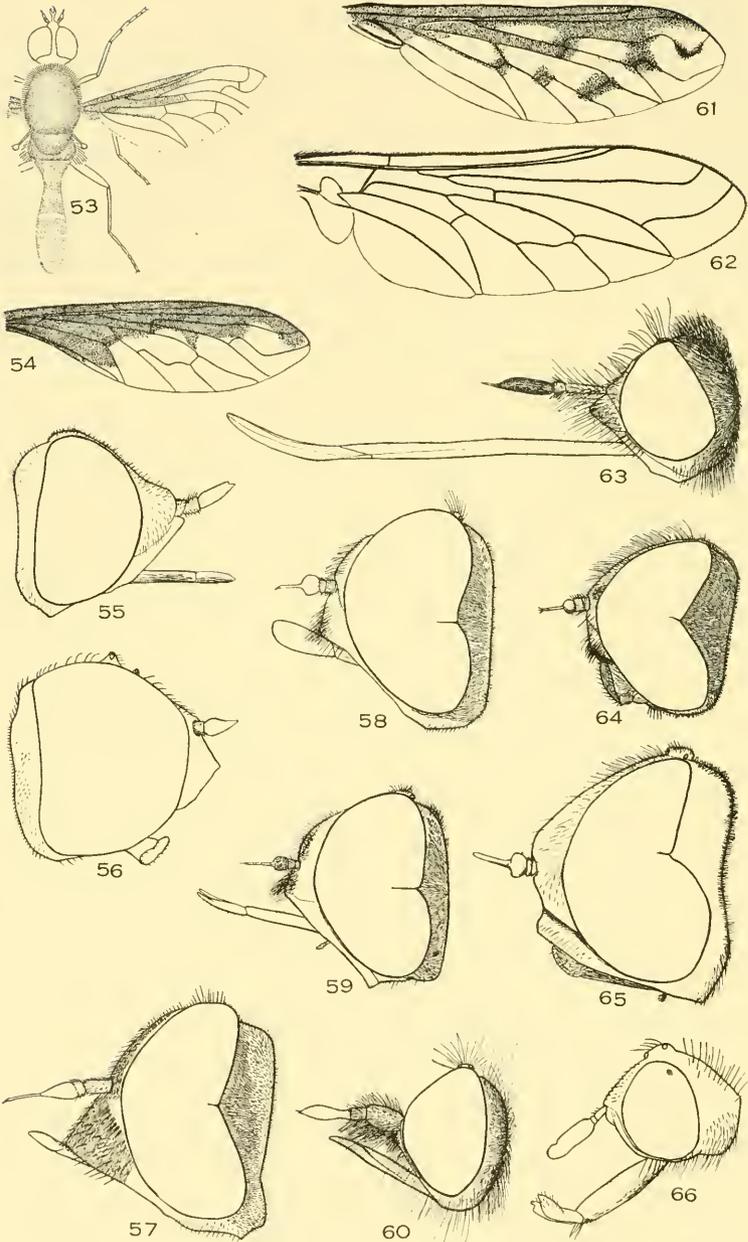
† Curran, 1930, Amer. Mus. Novit. No. 415, p. 2.



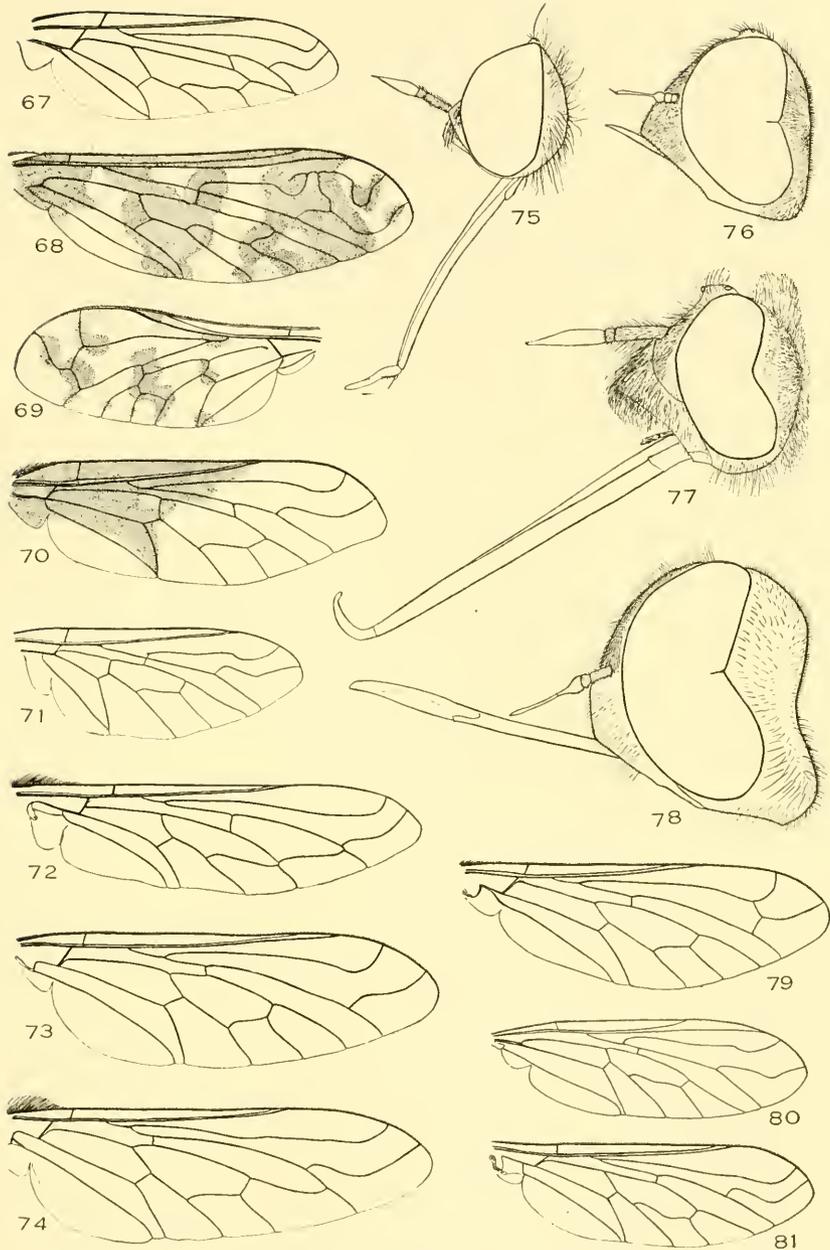
Bombyliidae II.—27, *Lepidanthrax proboscidea*; 28, *Thyridanthrax selene*; 29, *Geron*; 30, *Calopelta fallax*, antenna; 31, *Sphenoidoptera varipennis*; 32, *Metacosmus mancipennis*; 33, *Glabellula crassicornis*; 34, *Stonyx clelia*; 35, *Ogcodocera*; 36, *Mancia nana*; 37, *Eucessia*, n. sp.; 38, *Geminarina canalis*; 39, *Eucessia*, n. sp.; 40, *Paracosmus morrisonia*; 41, *Rhabdoselaphus sigma*.



Bombyliidae III.—42, *Prorates*; 43, *Desmatomyia*; 44, *Eclimus*; 45, *Lepidophora vetusta*; 46, *Mythicomyia*; 47, *Desmatomyia*; 48, *Lepidophora vetusta*; 49, *Aldrichia*; 50, *Amphicosmus cincturus*; 51, *Stonyx clelia*; 52, *Aldrichia*.



Bombyliidae IV.—53, *Amphicosmus cincturus*; 54, *Anthrax*; 55, *Paracosmus morrisoni*; 56, *Metacosmus mancipennis*; 57, *Exoprosopa*; 58, *Aphæbantus cervinus*; 59, *Epacmus modestus*; 60, *Conophora*; 61, *Neodiplocampta rederi*; 62, *Parabombylius*; 63, *Bombylius*; 64, *Anthrax irroratus*; 65, *Desmatoneura argentifrons*; 66, *Rhabdosclaphus sigma*.



Bombyliidæ V.—67, *Anisotamia*; 68, *Dipalta*; 69, *Geminaria canalis*; 70, *Ogcodocera*; 71, *Astrophanes*; 72, *Heterostylum*; 73, *Sparnopolius*; 74, *Anastæchus*; 75, *Geron*; 76, *Mancia nana*; 77, *Heterostylum*; 78, *Litorhynchus*; 79, *Conophorus*; 80, *Desmatoneura*; 81, *Epacmus, Aphaebantus*.

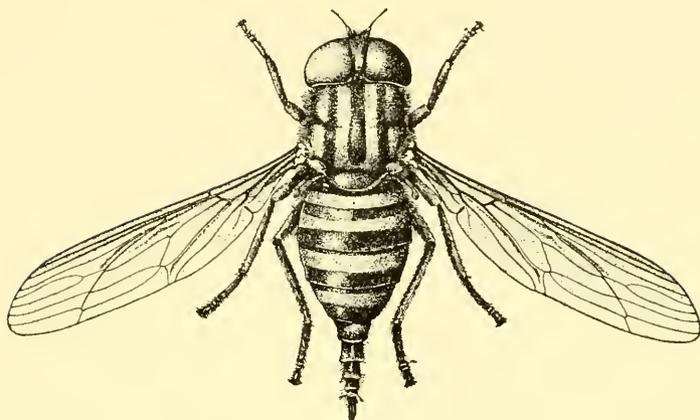
46. Proboscis projecting strongly beyond the anterior oral margin, the labellæ long and pointed 47
 Proboscis not or scarcely projecting beyond the oral margin, the labellæ short and broad..... 51
47. Face bare, the sides above, or the clypeus with hair..... 49
 Face with hair in the middle at least below..... 48
48. Posterior border of the eyes emarginate, the facets bisected by a short bare line opposite the emargination 53
 Posterior border of the eyes not emarginate, the eyes without a bare, bisecting line posteriorly (62).....**Parabombylius* Williston
49. Anterior crossvein situated beyond the basal third of the discal cell... 50
 Anterior crossvein situated at or before the basal fourth of the discal cell (17)*Sparnopolius* Lœw
50. The anterior branch of the third vein arises only a little before the apex of the second vein (31)*Sphenoidea* Williston
 The anterior branch of the third vein originates only a little beyond the apex of the discal cell and far before the apex of the second vein (44)*Eclimus* Lœw
51. Ocellar tubercle situated near the middle of the front (32, 56).
Metacosmus Coquillett
 Ocellar tubercle situated near the vertex 52
52. Style of antennæ broad and flattened, two segmented, simulating segments (43, 47)*Desmatomyia* Williston
 Style not broad and flattened 53
53. Posterior border of the eyes at least weakly indented and with a short, un-faceted stripe 54
 Posterior border of the eyes not at all indented and without any un-faceted stripe (40, 55).....*Paracosmus* Osten Sacken
54. Third antennal segment bulbous basally and with a long, almost parallel-sided apical part 55
 Third antennal segment sub-triangular, tapering 57
55. The second vein arises at an almost right angle beyond the base of the discal cell (65).....*Desmatoneura* Williston
 The second vein arises at an acute angle before the base of the discal cell 56
56. Proboscis strongly projecting beyond the anterior oral margin, the labellæ long and narrow; face produced; pulvilli absent (59).
Epacmus Osten Sacken
 Proboscis rarely strongly projecting, the labellæ broad; face usually receding; pulvilli present if the face projects (58).
Aphæbantus Lœw
57. Anterior oral margin close to the base of the antennæ.
Anisotamia Macquart
 Anterior oral margin very far from the antennal base (37, 39).
Eucessia Coquillett

Neodiplocampta, new genus

Proposed for *Diplocampta ræderi* Curran. The genus differs from *Diplocampta* Schiner in having the face produced, the third antennal segment rather long and conical, broad abdomen, different wing venation, etc. *Anthrax paradoxa* Jænnicke also belongs to this genus.

* Painter, 1926, Ent. News, xxxvii, p. 74; Curran, 1930, Amer. Mus. Novit. No. 404, p. 7.

Family Nemestrinidæ

*Neohirmoneura bradleyi* Bequaert.

Flies of moderate size, rather stout and compact in appearance, with many veins; thinly or densely pilose.

Head moderate in size, narrower or slightly wider than the thorax; eyes holoptic or dichoptic in the males, females dichoptic except in *Hymnophlaba*; proboscis long to rudimentary. Antennæ short and small, three segmented, and with a stout, jointed terminal arista. Tibiæ without spurs; empodia pulvilliform but the pulvilli often minute. Venation complicated, the fourth and fifth veins curving forward to terminate before the apex of the wing; anterior crossvein very oblique and simulating a longitudinal vein, the basal cells both long; five or six posterior cells and two or three submarginals.

The Nemestrinids are not numerous in collections and are usually difficult to catch. I have found them only in open fields in which the vegetation is of considerable height and have observed them in considerable numbers. They hover persistently and dart quickly away at the least motion; when present in numbers their "buzz" is very obvious and they may be heard at a considerable distance. Those with long proboscis often visit flowers. In the American species the venation is relatively simple but in some species of the genus *Nemestrinus* there are numerous crossveins in the wings, and some of them have the proboscis greatly elongated. The genus *Hirmoneura* is known to live upon root feeding beetle larvæ in the larval stage and it is probable that all the species are parasitic.

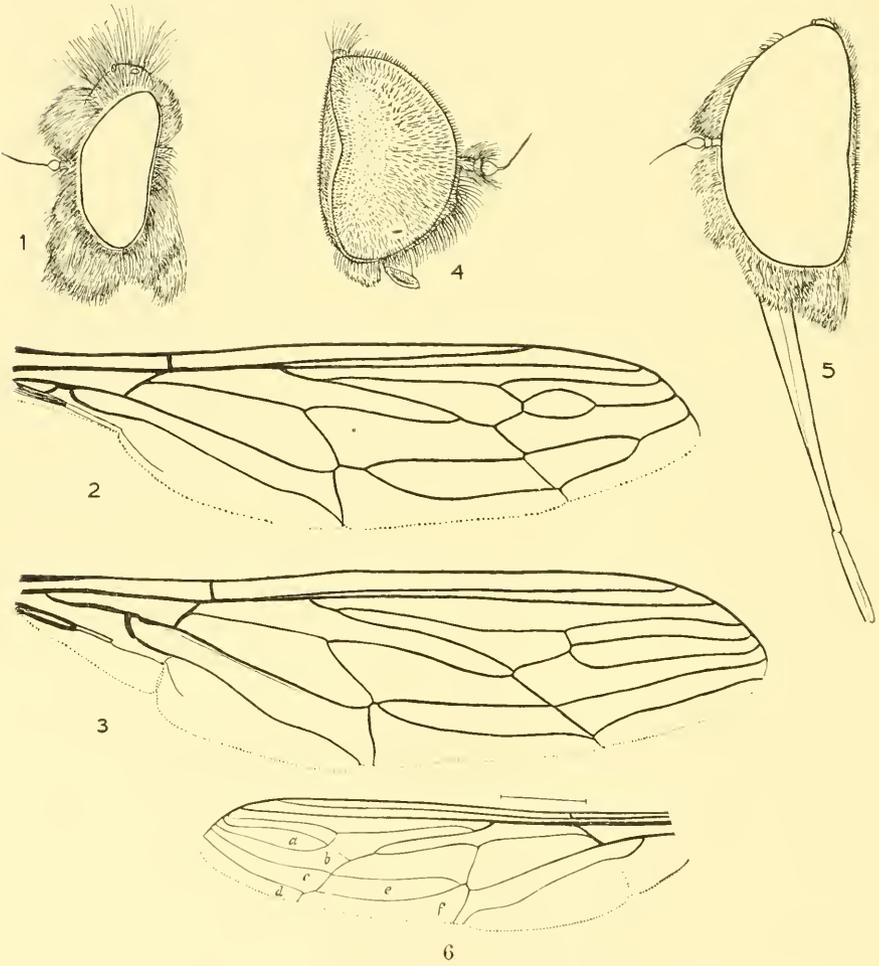
Three papers by Bequaert* cover the North American species, of which there are about a dozen.

* Bequaert, 1919, Journ. N. Y. Ent. Soc., xxvii, pp. 301-307; 1930, Psyche, pp. 286-297; 1934, Journ. N. Y. Ent. Soc. xlii, pp. 163-184.

KEY TO GENERA

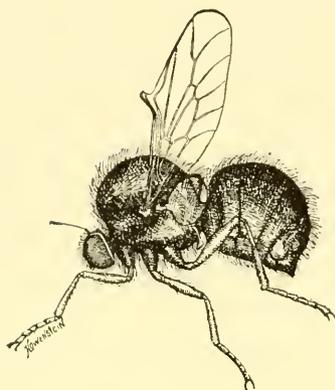
- 1. Eyes bare 3
Eyes densely pilose; proboscis short and thick 2
- 2. Three submarginal cells, both sexes holoptic (3, 4) *Hirmophlœba* Rondani
Two submarginal cells **Hirmoneura* Meigen
- 3. Three submarginal cells 4
Two submarginal cells; proboscis short and thick (text figure).
- 4. Proboscis very small, hardly visible, without fleshy labellæ; alula rudimentary (1, 2) *Parasymmyctus* Bigot
Proboscis elongate and protruding; alula broad (5 6).
Neorhynchocephalus Lichtwardt

* No North American species are at present known.



Nemestrinidæ.—1, 2, *Parasymmyctus clausa* O. S.; 3, 4, *Hirmophlœba texana*; 5, 6, *Neorhynchocephalus volaticus*, a third submarginal cell, b-f posterior cells.

Family Cyrtidæ

**Opsebius pterodontinus.**

Small to moderately large flies, never elongate, pilose or nearly bare.

Head small to very small, composed chiefly of the compound eyes which are usually contiguous in both sexes, the front, face or both obliterated; none, two or three ocelli present. Antennæ composed of two or three segments, with or without an apical arista, the third segment sometimes with apical bristles. Proboscis rudimentary or long, sometimes greatly exceeding the length of the body. Thorax large and convex, the squamæ and scutellum large. Abdomen inflated, convex, rather orbicular. Legs moderately stout, the empodia and pulvilli pad-like. Venation variable, the veins sometimes weak and indistinct; often a supernumerary crossvein between the third and fourth veins.

This family contains a small number of species and may be recognized by the swollen thorax, inflated abdomen and small head. Ten genera are known to occur in North America. Cole* has revised the family. Insofar as known the members of the family are parasitic on spiders.

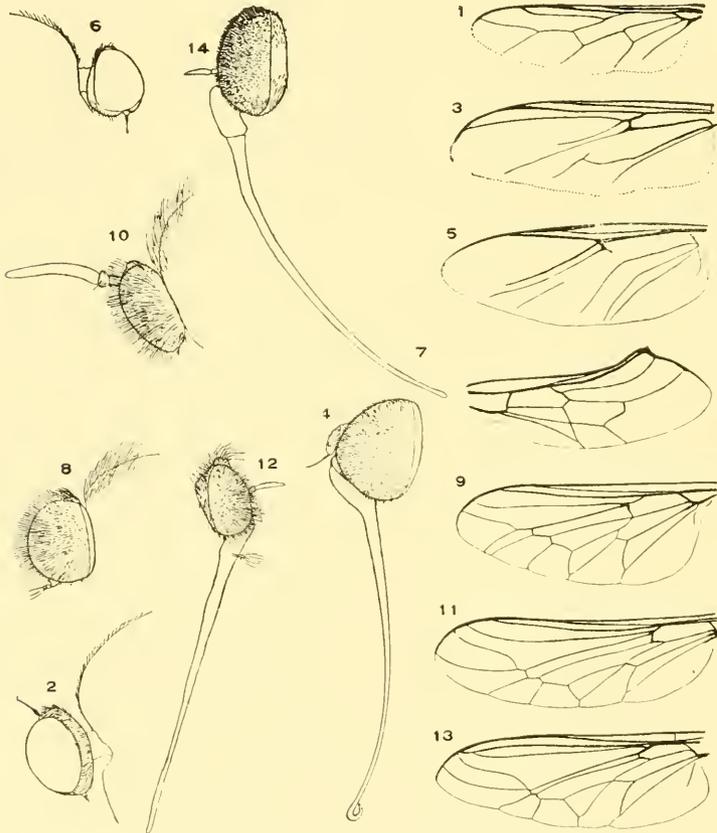
KEY TO GENERA

1. Prothoracic lobes greatly enlarged and meeting in front of the mesonotum; proboscis elongate (3, 4).....**Philopota** Wiedemann
Prothoracic lobes not forming a shield in front of the mesonotum... 2
2. Proboscis small and aborted 4
Proboscis elongate 3
3. Palpi absent; usually two ocelli (13, 14).....**Lasia** Wiedemann
Palpi present; three ocelli situated on a more or less prominent tubercle (11, 12)**Eulonchus** Gerstæcker

* 1919. Trans. Amer. Ent. Soc., xlv, pp. 1-79, plates I-XV.

- 4. Antennæ elongate, the third segment large 5
- Antennæ short, the third segment small 7
- 5. Eyes pilose or pubescent 6
- Eyes bare *Apelleia* Bellardi
- 6. Third antennal segment without terminal bristles (9, 10)
**Ocnæa* Erickson
Third antennal segment with terminal bristly hairs.. *Pialeoidea* Westwood
- 7. Antennæ inserted below the middle of the head 8
- Antennæ inserted above the middle of the head 9
- 8. Third antennal segment with three terminal setæ (7, 8).
Pterodontia Gray
Third antennal segment with an apical arista (5, 6).... *Ogcodes* Latreille
- 9. Eyes pilose (text figure) *Opsebius* Costa
- Eyes bare (1, 2) *Acrocera* Meigen

* Aldrich, 1932, Proc. U. S. N. M., lxxxi, Art. 9, p. 3.



Crytida.—1, 2, *Acrocera*; 3, 4, *Philopota*; 5, 6, *Ogcodes*; 7, 8, *Pterodontia*; 9, 10, *Ocnæa*; 11, 12, *Enlouchus*; 13, 14, *Lasia*.

Family Empidæ—The Dance Flies

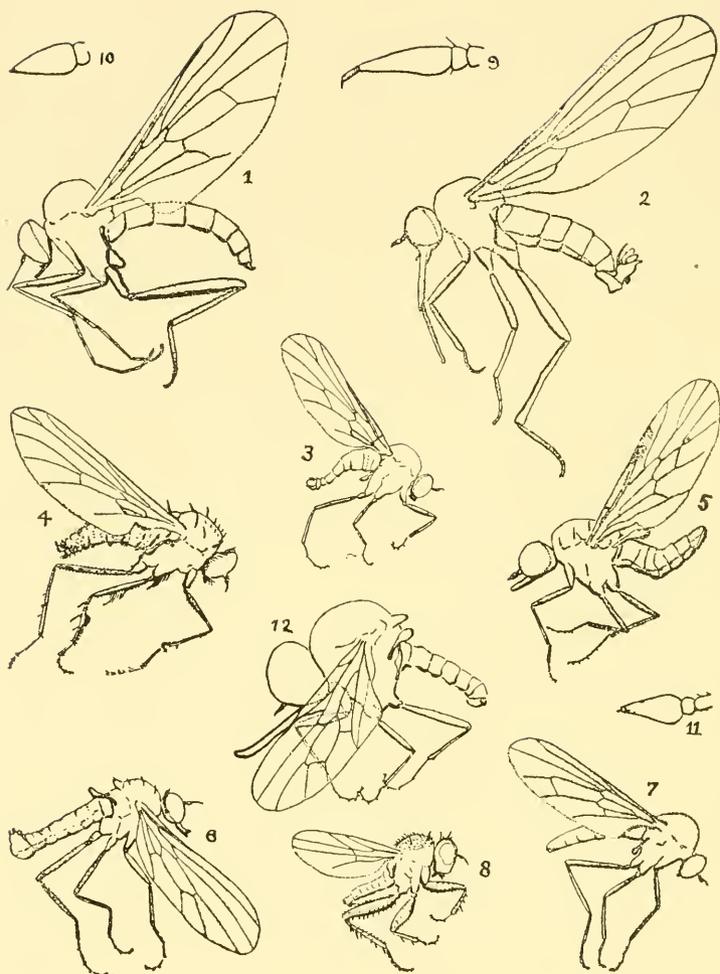
Flies of small to medium size, though rarely over 10 mm. in length.

Head more or less spherical, loosely connected with the thorax; males holoptic or dichoptic, the face sometimes almost obliterated by the approximate eyes; ocelli present. Antennæ porrect, composed of two or three segments, with or without an apical style or arista, or with dorsal arista; face receding or slightly prominent below, never with a strong mystax. Proboscis short or long, usually rigid. Thorax sometimes long and narrow, usually short, often strongly convex above. Male genitalia generally of complicated structure, often large or very large; ovipositor sometimes long and chitinized. Wing venation simple, the wings rarely absent or reduced in size; squamæ small; anal and second basal cell sometimes absent or incomplete. Legs usually slender, sometimes with structural peculiarities such as elongated coxæ or femora, the femora or tibiæ often thickened and with spines or tubercles or with processes or fringes of scales; pulvilli distinct; empodia usually membranous and linear.

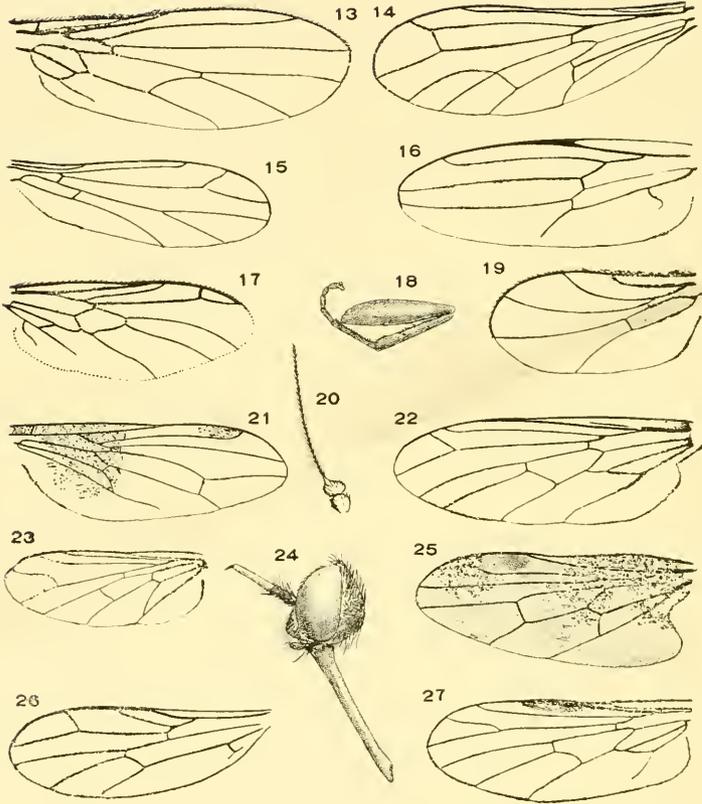
The adults are found almost everywhere but the Empids are rare in arid regions. They are most abundant in moist places, especially in woods, along streams and on the shores of ponds and lakes. All are predaceous, feeding upon smaller insects, mites, etc. As a general rule they are observed upon foliage and grass but many of them are confined to restricted habitats and others appear to be very local in distribution. Certain genera are found almost entirely on the trunks of trees and may be collected most easily by placing the mouth of the killing bottle over them, while others occur in large numbers on small flowers, notably *Prunus virginiana*. A few genera are found only along the seashore where they dart about among the pebbles, feeding upon small insects or upon freshly killed invertebrates.

The mating habits of the Empidæ are extremely interesting, but no more than mention of them can be made here. In some cases the males capture prey and use this food as a lure to attract the females. Sometimes the females devour the offering or it may be discarded as soon as the mating is completed. In other cases the male provides a balloon like bubble to attract the female. In some cases it is believed that copulation cannot be completed unless food is provided.

The immature stages are not well known but the larvæ live in decaying vegetation, under bark, and in streams.

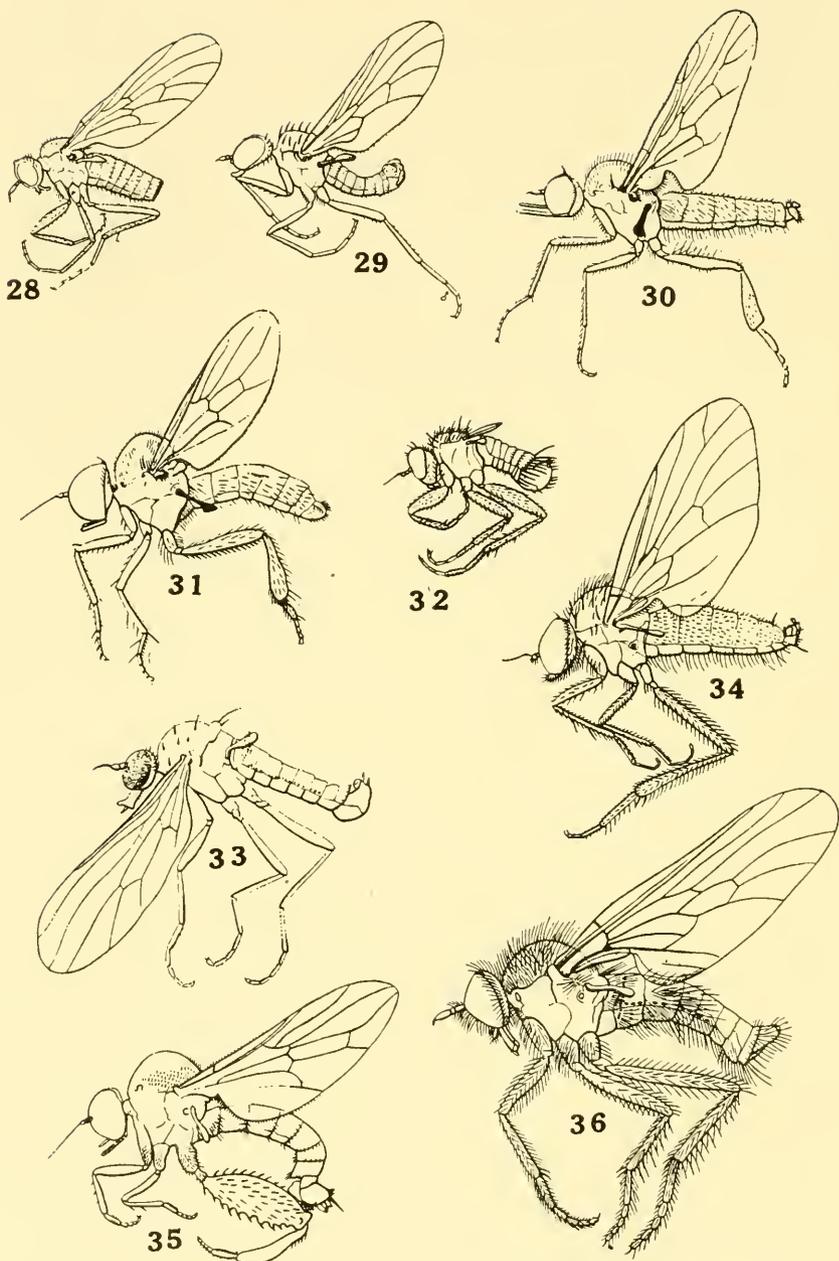


Empidæ I.—1, *Hybos*; 2, *Toreus*; 3, *Hesperempis*; 4, *Oreogeton*; 5, *Prorates* (Bombyliidæ); 6, *Heledromia*; 7, *Ocydromia*; 8, *Coloboneura*; 9, *Toreus*, antenna; 10, *Prorates* (Bombyliidæ); 11, *Hesperempis*, 12; *Mythicomyia* (Bombyliidæ).



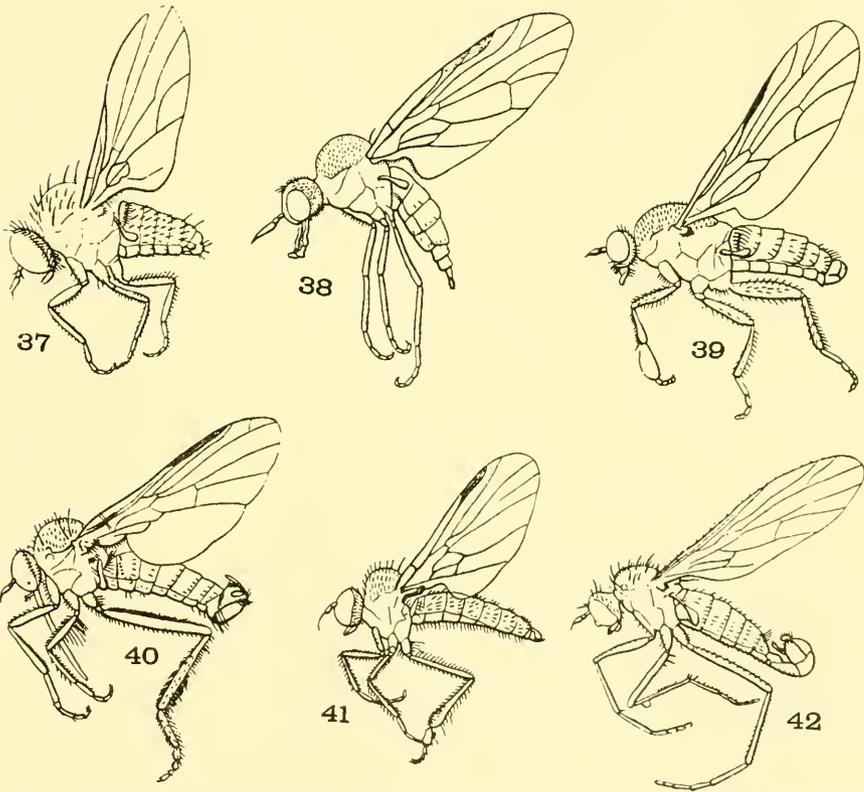
Empidæ II.—13, *Oreothalia*; 14, *Brachystoma*; 15, *Hemerodromia*; 16, *Tachypeza*; 17, *Lampremis*; 18, *Tachypeza*, front leg; 19, *Drapetis*; 20, *Drapetis*, antenna; 21, *Hybos*; 22, *Empis*; 23, *Geron* (*Bombyliidæ*); 24, *Empimorpha*; 25, *Syneches*; 26, *Chelifera*; 27, *Hilara*.

14. Posterior legs simple (41).....*Bicellaria* Macquart
 Posterior femora much enlarged and spinose*Hoplocyrtoma* Melander
15. Discal cell emitting three veins apically or, if open, the fourth vein
 branched 17
 Discal cell emitting two veins apically 16
16. Third antennal segment conical, the arista apical; middle tibiæ with
 several sets of bristles*Leptopeza* Macquart
 Third antennal segment oval; the arista sub-dorsal; middle tibiæ with
 only apical bristles (7)*Ocydromia* Meigen
17. Posterior femora enlarged and spinose beneath (53, 57)..*Edalia* Meigen
 Posterior femora not swollen 18
18. Posthumeral bristles present; antennæ apparently two segmented.... 19
 Posthumeral bristles usually absent, the antennæ with three segments.
Euthyneura Macquart
19. Antennæ ending in a style 20
 Antennæ without style or arista (51, 59).....*Allanthalia* Melander
20. Antennæ situated near the middle of the head, the third segment
 elongate 21
 Antennæ situated much below the middle of the head, the third seg-
 ment broad (60, 63)*Anthalia* Zetterstedt
21. Third antennal segment extremely long (45, 52).....*Axelempis* Curran
 Third antennal segment normal*Trichina* Meigen
22. Basal and anal cells very small; third vein never forked; abdomen
 shorter than the robust thorax 23
 Basal and anal cells not unusually short; third vein often furcate;
 abdomen as long or longer than the thorax 25
23. Eyes pubescent 24
 Eyes bare (37)*Microphorus* Macquart
24. Face broadened below and more or less hairy; costa continuing around
 the wing (48, 55)*Parathalassius* Mik
 Face not broadened below and with only oral hairs..*Microphorella* Becker
25. Antennæ with three segments 26
 Antennæ apparently two-segmented*Hormopeza* Zetterstedt
26. Proboscis directed obliquely forward or horizontal, the face broad,
 convex and short 27
 Proboscis normally vertical, if more or less oblique the face is long
 and narrow 31
27. Auxiliary vein entire, ending in the costa..... 28
 Auxiliary vein obsolete apically.....*Brochella* Melander
28. Third vein furcate..... 29
 Third vein simple.....*Anthepiscopus* Becker
29. Arista terminal, sometimes style-like..... 30
 Arista dorsal (34).....*Gloma* Meigen
30. Hypopleura bare (38).....*Iteaphila* Macquart
 Hypopleura haired (4).....*Oreogeton* Schiner



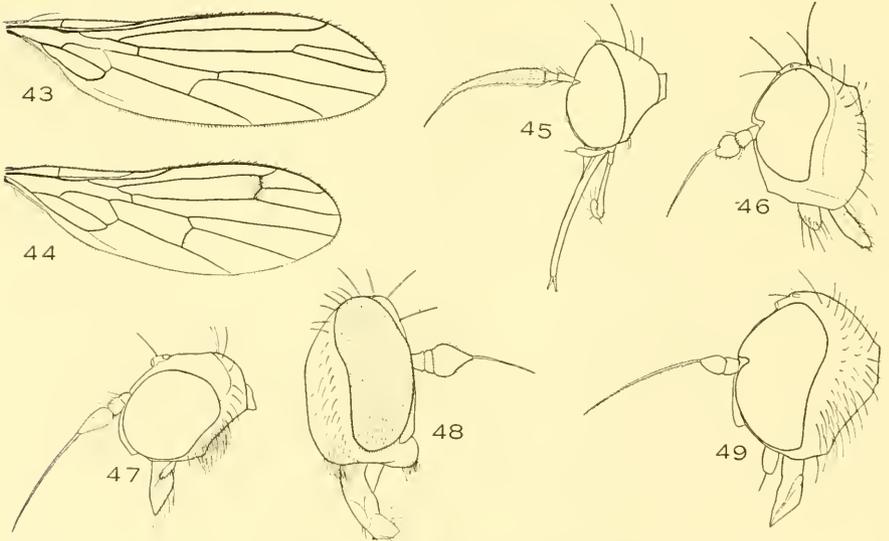
Empidae III.—28, *Anomalempis tacomæ*; 29, *Philetus memorandus*; 30, *Meghyperus occidentis*; 31, *Syndyas polita*; 32, *Thinodromia inchoata*; 33, *Heleodromia pullata*; 34, *Gloma fuscipennis*; 35, *Lactistomyia insolita*; 36, *Neocota weedii*.

- 31. Metapleura with hairs or bristles in front of the halteres..... 35
 Metapleura bare 32
- 32. Auxiliary vein ending in the costa..... 33
 Auxiliary vein obsolete apically (2, 9)..... **Toreus** Melander
- 33. Auxiliary vein bending apically to meet the costa; anal angle prominent (27, 39)..... **Hilara** Meigen
 Auxiliary vein almost straight, the anal angle broadly rounded..... 34
- 34. Thoracic bristles strong; antennæ below the middle of the head (29).
Philetus Melander
 Thoracic bristles almost absent; antennæ at the middle of the head (3, 11)..... **Hesperempis** Melander
- 35. Style three times the length of the third antennal segment.
Opeatocerata Melander
 Style not longer than the third segment..... 36
- 36. First antennal segment nearly or quite as long as the third, the antennæ situated high upon the head..... 37
 First segment much shorter than the third, situated at most a little above the middle of the head..... 38

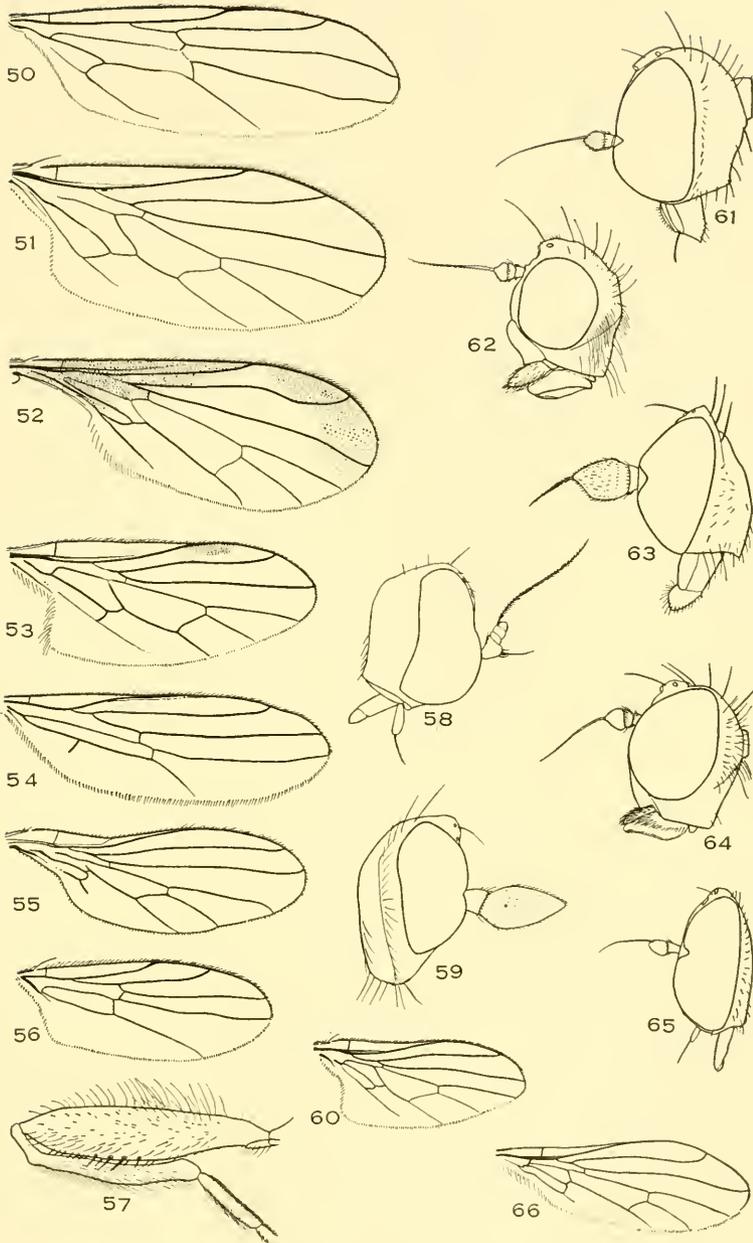


Empidæ IV.—37, *Microphorus velutinus*; 38, *Iteaphila macquarti*; 39, *Hilara*; 40, *Empis*; 41, *Bicellaria*; 42, *Proclinopyga amplectans*.

37. Arista much shorter than the third antennal segment (17).
 Lamprempis Wheeler and Melander
 Arista much longer than the third segment.....**Porphyrochroa** Melander
38. Face hairy 39
 Face bare 40
39. Third vein furcate (24).....**Empimorpha** Coquillett
 Third vein simple (36).....**Neocota** Coquillett
40. Third vein furcate (22, 40).....**Empis** Linnæus
 Third vein simple..... 41
41. Third antennal segment many times longer than wide (45, 52).
 **Axelempis** Curran
 Third antennal segment normal.....**Rhaphomyia** Meigen
43. Third antennal segment remarkably lengthened, strap-like, and without
 evident style 44
 Third antennal segment not remarkably long..... 45
44. Antennæ inserted above the middle of the head....**Niphogenia** Melander
 Antennæ inserted below the middle of the head....**Ceratempis** Melander
45. Antennæ situated at the middle of the head, the third segment with a
 short style which terminates in a bristle-like segment.
 **Boreodroma** Coquillett
 Antennæ situated above the middle of the head, the third segment
 usually with a long arista..... 46
46. Third vein simple 47
 Third vein branched 48



Empidæ V.—43 *Wiedemannia hamifera*; 44, *Clinocera binotata*; 45, *Axelempis fulvithorax*; 46, *Chersodromia houghi*; 47, *Chelipoda elongata*; 48, *Parathallasius aldrichi*; 49, *Platypalpus coquilletti*.



Empidæ VI.—50, *Platypalpus coquilletti*; 51, *Allanthalia pallida*; 52, *Axelempis fulvithorax*; 53, *Edalia ohioensis*; 54, *Tachydromia postica*; 55, *Parathallasius aldrichi*; 56, *Chersodromia houghi*; 57, *Edalia ohioensis*; 58, *Stilpon pectiniger*; 59, *Allanthalia pallida*; 60, *Anthalia bulbosa*; 61, *Tachydromia pusilla*; 62, *Wiedemannia hamifera*; 63, *Anthalia lacteipennis*; 64, *Clinocera taos*; 65, *Tachyempis simplicior*; 66, *Chelipoda elongata*.

Family Dolichopidæ—The Long-headed Flies

Small flies rarely exceeding 10 mm. in length, usually metallic green or blue, partly dusted with whitish, brownish or grayish, rarely yellow or blackish. Discal cell united with the second basal cell.

Head about as wide as the thorax, sometimes a little wider, usually a little higher than wide; face variable in width, sometimes practically eliminated by the approximation of the eyes, generally wider in the females than in the males; front usually wide and widening above, rarely obliterated by the approximation of the eyes in the males; with bristles above. Posterior orbits usually with orbital cilia which may be replaced below by fine hair. Proboscis fleshy, short, usually retracted; palpi flat, usually reposing on the proboscis, sometimes modified and highly ornamental. Antennæ composed of three segments, bearing a dorsal or apical arista; third segment usually more or less oval, sometimes elongated, especially in the males. Thorax convex above, sometimes with a conspicuous depression before the scutellum. Abdomen with five or six segments, conical, cylindrical, flattened, laterally compressed or more or less laterally compressed apically; hypopygium large, or small and concealed. Coxæ usually short, rarely a little elongate, the legs of moderate length, the femora usually somewhat enlarged, the tarsi of the males frequently beautifully modified, the tibiæ rarely so although sometimes brightly colored. Wings hyaline or with dark markings, sometimes ornamented with black and white or of peculiar shape. Second basal and discal cells united, the anal cell short, the sixth vein short or absent, the fourth vein usually straight or only gently curved forward, rarely forming a crossvein.

The adults occur everywhere in the vicinity of water and are particularly abundant in swamps and along lightly shaded streams where they occur on mud or sand; on foliage, usually in the sun; on stones in streams; on the trunks of trees and on fallen logs. Species of *Medeterus* and *Neurigona* are normally found on tree trunks, especially those having smooth bark; *Hydrophorus* and *Campsicnemus* occur on the surface of small pools; most genera occur on mud along water, some only on sand; *Diaphorus*, *Chrysotus* and *Hercostomus* occur chiefly on foliage and the same is true of *Condylostylus*, etc. Many of the species are extremely local in habitat, occurring only where conditions are perfectly suitable. The adults are all predaceous, feeding upon smaller insects and mites. I have frequently observed them devouring midges and also small larvæ occurring in the mud.

Many of the adults have very unusual mating dances which may be observed without difficulty as the species are common and soon return to their "mud flats" if disturbed. An excellent account of several of the species is given in the revision of *Dolichopus* by Van Duzee, Cole and Aldrich.

Little is known about the immature stages which are passed, for the most part, in mud, although some species live in the stems of grass and those of *Medeterus* live under the bark of trees and are definitely predaceous. Some species are said to feed upon decaying vegetation but they are probably predaceous.

The males are easily determined but the females are often difficult to name as they present less striking characters than the males. The American species were revised by Becker* but so many new forms have been described since that this work will furnish only a basis for the study of the family. The females present few structural characters and it is difficult to separate a few of the genera except by association and familiarity with the group. Several characters not previously used are employed in the key presented and most of the females are keyed out separately. With a little experience this sex should be as easily located in the correct genus as is the opposite sex and the males will trace out quite readily in this section of the key, although two or three genera are omitted as females are not available.

KEY TO GENERA†

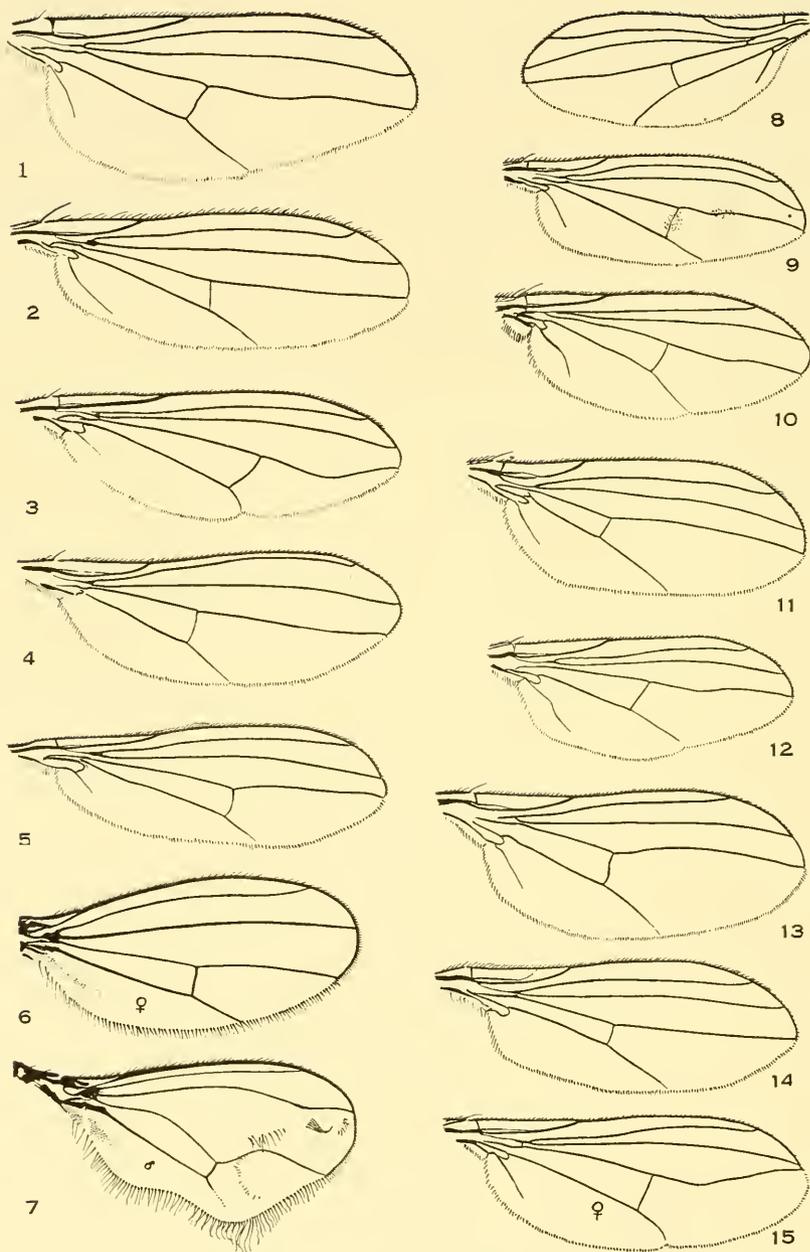
1. Fourth vein with a widely divergent fork beyond the posterior cross-vein and with an appendage at the bend (16); mesonotum scarcely longer than wide 2
 Fourth vein without such fork though often with strong curvature; mesonotum usually conspicuously longer than wide..... 8
2. Front scarcely excavated above from anterior view..... 3
 Front strongly excavated above from anterior view..... 4
3. Sixth (anal) vein present.....*Psilopiella* Van Duzee
 Sixth vein absent*Leptorhethum* Aldrich
4. Arista not differentiated from the third antennal segment which is produced style-like and extremely long.....*Megistostylus* Bigot
 Arista clearly differentiated 5
5. Arista apical.....*Chrysosoma* Guerin
 Arista dorsal, rarely sub-apical..... 6
6. Lower part of the face with hairs (83).....*Laxina*, n. g.
 Lower part of the face without hair..... 7
7. Scutellum with four bristles (16, 85).....*Condylostylus* Bigot
 Scutellum with a pair of strong bristles and sometimes a weak basal hair on either side (17, 71).....*Sciapus* Zeller

* 1922 (1921). *Abh. Zool.-bot., Gesselsch., Wien*, xiii, pp. 1-395.

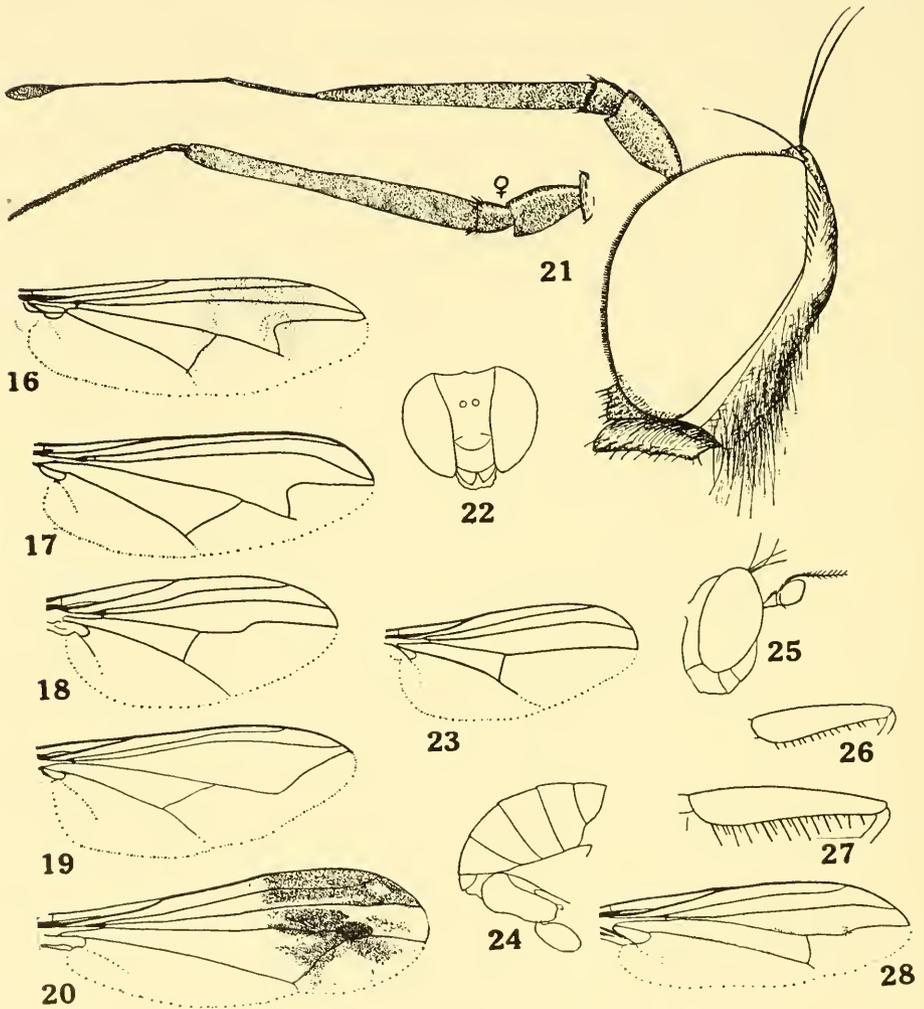
† *Syntormon* Löw appears to be distinct from *Synarthrus* to which our American species belong.

8. Thorax almost as broad as long; head wider than high; the front deeply excavated from anterior view; face wide (48, 51).
 * *Mesorhaga* Schiner
 Thorax and head different..... 9
9. Basal segment of the posterior tarsi with stout bristles above (24, 42, 57)..... † *Dolichopus* Latreille
 Basal segment of the posterior tarsi without bristles above..... 10
10. Mesopleura produced as a finger-like strip along the posterior edge of the anterior coxæ (20)..... ‡ *Liancalus* Lœw
 Mesopleura normal, not produced as above..... 11
11. Males 12
 Females 64
12. Hypopygium long, extending forward under the venter..... 13
 Hypopygium short, only the lamellæ sometimes extending forward... 25
13. Arista long pubescent, sub-plumose..... 14
 Arista quite short pubescent or bare..... 16
14. Third antennal segment very large, acuminate..... *Leptocorypha* Aldrich
 Third antennal segment normal, short and somewhat pointed..... 15
15. Face wide below, roof-like over the mouth, concave in the middle (22, 25, 46, 77)..... § *Pelastoneurus* Lœw
 Face narrow, especially below (66, 79)..... *Sarcionus* Aldrich
16. About the posterior third of the mesonotum concave or flattened..... 17
 Mesonotum flattened only immediately before the scutellum..... 20
17. Second antennal segment prolonged along the inner side of the third (67, 73)..... ¶ *Cœloglutus* Aldrich
 Second antennal segment not prolonged along the third..... 18
18. Hypopygium pedunculate, at least not sessile, reaching almost to the base of the abdomen 19
 Hypopygium sessile, the basal part not reaching half way to the base of the abdomen although the lamellæ may do so (45, 81).
 ¶¶ *Paraphrosylus* Becker
19. Third and fourth veins strongly converging apically, the distance between them at their apices not more than half as great as opposite the posterior crossvein; bristles rarely yellow (63, 86).
 ¶¶¶ *Medeterus* Fischer
 Third and fourth veins separated apically by at least two-thirds the distance separating them opposite the anterior crossvein; hair and bristles yellow (31, 59)..... ° *Thrypticus* Gerstæcker
20. The face hangs down apron-like below the eyes (15, 38).
 ¶¶¶¶ *Polymedon* Osten Sacken
 The face is not produced as a long, thin ribbon..... 21

* Van Duzee, 1917, Ent. News, xxviii, p. 123.
 † Van Duzee, Cole and Aldrich, 1921, Bull. 116, U. S. N. Mus.; Van Duzee and Curran, 1934, Amer. Mus. Novit. Nos. 683, 684.
 ‡ Van Duzee, 1917, Ent. News, xxxviii, p. 126.
 § Van Duzee, 1923, Ann. Ent. Soc. Amer., xvi, p. 30.
 ¶ Van Duzee, 1924, Pan-Pac. Ent., i, p. 73.
 ¶¶ Van Duzee, 1928, Psyche, xxxv, p. 38.
 ° Van Duzee, 1921, Psyche, xxviii, p. 124.
 ¶¶¶ Van Duzee, 1927, Ann. Ent. Soc. Amer., xx, p. 123.



Dolichopidae I.—1, *Anepsionmyia linearis*; 2, *Campsicnemus latipes*; 3, *Stolidosoma permufatum*; 4, *Xanthina nigromacula*; 5, *Diostracus prasinus*; 6, 7, *Collinellula magistri*; 8, *Peloro-peodes brevis*; 9, *Synarthrus tricoloripes*; 10, *Keirosoma albicinctum*; 11, *Chrysotimus luteus*; 12, *Nematoproctus flavicauda*; 13, *Chrysotus discolor*; 14, *Thinophilus ochrefaciens*; 15, *Poly-medon dilaticosta*.



Dolichopidae II.—16, *Condylostylus sipho*; 17, *Sciapus unifasciatus*; 18, *Argyra*; 19, *Plagioneurus univittatus*; 20, *Liancalus similis*; 21, *Rhaphphium*; 22, *Pelastoneurus vagans*; 23, *Diaphorus*; 24, *Dolichopus*, ♂ abdomen; 25, *Pelastoneurus vagans*; 26, *Hydrophorus*, front femur; 27, *Scellus*, front femur; 28, *Scellus vigil*.

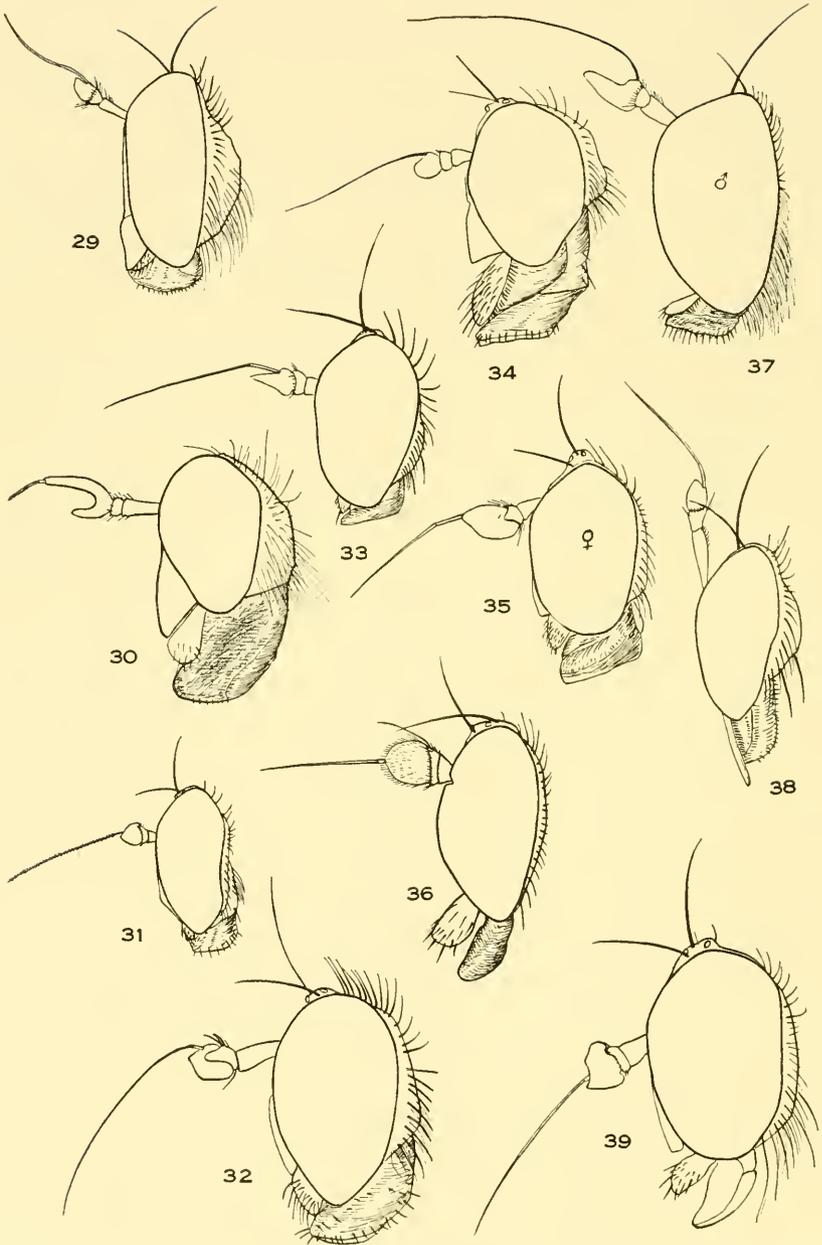
- Mesonotum without such depression, usually with a slight, transverse depression 42
35. Acrostical setulæ present, at least at the anterior edge of the thorax. 36
Acrostical setulæ absent.....**Micromorphus** Mik
36. Third and fourth veins almost parallel beyond the crossvein..... 37
Third and fourth veins converging before the apex (52).
***Neurigona** Rondani
37. Acrostical setulæ present only on the anterior margin of the mesonotum (60)**Xanthochlorus** Læw
Acrostical setulæ extending at least to the suture..... 38
38. Sixth (anal) vein present..... 39
Sixth (anal) vein absent..... 40
39. Hair and bristles wholly yellow (11).....**Chrysotimus** Læw
Hair and bristles not yellow (52).....***Neurigona** Rondani
40. Arista apical (36)..... 41
Arista sub-apical; third antennal segment pointed (62)..†**Achalcos** Læw
41. Pleura metallic (6, 7).....**Collinellula** Aldrich
Pleura yellow; third antennal segment rounded apically (4, 36).
‡**Xanthina** Aldrich
42. Fourth vein ending well before the tip of the wing; posterior crossvein very oblique (19)..... 43
Fourth vein ending but little before the tip of the wing, usually in or slightly behind it..... 44
43. Dorsocentral bristles strong (19).....**Plagioneurus** Læw
Dorsocentral bristles hair-like.....**Edematopus** Van Duzee
44. Posterior crossvein situated less than its own length from the wing margin along the fifth vein, the basal segment of the posterior tarsi longer than the second (43)..... 45
Posterior crossvein much shorter than the ultimate section of the fifth vein, or the first segment of the posterior tarsi decidedly shorter than the second (9)..... 49
45. Pteropleura haired in front of the posterior spiracle..... 46
Pteropleura bare 47
46. First antennal segment with stout setulæ below (72)..**Melanderia** Aldrich
First antennal segment bare below (**Hydrophorus** pt) (80).
Millardia, n. g.
47. Pteropleura produced to form a mammiform projection in front of the posterior spiracle (27, 28).....‡**Scellus** Læw
Pteropleura plain 48
48. Middle of the propleura haired; third antennal segment subrectangular, the arista dorsal (26, 43, 56, 78).....§**Hydrophorus** Fallén

* Van Duzee, 1913, Ann. Ent. Soc. Amer., vi, pp. 22-61.

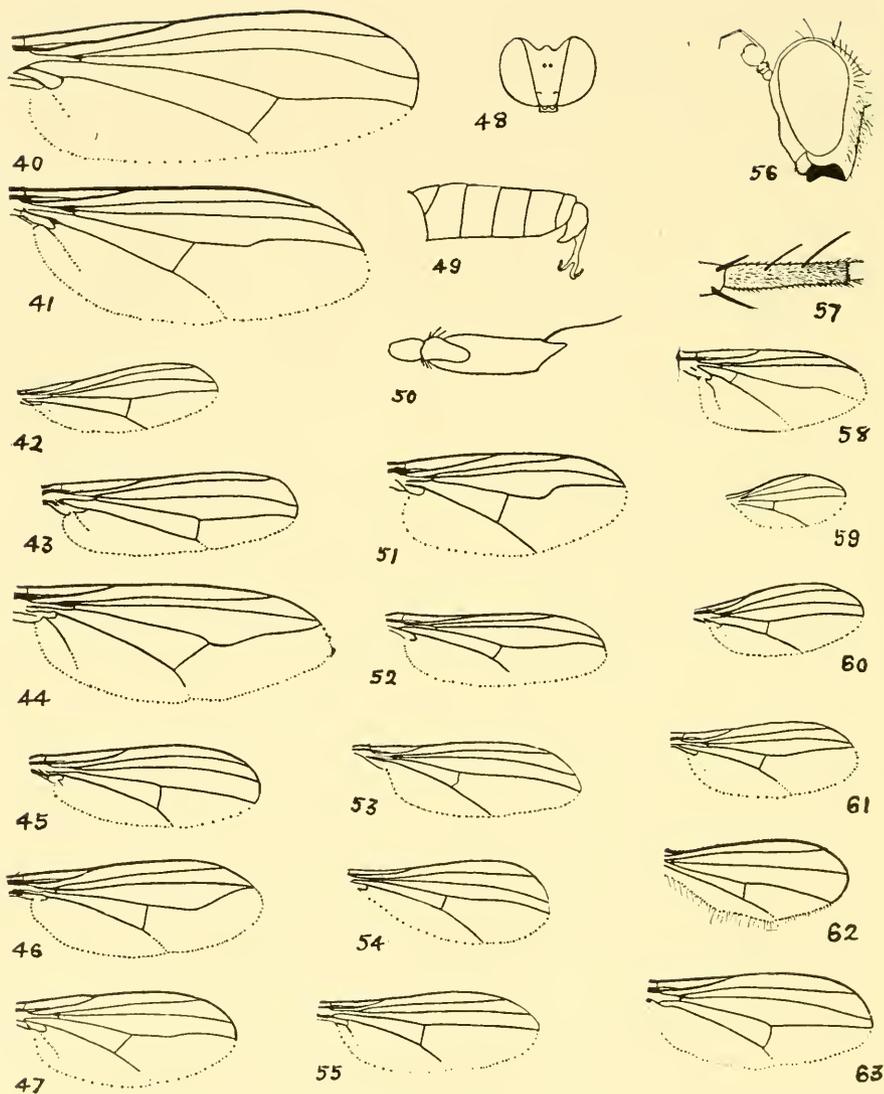
† The only difference in these two genera appears to be in the shape of the third antennal segment. They should probably be united.

‡ Greene, 1924, Proc. U. S. N. M., lxx, Art. 16.

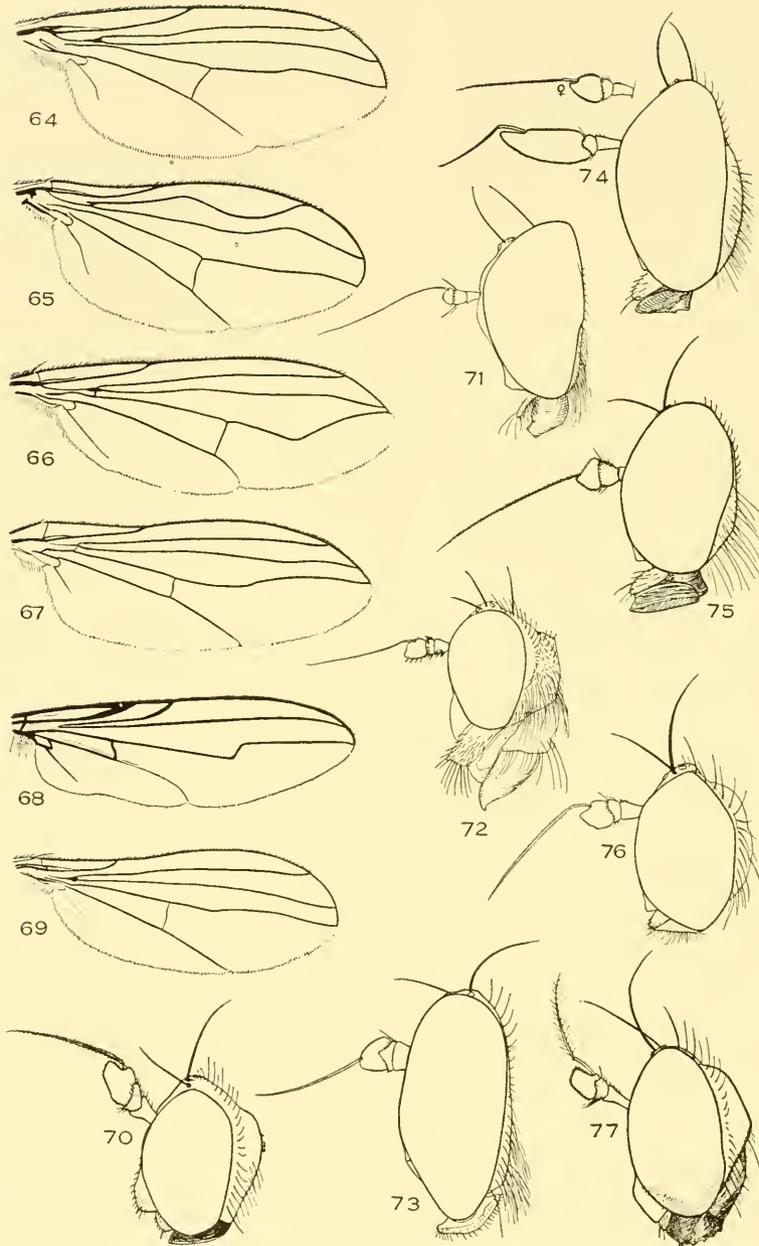
§ Van Duzee, 1926, Pan.-Pac. Ent., iii, p. 5.



Dolichopidae III.—29, *Tachytrechus*; 30, *Hypochararus*; 31, *Thrypticus*; 32, *Neosyntormon*; 33, *Peloropecodes brevis*; 34, *Diostracus prasinus*; 35, *Parasyntormon asellus*; 36, *Xanthina subcurva*; 37, *Stolidosoma permutatum*; 38, *Polymedon dilaticosta*; 39, *Chrysotus discolor*.



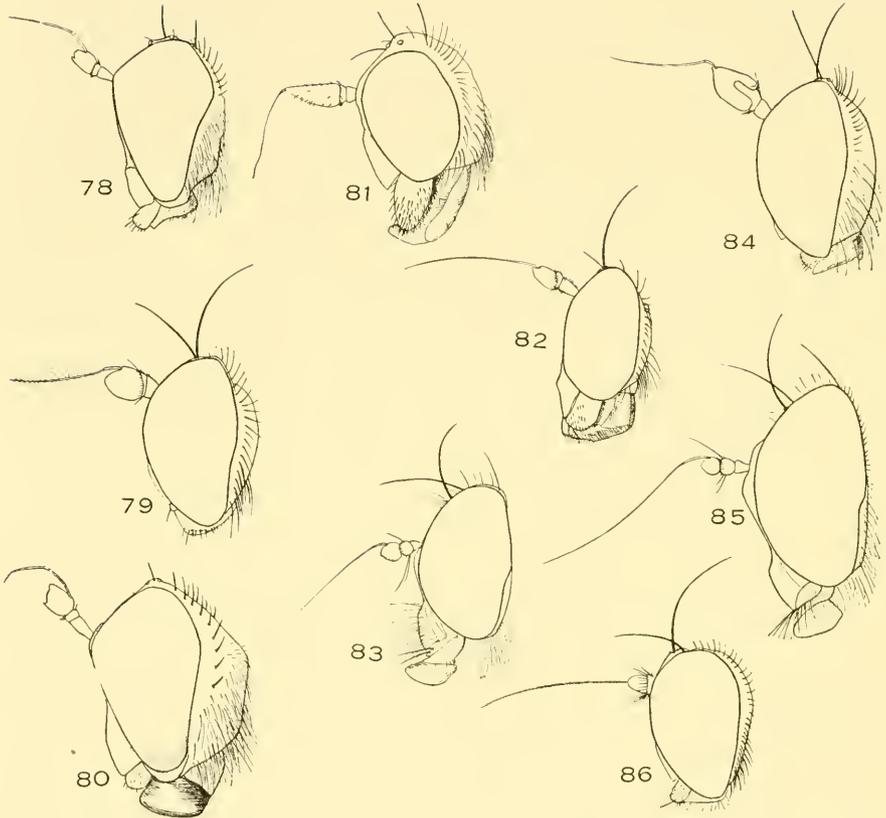
Dolichopidae IV.—40, *Hypocharassus*; 41, *Dolichopus*; 42, *Sympycnus*; 43, *Hydrophorus*; 44, *Tachytrechus sanus*; 45, *Paraphrosylus*; 46, *Petastoneurus*; 47, *Rhaphium*; 48, *Mesorhaga*, head from in front; 49, *Rhaphium* abdomen from side; 50, *Neosyntormon*; 51, *Mesorhaga*; 52, *Neurigona*; 53, *Sympycnus*; 54, *Parasyntormon*; 55, *Gymnopternus*; 56, *Hydrophorus*; 57, *Dolichopus*, 1st segment of posterior tarsus; 58, *Asyndetus syntormoides*; 59, *Thrycticus*; 60, *Xanthochlorus*; 61, *Hercostomus*; 62, *Achalcus*; 63, *Medeterus*.



Dolichopidæ V.—64, *Leucostola cingulata*; 65, *Diaphorus nigripennis*; 66, *Sarcionus pectinatus*; 67, *Cœloglutus bicoloripes*; 68, *Syntomoneurum alatum*; 69, *Neosyntormon*; 70, *Gymnopternus*; 71, *Sciapus tener*; 72, *Melanderia mandibulata*; 73, *Cœloglutus bicoloripes*; 74, *Argyra*; 75, *Diaphorus*; 76, *Hercostomus*; 77, *Pelastoneurus abbreviatus*.

74. Third and fourth veins conspicuously converging apically or the fourth strongly curved 75
 Third and fourth veins parallel beyond the posterior crossvein, or nearly so (1).....*Anepsiomyia* Bezzi
75. Fourth vein approaching the third in a broad curve and running parallel with it at the apex.....*Paracleius* Bigot
 Fourth vein not so strongly approaching the third or not parallel with it apically (3)..... 76
76. A second pair of weak scutellar bristles or hairs; metapleura bare; fourth vein sometimes angularly curved..... 77
 A single pair of scutellar bristles; metasternum with two or three minute hairs in front of the posterior spiracle, visible only in some lights; fourth vein with single curve (3, 37).....*Stolidosoma* Becker
77. Fourth vein straight beyond the posterior crossvein, though approaching the third (61, 76).....*Hercostomus* Læw
 Fourth vein curved beyond the crossvein..... 78
78. Sixth (anal) vein extending close to the margin of the wing (68).... 79
 Sixth (anal) vein extending little more than half way to the margin of the wing beyond the anal cell (15, 38)....*Polymedon* Osten Sacken
79. Fourth vein bent twice in middle of apical section (68, 82).
Syntomoneurum Becker
 Fourth vein not bent at nearly right angles (29, 44)..*Tachytrechus* Læw
80. A longitudinal flat or slightly concave area on the posterior third of the mesonotum 81
 No such area although there is usually a more or less distinct transverse depression immediately before the scutellum..... 91
81. Third and fourth veins parallel or almost so beyond the posterior crossvein 82
 Fourth vein converging toward the third..... 86
82. Hair and bristles wholly yellow..... 85
 Hair and bristles partly or wholly black or brown..... 83
83. Acrostical setulæ in two rows..... 88
 Acrostical setulæ distinct only on the anterior border of the mesonotum, or absent 84
84. Yellowish species (60).....*Xanthochlorus* Læw
 Black or green species.....*Micromorphus* Mik
85. Sixth (anal) vein absent (31, 59).....*Thrypticus* Gerstæcker
 Sixth vein present (11).....*Chrysotimus* Læw
86. Fourth vein conspicuously doubly curved forward beyond the crossvein; sixth (anal) vein reaching the wing margin or practically so, strong and curved backward at the tip; usually large species (52).
 **Neurigona* Rondani
 Fourth vein straight beyond the posterior crossvein; sixth vein weak, sometimes represented by a fold and usually curving toward the apex of the wing before its end..... 87

* Van Duzee, 1913, Ann. Ent. Soc. Amer., vi, pp. 22-61.



Dolichopidae VI.—78, *Hydrophorus extrarius*; 79, *Sarcionus actispina*; 80, *Millardia viridiflos*; 81, *Paraphrosylus prædator*; 82, *Syntomoneurum alatum*; 83, *Laxina caudatus*; 84, *Synarthrus tricoloripes*; 85, *Condylostylus siphio*; 86, *Medeterus nigrimana*.

101. Second antennal segment produced thumb-like into the third on the inner side (35, 54).....*Parasyntormon* Wheeler
Second antennal segment transverse or only gently convex apically...102
102. Middle of propleura wholly bare.....103
Middle of propleura with a single bristly hair (64)....*Leucostola* Læw
103. Lower section of the face not differentiated, the face short.....104
Lower section of the face strongly differentiated, the face reaching practically to the lower level of the eyes (45, 81).
Paraphrosylus Becker
104. *Diaphorus* Meigen and *Chrysotus* Meigen come here but there are no good characters for the separation of the females.
105. Second antennal segment produced thumb-like into the third on the inner side (32, 50, 69).....*Neosyntormon*, n. g.
Second antennal segment with the apex at most a little convex on the inner side106
106. Middle of propleura bare.....107
Middle of propleura haired.....109
107. Abdomen flattened dorsoventrally, rarely swollen; face narrowest in the middle (2).....*Campsicnemus* Walker
Abdomen cylindrical or tapering.....108
108. Abdomen short and tapering.....110
Abdomen long and slender, usually cylindrical or laterally compressed (42, 53).....*Sympycnus* Læw
109. Third and fourth veins parallel or nearly so beyond the posterior crossvein (10).....*Keirosoma* Van Duzee
Third and fourth veins rather approximate apically (12).
Nematoproctus Læw
110. Scutellum with a secondary pair of weak marginal scutellars situated between the base and the strong pair; sixth vein strongly developed; anal lobe distinct (8, 33).....*Peloropecodes* Wheeler
Scutellum without secondary basals, but with a pair of apical hairs; sixth vein weakly developed; anal lobe very weak...*Teuchophorus* Læw

Laxina, new genus

This genus is erected for those species, formerly placed in *Condylostylus*, *Sciapus* and *Psilopus*, in which the lower section of the face is hairy. The arista is dorsal; mesonotum rather square; scutellum with four bristles and the wings either hyaline or variegated with brown. Genotype:—*Dolichopus patibulatus* Say.

Neosyntormon, new genus

Differs from *Parasyntormon* Wheeler in having the arista dorsal, even though situated toward the apex of the third antennal segment. The propleura is bare and the hypopleura lacks hair. Both these char-

aeters are true of *Parasyntormon* also, but all the species of *Synarthrus* Loew have both the propleura and hypopleura haired. Genitalia small. Genotype:—*Parasyntormon montivagum* Wheeler.

P. asellus Wheeler is the only species I have seen belonging to *Parasyntormon*. The genus *Eutarsus* Loew is close to *Neosyntormon* but both the propleura and pteropleura bear fine hair, as in *Synarthrus*. *Eutarsus* does not occur in America.

Peloropecodes Wheeler

In his original description of this genus one might infer that the arista is apical, but I believe this is erroneous and that the arista is inserted toward the end of the third segment in the male. The type males of *salar* Wheeler, the genotype, all lack the third antennal segment so the point cannot be cleared up at present. Both females, however, are in excellent condition and since no type has been selected for the species, I now select one of the females. On general structure there can be no doubt that both *Pachyppyga* Parent and *Kophosoma* Van Duzee are synonyms.

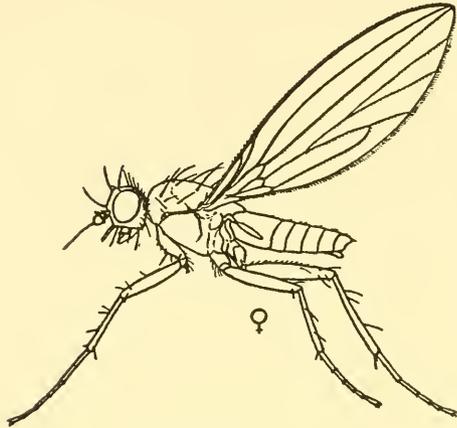
Teuchophorus Lœw

Wheeler has described a species from South Dakota which appears to have been correctly placed. The type is not in good condition, both wings being absent and part of the abdomen eaten away, but from what can be seen the specimen agrees well with European material taken near Leningrad. This genus is very close to *Peloropecodes* differing in having small genitalia, as in *Sympygenus*, less evident anal angle to the wings with less developed sixth vein, and the absence of a pair of small basal bristles on the scutellum in addition to the large pair. As a rule there is a pair of small hairs on the apical portion of the scutellum, absent in the species of *Peloropecodes* I have seen.

Millardia, new genus

This genus is proposed for the reception of species formerly placed in *Hydrophorus* Meigen in which the pteropleura bears conspicuous fine hairs and most, if not all of the species have several pairs of post-vertical bristles instead of a single pair. Genotype:—*Hydrophorus viridiflos* Walker.

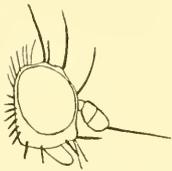
Family Lonchopteridæ—The Pointed-wing Flies



Lonchoptera sp.

Small, slender brownish or yellowish flies, the length 2 to 5 mm.

Head bristly; ocelli present; antennæ short, the third segment rounded, with a terminal arista. Legs moderately long, bristly, the pulvilli very small; empodia absent. Wings pointed apically, with only the basal crossveins, the anal cell closed; first vein very short, the fourth fureate.



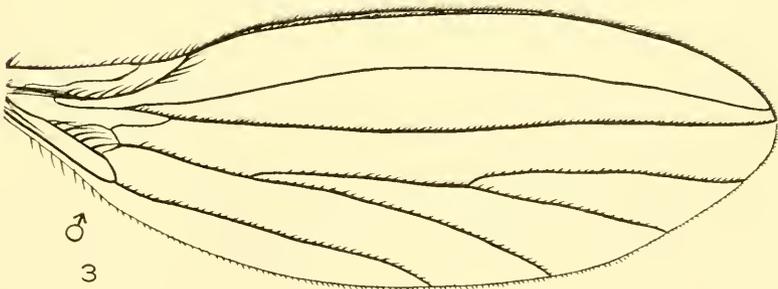
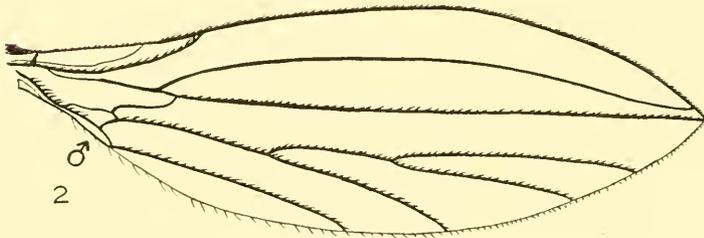
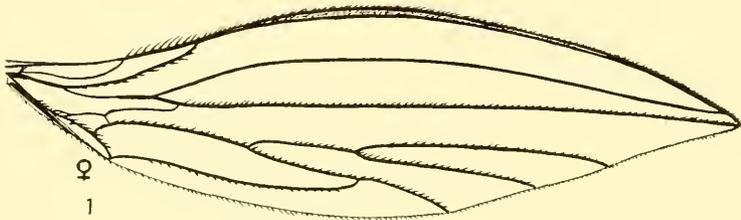
Lonchoptera, head

The adults are found in moist places and especially along shady brooks. The larvæ live under leaves and decaying vegetation; they are flat, with long bristles on the anterior two and apical segments; ten segments, the head not differentiated; posterior spiracles broadly separated on the apical segment. The larva transforms into a prepupa within the larval skin and later into a true pupa.

The family contains less than two dozen species, all belonging to the genus *Lonchoptera* Meigen. A key to the American species is given below. Descriptions of them are contained in American Museum Novitates No. 696.

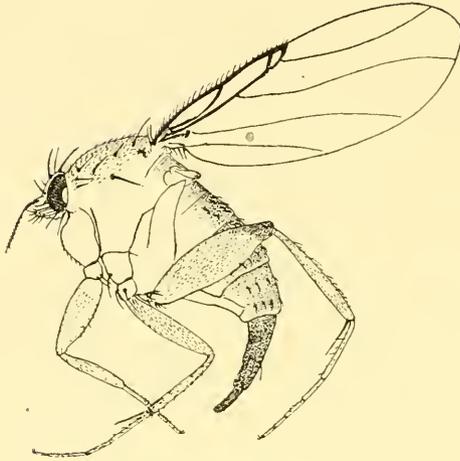
TABLE OF SPECIES

1. Bristles of the vertex and the orbital cilia wholly yellowish..... 4
 At least several of the upper orbital cilia black..... 2
2. Bristles of the vertex black..... 3
 Bristles of the vertex yellowish; about half the orbital cilia black.... 4
3. Wings very sharply pointed, very slightly concave posteriorly toward the apex, or at any rate not generally convex..... *uniseta* Curran
 Wings broader and much less sharply pointed, gently convex before the apex *occidentalis* Curran
4. Anal vein widely removed from the border of the wing; base of fifth vein with four or five long bristles..... *borealis* Curran
 Anal vein fused with the posterior border of the wing; base of fifth vein with numerous setulæ..... *dubia* Curran



Wings of *Lonchoptera*.—1, *uniseta* Curran; 2, *occidentalis* Curran; 3, *borealis* Curran.
 (Courtesy American Museum of Natural History.)

Family Phoridaë

*Megaselia* species.

Small or minute flies, often wingless, usually with a hunch-backed appearance.

Head small, rather flattened; front wide, usually bristled; face short and concave; oral opening large, the proboscis usually fleshy; palpi large, usually bristled; eyes never large, the ocelli sometimes absent in the apterous forms. Antennæ with three segments, the third large, the basal two small; arista dorsal or apical. Thorax usually arched, the scutellum absent in some wingless forms. Abdomen short, usually tapering posteriorly, sometimes partly membranous, especially in the wingless forms; male genitalia often large, in the female small and projecting, large and adapted for piercing in some genera. Legs short, well developed, the tibiæ with or without bristles; posterior femora usually more or less laterally compressed. Wings large, poorly developed or absent, the fully developed wings with two strong longitudinal veins and four or five fine ones.

The adults are readily recognized by their characteristic antennæ and wing venation. They are found almost everywhere but are particularly abundant about decaying vegetation, on leaves and windows or in the nests of termites and ants, and following armies of ants. The alate adults move about on leaves with a quick, jerky movement which is quite characteristic of the family.

The larval habits are diverse. Some are parasitic while others are unquestionably scavengers. The larva of *Apocephalus* lives in the heads of ants, the head dropping off when the larva is mature, while that of *Cataclínusa pachychondyla* lives curled about the necks of ant larvæ and feeds upon the food proffered the latter by the ants. Some species live on decaying animal matter and at least one species has been reared from honey comb. The family is one of great interest and offers an excellent field of study for patient, careful students of animal behavior.

The latest revision of the North American species is by Malloch.* The following key is adapted from Schmitz† and may prove unsatisfactory in some respects, but as I lack very many of the genera I am unable to improve upon it. Some of the characters used appear to be of little value from a generic standpoint but the species included in the genera present differences in addition to those given. Despite the title, Schmitz' paper is little more than a generic revision insofar as the taxonomist is concerned but a complete bibliography is included.

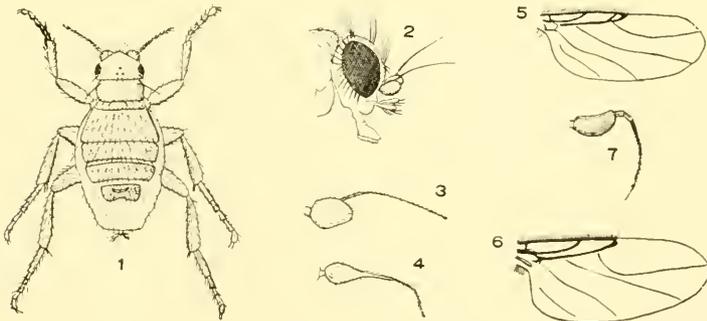
KEY TO GENERA‡

- 1. Prothoracic spiracle lateral..... 2
 Prothoracic spiracle dorsal (18).....*Ænigmatias* Meinert
- 2. Supra-antennal bristles proclinate, if absent the tibiæ lack isolated strong bristles 18
 Supra-antennal bristles erect, divergent or reclinate, if absent the tibiæ bear strong bristles; never wingless..... 3
- 3. Third vein with very evident branch..... 4
 Third vein not forked or only obscurely so..... 11

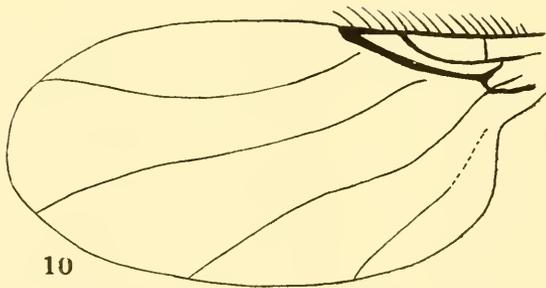
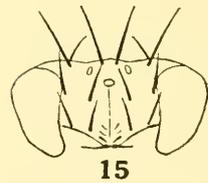
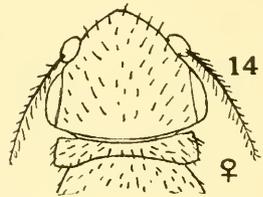
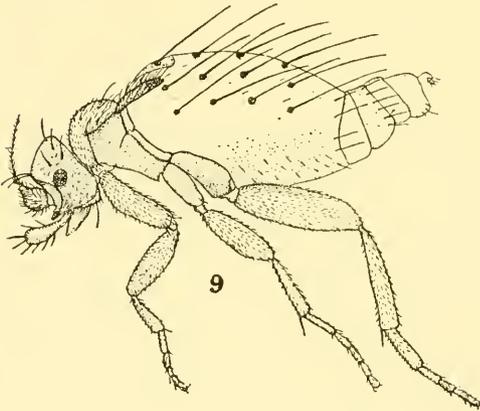
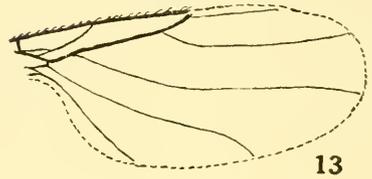
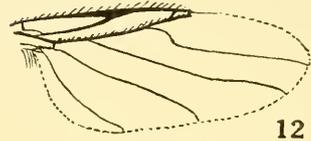
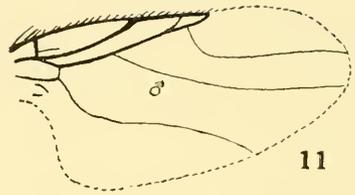
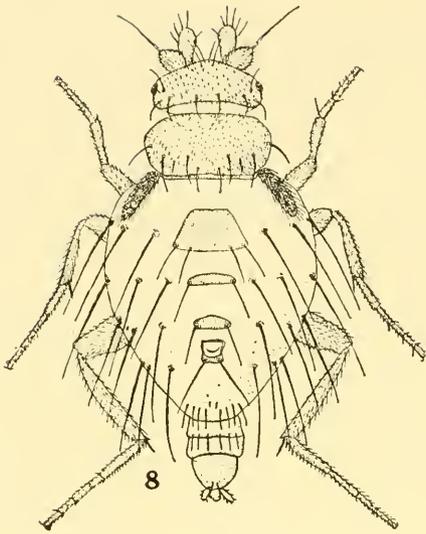
* 1912. Proc. U. S. N. M., xliii, pp. 411-529.

† 1929. Rev. der Phoriden, privately published (Dümmler, Berlin & Bonn).

‡ Checked by Dr. C. T. Brues.

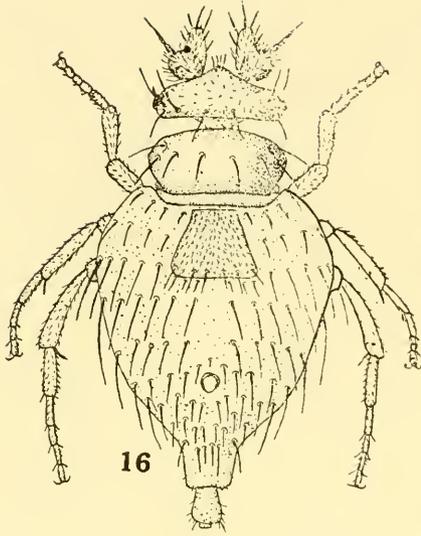


Phoridae I.—1, *Pulicophora*, ♀; 2, *Megaselia*; 3, *Phora*, antenna; 4, *Conicera*, antenna; 5, *Megaselia*; 6, *Hypocera*; 7, *Apocephalus*, antenna.

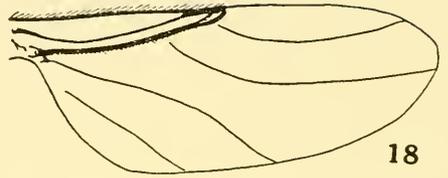


Phoridae II.—8, 9, *Ectomyia spinosa*, dorsal and lateral views; 10, *Plastophora*; 11, *Triphleba*; 12, *Aneurina*; 13, *Pulicophora*; 14, *Chonocephalus*, head of ♀; 15, *Beckerina*, head showing bristles.

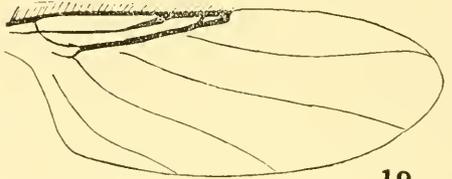
4. At least the middle tibiæ with strong bristles.....	5
Tibiæ without conspicuous bristles (15, 21).....	<i>Beckerina</i> Malloch
5. Mesopleura haired, at least in front near the spiracle.....	6
Mesopleura bare	8
6. Mesopleura with very long bristle.....	<i>Chatopleurophora</i> Schmitz
Mesopleura without long bristle.....	7
7. Posterior tibiæ with from one to three rows of closely placed short setulæ dorsally (19).....	<i>Dohniphora</i> Dahl
Posterior tibiæ without such ciliate rows..	<i>Chatocnemistoptera</i> Borgmeier
8. Third vein with closely placed setulæ above (12).....	<i>Aneurina</i> Lioy
Third vein bare or very sparsely setulose.....	9
9. Middle tibiæ with a strong anterior bristle beyond the middle.	
Middle tibiæ with a very weak bristle beyond the middle, or bare.....	<i>Paraspiniphora</i> Malloch 10
10. Posterior tibiæ with one to three rows of conspicuous, short setulæ dorsally (25)	<i>Diploneura</i> Lioy
Posterior tibiæ without such setulæ (11).....	<i>Triphleba</i> Rondani
11. Arista dorsal, at most sub-apical.....	12
Arista apical	17
12. Middle tibiæ without dorsal bristles beyond the basal third.....	13
Middle tibiæ with more than one pair of dorsal bristles.....	14
13. Eyes bare (3).....	<i>Phora</i> Latreille
Eyes haired	<i>Chatocnemistoptera</i> Borgmeier
14. Supra-antennal bristles present (6).....	<i>Hypocera</i> Lioy
Supra-antennal bristles absent	15
15. Ocelli widely separated, their triangle separated from the front an- teriorly by a three-ridged depression.....	<i>Stichillus</i> Enderlein
Ocelli normal, or the triangle forming a tubercle.....	16
16. Eyes very large; front very narrow (26).....	<i>Trineurocephala</i> Schmitz
Eyes normal; front wide	<i>Borophaga</i> Enderlein
17. Posterior tibiæ with a pair of bristles on the basal half (4, 24).	
Posterior tibiæ otherwise (22).....	<i>Conicera</i> Meigen <i>Coniceromyia</i> Borgmeier
18. Wings entirely normal in size.....	19
Wings smaller than normal or absent.....	46
19. Third vein forked	20
Third vein simple.....	32
20. Posterior tibiæ with a dorsal row of contiguous hairs and a postero- dorsal row of short cilia or at least one or two short bristles.....	23
Posterior tibiæ without the dorsal row of setulæ and the postero-dorsal cilia	21



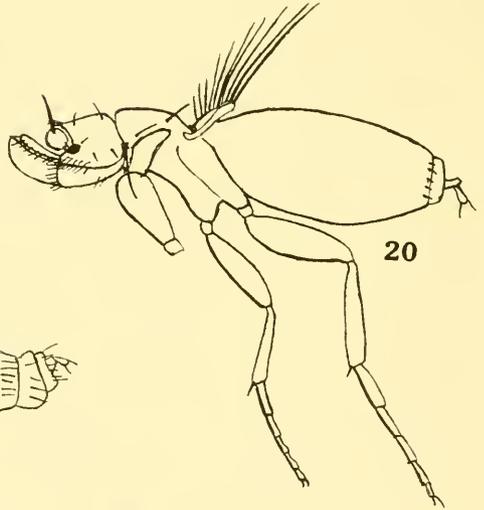
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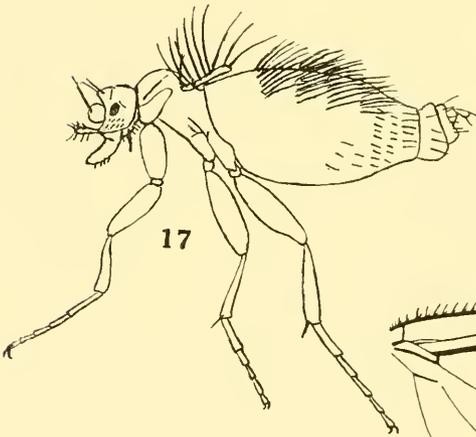
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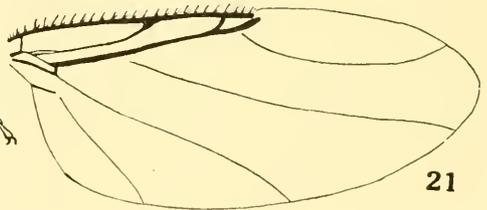
19



20



17



21

Phoridae III.—16, *Ecituncula setosa*; 17, *Xanionotum*; 18, *Aenigmatias*, ♂; 19, *Dohrniphora alleni*; 20, *Acontistoptera melanderi*; 21, *Beckerina neotropica*.

21. Anterior orbital bristle present.....**Woodiphora** Schmitz
At least the anterior orbital bristle absent..... 22
22. All the bristles on the anterior half of the front missing (23).
Gymnophora Macquart
Median frontals present.....**Metopina** Macquart
23. Supra-antennals entirely missing..... 24
At least one pair of supra-antennals..... 26
24. Arista apical or subapical..... 25
Arista dorsal**Cremersia** Schmitz
25. Hypopygium large; anal segment laterally compressed, the outline
lancet-shaped; fifth sternite with long apical hairs.
Neodohrniphora Malloch
Hypopygium small, the anal segment long and linear; ovipositor of
female chitinized and projecting.....**Apocephalus** Coquillett
26. Front with four rows of bristles..... 27
Bristling of the front incomplete; arista apical.
Acanthophorides Borgmeier
27. Upper pair of post-antennal bristles erect, directed more or less out-
ward 28
Upper pair of post-antennals proclinate or reclinate, not directed out-
ward 29
28. Upper post-antennals distinctly proclinate and directed a little out-
ward**Pseudohypocera** Malloch
Upper post-antennals directed outward (7).....**Apocephalus** Coquillett
29. Weak vein beyond the third vein weak or absent.....**Syneura** Brues
This vein distinct..... 30
30. Epistoma strongly produced, tube-like.....**Trophithauma** Schmitz
Face normal, not produced..... 31
31. Proboscis very long and thin (σ unknown).....**Rhyncophoromyia** Malloch
Proboscis normal (**Phalocrotophora** Enderlein) (2, 5)...**Megaselia** Rondani
32. Bristling of the front complete (as in **Megaselia**) or with additional
bristles 33
Bristling incomplete, the anterior orbital or other bristles absent..... 37
33. Front with additional bristles on the median area.
Pseudacteon Coquillett
Front with normal number of bristles..... 34
34. The weak vein lying parallel with the costa absent or indistinct..... 35
This vein distinct (2, 5).....**Megaselia** Rondani
35. Costa short, widened and almost filling the costal cell.
Parametopina Borgmeier
Costa short but not abnormally widened..... 36
36. Apices of first and third veins approximate.....**Syneura** Brues
Apices of first and third veins not approximated (10).
Plastophora Brues

- 44. Post-antennal bristles not distinguishable from others along the anterior border of the front.....*Cataclinusa* Schmitz
 Post-antennals absent 45
- 45. Front bristled only at the vertex and along the upper, inner margins of the antennal grooves which are narrower than the space between them; wings without basal transverse vein (14).

Chonocephalus Wandolleck

 Front narrow, only the post-antennal and pre-ocellar bristles absent.

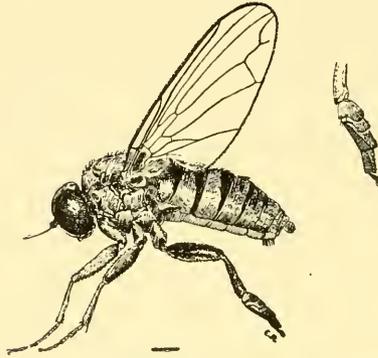
Melaloncha Brues
- 46. Wings wholly absent or microscopic..... 52
 Wings distinctly developed though small..... 47
- 47. Ocelli present 48
 Ocelli absent 50
- 48. Wings with trace of several veins..... 49
 Wings with at most the costal vein visible; halteres absent.

Ecitophora Schmitz
- 49. Proboscis geniculate or bent, distinctly elongate.

Eciptera Borgmeier & Schmitz

 Proboscis normal*Commoptera* Brues
- 50. Wing rudiments with long bristles..... 51
 Wing rudiments with hairs or cilia (8, 9).....*Ecitomyia* Brues
- 51. Eyes situated well behind the front margin of the head in profile; halteres present, though small (17).....*Xanionotum* Brues
 Eyes situated at the front margin of the head in profile; halteres absent (20)*Acontistoptera* Brues
- 52. Ocelli present (1, 13).....*Pulicophora* Dahl
 Ocelli absent 53
- 53. Thorax without bristles (14).....*Chonocephalus* Wandolleck
 Thorax with bristles (16).....*Ecituncula* Schmitz

Family Platypezidæ—The Flat-footed Flies



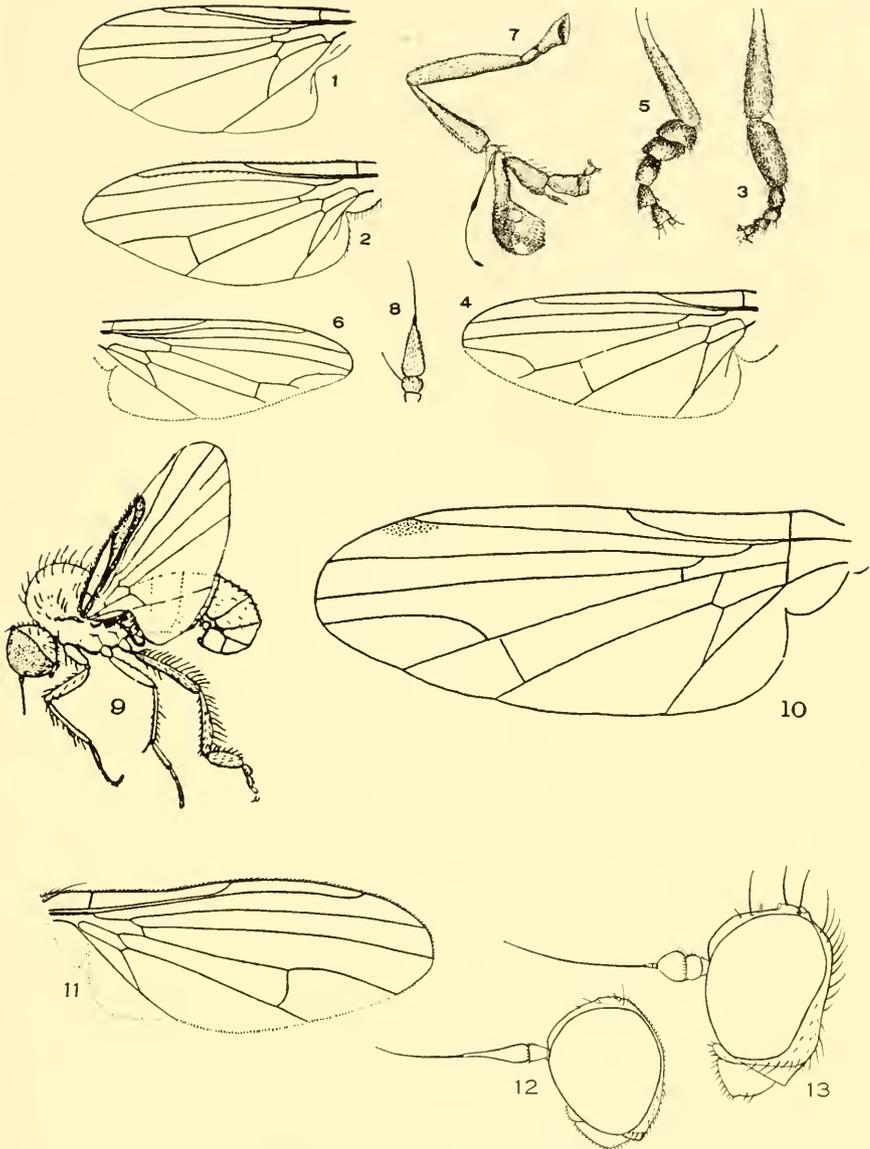
Platypeza species.

These are small flies with short hair and bristles, characterized by the wing venation and peculiarly shaped posterior tarsi, the basal segment being (usually) much flattened and sometimes strikingly ornamented.

Head hemispherical, as broad or broader than the thorax and closely applied to it; face depressed, short and broad; eyes bare, holoptic in the males and in some females; ocelli present. Antennæ porrect, the basal two segments short, the third more or less elongate-oval, pyriform or conical, with a terminal arista. Thorax rather stout, the mesonotum and scutellum with bristles. Legs short and strong, the posterior pair more or less thickened and at least the basal segment of their tarsi thickened or variously ornamented. Wings rather large; third vein simple, the fourth sometimes forked; apical cell open; basal cells rather small; posterior crossvein rarely absent. Abdomen rather short, broad and tapering or laterally compressed; hypopygium generally small.

The larvæ have been found in fungi and are flat, oval in outline, with jointed thread-like appendages on the sides of the segments. The puparia are rather similar to the larvæ in appearance.

For the most part the Platypezids are not common in collections nor are they often met with in the field. Williston states that they have been observed dancing in small swarms but they are usually found upon the leaves of bushes and low trees where they move about in a characteristic, jerky but remarkably agile manner. Mr. Johnson has obtained most of his specimens of *Agathomyia* by sweeping foliage. The species of *Callimyia* prefer moist woods. Fewer than thirty North American species are known.



Platypezidæ.—1, *Platynema*; 2, *Callimyia*; 3, *Callimyia*, hind tarsus of ♂; 4-7, *Platypeza*, wings and posterior legs; 8, *Agathomyia*, antenna; 9, *Microsania pectipennis*; 10, *Platypezoides diversa*; 11, 12, *Agathomyia*; 13, *Callimyia*.

KEY TO GENERA

- | | |
|---|---------------------------------|
| 1. Fourth vein furcate..... | 4 |
| Fourth vein not furcate..... | 2 |
| 2. Discal cell closed apically..... | 3 |
| Discal cell open..... | 5 |
| 3. First vein bare; third antennal segment elongate conical (8, 11, 12).
*<i>Agathomyia</i> Verrall | |
| First vein setulose above; third antennal segment rather short (2,
3, 13) | † <i>Callimya</i> Meigen |
| 4. The fourth vein branches close to the posterior crossvein, the posterior
branch reaching the wing margin (10)..... | * <i>Platyezoides</i> Johnson |
| The fourth vein branches nearer to the wing margin than to the pos-
terior crossvein, the posterior branch not reaching the wing margin
(4, 5, 6, 7)..... | * <i>Platyezpa</i> Meigen |
| 5. Third vein obsolete except apically (9)..... | * <i>Microsania</i> Zetterstedt |
| Third vein complete; three closed cells (1)..... | * <i>Platycnema</i> Zetterstedt |

* Johnson, 1923, Occ. Pap. Bost. Soc. Nat. Hist., v, pp. 51-58.

† Johnson, 1916, Psyche, xxiii, pp. 27-33.

Family Pipunculidæ—The Big-headed Flies

This family is characterized by the very large head and thinly pilose or practically bare body.

Head broader than the thorax, nearly spherical, composed chiefly of the large eyes; eyes of the male contiguous above the antennæ or closely approximated, in the female separated by a narrow front; face narrow. Antennæ small, three segmented, the third segment oval, reniform or aculeate below; arista dorsal. Ocelli present; proboscis small, usually concealed. Abdomen composed of six or seven segments, small, cylindrical; hypopygium conspicuous, often large; ovipositor usually elongate and extending forward under the abdomen. Legs simple; tarsi broad, the basal segment elongate; pulvilli present. Wings much longer than the abdomen; basal cells elongate; anal cell reaching close to the wing margin, rarely incomplete; apical cell narrowed apically but always open; three posterior cells; venation incomplete in *Chalarus* Walker. Squamæ vestigial. The wings are held flat over the abdomen when the insect is at rest.

The larvæ are parasitic on bugs of the families Cicadellidæ and Miridæ, and perhaps on other Homoptera and Heteroptera. The larvæ are elliptical, thick, depressed and narrowed at either end, naked and small. The oval, shining black puparia are obtuse at either end and somewhat smaller than the larvæ.

Pipunculidæ are found commonly wherever their hosts are to be found, but more especially near the edges of woods, in clearings and along shaded lanes. I have found them in large numbers in a small clearing in which the ground was kept constantly moist from a spring at one end and also along the edges of streams. Almost one hundred species are known from North America, most of which belong to the genus *Pipunculus*. Cresson* has monographed the family.

* Trans. Amer. Ent. Soc., xxxvi, pp. 267-329.

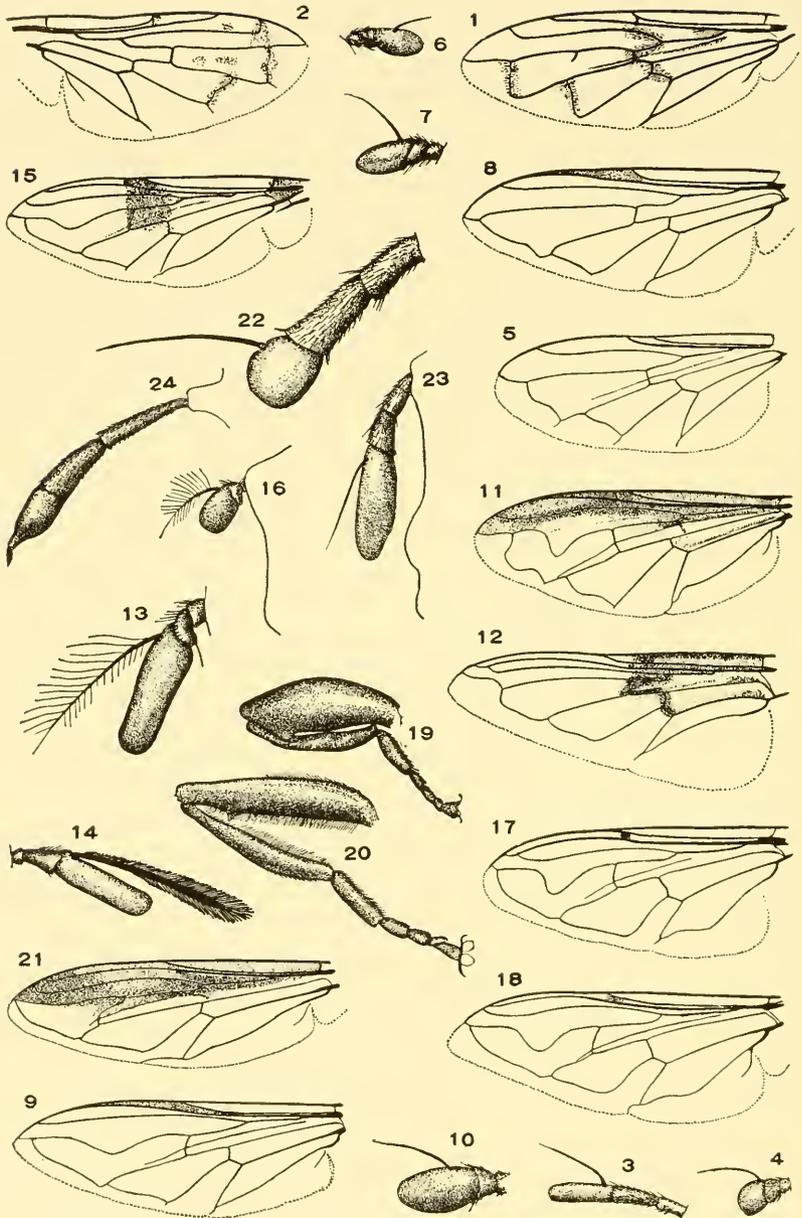
Family Syrphidæ—The Flower Flies

Small to large flies, the wing with a "spurious vein" lying between the third and fourth longitudinal veins.

Head variable, but never elongated, except rarely the produced epistoma. Face moderately wide to wide; eyes usually holoptic in the males, always dichoptic in the females. Oral opening large; proboscis usually short. Antennæ short or elongate, composed of three segments, usually with a dorsal arista, rarely with a terminal style. Ocelli present. Thorax rather large and robust, rarely with bristles. Abdomen composed of four to six visible segments; hypopygium rarely prominent, though often large. Legs variable but never elongate. Wings comparatively large; third vein never branched, straight or dipped into the apical cell, the apical cell closed; basal cells long; anal cell closed before the margin of the wing, always long; between the third and fourth veins a strong fold or "spurious vein", rarely absent, which is characteristic of the family.

The Syrphidæ comprise one of the largest and most popular groups of Diptera. They may be found anywhere and many species are very common. Most of them visit flowers but some occur only in woods, in moist places, in fields, or near ants' nests, depending upon their habits. The adults display great variation in habitus but may be recognized at once by their characteristic wing venation. Any locality with varied habitat should yield at least a hundred species and the general collector is certain to have many of them in his collection. Most of the common species are easily recognized by the use of "Williston's Synopsis" but on the whole the family is a difficult one, many of the genera and species being difficult to separate by means of keys and descriptions. Unfortunately there is no recent revision of the North American forms of which less than half are included in Williston's work. The number of short papers dealing with the family is very large and the literature scattered through numerous periodicals. Many attempts have been made to divide the Syrphidæ into subfamilies but with little success. Some of the groups may be well defined in one region but almost every character thus far used is found to lose its value when the study is extended to include the world fauna.

Almost all of the Syrphids are beneficial and they are second in importance only to the bees as pollinators of plants. Many of them live upon aphids, (plant lice) and mealy bugs in the larval stages. A few are known to be definitely injurious.



Syrphidae I.—1, *Microdon*; 2, *Orthoneura nitida*; 3, *Orthoneura nitida*, antenna; 4, *Chrysogaster nigripes*, antenna; 5, *Paragus*; 6, *Pipizella*, antenna; 7, *Paragus*, antenna; 8, *Cheilosia*; 9, *Syrphus laxus*; 10, *Syrphus laxus*, antenna; 11, *Salpingogaster*; 12, *Volucella*; 13, *Volucella*, antenna; 14, *Copestylum marginatum*, antenna; 15, *Arctophila flagrans*; 16, *Sericomyia militaris*, antenna; 17, *Eristalis*; 18, *Elophilus fasciatus*; 19, *Tropidea quadrata*, hind leg; 20, *Milesia*, hind leg; 21, *Spilomyia longicornis*; 22, *Spilomyia longicornis*, antenna; 23, *Chrysotoxum*, antenna; 24, *Cerioides*, antenna.

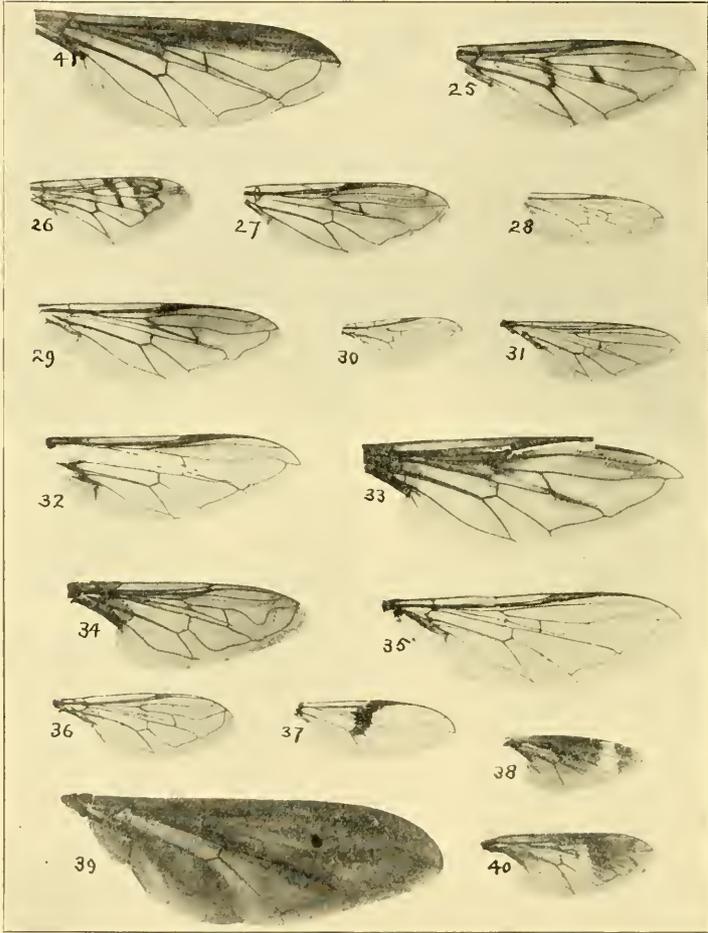
The larvæ are variable in habits and form. Some live in the nests of ants, termites, bees, etc., but nothing is known regarding their relationship to their hosts. Most of them live in decaying vegetation, while a very few are injurious to growing plants and bulbs. Among the well-known larval forms are the rat-tailed maggots which may be found in liquid media containing decaying vegetation and very rarely in carrion. The larvæ may be divided into four types: the *Microdon* type, with an unusually hard, convex upper surface and flat, soft ventral surface; the *Syrphus* type, some of which approach the first group in appearance, living upon aphids, decaying vegetation and plants; the short-tailed maggots, living in decaying vegetation; and the rat-tailed maggots which live in liquid media.

In the key to the genera several minute characters are used. These may prove difficult at first but once the student is familiar with them they will be found to be most useful. In some cases there may be difficulty in deciding the genus to which a species belongs but comparison with specimens of known genera will aid in reaching a decision. The final recourse, after careful study, is to send the puzzle to a specialist and receive his opinion. Most of them will gladly tell you what it is and return the specimen.

KEY TO GENERA

- 1. Antennæ with a terminal style, the third antennal segment tapering.. 2
 Antennæ with a dorsal arista, if sub-apical the third segment is not tapering from the base..... 3
- 2. Eyes bare (24, 46, 51)..... * *Cerioides* Rondani
 Eyes pilose *Callicera* Panzer
- 3. Arista bare; antennæ usually longer than the convex, pilose face; third vein usually with a stump of vein extending into the apical cell; anterior crossvein situated before the middle of the discal cell; apical crossvein often recurrent..... 4
 Arista variable; antennæ usually shorter, if elongate the humeri are bare, or the arista plumose; face concave, tuberculate or carinate, never rather evenly convex 6
- 4. Third vein with a stump of vein extending into the apical cell..... 5
 Third vein without such stump but there may be one from the fourth vein and from the apical crossvein..... *Mixogaster* Macquart
- 5. Abdomen spatulate..... *Rhopalosyrphus* Arribalzaga
 Abdomen not spatulate (1, 53, 59)..... † *Microdon* Meigen
- 6. Humeri pilose 7
 Humeri bare, often mostly concealed by the occiput..... 18

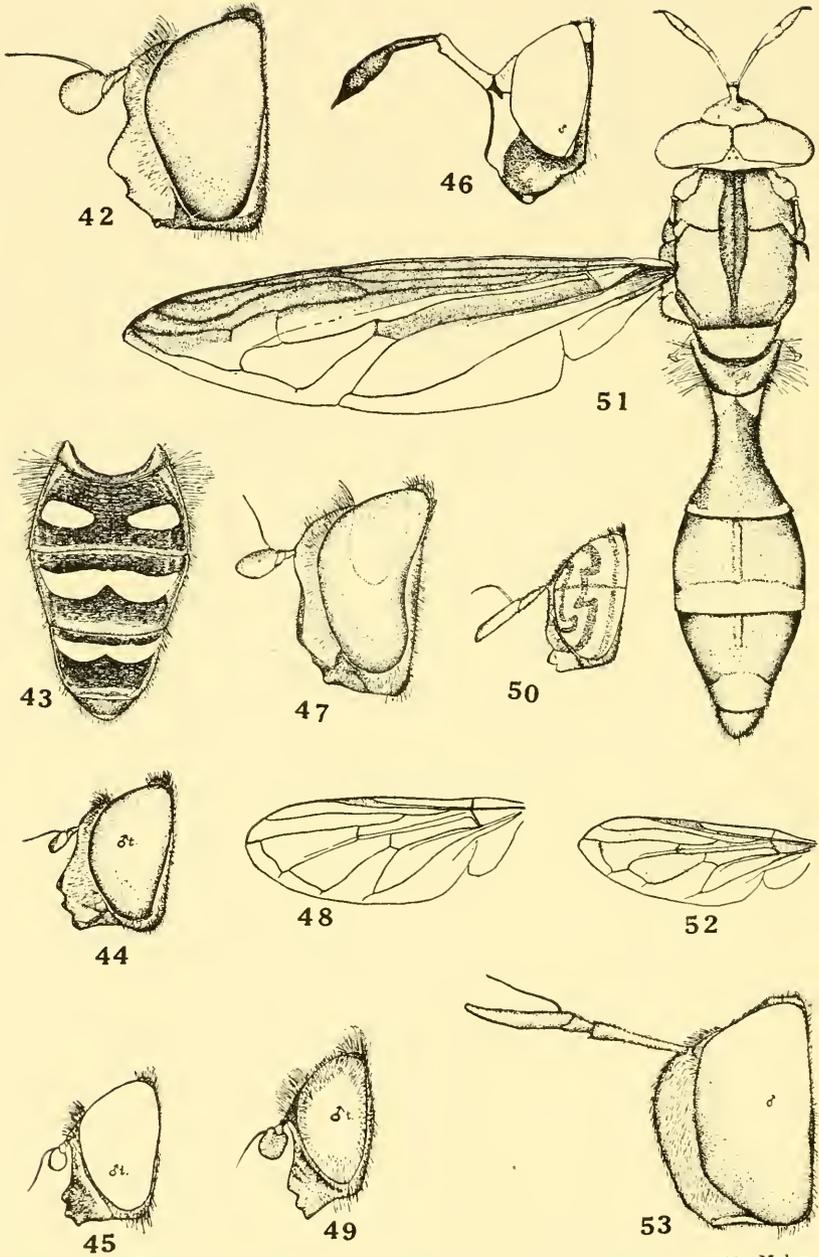
* Curran, 1925, Kans. Univ. Sci. Bull., xv, p. 25.
 † Curran, 1925, Kans. Univ. Sci. Bull., xv, p. 48.



Syrphidæ II.—25, *Ferdinandea*; 26, *Volucella fasciata*; 27, *Eumyiolepta auricaudata*; 28, *Syrirta pipiens*; 29, *Xylota pigra*; 30, *Pipizella*; 31, *Platycheirus erraticus*; 32, *Syrphus wiedemanni*; 33, *Sericomyia militaris*; 34, *Polydontomyia curvipes*; 35, *Scæva pyrastris*; 36, *Tropidea quadrata*; 37, *Baccha lemur*; 38, *Trichopsomyia*; 39, *Baccha*; 40, *Apophysophora* (S. Amer.); 41, *Chrysotoxum*.

- 7. Face perpendicular, with a swelling above; anterior crossvein at the basal fourth of the discal cell; antennæ elongate and porrect; abdomen strongly constricted basally.....*Mixogaster* Macquart
Face more or less tuberculate or carinate or the oral margin at least slightly prominent 8
- 8. All the femora with a patch of black setulæ on their bases anteriorly; third vein strongly curved into the apical cell..... 91
Posterior femora never with such setulæ; third vein at most moderately curved 9
- 9. Arista plumose, rarely pectinate; legs never with bristles..... 10
Arista bare or pubescent, if short plumose the legs bear bristles..... 16
- 10. Apical crossvein recurrent..... 11
Apical crossvein not recurrent, the apical cell never longest at its middle 15
- 11. Face with three strong tubercles, one on either side of the median tubercle (76).....**Ornidia* St. Fargeau and Serville
Face with only one tubercle or almost flat..... 12
- 12. Arista bushy plumose, appearing more or less strap-like (14, 65, 75).
† *Copestylum* Macquart
Arista loosely plumose or pectinate..... 13
- 13. Arista pectinate, the upper rays long, the lower ones extremely short.
Volucellosia Curran
Arista plumose 14
- 14. Eyes of the male widely separated, the front much longer than the face*Megametopon* Giglio-Tos
Eyes of male contiguous, the front at most slightly longer than the face (12, 13, 26, 77)..... ‡ *Volucella* Geoffroy
- 15. Facial side margins very distinct and extending almost to the base of the antennæ 43
Side margins not extending above the middle of the facial convexity.. 88
- 16. Apical crossvein strongly recurrent, the first posterior cell longest in the middle and usually with an appendage at this point (66, 78).
Citibæna Walker
First posterior cell not longest in the middle, the apical cell not strongly recurrent 17
- 17. Genitalia entirely concealed by the strongly convex abdomen when seen from the side; third antennal segment orbicular, very large; anterior crossvein situated before the middle of the discal cell (67, 79).
Nausigaster Williston
Genitalia visible from lateral view; third antennal segment never orbicular and abnormally large..... 42
- 18. Antennæ elongate and porrect; thorax and abdomen with bright yellow markings; wasp-like flies (23, 41, 82).....§*Chrysotoxum* Meigen

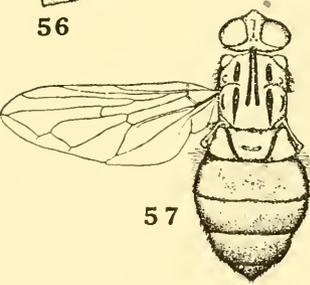
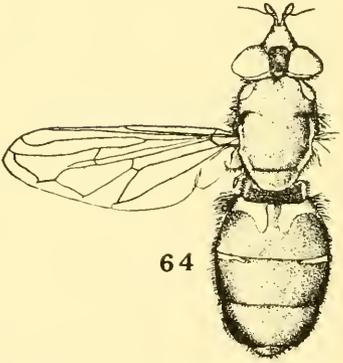
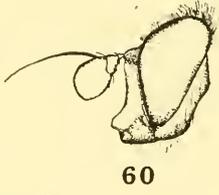
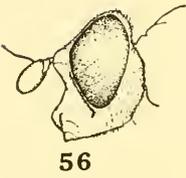
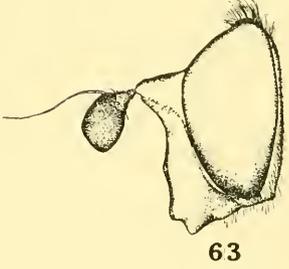
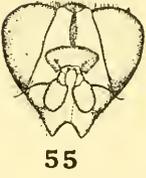
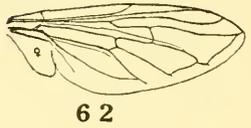
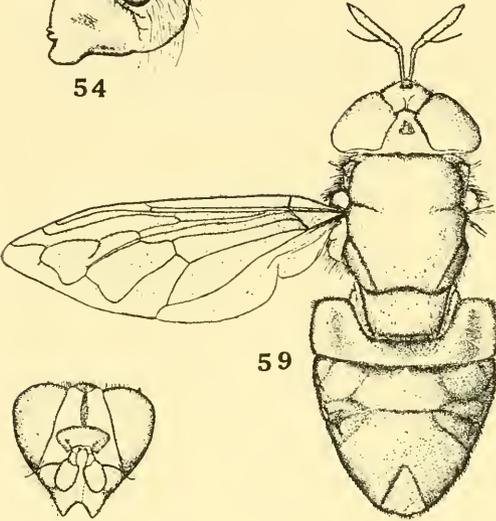
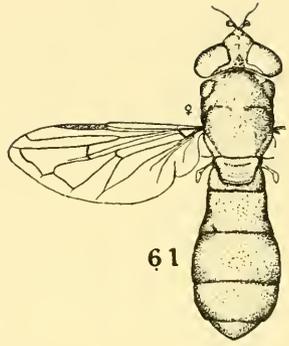
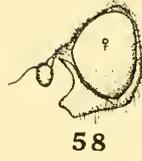
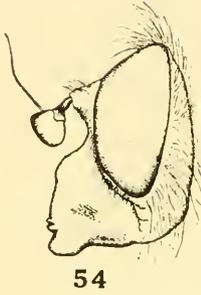
* Curran, 1930, Amer. Mus. Novit. No. 413, p. 2.
 † Curran, 1930, Amer. Mus. Novit. No. 413, p. 3.
 ‡ Curran, 1930, Amer. Mus. Novit. No. 413, p. 6.
 § Shannon, 1926, Pr. U. S. N. M., lxxix, Art. 11, p. 3.



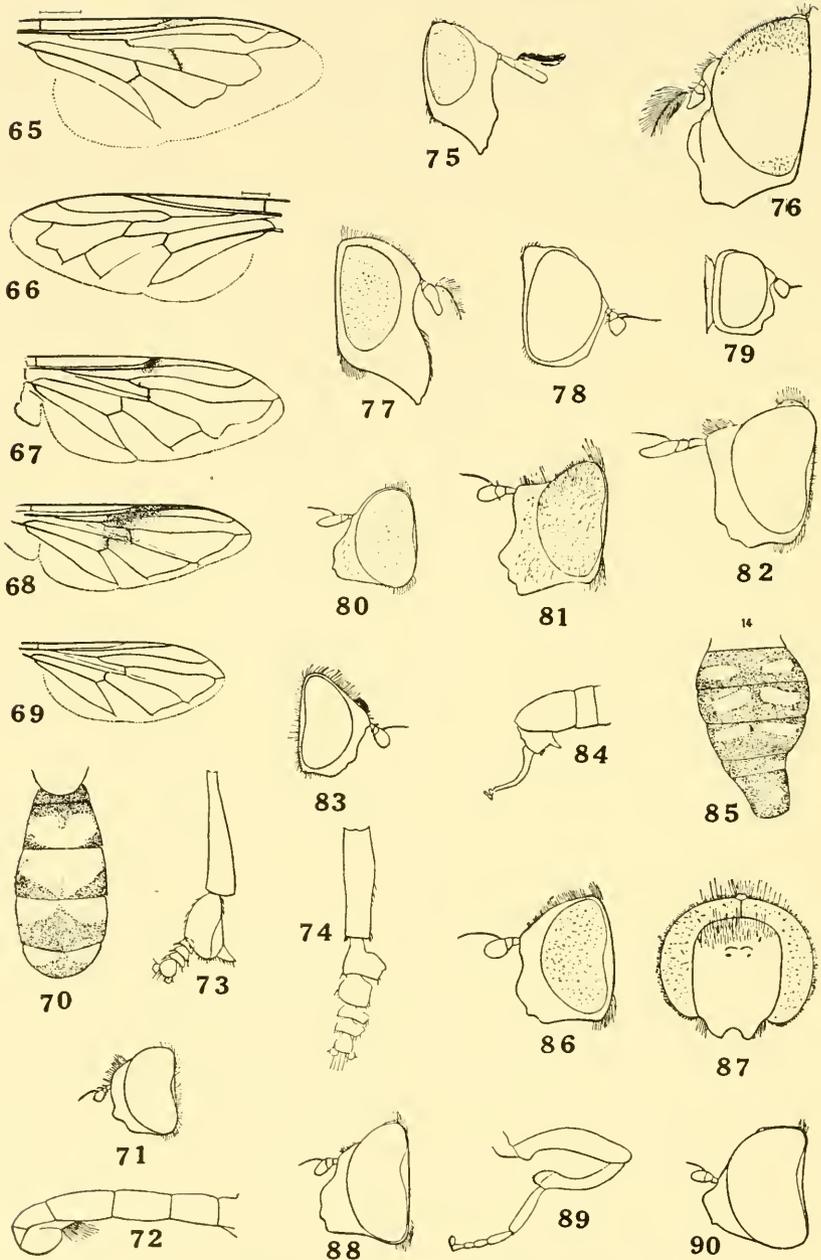
Syrphidae III.—42, *Epistrophe submarginalis*; 43, *Syrphus aberrantis*; 44, *Melanostoma confusa*; 45, *Cartosyrphus tarda*; 46, *Ceriodes ancorata*; 47, *Syrphus aberrantis*; 48, *Melanostoma luteipennis*; 49, *Cheilisia ferruginea*; 50, *Orthoneura nitidula*; 51, *Ceriodes abdominalis*; 52, *Chrysogaster ontario*; 53, *Microdon fulgens*.

- Antennæ shorter, if somewhat elongate they are decumbent and the abdomen drooping or wholly black..... 19
19. Face and scutellum more or less yellowish or translucent (if the face is entirely black the abdomen is oval and little more than twice as long as wide)..... 20
 Face wholly black, the scutellum rarely with a yellow tip..... 38
20. Abdomen drooping, never with yellow fasciæ in American species though often largely reddish; third antennal segment more than twice as long as broad; small species (7, 80).....**Paragus** Latreille
 Abdomen not normally drooping; antennæ usually short, the third segment rarely twice as long as wide, the abdomen usually with yellow spots or bands 21
21. Abdomen margined (the immediate lateral margins raised and not curving under) (43)..... 22
 Abdomen not margined, the thin side margins curving under..... 27
22. Species with long pile, the base of the abdomen broadly pale yellowish, the abdomen moderately broad; eyes pilose (68, 81).
Leucozona Schiner
 Species with shorter pile and usually with yellow markings beyond the second segment 23
23. Pleura with very bright, sharply limited yellow markings; front long and narrow**Xanthogramma** Schiner
 Pleura with diffuse yellowish markings or none; sides of mesonotum sometimes yellow 24
24. Third vein dipped into apical cell; third antennal segment long, robust, pointed; front not inflated; eyes bare; abdomen broad and flat, with wide fasciæ**Didea** Macquart
 Third vein rarely dipped into apical cell, if so the eyes are pilose or the abdominal spots are arcuate and the front more or less inflated. 25
25. Male genitalia projecting, long and cylindrical; abdomen of female broadly oval, the fifth segment half as long as the fourth (84, 85).
Eupeodes Osten Sacken
 Male genitalia normal; if the fifth segment of the female is about half as long as the fourth the abdomen has sub-parallel sides and the front is not whitish yellow immediately above the antennæ.... 26
26. Wings practically without villi; front very much swollen; apical cell much broadened on the apical half (35, 86, 87).....**Scæva** Fabricius
 Wings largely villous; front seldom much swollen; apical cell widened in only a few species (9, 10, 32, 43, 47).....***Syrphus** Fabricius
27. Pleura with sharply limited yellow markings; no yellow prescutellar spots; mesonotum without cinereous vitta; abdomen elliptical.
Xanthogramma Schiner
 Pleura with or without sharply limited yellow markings, if present the abdomen is long and narrow or the mesonotum bears a cinerous median vitta 28
28. Abdomen dark except for a pair of large, basal yellowish spots; eyes pilose**Ischyrosyrphus** Bigot
 Abdomen differently marked; eyes bare..... 29

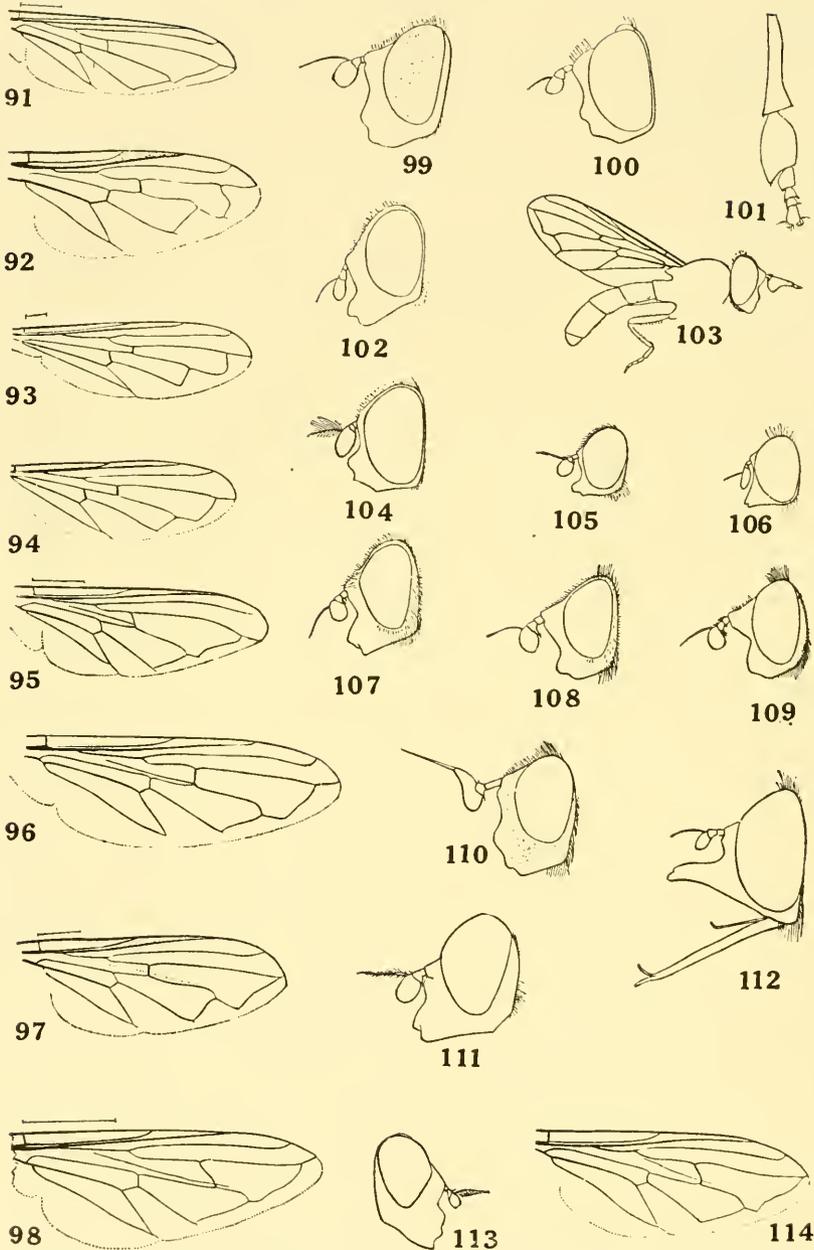
* Curran, 1930, Bull. Amer. Mus. Nat. Hist., lxi, p. 56; Fluke, 1933, Trans. Wisc. Acad. Sci., Arts & Letters, 28, pp. 63-126.



Syrphidae IV.—54, *Criorrhina caudata*; 55, *Brachyopa basilaris*, head from in front; 56, *Brachyopa basilaris*; 57, *Brachyopa nigricauda*; 58, *Chalcosyrphus depressus*; 59, *Microdon fulgens*; 60, *Cynorhina nigripes*; 61, *Chalcosyrphus depressus*; 62, *Chalcomyia aerea*; 63, *Cynorhina metcalfi*; 64, *Cynorhina pictipes*.



Syrphidæ V.—65, *Copestylum marginatum*; 66, *Citibæna*; 67, *Nausigaster punctulata*; 68, *Leucozona americanum*; 69, *Pyrophæna granditarsis*; 70, *Pyrophæna granditarsis*, abdomen; 71, *Baccha fuscipennis*; 72, *Sphærophoria cylindrica*, abdomen; 73, 74, *Pyrophæna granditarsis*, front and middle tibiae and tarsi; 75, *Copestylum marginatum*; 76, *Ornidia obesa*; 77, *Volucella bombylans*; 78, *Citibæna*; 79, *Nausigaster*; 80, *Paragus tibialis*; 81, *Leucozona americanum*; 82, *Chrysotoxum*; 83, *Doros æqualis*; 84, 85, *Eupeodes volucris*, ♂ abdomen and genitalia; 86, 87, *Scæva pyrastris*; 88, *Sphærophoria cylindrica*; 89, 90, *Toxomerus geminatus*, hind leg and head.



Syrphidae V.—91, *Cartosyrphus*; 92, *Chrysogaster nigrovittata*; 93, *Neoascia globosa*; 94, *Sphegina infuscata*; 95, *Rhingia nasica*; 96, *Hammerschmidtia ferruginea*; 97, *Brachyopa notata*; 98, *Merapioidus villosus*; 99, *Ferdinanda cressus*; 100, *Platyecheirus quadratus*; 101, *Platyecheirus peltatus*, front tibia and tarsus; 102, *Chrysogaster*; 103, *Pelecocera pergaudei*; 104, *Cartosyrphus*; 105, *Sphegina infuscata*; 106, *Neoascia globosa*; 107, *Myiolepta nigra*; 108, 109, *Chalcomyia aerea*, ♀ ♂; 110, *Merapioidus villosus*; 111, *Brachyopa notata*; 112, *Rhingia nasica*; 113, *Hammerschmidtia*; 114, *Criorrhina*.

51. Third antennal segment elongate; apical crossvein more or less recurrent (2, 3, 50).....*Orthonera* Macquart
Third antennal segment never twice as long as wide..... 52
52. Disc of abdomen opaque black, the sides shining (4, 52, 92, 102).
Chrysogaster Meigen
Disc of abdomen either wholly shining or with shining spots or bands. 53
53. Abdomen constricted basally or the third antennal segment very large 54
Abdomen broad; third antennal segment of normal size..... 57
54. Antennæ with a terminal arista on the produced upper angle (103).
Pelecocera Meigen
Antennæ with dorsal arista, the third antennal segment not produced at point of its insertion..... 55
55. Abdomen not constricted basally.....*Chamæsyrrhus* Mik
Abdomen petiolate 56
56. Third antennal segment longer than wide; arista shorter than antennæ (93, 106).....**Neoascia* Williston
Third segment at most slightly longer than wide, the arista longer than antenna (94, 105).....†*Sphagina* Meigen
57. Face wholly black in ground color..... 58
Face partly yellow in ground color..... 61
58. Hair of the thorax and abdomen scale-like and appressed.
Lepidostola Williston
Pile not scale-like, much of it erect..... 59
59. Scutellum large, subquadrate; male dichoptic..... 60
Scutellum rounded apically; male holoptic (107).....*Myiolepta* Newman
60. Mesonotum with a large, flattened rectangle posteriorly (58, 61).
Chalcosyrphus Curran
Mesonotum regularly convex (62, 108, 109).....*Chalcomyia* Williston
61. Pile mostly scale-like and closely appressed (27, 124, 125).
‡*Eumyiolepta* Shannon
Pile normal 62
62. Legs bearing distinct bristles (96, 113).....*Hammerschmidtia* Schummel
Legs without bristles..... 63
63. Epistoma produced into a long, porrect snout (95, 112)..*Rhingia* Scopoli
Epistoma not produced snout-like..... 64
64. The costal vein ends at the tip of the wing (55, 56, 57, 97, 111).
§*Brachyopa* Meigen
The costal vein ends before the tip of the wing (60, 63, 64).
¶*Cynorhina* Williston

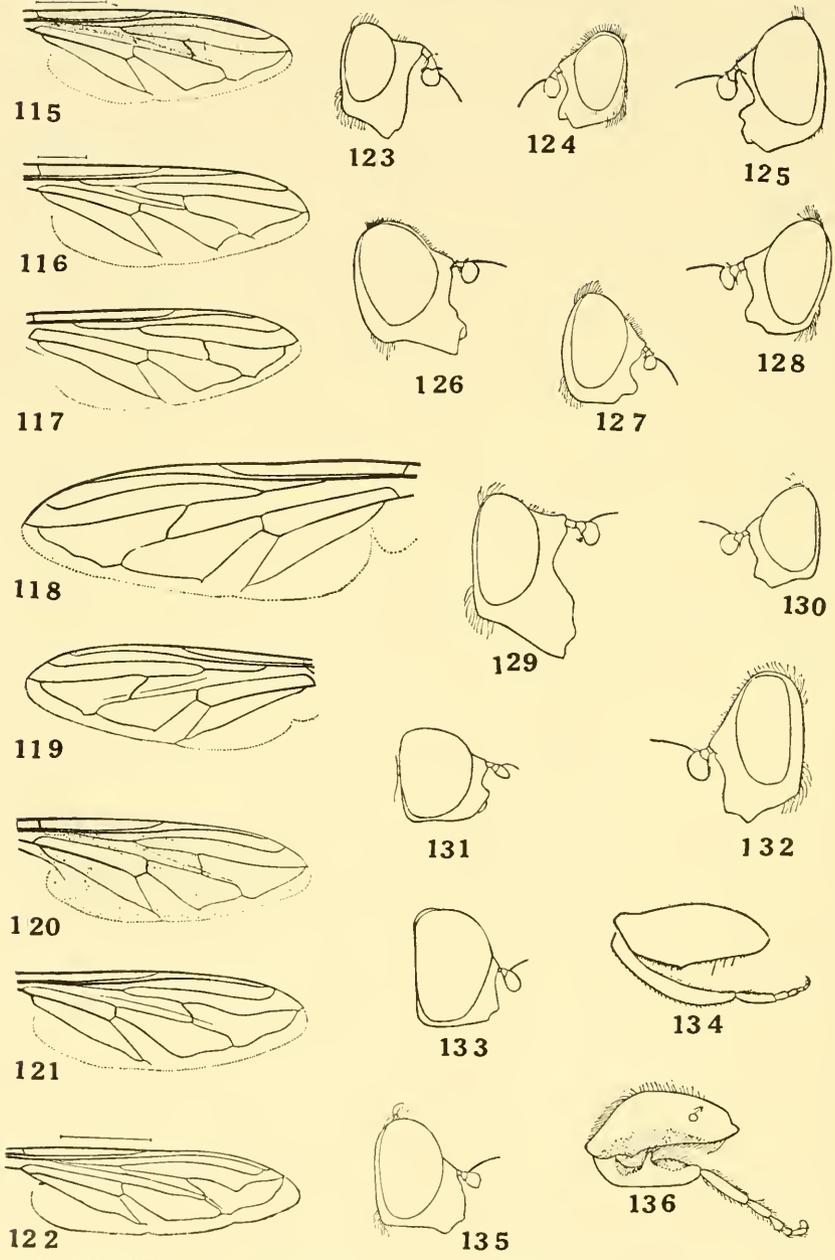
* Curran, 1925, Pr. Ent. Soc. Wash., xxvii, p. 51.

† Shannon, 1923, Bull. Brooklyn Ent. Soc., xviii, p. 19.

‡ Malloch, 1922, Ent. News, xxxiii, p. 267.

§ Curran, 1922, Ann. Ent. Soc. Amer., xv, p. 243.

¶ Curran, 1924, Can. Ent., lvi, p. 195.



Syrphidae VII.—115, *Somula decora*; 116, *Cynorhinella bella*; 117, *Crioprora cyanella*; 118, *Pocota grandis*; 119, *Chrysosomidia pulcher*; 120, *Sphecomyia pattoni*; 121, *Senogaster*; 122, *Milesia*; 123, *Somula decora*; 124, 125, *Eumyiolepta*, ♀, ♂, head; 126, *Cyniorhinella bella*; 127, *Pocota*; 128, *Chrysosomidia pulcher*; 129, *Sphecomyia pattoni*; 130, *Heliophilus pigra*; 131, *Senogaster*; 132, *Temnostoma alternans*; 133, 134, *Syritta pipiens*, head and hind leg; 135, *Tropidia quadrata*; 136, *Teuchocnemis*, hind leg.

65. Mesonotum with distinct yellow markings in addition to those on the humeri 78
 Mesonotum without distinct yellow markings, although the humeri may be yellow, sometimes partly or wholly pollinose..... 66
66. Third longitudinal vein moderately curved into the apical cell..... 83
 Third longitudinal at most slightly curved into the apical cell..... 67
67. Face produced downward; usually an indication of facial tubercle.... 68
 Face produced well forward and somewhat downward or evenly concave and not produced downward..... 72
68. Pile long and furry; flies bumble-bee-like in appearance..... 69
 Pile shorter; flies not bumble-bee-like..... 70
69. Arista placed at the tip of a conically produced third antennal segment (98, 110).....*Merapioidus* Bigot
 Arista dorsal, not situated on a prominence (54, 114).**Criorrhina* Meigen
70. Antennæ inserted on a long, conical prominence; face retreating below (115, 123).....*Somula* Macquart
 Antennæ not situated on a strong prominence, inserted lower down on the head; abdomen shorter and broader..... 71
71. Posterior femora swollen and with an apical projection below; abdomen of the male rather slender, wholly black (116, 126).
Cynorhinella Curran
 Posterior femora simple (60, 63, 64).....†*Cynorkina* Williston
72. Epistoma produced forward and downward (117, 152).
Crioprora Osten Sacken
 Epistoma not produced downward or forward beyond the antennal prominence 73
73. Bumble-bee-like flies, the pile very thick (118, 127).
Pocota St. Fargeau and Serville
 Not bumble-bee-like, the pile rather thin..... 74
74. Face tuberculate.....‡*Calliprobola* Rondani
 Face concave or carinate..... 75
75. Face carinate; posterior femora greatly swollen.....§*Planes* Rondani
 Face concave in profile..... 76
76. Pile of the scutellum thick and rather long but not concealing the ground color; head quite flat or gently concave above from anterior view; posterior femora with small tubercles below.
Brachypalpus Macquart
 Pile thinner and shorter, few of the hairs as long as the scutellum; head not quite flat above..... 77
77. Abdomen bright metallic æneous with opaque black bands and brassy or golden yellow pile; posterior femora slender and with black setæ beneath on almost the whole length; abdomen subcylindrical (Genotype, *Calliprobola crawfordi* Shannon) (119, 128).

¶*Chrysosomidia*, n. g.

* Curran, 1925, Kans. Univ. Sci. Bull., xv, p. 141.

† Curran, 1924, Can. Ent., lvi, p. 195.

‡ No North American specimens I have seen belong to this genus.

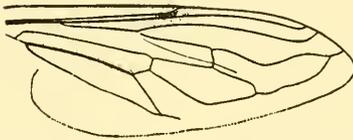
§ Shannon, 1926, Pr. U. S. N. M., lxi, Art. 9, p. 12.

¶ Shannon, 1916, (Calliprobola), Pr. Ent. Soc. Wash., xviii, p. 109.

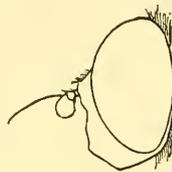
Abdomen differently colored; posterior femora usually with low ridge on the apical fourth bearing stout, short, spinose setae; head gently convex above from anterior view; abdomen not wholly pale pilose (29, 130).....**Heliophilus* Meigen

- 78. Face produced downward, longer than the front; pale mesonotal markings pollinose (120, 129).....†*Sphecomyia* Latreille
- Face not conspicuously produced, shorter than the front; if doubtful the pale mesonotal markings are of the ground color..... 79

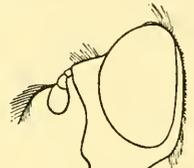
* Shannon, 1926, Proc. U. S. N. M., lxi, Art. 9, pp. 16, 26 (*Xylotomima*, *Xylota*).
 † Curran, 1932, Amer. Mus. Novit. No. 519, p. 8.



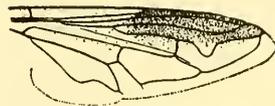
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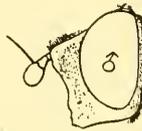
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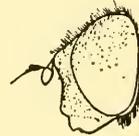
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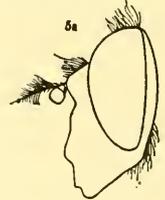
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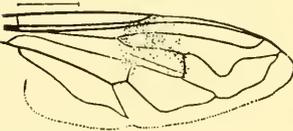
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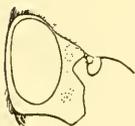
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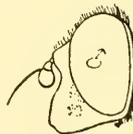
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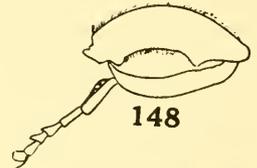
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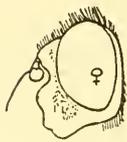
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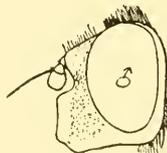
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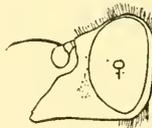
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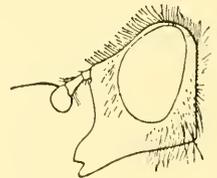
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Syrphidae VIII.—137, *Teuchoecnis lituratus*; 138, *Pterallastes thoracicus*; 139, *Sericomomyia militaris*; 140, *Mecromacrus cinctus*; 141, *Mallota sackeni*; 142, *Mecromacrus cinctus*; 143, *Eristalis transversus*; 144, *Arctophila flagrans*; 145, *Polydontomyia curvipes*; 146, *Parheliophilus laetus*; 147, *Mallota cimbiciformis*; 148, *Polydontomyia*, hind leg; 149, *Lunomyia*; 150, *Asemosyrphus mexicanum*; 151, *Lejops stipatus*; 152, *Crioprora*.

- 79. Face broadly carinate, convex in profile.....Ceriogaster Williston
Face concave or more or less tuberculate 80
- 80. Face produced somewhat downward and weakly tuberculate (60, 63,
64)*Cynorhina Williston
Face concave, not tuberculate..... 81
- 81. Abdomen with yellow pollinose fasciæ..... 82
Abdomen brassy, with opaque black fasciæ (119, 128).
†Chrysosomidia, n. g.
- 82. Posterior femora with a tooth-like projection below near the apical
endSpilomyia Meigen
Posterior femora simple (21, 22, 132).
‡Temnostoma St. Fargeau and Serville
- 83. Posterior femora with a bifid spur below; face concave, subcarinate
(121, 131).....Senogaster Macquart
Posterior femora without such spur..... 84
- 84. Posterior femora very greatly swollen, never with a triangular
preapical protuberance, though usually spinose; head almost cir-
cular, the cheeks linear (28, 133, 134) ..Syritta St. Fargeau and Serville
Posterior femora much less swollen; head not globose..... 85
- 85. Posterior femora with a small, toothlike projection below toward the
apex§ (20, 122)Milesia Latreille
Posterior femora not toothed, sometimes with a triangular process
apically 86
- 86. Posterior femora with a triangular projection apically (19, 36, 135).
¶Tropidia Meigen
Posterior femora without such process..... 87
- 87. Posterior femora strongly swollen and strongly arcuate, their tibiæ
with a median internal spur in the male (136, 137).
Teuchocnemis Osten Sacken
Posterior femora much less swollen and but little curved; tibiæ
simple; mesonotum ochraceous pollinose (138).....Pterallastes Læw
- 88. Abdomen with pale spots or fasciæ..... 89
Abdomen without pale spots or fasciæ, rarely reddish in ground color
beneath thick reddish pile on the second segment..... 90
- 89. Posterior calli with short, stout bristles; abdominal spots more or
less orbicular.....Condidea Coquillett
Posterior calli without bristles; abdomen with narrow pale fasciæ
at least beyond the second segment (16, 33, 139) ..§Sericomomyia Meigen
- 90. Face very broad and swollen; body pile almost unicolorous.
Pyritis Hunter
Face not unusually broad; pile bicolored (15, 144)....Arctophila Schiner
- 91. Marginal cell closed and petiolate..... 92
Marginal cell open..... 95

* Curran, 1924, Can. Ent. lvi, p. 195.

† Shannon, 1916, (Calliprohola), Pr. Ent. Soc. Wash., xviii, p. 109.

‡ Curran, 1930, Bull. Amer. Mus. Nat. Hist., lxi, p. 72.

§ Absent in some Oriental species.

* Shannon, 1926, Pr. U. S. N. M., lxi, Art. 9, p. 9.

¶ Curran, 1934, Amer. Mus. Novit. No. 724, p. 6.

- 92. Epistoma produced into a long, porrect snout....*Lycastirrhyncha* Bigot
Epistoma not produced..... 93
- 93. Eyes light brown with numerous small brown spots.
Lathyrphthalmus Mik
Eyes normally unicolorous..... 94
- 94. Thorax with yellow markings of short, squamose hairs (140, 142).
Meromacrus Rondani
Hair of the thorax never squamose or forming dense yellow patches
(17, 143)**Eristalis* Latreille
- 95. Posterior femora before the apex with a strongly raised, sub-triangular
ridge, the base with a distinct spur.....*Merodon* Meigen
Posterior femora variable, but never with a spur bearing triangular
plate or strong ridge..... 96
- 96. Eyes pilose 97
Eyes bare 98
- 97. Third antennal segment not longer than wide (141, 147).‡*Mallota* Meigen
Third antennal segment twice as long as wide.....*Quichuana* Knab
- 98. Mesonotum densely and evenly yellow pollinose. the ground color con-
cealed; face concave in female; with a tubercle but receding below
in the male (138).....*Pterallastes* Lœw
Mesonotum differently colored 99
- 99. Large robust species, the thorax thickly yellow or orange pilose,
rarely whitish; posterior femora swollen and arcuate in both sexes;
rather bumble-bee-like flies (141, 147)‡*Mallota* Meigen
Usually smaller and always more slender; if the posterior femora are
arcuate the tibiæ end in an apical spur.....100
- 100. Posterior tibiæ ending in a spur or triangular production, never
transverse on the ventral apex.....101
Posterior tibiæ transverse or rounded apically, never produced.....102
- 101. Large species, at least 12 mm. in length, the mesonotum at most
obscurely vittate (34, 145, 148).....*Polydontomyia* Williston
Smaller, more slender species, the mesonotum usually with two or
more cinereous or yellowish vitæ (151).....‡*Lejops* Rondani
- 102. Face entirely pollinose (146).....‡*Parhelophilus* Girschner
Face with a shining median vitta on at least the lower half.....103
- 103. Stigma simulating a crossvein.....104
Stigma at least twice as long as wide, although often paler apically,
never simulating a crossvein (18)‡*Elophilus* Meigen
- 104. Ocellar triangle extremely large in both sexes, the outer ocelli lying
very close to the eyes (150).....‡*Asemosyrphus* Bigot
Ocellar triangle smaller (149)‡*Lunomyia* Curran and Fluke

* Curran, 1930, Amer. Mus. Novit. No. 411, p. 3.
 † Curran, 1930, Bull. Amer. Mus. Nat. Hist., lxi, p. 74.
 ‡ Curran and Fluke, 1926, Trans-Wisconsin Acad. Sci., Arts & Letters, xxii, pp. 207-281.

Family Conopidæ—The Thick-headed flies

Rather thinly pilose or nearly bare, elongate flies of moderate size.

Head broad, the front broad in both sexes; ocelli present or absent. Antennæ with three segments, the third bearing a dorsal arista or terminal style. Oral opening large, the proboscis long and slender, often geniculate. Abdomen often constricted basally, the genitalia of both sexes conspicuous, often large or greatly elongated in the females. Anal cell closed, the first basal cell always very long, the second moderately long; apical cell closed or much narrowed. Above the antennæ an inflatable ptilinum.

The Conopids are commonly found about flowers and are sluggish in flight. They occur from spring to autumn but are much more common during the spring and early summer. The species of *Stylogaster* are rapid in flight, the flies being great hoverers. I have found them in the tropics in rather large numbers hovering over ant armies where they usually remain a few inches above the ground, suddenly disappearing, only to reappear in another patch of sunlight. In the north I have found them only about flowers of the Labiateæ and have observed them hovering as they sucked the nectar. Many of the species resemble Hymenoptera.

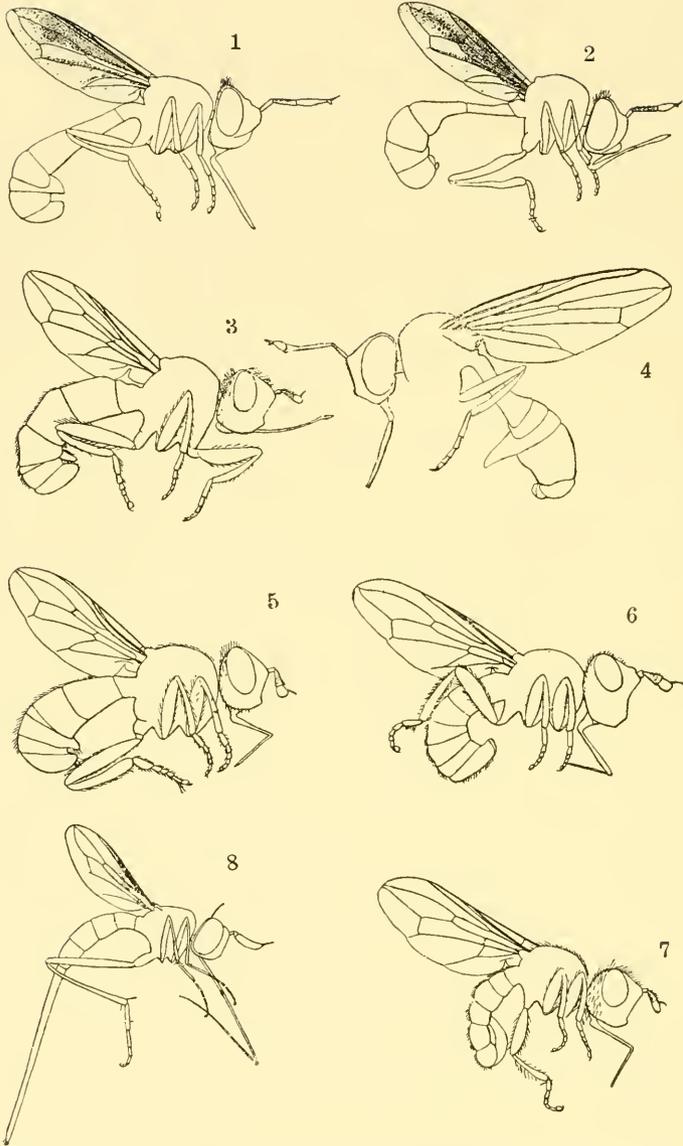
The members of this family are parasitic, mostly upon bees and wasps, oviposition usually occurring during flight. There are also records of parasitism on Orthoptera and the species of *Stylogaster* are in some way connected with ants but the exact relationship is unknown.

The generic and specific limits in the family are, for the most part, not sharply drawn, and this is especially true in the case of *Conops* and *Physocephala*. There have been a number of papers published dealing with the family in whole or in part; the most important of these is referred to in the footnote.*

KEY TO GENERA

- | | |
|--|------------------------------|
| 1. Antennæ with a terminal style..... | 2 |
| Antennæ with a dorsal or subdorsal arista..... | 4 |
| 2. Face with deep lateral grooves..... | 3 |
| Face without lateral grooves, the median carina strong; ocelli vestigial
(4)..... | <i>Tropidomyia</i> Williston |

* Van Duzee, 1927, Proc. Calif. Acad. Sci., xvi, pp. 573-604.



Conopidae.—1, *Conops xanthopareus*; 2, *Physocephala furcillata*; 3, *Zodion fulvifrons*; 4, *Tropidomyia bimaculata*; 5, *Oecenya modesta*; 6, *Myopa clausa*; 7, *Dalmannia picta*; 8, *Stylogaster neglecta*.

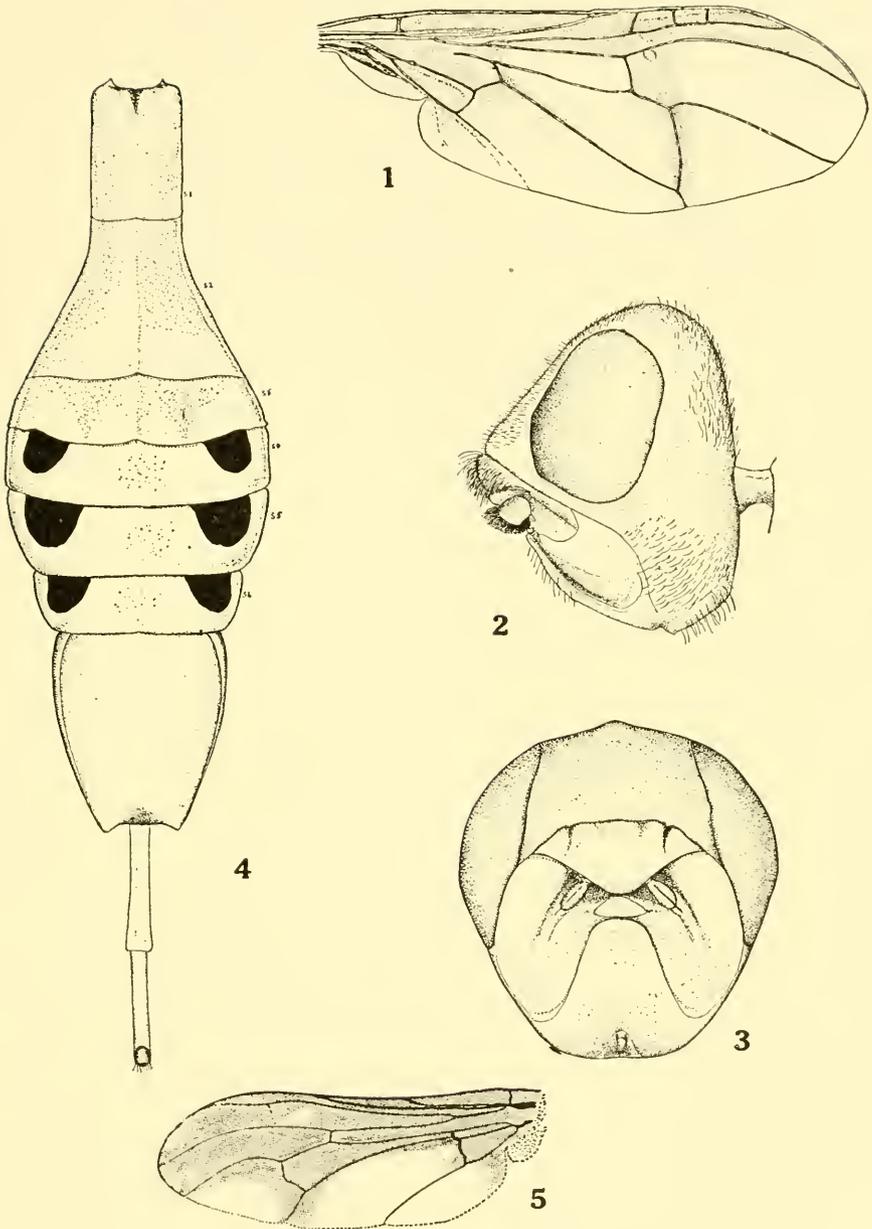
Family Pyrgotidæ

Elongate flies of moderate size, the ocelli absent in the North American genera, present only in *Teretrura* Bigot of the American forms; wings long, the legs somewhat elongate.

Head large, the front more or less produced, without frontal bristles; ocelli absent (present in only one American genus); cheeks wide; proboscis thick, the labellæ well developed; palpi large, flattened, or the proboscis narrow and short without labellæ and the palpi narrow; antennæ short to moderately long, the second segment without a dorsal excision, the third usually larger than the second, rarely minute. Legs moderately long. Wings long; auxiliary vein long, ending free or in the costa; apical cell widely open, not narrowed apically; anal cell usually triangular apically. Abdomen long, sometimes clavate in the males; female genitalia large, more or less cylindrical.

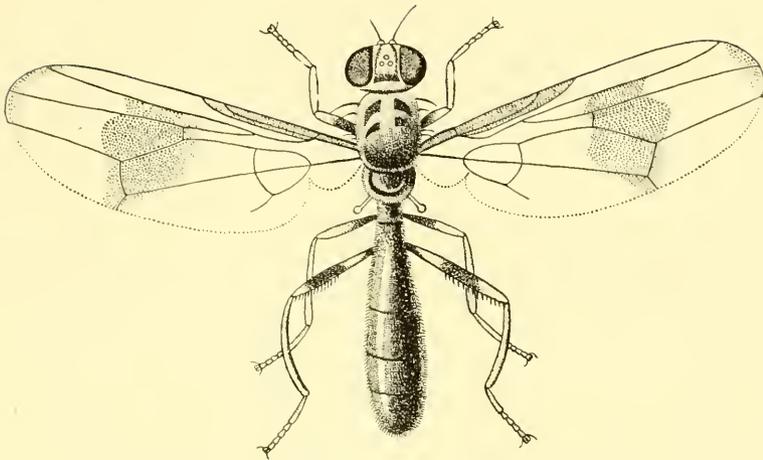
Species of the genus *Pyrgota* are parasitic in the larval stage on June beetles (Scarabæidæ) and the flies are sometimes common in the vicinity of badly infested fields. I suspect that *Pyrgotella chagnoni* Johnson is parasitic on species of *Dichelonyx* but my suspicion is based merely upon the fact that I have observed this species commonly in an open woods where the adult beetles were very common. The flies apparently are most active on dark days, in the evening or at night and they frequently are attracted to light. They are nocturnal and *P. undata* Wiedemann has been observed ovipositing on adult June beetles during flight. The flies select the soft part of the abdomen beneath the opened elytra in order to lay their eggs and the beetles have been observed on the ground making a loud noise as they struggled to escape the fly.

The exact limits of this family have not been definitely determined, and it is not certain that the species possessing ocelli should be retained in the family. Nothing of a definite nature is known of the immature stages of any of the American genera other than *Pyrgota*. There are two North American genera and three from South America that have been assigned to the family.



Pyrgotidæ.—Figures 1-4, *Tauroscypson guiana*; 5, *Pyrgota undata*.

Family Otitidæ—The Pictured-wing Flies



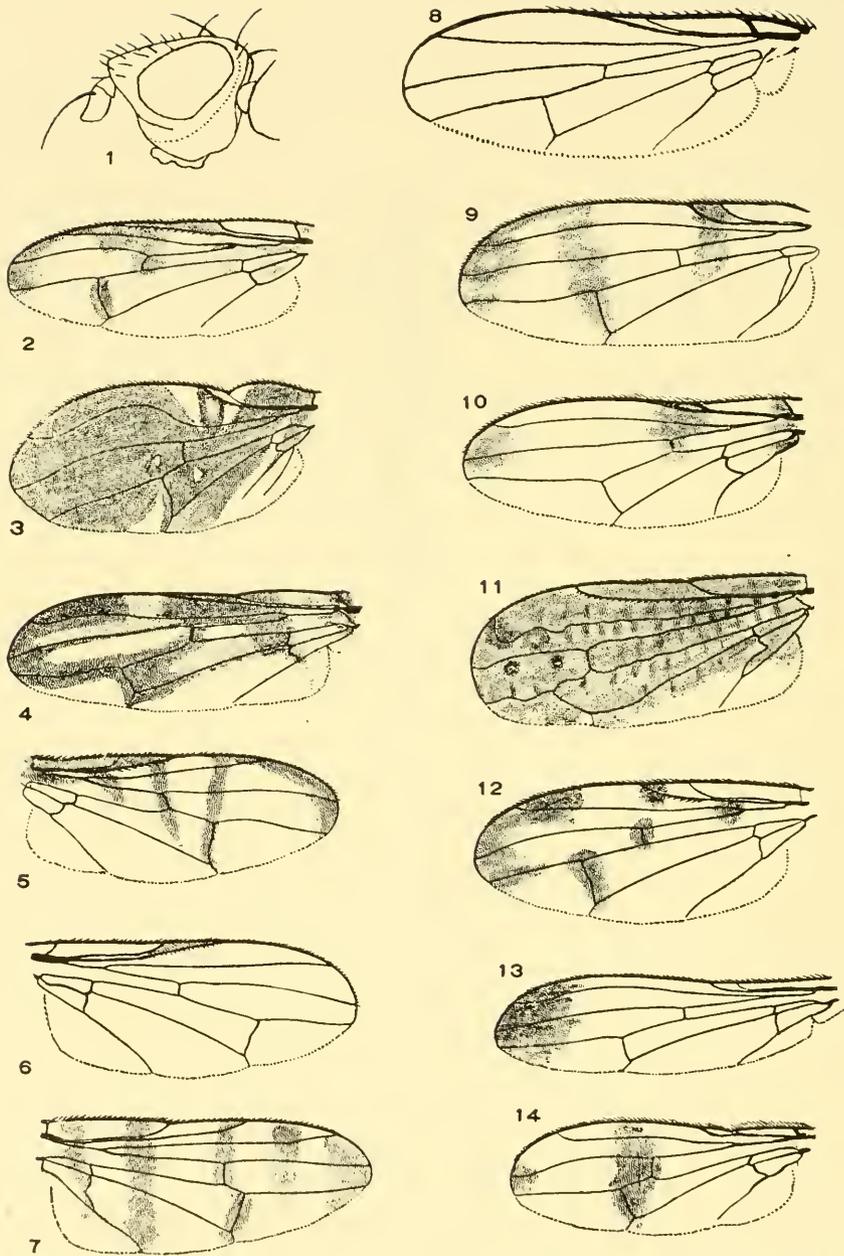
Paneryma elongata.

Rather small to moderately large flies, the wings usually marked with brown, black or yellowish.

Eyes separated in both sexes; frontals usually limited to the upper part; face variable, the oral vibrissæ always absent; clypeus usually well developed; proboscis short and stout; palpi large. Abdomen with five or six segments, the basal two more or less coalescent; male with long, curled penis, the female with a flattened, three segmented ovipositor. Legs short and stout or moderately long, the preapical tibial bristle present or absent. Wing venation usually complete, the anal cell absent in one genus; auxiliary vein separated from the first vein though often approximated to it, second basal and anal cells of moderate size.

The adults are usually found in moist places and many of the species are very common. This family is cosmopolitan but the species are most numerous in the tropics, particularly in South and Central America. Several of the species have the head strongly produced laterally and one fairly common species of *Richardia* has the eyes situated on long stalks, but this is a male character only.

Little is known about the immature stages although the larvæ of *Tritoxa* are said to damage onions and others have been reared from decaying plant products.



Otitidae I.—1, *Macrostenomyia*; 2, *Senopterina*; 3, *Delphinia picta*; 4, *Idana*; 5, *Rivellia*; 6, *Tetanops*; 7, *Pseudotephritis*; 8, *Psairoptera macrocephala*; 9, *Chatopsis*; 10, *Coilometopia*; 11, *Pterocalla*; 12, *Melieria*; 13, *Eumetopiella*; 14, *Richardia*.

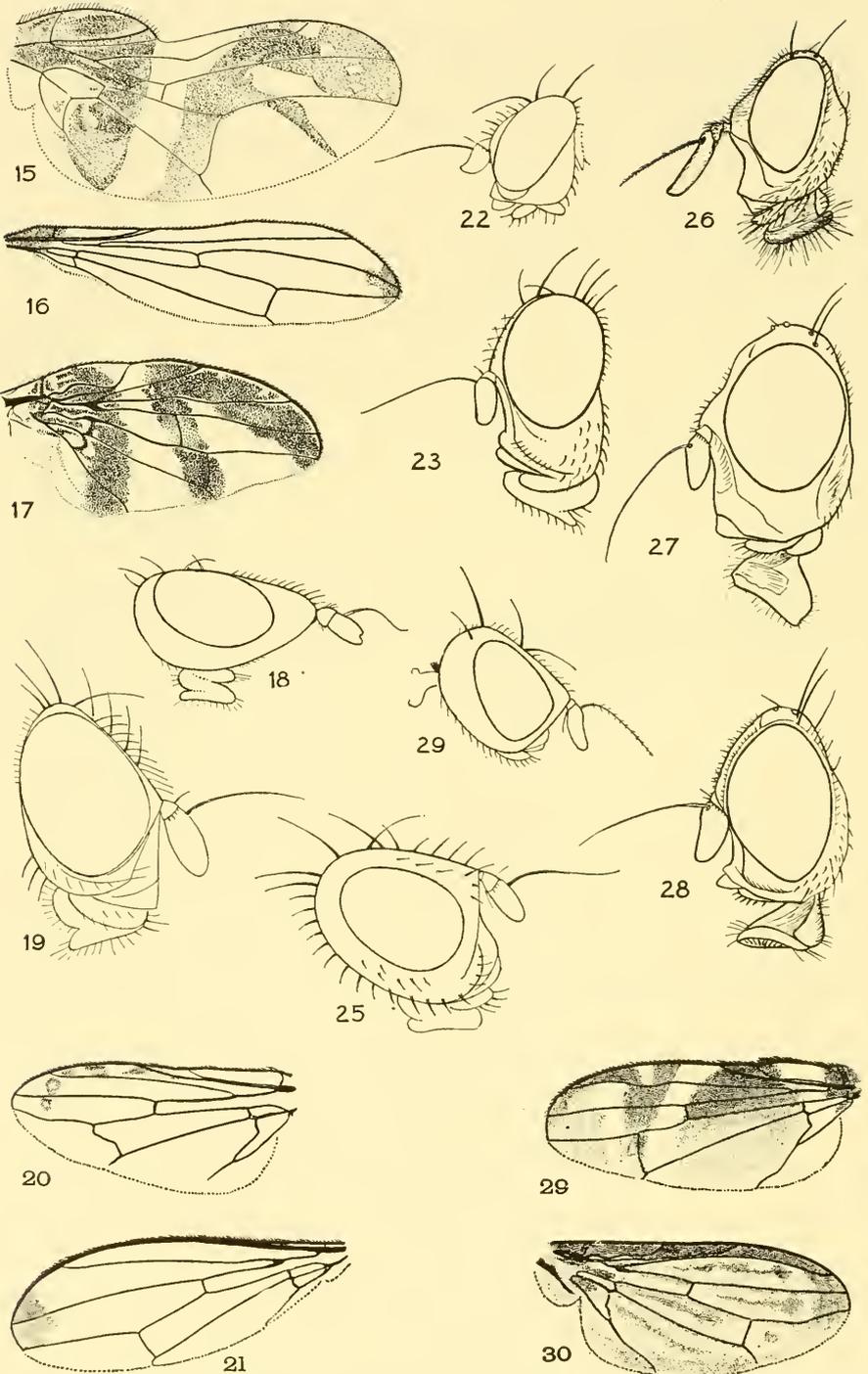
In the following key I have not followed the usual practice of recognizing the subfamilies, which Hendel has raised to family rank, for the very good reason that I do not believe the characters used are of much importance. The subfamily "Ortalinæ" (the name *Ortalis* is preoccupied in Ornithology and is not available) is distinguished by the presence of a propleural bristle, yet this is present, though less developed, in the Pterocallinæ, which is distinguished by its long stigmal cell, a character which is also subject to variation. As in the Trupaneidæ several of the genera in this family have been based upon wing pattern. The characters at present in use are undoubtedly fairly stable but some of the generic characters are admittedly weak inasmuch as the differences in venation might easily be connected by the discovery of new forms. Hendel has published several papers dealing with the family and has treated all but the "Ortalinæ" in *Genera Insectorum* (fascicles 96, 106, 113, 157).

The genus *Otitus* was established by Latreille in 1804 (*Nouv. Diet. d'Hist. Nat.*, xxiv, p. 196) and not in 1805 as given in catalogues. The type named was *musca porcus*, credited to Bose, but this species is the same as *formosa* Panzer. *Platystomidæ* cannot be used for the family name as *Platystoma* is preoccupied in Mollusca.

KEY TO GENERA*

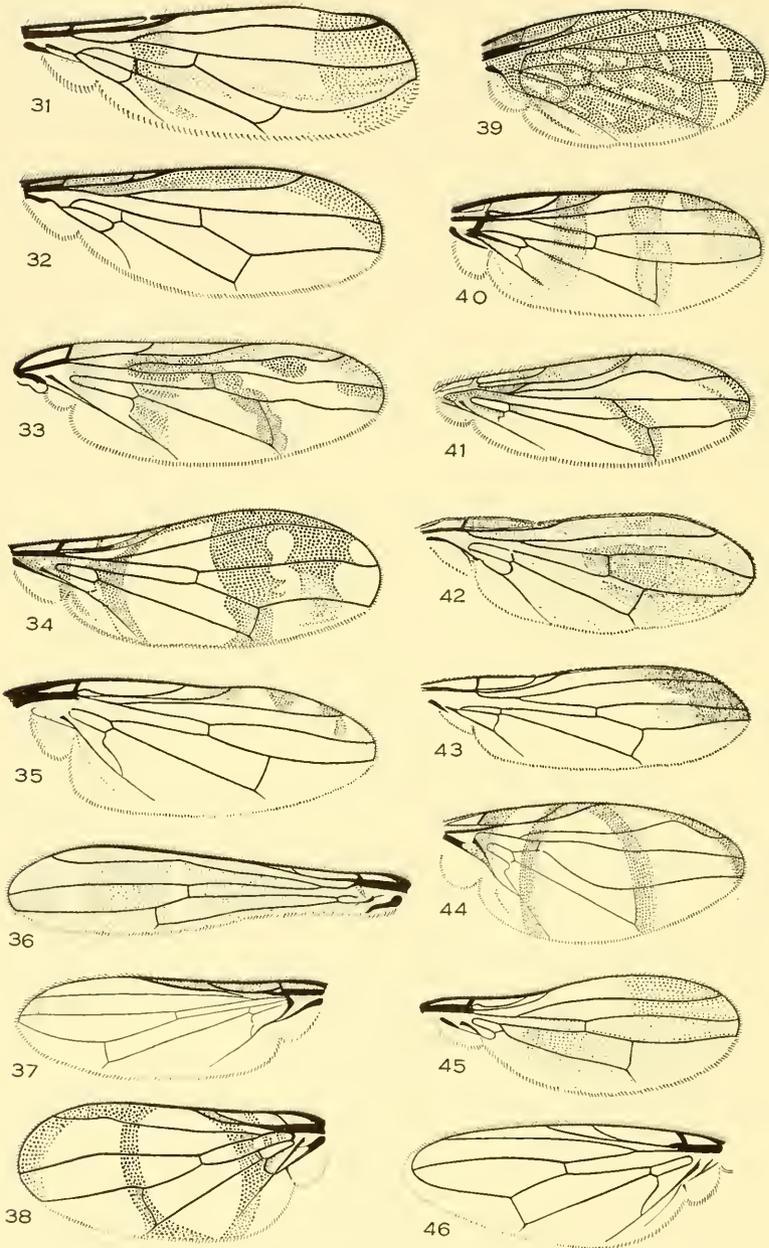
- 1. First vein bare 2
 First vein with dorsal setulæ at least on the apical third..... 34
- 2. Costa greatly weakened or broken at end of the auxiliary vein (*Richardinæ*) 3
 Costa not weakened or broken (*Ulidinæ*)..... 17
- 3. Posterior femora with short spines below..... 5
 Femora without spines below..... 4
- 4. Head about twice as long as high (56).....**Coniceps** Lœw
 Head not as long as high (38, 92).....**Epiplatea** Lœw
- 5. Posterior femora swollen, much larger than the others; eyes sometimes stalked (14).....**Richardia** Desvoidy
 Posterior femora not conspicuously swollen..... 6
- 6. Anal vein reaching the wing margin, at least as a fold..... 9
 Anal vein not nearly reaching the wing margin..... 7
- 7. Occiput very strongly narrowed at the upper third (80, 97).
Odontomera Macquart
 Occiput regular in outline..... 8

* *Pareuxesta* Coquillett is omitted.



Otitidæ 11.—15, *Ostracocelia mirabilis*; 16, *Myrmecothea*; 17, *Dyscrasis hendeli*; 18, *Eumetopiella rufipes*; 19, *Acrosticta foveolata*; 20, *Cedopa*; 21, *Macrostenomyia*; 22, *Eumecomyia gracilis*; 23, *Paragorgopsis maculata*; 24, *Sepsisoma sepsioides*; 25, *Steneretma*; 26, *Rivellia*; 27, *Chrysomyza*; 28, *Xanthacrona bipustulata*; 29, *Euphara*; 30, *Notogramma*.

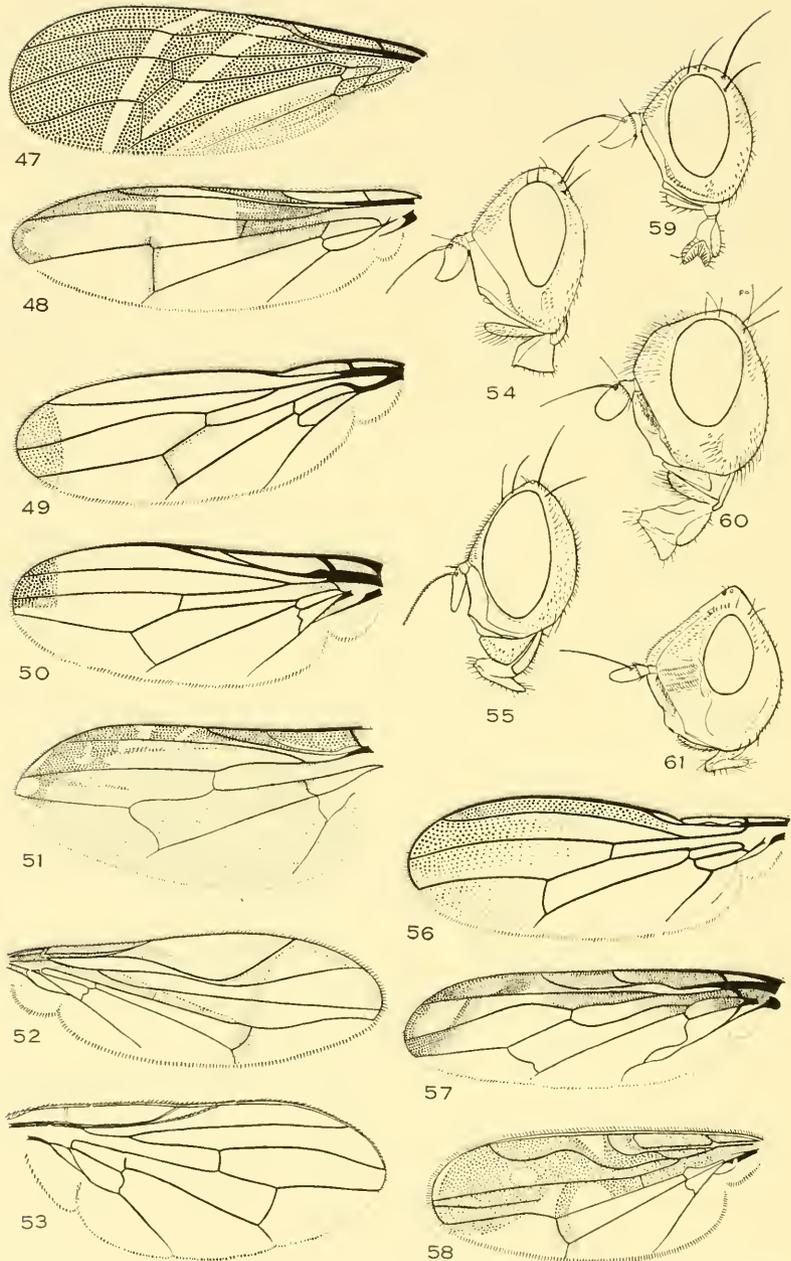
8. Occiput, from lateral view, strongly convex above the neck (24).
Sepsisoma Johnson
 Occiput flat or slightly concave above the neck (1, 21).
Macrostenomyia Hendel
9. Anterior crossvein situated farther from the posterior crossvein than the length of the latter..... 10
 Crossveins situated closer to each other than the length of the posterior crossvein (100)Hemixantha Læw
10. Abdomen with almost parallel sides or coarctate basally..... 11
 Abdomen tapering to the base..... 13
11. Anterior crossvein situated before the middle of the discal cell (31, 68).
Setellida Hendel
 Anterior crossvein situated beyond the middle of the discal cell..... 12
12. Anterior femora without spines beneath (78, 96).Neoidiotypa Osten Sacken
 All the femora with spines beneath.....Paneryma Wulp
13. First antennal segment short..... 14
 First antennal segment as long as the second (49, 93)..Pœcilomyia Hendel
14. Anterior crossvein situated at or before the middle of the discal cell;
 front concave above from anterior view (10, 73).Coilometopia Macquart
 Anterior crossvein situated well beyond the middle of the discal cell.. 15
15. Two pairs of scutellars..... 16
 Only one pair of scutellars (63, 76, 98, 107).....Melanoloma Læw
16. Front much wider than either eye (42, 105).....Zetekomyia, n. g.
 Front narrower than either eye.....Melanolomina, n. g.
17. Antennæ widely separated, situated in deep grooves, the face strongly convex in profile (50).....Ulidia Meigen
 Antennæ not situated in deep grooves or the face not strongly convex.. 18
18. Anal vein absent or not extending beyond the anal cell..... 19
 Anal vein extending well beyond the anal cell..... 20
19. Anal cell absent, the wings very narrow (25, 36).....Steneretma Læw
 Anal cell present (22, 45).....Eumecosomyia Hendel
20. Front with large rather deep pits or with strong transverse ridges or grooves 21
 Front normal, sometimes with four longitudinal grooves above..... 22
21. Auxiliary vein forming a rather acute angle with the costa (19, 37).
Acrosticta Læw
 Auxiliary vein forming an obtuse angle with the costa (30, 89).
Notogramma Læw
22. Antennæ as long as the head, the third segment four times as long as wide (51, 74).....Stictomyia Bigot
 Antennæ much shorter, the third segment never three times as long as wide 23
23. Face convex in the middle in profile..... 24
 Face concave in profile..... 25



Otitidae III.—31, *Setellida cœrulescens*; 32, *Setellia costalis*; 33, *Myennis*; 34, *Automola automaria*; 35, *Parædopa punctigera*; 36, *Steneretma*; 37, *Acrosticta foveolata*; 38, *Epiplatea arcuata*; 39, *Amphicnephes pullus*; 40, *Pareuxesta latifasciata*; 41, *Xanthacrona bipustulata*; 42, *Zetekomyia banksi*; 43, *Stenomyia*; 44, *Axiologina ferrum-equinum*; 45, *Eumecosomyia gracilis*; 46, *Chrysomya ænea*.

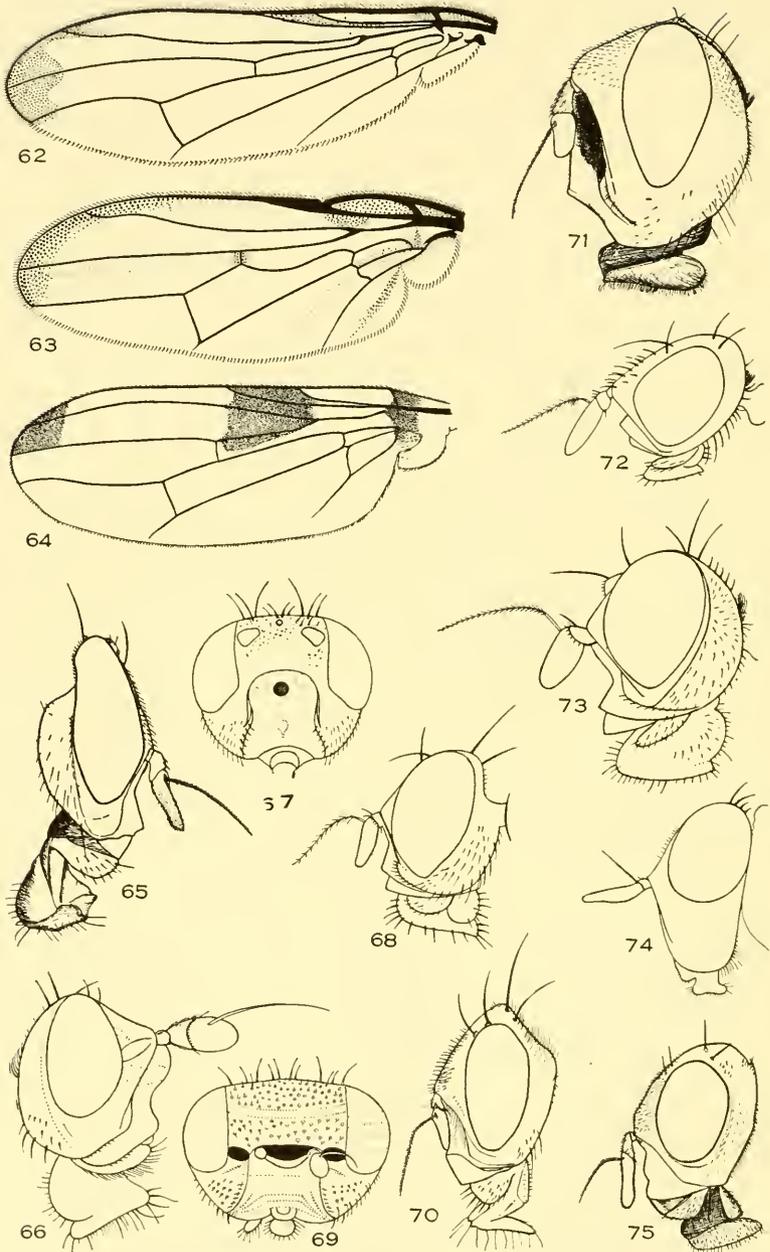
- 24. Eyes conspicuously higher than long, the face gently concave above
 (35, 67) *Parœdopa* Coquillett
 Eyes about as long as high, the face not concave above (20, 69).
Edopa Lœw
- 25. Head not or scarcely longer than high..... 26
 Head nearly twice as long as high (13, 18)..... *Eumetopiella* Hendel
- 26. Third antennal segment with the apex rounded above..... 27
 Third antennal segment with the apex angulate above..... 32
- 27. Anterior crossvein situated near or beyond the middle of the discal
 cell 28
 Anterior crossvein situated near the basal sixth of the discal cell
 (44, 82)..... *Axiologina* Hendel
- 28. Mesopleura bare; two sternopleurals (84, 102)..... *Seioptera* Kirby
 Mesopleura haired; one sternopleural..... 29
- 29. Frontal vitta with hairs or bristles..... 30
 Frontal vitta bare (27, 46)..... **Chryso-myza* Fallén
- 30. Prescutellar acrosticals absent *Zacompsia* Coquillett
 Prescutellar acrosticals present..... 31
- 31. Bristles arising from black spots (29)..... *Euphara* Lœw
 Frontals not arising from conspicuous black spots (64, 85). †*Euxesta* Lœw
- 32. Frontal vitta with at most two pairs of cruciate bristles or the face
 strongly receding..... 33
 Frontal vitta with hairs or several bristles (64, 85)..... *Euxesta* Lœw
- 33. Face strongly receding (43, 104)..... *Stenomymia* Lœw
 Face perpendicular below (9, 83)..... *Chætopsis* Lœw
- 34. Costa fractured or greatly weakened at the end of the auxiliary vein.. 35
 Costa entire 36
- 35. Abdomen petiolate (32, 72)..... *Setellia* Desvoidy
 Abdomen oval, not narrowed sub-basally..... *Epiplatea* Lœw
- 36. Propleural bristle weak or absent..... 37
 Propleural bristle strong..... 59
- 37. Three supra-alar bristles..... 38
 Four supra-alar bristles..... Family Tanypezidæ
- 38. Subcostal (stigmatal) cell usually extremely large; antennal grooves
 absent (*Pterocallinæ*) 39
 Subcostal cell usually normal; antennal grooves well developed, often
 deep (*Platystominæ* auct.)..... 48
- 39. Posterior crossvein more or less recurrent, never forming a sharp
 angle with the fourth vein..... 40
 Posterior crossvein not recurrent, forming less than a right angle with
 the fourth vein..... 43
- 40. Anterior crossvein situated beyond the middle of the discal cell..... 41
 Anterior crossvein situated before the middle of the discal cell (58).
Megalæmyia Hendel

* Hendel, 1909, Zool. Anzeiger, xxxiv, pp. 612-622.
 † Hendel, 1909, Ann. Mus. Nat. Hung., ix, p. 151.



Otitidae IV.—47, *Tritoxa flexa*; 48, *Himeroessa pretiosa*; 49, *Pecilomyia longicornis*; 50, *Ulidia apicalis*; 51, *Stictomyia punctata*; 52, *Dasymetopa stigma*; 53, *Califortalis hirsutifrons*; 54, *Ortalmomyia aldrichi*; 55, *Delphinia*; 56, *Coniceps niger*; 57, *Diacrita costatis*; 58, *Megalæmyia*; 59, *Melieria similis*; 60, *Califortalis hirsutifrons*; 61, *Tetanops luridipennis*.

41. Tip of the anal cell extending beyond the apex of the second basal cell 42
 Tip of the anal cell not produced beyond the apex of the second basal cell (28, 41).....*Xanthacrona* Wulp
42. Five pairs of dorsocentrals and acrosticals (17, 90)....*Dyserasis* Aldrich
 Two pairs of dorsocentrals (33).....*Myennis* Desvoidy
43. Triangle of the anal cell almost as long as the basal section..... 44
 Triangle much shorter than the basal part..... 45
44. Wings with parallel sides (11, 108).....*Pterocalla* Rondani
 Wings widest sub-basally (99, 106).....*Callopietromyia* Hendel
45. Anal cell convex apically, sometimes transverse on the posterior third, but never with a produced angle (23, 101)....*Paragorgopsis* Giglio-Tos
 Anal cell at least somewhat produced posteriorly..... 46
46. Second vein almost straight..... 47
 Second vein strongly sinuous apically (91, 103)..*Pseudopterocalla* Hendel
47. Anterior crossvein situated at or before the middle of the discal cell (52, 87).....*Dasymetopa* Lœw
 Anterior crossvein situated beyond the middle of the discal cell (7, 109)*Pseudotephritis* Johnson
48. Occiput very broad and convex from lateral view..... 49
 Occiput narrow, usually flattened..... 52
49. Without sternopleurals (16, 75).....*Myrmecothea* Hendel
 With one sternopleural..... 50
50. Posterior crossvein situated more than its own length beyond the anterior crossvein (62, 79).....*Myrmecomomya* Desvoidy
 Posterior crossvein situated less than its length beyond the anterior crossvein 51
51. Costal cell wide, convex anteriorly (3, 55)*Delphinia* Desvoidy
 Costal cell narrow, its anterior edge straight (47, 70).....*Tritoxa* Lœw
52. Abdomen somewhat laterally compressed; one pair of weak frontal bristles above; third antennal segment elongate; arista bare (2).
Senopterina Macquart
 Abdomen cylindrical or flattened, if slender the arista is plumose, the antennæ are short or there are two pairs of frontals..... 53
53. Abdomen elongate, more or less cylindrical basally..... 55
 Abdomen short and rather flattened..... 54
54. Costal cell widened, anal cell angled posteriorly (15).
Ostracocœlia Giglio-Tos
 Costal cell normal; anal cell rounded posteriorly (39, 65).
Amphicnephes Lœw
55. Sternopleural bristle absent..... 57
 Sternopleural bristle present..... 56
56. Anal cell rounded apically (4, 71).....*Idana* Lœw
 Anal cell angulate posteriorly (57, 66).....*Diacrita* Gerstæcker



Otitidae V.—62, *Myrmecomya*; 63, *Melanoloma affinis*; 64, *Euxesta mitis*; 65, *Amphicnephes*; 66, *Diacrita costalis*; 67, *Parædopa punctigera*; 68, *Setellida cærulescens*; 69, *Cedopa*; 70, *Tritoxa incurva*; 71, *Idana*; 72, *Setellia*; 73, *Coilometopia*; 74, *Stictomyia*; 75, *Myrmecothea*.

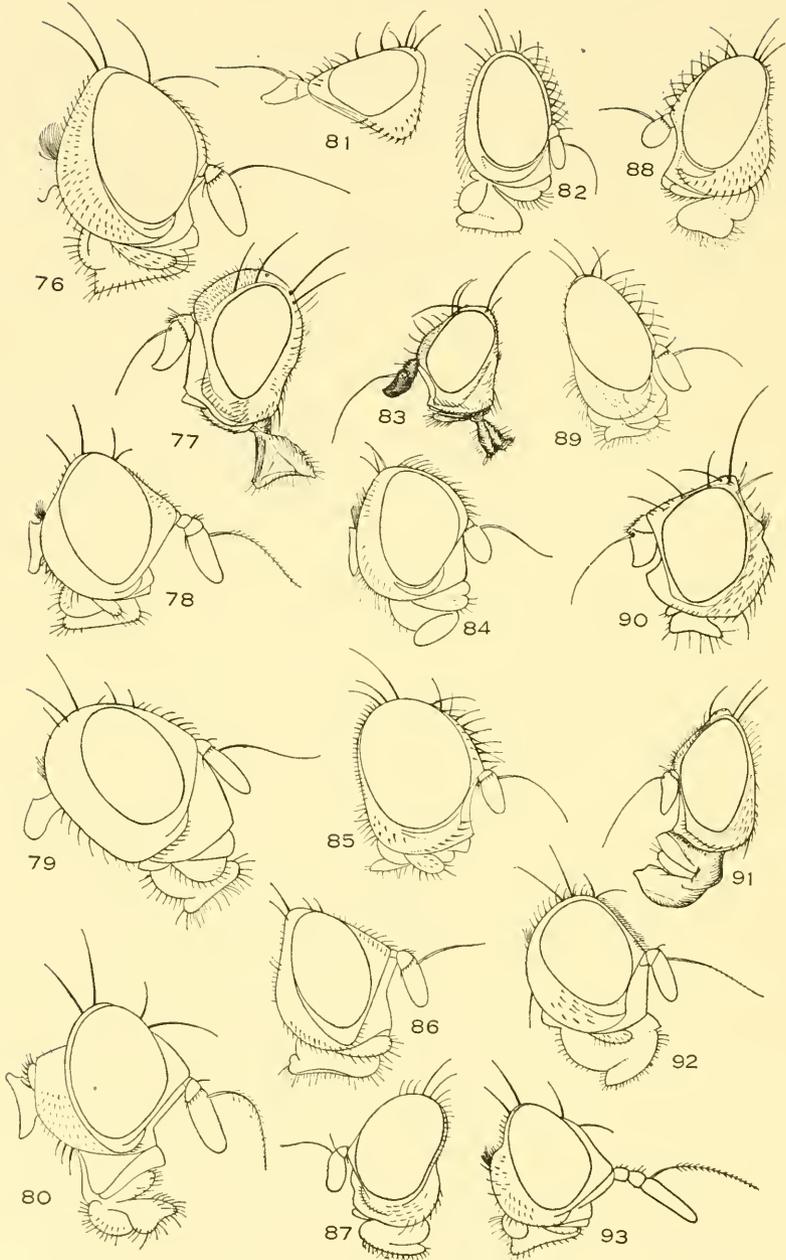
57. Discal cell conspicuously widened before the anterior crossvein (5, 26).
Rivellia Desvoidy
 Discal cell not conspicuously widened, rarely widest at the middle..... 58
58. Anterior crossvein oblique, at the middle of the discal cell (48, 86).
Himeroëssa Lœw
 Anterior crossvein transverse, well beyond the middle of the discal
 cellAcrostictella Hendel
59. Face sharply carinate..... 60
 Face not sharply carinate..... 62
60. Third antennal segment angulate above or elongate..... 61
 Third antennal segment orbicular.....Tetropismenus Lœw
61. Third antennal segment angulate at upper apex.....Tephronota Lœw
 Third segment elongate.....Hiatus Cresson
62. Mesonotum with presutural bristles (12, 59).....Melieria Desvoidy
 Mesonotum without presutural bristles..... 63
63. Front widening anteriorly..... 64
 Front narrowed anteriorly (34).....Automola Lœw
64. Three or four pairs of scutellar bristles; postocellars long and fine;
 hair of front long and rather abundant (53, 60).....Califortalis, n. g.
 Two pairs of scutellars; postocellars short; hair of front short, sparse
 and rather coarse..... 65
65. Verticals long and strong; cheeks much narrower than the eye-height
 (Ortalis auct) 66
 Verticals short; cheeks almost or quite as wide as the eye-height
 (6, 61).....Tetanops Fallén
66. Two pairs of well developed frontals; lunule haired (77, 95).
Ceratoxys Rondani
 Only one pair of well developed frontals; lunule bare (54, 94).
Ortalitymia, n. g.

Melanolomina, new genus

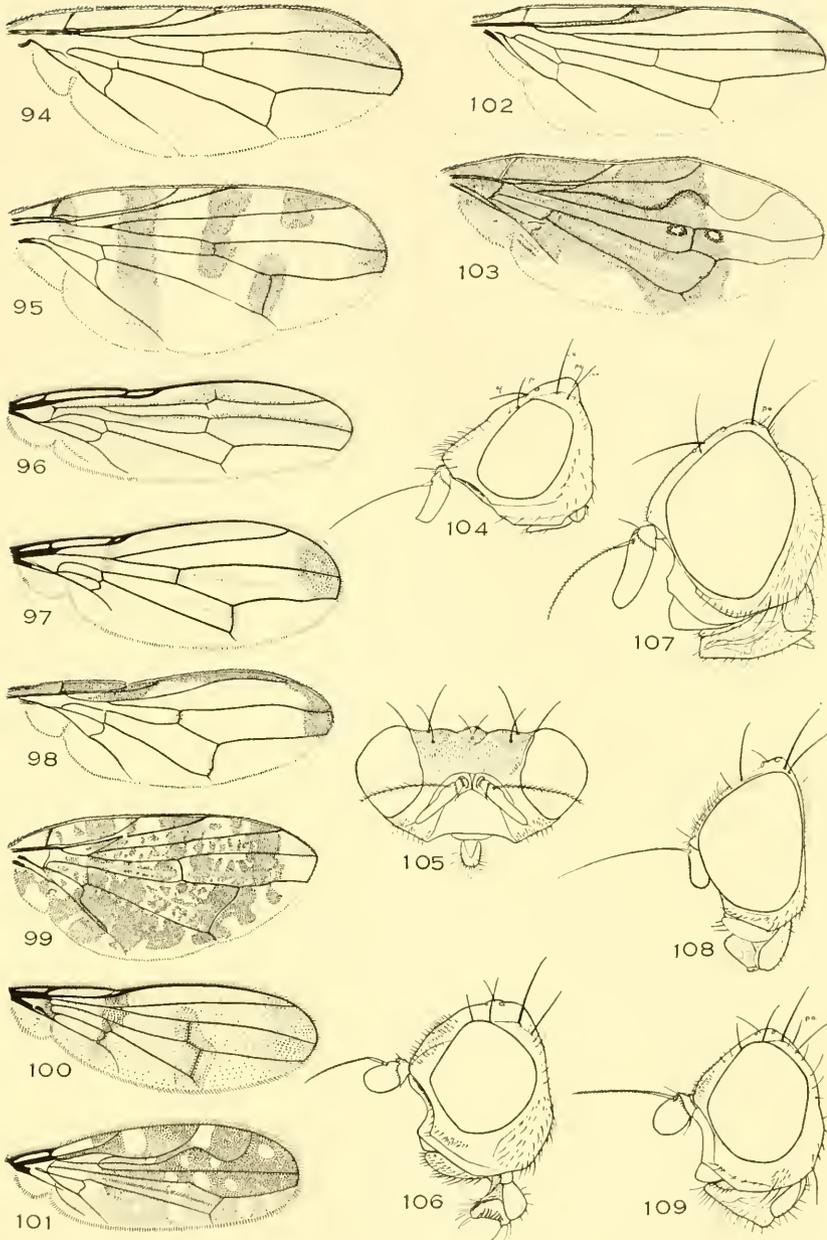
Differs from *Melanoloma* Loew in possessing two pairs of scutellar bristles. In the two species before me the mesonotum is more or less reddish and not metallic. Genotype:—*Odontomera varians* Schiner.

Zetekomyia, new genus

Differs from *Melanolomina* in having the front more than twice as wide as the eyes (from dorsal view) and a somewhat more elongate and more distinctly clavate abdomen. The head bears only four pairs of bristles: a pair of frontals, pair of ocellars, situated behind the anterior ocellus, and inner and outer verticals; hair very short; antennæ sepa-



Otitidae VI.—76, *Melanoloma affinis*; 77, *Ceratoxys latiuscula*; 78, *Neoidiotypa appendiculata*; 79, *Myrmecomya*; 80, *Odontomera nitens*; 81, *Acrometopia* (Chamæmyidæ); 82, *Axiologina ferrum-equinum*; 83, *Chætopsis ænea*; 84, *Seioptera vibrans*; 85, *Euxesta annone*; 86, *Himeroëssa pretiosa*; 87, *Dasymetopa*; 88, *Pareuxesta latifasciata*; 89, *Notogramma stigma*; 90, *Dyscrasis*; 91, *Pseudopteroalla*; 92, *Epiplatea arcuata*; 93, *Pæcilomyia longicornis*.



Otitidæ VII.—94, *Ortalmiomyia*; 95, *Ceratoxys latuscula*; 96, *Neoidiotypa appendiculata*; 97, *Odontomera nitens*; 98, *Melanoloma decrepita*; 99, *Callopietromyia annulipes*; 100, *Hemixantha spinipes*; 101, *Paragorgopsis maculata*; 102, *Seioptera vibrans*; 103, *Pseudopteroalla*; 104, *Stenomyia*; 105, *Zetekomyia banksi*; 106, *Callopietromyia annulipes*; 107, *Melanoloma decrepita*; 108, *Pteroalla*; 109, *Pseudotephritis vau*.

rated by a narrow carina, reaching to the oral margin, the third segment three times as long as wide; arista short plumose; facial grooves absent; two pairs of dorsocentrals; propleural and sternopleural bristles absent; scutellum with two pairs of bristles; posterior femora with bristles beneath; first vein bare above; anal cell rounded apically. Genotype:—*Z. banksi*, n. sp.

Califortalis, new genus

Related to *Ceratoxys* Rondani (*Anacampta* Læw) but readily distinguished by the presence of three or four pairs of marginal scutellars, a single, hair-like frontal and the very hairy front. The single species has somewhat the aspect of certain species of *Tetanops* Fallén but the bristles of the vertex are long and fine. Genotype:—*C. hirsutifrons*, n. sp., from California.

Ortalimya, new genus

Related to *Ceratoxys* Rondani but the front bears only one pair of strong frontals and at most a very weak second pair, the head is longer, the facial carina higher, the face more retreating and the front narrower and less hairy. The bristles of the vertex are long and moderately strong. Genotype:—*Ortalimya snowi* Cresson.

There has been much confusion concerning the identity of the genera mentioned in these notes. *Ceratoxys* differs from the other genera in the group by its conspicuously haired lunule. This leaves *Califortalis*, *Tetanops* and *Ortalimya* and I think the characters in the key will serve to separate them. The front in *Tetanops* is always wrinkled or pitted and frequently pollinose except for the pits.

Family Trupaneidæ—The Fruit Flies

Mostly rather small flies, usually with pictured wings, the auxiliary vein curving forward at a right angle.

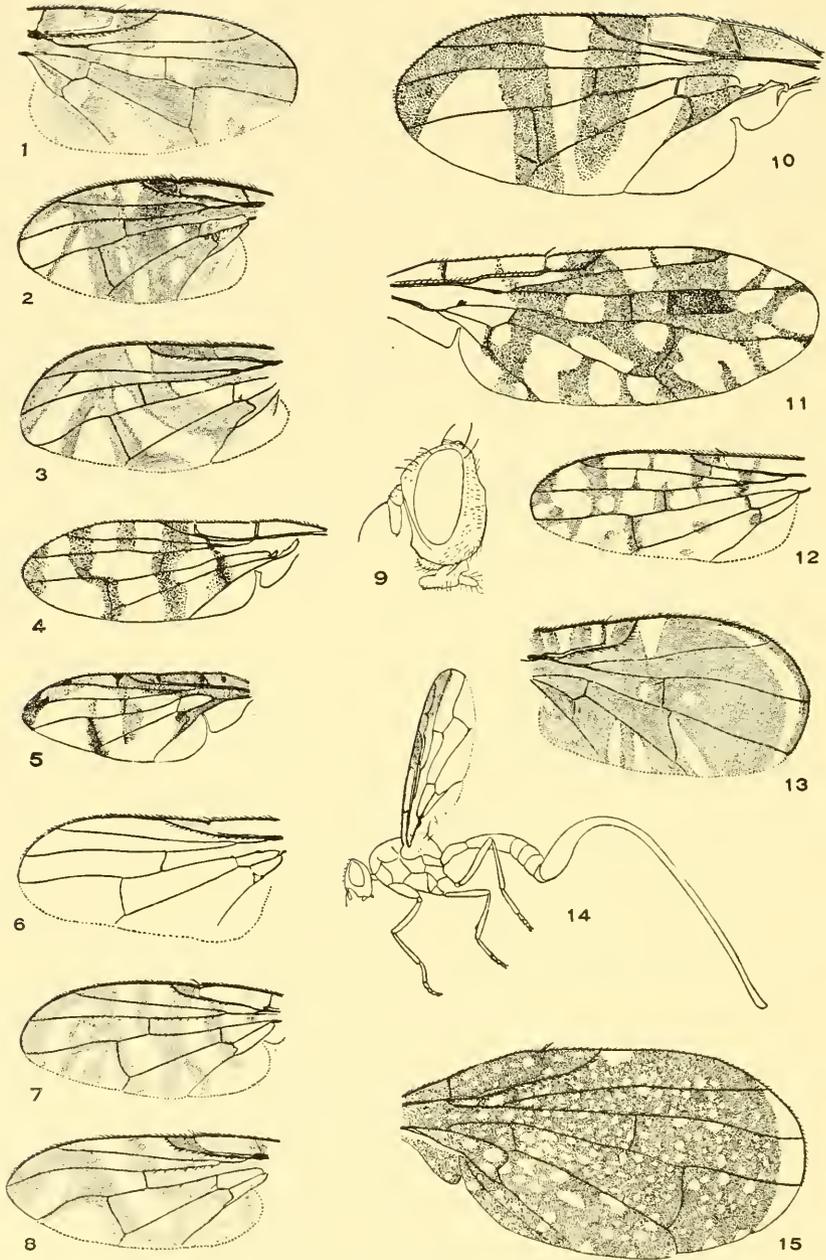
Head hemispherical, usually short; oral vibrissæ not distinct, the face vertical or somewhat retreating. Front broad, with bristles laterally, the anterior orbitals situated close to the orbits. Antennæ decumbent, short, rarely elongated. Proboscis of moderate length, rarely elongate and with the labellæ folding back, the labellæ usually broad and fleshy. Thorax with bristles although the anterior ones may be absent. Legs of moderate length, the tibiæ without preapical bristles. Wings large, usually with dark pattern, the auxiliary vein curving forward at right angles and sometimes evanescent at the tip; basal cells and anal cell always present, the latter often drawn out posteriorly into a long point or triangle. Abdomen composed of four or five segments; male genitalia small and only partly exposed; ovipositor segmented, usually exposed.

The adults are found in various habitats, often upon flowers. The larvæ live in the seeds and fruits of plants of various kinds or form galls. One of our commonest species lives in the heads of thistles, several make galls on golden rod, while others, like the fruit maggots, live in apples, cherries, citrus fruits, etc. Still others are leaf miners. The family is of considerable economic importance and has received a great deal of attention during recent years.

Among the papers essential to a study of the family are those listed below.* Other references will be found given in the key. Unfortunately the classification of this family is extremely artificial, being based largely upon the type of wing markings. In the key I have, in places, ignored the classification based upon wing maculation and a number of species must be shifted to genera in which they belong structurally, although differing to a certain degree, in wing pattern. Only the fact that I do not have access to all the North American genera prevents a more thorough revision of the genera. Recognition of many of the described species is difficult because they are not illustrated.

For many suggestions and the generous loan of material in this family I am greatly indebted to Mr. Marston Bates.

* Loew, 1873, Mon. N. A. Dipt., iii, pp. 211-351. Phillips, 1923, Rev. Trypet. N. E. Amer., Journ. N. Y. Ent. Soc., xxxi, pp. 119-155. Hendel, 1927, Flieg. Palæarkt. Reg.—Trypetidæ.



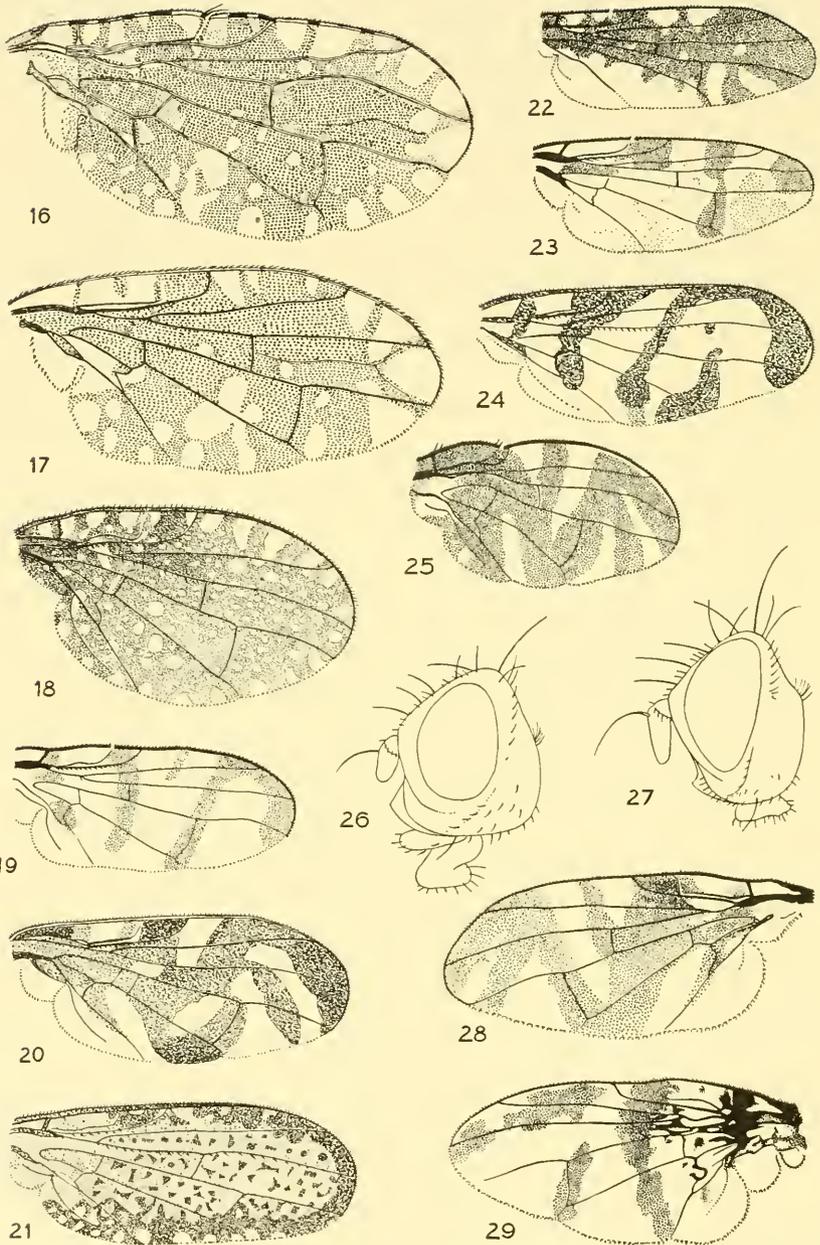
Trypaneidae I.—1, *Xenochaeta*; 2, *Hexacheta*; 3, *Anastrepha*; 4, *Euribia rufipes*; 5, *Acidia versatilis*; 6, *Neaspilota*; 7, *Oedicarena*; 8, *Straussia*; 9, *Anastrepha*; 10, *Rhagoletis indifferens*; 11, *Tephritis jonesi*; 12, *Tephritis* sp.; 13, *Polymorphomyia basilica*; 14, *Toxotrypanea curvicauda*; 15, *Eutreta pacifica*.

KEY TO GENERA*

1. Scutellum with six strong, regularly placed bristles..... 2
 Scutellum with not more than two pairs of bristles or they are weak
 and not regularly placed, the apical pair being very widely separated 4
2. Front more than half as wide as the head (1)..... *Xenochæta* Snow
 Front decidedly less than half as wide as the head..... 3
3. Triangle of the anal cell longer than the petiole (46, 70).
 Blepharoneura Lœw
 Triangle of the anal cell shorter than the petiole (2, 69).. *Hexachæta* Loew
4. Scutellum with two pairs of bristles, the apical pair strong..... 5
 Scutellum with one pair of strong bristles or if with two pairs the
 apical pair is absent and there are two pairs on the basal half..... 36
5. Fourth vein not or scarcely curved forward at the apex..... 6
 Fourth vein strongly curved forward at the apex (3, 9).
 Anastrepha Schiner
6. Anterior pair of dorsocentrals situated far in front of a line drawn
 between the anterior pair of supra-alars..... 24
 Anterior dorsocentrals situated at most slightly in front of such a line,
 usually behind 7
7. Proboscis very long and slender, geniculate; (*Asimoneura* Czerny;
 Rhynencina Johnson; *Aleomyia* Phillips) (4, 42)..... *Euribia* Latreille
 Proboscis short and thick, not geniculate in the middle..... 8
8. Arista short plumose or bare..... 9
 Arista long plumose..... *Molynocœlia* Giglio-Tos
9. Scutellum not mostly shining black or the apex yellow or sulcate..... 10
 Scutellum mostly shining black, the base narrowly yellow, the apex
 never sulcate (29, 66)..... *Ceratitis* McLeay
10. Acrostical and dorsocentral bristles in an almost transverse row (5, 60).
 † *Acidia* Desvoidy
 Dorsocentrals placed far in front of the acrosticals so that there appear
 to be two pairs of dorsocentrals..... 11
11. Notopleura with several setulæ near the posterior bristle (24, 63).
 Epochra Lœw
 Notopleura bare 12
12. Cheeks at most slightly more than one-fourth as wide as the eye-
 height, if doubtful the scutellum is sulcate..... 13
 Cheeks at least two-fifths as wide as the eye-height; oral margin not
 strongly produced 22
13. Stigmatal cell long and narrow, four times as long as wide; wings
 reticulate (21, 36)..... *Icterica* Lœw
 Stigmatal cell shorter and broader, not over three times as long as
 wide; wings not reticulate..... 14

* *Baryplegma* Wulp is omitted.

† *Trypeta versatilis* Curran is a true *Acidia* while *Acidia fratria* Lœw is a true *Trypeta*.



Trypaneidae II.—16, *Eurostina confusa*; 17, *Tetreuaresta obscuriventris*; 18, *Xanthomyia platyptera*; 19, *Zonosema*; 20, *Trypeta fratria*; 21, *Ictericia circinata*; 22, *Eucosmoptera tetraspina*; 23, *Terellia floriscientiae*; 24, *Epochra canadensis*; 25, *Stenopa vulnerata*; 26, *Orellia*; 27, 28, *Myoleja caesio*; 29, *Ceratitis capitata*.

14. Notopleura densely pollinose..... 20
 Notopleura not pollinose..... 15
15. Third antennal segment little longer than the basal two combined,
 never triangularly produced at the tip..... 18
 Third antennal segment elongate, usually produced as a sharp triangle
 at the upper apex 16
16. Postcallar (postalar) bristle situated far in front of the posterior
 intra-alar *Zonosemata* Benjamin
 Postcallar, intra-alar and acrostical bristles in almost straight line....16a
- 16a. Dorsocentral bristles situated well behind the supra-alar bristles
 (19, 31) *Zonosema* Lœw
 Dorsocentral bristles situated at most very slightly behind the supra-
 alars, usually slightly in front of them..... 17
17. Third longitudinal vein with at most two basal setulæ, usually bare;
 anterior crossvein situated but little beyond the middle of the discal
 cell (10, 43).....**Rhagoletis* Lœw
 Third vein with several strong setulæ on basal part; anterior crossvein
 situated well beyond the middle of the discal cell (*Euleia* Walker)
 (27, 28) †*Myoleja* Rondani
18. Scutellum swollen, convex, more or less deeply longitudinally grooved
 apically (*Tomoplagina* Curran) (58, 65)..... *Peronyma* Lœw
 Scutellum flat dorsally, not at all grooved..... 19
19. Face more or less carinate, not concave in profile, the oral margin not
 produced (20, 49)..... ‡*Trypeta* Meigen
 Face concave in profile, the oral margin produced (23, 62).
Terellia Desvoidy
20. Costal spine not longer than the thickness of the costa; wings narrow. 21
 Costal spines more than twice as long as the costal thickness; wings
 very broad, reticulate (18, 37)..... *Xanthomyia* Phillips
21. Wings reticulate; abdomen with paired shining black spots; oral mar-
 gin not produced (47, 53)..... *Acidogona* Lœw
 Wings hyaline, rarely banded; abdomen without paired black spots;
 oral margin conspicuously produced (6, 34)... §*Neaspilota* Osten Sacken
22. Scutellar bristles longer than the scutellum; antennal pits limited be-
 low, the head long..... 23
 Scutellar bristles very short; antennal pits almost obsolete; third an-
 tennal segment with several hairs above; tibiæ swollen (40, 57).
 ¶*Pyrgotoides*, n. g.
23. Fourth vein ending at or near the tip of the wing (7, 30).
 ¶*Edicarena* Snow

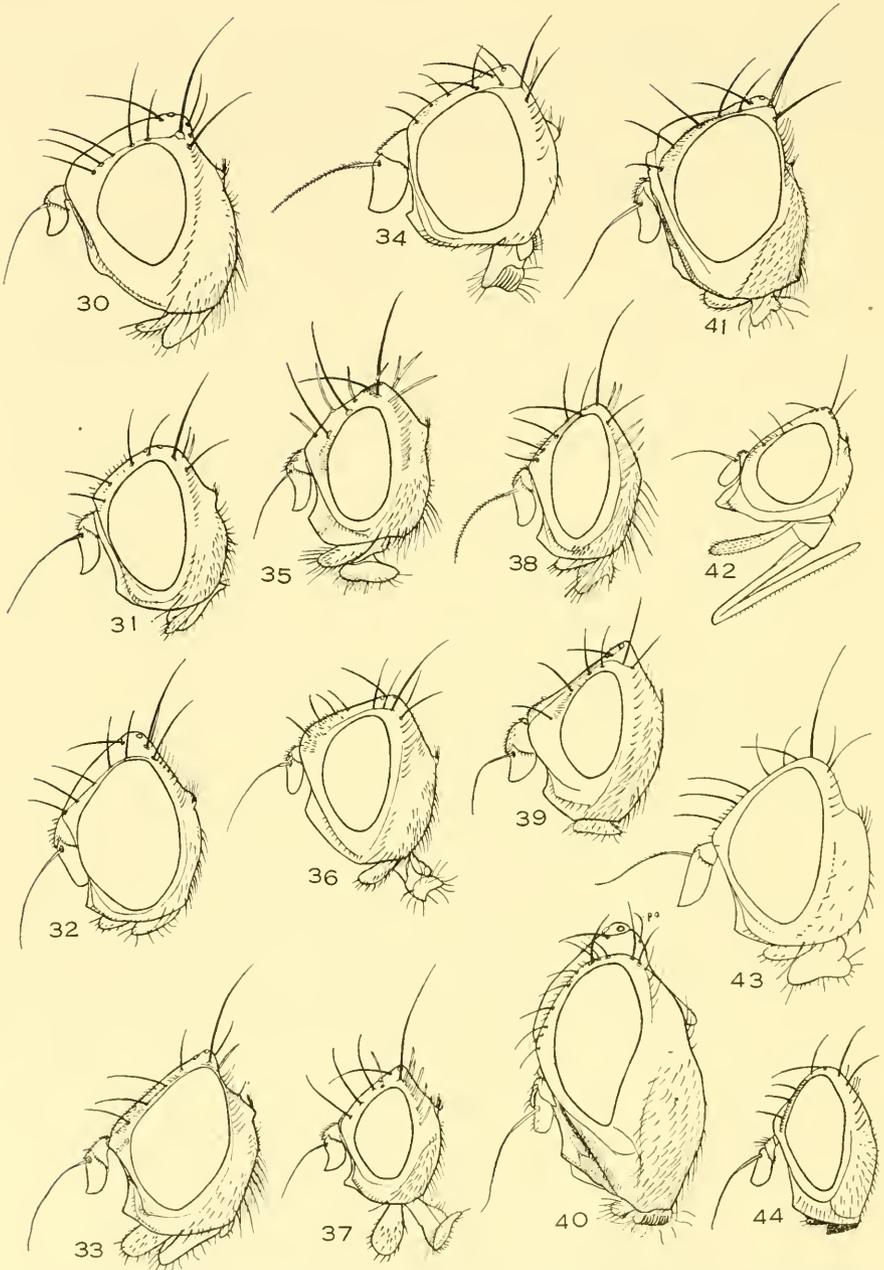
* Cresson, 1929, Tr. Amer. Ent. Soc., lv, pp. 401-414, 1 plate. Curran, 1932, Amer. Mus. Novit. No. 526, p. 5.

† *Euleia* Walker is the older name but there is considerable doubt about the identity of the genotype and I use *Myoleja* to avoid confusion.

‡ *Acidia fratria* Lœw belongs here.

§ Curran, 1932, Amer. Mus. Novit. No. 526, p. 3.

* A large species resembling the species of *Pyrgota* but distinguished by wing venation, presence of strong ocelli, shape of the head, etc. The genotype is *crassipes* n.sp. from Panama.



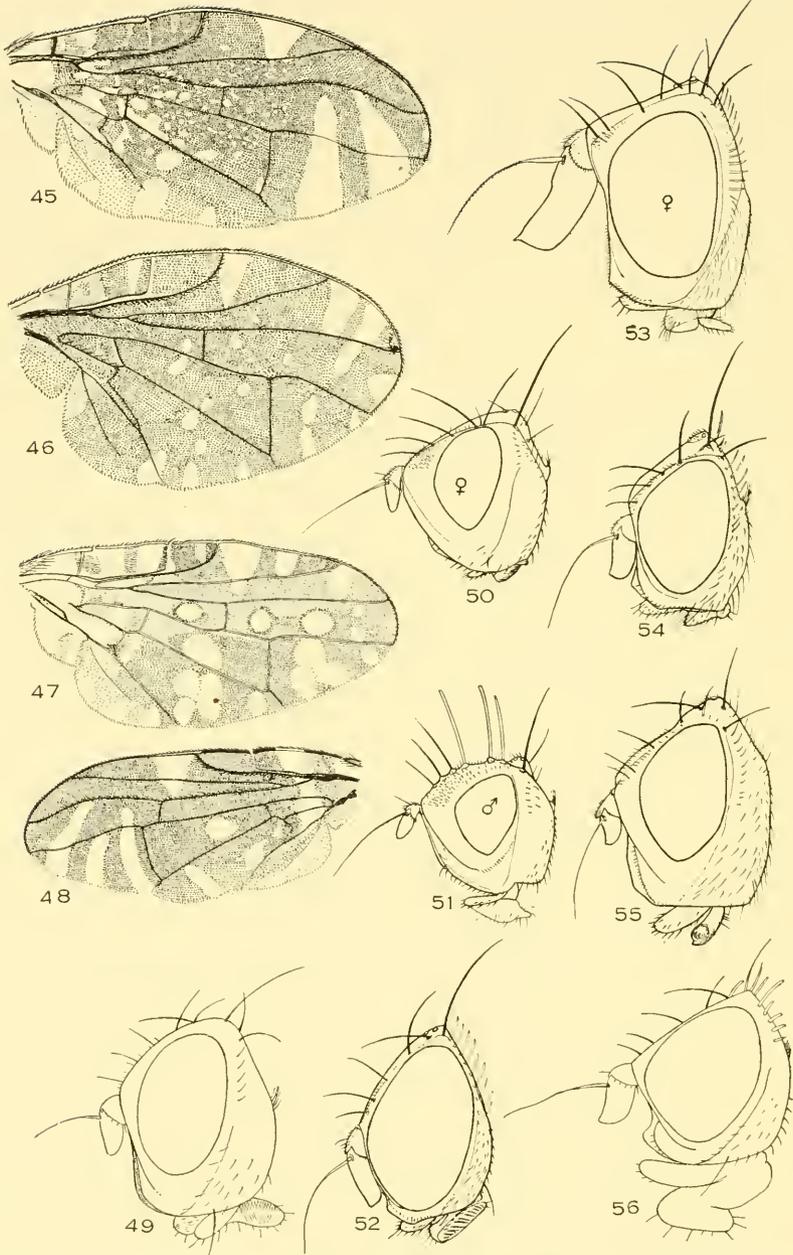
Trypaneidae III.—30, *Oedicarena diffusa*; 31, *Zonosema electa*; 32, *Tomoplagia*; 33, *Eutreta*; 34, *Neaspilota albidipennis*; 35, *Paracantha*; 36, *Ictericica sericata*; 37, *Xanthomyia platyptera*; 38, *Stenopa vulnerata*; 39, *Eurostina confusa*; 40, *Pyrgotoides clavipes*; 41, *Polionota*; 42, *Euribia*; 43, *Rhagoletis cerasi*; 44, *Procecidochares*.

- Fourth vein ending behind the tip of the wing, the wing-apex near the third vein; wings rather pointed (8, 50, 51).....*Straussia* Desvoidy
24. Anterior and posterior crossveins separated from each other by much less than half the length of the anterior crossvein; posterior crossvein very strongly recurrent (13).....*Polymorphomyia* Snow
Crossveins much less approximate; posterior crossvein not strongly recurrent 25
25. Scutellum strongly shining black, swollen and hemispherical..... 26
Scutellum more or less dull, more or less flattened or at most moderately convex 27
26. Parafacials bare (44, 79).....*Procecidochares* Hendel
Parafacials with a row of rather long pale hairs (61)...*Callachna* Aldrich
27. Notopleura cinereous pollinose..... 28
Notopleura bare or rather thinly brownish pollinose..... 31
28. Anal cell drawn out posteriorly into an elongate triangle..... 29
Anal cell not drawn out apically, or with a short, transverse triangle
(*Euaresta* Læw; *Urophora* Læw) (11, 12, 64).....*Tephritis* Latreille
29. Antennal pits not deep, not separated and strongly marked..... 30
Antennal pits deep, separated and strongly defined (41, 48).
**Polionota* Wulp
30. Face and front rather strongly narrowed to the antennæ; oral margin with hair only on the anterior half (17, 54).....†*Tetreuaresta* Hendel
Face and front not strongly narrowed to the antennæ; oral margin with bristles almost to the oral angles (45, 59).....*Acrotænia* Læw
31. Anterior crossvein situated not more than its own length from the posterior, both strongly oblique (32, 72).....*Tomoplagia* Coquillett
Anterior crossvein situated more than its length from the posterior, both never strongly oblique..... 32
32. Stigmal cell scarcely longer than wide (25, 38).....*Stenopa* Læw
Stigmal cell usually twice as long as wide, always much longer..... 33
33. Front with two pairs of black reclinate bristles, none converging (35, 73)*Paracantha* Coquillett
Front with three pairs of convergent frontals..... 34
34. Costal spines short and not very conspicuous..... 35
Costal spines rather long and conspicuous (15, 33).....‡*Eutreta* Læw
35. Wings with crossbands (26).....*Orellia* Desvoidy
Wings with a brown pattern containing hyaline indentations and spots (22)*Eucosmoptera* Phillips

* The single specimen I have before me is loaned by Dr. Aldrich and is determined as *mucida* Giglio-Tos. The figure by Giglio-Tos shows the anterior crossvein in the hyaline costal triangle and much farther from the posterior crossvein than I find it. The species I have illustrated may not be *mucida*, and may even belong to a different genus, depending upon the shape of the head. Mr. Van der Wulp's drawing is poor in regard to the anal cell.

† This genus is very doubtfully distinct from *Acrotænia*.

‡ Curran, 1932, Amer. Mus. Novit. No. 556.



Trypaneidae IV.—45, *Acrotania*; 46, *Blepharoneura*; 47, *Acidogona*; 48, *Polionota*; 49, *Trypeta*; 50, 51, *Straussia longipennis*; 52, *Xanthaciura insecta*; 53, *Acidogona melaneura*; 54, *Tetreuaresta obscuriventris*; 55, *Eurosta comma*; 56, *Trypanea*.

36. Front bristles well developed; ocellars present..... 37
 Frontals weak; ocellars absent; ovipositor very long and cylindrical
 (14)**Toxotrypanea** Gerstæcker
37. Head higher than long..... 38
 Head longer than high (67)..... 44
38. Scutellum without a deep longitudinal furrow..... 39
 Scutellum swollen and with a deep longitudinal furrow (58, 65).
Peronyma Lœw
39. Front immediately above the antennæ almost half as wide as the head
 and very much wider than either eye..... 40
 Front much less than half as wide as the head and, anteriorly, little
 if any wider than one eye from anterior view..... 41
40. Anterior pair of dorsocentrals situated far in front of a line drawn
 between the anterior pair of supra-alar bristles (16, 39).
***Eurostina** Curran
 Anterior pair of dorsocentrals situated at most slightly in front of a
 line drawn between the anterior supra-alars or behind such a line
 (55, 71).....**Eurosta** Lœw
41. Front twice as long as the width at vertex (52, 74)...**Xanthaciura** Hendel
 Front much less than twice as long as the width at vertex..... 42
42. Front with at least three pairs of convergent frontal bristles..... 43
 Front with two pairs of convergent frontals (76)....**Dyseuaresta** Hendel
43. Head almost as long as high, the oral margin projecting; eyes oblique,
 broadly oval (56, 75).....‡**Trypanea** Schrank
 Head much higher than long, the oral margin but little projecting; eyes
 perpendicular, rather narrowly oval (68, 78).....‡**Aciurina** Curran
44. Third antennal segment short, the apex rounded (Europe) (67).
Ensina Lœw
 Third antennal segment rather long, the upper apex angulate (77).
Paroxyna Hendel

The student will find it difficult to locate many species described in genera other than those to which they are now assigned. In the following list are given (1) the present genus and (2) in () the genera in which species may be found.

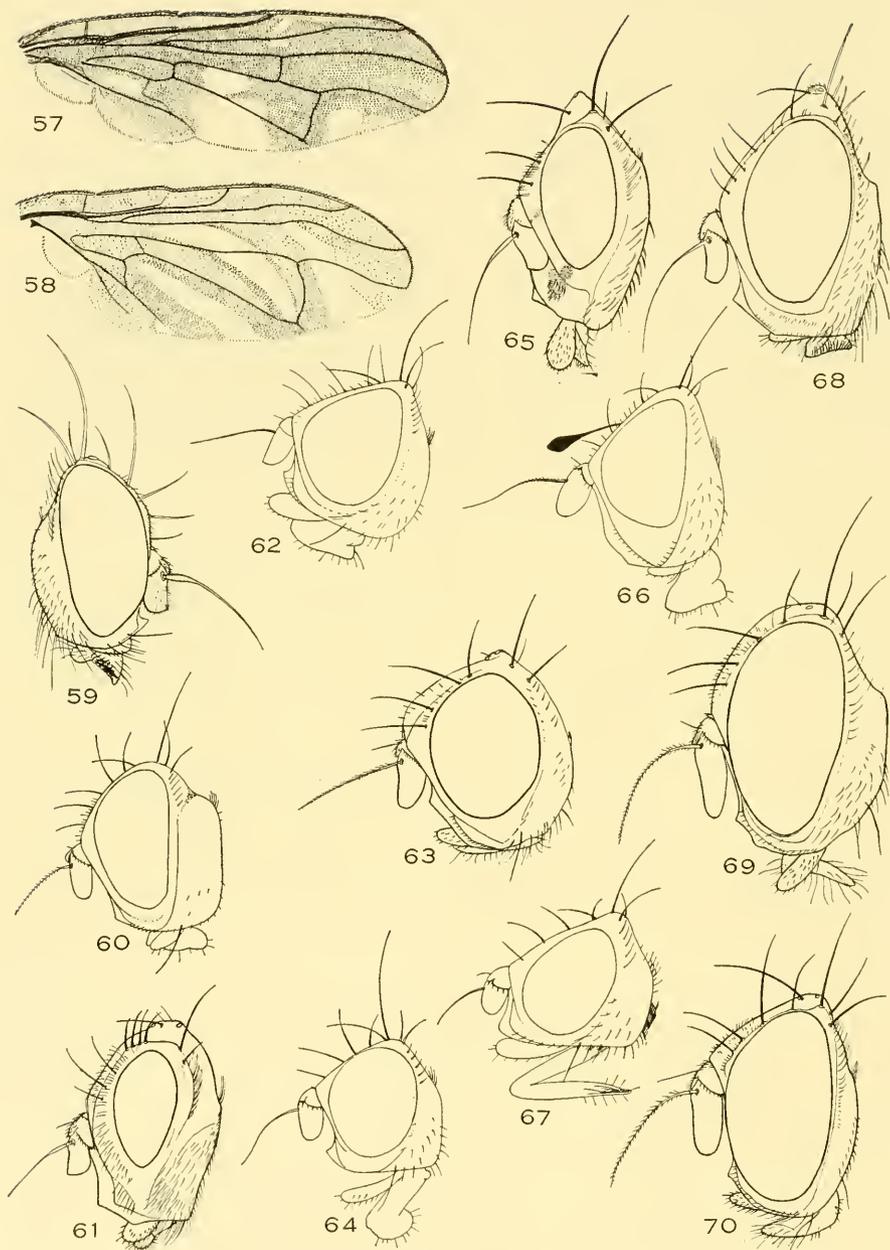
- Acidia** (*Spilographa*).
Dysenaresta (*Euaresta*, *Tephritis*).
Ensina (*Tephritis*).
Euribia (*Aleomyia*, *Urophora*, *Tephritis* Hendel, 1914).
Myoleja (*Aciura*, *Acidia*, *Eucosmoptera*).
Tephritis (*Euaresta*, *Ensina*, *Trypanea*, *Urellia*).
Terellia (*Trypeta*, *Orellia*).
Tetrenaresta (*Euaresta*, *Tephritis*).
Trypanea (*Urellia*, *Tephritis*).
Trypeta (*Orellia*, *Terellia*, etc.).
Zonosema (*Spilographa*, *Acidia*).

* Originally **Eurosta latifrons** Lœw was named as type of this genus but the species is a true **Eurosta** and does not possess the generic characters of **Eurostina**. The type of the genus should be known as **Eurostina confusa**, Slosson Collection, Delaware Water Gap.

† Curran, 1932, Amer. Mus. Novit. No. 556 (*Trypanea*).

‡ Curran, 1932, Amer. Mus. Novit. No. 556. In a letter to the author Dr. Hendel suggested the synonymy of this genus with **Tephrella** Bezzi and this is quite possible. However, I am retaining **Aciurina** on the suggestion of Mr. Bates, as a comparison of specimens with the genotype of **Tephrella**, a little known species, may prove that two genera exist.

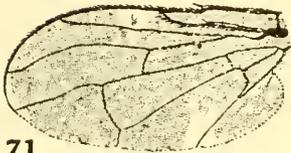




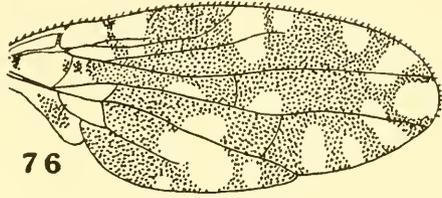
Trypaneidae V.—57, *Pyrgotoides clavipes*; 58, *Peronyma*; 59, *Acrotænia*; 60, *Acidia*; 61, *Callachna*; 62, *Terellia*; 63, *Epochra canadensis*; 64, *Tephritis*; 65, *Peronyma maculata*; 66, *Ceratitis capitata*; 67, *Paroxyna*; 68, *Aciurina*; 69, *Hexachæta*; 70, *Blepharoneura* (sp. Panama).

Mr. Bates has furnished the following list of species giving the correct generic position according to our present concepts:

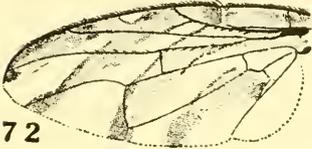
Acidia johnsoni Thomas = *Aciurina*.
Aciura limata Coquillett (*Eucosmoptera* Phillips) = *Myoleja*.
Aciura nigricornis Doane (*Eucosmoptera* Phillips) = *Myoleja*.
Rhagoletis formosa Coquillett = *Euribia*.
Rhagoletis grindeliae Coquillett = *Euribia*.
Rhyncencina longirostris Johnson = *Euribia*.
Trypeta baccharis Coquillett = probably *Tephritis*.
Trypeta bigeloviae Cockerell (*Eurosta* Townsend) = *Aciurina*.



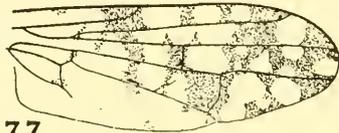
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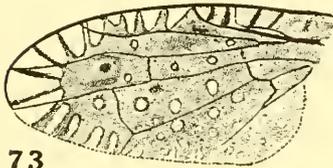
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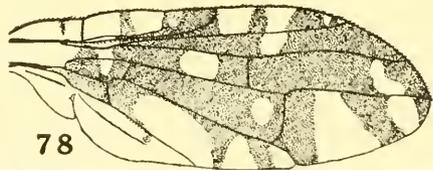
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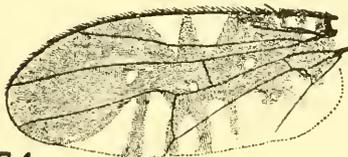
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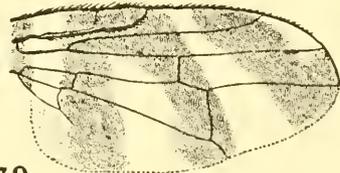
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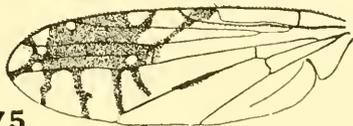
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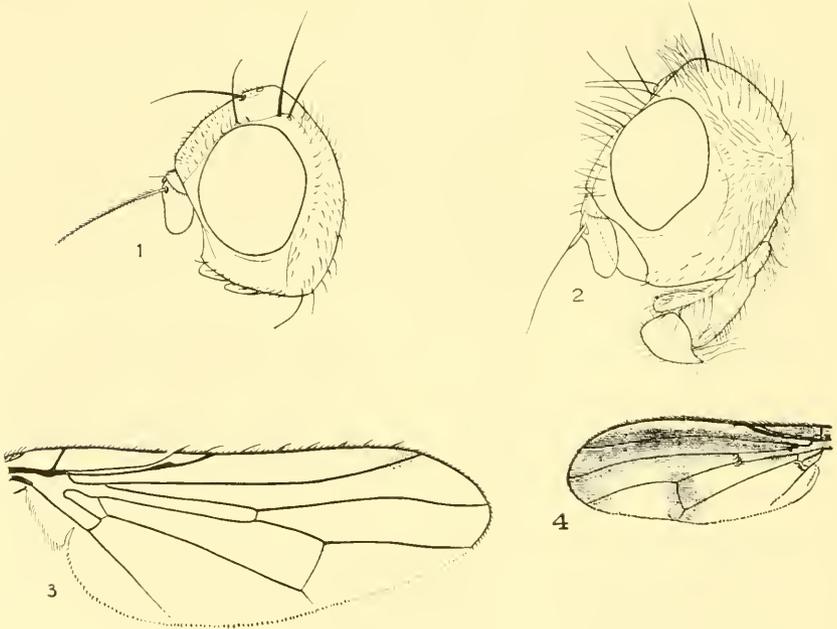
Trypaneidæ VI.—71, *Eurosta*; 72, *Tomoplagia*; 73, *Paracantha*; 74, *Xanthaciura insecta*; 75, *Trypanea wheeleri*; 76, *Dyseuaresta plesia*; 77, *Ensina*; 78, *Aciurina trixa*; 79, *Procecidochares*.

Family Pallopteridæ

Flies of medium size, usually with pictured wings, the auxiliary vein entire.

Head higher than long; oral vibrissæ absent; a single pair of frontal bristles; ocellars present; post-ocellars parallel; face slightly receding; antennæ rather short, the third segment oval; arista short plumose or bare. Mesonotum bristled in front of the suture (except in two species); propleural bristle usually absent; one sternopleural bristle. Legs of moderate length; tibiæ without preapical bristle. Wings rather large; anal cell short, the anal vein extending to the wing margin; auxiliary vein free but ending close to the first vein, the costa weakened or broken at the point of union; apical cell not narrowed apically. Abdomen elongate oval, sub-cylindrical, the ovipositor flattened and elongate.

These flies are found in moist and shady places, usually upon foliage, and along the sea-shore.



Pallopteridæ.—1, *Palloptera arcuata*; 2, 3, *Omomyia hirsuta*; 4, *Palloptera jucunda*.

Palloptera Fallén has been considered the only genus and has been reviewed by Malloch.* The genus has been placed in the Lauxaniidæ and Lonchæidæ. It differs from the former in lacking preapical tibial bristles and from the latter in having the front transverse anteriorly, the lunule being concealed. In many respects it shows a relationship to the Helomyzidæ but is excluded from the group by its flattened ovipositor and is, perhaps, more closely allied to the Otitidæ. The genus *Omomyia*, placed in the Cœlopidæ by Coquillett, belongs here. It shows a remarkable sexual dimorphism, the males bearing long, woolly pile while the females show little trace of it.

KEY TO GENERA

1. Facial carina strong, the antennal grooves deep; males densely pilose
 (2, 3) **Omomyia** Coquillett
 Facial carina quite weak; antennal grooves shallow; never densely
 pilose (1, 4)..... **Palloptera** Fallén

* 1924. Proc. U. S. N. M., lxx, Article 12, pp. 6-7.

Family Lonchæidæ

Small shining blackish flies, the auxiliary vein entire; the tibiæ without preapical bristles.

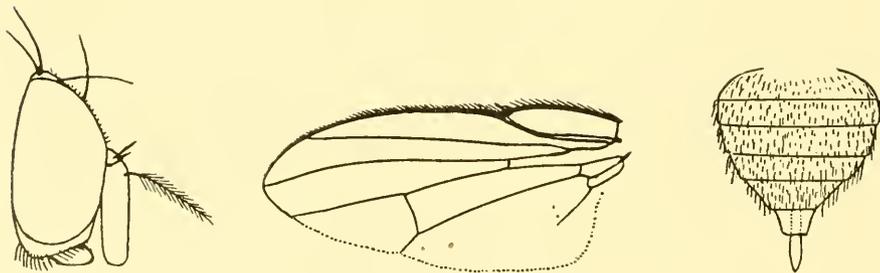
Head shorter than high; face and front moderately wide; oral vibrissæ absent; front with a single orbital, clothed with short hairs; ocellars present; postocellars divergent; antennæ elongate, decumbent. Thorax bristled posteriorly; mesopleura with bristles behind; one or two sternopleurals; propleural present, the propleura without hair. Legs short; tibiæ without preapical bristle. Wing venation complete; second basal and anal cells short, the anal vein reaching the wing margin faintly, and bisinuate. Abdomen oval, rather flat; ovipositor rather long and triangular.

The adults occur almost everywhere but prefer moist or shady places. The larvæ live in plants or decaying vegetation. They have been reared from under bark and may be predaceous.

This family is readily distinguished from the Periscelidæ by its entire auxiliary vein; from the Sapromyzidæ by the absence of preapical tibial bristles on at least the anterior and posterior tibiæ and from the Pallopteridæ by the presence of a propleural bristle and the exposed frontal lunule.

Lonchæa Fallén is the only genus recognized although *Earomyia* Zetterstedt may be distinguished by having the frontal lunule bare. Malloch* has reviewed the species. A few have been described since the publication of his paper.

* 1924. Proc. U. S. N. M., lxx, Art. 12, pp. 3-6.

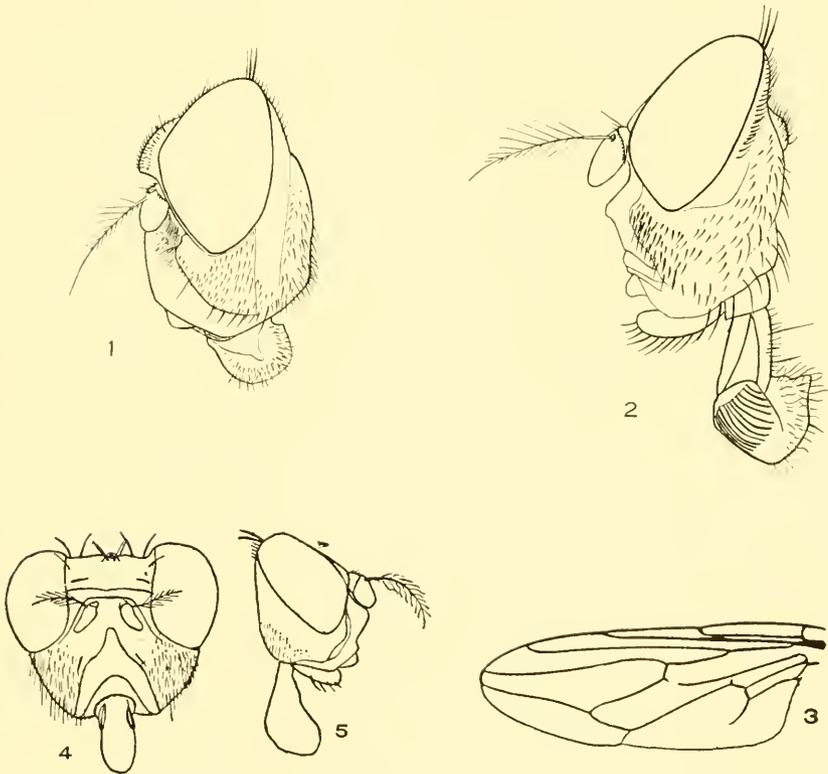


Lonchæa, head, wing and abdomen.

Family Ropalomeridæ

Moderately large tropical flies of a brownish and grayish color.

Front broad, excavated, with or without bristles; face broad, carinate, tuberculate or the oral margin prominent; cheeks broad, hairy; elypeus projecting; oral vibrissæ absent; proboscis short, the palpi slender or dilated; antennæ short; arista dorsal, bare or plumose. Thorax elongate; mesonotum with but few bristles, usually more or less mottled with gray and brown; scutellum often prominent and grooved. Abdomen shorter than the wings, flattened; hypopygium moderately large, largely concealed; ovipositor telescopic, projecting. Femora all



Ropalomeridæ.—1, *Willistoniella*; 2, 3, *Ropalomera*; 4, *Willistoniella*; 5, *Apophorhynchus*.

thickened; posterior tibiae often dilated. Apical cell narrowed apically; auxiliary vein absent or present; second basal and anal cells present.

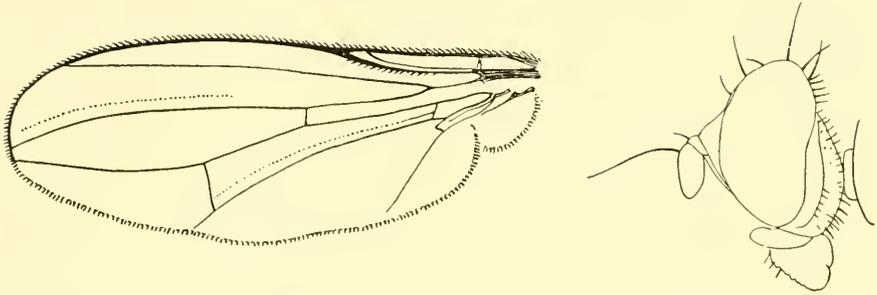
Only about a dozen species are known, all occurring in Central or South America. Evidently they are not uncommon at certain seasons of the year as Mr. Banks secured a number of specimens in Panama during July and August although I saw only two from December to March. They are evidently seashore inhabitants which extend their range up the rivers. The adults are fast in flight and are excellent hoverers. There is a recent revision of the family by Lindner.*

KEY TO GENERA

1. Auxiliary vein present 2
 Auxiliary vein absent.....**Rhinotora** Schiner
2. Scutellum oval 3
 Scutellum pyramidal, directed obliquely upward; arista plumose or bare
 (2, 3)**Ropalomera** Wiedemann
3. Arista plumose 4
 Arista bare**Kröberia** Lindner
4. Face tuberculate; frontal bristles absent (5)....**Apophorhynchus** Williston
 Face carinate; frontals present (1, 4).....**Willistoniella** Mik

* 1930. Deutsch. Ent. Zeitschr., 1930-31, pp. 122-137.

Family Tanypezidæ



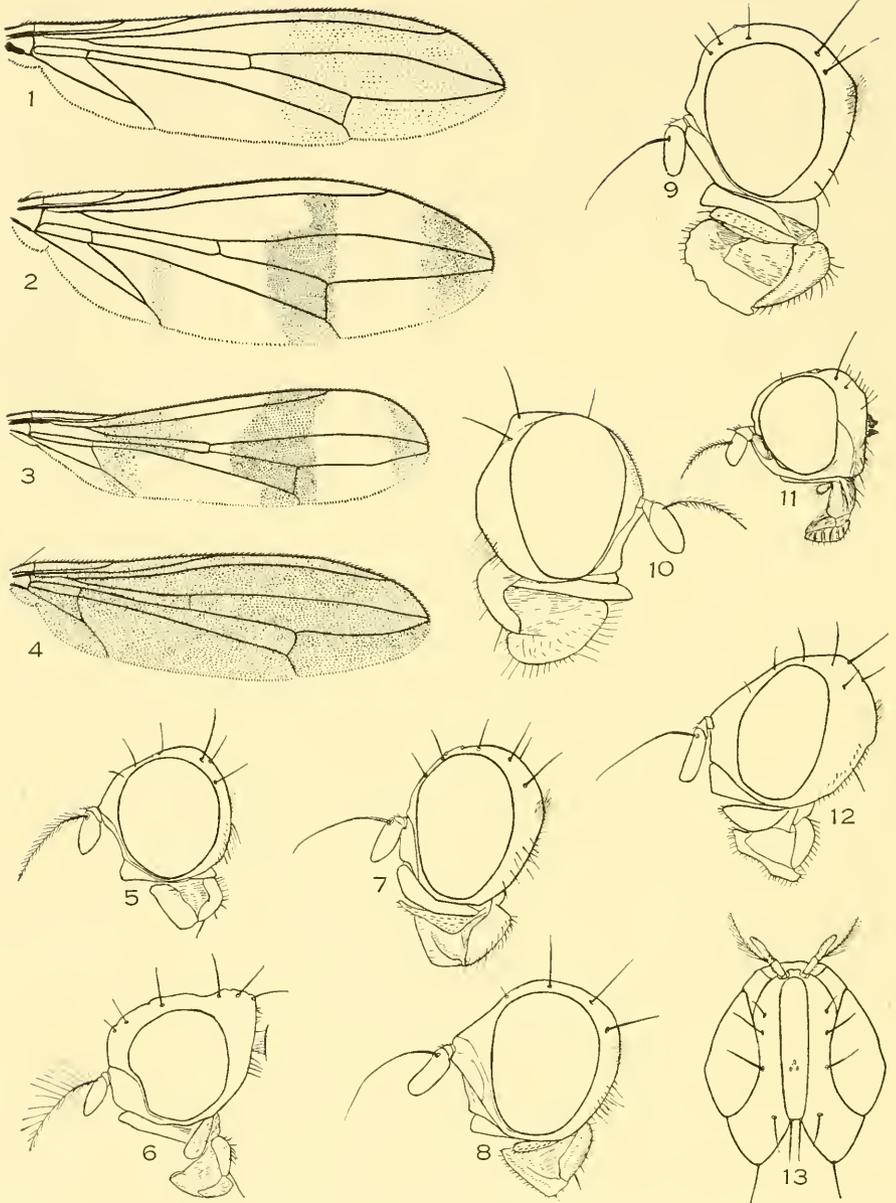
Tanypeza, head and wing.

Medium sized flies, with rather long, slender legs.

Head higher than long; face retreating below; two pairs of frontals; ocellars proclinate; antennæ pendulous, the third segment oval, moderately large; oral vibrissæ absent; palpi broadened. Thorax with only one pair of dorsocentrals; one humeral; no sternopleurals, one or two bristles on the mesopleura above, the mesopleura and pteropleura haired. Legs long, slender, without bristles. Wings with the apical cell narrowed; anal cell rounded apically, about as long as the second basal; first vein setulose above; auxiliary vein entire, touching the first vein before its end.

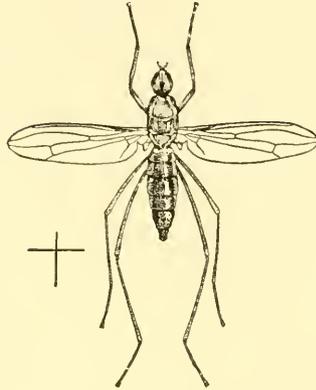
The adults occur in moist woods and are by no means numerous in collections. The immature stages are unknown.

Tanypeza Fallén is the only known genus unless *Tetradiscus* Bigot is distinct. However, *Tetradiscus* may not belong to this family and is too poorly described to be recognizable. There are fewer than a dozen known species belonging to the family, most of them occurring in the Neotropical region while one is known from Europe.



Calobatidæ I.—1, *Parasphen ruficauda*; 2, *Ptilosphen*; 3, *Rainieria*; 4, *Scipopus diversus*; 5, *Grallipeza*; 6, *Cardiacephala*; 7, *Grallomya*; 8, *Hoplocheiloma*; 9, *Scipopus*; 10, *Parasphen*; 11, *Calobata univittata*; 12, *Tæniaptera*; 13, *Cardiacephala*.

Family Calobatidæ—The Stilt-legged Flies



Calobata univittata.

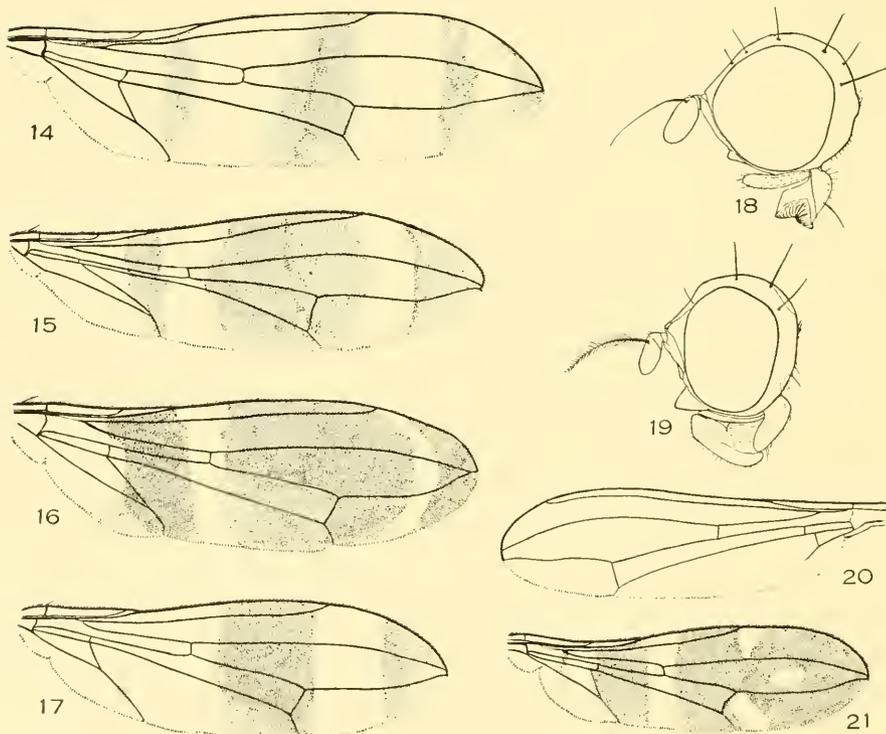
Elongate flies with very long legs and dorsal, bare to plumose arista.

Head higher than long, rather orbicular or elongate, the front wide in both sexes and usually with bristles; face usually receding, the oral margin more or less produced, the clypeus large and polished; palpi flat and broad; antennæ of moderate length, pendulous, with dorsal, bare to plumose arista. Thorax elongate, bristled posteriorly and on the sides; sternopleura with long bristly hair behind; true sternopleural bristles absent; pteropleura bare. Legs very long, the anterior pair widely separated from the middle pair, femora rarely with small bristles, the posterior four tibiæ usually with tiny bristles. Wings long, usually marked with brown or black, the anal cell rectangular or angulate apically; apical cell usually narrowed apically; auxiliary vein lying very close to the first vein and usually partly touching it, rarely ending well before the first vein. Abdomen long and narrow, the ovipositor long.

The adults are found near moist places in the Neartic region but seem to occur everywhere in the tropics, where they are scavengers, and evidently the larvæ live in excrement. Some species have been reared from excrement and the adults are attracted to it in very large numbers. However, I have found a few of the tropical species only on foliage near streams and these may have a different habit. Enderlein* has reviewed the group and Cresson has described many species.

* 1922, Arch. für Naturg., lxxxviii, Abt. 5, pp. 140-229.

As here understood this family comprises the genera *Calobata*, and *Cardiacephala* of the old family Micropezidæ. They really have little in common with this latter group except a superficial resemblance. The classification of the family is poor and several of the genera are based upon what appear to be trivial characters. Several of the genera occurring in South America, as well as a few included in the following key, are unknown to me so I am unable to do more than use the characters cited by their describers although I think that most of the genera are well founded and could be readily recognized upon characters other than those used. The genus *Cardiacephala* Schiner, of which I consider both *Plocoscelus* Enderlein and *Rhæcius* Enderlein to be synonyms, merely displays a diversity in head shape not found in other groups, but no sharp lines can be drawn between the three proposed genera. Some insects show specialization along one line, others in other ways.



Calobatidæ II.—14, *Hoplocheiloma*; 15, *Grallomya annulata*; 16, *Tæniaptera*; 17, *Grallipeza*; 18, *Rainieria*; 19, *Ptilosphen*; 20, *Calobata univittata*; 21, *Cardiacephala*.

KEY TO GENERA

1. Anal cell extending two-thirds the distance to the wing margin, its anterior edge very oblique (16)..... 2
 Anal cell much shorter, the crossvein much less oblique..... 5
2. Distance between the tips of the second and third veins more than half as great as the length of the ultimate section of the fourth vein (16) 3
 This distance less than half the length of the ultimate section of the fourth vein (1, 10).....**Parasphen** Enderlein
3. Arista bare 4
 Arista plumose or long pubescent (2, 19).....**Ptilosphen** Enderlein
4. Apical cell closed and short petiolate (12, 16).....**Taniaptera** Macquart
 Apical cell open (7, 15).....**Grallomya** Rondani
5. Arista bare 6
 Arista plumose 9
6. Distance between the tips of the second and third veins equal to less than half the length of the ultimate section of the fourth vein (4, 9)**Scipopus** Enderlein
 This distance greater than half the length of the ultimate section of the fourth vein..... 7
7. Postocellar bristles absent (8, 14).....**Hoplocheiloma** Cresson
 Postocellar bristles present, vertex with six bristles..... 8
8. Occiput strongly produced on either side of the vertex, concave in the middle from dorsal view.....**Mitromyia** Cresson
 Occiput at most weakly produced and very greatly concave from dorsal view (3, 18).....***Rainieria** Rondani
9. Posterior femora very conspicuously swollen on the apical third (6, 13, 21).....†**Cardiacephala** Schiner
 Posterior femora regular in outline..... 10
10. Postocellar bristles absent 11
 Postocellar bristles long and strong (5, 17).....**Grallipeza** Rondani
11. Stigmal cell long, the first vein ending in front of the anterior crossvein**Calobatina** Enderlein
 Stigmal cell short and not distinct, the first vein ending well before the anterior crossvein (11, 20).....**Calobata** Meigen

* *Tanyпода* Rondani is a synonym and I do not believe that the characters cited by Cresson for his genus *Meganeria* are of sufficient value to constitute a genus.

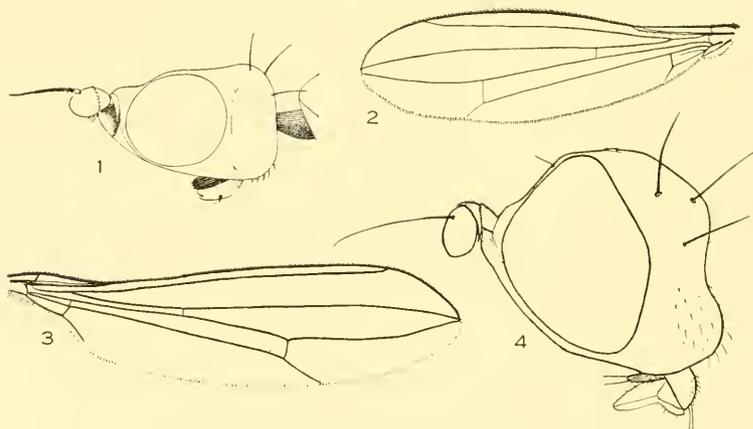
† The dorsal view of the head shows the extreme development of the lobe-like production of the posterior orbits which may not be produced beyond the vertex. *Rhæcius* (Enderlein) has been proposed for this latter group but there is every gradation between the two extremes.

Family Micropezidæ

Slender flies of moderate size, their legs long, the second basal cell united with the discal cell.

Head orbicular or elongate and subtriangular; front without bristles; face receding, without oral vibrissæ; antennæ short, the arista dorsal. Thorax elongate, the front and middle coxæ widely separated; posterior portion of the pteropleura with long hairs; one sternopleural bristle. Legs long and slender, the tibiæ with bristles. Wings long, the second basal cell united with the discal cell; apical cell narrowed or closed and petiolate apically; auxiliary vein not distinctly separated from the first vein. Abdomen long and slender, the female ovipositor large, pendulous; male genitalia rather small, the fifth sternite usually with long pendulous lobes.

The adults are found in marshes and moist places in woods. There are three or four Neartic, one Palearctic and many species in the American tropics. I have seen only *Micropeza* from the United States and Canada. The immature stages are unknown. Enderlein* has reviewed the family. I give the characters of his genera although I scarcely agree that there are four genera represented. The appendiculate apical cell does not seem to me to be of generic importance and I am inclined to recognize only *Micropeza* and *Metopobrachia*.



Micropezidæ.—1, 2, *Micropeza*; 3, 4, *Metopobrachia*.

KEY TO GENERA

1. Head subtriangular, much longer than high..... 2
 Head orbicular, but little longer than high..... 3
2. Apical cell open or closed in the wing margin (1, 2).... **Micropeza** Meigen
 Apical cell closed and petiolate..... **Neriocephalus** Enderlein
3. Apical cell open (3, 4)..... **Metopobrachia** Enderlein
 Apical cell closed and petiolate..... **Cliopeza** Enderlein

* 1922, Arch. für Naturg., Lxxxviii, Abt. 5, pp. 140-229.

Family Neriidæ

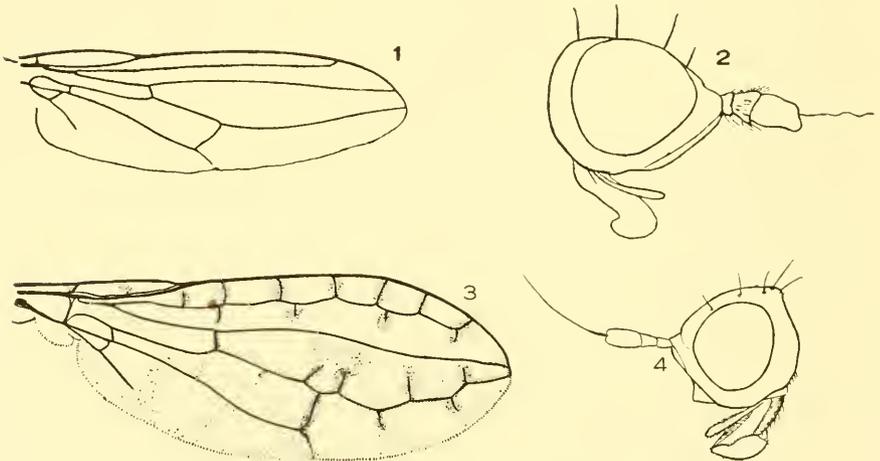
Slender flies of moderate size, with long legs and an apical arista.

Head longer than wide; two pairs of frontal bristles, the front wide in both sexes; face reeeding,* without oral vibrissæ; antennæ porrect, with a terminal bare or pubescent arista. Thorax long, the front and middle legs widely separated, the prosternum as long as the mesosternum; pteropleura bare; with or without a sternopleural bristle. Legs long and slender, the femora with short spines beneath. Wings long, the apical cell usually narrowed apically; anal and second basal cells short; auxiliary vein ending in the first vein. Abdomen long, rather flattened above; ovipositor long and pendulous, carried under the abdomen in life.

The adults are found near water or moist places. The family is strictly tropical, four of the nineteen genera occurring in North America. The immature stages are not known. Enderlein† has reviewed the group.

* In the old world Telostylinae the oral margin is prominent while in the Neriinae it is not conspicuous.

† 1922, Arch. für Naturg., lxxxviii, Abt. 5, pp. 140-229.

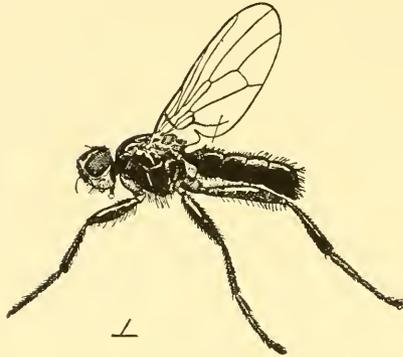


Neriidæ.—1, 2, *Nerius*; 3, 4, *Dictyonerius*.

KEY TO GENERA

1. Wings with numerous crossveins (3, 4).....**Dictyonerius** Enderlein
Wings with normal venation..... 2
2. Third antennal segment pointed apically; scutellum with one pair of
bristles**Glyphidops** Enderlein
Third antennal segment rounded or obtuse apically..... 3
3. Ventral surface of the anterior femora with setigerous tubercles on
the whole length**Odontoloxozus** Enderlein
Anterior femora with bristles only apically (1, 2).....**Nerius** Fabricius

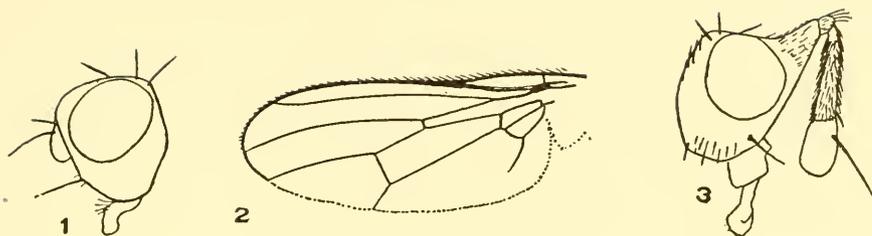
Family Piophilidæ

*Piophila casei.*

The flies included in this family rarely exceed five millimeters in length, and are usually glistening black or slightly bluish metallic in lustre.

Face not carinate, occiput more or less flattened; always two pairs of vertical bristles; postvertical bristles divergent; fronto-orbital bristles varying from two pairs to none; antennæ decumbent, the third segment elongate oval, arista bare in the American species; cheeks rarely fringed with hairs, the oral vibrissæ usually prominent, parafacials not differentiated as a linear orbital boundary; palpi well developed. Mesonotum almost always finely pubescent and polished; sternopleura never pruinose; one pair of dorsocentral bristles, four scutellar bristles. Legs of the male never toothed or deformed, the front femora usually furnished with long but delicate bristles. Abdomen more or less polished, pubescent but without bristles, broad, depressed, not constricted at the base; genitalia of the male more or less hidden asymmetrical; ovipositor extensile. Auxiliary vein terminating close to the end of the first vein, the costa broken at or near the termination, third and fourth veins parallel or more or less diverging, anal vein usually curved and evanescent apically, discal cell usually large, with the posterior crossvein usually long.

The larvæ are, in general, scavengers but some of them live in cheese and preserved meats. *Piophila casei*, the cheese-skipper, has a rather conical larva, pointed anteriorly and truncate posteriorly; body shining and smooth; antennæ two segmented; mouth hooks separated and divergent; anterior spiracles whitish, the abdominal travelling



Piophilidæ.—1, 2, *Piophila*; 3, *Prochyliza*.

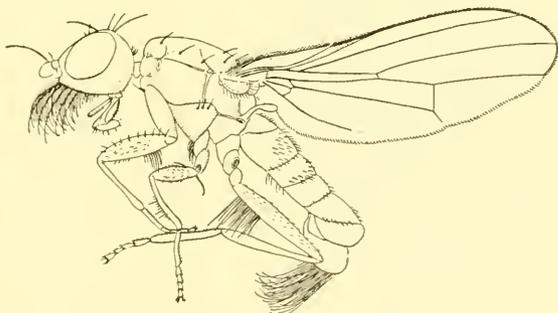
folds roughened, the posterior segment with four fleshy protuberances. The larva jumps by grasping the edge of the posterior truncature of the body with its mouth hooks and suddenly releasing it. The puparium is rugose and elliptic.

The members of this family have been placed in the Sepsidæ by most authors. The family differs from the Sepsidæ in several characters, particularly in having the costa broken at the end of the auxiliary vein, setulose mesonotum and the absence of a hair or fine bristle arising on the posterior edge of the posterior spiracle of the thorax. Melander* has reviewed the family.

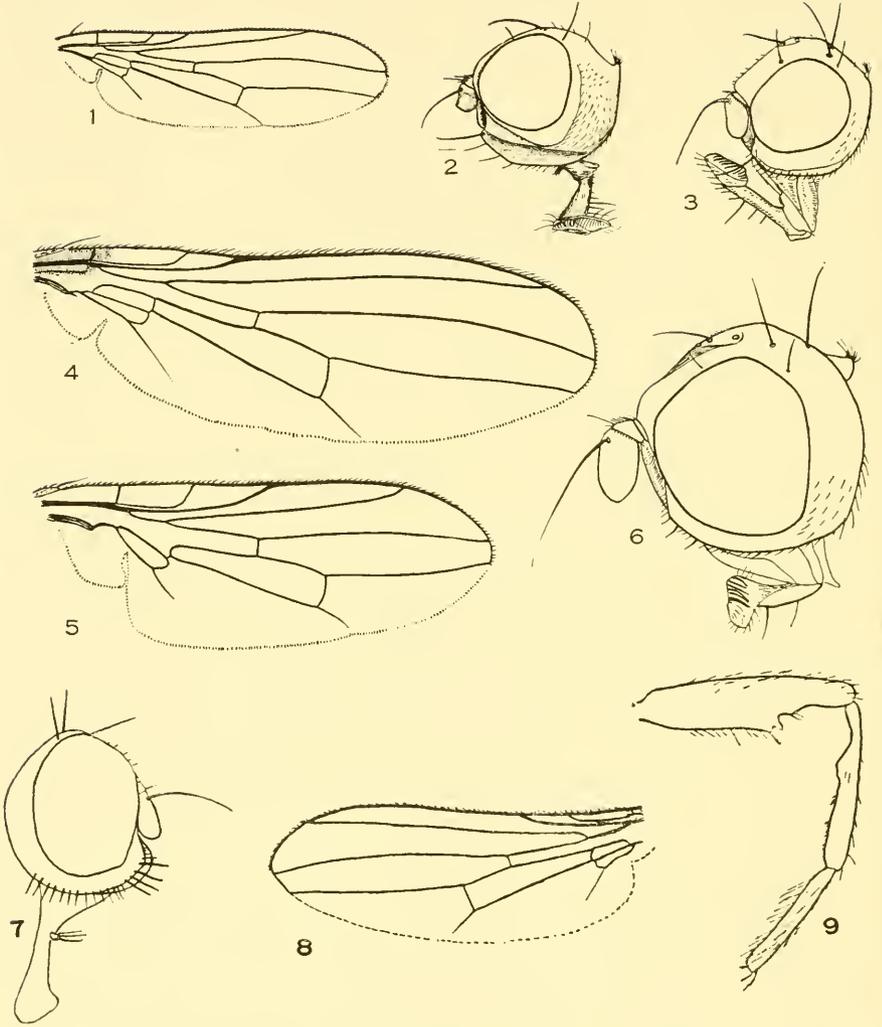
KEY TO GENERA

- 1. One or two pairs of frontal bristles..... 2
 No frontal bristles; face strongly receding; antennæ variable in length
 (3)*Prochyliza* Walker
- 2. Two pairs of dorsocentral bristles..... 3
 One pair of dorsocentral bristles (1, 2 and text fig.).....*Piophila* Fallén
- 3. One pair of frontal bristles (text fig.).....*Amphipogon* Wahlberg
 Two pairs of frontal bristles.....*Mycetaulus* Lœv

* 1924, *Psyche*, xxxi, pp. 78-86.

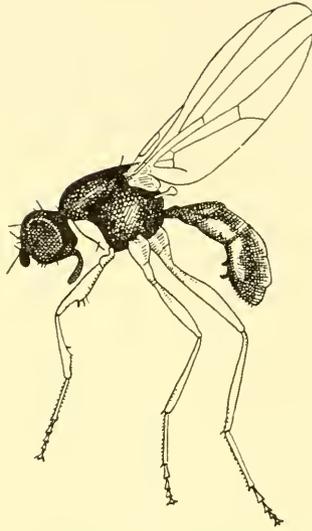


Amphipogon spectrum.



Sepsidae.—1, 2, *Themira minor*; 3, *Pandora*; 4, *Nemopoda minuta*; 5, *Pandora*; 6, *Nemopoda minuta*; 7, 8, 9, *Sepsis*.

Family Sepsidæ



Meroplius stercorarius.

Small, shining black or reddish flies.

Head more or less spherical, the occiput usually quite convex, face carinate; one or two pairs of vertical bristles, one or no orbitals, post-vertical bristles divergent; antennæ decumbent, the third segment oval, the arista usually bare; parafacials very narrow, reduced to an orbital line; palpi vestigial. Mesonotum usually aciculate or pollinose and not pubescent, its setulæ usually in three longitudinal rows; scutellar bristles usually two, rarely four in number; either one or two pairs of dorso-central bristles; sternopleura usually in part or entirely pruinose. Auxiliary vein curving so as to terminate obviously before the end of the first longitudinal vein, costa not broken, the third and fourth veins more or less converging; anal vein straight and abbreviated. Legs of the male usually deformed and armed with spines or thorn-like projections, usually located on the front pair. Abdomen with but sparse pubescence or fine setulæ, often constricted at the second segment and bearing a few bristles; male genitalia usually prominent, symmetrical, comprising a hypopygium with paired lateral valves, each tipped by a prong or flat

Family Lauxaniidæ



Homoneura species.

Rather small flies, rarely more than 6 mm. in length, the auxiliary vein entire and ending in the costa.

Head variable, the face projecting or retreating, convex, flat or concave, without oral vibrissæ although these are rarely poorly developed. Front wide, with two pairs of frontals, the upper pair always reclinate, the lower pair sometimes decussate; ocellars present or minute. Antennæ variable, the arista plumose to bare. Thorax with bristles, at least behind the suture; scutellum usually bare except for the marginal bristles; propleural bristle present or absent; one or two sternopleurals. Tibiæ all with preapical bristle. Wing venation complete, the second basal and anal cells short; apical cell usually widely open. Abdomen oval, rarely elongate.

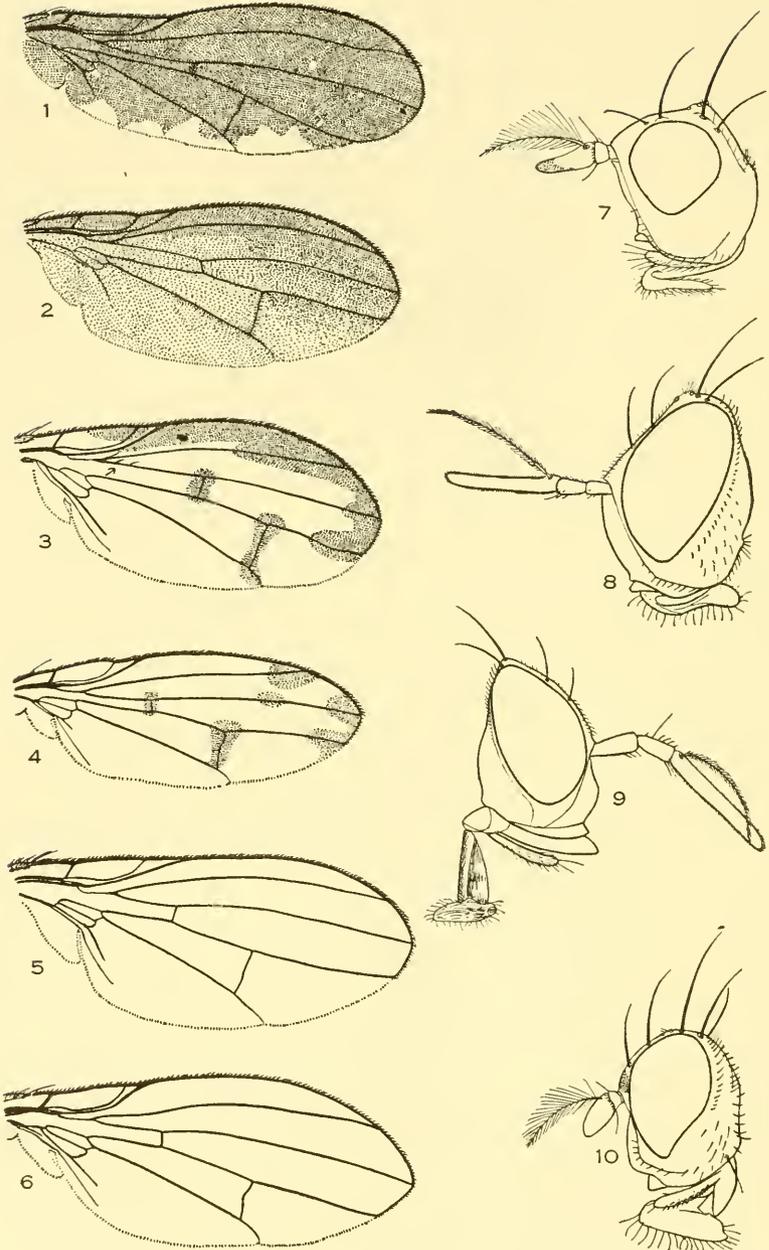
The adults may be found almost everywhere, but particularly in moist places where they may occur in large numbers. Many of the species are more in evidence in the evening than during the rest of the day. They are not very active and are therefore easily captured.

The larvæ of at least some of the species mine in plants and are economically important; others live upon decaying vegetation.

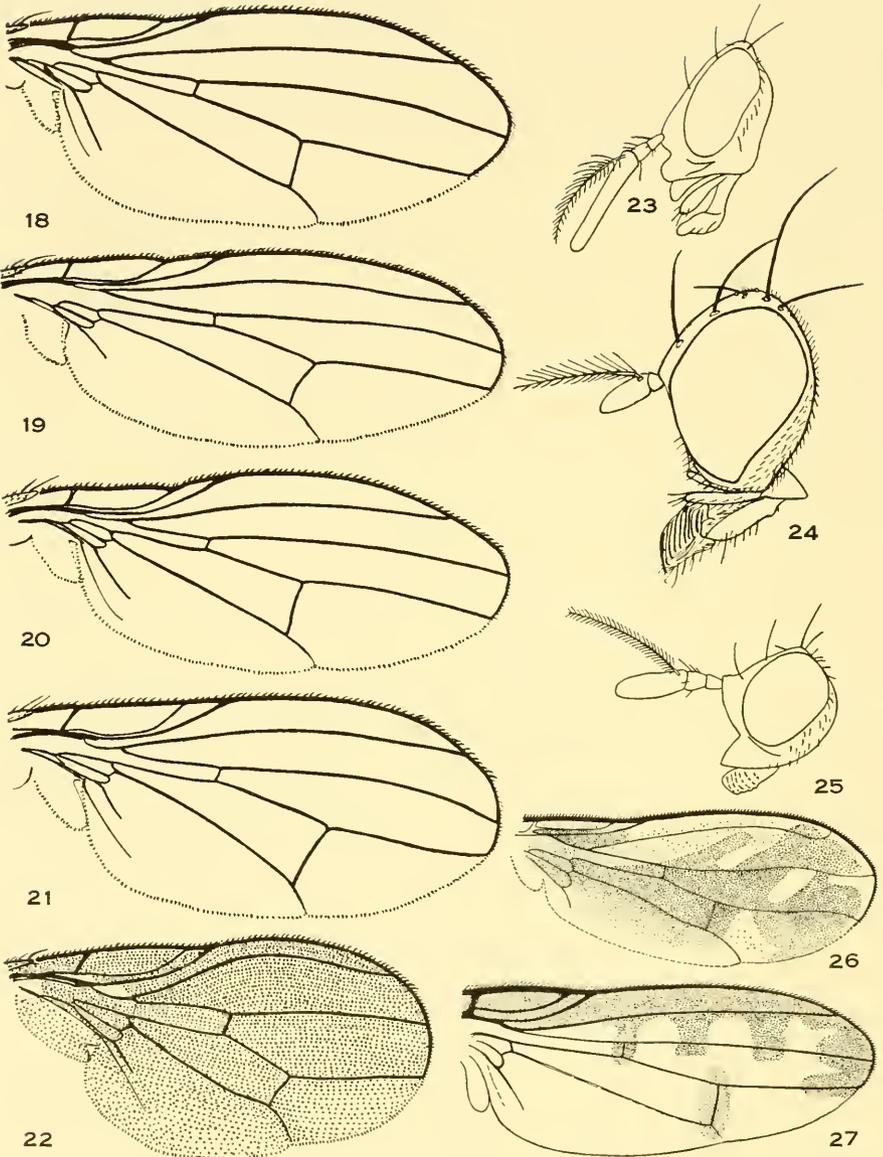
Sapromyzidæ has been used for this family by most American authors but *Lauxania* is older and should be used. Hendel has published extensively on the family: many changes have been made since his contribution in *Genera Insectorum** and he recognizes many additional genera in his key to genera.†

* 1908, Fascicle No. 68.

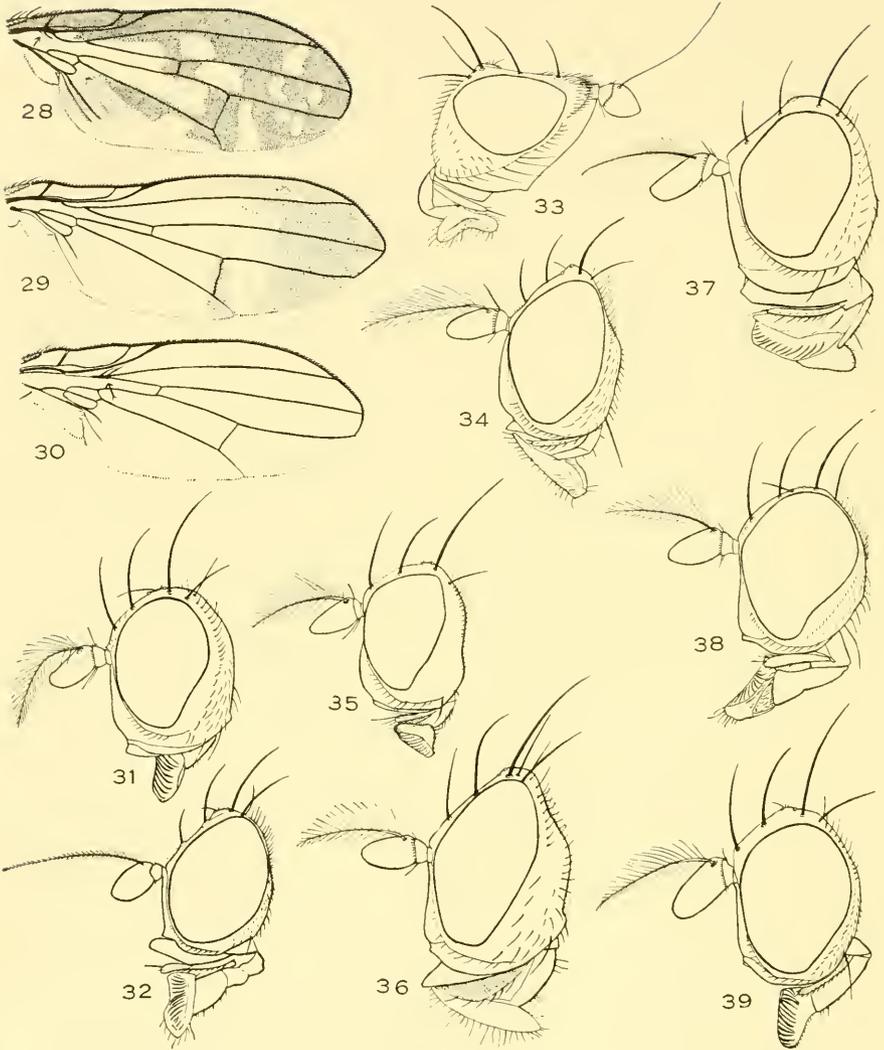
† 1925, *Encycl. Ent.*, B. Dipt., pp. 103-142.



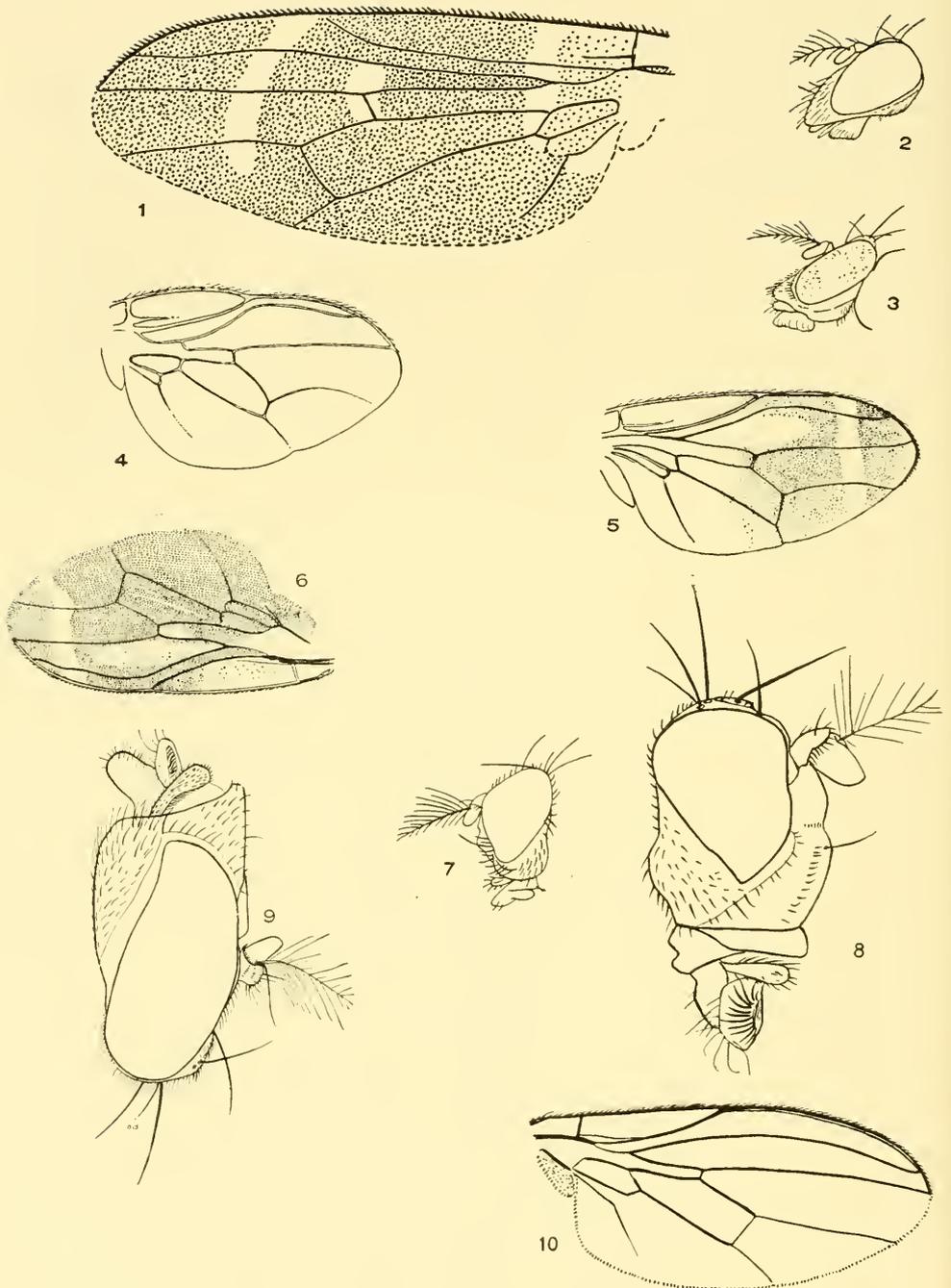
Lauxaniidae I.—1, *Chaetocœlia* sp.; 2, *Physegenua vittata*; 3, *Chaetominettia latelimbata*; 4, *Homoneura philadelphia*; 5, *Pseudogriphoneura*; 6, *Neogriphoneura*; 7, *Camptoprosopella vulgaris*; 8, *Lauxaniella opaca*; 9, *Steganolauxania latipennis*; 10, *Deutominettia bimaculata*.



Lauxaniidae III.—18, *Lauxania cylindricornis*; 19, *Trigonometopus vittatus*; 20, *Camptoprosopella vulgaris*; 21, *Lauxaniella opaca*; 22, *Steganolauxania latipennis*; 23, *Asilostoma*; 24, *Griphoneura*; 25, *Freyia nigrita*; 26, *Asilostoma palpalis*; 27, *Neominettia contigua*.



Lauxaniidæ IV.—28, *Setulina geminata*; 29, *Pseudocalliope*; 30, *Xenochætina*; 31, *Chæto-minettia*; 32, *Chæto-cælia*; 33, *Trigonometopus*; 34, *Xenochætina*; 35, *Neogriphoneura*; 36, *Setulina*; 37, *Pseudocalliope*; 38, *Pseudogriphoneura*; 39, *Sapromyza*.



Perisclidae.—1, *Marbenia peculiaris*; 2, *Neoscutops rotundipennis*; 3, *Scutops fascipennis*; 4, *Neoscutops rotundipennis*; 5, *Scutops fascipennis*; 6, *Panamenia chapmani*; 7, *Marbenia peculiaris*; 8, *Sphyroperisclis* sp.; 9, *Panamenia chapmani*; 10, *Sphyroperisclis* sp.

Family Periscelidæ

Small flies resembling the Lauxaniidæ, etc.

Face wide, more or less produced below; front with a single pair of bristles; postocellars divergent; arista plumose. Wing venation complete, the auxiliary vein short. Abdomen oval, somewhat depressed.

Members of this family are not numerous in collections and little is known about them. Malloch would retain the genera in the Sapromyzidæ and Melander included *Scutops* in his revision of the Geomyzidæ. The family contains seven genera, all occurring in America, *Periscelis* also being found in Europe.

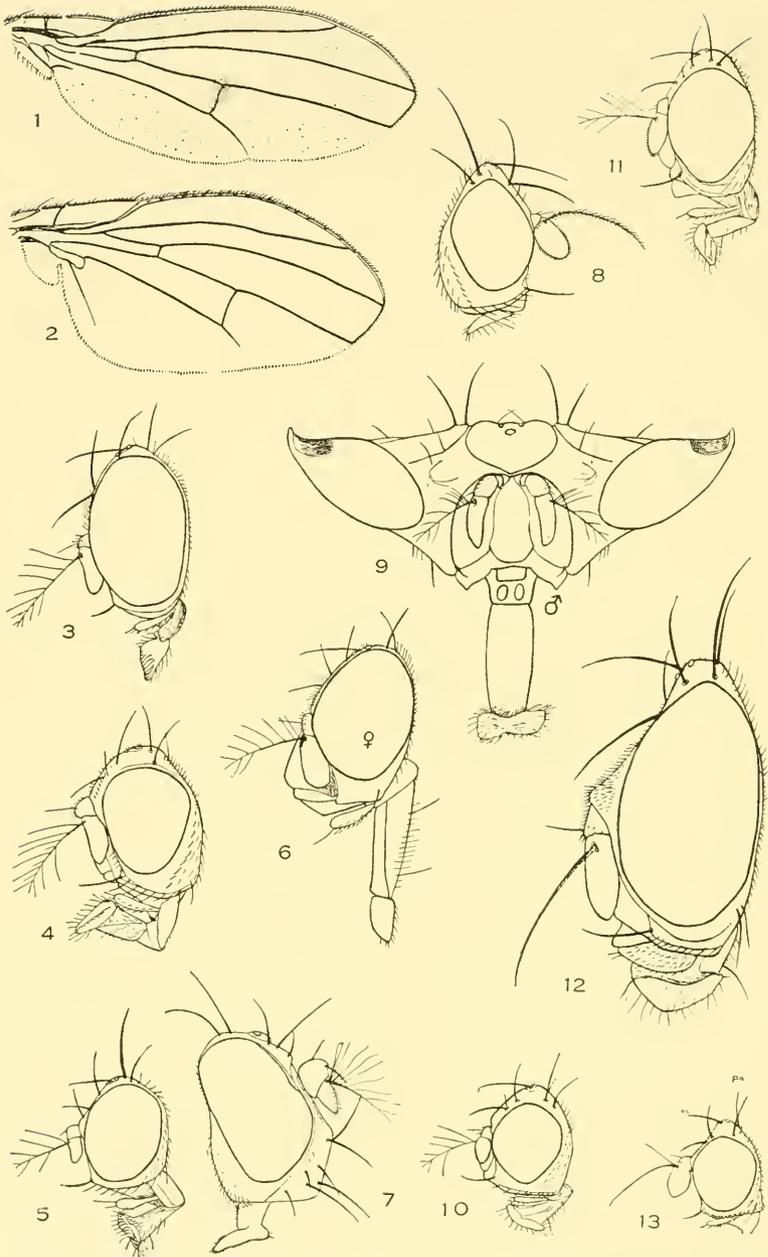
KEY TO GENERA

1. Costa extending to the fourth vein..... 2
Costa ending at the third vein..... 5
2. Face very strongly protruding below; auxiliary vein not curved forward apically 3
Face somewhat protruding below; auxiliary vein with a distinct forward curve apically; oral vibrissæ absent.....*Periscelis* Læw
3. Face evenly convex..... 4
Face flattened and bare in the middle above (3, 5).....*Scutops* Coquillett
4. Ocellars absent.....*Cyamops* Melander
Ocellars long and strong (24).....*Neoscutops* Malloch
5. Face most prominent below; veins strong (6, 9).....*Panamenia*, n. g.
Face not prominent below, more or less convex in the middle..... 6
6. Head almost or quite twice as wide as high; face very wide (8, 10).
Sphyroperiscelis Sturtevant
Head not nearly so wide; face and eyes of moderate width (1, 7).
Marbenia Malloch

Panamenia, new genus

This genus is, perhaps, most closely related to *Sphyroperiscelis* Sturtevant but the shape of the head is distinctive. The face is shield-shaped, the point below, the sides sharply limited and haired. Abdomen as broad as long, tapering sharply from near the base. Scutellum flat, bearing two pairs of marginals. Wings as in figure. Genotype:—*P. chapmani*, n. sp.

Head stramineous, the upper occiput and a broad frontal triangle black; thorax deep brown or blackish, the pleura yellowish; humeri, a large rectangle on the posterior half of the mesonotum and the scutellum, except the sides, stramineous; legs reddish yellow, the tibiæ with two brown bands, the anterior femora brown basally; wings brownish, with a preapical hyaline band; abdomen blackish or dark brown. Male, Barro Colorado Island, Canal Zone, (Curran).



Drosophilidae I.—1, *Cladochaeta nebalosa*; 2, *Rhinoleucophenga obesa*; 3, *Leucophenga maculosa*; 4, *Drosophila funebris*; 5, *Chymomyza amœna*; 6, *Zygothrica dispar*; 7, *Planinasus ambiguus*; 8, *Diastata*; 9, *Zygothrica dispar*; 10, *Scaptomyza gramineum*; 11, *Mycodrosophila*; 12, *Rhinoleucophenga obesa*; 13, *Cladochaeta nebulosa*.

Family Drosophilidæ—The Small Fruit Flies

Small flies, rarely exceeding a length of 5 mm. the head sometimes very broad, the wings often pictured.

Face nearly vertical in profile, rarely prominent, oral vibrissæ present, though sometimes weak; front with three pairs of bristles; post-ocellar bristles convergent, rarely absent. Third antennal segment oval or rounded, the basal two short; arista usually plumose, rarely pubescent or with a single long ray. Abdomen usually short, rather elongate and pendulous in *Curtonotum*. Auxiliary vein usually very short and ending in the first vein; costa broken twice; first vein short; second basal cell usually united with the discal cell; anal cell present, rarely incomplete.

The adults are found around decaying vegetation, flowing sap, fungi and ripe fruit, the larvæ being found in these substances. They are often pests to the housewife, since they apparently appear from nowhere when fruit is brought into the house and some of the fungus inhabiting species have the habit of hovering around the eyes during warm weather, causing not only irritation by their anties but pain when they get into the eye. In the tropics they sometimes occur in such numbers as to completely cover large fungi. There have been frequent complaints about them in milk bottles, the puparia becoming attached to the bottles and requiring special treatment for their removal.

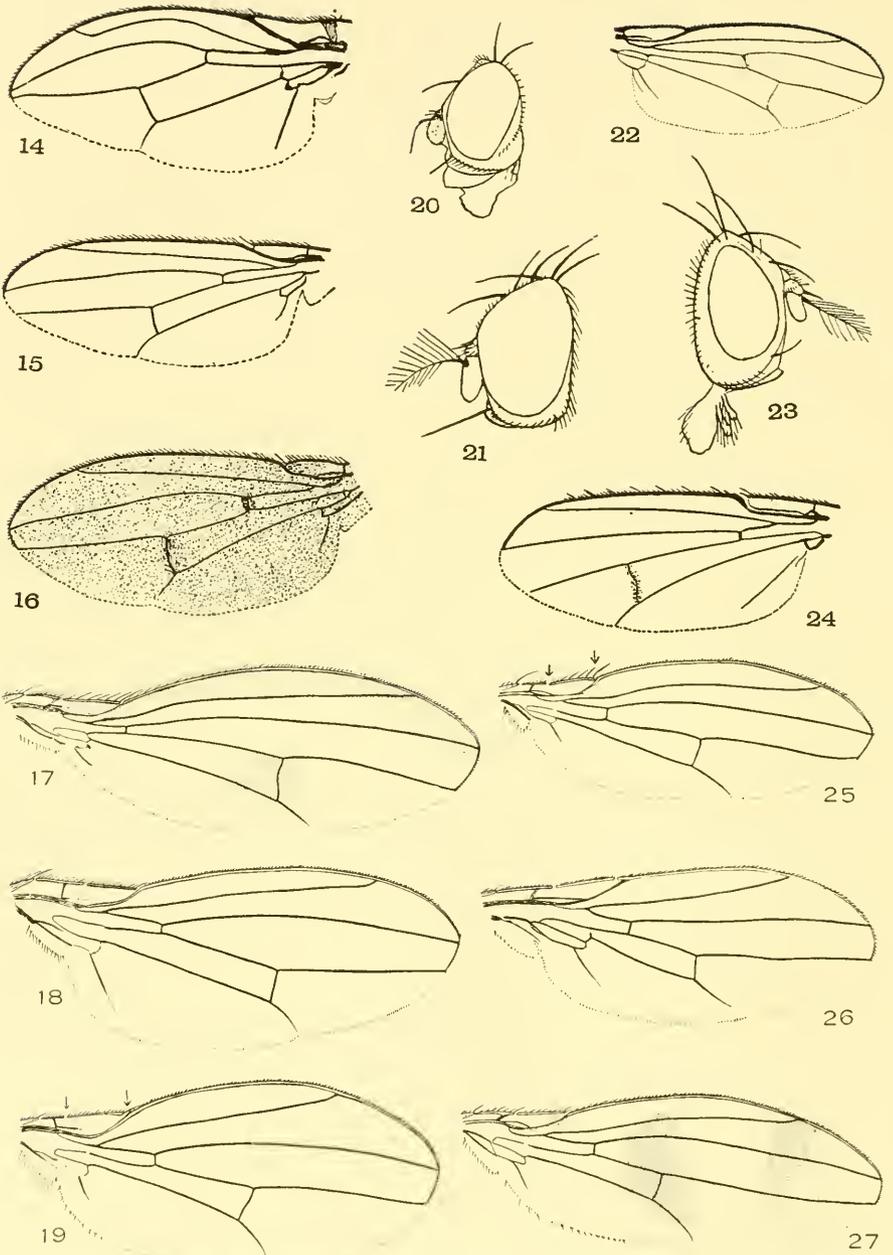
One of the species, *Drosophila melanogaster* Meigen, has been used extensively for the study of inheritance, being exceedingly well suited for this purpose because of the very short life cycle and large chromosomes. The general belief has been that the larvæ live upon fruit but it has been shown that they actually live upon the yeasts developing in it.

Sturtevant* has reviewed the North American species and Duda† has dealt with the Neotropical forms. In addition there are numerous small papers scattered through the literature. In addition to the genera given in the key several others, as well as a number of subgenera, have been proposed but most of them appear to be too poorly differentiated to deserve recognition. Aldrich‡ has discussed the occurrence in North America of the genus *Leiomiza* Macquart and described two species. As I have no specimens I am unable to place the genus in the key. Sturtevant* has referred this genus to the Asteiidae but this disposition of it does not agree with my interpretation of that family.

* 1921. The North American Species of *Drosophila*, Carnegie Inst. of Wash., pub. No. 301, 150 pp.

† 1927. Die Sudamerikanischen Drosophiliden, etc., Arch für Naturgeschichte, 1925, Hefts 11-12, pp. 1-229.

‡ 1919. Ent. News, xxx, p. 137.



Drosophilidae II.—14, *Stegana*; 15, *Leucophenga*; 16, *Drosophila*; 17, *Diastata vagans*; 18, *Zygothrica dispar*; 19, *Mycodrosophila dimidiata*; 20, *Sinophthalmus pictus*; 21, *Stegana*; 22, *Sinophthalmus pictus*; 23, *Curtonotum*; 24, *Curtonotum*; 25, *Scaptomyza gramineum*; 26, *Planinasus ambiguus*; 27, *Chymomyza amœna*.

Family Asteiidæ

Small flies, with the second vein ending only slightly beyond the first.

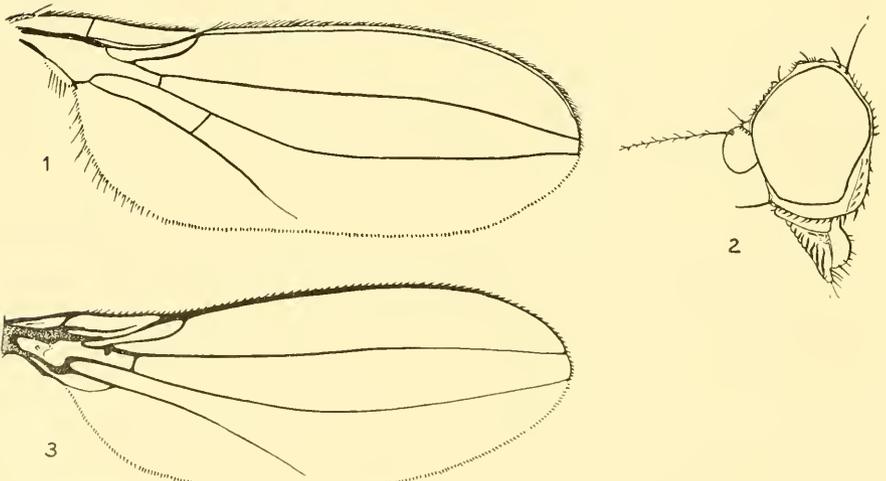
Head higher than long; face concave; oral vibrissæ well developed; front wide, with one or two pairs of bristles; thorax bristled posteriorly. Legs short. Wings long, with only one or two crossveins, before the basal third; auxiliary vein incomplete; costa entire, anal cell absent, the second basal sometimes open apically. Abdomen narrow.

This family comprises but few genera, three of which are recorded from America. The family may be at once recognized by the peculiar wing venation. Williston placed the two genera known to him in both the Drosophilidæ and Chloropidæ and there has been much doubt as to where they belong.

KEY TO GENERA

1. Posterior crossvein present 2
 Posterior crossvein absent, only one crossvein (3).....**Asteia* Meigen
2. Front with two bristles near the middle, half way between the ocellar triangle and antennæ.....*Crepidohamma* Enderlein
 Front with only weak bristles laterally (1, 2).....*Sigaloëssa* Coquillett

* Aldrich, 1915, Psyche, xxii, p. 96.



Asteiidæ.—1, 2, *Sigaloëssa rica* (*insularis* Curran, not Malloch); 3, *Asteia* sp.

Family Opomyzidæ

Small, rather elongate flies, sometimes with pictured wings.

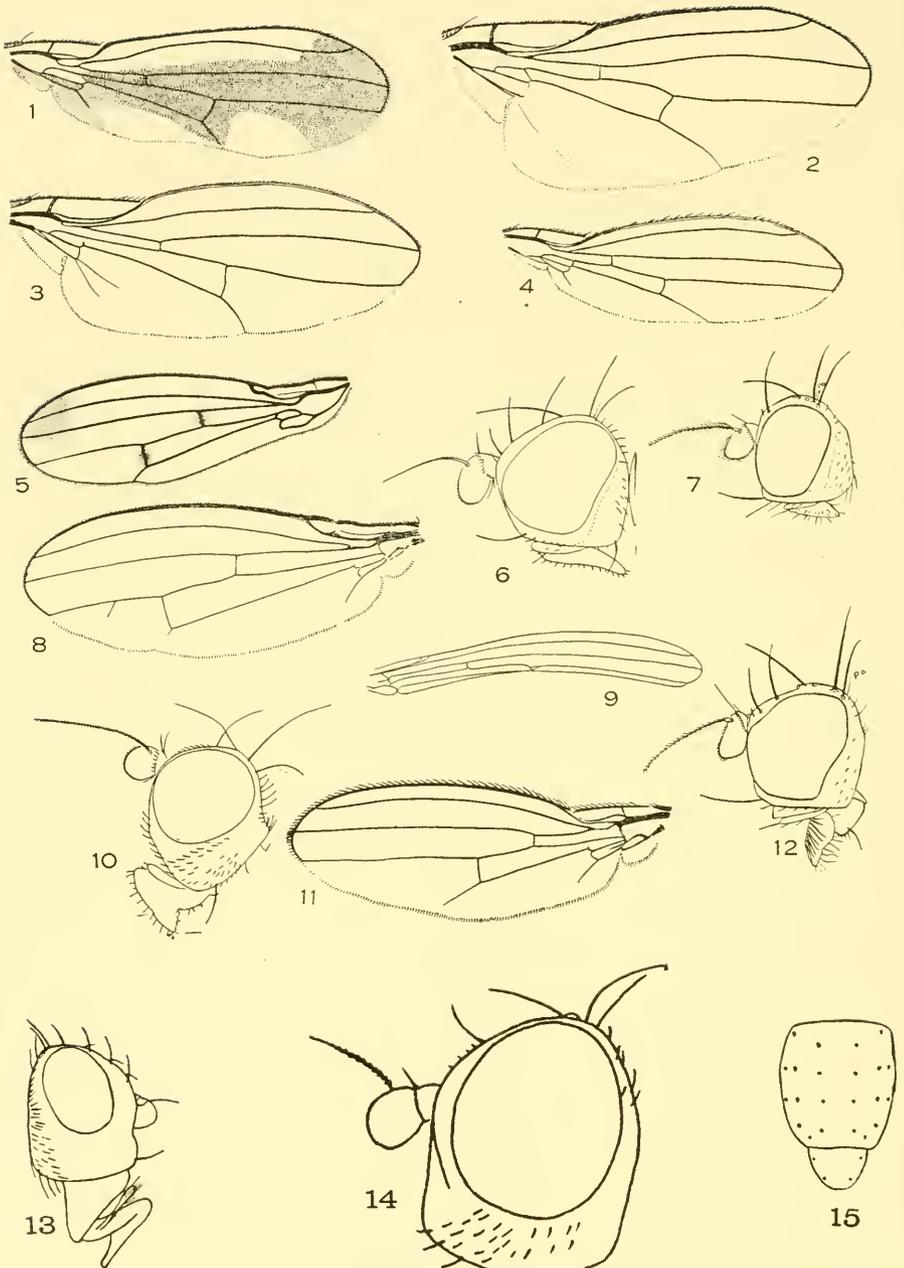
Head not longer than high, the face long, often narrow; one or more pairs of frontal bristles; postocellars divergent, convergent, or absent; oral vibrissæ absent or differentiated, never strong; palpi small. Presutural dorsocentrals present or absent; mesopleura bare; scutellum with or without hair in addition to the bristles; preapical tibial bristles absent. Subeosta incomplete or vestigial; anal and second basal cells complete, the first vein ending before the middle of the wing. Abdomen moderately long, the segments with marginal bristles; genitalia small.

Various authors have recognized three families for this group, the Anthomyzidæ and Tethinidæ in addition to the Opomyzidæ or Geomyzidæ. Despite the differences I believe that the genera should be grouped together, as otherwise there is sufficient grounds for the creation of a family for each of the genera. At any rate we may safely unite the Anthomyzidæ and Tethinidæ since both groups possess oral vibrissæ. However the vibrissæ are weak and the characters by which these groups are separated from *Opomyza* do not appear to be important in this case.

The flies occur chiefly in moist places and along the seashore. Practically nothing is known about the life histories, but it is known that species of *Opomyza* live in grass.

KEY TO GENERA

- | | |
|--|---------------------------|
| 1. Oral vibrissæ differentiated; post ocellar bristles converging, though small | 2 |
| Oral vibrissæ absent; post ocellars diverging or absent..... | 9 |
| 2. Presutural dorsocentrals present | 3 |
| Presutural dorsocentrals absent | 4 |
| 3. Cheeks haired only along the lateral oral margin..... | 6 |
| Cheeks with hairs over much of the surface or at least toward the eyes | 7 |
| 4. One pair of strong frontals (4, 7)..... | Mumetopia Melander |
| Two pairs of strong frontals..... | 5 |
| 5. Posterior crossvein situated only about its length from the wing margin (1, 12) | Ischnomyia Lœw |
| Posterior crossvein situated almost twice its length from the wing margin (6, 11) | Anthomyza Fallén |



Opomyzidae I.—1, *Ischnomyia vittata*; 2, *Tethina albula*; 3, *Pelomyia coronata*; 4, *Mumetopia nigrimana*; 5, *Geomyza*; 6, *Anthomyza*; 7, *Mumetopia occipitalis*; 8, *Opomyza*; 9, *Mutilloptera apicalis*; 10, *Opomyza*; 11, *Anthomyza*; 12, *Ischnomyia vittata*; 13, *Tethina*; 14, *Pelomyia occidentalis*; 15, *Pelomyia chaetotaxy*.

Family Agromyzidæ—The Leaf Miners

Small flies, blackish or yellowish in color, the postocellar bristles always present.

Head usually higher than long; front with at least three pairs of bristles; ocellars and postocellars present, the latter divergent; face receding or concave in profile; antennæ decumbent, the third segment rarely much longer than wide; arista pubescent or bare; oral vibrissæ present. Eyes large, the cheeks rarely half as wide as the eye-height. Legs short, the femora with bristles. Wings of moderate size, the venation complete or with the posterior crossvein absent; auxiliary vein more or less fused with the first vein or incomplete. Abdomen more or less depressed.

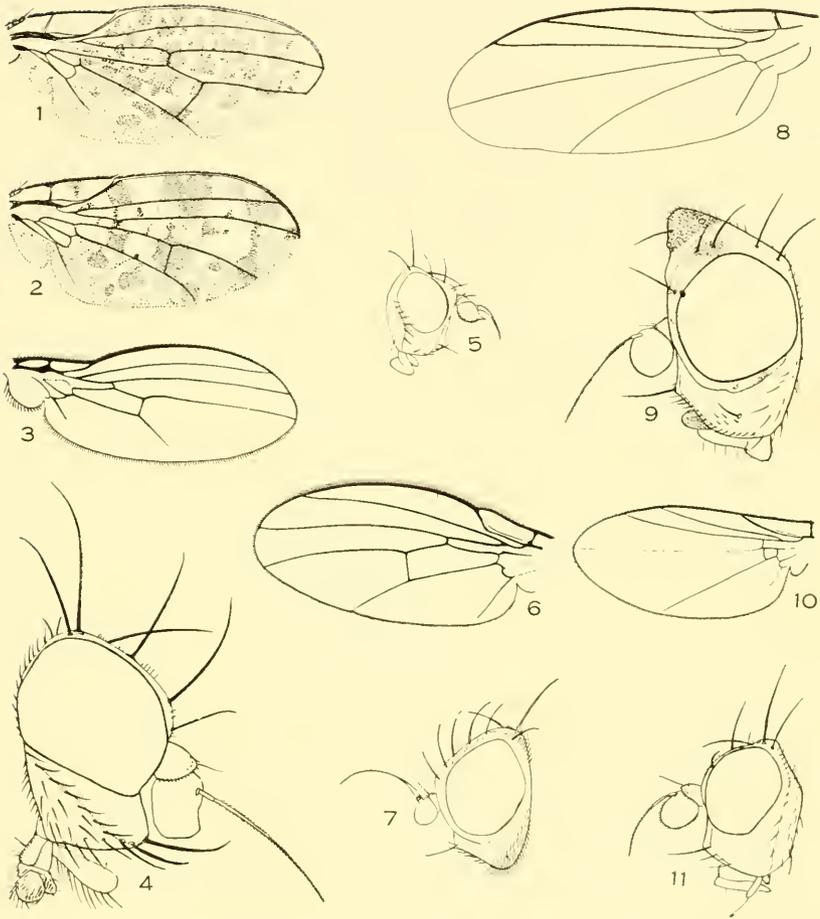
The adults occur everywhere and there are few deciduous plants which are not mined by their larvæ. Owing to their small size they are easily overlooked although easily recognized.

The larvæ make characteristic mines in the leaves of plants and most of them may be identified by the mines.

KEY TO GENERA

1. Arista absent (See Ochthiphilidæ, 3 and 5).....**Cryptochætum* Rondani
Arista present 2
2. Posterior crossvein present..... 3
Posterior crossvein absent..... 7
3. Posterior crossvein situated beyond the anterior crossvein..... 4
Posterior crossvein situated nearer to the base of the wing than the anterior crossvein (10).....*Napomyza* Haliday
4. Mesopleura with one or more bristles..... 5
Mesopleura bare 6
5. Third antennal segment with the upper apex acutely pointed (3, 5).
Cerodontha Rondani
Third segment not with an acute point, though sometimes angular (6, 7).
Agromyza Fallén
6. Front strongly produced forward, the ocelli situated on the anterior part (1, 9)*Traginops* Coquillett
Front regular in outline, the ocelli situated near the vertex..... 8
7. Fourth vein ending before the wing-tip*Antineura* Melander
Fourth vein ending behind the wing-tip (8, 11).....*Phytomyza* Fallén
8. Apical cell slightly narrowing apically.....*Schildomyia* Malloch
Apical cell widening apically, the costa not extending to the fourth vein (2, 4).....*Odinia* Desvoidy

* I have not seen this genus and its relationship is somewhat doubtful.



Agromyzidæ.—1, *Traginops irrorata*; 2, *Odinia williamsi*; 3, *Cerodontha dorsalis*; 4, *Odinia williamsi*; 5, *Cerodontha dorsalis*; 6, *Agromyza kincaidi*; 7, *Agromyza waltoni*; 8, *Phytomyza flavicornis*; 9, *Traginops irrorata*; 10, *Napomyza lateralis*; 11, *Phytomyza*.

Family Phyllomyzidæ

Small flies, usually black, sometimes silvery pollinose.

Costa broken at the humeral crossvein and at the apex of the auxiliary vein; postocellar bristles convergent or parallel; anterior frontals convergent, the others divergent, proclinate or reclinate; interfrontals present or there are rows of hairs; oral vibrissæ present though sometimes but poorly differentiated from the other bristles; proboscis long and geniculate, or short; antennæ not elongate, often small. Mesonotum with one to four pairs of dorsocentrals; mesopleura with or without bristles; pteropleura sometimes with distinct bristles. Legs moderately short. First vein ending near the basal third of the wing; second basal and anal cells small; posterior crossvein absent in *Paramyia*; costa usually bristly basally. Abdomen short and rather broad, the bristles weak or absent.

These flies were included by Williston in the Agromyzidæ while other authors have recognized the Milichiidæ and Carnidæ. *Phyllomyza* is an older generic name than *Milichia* and I do not consider the differences between the genera placed in the Carnidæ and Phyllomyzidæ as of more than generic value.

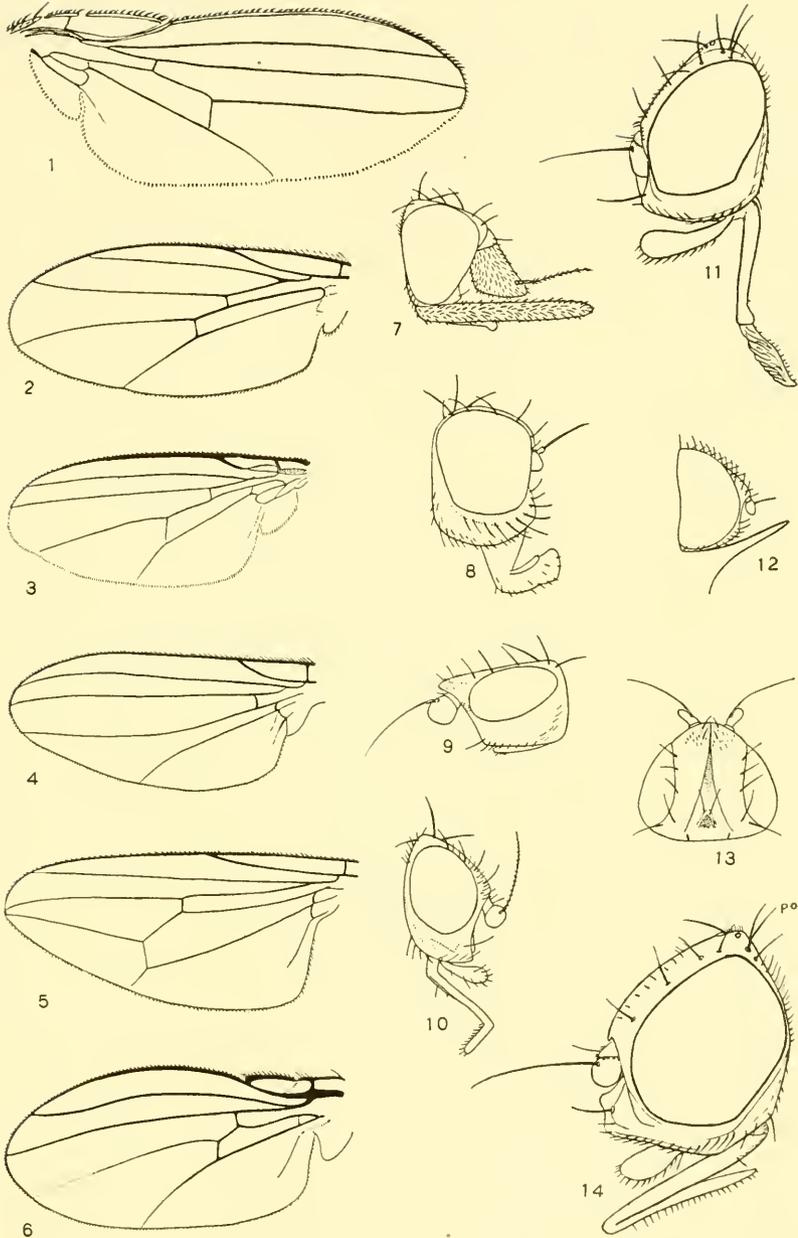
The adults are rather common and may frequently be found on fence posts, fences, logs, tree-trunks, etc. in the hot sun, or they may be taken by sweeping, on foliage or in grass. I have collected them only during dry weather and always in the bright sunlight. Keys to the species will be found in Melander's revision of the family,* and in a paper by Malloch†.

KEY TO GENERA

- | | |
|--|----------------------------|
| 1. Posterior crossvein present..... | 2 |
| Posterior crossvein absent (4, 26)..... | <i>Paramyia</i> Williston |
| 2. Costa extending to the fourth vein..... | 5 |
| Costa stopping at the third vein..... | 3 |
| 3. Proboscis very elongate and geniculate (3, 20)..... | <i>Aldrichiella</i> Hendel |
| Proboscis short | 4 |
| 4. Mesopleura bare (2, 9, 13)..... | <i>Euchlorops</i> Malloch |
| Mesopleura with two or three bristles (6, 21)..... | <i>Meoneura</i> Rondani |

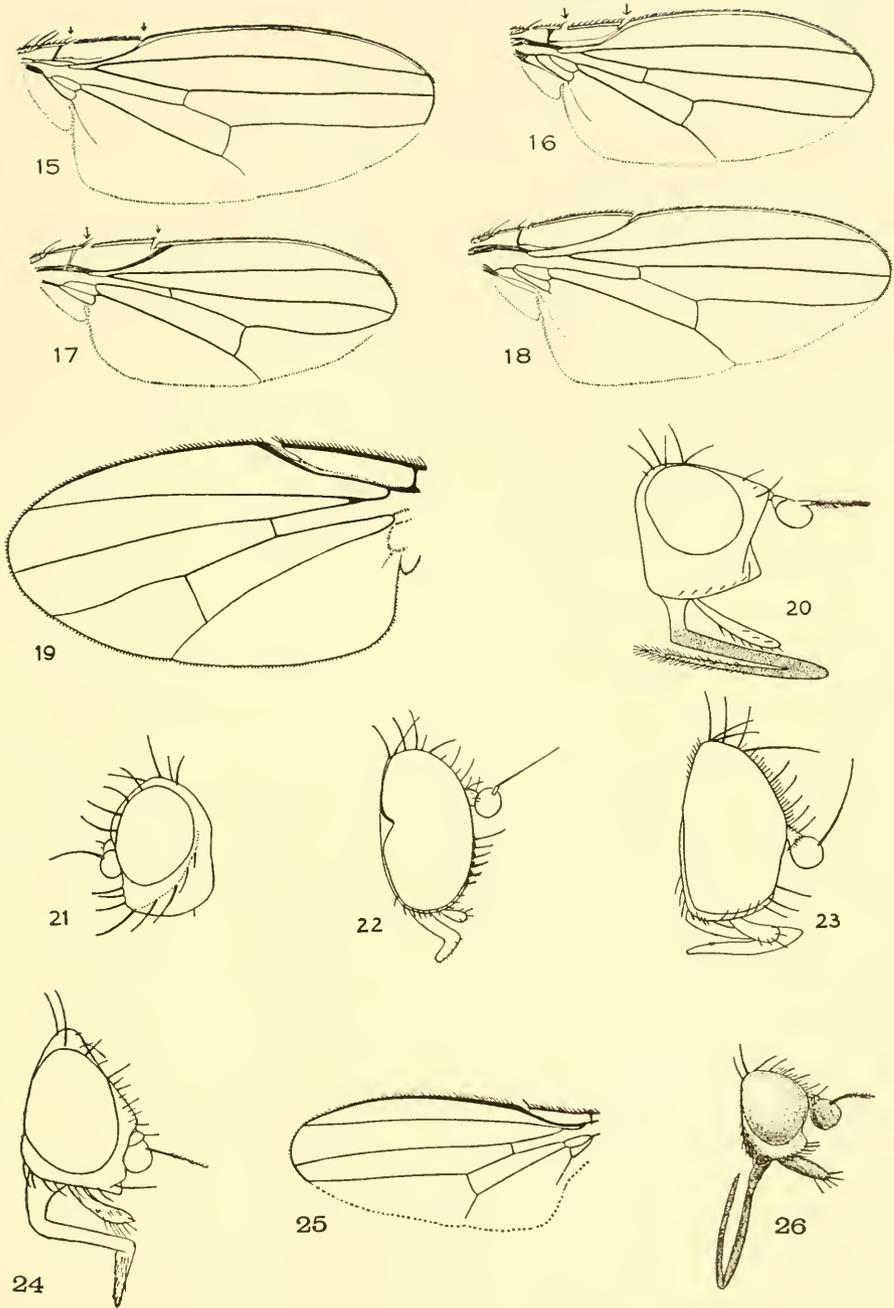
* 1913. Journ. N. Y. Ent. Soc., xxi, pp. 234-246.

† 1913, Proc. U. S. N. M., xlvi, pp. 127-152.



Phyllomyzidae I.—1, *Hypaspistomyia latipes*; 2, *Euchlorops vittata*; 3, *Aldrichiella agromyzina*; 4, *Paramyia nitens*; 5, *Eusiphona mira*; 6, *Meoneura vagans*; 7, *Phyllomyza hirtipalpis*; 8, *Hemeromyia nitida*; 9, *Euchlorops vittata*; 10, *Desmometopa M-nigrum*; 11, *Hypaspistomyia latipes*; 12, *Eusiphona mira*; 13, *Euchlorops vittata*; 14, *Desmomyza confusa*.

5. Costa with a very deep excision at the apex of the auxiliary vein;
 cruciate interfrontals developed 6
 Costa broken but the excision not extending into the cell; interfrontal
 hairs present 10
6. Mesopleura with strong bristles..... 7
 Mesopleura bare 8
7. Proboscis very long, geniculate.....*Paramilichia* Malloch
 Proboscis geniculate, but not unusually long (19, 23)..*Pholeomyia* Bilimek
8. Posterior margin of the eye excised at the middle..... 9
 Posterior margin of the eye not excised.....*Milichia* Meigen
9. Four pairs of dorsocentrals (18, 22).....*Eccoptomma* Becker
 One or two pairs of dorsocentrals (17, 22).....*Milichiella* Giglio-Tos
10. Apical cell very widely open, at most a little narrowed apically..... 11
 Apical cell only narrowly open (5, 12).....*Eusiphona* Coquillett
11. Bristles of the head and thorax strong; eyes at most short haired..... 12
 Bristles of head and thorax not strongly differentiated from the hair;
 eyes rather long pilose*Arctobiella* Coquillett
12. Proboscis geniculate, long and chitinized; vibrissal angle usually dis-
 tinct 13
 Proboscis shorter and more or less fleshy, the labellæ not elongate
 though folding back; vibrissal angles not developed; face strongly
 carinate (8).....*Hemeromyia* Coquillett
13. Posterior tibiæ flattened and broadened..... 14
 Posterior tibiæ not unusually flat and wide..... 16
14. Pteropleura with one or more small bristles (*Paramadiza* Malloch;
Mallochiella Melander) (1, 11).....*Hypaspistomyia* Hendel
 Pteropleura without bristle..... 15
15. Glossy black; frontal bristles weak (14, 15).....*Desmomyza*, n. g.
 Dull colored; frontals stronger; two pairs of divergent frontals; inter-
 frontals in differentiated rows (16, 10).....*Desmometopa* Læw
16. Lower edge of the head horizontal and long (24, 25).
Platophrymyia Williston
 Lower edge of the head rounded or short..... 17
17. Eyes hairy; palpi very large, projecting far beyond the oral margin
 (7) *Phyllomyza* Fallén
 Eyes bare or nearly so; palpi not projecting..... 18
18. Five or six pairs of orbitals..... 19
 Three pairs of orbitals.....*Cacoxenus* Læw
19. Apical scutellars converging.....*Neophyllomyza* Melander
 Apical scutellars diverging.....*Stomosis* Melander



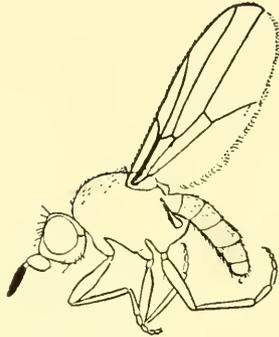
Phyllomyzidæ II.—15, *Desmomyza confusa*; 16, *Desmometopa*; 17, *Milichiella*; 18, *Ectoptymna*; 19, *Pholeomyia indecora*; 20, *Aldrichiella agromyzina*; 21, *Meoneura vagans*; 22, *Milichiella lacteipennis*; 23, *Pholeomyia indecora*; 24, 25, *Platophrymyia nigra*; 26, *Paramyia nitens*.

Desmomyza, new genus

Related to *Hypaspistomyia* Hendel but differing in having the pteropleura entirely bare instead of having some setulæ above. Genotype:—*D. confusa* n. sp. (New York).

The genotype is extremely like *H. glabra* Fallén, of which I believe *Desmometopa halteralis* Coquillett to be a synonym. It is entirely shining black except the base of the tarsi, the wings are milky white with yellowish veins. The only difference between *Desmomyza* and *Hypaspistomyia*, to which I refer *glabra*, lies in the presence in the latter of pteropleural setules. The type of *halteralis* has these, as do European specimens of *glabra* examined by me, hence my belief that Coquillett's species is the same as *glabra*. The weaker frontals will separate *Desmomyza* from *Desmometopa*.

Family Chloropidæ—The Frit Flies



Crassiseta species.

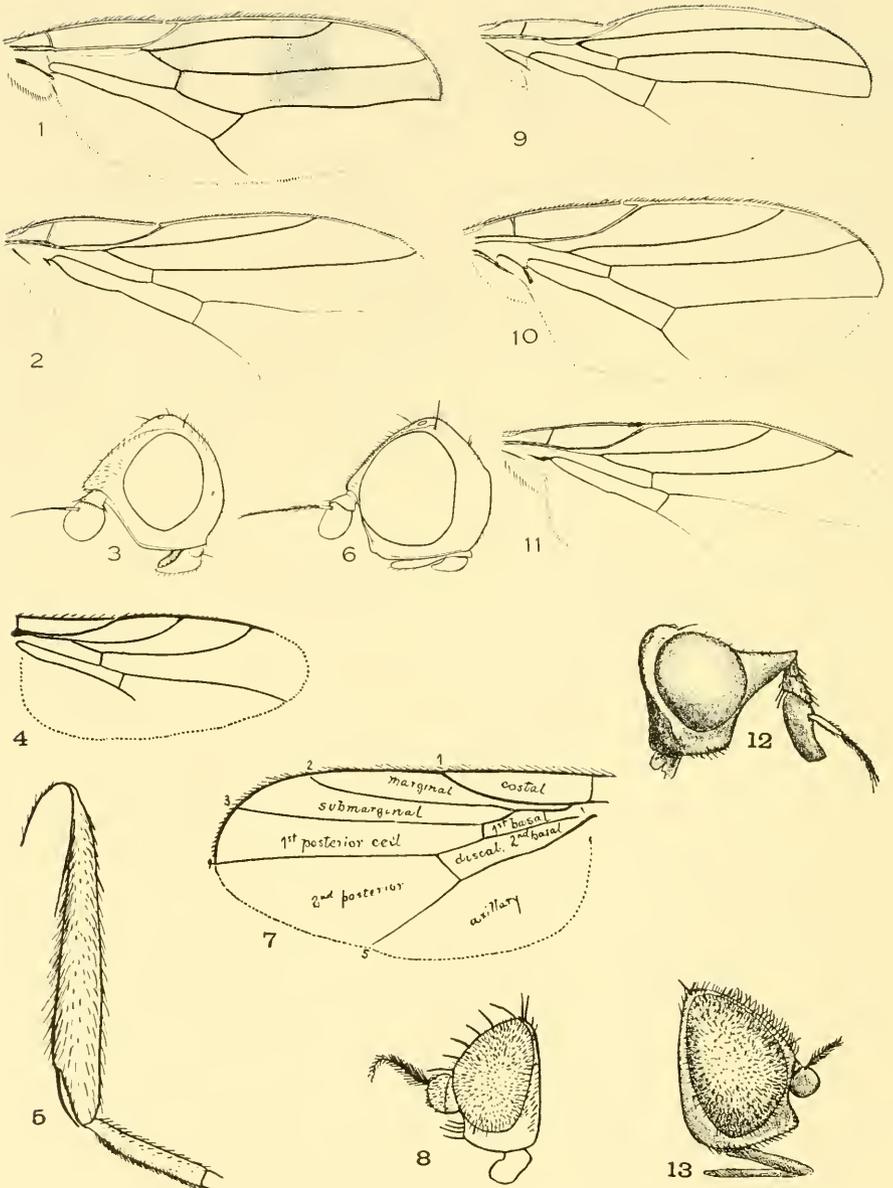
Small to very small, bare or nearly bare flies.

Head usually rather hemispherical, sometimes more or less triangular or rectangular, the face usually nearly vertical or receding; oral vibrissæ weak or absent; front broad, sometimes with bristles, the vertical triangle very large, often extending to the anterior margin of the front. Antennæ usually short, with rounded third segment, sometimes elongate. Wings of moderate length or rather short, auxiliary vein vestigial; second basal cell united with the discal cell; anal cell absent; fifth vein almost always with a slight, characteristic irregularity near the middle of the discal cell. Legs short, the femora rarely greatly thickened.

These flies are very common and representatives of the family may be collected almost anywhere. The family will be readily recognized as the large vertical or frontal triangle is characteristic and the peculiar gentle curve of the fourth vein is typical of the group.

The larvæ live in grass and other plants and some of them are economic pests of cereals. They are thick and cylindrical, with stout mouth hooks, two segmented antennæ and fleshy abdominal protuberances for locomotion.

The generic limits in some cases are evidently weak and it is not always easy to place some species with certainty. I am not certain that the so-called horny geniculate proboscis of *Madiza* Fallén constitutes a generic character in this case since there is a gradual evolution to the normal type found in *Oscinella* Becker. The apical section of the pro-



Chloropidæ I.—1, *Dactylothyrea curvinervis*; 2, *Chlorops sulphurea*; 3, *Chlorops*; 4, *Meromyza americana*; 5, *Hippelates collusor*; 6, *Cetema hypocera*; 7, *Madiza*; 8, *Pseudogaurax*; 9, *Dicræus*; 10, *Pseudogaurax*; 11, *Diptotaxa pulchripes*; 12, *Ectecephala*; 13, *Madiza*.

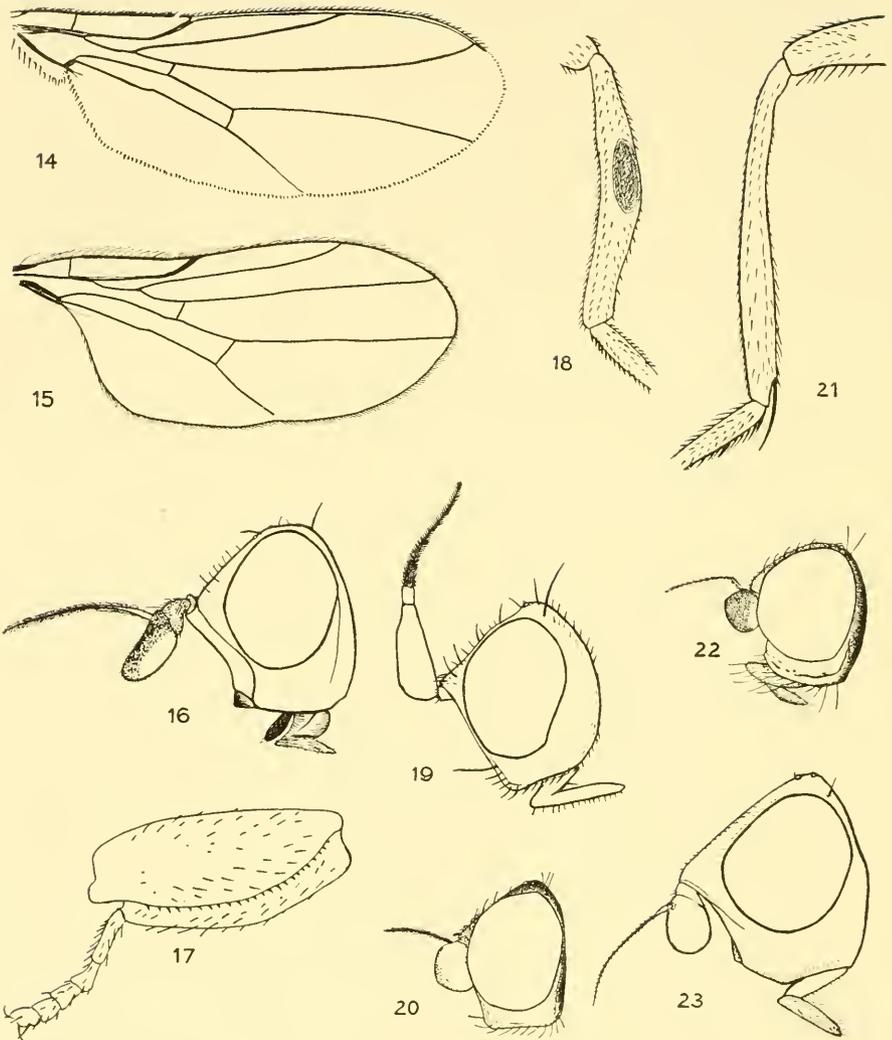
boscis is nothing more than the labellæ which are lengthened and narrowed and it is not always easy to decide whether the proboscis is geniculate or not. Trouble will also be experienced in connection with the pubescence of the arista and the presence of frontal bristles, both of which are characters which show gradual development in the presence of extensive collections. The only revision of the North American species of this family is by Becker.* In a recent paper on the Neotropical forms Duda† has proposed many new genera but his contribution has been so badly mangled by deletion necessitated in order to reduce its size to the absurd limits set by most publications that it is almost impossible to follow his keys.

KEY TO GENERA

1. Costa extending to the fourth vein 11
Costa ending at the third vein or slightly beyond it 2
2. Posterior crossvein absent **Elliponeura** Læw
Posterior crossvein present 3
3. Posterior femora greatly thickened, their tibiæ strongly arcuate
(4, 17) **Meromyza** Meigen
Posterior femora only moderately thickened, their tibiæ but little
curved 4
4. Middle tibiæ with a strong, curved apical spur; male genitalia large,
carried forward under the abdomen (6, 14, 21)..... **Cetema** Hendel
Middle tibiæ with normal terminal bristles 5
5. Posterior tibiæ with an oval, opaque "sensory organ" posterodorsally,
the tibiæ somewhat broadened (18, 23, 26) **Chloropisca** Læw
Posterior tibiæ without velvety sensory area 6
6. The distance between the crossveins along the fourth vein is not
greater than the length of the posterior crossvein (11)..**Diplotoxa** Læw
The distance is equal to at least twice the length of the posterior
crossvein 7
7. Mesonotum entirely black, coarsely punctured..... **Ephichlorops** Becker
Mesonotum usually vittate, not wholly black nor coarsely punctured... 8
8. Third antennal segment conspicuously longer than broad..... 9
Third segment rather circular in outline, often broader than long,
never conspicuously longer than broad (2, 3)..... **Chlorops** Meigen
9. Frontal triangle shining 10
Frontal triangle opaque (28) **Anthracophaga** Læw
10. Frontal triangle very long and broad, ending in a broad, obtuse point
a little before the base of the antennæ, convex in cross-section
(12, 24) **Ectecephala** Macquart
Frontal triangle strongly narrowing anteriorly and ending in an acute
point, flat in cross-section (16, 25) **Parectecephala** Becker

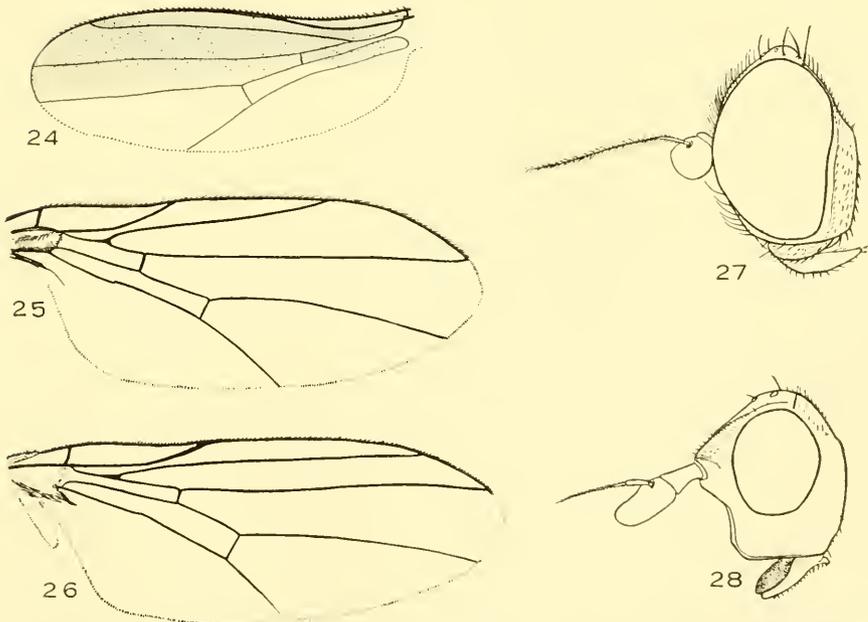
* 1912, Ann. Mus. Nat. Hung., x, pp. 21—.

† 1930, Fol. Zool. Hydrobiol., ii, pp. 46-128.



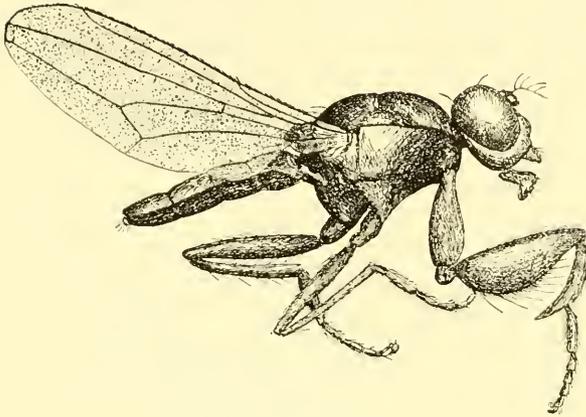
Chloropidæ II.—14, *Cetema hypocera*; 15, *Oscinella varipalpus*; 16, *Parectecephala*; 17, *Meromyza americana*, hind leg; 18, *Chloropisca variceps*, hind tibia; 19, *Ceratobarys pullophus*; 20, *Oscinella tripunctata*; 21, *Cetema*, middle tibia; 22, *Oscinella magnipalpoidea*; 23, *Chloropisca*.

- 11. Posterior tibiæ with a strong, curved ventral spur at or before the excavated apex (5) 12
 Posterior tibiæ normal 15
- 12. Arista flattened and strap-like (19).....*Ceratobarys* Coquillett
 Arista of ordinary shape, practically bare..... 13
- 13. Scutellum elongated, with flattened disc*Prohippelates* Malloch
 Scutellum with convex disc and of normal length..... 14
- 14. Front with distinct bristles toward the orbits..*Pseudohippelates* Malloch
 Front without bristles (5)*Hippelates* Lœw
- 15. Distance between the tips of the second and third veins at least twice that between the first and second*Siphunculina* Rondani
 Distance between tips of second and third veins but little more than that between the first and second 16
- 16. Arista bare or quite short pubescent 20
 Arista broadened or long pubescent 17
- 17. Arista appearing broadened and strap-like due to the arrangement of the dense pubescence*Crassiseta* Von Rössner
 Arista pubescent 18
- 18. Scutellum with strong marginal processes (1, 27)....*Dactylothyrea* Duda
 Scutellum without marginal processes 19



Chloropidæ III.—24, *Ectecephala*; 25, *Parectephala*; 26, *Chloropisca*; 27, *Dactylothyrea curvinervis*; 28, *Anthracophaga sanguilenta*.

Family Ephydridæ—The Shore Flies

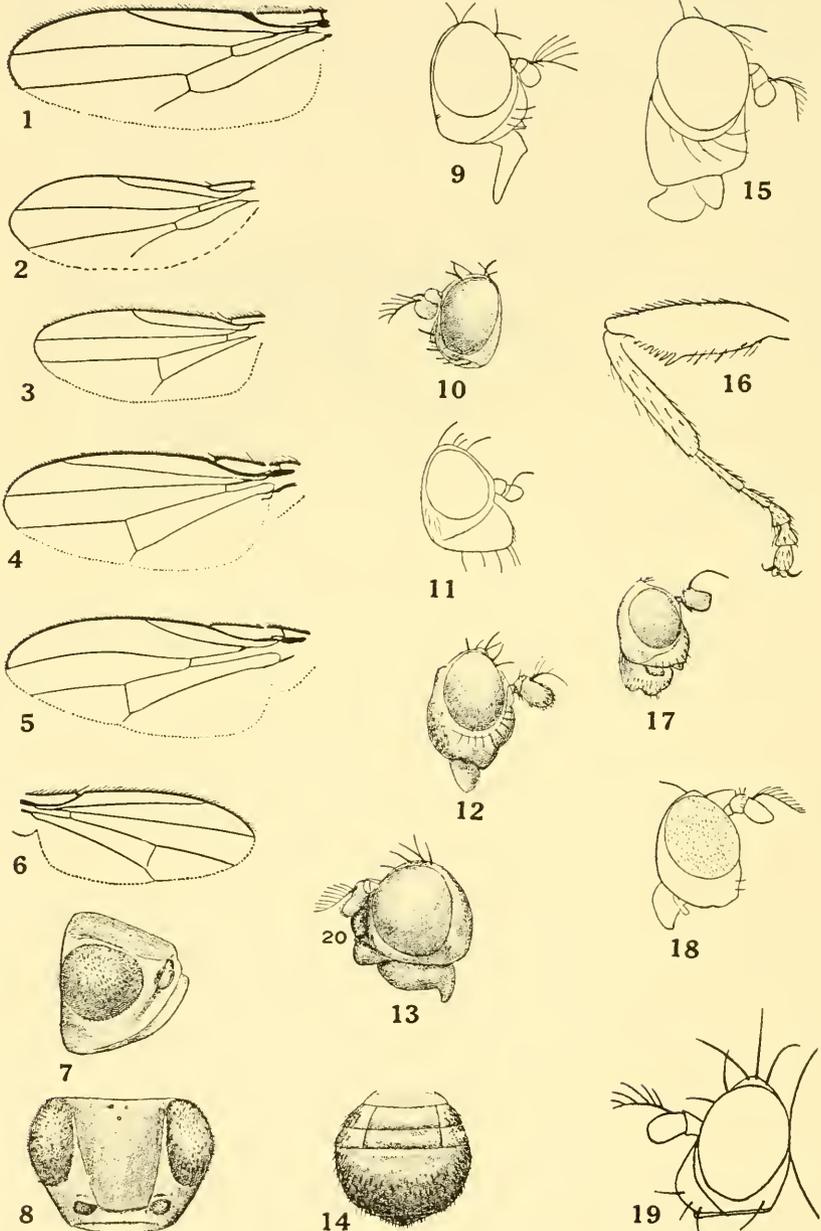


Ochthera humilis.

Small to very small flies, the anal cell absent, the second basal and discal cells united.

Face more or less, often remarkably convex, the oral cavity rounded, sometimes very large; clypeus distinct but often retracted within the oral cavity; no distinct oral vibrissæ but the sides of the face often with bristles or hairs. Antennæ short; arista bare, pubescent or pectinate, always dorsal. Thorax gently convex, bristled. Legs short; tibiæ without preapical bristle, the middle pair with apical spur. Wings rarely aborted; auxiliary vein united with the first vein except basally; costa broken before the tip of the first vein and weakened beyond the humeral crossvein; second basal and discal cells united; anal cell absent or extremely small and incomplete. Abdomen composed of six segments in the males, seven in the females, the number sometimes apparently reduced to three, variable but never elongate, often quite wide; genitalia usually retracted; body usually with but few hairs.

The adults are found in moist places, inhabiting marshes, swamps and the shores of lakes, ponds, and streams, along the edges of brooks and the sea shore. Many of the species are of local habitat but most of them are widely distributed. Some species occur in the flowers of water plants and have been found nowhere else. Water lilies are usually frequented by several species while in bloom and many occur on the



Ephydriæ I.—1, *Lytogaster*; 2, *Hydrina*; 3, *Ochtheroidea atra*; 4, *Parydra*; 5, *Brachydeutera argentata*; 6, *Notiphila*; 7, 8, *Lipocheata*; 9, *Allotrichoma*; 10, *Discocerina*; 11, *Ephyra*; 12, *Gastrops*; 13, *Brachydeutera*; 14, *Lytogaster*; 15, *Athyroglossa*; 16, *Ochtheroidea*; 17, *Lytogaster*; 18, *Hydrina*; 19, *Atissiella*.

leaves. Some of the species are able to walk on the surface of water and many of them will alight upon it if disturbed but they usually quickly return to the shore.

The larvæ live in various habitats, many are aquatic or live in mud, others in the stems of aquatic or semi-aquatic plants, a few in flowing sap. Many of them live in brackish, but may also occur in fresh, or even in alkaline water. One species, *Psilopa petrolei* Coquillett, occurs in the pools of crude petroleum found in California, breathing by projecting the posterior spiracles above the surface of the oil, but its food is unknown. Other species are found in the warm waters of geysers.

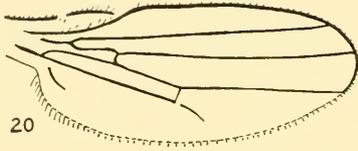
Many new genera have been described since the publication of Williston's Manual and some authors have recognized the Notiphilidæ as a separate family but there appears to be no good basis for this. Jones* reviewed the family in 1906. Since then there has been no comprehensive publication although Cresson has published several large papers containing descriptions of new species and genera and some keys.

KEY TO GENERA.

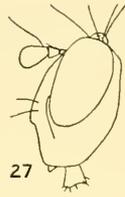
1. Scutellum normal 2
Scutellum as large as the mesonotum and almost concealing the abdomen, from dorsal view (see text figure).....*Peltopsilopa* Hendel
2. Costa extending to the fourth vein..... 3
Costa ending at the third vein 53
3. Antennæ small, inserted very far apart in cavities, the arista atrophied, very short and blunt (7, 8, 71)*Lipochæta* Coquillett
Antennæ normal; arista always long 4
4. Middle tibiæ with dorsal bristles (30, 57).....†*Paralimna* Lœw
Middle tibiæ without bristles except at the apex 5
5. Second antennal segment with a spinous bristle at the upper apical corner 6
Second antennal segment without such bristle..... 31
6. First and fifth abdominal segments exceptionally short, the abdomen apparently composed of three long segments, the lateral margins revolute 7
Abdomen with five distinct segments, the lateral margins not margined. 8
7. Face with two pairs of bristles below.....*Trimerinoides* Cresson
Face with one pair of bristles below (48)*Trimerina* Macquart
8. Arista pectinate 9
Arista bare (40, 53)*Mosillus* Latreille

* Tech. Bull. Calif. Exp. Sta., 1, No. 2.

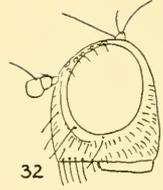
† Cresson, 1918, Trans-Amer. Ent. Soc., xlv, p. 45 (Costa Rica).



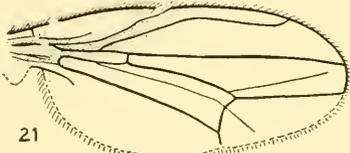
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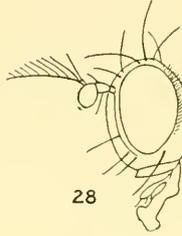
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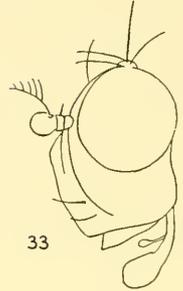
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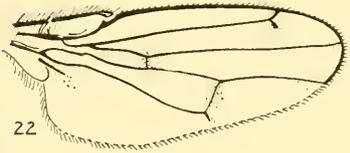
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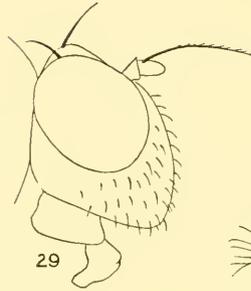
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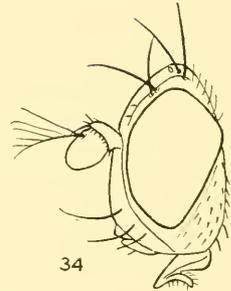
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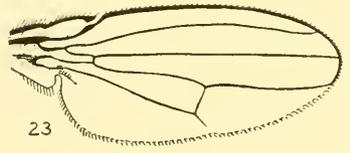
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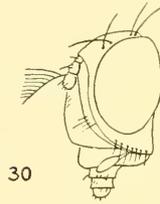
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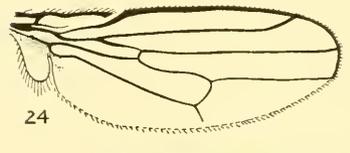
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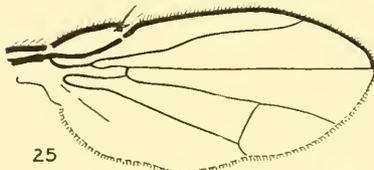
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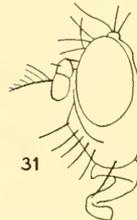
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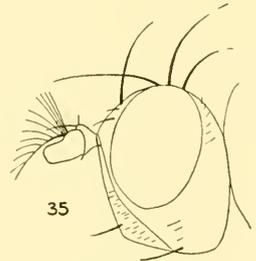
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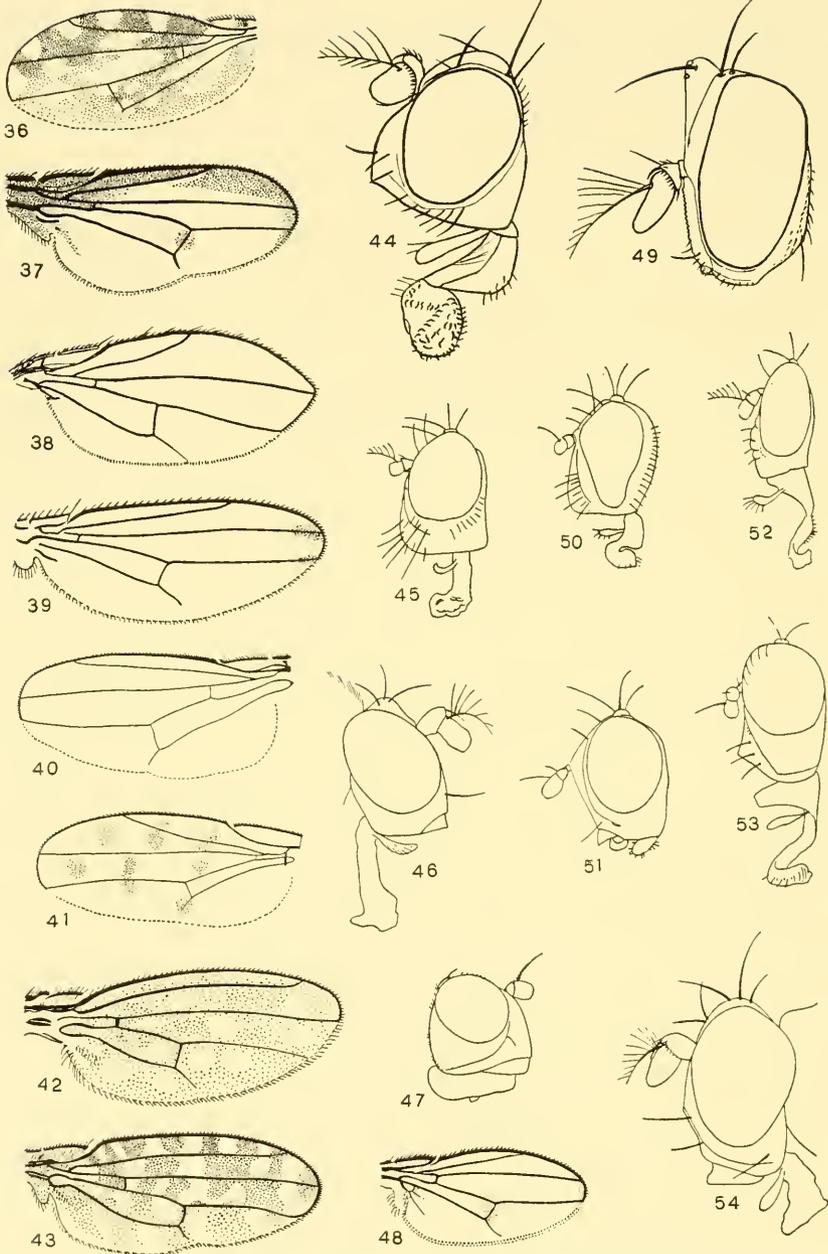


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Ephydriæ II.—20, *Glenanthe*; 21, *Clanoneurum*; 22, *Parydra*; 23, *Cœnia*; 24, *Pelina*; 25, *Dichæta*; 26, *Hyadina*; 27, *Axysta*; 28, *Dichæta*; 29, *Psilephydra*; 30, *Paralimna*; 31, *Hecamedoides*; 32, *Lamproscatella*; 33, *Edenops*; 34, *Ditiichophora valens*; 35, *Notiphila*.

- 9. Wings with a strong fold extending the length of the discal cell near the middle and another in the apical cell (21, 49)...*Clanoneurum* Becker
Wings without such folds 10
- 10. Arista without rays below 11
Arista with two or three rays below (38, 44).....*Ptilomyia* Coquillett
- 11. Face with transverse ridges, at least laterally, which may be very broad, or fine and numerous, usually limited to the lower half of the face 12
Face without such ridges 14
- 12. Facial ridges very fine, extending across the face, sometimes not continuous on the lower part (58, 66).....*Leptopsilopa* Cresson
Facial ridges very broad 13
- 13. Facial ridges strong, extending across the face (68).*Cerometopum* Cresson
Facial ridges resulting from sub-lateral pits and not extending over the middle of the face (37, 52)*Discomyza* Meigen
- 14. With only one pair of dorsocentral bristles..... 21
With two pairs of dorsocentrals 15
- 15. Ocellar bristles widely separated, situated opposite the anterior ocellus. 16
Ocellars normal, situated above the anterior ocellus..... 19
- 16. Bristles on the sides of the face all convergent..... 17
Bristles on the sides of the face partly divergent, partly convergent.
Polytrichophora Cresson
- 17. Face with two rows of bristles on either side..... 18
Face with one row of bristles on either side (10, 56).*Discocerina* Macquart
- 18. Posterior tibiæ with a strong, curved apical spine (31).
Hecamedoides Hendel.
Posterior tibiæ without apical spine*Diclasioipa* Hendel
- 19. Interfrontalia with two pairs of bristles (67, 72).....*Paratissa* Coquillett
Interfrontalia without bristles, the ordinary frontals present..... 20
- 20. Face rather strongly carinate above, the carina ending prominently at the middle of the face (41, 63).....**Ilythea* Haliday
Face very gently convex longitudinally, not carinate (*Typopsilopa* Cresson) (54).....*Psilopina* Becker
- 21. Oral opening large, the clypeus always prominent, the middle of the face usually strongly produced 22
Oral opening smaller, the face usually convex and receding below, the face never strikingly produced in the middle..... 24
- 22. Third costal section longer than the second (19).....*Atissiella* Cresson
Third costal section shorter than the second..... 23
- 23. Ocellars inserted opposite the anterior ocellus (45).....*Atissa* Haliday
Ocellars inserted above the anterior ocellus (9).....*Allotrichoma* Becker

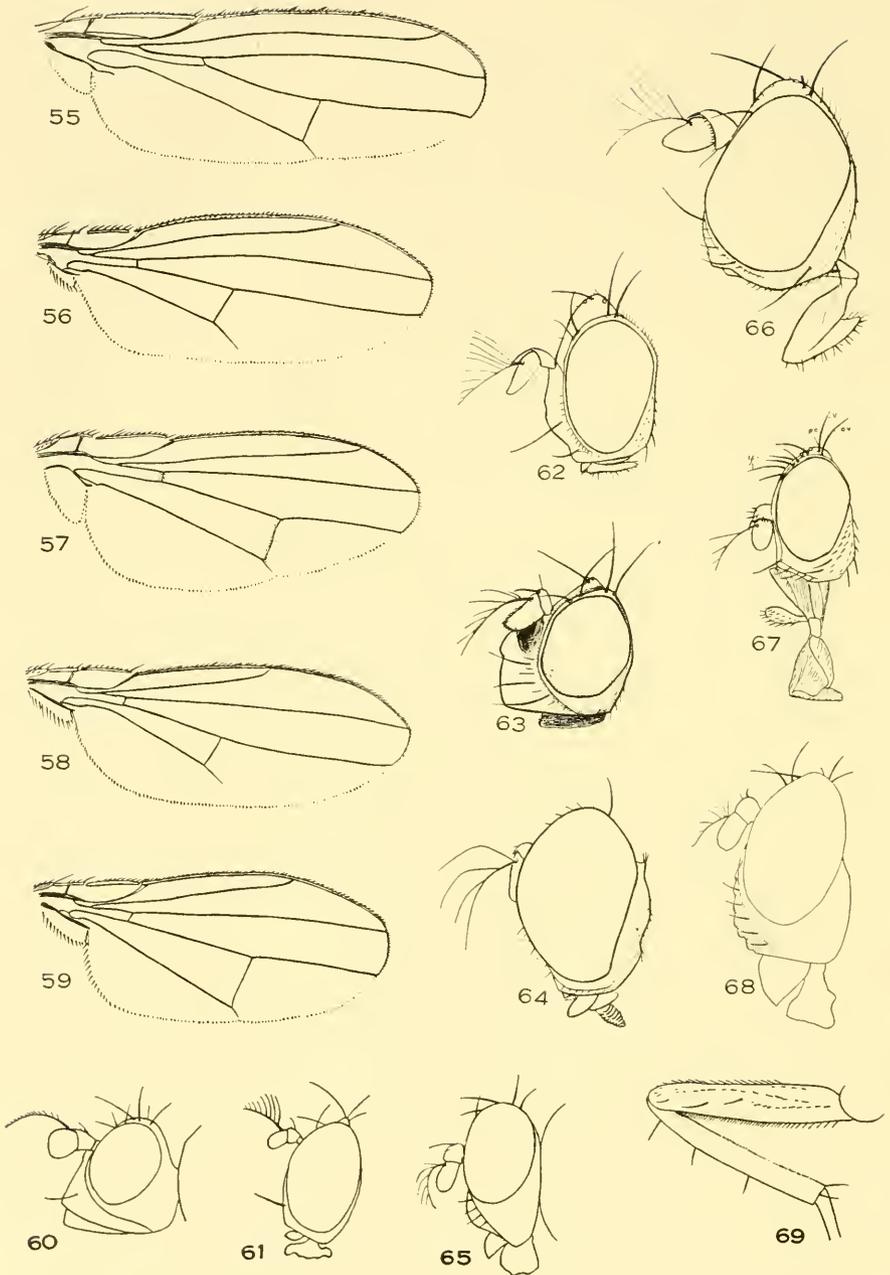
* Cresson, 1918, Trans. Amer. Ent. Soc., xlv, p. 50 (Costa Rica).



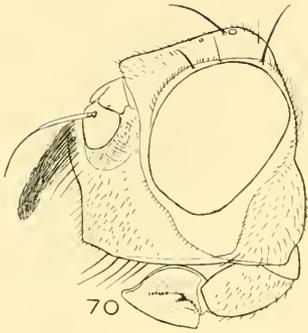
Ephydriæ III.—36, *Nostima sloussonæ*; 37, *Disomyza*; 38, *Ptilomyia ænigma*; 39, *Psilopa*; 40, *Mosillus*; 41, *Ilythea*; 42, *Scatophila*; 43, *Scatella*; 44, *Ptilomyia ænigma*; 45, *Atissa*; 46, *Plagiops*; 47, *Parydra*; 48, *Trimerina*; 49, *Clanoneurum*; 50, *Glenanthe*; 51, *Pelina*; 52, *Disomyza*; 53, *Mosillus*; 54, *Psilopina*.

24. Front shining 27
 Front pollinose 25
25. Face with longitudinal ridges below (59, 73).....*Rhysophora* Cresson
 Face without ridges below 26
26. Eyes longitudinally oval (34).....*Ditrichophora* Cresson
 Eyes not regularly oval, widened below the middle and narrowing the
 face above (10, 56).....**Discocerina* Macquart
27. Face carinate above (15)*Athyroglossa* Læw
 Face very gently convex above, without a distinct ridge..... 28
28. Face and front on the same plane, flat, the face slightly convex be-
 low (46)*Plagiops* Cresson
 Face, front or both conspicuously convex 29
29. Second and third antennal segments pendulous, the third more than
 twice as long as wide 30
 Antennæ not pendulous, the third segment not twice as long as wide
 (39, 61)*Psilopa* Fallén
30. Spine of second antennal segment long and strong (62).
Clasiopella Cresson
 Spine of second antennal segment fine (77).....*Ceropsilopa* Cresson
31. Oral opening small; eyes usually with distinct hair 32
 Oral opening large; eyes usually bare 43
32. Anterior femora greatly enlarged, their tibiæ ending in a spur..... 33
 Anterior femora not remarkably enlarged, their tibiæ not ending in a
 spur 34
33. Scutellum with four marginal bristles (see text figure).
Ochthera Latreille
 Scutellum with two marginal bristles (64).....*Stenochthera* Hendel
34. Arista pectinate 35
 Arista bare or pubescent 38
35. Face and front polished 36
 Face and front thickly pollinose 37
36. Sides of the face with deep punctures resulting in short, transverse
 ridges (3, 16, 65).....**Ochtheroidea* Williston
 Sides of face without pits or wrinkles.....*Ceropsilopa* Cresson
37. Acrostical hairs absent (36)*Nostima* Coquillett
 Acrostical hairs present.....*Hydrellia* Desvoidy
38. Mesonotum with three pairs of dorsocentrals, a strong one near the
 inner end of the suture, another in front; four scutellars (2, 18).
Hydrina Desvoidy
 Mesonotum with at most one pair of strong dorsocentrals, rarely an
 extremely weak second pair 39

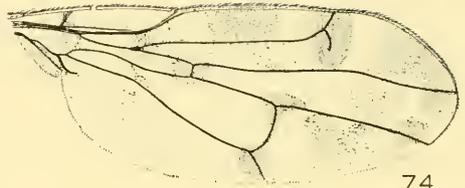
* Cresson, 1918, Trans-Amer. Ent. Soc., xliv, pp. 56, 60 (Costa Rica).



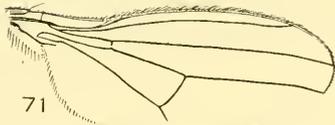
Ephydridæ IV.—55, *Ephydra milbræ*; 56, *Discocerina obscurella*; 57, *Paralimna texana*; 58, *Leptopsilopa nigra*; 59, *Rhysophora aspersa*; 60, *Parydra*; 61, *Psilopa*; 62, *Clasiopella*; 63, *Ilythea*; 64, *Stenochthera*; 65, *Ochtheroidea centralis*; 66, *Leptopsilopa nigrimana*; 67, *Paratissa pollinosa*; 68, *Cerometopum mosilloides*; 69, *Notiphila erythroceræ*, middle leg.



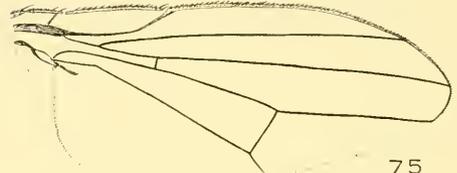
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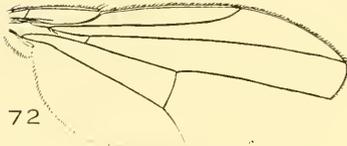
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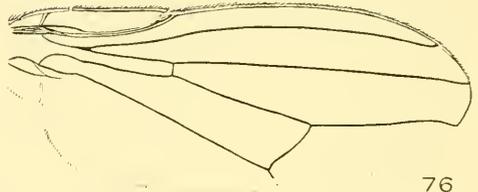
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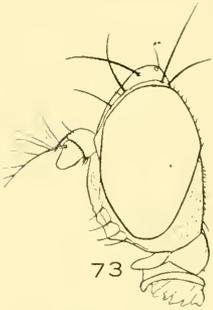
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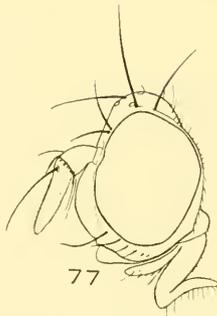
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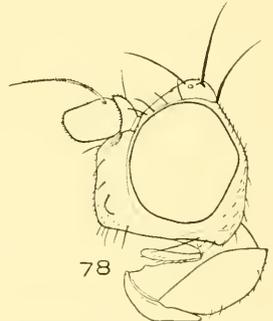
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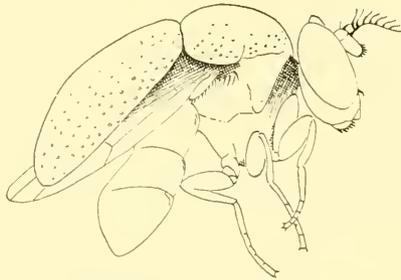


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Ephyridæ V.—70, *Cirrula gigantea*; 71, *Lipochæta*; 72, *Paratissa pollinosa*; 73, *Rhyssophora aspersa*; 74, *Gastrops nebulosa*; 75, *Ædenops nuda*; 76, *Cirrula gigantea*; 77, *Ceropsilopa*; 78, *Scatella*.

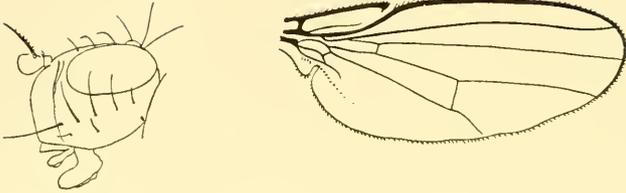
54. Front with a conspicuous proclinate orbital on either side; bristles of the face situated close to the facial grooves and strong (25, 28).
 **Dichæta* Meigen
 Front with hair-like orbitals in front; bristles of the face situated twice the width of the parafacial from the facial groove, rarely strong (6, 35, 69).....**Notiphila* Fallén
55. Oral opening small; face most prominent in the middle (27).
Axysta Haliday
 Oral opening large 56
56. Clypeus prominent (5, 13).....*Brachydeutera* Lœw
 Clypeus concealed (42)*Scatophila* Becker

* Cresson, 1917, Trans.-Amer. Ent. Soc., xliii, pp. 27-66.



Peltopsilopa species.

Family Canaceidæ



Canace, head and wing.

Very small flies, not more than 3.5 mm. in length, very similar to certain Ephydridæ but with the anal cell complete.

Head large, the oral opening very large; clypeus prominent; proboscis large, with fleshy labellæ; palpi well developed; front wide in both sexes, with three or four pairs of divergent orbitals, the ocellar triangle sometimes extending to the base of the antennæ; cheeks wide, bearing bristles; oral vibrissæ present; face gently convex in profile; antennæ short, the arista bare or pubescent. Thorax short, bearing four pairs of dorsocentrals and a pair of presutellar acrosticals; scutellum with one or two pairs of bristles. Legs rather short. Auxiliary vein evanescent apically, the costa broken before the end of the first vein; basal and anal cells complete; anal vein short. Abdomen composed of seven segments, the first not strongly differentiated from the second which is elongate.

The members of this family occur along the seashore, the larvæ living in brackish water.

I believe that there is but one genus in the Nearctic Region. In 1924 Malloch described a species under the name *Canacea macateei*, and Johnson, in his "List of the Insects of New England" recognized the genus *Canacea*. However, I was informed by Mr. Malloch during a conversation several years ago that "*Canacea*" was a slip of the pen, that he had no intention of establishing a new name, and that he was extremely doubtful that his species differed generically from *Canace* Haliday. I have not seen representatives of *Canace* but I can find nothing in the descriptions to warrant the recognition of *Canacea*. There are three species known from the United States, one from the

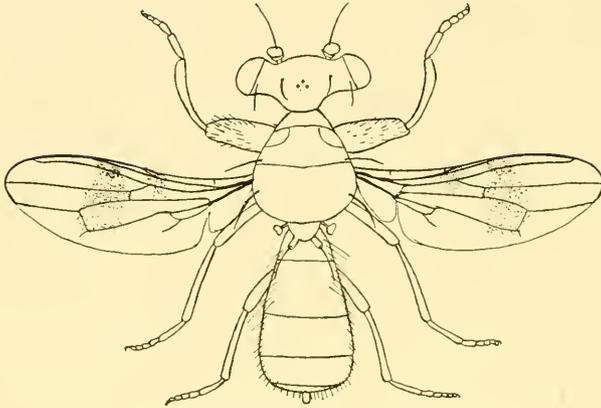
Hawaiian Islands (*Procanace*) and one from Panama (*Neocanace*) and at least two from South America (*Canace* and *Neocanace*).

The following key includes the described genera of which I have records.

KEY TO GENERA

- 1. First vein haired above on the apical half
Macrocanace Tonnoir and Malloch
 First vein bare above 2
- 2. Four pairs of dorsocentral bristles 3
 Only two pairs of dorsocentral bristles.....**Xanthocanace** Hendel
- 3. Pleura bare..... 4
 Pleura with bristles and bristly hairs..... 5
- 4. Frontal triangle extending to about the middle of the front; antennæ reaching to the oral margin (**Dinomyia** Becker).....**Procanace** Hendel
 Frontal triangle extending to the anterior margin of the front or almost so; one pair of scutellar bristles.....**Chætocanace** Hendel
- 5. Face evenly convex.....**Canace** Haliday
 Face concave below the middle, convex above (**Procanace** Curran, not Hendel) **Neocanace**, n. n.

Family Diopsidæ—The Stalk-eyed Flies

*Sphyrocephala brevicornis* Say.

The members of this family are mostly rather small, with the eyes situated on the ends of long stalks, a character not developed in our one genus.

Weakly haired, almost bare, the head transverse, short, conspicuously produced toward either side so that the eyes are separated by about four times their width; antennæ very widely separated, the basal segments short, the third roundish, with dorsal arista; front bare except at the vertex; oral vibrissæ absent. Legs of moderate length, the anterior femora thickened and with short spines beneath. Auxiliary vein closely approximated to the first vein for most of its length but ending far before it; second basal cell united with the discal cell; apical cell somewhat narrowed apically; anal cell long, the anal vein short.

The only American representative of this family is *Sphyracephala brevicornis* Say, a quite small and inconspicuous species. In the Neartic region there are no flies which resemble it in the shape of its head but in the Neotropical region there are many Otitidæ and Drosophilidæ which have the eyes more or less stalked, one Otitid having much longer stalks than any true Diopsid I have seen.

Our single species is found along the edges of streams, ponds and marshy lakes and occurs from early spring to late autumn and has been taken in numbers about a privy and on skunk-cabbage. The immature stages are unknown.

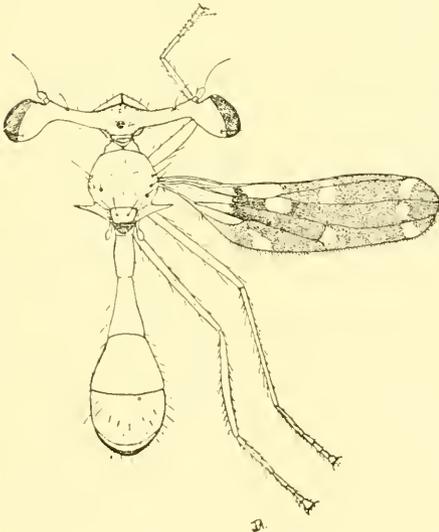
This family has a particular fascination for most people owing to the peculiar structure of the head. Why the eyes are stalked we do not know and there may be no reason for it.

KEY TO GENERA OF THE WORLD

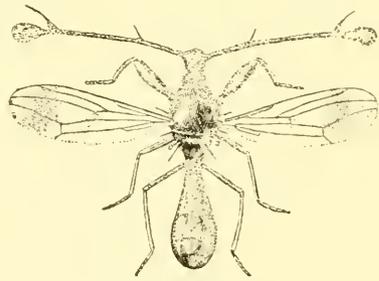
1. Mesopleura not produced to form a strong spine..... 2
 Mesopleura produced and forming a strong spine similar to that on the hypopleura.....*Teleopsis* Rondani
2. Mesonotum with a pair of long, black intra-alar bristles..... 3
 Mesonotum without intra-alar bristles.....*Diopsis* Linnæus
3. Scutellum longer than deep, without bristles except on the ends of the processes 4
 Scutellum very short, as deep as long, with a pair of erect black bristles on the disc*Diopsina* Curran
4. Eye-stalks little longer than wide, with a strong bristle behind each antenna in addition to that behind the eye.....*Sphyracephala* Say
 Eye-stalks longer, usually very long, either with a bristle near the middle and far before the base of the antennæ or without frontal bristles, only the one behind the eye being present..... 5
5. Eye-stalks short, not over three times as long as wide, without median bristle; steropleural spine short; bend of fifth vein without appendage; anal vein continued beyond the anal cell.....*Microdiopsis*, n. g.
 Eye-stalks very long, with a median bristle; pteropleural spine long and acute; bend of fifth vein with appendage; anal vein not continued beyond the anal cell.....*Diasemopsis* Rondani

Microdiopsis, new genus

Proposed for *Syhyracephala cothurnata* Bigot, from the East Indies. The genus differs from *Sphyracephala* in having longer eye-stalks, with the antennæ close to the eyes, no bristle on the middle of the stalk, no appendage at the bend of the fifth vein, etc.



Diopsina ferruginea.



Diopsis species.

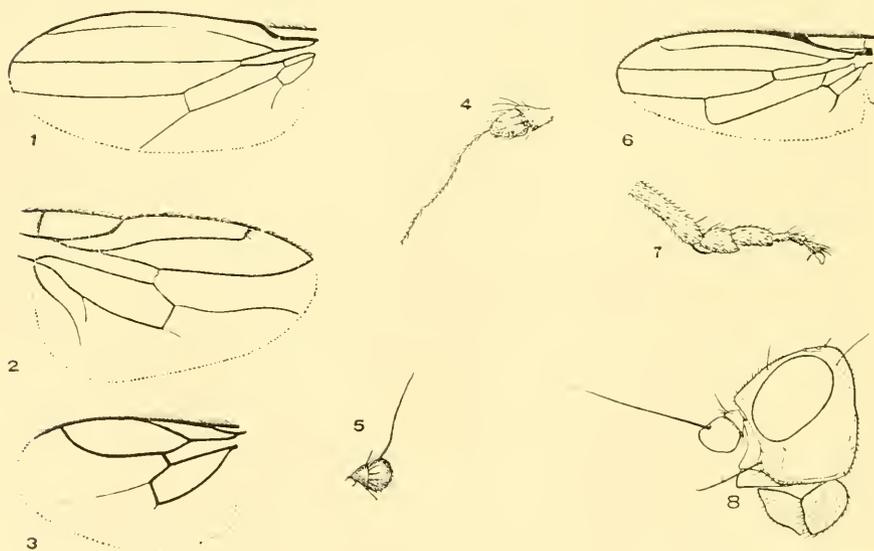
Family Borboridæ

Rather small to very small, usually black or brown flies.

Head hemispherical, the face rather perpendicular, concave or somewhat retreating; oral vibrissæ present; front broad, usually with bristles. Antennæ short, rounded or oval, with dorsal, pubescent or bare arista. Wings rarely absent; auxiliary vein incomplete or practically absent; second basal and anal cells often incomplete or absent. Legs of moderate length, the femora strong; basal segment of the posterior tarsi short and usually dilated.

The Borborids are almost always found about decomposing organic matter, in swampy places and about excrement.

The larvæ of *Borborus* live in excrement and refuse and are cylindrical, their skin roughened by minute bristles; antennæ two segmented; mouth hooks well developed; posterior segment with a conical protuberance and smaller tubercles about the spiracles. In *Limosina* the posterior spiracles are tube-like and the larvæ are found in fungi, algæ, etc.



Borboridæ.—1, *Sphaerocera*; 2, 3, 4, *Leptocera*; 5, 6, 7, *Borborus*; 8, *Scatophora*.

The North American species have been monographed by Spuler.* Here is one of the best examples of the short sighted policy of Entomological publications in refusing to accept long papers and Spuler's work has lost much of its value. The work appeared in seven different journals (of various sized pages) and in nine parts and the entire sequence has been lost.

KEY TO GENERA

1. Wings and halteres present 2
Wings and halteres absent **Aptilotus** Mik
2. Mesonotum and scutellum with bristles..... 3
Mesonotum and scutellum without bristles (1)..... **Sphærocera** Latreille
3. Fourth vein reaching the margin of the wing..... 4
Fourth vein not nearly reaching the wing margin (2, 3, 4).
Leptocera Olivier
4. Posterior tibiæ with an apical spur below (5, 6, 7)..... **Borborus** Meigen
Posterior tibiæ without apical spur (8)..... **Scatophora** Desvoidy

* 1923, Proc. Acad. Nat. Sci. Phila., lxxv, pp. 369-378; 1924 (Leptocera, part), Psyche, xxxi, pp. 121-134; 1924, (Leptocera, part) Ann. Ent. Soc. Amer., xvii, pp. 106-116; 1924, (Sphærocera and Aptilotus), Pan. Pac. Ent., i, pp. 66-71; 1925, (Leptocera, part), Can. Ent., lvii, pp. 99-104, 116-124; 1925, (Leptocera, part), Journ. N. Y. Ent. Soc., xxxiii, pp. 70-84, 147-162; 1925, (Borborus and Scatophora), Bull. Brooklyn Ent. Soc., xx, pp. 1-16.

Family Clusiidæ

Rather small flies in which the wings are almost always marked with black or brown.

Head broad, sub-hemispherical; face short, nearly vertical or gently receding below; front broad, with three or four pairs of frontals and often with a pair of cruciate interfrontals; ocellars present or absent; postverticals divergent, rarely absent. Antennæ porrect, the basal two segments short, the third rounded, with a terminal or subapical arista which may be bare, pubescent, or thickly long haired. Proboscis short, the palpi rather broad. Abdomen of moderate length, rather slender. Legs of moderate length, slender, the tibiæ with or without a preapical bristle. Wing venation complete, the second basal and anal cells very small; first vein ending near the basal fourth of the wing, the auxiliary vein narrowly separated from it.

The adults are found in moist places and about decaying wood, sometimes occurring in large numbers, although most of the species are not common.

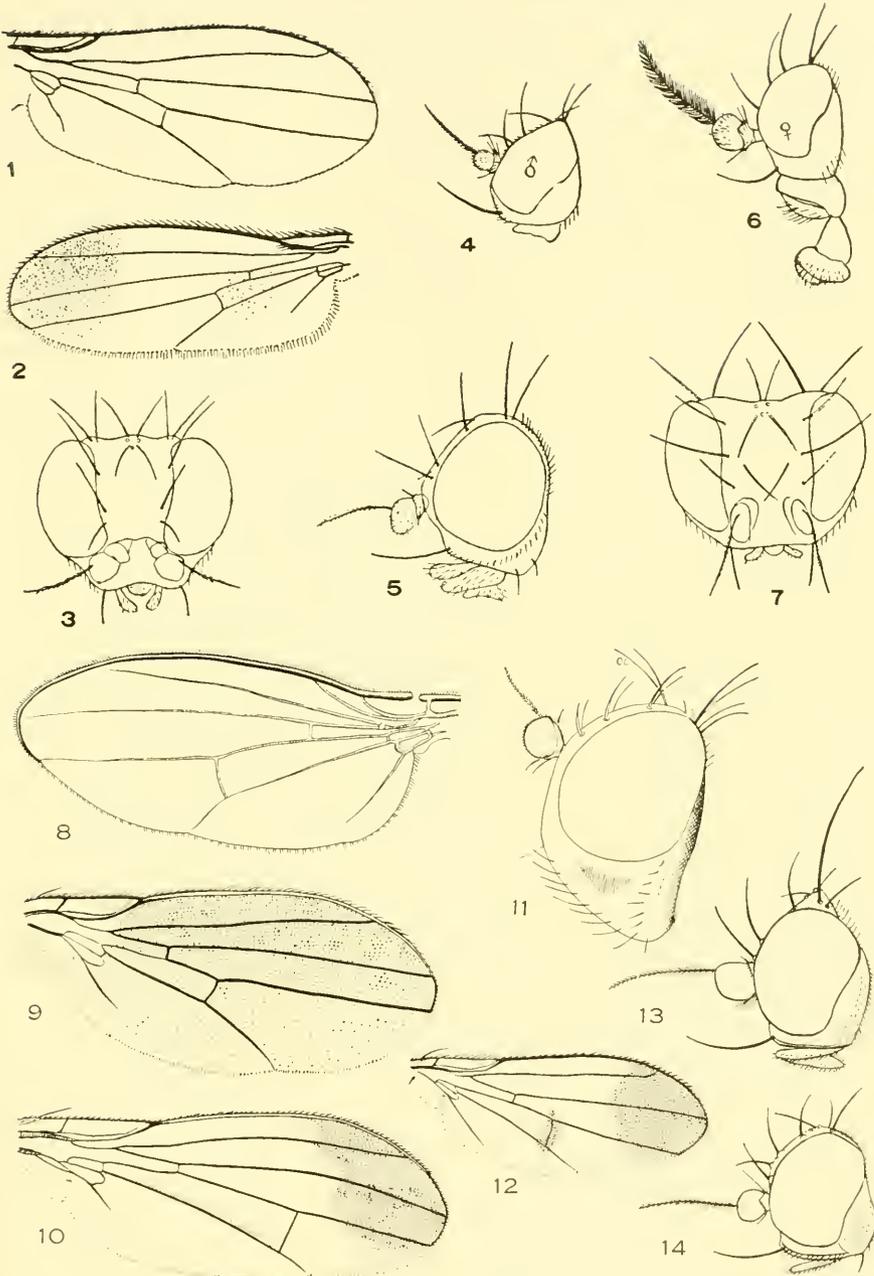
The larvæ occur in decaying wood and under the bark of trees. They are white, slender, cylindrical and slightly thickened posteriorly. Mouth hooks small, the segments not distinctly separated but with transverse ventral swellings for locomotion. They have the power of leaping, accomplishing this by grasping the hooklets on the apical segment with their mouth hooks and suddenly letting go. The puparia are yellowish, ellipsoidal and with horns on the apical segment as in the larvæ.

Melander and Argo* have revised the American species of the family including many species from other regions. The vast majority of the species are tropical. Of the seventy known American species only a small number occur in the Neartic region.

KEY TO GENERA

1. Eyes with microscopic pubescence; costa broken near the humeral crossvein (8, 11) *Acartophthalmus* Czerny
- Eyes bare; costa weakened or broken near the end of the auxiliary vein. 2
2. Anterior pair of frontal bristles convergent or proclinate..... 4
- All the frontal bristles reclinate 3

* Proc. U. S. N. M., 1924, Vol. xliv, Article 11, pp. 1-54.



Clusiidae.—1, Clusioides; 2, Chætoclusia; 3, Heteromeringia; 4, Clusioides; 5, Clusia; 6, Chætoclusia; 7, Clusioides; 8, Acartophthalmus; 9, Czernyola atra; 10, Clusia lateralis; 11, Acartophthalmus; 12, Sobarocephala variegata; 13, Sobarocephala; 14, Czernyola.

3. Cruciate interfrontals arising from the orbits (9, 14) . . . **Czernyola** Bezzi
 Cruciate interfrontals arising on the frontal vitta (1, 4, 7).
Clusioides Coquillett
4. Cruciate interfrontals absent 5
 Cruciate interfrontals present (5, 10) **Clusia** Haliday
5. First vein with dorsal setæ; postverticals absent (2, 6).
Chaetoclusia Coquillett
 First vein bare; postverticals present 6
6. Preapical bristles on middle tibiæ and prescutellar acrostical bristles
 present; presutural dorsocentrals absent (12, 13) . . **Sobarocephala** Czerny
 Preapicals and prescutellar acrosticals absent (3) . . **Heteromeringia** Czerny

Family Chamæmyidæ

Small flies, usually grayish in color.

Front wide, with at most two pairs of bristles, often bare; face gently concave or strongly receding; oral vibrissæ absent; postverticals convergent or absent; proboscis short; antennæ short. Mesonotum with or without bristles; prothoracic bristle absent; one sternopleural; mesopleura usually bare, rarely setulose. Front femora with bristles; tibiæ without preapical bristle. Wings with the auxiliary vein entire, sometimes touching the first vein before its end; anal vein not reaching nearly to the wing margin, the anal and second basal cells always complete; costa not broken. Abdomen short or slightly elongate.

The larvæ of *Leucopis* are predaceous upon aphids and I have found them commonly on plant lice attacking thistle, *Oenothera*, burdock, etc. They are somewhat triangular in outline, the posterior spiracles being located at the posterior corners of the body and strongly projecting. All I have seen have been pale yellowish, with a darker median vitta. They usually conceal themselves under the aphids or in the axils of leaves. Pupation usually takes place in the axils, the head pointing upward on the stem, but the location is variable.

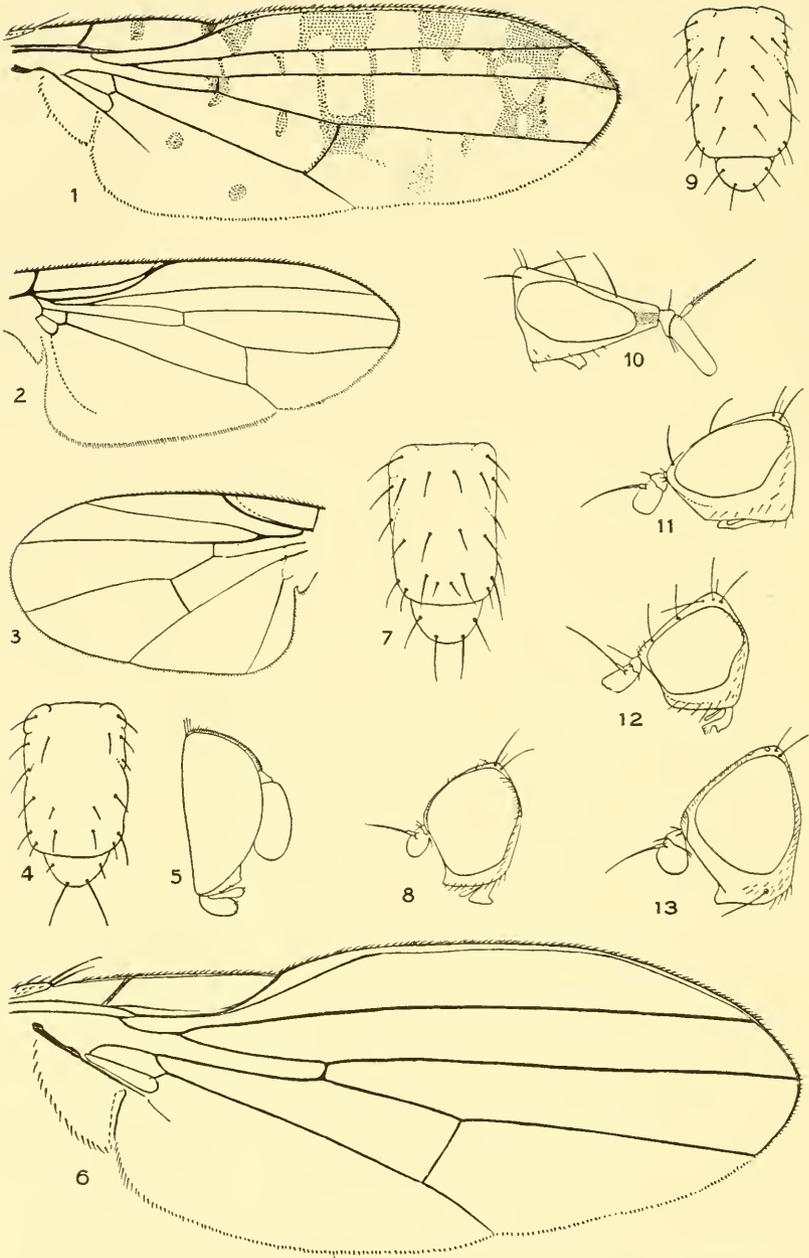
KEY TO GENERA

- | | |
|--|---------------------------------|
| 1. Front without distinct bristles | 2 |
| Front with one or two pairs of strong bristles | 4 |
| 2. Arista absent (<i>Agromyzidæ</i>) (3, 5) | <i>Cryptochætum</i> Rondani |
| Arista present | 3 |
| 3. Shining black species | <i>Paraleucopis</i> Malloch |
| Densely cinereous pollinose species (2, 13)..... | * <i>Leucopis</i> Meigen |
| 4. Face very strongly receding, the head pointed (1, 10). | |
| | <i>Acrometopia</i> Schiner |
| Face only a little retreating | 5 |
| 5. Three or four pairs of dorsocentrals..... | 6 |
| Two pairs of dorsocentrals (4, 8)..... | † <i>Pseudodinia</i> Coquillett |
| 6. Three pairs of dorsocentrals (<i>Ochthiphila</i> Fallén) (6, 7, 12). | |
| | <i>Chamæmyia</i> Meigen |
| Four pairs of dorsocentrals (9, 11)..... | ‡ <i>Plunomia</i> , n. g. |

* Malloch, 1921, Bull. Ill. Nat. Hist. Survey, xiii, p. 349.

† A paratype of *Pseudodinia polita* Malloch lacks the two strong frontals and I would place it in *Paraleucopis* but it lacks the setulæ on the underside of the costa.

‡ For *Chamæmyia elegans* Malloch, 1921, not Panzer.

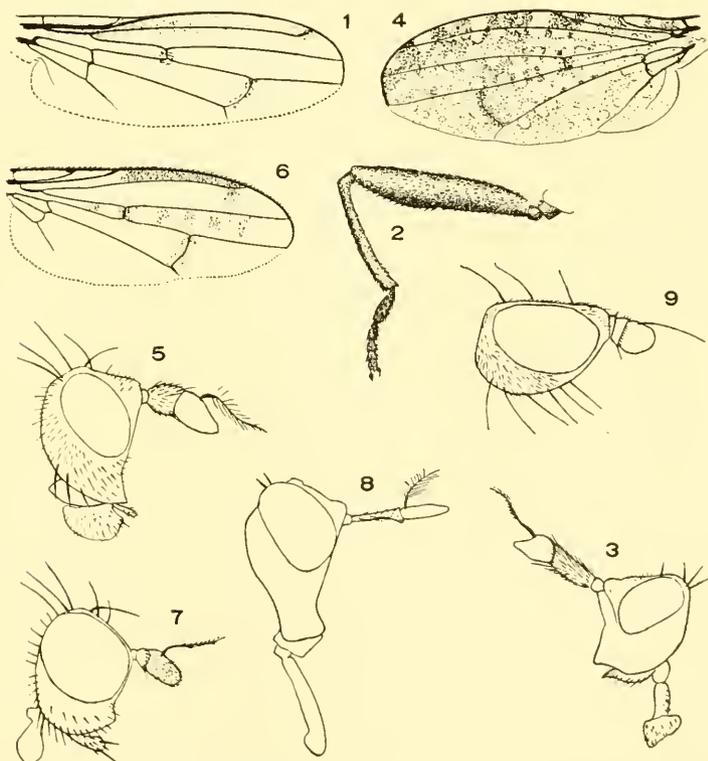


Chamæmyiidae.—1, *Acrometopia maculata*; 2, *Leucopis major*; 3, *Cryptochaetum iceryæ*; 4, *Pseudodinia polita* chaetotaxy; 5, *Cryptochaetum iceryæ*; 6, *Ochthiphila polystigma*; 7, *Ochthiphila*, chaetotaxy; 8, *Pseudodinia polita*; 9, *Plunomia elegans*, chaetotaxy; 10, *Acrometopia maculata*; 11, *Plunomia elegans*; 12, *Ochthiphila polystigma*; 13, *Leucopis major*.

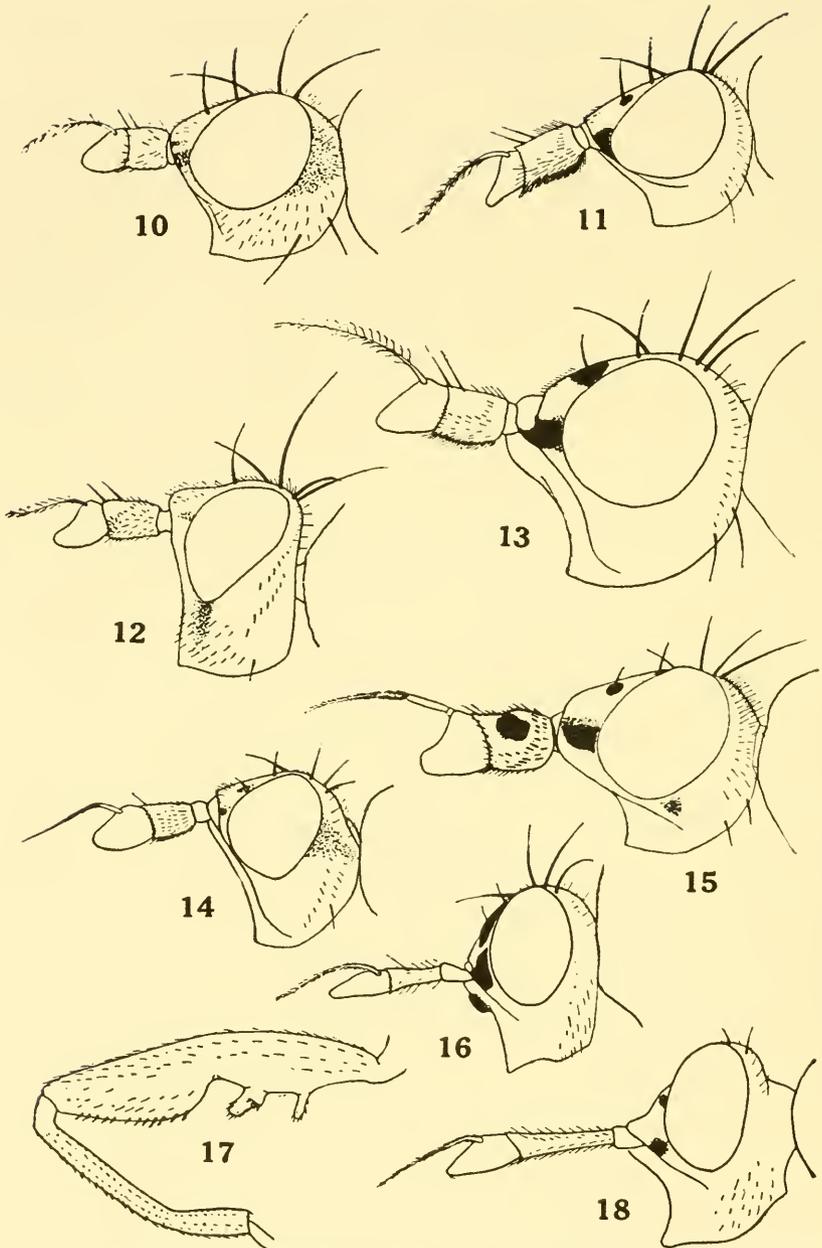
Family Tetanoceridæ—The Marsh Flies

Head short, as broad or broader than the thorax; face retreating, more or less perpendicular below; oral vibrissæ absent. Abdomen composed of six segments, rather long and narrow, sub-cylindrical. Wings longer than the abdomen; auxiliary vein entire, wholly separated from the first vein; posterior basal and anal cells complete, small. Legs of moderate length, the femora with bristles, the middle pair with a short bristle near the middle of the anterior surface; tibiæ with preapical bristle.

The adults are found in moist places, along the banks of streams, ponds, etc. and most of them may be recognized on sight by the shape of the head.



Tetanoceridæ I.—1, 2, 3, *Sepedon*, wing, hind leg and head; 4, *Dictya* sp.; 5, *Tetanocera*; 6, *Dyctia nana*; 7, *Dyctia*; 8, *Thecomyia* (S. America); 9, *Trigonometopus* (Sapromyzidæ) (Williston).



Tetanoceridae II.—10, *Trypetoptera pallida*; 11, *Limnia saratogensis*; 12, *Hoplydyctia setosa*; 13, *Euthycera arcuata*; 14, *Helroneura*; 15, *Limnia shannoni*; 16, *Dietyomyia ambigua*; 17, *Sepedon armipes*, posterior femur and tibia of ♂; 18, *Sepedon tenuicornis*.

The larvæ are slender, cylindrical, thin anteriorly, the terminal segment with six or eight conical, fleshy tubercles. They are aquatic.

The North American species have been reviewed by Cresson (1920, Trans. Amer. Ent. Soc., xlvii, pp. 27-89) and Melander (1920, Ann. Ent. Soc. Amer. xiii, pp. 305-332), the former under the name *Sciomyzidæ*.

KEY TO GENERA

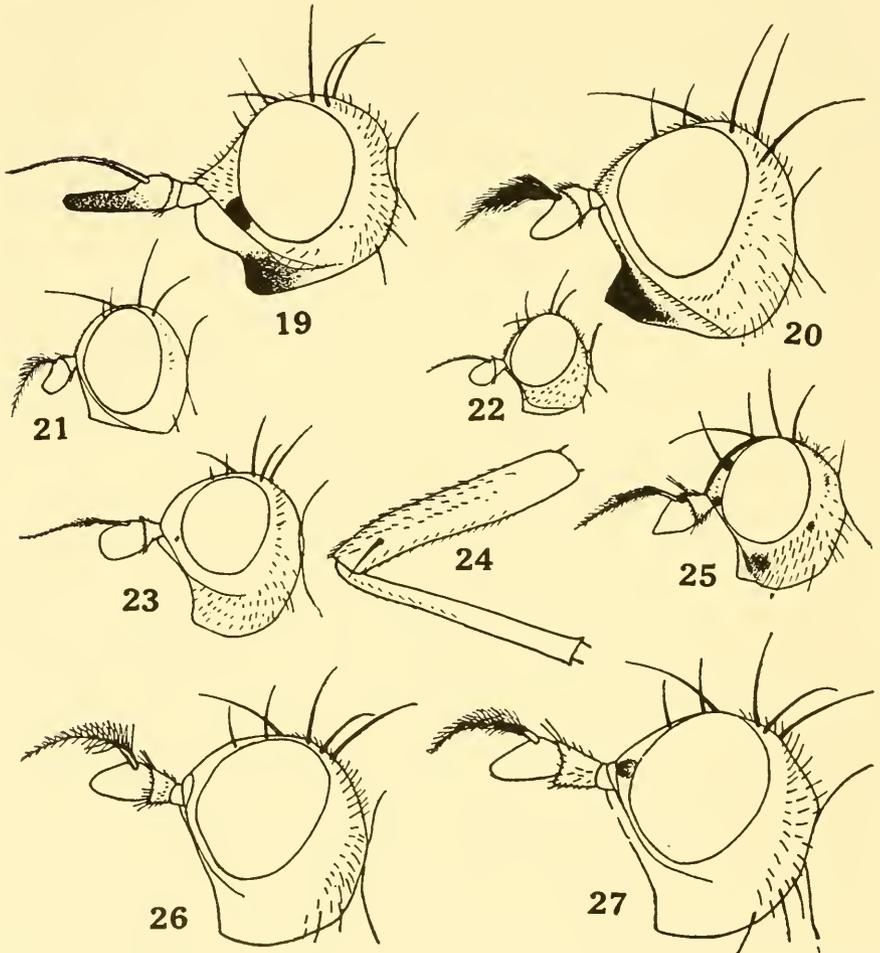
- 1. Propleural bristle present 2
 Propleural bristle absent 5
- 2. Anterior tibiæ with two approximate preapical bristles dorsally..... 3
 Anterior tibiæ with one dorsal preapical bristle..... 4
- 3. Arista densely short white haired (19).....*Oidematops* Cresson
 Arista with long, black rays (20).....*Sciomyza* Fallén
- 4. Front polished black; cheeks narrow (21).....*Pteromicra* Lioy
 Front dull; cheeks moderately broad (22).....**Melina* Desvoidy
- 5. Scutellum with two pairs of bristles..... 7
 Scutellum with one pair of bristles..... 6
- 6. Second antennal segment longer than the third (1, 2, 3, 17, 18).
 Sepedon Latreille
 Second antennal segment shorter than the third...*Hemitelopteryx* Cresson
- 7. Third antennal segment oval, three times as long as the second; front
 distinctly narrowed anteriorly 8
 Third antennal segment rarely oval, usually flattened or concave above,
 the second segment at least half as long as the third..... 9
- 8. Posterior tibiæ with two preapical dorsal bristles (2, 3).
 †*Renocera* Hendel
 Posterior tibiæ with one preapical dorsal bristle.....*Antichæta* Haliday
- 9. Mesopleura and pteropleura with one or more bristles..... 10
 Mesopleura and pteropleura at most with short hairs..... 11
- 10. One sternopleural bristle (12).....*Hoplodictya* Cresson
 No sternopleural bristle (4, 6, 7).....‡*Dictya* Meigen
- 11. Two or three pairs of dorsocentrals..... 12
 One pair of dorsocentrals (14)*Hedroneura* Hendel
- 12. Two pairs of dorsocentrals..... 13
 Three pairs of dorsocentrals (25)*Pœcilographa* Melander
- 13. Mesopleura and pteropleura bare..... 14
 Mesopleura and pteropleura with setulæ 16
- 14. Frontal lunule exposed; wings brown with rounded clear spots..... 15
 Frontal lunule mostly concealed; wings never with rounded, clear
 spots (5, 24, 26, 27)*Tetanocera* Dumeril

* *Dyctia* Desvoidy is an older name but its use conflicts with *Dictya* Meigen.

† Curran, 1933, Amer. Mus. Novit. No. 682, p. 9.

‡ Curran, 1932, Amer. Mus. Novit. No. 517.

- 15. Second antennal segment slender, much longer than the third (16).
Dictyomyia Cresson
 Second antennal segment broad, slightly longer than the third (13).
Euthycera Latreille
- 16. Arista practically bare; infrasquamal swellings with bristles.
Elgiva Meigen
 Arista with long rays or long pubescent..... 17
- 17. Arista with long, black rays (10).....Trypetoptera Hendel
 Arista white pubescent (11, 15).....Limnia Desvoidy



Tetanoceridæ III.—19, *Oidematops ferruginea*; 20, *Sciomyza aristalis*; 21, *Pteromicra*; 22, *Dyctia nana*; 23, *Renocera johnsoni*; 24, *Tetanocera*, middle femur and tibia; 25, *Pecilographa decora*; 26, *Tetanocera valida*; 27, *Tetanocera plebeja* (10-27 after Cresson).

Family Chyromyidæ

Small flies, the wings sometimes pictured.

Subeosta entire, free and ending in the costa, the costa weakened before its end; postocellar bristles convergent; plates of the orbital bristles extending almost to the anterior border of the front; head higher than long, more or less receding below, the oral margin never conspicuously produced; two pairs of frontal bristles; palpi not large; proboscis short and fleshy; antennæ shorter than the face; arista pubescent. Mesonotum usually with five pairs of dorsocentrals, two pairs of scutellar bristles; mesopleura with one or more bristles; sternopleurals, two to four in a straight line along the upper edge; propleural bristle present. Tibiæ usually with preapical bristles. Anal and second basal cells complete; costa with spines. Abdomen rather narrow, bearing bristles on the apices of the segments; genitalia small.

The species of *Chyromya* differ from those of the other genera in having three pairs of frontal bristles, the anterior pair convergent, four pairs of dorsocentrals and no preapical tibial bristles. There are at least two North American species, *flava* Linnaeus, and another that is either *minima* Becker or an undescribed form since it bears only a single pair of dorsocentrals. Some species placed in the genus *Aphaniosoma* Becker have five pairs of dorsocentrals or the number may be reduced to one or two distinct pairs with a row of bristly hairs in front of the suture. These two genera have been placed in a separate family, based upon the absence of preapical bristles on the tibiæ, but I do not see how the family can be maintained.

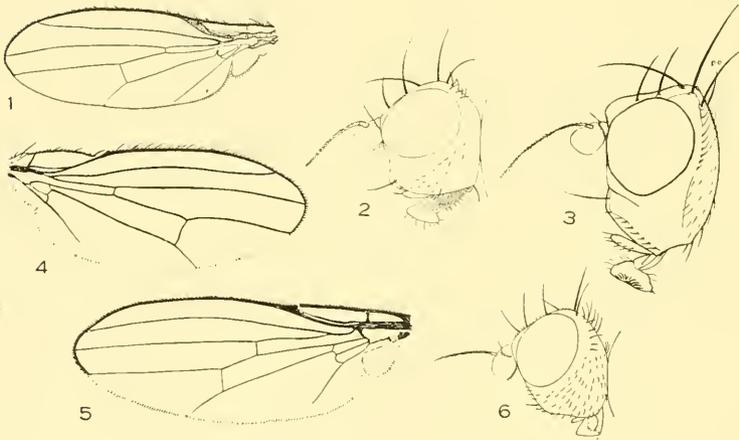
I am not well acquainted with the habits of these insects but believe that all are found on foliage near the sea coast and in moist places. The number of known species is not large and most of the American species are southern in distribution or occur along the coastal regions.

Malloch would unite this family with the Helomyzidæ but the head characters appear to indicate a very distinct difference and I fail to see any really close relationship. Melander included the genera in the Geomyzidæ* and keys to the species will be found in his work.

* 1913, Journ. N. Y. Ent. Soc., xxi, pp. 283-300.

KEY TO GENERA

- 1. All the tibiae with preapical bristles..... 2
 Tibiae without preapical bristles 4
- 2. Cheeks half as wide as the third antennal segment..... 3
 Cheeks not over one-third as wide as the third antennal segment.
Spilochroa Williston
- 3. Cheeks not half as wide as the eye-height; bristles black..... 5
 Cheeks almost as wide as the eye-height; bristles wholly yellow (3, 4).
Zagonia Coquillett
- 4. Anterior pair of orbitals convergent (5, 6).....Chyromya Desvoidy
 All the orbitals reclinateAphaniosoma Becker
- 5. Mesopleura with hairs and a strong bristle (1, 2)...Trixoscelis Rondani
 Mesopleura bareNeossos Malloch



Chyromyidae.—1, 2, *Trixoscelis*; 3, 4, *Zagonia flava*; 5, 6, *Chiromya flava*.

Family Megamerinidæ

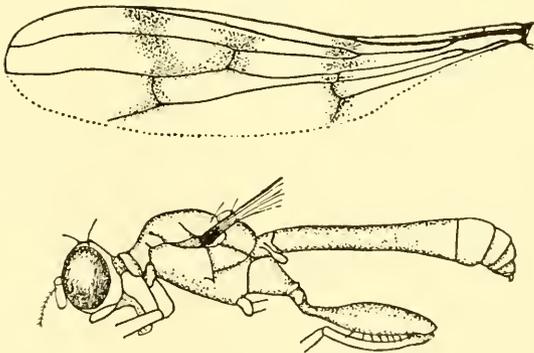
Small, elongate, slender flies with petiolate abdomen and inersate posterior femora.

Head nearly spherical, broader than high; front moderately broad in both sexes; frontal bristles absent, the ocellars and verticals strong; face very gently convex, without vibrissæ; antennæ of moderate length, decumbent. Thorax elongate and narrow, with bristles posteriorly; mesosternum long, the posterior two pairs of legs approximate; scutellum short and broad. Abdomen elongate and clavate, the basal segments slender and fused. Legs of moderate length, the posterior femora strongly swollen and with bristles below on the apical half. Wings narrow; auxiliary vein absent; first vein ending at basal third of the wing; first basal cell long, the anal cell as long as the second basal, more or less rounded apically.

The single genus representing this family in America occurs in the tropics. I have seen only four specimens collected on Barro Colorado Island, Canal Zone, and Cresson had the same number from Costa Rica. I found the specimens among rather thick foliage in moist places. They resemble species of *Sphagina* (Syrphidæ) although much smaller, but, of course, the resemblance is only superficial.

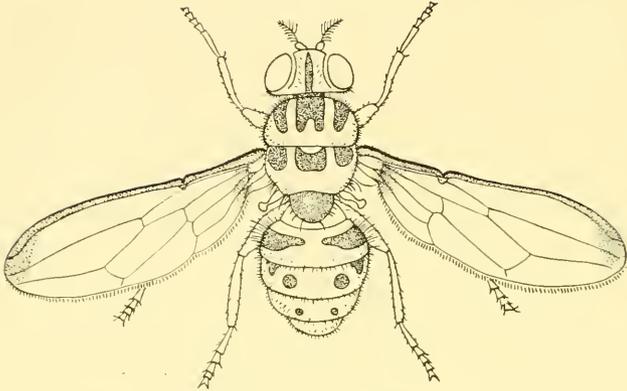
Syringogaster Cresson is our only genus and is represented by two described species, both of which occur in Panama.

I am not certain that this genus belongs to the Megamerinidæ as the species show striking differences from a species of *Megamerina* (so named) in the American Museum of Natural History.



Syringogaster, wing, body.
(Cresson)

Family Psilidæ

- *Somatia xanthomelas*.

Flies of medium or small size.

Front broad, with bristles on the upper part; face perpendicular or receding in profile; oral vibrissæ absent; antennæ decumbent, rather short to very long; arista pubescent, rarely long plumose. Abdomen slender or moderately slender; genitalia not prominent, the ovipositor usually elongate. Wings moderately large, the auxiliary vein absent or incomplete; apical cell not narrowed apically; second basal and anal cells large. Legs rather elongate; tibiæ without preapical bristles.

The adults are usually found in moist places or shady woods. The Psilidæ are not always easy to recognize but all the known species have a peculiar ridge or weakening across the basal third of the wing extending from the end of the incomplete auxiliary vein. The character is not at all conspicuous but its presence is sufficient to place the insects.

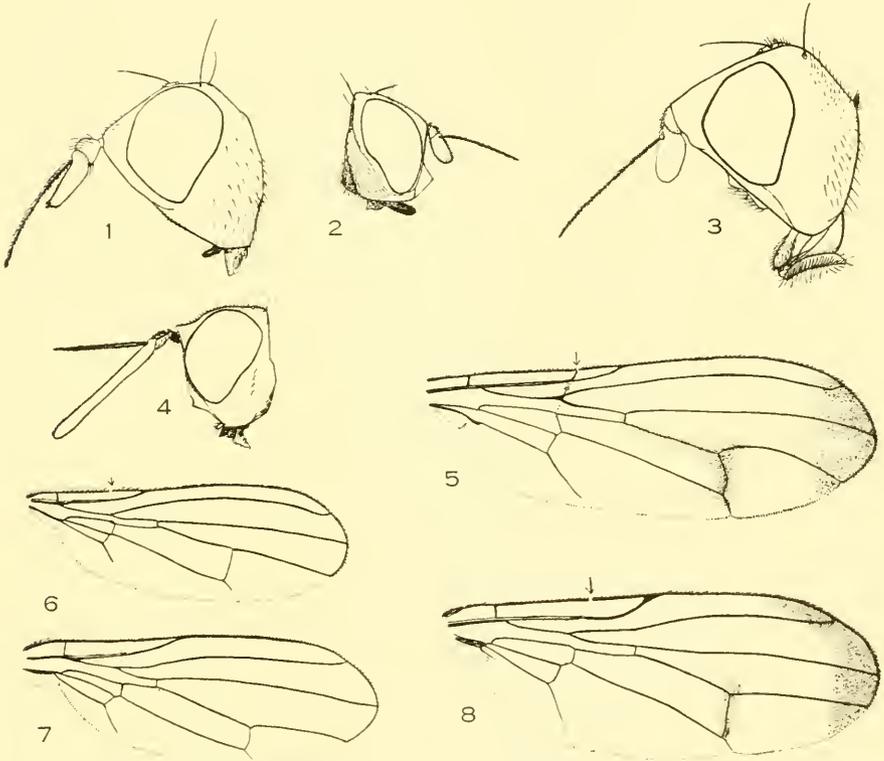
The larvæ live in the roots or galls of plants and one of them is known as the carrot rust fly, often doing considerable damage to this crop. The larvæ of *Psila* are slender, bare, cylindrical and of a pale yellowish color, the posterior spiracles forming small rounded or button-like processes.

Melander* has published a synopsis of the known species.

* 1920, *Psyche*, xxvii, pp. 91-101.

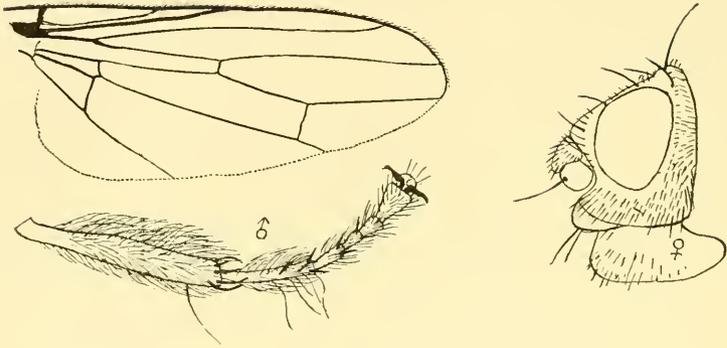
KEY TO GENERA

1. Third antennal segment shorter than the arista..... 2
 Third antennal segment longer than the arista (4, 5)..*Loxocera* Meigen
2. Pteropleura bare 3
 Pteropleura with hairs*Strongylophthalmyia* Heller
3. A pair of dorsocentrals in front of the suture (1, 6).
 Pseudopsila Johnson
 Only the prescutellar dorsocentrals present..... 4
4. Cheeks almost half as wide as the eye-height (3, 7).....*Psila* Meigen
 Cheeks at most one-sixth as wide as the eye-height..... 5
5. Arista pubescent (2, 8)*Chyliza* Fallén
 Arista long plumose (Tropical) (Text figure)*Somatia* Schiner



Psilidæ.—1, *Pseudopsila*; 2, *Chyliza*; 3, *Psila*; 4, 5, *Loxocera*; 6, *Pseudopsila*; 7, *Psila* lævis; 8, *Chyliza*.

Family Cœlopidæ



Cœlopa, wing, head and front tibia and tarusus of ♀.

Flies of moderate size, living along the sea-shore.

Thorax and abdomen flat, the former depressed, with bare, shining mesopleura, the scutellum flat above. Front with bristles; cheeks with hairs and bristles, the face deeply concave; oral vibrissæ absent or extremely weak; antennæ short, pendulous, the second segment as large as the first. Legs usually stout, with bristles and hairs, all the tibiæ with dorsal preapical bristles; basal tarsal segment long; apical tarsal segment broadened and with stout claws. Wing venation complete, the second basal and anal cells of equal length; auxiliary vein entire, the first vein ending at the middle of the wing.

The larvæ live in kelp washed up on the sea-shore and sometimes occur in countless numbers.

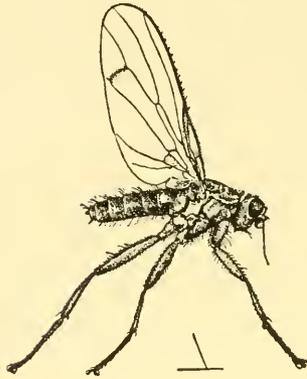
The genus *Omomyia* Coquillett, placed in this family by its describer, belongs to the Pallopteridæ. There is but one North American genus, *Calopa* Meigen. Aldrich* has recently reviewed the American species.

KEY TO AMERICAN SPECIES OF CŒLOPA.

- 1. First vein with a few hairs on apical section above (California, Oregon)vanduzeei Cresson
- First vein bare..... 2
- 2. Males 3
- Females 5

* Revision * * * Cœlopa, Proc. U. S. N. M., lxxvi, Article 11, pp. 1-6.

Family Helomyzidæ

*Pseudoleria pectinata* Lœw.

Flies of moderate size, with oral vibrissæ.

Face vertical or retreating; front bristly on a little more than the posterior half; antennæ short, the third segment more or less rounded. Abdomen composed of six segments, the male genitalia conspicuous. Wings moderately large, the costa usually with short bristles; second basal and anal cells small; first vein bare. Tibiæ with preapical bristle.

The so-called frontal plates, characteristic of this family and poorly developed in most other families are actually a differentiated, broad, pollinose strip on either side of the front. They are slightly oblique, diverging from the eyes anteriorly and the frontal bristles are situated on them. The presence of these "plates", in conjunction with the shape of the antennæ serve as a ready means of identifying a Helomyzid.

The flies are found in various habitats, generally in shady or damp places. Adults have been collected by burying a tin can with its open end flush with the ground and examining it early in the morning.

The larvæ are scavengers and live upon decaying animal and vegetable substances, in fungi, excrement, etc. They are cylindrical, rather pointed anteriorly, obtuse behind; antennæ situated upon long conical processes; mouth hooks large; abdominal segments widened in front laterally, with bristly pseudopods ventrally.

Czerny* has monographed the family while Garrett and others have published papers dealing with the North American species since that time.

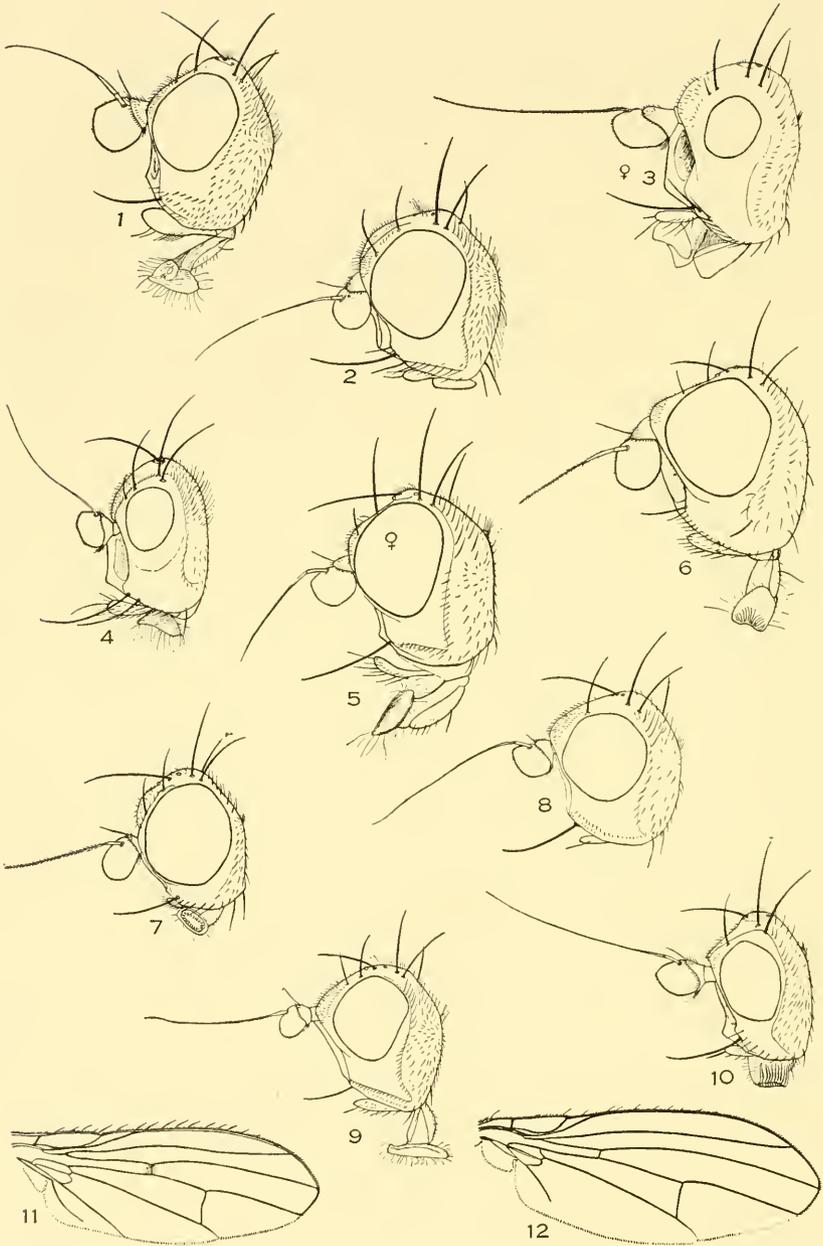
* 1924, Abh. zool.-bot. Gesellsch., Wien., xv, pp. 1-166; also, 1926, Konowia, v, pp. 53-56; 1927, Konowia, vi, pp. 35-49; 1928, Konowia, vii, pp. 52-55.

KEY TO GENERA

1. Propleural bristle absent; anal vein not reaching wing margin..... 2
Propleural bristle present; anal vein reaching wing margin..... 4
2. Humeral bristle absent 3
Humeral bristle present (12).....*Allophyla* Lœw
3. Five pairs of dorsocentrals (15)*Suillia* Desvoidy
One pair of dorsocentrals (14)*Porsenus* Darlington
4. Middle tibiæ with several bristles on dorsal surface 5
Middle tibiæ with only the preapical bristle dorsally..... 6
5. Two pairs of fronto-orbitals; one pair of presutural dorsocentrals;
wings usually mutilated (4, 16)*Criddleria* Curran
One pair of fronto-orbitals; no presuturals; wings entire (10, 13).
**Æcothea* Haliday
6. Pteropleura in part bristly or hairy..... 7
Pteropleura bare 9
7. Mesopleura hairy 8
Mesopleura bare (8, 11).....*Pseudoleria* Garrett
8. Prosternum with one pair of bristles*Scoliocentra* Lœw
Prosternum with several bristles*Trichochlamys* Czerny
9. Humeral bristle present 10
Humeral bristle absent; 3 pairs of scutellars.....*Orbellia* Desvoidy
10. Without prosternal bristles 13
With one or more pairs of prosternals..... 11
11. With one pair of prosternals 12
With two or more pairs of prosternals (2)*Helomyza* Fallén
12. Anterior orbital bristle as long as the posterior.....*Anypotacta* Czerny
Anterior orbital bristle much shorter than the posterior (9).
† *Amœbaleria* Garrett
13. Middle tibiæ with several apical bristles on ventral surface..... 15
Middle tibiæ with only one apical bristle on ventral surface..... 14
14. First vein ending opposite or before the small crossvein (1, 6).
Tephrochlamys Lœw
First vein elongate, ending distinctly beyond the anterior crossvein.
Heteromyza Fallén
15. Second vein joining the costa far beyond the tip of the first..... 16
Second vein joining the costa only a little beyond the tip of the first.
Lutomyia Aldrich
16. Third antennal segment more or less angulate dorsally; middle femora
with several partial rows of bristles anteriorly; middle tarsi with
spines at apices of segments 17
Third antennal segment evenly rounded; otherwise different..... 18

* Czerny, 1928, Konowia, vii, p. 52.

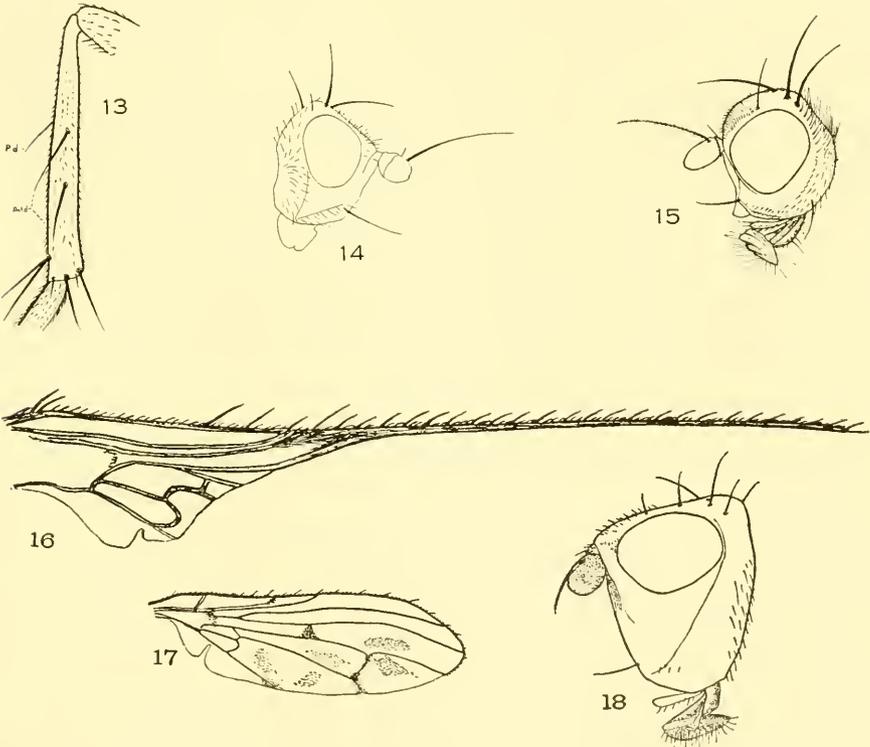
† Czerny, 1927, Konowia, vi, p. 38.



Helomyzidae I.—1, *Tephrochlamys borealis*; 2, *Helomyza* sp.; 3, *Eccoptomera simplex*; 4, *Criddleria hemiptera*; 5, *Acantholeria* sp.; 6, *Tephrochlamys canescens*; 7, *Neoleria leucostoma*; 8, *Pseudoleria pectinata*; 9, *Amœbaleria helvola*; 10, *Cœtothea fenestralis*; 11, *Pseudoleria pectinata*; 12, *Allophyla* sp.

- 17. One frontal bristle; eyes very small (3)*Eccoptomera* Lœw
Two frontals; eyes of moderate size*Viatia* Garrett
- 18. Anterior frontal bristle much shorter than the posterior..... 19
Anterior frontal bristle as long as the posterior (*Postleria* Garrett)
(7)*Neoleria* Malloch
- 19. Mesopleura wholly bare 20
Mesopleura with some bristles posteriorly (17, 18)....**Anorostoma* Lœw
- 20. Antennal grooves distinct*Schrœderella* Enderlein
Antennal grooves not distinctly outlined 21
- 21. Antennæ separated from each other by about half the width of the
third antennal segment*Morpholeria* Garrett
Antennæ separated from each other by more than the width of the
third antennal segment (5).....*Acantholeria* Garrett

* Czerny, 1927, *Konowia*, vi, p. 36; Curran, 1933, *Amer. Mus. Novit.* No. 676, pp. 1-9.



Helomyzidæ 11.—13, *Ecothea fenestralis*; 14, *Porsenus johnsoni*; 15, *Suillia fuscicornis*; 16, *Criddleria hemiptera*; 17, 18, *Anorostoma cinereum*.

Family Dryomyzidæ

Flies of moderate size, the femora without bristles.

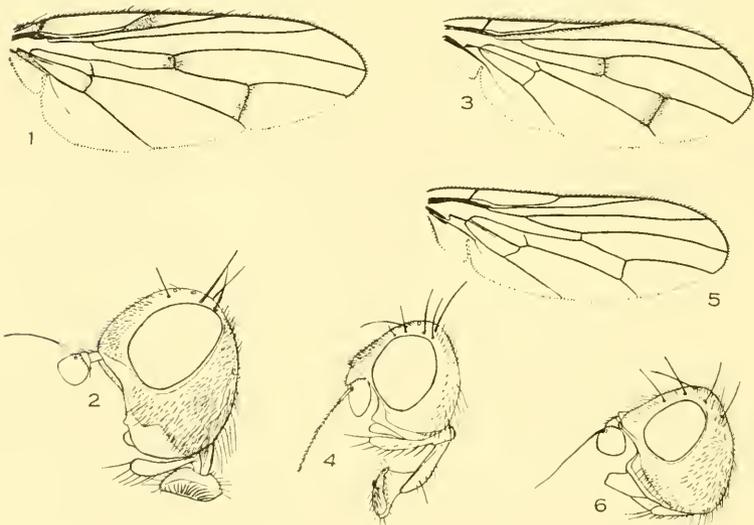
Head short, as broad or broader than the thorax, the face retreating, more or less perpendicular below, without oral vibrissæ. Abdomen composed of six segments, moderately long and narrow, more or less cylindrical. Wings longer than the abdomen, the auxiliary vein separated from the first vein; posterior basal and anal cells complete. Legs of moderate length, the tibiæ with a preapical bristle.

The adults are found in moist places, along the edges of streams, ponds, etc. Swampy woods are excellent collecting spots.

The larvæ are aquatic. They are slender, cylindrical, thin anteriorly, the terminal segment with six or eight conical, fleshy tubercles.

The flies placed in this family have been included in the Tetanoceridæ and Helomyzidæ. From the former they are separated by the absence of femoral bristles and from the latter by the absence of oral vibrissæ. The latest revision of the family is by Melander* who included the genera in the Tetanoceridæ.

* Review of the Nearctic Tetanoceridæ, 1916, Ann. Ent. Soc. Amer., xiii, pp. 305-322.

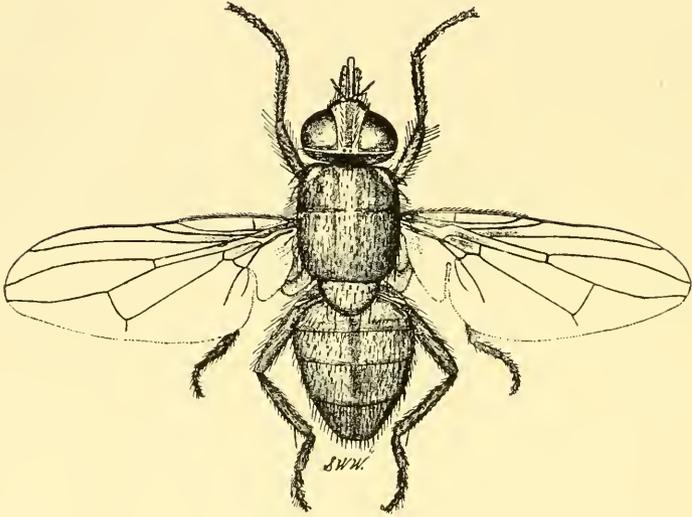


Dryomyzidæ.—1, 2, *Macromelandria mirabilis*; 3, 4, *Neuroctena anilis*; 5, 6, *Edoparena glauca*.

KEY TO GENERA

1. First longitudinal vein bristled (3, 4)..... **Neuroctena** Rondani
 First vein wholly bare 2
2. Only two pairs of scutellar bristles 3
 Three pairs of scutellars (**Edoparea glauca** Coquillett) (5, 6).
Edoparena, n. g.
3. Costa not bristled 4
 Costa with conspicuous short bristles on the apical half (**Helcomyza mirabilis** Melander) (1, 2).....**Macromelanderia**, n. g.
4. Two pairs of dorsocentrals; face concave.....**Dryomyza** Fallén
 At least seven pairs of dorsocentrals; face not concave in profile.
Heterocheila Rondani

Family Muscidae

*Lyperosia irritans* L.

Flies of medium to small size, usually dull colored, the squamæ large or of medium size, hypopleural bristles absent, the second antennal segment grooved above.

Arista plumose, pubescent, bare or pectinate, eyes approximate or widely separated in the males, the front rarely narrowed in both sexes; frontal bristles always present, intrafrontals frequently present; orbitals developed but rarely in the males. Abdomen composed of four segments in the male, five in the female. Male genitalia usually not prominent but sometimes conspicuous; fifth sternal lobes sometimes prominent.

As here understood this family includes the Scatophagidæ, Anthomyidæ and those Muscidæ (of the Williston Manual) lacking hypopleural bristles. In some cases the hypopleura is haired but there need be no question in connection with known North American genera about intergradation with the Metopiidæ. There is no means by which the Scatophagidæ can be separated from the Anthomyidæ, unless the size of the lower lobe of the squamæ is used, in which case the genus *Anthomyia* must be associated with the Scatophagids while many of the other genera

would form a different family. Wing venation is not a character to be used in separating families in this group, nor can the character of the plumosity of the arista be used.

The Muscidae are found everywhere and many of them are serious pests. The raddish maggot, cabbage maggot, onion maggot, seed corn maggot, and many others take annual toll of our crops. So much has been written about the house fly as a carrier of disease that only a brief review need be given here. Others are pests of domestic animals and also pay attention to man. The Tse-tse flies, formerly considered as belonging to this family, and not greatly distinct at best, are carriers of trypanosomes causing sleeping sickness.

Many entomologists believe that the *House Fly* (*Musca domestica*) has been responsible for more human suffering than any other insect and the evidence in support of this is very strong. It is said that deaths due to diseases carried by flies have exceeded those caused by wounds during the wars preceding the world war (1914-1918), whereas during this latter conflict the mortality from such diseases was negligible, due to efficient sanitary practices. The House Fly breeds in manure, garbage and almost any decaying matter and its control consists of the screening and disposal of such material at frequent intervals. Manure should be kept, as much as possible, either on such a maggot trap as recommended by Hutchison*, sprayed occasionally with a mixture of one pound of powdered hellebore to twenty gallons of water at the rate of one gallon of the spray to one cubic foot of manure, or sprinkled with powdered borax at the rate of one pound to 16 cubic feet of manure. The borax treatment must not be repeated, the fresh manure being piled in such a way that it may be treated separately. All garbage should be destroyed at least twice a week.

Because the House Fly feeds on filth of all kinds and visits our foodstuffs, alighting with impunity upon the things we would eat, it is particularly loathsome. It is attracted to almost anything that is moist, such as sputum, feces, garbage, etc., and may fly directly from any of these to food used for human consumption. The diseases carried on its body (in the form of the causative organisms) are *Typhoid Fever*, *Dysentery*, *Cholera*, *Yaws*, *Anthrax* and some forms of *Conjunctivitis*. Many other bacteria, some of them undoubtedly capable of causing disease, are also carried.

In addition to destroying the breeding places of flies efforts should be made to prevent them from coming in contact with foodstuffs by screening all buildings. Sickrooms should be particularly well screened in order to prevent flies from carrying the disease to other individuals.

* U. S. Dept. Agric. Bull. 200, 1915.

The *Stable Fly* (*Stomoxys calcitrans*) is a biting insect and is sometimes known as the *Biting House Fly*. It is not a general visitor in houses but may be common in yards and on porches near stables, and is most active in the hot sun. It is also a pest on beaches and along streams on bright, sunny days. It breeds in manure and decaying vegetation so may be controlled by measures taken against the House Fly. Domestic animals suffer greatly from its bites and milk production may be greatly reduced when the fly is abundant. The flies enter the stable on cattle and horses and many of them remain there over night. Use of a fly spray in stables will greatly reduce their numbers. The view has been expressed that infantile paralysis is carried by this fly but the accusation has not been proved. However, under certain conditions it may transmit sleeping sickness.

The *Horn Fly* (*Lyperosia irritans*) so named because of its habit of feeding about the base of the horns of cattle, is also a biting fly. It rarely attacks man.

The classification of this family is still in an unstable condition and it is seldom that two authors use the same generic limits and very frequently different names are used for the same generic concept. Unfortunately several of the genera are not available for study and I have been forced to include about a score of them from descriptions only, while four of those recorded from North America are excluded. A half dozen genera occurring in South America and not yet recognized from our region are keyed out as it is likely that they occur in the tropics. In one or two cases the characters I have used will change the limits of genera, and I have recognized as genera groups sometimes considered to be no more than subgenera.

In order to facilitate the use of the Key I have prepared a synoptic key leading to the main subdivisions employed.

SYNOPTIC TABLE

A. With at most one sternopleural bristle.....	1
With two or more sternopleurals	B
B. Anal vein extending to the wing-margin..	39
Anal vein not extending to the wing-margin.....	C
C. Arista plumose, pubescent or bare.....	D
Arista pectinate, without rays below.....	144
D. First vein setulose on most of its length.....	77
First vein bare beyond the humeral crossvein.....	E

E. Pteropleura haired 83
 Pteropleura bare F

F. One pair of presutural dorsocentral bristles..... 98
 More than one pair of presutural dorsocentrals.....106

KEY TO GENERA.

1. With at most one sternopleural (c. f. *Lispoides*)..... 2
 With two to four sternopleurals..... 38

2. Pteropleura bare 8
 Pteropleura haired 3

3. Anterior tibiæ without abundant ventral setulæ..... 4
 Anterior tibiæ beneath with abundant black setulæ..**Allomyella* Malloch

4. First vein bare 5
 First vein setulose apically; sixth vein not reaching wing margin.
Dasypleuron Malloch

5. Sixth vein reaching wing margin 6
 Sixth vein not reaching wing margin.....*Eugencephala* Johnson

6. With distinct sternopleural bristle 7
 Without sternopleural bristle; wings with several brown spots.
Ernoneura Becker

7. Propleural bristle long and strong; arista short plumose on whole
 length †*Megaphthalma* Becker
 Propleural bristle very weak or absent; arista long plumose or bare
 (33)*Scopeuma* Latreille

8. Head at least as high as long; face at most moderately retreating.... 11
 Head decidedly longer than high, the face strongly retreating below.. 9

9. Stigmatal bristle absent 10
 Stigmatal bristle strong*Paratidia* Malloch

10. Third antennal segment with a fine, long hair on the outer surface
 near the insertion of the arista (41)..... ‡*Acicephala* Coquillett
 Third antennal segment without such hair.....‡*Pseudacicephala* Malloch

11. Hypopleura never with bristles 12
 Hypopleura with a row of bristles; costa ending at third vein, the
 fourth vein incomplete; front half as wide as head (*Eginiinæ*).
 (52, 59)§*Lutzomyia*, n. g.

12. Frontal bristles or hair long 13
 Frontal bristles extremely short, the front nearly bare (40).
Hydromyza Fallén

* Curran, 1927, Can. Ent., lix, p. 260.

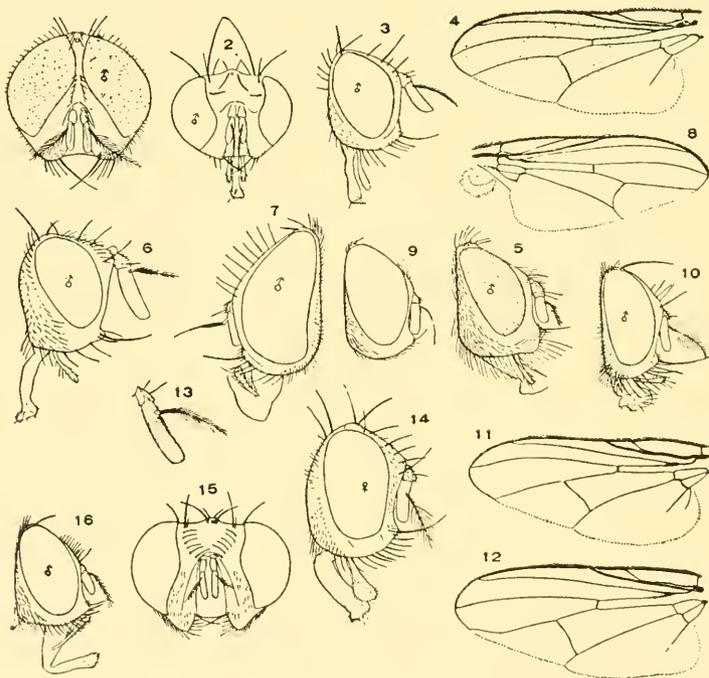
† Curran, 1933, Amer. Mus. Novit. No. 682, p. 10.

‡ Curran, 1927, Can. Ent., lix, p. 259 (*Acicephala*).

§ Differs from *Eginiella* Malloch (China) in having the front of the male half as wide as the head and in lacking bristles on the legs, with the exception of the apical tibial bristles. *Lutzomyia americana*, n. sp. from Arizona.

- 13. Anterior tibiae without a short, rectangular apical spine below..... 14
 Anterior tibiae with a short, stout, rectangular spine at apex of ventral surface**Acanthocnema* Becker
- 14. Anteroventral surface of the anterior femora and tibiae without stout bristles, the front tibiae rarely with a single bristle on this surface. 15
 Anteroventral surface of the anterior femora and tibiae with stout bristles *Norellia* Desvoidy
- 15. Prothoracic bristle always, the stigmatic usually, present..... 16
 Prothoracic and stigmatic bristles absent..... 28
- 16. Palpi long and slender, armed at the apex with a long, outstanding bristle 17
 Palpi more or less broadened, without an outstanding bristle..... 20
- 17. Third vein not sinuate..... 18
 Third vein rather strongly sinuate.....*Scoliaphleps* Becker
- 18. Stigmatal bristle weak or hair-like, usually absent..... 19
 Stigmatal bristle strong (46, 60).....*Cordilura* Fallén
- 19. Eyes round*Neogymnomera* Malloch
 Eyes with a slight emargination on the lower posterior half..... 36

* Curran, 1929, Can. Ent., lxi, p. 132.



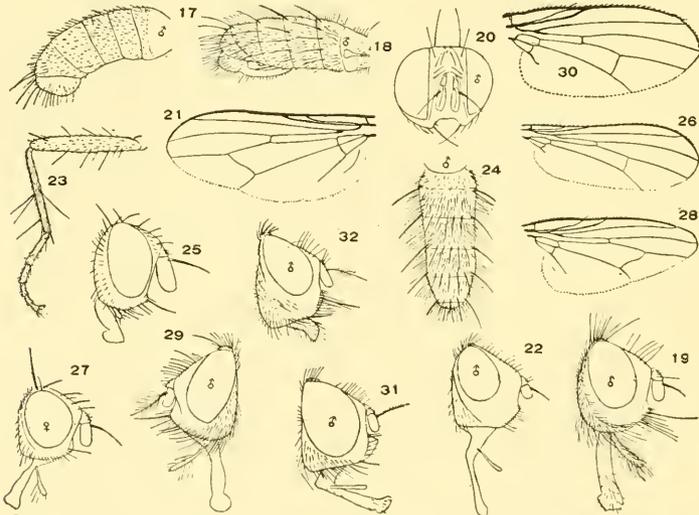
Muscidae I.—1, *Helina lucorum*; 2, *Schönomyza chrysostoma*; 3, *Limosia*; 4, 5, *Lasiops spiniger*; 6, *Phyllogaster cordyluroides*; 7, 8, *Fannia*; 9, *Ophyra senescens*; 10, *Helina*; 11, *Spilaria*; 12, *Pseudolimnophora*; 13, *Pseudolimnophora*, antenna; 14, 15, *Lispe*; 16, *Limnophora*.

20. Cheeks usually less than one-third the eye-height; face as long as the front or nearly so..... 21
 Cheeks more than half as wide as the eye-height; face shorter than the front, slightly retreating below; intra-alar bristles absent; scutellum with four bristles.....**Gimnomera** Rondani
21. First vein bare..... 24
 First vein setulose on apical portion..... 22
22. Scutellum with six bristles.....**Bucephalina** Malloch
 Scutellum with four bristles..... 23
23. Palpi strongly widened and spatulate.....***Cordylurella** Malloch
 Palpi but little widened.....**Megaphthalma** Becker
24. Anal vein extending to the wing margin..... 26
 Anal vein not reaching the wing margin..... 25
25. Third antennal segment four times as long as wide.**Micropselapha** Becker
 Third antennal segment less than three times as long as wide.
Cordylurella Malloch
26. With two or more rows of acrostical hairs..... 27
 Without acrostical hairs.....**Cordilura** Fallén
27. With more than two rows of acrostical hairs (57)...**Ceratinostoma** Meade
 With only two rows of acrostical hairs.....**Opsiomyia** Coquillett
28. Third antennal segment angulate at upper apex..... 29
 Third antennal segment rounded apically..... 33
29. Acrostical setæ in two rows..... 30
 Acrostical setæ in several rows (34).....**Spaziphora** Rondani
30. Anterior tibiæ clothed beneath with dense, black setulæ..... 31
 Anterior tibiæ not clothed beneath with dense, black setulæ..... 32
31. Male wing broadly emarginate between the fourth and fifth veins.
Pleurochaeta Becker
 Male wing normal in outline.....**Pogonota** Zetterstedt
32. Palpi spoon shaped, narrow basally.....**Pseudopogonota** Malloch
 Palpi broad, tapering basally but the base broad....**Trichopalpus** Rondani
33. Mesopleura with an extensive bare area above the anterior coxæ.... 34
 Mesopleura haired on almost the whole surface (33)..**Scopeuma** Latreille
34. Fourth vein strongly approaching the third at the wing-tip.
Lasioseclus Becker
 Fourth vein not strongly approaching the third apically..... 35
35. Anterior tibiæ without dense, short setulæ beneath..... 36
 Anterior tibiæ with dense, short setulæ beneath....**Microprosopa** Becker
36. Anal vein almost reaching the wing margin (39)....**Achatella** Malloch
 Anal vein not nearly reaching the wing margin..... 37
37. Arista plumose or very long pubescent.....**Parallelomma** Becker
 Arista pubescent**Americina** Malloch

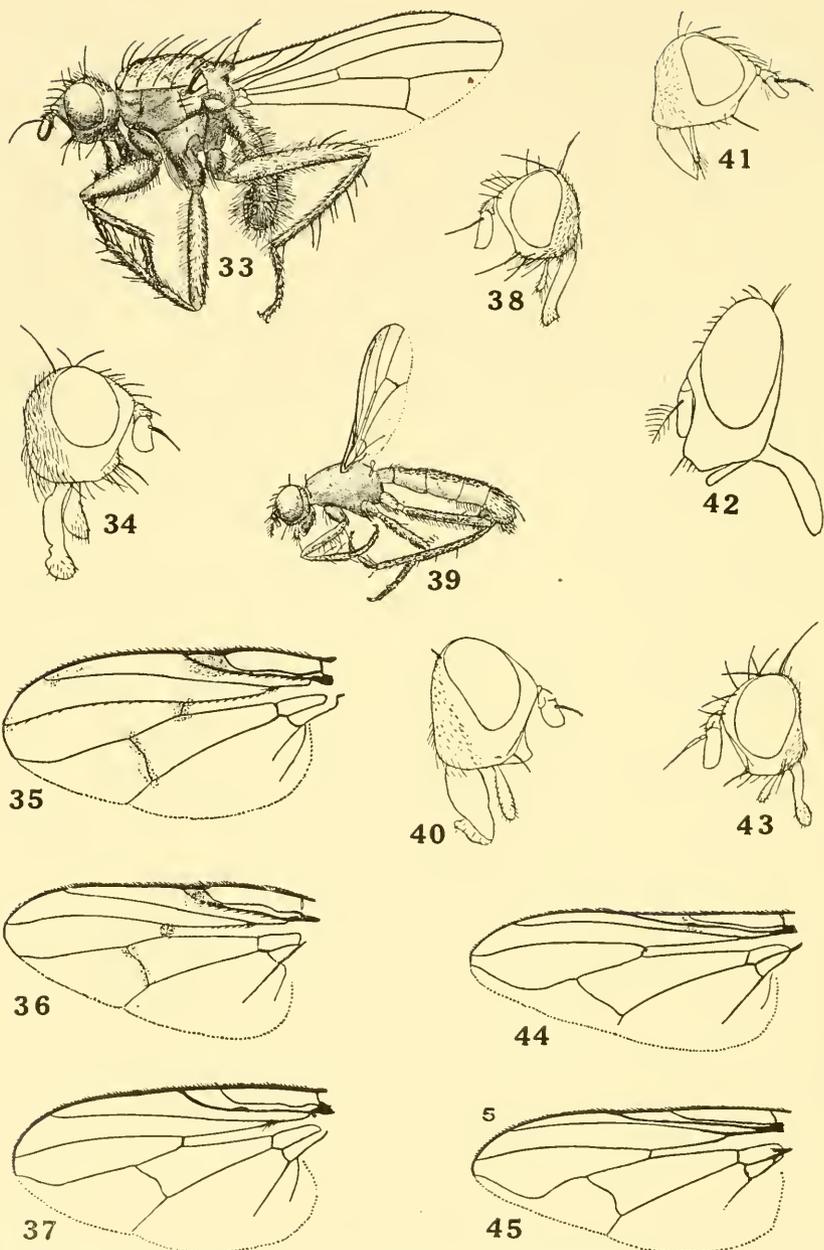
* Curran, 1929, Can. Ent., Ixi, p. 133.

- 38. Anal vein extending to the margin of the wing, at least weakly..... 39
 Anal vein never extending to the margin of the wing..... 75
- 39. Under surface of the scutellum with fine, soft, erect hairs..... 51
 Under surface of the scutellum bare..... 40
- 40. Three sternopleurals 44
 Two sternopleurals (cf. *Fucellia*)..... 41
- 41. Upper apex of third antennal segment acute or angulate; scutellum
 with four bristles..... 42
 Third antennal segment rounded apically; scutellum with one pair of
 marginals 43
- 42. Arista thickened on basal half, its penultimate segment much longer
 than wide (43)..... *Pselaphephila* Becker
 Arista thickened on basal fourth, its penultimate segment short.
Chaetosa Coquillett
- 43. Three pairs of postsutural dorsocentral bristles.... *Hexamitocera* Becker
 Two pairs of postsutural dorsocentral bristles..... *Cleigastrea* Macquart
- 44. Scutellum with one or two pairs of marginal bristles; palpi without
 long outstanding apical bristle..... 45
 Scutellum with six marginals; palpi with strong apical bristle.
Plethochaeta Coquillett
- 45. First vein bare 46
 First vein setulose on apical third (38)..... *Orthacheta* Becker
- 46. Anterior femora without strong bristles on the anterior surface..... 47
 Anterior femora with strong bristles on the anterior surface, propleura
 haired **Amaurosoma* Becker

* Curran, 1927, Can. Ent., lix, p. 293.

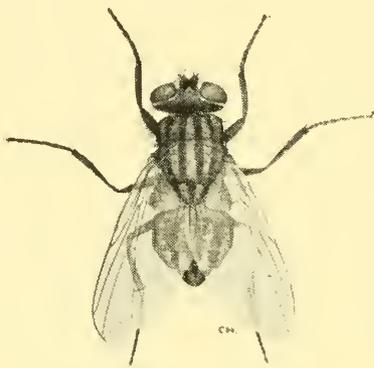


Muscidae II.—17, *Pentacracia aldrichi*, ♂ abdomen; 18, *Eremomyia humeralis*, ♂ abdomen; 19, *Eremomyia humeralis*; 20, *Neodexiopsis*; 21, 22, *Hammonya*; 23, *Coenosia*, hind leg; 24, *Hylemya*, abdomen; 25, *Tetracheta unica*; 26, *Hoplogaster*; 27, *Pegomya bicolor*; 28, 29, *Hydrophoria divisa*; 30, *Platycenosia pokorny*; 31, 32, *Hylemya*.



Muscidae III.—33, *Scopeuma*; 34, *Spaziphora*; 35, *Cyrtoneurina*; 36, *Cyrtoneuropis rescita*; 37, *Myospila mediatubunda*; 38, *Orthacheta*; 39, *Achatella varipes*; 40, *Hydromyza confluens*; 41, *Acicephala polita*, hair on third antennal segment not shown; 42, *Morellia*; 43, *Pselaphelphila*; 44, *Morellia*; 45, *Graphomya maculata*.

77. Apex of posterior coxæ haired behind.....*Chætogenia* Malloch
 Posterior coxæ bare behind..... 78
78. Prosternum setose..... 80
 Prosternum bare..... 79
79. Arista short plumose*Steinella* Malloch
 Arista long plumose (36).....*Cyrtoneuroopsis* Malloch
80. Fourth vein curved forward apically..... 81
 Fourth vein not curved forward apically.....*Smithomyia* Malloch
81. Posterior tibiæ with a strong posterodorsal bristle near the apical
 third*Pæcilophaonia* Malloch
 Posterior tibiæ without calcar (35).....*Cyrtoneurina* Giglio-Tos
82. Pteropleura haired 83
 Pteropleura bare 97
83. Propleura haired in the middle..... 84
 Propleura bare in the middle..... 85



Musca domestica L.

84. Fourth vein ending well before the apex of the wing...*Musca* Linnæus
 Fourth vein ending well behind the apex of the wing.*Mallocharia* Curran
85. Proboscis tapering from the base, long, adapted for biting (as in
Stomoxys)*Hæmatobosca* Bezzi
 Proboscis short and stout, the labellæ large..... 86
86. Ridge at inner edge of lower squamal lobe bare..... 88
 Ridge at inner edge of lower squamal lobe with hairs..... 87
87. Fourth vein ending before the wing-tip.....*Orthellia* Desvoidy
 Fourth vein ending behind the wing-tip (51, 54)...**Philornis* Macquart
88. Fourth vein ending distinctly behind the wing-tip..... 90
 Fourth vein ending distinctly before the wing-tip..... 89
89. Middle tibiæ with a strong anteroventral bristle beyond the middle.
Pyrellia Desvoidy
 Middle tibiæ without anteroventral bristle beyond the middle (42, 44).
 †*Morellia* Desvoidy

* Aldrich, 1923, Ann. Ent. Soc. Amer., xvi, p. 308.

† Malloch, 1923, Ann. Mag. Nat. Hist., xii, pp. 520, 523.

90. Prosternum bare 93
 Prosternum haired 91
91. First vein with setulæ opposite the humeral crossvein...*Clinopera* Wulp
 First vein bare above on the whole length..... 92
92. Facial depression extremely deep, with almost parallel sides; cheeks
 wide (49, 53).....*Charadrella* Wulp
 Facial depression very shallow, widening below; cheeks narrow (55).
Dichatomyia Malloch
93. Palpi spatulate, flattened, always strongly widening apically (14, 15).
 **Lispe* Latreille
 Palpi not unusually widened, not flattened apically..... 94
94. Calcar present 95
 Posterior tibiæ without strong posterodorsal bristle beyond the middle. 104
95. Fourth vein very strongly curved forward at the apex..... 96
 Fourth vein not curved forward at the apex...*Pseudophaonia* Malloch
96. Third and fourth veins equidistant from the wing-tip.
Hypodermodes Knab
 Fourth vein ending far behind the wing-tip.....*Mesembrina* Meigen
97. A single pair of presutural dorsocentral bristles..... 98
 Two pairs of presutural dorsocentrals or they are absent.....106
98. Lower lobe of the squamæ much longer than the upper.....100
 Lower lobe of the squamæ scarcely longer than the upper..... 99
99. Front decidedly longer than wide (26).....†*Hoplogaster* Rondani
 Front wider than long, narrowing anteriorly (2)...†*Schænomyza* Haliday
100. Costa extending to the fourth vein.....101
 Costa ending at the third vein or a little beyond.....*Allognota* Pokorný
101. Three postsutural dorsocentrals.....102
 Two pairs of postsutural dorsocentrals.....*Bithoracochæta* Stein
102. Posterior tibiæ with three long median bristles, one on the postero-
 dorsal surface although this latter may be short.....103
 Posterior tibiæ without a single posterodorsal bristle at the middle,
 sometimes with two posterodorsals.....104
103. Anterior tibiæ with an anterodorsal beyond the middle.
Macrocoænusia Malloch
 Anterior tibiæ without an anterodorsal bristle (20).‡*Neodexiopsis* Malloch
104. Posterior tibiæ with an anteroventral bristle.....105
 Posterior tibiæ without an anteroventral bristle...‡*Xenocoænusia* Malloch
105. Posterior tibiæ with a long anterodorsal and long anterior bristle
 situated very close to each other (23).....§*Coenosia* Meigen
 Posterior tibiæ with anterodorsal and anteroventral bristle, their
 bases not close together (3).....¶*Limosia* Desvoidy

* Aldrich, 1913, Journ. N. Y. Ent. Soc., xxi, p. 131.

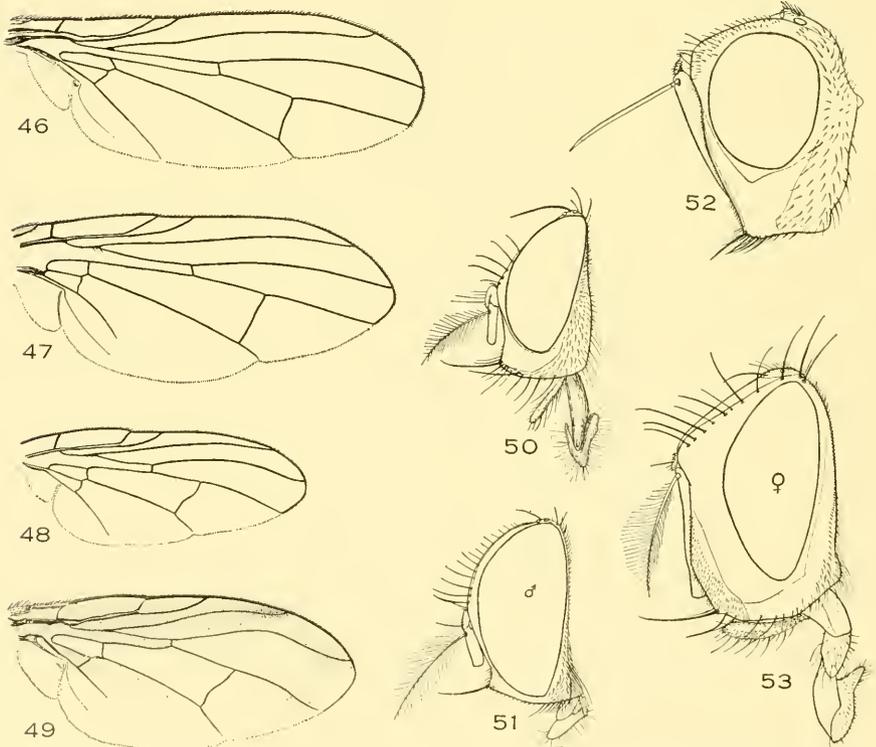
† Hockett, 1934, Trans. Amer. Ent. Soc., ix, pp. 87, 106.

‡ Hockett, 1934, Trans. Amer. Ent. Soc., ix, p. 74 (*Neodexiopsis*).

§ Hockett, 1934, Trans. Amer. Ent. Soc., ix, p. 83.

¶ Hockett, 1934, Trans. Amer. Ent. Soc., ix, p. 135.

- 106. Sternopleural bristles situated in a nearly equilateral triangle, almost always three in number.....107
Sternopleurals not forming a nearly equilateral triangle, if only three are present the lower one is decidedly farther from the anterior...111
- 107. Dorsocentrals very weak, poorly differentiated.....*Atherigona* Rondani
Dorsocentrals strong108
- 108. Anterior tibiae with a posterior bristle near or beyond the middle...109
Anterior tibiae without posterior bristle except at apex.
Lispocephala Pokorny
- 109. Four sternopleurals, the posterior three in a straight line.
Macrorchis Rondani
Three sternopleurals110
- 110. Posterior bristle on front tibiae very long, situated before the middle.
Dialyta Meigen
Posterior bristle on front tibiae short, situated beyond the middle.
Limnospila Schnabl
- 111. Sixth vein very short, the seventh curved strongly forward so that it would bisect the sixth only a little beyond the end of the latter...112
Sixth vein not unusually short, the seventh never curved so that it would bisect the sixth.....114

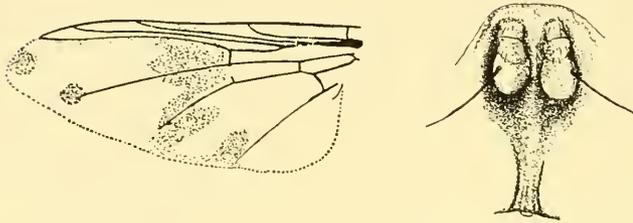


Muscidae IV.—46, *Cordilura*; 47, *Limnophora*; 48, *Phaonia*; 49, *Charadrella macrosoma*; 50, *Phaonia*; 51, *Philornis spermophile*; 52, *Lutzomyia latifrons*; 53, *Charadrella macrosoma*.

112. Posterior tibiæ with dorsal bristle near or somewhat beyond the middle, or with two posterodorsal bristles.....115
 Posterior tibiæ without dorsal or posterodorsal bristles.. *Azelia* Desvoidy
113. Eyes of male very broadly separated; posterior tibiæ sometimes with two posterodorsal bristles and without the dorsal... *Euryomma* Stein
 Eyes of male approximate, the front at least narrowed; dorsal tibial bristle always present (7, 8).....**Fannia* Desvoidy
114. Proboscis long and narrow, widened basally, adapted for blood-sucking *Bdellolarynx* Austen
 Proboscis short and thick, the labellæ fleshy.....115
115. Prosternum bare119
 Prosternum haired laterally116
116. Posterior thoracal spiracle long and narrow.
Synthesiomyia Brauer & Bergenstamm
 Posterior thoracal spiracle little longer than wide.....117
117. Hypopleura hairy in front of and below the spiracle... *Ariciella* Malloch
 Hypopleura bare118
118. Basal abdominal sternite bare (16, 47)..... †*Limnophora* Desvoidy
 Basal abdominal sternite with several hairs (12, 13).
 †*Pseudolimnophora* Schnabl
119. Third vein with setæ basally on the upper margin or before the furcation120
 Third vein bare above122
120. Lower lobe of the squamæ large, its inner end reaching the base of the scutellum (45)..... *Graphomya* Desvoidy
 Lower squamal lobe narrow, not produced inwardly.....121
121. Fourth vein ending in the wing tip or very close to it (37, 56).
Myospila Rondani
 Fourth vein ending far behind the wing tip, not conspicuously curved forward apically ‡*Mydæa* Desvoidy
122. Posterior coxæ bare behind at apex.....124
 Posterior coxæ with hairs behind at apex.....123
123. Eyes pilose (4, 5)..... §*Lasiops* Meigen
 Eyes bare *Allæostylus* Schnabl
124. Fourth vein strongly curved forward apically.....125
 Fourth vein not or very slightly curved forward apically.....127
125. Fourth vein ending well behind the tip of the wing.....126
 Fourth vein ending before the tip of the wing.
Pararicia Brauer & Bergenstamm
126. Posterior spiracle twice as long as wide, with black hairs extending over the lower flap..... *Muscina* Desvoidy
 Posterior spiracle not nearly twice as long as wide.. *Bigotomyia* Malloch
127. Posterior tibiæ, posterodorsally, bare or with two or more bristles..129
 Posterior tibiæ with only the calcar, rarely with a very short posterodorsal bristle near the base.....128
128. Cheeks below with two to five upwardly curving bristles on the anterior half *Dendrophaonia* Malloch
 Cheeks with at most one upwardly curving bristle.....133

* Malloch, 1924, Ann. Mag. Nat. Hist., xiii, p. 416; xiv, p. 515.
 † Hockett, 1932, Journ. N. Y. Ent. Soc., xi, pp. 25-76, 105-158, 279-325.
 ‡ Malloch, 1923, Can. Ent., lvi, p. 220.
 § Malloch, 1920, Can. Ent., liii, p. 272 (*Trichopticus*).

Family Gasterophilidæ—The Horse Bot Flies



Gasterophilus intestinalis, wing and part of head showing antennæ.

Flies of moderate size, without bristles, the thorax pilose; mouth parts very small; apical crossvein absent.

Head short and deep, pilose; front broad; antennæ small, situated in deep pits separated by a carina; second segment without groove; arista bare; mouth parts very small, the palpi swollen, though short, larger than the proboscis; ocelli present. Scutellum large; postscutellum absent. Legs of moderate length. Apical crossvein absent, the vein closing the discal cell also absent and the fourth and fifth veins evanescent apically. Squamæ small. Abdomen elongate oval in the male, slightly tapering, in the female tapering apically, the ovipositor large and protuberant.

The bot flies are frequently serious pests of horses and may be collected in the neighborhood of these animals, although they are remarkably good fliers. The larvæ live in the stomach, throat and nasal passages of horses and related animals and reports of their occurrence in other animals are very rare. The eggs are laid by *G. intestinalis* on the legs or shoulders of the victim and are taken into the mouth when the animal licks these parts; *G. veterinus* lays its eggs on the underside of the head and it is believed that the larvæ make their way through the skin and into the mouth and thence to the pharynx where they attach themselves. *G. hamorrhoidalis* lays its eggs about the lips of the horse and the young larvæ pass to the rectum where they fasten themselves to the walls. Horses apparently recognize the flies, at least those of *veterinus*, and it is not an uncommon sight to see horses with their heads resting on each other's backs as a protection against egg laying.

Gasterophilus has usually been placed in the Cæstridae but Girschner long since pointed out that it was more closely related to the Muscidae (Anthomyidæ) and it has been included in that family. Other

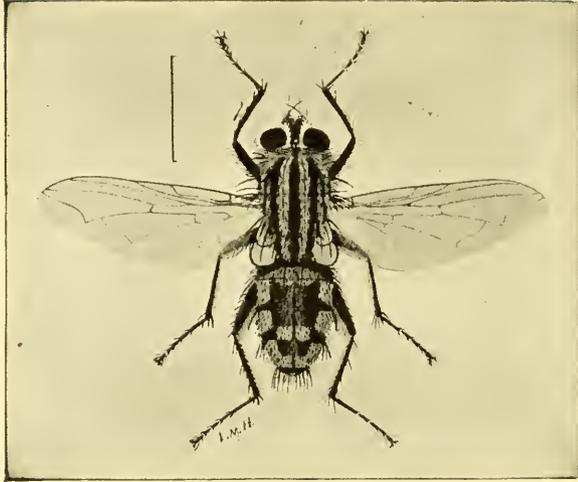
authorities have placed it in the Acalyptera where it would seem to belong on account of the shape of the second antennal segment. However, the species possess strong posterior calli and it is possible that the family is, despite the antennal character, more nearly related to the Muscidae.

The family contains but one genus, *Gasterophilus* Clark, and there are three North American species.

KEY TO THE NEARCTIC SPECIES OF GASTEROPHILUS

- 1. Wings with dark spots.....*intestinalis* Degeer
 Wings without dark spots..... 2
- 2. Discal cell closed beyond the first basal cell; apex of abdomen broadly reddish pilose*hæmorrhoidalis* Linnæus
 Discal cell closed almost opposite the end of the first basal cell; basal cells of equal length; abdomen with whitish pile crossed by a black median band*veterinus* Clark

Family Metopiidæ—The Flesh Flies

*Sarcophaga sarraceniarum*.

Flies of medium to moderately small size, the abdomen usually dark and tessellate or metallic green or blue.

Front in both sexes broad, usually somewhat narrowed in the males, rarely very narrow; face variable; vibrissæ present; antennæ long or short, the arista plumose, pubescent or bare. Abdomen composed of four segments in the males, the fifth short in the females; abdominal bristles usually strong, at least on the apical segments. Hypopleura with a row of bristles; postscutellum developed only in *Mesembrinella*. Apical cell usually open, rarely closed and petiolate, usually ending far before the apex of the wing.

As here considered this family comprises the Sarcophagidæ, part of the Muscidæ and part of the Tachinidæ of Williston's Manual. The absence of the postscutellum distinguishes it from the Tachinidæ while the presence of hypopleural bristles separates it from the Muscidæ and the well developed mouth parts from the Cæstridæ. A study of pupal and larval characters indicates that the association of the genera now included in the family is a natural one, although the genus *Mesembrinella* is a doubtful member.

Insofar as known the larvæ are flesh feeders, parasites or scavengers on excrement and all have the posterior spiracles situated within a deep depression.

As indicated in the introduction I consider *Myiasis* in man is generally an accidental occurrence. There is evidence that it may occur under conditions where an open wound is not dressed and incidents of this kind were not rare during the World War. Indeed, the condition of maggot-infested wounds led to the discovery of the value of flies as an aid in curing serious wounds and also in the treatment of *Osteomyelitis*. It is true that some medical men express doubt about the efficacy of the maggot treatment of this disease but the evidence seems to be in its favor. The maggots feed, for the most part at any rate, only on decayed tissue and the bacteria present in the wound. Whether healing results from the consumption of bacteria or the secretion of a substance stimulating the growth of new flesh is immaterial.

The larvæ of the *Screw Worm Flies* (*Cochliomyia macellaria* and *americana*) occasionally attack man. The eggs are laid in open wounds or nasal or other discharges from the body and the larvæ quickly bore into healthy tissue. From fifty to more than two hundred eggs may be laid at a time. There have been a number of fatal cases in the United States while, in the tropics, death from the attacks of the maggots is said to be not rare. Sheep and range animals are normally attacked when wounded or when the wool becomes fetid due to filth.

The classification of the group is in chaotic condition. A great many genera have been proposed upon characters possessed by one sex or the other and upon characters which are apparently of not more than specific or group value and which, when large collections are studied, are found to be entirely unsatisfactory. There are no doubt several North American genera not included in the key but, without specimens, it is impossible to locate them. I have included all the North American genera known to me but am acquainted with several others occurring in South America which may possibly occur in the North American Tropics although there are, as yet, no records.

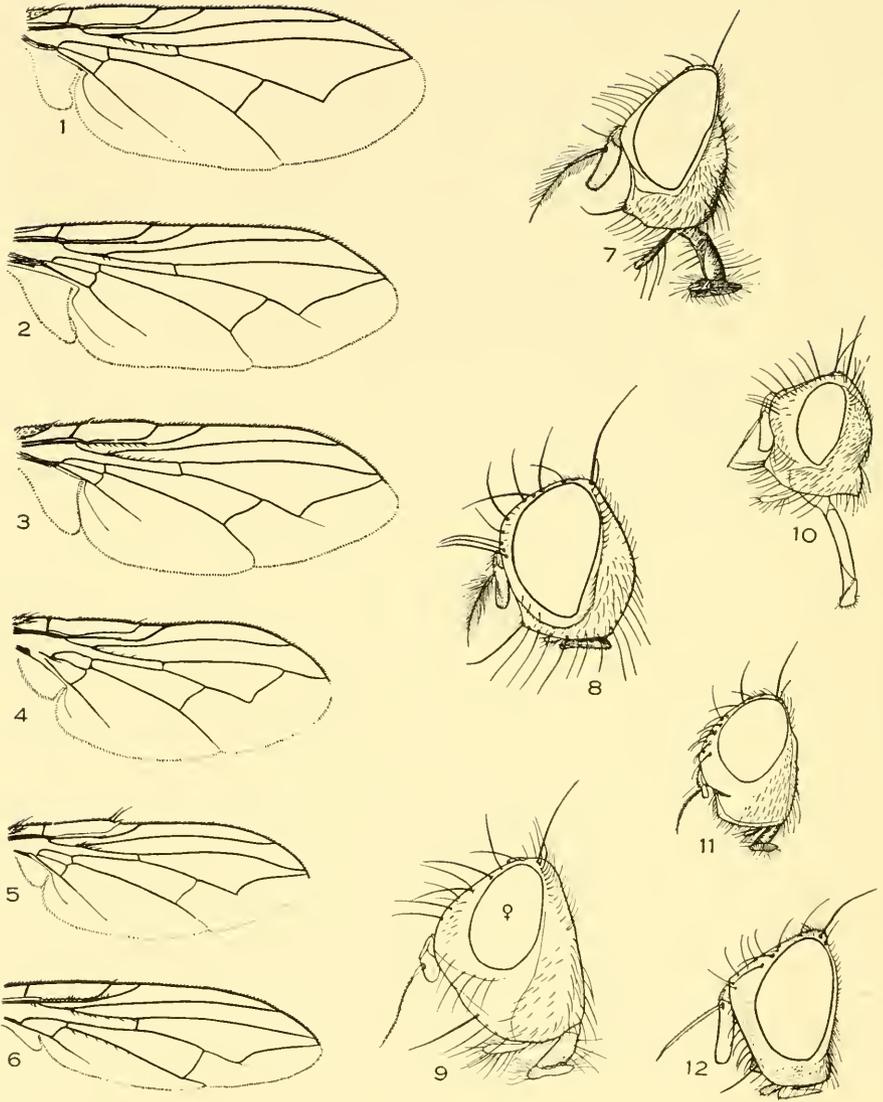
There are three papers which will be found most useful in the study of the insects belonging to this family, published by Aldrich*, Allen† and Shannon‡. In the former many of the specific names have been replaced by older names as the result of a study of the types of species described by older authors. For these corrections see Aldrich*.

It is unfortunate that the name of this family must be changed to Metopiidæ, but since there has been no previous grouping of the included genera into a single family the shock should not be great. The basic use of *Miltogramma* for tribal name has always been erroneous

* 1916, *Sarcophaga and Allies*, (Thomas Say Foundation, Vol. i). 1930, *Notes on Types*, etc., Proc. U. S. N. M., lxxviii, Art. 12.

† 1926, *N. Amer. Miltogrammini*, Proc. U. S. N. M., lxxviii, Art. 9.

‡ 1926, *Syn. Amer. Calliphoridae*, Proc. Ent. Soc. Wash., xxviii, pp. 115-139.

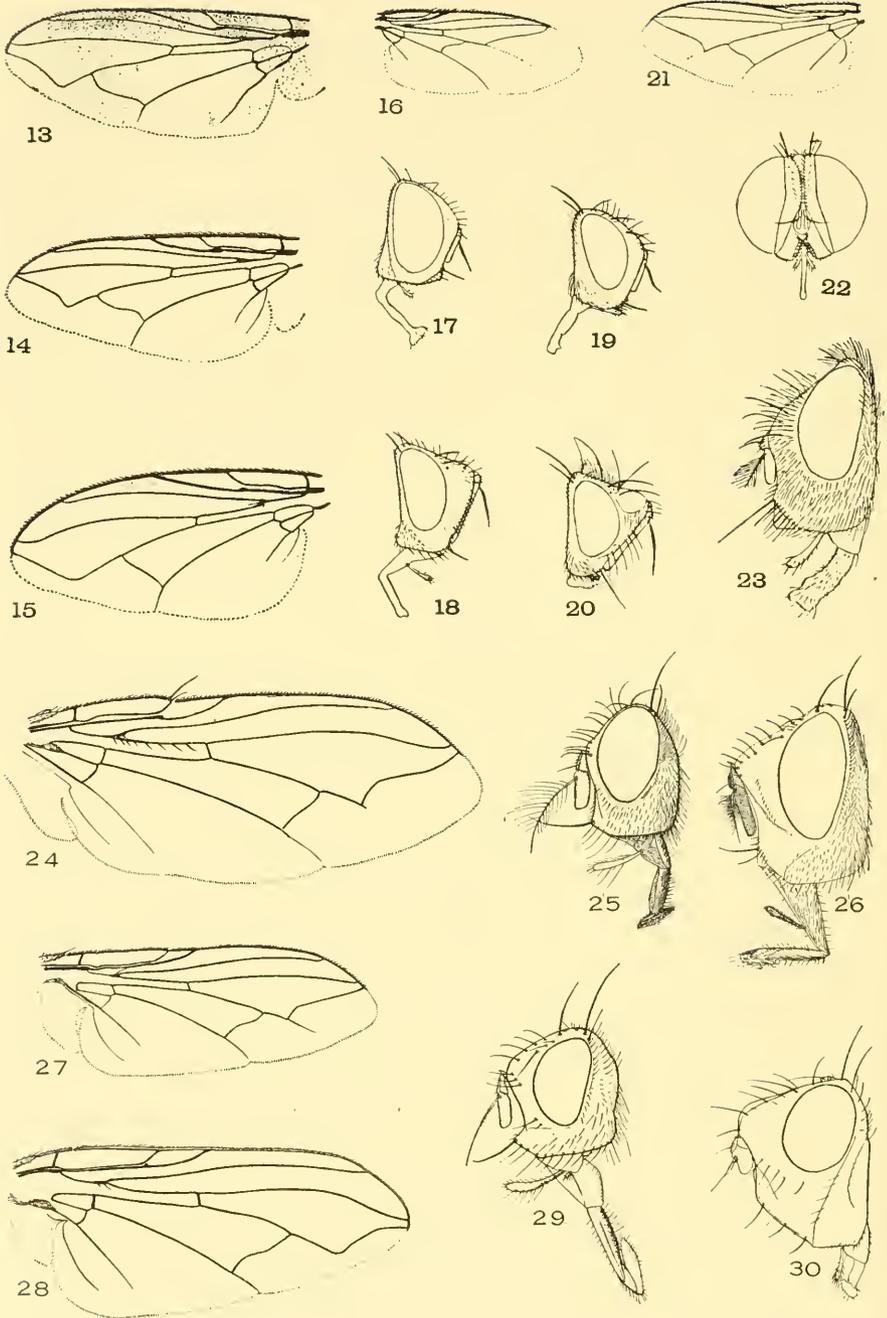


Metopiidae I.—1, *Metopia*; 2, *Euaraba*; 3, *Helicobia*; 4, *Phytodes herculus*; 5, *Neophyto setosa*; 6, *Johnsonia*; 7, *Opsodexia*; 8, *Johnsonia*; 9, *Neophyto setosa*; 10, *Brachicoma devia*; 11, *Melanophora*, (Tachinidae); 12, *Euaraba*.

and the same is true of *Calliphora* as *Onesia* has page priority. Since *Sacrophaga* was proposed long after *Metopia* and *Calliphora* the name could scarcely be used in any event.

KEY TO GENERA

1. Arista pubescent or bare..... 2
 Arista plumose 23
2. First vein bare 3
 First vein setose *Opsidiopsis* Townsend
3. Apical cell closed 4
 Apical cell open..... 6
4. Distal section of the fifth vein longer than the penultimate section (16) *Taxigramma* Perris
 Distal section of the fifth vein little more than half as long as the penultimate section 5
5. Apical cell ending far before the wing tip, short petiolate (19).
 Hilarella Rondani
 Third vein ending only a little before the wing tip, the apical cell long petiolate (4, 30)..... *Phytodes* Townsend
6. Facial ridges without bristles or they are short and hairlike, the parafacials often bristly..... 7
 Facial ridges with bristles on lower half or more (12)..... 6a
- 6a. Arista thin on apical third..... *Sphenometopa* Townsend
 Arista wholly thickened (2, 12)..... *Euaraba* Townsend
7. Parafacials with only fine hair, without bristles, or with only one below. 11
 Parafacials with a row of bristles (cf. *Camptopyga*)..... 8
8. Antennæ reaching almost to the oral margin..... 9
 Antennæ very short, the third segment scarcely longer than the second (5, 9)..... *Neophyto* Townsend
9. Facial ridges divergent below, the depression wider than parafacial... 10
 Facial ridges with parallel sides, the depression deep, narrow and not as wide as either parafacial (18)..... *Opsidea* Coquillett
10. Third antennal segment not more than twice as long as the second; face not strongly receding (10)..... *Brachicoma* Rondani
 Third antennal segment more than three times as long as the second; face very strongly receding (1, 20)..... *Metopia* Miegen
11. Apical cell ending in the wing tip..... *Opelonsia* Townsend
 Apical cell ending far before the wing tip..... 12
12. Head at vibrissæ much shorter than at base of antennæ, the oral margin not produced 13
 Head at vibrissæ almost or quite as long as at base of antennæ, the oral margin usually prominent..... 17
13. Abdominal bristles strong..... 14
 Abdominal bristles poorly differentiated from the hair; abdomen subglobose *(Estrohilarella)* Townsend
14. Frontals not extending below the base of the antennæ..... 15
 Frontals descending to the middle of the second antennal segment.
 Phrosinella Desvoidy



Metopiidae II.—13, *Hemilucilia*; 14, *Pollenia rudis*; 15, *Mesembrinella*; 16, *Taxigramma*; 17, *Senotainia*; 18, *Opsidea*; 19, *Hilarella*; 20, *Metopia leucocephala*, ♂; 21, 22, *Pachyophthalmus*; 23, *Pollenia rudis*; 24, *Camptopyga*; 25, *Sarcophaga*; 26, *Raviniopsis*; 27, *Senotainia*; 28, *Opsodexia*; 29, *Camptopyga*; 30, *Phytodes herculus*.

15. Third vein usually bristled half way to the crossvein or the arista thickened on not more than the basal half..... 16
 Third vein with only one to three small basal setulæ, the arista thickened on almost its whole length; third antennal segment five times as long as second..... 15a
- 15a. Vibrissæ situated level with the anterior oral margin.... *Ouelletia*, n. g.
 Vibrissæ situated almost the length of the second antennal segment above the oral margin..... *Eusenotainia* Townsend
16. Three pairs of almost equally strong marginal scutellars.
Gynnoprosope Townsend
 Apical pair of scutellars weak or absent..... *Eumacronychia* Townsend
17. A row of proclinate hairs on the parafrontals close to the frontals (21, 22)..... *Pachyophthalmus* Brauer & Bergenstamm
 No such row of hairs, the parafrontals sometimes haired over most of the surface or bearing one or more pairs of orbitals..... 18
18. Costal spine very long and strong; two pairs of strong scutellars (24, 29)..... *Camptopyga* Aldrich
 Costal spine short 19
19. Parafacial hairs conspicuous, moderately long..... 20
 Parafacial hairs inconspicuous, very short..... 22
20. Second abdominal segment with erect median marginals..... 21
 Second abdominal segment without median marginals.
Wohlfahrtia Brauer & Bergenstamm
21. Frontals not descending below the base of the antennæ. *Amobia* Desvoidy
 Frontals descending below the base of the antennæ and divergent below (10) *Brachicoma* Rondani
22. Three pairs of almost equally strong scutellars (17, 27).
Senotainia Macquart
 Apical scutellars very much weaker than the other two pairs.
Eumacronychia Townsend
23. Fifth vein bare 24
 Fifth vein bristled (6, 8)..... *Johnsonia* Coquillett
24. Lower lobe of the squamæ haired above at least on basal half..... 25
 Lower lobe of the squamæ bare or pubescent above..... 29
25. Propleura pilose 26
 Propleura bare *Adiscochaeta* Enderlein
26. First vein setose posteriorly before the humeral crossvein.
 **Paralucilia* Brauer & Bergenstamm
 First vein not setose posteriorly..... 27
27. Abdomen metallic blue or green..... 28
 Abdomen black in ground color, tessellate..... *Squamatoides* Curran
28. One sublateral bristle..... *Cynomya* Desvoidy
 Two or three sublateral bristles..... †*Calliphora* Desvoidy

* *Chrysomya desvoidyi* belongs here.

† *Stringomyia* Pokorny is a synonym and *Onesia* Desvoidy is very doubtfully distinct. If the two genera are united *Onesia* will have priority.

29. First vein setose posteriorly between the humeral crossvein and base of the wing 30
 First vein bare posteriorly..... 37

30. First vein setulose below as well as above..... 31
 First vein bare below..... 32

31. Postsutural acrosticals absent*Sarconesia* Bigot
 Postsutural acrosticals present.....*Sarconesiopsis* Townsend

32. Face yellow, clothed with yellow hairs..... 33
 Face black, the hairs black..... 35

33. Palpi short and slender*Cochliomyia* Townsend
 Palpi long, normal..... 34

34. Vibrissæ situated the length of the second antennal segment above the oral margin (13).....*Hemilucilia* Brauer
 Vibrissæ almost on a level with the oral margin.....*Chloroprocta* Wulp

35. Aristal rays quite short and appressed; head almost as long as high.
Boreëllus Aldrich & Shannon
 Aristal rays long, not appressed; head decidedly higher than long..... 36

36. Upper lobe of the squamæ haired above.....**Phormia* Desvoidy
 Upper lobe of the squamæ haired only on the margin.
Protocalliphora Hough

37. Antennæ very short, the third segment little longer than the second;
 face receding below, the vibrissæ closely approximate.
Neophyto Townsend
 Antennæ elongate 38

38. Suprasquamal ridge with erect black hairs..... 39
 Suprasquamal ridge bare or pubescent..... 40

39. Subcostal sclerite setulose.....*Lucilia* Desvoidy
 Subcostal sclerite bare.....*Phenicia* Desvoidy

40. Thorax with abundant yellow tomentose hairs among the black hairs (14, 23)*Pollenia* Desvoidy
 Thorax without tomentose hairs..... 41

41. Postscutellum strongly developed; propleura bare; prosternum setulose laterally; bend of fourth vein broadly rounded (15).
Mesembrinella Giglio-Tos
 Postscutellum not developed..... 42

42. Three or more sternopleurals..... 50
 Two sternopleurals 43

43. Fourth vein ending almost in the tip of the wing..... 44
 Fourth vein ending well before the tip of the wing..... 45

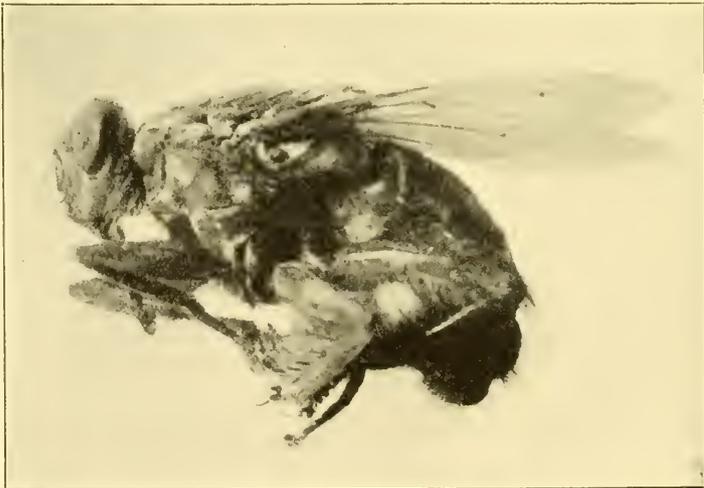
44. Arista long plumose (7, 28).....‡*Oposodexia* Townsend
 Arista short plumose.....*Opelousia* Townsend

* *Protophormia* Townsend is separated by the absence of strong acrostical bristles but the character is of not more than specific value in this instance, some specimens possessing distinct acrosticals.

‡ Reinhard, 1929, Pr. U. S. N. M., lxxvi, Art. 20, p. 6.

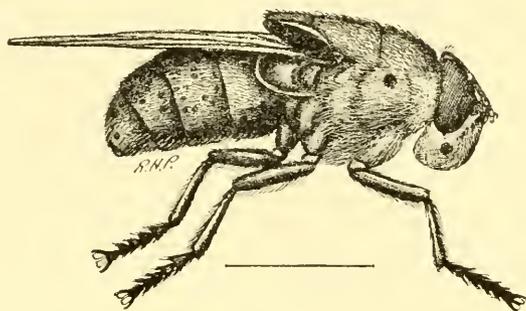
Ouelletia, new genus

Rather similar to *Senotainia* but the facial ridges are haired on almost the lower half, the arista is wholly thickened and the face re-treating. Differs from *Euscnotainia* in having the vibrissæ more widely separated and situated level with the anterior oral margin. Differs from *Euaraba* in the haired facial ridges and much narrower frontal vitta. Front three-fourths as wide as either eye, slightly more than one-third as wide as the head, the parafrontals wider than the vitta, frontals ending at base of antennæ; two pairs of orbitals in the male and a reclinate frontal in the orbital row, ocellars long; outer verticals weak. Checks one-fifth as wide as the eye-height. Parafacials wide, setulose on upper half. Palpi of moderate length. Facial depression very deep. Antennæ elongate, the third segment very long and broad; arista wholly thickened, the penultimate segment short. Acrosticals 1-1, weak, dorso-centrals 2-3, the front ones fine; three pairs of marginal scutellars; sternopleurals 1-1. Bend of fourth vein with a slight fold; base of third vein with a single bristle. Squamæ produced inwardly. Abdomen oval, without discals, the apical two segments with weak marginals. Black, with whitish pollen; frontal pollen mostly brownish yellow, the meso-notal pollen with brownish yellow tinge. Abdomen with a broad median dark vitta and large black triangles on the second and third segments. Genotype, *O. aristalis*, new species, from Lauzon, Quebec, June.



Phrissopodia præceps Wiedemann.

Family Cuterebridæ—The Robust Bot Flies



Cuterebra sp.

Flies of large size, the hair very short, sparse except on the thorax; squamæ large; metascutellum not at all developed.

This family differs from the Cæstridæ in having the scutellum elongate, the postscutellum entirely undeveloped, the arista is usually plumose or pectinate, the form is generally more robust and the body less evidently hairy. In addition the oral opening is larger, subtriangular (produced in front toward the vibrissal angles) and the palpi are always small.

The remarks concerning the Cæstridæ apply fairly well to this family. These flies are, in North America at least, mostly parasitic upon rodents and they have been reared from rabbits, rats, mice and squirrels. The larvæ have been found along rabbit runs, but the adults are only infrequently encountered.

It seems probable that this family is an offshoot of the Metopiidæ type rather than of the Tachinid stock as is evidenced by the absence of the postscutellum and the usually feathered arista. There does not seem to be a close relationship between these insects and the Cæstridæ despite the similar habits and reduced mouth parts while the Gastrophilidæ are still further removed, coming, as they do, close to the Muscidæ. The Tachinidæ having reduced mouth parts have more or less distinct abdominal bristles.

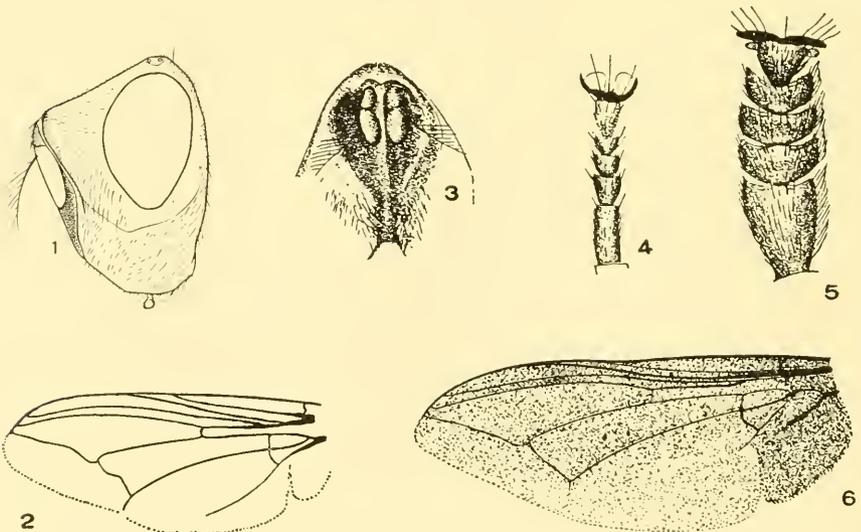
Probably the most unusual habit in the insect world is that of *Dermatobia hominis* (*cyaniventris*), the human bot fly. The fly lays its eggs on other insects, usually mosquitoes, and they are carried by the latter to the host. The eggs contain mature first stage larvæ and these emerge from the eggs when the carrier begins feeding and pene-

trate the skin. The maggots remain in the host for from forty-five to fifty-five days and cause rather severe muscular pains as well as inducing drowsiness. It is said that the adult flies lurk in the vicinity of mosquito infested pools and capture the mosquitoes as they emerge, laying from ten to thirty eggs on each. I have seen mosquitoes heavily laden with the eggs. Ticks and species of Muscidae are also carriers.

KEY TO GENERA

1. No facial carina; antennae elongate, the third segment three times as long as wide 2
- Facial carina developed, though low; antennae short, the second segment rarely over twice as long as wide..... 3
2. Arista rather thickly long plumose.....*Pseudogametes* Bischof
- Arista with rays on upper side only (1, 2, 4).....*Dermatobia* Brauer
3. Arista bare (South America).....*Rogenhoferia* Brauer
- Arista pectinate above and usually with one or more rays below on the apical part (3, 5, 6).....**Cuterebra* Clark

* I can find no character by which to separate *Bogeria* Austen, described from a damaged specimen lacking the aristal rays and based upon the bare arista. Townsend (Ins. Ins. Mens., v. p. 23) attempts to separate the two genera on the shape of the facial depression but I cannot follow him in this.



Cuterebridae.—1, *Dermatobia cyaniventris*; 2, *Dermatobia*; 3, *Cuterebra*, antennae; 4, *Dermatobia*, tarsus; 5, *Cuterebra*, tarsus; 6, *Cuterebra*.

Family *Œstridæ*—The Bot Flies

Flies of moderate to large size, thick set and for the most part more or less pilose, the squamæ large.

Head large, the lower part more or less swollen; mouth opening small, the mouth parts reduced in size, very small. Front broad in both sexes, widening anteriorly in the male; ocelli present. Antennæ short, composed of three segments, decumbent and partly sunken in the facial depression or antennal grooves; arista bare. Eyes bare, rather small. Thorax robust, with transverse suture; hypopleura bearing dense, long hair. Abdomen short, conical or but little elongate; genitalia hidden. Squamæ large. Wing venation as in the Tachinidæ, the first vein ending beyond the middle of the wing, the auxiliary vein long and ending in the costa; fourth vein ending before the apex of the wing, close to the third; both basal cells present, the second basal and anal cell short.

The *Œstrids* are not common in collections and good series of all but a very few species are unusual. The adults are remarkably good fliers, are excellent hoverers and extremely difficult to catch as well as being rarely encountered. Some collectors have had success in locating larvæ and pupæ in pastures, and rearing the adults. Otherwise one usually runs across them only by accident.

In some cases the eggs are laid on the hind legs, the larvæ working their way under the skin and through the muscles until they reach the back, where they make an opening through which to breath. The larvæ of some species live in the nasal sinuses and, in sheep, are responsible for "staggers". The exact means by which some of the species reach their feeding places is not known, and, in fact, relatively little is known about most species which have been described.

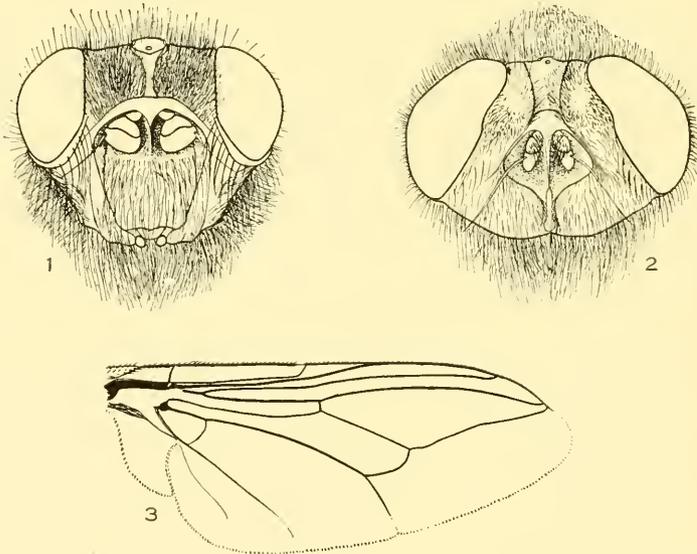
In America the larvæ of *Œstrus ovis* have been found in the eye of man. Normally the living larvæ are deposited in the nostrils or eyes of sheep, the fly dashing in and depositing a maggot. The larvæ work their way to the nasal sinuses and mature the following spring when they either drop out or are ejecting during sneezing. In man they have been found only in the eye, larviposition probably having taken place as described for sheep. However, there are no records of the victim having been aware of the attack so it is possible that the larva was deposited while the victim was sleeping.

The literature dealing with the family is scattered and a thorough revision of the American species is badly needed. The genitalia of both sexes furnish good taxonomic characters.

It is not an easy matter to decide the relationship of this family but it seems probable that it originated from Tachinid stock, since the postscutellum is strongly developed, and the scutellum usually short and broad. The Tachinidæ with reduced mouth opening and mouth parts are more or less bristled and are consequently easily distinguished. However, as these are inhabitants of the Old World tropics we need not discuss them here. More is said about the affinities of the old family *Æstridæ* under the *Cuterebridæ*.

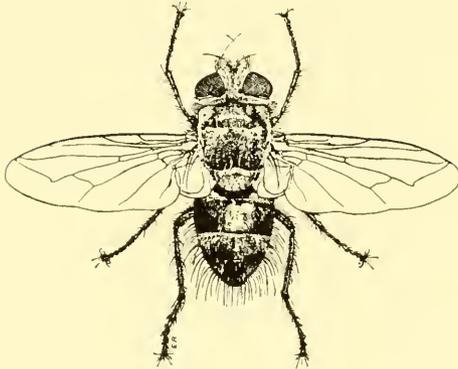
KEY TO GENERA

- 1. Apical cell closed and petiolate.....*Æstrus* Linnaeus
 Apical cell open..... 2
- 2. Facial grooves only narrowly separated below (2)...*Cephalemya* Latreille
 Facial grooves very broadly separated..... 3
- 3. Palpi absent; scutellum bare on apical third (3).....*Hypoderma* Clark
 Palpi small, globular; scutellum pilose apically (1)...*Ædamagena* Latreille



Æstridæ.—1, *Ædamagena tarandi*; 2, *Cephalemya abdominalis*; 3, *Hypoderma lineatum*.

Family Tachinidæ—The Tachinids



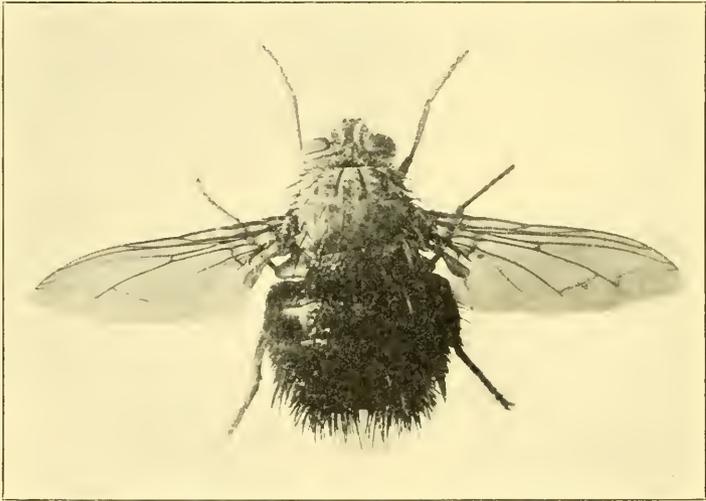
Zenillia species.

Small to rather large flies, the thorax with bristles, the head and abdomen generally with bristles.

Head variable in size, sometimes narrower than the thorax, at other times conspicuously wider; both sexes dichoptic although the eyes of the males are sometimes closely approximated, rarely so in the females; front often wide in both sexes, usually wider in the female than in the male of the same species; frontal bristles almost always present, orbital bristles usually present in the females and often in the males; ocellars present or absent; outer verticals present or not distinguishable from the postocular cilia; cheeks variable in width; oral margin variable, sometimes strongly produced, at other times receding; oral vibrissæ usually present; proboscis variable in length and thickness, sometimes very elongate, on the other extreme very small; palpi present or absent; antennæ variable, consisting of three segments, the second with a longitudinal seam above on the outer side and usually bearing stout hairs and one or more bristles; arista composed of two or three obvious segments, plumose, pubescent or bare. Thorax with bristles; hypopleural bristles present, rarely weak, postscutellum well developed. Legs variable, bearing bristles; pulvilli always present on at least the posterior four legs, often elongate. Wings variable in shape, sometimes pictured; all the veins simple; apical crossvein usually present, formed

by the curvature of the fourth longitudinal vein, this vein rarely straight or almost so, sometimes obsolete apically; posterior crossvein rarely absent; first, third and fifth veins sometimes bristled; basal and anal cells complete. Squamæ almost invariably large. Abdomen variable in shape, usually bearing conspicuous bristles on the sides, apex and disc, but these variable; genitalia variable in both sexes.

The Tachinids are, insofar as known, all parasitic on other insects, particularly Lepidopterous, Tenthredinid, and beetle larvæ and adult beetles, as well as Hemiptera, Orthoptera and possibly some other orders of insects. One or two species are known to be parasitic on other



Paradejeania species.

flies (Syrphidæ). The species parasitic on Hemiptera usually have a bristleless, or near bristleless abdomen while many of those parasitizing beetles have a long, piercing ovipositor, but this character is not limited to such species. The eggs are variable, some being very small (microtype), while others are large (maerotype). A small number of species deposit living larvæ or eggs just ready to hatch. The study of the immature stages of the Tachinids should prove to be a most fascinating one as is indicated by such work as has already been done. The species of *Gonia*, which lay microtype eggs, scatter hundreds of them (as many as a thousand) over vegetation and the ground; they are eaten by feeding caterpillars and ultimately destroy their host. This may seem a haphazard way of doing things but the flies are efficient parasites as

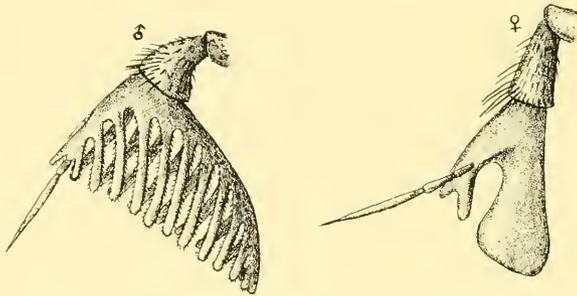
evidenced by their numbers. In at least one species the larvæ, resembling little coiled cones, remain for long periods on leaves, until they are brushed by the hair of a caterpillar, when they suddenly become active, make their way up the hair and enter the body. Most species, however, apparently oviposit in or on the host and in the case of many caterpillars the egg shells remain attached to the larva for long periods, and may be found on them as long as the larval skin exists. This is commonly the case with silk worm caterpillars parasitized by species of *Achaetoneura*, but the characteristic is not restricted to this genus. The literature on this subject is more extensive than one might imagine although I must confess that I am not familiar with it in its entirety.

The study of the immature stages has been greatly stimulated because of the economic importance of these insects. A goodly number of species have been imported to America in connection with the natural control of foreign pests which have become established here and the study of the group has resulted. The best known of the imported Tachinids is *Compsilura concinnata* Bouché, which is now well established in the northeastern states and parts of eastern Canada, and is spreading rapidly. This species is one of the chief parasites of the Gypsy Moth but it apparently attacks almost any kind of caterpillar. *Microphthalma michiganensis* Townsend, has been established in New Zealand from shipments made by the Canadian government. Some of the species imported have occurred in this country for many years and are perhaps indigenous but it is not by any means certain that the native flies will attack the alien hosts. This point is mentioned merely to illustrate the fact that the same species may have different habits in different regions. It also demonstrates our lack of knowledge concerning these insects. Parasites are searched for in all parts of the world, but most of those we have introduced are from Europe and Asia. Just how many of these introductions have resulted in the definite establishment of species in this country we do not know, but there are some failures as well as notable successes. Immediate results in control must not be expected, but it seems likely that in due time a natural control of the pests will occur. To expect the Tachinids, or other parasites, to control the pests they are brought to fight within a few years is just as absurd as to have expected the Pilgrim Fathers to have completely settled this country in ten years.

Tachinids occur everywhere and many species are common. Clearings or lanes in woods are excellent for some species; most of them visit flowers at some time or other, and many are found in grass. A few species are nocturnal, others fly at dusk or on dark days and a number

of them are attracted to light. "Honey dew" is very attractive to many of the species. The adults are frequently very busy creatures and many females seem to fly incessantly in search of a suitable host for their offspring.

It is extremely unfortunate that this important family is in such a hopeless state taxonomically. The forms I include were at one time placed in two distinct families, the Tachinidæ and Dexiidæ, and some authors have recognized a number of families for the group. The Dexiids were separated because of the plumose or haired arista but the character is not of value. During my studies of this family I have searched in vain for reliable characters by which to differentiate groups. Many characters are good up to a certain point but beyond that they cease to be of real value. In many genera the propleura is haired but in some this character is not reliable. The same is true in regard to the hairiness of the lower squamal lobe, a character occurring in but a few genera in the world. The chaetotaxy is variable and there is every gradation between extremes.



Complex antennæ found in Tachinidæ.

The question of generic limits in this family is a most perplexing one. No two people have the same conception of generic limits and it will be found that I disagree in many respects with Townsend, Ville-neuve, Aldrich and others, although agreeing rather well with Dr. Aldrich. I have been unable to correlate all of Townsend's genera with my conception of genera but I have indicated, in the index, a great many which I think should be placed in the synonymy. It might be, of course, that I have gone too far in reducing the number of described genera and that some of those relegated to the synonymy should be recognized as distinct. I feel, however, that the number of genera recognized is still too large and that we may safely reduce it to the benefit of the taxonomy of the family. It is true that in the present work I have added a number of new names and my excuse for doing so is to be found in the fact that I am unable to place the species in any described

genus known to me. No one can correct the classification of this family without a very large collection from all parts of the world and a very extensive study will be necessary before any satisfactory generic limitation can be fixed. Indeed, the classification can never be settled because we are continually discovering new connecting links between genera and species. Some genera are well established and fairly well limited but the number is small.

It is unfortunate that Dr. C. H. T. Townsend has been unable (up to the present time) to find a publisher for his volumes on the classification of this family. No one has ever equalled Townsend in knowledge of the Tachinidæ and his keys would prove to be of inestimable value and would throw light on the position of the hundreds of genera described in various places. At the present time one is absolutely lost unless specimens are available, and it is only by chance that an occasional specimen can be determined.

The student will find a number of changes in nomenclature incorporated in this work and I fear that this will cause some confusion. However, due to the work of Townsend and others we have now discovered older names for many of our species and genera and many misconceptions in identification have been corrected. It is suggested that, if a name occurs in literature and cannot be found in the key, it be looked for in the index. In this way most of the names will be found. Nevertheless, there will be confusion because most of the older authors had little conception of the position of the species described and many very different forms have been placed in the same genus. Things are not quite as hopeless as they may seem, but the beginner will find himself badly handicapped, at least until a catalogue is published.

A preliminary key has been prepared in order to obviate the necessity of going through the entire key and turning many pages before arriving at suitable couplet. Any figures on the right of the page of the abbreviated key refer to a couplet in the key proper and the search for the genus should be taken up from that point.

SYNOPTIC TABLE OF KEY GROUPS

A.	Lower lobe of squamæ bare above	B
	Lower lobe of squamæ pilose above.....	2
B.	Middle of propleura bare	C
	Middle of propleura with pile or hair.....	4
C.	Infrasquamal setulæ absent; abdomen with bristles.....	E
	Infrasquamal setulæ present or the abdomen without dorsal bristles..	D
D.	Eyes haired	55
	Eyes bare or almost so.....	84

E. Eyes bare or with inconspicuous short hair..... G
 Eyes pilose F

F. Parafacials with hairs or bristles extending to the lower half.....161
 Parafacials bare at least on the lower half.....181

G. Parafacials with hairs or bristles.....236
 Parafacials bare on at least the lower half..... H

H. Thorax without plumose hairs I
 Thorax with plumose hairs.....Teleothyria

I. Facial ridges bristled on less than the lower half..... J
 Facial ridges with strong bristles on lower half or more.....293

J. Apical crossvein present K
 Apical crossvein absent342

K. Palpi present and well developed L
 Palpi absent or very greatly reduced.....348

L. Apical cell at most with an extremely short petiole..... M
 Apical cell long petiolate.....355

M. Ultimate section of fifth vein less than half as long as the preceding section N
 Ultimate section of fifth vein three-fourths as long as the preceding sectionCatalinovia

N. Penultimate arisal segment not over twice as long as wide..... O
 Penultimate arisal segment three times as long as wide.....361

O. No appendage or strong fold at bend of fourth vein.....385
 A strong appendage or fold at bend of fourth vein.....372

KEY TO GENERA

1. Lower lobe of squamæ bare or pubescent above..... 3
 Lower lobe of squamæ with long, fine hairs above..... 2

2. Parafacials haired to below the middle (113)...**Bombyliopsis** Townsend
 Parafacials with but a few hairs below the frontals (91).
Hystricia Macquart

3. Middle of propleura bare..... 53
 Middle of propleura with pile or hair..... 4

4. Eyes thickly hairy, the head almost as long below as at base of antennæ 5
 Eyes bare, or, if pilose, the face retreating and the facial ridges usually bristled on the lower half..... 8

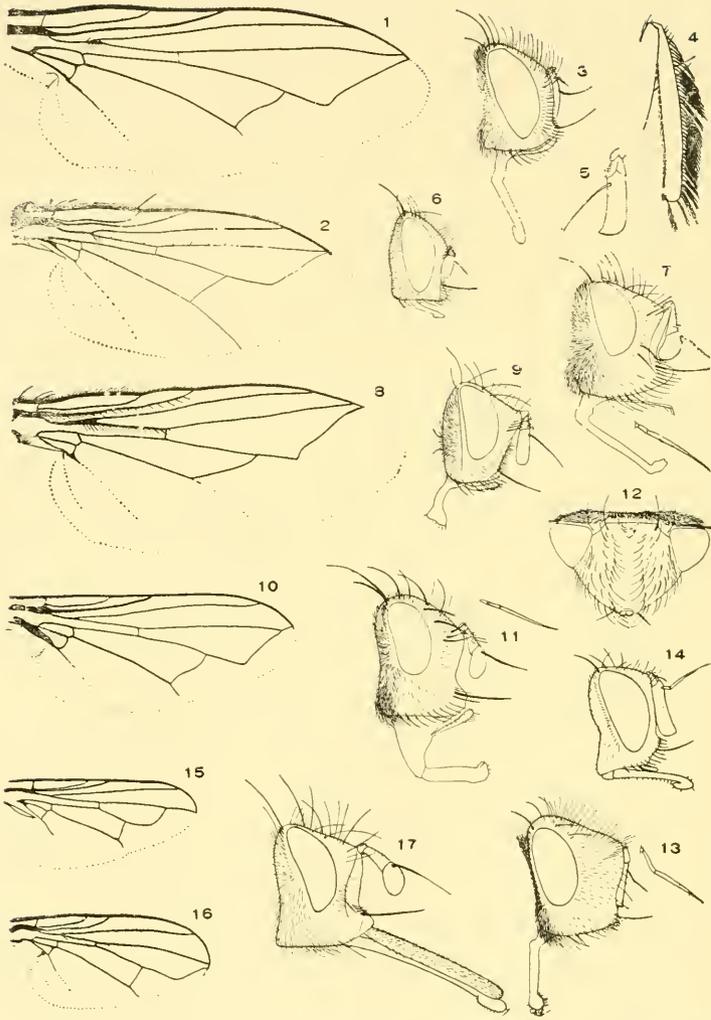
5. Parafacials bare 6
 Parafacials haired on lower half..... 7

6. Facial ridges bristled on lowest three-fourths; first vein setulose.
Hypochaeta Brauer & Bergenstamm
 Facial ridges and first vein bare (100).
Pseudohystricia Brauer & Bergenstamm

7. Palpi well developed.....	<i>Arthrochæta</i> Brauer & Bergenstamm	
Palpi absent or extremely small; large, robust species.	<i>Tachinomima</i> Brauer & Bergenstamm	
8. Thorax without plumose hair.....		9
Thorax, at least on the pleura, clothed with plumose hairs (Genotype: <i>Ptilomyia bequaerti</i> Curran).....	<i>Ptilomyioides</i> , n. g.	
9. Palpi present, strongly developed, at least as long as the second an- tennal segment		19
Palpi absent or very small.....		10
10. Arista plumose		11
Arista bare or pubescent.....		13
11. Posterior tibiæ rather closely ciliate.....	<i>Opsotheresia</i> Townsend	
Posterior tibiæ not ciliate.....		12
12. Palpi absent	* <i>Atelogossa</i> Coquillett	
Palpi slender and short.....	<i>Phasiops</i> Coquillett	
13. Parafacials with hairs or bristles.....		14
Parafacials bare; ocellars strong (54).....	† <i>Cylindromyia</i> Meigen	
14. Ocellars strong		15
Ocellars weak or absent; parafacials without bristles.....		18
15. Parafacials with strong bristles below; apical cell petiolate.	<i>Antillicolla</i> Curran	
Parafacials with hair.....		16
16. Apical cell ending very close to wing-tip; head short.	<i>Phosocephala</i> Townsend	
Apical cell ending far before the wing-tip; head long.....		17
17. Abdomen with ordinary bristles below, rounded apically.	<i>Gymnomma</i> Brauer & Bergenstamm	
Abdomen with spines ventrally, emarginate apically.	<i>Juriniopsis</i> Townsend	
18. With ordinary bristles on the abdomen.....	<i>Epalpus</i> Rondani	
With blunt spinose bristles on the dorsum of the abdomen.	<i>Rhachoëpalpus</i> Townsend	
19. Parafacials hairy or bristly to well below the middle.....		20
Parafacials with at most a few hairs below the lowest frontals.....		33
20. Parafacials with ordinary hairs.....		22
Parafacials with bristles		21
21. Apical cell open (73, 74).....	<i>Goniochæta</i> Townsend	
Apical cell petiolate.....	<i>Eutrichogena</i> Townsend	
22. Ocellar bristles strongly developed.....		27
Ocellar bristles extremely weak or absent.....		23
23. Palpi but little longer than the length of the oral opening, enlarged apically		25
Palpi very much longer than the length of the oral opening, with par- allel sides or somewhat narrowed apically.....		24

* Curran, 1930, Bull. Amer. Mus. Nat. Hist., lxi, p. 92.

† Aldrich, 1926, Pr. U. S. N. M., lxxviii, Art. 23, pp. 1-27.



Tachinidae I.—1, *Lydella*; 2, *Aphria occidentalis*; 3, *Spallanzania hebes*; 4, *Leschenaultia adusta*; 5, *Acemya dentata*, antenna; 6, *Atacta*; 7, *Peleteria*; 8, *Voria ruralis*; 9, *Tachinomyia robusta*; 10, *Cistogaster*; 11, *Archytas*; 12, 13, *Gonia*, head, dorsal and lateral views; 14, *Epigrimyia*?; 15, *Alophora*; 16, *Plectops*; 17, *Dejeania vexatrix*.

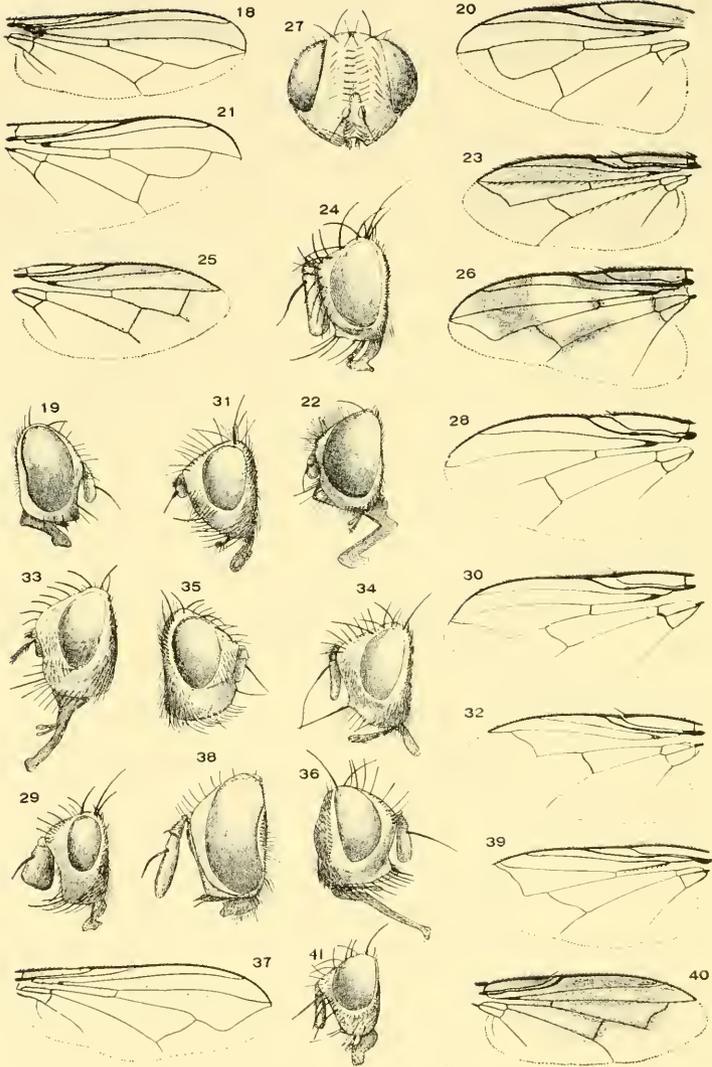
24. Acrostical bristles absent.....**Eudejeania** Townsend
 Acrostical bristles present (17).....**Dejeania** Brauer & Bergenstamm
25. Abdomen convex, the apex rounded..... 26
 Abdomen very large, unusually flat above, sub-rectangular, the apex
 strongly emarginate (60).....**Paradejeania** Brauer & Bergenstamm
26. Second abdominal segment with at most four median marginals, if
 with discals they are arranged in pairs (11, 102)...***Archytas** Jännicke
 Second abdominal segment with many marginals, numerous discals or
 the pile very long and bristly (95).....**Jurinia** Desvoidy
27. Ultimate section of fifth vein two-thirds as long as preceding section.
Metaplagia Coquillett
 Ultimate section of fifth vein not one-third as long as preceding sec-
 tion 28
28. Abdomen without discals, or they are fine and hair-like..... 29
 Second and third abdominal segments with strong discals.
Protodejeania Townsend
29. Face not carinate on lower half of depression..... 31
 Face carinate on whole length of depression..... 30
30. Hair of parafacials inconspicuous...**Myiomima** Brauer & Bergenstamm
 Hair of parafacials strong.....**Ursophyto** Aldrich
31. Arista plumose**Phalacrodexia** Townsend
 Arista bare or pubescent..... 32
32. Posterior sublateral bristle present.
 †**Cnephaliodes** Brauer & Bergenstamm
 Posterior sublateral bristle absent; proboscis long, the labellæ small.
Phytopsis Townsend
33. Frontal bristles not or scarcely extending below the base of the an-
 tennæ; arista strongly pubescent or plumose..... 38
 Frontal bristles usually extending to the base of the third antennal
 segment; arista not conspicuously pubescent..... 34
34. Ocellars present 35
 Ocellars absent ‡**Belvosia** Desvoidy
35. Facial ridges with strong bristles on at least the lower half..... 37
 Facial ridges with only a few hairs above the vibrissæ..... 36
36. Eyes pilose (**Zenillia submissa** A. & W.).....**Collatia**, n. g.
 Eyes bare**Parademoticus** Townsend
37. Infrascquamal setulæ present.....**Hypocheatopsis** Townsend
 Infrascquamal setulæ absent.....**Chaetophlepsis** Townsend
38. Arista with long rays..... 39
 Arista with long rays.....§**Arctophyto** Townsend
39. Infrascquamal setulæ absent 40
 Infrascquamal setulæ present (**Metopiidæ**).....**Opsodexia** Townsend

* Curran, 1928, Can. Ent., ix, p. 202.

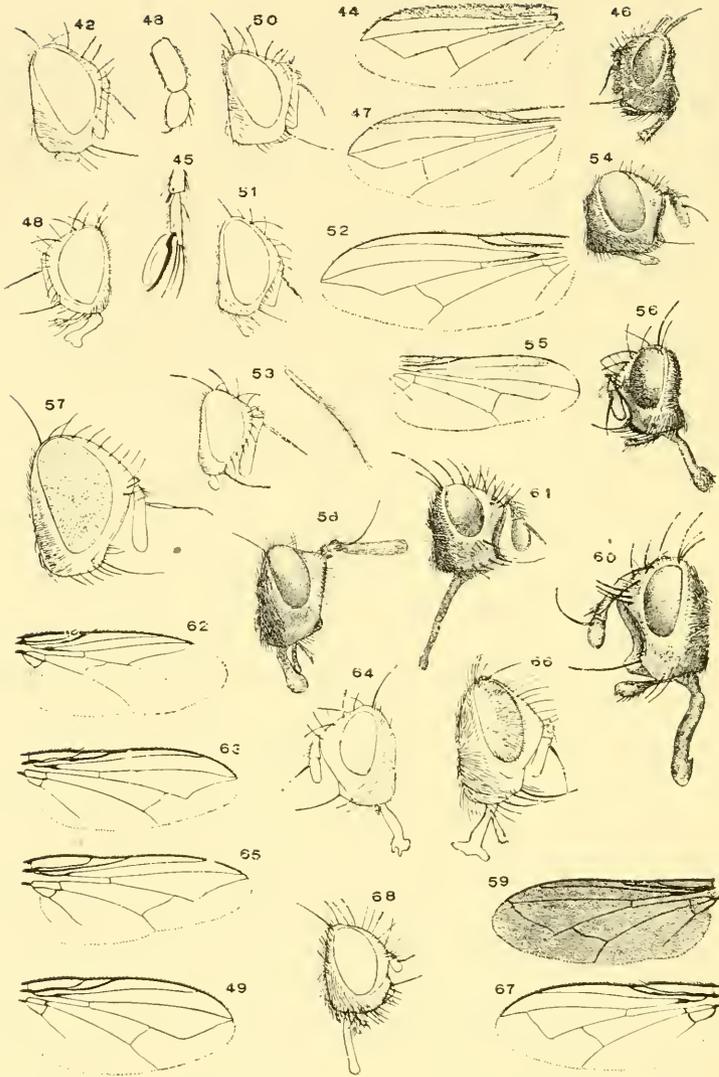
† Rowe, 1931, Ann. Ent. Soc. Amer., xxiv, p. 647 (**Fabriciella**).

‡ Aldrich, 1928, Pr. U. S. N. M., lxxiii, Art. 8, pp. 1-45.

§ Curran, 1924, Can. Ent., lvi, p. 302.



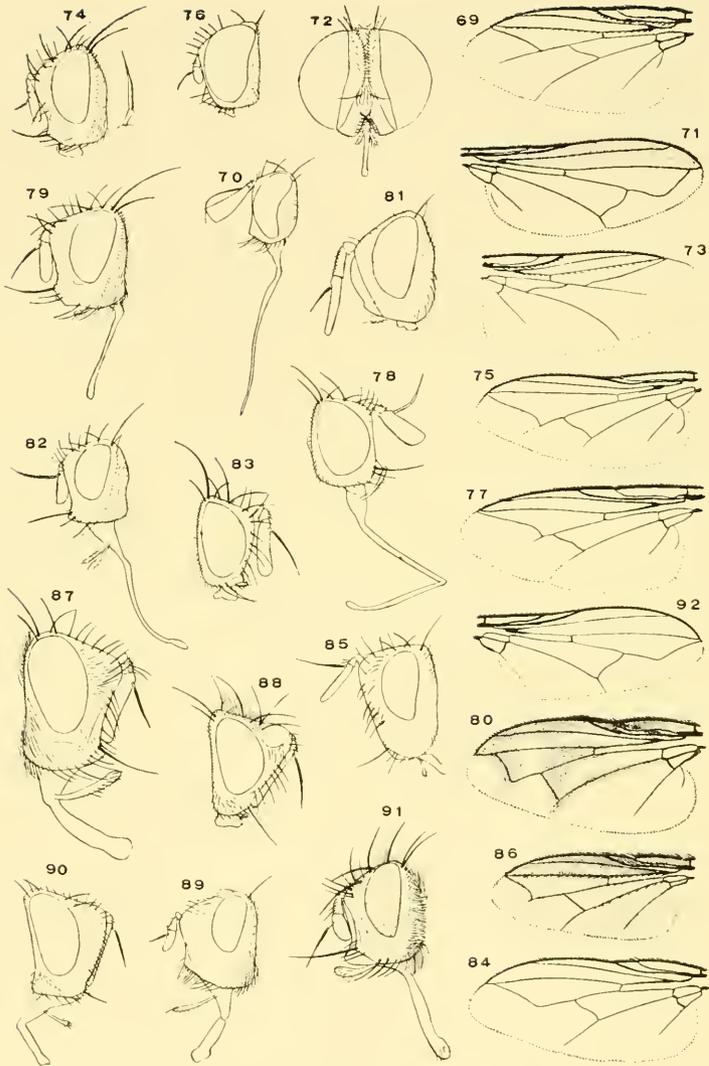
Tachinidae II.—18, 19, *Acaulona costata*; 20, *Alophora fumosa*; 21, 22, *Alophora*; 23, 24, *Ceratomyiella*; 25, *Euscopolia dakotensis*; 26, 27, *Estrophasia calva*; 28, 29, *Euryceromyia robertsoni*, bristles omitted from third vein of wing; 30, 31, *Neophyto setosa* (Metopiidae); 32, 33, *Rhinophora mexicana*; 34, *Cryptocigenia*; 35, *Myiophasia*; 36, *Binghamimyia*; 37, 38, *Hemyda aurata*; 39, *Cuphocera*; 40, 41, *Wagneria*, bristles omitted from veins.



Tachinidae III.—42, *Paradidyma braueri*; 43, *Paradidyma*, apex of front tarsus of ♀; 44, *Vanderwulpia townsendi*; 45, *Paradidyma braueri*, front tarsus of male; 46, *Spallanzania*; 47, *Beskia cornuta*; 48, 49, *Spathidexia dunningi*; 50, 51, Genera incert.; 52, *Paradidyma braueri*; 53, *Vanderwulpia townsendi*; 54, *Cylindromyia*; 55, *Catharosia nebulosa*; 56, *Gymnochæta*; 57, *Zenillia* 58, 59, *Penthosia satanica*; 60, *Paradejeania*; 61, *Cuphocera*; 62, *Taxigramma* (*Metopiidae*); 63, 64, *Icelia triquetra*; 65, 66, *Uramya halesidotæ*; 67, 68, *Leucostoma*.

56. Ultimate section of fifth vein not over one-third as long as the preceding section, or the parafacials without bristles..... 58
 Ultimate section of fifth vein at least half as long as the preceding section; parafacials with one or more proclinate bristles..... 57
57. Inner end of posterior crossvein lying immediately behind the anterior crossvein*Plagia* Meigen
 Discal crossvein lying well beyond the anterior crossvein.
Cyrtophlœba Rondani
58. Fourth vein angulate or with sharp curve; abdomen with strong bristles 59
 Fourth vein approaching the third in a gentle curve; abdomen with only weak bristles apically.....*Gymnophania* Brauer & Bergenstamm
59. Parafacials without bristles along their inner edges, sometimes with bristly hairs along their middle..... 61
 Parafacials with a row of bristles along their inner edges..... 60
60. Basal two arisal segments short; antennæ simple in both sexes.....60a
 Basal arisal segments very elongate; third antennal segment of male composed of two or three arms (103, 104).....*Dichocera* Williston
- 60a. Third antennal segment but little longer than the second.
Muscopteryx Townsend
 Third antennal segment several times as long as the second (42, 43, 45, 52, 96).....*Paradidyma* Brauer & Bergenstamm
61. Parafacials without strikingly long hair, or it is irregularly spaced... 62
 Parafacials with the hairs arranged in a median series and increasingly long and strong below.....**Eulasiona* Townsend
62. Bend of fourth vein with at most a distinct fold..... 63
 Bend of fourth vein with a long appendage.
Metopomuscopteryx Townsend
63. Three pairs of presutural acrostical bristles or three presutural dorsocentrals*Lydina* Desvoidy
 At most two pairs of presutural acrostical bristles..... 64
64. Two pairs of presutural acrosticals and dorsocentrals (35, 139).
Myiophasia Brauer & Bergenstamm
 A single pair of presutural acrosticals and two pairs of dorsocentrals.
Townsendina, n. g.
65. Facial ridges without strong bristles..... 69
 Facial ridges with strong bristles on lower half or more..... 66
66. Parafacials not wider than antennæ..... 67
 Parafacials much wider than antennæ; oral margin scarcely produced.
Myiopharus Brauer & Bergenstamm
67. Arista long plumose.....*Comyops* Wulp
 Arista at most very short plumose..... 68
68. Ocellars strong; face not strongly retreating below; female piercer as long as the abdomen.....*Spathimyia* Townsend
 Ocellars absent or hairlike; face strongly retreating.
Paralispe Brauer & Bergenstamm

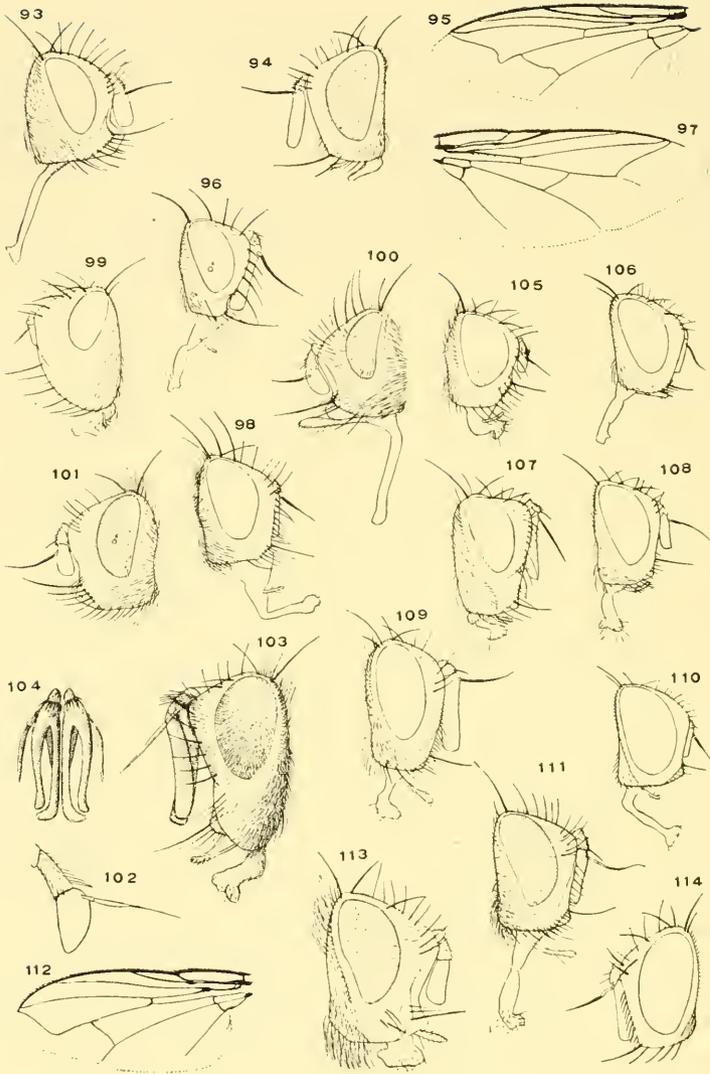
* Curran, 1927, Bull. Brooklyn Ent. Soc., xxii, p. 149.



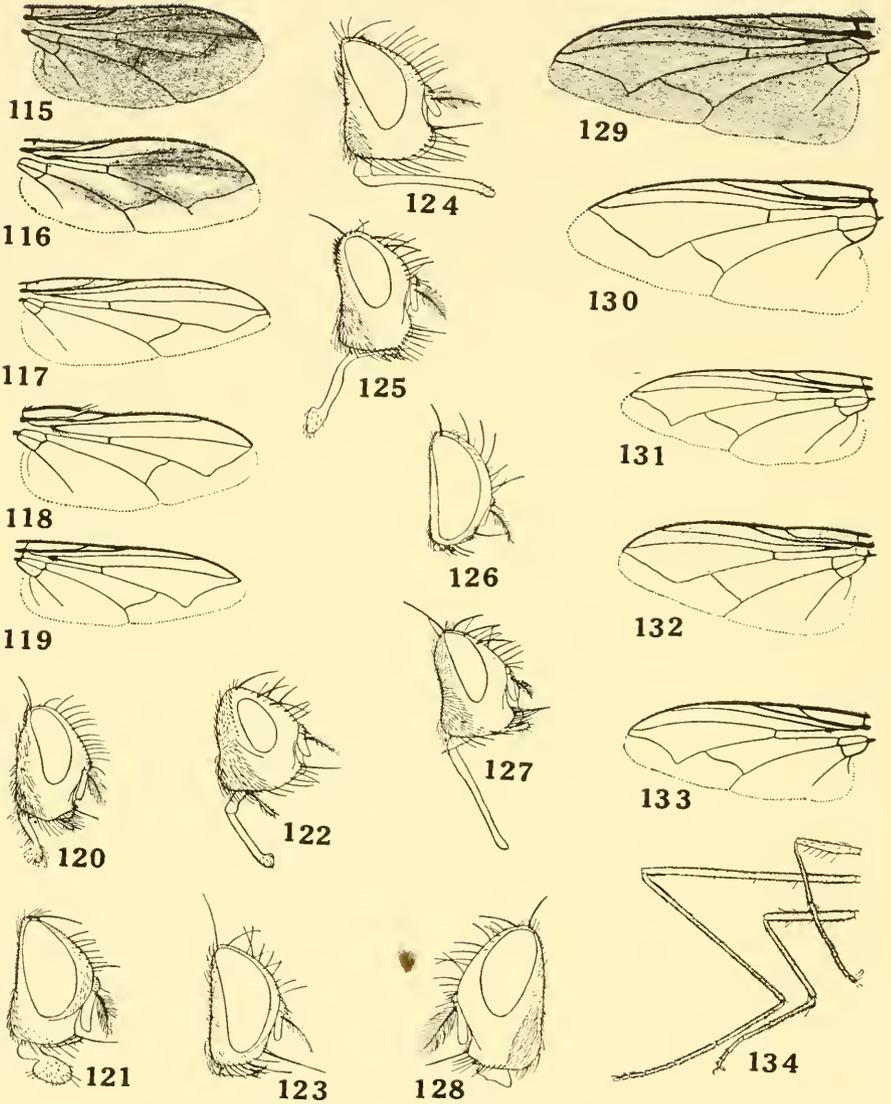
Tachinidæ IV.—69, *Plagiomima anomala*; 70, *Beskia cornuta*; 71, *Xanthomelana arcuata*; 72, *Pachyophthalmus floridensis* (Metopiidæ); 73, 74, *Goniochaeta plagioides*; 75, *Pachyophthalmus floridensis* (Metopiidæ); 76, *Xanthomelana arcuata*; 77, *Linnæmya*; 78, *Siphona*; 79, *Plagiomima anomala*; 80, 81, *Eutheira tentatrix*; 82, *Epigrimyia*; 83, *Chaetoplagia*; 84, 85, *Euthyrosopa petiolata*; 86, *Chaetoplagia*; 87, *Chaetogædia analis*; 88, *Metopia* (Metopiidæ); 89, *Melanophrys insolita*; 90, *Opsidia gonioides* (Metopiidæ); 91, *Hystricia*; 92, *Chryseria flava*.

- 69. Not metallic green or blue..... 70
Metallic green or blue.....*Chrysotachina* Brauer & Bergenstamm
- 70. Parafrontals pollinose, at most bare at the vertex..... 71
Parafrontals shining black*Polidaria* n. g.
- 71. Oral margin not strongly oblique in front nor carried strongly upward toward the base of the antennæ; antennæ situated at or above the middle of the eyes; oral margin produced or not..... 72
Oral margin and antennal base unusually approximated, the oral margin strongly oblique in front; antennæ situated below the middle of the eyes; parafacials always with many hairs below the frontals.
Lydina Desvoidy
- 72. Ocellar bristles strong..... 75
Ocellars absent or very weak..... 73
- 73. Antennæ inserted at upper fourth of eyes; bend of fourth vein with stump (141, 167).....*Xanthophyto* Townsend
Antennæ inserted at middle of eyes; bend of fourth vein without stump 74
- 74. Arista plumose (188, 195).....*Zonalia*, n. g.
Arista short pubescent or bare (146, 161, 166, 187).....*Corozalia*, n. g.
- 75. Head almost as long below as at the antennæ, the oral margin produced; vibrissæ usually situated above oral margin..... 77
Face retreating below; vibrissæ level with oral margin..... 76
- 76. Fifth vein bristled.....*Minthoplagia* Townsend
Fifth vein bare..... 78
- 77. Palpi of normal length, more or less swollen apically..... 78
Palpi not more than half the usual length, never widened apically; fourth vein with long appendage at bend (77)....*Linnæmya* Desvoidy
- 78. Pteropleural bristle extending to the apex of the squamæ..... 81
Pteropleural bristle normal..... 79
- 79. Face about as long below as at the antennæ..... 80
Face strongly receding.....*Thelairodoria* Townsend
- 80. Abdomen long and slender.....*Oxydextia* Bigot
Abdomen short, robust.....*Mericia* Desvoidy
- 81. Posterior pair of presutural acrosticals situated very close to the suture 82
Posterior pair of presutural acrosticals situated far before the suture; female ocellars reclinate; male with outer verticals.
Trafoia Brauer & Bergenstamm
- 82. Pleura with fine, pale pile below; third antennal segment rounded apically*Neoerigone* Townsend
Pleura wholly black haired..... 83
- 83. Front tarsi of female broadened; third antennal segment rectangular at upper apex (142) (*Exoristoides* Coquillett, *Exoristopsis* Townsend)*Eversmannia* Desvoidy
Third antennal segment rounded at upper apex.....*Mericina* Curran

* The genera *Neoerigone*, *Eversmannia* and *Mericina* are so poorly distinguished that I think they should be united. For key to species see Aldrich, Proc. U. S. N. M., lxxxi, Art. 9, p. 24 (*Exoristoides*).



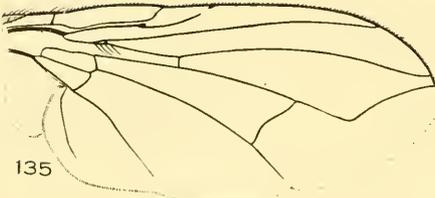
Tachinidae V.—93, *Fischeria flava*; 94, *Zenillia*; 95, *Jurinia*; 96, *Paradidyma singularis*; 97, 98, *Stomatomya parvipalpis*; 99, *Microphthalma disjuncta*; 100, *Pseudohystericia*; 101, *Microtrichoma?*; 102, *Archytas californica*; 103, *Dichocera lyrata*; 104, *Dichocera lyrata*, antenna; 105, *Muscopteryx*; 106, *Hilarella* (Metopliidæ); 107, *Neotractocera*; 108, *Viviania*; 109, *Achatoneura*; 110, *Senotainia* (Metopliidæ); 111, *Gædiopsis*; 112, *Genea analis*; 113, *Bombyliopsis*; 114, *Chætoglossa*, proboscis omitted.



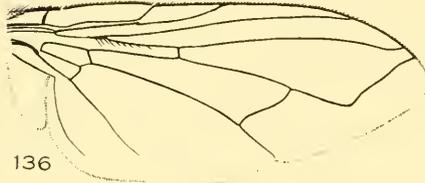
Tachinidae VI.—115, *Melanophora*; 116, *Sophia*; 117, *Calodexia*; 118, *Billea*; 119, *Rhynchiodexia*; 120, *Scotiptera*; 121, *Cholomyia*; 122, *Billea*; 123, *Thelaira*; 124, 125, *Rhynchiodexia*; 126, *Calodexia*; 127, *Hystriodexia*; 128, *Zelia*; 129, *Scotiptera melaleuca*; 130, *Hystriodexia*; 131, *Zelia*; 132, *Chaetona*; 133, *Rhynchiodexia*; 134, *Cholomyia*, legs.

- Face short, with a strong facial carina, the antennal grooves deep; proboscis one-half longer than the head-height; abdomen without bristles, the apical segments with longish hairs; female genitalia with stout spines on the sides.....*Imitomyia* Townsend
101. Second abdominal segment with at least well developed median marginals123
 Second abdominal segment without dorsal bristles.....102
102. Posterior tibiæ without flattened bristles.....103
 Posterior tibiæ ciliate dorsally with scale-like bristles (163, 164).
Trichiopoda Latreille
103. Facial depression shallow or somewhat carinate, if deep not sub-oval in outline; arista, if wholly thickened, reddish in color.....104
 Facial depression very deep and sub-oval; arista black, wholly thickened; shining black flies (89)*Melanophrys* Williston
104. Arista not wholly thickened; parafacials without transverse furrows. .105
 Arista wholly thickened; parafacials shining black, with many transverse furrows (25).....*Euscopolia* Townsend
105. Fourth vein strongly curved beyond the crossvein.....106
 Fourth vein gently curved, the apical cell open in the wing-tip.
Gymnophania Brauer & Bergenstamm
106. Face not or but little retreating, the vibrissæ situated well above the oral margin109
 Face strongly retreating, oral vibrissæ strongly differentiated and on a level with the oral margin, or absent.....107
107. Apical cell petiolate.....108
 Apical cell open near the wing-tip.....*Pseudapinops* Coquillett
108. Apical cell ending well before the wing-tip....**Hesperophasia* Townsend
 Apical cell ending in the wing-tip (55).....*Catharosia* Rondani
109. Oral vibrissæ, if strongly differentiated, situated almost level with the oral margin; abdomen short, oval, spherical or flattened, rarely elongate110
 Oral vibrissæ strongly developed, sometimes duplicated, situated well above the oral margin and without hairs above or below; abdomen long and narrow (71, 76).....*Xanthomelana* Wulp
110. Abdomen short, or if elongate not flattened.....111
 Abdomen elongate and flattened; oral margin produced; apical cell petiolate; wing veins broadly bordered with black.
Bibiomima Brauer & Bergenstamm
111. Sternites broad, the female genitalia not remarkably large; oral vibrissæ usually strongly differentiated, their angle high above the oral margin; abdomen short, rather spherical in outline, strongly convex or flattened.....113
 Sternites linear, thread-like; second sternite large, produced downward and with very short, stout setulæ on the lower part; female genitalia very large; vibrissæ distinct, situated but little above the oral margin; palpi minute.....112

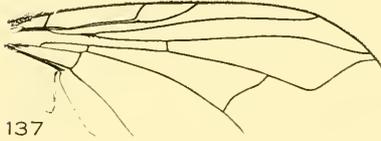
* Curran, 1927, Can. Ent., lix, p. 300.



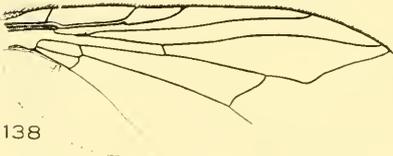
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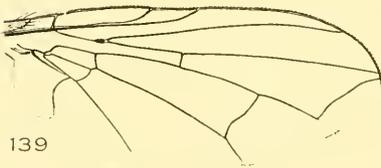
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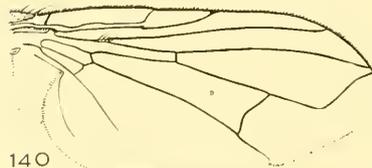
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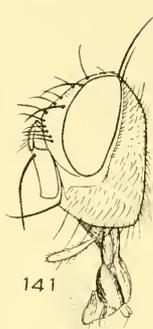
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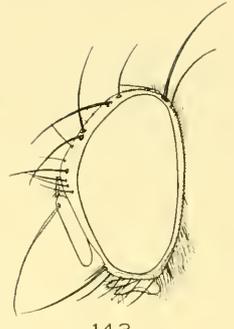
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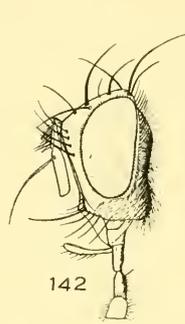
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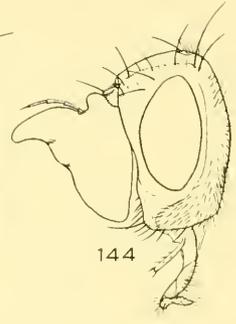
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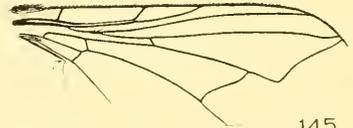
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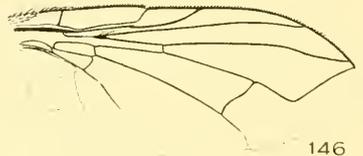
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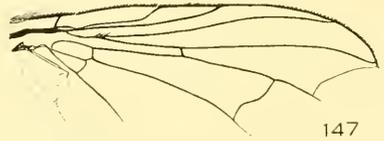
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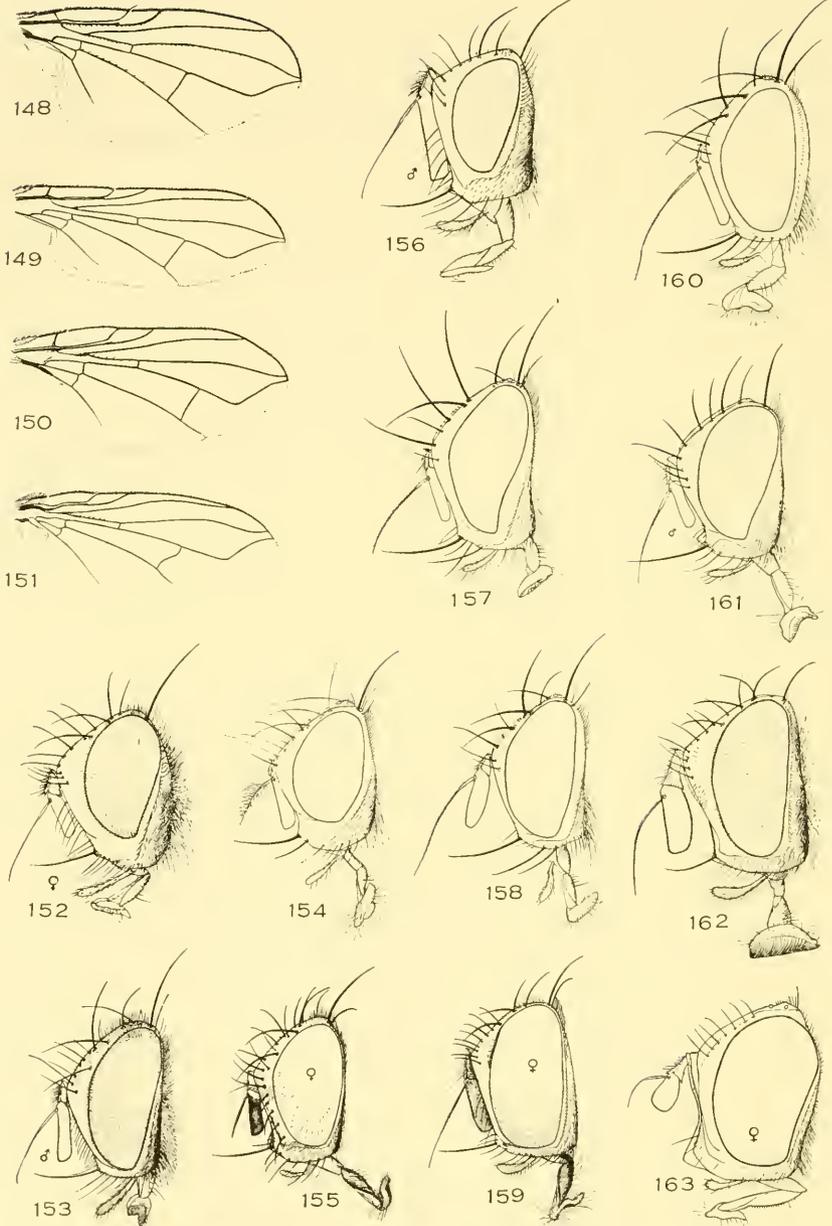


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Tachinidæ VII.—135, *Blondelia*; 136, 137, *Doryphorophaga*; 138, *Pelecotheca*; 139, *Myiophasia*; 140, *Compsilura*; 141, *Xanthophyto*; 142, *Eversmannia*; 143, *Aridalia*; 144, *Euryceromyia*; 145, *Winthemia*; 146, *Corozalia rufiventris*; 147, *Zuanalia*.

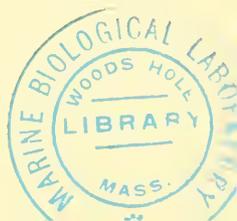


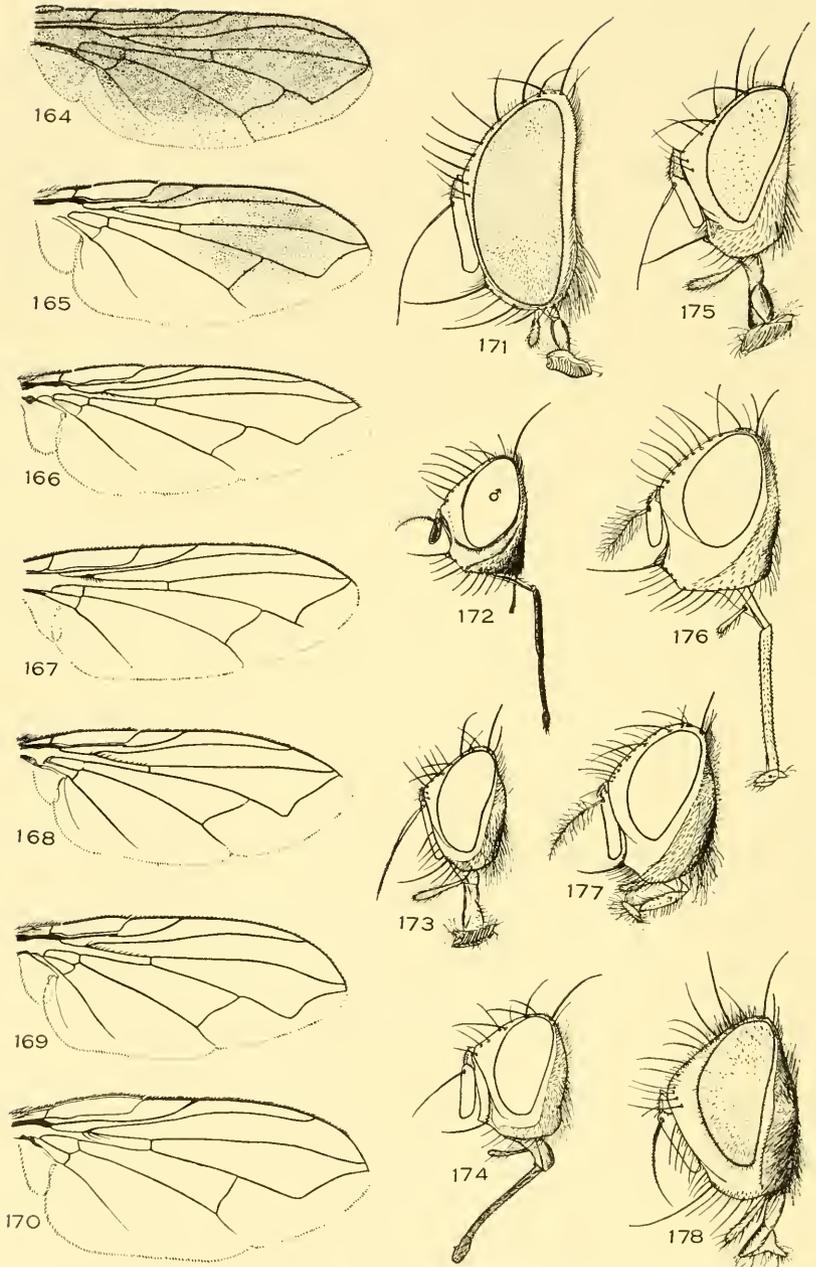
Tachinidae VIII.—148, *Actia*; 149, *Elodia*; 150, *Epigrimyia*; 151, *Thelairalia*; 152, *Pelecotheca*; 153, *Doryphorophaga*; 154, *Schwarzalia*; 155, *Ricosia*; 156, *Compsilura*; 157, *Thelairalia*; 158, *Patillalia*; 159, *Anacamptomyia americana*; 160, *Agraralia*; 161, *Corozalia*; 162, *Winthemia*; 163, *Trichiopoda*.

127. Pteropleural bristle normal.....123
Pteropleural bristle reaching to the apex of the squamæ.
Meleterus Aldrich
128. Face retreating below.....*Pædarium* Aldrich
Face as long below as at the antennæ.....*Chætovoria* Villeneuve
129. Oral vibrissæ situated level with the oral margin; posterior crossvein
situated near the middle of the wing.....130
Oral vibrissæ either situated well above the oral margin or the pos-
terior crossvein near the apical third of the wing.....133
130. Cheeks very much narrower than the eye-height.....131
Cheeks almost or quite as wide as the eye-height....**Uclesia* Girschner
131. Facial depression broad and shallow, the edges rather flattened.....132
Facial depression deep and narrow, the edges prominent.
Menetus Aldrich
132. Parafacials rather narrow, with small hairs over a considerable part
of the surface*Metavoria* Townsend
Parafacials wide*Metaplagia* Coquillett
133. Apical cell at most extremely short petiolate.....134
Apical cell long petiolate.....137
134. Face strongly receding below; third antennal segment about three
times as long as the second; three pairs of strong scutellars, the
apical pair widely spaced and divergent.....136
Face usually but little receding; third antennal segment less than twice
as long as the second.....135
135. Costal spine short; facial depression rather narrow (35, 139).
Myiophasia Townsend
Costal spine long and strong; facial depression wide....*Lasionalia*, n. g.
136. First vein setulose on apical half.....*Meigeniella* Coquillett
First vein bare (34).....†*Cryptomeigenia* Brauer & Bergenstamm
137. Third vein ending near the wing-tip (32, 33).....*Rhinophora* Desvoidy
Third vein ending far before the wing-tip.....*Steveniopsis* Townsend
138. Frontal vitta opaque.....139
Frontal vitta shining black (37, 38).....*Hemyda* Desvoidy
139. Posterior tibiæ without scale-like bristles.....140
Posterior tibiæ ciliate above with scale-like bristles (102, 139).
Trichiopoda Latreille
140. Anterior femora with a row of long bristles on at least the apical
half of the posteroventral surface, appearing as widely spaced cilia.141
Anterior femora with at most two or three posteroventral bristles
apically; the hairs on the posterior surface wholly appressed (18,
19)*Acaulona* Wulp
141. Apical cell open, or if closed in the wing margin there are hairs about
the base of the vibrissæ.....143
Apical cell closed and petiolate.....142

* Curran, 1927, Can. Ent., p. 299.

† Curran, 1926, Tr. Roy. Soc. Canada, Sec. v, p. 156.

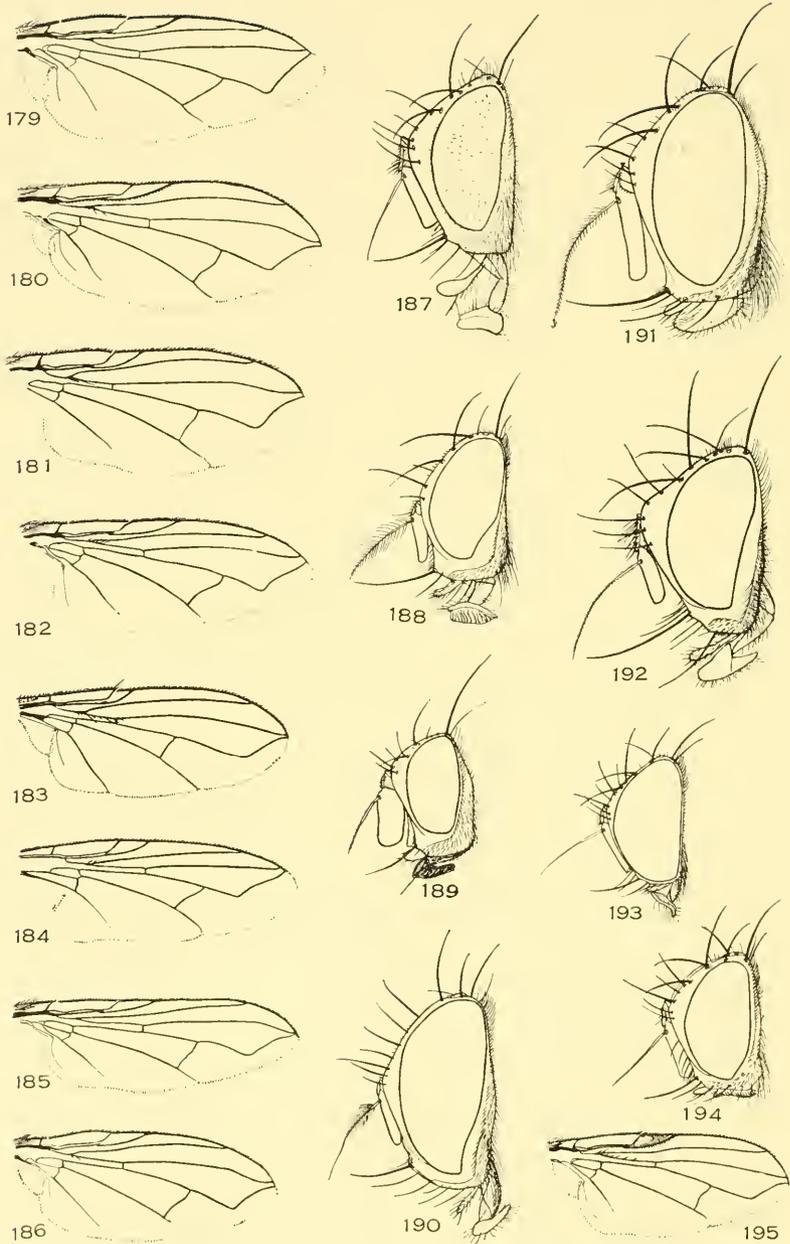




Tachinidae IX.—164, *Trichiopoda*; 165, *Patillalia*; 166, *Corozalia panamensis*; 167, *Xanthophyto*; 168, *Aridalia*; 169, *Canalia*; 170, *Oxynopsalia*; 171, *Anadiscalia*; 172, *Prorhynchops? errans*; 173, *Elodia*; 174, *Epigrimyia*; 175, *Doryphorophaga*; 176, *Shermanalia*; 177, *Zuanalia*; 178, *Pseudeuantha*.

142. No hairs surrounding the oral vibrissæ which are situated high above the oral margin; abdomen long and slender (71, 76).
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149. Vibrissal angles not approximated, or if so the vibrissæ situated level with the oral margin.....150
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151. Vibrissæ situated distinctly above the oral margin; oral margin not prominent (108).....*Viviania* Rondani
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* Curran, 1927, Can. Ent., lix, p. 297.
 † Curran, 1934, Amer. Mus. Novit. No. 635.



Tachinidae X.—179, *Agrarialis*; 180, *Schwarzalia*; 181, *Microtownsendia*; 182, *Anadiscalia*; 183, *Siphona*; 184, *Pseudeuanta*; 185, *Shermanalia*; 186, *Chaetonia*; 187, *Corozalia*; 188, *Zonalia*; 189, *Actia*; 190, *Chaetonia*; 191, *Canalia*; 192, *Blondelia*; 193, *Microtownsendia*; 194, *Oxynopsalia*; 195, *Zonalia*.

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* Curran, 1927, Can. Ent. lix, p. 12 (*Lydella*).

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* Aldrich and Webber, 1924, Pr. U. S. N. M., lxiii, Art. 17, pp. 45, 51 (*Phorocera*).

† Aldrich and Webber, 1924, Pr. U. S. N. M., lxiii, Art. 17, pp. 45, 51.

226. Head as long below as at the antennæ; antennæ arising below the middle of the eyes.....*Tricogena* Rondani
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* Aldrich & Webber, 1924, Pr. U. S. N. M., lxiii, Art. 17, p. 5.

† Reinhard, 1930, Ent. News, xli, p. 262.

‡ Aldrich & Webber, 1924, Pr. U. S. N. M., lxiii, Art. 17, p. 11.

239.	Apical cell open or closed in the wing margin (3, 46).	
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* Curran, 1925, Trans. Roy. Soc. Canada, Section V, p. 226.

† Aldrich, 1926, Pr. U. S. N. M., lxxix, Art. 13, p. 2.

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Chaetogædia Brauer & Bergenstamm

* Curran, 1930. Bull. Amer. Mus. Nat. Hist., lxi, p. 93.

† Curran, 1927. Can. Ent., lix, p. 294.

269. Base of wings deep brown; abdomen piceous or largely castaneous
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* Curran, 1927, Can. Ent., lix, p. 294.

† Aldrich, 1931, Pr. U. S. N. M., lxxx, Art. 11, p. 3.

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* Villeneuve and Aldrich (1929, 1933) recognize *Arrhinomyia* as distinct from *Elodia* but I see no reason for this.

† Curran, 1926, Tr. Roy. Soc. Canada, Sec. V, p. 163.

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* Curran, 1926, Tr. Roy. Soc. Canada, Sec. V, p. 168.

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346. Antennæ arising near upper edge of eyes, enormous in size; head almost rectangular; bristles of thorax not unusually depressed (28, 29, 144)*Euryceromyia* Townsend
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* Aldrich, 1926. Pr. U. S. N. M., lxxviii, Art 23, pp. 1-27.

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* Curran, 1927, Can. Ent., lix, p. 297.

† Curran, 1932, Amer. Mus. Novit. No. 534, p. 13 (*Bucentes*).

‡ Curran, 1933, Amer. Mus. Novit. No. 614, pp. 1-7.

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* Curran, 1926, Tr. Roy. Soc. Canada, Sec. V, p. 168.
 † Curran, 1927, Can. Ent., lix, p. 20.
 ‡ This genus was described from specimens reared in Massachusetts from material originat-
 ing in Japan.

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* Aldrich, 1927, Journ. Wash. Acad. Sci., xvii, p. 85.
 † Aldrich, 1925, Pr. U. S. N. M., lxvi, Art. 18, p. 29.
 ‡ Reinhard, 1931, Pr. U. S. N. M., lxix, Art. 11, p. 9.

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* Curran, 1930, Bull. Amer. Mus. Nat. Hist., lxi, p. 96.

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* Curran, 1933, Amer. Mus. Novit. No. 614, pp. 1-7.

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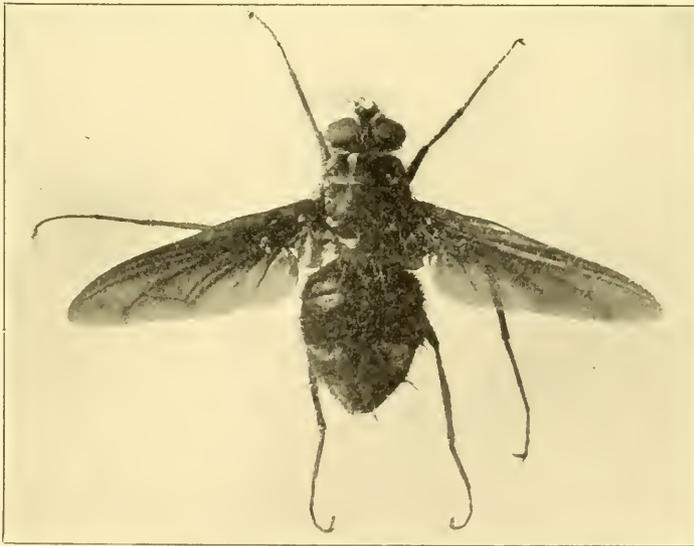
* Curran, 1934, Amer. Mus. Novit. No. 685, pp. 1-21.

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* Curran, 1927, Can. Ent., lix, p. 23.

† Curran, 1933, Amer. Mus. Novit. No. 614, pp. 1-7.

- At most two pairs of strong presutural acrosticals, the posterior pair not situated very close to the suture (132).....*Chætona* Wulp
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Tachinophyto Townsend



Scotiptera melaleuca.

Collatia, new genus

This genus is proposed for the reception of *Zenillia submissa* Aldrich and Webber. It possesses the characters of *Zenillia* but has the propleura haired on the middle portion.

Townsendina, new genus

Differs from *Myiophasia* Brauer and Bergenstamm in having only one pair of presutural acrosticals and long, bristly hairs on the parafacials. Front narrow above, widening anteriorly; cheeks half as wide as the eye-height; antennæ reaching four-fifths the distance to the oral margin, the second segment only one-third shorter than the third; arista thickened on basal fourth; proboscis short; eyes short pilose. Dorsocentrals 3-3; acrosticals 1-2; propleura bare; infrascapular setulæ present. Apical cell ending moderately before the wing tip; third vein with two bristles basally. Abdomen with discals and marginals. Thorax cinereous pollinose, weakly vittate; abdomen with broad, basal cinereous fasciæ on segments two to four. Genotype:—*T. fasciata*, n. sp., (Colorado).

Polidaria, new genus

Proposed for *Tachina arcus* Walker, a species placed in the genus *Polidea* by most authors. As it does not belong to *Polidea*, a new genus is proposed for its reception.

Zonalia, new genus

Female.—Head short, almost twice as high as long; two pairs of proclinate frontals; ocellars short; outer verticals absent; cheeks narrow; face slightly retreating below; facial ridges with weak bristles on the lower half; antennæ reaching to the oral margin; arista long plumose. Acrosticals 1-0; dorsocentrals 2-3; one sublateral; posthumeral absent; propleura bare; infrascapular setulæ present; two sternopleurals; prosternum bare; three pairs of marginal scutellars. Anterior tibiae with one posterior bristle. Apical cell ending close to the wing-tip; third vein bristled more than half way to the anterior crossvein. Abdomen without discals; first segment without marginals; ovipositor normal. Front, thorax and sides of abdomen with whitish pollen, although the whole insect appears shining black from most views. Length, 5 mm. Genotype:—*Z. nitens*, n. sp. (Panama).

Corozalia, new genus

Male.—Eyes haired; front moderately narrow, without orbitals or ocellars; outer verticals absent; cheeks narrow; face moderately retreating, the oral margin produced; facial ridges bare; antennæ reaching lowest fifth of face, the second segment somewhat less than half as long as the third; arista practically bare; proboscis short; palpi clavate. Acrosticals and dorsocentrals 3-3, the posterior acrosticals close to the suture; posterior sublateral present; posthumeral absent; sternopleurals 2-1; infrasquamal setulæ present. Anterior tibiæ with one long posterior bristle. Apical cell ending moderately before the wing-tip; third vein with two basal bristles. Abdomen elongate, tapering, with paired discals; first segment with marginals. Black, with cinereous pollen, the mesonotal pollen sometimes with yellowish tinge, with narrow, distinct vitta; apical half of abdominal segments bare. Length, 8 to 10 mm. Genotype:—*C. longula*, n. sp. (Panama).

Chætonalia, new genus

Male.—Head almost twice as high as long; cheeks very narrow; face and front narrow; no orbitals; ocellars very small and hair-like; outer verticals not developed; face slightly receding below, the ridges bare; antennæ long, the second segment short; arista short plumose on basal half; proboscis short; palpi slightly clavate. Acrosticals 1-1; dorso-centrals 2-3; posterior sublateral and posthumeral absent; two sternopleurals; infrasquamal setulæ present. Apical cell ending a little before the apex of the wing; third vein with two basal bristles. Abdomen with paired discals; first segment with pair of marginals. Pollen cinereous yellow, yellow on the front; mesonotum strongly quadrivittate; abdominal segments with about the apical half bare. Length, 5.5 mm. Genotype:—*C. lateralis*, n. sp. (Panama).

Canalia, new genus

Female.—Front rather narrow; two pairs of orbitals; ocellars long; outer verticals strong; cheeks very narrow; face gently receding, the oral margin slightly produced; ridges bare; proboscis short; palpi very slightly clavate; antennæ reaching almost to the vibrissæ, the second segment short; arista short plumose. Acrosticals 2-1; dorso-centrals 2-3; posterior sublateral and posthumeral bristle absent; two sternopleurals; infrasquamal setulæ present; prosternum haired. Wings tinged with brown, especially toward the apex; apical cell ending a little in front of the wing-tip; third vein bristled to the anterior crossvein. Abdomen elongate oval, without discals, the first segment without marginals.

Black, the antennæ, coxæ and base of the abdomen on the broad sides, yellow; apex of abdomen red; pollen of the head white, of the mesonotum cinereous yellow, a broad brown fasciæ immediately behind the suture; abdominal segments narrowly white pollinose basally. Length, 7 mm. Genotype:—*C. fasciata*, n. sp. (Panama).

Schwarzalia, new genus

Female.—Arista long plumose; parafacials with short, fine hair; front of moderate width, with two pairs of orbitals; ocellars long; outer verticals weak; cheeks wide; face retreating, the oral margin produced; ridges bare; proboscis short; palpi scarcely clavate; antennæ practically reaching the oral margin. Acrosticals weak, 3-1; dorsocentrals 2-3; posterior sublateral and posthumeral bristle absent; two sternopleurals; prosternum bare; infrasquamal setulæ present. Apical cell ending a little before the wing-tip; third vein bristled half way to the anterior crossvein; first vein bristled on whole length. Abdomen elongate oval, without discals, the first segment without marginals. Black, the palpi, coxæ, femora mostly, humeri and basal half, or less, of the abdomen yellowish-red; head and the broad bases of the abdominal segments white pollinose; thorax cinereous pollinose, mesonotum with a broad black band behind the suture. Length, 7.5 mm. Genotype:—*S. luteipennis*, n. sp. (Panama).

Tachinalia, new genus

Female.—Robust, the abdomen broader than the thorax and not much longer than wide. Eyes with long hair; parafacials haired; front rather narrow, with two pairs of orbitals; ocellars long, outer verticals absent; cheeks wide; face retreating, the oral margin produced; ridges bare; proboscis short; palpi slightly clavate; antennæ reaching the lowest fifth of the face; arista bare. Acrosticals 2-3; dorsocentrals 3-3; posterior sublateral absent; posthumeral present; sternopleurals 2-1; prosternum bare; scutellum with many spinose bristles. Apical cell ending moderately before the wing-tip; third vein bristled basally. Abdomen almost wholly covered with spinose bristles. Head with cinereous pollen, thorax thinly pollinose; scutellum reddish, abdomen castaneous. Length, 10 to 11 mm. Genotype:—*T. hispida*, n. sp. (California).

Coloradalia, new genus

Male.—Front wide, the frontals not strong; ocellars long, reclinate; cheeks one-third as wide as eye-height; face strongly retreating, the ridges bristled on almost their whole length; middle of face deeply sunken, the oral margin not produced; antennæ almost as long as the face, the second segment short; proboscis short, palpi clavate; eyes with short hair. Aerosticals and dorsocentrals 3-3, the aerosticals not strong; posterior sublateral weak, the posthumeral hair-like; two sternopleurals; prosternum concealed. Apical cell ending a little before the wing-tip; third vein with two basal bristles, one of them long; first vein bristled on its whole length. Abdomen elongate oval, very deep, the genitalia large, but normally mostly concealed; discals and marginals on segments two to four. Black, cinereous pollinose; the mesonotum and front with yellowish tinge; apices of segments less thickly pollinose. Length, 5 mm. Genotype:—*C. ocellaris*, n. sp. (Colorado).

Lasionalia, new genus

Male.—Related to *Townsendina*, n. g., but the apical cell is closed, the posterior sublateral present, etc. Eyes bare; front narrow, widening anteriorly; ocellars long; outer verticals not developed; cheeks almost half as wide as the eye-height; parafacials with a complete row of bristly hairs and a second partial row on the upper half; ridges bare; face strongly retreating, the oral margin scarcely produced; proboscis short, the palpi slightly clavate; antennæ not reaching to the vibrissæ, the second segment somewhat shorter than the third; arista bare. Aerosticals and dorsocentrals 2-3; posterior sublateral present, the posthumeral absent; two sternopleurals; prosternum bare. Apical cell ending a little before the wing-tip, very short petiolate; third vein with one or two basal bristles. Abdomen elongate-oval, each segment with discals and marginals. Black, yellowish cinereous pollinose; palpi yellow; tibiæ rather reddish. Length, 5.5 mm. Genotype:—*L. cinerea*, n. sp. (Minnesota).

Oxynopsalia, new genus

Female.—Front of moderate width; two pairs of orbitals; ocellars long; outer verticals well developed; cheeks narrow; face strongly receding, the oral margin not produced; ridges bristled on more than the lower half; proboscis short; palpi clavate; antennæ reaching to the oral margin, the second segment somewhat elongate; arista bare. Eyes short

pilose. Acrosticals and dorsocentrals 3-3, the posterior presutural acrosticals situated close to the suture; posterior sublateral and posthumeral bristle present; two sternopleurals; prosternum bare, narrow. Apical cell ending close to the wing-tip; third vein with three bristles basally. Abdomen elongate oval, each segment with marginals, the second and third with discals; ovipositor simple. Black, the head and thorax cinereous pollinose, the mesonotum mostly brownish; bases of abdominal segments very narrowly white pollinose. Length, 4.5 mm. Genotype:—*O. nitida*, n. sp. (Panama).

Anadiscalia, new genus

Male and female.—Head twice as high as long; front narrow, female with two pairs of orbitals; ocellars long; outer verticals weak; cheeks and parafacials extremely narrow; face retreating but slightly; oral margin not prominent, the ridges bare; proboscis short, the palpi clavate; antennæ reaching almost to the oral margin, the second segment short; arista bare; eyes short haired. Acrosticals and dorsocentrals 3-3; posthumeral and posterior sublateral present; two sternopleurals; prosternum haired. Apical cell ending moderately before the wing-tip; third vein with two bristles basally. Abdomen oval, not deep. Black, cinereous pollinose; palpi, humeri and abdomen reddish yellow, the abdomen with a more or less distinct median vitta, the apices of the segments more or less, and the fourth segment almost entirely black. All segments with marginals but without discals. Length, 6 to 7 mm. Genotype:—*A. basalis*, n. sp. (Panama).

Zuanalia, new genus

Female.—Arista long plumose; front wide, with two pairs of orbitals; ocellars long; outer verticals moderately strong; cheeks almost half as wide as eye-height; parafacials bare; face strongly retreating on upper part, the oral margin slightly produced; proboscis short; palpi clavate, antennæ reaching almost to the oral margin. Acrosticals 3-1, the presuturals very weak; dorsocentrals 3-4; posterior sublateral absent; posthumeral present; sternopleurals 2-1; prosternum bare. Apical cell ending a little before the wing-tip; bend of fourth vein with appendage; base of third vein with about four bristles. Abdomen short oval, rather deep. Head, thorax and legs reddish in ground color; head yellow pollinose; mesonotum metallic blue, cinereous pollinose, trivittate; abdomen wholly metallic blue, the bases of the segments cinereous pollinose. Length, 10 mm. Genotype:—*Z. azurea*, n. sp. (Panama).

Patillalia, new genus

Female.—Front of moderate width; two pairs of orbitals; ocellars long; outer verticals strong; cheeks narrow; face receding, the oral margin not produced; proboscis short; palpi clavate; antennæ reaching almost to the vibrissæ; arista very short pubescent. Dorsocentrals and acrosticals 3-3; posthumeral and posterior sublateral present; two sternopleurals; prosternum haired. Apical cell ending a little before the wing-tip; third vein with two strong basal bristles. Abdomen oval; all segments with marginals, the fourth with discals. Black; head white pollinose; the front yellowish above; thorax with white pollen on the sides, yellowish above, distinctly vittate; abdomen with very broad cinereous bands on the bases of the segments. Length, 7 mm. Genotype:—*P. fasciata*, n. sp. (Panama).

Agrarialia, new genus

Male.—Front wide, only a little narrower than the face; two pairs of strong orbitals; ocellars long; outer verticals strong; cheeks very narrow; face retreating, the oral margin scarcely produced; ridges bare; proboscis short; palpi clavate, hairy; antennæ reaching practically to the oral margin, the second segment short, arista very short pubescent. Acrosticals 3-3, dorsocentrals 3-4; posthumeral and posterior sublateral present; sternopleurals 2-1; prosternum haired. Apical cell ending well before the wing-tip; third vein bristled almost to the anterior crossvein. Abdomen elongate oval, somewhat tapering; each segment with marginals, but no discals; third segment with large sexual patch below. Black, cinereous pollinose, the head largely silvery; mesonotum with yellowish tinge, strongly vittate; apical third of abdominal segments shining black. Length, 7.5 mm. Genotype:—*A. sexualis*, n. sp. (Panama).

Aridalia, new genus

Female.—Front about as wide as the face; two pairs of orbitals; ocellars rather short and weak; outer verticals well developed; cheeks very narrow; face receding, the ridges bare, the oral margin not produced; proboscis short; palpi weakly clavate; antennæ reaching to the oral margin; arista short pubescent. Acrosticals 3-3; dorsocentrals 3-4; posthumeral and posterior sublateral present; sternopleurals 2-1. Apical cell ending well before the wing-tip; third vein bristled to the anterior crossvein. Abdomen elongate oval, tapering apically; each

segment with marginals but without discals. Black with cinereous pollen; palpi yellow; sides of the abdomen broadly reddish on the basal half, the apex also reddish; pollen of front rather golden, of mesonotum more or less ochreous and strongly vittate; apices of abdominal segments broadly bare. Length 8 mm. Genotype:—*A. lateralis*, n. sp. (Panama).

Shermanalia, new genus

Male.—Arista long plumose; front moderately narrow; ocellars long; outer verticals absent; cheeks one-third as wide as eye-height; face scarcely retreating, the oral margin prominent, the ridges bare; apical section of the proboscis as long as the head-height; palpi somewhat clavate; antennæ not reaching to the oral margin, the second segment short. Acrosticals 1-1, the anterior pair weak; dorsocentrals 2-3; posthumeral and posterior sublateral absent; sternopleurals 2-1; prosternum bare. Apical cell almost closed a little before the wing-tip; third vein with two weak bristles basally. Abdomen elongate, more than twice as long as wide, rather cylindrical, all the segments with marginals but without discals. Black, clothed with thick yellowish pollen; mesonotum with three black vittæ, the median one wide; first abdominal segment with an hourglass-shaped black spot, the base black, the following segments broadly black apically, the black expanding triangularly just below the sides. Length, 6 mm. Genotype:—*S. pretiosa*, n. sp. (Panama).

Prorhynchops errans Curran (fig. 172) traces to this genus but the arisal rays arise from only the upper and lower surfaces. It is probably not a *Prorhynchops* as it lacks discal bristles.

Thelairalia, new genus

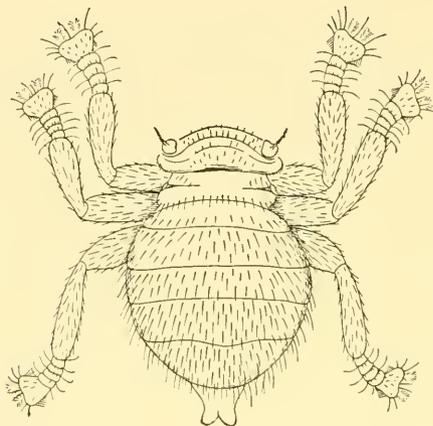
Male.—Front rather wide, with a single pair of strong orbitals; ocellars short and hair-like; outer verticals distinct; cheeks narrow; face receding, the oral margin not produced; proboscis short; palpi weakly clavate; antennæ not reaching to the oral margin; arista very short plumose. Acrosticals 3-3; dorsocentrals 2-3; posterior sublateral poorly developed, the posthumeral absent; sternopleurals 1-1; prosternum haired. Apical cell ending moderately before the wing-tip; third vein bristled more than half way to the anterior crossvein. Abdomen tapering, each segment with marginals, only the fourth with discals. Black, yellow pollinose; mesonotum with four vittæ which unite to form

a broad postsutural fascia; first abdominal segment wholly, the others on the apical half, shining. Length, 8 mm. Genotype:—*T. fasciata*, n. sp. (Panama).

Microtownsendia, new genus

Female.—Front as wide as the face; two pairs of orbitals; ocellars moderately strong; outer verticals strong; cheeks extremely narrow; face receding, the ridges bare; oral margin not produced; proboscis short; palpi clavate; antennæ reaching the oral margin, the second segment short; arista bare. Acrosticals and dorsocentrals 2-3; posthumeral and posterior sublateral present; two sternopleurals; prosternum haired. Apical cell ending a little before the wing-tip; third vein with two basal bristles. Abdomen oval, the fourth segment elongate; discals absent, each segment with marginals. Black, with cinereous white pollen; mesonotum thinly pollinose and weakly vittate; bases of abdominal segments narrowly pollinose; palpi yellow. Length, 3.75 mm. Genotype:—*M. nitens*, n. sp. (Panama).

Family Braulidæ—The Honey-bee Parasite

***Braula cæca.***

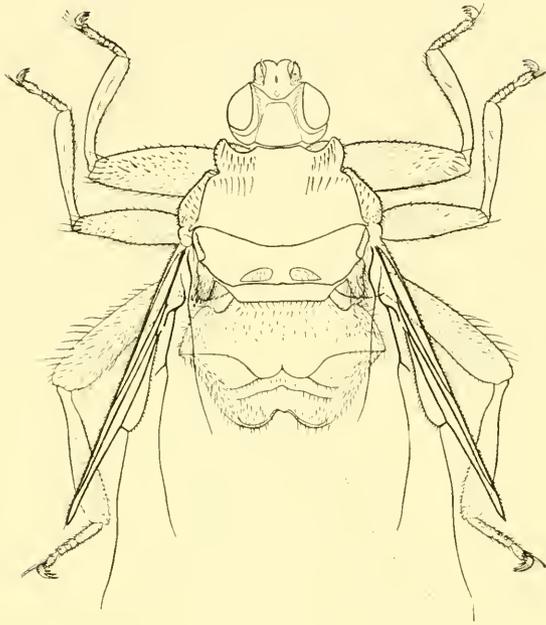
This family is comprised of a single species of *Braula*, parasitic upon honey bees.

Scutellum absent, the mesonotum not differentiated from the abdominal segments, the abdomen sessile; eyes minute; ocelli absent; antennæ set in lateral grooves; vertex without bristles. Fifth tarsal segment broad and bearing an inflexed comb of many microscopic teeth. Wings entirely absent.

The Braulidæ are not larviparous, but lay eggs.

Braula cæca Nitzsch is a small convex insect found only in the hives of honey bees. It is said to be cosmopolitan in distribution but is rare in this country, at least in collections.

Family Hippoboscidae—The Bird Parasite Flies

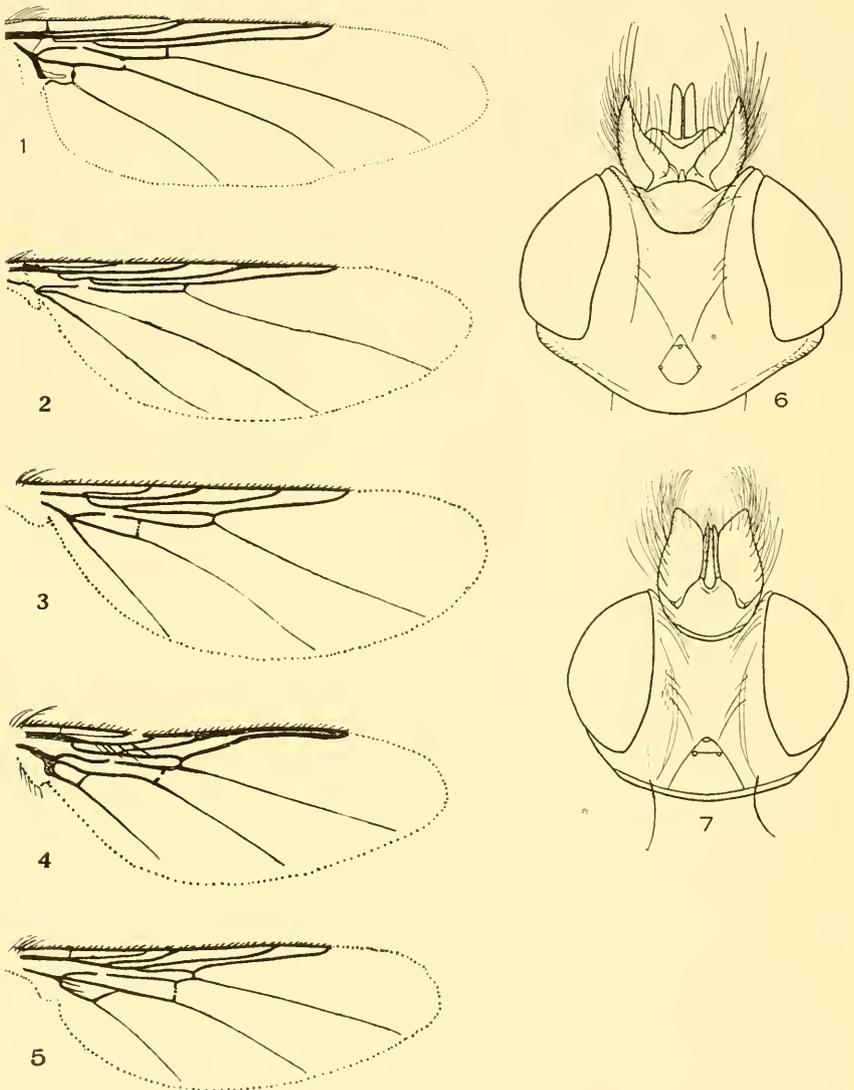


Olfersia sordida.

Small, flat flies of leathery consistency, usually with wings, the posterior veins weaker.

Head flattened, usually attached to an emargination of the thorax. Face short; palpi forming a sheath for the proboscis, projecting in front of the head; antennæ inserted in pits or depressions near the border of the mouth, apparently with a single segment, with or without a terminal bristle or hairs. Eyes round or oval; ocelli present or absent. Thorax flattened; scutellum short and broad. Halteres present or rudimentary, rarely absent. Abdomen sac-like, the sutures indistinct, the basal segments usually fully chitinized. Legs short and strong, broadly separated by the sternum; tarsi short; claws strong and often with one or two teeth. Wings present or absent, the veins approximated to the anterior border, with weak ones running obliquely across the posterior two-thirds of the wing. Larviparous.

The adults occur on birds and mammals. They are most frequently found on birds, seldom flying. In the old world species of *Hippobosca* are found on horses, camels, etc. and often occur in large numbers, as is the case with the sheep tick, a wingless species occurring wherever sheep are raised.



Hippoboscidae.—1, *Stilbometopa impressa*; 2, *Pseudolynchia maura*; 3, *Lynchia americana*; 4, *Ornithoica*; 5, 6, *Ornithomyia*; 7, *Ornithoctona erythrocephala*.

Aldrich* has published a key to the genera but the species are very difficult to determine, there are no keys to the American species, and although most of them have been figured, the illustrations and descriptions are scattered.

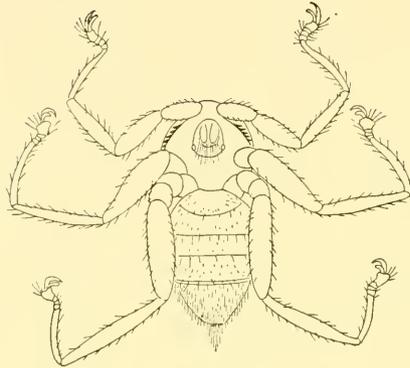
KEY TO GENERA†

1. With functional wings, longer than abdomen..... 2
 Wings rudimentary, broken off or absent..... 12
2. Wing with five or six distinct veins behind the costa..... 3
 Wing with only three distinct veins behind the costa, the first, third and fifth *Lipoptena* Nitzsch
3. Anal cell closed by a crossvein (4)..... 4
 Anal cell open apically (2)..... 9
4. Ocelli present 6
 Ocelli absent 5
5. Claws bidentate; head rounded behind and free from thorax (not naturalized in America)..... *Hippobosca* Linnæus
 Claws tridentate; head truncate behind, in a deep emargination of the thorax (1)..... *Stilbometopa* Coquillett
6. Third vein joining the tip of the costal vein at a distinct angle; claws tridentate 7
 Third vein confluent with the costal vein on the apical third; claws bidentate (4)..... *Ornithoica* Rondani
7. Antennal processes two-thirds as long as the head, straight and parallel with each other, broadly rounded at tip..... *Ornithopertha* Speiser
 Antennal processes much shorter, more or less pointed..... 8
8. Antennal processes broad, concave above, with projecting outer rim, curved inwardly so as to almost or quite touch each other (7).
Ornithoetona Speiser
 Antennal processes narrow, without outer rim, divergent and curving downward (5, 6) *Ornithomyia* Latreille
9. Crossvein closing the second basal cell entirely absent (2)..... 11
 Crossvein closing the second basal cell at least half present (3)..... 10
10. Lateral lobe of the metanotum swollen and bearing a mammiform process; fourth vein setulose (see text figure).... *Olfersia* Wiedemann
 Lateral lobe of metanotum less swollen and without processes; fourth vein bare (3)..... *Lynchia* Weyenbergh
11. Ocelli entirely absent; scutellum angulate laterally (2).
Pseudolynchia Bequaert
 Ocelli occasionally present but minute; scutellum convex posteriorly.
Microlynchia Lutz, Neiva and Costa Lima
12. Halteres present 13
 Halteres absent; wings aborted, reduced to short knobs.
Melophagus Latreille
13. Ocelli present, claws bidentate; with basal stumps of broken wings.
Lipoptena Nitsch
 Ocelli absent, claws tridentate; wings present, much shorter than the abdomen. (*Brachypteromyia* Williston)..... *Myophthiria* Rondani

* 1923. *Ins. Ins. Menstr.*, xi, pp. 75-79.

† Checked by Dr. J. Bequaert.

Family Nycteribiidæ



Basilia species.

Small, spider-like, wingless flies.

Head oval, folding back when at rest in a groove on the dorsum of the thorax. Antennæ short, two segmented, the oval terminal segment with bristles, inserted in cavity; eyes and ocelli vestigial. Thorax depressed, laterally and anteriorly with comb-like bristles. Abdomen oval, with more or less distinct segmentation. Legs long, the knees at rest prominent above the thorax; femora broad; tibiæ clubbed or shovel-shaped; basal tarsal segment very long. Halteres pendunculate or sessile, often indistinct. Larviparous.

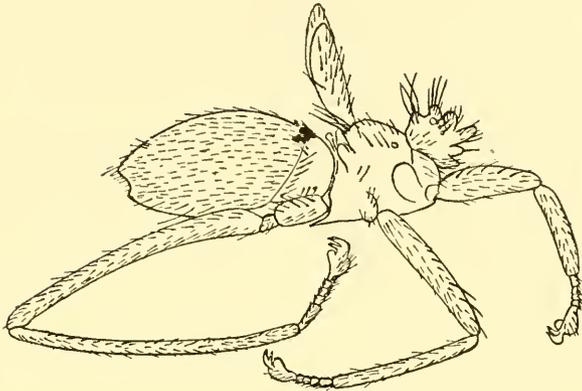
The members of this family are all parasitic upon bats and occur throughout the tropics and subtropics but are most numerous in the Old World.

Ferris* considers that we have but one genus in North America and perhaps two genera in the western hemisphere. *Nycteribia* possibly occurs in Brazil but there are no positive records from other parts of the continent. The two genera are separable as follows:

- | | |
|---------------------------------|-----------------------------|
| 1. Eyes absent | <i>Nycteribia</i> Latreille |
| Eyes present, two-faceted | <i>Basilia</i> Ribeiro |

* 1924. Ent. News, xxxv, pp. 191-199.

Family Streblidæ—The Bat Flies



Pterellipsis aranea.

Head of moderate size, with a freely movable neck. Eyes, when present, small, without or with very few facets; ocelli absent. Antennæ inserted in a pit, two segmented, the second segment with a bristle. Proboscis short, not protrusible, thickened basally; palpi broader than long, projecting leaf-like in front of the head, not forming a sheath for the proboscis. Abdomen with a distinct basal segment, the other segments rarely distinguishable, the basal segment with special bristles for the protection of the wings when at rest. Posterior coxæ always enlarged; fifth segment of the tarsi usually elongate and enlarged; pulvilli present, the claws never toothed. Wings sometimes vestigial or wanting, when present the veins stout and covered with hairs. Halteres present.

All but one species are parasitic upon bats but they are restricted to the tropics and the subtropico-temperate zones. Kessel* has reviewed the family.

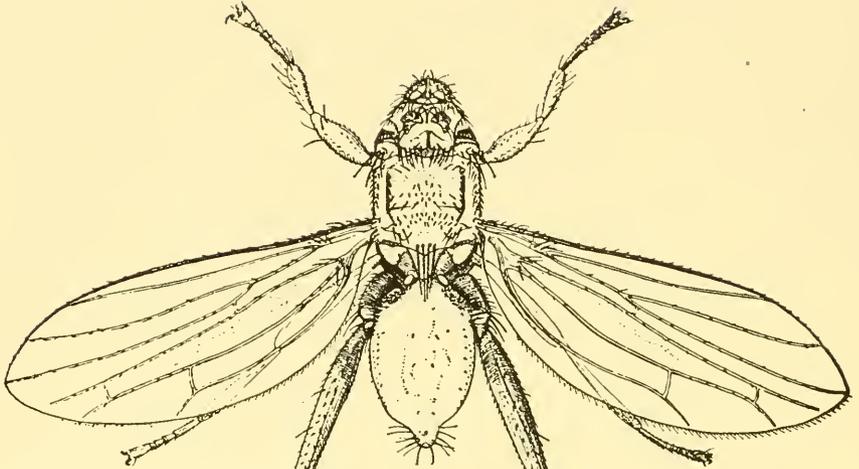
KEY TO GENERA †

1. With a ctenidium of black bristles on the ventral surface of the head. 2
- Without a ctenidium on under surface of head. 4
2. Eyes present; wings well-developed, with six veins (1) 3
- Eyes absent; wings reduced to oval pads, much shorter than the thorax. 3

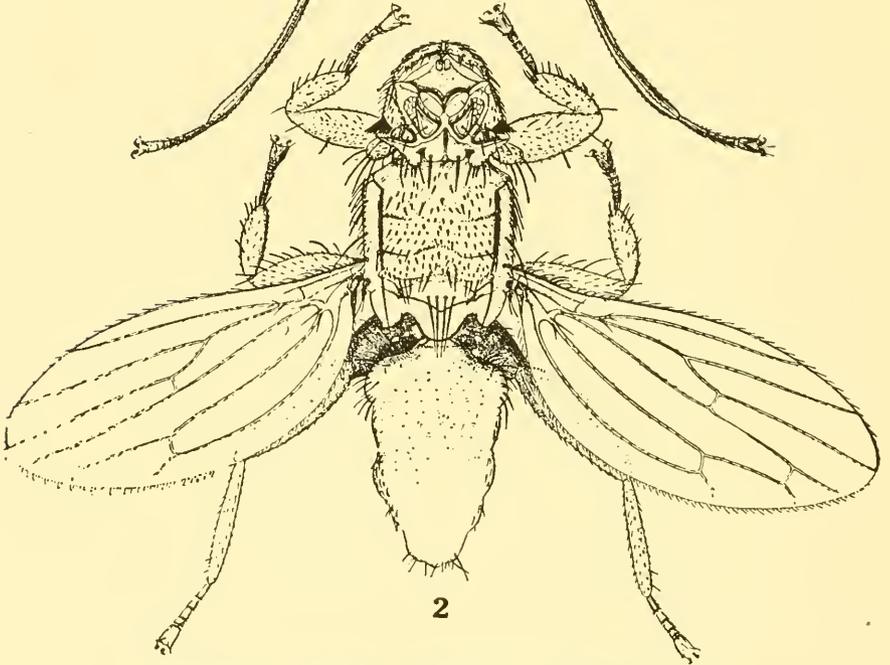
Metelasmus Coquillett

* 1925. Journ. N. Y. Ent. Soc., xxxiii, pp. 11-34, 4 plates.

† Checked by Dr. J. Bequaert.



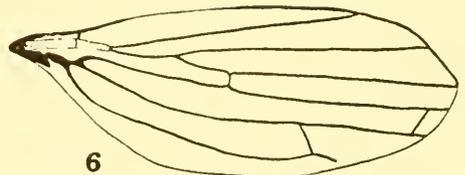
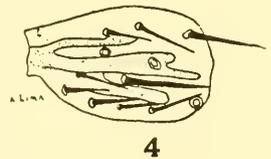
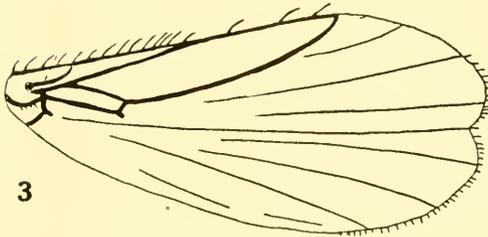
1



2

Streblidæ I.—1, *Strebla vespertilionis*; 2, *Euctenodes mirabilis*.

- 3. Ctenidium extending to the sides of the head and visible laterally from dorsal view 3a
 Ctenidium ending far before the sides of the head (*E. breviceps*, Panama) *Eldunnia*, n. g.
- 3a. Posterior femora about twice as long as the anterior ones; anterior cross-vein before the middle of the wing (1) *Strebla* Wiedemann
 Posterior femora decidedly less than twice as long as the anterior ones; anterior crossvein beyond the middle of the wing (2).
Euctenodes Waterhouse
- 4. Wings entirely lacking 5
 Wings present, though small 6
- 5. Posterior legs about twice as long as the anterior ones.
Megistopoda Macquart
 Posterior legs not twice as long as the anterior ones.
Paradyschiria Speiser
- 6. Wings of normal size 8
 Wings small, narrow or short 7
- 7. Wings erect and narrow; posterior legs about twice as long as anterior ones (5, also text figure) *Pterellipsis* Coquillett
 Wings lying flat, short; posterior legs not twice as long as anterior ones (4) *Aspidoptera* Coquillett
- 8. Wings with a single crossvein and three longitudinal veins; thorax compressed (3) *Nycterophilia* Ferris
 Wings with at least two crossveins and six longitudinal veins; thorax depressed 9
- 9. Posterior legs at least twice as long as the anterior pair 10
 Posterior legs obviously less than twice as long as the anterior pair (6) *Trichobius* Gervais
- 10. Posterior legs three times as long as the body. *Paratrichobius* Costa Lima
 Posterior legs about twice as long as the front pair *Speiseria* Kessel



Streblidæ II.—3, *Nycterophilia coxata*; 4, *Aspidoptera minuta*; 5, *Pterellipsis aranea*; 6, *Trichobius sparsus*.

GLOSSARY OF TERMS USED IN DIPTEROLOGY

Abdomen—The hindmost of the three main body divisions.

Acalypteratæ—The Acalypterate Muscoidea—those with very small or linear squamæ.

Acrostical bristles—The rows of mesonotal bristles between the dorsocentrals—the two median rows of bristles of the thorax.

Acrostical hairs—Hairs lying between the dorsocentral bristles.

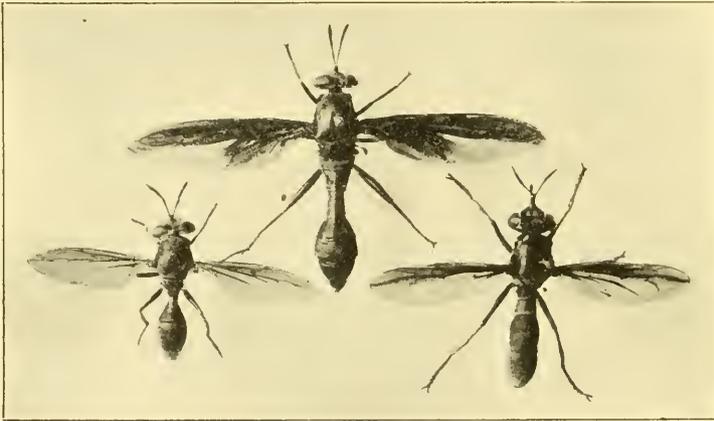
Acrostical setulæ—Very short hairs between the dorsocentral bristles.

Adventitious veins—Veins occurring in abnormal positions, sometimes rather regularly placed, and sometimes normally present.

Ædeagus—Part of the male genitalia: the penis and its sheath.

Alate—Having wings.

Alula—A lobe at the base of the wing posteriorly.



Ceria.

Ceriomydas.

Conops.

Examples of mimetic resemblances in flies.

Anal cell—The cell lying between the fifth and sixth veins (Cu).

Anal crossvein—The crossvein closing the anal cell apically—(Cu₂) of Comstock-Needham.

Anal lobe—The basal part of the wing behind the anal vein.

Anal vein—The sixth longitudinal vein. The second anal is usually absent or represented by a fold.

Anepisternite—The mesopleura.

Annulate—Having rings, but not completely segmented.

Annulus—A ring or band.

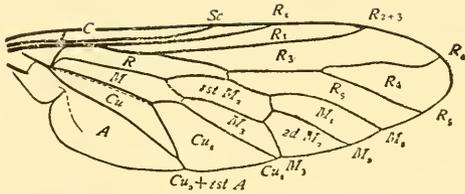
Antennæ—The feelers, attached to the head and separating the face and the front. They are sensory organs and perhaps combine the senses of smell and hearing.

Antennal fovea—See antennal grooves.

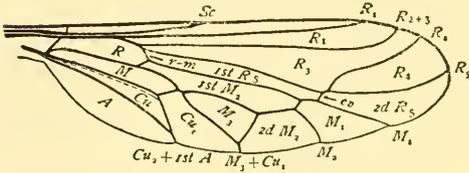
Antennal grooves—Definite depressions in the middle of the face in which the antennæ may rest. They are limited laterally by the facial ridges and in the middle, unless they are united, by a carina.

Anterior crossvein—The short crossvein connecting the third and fourth longitudinal veins on the basal half of the wing—(r-m).

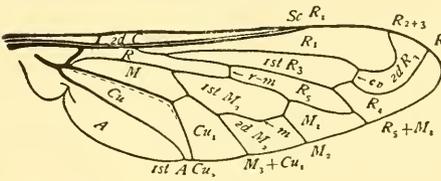
- Apicad—Toward the apex.
- Apical cell—The first posterior cell—the space between the third and fourth longitudinal vein beyond the anterior crossvein (R_5).
- Apical scutellars—The apical pair of marginal bristles on the scutellum. The term is loosely applied and often means the sub-apical scutellars, in cases where the true apicals are absent.
- Apical spurs (of tibia)—Short, rather stout bristles often present on the under or ventral surface of the tibiæ. The number varies, and may differ on different pairs of legs.
- Appendage (vein)—The presence of a short vein at the angle of a bend.
- Apterous—Wingless.
- Arcuate—Arched like a bow.
- Arista—A bristle-like portion of the third antennal segment which may be apical or dorsal and sub-basal. It is composed normally of three segments; the first is usually minute and the second short, although all three may be elongate.
- Auxiliary vein—The subcostal vein; that vein lying between the costa and first vein, often absent. (Subcostal; mediastinal.)
- Axillary cell—The area behind the anal vein.
- Axillary lobe—The area behind the anal vein. See axillary cell.
- Axillary vein—The second anal vein when this is present (2nd A).
- Basad—Toward the base.
- Basicosta—The second distinct "scale" at the base of the wing in Muscoids. It is bare. The basal "scale" is the epaulet and is haired.
- Basitarsus (si)—A term applied to the basal segment of the tarsi.
- Band of fourth vein—The curve of the fourth vein beyond the posterior crossvein (Muscoids).
- Bilobed—Divided or split into two parts.
- Calcar—A single posterodorsal bristle usually strong, situated on the posterior tibiæ at or beyond the middle (Muscidæ).
- Calypter (Calypters, Calypteræ)—See squamæ.
- Calypteræ—See Calypteratæ.
- Calypteratæ—The Calypterate Muscoidæ—Tachinidæ, Metopiidæ, Muscidæ, Estridæ and Cuterebridæ.
- Capitate—Enlarged at the apex.
- Carinate—Ridged or bearing a raised line or keel.
- Caudad—Toward the posterior end of the abdomen or hind margin of the wing.
- Caudal—Pertaining to the apex of the abdomen.
- Cephalad—Toward the front of the head.
- Cell—A space in the wing bounded by veins.
- Cheeks—The space below the eyes. Sometimes termed the peristoma.
- Chitinized—Hardened or horn-like; not membranous. There has been a great deal of discussion as to the proper use of the term chitin. As generally, and I think properly, used it refers to the leather-like, or hard part of insects; now commonly written sclerotized.
- Clavate—Clubbed or enlarged at the apex.
- Claws—Tarsal claws, borne on the fifth (or apical) tarsal segment.
- Clypeus—A distinct sclerite at the base of the proboscis adjacent to the anterior oral opening. Some authors have contended that the clypeus is absent and that the middle of the face is the true clypeus. This seems very doubtful and I do not accept the contention. The term has been applied recently to the middle of the face, but epistoma is a much better term for that part.
- Coarctate—Narrowed between the base and apex at some point.
- Comb—A row of closely set, short bristles. (Often occurring on the femora or tarsi: Drosophilidæ, etc.)



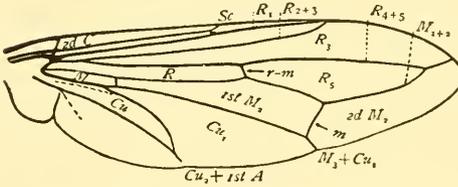
Anisopus
(Anisopodidae)



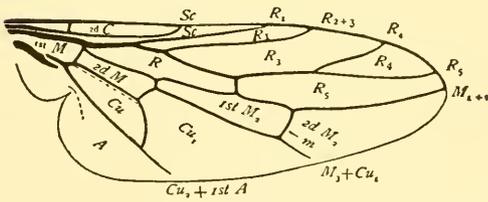
Thereva
(Therevidae)



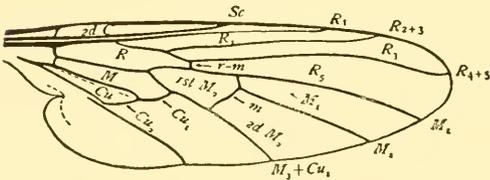
Pantarbes
(Bombyliidae)



Conops
(Conopidae)



Scenopinus
(Scenopinidae)



Rhamphomyia
(Empididae)

THE VEINS AND CELLS, COMSTOCK-NEEDHAM SYSTEM

COMSTOCK-NEEDHAM SYSTEM OF WING VENATION.

The comparison of the system here used is with that of Comstock-Needham, not as revised by Tillyard and others.

Anal cell—Cu.

Anal crossvein—Cu₂.

Crossveins—h;r-m; m; M₂; Cu₂; Sc₂.

Discal cell—1st M₂.

Discoidal crossvein—M₃.

Fifth longitudinal—Cu_{1, 2}.

First basal cell—R.

First vein—R plus R₁. (the main stem of the vein, basad of R_s, is R,—beyond R_s, R₁).

Large crossvein—m and outer section of M₃.

Marginal cell—R₁.

Posterior cells—R_s to Cu₁.

Posterior crossvein—m, and sometimes also outer section of M₃.

Præfurca—R_s.

Second vein—R_s, and its anterior branch, R₂₊₃.

Small crossvein—r-m.

Subcostal crossvein—Sc₂.

Submarginal cells—R₃, R₄.

Third long. vein—Posterior branch of R_s—R₄₊₅.

Compressed—Flattened from side to side—laterally compressed.

Connate—Fused and immovable.

Constricted—Narrowed.

Corneous—Horn-like in texture or appearing so.

Costa—See costal vein.

Costal cell—The cell between the costa and subcostal or auxiliary vein.

Costal vein—The vein extending along the front margin of the wing.

Crossveins—There are five typical crossveins in the wings: humeral, anterior, posterior, discoidal and anal (The equivalents of these in the Comstock-Needham system are, in order,—h; r-m; m; M₂ and Cu₂). In addition to these there is the subcostal crossvein (Sc₂), and there may be one or more veins simulating crossveins. The apical crossvein is merely the anteriorly curved fourth longitudinal vein (Muscoïds). The base of the third vein, base of posterior branch of the fourth vein and the base of the branches of the fifth vein may simulate crossveins. In some families there may be additional crossveins (see Nemestrinidæ, Bombyliidæ, etc.).

Cruciate—Crossing each other.

Ctenidium—A comb-like row of bristles.

Cubitus—Fifth longitudinal vein.

Decumbent—Depressed; hanging down.

Decussate—Crossing or cruciate.

Depressed—Flattened dorsoventrally, contrasting with compressed.

Dichoptic—Eyes separated by the front.

Digitate—Bearing a finger-like process.

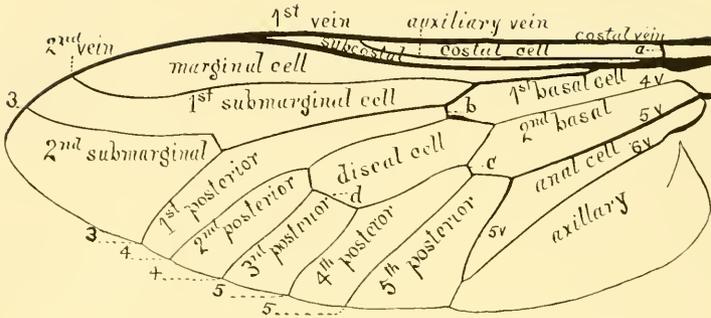
Discal cell—A (usually) closed cell (on the disc of the wing, lying between the fourth and fifth veins). It may be absent, open apically, or united with one of the basal cells, usually the second basal, abnormally with the first basal (1st M₂).

Discal crossvein—The vein separating the discal and second basal cells. (See discoidal crossvein.) (M₂ of Comstock-Needham system).

Discal scutellars—Bristles on the disc of the scutellum.

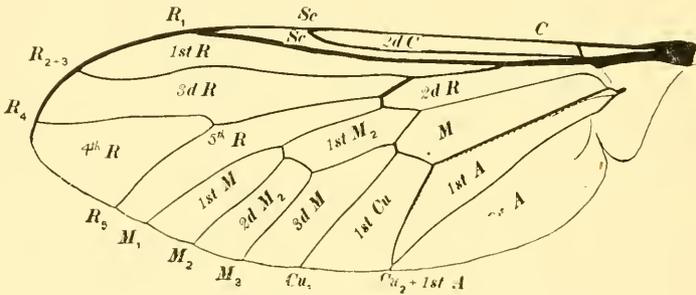
Discoidal crossvein—The vein separating the discal and second basal cells. (See discal crossvein.) (M₂ of Comstock-Needham system).

Dorsad—Toward the upper surface.



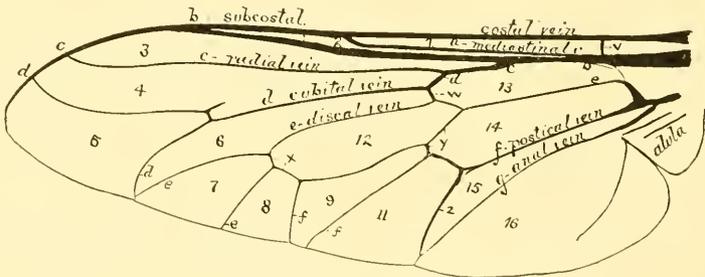
WING OF TABANUS

The terminology of the veins and parts shown on this figure is that used in the present work, except in the Tipuloidea.



WING OF SILVIUS

Comstock-Needham system. Veins. C—costa, Sc—subcosta, R—radius, M—media, Cu—cubitus, A—anal. Cells. C—costal, Sc—subcostal, R—radial, M—medial, Cu—cubital, A—anal.



WING OF PANGONIA

Schiner's system. Cells. 1, costal; 2, mediastinal; 3, subcostal; 4, 5, cubital; 6, 7, 8, 9, 11, first to fifth posterior cells; 12, discoidal cell; 13, 14, 15, first to third basal cells; 16, axillary cell.

- Dorsal—Pertaining to the upper surface of the body.
- Dorsocentrals—Dorsocentral bristles of the thorax.
- Dorsopleural suture—See notopleural suture.
- Dorsum—Upper surface. Refers to thorax and abdomen.
- Epaulet—The first "scale" at the base of the costa. It is haired and is followed by a bare "scale", the basicosta.
- Empodium (ia)—A bristle, hair or pad borne on the apical tarsal segment between the pulvilli.
- Epiphysis—A lappet-like process or lobe.
- Epistoma—Correctly, the anterior oral margin. Frequently used to denote the facial depression or middle of the face from the oral margin to the antennæ.
- Eyes—The compound eyes, composed of, usually, many facets.
- Face—The front of the head between the mouth and the antennæ.
- Facets—The divisions comprising the compound eyes.
- Facial depression—The middle of the face. Facial plate.
- Facial plate—The central part of the face.
- Femur (femora)—The long part of the leg nearest the thorax, but separated from the thorax by the coxa and trochanter. The thigh.
- Fifth longitudinal vein—The vein running along the posterior side of the second basal cell, and of the discal cell, usually two-branched, the second branch separating the fourth and fifth posterior cells. (Cu_{1,2}; postical.)
- First basal cell—A cell lying between the first, second and third and the fourth longitudinal veins on the basal half of the wing.
- First vein—The vein lying immediately behind the auxiliary vein, or when that is absent, immediately behind the costa. (R and R₁.)
- Flagellum—In flies having six or more antennal segments the portion beyond the scape.
- Fourth longitudinal vein—The vein, usually arising near the base of the wing, separating the two basal cells and bordering the discal cell anteriorly, often branched, the posterior branch often partly closing the discal cell. (Medial, M_{1,2,3}; discoidal.)
- Front—The space between the eyes lying above the antennæ and limited by the vertex or top of the head.
- Frontalia—The central stripe of the front. Frontal vitta.
- Frontal lunule—The space between the bases of the antennæ and the ptilinal or frontal suture, actually occurring only in Cyclorrhaphous flies, but the term, or "lunula", is loosely applied to some other flies.
- Frontal orbits—The space contiguous to the eyes on the front.
- Frontals or frontal bristles—Bristles situated along the inner edge of the parafrontals.
- Frontal triangle—The triangle in holoptic flies bounded above by the eyes and below by the antennæ.
- Frontal vitta—The softer area between the rows of frontal bristles or hairs extending from the antennæ to the ocelli. This allows the head to expand laterally in Cyclorrhaphous Diptera when the ptilinum is expanded.
- Fronto-orbital bristles—The orbitals or orbital bristles. The term is variously used and is often applied to the frontals in the Acalypterata.
- Gena (næ)—The cheek. Often refers to the parafacials. The term is best avoided.
- Geniculate—Abruptly bent or elbowed.
- Genitalia—The external sexual organs together with the adjacent parts.
- Gibbous—Puffed out; hunch-backed.
- Glabrous—Without hairs; smooth.
- Halteres—Appendages arising on the posterior of the pleura, with a long stem and apical knob. These occur in practically all Diptera, rarely being

reduced to slight swellings in some apterous forms. They are supposed to be the rudiments of the second pair of wings but I doubt this. The removal of the halteres renders the insects unable to fly.

Holoptic—Eyes contiguous, dividing the front into an upper and lower part.

Humeral crossvein—A crossvein situated near the base of the wing and extending from the costa to the auxiliary or subcostal vein and continuing to the first vein.

Humeri—The anterior corners of the mesonotum usually more or less well marked.

Hyaline—Transparent.

Hypopleura—The space below the posterior spiracle and above the posterior coxæ.

Hypopleural bristles—Bristles on the hypopleura, usually in a vertical row.

Hypopygium—The male genitalia together with the adjacent parts. It is composed of several of the apical abdominal segments and is variously modified.

Infra-squamal setulæ—Fine hairs below the point of attachment of the squamæ.

Intercalary vein—A term sometimes applied to the posterior branch of the fourth vein in cases where its base partly closes the discal cell (M_2).

Interfrontal (bristles or hairs)—Hairs or bristles on the frontal vitta.

Interfrontalia—The frontal vitta.

Intra-alar bristles—Bristles situated behind the suture and between the supra-alar and dorsocentral bristles.

Jowls—The cheeks, behind the depressed anterior part. Sometimes termed the peristoma.

Labellæ—The lips of the proboscis. Supposed to be the modified labial palpi. Sometimes broadly expanded, at other times much reduced or apparently lacking.

Lamella (e)—A leaf-like plate.

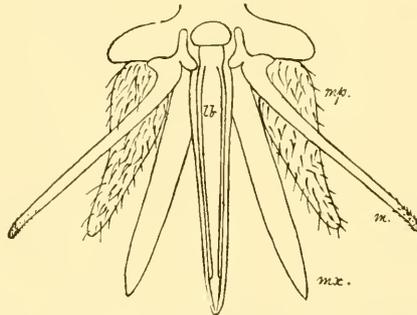
Lamellate—Broadened and flat; bearing lamellæ.

Large crossvein—The crossvein closing the discal cell; posterior crossvein (m and M_3).

Lateral—At, toward, or pertaining to the sides of the body.

Lunula—A term applied to the more or less crescentic area above the antennæ in some flies, notably in the Syrphidæ. Also a lunulate marking.

Lunule—See lunula.



MOUTHPARTS OF FEMALE TABANUS.

lb, labium; m, mandible; mp, maxillary palpus; mx, maxilla.

Macrotrichia—The larger microscopic hairs on the surface of the wings.

Marginal cell—The cell lying between the first and second longitudinal veins (R₁).

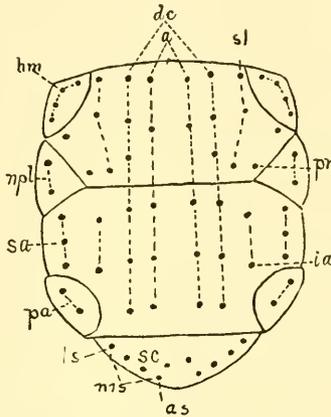
Marginal scutellars—Bristles situated close to or on the margin of the scutellum.

Media—The fourth longitudinal vein.

Medial—Pertaining to the media or middle.

Median—Along the middle.

Mesad—Toward the middle.



MESONOTAL BRISTLES

a, acrosticals; as, apical scutellars; dc, dorsocentrals; hm, humeral; ia, intra-alar; ls, lateral or basal scutellars; ms, marginal scutellars; npl, notopleural; pa, postalars; pr, presutural; sa, supra-alars; sc, scutellars; sl, sublaterals.

Mesonotum—The dorsum of the mesothorax or the main part of the back. Sometimes termed the mesoscutum. According to morphological usage the divisions of the mesonotum are, from front to rear, prescutum, scutum, scutellum and postscutellum.*

Mesopleura—A so-called pleurite or sclerite of the pleura bounded above by the mesonotum, in front by the propleura, below by a more or less distinct suture and behind by a suture extending down from in front of the wings. The so-called suture separating the mesopleura and sternopleura is merely a fold leaving an exterior furrow.

Mesoscutum—See mesonotum.

Mesosternum—The under side of the mesothorax.

Mesothorax—The second and largest segment of the thorax. The wings and second pair of legs arise from this segment.

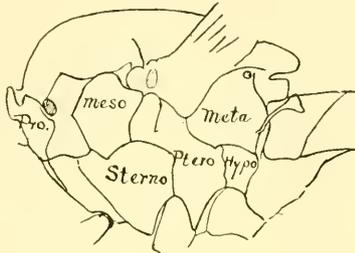
Metacephalon—The area behind the mouth extending up toward the neck.

Metanotal slopes—Swellings on the sides of the metanotum or its sloping sides (pleurotergite).

* While not professing any great knowledge of morphology I am far from being convinced that the *Metanotum*, as used by taxonomists is actually part of the *Mesonotum*: there is a distinct, membranous suture between this part and the scutellum, such as one expects to find between true sclerites.

- Metanotum**—The dorsum of the metathorax, lying behind the scutellum. (*According to recent morphological usage this is the postnotum or post-scutellum and is part of the mesonotum: the true metanotum is found only in the lower Diptera, as Psychodidæ.) See footnote, p. 487.
- Metapleura**—The part of the metathorax above the hypopleura and outside of the metanotum. It is a poorly defined area and not really separable from the metanotum.
- Metasternum**—The under side of the metathorax, situated behind the middle coxæ and extending to behind the posterior coxæ.
- Metatarsus (si)**—A term applied to the basal segment of the tarsi.
- Metathorax**—The third segment of the thorax. The posterior legs and halteres arise from this segment.
- Micropterous**—With small or vestigial wings.
- Microtrichia**—The smaller abundant hairs of the wing. When these are present the wing is said to be villous.
- Moniliform**—Resembling a string of beads.
- Neuration**—The arrangement of the veins of the wing.
- Node**—A swelling or knot-like knob.
- Notopleura**—A depression, more or less triangular, situated immediately before the transverse suture and behind the humeri.
- Notopleural suture**—The suture extending from the humeri to the base of the wings.
- Notum**—The dorsal surface; particularly of the thorax.
- Ocellar bristles**—Bristles arising within the ocellar triangle or on either side of the anterior ocellus.
- Ocellar triangle**—The triangle formed by the ocelli or the triangular, well marked area surrounding them. This triangle has sometimes been termed the frontal triangle in cases where it extends almost to the antennal base.
- Ocellar tubercle**—A term applied to the swelling on which the ocelli are sometimes situated, especially in the Asilidæ.
- Ocelli**—The simple eyes, located on the front, usually near the vertex.
- Occipital cilia**—The row of bristly hairs behind the eyes.
- Occipital fringe**—The fringe of fine hairs behind the eyes.
- Occiput**—The back of the head. Morphologically the subtriangular area limited by the vertex between the eyes and the neck.
- Onychium (ia)**—A pad between the tarsal claws.
- Orbit**—The part of the head immediately surrounding the eyes.
- Orbital bristles**—Bristles, usually proclinate or divergent, situated on the parafrontals between the frontals and orbits.
- Ordinary crossvein**—Anterior or small crossvein, r-m (Schiner).
- Ovipositor**—The female genitalia with the adjacent parts, composed of several segments and usually telescopic, but often variously modified.
- Palpi**—The maxillary palpi.
- Parafacials, parafacialia**—The part of the face between the facial ridges and the eyes.
- Parafrontals**—The part of the front outside the frontal bristles.
- Pectinate**—With branches like a comb.
- Pectus**—The under side of the thorax.
- Pendulous**—Hanging from one end.
- Peristoma**—Correctly, the region surrounding the mouth, but used in various senses. The part of the cheeks nearest the oral opening. The anterior oral opening. The anterior part of the cheeks. The term should be avoided as being too confusing.
- Petiolate**—Attached by a stalk or stem.
- Phytophagous**—Feeding on plants.

- Pilose**—Having long, fine hair, usually dense. The term is loosely applied to include any hair that is not coarse.
- Pleurites**—A term applied to the sclerites or sections of the pleura.
- Pleurotergite**—The hypopleura; morphologically the lateral division of the metanotum (postscutellum), at least in Nematocera.

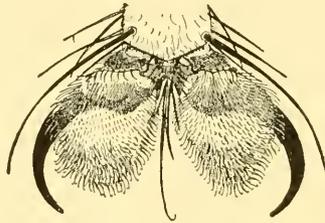


PLEURAL DIVISIONS OF SYRPHUS

Hypo, hypopleura; Meso, mesopleura; Meta, metapleura; Pro, propleura; Ptero, pteropleura; Sterno, sternopleura.

- Plumose**—Having rays on both sides like a feather.
- Pollen**—A fine, dust-like substance on the integument.
- Pollinose**—Covered with "dust" or "bloom".
- Posterior calli**—The swellings at the posterior corners of the mesonotum, present in the Calypteratæ, and other families, but absent in the Acalypteratæ as a rule. (Posterior callosities).
- Posterior cells**—The cells on the apical part of the wing lying between the third and fifth veins, exclusive of the discal cells (R_2 to Cu_1). Some of these cells may be closed by the union of veins apically.
- Posterior crossvein**—The vein or veins closing the discal cell apically (m and M_3). According to Schiner the basal section of Cu_1 of the Comstock-Needham System.
- Posterior orbits**—The part of the head immediately behind the eyes.
- Posthumeral bristle**—A bristle situated behind the humerus.
- Post ocellar(s) (bristles)**—A pair (or more) of bristles arising just below the vertex on the occiput and behind the ocellar tubercle, sometimes termed post-verticals.
- Postscutellum**—A convex, transverse swelling below the scutellum; actually the upper, posteriorly produced section of the metanotum.
- Postvertical(s) bristles**—See post ocellars.
- Præfurca**—See prefurca.
- Pra**—Prealar bristle.
- Præscutum**—The part of the mesonotum in front of the transverse suture.
- Prealar (bristle)**—The anterior supra alar bristle. This is frequently absent or reduced. It is used particularly in Muscidæ.
- Prefurca**—The petiole of the second and third longitudinal veins. Base of R_{4+5} (The Radial sector R_s).
- Preapical bristle (of tibia)**—A dorsal, short bristle situated before the end of the tibia.
- Prescutum**—See præscutum.
- Presutural bristle**—A bristle situated in front of the inner end of the notopleura in front of the suture. The lateral bristle situated in front of but close to the suture.

- Proboscis—The mouthparts exclusive of the palpi; always more or less tube-like. They may be slender and adapted for piercing, or thick and adapted for lapping.
- Proclinate—Curving or directed forward.
- Pronotum—The dorsum of the prothorax.
- Propleura—The sides of the prothorax. This is usually a depressed area, but also includes the area above the front coxæ.
- Propleural bristle—A bristle situated on the propleura immediately above the front coxæ.
- Prosternum—The under side of the prothorax, between and in front of the anterior coxæ.
- Prothoracic bristle—A bristle situated immediately above the anterior coxæ (See propleural bristle).
- Prothorax—The first segment of the thorax. The first pair of legs arise from the prothorax.
- Pruinose—Covered with a hoary dust. (See pollinose).
- Pseudosutural foveæ—Impressed polished areas on the humeral portion of the mesonotum (humeral pits); in Tipulidæ and elsewhere.
- Pteropleura—A sclerite lying below the base of the wings.
- Pteropleural bristle(s)—Bristle or bristles on the pteropleura.
- Pteropleurites—The upper and lower sections of the pteropleura.
- Ptilinum—An inflatable sac, occurring in Cyclorrhaphous flies and pushed out above the antennæ by the insect in emerging from the pupa (or puparium). This sac is coarsely grained or pubescent and when forced out thrusts the face into a horizontal position and when retracted after emergence leaves the frontal lunule exposed and is concealed in part beneath the facial ridges.
- Pubescent—Having very short, fine hair.



Foot of house-fly, showing claws, pulvilli and the hair-like empodium.

- Pulvilli—Pads borne on the apical segment of the tarsus between the claws.
- Pulvilliform—Shaped like the pulvilli.
- Punctate—Pitted; covered with small pits.
- Puparium—The pupa when formed within the hardened larval skin.
- Pupiparous—Giving birth to larvæ ready to pupate.
- Radial—Pertaining to the radius.
- Radial cell—Any cell bordered in front by a branch of the radius.
- Radius—The first to third longitudinal veins. R_1 to R_3 of Comstock-Needham system.
- Raptorial—Fitted for grasping prey.
- Reclinate—Curving or directed backward.
- Recurrent—The anterior end nearer the base of the wing than some other part.
- Reniform—Kidney-shaped.
- Reticulate—Having a network.

- Rostrum—The beak or snout.
- Rugose—Wrinkled.
- Rugulose—Finely wrinkled.
- Scape (of antennæ)—The basal two segments in those flies having six or more antennal segments. These segments are differentiated from the remaining segments, although the first may be small and ring-like; the second segment is sometimes called the pedicel.
- Sclerite—Any piece of the body well surrounded by sutures.
- Scutellum—A (usually) convex sclerite attached to the back of the mesonotum. Sometimes termed the shield.
- Scutum—The part of the mesonotum behind the transverse suture.
- Second basal cell—A cell lying immediately behind the first basal, rarely united with it, more often open apically and united with the discal cell, but closed in most cases (Cell M).
- Second vein—The vein (frequently absent), lying immediately behind the first vein, its base always united with the base of the third vein (Rs and its anterior branch R_{2+3}).
- Serrate—Toothed along the edge like a saw.
- Sessile—Broadly attached; incapable of movement.
- Seta—A bristle.
- Setaceous—Bristle-like.
- Setigerous tubercles—Tubercles, occurring on the scutellum or legs, each bearing a spine or bristle on its top.
- Setulæ—Very short hairs, sometimes coarse.
- Setules—Setulæ.
- Setulose—Bearing setulæ.
- Sinuuous—S-shaped, winding back and forth.
- Sixth longitudinal vein—The first anal vein. The second anal is usually absent or represented by a fold extending around the anterior apex of the alula. (Anal vein).
- Small crossvein—The anterior crossvein (r-m).
- Spatulate—Broadened apically, narrow basally.
- Spiracles—The external openings of the tracheal system.
- Spurs—Either movable spines at the end of the tibiæ or strong production of apex of tibiæ or a tapering production of some part of the body, usually on the legs.
- Spurious vein—An extra, usually very weak vein crossing the anterior crossvein.
- Squamæ—The scales or connecting lobes connecting the wings basally with the thorax. There are two lobes, the upper and lower. The lower lobe is often greatly enlarged and is generally referred to as the squama.
- Squamose—Scale-like. Refers particularly to scale-like hairs.
- Sternites—Ventral sclerites or the under side of the segments.
- Sternopleural bristles—Bristles situated on the upper part of the sternopleura on the posterior half.
- Sternum—The under side of the thorax, comprising the pro-, meso- and metasternum.
- Stigma—A darkened and often thickened area lying immediately behind the costa, either beyond the tip of the first or second veins.
- Stylate—Bearing a style.
- Style—A thick, terminal portion of the antennæ arising from the third segment, sometimes simulating segments, but usually tapering.
- Stylose—Bearing a style.
- Subantennal groove—See facial grooves.
- Subcosta—The vein, usually present, between the costa and the first longitudinal vein.

- Subcostal cell—The cell between the subcosta or auxiliary vein and the first vein or radius.
- Subcostal crossvein—A crossvein, sometimes present, connecting the subcosta or auxiliary vein and the first vein. This is used taxonomically in the Mycetophilidæ and the Tipuloidea (Morphologically sc_2).
- Subcostal vein—The vein lying between the costa and the first longitudinal vein. It is sometimes absent or greatly reduced.
- Sublateral bristles—Bristles situated in a line with the intra-alars but in front of the suture. The anterior two are sometimes included as posthumeral but the term is deceptive.
- Submarginal cell(s)—The cell or cells lying between the second and third longitudinal veins (R_2 and R_3).
- Sulcate—Grooved or furrowed.
- Supernumerary cells—Additional cells occurring in the wings due to the presence of extra crossveins (See Nemestrinidæ, Bombyliidæ, etc.).
- Supernumerary crossveins—Crossveins, other than those normally present.
- Supra-alar bristles—Bristles close to the edge of the thorax behind the suture.
- Suture—A line separating the parts of the body wall.
- Tarsus (si)—The feet, composed normally of five segments. The apical segment bears the claws, pulvilli and empodium when these are not obsolete. In rare cases the number of tarsal segments is reduced to two. The tarsal segments are numbered from the base, segments one to five, although the first segment is sometimes termed the basitarsus or metatarsus.
- Tegulæ—See Squamæ.
- Tergites—Dorsal sclerites or the upper side of the segment.
- Third longitudinal vein—The vein arising jointly with the second vein and branching from it, sometimes branched. Behind it is the first posterior cell and behind or before its base, the first basal cell (R_{4+5} ; Posterior branch of R_s ; Cubital).
- Thorax—The middle part of the body bearing the wings and legs.
- Tibia(e)—The part of the leg beyond the femur.
- Transverse suture (of thorax)—The depressions extending inward from the sides of the mesonotum near the middle, but not true sutures. In the Muscoids this is said to be complete or extend entirely across, but this is not always the case. Usually the suture is obsolete in the middle. In the Tipulidæ it is V-shaped. The suture divides the anterior series of bristles from the posterior dorsocentrals and acrosticals, whether it is complete or not.
- Trichostical bristles—Hypopleural bristles, used especially in the Asilidæ.
- Trochanter—The small, ring-like portion connecting the coxæ and femora. This often appears more or less triangular as only part of it is generally visible.
- Truncate—Ending transversely or with cut-off apex.
- Tubercle—A conspicuous, more or less rounded swelling, sometimes elongate as on the face of Syrphidæ, etc.
- Tuberculate pits—Paired shiny dots at or near the anterior margin of the mesonotum, one on either side of the median line; in Tipulidæ.
- Ungues—Claws.
- Venation—The arrangement of the veins of the wings.
- Venter—The under surface of the abdomen.
- Ventrad—Toward the venter.
- Ventral—Pertaining to the under side of the body.
- Vertex—The uppermost edge of the front; usually that part between the ocelli and the back of the head, or behind and between the upper angles of the eyes.
- Vertical triangle—The space, in holoptic flies, surrounding the ocelli.

- Vibrissæ—The large bristles arising from the vibrissal angles at the sides of the mouth in many Cyclorrhaphous Diptera. This term has been misapplied to include the bristles sometimes found on the facial ridges.
- Vibrissal angles—The more or less rounded angles formed by the facial ridges just above the oral margin.
- Viviparous—Bringing forth living young.

LITERATURE

For the convenience of those who may not be familiar with American literature on Entomology lists of general works on Diptera and periodicals, etc., published in North America is given. This list is not complete but includes the more important publications. Occasionally descriptions are published in other journals but the number is small. Certain journals contain more papers dealing with flies than others, but there is a great deal of variation over a period of years. Monographic work on American insects is greatly handicapped because there is no medium of publication, most journals accepting only short papers.

General Works for Students of Diptera

- Aldrich, J. M.—Catalogue of North American Diptera.
- Lœw, H.—Diptera Americæ Septentrionalis Indigena, I to X. (Latin). 1000 new species. The types are almost all in the Museum of Comparative Zoology, Harvard University.
- Lœw, H.—Monographs of the Diptera of North America. Dolichopidæ, Ephyrididæ, Otitidæ, Tetanoceridæ and Trypaneidæ. Most of the species have been elucidated in later work.
- Lœw, H.—Neue Beiträge zur Kenntniss der Dipteren. (German). Partly North American.
- Macquart, J.—Diptères Exotiques, nouveaux ou peu connus. Vols. I, II and Supplements I to V. (French).
- Say, Thomas—The Complete Writings of Thomas Say on the Entomology of North America (Two volumes).
- Wiedemann, C. R.—Aussereuropäische Zweiflügelige Insecten. Vols. I, II (German).

Current North American Periodicals Dealing Entirely With Entomology

- Annals of the Entomological Society of America.
- Bulletin of the Brooklyn Entomological Society.
- Canadian Entomologist.
- ‡ Entomologica Americana (Published by Brooklyn Entomological Society).
- Entomological News.
- † Insecutor Inscitiæ Menstruus.
- Journal of Economic Entomology.
- Journal of the Kansas Entomological Society.
- Journal of the New York Entomological Society.
- ‡ Memoirs of the American Entomological Society.
- Pan Pacific Entomologist.
- Proceedings of the Hawaiian Entomological Society.
- Proceedings of the Entomological Society of Washington (D. C.).
- Psyche.
- ‡ Thomas Say Foundation of the Entomological Society of America.
- Transactions of the American Entomological Society.

* No parts on Diptera published.

† Publication discontinued. Mostly Diptera and Lepidoptera.

‡ Irregular publications.

Scientific Publications Containing Entomological Papers

- American Journal of Hygiene.
 American Museum Novitates (American Museum of Natural History).
 Anales del Instituto de Biologia (Mexico City).
 Bulletin of the American Museum of Natural History.
 Bulletin of the Buffalo Society of Natural Sciences.
 Bulletin of the Illinois State Laboratory of Natural History.
 Journal of the Washington Academy of Sciences (D. C.)
 Kansas University Science Bulletin.
 Occasional Papers of the Boston Society of Natural History.
 Ohio Journal of Science.
 Proceedings of the Biological Society of Washington.
 Proceedings of the California Academy of Sciences.
 Proceedings of the United States National Museum.
 Transactions of the Royal Canadian Institute.
 Transactions of the Royal Society of Canada.
 Transactions of the Wisconsin Academy of Sciences, Arts and Letters.
 Zoological Record (London, England). Separate parts may be obtained.
 Lists all new species described each year.
 See also Government publications of the United States, Canada and the States and Provinces.

CORRECTIONS

- Page 327. *Leucophanga* Mik. Most species of this genus will trace to couplet 10, where they may be distinguished by having the costa ending at the third vein.
- Page 359. For *Microdiopsis*, n. g. read *Pseudodiopsis* Hendel. The genotype is the same.

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