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SYNOPSIS

OF THE

APHIDIDÆ OF MINNESOTA.

BY O. W. OESTLUND.

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ADDRESS.

PROF. N. H. WINCHELL,

DEAR SIR: I have the honor herewith to make another contribution to the entomology of Minnesota.

As neither time nor means are yet at hand to undertake a systematic work of the whole field of entomology, as contemplated by the law creating the survey, I have, as heretofore, given special attention only to some group or family, as circumstances and literature at hand make it possible to do anything like presentable work. The following paper is a second contribution on the family of plant-lice, or Aphididæ, a preliminary list of which was given in the last annual report. The two past seasons have enabled me not only to make some corrections to this list, but also several additions, which I have now put in the form of a synopsis of the family as far as known to occur in Minnesota. I am aware of the fact that shortcomings will be found, and that probably a too hasty conclusion has been drawn in many cases, but, as this is a first attempt of a systematic treatment of our American forms, I have some hopes that it will still be received with favor by all who will have occasion to use it, and that it will prove a valuable contribution to the entomology of Minnesota.

In the introduction I have given some general remarks together with explanations of the terms more commonly used in describing species, that may be of value to the student not already familiar with the terms of entomology. Here I have also added a bibliography of our American authors treating of the family, as far as known to me, which is also, I believe, a first attempt.

The species here treated of were mostly collected along the Mississippi river, but the report can now be considered to apply to the whole state, with the exception of the northern part, or pine district, which has not yet been examined. Two months of the present season spent in the western part of the state, mostly along the lakes Big Stone and Traverse, have enabled me to add many valuable notes from that part of the state.

The gorge of the Mississippi between St. Paul and Minneapolis, formed by the recession of the St. Anthony falls, affords probably as favorable a locality for plant-lice as any that can be found. The steep bluffs on either side give the necessary protection and moisture for a varied and luxuriant growth of vegetation, making a paradise for the aphides as well as the student of these forms. But as the two cities are rapidly extending over this territory and changing the condition of things, I have deemed it fortunate to have had the opportunity to make a thorough collection before a complete change has taken place.

In treating of the family in an ascending order, I have departed from what is customary; but as it is more natural and has advantages there is no need of further apology.

I am under obligations to Mr. Monell, formerly of St. Louis, but now of Mine la Motte, Mo., for many suggestions as well as favors of specimens for comparison. In recognition of Mr. Monell as one of our foremost aphidologists I have named a new genus in honor of him, on the re-discovery of one of Dr. Fitch's species that for the past thirty years has remained a puzzle to entomologists.

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UNIVERSITY OF MINNESOTA,
Minneapolis, Minn., September 27, 1887.

INTRODUCTION.

The Aphididæ or plant-lice are small soft-bodied insects, commonly found on the foliage of plants, on the sap of which they feed. Their study is of great importance both from an economic as well as scientific standpoint.

The terms used in treating of the species are in main the same as those used in treating of insects in general; but as some have a special application to this family and a few are peculiar to it, I shall give a short exposition of those terms commonly used in describing species.

The body of plant-lice, as of insects in general, is divided into three principal parts, which are more or less distinct from each other. These parts are the head, thorax, and abdomen.

HEAD. The head is the front portion of the body, and in the family is mostly small, never wider than the thorax. As appendages to the head are to be noticed the antennæ, eyes and beak.

ANTENNÆ. The antennæ are fili-form, jointed appendages inserted in front of the eyes. Some of the best characters for the distinction of both genera and species are drawn from them. In length they vary from hardly longer than the head to more than twice the length of the body. In the number of joints they vary from only three in Phylloxera to seven in the greater number of genera. They are inserted directly on the head, or on a prolonged or raised lobe called the *frontal tubercles* as seen especially in the Nectarophorini. The two basal joints are always short; the third is as a rule the longest, and the fourth, fifth and sixth each respectively shorter; the sixth short, and nearly always with a small contraction at the end called the *unguis* or nail, which is shorter than the joint. The seventh joint of the seven-

jointed antennæ is really the same thing as this unguis of the six-jointed antennæ, but here prolonged so as to be as long or longer than the sixth, and in some of the higher genera even longer than the third. When thus, it is convenient to consider it as a separate joint as is commonly done by entomologists. This joint is always much narrower than the other, setaceous and often imbricated. The relative length of the joints is in most cases quite constant and gives good specific characters, but in some of the higher genera they vary so much that it is only by taking the average of a number of specimens that we can get measurements of any value. On the very tip of the antennæ are always found two short hairs that differ from those of the other joints, and which evidently correspond to the more conspicuous bristles of the Psyllidæ. In nearly all cases the antennæ are found with a fine pubescence scattered over the joints, but not so as to be readily noticed; in only a few cases, as in Chaitophorus, does this pubescence become so decided as to be of generic value. The third joint, and often the fourth, fifth and sixth, are supplied with sense pores, or small circular spots covered by a membrane, and look very much like the ocelli of the head. In the following pages I speak of these as *sensoria*. They are considered by entomologists to be organs of smell or hearing, or both. I have always found them present and they often give very good specific characters, though very few writers have yet made use of them in describing species. In living specimens they are often difficult to observe, but in specimens mounted in Canada balsam they are most beautifully brought out. In form they are usually small circular, but often large oval or irregular, giving to the antennæ a rough or tuberculate surface. They are nearly always restricted to the under side of the joint, and often to a definite number in a single row. Near the tip of the fifth, and at the contraction of the sixth joint, one or more of these sensoria are always to be found. The antennæ of the male is often longer and more highly developed than that of the female.

EYES. The sense of sight is strongly developed in the Aphidæ. The compound eyes are large, hemispherical, situated on the side of the head, and always present except in a few root-inhabiting species, where they are either much reduced in size or altogether wanting. On the back part of each eye some of the lenses are slightly raised above the general surface forming the

ocular tubercles. The winged forms are in addition always provided with three simple eyes or *ocelli*: one near each of the compound eyes, and one on the vertex or front of the head. In many of the lower genera they are not very readily seen, but in some of the higher they are very conspicuous. Why the winged form should be provided with these simple eyes in addition to the compound has not yet been answered to satisfaction, but it appears very probable that they correspond to the nocturnal eyes of the Arachnida, and that it is as such that they are made use of.

BEAK. One of the principal characters of the order to which the present family belongs, is the modification of the mouth parts into a beak by means of which they suck the juices on which they live. The beak is situated on the under side of the head, and when not in use is commonly folded close to the body between the legs. The external part of the beak is composed of three joints, which are channelled on the inner surface for the reception of four very fine piercers or *setæ*, by means of which the leaf or bark is punctured and the sap is drawn up into the body. In length it varies from very short to much longer than the body in some of the foreign species. Some good generic and specific characters can often be drawn from it. It is present in all the forms and in both sexes, with few exceptions.

THORAX. The thorax is the second of the three grand divisions of the body, and is itself divided into three parts or segments. The first of these is the *prothorax*, or the segment next to the head, with which it is united by a membrane that is usual of a paler color. The upper surface of the prothorax is smooth and hard, like the rest of the thorax, and is called the *pronotum*. On either side of the prothorax there is often seen a tubercle which is spoken of as the lateral tubercle, but although its presence or absence is constant, not much use has yet been made of it in classification. This segment supports the first pair of legs and is usually small, narrower than the head, but in Chermes it is as large as the mesathorax and in Monellia almost as well developed. The second segment is the *mesathorax* and is always well developed. It supports the wings together with the second pair of legs. The upper surface is smooth and divided into four lobes, of which the two lateral ones are the largest and contain the strong muscles of the wings; the hindmost lobe, which is usually transverse or triangular in form, is

sometimes referred to as the *scutellum.* The third segment or *metathorax* is closely united with the second, but not much of it is apparent externally. It supports the third pair of legs.

The thorax is sometimes low and flat, on the same level with the rest of the body; again it is much raised or arched as is seen especially in the Pempheginæ.

WINGS. The wings are four in number, of which the front pair are much larger than the hind pair. They are membranous, often very thin or hyaline so as to be iridescent. Without color, but often the veins are of a deep black, or with a smoky border on each side; more rarely with spots or patches of black or smoky brown across the disk, as is seen in many of the Callipterini. In the lower genera the wings are short and broad, but in the higher genera they become much longer and narrower. The veins are few in number and afford some of the best characters for the separation into sub-families; they are all smooth, with exception of a series of fine hairs on the sub-costal of the fore-wings that I have noticed in some of the Pempheginæ. The first vein running along the front margin of the fore wings, is called the *costal vein;* and parallel with this one is a second vein called the *sub-costal.* This second vein near the apex of the wing expands, uniting with the costal, forming a slightly thickened or darker colored surface called the *stigma.* In some of the Chermesinæ the stigma becomes excessively large, allying them with the half coriaceous wings of the Heteropterous Hemiptera. From the sub-costal there runs across the disk of the fore wings two or three oblique veins called the *discoidal veins.* The two nearest to the insertions of the wings are always simple; the third discoidal, or *cubital vein* as it is also called, is altogether wanting in the Chermesinæ, simple in the Pempheginæ, with one branch in the Schizoneurinæ, and with two branches in the two highest sub-families. The short vein arising from the stigma is called the *stigmal vein;* it becomes in a few cases very obscure or subobsolete, very rarely altogether wanting. The veins of the hind wings are made to correspond with those of the fore wings, but there are never more than two discoidals, and the stigma and stigmal veins are also wanting. In normal specimens the veins are very constant, but occasionally abnormal specimens will be found with one or more of the usual veins partly or wholly wanting; or again with supernumerous veins or branches. Thus the cubital vein is sometimes seen with three branches instead of

two; the stigmal has also been found with one branch. By comparing a number of specimens in such cases the normal venation will always become apparent.

The cells, or spaces between the veins, are rarely referred to in descriptions.

On the front margin of the hind pair of wings there is a slightly raised and thickened place from which two or more fine hooks arise, which fasten into a corresponding fold on the posterior margin of the fore wings, thus making a continuous surface of the two wings in flight.

When at rest the wings are, in most cases, held in a slanting perpendicular position over the abdomen; in some cases they are folded flat or horizontally upon the abdomen.

LEGS. The legs are six in number and supported by the thorax, as has already been stated. They are rather short in the lower genera, but long and slender in the higher. Sometimes they are quite smooth, but more commonly with numerous fine hairs, or even hirsute. The first small joint by which they are united to the thorax is called the *coxa;* the first long joint is the *femur* and the second the *tibia.* The tibia supports the *tarsus* which is two jointed, but the second joint is often very small and inconspicuous; the tarsus is always furnished with two long and stout claws. In a single genus, Mastopoda, the tarsi are atrophied, the peculiar structure of which will be more fully treated under the genus.

ABDOMEN. The series of segments following the thorax is called the abdomen and formes the third principal division of the body. In shape it is usually oval or ovoid, and capable of much distention by food, eggs or pseudova, so as to be much larger than the rest of the body. On either side there is often a protruding edge or fold, and when thus the abdomen is said to be margined. The upper surface, or *dorsum,* is often furnished with tubercles or patches of a different color that give us good specific characters. The last segment, especially in the oviparous female, is furnished with two smooth horny plates called the anal plates. In some cases, as in Callipterus, the abdomen is much drawn out into a kind of ovipositor enabling the insect to dispose its eggs between the crevices of the bark. The appendages of the abdomen deserving special mention are the honey-tubes and the style.

HONEY-TUBES. The sixth abdominal segment has on the dorsal side two openings, usually raised more or less above the sur-

face as tubes, called the *honey-tubes.** What their use may be to the insect does not yet seem to be clearly made out, though many curious and ingenious hypotheses have been brought forward by different writers, but which I can not here produce nor discuss. Evidently they are some kind of secretory organs, as the sweet liquid they give off is much sought for by ants. In some cases the honey-tubes are altogether wanting, or simply circular openings on a level with the surface of the abdomen, and often obscured by pulverulent or flocculent matter with which the abdomen in such species is commonly covered. When slightly raised above the surface it is said to be tubercle-like; or when longer than broad it varies from moderately long to very long as is seen in most of the Nectarophorini where they are often half the length of the whole body. In form they are usually cylindrical, but in some cases enlarged near the base, in the middle, or near the apex, when they are said to be clavate. The apex is sometimes simply truncate, again expanding into a narrow flat rim, or more broadly expanding and trumpet-like; more rarely it is round or knob-like. Usually the tubes are opaque, more rarely transparent so that the liquid globules can be seen through them. The surface is smooth and shining, more rarely imbricated.

The honey-tubes, which are so characteristic of the family, give us some of the best characters for the separation of the genera.

STYLE. The last segment of the abdomen is furnished with a more or less prominent process known as the *style.* In some cases, like the honey-tubes, it is wanting, or not to be distinguished from the last segment of the abdomen, but in most cases it is distinct and conspicuous. In form it is often cone-like, as in most of the Aphis; again it is enlarged or rounded at apex, as is seen in Callipterus; when it is widest in the middle and more or less curved upwards, as in most of the Nectarophorini, it is said to be *ensiform* or *falchion-shaped.* The surface is usually smooth, but sometimes wrinkled or imbricated, usually with several long hairs or bristles. In color it agrees in most cases with the abdomen, but occasionally distinct.

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*These appendages are known under several different names. Fitch speaks of them as *horns;* by English writers they are usually called *cornicles, nectaries* or *siphuncles,* and most of our own writers speak of them as *nectaries* or *honey-tubes,* the last of which I have used in all my writings on this family.

METAMORPHOSIS.

The four characteristic stages of insect-life in general, the egg, larva, pupa and imago, are greatly modified in the present family, and will require some special terms and explanation. Ordinarily these stages are passed through by each individual, but in the present case the same stages comprise a greater or less number of individuals. Moreover the pupa stage is not well marked; but this can also be said of the whole order of Hemiptera, in which the pupa is active and but slightly differing from the larva, on which account the order is said to have incomplete metamorphosis. The three well marked stages in the life of the Aphididæ are the *egg*, *pseudogyna* and *imago*.

EGG. It is now pretty well established that each species is found in the egg at some time or other, though they are known only in a comparatively few cases. As in other insects, therefore, the egg seems to be the condition in which the winter is more commonly passed. In shape they are usually a long oval, about as long again as broad, rounded at both ends. The surface is very smooth and shining; when first laid pale greenish or yellow, but soon becoming shining black. The number deposited by each individual varies from one to many, but more commonly the number is definite.

PSEUDOGYNA. The young hatching from the egg never develops directly into the true male or female. but is always an asexual or *agamous* form that produces living individuals like itself without the intervention of the male, and which in turn are capable of producing their own kind. This mode of reproduction is continued through a number of generations, and have by Lichtenstein, to whom we are much indebted for what we know on this subject, been called *pseudogynæ* (false females). They are considered as only transitory or larval forms, corresponding to the larval stage of other insects.

The different generations of these pseudogynæ differ often much from each other and have received separate terms for their designation. Lichtenstein recognizes four different forms, though the number varies in different cases. These he calls:

Pseudogyna fundatrix.
Pseudogyna migrans.
Pseudogyna gemmans.
Pseudogyna pupifera.

The first of these (*pseudogyna fundatrix*) is the immediate issue of the fecundated egg. Prof. Riley calls it the stem-mother, as it is the foundress of the colony, which the above name also implies. It is always apterous, and produces the gall in species that live thus protected.

The second form (*pseudogyna migrans*) differs from the first in acquiring wings. Apparently it differs in no respect from an imago, as ordinarily understood in entomology by this term, and in description of species it is made use of as such, though theoretically it is still incomplete or a pseudogyna. This form takes readily to the wings and thus spreads the colony over a greater area.

The third form (*pseudogyna gemmans*) following the second, is again without wings or apterous. It continues often to produce through a number of generations that in all respects are similar to each other. It is often but a counterpart of the first form.

The fourth form (*pseudogyna pupifera*) is the last generation of the pseudogynæ in which the viviparous power is retained, but with which it also terminates. The living larvæ produced by this form develop into the true male and female.

As before said, the number and relation of these generations vary for different genera, and we are yet too little acquainted with the extent of this variation to make statements that would apply to the whole family. In some cases we have at least one, if not more generations, between the first (*fundatrix*) and the second (*migrans*), like the first in being apterous but differing in size and in other respects. In other cases each generation of the pseudogyna, as far as is known, acquire wings before reproducing their own kind, as is the case in Callipterus, Drepanosiphum and Monellia.

In descriptive entomology it has been the custom to speak of the wingless forms of the pseudogyna as the *apterous viviparous female*, and of the winged forms as the *winged viviparous female.* Of the true sexes the female is spoken of as the *oviparous female,* in distinction from the wingless pseudogyna form.

IMAGO. The imago comprises the sexual form, male and female. These as soon as full grown pair, and the female deposits the eggs and thus closes the cycle.

The male is either winged or wingless and often both in the same species. The female is as a rule wingless, and would thus appear to be less developed than even some of the pseudogyna,

but cases similar to this we find in every order of insects, even the highest, as in Lepidoptera and Hymenoptera. Wings are not essential organs and can therefore be wanting in the imago stage.

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SYNOPSIS OF THE APHIDIDÆ

FOUND IN MINNESOTA.

FAMILY APHIDIDÆ.

Antennæ variable in length, three to seven-jointed, filiform, provided with sensoria, ending with two short hairs (*pili sensuales*) that correspond to the two bristles of the Psyllidæ. Eyes large, hemispherical, placed in front of the antennæ, provided with an ocular tubercle. Ocelli three and always present in the winged form. Beak present in both sexes with few exceptions, three-jointed. Wings four in number, membranous, charged with few veins; the front pair much larger than the hind pair. Tarsi two-jointed (except in Mastopoda which has the tarsi atrophied), ending with a double claw. Abdomen with two dorsal openings or honey-tubes on the sixth segment, rarely wanting. Last segment with a more or less prominent process or style.

The six subfamilies more commonly recognized may be separated in the following manner:

1 { Winged form unknown; subterranean species. - RHIZOBIINÆ.
  { Winged form known; aerial in habit. - - - - 2.

2 { Antennæ 3–5 jointed; fore wings with only two discoidals. CHERMESINÆ.
  { Antennæ 6 or 7-jointed; fore wings with three discoidals. - 3.

3 { The third discoidal simple. - - . - PEMPHEGINÆ,
  { The third discoidal branched. - - - - - 4.

4 { The discoidal with only one branch. - - SCHIZONEURINÆ.
  { The discoidal twice-branched. - - - - 5.

5 { Antennæ 6-jointed. - - - - - LACHNINÆ.
  { Antennæ 7-jointed, rarely only 6-jointed. - - - APHIDINÆ.

Subfamily RHIZOBIINÆ.

Subterranean species, which never acquire wings as far as known, living on roots of plants. Antennæ short, mostly five-jointed, or six-jointed when the unguis or spur of the fifth is counted as one, as is done by some writers. Beak variable in length; eyes very small, inconspicuous, or none; legs short and stout; tarsi with two claws which are sometimes folded so as to appear as single, or with only one claw in Rhizobius. Honey-tubes wanting. Style inconspicuous or none. Body mostly short, convex above, smooth or sometimes hairy or tufted with setæ or flocculent matter.

It has been customary to put all such subterranean species that are known only in the apterous condition and can not with certainty be classified with any of the higher subfamilies into the one under consideration. But several of these underground species are now known to acquire wings, and have accordingly been been classified with the following subfamilies; it is therefore probable that this will be the case with most, if not all, of the remaining species as they become better known, as we have no substantial character on which to rely except on the supposed permanent apterous condition. Of the five or six genera usually excepted by European entomologists, only two have been recognized so far in this country: Rhizobius and Tychea, the last of which has a representative in Minnesota.

Genus TYCHEA Koch, 1857.

Antennæ short, five-jointed, third joint the longest, or but very little difference in any of them. Eyes none or very rudimentary. Beak rather long and stout. Legs short; tarsi with two claws. Honey-tubes wanting. Style small or none. Body usually broadly oval, convex above, often with tufts of setæ or flocculent matter.

Found mostly on roots of grasses or herbaceous plants, and usually in connection with ants.

1. Tychea radicola Oestlund.

Tychea radicola Oest. Geol. Surv. Minn., 14th Report, p. 56, 1886.

Antennæ five-jointed not counting the spur; third joint the longest, but slightly longer than the fourth. Beak long, reach-

ing to middle of abdomen, dusky at tip. Abdomen rounded, convex above, margined with tufts of white flocculent matter. Style very short, globular and slightly hairy. Color very pale or white.

This species, found on the roots of *Ambrosia trifida*, will be easily recognized on account of the tufts of white waxy matter around the margin of the abdomen.

The following species have been described as American, some of which will require further study to establish them as good species:

Tychea panici Thos., on the roots of *Panicum glabrum*.

Tychea erigeronensis Thos., found on the roots of *Erigeron canadense*, which may be but an immature form of *Aphis middletonii* common on the roots of the same plant.

Rhizobius lactucæ Fitch, on the roots of lettuce.

Rhizobius poæ Thos., found on the roots of *Poa annua* (?).

Rhizobius eleusinis Thos., on the roots of *Eleusine indica*.

Subfamily CHERMESINÆ.

Antennæ short, five-jointed or only three-jointed in Phylloxera. Beak short, never very long, and sometimes wanting in the perfect sexes. Eyes nearly always large and prominent. Prothorax large, often as much developed as thorax proper. Fore wings with three simple oblique veins; hind wings with a single oblique vein, which sometimes becomes very obscure or entirely wanting. Legs short; tarsi with two claws. Honey-tubes wanting.

The subfamily as here defined includes the Phylloxera, though Lichtenstein and others, who have made a special study of this genus, consider it as the type of a distinct family—the Phylloxeridæ—which I think is likely to be generally accepted as soon as the numerous forms belonging here become better known. But as the subfamily has been very little studied in reference to Minnesota, and besides very little is known in regard to any of the species in this country, I treat of it here as customary, and more to call attention to the subject than to present any additional material.

When the genus Phylloxera be excepted the species are not very numerous, but of much interest as found almost exclusively on the coniferous trees, and presenting many peculiarities in habit and development. As soon as the northern parts of Min-

nesota can be examined, which are covered with coniferous trees, we can expect a rich field, and much valuable matter in our knowledge of these insects.

When Phylloxera be included the subfamily will naturally fall into two tribes, Chermesini and Phylloxerini, recognized by the number of joints to the antennæ. We have only a single genus to each of these tribes as represented in this country.

Genus PHYLLOXERA Fonscolombe, 1841.

Antennæ short, not more than one-third or one-fourth the length of the body; three-jointed, the first and second short and nearly equal, the third or terminal much the longest, imbricated, and with a large sensoria near the base and a much larger one near the apex. Eyes well developed in the winged insect, but small and rudimentary in some of the apterous. Beak moderately long, entirely wanting in the perfect sexes. Legs very short; tarsi one-jointed, furnished with two claws, two capitate bristles or long hairs, and with a cushion-like pad or pulvillus between the claws. Wings thin and delicate, large in proportion to the size of the body, folded horizontally when in repose; fore wings with a well marked subcostal and three oblique veins without any branching. The first and second of these oblique veins are sometimes united so that the second appear to be a branch of the first. Hind wings with a veinless subcostal. Honey-tubes wanting. The form of the body varies considerable, from globular in the early apterous form, to fusiform or ovate later on in the season. Most of the species form galls on plants, attacking not only the leaves but also the roots, as is the case with the well-known and so destructive grape Phylloxera both in this country and on the continent.

Only one species has been observed in Minnesota, but I doubt not that several will be found, especially on the leaves of the oak and hickory, here as elsewhere.

1. Phylloxera prolifera n. sp.

Apterous females. Color very pale lemon-yellow, smooth, convex above, especially in front, tapering behind into a rather long ovipositor. Eyes as a very small black spot. Antennæ short and fine, 3-jointed: I 0.05^{mm}, II 0.05^{mm}, III 0.10^{mm}. Beak short and thick, about 0.10^{mm}; the setæ very long when ex-

tended, at least as long as the body, brownish. Legs short; tarsi with two rather small claws, and with the two capitate hairs as usually in the genus.

Found in the galls of *Pemphigus populicaulis* Fitch during the fall after the pemphigiens have left or become destroyed. Usually but one female, or at most a few, was to be found in the gall together with a great number of pseudova in a pile that often would be several times the female in bulk. The pseudova are greenish-yellow when first laid, but soon become decidedly yellow before the larva frees himself from the covering. Their length is about 0.45^{mm}, and breadth 0.25^{mm}. I think this is the same species as mentioned by Prof. C. V. Riley as found in the galls of *Pemphigus populi-transversus* Riley,* which seems to take the place of the above named gall in the western and southern states. The insect was found not only in the galls fallen to the ground, as was the case by those observed by Prof. Riley, but more often in those still remaining on the tree. Time did not allow me to give any special attention to this interesting species, but I think it can nevertheless be recognized from the above short description on account of its peculiar habits. It is very probable that the early stages will not be found in connection with the galls, but on some other part of the tree, or even on some other tree, as migration from one tree to another appears not to be rare in the present genus.

Genus CHERMES Linnæus, 1748.

Antennæ short, stout, composed of five joints, the two first short, the third, fourth and fifth not much longer, and nearly sub-equal. Eyes conspicuous in winged form, sometimes wanting in the apterous. Beak short and stout; the setæ when extended are somtimes two or three times the length of the body Thorax much developed, especially the prothorax. Fore wings unusually broad; the costal rounded; the subcostal stout, ending with a broad stigma; the cubital wanting, but the long stigmal vein has the position and appearance of a cubital; two discoidals. Hind wings with but one discoidal. Legs short, tarsi with two claws. Honey-tubes wanting.

The species are not very numerous, and almost without exception confined to coniferous trees. The body is usually covered

*See Bull. U. S. Geol. and Geogr. Surv. of the Terr., Vol. V., No. 1, p. 16.

by a flocculent exudation. No representative of this genus has yet been observed in Minnesota, but most of the species known will, without doubt, be found in the northern half of the state so rich in coniferous trees.

The following species belonging to the Chermesinæ have been recorded as American:—

Phylloxera vitifoliæ (Fitch). The grape Phylloxera.
Phylloxera castaniæ (Hald.). On the chestnut.
Phylloxera caryæcaulis (Fitch). On the hickory.
Phylloxera caryævorna (Fitch). On the hickory.
Phylloxera caryæfoliæ Fitch. On the hickory.
Phylloxera caryæglobuli Walsh. On the hickory.
Phylloxera caryæsemen (Walsh). On the hickory.
Phylloxera caryæfallax Riley. On the hickory.
Phylloxera caryæglobosa (Shimer). On the hickory.
Phylloxera spinosa (Shimer). On the hickory.
Phylloxera caryæsepta (Shimer). On the hickory.
Phylloxera forcata (Shimer). On the hickory.
Phylloxera depressa (Shimer). On the hickory.
Phylloxera conica (Shimer). On the hickory.
Phylloxera caryægummosa Riley. On the hickory.
Phylloxera caryæren Riley. On the hickory.
Phylloxera rileyi Licht. On oak.
Chermes pinicorticis (Fitch). On pine.
Chermes laricifoliæ Fitch. Larix americana.
Chermes abieticolens (Thos.). On spruce.
Chermes abietis (Linn). On spruce.

Subfamily PEMPHIGINÆ.

Antennæ rather short; six-jointed, or rarely only five-jointed; the third joint the longest, the sixth usually coming next in length when the unguis or spur is counted. In some cases the third and following joints are annulated. Eyes large in the winged form; often wanting in the gall inhabiting apterous form. Beak moderately long, or wanting altogether in the true sexes. Thorax usually strongly arched above. Fore wings with the cubital simple, usually very hyaline or obsolete at base; the two discoidals often starting from the same point, or nearly so. Hind wings with two discoidals, except in Hormaphis, where there is but one. Legs short, tarsi with two claws and sometimes with a pair of capitate hairs as in Phylloxera. Honey-tubes wanting. Style inconspicuous or none.

This subfamily constitutes pre-eminently the gall making aphides, as most of them construct galls of peculiar shapes on various parts of woody plants, mostly trees.

The genera found in America may be recognized as follows:

1 { Hind wings with two discoidals. - - - - PEMPHIGUS.
  { Hind wings with only one discoidal. - - - - - 2.

2 { Antennæ 6-jointed. - - - - - TETRANEURA.
  { Antennæ 5-jointed. - - - - - HORMAPHIS.

Genus HORMAPHIS Osten-Sacken, 1861.

Antennæ five-jointed, first and second short, third the longest, fourth and fifth sub-equal; the three last joints strongly annulated. Eyes conspicuous. Beak moderately long. Front wings with the simple cubital obsolete at base; the two discoidals starting from the same point. Hind wings with a single discoidal, which is often very faint and almost obsolete. Legs moderately long; tarsi two-jointed, with two claws and a pair of long capitate bristles or hairs. Honey-tubes and style wanting.

Three species are now known, all from America, to which the genus appears to be peculiar. One, found on the witch-hazel (*Hamamelis virginica*), forms a gall on the leaves, and a second species on the same plant forms a gall by a deformation of the fruit-bud in autumn. A third species, described now, as I think, for the first time, forms no true gall, but finds a somewhat similar protection by corrugating the leaf under which it is found.

1. Hormaphis papyraceæ n. sp.

Antennæ nearly one-half the length of the body, about 0.60^{mm}, III 0.25^{mm}, IV 0.12^{mm}, V 0.13^{mm}, all the joints of nearly the same thickness; III with about twenty-five annulations, and the two last with about the same number together; the last joint with no apparent constriction or nail. Eyes dark brown. Beak rather short, appearing to rise from between the first pair of legs. Thorax very high, convex above, all black. Fore wings with cubital obsolete for nearly half its length; stigma long and narrow, pointed. Hind wings with two hooklets. Abdomen blackish, covered with a pulverulent and flocculent substance. Legs moderately long, black; tarsi two-jointed, with two claws and two superior capitate hairs. Honey-tubes and style wanting. Length of body 1.30^{mm}; to tip of wings 2.30^{mm}. Larvæ blackish, very flocculent, especially on the last segments.

Found on the under side of the leaves of birch (*Betula papyracea* Ait.), corrugating them between the veins, forming long folds, in which the lice are packed as close as it is possible for them to be and at the same time to reach the leaf with the beak. Being also abundantly covered by a flocculent substance, especially the apterous form, they find undoubtedly a good protection between these plications of the leaf. The first winged form was taken in the early part of June.

Genus PEMPHIGUS Hartig, 1841.

Antennæ moderately long, not more than half the length of the body, usually shorter; the third joint the longest, the sixth next in length, and always with a contraction or nail-like process at apex; sometimes annulated, but more commonly smooth or only with transverse sensoria, which sometimes give to the antennæ a very tuberculate and uneven surface. Eyes large in winged form, but often rudimentary or wanting in the apterous. Beak moderately long. Thorax much developed, arched above and with conspicuous lobes. Front wings with the cubital simple; the two discoidals arising from nearly the same point. Hind wings with two discoidals. Legs moderately long; tarsi two-jointed, and with two claws. Honey-tubes wanting. Style very small or none.

The species of this genus are more readily recognized from the peculiar galls that they produce than from any character that we can find in the insect. The species found in Minnesota may be separated as follows:

1. Unguis of the sixth joint longer than the joint; producing a large irregular gall on the end of twigs of the poplar. - P. VAGABUNDUS.
   Unguis shorter than the joint. - - - - - 2.
2. All the joints of the antennæ with transverse sensoria; size small; producing a smooth and regular gall on the leaf of sumach. - P. RHOIS.
   The last joint never with transverse sensoria; size larger. - - 3.
3. Cubital arising from the same point as the second discoidal; producing a pseudogall by curling the terminal leaves of ash. - P. FRAXINIFOLII.
   Cubital separate or obsolete at base. - - - - 4.
4. Contraction of the sixth joint abrupt, the joint being thickest at the apex; producing a globular gall by the twisting of the petiole near the base of the leaf of the poplar, and hence with a broad and oblique opening. - - - - - - - - P. POPULICAULIS.
   Contraction of the sixth joint gradual, the joint being thickest below the apex; producing an oval or globular gall on the petiole of the poplar with a small transverse opening. - - - P. POPULI-TRANSVERSUS.

1. Pemphigus populicaulis Fitch.

Pemphigus populicaulis Fitch. Ins. N. Y., 5th Report, § 353, 1859.
Byrsocrypta (pemphigus) populicaulis Walsh. Proc. Ent. Soc. Phil., Vol. I, p. 305, 1862.

Antennæ short, third joint with about six transverse sensoria, and the fourth with about half as many; the sixth joint is narrow at base gradually widening to the apex, where the contraction is abrupt, forming the short unguis; III 0.18mm, IV 0.10mm, V 0.10mm, VI 0.18mm with the unguis. Fore wings with the two discoidals arising close together, the third obsolete at base; stigma rather short and broad. Head and thorax black. Abdomen greenish, pulverulent. Expanse of wings about 6mm.

The gall produced by this species is the globular swelling so often seen on the petiole near the base of the leaf of cottonwood (*Populus monilifera*). It is formed by the folding or twisting of the petiole, the edges coming together obliquely to the base of the leaf forming a broad opening or mouth.

2. Pemphigus populi-transversus Riley.

Pemphigus populi-transversus Riley. Bull. U. S. Geol. Surv. Terr., Vol. V, p. 15, 1879.

Antennæ similar to the foregoing species (*P. populicaulis*), but third and fourth joints with fewer transverse sensoria; the contraction of the sixth joint is more gradual, the joint being widest below the apex near the middle, and the unguis longer. Fore wings with the two discoidals arising close together; the cubital obsolete at base; stigma rather long and narrow. Expanse of wings 7mm.

This species is slightly larger than the foregoing, but in other respects quite similar; like it also, pruinous, especially so in the apterous form. The gall is also similar in size and form, produced on the petiole near the base of the leaf of cottonwood (*Populus monilifera* and *balsamifera*). The swelling causes a curving of the petiole, and the mouth is a small opening transverse to the petiole or parallel to the base of the leaf.

3. **Pemphigus vagabundus** (Walsh).

Byrsocrypta vagabunda Walsh. Proc. Ent. Soc. Phil., Vol. I, p. 306, 1862.

Pemphigus vagabundus Packard. Guide to the study of Ins., p. 524, 2d ed., 1870.

Antennæ about half as long as the body; third joint with 8–10 transverse sensoria, fourth with only a few; sixth joint, with the unguis, as long as the third; the unguis as long again as the sixth joint; III 0.30^{mm}, IV 0.10^{mm}, V 0.08^{mm}, VI 0.30^{mm}, of which the unguis measures at least 0.20^{mm}. Beak reaching second coxæ. Head and thorax black. Abdomen paler. Wings very hyaline, with thin and almost imperceptible veins except costal and subcostal which are slightly smoky; stigma rather narrow. Second discoidal originating near to the first. Length of body about 1.75^{mm}; expanse of wings about 7^{mm}.

The species described by Walsh as *vagabunda* is evidently something else from that producing the large irregular gall on the end of twigs of poplar to which the name *vagabunda* has also commonly been applied. It was first described from specimens taken on various forest trees without knowing the gall, and it was not till sometime afterwards that the connection was made between the two. Moreover the specimens described by Walsh were taken in September, when it has been supposed the winged insect made its appearance, but as I have found the galls empty and beginning to turn black already in August, it is evident that the species of this gall appears much earlier.

The galls are very common in and around Minneapolis, and I had hopes of making out the life history during the present season, but from my absence during the greater part of the season I was unable to do so. On my return in August I found all the galls deserted with only castings and occasionally a dead specimen. In one gall I thus found a great number of winged specimens from which I have given the above description. All the castings also agree with the same, and are so strongly characterized by the long unguis of the sixth joint that I have no doubt that this is the true species of the gall in question.

4. Pemphigus rhois (Fitch).

Byrsocrypta rhois Fitch. Month. Journ. N. Y. St. Ag. Soc., p. 73, Aug., 1866.
Melaphis rhois Walsh. Phil. Ent. Soc., Vol. VI., p. 281, Dec., 1866.
Pemphigus rhois Packard. Guide to the study of Ins., p. 524, 2d Ed., 1870.

Antennæ about half as long as the body; joints 3–6 with numerous transverse sensoria that almost encircle the joints; the unguis short but distinct; the normal six-jointed antenna measures on an average, III 0.12^{mm}, IV 0.10^{mm}, V 0.10^{mm}, VI 0.15^{mm}. Fore wings with the cubital obsolete at base; the two discoidals are not as close together at base as usual in this genus. Hind wings with the position of the veins normal; second discoidal obsolete at base. Length of body about 1^{mm}, to tip of wings 2–2.50^{mm}.

A small species that makes a smooth, thin walled gall on the underside of the leaf of sumach (*Rhus glabra*) usually near the base of the leaf, varying from half an inch to an inch in diameter. It departs somewhat from a typical Pemphigus, and was made the type for a new genus by Walsh, though a variation in the number of joints alone will not warrant a separation in this case. The normal number of joints is six, but often some are found connate so as to be but five-jointed and more rarely only four-jointed.

5. Pemphigus fraxinifolii Riley.

Pemphigus fraxinifolii Riley. Bull. U. S. Geol. Sur. Terr., Vol. V., p. 17, 1879.
Pemphigus fraxinifolii Thomas. Ins. Ill., 8th report, p. 146 and 210, 1879.

Antennæ about half as long as the body; joints 3–5 with transverse sensoria, but less distinct than usual; III 0.25^{mm}, IV 0.12^{mm}, V 0.15^{mm}, VI 0.18^{mm} including the unguis of the usual length. Head and thorax dusky or black, abdomen dark green varying to yellowish green. Beak reaching second coxæ. Wings hyaline, with slender veins; the third discoidal subhyaline at base, arising from nearly the same point as the second discoidal; stigmal vein subobsolete at base, arising from the middle of the stigma, nearly straight. Hind wings with the two discoidals arising from the same point. Length of body 2^{mm}; to tip of wings 3^{mm}.

Found on the terminal leaves of ash (*Fraxinus americanus*) causing them to curl and form a pseudogall. The insects are much covered with a flocculent matter, and exude an abundant liquid as in *Schizoneura americana*, with which species it would appear to agree in habit.

The following species of Pemphiginæ have been recorded as American though not yet found in Minnesota:

Tetraneura ulmi (Linn), producing a small pedunculated gall on the leaves of elm.

Tetraneura graminis Monell, on the leaves of *Aira caespitosa* and *Agrostis plumosa*, enveloped in a cotton-like secretion. For a notice of these two species see the Can. Ent., Vol. XIV., p. 16.

Hormaphis hamamelidis (Fitch), producing a conical gall on the leaves of witch-hazel (*Hamamelis virginica*).

Hormaphis spinosus (Shimer), producing a gall on the stem of the same plant in autumn, being a deformation of the fruit bud.

Pemphigus tesselata (Fitch), found on the branches of alder (*Alnus rubra*).

Pemphigus imbricator (Fitch), a flocculent species found on the under side of the branches of beech (*Betula*).

Pemphigus populariа Fitch, the gall of which is not known; described from specimens found on trunk of poplar.

Pemphigus populi-globuli Fitch, producing a globular gall on the upper surface, near the base of the leaf of poplar (*Populus balsamifera*).

Pemphigus populi-venæ Fitch, producing an oblong compressed gall on the mid-vein of the leaves of poplar (*Populus balsamifera*).

Pemphigus pseudobyrsa Walsh, producing a smooth, semicircular, compressed gall near the mid-vein of the leaves of poplar (*Populus angulata*).

Pemphigus formicarius Walsh, and

Pemphigus formicetorum Walsh, found in the nest of ants.

Pemphigus ulmi-fusus (Walsh), producing a spindle-shaped gall on the upper surface of the leaves of red elm.

Pemphigus populi-monilis Riley, producing a series of small galls on the upper side of the leaf of the narrow-leaved cottonwood (*Populus balsamifera*).

Pemphigus populi ramulorum Riley, forming an irregular globular gall on the twigs of *Populus balsamifera.*

Pemphigus acerifolii Riley, a flocculent species on the under side of the leaves of *Acer dasycarpum*, causing them to curl.

Pemphigus aceris Monell, on the under side of limbs of hard maple, enveloped in wooly matter.

Pemphigus rubi Thomas, on the under side of the leaves of *Rubus occidentalis*, along the mid-vein.

Subfamily SCHIZONEURINÆ.

Antennæ short, not more than half the length of the body and mostly shorter, six-jointed, the last with a short spur; usually annulated and with transverse sensoria, or when not annulated with circular sensoria. Beak moderately long, wanting in some of the sexual forms. Fore wings with two discoidals usually arising from near to each other; the third or cubital with one branch, obsolete at base. Hind wings with one or two discoidals. Honey-tubes rudimentary or wanting. Style none.

Most of the species are found with a flocculent matter, though some are only pulverulent. A few produce galls as in the preceding subfamily, but more commonly they only curl the leaves or are protected by their flocculent exudation. Several of the subterranean species belong here. Some aphidologists would include this subfamily with the Pemphiginæ, principally on account of similarity in habit and development, but I prefer with others to consider it as distinct.

The two genera found in America may be distinguished as follows:

Hind wings with two discoidals. - - - - - - SCHIZONEURA.
Hind wings with only one discoidal. - - - - - - COLOPHA.

Genus COLOPHA Monell, 1877.

Antennæ short, not reaching beyond the thorax, strongly annulated; third joint the longest and about as long as the three following. Beak short. Fore wings with the two discoidals arising from nearly the same point. Hind wings with only one discoidal. Honey-tubes and style wanting.

Only two species are known in this genus, and one of these forms a true gall on the elm. The oviparous female produces but one large egg in the fall.

1. Colopha ulmicola (Fitch).

Byrsocrypta ulmicola Fitch. Ins. N. Y., 4th Report, p. 63, §347, 1858.

Thelaxes ulmicola Walsh. Proc. Ent. Soc. Phil., Vol. I., p. 305, 1862; American Entomologist, Vol. I., 1869.

Colopha ulmicola Monell. Can. Ent., Vol. IX., p. 102, 1877.

Glyphina ulmicola Thomas. Ins. Ill., 8th Rept., p. 142 and 204, 1879.
Colopha compressa Lichtenstein and other European authors; Monell, Can. Ent., Vol. XIV., p. 15, 1882.

Antennæ reaching to the insertions of the fore wings, strongly annulated; the third joint the longest, about as long as the three following joints. Fore wings with the cubital once branched, obsolete for some distance at base; the two discoidals close together at base. Hind wings with only one discoidal. Honey-tubes wanting. Expanse of wings 3-4^{mm}.

This species produces the well-known cock's-comb gall on the upper surface of the leaf of elm (*Ulmus americana*). Placed between two parallel branch veins of the leaf, the opening is always a long slit on the under side parallel with these veins. The gall above is about one inch long by one-fourth as high, compressed and with numerous perpendicular folds or wrinkles, the summit cut-toothed.

There has been great diversity of opinion in regard to the generic position of this species, as will be seen from the above synonyms. Some of the latest writers in Europe have considered Koch's compressa as identical with our ulmicola, which opinion I followed in my list of the family in the 14th annual report of the survey. But Mr. Monell, the author of the genus as now recognized, writes me: "I think our European friends have been a little hasty in calling compressa and ulmicola identical. I doubt it very much." As far as my own observations go, I think it is distinct.

Not observed to be as common here in Minnesota as further south.

Genus SCHIZONEURA Hartig, 1841.

Antennæ sometimes half as long as the body, but usually shorter; third joint the longest and often as long as the three following joints; annulated and then with transverse sensoria, or smooth when they are circular. Beak moderately long, but often reaching third pair of coxæ. Fore wings with cubital once branched, mostly obsolete for some distance at base; the two discoidals close together at base. Hind wings with two discoidals. Honey-tubes rudimentary or wanting.

Most of the species are covered with flocculent or wooly matter. In habit the genus shows a great diversity; some are found

on leaves with or without curling them, others on the twigs or limbs under cover of their wooly matter, not a few are subterranean on roots of grasses or trees, and Mr. Walsh describes one species as inhabiting the fungus.

The five species found in Minnesota may be recognized as follows:

1 { Antennæ annulated; sensoria transverse. - - - - - - 2.
  { Antennæ not annulated; sensoria circular. - - - - - - 3.

2 { Cubital obsolete at base. - - - - - - - S. AMERICANA.
  { Cubital not obsolete. - - - - - - - - - S. CRATÆGI.

3 { Abdomen with a patch of velvety black above. - - - S. CORNI.
  { Abdomen of uniform color. - - - - - - - - - - 4.

4 { All black; aerial. - - - - - - - - - - S. QUERCI.
  { Abdomen greenish; subterranean. - - - - - S. PANICOLA.

1. Schizoneura americana Riley.

Schizoneura americana Riley. Bull. U. S. Geol.Surv. Terr., Vol. V., p. 4, 1879.

Head and thorax black; abdomen reddish brown. Antennæ reaching the abdomen; third joint the longest and longer than the three following; III 0.45^{mm}, IV 0.12^{mm}, V 0.13^{mm}, VI 0.10^{mm}; third fourth and fifth joints strongly annulated, there being about 22 annules to the third. Beak rather long. Cubital vein of fore wings obsolete for some distance at base, rarely tracable its whole length. Honey-tubes sub-obsolete, hardly above the surface of the abdomen.

Found on the under side of the leaves of elm (*Ulmus americana*) causing them to curl, forming a pseudogall. When very numerous they sometimes affect all the leaves at the end of a twig forming a mass, conspicuous on account of the sickly yellowish-color of all the leaves thus involved. Strongly pulverulent, and exuding an abundance of liquid that is found as small globules in the gall. Expanse of wings 5-6^{mm}.

2. Schizoneura cratægi n. sp.

Head and thorax shining black; abdomen that is reddish-brown in the apterous form, becomes dusky or almost black in the winged. Antennæ similar to the preceding species but somewhat shorter; III 0.35^{mm}, IV 0.10^{mm}, V 0.12^{mm}, VI 0.10^{mm}. Beak reaching third coxæ, or abdomen. Wings hyaline, with slender veins; cubital of the fore wings can be distinctly traced

for its whole length though often very slender, branching from about midway of its length. In other respects the wings are similar to the foregoing species. Legs and tarsi somewhat shorter. Honey-tubes are circular openings but slightly raised above the surface of the abdomen. Expanse of wings 6mm. The apterous forms are much covered with flocculent matter; the winged only pulverulent.

Found very numerous on the under side of the twigs of hawthorn (*Cratægus punctata*). One tree especially, observed during September, had almost a continuous row on the under side of every twig, and very conspicuous from the flocculent covering of the apterous form. Very similar to *Schizoneura americana* in size and general appearance, but distinct in habit and easily distinguished by a shorter antenna and the cubital not being obsolete at base.

This is evidently not *S. lanigera*, and I know of no other species as found on Cratægus or related plants, and have therefore described it as new.

3. **Schizoneura corni** (Fab).

Head and thorax black; abdomen reddish-brown, with a large patch of velvety black covering all of the dorsum except three of the first and some of the last segments. Antennæ reaching to end of thorax; not annulated, hairy, with a single row of circular sensoria on the under side, about six to the third joint, three to the fourth, two to the fifth, and one at the contraction of the sixth; III 0.30mm, IV 0.12mm, V 0.10mm, VI 0.15mm, with the short unguis. Beak reaching third coxæ. Wings hyaline, with slender veins; cubital obsolete at base; stigma broad and short, smoky. Honey-tubes a circular opening almost on a level with the abdomen. Expanse of wings 6–7mm.

This species is very common in the fall during September and October. Found in great numbers on the under side of the leaves of Cornus, and also on the wing, when they are caught in great numbers in the webs of spiders. It agrees in all respects with the description and figure of *S. corni* Fab. as given by Buckton, and I have no doubt that our species is identical with the European. Walsh's *cornicola* is apparently something else.

4. Schizoneura querci (Fitch).

Eriosoma querci Fitch. Ins. N. Y., 5th Report, §306, 1859.
Schizoneura querci Thomas. Ins. Ill., 8th Report, p. 139, 1879.

What I presume to be this species I have taken on several occasions in the apterous form on oak, but I have never succeeded in finding or rearing the winged form. The apterous form is found with much flocculent matter, as common in this genus, and the antenna, as seen from the larva, is not annulated but smooth. I add Fitch's notes on the winged form:

"The winged individuals are black throughout, and slightly dusted over with an ash-gray powder resembling mould. The fore wings are clear and glassy, with their stigma-spot dusky and feebly transparent, their rib-vein black, and their third oblique vein abortive nearly or quite to the fork. It is 0.16 (inch) long to the tips of its wings."

5. Schizoneura panicola Thomas.

Schizoneura panicola Thomas. Ins. Ill., 8th Report, p. 138, 1879.

Head and thorax dusky or black; abdomen pale greenish with some black marking above, on the last segment at least. Antennæ reaching to the end of thorax, hairy, third joint the longest, the three following subequal; sensoria rather indistinct, three or four to the third joint, and usually one or two to each of the following. Beak reaching abdomen. Honey-tubes as circular openings on level with surface of abdomen, but rather conspicuous from being bordered with a ring of black. Wings hyaline, with slender but distinct veins. Fore wings with the cubital obsolete for some distance at base; stigma short and broad; stigmal vein but slightly curved near the base, straight. Expanse of wings about 5^{mm}.

Found on the roots of grasses; more commonly on *Panicum glabrum* also on *Setaria glauca* and *Eragrostis pectinacea spectabilis*. The winged form found during September.

American species of Schizoneurinæ not yet found in Minnesota are the following:

Colopha eragrostidis Middleton, found on *Eragrostis poæoides megastachya* and on some species of *Panicum*.

Schizoneura lanigera (Hausmann), the woolly aphis of the apple tree.*

*In 1880 Mr. Mendenhall read a paper before the Minnesota State Horticultural Society on plant lice, found in the annual report of the society for that year, in which he speaks of the

Schizoneura fungicola (Walsh). "Numerous individuals, unaccompanied by larvæ, occurred on a large, moist fungus a hundred yards from the nearest trees, which were all oaks." (Walsh.)

Schizoneura cornicola (Walsh), found on the under side of the leaves of red osier dogwood (*Cornus*).

Schizoneura rileyi Thomas, on the limbs and trunk of elm (*Ulmus americana*), causing a knotty growth of the wood.

Schizoneura pinicola Thomas, feeding at the base of the leaves of white pine, covered with a flocculent secretion.

Subfamily LACHNINÆ.

Antennæ moderately long, usually half the length of the body or a little longer, six-jointed, third the longest, sixth with a short spur or unguis as in the foregoing subfamily. Beak long, usually reaching to or beyond the third pair of coxæ, sometimes much longer than the body. Fore wings with the cubital twice forked; two discoidals. Hind wings with two discoidals. Legs long, especially the hind pair; tarsi two-jointed, provided with two strong claws. Honey-tubes very short and thick, tuberculate, sometimes reduced to a level with the surface of the body, and very inconspicuous. Style very short on none.

This subfamily is intermediate between the last and the next, principally partaking of the Pemphiginæ in the form of the antennæ, and of the Aphidinæ in the venation of the wings. But it is readily separated from either, and in habit is quite distinct. None of the species construct galls, or protection of any kind, as we find so often in the Pemphiginæ, but they are usually found on the limbs or the trunks of trees, and their only protection lies in their similarity in color with the branch or trunk on which they are found. In color they are therefore mostly dull gray, brown, or black. In size they are some of our largest aphides, often quite clumsy looking, with a small head and thorax but a very large and broad abdomen.

Only two genera are represented in America:

Stigmal vein straight, abdomen bare. - - - - LACHNUS.

Stigmal vein curved, abdomen flocculent or woolly. - - PHYLLAPHIS.

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woolly apple tree louse and other species that are injurious to the horticulturist, but without stating if the species had been found in Minnesota or not. I hardly doubt that this species is already found in the state, as it is common south of us, and it is only from a want of opportunity to search for it where it is likely to be found that I do not add it to the list of Minnesota species.

In the same paper Mr. Mendenhall also speaks of *Pemphigus populi-monilis*, but as this species appears to be confined only to the narrow-leaved cottonwood (*Populus balsamifera angustifolia*), a species of poplar not found here, this one at least can hardly refer to Minnesota.

Genus LACHNUS Burmeister, 1835.

Antennæ usually about half as long as the body, six-jointed, the last joint with an unguis or spur at the tip, which is always shorter than the sixth. Beak very long, reaching to or beyond the third pair of coxæ, sometimes much longer. Fore wings with two discoidals, a twice branched cubital, and an almost straight stigmal vein; stigma unusually long. Hind wings with two discoidals. Legs very long, especially the hind pair, with long and two-jointed tarsi provided with two strong claws. Honey-tubes short, not longer than broad, often tuberculate or even wanting. Style inconspicuous or none.

Lachnus is the typical genus of the subfamily, with a rather small and narrow head and thorax, but a broad and clumsy abdomen, long and slender beak, very long legs. The body is nearly always covered with fine hairs, and sometimes also slightly pulverulent. Found mostly on branches of trees; but occasionally also on the leaves.

1. Lachnus laricifex Fitch.

Lachnus laricifex Fitch. Trans. N. Y. Agr. Soc., Vol. XVII, § 288, 1858.

Antennæ about reaching to the abdomen, dusky or black except at base; third joint the longest, as long as the fourth and fifth together; the last joint fusiform and shortest; III 0.50^{mm}, IV 0.23^{mm}, V 0.25^{mm}, VI 0.15^{mm}. Beak very long and slender, 1.40^{mm}, reaching beyond the third pair of coxæ; pale at base, more or less dusky at tip. Eyes black. Legs long and slender, with dusky or almost black femora; tibiæ pale, except at the apex, together with the tarsi, black; tarsi very long (about 0.30^{mm}, front pair), with two strong claws. Expanse of wings about 9^{mm}. Fore wings with a strong, robust, and dusky costal and subcostal, but the oblique veins are very thin. The two oblique discoidals being strongest and brownish; the cubital subhyaline, especially at base; the stigmal vein straight and appearing as a continuation of the subcostal, forming a marginal cell of about the same width as the stigma. Stigma very long, about one-third the length of the wings, of uniform width throughout, and truncate in front, in color rather dark brown. Hind wings with four hooklets. Honey-tubes short and thick, black. The winged insect is more or less black throughout, quite hairy,

especially the front of the head, the abdomen and the legs. The apterous form are brownish, or even grayish from being more or less pulverulent, especially on the under side, above with a longitudinal white line on the abdomen.

The apterous form was described by Dr. Fitch some thirty years ago, but the species appears not to have been observed by any of our entomologists since that time. The insect is not rare on the tamarack or American larch, *Larix americana*, but is quite difficult to find on account of its great similarity in color and shape to the irregularities of the twig on which it lives. It is generally located in the axils of the tufts of leaves, but when numerous can be found anywhere on the small twigs. It moves about with a very rapid and jerky motion when disturbed, reminding us of the Cicindela among the beetles, and thus easily escapes from observation unless you have well spotted the individual. The winged form first makes its appearance about the middle of May.

Several species of Lachninæ have been recorded as American, most of which will undoubtedly also be found in Minnesota.

Phyllaphis fagi (Linn.), found on the beach (*Fagus*).

Phyllaphis niger Ashmead, on oak (*Quercus phellos laurifolia*).

Lachnus viminalis (Fonsc.), on the limbs of willow. This is the same species as *L. dentatus* of Le Baron.

Lachnus caryæ (Harris), on the limbs of hickory (*Carya porcina*).

Lachnus strobi (Fitch), on white pine.

Lachnus abietis (Fitch), on *Abies nigra*.

Lachnus quercifoliæ Fitch, on the leaves of white oak.

Lachnus salicelis Fitch, on the twigs of willow. This is probably a Melanoxanthus or Chaitophorus.

Lachnus alnifoliæ Fitch, on leaves of alder.

Lachnus longistigma Monell, on linden (*Tilia americana*).

Lachnus quercicolens Ashmead, on oak.

Lachnus australe Ashmead, on pine.

Lachnus platanicola Riley, on sycamore trees.

Subfamily APHIDINÆ.

Antennæ 7-jointed, never very short, often much longer than the body. Eyes always present, and with a distinct tubercle. Beak variable in length, but seldom very long. Fore wings with two discoidals, a twice forked cubital, and more or less curved stigmal vein. Hind wings with two discoidals. Legs usually of moderate length; tarsi two-jointed, and with two claws (except the anomalous *Mastopoda*). Honey-tubes of variable length, but mostly longer than broad, or very rarely none. Style present and mostly very conspicuous.

This is by far the largest subfamily, and it more than outnumbers all the others put together. The characters are somewhat variable, making it much more difficult to define than any of the preceding. One of the most easily observed character is undoubtedly the so-called seventh joint of the antennæ, which, as has been stated by several writers, is but a contracted prolongation of the sixth, but as it here takes on the character of a separate joint, being nearly always longer than the sixth, and often as long or longer than the third, it is convenient to consider it as such. In some of *Callipterini* it becomes so reduced in length as to be difficult to distinguish from the unguis, and we have, therefore, to rely on other characters.

A great many of the species are found on herbs or annual plants, some are confined to the foliage of trees, or more rarely to the twigs, and a few have a subterranean habit. They are mostly found on the under side of the leaves, or, more rarely, on the stem of the plant they inhabit, and never construct a true gall; but a few of the genus *Aphis* curl the leaves, and so form what is known as a pseudogall. The body is usually smooth, sometimes pulverulent, but never with the flocculent substance found in the lower subfamilies. In development they are the typical aphides.

The subfamily may be divided into the three following tribes:

1 { Style long, at least as long as the tarsus of the first pair of legs; antennæ on conspicuous frontal tubercles. - - - NECTAROPHORINI.
  { Style short or none, hardly ever longer than the tarsus; antennæ on no frontal tubercles, or on very short ones. - - - - 2.

2 { Style conical; honey-tubes moderately long, cylindrical or rarely incrassate. - - - - - - - - APHIDINI.
  { Style very short or none, globular or knobbed; honey-tubes short, not longer than broad, or if longer they still show a strong incrassate character. - - - - - - - - CALLIPTERINI.

TRIBE CALLIPTERINI.

Antennæ variable in length, in the typical genera as long or longer than the body; in those where they are shorter, more or less hirsute; on no frontal tubercles, except in *Drepanosiphum;* seven jointed, and the last joint, with few exceptions, as long or longer than the sixth. Beak very short except in Melanoxanthus. Wings normal, sometimes clouded by dusky markings or bands. Abdomen often tuberculate and hairy. Honey-tubes very short and tuberculate, not longer than thick, or when longer they still show a strong incrassate character; rarely obsolete. Style very short or none, usually rounded or globular at tip.

The genera here collected into a tribe have hitherto been disposed of otherwise, some being even classified with the *Lachninæ.* But they all show strong relationship, and have characters by which they can be readily distinguished from the two remaining tribes. In form they are some of our most elegant aphides; usually with an elongate and somewhat flattened body. In habit they are also quite uniform and distinct. If necessary the tribe could again be divided with Chaitophorus as type for those nearest to Lachninæ, as seen from the shortened antennæ and hirsute body; and Callipterus as type for the remaining genera as typical Aphidinæ.

The genera found in Minnesota may be separated as follows:

1. Antennæ nearly as long, and sometimes much longer than the body; never hairy. - - - - - - - - - - 2.
   Antennæ always shorter than the body and hairy. - - - 4.

2. Wings held horizontal in repose. - - - - MONELLIA.
   Wings deflexed in repose. - - - - - - 3.

3. Honey-tubes longer than broad, enlarged near the base; style very inconspicuous or none. - - - - - DREPANOSIPHUM.
   Honey-tubes short, tuberculate, sometimes obsolete; style short, globular. - - - - - - - - CALLIPTERUS.

4. Beak short; honey-tubes tuberculate. - - - CHAITOPHORUS.
   Beak long; honey-tubes moderately long, and vasiform. - - - - - - - - - - MELANOXANTHUS.

Genus MELANOXANTHUS Buckton, 1877.

Antennæ about one-half as long as the body, hairy as in Chaitophorus; seventh joint as long as the sixth, or usually longer. Beak long, reaching third pair of coxæ. Prothorax with a lateral tubercle. Legs normal, hairy. Wings with well defined veins. Honey-tubes short and stout, but always longer than broad, vasiform or broadest in the middle. Style very short and broad, or none.

Mr. Buckton, who has first given us a description of the genus, places it between Rhopalosiphum and Siphocoryne, but a more natural position is undoubtedly, as has been suggested to me by Mr. Monell, in the vicinity of Chaitophorus. I would consider it as connecting the Aphidinæ with the Lachninæ; having the venation of the former together with the antennæ, but in general form, together with some minor characters, and especially in habit, allies it to the latter. Its relationship to Chaitophorus is especially seen in the antennæ and honey-tubes.

Wings with robust and conspicuous veins, which are somewhat smoky along the sides. - - - - - - - M. SALICIS.
Wings with their veins not smoky. - - - - - M. BICOLOR.

1. Melanoxanthus salicis (Linn.).

Aphis salicis Linn. Syst. Natura, 1761.
Melanoxanthus salicis Buckton. Mon. Brit. Aphid., Vol. II., p. 21, 1879.
? *Chaitophorus smithiæ* Monell. Bull. U. S. Geol. Surv. Terr., Vol. V., No. 1, p. 32, 1879.

Antennæ about half as long as the body, blackish except at base, with very long and spreading hairs; III 0.60^{mm}, IV 0.35^{mm}, V 0.30^{mm}, VI 0.20^{mm}, VII 0.15^{mm}. Beak long, 0.90^{mm}, reaching to or beyond third pair of coxæ. Prothorax with a blunt tubercle on each side; lobes all black. Legs yellowish, with black tibial points and tarsi. Wings with thick veins, slightly smoky along each side, especially the first discoidal, so as to be quite conspicuous. Abdomen with a grayish medial line and markings of the same color along each side. Honey-tubes vasiform, contracted at base, enlarging to at least twice the width in the middle, and again contracting at apex, twice the length of the tarsi in the winged form, in the apterous somewhat shorter; in

color a bright orange, often a decided reddish, contrasting much with the darker colors of the abdomen. Style not well defined. Length of body 3.00–3.75^{mm}; to tip of wings 5.50^{mm}. The males are much smaller in body, but with fully as large wings and antennæ as the females. The apterous form are also of a very large size, long oval, and with markings and color as above.

This very large and conspicuous species is by no means rare on the branches of willows, and occasionally also found on the poplar. In my list of the Aphididæ, in the last annual report of the survey, I refer to it as *Lachnus salicicola* Uhler, which is, as I now learn from specimens kindly furnished me by Mr. Monell, a very similar species, belonging to the genus under consideration. At the time I was unacquainted with Buckton's Monograph, and was led to consider it as a *Lachnus*, and as identical with Uhler's species from the writings of Doctor Thomas. *Lachnus salicicola* Uhler, or more correctly *Melanoxanthus salicti* Harris, as Harris' name is not occupied when applied to this genus, is a species of the eastern states, not yet found as far west as in Minnesota.

2. **Melanoxanthus bicolor** n. sp.

Antennæ somewhat longer and more slender than in the foregoing species; last joint always much longer than the sixth; III 0.65^{mm}, IV 0.35^{mm}, V 0.35^{mm}, VI 0.15^{mm}, VII 0.30^{mm}. In the winged males the relative length of the joints are somewhat more, also more thickly covered with small, round sensoria. Beak long, 0.85^{mm}, reaching to or beyond third pair of coxæ. Prothorax with lateral tubercles; lobes of thorax proper all black except the scutel, which usually has the reddish-brown color of the body. Legs brownish-yellow, with dusky tibial points and tarsi. Wings clear, with much thinner veins than in the foregoing, not bordered by any duskiness. Abdomen reddish-brown, with a medial line of paler color. Honey-tubes rather pale yellow, about twice the length of the tarsi (0.35^{mm}), vasiform, or in shape similar to the foregoing species. Style short, as broad as long, hairy, in color blackish, as well as the anal plates. Length of body 3.75^{mm}.

This species is quite distinct from the foregoing, though found on the same tree, and similar in habit. The body is elongate, conforming more with the typical *Callipterini;* the predominat-

ing color brown, and not with the grayish-white medial line; honey-tubes paler in color; the wings clearer and with more slender discoidal veins.

Genus CHAITOPHORUS Koch, 1854.

Antennæ mostly a little more than half the length of the body, hairy, last joint always as long or longer than the sixth. Beak short, but sometimes reaching second pair of coxæ or slightly beyond. Prothorax with no lateral tubercles. Wings much as in Aphis, but sometimes with smoky bands or spots. Legs moderately long, hairy. Abdomen usually tuberculate, and with long slender hairs, but which are never knobbed, even in the apterous form, as is so often the case in Callipterus. Honey-tubes short and thick; seldom longer than thick at base, rarely subobsolete. Style tubercle-like.

In general form the species of this genus have an elongate body, as in Callipterus, with which it shows many points of similarity; but will be recognized from the shorter antennæ and legs, together with the long spreading hairs of the antennæ and the whole body.

1	Abdomen with black dorsal spines in addition to the usual hairs of the body.	C. SPINOSUS.
	Abdomen with no dorsal spines.	2.
2	Wings with a smoky border along the veins.	C. POPULICOLA.
	Wings clear.	3.
3	Stigma long and narrow.	C. NEGUNDINIS.
	Stigma short and broad.	4.
4	Abdomen with transverse bands of brownish-black.	C. POPULIFOLIÆ.
	Abdomen of uniform black, or greenish-black.	C. NIGRÆ.

1. Chaitophorus negundinis Thos.

Chaitophorus negundinis Thomas. Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 10, 1878.

Antennæ about as long as the body, paler at base, rest dusky, with long spreading hairs; III 0.40^{mm}, IV 0.30^{mm}, V 0.25^{mm}, VI 0.10^{mm}, VII 0.25^{mm}; the relative length of the joints varies somewhat, especially the third. Beak moderately long, reaching second pair of coxæ. Thorax with lobes black; prothorax green, or only dusky. Wings very thin and hyaline, with very narrow veins, except the costal and subcostal; stigma long and

narrow, pointed in front. Legs pale, with dusky tips, hairy. Abdomen green, often with a paler medial and marginal line, Honey-tubes short, about as long as thick at base, concolorous with abdomen. Style very short and truncate. Length of body about 2mm; expanse of wings 6mm.

The whole insect is very hirsute, especially the apterous form. Found on the under side of the leaves of box-elder, *Negundo aceroides* Mœnch., and when numerous can be found almost everywhere on the leaf, leafstalk and younger twigs. In early spring, even before the leaves are yet out, the newly hatched larvæ can often be seen crowding around the buds.

2. **Chaitophorus spinosus** Oestl.

Chaitophorus spinosus Oestlund. List Aph. Minn., p. 49, 1886.

Apterous form: Antennæ about one-half the length of the body, the basal joints pale except at apex, the two last all black; III 0.40mm, IV 0.30mm, V 0.28mm, VI 0.08mm, VII 0.08mm. Beak hardly reaching second pair of coxæ. Abdomen yellow, with green dorsal markings, and with transverse rows of black spine-like hairs, which are also found on the head and thorax, together with the ordinary long white hairs of the genus. Honey-tubes typical, concolorous with the abdomen. Length of body 2–2.50mm, (exclusive of the ovipositor).

In the oviparous female, found during the fall, the tip of the abdomen is drawn out into a very long ovipositor, which is very conspicuous, as it becomes brownish-red with age. These females, at the time of ovipositing, descend to the woody part of the tree, securely depositing their stock of eggs in the crevices and between the bark. The species feeds on the leaves of the oak, and, as far as I have observed, is found only on the upper branches. The black spine-like hairs of the body will distinguish it from all other species of this genus. The winged form has not yet been observed.

3. **Chaitophorus populifoliæ** (Fitch).

Aphis populifoliæ Fitch. Cat. Hom. N. Y. St. Cab., p. 66, 1851.

Antennæ about two-thirds of the body in length, not as hairy as usual in the genus; third with numerous sensoria, fourth with a row of 4–6 larger ones, the seventh imbricated; III 0.35mm, IV 0.22mm, V 0.15mm, VI 0.10mm, VII 0.25mm. Beak short,

reaching second pair of coxæ. Thorax all black. Wings hyaline, as in *negundinis*, with slender brownish veins; stigma short and broad, dusky. Abdomen greenish, with a marginal row of blackish spots, and transverse bands of the same color above, often running together into a large quadrate patch. Honey-tubes as usual, slightly dusky. Style short and rounded. Length of body 1.60^{mm}; to tip of wings 3^{mm}.

Found on the under side of the leaves of *Populus grandidentata* Mx. It is with some doubt that I consider it as synonymous with Dr. Fitch's *Aphis populifoliæ*, found on the same tree, as the above description differs in several respects from Dr. Fitch's short description. The dorsal bands of all the species I have examined do not show any division in the middle, as appears to have been the case with Fitch's species. The antennæ are hardly hairy, but in other respects it is undoubtedly a Chaitophorus. It is quite similar to *negundinis*, but will be distinguished from this species by the short and broad stigma.

It remains to be ascertained if this species is not identical with *Chaitophorus populi* (Linn.), the two are at least very closely related.

4. **Chaitophorus populicola** Thos.

Chaitophorus populicola Thomas. Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 10, 1878.

Antennæ about two-thirds of the body in length, very hairy; third and fourth joints with numerous small sensoria; III 0.35^{mm}, IV 0.20^{mm}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.15 to 0.20^{mm}. Beak stout, reaching middle pair of coxæ (0.40^{mm}). Thorax shining black, as well as prothorax; membrane yellowish. Wings with rather stout brownish veins; the discoidals with a smoky border on each side, expanding somewhat at the end of each vein; stigma smoky; hind wings more clear. Legs hairy, dusky or black. Abdomen greenish-yellow, with some transverse bands of black above. Honey-tubes paler than the abdomen, sometimes yellowish, about half as long as the tarsi. Style short, inconspicuous. Length of body 1.50–2^{mm}.

Apterous form reddish-brown, with a large Y-shaped yellowish spot on the abdomen. Found on the leaves of *Populus monilifera* Ait., and well distinguished from the other species by the smoky border along the veins of the wings.

5. Chaitophorus nigræ Oestl.

Chaitophorus nigræ Oestlund. List Minn. Aph., p. 49, 1886.

Antennæ nearly as long as the body, hairy; III 0.30mm, IV 0.15mm, V 0.12mm, VI 0.08mm, VII 0 20mm. Beak short, not reaching second pair of coxæ (0.25mm). Thorax all black. Legs more or less dusky, with black tarsi. Wings with slender brownish veins; stigma rather short and broad, brownish as the veins. Abdomen somewhat greenish, but mostly quite black. Honey-tubes not longer than thick, usually a little paler. Style globular. Length of body 1.50mm. Apterous form varying from green to black. Found on the leaves of *Salix nigra* Marsh., as well as other species of willow. A small, blackish, hairy, aphis-like species, not as well characterized as the other species we have.

The following species have not yet been found in Minnesota:

Chaitophorus aceris (Linn.), on *Acer pennsylvanicum* if Dr. Fitch is correct in his identification.

Chaitophorus viminalis Monell, on young twigs and leaves of *Salix lucida* and *S. babylonica.*

Chaitophorus quercicola Monell, on the under side of the leaf of oak, *Quercus prinus.*

Chaitophorus flavus Forbes, on cultivated corn.

Chaitophorus pinicolens (Fitch), on pine. This is Dr. Fitch's *Aphis pinicolens,* which is believed to be a Chaitophorus.

Genus CALLIPTERUS Koch, 1855.

Antennæ usually about as long as the body, or sometimes much longer, smooth; transition from the sixth joint to the seventh gradual; the sensoria of the third in a single row, rather large, but usually on a level with the joint and difficult to trace. Eyes pale or bright red in color. Beak very short, rarely reaching the second pair of coxæ. Wings deflexed in repose, often with clouded spots or bands; front wings with the stigma short and much curved, often subhyaline. Honey-tubes short, sometimes almost on a level with the abdomen. Style short, enlarged at apex.

Some of our most elegant aphides, with an elongate, slender, and more or less depressed body, and of very pale and delicate colors. Sporadic in habit. Nearest to Chaitophorus in general appearance, but with much longer and smoother antennæ. The apterous form with long, slender and capitate hairs on the body, and usually of a pale yellow or whitish color.

The following species have been observed in Minnesota:

1 { Dorsum of winged form with tubercles. - - C. ULMIFOLII.
  { Dorsum without tubercles. - - - - - 2.

2 { Marginal cell dusky. - - - - - C. BELLUS.
  { Marginal cell hyaline. - - - - - - 3.

3 { Wings with shaded spots, arranged somewhat in transverse bands. 4.
  { Wings hyaline; the discoidal margined with black, often expanding at tip. - - - - - - - C. BETULÆCOLENS.

4 { Abdomen with conspicuous transverse spots or bands; seventh joint of antennæ longer than the sixth. - - - - C. DISCOLOR.
  { Abdomen with faint transverse bands, or none; seventh joint equal or nearly so to the sixth. - - - - - C. ASCLEPIADIS.

1. **Callipterus discolor** Monell.

Callipterus discolor Monell. U. S. Geol. Surv. Terr., Vol. V., No. 1, p. 30, 1879.

Myzocallis bella Thomas. Ins. Ill., 8th Rept., p. 108, 1879.

Antennæ about as long as the body, pale, with tips of joints 3-6 dusky; the single row of rather large sensoria on the third not always apparent; III 0.45^{mm}, IV 0.30^{mm}, V 0.25^{mm}, VI 0.12^{mm}, VII 0.20^{mm}. Head pointed in front. Eyes pale red. Beak very short. Thorax with a dusky band on either side. Legs pale, with dusky tarsi. Wings with irregular dusky spots, arranged somewhat in two oblique bands, which become especially apparent when the insect is seen from above with closed wings; veins ending in a smoky patch; second discoidal sinuous; stigma rather short. Veins of hind wings very sinuous. Abdomen yellowish, with four rows of black patches, which often are more or less confluent. Honey-tubes short, pale. Length of body 1.50–1.80^{mm}.

Found on the leaves of *Quercus macrocarpa* Mx. The winged females found in the early part of the season are much smaller than those found further on. Mr. Monell gives the seventh joint of the antennæ as shorter than the sixth, but in normal specimens it is evidently longer.

Dr. Thomas' description of *Myzocallis bella* I think will agree better with the species under consideration than with Walsh's *Aphis bella*, with which he has confounded it.

The apterous form yellowish, and with long capitate hairs.

2. Callipterus asclepiadis Monell.

Callipterus asclepiadis Monell. Bull. U. S. Geol. Surv. Terr., Vol. V., No. 1, p. 29, 1879.

Antennæ about as long as the body, pale, tips of joints 3–6 black; the seventh joint of about the same length as the sixth; III 0.35^{mm}, IV 0.25^{mm}, V 0.20^{mm}, VI 0.10^{mm}, VII 0.10^{mm}. Beak a little longer than usual in the genus, reaching second pair of coxæ. Thorax with a marginal band on either side, as in foregoing species. Wings very much as in *C. discolor*, but usually not as distinctly marked. Abdomen yellowish, with longitudinal rows of dusky patches. Honey-tubes very short, yellowish. Length of body 1.50^{mm}.

Found on the underside of the leaves of *Asclepias cornuti* Linn. The apterous form are almost uniformly yellow or whitish, with long capitate hairs, easily distinguished from those of *C. discolor*.

3. Callipterus ulmifolii Monell.

Callipterus ulmifolii Monell. Bull. U. S. Geol. Surv. Terr., Vol. V., No. 1, p. 29, 1879.
Callipterus ulmicola Thomas. Ins. Ill., 8th Rept., p. 111, 1879.

Antennæ about as long as the body, pale, with the tips of joints 3–5 black; seventh joint about as long as the sixth; III 0.50^{mm}, IV 0.30^{mm}, V 0.25^{mm}, VI 0.12^{mm}, VII 0.12^{mm}. Eyes pale red. Beak short. Head and thorax usually with longitudinal lines of pulverulent. Wings thin and delicate; the second discoidal hardly at all sinuous; the subcostal curves in near the base of the stigma; stigma short and broad, dusky at both ends. Abdomen with four mammiform tubercules above on the basal segments, the other segments with various shorter tubercles; also with some pulverulent lines or dots, as on the head and thorax. Honey-tubes very short, concolorous with abdomen. Length of body 1.50–1.80^{mm}.

This delicate species is found on the under side of the leaves of *Ulmus americana* Linn., and is easily distinguished from our other species on account of the tubercles of the abdomen.

4. Callipterus betulæcolens (Fitch.).

Aphis betulæcolens Fitch. Cat. Hom. N. Y. St. Cab., p. 66, 1851.
Callipterus betulæcolens Monell. Bull. U. S. Geol. Serv. Terr., Vol. V., p. 29, 1879.

Antennæ much longer than the body, sometimes nearly twice its length; first joint twice as long and large as the second; joints 3–6 white at base, with the apical half black; the seventh twice as long as the sixth, all black; the third joint with a single row of rather large sensoria; III 1.20^{mm}, IV 0.80^{mm}, V 0.65^{mm}, VI 0.30^{mm}, VII 0.70^{mm}; or the average of the smaller species: III 1.00^{mm}, IV 0.50^{mm}. V 0.45^{mm}, VI 0.20^{mm}, VII 0.40^{mm}. Eyes darker than usual in the genus. Beak also somewhat longer than usual, nearly reaching the second pair of coxæ. Legs nearly all black. Wings hyaline, with a rather pale and slender costal and subcostal; the first discoidal black, margined with dusky, and the most conspicuous vein; the other discoidals also slightly margined, as is apparent at least from the smoky patch at the tip of each vein; the stigmal vein often subobsolete for more than one-half of its length; stigma pale, except a smoky patch at each end, about as long again as broad. Honey-tubes concolorous with the abdomen, nearly as long as the tarsi. Length of body 2–2.50^{mm}; to tip of wings 4–4.50^{mm}.

This large species reminds us, in more than one respect, of Nectarophora, and differs somewhat from the typical Callipterus. It is found here on the under side of the leaves of *Betula papyracia* Ait., and varies considerable both in size and color, being found from a bright yellow to a bluish green. It is evidently distinct, though similar, to the European species found on the same tree.

5. Callipterus bellus (Walsh).

Aphis bella Walsh. Proc. Ent. Soc. Phil., Vol. I, p. 299, 1862.
Callipterus bella Monell. Bull. U. S. Geol. Surv. Terr., Vol. V, No. 1, p. 29, 1879.
Callipterus walshii Monell, l. c.
Myzocallis bella Thomas. Ins. Ill., 8th Rept., p. 106, 1879.

Antennæ not quite as long as the body, pale, with tips of joints 3–6 black; the sensoria of the third joints not very distinct; III 0.45^{mm}, IV 0.30^{mm}, V 0.25^{mm}, VI 0.15^{mm}, VII 0.25^{mm}. Eyes pale red (not black, as Walsh has it). Beak short. Pro-

thorax quite large; thorax with a broad marginal band of black, extending from the eyes to the base of the wings. Wings hyaline, with the costal and subcostal, as well as the space between, of a dark brown or black, including the stigma. A smoky-brown continuation of this band runs through the stigmal cell to the apex of the wing. The discoidals all slender; the stigmal vein short, sharply curved, forming a cell not broader than the stigma, and is altogether within the marginal band. Honey-tubes very short and conspicuous. Length of body about 2^{mm}; to tip of wings 3.50^{mm}.

Found on the under side of the leaves of red oak, *Quercus rubra* Linn. I do not think that *C. walshii* is distinct, though a smaller variety. Dr. Thomas appears not to have seen this species, as his own description of *Myzocallis bella*, which he thinks the same as Walsh's species, is evidently *C. discolor*. The insect is well characterized by the black margin of the head and thorax, and the continuation of this band along the whole length of the wing. It comes nearer to the following genus than any of the other species, and may be considered as connecting the two.

Species described as American, but not yet found in Minnesota are the following:

Callipterus mucidus Fitch, a doubtful species.
Callipterus castaneæ Fitch, on the under side of the leaves of chestnut.
Callipterus punctatus Monell, on the under side of the leaves of *Quercus bicolor*.
Callipterus hyalinus Monell, on the under side of leaves of *Quercus imbricaria*.
Callipterus caryæ Monell, on leaves of walnut, hickory and pecan.
Callipterus quercicola Monell, on oak.
Callipterus trifolii Monell, on clover leaves.

Genus MONELLIA n. g.

Antennæ longer than the body, on no frontal tubercles. Eyes pale red; ocelli present. Beak very short. Thorax low and flat; prothorax nearly as large as thorax proper. Wings held horizontal in repose; venation as in Callipterus. Honey-tubes not obvious. Style short, enlarged at apex.

Small and delicate insects of very pale color and a strongly depressed body. Distinguished from the foregoing genus by the horizontal position of the wings when at rest, and by the much developed prothorax. In habits similar to Drepanosiphum, and like it, the oiviparous female appears always to acquire wings

before producing living young. The genus is named in honor of Mr. Monell, who has done so much towards our knowledge of the Aphididæ of North America, and especially in the genus Callipterus.

1. **Monellia caryella** (Fitch).

Aphis caryella Fitch. Trans. N. Y. St. Agr. Soc., Vol. XIV, or Ins. of N. Y., Vol. I, p. 165, 1855.
Aphis punctatella Fitch. l. c., p. 165.
Aphis maculella Fitch. l. c., p. 166.
Aphis fumipennella Fitch. l. c., p. 166.
Aphis marginella Fitch. l. c., p. 166.
Callipterus caryellus Fitch. Trans. N. Y. St. Agr. Soc., Vol. XVI., or Ins. of N. Y., Vol. II, § 167, 1856.
Callipterus punctatellus Fitch. l. c., § 168.
Callipterus maculellus Fitch. l. c., § 169.
Callipterus fumipennellus Fitch. l. c., § 170.
Callipterus marginellus Fitch. l. c., § 171.

Antennæ longer than the body, the first and second, together with the base of the third, dusky or black, the remaining joints pale at base becoming dusky or black at tip. Sensoria of the third joint all close together on the basal half, which is also somewhat thickened. The relative length of the joints varies considerably in this variable species, but the most constant measurement appears to be: III 0.40^{mm}, IV 0.30^{mm}, V 0.28^{mm}, VI 0.20^{mm}, VI 0.15^{mm}. Beak very short. Eyes bright red. Thorax low and depressed; prothorax very large, as large as the thorax proper, often with a marginal band of black as seen in *Callipterus bellus*. Wings hyaline, iridescent, folded horizontally close to the body in repose. In full colored specimens a band of dark brown or black is often seen along the upper margin of the fore wings, including the costal and subcostal. Stigma short, regularly curved, often subobsolete. Honey-tubes not apparent. Length of body 1.50–2^{mm}; color of body pale yellow or whitish.

This interesting species is found on the under side of the leaves of *Carya amara* Nutt, along the mid-vein; usually but one, or at the most, a few, are found on the same leaf. On being disturbed they are capable of jumping to a considerable distance, a fact, though, not confined to this species, but observed in several of this tribe. The species appears not to have been

observed since it was first described by Dr. Fitch, and much uncertainty has therefore been in regard to its position. I do not hesitate to consider the four species described by Dr. Fitch in connection with his *Aphis caryella*, as only varieties, as often two or three of them are seen on the same leaf, and transitional forms have been observed between most of them. In my list of the Aphididæ of Minnesota, in the fourteenth annual report of the survey, I give *Callipterus caryæ* Monell as a species for Minnesota, based on the observation of a few wingless specimens, which I now do not doubt belong to the one under consideration, and *C. caryæ* should therefore be dropped from the list.

Genus DREPANOSIPHUM Koch, 1887.

Antennæ fixed on frontal tubercles, longer than the body; the setaceous seventh longer or as long as the third; third joint with a single row of rather large sensoria. Eyes bright red. Beak short. Wings long and narrow; marginal cell elongated towards the apex. Honey-tubes moderately long in our species, but much longer in some of the foreign, enlarged towards the base. Style inconspicuous or none.

A well characterized genus, which by some writers has been put in Nectarophora, or near to it; but a more natural position is without doubt in connection with Callipterus, as has been pointed out by Mr. Monell.

1. Drepanosiphum acerifolii (Thomas).

Siphonophora acerifoliæ Thomas. Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 4, 1878.

Drepanosiphum acerifolii Monell. Bull. U. S. Geol. Surv. Terr., Vol. V., No. 1, p. 27, 1879.

Antennæ much longer than the body, pale, with tips of joint 3–6 dusky, third joint with a single row of sensoria on the basal half, slightly raised above the surface; setaceous seventh very long, often much longer than the third; III 0.80^{mm}, IV 0.65^{mm}, V 0.60^{mm}, VI 0.15^{mm}, VII 0.85^{mm}, or sometimes over 1^{mm}. Wings hyaline, with slender veins; veins sometimes slightly dusky along the margins, expanding into a patch at tip; stigma short and broad. Abdomen with several rather large tubercles on the basal segments above, each tipped with a short stiff hair.

Honey-tubes slightly longer than the tarsi, enlarged towards the base. Length of body 1.50–2^{mm}; to tip of wings about 3.50^{mm}.

Found, mostly solitary, on the underside of the leaves of *Acer dasycarpum* Ehrh. A very beautiful species of a light gray color and with longitudinal lines of pure white above, which are often broken into dots.

TRIBE APHIDINI.

Antennæ moderately long, nearly always a little shorter than the body; on no frontal tubercles, or on very inconspicuous ones. Seven-jointed (except in *Mastopoda*); the seventh joint always longer than the sixth. Eyes dark brown or black. Beak moderately long, never very short. Legs moderately long and stout. Abdomen usually short, obtuse or rounded behind. Honey-tubes moderately long, rarely very short or wanting, cylindrical or slightly incrassate in a few cases. Style moderately long, stout, conical, very rarely none.

While the Nectarophorini are characterized by a long and cylindrical body, the Callipterini by a long and flat, the present tribe mostly presents us with a short and compact form. The appendages are nearly always of a moderate length. The presence or absence of frontal tubercules is not sufficient to separate the present tribe from the following, as in fact no one character taken by itself will, as the two tribes run a great deal into each other in this respect.

They are found in large colonies on herbaceous plants or on the leaves of woody plants, and in a few cases also on roots. The following genera are represented in Minnesota:

1 { Antennæ 7-jointed; tarsi normal. - - - - - 2.
  { Antennæ 6-jointed; tarsi atrophied. - - - MASTOPODA.

2 { Honey-tubes clavate. - - - - - SIPHOCORYNE.
  { Honey-tubes cylindrical, rarely incrassate or none. - - 3.

3 { Body long and somewhat depressed; honey-tubes short, not longer than style. - - - - - - - HYALOPTERUS.
  { Body short and thick; honey-tubes moderately long, nearly always longer than style. - - - - - - - - APHIS.

Genus HYALOPTERUS Koch.

Antennæ about as long as the body; the seventh joint about as long as the third. Sensoria small and irregularly disposed. Beak short. Eyes dark red. Wings hyaline, with slender veins. Honey-tubes short and narrow, not longer than the style.

The genus is difficult to define, as it stands too close to Aphis, but it partakes of the foregoing tribe in the long and somewhat depressed form of the body, and in a short beak. It can be considered as connecting the Callipterini with the Aphidini.

1. Hyalopterus arundinis (Fab.).

Aphis arundinis Fab.
Hyalopterus arundinis Koch.
Aphis phragmitidicola Oestl. List Aph. Minn., p. 44, 1886.

Antennæ nearly as long as the body, dusky except at base; seventh joint as long as the third, imbricated; III 0.40^{mm}, IV 0.25^{mm}, V 0.20^{mm}, VI 0.10^{mm}, VII 0.40^{mm}; third and fourth joints with numerous small sensoria, grouped irregularly on the under side. Beak short and thick, not reaching second pair of coxæ. Thorax black or blackish. Wings very hyaline, slightly iridescent; stigma long and narrow, slightly dusky. Abdomen long and narrow, tapering behind, pale green. Honey-tubes short, not longer than style, narrow, situated rather far up on the abdomen. Style about as long as the tarsi, cylindrical, slightly curved upwards.

The species is found in small colonies on the leaves of *Phragmitis communis* Linn. The individuals are all more or less covered with a whitish powder, and live closely appressed to the leaf on which they feed.

Genus MASTOPODA Oestlund, 1886.

Antennæ about as long as the body, six-jointed, the third and setaceous sixth being the longest, on no frontal tubercles. Eyes dark red. Beak moderately long. Wings as in Aphis. Legs moderately long, with the tarsi and claws atrophied. The tibiæ are truncate at tip, and furnished with a membrane, the structure of which seems to be similar to that of the Diptera, as they are able to walk with ease not only on the perpendicular,

but also on the under surface of a horizontal glass plate. The upper side of the tibial tip is furnished with a small tubercle, which probably represent the claws.

The genus is anomalous in several respects, but in general appearance and habit comes nearest to Aphis, and will therefore, I think, fall into the present tribe.

1. **Mastopoda pteridis** Oestl.

Mastopoda pteridis Oestl. List Minn. Aphid., p. 53, 1886.

Antennæ about as long as the body, black; III 0.55^{mm}, IV 0.20^{mm}, V 0.10^{mm}, VI 0.80^{mm}. Beak reaching second pair of coxæ. Wings with black and well defined veins; venation sometimes quite variable. Legs pale, with dusky or black tips; tibiæ quite long with a truncate and somewhat enlarged tip ending with a membranous structure, with true tarsi and claws wanting. Abdomen pale green or yellowish, with some dusky markings above. Honey-tubes rather long (0.40^{mm}), cylindrical, black. Style very short, conical and hairy as in Aphis. Length of body 1.60^{mm}, to tip of wings 2.90^{mm}.

The full grown larva, or apterous form, pale yellow, with a reddish yellow thorax, and abdomen above with tortoise-shelled dusky markings. Young larva uniformly pale yellow. Found on the under side of the fronds of *Pteris aquilina* Linn., in large colonies. They have been found only in one place although the fern is common all along the river, and appears to be a local and rare species.

Genus APHIS Linn. 1748.

Antennæ on no frontal tubercles, or on very inconspicuous ones, usually a little shorter than the body. Eyes dark red or black. Beak moderately long, never reaching abdomen except in *A. cardui.* Wings rather short and broad, deflexed in repose; venation typical. Legs moderately long, stout. Abdomen short and broad, rounded or obtuse behind. Honey-tubes of moderate length, cylindrical, or sometimes slightly incrassate, very rarely wanting. Style more or less prominent, short, thick, conical.

The most extensive genus of the family, and the species difficult to distinguish on account of their great similarity to each other. The following synoptical tables are affixed for determining the species, but which are not expected to be more than

temporary, being more or less artificial. It is still hoped that this first attempt to arrange our American species of this extensive genus in their natural order will be of some service, if not a basis for future work.

It may be convenient to recognize the following groups:

1 { Forming a pseudogall by the twisting or curling of the leaves. - - - - - - - - - APHIS PEMPHIGINI.
{ Living unprotected on the food plant. - - - - - 2.

2 { Last joint of the antennæ shorter than the third. - APHIS GENUINI.
{ Last joint longer than the third. - - APHIS NECTAROPHORINI.

A. Aphis pemphigini.

SYNOPTICAL TABLE OF THE SPECIES.

1 { Prothorax with a lateral tubercle. - - - - - 3.
{ Prothorax with no tubercle. - - - - - - - 2.

2 { Beak long, reaching third pair of coxæ; honey-tubes long. - - - - - - - - - A. SYMPHORICARPI.
{ Beak shorter; honey-tubes short. - - A. HELIANTHI.

3 { Beak long, reaching third pair of coxæ. - A. CRATÆGIFOLIÆ.
{ Beak moderately long. - - - - - - - 4.

4 { Size small, dark red. - - - - A. CORNIFOLIÆ.
{ Size larger, green or brown. - - - - - - - 5.

5 { Legs white or pale. - - - - - A. ALBIPES.
{ Legs greenish or black. - - - - A. CERASIFOLIÆ.

1. Aphis symphoricarpi Thomas.

Aphis symphoricarpi Thomas. Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 12, 1878 (in part).

Antennæ a little shorter than the body; third and fourth joint much thickened, and sometimes almost united, with numerous irregular round or oblong sensoria; III 0.25mm, IV 0.25mm, V 0.22mm, VI 0.12mm, VII 0.35mm. Beak long, 0.75mm. Eyes dark brown. Wings with rather prominent blackish veins; stigma broad. Legs black, with only base of femur and tibia pale. Abdomen green, with marginal patches of black above the honey-tubes, and more or less transverse bands between the honey-tubes. Honey-tubes black, cylindrical, hardly

twice the tarsi in length (0.25mm). Style very short and blunt, concolorous with abdomen. Length of body 2.30mm; to tip of wings 3.50mm.

Found on the leaves of *Symphoricarpus vulgaris*, at the end of branches, causing them to curl.

2. Aphis cratægifoliæ Fitch.

Aphis cratægifoliæ Fitch. Cat. Hom. N. Y. St. Cab., p. 66, 1851.

Antennæ somewhat shorter than the body, black; joints III—VI with numerous irregularly disposed sensoria, especially on the third, which becomes somewhat thickened and very uneven; III 0.40mm, IV 0.25mm, V 0.18mm, VI 0.10mm, VII 0.35mm; or, in smaller specimens, somewhat less. Beak long, reaching third pair of coxæ (0.70mm). Thorax all black, smooth; membrane often pale. Wings hyaline with slender brownish veins; stigma long and narrow, pointed in front, slightly dusky. Legs pale, with tips of the joints black. Abdomen greenish, or greenish-brown, with a marginal row of black patches. Honey-tubes concolorous with abdomen, about twice the length of the tarsi. Length of body 1.80–2.30mm; to tip of wings 3.50–4mm.

Found on the leaves of *Cratægus*, corrugating them. Specimens taken during May on *Cratægus tomentosa* Linn. were found to curl the leaves very much, and as they turned dark brown or red they became very conspicuous. What is apparently the same species was again taken during October on several species of *Cratægus*, but not causing the leaves to curl, or very slightly so. Our species should be compared with the several European ones found on the same tree.

3. Aphis cerasifoliæ Fitch.

Aphis cerasifoliæ Fitch. Ins. of N. Y., I., p. 131, 1855.

Antennæ nearly as long as the body; III 0.40mm, IV 0.25mm, V 0.25mm, VI 0.12mm, VII 0.45mm; third joint with a moderate number of sensoria, round, and disposed nearly in a straight row. Beak moderately long, not reaching second pair of coxæ (0.35mm). Thorax black, with membrane greenish. Wings with slender brownish veins; stigma long and pointed in front, slightly if at all dusky. Second fork much nearer the apex of the wing than to the base of the first fork. Abdomen pale green, with marginal dots or patches of darker color; a medial

and also transverse line of deeper green. Honey-tubes about twice the tarsi in length (0.25^{mm}), concolorous with abdomen, becoming dusky at apex. Length of body 2^{mm}; to tip of wings 3.50–4^{mm}.

A common species, found on the leaves of *Prunus virginiana* Linn. Their presence is usually quite conspicuous by the bunch of deformed leaves on top of the branch where they are found. The apterous form, at least, is thickly covered with whitish powder, and a great amount of liquid globules is often found among them, as is so often seen in *Schizoneura americana.*

4. Aphis albipes n. sp.

Antennæ nearly as long as the body, becoming black in winged form, but quite pale or white with only tips of the apical joints dusky in the apterous form, smooth, or nearly so; III 0.50^{mm}, IV 0.40^{mm}, V 0.30^{mm}, VI 0.15^{mm}, VII 0.45^{mm}. Beak not more than reaching secoud pair of coxæ (0.35^{mm}). Thorax black, membrane brownish. Legs very pale or white, with only tips of the joints, together with the tarsi, dusky. Wings hyaline, with slender veins; stigma rather long and somewhat pointed in front. Abdomen brown, with transverse bands of black; ventral reddish-brown. The larvæ are all of a reddish-brown color, with a white transverse dash on either side of the abdomen, and a larger one nearly between the honey-tubes. Honey-tubes short (0.15^{mm}), cylindrical, or slightly narrowed at base. Style nearly as long as the honey-tubes, very pale or white. Length of body 2.30^{mm}; to tip of wings 4^{mm}.

Found on the under side of the leaves of *Symphoricarpus vulgaris* Linn., together and often in company with the previous species described from the same plant.

5. Aphis helianthi Monell.

Aphis helianthi Monell. Bull. U. S. Geol. Surv. Terr., Vol. V, p. 26, 1879.

Antennæ two-thirds as long as the body, black; joints 3–5, with numerous round sensoria of various sizes; III 0.30^{mm}, IV 0.15^{mm}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.20^{mm}. Beak variable in length, in some not more than reaching the second pair of coxæ, while in others it was found to reach beyond the third pair. Head and thorax all black. Wings hyaline; stigma short and

broad. Abdomen short and broad, dark green in color, with transverse bands of black above, and a marginal row of impressed dots. Honey-tubes short, hardly longer than the tarsi (0.10^{mm}). Style about as long as the honey-tubes. Length of body 1.50^{mm}; to tip of wings 2.50–3^{mm}.

Found on the leaves and stem of *Helianthus*, corrugating the leaves.

6. Aphis cornifoliæ Fitch.

Aphis cornifoliæ Fitch. Cat. Hom. N. Y. St. Cab., p. 65, 1851.

Antennæ about as long as the body, more or less dusky; joints 3–5 with numerous small, round sensoria; III 0.30^{mm}, IV 0.20^{mm}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.25^{mm}, from which it varies more or less. Head and thorax dusky black; prothorax with a very distinct lateral tubercle. Legs pale yellow, with tips of tibia and the tarsi black. Wings hyaline, with slender slightly dusky veins. Abdomen short and broad behind, dark brown. Honey-tubes short, cylindrical, scarcely longer than the tarsi. Style short, dusky. Length of body about 1.20^{mm}; to tip of wings 2.25^{mm}.

This small species is found on the under side of the leaves of several species of *Cornus* or dog-wood, corrugating them when numerous.

B. Aphis genuini.

SYNOPSIS OF THE SPECIES.

1	Subterranean in habit.	2.
	Aerial in habit.	3.
2	Color leaden-gray or pale.	A. MIDDLETONII.
	Color pale red or pinkish.	A. TRIFOLII.
3	Honey-tubes not obvious.	A. LONICERÆ.
	Honey-tubes obvious.	4.
4	Honey-tubes slightly incrassate.	5.
	Honey tubes cylindrical.	6.
5	Stigmal vein regularly curved its whole length; second branch of the cubital arising midway between the base and the apex.	A. MARUTÆ.
	Stigmal vein only curved at base, then running straight to the apex; second branch arising near the apex.	A. MAIDIS.
6	Honey-tubes short, not longer than tarsi.	7.
	Honey-tubes longer than tarsi.	9.

7 { Style conical, acute at tip. - - - - A. BRASSICÆ.
Style obtuse at tip. - - - - - - - 8.

8 { Sensoria numerous, irregular; honey-tubes greenish. A. MIMULI.
Sensoria few, in a single row; honey-tubes dusky or black. A. MONARDÆ.

9 { Honey-tubes from one and a half to twice the length of the tarsi. 10.
Honey-tubes more than twice the length of the tarsi. - - 15.

10 { Joints IV and V of antennæ longer than III. - A. THASPII.
Joints IV and V less than III. - - - - - 11.

11 { Stigma very black and conspicuous ; abdomen of a deep black. -
- - - - - - - - A. NEILLIÆ.
Stigma at most only smoky; abdomen more or less green. - 12.

12 { Joint III alone with sensoria. - - - - - 13.
Joints 3–5 with sensoria. - - - - A. CARDUELLA.

13 { Joint III with a single row of rather large sensoria. A. RUBICOLA.
Joint III with numerous irregularly placed sensoria. - - 14.

14 { Style long, body yellowish-green. - - - A. EUPATORII.
Style short, body greenish. - - - A. ASCLEPIADIS.

15 { Abdomen of winged form with spots or patches of white flocculent matter above. - - - - - - A. MACULATÆ.
Abdomen with no flocculent matter. - - - - 16.

16 { Second branch of the cubital very near to the apex of the wing. -
- - - - - - - - A. SALICICOLA.
Second branch from midway between the apex and the base. - 17.

17 { Color black, or at least not green. - - - - 18.
Body with at least abdomen green. - - - - 20.

18 { Beak reaching second pair of coxæ; sensoria all small. A. APARINES.
Beak reaching third pair of coxæ; sensoria irregular in size. - 19.

19 { Sensoria present on the fourth, in a single row; larvæ black. A. RUMICIS.
Usually no sensoria on the fourth; larvæ yellowish. A. OXYBAPHI.

20 { Honey-tubes twice the tarsi in length; sensoria on III only. A. RIPARIÆ.
Honey-tubes three times the tarsi in length; sensoria on III and IV.
- - - - - - - - - A. OENOTHERÆ.

8. Aphis middletonii Thos.

Aphis middletonii Thomas. Ins. Ill., 8th Rept., p. 99, 1879.

Apterous form: The color of a full grown specimen is leaden gray, with head more or less dusky; abdomen with marginal spots and also commonly some transverse bands of black. Eyes as usual in Aphis. Antennæ short, about one-third or not more than one-half the length of the body, dusky except at base; III

0.18mm, IV 0.10mm, V 0.08mm, VI 0.08mm, VII 0.15mm. Beak rather long, reaching third pair of coxæ (0.50mm). Legs more or less dusky. Honey-tubes short (0.15mm), slightly thickest at base. Style short, conical, hairy. Anal plates dusky or black. Length of body 1.50–1.75mm.

This peculiar species is found very plentiful on the roots of *Erigeron canadensis*, and more rarely on *Ambrosia trifida*. Dr. Thomas gives several other plants on the roots of which it is found. Winged specimens have never been taken. Young specimens are all more or less pulverulent.*

9. Aphis trifolii n. sp.

Specimens of another subterraneous species, as found on the roots of *Trifolium repens* Linn., was brought to my notice lately, but I only made some general notes at the time and have not since succeeded in finding it, and can therefore not give a full description. It can be recognized by its pale red or pinkish color, in size much smaller than the preceeding, with which it in other respects is quite similar.

10. Aphis loniceræ Monell.

Aphis loniceræ Monell. Bull. Geol. Surv. Terr., Vol. V., p. 26, 1879.

Chaitophorus lonicera Thomas. Ins. Ill., 8th Rept., p. 104, 1879.

"*Winged individuals:* Green, often with two darker longitudinal stripes. Head and thorax brownish. Antennæ about as long as the body; frontal tubercles short, but distinct; apical joint filiform, as long as the two preceding taken together. Rostrum reaching below the second pair of coxæ. Wings hyaline; stigma rather long. Nectaries scarcely projecting above the surface of the abdomen. Lateral edges of the abdomen with four or five very short, green, mammiform tubercles. Style not perceptible. Length 2.54mm; to tip of wings 4.57mm." (Monell).

*Since writing the above winged specimens have been taken during the latter part of September, like the apterous also feeding on the roots near the surface of the ground. Antennæ about half the length of the body; third joint with several rather large sensoria arranged in almost a regular row. Ocelli present but small, the two lateral ones close to the compound eyes. Beak reaching second pair of coxæ. Head and throax black; abdomen dull green as in apterous, with a lateral row of dusky spots, and more or less pulverulent. Wings as usual in the genus. Honey-tubes short, about as long as the tarsi, cylindrical.

Eggs were observed scattered among the apterous form during the same time. These appear, therefore, to be laid on the roots also, and are probably further taken care of by the ants, which were always found to attend this species.

A peculiar species, found on the wild honeysuckle or *Lonicera glauca* Hill. I have seen only the wingless form, which are very pulverulent, and exude an abundant liquid secretion that, dropping on the leaves and surrounding objects, soon hardens into a white gummy substance. Antennæ nearly as long as the body, pale, slightly hairy; III 0.75^{mm}, IV 0.50^{mm}, V 0.40^{mm}, VI 0.15^{mm}, VII 0.50^{mm}. Beak reaching beyond second pair of coxæ (0.50^{mm}). Legs long, pale; tarsi rather long, with strong claws. Length of body nearly 3^{mm} in full grown specimens.

This species departs somewhat from a typical *Aphis*, but at present may as well be taken in connection with this genus.

11. **Aphis maidis** Fitch.

Aphis maidis Fitch. Ins. N. Y., I., p. 318, 1856.

Antennæ about two-thirds as long as the body, black; third and fourth joints with several round sensoria; III 0.30^{mm}, IV 0.15^{mm}, V 0.12^{mm}, VI 0.10^{mm}, VII 0.20^{mm}, but the length varies considerable in specimens of different size. Beak short (0.20^{mm}). Wings hyaline, with slender veins; stigma long and pointed stigmal vein curved for half of its length, then running almost straight to the apex of the wing. Second branch of the cubital near to the apex. Head and thorax black; abdomen greenish, with some black markings above. Honey-tubes short (0.12^{mm}), slightly incrassate, being widest in the middle. Style short, not more than one-half the length of the honey-tubes. Length of body 1.20^{mm}.

This species is found on all parts of the corn, often proving quite destructive when appearing in great numbers. Of late considerable attention has been given to this species, as well as others found on corn, by the state entomologist of Illinois, as found in the reports of that state. Prof. Forbes is evidently in error in considering *A. maidis* as more properly belonging to Rhopalosiphum on account of the incrassate honey-tubes. It is in all respect an Aphis.

12. Aphis marutæ Oestl.

Aphis marutæ Oestlund. Geol. Surv. Minn., 14th Rept., p. 40, 1886.

Antennæ similar to *Aphis maidis;* third joint strongly tuberculate. Beak reaching beyond second pair of coxæ (0.40^{mm}). Head and thorax shining black; prothorax with no lateral tubercle, membrane greenish. Wings with more robust veins than *A. maidis;* stigmal vein shorter, and curved its whole length; second branch of the cubital midway between the base of the first branch and the apex of the wing. Abdomen pale green, with a marginal row of black spots, and a large subquadrate patch above. Honey-tubes and style much as in the preceding species. Length of body 1.50^{mm}.

Found on *Maruta cotula* DC., or common mayweed, as growing in shaded and protected places. Similar to *Aphis maidis* in several respects, but of a much brighter green.

13. Aphis brassicæ Linn.

Aphis brassicæ Linn. Syst. Nat. II., 734.

Antennæ nearly as long as the body, dusky; third joint alone with sensoria, numerous and irregular in size; III 0.55^{mm}, IV 0.25^{mm}, V 0.25^{mm}, VI 0.10^{mm}, VII 0.40^{mm}. Beak reaching second pair of coxæ. Thorax black, with membrane of prothorax pale. Wings hyaline, with slender but distinct brownish veins. Abdomen of a dirty green or yellowish-green, pulverulent, with a marginal row of spots and transverse bands of black. Honey-tubes short and small, not longer than tarsi (0.10^{mm}); more or less dusky. Style about as long as the honey-tubes, very acute at apex. Length of body 2^{mm}.

Found not only on cultivated cabbage, to which it becomes quite destructive at times, but also often on the wild mustard, *Senapis nigra* Linn. This species is more or less pulverulent.

14. Aphis mimuli n. sp.

Antennæ a little more than one-half the body in length; joints 3–5, with numerous sensoria of varying size; III 0.25^{mm}, IV 0.15^{mm}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.20^{mm}. Beak reaching third pair of coxæ. Thorax all black. Wings thin, with slender brownish veins; stigma narrow, pointed in front; second

branch of the cubital nearer the margin than the origin of the first branch. Abdomen pale green, with no dusky markings, or only a longitudinal middle line of deeper green. Honey-tubes very short, not longer than tarsi (0.10^{mm}), concolorous with abdomen. Style about as long as the honey-tubes, conical, and obtuse at apex. Length of body 1.30^{mm}.

A small pale greenish species living on *Mimulus jamesii*, growing in damp places along the river. In size and form of the honey-tubes it comes nearest to *A. brassicæ*, but is a much smaller species, and not at all pulverulent.

15. Aphis monardæ n. sp.

Antennæ nearly as long as the body; the sensoria large, all of nearly the same size, and disposed in a single row, about six to the third joint, and two or three to the fourth; III 0.25^{mm}, IV 0.13^{mm}, V 0.12^{mm}, VI 0.08^{mm}, VII 0.20^{mm}. Beak reaching third pair of coxæ. Thorax of a deep black, prothorax with a lateral tubercle. Wings very much as in preceding species. Abdomen greenish, with much mottling of black above. Honey-tubes slightly longer than tarsi (about 0.10^{mm}), black. Style about as long as tarsi. Length of body 1.10^{mm}; to tip of wings 2.10^{mm}.

Larvæ varies from a pale green to almost black.

Found on the under side of the leaves of *Monarda fistulosa*. Distinguished from the preceding species by its smaller size, darker colors, and large sensoria of the antennæ.

16. Aphis thaspii n. sp.

Antennæ about two-thirds as long as the body; third joint with numerous sensoria, the fourth at most with only a few; joints 4–7 imbricated; III 0.40^{mm}, IV 0.17^{m}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.28^{mm}. Beak reaching second pair of coxæ, or slightly beyond (0.35^{mm}). Head and thorax all black, with membrane sometimes paler. Abdomen of a dusky green, sometimes almost black. Wings with slender veins; stigma long and pointed in front, slightly dusky. Honey-tubes about twice the tarsi in length (0.20). Style about as long as the tarsi, obtuse. Length of body 1.50–2^{mm}; to tip of wings 3–3.50^{mm}.

Found on the umbels of *Thaspium aureum*, nearly always accompanied by ants.

17. Aphis neilliæ n. sp.

Antennæ two-thirds as long as the body, dusky; joints 3–6 with numerous sensoria, and very tuberculate; III 0.40mm, IV 0.25mm, V 0.20mm, VI 0.10mm, VII 0.25mm. Beak moderately long (0.40mm). Thorax all black; prothorax with a lateral tubercle. Legs black, but with the femora more or less pale. Wings hyaline, with thin veins; stigma short and broad, all black. Abdomen of nearly uniform black, but not shining as the black of the thorax. Honey-tubes black, cylindrical, or somewhat thicker at base, about twice the tarsi in length. Style short, black, obtuse. Length of body 1.80mm; to tip of wings 3.50mm.

Found on the under side of the leaves of *Neillia opulifolia* Linn. Well characterized by the short and broad stigma, very black in comparison with the otherwise hyaline wings.

18. Aphis eupatorii Oestl.

Aphis eupatorii Oestlund. Geol. Surv. Minn., 14th Rept., p. 39, 1886.

Antennæ two-thirds as long as the body; third joint above with distinct sensoria, which are numerous, and the joints much tuberculate; III 0.35mm; IV 0.20mm, V 0.15mm, VI 0.10mm, VII 0.25mm. Beak rather long, reaching third pair of coxæ (0.50mm). Head and thorax black; prothorax with membrane greenish, also with a distinct tubercle. Wings hyaline, with slender veins; stigma elongate, hardly dusky. Abdomen greenish-yellow, with a marginal row of spots, and last segments more or less dusky above. Honey-tubes about one and a-half times the tarsi in length (0.20mm), of the same color with the abdomen, or but slightly dusky. Style as long as the honey-tubes, concolorous with the abdomen. Length of body 1.70–2mm; to tip of wings 3–3.50mm.

Found on the flower stalks of *Eupatorium perfoliatum* Linn.

19. Aphis carduella Walsh.

Aphis carduella Walsh. Proc. Ent. Soc. Phil., Vol. I., p. 300, 1862.

Antennæ somewhat shorter than the body; joints 3–6 with numerous mostly small sensoria; III 0.30mm, IV 0.20mm, V 0.15mm, VI 0.10mm, VII 0.20mm. Beak reaching third pair of coxæ (0.40mm). Head and thorax of a dull black; prothorax

with a lateral tubercle. Wings with very slender veins; costal yellowish; stigma slightly dusky, about as long again as broad. Abdomen of a dull green, with a marginal row of black spots. Honey-tubes about half as long again as the tarsi (0.15mm). Style slightly shorter. Length of body 1.25mm; to tip of wings 3mm.

Found rather common on several species of *Circium*, or thistle.

20. Aphis asclepiadis Fitch.

Aphis asclepiadis Fitch. Cat. Hom. N. Y. St. Cab., p 65, 1851.
Siphonophora asclepiadis Thomas. Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 7, 1878.

Antennæ two-thirds as long as the body, third joint with numerous irregularly placed sensoria; III 0.35mm, IV 0.18mm, V 0.15mm, VI 0.10mm, VII 0.25mm. Beak nearly reaching third pair of coxæ. Head and thorax shining black; prothorax with a lateral tubercle, membrane greenish. Wings hyaline, with very slender veins; stigma elongate, grayish. Abdomen pale green, with a marginal row of impressed black dots, also some black above on the last segments. Honey-tubes about twice the tarsi (0.20mm). Style not more than one-half the honey-tubes. Length of body 1.50mm; to tip of wings 3–3.10mm.

A rather common species, especially on *Asclepias cornuti*, but also found on *Euphorbia* and *Apocyne*. What I quote as *Aphis apocyni* in my list of the Aphididæ of Minnesota, on the authority of Dr. Thomas, I consider now to be the same as *Aphis asclepiadis*.

21. Aphis rubicola n. sp.

Antennæ nearly as long as the body; joint 3 with only a few (3–6) very large sensoria in a single row; III 0.18mm, IV 0.12mm, V 0.10mm, VI 0.08mm, VII 0.22mm. Head and thorax shining black; membrane of prothorax greenish. Wings with slender, brownish veins; stigma elongate. Abdomen greenish. Honey-tubes concolorous with abdomen, twice the tarsi in length (0.15mm). Style half as long as the honey-tubes, pale, hairy. Length of body 0.75–1mm; to tip of wings 2mm.

This is one of our smallest Aphis, found on the under side of the leaves of *Rubus strigosus* Mx. Should be easily recognized from our other species on account of its small size and simple sensoria.

22. Aphis maculatæ n. sp.

Antennæ about two-thirds as long as the body, slightly pubescent with spreading hairs; third joint with numerous distinct sensoria; III 0.40mm, IV 0.20mm, V 0.20mm, VI 0.12mm, VII 0.35mm. Beak nearly reaching third pair of coxæ (0.50mm). Thorax of a deep black; prothorax with a large and distinct lateral tubercle. Wings hyaline, with slender, brownish veins; stigma elongate, smoky; second branch of the cubital nearer to the margin than the origin of the first branch. Abdomen blackish, with tubercle to the segments along each side; dorsum with patches of a pure white flocculent matter, disposed somewhat in rows, ventral uniformly pulverulent. Honey-tubes about three times the tarsi in length (0.30mm), dusky. Style about as long as the tarsi, hairy. Length of body 2mm; to tip of wings 4mm.

A species found early in the season on dog-wood (*Cornus*), on the under side of the leaves. Very characteristic on account of the white flocculent patches of the abdomen, found both in the winged and wingless form. The antennæ in the long and spreading hairs comes nearer to the hirsute character of Chaitophorus than any other Aphis with which I am acquainted.

23. Aphis rumicis Linn.

Aphis rumicis Linn. Syst. Nat., II., 734.

Antennæ two-thirds as long as the body; third joint with numerous irregular sensoria, fourth commonly with a few rather large ones in a single row; III 0.40mm, IV 0.30mm, V 0.25mm, VI 0.12mm, VII 0.35mm; last joint varies considerable, sometimes even as long as the third. Beak about 0.50mm long. Thorax all black, shining; prothorax with a lateral tubercle. Legs mostly with pale or whitish tibiæ. Wings pellucid, with very slender veins; stigma elongate, grayish. Abdomen black or blackish. Honey-tubes black, somewhat more than twice the tarsi in length (0.25mm). Style half as long as the honey-tubes.

One of our most common species, found on a great number of different plants, but more often on *Chenopodium* and *Rumex*. The synonyms of this species are very numerous, some authors giving as many as twenty, but from the scanty descriptions of the older entomologists, especially in Aphis, it becomes very difficult to say which are synonyms and which are not. The whole subject needs a careful revision.

24. Aphis oxybaphi n. sp.

Antennæ a little shorter than the body, black; joint three with numerous small round sensoria; transition from the sixth to the seventh abrupt; III 0.30mm, IV 0.25mm, V 0.23mm, VI 0.15mm, VII 0.25mm. Beak about 0.50mm long. Prothorax with a lateral tubercle. Wings hyaline; stigma long and narrow, pointed in front; second branch of cubital nearer the apex than the base of the first branch. Wings yellowish at base. Legs with black femora except first pair; all the tibiæ pale, but with black tarsi. Abdomen of a uniform pale reddish-brown, with a marginal row of black patches. Honey-tubes hardly longer than the tarsi in the winged male, but much longer in the female and in the wingless form; cylindrical, black. Style short and stout, conical. Length of body 1.50–1.80mm. The larvæ are much paler, almost of a lemon-yellow, with some mottlings of darker color on the dorsum of the abdomen.

Found on the stems and leaves of *Oxybaphus angustifolius.*

25. Aphis aparines Fab.

Antennæ about as long as the body, on moderately developed frontal tubercles, which are slightly gibbous on the inner side; sensoria small and irregularly placed on joints 3–5; III 0.30mm, IV 0.25mm, V 0.15mm, VI 0.10mm, VII 0.30mm. Beak reaching second coxæ (0.35mm). Prothorax with no lateral tubercle, shining black. Stigma elongate, slightly dusky. Abdomen black. Honey-tubes about twice the length of the tarsi (0.25mm), cylindrical, black. Length of body 1.40mm; to tip of wings 2.80mm.

Found on *Galium aparine* Linn.

26. Aphis œnotheræ n. sp.

Antennæ shorter than the body, black, or only base of third joint pale; joints 3–5 with a moderate number of rather small sensoria; III 0.25mm, IV 0.18mm, V 0.15mm, VI 0.10mm, VII 0.25mm. Beak moderately long. Thorax of a deep dull black; prothorax with a tubercle, membrane greenish. Abdomen bright green, with a marginal row of black spots. Honey-tubes about three times the tarsi (0.30mm). Style about half as long as the honey-tubes, cylindrical, very acute at tip, dusky or black. Length of body 1.50mm; to tip of wings 3mm. Larvæ pale green.

Found among the seed-pods and upper stems of *Œnothera*. This as well as the foregoing species shows some affinities to the next tribe.

27. Aphis ripariæ Oestl.

Aphis ripariæ Oestl. Geol. Surv. of Minn., 14th Rept., p. 41, 1886.

Antennæ about as long as the body, black, except base of third joint; third joint with numerous small sensoria, seventh nearly as long as the third. Beak reaching second coxæ. Thorax dull black; prothorax with a lateral tubercle. Second branch of the cubital nearer to the apex of the wing than the base of the first branch. Honey-tubes about twice the length of the tarsi. Style about as long as the tarsi, cylindrical, obtuse at apex. Length of body 2^{mm}.

Found on the under side of the leaves of *Vitis riparia* Mx.

28. Aphis salicicola (Thos.).

Siphonophora salicicola Thos. Bull. Ill. St. Lab. Nat. Hist., 2, p. 8, 1878.

Aphis salicicola Monell. Bull. U. S. Geol. Surv. Terr., Vol. V, No. 1, p. 24, 1879.

Antennæ shorter than the body; third joint with a single row of rather small sensoria; III 0.30^{mm}, IV 0.15^{mm}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.25^{mm}. Beak reaching third coxæ. Thorax all black; prothorax with a lateral tubercle. Wings hyaline, with slender, brownish veins; second branch of cubital vein very near to the apex of the wing. Abdomen dark green, with more or less black above. Honey-tubes about three times the tarsi in length, or somewhat more, pale green, becoming dusky at tip, cylindrical, but slightly widest at base. Style long and Nectarophora-like, about one-third the honey-tubes in length, slightly curved and thickest in the middle. Length of body 1.50^{mm}; to tip of wings 3.30^{mm}.

Found on the under side of the leaves of *Salix discolor*. This species also shows strong affinities to Nectarophora, but is undoubtedly best taken in connection with Aphis, as has been done by Mr. Monell.

C. Aphis nectarophorini.

SYNOPSIS OF THE SPECIES.

1	Seventh joint less than twice the third in length.	2.
	Seventh at least twice as long as the third.	9.
2	Honey-tubes short, about twice the tarsi in length.	3.
	Honey-tubes longer.	4.
3	Antennæ not as long as the body.	A. MALI.
	Antennæ as long as body.	A. PRUNIFOLIÆ.
4	Honey-tubes knobbed at apex.	A. FRIGIDÆ.
	Honey-tubes not knobbed.	5.
5	Beak reaching abdomen.	A. CARDUI.
	Beak not reaching abdomen.	6.
6	Beak very short, not reaching second coxæ.	A. ADIANTI.
	Beak longer.	7.
7	Prothorax with no lateral tubercle.	A. ANNUÆ.
	Prothorax with a tubercle.	8.
8	Second branch of cubital near apex of wing.	A. FRONDOSÆ.
	Second branch midway.	A. POLANISIÆ.
9	Antennæ longer than body.	A. SETARIÆ.
	Antennæ shorter.	10.
10	Abdomen of uniform color, pale brown.	A. SPIRÆÆ.
	Abdomen yellowish, with a dorsal patch of black.	A. AGERATOIDES.

29. Aphis mali Fab.

Antennæ shorter than the body, black; III 0.28^{mm}, IV 0.15^{mm}, V 0.15^{mm}, VI 0.08^{mm}, VII 0.40^{mm}. Head and thorax black, with membrane of prothorax usually green. Wings rather long, hyaline; second branch of the cubital rather near to the apex. Legs pale, with black joints and tarsi. Abdomen green, with a row of black dots on each side. Honey-tubes about twice the tarsi in length, more or less dusky.

Found rather plentiful throughout the season on the common apple, the crab-apple, as well as the mountain ash. They are found mostly on the leaves, but when very numerous also on the tender twigs. Dr. Fitch's *Aphis malifoliæ* appears to be but a variety.

30. Aphis prunifoliæ Fitch.

Aphis prunifoliæ Fitch. Ins. N. Y., I, p. 122. Trans. N. Y. St. Ag. Soc., Vol. XIV, p. 826, 1855.

Antennæ as long as the body. Head and thorax shining black; abdomen pale green, with a marginal row of dots. Honey-tubes cylindrical, reaching to the tip of the abdomen.

A species very similar to the foregoing found on the plum tree. Our species appears to be distinct from the European *A. pruni*, but should be further compared. I have observed the species but once in Minnesota, and at the time only took some general notes. Thomas and Saunders consider it identical with the European, while Monell and Osborn give it as above.

31. Aphis frigidæ Oestl.

Aphis frigidæ Oestl. Geol. Surv. Minn., 14th Rept., p. 46, 1886.

Antennæ a little shorter than the body; III 0.25^{mm}, IV 0.15^{mm}, V 0.15^{mm}, VI 0.10^{mm}, VII 0.35^{mm}. Beak reaching third coxæ. Thorax black. Wings hyaline, with black and rather prominent veins; second branch of cubital nearer the apex than base of the first branch. Abdomen longer than broad, rather acute behind. Honey-tubes long and slender, cylindrical, being enlarged and round at tip, as if ending with a knob, about 0.40^{mm}. Style short and conical, concolorous with abdomen. Length of body 1.30^{mm}.

A very peculiar species, found occasionally together with Nectarophora frigidæ on *Artemisia frigida*. It is a small active species, of grayish color from the pulverulent body, found mostly on top of the branches above a colony of the above named Nectarophora.

32. Aphis cardui Linn.

Antennæ black, nearly as long as the body; third joint with numerous sensoria; III 0.45^{mm}, IV 0.30^{mm}, V 0.20^{mm}, VI 0.10^{mm}, VII 0.55^{mm}. Beak very long, reaching beyond third coxæ. Thorax shining black; membrane of prothorax yellowish. Wings hyaline, slightly iridescent; stigma rather broad. Legs pale brown, with tips of joints black. Abdomen brownish or greenish-brown, with a marginal row of black spots, usually with a large quadrate patch of black above; ventral pale greenish-

brown. Honey-tubes cylindrical, somewhat enlarged at base, about 0.30^{mm} long, black. Style short, conical, concolorous with abdomen. Length of body 2^{mm}; to tip of wings 3.50^{mm}.

Found on *Circium lanceolatum*. Has the beak longer than any other Aphis with which I am acquainted. The color varies a great deal, especially of the larvæ, from a decided yellow to a brownish-green. Numerous ants were found to attend this species.

33. Aphis adianti (Oestl.).

Siphonophora adianti Oestl. Geol. Surv. Minn., 14th Rept., p. 26, 1886.

Antennæ about as long or longer than the body, black except at base, on small frontal tubercles; III 0.30^{mm}, IV 0.20^{mm}, V 0.20^{mm}, VI 0.10^{mm}, VII 0.45^{mm}. Beak short, not reaching second coxæ. Abdomen short and broad, rounded behind. Honey-tubes long (0.35^{mm}), cylindrical, dusky above. Style short, conical, concolorous with abdomen. Legs rather short, pale in color. Whole body of a lemon-yellow, with the antennæ, tips of the legs, and honey-tubes, dusky or black.

Found on the fronds of *Adiantum pedatum* Linn. Although this species has been observed from June until October, and is by no means a rare form, none but wingless have yet been found. It is undoubtedly an Aphis, and not Siphonophora, as I at first considered it.

34. Aphis annuæ Oestl.

Aphis annuæ Oestl. Geol. Surv. Minn., 14th Rept., p. 43, 1886.

Antennæ a little shorter than the body, black; III 0.30^{mm}, IV 0.25^{mm}, V 0.20^{mm}, VI 0.10^{mm}, VII 0.50^{mm}. Head and thorax shining black; prothorax with no lateral tubercle. Wings long; second branch of the cubital very short and near the margin of the wing. Abdomen dull green, sometimes with a marginal row of black spots. Honey-tubes about twice the tarsi in length, black. Style about half as long as the honey-tubes, black. Length of body 2^{mm}; to tip of wings 3.50^{mm}.

Found on leaves and stem of *Poa annua* Linn.

35. Aphis frondosæ Oestl.

Aphis frondosæ Oestl. Geol. Surv. Minn., 14th Rept., p. 38, 1886.

Antennæ about as long as the body, black; joints 3–5 with sensoria placed in a single row; III 0.35mm, IV 0.25mm, V 0.25mm, VI 0.15mm, VII 0.45mm. Thorax all black. Wings hyaline, with narrow, blackish veins. Second branch of cubital nearer the margin of the wing than to the base of the first branch. Abdomen greenish, with more or less marking of black above. Honey-tubes about 0.30mm long, black. Style conspicuous, about half the honey-tubes in length, slightly curved as in Nectarophora. Length of body about 1.80mm.

Found in large colonies on *Bidens frondosa* Linn.

36. Aphis polanisiæ Oestl.

Aphis polanisiæ Oestl. Geol. Surv. Minn., 14th Rept., p. 42, 1886.

Antennæ about as long as the body, or often somewhat shorter, on inconspicuous frontal tubercles; third and fourth joints with numerous sensoria. III 0.30mm, IV 0.15mm, V 0.12mm, VI 0.10mm, VII 0.20mm. Head and thorax black; prothorax with membrane green, also with a lateral tubercle. Abdomen greenish, or yellowish-green, with a marginal row of dots, and a large quadrate patch of black above. Honey-tubes about twice the tarsi in length, concolorous with abdomen or slightly dusky. Style rather thick and conical, concolorous with abdomen. Length of body 1.80–2mm; to tip of wings 3.60mm.

Found on the seed-pods and leaves of *Polanisia graveolens* Raf. The wingless form are usually of a uniform green with the pods on which they are found.

37. Aphis setariæ (Thos.).

Siphonophora setariæ Thos. Bull. Ill. St. Lab. Nat. Hist., 2, p. 5, 1878.

Aphis setariæ Monell. Bull. U. S. Geol. Surv. Terr., Vol. V, 2, p. 23, 1879.

Antennæ about as long as the body, or often longer, on inconspicuous frontal tubercles; third joint with sensoria, and tuberculate. III 0.30mm, IV 0.20mm, V 0.15mm, VI 0.10mm, VII 0.60mm. Thorax dull black, prothorax with a lateral tubercle. Legs very pale, with dusky joints and tarsi. Wings hyaline;

econd branch rather near the apex; stigma slightly dusky. Abdomen pale brown. Honey-tubes dusky, about 0.25mm. Style very pale, almost white, fully one-half the honey-tubes in length.

Found on *Setaria glauca* Beauv., *Panicum crus-galli* Linn, and on *Ampelopsis quinquefolia* Mx.

38. Aphis spirææ n. sp.

Antennæ on slight frontal tubercles, nearly as long as the body, black; third joint thickest and tuberculate, the distinction between third and fourth often subobsolete; III 0.30mm, IV 0.20mm, V 0.20mm, VI 0.10mm, VII 0.55mm. Beak stout, reaching second coxæ. Head and thorax black; prothorax with a tubercle. Wings with narrow veins; stigma black, pointed in front, elongate. Legs very pale, but with black joints and tarsi. Abdomen of a uniform dark reddish-brown. Honey-tubes long and slender, black. Style as long as the tarsi, straight, pale or almost white. Length of body 2mm; to tip of wings 3.50mm.

Found on *Spiræa salicifolia* Linn.

39. Aphis ageratoidis Oestl.

Aphis ageratoidis Oestl.

Antennæ on inconspicuous frontal tubercles, somewhat shorter than the body, black; III 0.25mm, IV 0.18mm, V 0.15mm, VI 0.10mm, VII 0.50mm; third and fourth joints with sensoria. Beak reaching second coxæ. Thorax black; prothorax with a tubercle; membrane greenish. Abdomen pale yellow, with a dorsal patch of dark green, which is much longer than broad. Honey-tubes twice the tarsi in length, black. Style slender, pale yellow, about as long as the tarsi. Length of body 1.60mm; to tip of wings 3mm.

Found on the flower heads of *Eupatorium ageratoides* Linn.

The following Aphidinæ have been recorded as American, but not yet found here:

Sipha rubifolii Thomas,* found on the under side of leaves of the common blackberry.

Aphis cerasicolens Fitch, on the common black cherry tree (*Cerasus serotina*).

Aphis sambucifoliæ Fitch, on the under side of the leaves of elder.

Aphis circæzandis Fitch, on *Galium circæzans.*

Aphis gossypii Glover, on the cotton plant.

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*The genus Sipha is similar to Aphis, but the antenna is only six-jointed, and similar to that of Mastopoda.

Aphis vitis Scop., on tame grape vines.
Aphis quercifoliæ Walsh, on the oak.
Aphis coriopsidis (Thomas), on the heads and flower stalks of *Coriopsis aristosa.*
Aphis diospyri Thomas, on the leaves of *Diospyros virginiana.*
Aphis vernoniæ Thomas, on the under side of the leaves of *Vernonia fasciculata.*
Aphis cephalanthi Thomas, on young twigs and the leaves of the button-bush (*Cephalanthus*).
Aphis impatientis Thomas, found on *Impatiens fulva.*
Aphis lutescens Monell, on *Asclepias syriaca.*
Aphis calendulicola Monell, on the under side of the leaves of *Calendula micrantha.*
Aphis medicaginis Koch, found on *Caragana arborescens, Robinia viscosa* and *Melilotus italica*, according to Monell.
Aphis atriplicis Linn., a common aphis on the Chenopodiaceæ, according to the same author.
Aphis hyperici Monell, on the young twigs and under side of the leaves of *Hypericum kalmianum*, and *H. prolificum* according to Thomas.
Aphis nerii Kalt., on oleander.
Aphis cucumeris Forbes, on *Cucumis* and allied plants.
Aphis citri Ashmead, on *Citrus.*

Genus SIPHOCORYNE Passerini, 1860.

Antennæ on no frontal tubercles, shorter than the body; third joint very tuberculate, so as to appear as serrate on the under side; seventh joint not longer than the third. Beak moderately long. Wings and legs as in Aphis. Honey-tubes moderately long, rarely long, distinctly clavate. Style short.

The genus is difficult to define, as we have no very distinct characters to rely upon. It is often defined as similar to Rhopalosiphum except in wanting the frontal tubercles, but as this is not a reliable character in all cases, Mr. Monell has suggested that this genus be united with Rhopalosiphum, which then, taken in its widest sense, would be known especially by the clavate honey-tubes. Although we may not put that importance on the presence or absence of frontal tubercles, as it has been customary to do, I still think it is a good generic character, and helps us to readily separate the Aphidini from the Nectarophorini. I would therefore retain the present genus for those species with clavate honey-tubes and the antennæ on no frontal tubercles. Besides, the antennæ are shorter than the body, and with a much tuberculate third and also sometimes fourth joint, so as to appear as serrate and slightly curved. The genus is also more especially confined to the Umbelliferæ.

The species within our district are not very numerous, and may be separated as follows:

1 { Joint III as long as IV+V. - - - - S. XANTHII.
{ Joint III as long as IV+V+VI. - - - - - 2.

2 { Abdomen with a large dorsal patch of black. - S. ARCHANGELICÆ.
{ Abdomen only with irregular markings of darker green. S. SALICIS.

1. Siphocoryne archangelicæ Oestl.

Siphocoryne archangelicæ Oestl. Geol. Surv. Minn., 14th Rept., p. 36, 1886.

Antennæ not more than one-half the length of the body, black; third and fourth joint very much tuberculate and serrate, and almost connate; III 0.40mm, IV 0.15mm, V 0.10mm, VI 0.10mm, VII 0.15mm. Beak short, not more than reaching second coxæ. Head and thorax shining black; prothorax with no lateral tubercle, membrane green. Stigma long and narrow; stigmal vein curved its whole length and terminating midway between the stigma and second branch of the cubital. Abdomen greenish, with a patch of black above. Honey-tubes concolorous with abdomen or slightly dusky, reaching to the tip of the style, widening to twice the diameter in the middle. Style short, conical. Length of body 2–2.50mm; to tip of wings 3.50mm.

Found on the umbels of *Archangelica atropurpurea* Hoffm.

2. Siphocoryne salicis (Monell).

Rhopalosiphum salicis Monell. Bull. U. S. Geol. Surv. Terr., Vol. V, No. I, p. 26, 1879.

Antennæ about half as long as the body; third and fourth joints subconnate, very rough and serrate; III 0.45mm, IV 0.15mm, V 0.15mm, VI 0.10mm, VII 0.30mm. Beak reaching beyond second coxæ and much longer than in preceding species. Origin of the second branch of cubital nearer to the margin of the wing than to the first branch. Stigmal vein running straight to the margin for half its length, and terminating nearer to the second branch than to the stigma. Abdomen green, with some transverse markings of deeper color above. Honey-tubes reaching tip of abdomen (0.35mm), enlarged to twice their diameter in the middle. Style about one-third as long as the honey-tubes, robust. Length of body 2mm; to tip of wings 3.50mm.

Found on the leaves of *Salix lucida.* Specimens here are somewhat larger than that given by Mr. Monell.

3. Siphocoryne xanthii Oestl.

Siphocoryne xanthii Oestl. Geol. Surv. Minn., 14th Rept., p. 36, 1886.

Antennæ about one-half the length of the body; third and fourth strongly tuberculate; III 0.35^{mm}, IV 0.20^{mm}, V 0.15^{mm}, VI 0.08^{mm}, VII 0.30^{mm}. Beak not reaching second coxæ. Thorax black. Second branch about midway between the margin of the wing and origin of first branch. Abdomen yellowish-green, with transverse markings of deeper green. Honey-tubes pale, reaching to or beyond tip of abdomen, enlarging in the middle or slightly above to twice the diameter at base. Style as long as the tarsi, curved. Length of body 2^{mm}.

Found on the under side of the leaves of *Xanthium canadense* Mill.

In my preliminary list of the Aphididæ of Minnesota I give *S. xanthii* as a typical American species of the genus in question, which should have been *S. archangelicæ*, as *xanthii* is not typical but partakes somewhat of the next tribe, coming near to Myzus.

TRIBE NECTAROPHORINI.

Antennæ generally longer than the body, on distinct frontal tubercles; the setaceous seventh joint often longer than the third. Beak long. Legs long and slender. Abdomen nearly always longer than broad, cylindrical, widest in middle and pointed behind. Honey-tubes long, cylindrical, or enlarged in the middle and clavate. Style long, nearly always acute and somewhat curved upward.

As before stated, the tribes of this sub-family are difficult to define, as there are exceptions to every character with which we are acquainted, yet the division appears to be natural. The present tribe, as a rule, is known by a larger size, abdomen long and more or less pointed behind. All the appendages are also longer in proportion to the body than in the two preceding tribes, showing a greater activity and varied mode of life. The great majority are found on annual plants, and more rarely on the leaves of shrubs or trees.

The genera are not as well defined in this tribe as what is generally the case in the family, and authors, therefore, differ much in regard to their number and extent. We would recognize the following genera as American:

1 { Honey-tubes cylindrical. - - - - - - 2.
  { Honey-tubes incrassate. - - - - - - 3.

2 { Antennæ on prominent and approximate frontal tubercles. - - - - - - - - - NECTAROPHORA.
  { Frontal tubercles not approximate; gibbous, as is also the first joint. - - - - - - - - - - MYZUS.

3 { Prothorax with a lateral tubercle; wings clouded. MACROSIPHUM.
  { Prothorax with no lateral tubercle. - - RHOPALOSIPHUM.

Genus MYZUS Passerini, 1860.

Antennæ about as long as the body, situated on moderately distinct frontal tubercles, which are gibbous on the inner side. First joint of the antenna also gibbous. Legs moderately long. Honey-tubes rather long, cylindrical. Style moderately long. Body often with capitate hairs.

It may still be considered as an open question if we are justified or not in retaining the present genus. This, as well as the following genus, partakes more or less of the three tribes of the Aphidinæ, and may be considered as intermediate forms, which it becomes convenient thus to put together in a separate genus.

Some of the species partake strongly of the Callipterini in their pale colors and capitate hairs of the body; the length of the antenna is mostly that of the Aphidini, and also often in the shape and size of the body; but most of the characters ally them with the tribe under consideration.

The following species have been found in Minnesota:

1 { Corrugating the leaves. - - - - - M. RIBIS.
  { Not corrugating the leaves. - - - - - - 2.

2 { Wingless form with capitate hairs. - - - M. ROSARUM.
  { With no capitate hairs. - - - - - - 3.

3 { Color of body black. - - - - - M. CERASI.
  { Color of body green. - - - - - M. ACHYRANTES.

1. **Myzus cerasi** (Fab.).

Aphis cerasi Fab.
Myzus cerasi Pass.

Antennæ about three-fourths the length of the body, black; III 0.40mm, IV 0.25mm, V 0.20mm, VI 0.10mm, VII 0.30mm. Honey-tubes about 0.35mm long, black; style about one-third as long. The winged form is shining black, but the wingless forms are usually of a dull black or brown. Abdomen short and very broad, giving an ovoid or globose outline to the body. The males have the antennæ much longer than the body, according to Buckton.

This species is very common on the cultivated cherry, and at times appears in enormous numbers. They are mostly found on the leaves, but when very numerous will also attack other parts of the tree. This species comes nearest to Aphis in general appearance and habit, and departs more from the typical Myzus than any other species of the genus.

2. **Myzus rosarum** (Walk.).

Aphis rosarum Walk.
Siphonophora rosarum Koch.
Myzus potentillæ Oestl. Geol. Surv. Minn., 14th Rept., p. 30, 1886.

Antennæ as long or a little longer than the body, black; III 0.55mm, IV 0.30mm, V 0.30mm, VI 0.12mm, VI 0.45mm. Beak reaching to or slightly beyond second coxæ. Legs black, with base of the femora and tibiæ paler. Abdomen greenish, with more or less black above in the form of transverse bands. Honey-tubes pale, about three times the tarsi. Style short, acute, pale. Length of body 2mm.

The larvæ of this species are provided with capitate hairs.

Found on the wild rose and on *Potentilla anserina* Linn.

Last year I described this species as new from the Potentilla, but I have since found the same on the rose, and this led me to compare it with Buckton's *Siphonophora rosarum*, with which it appears to be identical.

3. Myzus ribis (Linn.).

Aphis ribis Linn.
Myzus ribis Pass.

Antennæ longer than the body, black; third and fourth joints strongly tuberculate, and with numerous sensoria; III 0.60^{mm}, IV 0.40^{mm}, V 0.40^{mm}, VI 0.10^{mm}, VII 0.90–1.10^{mm}. Beak rather long, about 0.50^{mm}. Head and thorax shining black; abdomen pale green or yellowish-green, with a large quadrate patch of black above, the margin with a row of black dots. Honey-tubes pale or but slightly dusky, cylindrical, or sometimes widening in the middle, and thus approaching to the following genus; about 0.40^{mm} long. Style conical, concolorous with abdomen, about one-third as long as the honey-tubes. Length of body 2^{mm}; to tip of wings 3.75^{mm}. Larvæ very pale, and with capitate hairs.

Found on the cultivated currant, corrugating the leaves. *Rhopalosiphum ribis* Koch, I think, is but a variety of the above.

4. Myzus achyrantes (Monell).

Siphonophora achyrantes Monell. Bull. U. S. Geol. Surv. Terr., Vol. V, No. 1, p. 18, 1879.
Myzus malvæ Oestl. Geol. Surv. Minn., 14th Rept., p. 31, 1886.

Antennæ about as long as the body, black; III 0.55^{mm}, IV 0.45^{mm}, V 0.35^{mm}, VI 0.15^{mm}, VII 0.50^{mm}. Beak reaching second coxæ. Abdomen pale green, with transverse markings above of black, often becoming confluent into a patch above the honey-tubes. Honey-tubes cylindrical or more rarely slightly enlarged in the middle as in preceding species, pale, becoming dusky at the apex. Style long, slender, slightly curved upward. Length of body 2.50^{mm}; to tip of wings 4^{mm}.

This species shows much in common with Nectarophora, in which genus it was also placed by Mr. Monell, who first described the same.

Genus RHOPALOSIPHUM Koch, 1854.

Antennæ on more or less distinct frontal tubercles, about as long as the body or sometimes much longer. Beak of variable length. Prothorax with no lateral tubercle. Honey-tubes enlarged in the middle or clavate, moderately long, or sometimes very long. Style also varies from small and slender to the large curved one of the next genus.

The characters of this genus vary to a great extent, and the only character that is anything like constant is the clavate honey-tubes. The smaller species, with antennæ about as long as the body, partake a good deal of the Aphidini; while the larger species with long antennæ and distinct frontal tubercles are more closely related to the following genera. The following species have been found within our district:

1 { Style small and slender; of moderate size. - - - 2.
  { Style long and more robust; size larger. - - - - 3.

2 { Antennæ shorter than body; veins robust. - - R. SEROTINÆ.
  { Antennæ a little longer than the body; veins normal. - R. RHOIS.

3 { Style conical. - - - - - - R. SOLANI.
  { Style large and curved upward. - - - - - 4.

4 { Antennæ excessively long; size large. - - - R. ONOCLEÆ.
  { Antennæ a little longer than body; size not so large. - - 5.

5 { Abdomen with a dorsal patch of black. - - R. DIANTHI.
  { Abdomen with no dorsal patch. - - - - R. NABALI.

1. Rhopalosiphum rhois Monell.

Rhopalosiphum rhois Monell. Bull. U. S. Geol. Survey Terr., Vol. V, No. 1, p. 27, 1879.

Antennæ a little longer than the body, black, on rather inconspicuous frontal tubercles; III 0.50^{mm}, IV 0.40^{mm}, V 0.30^{mm}, VI 0.15^{mm}, VII 0.50^{mm}. Beak reaching second coxæ. Head and lobes of thorax all black, membrane somewhat paler. Wings with slender, black veins. Abdomen brownish-yellow, but often greenish. Honey-tubes about 0.40^{mm} long, clavate. Style small and slender, about one-third the honey-tubes in length. Length of body 1.60–2^{mm}.

This species is found on the under side of the leaves of *Rhus glabra*, mostly along the midvein. The apterous forms are reddish-brown, but the winged form often shows more or less of the greenish color, especially on the abdomen.

2. Rhopalosiphum serotinæ n. sp.

Antennæ shorter than the body; the sensoria not very numerous, but large and distinct; III 0.35mm, IV 0.30mm, V 0.22mm, VI 0.12mm, VII 0.35mm. Beak reaching second coxæ. Head and thorax brownish, abdomen green. Wings with very prominent and robust veins, especially the first and second discoidal; stigma very narrow, long. Honey-tubes mostly concolorous with abdomen, becoming somewhat dusky, widest in the middle, contracting near the apex which is rounded or knob-like. Style short, concolorous with abdomen. Length of body about 1.80mm.

A strongly characterized species found on *Solidago serotina*. It is intermediate between Siphocoryne and the present genus.

3. Rhopalosiphum solani (Thos.).

Megoura solani Thomas. Ins. Ill., 8th Rept., p. 73, 1879.

Antennæ a little longer than the body, on rather prominent frontal tubercles. Honey-tubes long, extending beyond the tip of the abdomen, much dilated in the middle. Style about one-third as long as the honey-tubes, rather thick, conical. Head and thorax black; abdomen greenish.

Found mostly solitary on cultivated tomato.

4. Rhopalosiphum dianthi (Schrank).

Rhopalosiphum sonchi Oestlund. Geol. Surv. Minn., 14th Rept., p. 34, 1886.

Antennæ about as long as the body, black; joints 3–5 with numerous rather small, round sensoria; III 0.70mm, IV 0.45mm, V 0.35mm, VI 0.12mm, VII 0.75mm. Beak reaching second coxæ. Thorax black, with membrane greenish. Abdomen green, with a marginal row of black spots, and a large dorsal patch of the same color. Honey-tubes about 0.50mm long, pale brown. Style about half as long as the honey-tubes, curved upward. Length of body about 2mm.

In my last report I described this species as found on *Sonchus asper*, but which on further study appears to be the same as the *dianthi* of Europe.

5. Rhopalosiphum nabali Oestl.

Rhopalosiphum nabali Oestlund. Geol. Surv. Minn., 14th Rept., p. 34, 1886.

Antennæ longer than the body; joints 3–5 with numerous small sensoria that give a tubercular or rough surface to these joints; III 1.10^{mm}, IV 0.65^{mm}, V 0.55^{mm}, VI 0.10^{mm}, VII 1.20^{mm}. Beak reaching slightly beyond second coxæ. Thorax dusky brown, shining. Abdomen greenish, with some dorsal bands of dusky markings. Honey-tubes long (about 0.75^{mm}), and much dilated in the middle. Style large and very conspicuous, about half as long as the honey-tubes, widest in the middle and curved upward. Length of body 2.50–3^{mm}.

Found very numerous on the upper stalk and flower heads of *Nabalus albus*.

6. Rhopalosiphum ampullata (Buckt.).

Amphorophora ampullata Buckton. Monograph of British Aph., Vol. I, p. 187, 1876.

Apterous form: Antennæ about twice as long as the body, on very conspicuous frontal tubercles; III 1.30^{mm}, IV 1.20^{mm}, V 1^{mm}, VI 0.30^{mm}, VII 1.65^{mm}. Eyes bright red. Honey-tubes long, (about 0.80^{mm}) and much dilated in the middle, concolorous with the body, becoming dusky at tip; transparent, the liquid globules being seen. Style about one-third as long as the honey-tubes, yellowish. Body all green, with some mottlings of deeper color above. Legs very long and slender, all green except tips of tibiæ and the tarsi, black. Length of body about 3^{mm}, or slightly more.

This large and interesting species was found feeding on the fronds of *Onoclea struthiopteris* or ostrich-fern. It agrees in all respects with Buckton's description and figure of *Amphorophora ampullata*, and I doubt not that they are identical. The length of the antennæ, together with the distinct frontal tubercles, may justify our exception of Amphorophora as a good genus, but at present I am unable to break up the genus Rhopalosiphum as given by Koch, so as to get anything like satisfaction out of it.

Genus MACROSIPHUM Oestlund, 1886.

Antennæ as long or longer than the body, on moderately large frontal tubercles, but these not as approximate as in the next genus. Prothorax well developed, and with a distinct lateral tubercle. Wings rather long, clouded near the apex. Legs long and slender. Honey-tubes very long, much dilated in the middle, curved. Style long and conspicuous.

In my last report I proposed this genus for the elegant species found on the wild raspberry. It may be too close to Rhopalosiphum, when this genus is taken in its widest sense, but still it is as distinct from the more typical species of Rhopalosiphum, as *nympææ* or *rhois*, as any of the species of Nectarophora. The species *Rhopalosiphum dianthi* and *nabali* are intermediate forms between that genus and the present one.

1. Macrosiphum rubicola Oestl.

Macrosiphum rubicola Oestlund. Geol. and Nat. Hist. Surv. of Minn., 14th Rept., p. 27, 1886.

Antennæ as long or longer than the body, black, with the base of the third joint pale, this joint also more or less tuberculate; III 0.90^{mm}, IV 0.70^{mm}, V 0.55^{mm}, VI 0.15^{mm}, VII 0.90–1.10^{mm}. Thorax with the lobes shining black; prothorax with a distinct lateral tubercle. Wings large; stigma long, broadest at the origin of the stigmal vein, dusky; at the apex of the fore wing there is a clouded patch between the stigmal and the cubital veins, extending slightly into the stigmal cell. Abdomen of a very pale color, whitish or greenish-white. Honey-tubes very long, about 1^{mm}, much dilated in the middle, slightly curved, transparent, slightly dusky. Style long, bent upward, of the same color as the abdomen. Length of body about 3^{mm}. Found on twigs and leaves of *Rubus strigosus*.

Genus NECTAROPHORA (Koch).*

Antennæ nearly always longer than the body, on distinct and approximate frontal tubercles; seventh joint mostly longer than the third. Prothorax with no lateral tubercle. Wings large.

*It is with some reluctance that I propose to replace a name that has already become so familiar and extensively used as that of Siphonophora. But Siphonophora as a generic term was already appropriated for the Myriapoda before Koch made use of it in the Aphididæ; and it is also used to denote an order of the oceanic Hydrozoa, and should, therefore, according to practice, be replaced by one not already occupied.

legs long and slender. Honey-tubes long and cylindrical. Style long, falchion-shaped.

Next to Aphis, one of the largest genus of the family, with the species all very much alike and difficult to separate. In habit they are also much like Aphis, found mostly in large colonies on herbaceous plants.

The species found in Minnesota may be separated in the following manner:

1. Color of body green, at least the abdomen. - - - 2.
   Color some other than green. - - - - - - 10.

2. Apterous form pulverulent. - - - - - 3.
   Apterous form not pulverulent. - - - - - 5.

3. Style long, equal to the honey-tubes. - - N. LUDOVICIANÆ.
   Style shorter than the honey-tubes. - - - - - 4.

4. Honey-tubes not much longer than style; sensoria only on third joint. - - - - - - - - N. FULVÆ.
   Honey-tubes more than twice the style in length; sensoria on joints 3–5. - - - - - - - - N. GERANII.

5. Fourth joint of antennæ about one-half of the seventh in length. - - - - - - - - - N. CYNOSBATI.
   Fourth joint more than one-half of the seventh. - - - 6.

6. Seventh joint of antennæ shorter or not longer than the third. - 7.
   Seventh much longer than the third. - - - - 9.

7. Honey-tubes very long, black; sensoria on third joint alone. - - - - - - - - N. ERIGERONENSIS.
   Honey-tubes not as long; sensoria on joints 3–4. - - - 8.

8. Antennæ about as long as the body. - - - N. PURPURASCENS
   Antennæ much longer than body. - - - - N. ROSÆ.

9. Beak moderately long; 0.40^{mm}. - - - N. CORYDALI.
   Beak long; 0.65^{mm}. - - - - - - N. PISI.

10. Style more than one-half the honey-tubes in length. - - - 11.
    Style one-half the honey-tubes or less. - - - - 13.

11. Eyes red; color of body pale brown. - - - N. PALLIDA.
    Eyes dark brown, or black. - - - - - 12.

12. Larvæ smooth. - - - - - - N. RUDBECKIÆ.
    Larvæ with the dorsum tuberculate. - - N. AMBROSIÆ.

13. Style black; honey-tubes imbricated. - - - N. FRIGIDÆ.
    Style pale; honey-tubes smooth. - - - - - 14.

14. Honey-tubes very long, more than twice the style. - S. POTENTILLÆ.
    Honey-tubes moderately long, not more than twice the style. - 15.

15. Abdomen with a marginal row of impressed pits. S. CHRYSANTHEMI.
    Abdomen with only a row of black dots. - - S. GRANARIA.

1. Nectarophora fulvæ n. sp.

Antennæ longer than body; more or less dusky; III 0.60mm, IV 0.50mm, V 0.45mm, VI 0.15mm, VII 0.70mm. Beak reaching beyond second coxæ, 0.40mm. Head and thorax dark brown or black. Abdomen dark green. Honey-tubes short, not longer than style, 0.20mm; dusky or black. Style stout, concolorous with abdomen, 0.20mm long.

This peculiar species is found on *Impatiens fulva*. The larvæ are very pulverulent, so as to appear white; and the castings of these are very conspicuous when found on the plant.

Length of body 2mm; to tip of wings 4.25mm.

2. Nectarophora ludovicianæ (Oestl.).

Siphonophora ludovicianæ Oestl., Geol. Surv. Minn., 14th Rept., p. 23, 1886.

Antennæ longer than body, black; III 1mm, IV 0.80mm, V 0.65mm, VI 0.20mm, VII 1mm. Beak long, 0.45mm. Eyes of a brighter red than usual. Head and thorax blackish. Abdomen green, more or less pulverulent, as in the apterous form, which are much covered with a yellowish white substance, giving to them the same color and tomentous appearance as the plant. Honey-tubes black; slightly thicker at base, 0.50mm long. Style very long, about as long as the honey-tubes, 0.50mm, yellowish. Length of body 2.50mm; to tip of wings 4.50mm.

Found on *Artemisia ludoviciana*; a large and very active species. I have never found it numerous or in large colonies, as is usual in this genus.

3. Nectarophora geranii n. sp.

Antennæ much longer than body, slender; III 0.80mm, IV 0.70mm, V 0.70mm, VI 0.20mm, VII 1mm. Head and thorax brownish, rest of body pale green. Wings yellow at base; veins rather prominent, brownish. Legs pale except the joints, and the tarsi black. Honey-tubes very long and slender, 0.90mm, dusky, or becoming black. Style concolorous with abdomen, 0.25mm. Length of body 2.25mm; to tip of wings 4.50mm.

Found on *Geranium maculatum* Linn., mostly on the stem and petioles of the upper leaves. The apterous form is covered with a fine white pulverulent substance, which gives them a glaucous

appearance. Joints four and five of the antennæ are mostly equal, or nearly so. Some winged males had joints III, IV and V equal (0.70^{mm}), and the last joint very long (1.25^{mm}).

4. Nectarophora cynosbati n. sp.

Antennæ longer than the body, dusky or black; III 0.75^{mm}, IV 0.45^{mm}, V 0.40^{mm}, VI 0.10^{mm}, VII 1^{mm}. Beak long, 0.60^{mm}. Head and thorax pale brown, or dusky, shining. Wings hyaline, second branch of the cubital nearer the apex than to the first branch. Legs pale except at joints. Abdomen uniformly green. Honey-tubes greenish, or becoming dusky towards the apex; 0.40^{mm} long. Style half as long as the honey-tubes, concolorous with the abdomen. Length of body 2^{mm}, or slightly over; to tip of wings 4.80^{mm}.

Found on the under side of the leaves and twigs of *Ribis cynosbati* Linn.

5. Nectarophora purpurascens n. sp.

Antennæ about as long as the body, or but slightly longer; III 0.70^{mm}, IV 0.50^{mm}, V 0.40^{mm}, VI 0.15^{mm}, VII 0.55^{mm}. Beak reaching second coxæ. Head and thorax shining black. Abdomen green. Honey-tubes pale at base, dusky above, 0.50^{mm} long. Style half as long as the honey-tubes, pale. Length of body 2.30^{mm}; to tip of wings 4.30^{mm}.

Found on *Thalictrum purpurascens* Linn. The larvæ change to the same purple color as the plant soon after they have been killed.

6. Nectarophora rosæ (Linn.).

Aphis rosæ Linn.
Siphonophora rosæ Koch.

Antennæ longer than body, black; III 1^{mm}, IV 0.90^{mm}, V 0.75^{mm}, VI 0.20^{mm}, VII 1.10^{mm}. Head and thorax shining black; abdomen green, with a marginal row of black dots and some transverse black bands above. Honey-tubes black, 0.60^{mm}. Style about half as long the honey-tubes. There is also a pale red or pinkish variety found on some of our wild roses. Length of body nearly 3^{mm}; to tip of wings 4.50^{mm}.

Found plentiful both on the cultivated and wild rose.

7. Nectarophora erigeronensis (Thos.).

Siphonophora erigeronensis Thos. Bull. Ill. St. Lab. Nat. Hist., No. 2, p. 7, 1878.

Antennæ a little longer than the body, dusky except at base; III 0.70^{mm}, IV 0.60^{mm}, V 0.50^{mm}, VI 0.15^{mm}, VII 0.70^{mm}. Beak long. Head and thorax of a deeper and somewhat more shining green than the abdomen. Legs long and slender, black except basal half of the femora. Abdomen of uniform green. Honey-tubes very long, 0.80^{mm}, black. Style nearly half the honey-tubes in length, concolorous with abdomen.

This very common and plentiful species is found on *Erigeron canadense* Linn.

8. Nectarophora corydalis (Oestl.).

Siphonophora corydalis Oestl. Geol. Surv. Minn., 14th Rept., p. 25, 1886.

Antennæ longer than the body, black; III 0.90^{mm}, IV 0.75^{mm}, V 0.70^{mm}, VI 0.20^{mm}, VII 1.20^{mm}. Beak 0.40^{mm}. Head and thorax very smooth and shining, yellowish. Abdomen green. Honey-tubes long, 0.60^{mm}; more or less dusky, green at base. Style at least half as long as the honey-tubes, concolorous with abdomen.

Found on *Corydalis aurea* Willd.

9. Nectarophora pisi (Kalt.).

Antennæ much longer than the body, pale or only tips slightly dusky; III 0.90^{mm}, IV 0.75^{mm}, V 0.70^{mm}, VI 0.20^{mm}, VII 1.10^{mm}. Beak long, 0.65^{mm}. Head and thorax olive brown; abdomen pale green. Honey-tubes green, 0.90^{mm} long. Style long, 0.45^{mm}, concolorous with abdomen.

A very common species found on *Capsella bursa-pastoris*, *Urtica gracilis* Ait., and other garden plants and weeds.

10. Nectarophora granaria (Kirby).

Aphis granaria Kirby.
Aphis hordei Kyber.
Aphis cerealis Kalt.
Aphis avenæ Fitch.
Siphonpohora cerealis Koch, Kalt., Pass.
Siphonophora avenæ Thomas.
Siphonophora granaria Walk., Buckt., Monell.

Antennæ about as long as the body or a little longer, black; III 0.60mm, IV 0.50mm, V 0.40mm, VI 0.15mm, VII 0.65mm. Head and thorax of a dark brown; abdomen of a paler reddish-brown, or green in the early brood found on the leaves. Honey-tubes black, about 050mm. long. Style about one-half as long. This species is found on cultivated wheat and oats, as well as on several species of grasses.

11. Nectarophora potentillæ n. sp.

Antennæ longer than body, black; III 0.80mm, IV 0.65mm, V 0.50mm, VI 0.15mm, VII 0.85mm?. Beak long and stout, 0.60mm. Head and thorax shining pale brown. Wings with narrow veins; second branch midway. Abdomen of a very pale brown color, somewhat darker in the middle and along the margins. Honey-tubes concolorous with the abdomen, about 0.60mm long. Style rather short, not more than 0.20mm long, pale. Length of body 2.60mm; to tip of wings 5mm.

Found on the under side of the leaves of *Potentilla anserina*. Comes nearest to the brownish variety of N. rosæ, but is much paler, and the style shorter.

12. Nectarophora frigidæ (Oestl.).

Siphonophora frigidæ Oestl. Geol. Surv. Minn., 14th Rept., p. 20, 1886.

Antennæ about as long as the body, black; III 0.60mm, IV 0.45mm, V 0.40mm, VI 0.15mm, VII 0.50mm. Beak long, 0.60mm. Head and thorax of a deep black; abdomen of a shining dark green, with a metallic lustre. Honey-tubes black, 0.40mm long. Style about half as long, black. Length of body 2.30mm; to tip of wings 4mm.

This peculiar species is found on *Artemisia frigida*, as growing on the bluffs of the Mississippi river near the falls of St. Anthony. In the preceding report I described the apterous male of this species, which has again repeatedly been observed in addition to the winged male. What the economy of the wingless male is we do not know, nor why the two forms should be found in the same species; but which is a fact observed not only in this, but also in several other cases.

13. Nectarophora chrysanthemi (Oestl.).

Siphonophora chrysanthemi Oestl. Geol. Surv. Minn., 14th Rept., p. 22, 1886..

Antennæ about as long as the body, all black; III 0.70^{mm}, IV 0.55^{mm}, V 0.45^{mm}, VI 0.10^{mm}, VII 0.80^{mm}. Beak at least 0.60^{mm} long. Head and thorax of a deep shining black; abdomen of a somewhat duller dark brown, with a row of impressed pits on each side. Honey-tubes shining black, about 0.50^{mm} long; style half as long, pale. Length of body about 2.25^{mm}.

Found on the upper stalks and flower heads of *Bidens chrysanthimoides* Mx.

14. Nectarophora pallida n. sp.

Antennæ much longer than the body, black; only third joint with sensoria; III 1.10^{mm}, IV 0.90^{mm}, V 0.75^{mm}, VI 0.20^{mm}, VII 1.10^{mm}. Beak long, 0.70^{mm}. Head and thorax of a pale olive brown, shining; abdomen of a very pale reddish or pinkish color, with the young embryos visible. Eyes reddish brown, much paler than usual in this genus. Honey-tubes large, thickest at base; black, or usually somewhat paler at base; about 0.90^{mm} long. Style very large and stout, at least half as long as the honey-tubes, yellowish. Length of body 2.50–3^{mm}; to tip of wings 5^{mm}.

This large species, as found on the wild rose, appears to be distinct from the green species found on the same plant. The apterous viviparous female is usually 3^{mm} long, or sometimes even longer. Antennæ somewhat longer than above; honey-tubes 1^{mm}, black; style half as long.

15. Nectarophora ambrosiæ (Thos.).

Siphonophora ambrosiæ Thomas. Bull. Ill. St. Lab. Nat. Hist., 2, p. 4, 1878.

Antennæ somewhat longer than the abdomen; III 0.90^{mm}, IV 0.75^{mm}, V 0.65^{mm}, VI 0.15^{mm}, VII 1^{mm}. Beak about 0.75^{mm} long. Whole insect of a rather dark brown; in winged form smooth and shining, but in apterous with the dorsum tuberculate. Honey-tubes about 0.75^{mm} long, black; style stout, at least half as long as the honey-tubes, or longer; paler in color than abdomen. Length of body 2.75^{mm}; to tip of wings 4.75^{mm}.

Found in great numbers on *Ambrosia trifida* Linn., and *psilostachya*. Similar to *N. rudbeckiæ* in size and habit, and with it subject to a great amount of variations. The only well-marked difference, beside color, seems to be in the tuberculate dorsum of the larvæ.

16. Nectarophora rudbeckiæ (Fitch).

Aphis rudbeckiæ Fitch. Cat. Hom. N. Y. St. Cab., p. 66, 1851.
Siphonophora rudbeckiæ Thomas. Bull. Ill. St. Lab. Nat. Hist., 2, p. 4, 1878.

Antennæ much longer than the body, black, with the base paler; III 0.95mm, IV 0.80mm, V 0.70mm, VI 0.18mm, VII 1.mm, Beak long, about 0.90mm. Body bright red; head and thorax of nearly the same shade, or but slightly darker. Honey-tubes long, about 0.85mm, shining black. Style at least half the honey-tubes in length or longer (0.50mm), paler than abdomen. Wings with yellow insertions.

This bright red variety, as found on *Silphium perfoliatum* and other composite plants, I consider as the typical *rudbeckiæ*.

The following Nectarophorini have been recorded as American, but not yet found in Minnesota:

Rhopalosiphum berberidis (Kalt.), found on the under side of the leaves of barberry.
Rhopalosiphum tulipæ Thomas, found on *Tulipa gesneriana*.
Myzus persicæ (Sulz.), the peach tree aphis.
Phorodon humili (Schrank), on the hop.
Phorodon mahaleb (Fonsc.), has been found, according to Monell, at St. Louis.
Phorodon scrophulariæ Thomas, on what was supposed to be *Scrophularia nodosa* (Thomas).
Nectarophora euphorbiæ (Thomas), found on *Euphorbia; N. euphorbicola* of the same writer is probably but a variety.
Nectarophora lactucæ (Kalt.), occasionally found on garden lettuce.
Nectarophora polygoni (Walk.) found on *Polygonum persicaria*.
Nectarophora verbenæ (Thomas), on the leaves of *Verbena*.
Nectarophora rubi (Kalt.), found on blackberry. What Thomas has identified as this species is probably but an immature form of *Macrosiphum rubicola*.
Nectarophora lilii (Monell), found on *Lilium*.
Nectarophora calendulella (Monell), on the under side of leaves of *Calendula micrantha*.
Nectarophora tulipæ (Monell), on the petals and stigma of tulips.
Nectarophora tiliæ (Monell), on the under side of the leaves of linden, causing them to curl.
Nectarophora liriodendri (Monell), on *Liriodendron tulipifera*.

Nectarophora cratægi (Monell), on the under side of the leaves of *Cratægus coccinea.*
Nectarophora sonchi (Linn.), on *Sonchus oleracea.*
Nectarophora calendulæ (Monell), on *Calendula micrantha.*
Nectarophora fragariæ immaculata (Riley), on the strawberry.
Nectarophora gerardiæ (Thomas), on *Gerardia tenuifolia.*
Nectarophora heucheræ (Thomas), on *Heuchera hispida.*
Nectarophora cucurbitæ (Thomas), on the leaves of squash vines.
Nectarophora citrifolii (Ashmead), on orange.
Nectarophora prunicola (Ashmead).
Nectarophora solanifolii (Ashmead), on *Solanum jasminoides.*
Nectarophora minor (Forbes).

LIST OF NORTH AMERICAN PLANTS WITH THE SPECIES OF APHIDES KNOWN TO ATTACK THEM.

Alder (Alnus rubra).
    Pemphigus tesselata (Fitch).
    Lachnus alnifoliæ Fitch.
Alum root (Heuchera hispida).
    Nectarophora heucheræ (Thomas).
Amarantaceæ (Achyrantes).
    Myzus achyrantes (Monell).
American larch. See larch.
Apple. Cultivated.
    Schizoneura lanigera (Hausm.).
    Callipterus mucidus Fitch.
    Aphis mali Fab.
Ash (Fraxinus americana, sambucifolia and quadrangulata).
    Pemphigus fraxinifolii Riley.
Aspen (Populus tremuloides). See poplar.
Aster.
    Aphis middletonii Thomas (roots).

Balsam poplar (Populus balsamifera). See poplar.
Barberry (Berberis vulgaris).
    Rhopalosiphum berberidis (Kalt.).
Barley. Cultivated.
    Nectarophora granaria (Kirby).
Basswood (Tilia americana).
    Lachnus longistigma Monell.
    Nectarophora tiliæ (Monell).
Bean. Cultivated.
    Aphis rumicis Linn.

Bedstraw (Galium aparine).
Aphis aparines Koch.
(Galium circæzans.)
Aphis circæzandis Fitch.
Beech (Fagus).
Phyllaphis fagi (Linn.).
Schizoneura imbricator (Fitch).
Bidens. See bur-marigold.
Birch (Betula papyracea).
Hormaphis papyraceæ Oestl.
Callipterus betulæcolens (Fitch).
Bitternut hickory (Carya amara). See hickory.
Blackberry.
Sipha rubifolii Thos.
Nectarophora rubi (Kalt.).
Black Cherry (Prunus serotina). See Cherry.
Box elder (Negundo aceroides).
Chaitophorus negundinis Thos.
Bur-marigold (Bidens chrysanthimoides).
Nectarophora chrysanthemi (Oestl.).
Nectarophora rudbeckiæ (Fitch).
(Bidens frondosa).
Aphis frondosæ Oestl.
Bur oak (Quercus macrocarpa). See oak.
Button-bush (Cephalanthus occidentalis).
Aphis cephalanthi Thos.

Cabbage (Brassica oleracea).
Aphis brassicæ Linn.
Calendula micrantha.
Aphis calendulicola Mœnell.
Nectarophora calendulæ (Monell).
Nectarophora calendulella (Monell).
Caragana arborescens.
Aphis medicaginis Koch.
Carnation pink.
Rhopalosiphum dianthi (Schr.).
Chenapodiaceæ.
Aphis atriplicis Linn.
Aphis rumicis Linn.
Cherry. Cultivated.
Myzus cerasi (Fab.).
(Prunus serotina).
Aphis cerasicolens Fitch.
(Prunus virginiana).
Aphis crasifoliæ Fitch.
Choke cherry (Prunus virginiana). See cherry.
Chestnut (Castanea vesca).

Chestnut Phylloxera castaneæ (Hald.).
Callipterus castaneæ Fitch.
Clover (Trifolium).
Callipterus trifolii Monell.
(Trifolium repens).
Aphis trifolii Oestl. (roots).
Cocle-bur (Xanthium canadense).
Siphocoryne xanthii Oestl.
Common brake (Pteris aquilina).
Mastopoda pteridis Oestl.
Cone-flower (Rudbeckia laciniata).
Nectarophora rudbeckiæ (Fitch).
Corn. Cultivated.
Aphis maidis Fitch.
Cornel. See dogwood.
Corydalis aurea.
Nectarophora corydalis (Oestl.).
Cotton. Cultivated.
Aphis gossypii Glover.
Cottonwood (Populus monilifera). See poplar.
Cranberry-tree (Viburnum opulus).
Aphis viburni Scop.
Crab-apple.
Aphis mali Fab.
Cranebill (Geranium maculata).
Nectarophora geranii Oestl.
Cucumber. Cultivated.
Aphis cucumeris Forbes.
Cup-plant (Silphium perfoliatum and intigrifolia).
Nectarophora rudbeckiæ (Fitch).
Currant. Cultivated.
Myzus ribis (Linn.).

Dock (Rumex).
Aphis rumicis Linn.
Dogbane (Apocynum cinnabinum).
Aphis asclepiadis Fitch.
Aphis apocyni Koch.
Dogwood (Cornus florida).
Aphis cornifoliæ Walsh.
(Cornus paniculata).
Aphis cornifoliæ Walsh.
Aphis maculata Oestl.
Schizoneura corni Fab.
(Cornus stolanifera).
Schizoneura cornicola Walsh.

Elder (Sambucus).

Elder Aphis sambucifoliæ Fitch.
(Aphis sambuci Linn.?)
Eleusine indica.
Rhizobius eleusinis Thos. (roots).
Elm (Ulmus americana).
Tetraneura ulmi (Linn.).
Colopha ulmicola (Fitch).
Schizoneura americana Riley.
Schizoneura rileyi Thomas.
Callipterus ulmifolii Monell.
(Ulmus fulva).
Pemphigus ulmifusus (Walsh).
Evening primrose (Œnothera biennis).
Aphis œnothera Oestl.
Eupatorium (Eupatorium perfoliatum).
Aphis eupatorii Oestl.
(Eupatorium agerotoides).
Aphis agerotoidis Oestl.

Fern (Adiatum pedatum).
Aphis adianti (Oestl.).
(Onoclea struthiopteris).
Rhopalosiphum ampullata (Buckt.).
(Pteris aquilina).
Mastopoda pteridis Oestl.
Figwort (Scrophularia nodosa).
Phorodon scrophulariæ Thos.
Fleabane (Erigeron canadense).
Tychea erigeronensis Thos. (roots).
Aphis middletonii Thos. (roots).
Nectarophora erigeronensis (Thos.).
Fungus.
Schizoneura fungicola (Walsh).

Galium. See bedstraw.
Gerardia tenuifolia.
Nectarophora gerardiæ (Thos.).
German ivy.
Rhopalosiphum dianthi (Schr.).
Golden rod (Solidago serotina and rigida).
Siphocoryne serotinæ Oestl.
Nectarophora rudbeckiæ (Fitch).
Gooseberry (Ribis cynosbati).
Nectarophora cynosbati Oestl.
Goosefoot (Chenopodiaceæ).
Aphis atriplicis Linn.
Aphis rumicis Linn.

Grapevine. Cultivated.
Phylloxera vitifoliæ (Fitch).
Nectarophora viticola (Thos.).
(Vitis riparia).
Aphis ripariæ Oestl.
Grasses (Agrostis plumosa).
Tetraneura graminis Monell.
(Aira cæspitosa).
Tetraneura graminis Monell.
(Eragrostis poæoides).
Colopha eragrostidis Middleton.
(Panicum crusgalli).
Aphis setariæ (Thos.).
(Panicum glabrum).
Tychea panici Thomas (roots).
Schizoneura panicola Thos. (roots).
(Phalaris canariensis).
Nectarophora granaria (Kirby).
(Poa annua).
Rizobius poæ Thos. (roots).
Aphis annuæ Oestl.
Nectarophora granaria (Kirby).
(Setaria glauca).
Aphis setariæ (Thos.).
Great angelica (Archangelica atropurpurea).
Siphocoryne archangelicæ Oestl.
Great-toothed poplar (Populus grandidentata). See poplar.

Hawthorn (Cratægus coccinia).
Nectarophora cratægi (Monell).
(Cratægus punctata).
Schizoneura cratægi Oestl.
Aphis cratægifolia Fitch.
Helianthus. See sunflower.
Hickory (Carya).
Phylloxera caryæcaulis (Fitch).
Phylloxera caryæglobosa Shimer.
Phylloxera caryævenæ (Fitch).
Phylloxera conica (Shimer).
Phylloxera forcata (Shimer.)
Schizoneura caryæ (Fitch).
Lachnus caryæ Harris.
Callipterus caryæ Monell.
(Carya alba).
Phylloxera caryæfoliæ (Fitch).
Phylloxera caryæfallax Riley.
Phylloxera caryæglobuli Walsh.
Phylloxera caryægummosa Riley.

Hickory (Carya alba).
Phylloxera caryæsepta (Shimer).
Phylloxera depressa (Shimer).
(Carya amara).
Phylloxera spinosa (Shimer).
Monella caryella (Fitch).
(Carya glabra).
Phylloxera caryæglobuli Walsh.
Phylloxera caryæren Riley.
Phylloxera caryæsemen (Walsh).
High cranberry. See cranberry tree.
Honey-suckle (Lonicera glauca).
Aphis loniceræ Monell.
Hop (Humulus lupulus).
Phorodon humuli (Schr.).
Horse-mint (Monarda fistulosa).
Aphis monardæ Oestl.

Indian plantain (Cacalia suaveolens).
Nectarophora rudbeckiæ (Fitch).
Ironweed (Vernonia fasiculata).
Aphis middletonii Thos. (roots).
Aphis vernoniæ Thos.
Nectarophora rudbeckiæ (Fitch).

Knotweed (Polygonus persicaria).
Nectarophora polygoni (Walk.).

Larch (Larix americana).
Chermes laricifoliæ Fitch.
Lachnus laricifex Fitch.
Leguminosæ.
Aphis medicaginis Koch.
Lettuce. Cultivated.
Rhizobius lactucæ Fitch (roots).
Nectarophora lactucæ (Kalt.).
Lily (Lilium).
Nectarophora lilii (Monell).
Linden. See basswood.
Liriodendron. See tulip-tree.

Maidenhair (Adiantum pedatum).
Aphis adianti (Oestl.).
Mallow (Malva rotundifolia).
Myzus achyrantes (Monell).
Maple (Acer dasycarpum).
Drepanosiphum acerifolii (Thos.).
Pemphigus acerifolii Riley.

Maple (Acer pennsylvanicum).
Chaitophorus aceris (Linn.).
(Acer saccharinum).
Pemphigus aceris Monell.
May-weed (Maruta cotula).
Aphis marutæ Oestl.
Meadow-parsnip (Thaspium aureum).
Aphis thaspii Oestl.
Meadowrue (Thalictrum purpurascens).
Nectarophora thalictri Oestl.
Meadow-sweet (Spiræa salicifola).
Aphis spirææ Oestl.
Melilotus italica.
Aphis medicaginis Koch.
Melon. Cultivated.
Aphis cucumeris Thos.
Milk-weed (Asclepias cornuti).
Aphis asclepiadis Fitch.
Callipterus asclepiadis Monell.
(Asclepias obtusifolia).
Callipterus asclepiadis Monell.
(Asclepias syriaca).
Aphis lutescens Monell.
Monkey-flower (Mimulus jamesii).
Aphis mimuli Oestl.
Mountain ash (Pyrus americana).
Aphis mali Fab.
Mustard (Senapis nigra).
Aphis brassicæ Linn.

Nabalus albus. See white lettuce.
Nettle (Urtica gracilis).
Nectarophora pisi (Kalt.).
Nine-bark (Neillia opulifolia).
Aphis neilliæ Oestl.

Oak (Quercus).
Schizoneura querci (Fitch).
Callipterus quercicola Monell.
Aphis quercifoliæ Walsh.
(Quercus alba).
Phylloxera rileyi Licht.
Lachnus quercifoliæ Fitch.
(Quercus bicolor).
Phylloxera rileyi Licht.
Callipterus discolor Monell.
Callipterus punctatus Monell.

Oak (Quercus imbricaria).
Callipterus hyalinus Monell.
(Quercus macrocarpa).
Chaitophorus spinosa Oestl.
Callipterus discolor Monell.
(Quercus obtusiloba).
Phylloxera rileyi Licht.
(Quercus phellos laurifolia).
Phyllaphis niger Ashmead.
(Quercus prinus).
Chaitophorus quercicola Monell.
(Quercus rubra).
Callipterus bellus (Walsh.).
(Quercus virens).
Lachnus quercicolens Ashmead.
Oats. Cultivated.
Nectarophora granaria (Kirby).
Oleander (Nerium oleander).
Aphis nerii Kalt.
Orange (Citrus).
Aphis citri Ashmead.
Ostrich-fern (Onoclea struthiopteris).
Rhopalosiphum ampullata (Buckt.).
Oxybaphus angustifolius.
Aphis oxybaphi Oestl.
Pea. Cultivated.
Nectarophora pisi Linn.
Peach. Cultivated.
Myzus persicæ (Sulz.).
Pecan.
Callipterus caryæ Monell.
Persimmon (Diospyros virginiana).
Aphis diospyri (Thos.).
Pigweed (Chenopodium).
Aphis rumicis Linn.
Pine (Pinus).
Chermes pinicorticis (Fitch).
Lachnus australi Ashmead.
Chaitophorus pinicolens (Fitch).
(Pinus strobus).
Schizoneura pinicola Thos.
Lachnus strobi Fitch.
Plum. Cultivated.
Aphis pruni Koch.
Myzus persicæ (Sulz.).
Nectarophora prunicola (Ashmead).
Polanisia (Polanisia graveolens).
Aphis polanisiæ Oestl.

Poplar (Populus balsamifera).
Pemphigus popularius Fitch.
Pemphigus populiglobuli Fitch.
Pemphigus populivenæ Fitch.
Pemphigus populiramulorum Riley.
Pemphigus populitransversus Riley.
(Populus balsamifera angustifolia).
Pemphigus populimonilis Riley.
(Populus grandidentata).
Aphis populifoliæ Fitch.
(Populus monilifera and angulata).
Phylloxera prolifera Oestl.
Pemphigus populicaulis Fitch.
Pemphigus populitransversus Riley.
Pemphigus pseudobyrsa (Walsh).
Pemphigus vagabundus (Walsh).
Chaitophorus populicola Thos.
Pot marigold. See calendula.

Ragweed (Ambrosia psilostachya).
Nectarophora ambrosiæ (Thos.).
(Ambrosia trifida).
Tychea radicola Oestl. (roots).
Aphis middletonii Thos. (roots).
Nectarophora rudbeckiæ (Fitch).
Raspberry (Rubus occidentalis).
Pemphigus rubi Thos.
(Rubus strigosus.)
Aphis rubicola Oestl.
Macrosiphum rubicola Oestl.
Red elm (Ulmus fulva). See elm.
Red oak (Quercus rubra). See oak.
Reed (Phragmites communis).
Hyalopterus arundinis (Koch)
Robinia viscosa.
Aphis medicagenis Koch.
Rose. Cultivated.
Nectarophora rosæ (Linn.).
(Wild).
Myzus rosarum (Walck).
Nectarophora pallida Oestl.

Scrophularia nodosa.
Phorodon scrophulariæ Thos.
Shag-bark hickory (Carya alba). See hickory.
Shepherd's purse (Capsella bursa-pastoris).
Aphis rumicis Linn.
Nectarophora pisi (Kalt.).

Silver-weed (Potentilla anserina).
Myzus rosarum (Walck).
Nectarophora potentillæ Oestl.
Snowball (Viburnum opulus roseum).
Aphis viburni Scop.
Snowberry (Symphoricarpus vulgaris).
Aphis albipes Oestl.
Aphis symphoricarpi Thos.
Solanum jasminoides.
Nectarophora solanifolii (Ashmead).
Sorghum. Cultivated.
Chaitophorus flavus Forbes.
Sow-thistle (Sonchus oleraceus).
Rhopalosiphum dianthi (Schr.).
Nectarophora rudbeckiæ (Fitch).
Nectarophora sonchi (Linn.).
Nectarophora sonchella (Monell).
Spruce (Abies nigra and alba).
Chermes abieticolens Thos.
Chermes abietis (Linn.).
Lachnus abietis Fitch.
Spurge (Euphorbia marginata).
Nectarophora euphorbicola (Thos.).
(Euphorbia maculata.)
Nectarophora euphorbiæ (Thos.).
Squash-vines.
Aphis cucumeris (Forbes).
Nectarophora cucurbitæ (Thos.).
St. Johnswort (Hypericum kalmianum).
Aphis hyperici Monell.
(Hypericum prolificum).
Callipterus hyperici (Thos.).
Strawberry (Fragaria).
Nectarophora fragariæ immaculata (Riley).
Nectarophora minor (Forbes).
Sumach (Rhus glabra).
Pemphigus rhois Fitch.
Rhopalosiphum rhois Monell.
Sun-flower (Helianthus).
Aphis helianthi Monell.
Sycamore (Platanus).
Lachnus platanicola Riley.
Symphoricarpus. See snowberry.

Tamarack. See larch.
Thistle (Circium).
Aphis carduella (Walsh).
Aphis cardui Fab.
Nectarophora rudbeckiæ (Fitch).

Thorn. See hawthorn.
Tickseed (Coreopsis aristosa).
Aphis coriopsidis (Thos.).
Tomato. Cultivated.
Rhopalosiphum solani (Thos.).
Touch-me-not (Impatiens fulva).
Aphis impatientis Thos.
Nectarophora fulvæ Oestl.
Tulip (Tulipa gesneriana).
Rhopalosiphum tulipæ Thos.
Nectarophora tulipæ (Monell).
Tulip-tree (Liriodendron tulipifera).
Nectarophora liriodendri (Monell).

Vervain (Verbena).
Nectarophora verbenæ (Thos.).
Virginia creeper (Ampelopsis quinquifolia).
Aphis setariæ (Thomas).

Walnut (Juglans).
Schizoneura caryæ (Fitch).
Callipterus caryæ Monell.
Wheat. Cultivated.
Nectarophora granaria (Kirby).
White elm. See elm.
White lettuce (Nabalus albus).
Rhopalosiphum nabali Oestl.
White oak (Quercus alba). See oak.
White pine (Pinus strobus). See pine.
White snake-root (Eupatorium agerotoides). See eupatorium.
Willow (Salix).
Aphis salicicola (Thos.).
Melanoxanthus salicis (Linn.).
Melanoxanthus salicti (Harris).
Melanoxanthus bicolor Oestl.
Lachnus salicellis Fitch.
Lachnus viminalis Fonsc.
Chaitophorus nigræ Oestl.
Chaitophorus viminalis Monell.
Siphocoryne salicis (Monell).
Witch-hazel (Hamamelis virginiana).
Hormaphis hamamelidis (Fitch).
Hormaphis spinosus (Shimer).
Worm-wood (Artemisia frigida).
Aphis frigidæ Oestl.
Nectarophora frigidæ Oestl.
(Artemisia ludoviciana.)
Nectarophora ludovicianæ Oestl.

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Synonyms are printed in *italics*.