

Mr. James Hammond, of Hammond P. O., Perth Co., writes under date of 7th of August as follows: "I noticed some time ago that something was doing considerable damage amongst my fall wheat (silver chaff variety). I mentioned the fact to some of my neighbours, telling them that it appeared to be cut at, or near the ground, but they appeared to be equally ignorant with myself as to the cause, and I thought little more about it until I saw your letter in the last issue of the *Weekly Globe*, when I examined some stalks, and find from your description that it is the genuine Hessian Fly. I enclose herewith samples of the insect in stalk, from which you will be able to judge of the correctness of my conclusion." These stalks from Mr. Hammond contained the insects in the flax seed state.

Judging from these letters which may be taken as fair samples of the correspondence, the estimate formed was, I think, rather under than over the mark, and the aggregate loss to the farmers of Ontario from the depredations of this insect during the past season must be a very large sum, as the area of land under wheat was very extensive.

Through the kindness of Mr. John Wallis, I have been enabled to compare the weight and appearance of the grain in the ears of the injured stalks with that of those of the healthy ones. I find that 100 of the kernels from the healthy plants which presented a plump appearance and a firm structure weighed 120 grains, while the same number taken from diseased stalks present a shrivelled appearance and a structure much less firm, and weighed only 59 grains, a difference of a little more than 100 per cent. By late sowing as recommended in my annual address to the Entomological Society in August last, Mr. Wallis now has a field of fall wheat in excellent condition, occupying the same ground as that on which the wheat was most injured last season. In order to test the value of this recommendation, he has departed from his usual course of rotation of crop so as to give the insects a fair chance, and judging from appearances at the present time it promises an abundant yield.

HOMOPTERA.—THE HARVEST FLIES AND THEIR ALLIES.

BY JAMES FLETCHER, OTTAWA, ONT.

The Cicadæ or Harvest Flies belong to that order which is known to Entomologists under the name of Hemiptera, (from two Greek words $\eta\mu$ = half, and $\piτερόν$ = a wing).

It is to this order of insects, alone, that the name—bug—properly belongs. Although now generally applied to all kinds of insects, it appears formerly to have been used for any object of terror, real or imaginary, and also as a term of contempt for something disagreeable and hateful; we have a remnant of its original meaning in the word "bug-bear." Perhaps the name was applied more distinctively to the Hemiptera on account of the disgusting odour which many of the Heteropterous members of the order have the power of emitting when disturbed.

In their earlier stages the Hemiptera have what are known as Incomplete Metamorphoses—that is, they do not entirely change their conditions during each of the different periods of their existence, as the Lepidoptera and Coleoptera do, where there is first of all the egg that hatches into an active larva which when full grown passes into a quiescent pupal state, previous to the fully developed imago condition.

The pupæ of the Hemiptera are active and very similar to the larvæ; in fact the only noticeable change which takes place in the form of these insects, from the time the egg hatches until they attain the perfect shape, is a gradual development of their wing covers and wings, and the growth of their bodies which makes it necessary for them to frequently cast their skins. When all the transformations have been completed, the imagines (perfect insects) generally possess four wings; the superior pair or hemelytra which are attached to the mesothorax, have the basal part or *corium* opaque and of a leathery consistence and the apical portion membranous and transparent; the inferior pair are attached to the metathorax and are entirely membranous and generally transparent and capable of being folded when the insect is in repose.

The whole of these insects are *Suctorial*—that is, live on fluids. To enable them to do this their mouth parts consist of a more or less slender beak or *promuscle*, which varies

according to the food or the circumstances under which they live. Those species which feed on animal food or under bark, have shorter and thicker beaks than those which derive their nourishment from vegetation, and as the former are for the most part beneficial and feed on other insects, this is a very important distinction for everyone to become familiar with. The beak consists of the labium, which is so modified as to form a hollow sheath, by having its two sides turned up, so that a deep groove is left in the middle of its upper surface, which acts both as a canal up which the juices on which the insect feeds flow, and also as a sheath for four delicate sharply pointed *setæ* or bristles which are actually the jaws and maxillæ modified for a special use. It is with these instruments that the insect punctures the plant or animal from which it derives its food.

The insects comprised in this order are of the most anomalous shapes, and there are embraced within its limits some of the most curious and wonderful forms of insect life. Their geographical range is very wide, for there is hardly any part of the globe of which the land and water do not produce their own peculiar forms. The number of species classed within this order is said to reach nearly 10,500, which are about equally divided between the two sub-orders into which the Hemiptera are divided. These two sub-orders are called Hemiptera-heteroptera and Hemiptera-homoptera, which again are divided into divisions and sub-divisions, and the latter of these are distributed into families which contain the various genera and species.

It was Latreille who divided the Hemiptera into these two divisions: "The Homoptera are the higher in rank, as the body is more cephalized, the parts of the body more specialized, and in the Aphidæ which top the series, we have a greater sexual differentiation, the females being both sexual and asexual, the latter by a budding process, and without the interposition of the male, producing immense numbers of young which feed in colonies. The Heteroptera, on the other hand, have the body less compactly put together, the abdomen and thorax are elongated, the head is small compared with the rest of the body, and the species are large (a sign of degradation among insects) and several families are aquatic, indicating a lower grade of development, while representatives of these were the first to appear in geological times. Their affinities are with the Orthoptera and Neuroptera, while the Homoptera whose bodies are more cylindrical ally themselves with the first and higher series of sub-orders."—(Packard).

For convenience sake we will take a short glance at the Heteroptera first, and then pass on to the Homoptera.

In the Hemiptera-heteroptera (*ἕτερος* = various, *πτερά* = wings) the hemelytra are thick and opaque at the base, but membranous and translucent at the tips; they lie horizontally on the top of the back and cross each other obliquely so that the translucent part of one overlaps the same part of the other. The underwings which these cover are entirely membranous; the head is horizontal and bears on its front part the articulated promuscis or beak which is bent down and carried underneath the breast. Between the wings there is a scutellum which is generally triangular, but which is sometimes so large as to cover the

whole of the upper side of the body, leaving only the margins of the fore-wings visible. (See figure 83). The modes of life among these bugs are very varied; animals, birds, insects and plants are all liable to their attacks, and they are sometimes exceedingly destructive. For the most part they are found upon the plants on which they subsist; but others again feed on weaker insects found in similar situations. They continue active and require food during all their stages. The larvæ are distinguished by the total want of any appearance of wings; whilst in the pupæ the rudiments of these limbs appear on the back of the thorax. All of these insects have ocelli or

I

I

Fig. 83.

simple eyes on the front of the head between the two large compound eyes, but these, like the wings, are only developed in the perfect state.

The great entomologist, Latreille, divided this order into two primary sections to which he applied the names of *Geocoris* or Land Bugs, and *Hydrocorisa* or Water Bugs. Westwood, however, improved on this arrangement by calling the former of these *Aurocorisa*, or Air Bugs, because there were certain species (*Hydrometridæ*) which had to be included in it, but which do not live on land, but pass the greater part of their time on the water, although they never dive below the surface. These species were also included by Latreille in his *Geocorisæ* and called *Ploteres*. Westwood's arrangement of Latreille's system was as follows:—

- (1.) *Hydrocorisa*, or those which reside in water.
- (2.) *Aurocorisa*, or those which breathe the free air.

1. *Hydrocorisa*.—There are many species of water bugs which differ very much in appearance, but they all have the antennæ very short and concealed in cavities beneath the eyes, their legs are modified according to their mode of life: the anterior pair are short and fold close to the body, forming a pair of claw-like organs with which they seize their prey; the other legs, particularly the last pair, are generally elongated and ciliated with stiff bristles which spread out when the limb is driven backward through the water and so act as the blade of an oar; of course when drawn forward they pass through the water easily. The eyes are often of a large size. Nearly all the species in this group are of a dull inconspicuous colour. They have to come to the surface of the water frequently to obtain a supply of atmospheric air, which they carry down to the bottom again in different ways; among the *Notonectidæ* it is carried in a space beneath the closely fitting hemelytra and the upper surface of the abdomen, where it is retained by means of rows of hairs. It is into this cavity that the spiracles or mouths of the breathing tubes open.

2. *Aurocorisa*.—In this section the insects may be generally recognized by the greater length of the antennæ, and by the legs being fitted for running and walking and not for swimming. Good examples of these insects are found in the destructive Squash Bugs and Chinch Bugs, as well as in the useful Spined Soldier Bugs and Rapacious Soldier Bugs. This, too, is the section which boasts the possession of that highly objectionable creature, the bed-bug (*Acanthia lectularia*), but it also includes the *Reduvii*, a family of cannibal insects, one species of which, *R. personatus*, is known in Europe to feed on these, and which family is represented in Canada by some useful species.

The other sub-order of the Hemiptera is called Hemiptera-homoptera (*ὁμός* = like, *πτερά* = wings), or same winged, because both the upper and under pairs of wings are of a similar character; both pairs are membranous, generally transparent and net-veined, the upper larger than the lower. The wings do not lap over each other when the insect is in repose as is the case among the Heteroptera, but are much deflexed at the sides and lie over the back like the roof of a house. The body is generally thick and convex, rather than depressed, and this partly accounts for the deflexed position the wings take when not in use. With few exceptions the antennæ are very short and bristle like. The face is either vertical or slopes obliquely under the body, so that the beak, which is composed of three joints, two short ones and one very long one, is set rather far back and issues from the under surface of the head close to the breast. In nearly all it is long and slender, as they all feed entirely on vegetable juices.

Within the limits of this sub-order are included some very grotesque and curious forms, and some which at first sight are apparently very dissimilar; but which, on a careful examination can easily be recognised as belonging to the same group. There are the Musical Cicadæ, the well-known Lantern-flies, the active, strangely-formed little Tree-hoppers and Leaf-hoppers, the Cuckoo-spit insects or Frog-hoppers, the lively Psyllidæ, the destructive Aphides or Plant-lice, with their remarkable transformations, and the extraordinary Coccidæ, or scale insects, which bear a closer resemblance to vegetable excrescences than to living animals.

None of the species have more than three joints of the feet, and Mr. Westwood considered this such an important character that he based his system upon it, dividing them into three sections:—

1. Trimeræ. Tarsi three jointed; antennæ minute, setigerous; wings areolate.
2. Dimera. Tarsi two jointed; antennæ, filiform, 5 to 10 jointed; wings sub-areolate.
3. Monomera. Tarsi one jointed; antennæ, 6 to 25 jointed; wings not areolate.

In the first of these divisions the Cicadæ or Harvest flies find their appropriate place—in fact the first section of Westwood's arrangement corresponds with Linné's genus *Cicada*, or Latreille's family Cicadares. The name of the Cicadæ is supposed by some to be a hybrid word derived from the Latin *Ciccum* = a thin skin, and the Greek *αἰεῖν* = to please, in reference to its song; others derive its name from the Latin words *Cito Cadat*, implying that the perfect insects are short-lived. The Cicadidæ are the largest insects in the sub-order. In Westwood's *Arcana Entomologica*, Pl. 51, there is a figure of a gigantic species (*Cicada Imperatoria*, Westwood) which measures eight inches and a quarter between the tips of the outstretched wings, and in my own collection I have a very beautiful Indian species which measures six inches. This latter belongs to a group of the Cicadidæ, in which the wings are opaque and more or less coriaceous; the upper wings are of a dull, reddish black, with the veins of a slightly lighter shade, and across the middle of them there is a broad white band three-sixteenths of an inch wide; the rest of the upper surface is black, with the exception of a bright orange band across the prothorax. The eyes and the abdomen are a rich brown and the underwings a deep velvety black.

The Cicadidæ have the head short and broad with two large prominent eyes and three ocelli placed in a triangle between them; usually the wings are completely membranous, of a uniform consistence and delicately transparent, with few but distinct nerves. There are, however, a few exceptions to this rule, as in the Indian genus *Polynura*, where the apical division of the wings is very thickly reticulated; and in a small group of the Cicadæ where the hemelytra are wholly, or in part, of a coriaceous nature. The abdomen is short and pointed, and the legs are short, the anterior femora are much thickened and toothed beneath. The ovipositor of the female is a very interesting object. This organ, which is the instrument with which the female places her eggs in a safe and proper asylum to wait until they are hatched, is lodged in a sheath which lies in a groove of the last ring of the abdomen. It is of equal thickness throughout, except at the tip, where it is slightly enlarged and angular. On each side it bears a set of nineteen sharp teeth, very fine at the point, and from that gradually increasing in size. The sheath is composed of two horny pieces, slightly curved, and ending in the form of a long spoon, so that the concave or hollow part may receive the convex or rounded part of the ovipositor. On examining this auger, for such it really is, under the microscope, it will be found to be three pieces most beautifully fitted together—two outer ones which have an alternate and separate motion, and on the outside edges of which the rows of teeth before mentioned are situated, and another fixed single piece, in between the other two, at the back, to which they act as a sheath, but which in turn supports and keeps them in their proper place by means of two internally-dilated lateral grooves, which receive the dilated edges of the serrated pieces, and in which these slip up and down. This last supporting dorsal-piece has a deep groove down its centre, and it is thought to consist of two separate pieces firmly soldered together, but which have not the slightest motion independent of each other. This instrument is composed of a hard horny substance called chitine, the same as are the stings of bees and wasps, and the ovipositors of *Ichneumon* flies. The auger of the *Cicada* then consists of two sharp saws which work alternately, and a central supporting dorsal-piece which holds them in their place and strengthens them. This instrument somewhat resembles the saw of the saw-flies, but as it has slightly different work to perform it bears corresponding modifications. It would, however, be impossible to conceive anything more exactly fitted for their required uses than these beautiful organs are.

The most peculiar characteristic of this family however consists in the structure of the musical instrument with which the males make the trilling sound for which they have been famous since ancient times. These organs are internal, and consist of two stretched membranes which are acted upon by two strong muscles, and the sound issues from two holes beneath two special expansions of the metasternum, which both cover up and protect these tympana or sound organs, and also act as sounding boards. The song varies much in the different species, and it would appear that the voice of the European one must have a much more grateful tone than that of his American cousin which we know, for we read in Kirby and Spence that the song of the *Cicada* has been a favourite theme in the verses

of every Grecian bard from the time of Homer to Anacreon. In Westwood's "Arcana Entomologica" the following translation of Anacreon's ode to the Cicada is given :—

Happy creature! what below
 Can more happy live than thou?
 Seated on thy leafy throne,
 (Summer weaves thy verdant crown,)
 Sipping o'er the pearly lawn
 The fragrant nectar of the dawn;
 Mirthful tales thou lov'st to sing,
 "Every inch" an Insect King:
 Thine the treasures of the field,
 All thy own the seasons yield;
 Nature plants for thee the year,
 Songster to the shepherds dear:
 Innocent, of placid fame,
 Who of men can boast the same?
 Thine the lavished voice of praise,
 Harbinger of fruitful days;
 Darling of the tuneful nine,
 Phœbus is thy sire divine;
 Phœbus to thy notes has given
 Music from the spheres of heaven:
 Happy most as first of earth;
 All thy hours are peace and mirth;
 Cares nor pains to thee belong,
 Thou alone art ever young;
 Thine the pure immortal vein,
 Blood nor flesh thy life sustain;
 Rich in spirits—health thy feast;
 Thou'rt a demigod at least.

These insects are also emblematically represented in the hieroglyphics of Egypt as priests—"They were called Tettix by the Greeks by whom they were often kept in cages for the sake of their song. Supposed to be perfectly harmless and to live only on the dew, they were addressed by the most endearing epithets and were regarded as all but divine. One bard entreats the shepherds to spare the innoxious Tettix, that nightingale of the nymphs, and to make those mischievous birds—the thrush and blackbird—their prey. Sweet prophet of the summer, says Anacreon, addressing this insect; the muses love thee; Phœbus himself loves thee, and has given thee a shrill song; old age does not wear thee out; thou art wise, earth-born, musical, impassive, without blood; thou art almost like a God. So attached were the Athenians to these insects that they were accustomed to fasten golden images of them in their hair, implying at the same time a boast that they themselves, as well as the Cicadæ, were *Terræ filii*. They were regarded indeed by all as the happiest as well as the most innocent of animals—not, we will suppose, for the reason given in the couplet by the saucy Rhodian bard, Xenarchus, where he notices the peculiarity of the males alone being possessed of the power of singing, and says :—

'Happy are the Cicadæ's lives,
 Since they all have voiceless wives.'

That the Grecian Cicadæ had more musical notes than ours is proved by the fact that its song and the music of the harp were both called by the same name *τεπερισμα*. The Cicada was the emblem of the Science of Music, which was accounted for as follows:—When two rival musicians, Eunomus and Ariston were contending on the harp, the former broke a string and would have been beaten but a Cicada flew down, and settling on his harp, supplied with his voice the missing string and gained him the victory. At Surinam there is a species which is still called *Lierman*, from a supposed resemblance between the sound of the harp or lyre and its song.

Virgil accuses a species found in Italy of bursting the very shrubs with its voice. As far as our own species are concerned, too, I fear no one but an enthusiastic Entomologist, could persuade himself that he found anything very pleasing in the song. I know of nothing more similar to that of *C. pruinosa*, the Frosted Harvest fly, than the noise of a scissors-grinder's wheel. The short carol seems to be produced with a tremendous effort, slowly at first, and gradually rising in intensity of pitch, until at a certain point it begins to descend rapidly, so that one might suppose, if the chorister made the noise with his throat, that he had been seized by that member and were being strangled.

The Dog-day Cicada, or Frosted Harvest fly, which is known under the name of *C. canicularis*, as well as that given above, is by far the commonest species in Canada. It is a large handsome fly, sometimes over two inches in length from the front of the face to the end of the hemelytra. The head is black and prettily variegated with green and brown markings; it is very wide, short and transverse; the eyes are prominent, and the thorax is broad and also ornamented with green and brown markings. The wings are transparent and slightly hyaline. The outer edge and the veins of the basal portion are green for about one-third of their extent and deep brown for the remainder; towards the apex of each hemelytron there is a brown W shaped mark. This insect, which is to be heard on hot days throughout the whole summer, is tolerably common in Canada, but is somewhat difficult to capture. In passing through the rocky country between Lake Superior and Manitoba about the middle of last September, I heard many of these flies trilling out their shrill notes. The specific name *pruinosa* = frosted, is given on account of the newly-evolved imagines being thickly covered beneath their abdomens with a white powdery matter, which gradually gets rubbed off as the insects get older.

In the United States this Cicada is carried off by large burrowing wasps or hornets as food for their young. These wasps are exceedingly handsome and are called *Stizus grandis* and *S. speciosus*. I have a specimen of the former of these which was captured in the act by Mr. A. H. Moore in the Smithsonian grounds at Washington. It measures one inch and three-quarters from the forehead to the tip of the abdomen, and possesses a large formidable sting with which these insects paralyze their victims previous to storing them away as food for their progeny. In the American Entomologist, vol. 1, N.S., there is a most interesting account of the instinct displayed by *S. speciosus* in availing itself of a favourable wind to transport its victims to its burrows, which, on account of their large size compared with its own, it would be unable to do without some assistance.

Cicada rimosa, Say.—The Creviced Harvest fly is the smallest species we have; it generally appears a few weeks previous to *pruinosa*, and in the United States at the same time as *C. septendecim*, which it resembles somewhat and with which it has been frequently confounded. It has the outer edge of the wings, parts of the legs and the edges of the abdomen of a yellowish brown, but not so bright as in *septendecim*, and the eyes are dark. In size, too, it is much smaller.

Cicada septendecim, L.: the Seventeen-year Locust.—This remarkable insect, concerning which so much has been written, is also said to have been found in Canada. It is a slighter insect than *C. pruinosa*, and its colours are much brighter; the body is black and the eyes reddish orange, the legs and under-side of the abdomen are orange, as are also the outside edges and veins of the wings.



Fig. 84.

Fig. 84, copied from Prof. C. V. Riley's first report of Missouri, gives a very good idea of the appearance of this insect in its various stages: *a* represents the pupa which is honey-yellow in colour; *b*, the cast-off skin from which the perfect insect has emerged through the rent in the back. When the larva is first hatched from the egg it presents the appearance shown at Fig. 86, and is an active little creature which moves its long eight jointed antennæ as dexterously and rapidly as does an ant; the mature larva differs considerably from the newly-hatched one, but principally in having shorter antennæ; *c* represents the fully developed fly, and *d* a piece of a young branch which has been bored by the ovipositor of the female for the reception of her eggs, which are shown at *e*. As its name implies, this insect generally requires seventeen years to complete its transformations; this fact was pointed out many years ago by the botanist Kalm.

Prof. Riley, who has given this species a great deal of study, and discovered many interesting points in its history, was the first to work out the problem of its periodical appearances. He found that there are also thirteen year broods and that both sometimes occur in the same locality, but that in general terms the thirteen year brood might be called the southern form, and the seventeen year the northern form; at the two limits of their respective ranges these broods over-lap each other. The shorter-lived form he called provisionally *C. tredecim*. It was the existence of this brood which caused Entomologists to doubt the propriety of Linné's name, until Prof. Riley cleared the matter up, because they could not make the dates of its periodical visits correct when calculating each appearance as occurring at the end of every seventeen years in any one locality. In his first Missouri Report he gives a full account of his investigations, and relates that "it happened that one of the largest seventeen year broods occurred simultaneously with one of the largest thirteen year broods in the summer of 1868. Such an event, so far as regards these two particular broods, has not taken place since the year 1647, nor will it take place again till the year 2089.

There are absolutely no specific differences between the two broods other than in the time of maturing. Another interesting discovery was, that there is a dimorphous form which appears with both these broods. It is much smaller and differs in many important points from the ordinary form. The colour is much darker, it has an entirely different voice, appears a fortnight sooner, and the two forms never copulate. This form was described by Dr. J. C. Fisher in 1851, as *C. Cassinii*, but the specific differences are not considered to be sufficiently well defined to give it the rank of a species.

The perfect insects make their appearance in the United States in the beginning of June, and last for about a month, and as they generally appear in vast numbers, they do considerable damage. Local changes take place so rapidly now, and these flies take so long to perfect themselves, that frequently roads are built and paths made in places where, perhaps seventeen years before, when they were hatched from the egg, it was virgin soil. This contingency frequently makes it necessary for them to bore through hard roads and between stones well beaten down; and that they do this, the honeycombed state of the ground bears ample testimony. When the larvæ, in which stage the insect passes the greater part of its life, is full grown, it works its way up towards the surface, and then turns to the pupa state, which only lasts a few days. When they are ready to emerge they leave their burrows as evening draws on, and crawl up on to some object elevated above the ground, such as a fence or the stem of a plant; this they grasp firmly with their claws, the skin of the back bursts and ten minutes afterwards the perfect insect has entirely freed itself of all encumbrance; the wings soon develop, but it is not for three or four days that the muscles harden sufficiently for them to assume their characteristic rapid flight and shrill song. As is the case with several other insects the males make their appearance some days before the females, and also leave sooner. The skin of the pupa (Fig. 84 *b*) retains its perfect shape for many months after the fly has left it. Those of *C. pruinosa* are very common here in a dry rocky wood. Prof. Riley also figures a remarkable chamber built up by the larva of this species in localities where the soil was low and swampy, and in which was found the pupa awaiting the time of its change to the winged state. These

chambers were first noticed by Mr. S. S. Rathvon at Lancaster, Pa., and are from four to six inches above the ground, with a diameter of one inch and a quarter. (See fig. 85.) When ready to emerge the insect backs down to an orifice which it left in the side of the structure, even with the surface of the ground, issues forth and undergoes its transformations in the usual manner. After pairing the females deposit their eggs in the twigs of different trees—oak, hickory, and apple chiefly, but also in many other kinds, and even sometimes in coniferous trees. The eggs are placed at the bottom of grooves bored by means of the ovipositor. The insect settles on a branch of moderate size, which she clasps on both sides with her head towards the end, then bending down the piercer at an angle of 45 degrees, thrusts it obliquely through the bark and fibres into the very centre of the twig; after this nidus is finished she deposits the eggs in two rows with a narrow

Fig. 85.

strip of wood left between them; there are from ten to twenty eggs in each groove. It takes about fifteen minutes to prepare a groove and fill it with eggs. There are sometimes as many as twenty grooves made in a branch by one insect, and each female has a stock of from 500 to 700 eggs. It frequently happens that these branches bearing the eggs, are so weakened by the operation, that they are broken off by the wind, and fall to the ground; when this is the case the eggs never hatch, for, like those of many of the gall flies the moisture of the living wood is necessary for their proper development, as shown by the fact that they are much larger just before hatching than when first deposited about six weeks before. When hatched, they throw themselves fearlessly from the tree to the ground, and from their small size, one line in length, they are very light and receive no injury. The newly-hatched insect is shown in fig. 86. They immediately burrow down into the ground and feed on roots. There are numberless stories in the newspapers every year about people being stung by the Cicadas, but none have ever been satisfactorily proved.

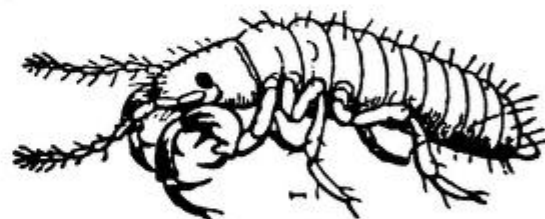


Fig. 86.

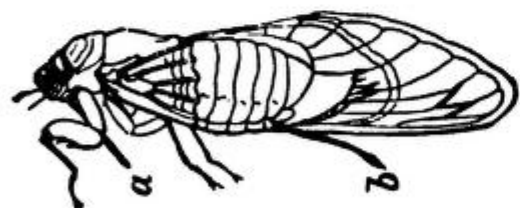


Fig. 87.

If these tales be true the injuries could, of course, only be inflicted by the beak, fig. 87 *a*, or by the ovipositor *b*, but I fancy that these tales are about as true as the newspaper accounts of the "frightful poisonings" yearly laid at the door of the larva of the Tomato Sphinx:

"The song of this species is in one uniform musical key, which is *C* sharp."

Of the Fulgoridæ or Lantern flies there is a small species found in the United States called *Scolops dulcipes*, which has the front part of the head much prolonged and projecting upward like a thin curved horn. Prof. T. Glover found it not uncommon in July and September in the neighbourhood of Maryland Agricultural College. None have so far been recorded from Canada.

Among the Cercopidæ are found several strange genera, including the Tree-hoppers, Frog-hoppers and Leaf-hoppers. The Tree-hoppers (*Membracis* of Harris) are dull-coloured little insects which are to be found on the stems and leaves of plants during the summer and autumn months. Many of them have very grotesque forms with the face nearly vertical, the thorax tapering to a point behind, and so much enlarged as to cover the greater part of the upper side of the body; it is too frequently ornamented with blotches or stripes of another colour. These insects are well protected from detection by their enemies, both by their habits and by a striking resemblance which frequently exists

between their shapes or marking and those portions of the plants which they infest. They are mostly angular in outline, some have the upper surface, which consists chiefly of the enlarged thorax, rough and dark coloured like the bark of a tree; others have horn-like processes resembling the thorns of a plant; this simile is further carried out by a habit they have of sitting still for hours on the stem of a plant with their heads all turned one way—upwards towards the end of the shoot. Some again are protected by their colours, as the green species which are found among foliage, or the brown and mottled ones which frequent the bark and stems of trees. Although, as stated above, they will sit still without moving for hours together, they are by no means asleep and are very difficult to capture. A slight movement is sufficient to make them spring from their resting-place with great quickness, and they settle again so suddenly that it is no easy matter to follow them. There is no class of insects which proves so well as these do the advantage of an Entomologist being to a certain extent an artist, for the colours of many of these interesting little insects are so fugitive that many of them lose their brightness almost before they are moved from the setting boards, and for a thorough study, paintings of them as caught are essential. We have several species in Canada, of which the following are some of the most interesting of those taken in the vicinity of Ottawa. They were most of them taken in the beating net, of which an illustration was given in the Canadian Entomologist for 1878, at page 62. I may mention that this net has received a thorough trial at the hands of my colleague, Mr. Harrington, and myself, and we have found it most satisfactory, and by far the most convenient pattern yet brought to our notice.

Enchenopa binotata, Say: the two-spotted Tree-hopper.—This is perhaps the prettiest and most curious little insect we have of this order. Its shape, in profile, is exactly that of a partridge with outstretched neck and head. It also has the habit of congregating in small clusters on the stems of the plants it feeds upon, and as there are generally specimens in all the different stages of growth, they may be likened to a brood of those birds. Sometimes the perfect insects form in single file along a branch, when they look like thorns or excrescences of the bark. The long neck-like extension is only a prolongation of the thorax, the head of course is underneath and furnished with a promuscis or beak for sucking sap. The general colour is a dark brown, and there are two yellow spots separated by a black space on the ridge of the back (thorax). The total length is not more than four lines from the apex of the wings to the tip of the thoracic protuberance. One of the most remarkable characteristics of these insects is found in the shape of the four anterior tibiae, which are very broad and flat. It is not an uncommon species, and is found on several trees such as hickory, butternut, locust and *Celastrus scandens*.

Smilia vau, Harris.—The V-marked Tree-hopper is also found on the hickory and butternut. It is about three lines in length with the thorax, which forms an arched crest over the body, rounded in front and keeled from the middle backwards to the tip. It is of a brown colour, and has its back ornamented with V-shaped marks.

Entilia carinata, Forster: the keeled Tree-hopper.—This species I have found plentifully on the common sun-flower (*Helianthus annuus*) clustered together in small families beneath the leaves. They are about one-fifth of an inch long and have two humps on the back, the space between them being in the shape of a complete semi-circle. The colours vary much: in some specimens it is a light cinnamon with wavy lines running to the posterior angle of the very large thorax. In others it is a dark reddish brown with a broad subterminal white band, the front is almost perpendicular and black.

Ceresa bubalus, Fabr.: the Buffalo Tree-hopper.—The colour of this species is a beautiful green. It is very triangular in shape, and has a pair of sharp curved spines, one on each side of the thorax, which somewhat resemble the horns of a buffalo, and from which fact it takes its specific name. It is a very active species, and flies a long distance when disturbed. I have taken it on young apple-trees and rose-bushes. The eggs are said to be deposited in a curved row, in a series of punctures made by the ovipositor of the female in the bark of several trees. It has been accused of injuring grape-vines by puncturing the bark of the stems for this purpose.

C. diceros, Say.—The two-horned Tree-hopper much resembles the last in shape and

size, but has a brown spot on each side of the thorax behind the horns, and a bar across the middle of the back and the posterior tip, of the same colour.

Telamona ampelopsidis, Harris.—Is a rather large Tree-hopper, sometimes measuring half an inch in length. It is found on the Virginian Creeper (*Ampelopsis quinquefolia*) and is very much the same colour as the bark of that plant. The thorax is raised up in the middle into a square hump and is crossed with three, more or less distinct, brown bands. I have taken this insect in the month of July.

In some of the Cercopidæ the face slopes downwards towards the breast; the thorax is of moderate size, and never extends much beyond the base of the wing-cases, and does not conceal the head when viewed from above.

The Frog-hoppers (*Amphrophora*), also called Cuckoo-spits, are those insects which have the habit of enveloping themselves in the remains of the liquid food which they suck from plants and then eject again in the form of a frothy substance with which they entirely cover themselves, in the same way that the larvæ of some beetles, to a less extent, cover their bodies with the remains of their solid food. In the perfect state, to which they attain late in the summer, they are very active insects, mostly of dull colours, and are to be found in grass and low herbage; one species, however, *A. parallela*, Say, is the insect which forms the small masses of foam, which may be seen on the young branches of pine trees in June and July. It is an oval brown insect about half an inch long with a white spot in the middle of each hemelytron. The popular names of these insects are taken from an absurd idea, which actually dates back to the days of Aristotle, and which is fully believed in by many people even to-day that the frothy excrementitious secretion was the spittle of the cuckoo or the frog.

Clastoptera proteus, Say, is a pretty little short and broad insect, roundish in shape and about two lines in length, having the head and thorax black with three bright yellow stripes; the hemelytra are of a peculiar shape, being deeply grooved in the middle and having the apices turned abruptly down; they are also marked with two short oblique yellow stripes, running from the shoulders to the middle of the back, and at the tip of each wing-cover there is a black spot. This species is said to feed on the cranberry and blueberry.

C. obtusa, Say, found on hickory, is a rather larger species of a much less conspicuous colour, being brownish grey, and having the hemelytra veined and spotted with brown towards the apex.

The Leaf-hoppers (*Erythroneura*).—There is no better known example of this genus than that dreadful little pest—the grape-vine leaf-hopper *E. vitis*, which in some years will entirely spoil a whole crop of grapes by destroying the leaves just when the berries are half formed. This annoying little fly is almost rendering impossible the cultivation of the ornamental Virginia Creeper in this city.

The grape-vines do not appear to have suffered so much, although the havoc among these has been very great. The insect that



Fig. 88.

causes all this mischief is really a most beautiful little creature. It is yellow with two red bands across the wings. (See Fig. 88). In the larva state it is bright crimson and has a very curious sidelong motion like a crab. The perfect fly nearly always settles underneath the leaf and sucks the sap from the parenchyma by means of its little trunk. The leaves first turn white, in patches, and then fall off. When large numbers of these flies spring from the leaves, as they will if the foliage is moved,

they make quite a perceptible sound like rain. I have found them exceedingly difficult to combat, and really think the only way is to disturb them at night and hold a torch for them to fly into. There are a great many species of this genus in Canada, one of which is very troublesome to the apple. These flies are generally, but erroneously, called Thrips.

The second section of the Homoptera is known as Dimera, or those with two jointed feet. In this section we find very much smaller insects with antennæ longer than the head and in the winged individuals four wings ordinarily all of the same membranous texture. There are only two genera Psyllidæ and Aphidæ. The Psyllidæ or Flea-lice are small insects found on leaves and in some species raising galls. Although several kinds are known to occur, almost every tree having its own species, very few have been described. They have rather long antennæ terminated by two slender bristles; the beak is short and triarticulate, and the eyes are lateral and prominent as in the Cicadæ. On the front of the face are three ocelli placed in a triangle, the posterior ones quite close to the eyes.

The larvæ and pupæ have the body very flat, and in some species as *Psylla celtidis-mamma*, Riley, live in galls. I exhibited at the last annual meeting of the Society in Montreal specimens of the galls and pupæ of this species, and Prof. Riley then kindly informed me of its proper name, and told me where the only printed description could be found, namely, in an article written by himself for Johnson's "New Universal Cyclopædia," under the head of "Galls." For the benefit of our members I reproduce this in full:—"The Flea-lice produce galls of various shapes and sizes on the stems and leaves of the Hackberry (*Celtis*). In life habits they differ from all the other gall insects, and agree with their nearest relatives, the Plant-lice, only in being the architects of their own galls. The egg, glued in spring to tender leaf or twig, soon hatches, and under the irritation caused by the young *Psylla* the gall soon embeds it. Within this gall the insect dwells till it has acquired the pupa state, which is generally by the time the leaves begin to turn and drop, then by means of certain horny spines or thorns at the end of its body, this pupa works its way out of its prison, and once out soon gives forth the perfect fly. The galls made by these Flea-lice are generally woody. Most of them are yet undescribed. *P. celtidis grandis* (Riley, M.S.) makes on the leaf-stalks a large grayish yellow swelling, which is an exception in being polythalamous. The few cells it contains are more or less filled with a white flocculent matter secreted by the insect." The perfect insect of *P. celtidis-mamma* appears in September and passes the winter in the crevices of the rough bark of the hackberry on which it underwent its preparatory stages, and adjacent trees. On November 24th last, I collected several specimens in a torpid state. The males are about one-eighth of an inch in length, and the females about one-third larger. The wings are deflexed at the sides of the body, and the hemelytra, which are rounded at the tips, are traversed by three strong nerves (the costal, median, and sub-median), each divided but once and disposed as shown in Fig. 89, which is another species, but serves

Fig. 89.

to show the general arrangement; the underwings are much more transparent and the nerves are very delicate. The colour is grey like the bark of the trees on which they are found; the antennæ which are terminated by two pairs of bristles are composed of ten joints, the eight basal ones yellow striped with black at their upper ends, and the two terminal ones entirely black. The femora are black for the greater part of their length,

as are the tarsi entirely; the tibiae are yellow. The thorax is black with a white median stripe, and the wing-cases are prettily mottled with brownish dots which form a dark triangular spot, in the middle of each, with the base on the costal margin; there is also a dark spot at the junction of each nerve with the margin, which has the effect of leaving a more or less distinct sub-terminal white band. The colours vary considerably, but seem to be darker in the females. The abdomen of the male is terminated by several bristle-like appendages, and that of the female by a conical ovipositor. In general appearance, although little more than one line in length, these insects much resemble miniature Cicadae. I found that many of the galls of this species also were polythalamous, one which I opened containing four pupae. The occurrence of this insect at Ottawa is somewhat interesting. The three trees of *Celtis occidentalis* upon which the galls occur are the only specimens of that tree which I have found in this locality, during four years of constant botanical investigation. Prof. Macoun, too, tells me that with the exception of a small grove at Belleville these are the only specimens he has heard of east of Toronto. It is evident then that it is quite uncommon, and yet these trees were so thickly covered with galls that the leaves in many instances had more than a dozen galls on their undersides, and had much more the appearance of bunches of berries than of foliage. How did these small insects which only feed on this tree traverse so great a distance from one locality to another? The gall is mammiform, having a thick fleshy outer coat, and inside this a thin woody one; the cavity inhabited by the flat larva is narrow, and the centre of the gall is filled up with a solid mass of the same nature as the outside wall. When the pupae are mature they work their way up through the top of the galls, which are all on the underside of the leaves, and come out on the upper surface.

The other genus in this division is *Aphis*. These exceedingly injurious insects which attack almost every form of vegetation, are too well known to need any elaborate description. The word *Aphis* is derived from a Greek word meaning to exhaust. Although most of these insects are of small size, very few exceeding one or two lines in length, yet they make up for their want of size by their vast numbers; the rapidity with which they increase is almost beyond credence. "Réaumur has proved that one individual in five generations may become the progenitor of nearly six thousand millions of descendants." (Harris, p. 235).

In the autumn the perfect Aphides pair, and the female lays an egg on the branch of a tree which hatches the next spring. The newly-born larva immediately begins its work of depredation, piercing the young leaves and shoots with its sharp beak. It grows rapidly and soon arrives at maturity. The Rev. J. G. Wood, in "Insects at Home," gives the following concise history of their lives:—"These insects are prolific almost beyond belief. As a general rule, insects lay eggs which are hatched, pass through the state of larva and pupa, and then become perfect insects. But the Plant-lice go on a very different plan. Sometimes as if to show that they are amenable to law, they do lay eggs; but this is the exception and not the rule, which is somewhat as follows, though varied every now and then by these most eccentric of insects: A female *Aphis* takes her place on a branch—say of the rose—plunges her beak into the tender bark and begins to suck the sap. After a short time she begins to produce young Aphides at an average of fourteen per diem. These young creatures are just like their mother, only less, and immediately follow her example by first sucking the sap of the plant and then producing fresh young. As to the opposite sex it is no business of theirs. The extent to which this peculiar mode of increase (gemination) can be carried may be imagined from the fact that a single female *Aphis*, isolated from the other sex, began to produce prolific females, which, in their turn, produced others, and so on for four years, during the whole of which time not a male *Aphis* had been suffered even to approach them. It is in consequence of this remarkable mode of production that the twigs and buds become so rapidly covered with Aphides, the quickly succeeding generations crawling over the backs of their predecessors so as to arrive at an unoccupied spot of bark in which they can drive their beaks. Thus, at the beginning of a week, say on Monday, a rose-tree may be apparently free from Aphides, or have at the most six or seven of the 'blight' upon it, but by Thursday the whole plant will be so thickly covered with Aphides that scarcely a particle of the bark can be seen."

No part of a plant seems to be exempt from their attacks; driving their sharp beaks through the epidermis, they suck the sap from the leaves, the young twigs, the roots, and even the rough bark of the stem. A good representation of a too common species, *A. mali*, the apple blight, is given at Fig. 90, and illustrates the structure of most of these insects; we have the winged male of the natural size and the same with the female magnified. The best remedy for all the small insects which affect the bark and foliage of trees, is undoubtedly a frequent application of a solution of whale oil soap thrown on to the foliage by means of a syringe. The bark-lice which swarm on apple-trees in the autumn may be easily cleaned off by means of a thorough scrubbing with soap-suds; the addition of flour of sulphur to this mixture will prevent

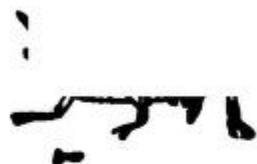


Fig. 90.

fungoid diseases making way where the Aphides have injured the bark. Many of the species make galls on different plants as on the poplar. The injuries done by these minute flies, I have said, is very great. Kirby and Spence state that the damage done to hops alone in England often made as much difference as £200,000 in the duty on hops in one year. I have myself occasionally seen in the south of England, what gave promise of being a splendid crop of hops, rendered worthless by a species of *Aphis*, in the short period of about a fortnight. It is to this family that the dreaded *Phylloxera* belongs which has absolutely rendered the cultivation of the vine impossible in some parts of France, and I know from personal information that a large grape-grower in one of the best champagne districts in that country had, in 1880, on account of this insect, simply to give up vine-growing, grub up his vineyards, and burn the vines.

Our President has so ably described this insect in its different forms in several papers during the past year or two that further reference to it is unnecessary.

In the last division, Monomera, which have only one joint in the tarsus, we find those extraordinary insects the Coccidæ, or Scale insects, as they are called, on account of the peculiar shape of the females, which in different species take different forms; some are oval and more or less convex, some shaped like a boat turned bottom upwards, some kidney shaped or globular; and one of the best known, the oyster-shell bark louse, takes the shape its name implies. Westwood remarks truly: "These form one of the most anomalous tribes of insects with which we are acquainted, and which already prove that annulose animals may exist, which become more and more imperfect as they approach the winged state, and which in that state lose all trace of articulation in the body as well as of articulated limbs (as in the female Cocco), leaving, in fact, inert and fixed masses of animal matter, motionless and apparently senseless, and which resemble nothing more nearly than the vegetable excrescences called galls."

The females undergo only a partial transformation, and never possess wings; the males on the other hand have a complete metamorphosis, with a quiescent pupal state, in which the rudiments of the antennæ, wings, etc., are perceptible, and have the legs arranged on the breast with the anterior pair directed forwards, a peculiarity not occurring in any other insects. The mature female retains the beak, but does not acquire wings, and the male has two wings, but the mouth parts disappear.

The eggs are hatched beneath the protecting scale, which was formerly the mother's body; they soon make their escape, as active little six-footed grubs, with slender beaks and two long bristles at the end of the body; and in some species, as *C. adonidum*, the Mealy Bug of the greenhouse, are covered with a white powdery covering. Most species, however, are naked. At this stage both sexes are alike.

As soon as they leave the scale they move along the branches towards the tip, and fix their beaks in the bark of the twig. From this time they remain motionless, fastened to the epidermis of the plant by means of small white downy threads emitted from the undersides of their bodies, they lose the caudal bristles, a scale forms over them, and they increase rapidly in size.

In this condition they pass through the winter, and it is not until the following spring that the sexes are developed. Some of the scales will then be noticed to increase in size, and these are the females. Under the smaller scales the transformations of the males take place, and they are remarkably different from those of the females, for in this sex there is what is not found in any other member of this order, a complete metamorphosis. These males remain under the scales (their outer skins) from which they detach themselves, until they evolve as perfect insects. After the insects have paired, the body of the female dries up, the whole substance apparently being consumed by the enormous number of eggs she lays. Many of these insects are exceedingly injurious to vegetation, and are difficult to combat. We have several species in Canada, but there is little positive knowledge concerning them. It is a very curious thing how they migrate from one tree to another. They will appear suddenly on trees which have been without them for years. This year, and from the amount of downy material in which it envelops its eggs, a very conspicuous species has appeared for the first time on a Virginian creeper near my house. There were, perhaps, a dozen females this year, and on examining the young shoots a few days ago, I found them well stocked with the half-grown scales. This species seems to answer the description of one Harris mentions on page 256, a thorough investigation of which he was prevented from carrying out by its premature destruction by fire, together with the grape-vine upon which it was feeding.

The *Aspidiotus conchiformis*, oyster-shell bark louse, attacks many different trees, but chiefly the apple. It has also been found on the currant, plum, pear, cherry, and apricot. Fig. 91 represents a twig of an apple tree covered with these scales. This is becoming a very injurious pest in Ontario, and unfortunately gardeners seem to have got an idea that nothing can be done to stop its ravages, so let it take its chance. I have been frequently told that it was useless to apply the soap wash, on account of the insect being protected by a scale. This of course is not the case. If a strong mixture of whale-oil soap, with tobacco in it, is syringed on the trees four times through the month of June, it can be kept well in hand, because then the young larvæ are unprotected by a scale.



Fig. 91.

Although the greater number of the Coccidæ are so injurious, yet there are some among them which produce commodities of very great commercial value. It is from the female scales of *C. lacca*, a species of this family which attacks *Ficus indica*, that the Indian product lac is obtained. This substance has many uses in the economic arts; it is the chief ingredient in sealing wax and several varnishes, and is also the basis of French polish. In India it is mixed with sand to form grindstones; dissolved in water and mixed with ivory black it makes a good ink. It is also from this insect that the colouring matter called lac-lake is prepared, which has been used as a substitute for cochineal. The East India Company are said to have saved in a few months \$70,000 in the purchase of scarlet cloth dyed with a mixture of this colour and cochineal conjointly, and this without any inferiority in the colour obtained. These scales are known as stick-lac when they are unseparated from the twigs upon which they formed; seed-lac when removed and pounded, and a part of their colouring matter extracted in water; lump-lac when melted down into cakes; and shellac when strained and allowed to harden in thin laminæ or flakes. But the most valuable of these insects is, perhaps, the Cochineal (*C. cacti*), which attacks a kind of indigenous cactus (*Opuntia cochinillifera*) found in Mexico where it is called nopal, and which is cultivated in plantations called nopalleiros, for the express purpose of feeding these insects. It is one of the most remunerative industries of the country. It has been calculated that 70,000 dried insects are required to make a pound of cochineal. In 1866 England imported 32,757cwt., valued at £594,818, and exported 21,238cwt., the annual consumption being about 12,000cwt. The price in 1870 was about 3s. a pound. In 1871 the imports into the United States were 1,849,842lb, valued at \$1,184,255. Many attempts have been made to introduce this insect into other countries. The East India Company even offered a reward of £6,000 to anyone who would introduce it into India. It was introduced into the Canary Islands about 1830,

and after the failure of the grape in 1850, became the principal article of export. In 1870 the exports reached 6,000,000lb, worth on the spot \$3,200,000. In 1844 the French succeeded in introducing it into Algeria, and the Dutch have introduced it into Java.

The literature on this family is most meagre, and, in fact, until Prof. Comstock published his article in the United States Department of Agriculture Report of 1880, nothing systematic of any consequence had been done. This gentleman is making a thorough investigation of this difficult but interesting subject, and as it is necessary to have a large series of specimens, it is in the hands of everyone to assist him, for if any person who noticed a plant infested by these insects were to send a note and specimens to him I am sure he would be glad to receive them, and they might possibly do much good by putting into the hands of a specialist, species unknown to science, upon which he would experiment in the same careful and thorough manner which is so manifest in all his work. It is satisfactory to know that after a great number of experiments, Prof. Comstock has found that, for all these insects the most effectual remedy is that very economical one—common soap.

Horse breeze fly	PAGE.
Horse flies	51
House flies	50
	38, 51

I.

Ichneumon fly	17
Insects, fossil, bibliography of	33
" injurious to forest trees	32
" injurious to fruit trees in California	32
" noxious and beneficial	33

L.

Lachnosterna fusca	26
Lampyrus Italica	35
noctiluca	35
Lasiopoda vitis	49
Last year's collecting, notes on	27
Leaf-hoppers	78
Leaf-mining anthomyidæ	31
Leopard moth	14
Lema trilineata	54
Leucania unipuncta	54
Lintner, J. A., article by	31
Lobesia botrana	67
Long-stings	23
Luminous insects	34
Luna moth	28
Lyman, H. H., article by,	6

M.

Midge, clover	47, 48
" wheat	47
Moffat, J. Alston, article by	27
Monachus saponatus	56
Monocesta coryli	59
Mud-wasp	25
Mundt, A. H., article by	31
Musca domestica	38, 51

N.

Nematus ventricosus	10
Nemoria leucanise	52

O.

Odontota rosea	61
Oedionychus quercata	60
Oestrus bovis	51
" ovis	51
Onion flies	53
Ophion macrurum	17
Orsodachna childreni	54
Ortalis flexa	53
Ox bot-fly	51
Oyster-shell bark louse	82

P.

Pachybrachis tridens	56
Papilio machaon	13
Paria aterrima	56
Photuris pennsylvanica	34

Phyllotreta vittata	PAGE.
Phylloxera vastatrix	60
Pickled fruit fly	9, 62
Pieris marsupia	21
" protodice	13
" rapae	14, 26
Pipiza radicum	14, 25, 27, 30
Plagiocera lapponica	10, 50, 66
" scripta	59
Platycerus quercus	59
Plum curculio	25
Polestes annulatus	26
Polyphemus moth	25
Potato sphinx	15
Psylla celtidis-mamma	26
Pyrophorus noctilucus	79
	35

R.

Reed, E. B., articles by	3, 4, 12, 45
Report of Council	4
" Montreal Branch	6
" Secretary-Treasurer	6
Rhyssa atrata	23
" lunator	23
Root louse Syrphus fly	10, 50, 66

S.

Samia cecropia	13
" columbia	13
Sarcophaga carnaria	52
" sarracenise	52
Saunders, W., articles by	7, 14, 32, 62
Saunders, W. E., article by	33
Scolops dulcipes	76
Sheep bot-fly	52
Smilia van	77
Syneta tripla	54
Systema frontalis	10
" marginalis	61

T.

Tabanus atratus	50
Tachina doryphoræ	52
Talamona ampelopsides	78
Teles polyphemus	15
Tree-hoppers	77
Trichogramma pretiosa	10
Trupanea apivora	50
Two-winged flies	45
Tyroglyphus phylloxera	10, 62, 66

V.

Vespa maculata	44
" occidentalis	44
Vitis coryloides	48
" pomum	48
" tomatos	49
" viticola	49

Y.

Yeast as an insect destroyer	29
--------------------------------------	----

THIRTEENTH ANNUAL REPORT
OF THE
ENTOMOLOGICAL SOCIETY
OF
ONTARIO,
INCLUDING REPORTS ON SOME OF THE NOXIOUS, BENEFICIAL
AND OTHER INSECTS OF THE PROVINCE.

PREPARED FOR THE HONOURABLE THE COMMISSIONER OF AGRICULTURE
BY THE OFFICERS AND MEMBERS OF THE SOCIETY.

1882.

To the Honourable the Commissioner of Agriculture :

SIR,—I beg to submit to you, herewith, the Annual Report of the Entomological Society of Ontario, prepared in compliance with the provisions of our Act of Incorporation.

The audited Financial Statement is submitted, as well as the transactions of the annual meeting, which was held this year in the City of Montreal, on August 24th. The Society is greatly indebted to your courtesy in enabling them to meet in Montreal, as an opportunity was thus afforded of obtaining the presence of a large number of scientists, who were attending the session there being held, of the American Association for the Advancement of Science.

I have, also, the honour to submit, herewith, for your approval, illustrated reports of various insects, which have been prepared by members of the Society.

In order to make these reports more useful and their information more accessible to those interested in them, the Society has thought it advisable to prepare an index of the whole series that have been issued by the Department, and I trust that it will meet with