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University of Maine.

Maine Agricultural Experiment Station

ORONO

BULLETIN No. 187.

JANUARY 1911

INSECT NOTES FOR 1910.

This bulletin contains brief notes upon some of the more important insects of the year 1910. Among them are the Birch-leaf *Bucculatrix*, the Black fly and the Carrot rust fly, as well as more extended descriptions of some gall insects and of four new species of *Psyllidae*.

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 AGRICULTURAL EXPERIMENT STATION
 ORONO, MAINE.

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BULLETIN NO. 187

INSECT NOTES FOR 1910.*

O. A. JOHANNSEN.

Following the custom of former years, notes of a miscellaneous character comprising new observations, new locality references, etc. of insects taken by us or sent in during the season are given here. Compilations and remedial measures are both avoided, and the statements are often the mere transferral of notes from the Station records. Insect notes of more popular character are given in more detail in other bulletins and circulars issued by the Station. The lot numbers quoted are references to our Station records, inserted for our own convenience. The parts on the *Aphididae* and *Psyllidae* were written by Miss Edith M. Patch, to whom the new species must be credited.

LEPIDOPTERA.

As usual by far the largest number of species concerning which complaints are made and also sent to the Station for identification this year, belong to this order. Those most frequently sent in were *Anisota rubicunda*, *Diacrisia virginica*, *Hyphantria cunea*, *Euproctis chrysoorrhæa*, and *Tmetocera ocellana*. The following species are noted here primarily for the locality or food plant records.

Apatela americana. Mountain ash. Seal Harbor. Sept.

Balsa malana. Apple. Orono. May.

Noctua clandestina. Hollyhock, strawberries. E. Sumner. May.

Cucullia convexipennis. Cult. aster. Orono. Sept.

Rhodophora florida. Evening primrose. Orono. July.

Pheosia dimidiata. Balm of Gilead. Orono. July.

Euproctis chrysoorrhœa. Strawberries. Bath. June.

Paleacrita vernata. Apple. Orono. May.

*Papers from the Maine Agricultural Experiment Station: Entomology No. 46.

Alsophila pometaria. Apple. Monmouth and Orono. May.
Epicnaptera americana. Apple. Orono. July.
Eurycyttarus confederata. (Fig. 2.) Cambridge. June.
Plodia interpunctella. Packed raisins. Portland, Orono.
Colcophora fletcherella. Apple. Orono, Monmouth. April.
Bucculatrix canadensisella. Birch, alder. Many localities.
Bucculatrix pomifoliella. Apple. East Corinth.
Tischeria malifoliella. Apple. Monmouth. June.

Hyphantria cunea (Fall Web-worm).

Of all insects submitted to us for identification the web-worm was most frequently sent in, and in this region at least its work was the most conspicuous. Many different kinds of trees and shrubs were affected, the apple being particularly subject to injury. Fig. 1 illustrates one of several apples which were taken from a web-worm nest. The caterpillars had peeled the apples.

Heterocampa guttivitta (Saddled prominent).

After 3 seasons of very severe infestations these insects have suddenly disappeared. We have seen no specimens nor have any been sent in. In response to letters sent to people living in districts most severely infested in former years we learn that no insects of this species have been observed.

Bucculatrix canadensisella (Birch leaf *Bucculatrix*) as a leaf miner.

This insect was reported and the larva described in Insect Notes for 1909. This year the adults were abundant in June upon the birch leaves. Though some cocoons were found upon the trunks and branches, most of them were seen upon dried leaves, sticks and grass underneath the trees and among rubbish in fence corners. Some flat, translucent objects, resembling the eggs of the codling moth, though of course much smaller, were seen on the under side of the leaves, which may have been the eggs of the *Bucculatrix*. Early in August no larvæ had yet been observed externally upon the leaves, but many leaf miner trails, each with a minute larva within, were seen. Several leaves containing miners were carefully examined to be sure that there were no larvæ upon the surface, and placed in a cage.

After a few days all the larvæ had left the mines and were feeding on the surface. Examination proved them to be the larvæ of *B. canadensisella*. Thus it is seen that this species passes the first 2 months of its existence as a leaf miner in the same manner as the Apple Bucculatrix.

The young larva is rendered quite conspicuous by the prominence of the black ganglia of the ventral nerve cord, visible even when within the leaf mine. The full grown larva has 3 pairs of claws on each of the intermediate abdominal prolegs, but in the earlier stage there is but one pair. The nerve ganglia become less noticeable as the larva increases in size.

Fortunately for the birches, the larvæ do not reach their greatest development until late in August, so that there can be but little permanent injury done to the tree. In the region about Orono, *Betula populifolia* and *papyrifera* as well as the cultivated *B. alba* show the greatest amount of injury, while *B. lenta* and *lutca* are less severely treated. The alder (*Alnus incana*) when near a birch tree may also be attacked, though the injury to the leaf is not so great.

DIPTERA.

From among a number of observations upon the biology of various species of Diptera and reserved for publication elsewhere, the following have been selected as being of general interest. As in former years, *Rhagoletis pomonella* (Apple maggot) heads the list of the more injurious Diptera of Maine.

Parthenogenesis and Pædogensis in Tanytarsus.

Notes on the pædogenic reproduction of *Tanytarsus dissimilis* have already been published in Science (Nov. 25, '10). To the observations made there may be added that although many adults were reared this year no males were among them. One female, accidentally held captive by its wings in its own pupal skin, was observed to lay eggs. These eggs were transferred into distilled water, but unfortunately immediately disintegrated. Later more eggs were obtained which had been laid by newly emerging females. The eggs in each string, about 60 in number, are arranged side by side, but lie somewhat obliquely in a single row, surrounded by gelatine. Each egg is

elongate oval in outline, flattened on one side. About 2 days after deposition the larvæ emerge through a longitudinal slit. The nearly transparent larvæ, within a few hours begin the construction of their cases or tubes. As the insects were confined in glasses with tight fitting covers, and no males have been bred this year, we have demonstrated here a case of parthenogenetic reproduction.

Simulium and pellagra.

The two species *S. hirtipes* and *venustum*, so common in various parts of the northeastern states, were abundant during the spring and summer in this vicinity. To those who have camped in the woods or mountains where *Simulium* is abundant, the bite of this short-bodied, hump-backed little fly is only too well known. The females only are blood-thirsty. They are a veritable scourge to the hunters and fishermen in Maine. Recently some German veterinarians have shown that they are the cause of a serious disease in cattle. More recently still Dr. L. W. Sambon of England makes the claim that *S. reftans* is the transmitter of the disease *Pellagra* prevalent in the south of Europe, which in the last 2 or 3 years has excited physicians in the southern states. Sambon states that the disease follows water courses and only persons much in the open are attacked. These facts are peculiarly significant and here is the clue by which a link may be added to the chain of circumstantial evidence to establish the guilt or innocence of the gnat. The insect breeds only in water which is shallow but at the same time swift. If the larva be transferred to still water it will die in a very few hours, but it may live for several days in a situation kept moist by trickling water. The larvæ are found on rocks and debris, particularly in little brooks, and the adult flies are never found at a great distance from such localities, rarely entering houses. If Sambon is correct in his view we must assume that a person afflicted with pellagra has been in the open in the vicinity of a brook or stream where *Simulium* abounds, at a comparatively recent period prior to his infection.

Simulium reftans, the species which is accused of carrying the infection in Europe, has been thus far only recorded from Greenland on the western hemisphere. This, however, in itself would be no bar to the acceptance of the theory, since we know that in the case of malaria several species of *Anopheles* are concerned in the transmission of the disease.

Another theory is the one recently advanced by Alessandrini in his paper, "Pellagra due to Filaria in drinking water from shallow wells," in *Policlinico* (June 26, 1910). He claims that the sea shore and mountainous regions are exempt, and that the disease ceases to spread where artesian wells are substituted for shallow wells and surface drinking water. As *Simulium* is particularly common in the vicinity of small streams in mountainous regions, and cannot breed in quiet surface water or shallow wells, the views of this investigator are decidedly opposed to those of Sambon.

Though laboratory methods are necessary to finally establish the fact whether or not this little gnat is concerned in transmitting pellagra, the peculiarities in its breeding habits give the physician living in regions where the disease is prevalent a basis upon which to work.

Psila rosæ (Carrot rust fly) on parsnips.

This insect has occasionally been reported from Canada and also from Maine and New York as injurious to carrots and celery. This spring some parsnips which had been in the ground over winter, were pulled, and found to bear the characteristic "rust spots" of the carrot rust fly. The pupal skins were found in the ground, not adhering to the roots. The larvæ form cavities, especially in the upper third of the root, the cavities not exceeding $\frac{1}{2}$ inch in depth. As a number of larvæ were found it appears that part at least hibernated in this state. Adults emerged the first 2 weeks in May. Many parsnip roots exposed for sale in the markets in this vicinity at this time were found to be similarly affected.

Eurosta solidaginis.

See *Eurytoma gigantea* under Hymenoptera.

Phorbia fusciceps (Fringed Anthomyiid).

In a market garden in Orono many bean plants were affected by the larvæ of this insect mining in the cotyledons and stems early in June. Though at first the plants seemed severely injured, after the larvæ had pupated most of the plants fully recovered, apparently unaffected by the earlier injury.

Some complaints were also received from farmers in Aroostook County claiming injury to seed potatoes. Specimens sub-

mited were badly decayed and infested with the larvæ of this fly. It is quite possible that the infestation by the fly occurred after decay had set in, as some decayed tubers were found free from larvæ. The flies emerged the latter part of June.

Phorbia (Chortophila) cinerella.

A number of specimens, both male and female, were reared from larvæ associated with *Musca domestica* from horse manure, the flies emerging about September 1. This insect was first described by Fallen and redescribed by Meigen under the name of *pusilla*, under which name it is given by Schiner (II. p. 638). The description by Rondani in Dipt. Ital. Prodromus VI. p. 220 is most characteristic.

Hamatobia serrata (Horn fly).

This insect has been recorded from Maine in the Report of Maine Agr. Expt. Stat. in 1892 and again in 1896. These pests were very abundant this year during August, upon the University herd.

Musca domestica (Typhoid fly).

Many specimens were reared from nearly fresh, non-fermenting horse manure. The eggs were deposited about Aug. 20, the flies emerging September 8-10. Associated with this species were the larvæ of *Spheroocera subsultans*, *Borborus geniculatus*, and *Phorbia cinerella*.

Phormia regina.

The larvæ of this widespread species were found early in July, in decaying water melon rind. Adults emerged July 29-30. In the key on p. 342 of Williston's manual (3d Ed.) the last line reads, "Mesonotum flattened behind transverse suture." This does not apply to *Phormia regina*. See also Townsend's statement in last paragraph on page 123, Smithsonian Miscellaneous Collections, Vol. 51, and Thompson's note, last paragraph on page 213, Psyche, Vol. XVII.

COLEOPTERA.

Beetle injuries most frequently noticed this season were those caused by *Saperda candida* (Round-headed apple-tree borer), *Conotrachelus nenuphar* (Plum Curculio) on the apple, and *Pissodes strobi* killing the terminal shoots of young pine. Other injurious species are those noted below.

Amphicoma vulpina.

Mr. John C. Parlin of Norridgewock sent in some specimens of this species with the statement that he had seen large numbers of them clinging to oat heads and flying over the field near Buckfield, Maine. He writes further, " * * * the owner of the farm told me that in June he found in a corn field adjoining the grass field a great number of brownish grubs which they called 'little grubs' to distinguish them from the 'white grub.' * * * He said they were about the diameter of a lead pencil, shorter than the white grub. Of course he does not know that these grubs were the larvae of *Amphicoma* but when he found the beetles so abundant just off that end of the corn field he connected them in thought even before I spoke of them. He said there were thousands of the beetles in the field." Mr. Parlin states in a later communication that the corn field was an old run out June grass field the year before. He also had seen the beetles in great numbers in the vicinity of Norridgewock flying over a newly mown field.

Callidium antennatum (Black horned Callidium).

The larva of this species was noted by Harris, and later by Packard, living in the trunks of pines and junipers. It was again noted in Bulletin 148 (Me. Agr. Sta.) numerous specimens having been found at Athens in the attic of a new house, the inference being that they emerged from the pine timber. Specimens were also found in Orono resting on cedar trunks. This year some specimens were sent in August 10 from East Holden, Maine. Lots 18 and 1294.

Saperda obliqua (Alder borer) infesting birch.

A number of specimens of this species were found in Orono in the small branches ($\frac{1}{2}$ to 1 inch in diameter) of the European white weeping birch (*Betula alba*). At the time of pupation,

the latter part of June, the branches containing grown larvae and pupae were broken off by the wind, the break occurring near the cell containing the insect. The larvae are white in color. Adults were obtained about 2 weeks later. Lot 1229.

Otiorynchus sulcatus (Black vine weevil).

This species has been recorded by Professor Forbes, Mr. Swartz, and also by Doctor Fletcher of Canada upon corn, ferns, and the cyclamen. In March of this year Mr. Wm. Miller of Bar Harbor sent in specimens for identification which were said to be nibbling the flowers while the larvae were doing much damage to the roots of cyclamen. As the species works by night some difficulty was experienced in catching the culprits. Lot 852.

HYMENOPTERA.

Lophyrus abietis (Fir Sawfly)

This year there have been no complaints made to the Experiment Station concerning this insect which for several seasons has been so injurious to the firs in some parts of the State.

Emphytus canadensis (Violet sawfly).

Some larvae answering Dr. Dyar's description of the above mentioned species were found July 2 in Orono, feeding upon pansies. This insect has been reported from several northern states and from Canada. In Bul. 27, n. s., U. S. Dept. Agri., Div. Ent. p. 26, is given a full account of this pest. Lot 1236.

Aulax glechomae and *Torymus flavicoxa*.

Spherical galls were very common this summer upon plants of *Nepeta hederacea* (Ground Ivy) which grow abundantly along the roadsides near the University campus. The galls (Fig. 4) which are usually green, though sometimes tinged with red and yellow, were full grown by the end of July and by the middle of September had become dry. They do not appear to differ from Connold's figure in "British Vegetable Galls." The gall maker is an *Aulax* in the sense of Kieffer (*Genera Insectorum*) and answers Cameron's description of *A. glechomae* in his "British Phytophagous Hymenoptera," excepting that the abdomen is uniformly dark brown and shining. Some plants with galls

upon them were transplanted to the Insectory in June. In September, when examined, each gall was found to contain a single mature, fully developed *Aulax*; while all galls gathered from plants growing in the open at this time were found to contain larvae of Hymenopterous parasites. Galls gathered in the fall of 1909 and kept over winter produced only parasites (*Torymus flavicoxa*, lot 767) which emerged in June.

Eurytoma gigantea.

Is this species a true gall maker or is it parasitic upon the larvae of *Eurosta solidaginis*? The galls in which they are found cannot be distinguished externally from those inhabited by the Trypetid excepting possibly by their slightly smaller size. The cavity within the gall, however, is irregular in shape, discolored and darkened, and filled with frass, differing in this respect from the cell of the dipteran which is clean and oval in shape. Larvae of various sizes of the Hymenopteron were found in the smaller galls collected March 29, while only pupae of the Trypetid were present in the larger galls. In August galls were again gathered and examined. Each contained a half grown *Eurytoma* larva and in none was there evidence of it having been inhabited by the Trypetid. The fact that the frass seems to be of plant tissue, that the gall cell is irregular in shape, and that half grown larvae are found, all lead one to believe that this species is not parasitic.

HETEROPTERA.

Blissus leucopterus (Chinch bug).

Complaints have been made that some insects, spoken of as "ground fleas" kill the grass in large patches on the lawns in Bar Harbor and in Bangor. An examination showed that the injury was due to the nymphs of the Chinch bug which were present in large numbers. Some years ago this trouble was more wide spread. The details of these former occurrences and the remedies suggested will be found in the Reports of the Maine Station for 1892 and 1894 and also in Bulletin 91 (1903). Lot 1276.

HOMOPTERA.

Gossyparia spuria (Elm bark louse).

Badly infested twigs of the American Elm were sent in from Castine, Maine. Several trees upon the University campus at Orono are also affected. Lot No. 1298.

Phenacoccus sp.

Some specimens of what may be *P. dcarnessi* with the description of which they agree, were sent in from Wiscasset, Maine, in June. The white downy secretions make this insect a conspicuous object. They were found under the bark of an apple tree. Lot No. 1244.

Eulcanium canadense.

This species was abundant on the branches of an elm tree in Bridgton, Maine, June 9, 1910. Lot No. 1207.

Chionaspis lintneri.

One tree of *Betula populifolia*, was found in Orono in August badly infested with this scale. Lot No. 1300.

PSYLLIDAE.

EDITH M. PATCH.

So little attention has been paid the psyllids in New England that a group of 6 species taken in Maine during the summer of 1910 has been of interest to the collectors. Two of these, at least, *Psylla pyricola* and *P. striata*, from the character of the host plants are of real economic importance, the one being at times a serious pest of the pear and the other when abundant being injurious to the new growth on shade birches. Besides these 6 species, a blackberry psyllid is sometimes abundant in Maine but we have at present no material to work up for this.

For the study of structural characters, the admirable paper by Mr. H. B. Stough* has been of great aid and the species here briefly recorded were worked over with reference to that publication. For the Comstock-Needham terminology of psyllid

*1910. H. B. Stough. The Hackberry Psylla. *Pachypsylla Celtidismammae* Riley. A study in Comparative Morphology. The Kansas University Science Bulletin, Vol. 5. No. 9.

wing veins (Fig. 18) the reader is referred to "Die Fossilen Insekten"*** and to "Homologies of Wing Veins"*** for the interpretation of *Sc* and *R*.

Psylla pyricola.

Apparently the first record of an infestation of the common pear tree psyllid in Maine was given by a correspondent in Camden, Maine, September 10. The pear leaves submitted were badly discolored both by the psyllid work and the attendant honey dew fungus. Nymphs, pupae and adult psyllids were abundant at this date.

Psylla floccosa.

The downy psyllid of the alder was very abundant upon the new growth of *Alnus incana* (L.) Moench, this spring. This species was described in The Canadian Entomologist Vol. 41, pp. 301-303. For the sake of comparison with the two new species of this genus which follow a few characters of *floccosa* are here given.

Head. The head is broader than the prothorax, and of practically the same type as that of *galeaformis*. The epicranial plates are distinctly separated by a median suture and the 3 ocelli are arranged as in *galeaformis*. Like the 2 other representatives of this genus here described the antennae are normally 10-jointed and a single distal circular sensorium is borne upon joints IV, VI, VIII and IX. The terminal spine-like setae are nearly equal in length. Slender setae are present, but not numerous, on joints III-X inclusive. The antenna is about 2.5 mm. long and filiform and the tip extends nearly to the genital segment of the abdomen. Fig. 8 gives the head in cephalic aspect.

Wings. Fig. 5. The wings are colorless but in form and venation they are exceedingly similar to *galeaformis*, and the stigma though indicated is very narrow and pale. The wing is about 4.2 mm. long.

Genitalia. Male. The supra-genital plate is somewhat cylin-

**1905-1908. A. Handlirsch. Die Fossilen Insekten und die Phylogenie of Rezenten Formen.

***1909. Edith M. Patch. Homologies of the Wing Veins of the Aphididae, Psyllidae, Aleurodidae and Coccidae. Annals of the Entomological Society of America, Vol. 2, No. 2.

dricul and without lateral processes. At the geniculation the copulatory organ is enlarged and knob-shaped. From a lateral aspect the forceps widen out near the tip. The tip on the inner surface has 2 blunt processes not claw-like as in *galcaformis*, and the inner setae at the tip are much more numerous than in *galcaformis*. Fig. 7 will give an idea of some of these characters.

Female. The lateral aspect of the genital segment (Fig. 6) shows the following characters for the female. The dorsal line of the supra-genital plate is nearly straight to near the tip where the end of the plate is abruptly and conspicuously turned up. The setae of this plate are scattered but long, and they are not present at the tip. Numerous setulae, small and blunt, give the plate a pebbly appearance when viewed through a 1-5 in. objective. Circum-anal wax glands are present. The subgenital plate has a pointed end and the surface is very sparingly supplied with setae the length of those upon the supra-genital plate. The ovipositor and the very broad sting-palpi extend beyond the upper and lower plates. Fig. 6.

Psylla galcaformis n. sp.

Specimens of this species have been taken from the leaves of the Alder, *Alnus incana*, July 26, 1905; August 17, 1905, and September 1, 1910. In head and wing characters it is so much like *floccosa* that they might easily be taken for the same species. These 2 alder species can, however, be definitely separated on the characters of the genitalia as will be seen from the accompanying descriptions and figures. The frontal cones of *galcaformis* are relatively shorter and blunter than in *floccosa* and the wings are yellow which distinguishes them from the hyaline, colorless wings of *floccosa*.

The general body color of a well colored specimen is pale yellowish brown beneath and dark brown dorsally. Head reddish orange dorsally, rest pale yellowish brown. Thorax with lobes reddish amber marked with white curved lines, the lobe of the metathorax being redder than the others. Legs are pale yellowish brown. The fore-wings are transparent and a pale golden brown in color with veins brown except at base, where they are greenish. Abdomen with about 7 dark brown transverse heavy

bands, between the first and second of which is a deep rich red band. The genital segment is dark brown.

Head. The head is broader than the prothorax. The cephalic aspect (Fig. 13) presents 2 sub-quadrate epicranial plates, the dorsal margin of which gives a decided concave curve. A distinct median suture separates the plates. All 3 ocelli are visible in this view of the head. The front ocellus, situated at the ventral end of the median epicranial suture, is just at the median dorsal angle of the frontal lobes. The frontal cones are large, triangular processes, their combined bases extending the full breadth of the head ventrad the compound eyes, and in length the cones are nearly equal to the length of the epicranial plates from the same aspect. The distal tip of the cone is directed ventrad. The setae of the cones are longest and most numerous near the tips. The antennal sockets are about on a line with the front ocellus. The antennae are about 2.75 mm. long, reaching if extended backward far along on the abdomen. The antenna is 10-jointed. III is longer than any other joint, IV to VIII are subequal, IX and X combined are about equal to VIII. Joints IV, VI, VIII and IX each bear a single distal circular sensorium. There are a very few scattered slender setae on the antenna and X is armed with two stout terminal spine-like setae not quite equal in length.

Wings. In form and venation the wings of *galcaformis* are typical of the genus *Psylla*. The stigma is distinctly indicated but narrow, appearing like a mere widening of the costal margin. Fig. 9 gives a more adequate idea of the venation than a description. The wing length is about 4.1 mm.

Genitalia. Female. The genital segment is long and tapering, from the lateral aspect. The supra-genital plate has a slight concave curve in dorsal outline, the tip is rounded and somewhat hood-shaped and is bristling with long setae. Setae of the same sort are present but less numerous along the dorsal line of the supra-genital plate back from the tip and along the lateral surface are small but stout spine-like setulae which are visible through a 1-6 in. objective. The subgenital falls far short of the supra-genital plate in length. The tip is pointed and splinter-like. Along the ventral surface are long setae and on the lateral surface are short, stout spine-like setulae, both

setae and setulae being practically the same as those of the upper plate. The ovipositor slightly exceeds the supra-genital plate in length. The sting-palpi are narrow, compared with those of *Psylla floccosa*. Fig. 12 represents this segment.

Male. The genital segment (fig. 10) is of the same general type as that of *floccosa* and it would be difficult to separate these two species on that segment without a dissected mount. A reliable character is found, however, in the forceps of the sub-genital plate. When viewed from the caudal aspect each arm of the forceps is seen to be tipped with two acute claw-like projections in contrast with the blunt forceps of *floccosa*. The terminal inner setae of the forceps are not so numerous as in *floccosa*. Fig. 11.

The color notes are taken from the living specimen, and the structural details from balsam mounts. Cotypes collected from *Alnus incana* (L) Moench. July-September, at Orono, Maine. (Lot 1326 Sub. 3.)

Psylla striata n. sp.

The tips of birch shoots were very commonly covered by inconspicuous woolly masses in the new growth during the spring of 1910. Concealed in this protective covering were psyllid nymphs. Late in June the mature forms appeared. The freshly molted specimens had greenish thorax and abdomen and yellow wings. Among the older well colored individuals the females had 3 distinct, abruptly marked color divisions, the head and thorax being amber yellow, the abdomen vivid green to the cephalic edge of the genital segment which was dark yellowish brown. The wings were amber in tone and darker than the head and thorax. In the male the head and thorax were pale amber yellow, the wings a darker yellow and the abdomen pale green. The eyes of both male and female were dove gray.

Head. The head is broader than the prothorax. The cephalic aspect (Fig. 16) presents the following characters. The 2 epicranial plates taken together are heart-shaped, the dorsal line being a concave curve and the line from the posterior ocelli to the front ocellus being a convex curve. A distinct median suture separates these plates. The frontal lobes are prominent but are relatively shorter than in *floccosa* and *galcaformis* and are more rounded. They are supplied with setae. The anten-

nae are relatively shorter than in *floccosa* and *galcaformis*. They are 10-jointed. III is the longest joint. IV to VIII are subequal. IX and X together are about equal to VIII. A single distal circular sensorium is borne by each of segments IV, VI, VIII and IX. The 2 terminal stout spine-like setae of X are unequal in length, one being about $\frac{3}{4}$ the length of the other. The antennal length is about 1.55 mm.

Wings. In form and venation the wings of *striata* (fig. 14) are the same general type as those of *floccosa* and *galcaformis* except that in the *striata* wing the stigma is relatively much wider and more strongly indicated. The wing length is about 2.65 mm.

Genitalia. Male. The supra-genital plate is somewhat conical with the anal opening at the distal tip a little flared. This plate is about evenly and thickly supplied with setae. The forceps of the subgenital plate are also thickly setous, the setae becoming shorter and more spine-like at the tip. The tip of each branch of the forceps is armed with 2 strongly chitinized claws. Fig. 15 gives a very good idea of these structures.

Female. From the lateral aspect, well shown in Fig. 17, the genital segment of the female shows the following characters. The supra-genital plate is fusiform at the end. This fusiform portion is without long setae and the margin is striated. A few scattered setae are present along the dorsal line and numerous stray blunt, very short setulae thickly stud the lateral surface of the plate. A well defined circular area of circum-anal wax glands is present at the cephalic portion of the plate. The subgenital plate is broader than in *galcaformis* and *floccosa* and the tip is gently curved up. There are a few setae present chiefly along the ventral line and the lateral surface of the plate is thickly set with strong setulae similar to but longer than those of the upper plate. The lower plate is considerably shorter than the upper. A little cephalad the tip of the lower plate the ovipositor takes a sudden bend dorsad and the tip of the ovipositor touches the supragenital plate, but does not extend to the end of the plate.

The color notes are from living material and the structural details are from balsam mounts.

Cotypes collected from *Betula*, June, at Orono, Maine. (Lot 1228)

Aphalara veazici n. sp.

A green bodied psyllid with amber yellow wings was collected in great numbers in the vicinity of Orono. The vegetation swept by the collecting net was *Solidago* and *Myrica asplenifolia* L. (sweet fern) in one locality and grass, *Solidago* and other growth in a second locality. The nymphs were not found and the host plant is as yet unknown. The species was most abundant in late June and early July, though a few specimens were taken in the same localities July 27.

Head. The head is broader than the prothorax and nearly twice as broad as long when viewed from the dorsal aspect. The cephalic aspect of the head (Fig. 19) shows 2 approximate but separated quadrate *epicranial plates* (*ep*). These are raised and very distinct. At the latero-caudal angles of these plates are situated the posterior ocelli. In a triangular enlargement of the suture between the 2 epicranial plates at their mediocephalic angles is situated the front ocellus (*fo*). The ventral aspect of the head (fig. 20) shows the *frontal cones* (*fc*), ovoid in outline placed one on each side the *frons* (*fr*). The frons is also rather ovoid and about the size of the frontal cones. The distal end of the frons projects caudad. The antennal sockets are about on a line with the front ocellus and are situated in an angle caudad the frontal cones and mesad the compound eyes. The antenna, if extended backward, would reach a little caudad the base of the first pair of wings, their length being about 0.8 mm. There are 10 joints. III is longer than any other. IV to VIII are subequal, each being about half the length of III. IX and X are shorter and broader than the preceding joints. X with two stout terminal diverging spines, one of which is slightly longer than the other. Joints IV to VIII inclusive each bear a single distal, laterally placed, circular sensorium fringed with delicate hairs. These resemble somewhat the terminal sensorium of the fifth and sixth antennal joints of the aphids. The antenna is not setose.

Wings. The wings are amber yellow in tone and are with or without pale brown flecks which when present give the distal portion of the wings a mottled appearance. The variation in the flecking of the wings is perhaps due to differences in the age of the individuals, as psyllids are uniformly paler when young than the more highly colored individuals. The distal end of the

wing is rounded and the veins are stout. There is no stigma, R₁ striking the margin at a point a little nearer to the base of the wing than to the distal end of R_s. The cephalic branch of R touches very nearly the extreme tip of the wing. The wing length is about 1.85 mm. Fig. 18 gives a typical wing of this species.

Genitalia. In the male the abdomen is abruptly constricted just cephalad the genitalia. The *supra-genital plate (sa)* is a fleshy upright structure attached to the dorso-cephalic portion of the subgenital plate. It ends distally in a membranous ring which is the anus(*a*). Extending caudad from the lateral areas of the supra-genital plate are two *lateral processes (lp)* of this plate. In a lateral aspect these plates are triangular in form, the cephalic portion being attached to the upright portion of the supra-genital plate. The distal portion of these lateral processes touch the lateral surface of the forceps when the forceps are directed cephalad. The supra-genital plate is armed with short spine-like setae which are visible through a 1-6 in. objective. Those near the region of the anus are longest and stoutest.

The arms of the forceps (*f*) at the caudal extremity of the sub-genital plate (*sg*) are from the lateral aspect largest at the distal end which is blunt and somewhat rounded. Each arm (Fig. 24) is supplied on the inner surface near the tip with a large strong claw-like process. The forceps when examined through a 1-6 in. objective are seen to be sparsely supplied with setae. At the base of each arm on the cephalic surface is a strong spine-like seta. Figs. 21, 22 and 24 represent these parts.

The genital segment of the female is somewhat wedge shaped and is less than the combined length of the 3 preceding ventral segments. The supra-genital plate (*sa*) is gently up-curved at the distal tip. The dorsal portion is supplied with long setae plainly visible through a 2-3 inch objective. Its lateral surface is thickly beset with very short, stout setulae visible through a 1-6 inch objective. Near the base of this plate at the dorsal median line is a region of circum-anal wax glands. These were difficult to locate in the ordinary dissected balsam mount. The subgenital plate (*sg*) is not so long as the upper plate, being about the length of the 2 preceding ventral segments. Its surface is

sparingly supplied with small setae, larger however than the setulae of the supra-genital plate.

The brown highly chitinized pointed tip of the ovipositor extends about to the tip of the supra-anal plate (*sa*). Fig. 23 gives a good lateral aspect of this segment.

The color notes are from live specimens and the structural notes are from balsam.

Cotypes collected in June and July at Orono and Veazie, Maine. (Lots 1232 and 1326 Sub. 1).

Trioza obtusa n. sp.

This species was bred from nymphs developing on *Amelanchier canadensis* (L.) Medic, the winged forms appearing July 6, 1910, and later. A male of the same species taken from *Amelanchier* is in our collection with the date August 1, 1906. In general coloration this species varies from pale green bodied freshly molted individuals with colorless hyaline wings, to older deeply colored individuals with bodies of ochre yellow and wings very dark and smoky. The mesonotum is roundly pointed cephalad and more elevated than pronotum.

Head. The frontal cones are not vertical but are distinctly visible from above. They are widely diverging, the mesal line being convex and the lateral line concave. The tip is rather acute. A dorso-cephalic aspect of the head (Fig. 29) shows 2 quadrate epicranial plates with a median suture between them. All 3 ocelli are visible in this aspect. The antennae are short and 10-jointed. IX, X and distal VIII are darker and somewhat broader than the preceding joints. IV, VI, VIII and IX each bears a distal circular sensorium. Two very unequal setal spurs terminate X, the shorter one being about half the length of the longer and thicker. The antennal length is about 0.85 mm.

Wings. Fig. 25 sufficiently represents the form and venation of the fore wing. They are sometimes very dark and 3 characteristic black dashes are present at the wing margin, one between the cubital branches, one between the branches of media and one between media and cubitus. The wing is roundly pointed at the apex between the branches of media. The venation is a good *Trioza* type, the main vein branching into R, M, and Cu at practically the same point. There is no stigma. The wing length is about 2.63 mm.

Genitalia. Female. The genital segment ends in an obtuse point. Fig. 26 represents a slightly dorso-lateral view. The supragenital plate has no long setae at the tip but some very small setulae. A circum-anal area of wax-glands is present at the cephalic portion of this plate. The deep hollow subgenital plate is pointed at the apex. There are numerous stout setae scattered over the surface but none at the distal tip.

Male. The abdomen of the male is strongly constricted just cephalad the genital segment. The supragenital plate consists of an erect portion ending in a circular opening,—the anus. Extending nearly from the base but not quite to the tips of this portion are two broad lateral processes. These processes are concave on the dorsal line and bluntly rounded at the tip. They are very thickly set with setae. A row of very long, strong lash-like setae fringe the concave line of these processes and are thickest at the tip. The forceps of the subgenital plate are strong structured enlarged and blunt at the end, and considerably constricted about midway their length. Fig. 27 shows this segment.

The nymphs of this species were found in all stages upon the leaves of *Amelanchier canadensis*. They were collected by Mr. William C. Woods, July 6 to July 27, 1910. They fed upon the ventral surface of the leaves where their presence was readily detected on account of the beautiful white floss-like wax filaments that curled softly up from the margin of their bodies. These wax filaments are secreted by wax glands which extend in a single marginal row in the earlier stages but which in the later instars occur both on the margin and for a considerable distance mesad on the dorsal surface of the body. A crescent shaped area of wax glands surrounds the anus in all the nymphal stages.

Nymph. First instar. Fig. 30. The marginal wax tubes are cylindrical and are arranged 8 on each side of the head cephalad the eye, one on each thoracic segment at the caudal angle, and about 12 along each side of the abdomen.

Second instar. Fig. 31. The marginal wax tubes are cylindrical and are arranged 10-13 on each lobe of the head cephalad the eye; a single prothoracic waxtube situated caudad the eye, 7 along the mesothorax, 3-4 on the metathorax, and about 18 along each side of the abdomen.

Third instar. Fig. 32. The marginal wax tubes are not quite uniform in size. They are arranged 14 on each lobe of the head cephalad the eye, a single one on the prothorax just caudad the eye, 15-16 on the wing pad of the mesothorax, 4-5 on the wing pad of the metathorax and about 30 along each side of the abdomen.

Fourth instar. Pupa. Fig. 33. The marginal wax tubes are vasiform and vary in size. Upon the head the wax tubes are thickly situated over an area nearly the breadth of the eye. There is one prothoracic marginal wax tube just caudad the eye. The marginal wax tubes of the mesothoracic wing pad number about 60 while others are present extending mesad, and the marginal tubes of the metathoracic wing pad number 10-12. On the abdomen are about 60 marginal tubes and a thick triangular area of dorsal tubes extending cephalad.

The thorax and abdomen of the pupa are pale green with pale yellowish brown broad transverse bands. The head is of a pale yellowish brown tint, with dark eyes. The antennae hardly reach the wing pads which are creamy white. Entire body with a stiff but delicate white fringe of long wax filaments in an unbroken and perfectly regular row.

Cotypes collected on *Amelanchier canadensis* (L.) Medic. in July at Orono, Maine. (Lot 1238).

APIIIDIDAE.

EDITH M. PATCH.

Mindarus abietinus Koch.

(*Schizoneura pinicola* Thomas).

On July 12, 1909, the tips of white spruce, *Picea canadensis* (Mill.), and balsam fir, *Abies balsamea* (L.) Mill., in the vicinity of Orono were noticed to be very generally and very seriously affected. No cause for the trouble could at that date be found. In the growth of mixed young balsam fir and white spruce the new shoots of the fir were entirely killed, having withered after making a growth of about one-fourth inch. The spruce tips were much ruffled and in many cases also dead and it was surmised that the same cause might be responsible for the trouble of both these conifers. (Lot 759. Lot 760).

It was not until May 25, 1910, however, that the explanation

of this fir and white spruce trouble was chanced upon. At this date the new growth of both these conifers on the Maine Campus was noticed to be badly ruffled and upon examination found to be thickly packed with *Mindarus abietinus*. Only apterous viviparous forms were present, those on the fir being mature and already producing, while those collected on the spruce molted on the night of May 25 and were producing by the 27th. The tender new growth was the only part of the tree infested, the aphids feeding upon the shoots and the needles becoming curled, roughened, and uneven from the disturbance. The infestation was so severe that these trees could not be touched without a heavy shower of honey dew ensuing and the branches were wet with the sticky globules.

In the vicinity of Orono these aphids were so very generally attacked by Syrphus maggots that by the first of June scarcely a *Mindarus* could be found, and in their stead hungry syrphids were vainly seeking for food. Practically the whole infestation in this locality was therefore wiped out about two weeks before the usual time* for the development of the winged forms and their migration from white spruce and fir.

The 1910 growth of both white spruce and fir retained their ruffled appearance during the season and many of the twig tips died. Typical work of *Mindarus* was received July 8, 1910, from Caribou, Maine, from the owner of a fine spruce hedge who reported that it had made excellent growth for about 12 years but that this present season the tips of nearly all the upper branches were dying.

The work of this insect is illustrated by Figs. 34-36, these photographs being taken July 11 of spruce and fir twigs which were thickly infested late in May.

Specimens of *Mindarus abietinus* upon *Abies balsamea* were sent from Highspire, Pa., on May 25, with the comment that they were present in 4 different localities. These were winged which would indicate that the migrants develop some 3 or 4 weeks earlier in that region than in Maine.

The summer generations of *M. abietinus* have not been found in Maine. Of special interest in this connection is the record by Doctor Felt (25th Report) of the abundance of *pinicola* Thomas

*Me. Agr. Expt. Sta. Bulletin 182, p. 244.

upon the roots of white pine seedlings, and the fall migration thence. (Aphid Nos. 21-10, 22-10, 53-10, 54-10).

RECENT LITERATURE ON MINDARUS ABIETINUS KOCH.

Felt, E. P. *Schizoneura pinicola* Thomas. 25th Report of the State Entomologist (1909) 1910. pp. 80-81.

Nüsslin, O. Zur Biologie der Gattung *Mindarus* Koch. Biologischen Centralblatt. Bd. XXX, Nr. 12 and 13. 15. Juni und 1, Juli 1910.

Patch, Edith M. Me. Agric. Expt. Sta. Bul. No. 182, pp. 242-245. 1910.

Tullgren, Albert. Aphidologische Studien I. Uppsala 1909. pp. 59-61.

Aphis scdi Kalt.

The Garden Orpine, or Live-for-ever, *Sedum purpureum* Tausch., along the Orono roadsides was observed to be badly deformed in June, the stem terminating in a rosette of abnormally small leaves (Fig. 3). The aphid concerned with this deformation corresponded to *Aphis scdi* Kalt as presented both by Koch and Buckton and there seems no reason to consider it a different species. This species has not previously been recorded for America. (Aphid 24-10).

Eucallipterus tiliac (Linn.)

From September 5 to 29 collections of *E. tiliac* were made from the ventral surface of leaves of the basswood, *Tilia americana* L. at Orono. During this month, apterous viviparous, alate viviparous, apterous oviparous females and alate males were taken. (Aphid 110-10).

Pemphigus rhois (Fitch).

Sumacs in Bangor, Me., were rendered particularly ornamental this fall by virtue of great numbers of the large beautiful galls of *P. rhois* on the leaves. The aphids in one gall were counted on October 2, and 141 apterous viviparous forms, 1150 winged viviparous forms besides numerous nymphs and pupae were present in a single gall. (Aphid 145-10).

Hyalopterus arundinis (Fab.)

An especially heavy infestation of *H. arundinis* occurred on a variety of large green plum trees at Orono this season. Later in July the leaves on the ventral surface were so thickly packed that there was "beak room only" for the aphids present, the rest of their bodies being pressed out from the leaf and supported by one another. No tendency of leaf curl was manifested, the leaves remaining perfectly flat. (Aphid 79-10).

Tetraneura graminis (colophoidea).

Through a misprint on page 208 of Bulletin 181 of this Station the name of this insect appeared written as a trinomial. *Colophoidea* should have been enclosed in braces as it here appears.

Chermes cooleyi in New England.

Typical large, well-formed galls of *Chermes cooleyi* Gillette were received from Manchester, Mass., in September 1910, where they were taken on Colorado Blue Spruce. As this tree is not generally grown in the east the infestation is of especial interest. In *Chermes of Colorado Conifers*, Proceedings of the Academy of Natural Sciences of Philadelphia, 1907, Professor Gillette states that in Colorado this species migrates to red fir, (*Pseudotsuga mucronata*) and that he finds the galls most numerous in parks or lawns where the blue spruce and red fir are clustered together. This fact in the life history is significant for its possible economic bearing. In plans for landscape gardening in the east which include the Colorado Blue Spruce, it would seem wise not to plant the red fir or closely allied varieties on the same or neighboring estates.

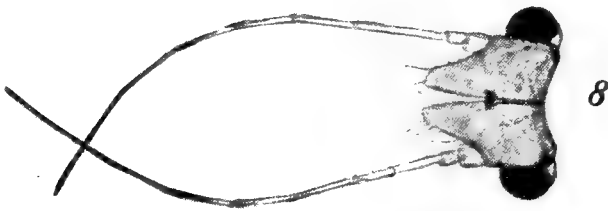
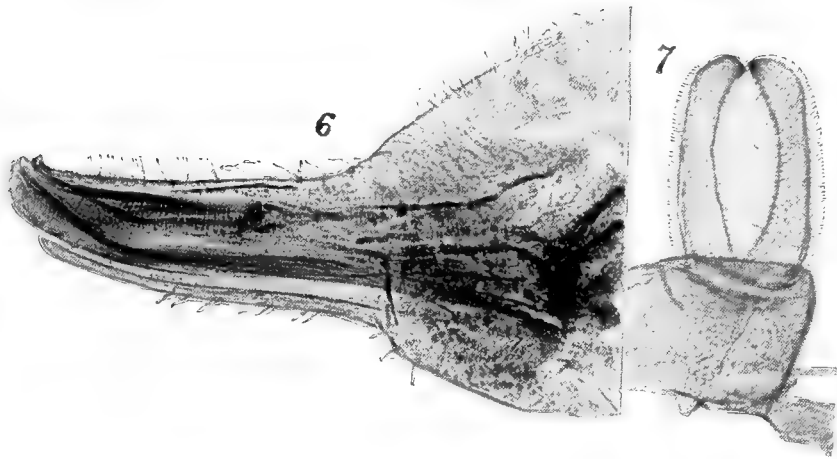
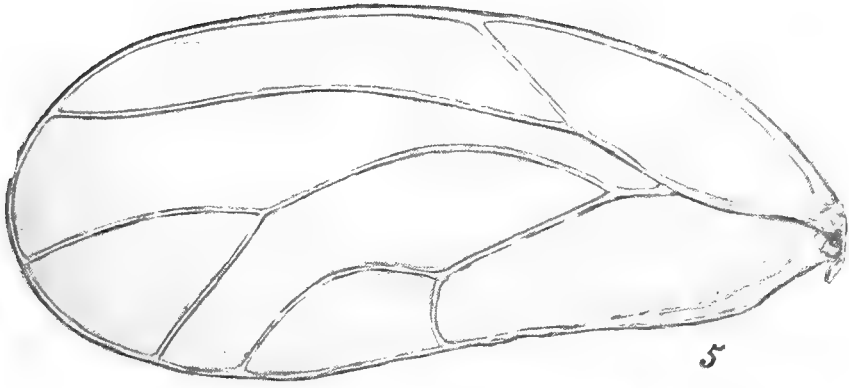
THYSANURA.

Smythurus albamaculata (Garden flea).

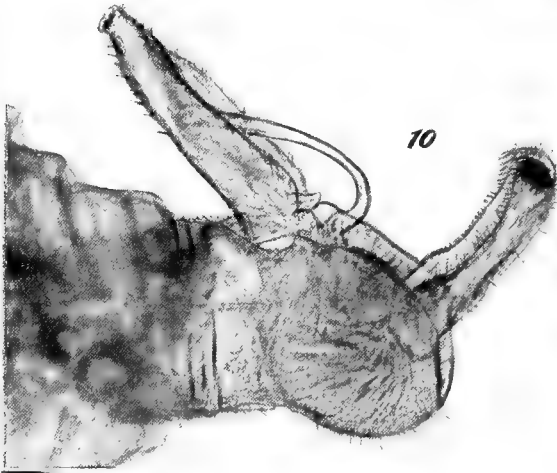
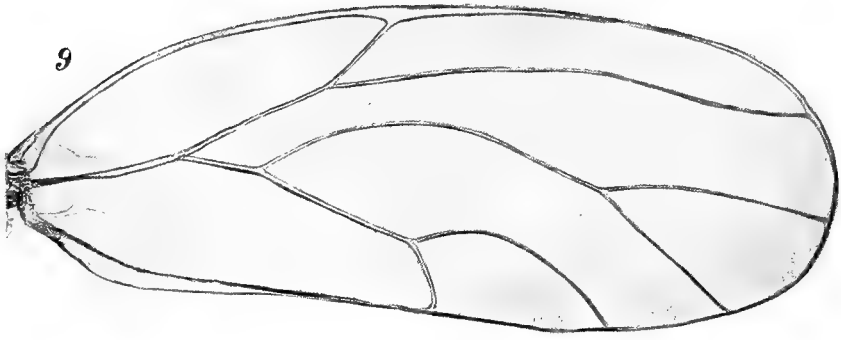
A correspondent from Newport Farm, Maine, sent in specimens of this insect with the statement: " * * * they eat up everything in sight. I am also sending you a sample of their work on peas and onions. As for small seedlings such as beets, carrots, and spinach, they eat them as soon as they break ground." Accounts of the habits together with the description of this species were published in the Report of the Maine Agricultural Experiment Station for 1896, pp. 124-126. See also notes in Bulletins No. 123, p. 220, and No. 134, p. 225. Lot No. 1152.



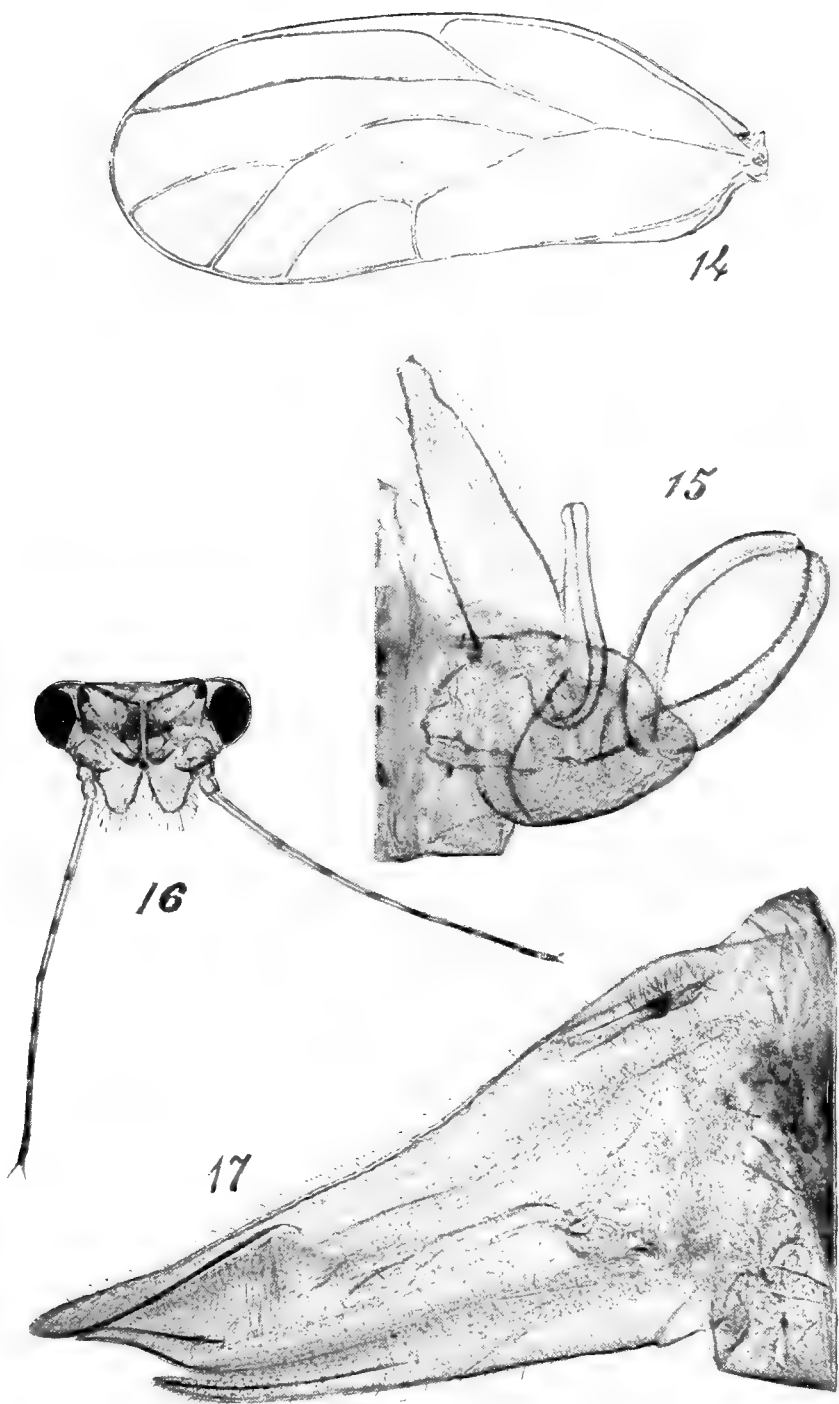
1, Webworm injury. 2, Bag worm (*Eurycyttarus confederata*).
 3, Work of *Aphis sedi* on Live-for-ever. 4, Gall of *Aulax glechomae* on Ground Ivy.



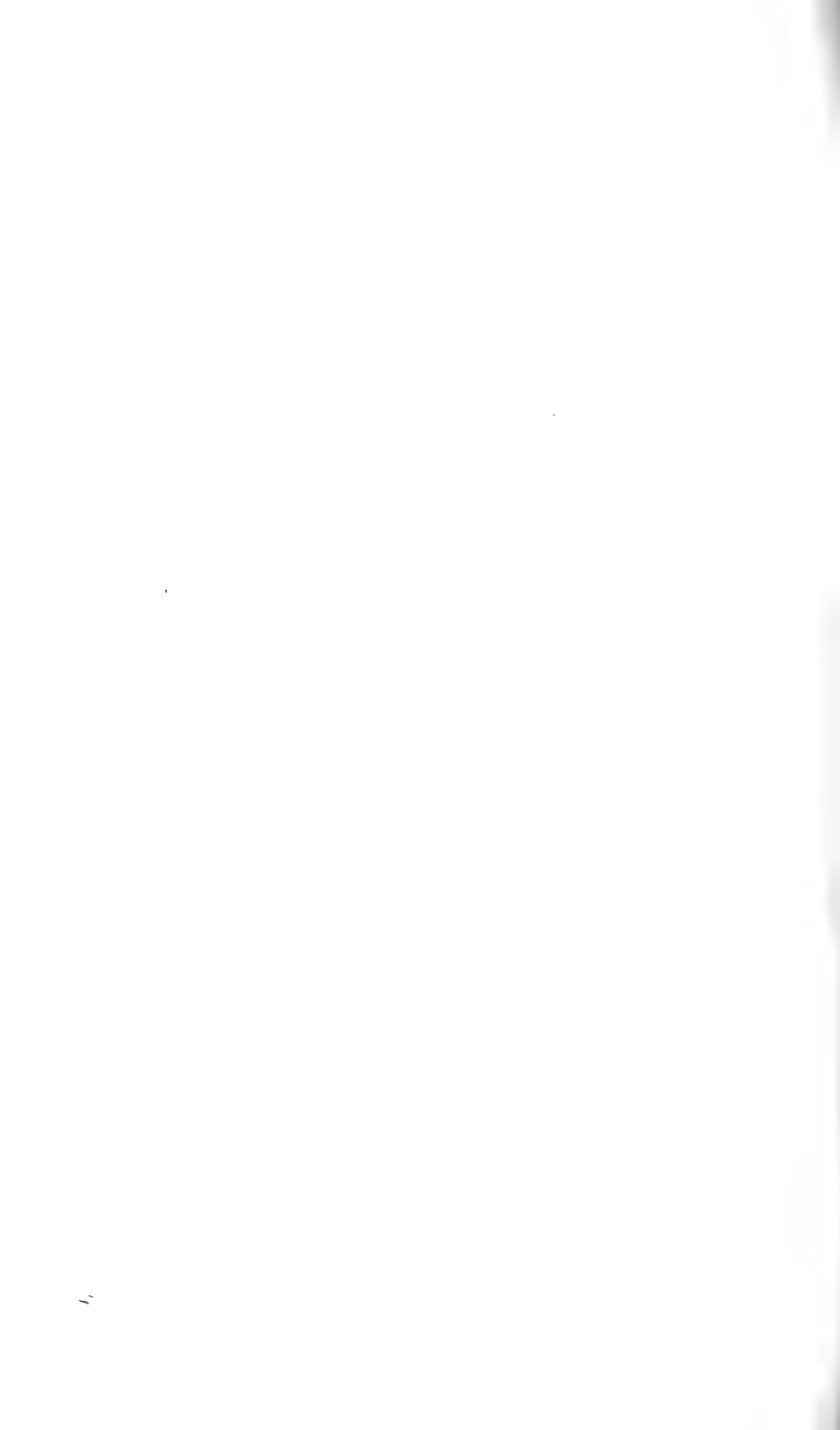
Psylla floccosa. 5, Fore Wing. 6, Caudal segment of female; lateral aspect. Note that the supra genital plate has an abrupt upward turn at apex. 7, Forceps of male; caudal aspect. Note blunt tips. Compare with fig. 11. 8, Head, cephalic aspect.

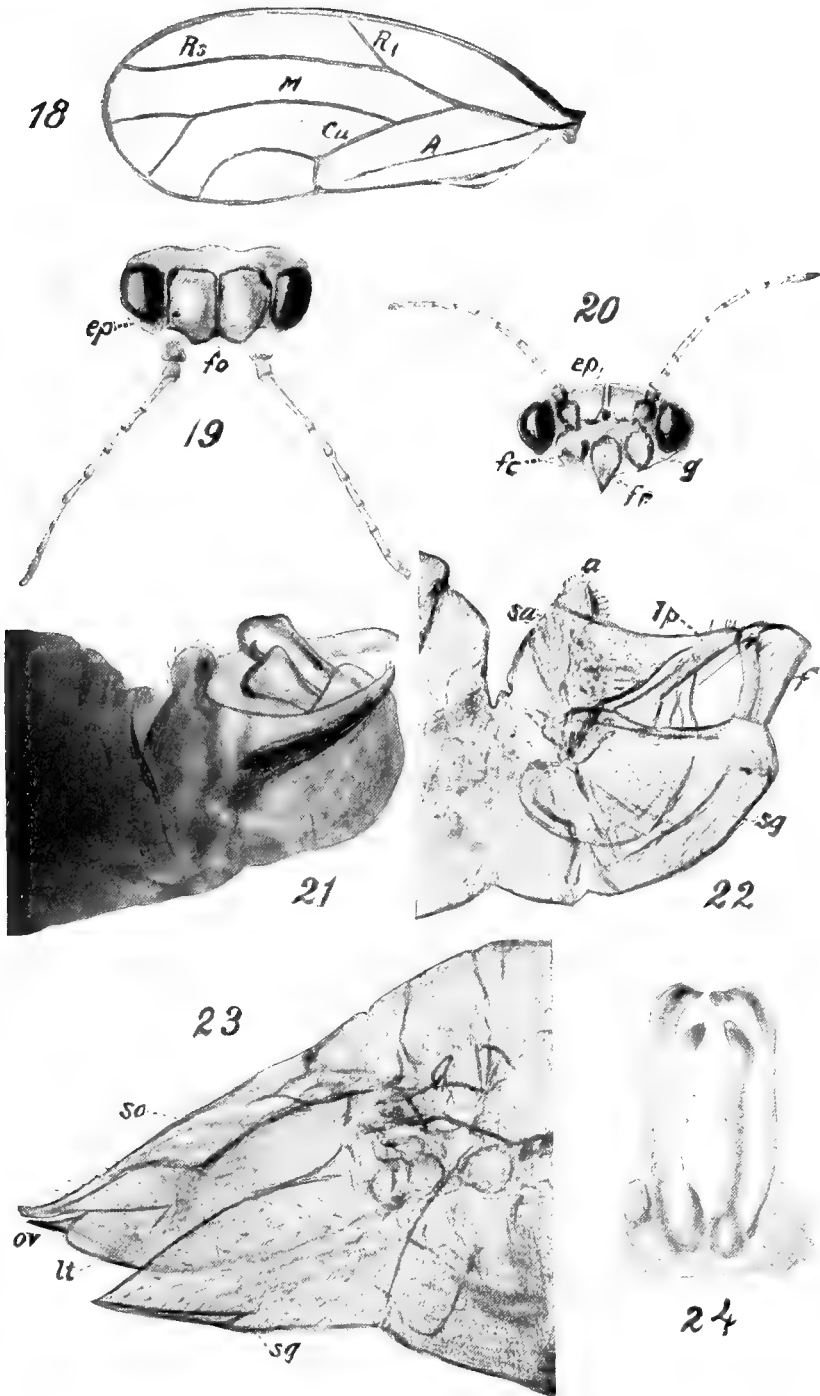


Psylla galeaformis. 9, Fore wing. 10, Caudal segments of male; lateral aspect. 11, Forceps of male; caudal aspect. 12, Caudal segment of female; lateral aspect. 13, Head, cephalic aspect.



Psylla striata. 14, Fore wing. 15, Caudal segment of male; caudo-lateral aspect. 16, Head; cephalic aspect. 17, Caudal segment of female; lateral aspect.

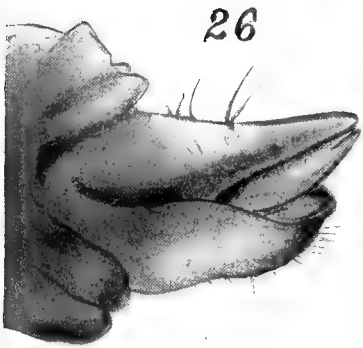




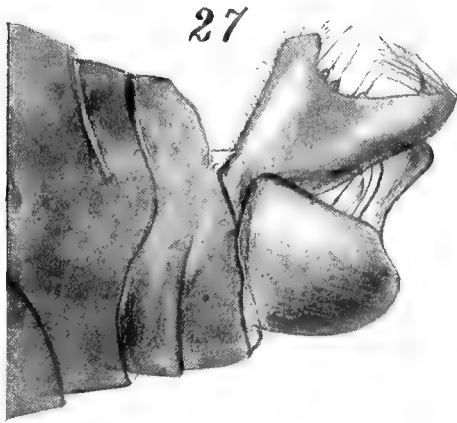
Alphalara veaziei. 18, Fore wing. 19, Head, cephalic aspect. 20, Head; ventral aspect. 21, Caudal segment of male; dorso-lateral aspect, forceps retracted. 22, do.; lateral aspect. 23, Caudal segment of female; lateral aspect. 24, Forceps of male; cephalic aspect.



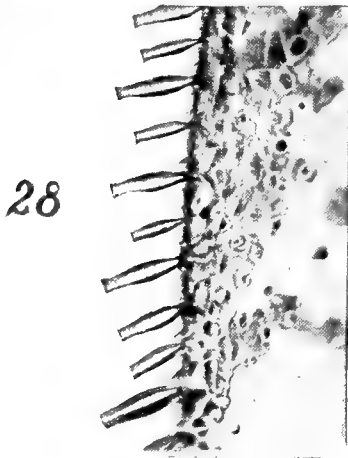
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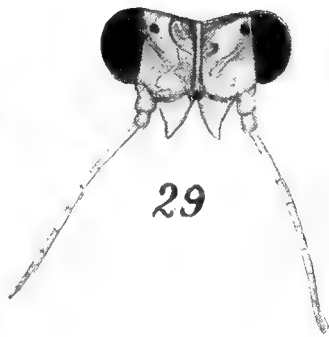
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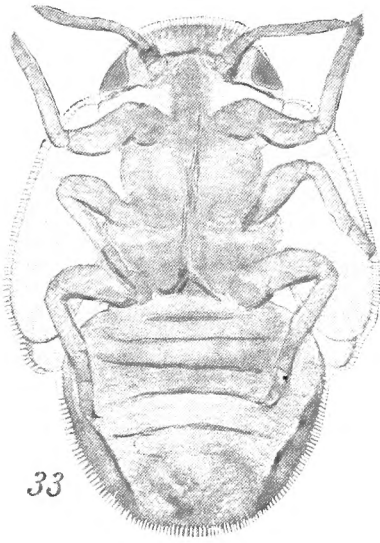
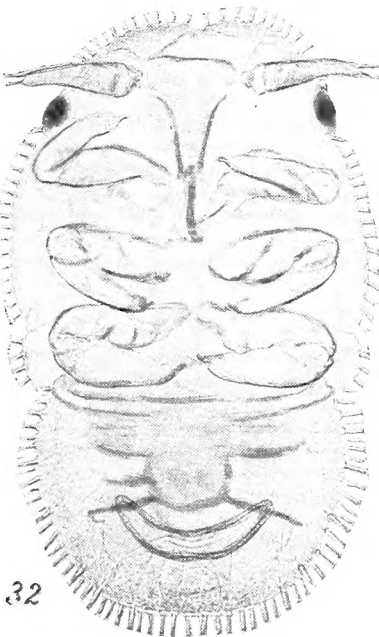
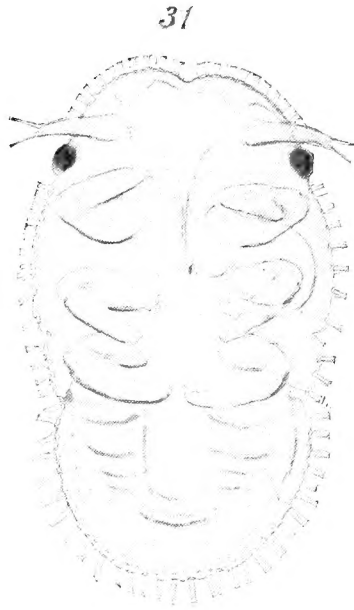
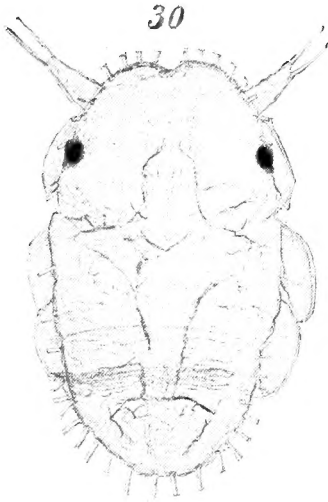
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Trioza obtusa. 25, Fore wing. 26, Caudal segment of female; dorso-lateral aspect. 27, Caudal segment of male; lateral aspect. 28, Marginal wax glands on wing pad of pupa. 29, Head; dorso-cephalic aspect.





Trioza obtusa. 30, First instar. 31, Second instar. 32, Third instar. 33, Pupa.





Work of *Mindarus abietinus*. 34, On Spruce (*Picea canadensis*).
35, 36, On Balsam Fir (*Abies balsamea*).

