Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☑ Bound with other material/ Relié avec d'autres documents
- ☑ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

- ☐ Coloured pages/ Pages de couleur
- ☐ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed/ Pages décolorées, tachetées ou piquées
- ☐ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☑ Quality of print varies/ Qualité inégale de l'impression
- ☑ Continuous pagination/ Pagination continue
- ☐ Includes index(es)/ Comprend un (des) index

Title on header taken from:/ Le titre de l'en-tête provient:

- ☐ Title page of issue/ Page de titre de la livraison
- ☐ Caption of issue/ Titre de départ de la livraison
- ☐ Masthead/ Générique (périodiques) de la livraison

☐ Additional comments:/ *Commentaires supplémentaires:*

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.

10X	12X	14X	16X	18X	20X	22X	24X	26X	28X	30X	32X
						✓					

The Canadian Entomologist.

VOL. XXIV. LONDON, OCTOBER, 1892. No. 10.

MEETING OF THE ENTOMOLOGICAL CLUB OF THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, 1892.

(Held at Rochester, N. Y., Aug. 17–19, 1892.)

The Rochester meeting of the Club was probably the most interesting, both in attendance and interest shown, that the Club has ever held. The sessions were held in room four of Anderson Hall, University of Rochester, with an average attendance of fifteen. Members registered and received badges as follows:—Dr. J. A. Lintner, Albany, N. Y.; E. A. Schwarz, Dr. C. V. Riley, D. G. Fairchild, W. T. Swingle, M. B. Waite, Wm. H. Ashmead, L. O. Howard, Dr. C. W. Stiles and Erwin F. Smith, Washington, D. C.; Chas. W. Hargitt, Syracuse, N. Y.; Prof. D. S. Kellicott, Columbus, O.; Dr. John B. Smith, New Brunswick, N. J.; Prof. Bèla Krécsy, Kecskemit, Hungary; Dr. E. B. Southwick, New York City; Prof. Herbert Osborn, Ames, Iowa; Rev. Chas. J. S. Bethune, Port Hope, Can.; Prof. F. M. Webster, Wooster, O.; Howard Evarts Weed, Agricultural College, Miss.; Henry G. Hubbard, Detroit, Mich.; P. H. Rolfs, Lake City, Fla.; Miss Edith J. Claypole, Miss Agnes M. Claypole, Akron, O.; Prof. G. H. Perkins, Burlington, Vt.; Prof. Wm. Saunders and James Fletcher, Ottawa, Ont.; O. F. Cook, Clyde, N. Y.; Rev. L. C. Wurtele, Acton, P. Q.; Prof. H. H. Wing, Ithaca, N. Y.

The daily programmes and announcement of the meetings were given in the programmes of the A. A. A. S.

MINUTES.

The Entomological Club of the A. A. A. S. held its first session in room four, Anderson Hall, at 10 a. m., on Aug. 17. Owing to the absence of the President, Mr. J. B. Smith called the meeting to order. On motion of Mr. Howard, the chairman appointed Messrs. Lintner, Bethune and Osborn a committee to arrange the programme for the meeting. The Secretary, Mr. Marlatt, being unable to be present, Mr. Howard Evarts Weed was elected Secretary for the meeting. It being the hour for the

calling to order of the general session of the A. A. A. S., an adjournment was taken until 2. p. m.

The Club met at 2 p. m. and was called to order by President Schwarz; twenty members present. The President called attention to the committees appointed at the Washington meeting of the Club who were to report at the present meeting. On motion of Mr. Smith, it was agreed to meet each morning at 9 a. m. and at such other times as would not interfere with the meetings of Section F. Mr. Riley occupied the chair during the reading of the address of the President by E. A. Schwarz, Washington, D. C.

[The address was published in full in the September number of the CANADIAN ENTOMOLOGIST, pp. 213–224.]

The address was discussed by Messrs. Riley, Smith and Howard as follows :—

Mr. Riley remarked upon the inferiority of modern as compared with older illustrations, one reason for this being the greater ease and rapidity of the illustrations of to-day. A good illustration is a labour of love and a scientific work. In detail illustrations the process method of illustration is satisfactory, whereas in copper plate and engraving the author must supervise the work, this being especially true in wood engraving. A wood engraver is more apt to damage a good drawing than the process methods. The latter have been a great aid to recent writers, who have thus had much advantage, and have been enabled to more fully illustrate their works. Mr. Riley thought that outline drawings were the most satisfactory, as they bring out the details more clearly.

Mr. Smith thought that the illustrations of the future would be largely made from photographs or photo-micrographs. It is now possible to prepare dissections and to have points of structure mounted in such a way as to bring out proper detail, and photographs can be made from these. Some details are thus brought out which otherwise would not be noticed.

Mr. Howard thought that there were two principal reasons for the inferior illustrations of recent writers. First, the artist does not understand how to draw for particular processes, and, second, although good illustrations were used, poor printing made them inferior work, as they required very careful printing and a good quality of paper. By the process methods illustrations are more easily and cheaply made, and thus more are now used.

The Club then adjourned.

THURSDAY, August 18, 1892.

The Club met at 9.30 a. m., President Schwarz in the chair, seventeen members present. The minutes of the first day's proceedings were read and approved.

On motion of Mr. Smith, seconded by Mr. Lintner, the full proceedings of the Club were ordered to be published in the CANADIAN ENTOMOLOGIST, and an abstract of the proceedings in "Insect Life."

At the Washington meeting of the Club the Secretary was asked to obtain as full minutes of the former meetings of the Club as possible, to be preserved in permanent form. A bill was presented for some of the back numbers of "Entomologica Americana" containing the proceedings, and Mr. Smith stated that he would see that the bill was paid. Mr. Fletcher asked how the small expenses of the Club were met, whereupon several of the former secretaries of the Club stated that these bills were paid by the Secretary. Mr. Kellicott thought that a law ought to be passed providing for the payment of the few necessary expenses of the Club. He was in favor of an assessment, as next year the Club should have an especially good programme.

Mr. Smith objected to an assessment as this was not done by other clubs connected with the A. A. A. S., and most of the expenses were paid for by the Association.

Mr. Osborn objected to an assessment, in that it was not known just who were members of the Club, the membership varying from year to year according to the attendance at the Association.

On motion of Mr. Lintner hereafter the Secretary is empowered to meet the necessary expenses of the Club each year, and present a bill for the same at a future meeting.

On motion of Mr. Smith the President was empowered to appoint a committee to nominate the officers of the Club for the ensuing year. The President appointed Messrs. Fletcher, Osborn and Smith.

Mr. Kellicott then exhibited specimens of pine twigs damaged by *Retinia comstockiana*. Mr. Southwick stated that this insect, so called, was common in Central Park, but a comparison of some specimens which he had with some at Washington had shown them to be a different species.

The following paper was then read:—

PREPARATORY STAGES OF CALOTHYSANIS AMATURARIA.

BY D. S. KELLICOTT.

The preparatory stages of this pretty Phalenid are not given in Packard's "Monograph of the Geometrid Moths", nor cited by Henry Edwards in his "Catalogue of the Preparatory Stages of N. A. Lepidoptera"; and, since they differ in some regards from the general characters of the caterpillars of the genus as given by Guenée, I have drawn up a brief account of larva and pupa.

The food plant at Columbus is *Polygonum dumetorum*, on which it was found in abundance during July and the first week in August.

Larva, 25 mm., long slender, cylindrical, with the last ring slightly swollen, and the first abdominal very much so, its diameter equaling twice that of the next ring. In ground colour there are two varieties: one deep brown or black, the other reddish or light brown. The skin under a lens exhibits paler lines and stripes made by whitish dots. Colour beneath similar to that above, except that the whitish stripes are plainer. The head is small, concolorous, with a white line on either side of the occiput extending on the prothorax; on the front there are four faint white longitudinal lines. On the 2nd, 3rd, 4th and 5th abdominal rings there is a pale lateral stripe, having three white curved lines on each, so arranged as to give the appearance of a slender stem twining about a rod. There are a few whitish dashes on sides of thorax; legs concolorous.

The larva clings to the smooth stems by its claspers, head downwards and body curved like an inverted clothes-hook. When disturbed it springs from its support to the ground, and quickly wriggles itself under cover. Its behaviour when walking is singularly hesitating and unsteady; after each step it lifts its body and explores right and left for danger before venturing another advance. When in this attitude its remarkably swollen first abdominal ring reminds one of a miniature cobra.

The pupa is light in colour, somewhat swollen below; the slender pointed abdomen tipped with black ends in a strong triangular piece edged with hooklets; the hind shield is triangular, with four tubercles between the base of the antennal covers and with the clypeal apex bilobed. Length, 12 mm.

The pupa is sustained among the herbage by a few silken threads, which are the merest shadow of a cocoon. Pupa July 26, imago Aug. 1.

Mr. Webster followed with a paper on

INSECTS REARED FROM GALLS ON MUHLENBERGIA MEXICANA.

BY F. M. WEBSTER.

Eight years ago, in Indiana, I found a gall on this grass that had somewhat the appearance of a diminutive ear of corn with the husks, but more pointed and minus the silk. The husks (I can find no better term for them) were imbricated and pointed, being placed regularly, one over the other, leaving the junctures along the margins. In this gall I found a pupa or, as seems now more probable, a puparium, but reared no insect therefrom. The past spring, Prof. L. H. McFadden, of Westerville, Ohio, kindly sent me a number of these galls, from which, and the stems to which they were attached, I reared the following species:—

Muhlenbergia Mexicana Gall.

1st. Several specimens of an *Oscinid.* 2nd. A *Pteromalid.* 3rd. A *Eurytomid.* 4th. A great number of *Lasioptera*, probably the author of the gall. 5th. Numerous examples of a species of *Polygnotus*, probably a parasite on the Lasioptera. 6th. Specimens of a species of *Eupelmus* that might have come from eggs of Orthoptera, which had been placed in the gall by the parent, or from the puparia of a *Chlorops*, of which I reared no adults.

Thus, from a single species of gall, with a few inches of the stems to which they were attached, were reared six species, with proof of their having contained the seventh, while another, the eighth, had used it as a nidus.

Replying to a question by Mr. Lintner, Mr. Webster stated that it was possible that all the species named did not emerge from one gall, as there were about twelve galls in the breeding jar, but all from the same locality. It was not known how many came from a single gall, or how many from any particular gall. He also remarked upon the recent researches of Mr. Enock in regard to the Hessian Fly, who found that the breast bone of the larvæ was used in turning around within the puparium.

Mr. Smith remarked that in all species of Cecidomyia which he had reared the larvæ turned, but he did not see the necessity of using the breast bone.

Mr. Webster asked if there were not Cecidomyidæ without a breast bone, and thought that if this could be ascertained the question of its use in turning would be settled.

Mr. Kellicott stated that all Cecidomyidæ turn in their burrows throughout their lives, those with strong breast bone turning about quite freely.

Mr. Webster stated that he had observed thin, almost transparent. empty cases projecting from the apexes of the galls, and also found them in the bottom of the breeding jar. These he took to be the cases of the pupæ, and similar to those observed in connection with the wheat midge. Their presence, in this case, implied that enclosed in these the insect made its way out of the coarctate larval skin, and to the outside of the gall, before the imago emerged. He also stated that it would be interesting to verify the statements of Mr. Enock as to the use of the breast bone or anchor-process in the turning of the larva within the coarctate skin.

As few of the members of the Club had seen Mr. Enock's paper, he would make some transcripts from it which would explain his meaning :— * * * "Anyone who will take the trouble to carefully examine, under the microscope, the *true* larva (by this I mean the larva in its first or *feeding* stage) will at once see that it does not possess any anchor-process at all ; and it is not until the *final* larval stage, when the larva is securely sealed up within the puparium or coarctate larva, or second larval stage, that the anchor-process is developed and utilized in the most wonderful manner." [Enock's Life-history of Hessian Fly, Trans. Ent. Soc. Lond., 1891, Pt. 2, (June) p. 336.]

"Though my endeavours to catch a larva in the act of turning round were not successful, I made some valuable observations from the contortions of the disturbed larvæ, the most important being that, by a powerful contraction of the muscles attached to the lower part of the anchor-process, the larva was enabled to draw the apparatus in at the base until it was at right angles to the normal position ; the head, too, was drawn *quite* in, so that the forked end of the anchor-process projected to its fullest extent, and whilst in this naked condition it is thrust into the inside walls of the coarctate larva, the muscles are relaxed, and the ventral surface brought into contact with the inside ventral surface of the coarctate larva. Then other muscles appear to move a portion of the dorsal surface of the body downwards and round towards the bottom or head-end of the coarctate larva ; the tips are then withdrawn, the base contracted again, and a hold taken by the tips being driven in a little

higher up; again the muscles bring a tiny portion of the body further round and down, and so this leverage goes on until the larva has completed its task, reversed its position, and rests with its head *up* and the anchor-process *outwards;* the spines on the skin of the larva, all of which point down toward the base, assist it materially in obtaining a firm hold on the inside of the coarctate larva, preventing it from slipping back." (Loc. Cit., p. 339.)

Mr. Lintner asked if the Cecidomyid on choke cherry has been described. Mr. Kellicott thought that the species had been described by Riley, but Mr. Osborn stated that he had had it under observation for four years, and so far as he knew no description of the species had been published.

Mr. Webster stated that he would send specimens of the galls on *Muhlenbergia Mexicana* to any members of the Club who so requested. He also stated that he had reared another species of *Lasioptera* from small, black, orbicular mines on the leaves of a species of Solidago, probably *S. lanceolata.* The species was very small and the larvæ were leaf miners.

Mr. Smith stated that he had seen the work of this species in New York, but he had mistaken it for fungus attack.

Mr. Stiles then made some remarks upon "A Cutaneous Disease of Cattle Caused by an Arachnoid." (This paper will be published in the next number of the C. E.)

In reply to a question, Mr. Stiles stated that this parasite was found as far west as Illinois and in many of the southwestern states. It shows itself on living animals by small lumps upon the skin, and after a time the hair dies at the place of attack. These, like most animal parasites, are only with great difficulty transported from one animal to another. There is a similarity in the species found upon the dog to that found upon the pig. It is hardly possible to mistake these parasites for larval forms, on account of the alomers upon the abdomen.

As the Section of Biology was in session, the Club adjourned until the close of that Section.

The Club met again at 12.15, twelve members present.

Mr. Riley read a paper upon *Galeruca xanthomelæna* polygoneutic at Washington, which will be published hereafter.

Mr. Smith followed with a paper on *Galeruca xanthomelæna* monogoneutic at New Brunswick, New Jersey.

THE ELM LEAF BEETLE.

(GALERUCA XANTHOMELÆNA, Schrank.)

BY JOHN B. SMITH, SC. D.

My first practical acquaintance with this species began at New Brunswick, N. J., in the spring of 1889. In the Rutgers College campus there are a considerable number of elms, many of them grand old trees, which for several seasons in succession and up to 1888 had been defoliated by *Galeruca xanthomelæna*, larva and imago. A double row of young trees, many of them elms, extends from the College campus to the Theological Seminary, a distance of about 280 yards, and at the beginning of this row, most distant from the Seminary, the Experiment Station building is situated. There are also a considerable number of elms among the other shade trees in this part of the city. It was my intention to protect the trees in and near the College campus, and near the Experiment Station, from injury; and, to obtain accurate data for a full history of the species, I noted the dates of the principal occurrences in the life of the insect. According to these notes, the hibernating beetles began appearing in 1889 about the middle of April, very gradually increasing in number to the beginning of May, when they became more plentiful. Eggs were first noticed May 12, giving larvæ May 24. The details of the destructive measures adopted are immaterial here, and are published in my Report for 1889. June 28 nearly all the beetles of the hibernating brood had disappeared, and after July 3 no more were seen. At this time all eggs were hatched. July 5th pupation was quite general, and imagos of the summer brood were developing in numbers July 15. There was a distinct period of a week or ten days during which no beetles could be found, and at that time no unhatched eggs were on the trees. The watch had been close, and I was positive that at the time the last of the hibernating insects had disappeared, the larvæ from the first lot of eggs laid were no farther advanced than full fed and ready for pupation. After the last days of June there were no egg masses to be found on the trees, and by the middle of August the beetles had all disappeared. I felt positive of my results, and published as a fact that the species was single brooded at New Brunswick. This was contrary to all that had been previously written; but in no published accounts were details of actual observations given. I repeated my observations in 1890 and 1891, and presented them at the Washington meeting of the Club. Dr. Riley felt quite certain that I was mistaken, though he could not question my observations, while

Dr. Lintner expressed surprise that the beetles should go into winter quarters in midsummer, and yet more that they should feed for so long a time previously. To settle the matter, if possible, I repeated my observations during the present season, while Dr. Riley carried on a series of observations at Washington, D. C. Dr. Riley, in *Science* No. 492 for July 8, 1892, records the facts that he then had imagos of a summer brood, and that these imagos had oviposited June 28. In a letter dated July 27, he informed me that the larvæ from these eggs had pupated. It is thus positively settled, that at Washington, D. C., there are two broods at least of this insect. My observations at New Brunswick gave an opposite result.

The season was rather later than that of 1889, and I saw no trace of beetles until May 17, and no beetles until May 19. The elms were at this time in full leaf, and began to show the characteristic little holes eaten by the insects. Eggs were first observed May 29, on a small tree, every part of which I could readily scan, and I selected this tree, which was a prime favourite with the insects, for special observation, while I also examined daily the trees in front of the Experiment Station building, the lower branches of which were within easy reach. Dissections made at this time showed that the ovaries of all the females were fully distended, each containing a considerable number of mature eggs, so many, indeed, that it was impossible to get out an ovary entire. The males, when examined, showed rigid, fully-developed testes, which were easily found and removed. The first batch of eggs gave larvæ June 6, and oviposition continued to June 20th, or perhaps a little later. The hibernating beetles gradually lessened in number, and had disappeared entirely June 30. On June 29, I found the first pupa, and on that day collected all the unhatched egg clusters I could find—a very few only. One of these clusters gave larvæ July 1, and all the others failed to hatch. During the first days of July, I gathered about 200 pupæ or larvæ ready for pupation, and beetles began appearing July 8 in the open air, as well as in my jars. There were then on the trees at this date larvæ of all sizes, pupæ and beetles of the summer brood, but *no* egg masses. The beetles in my breeding jars were fed until August 1, at which date all refused to feed further. I had noticed, a few days previously an indisposition to feed among some of the older beetles, and had noted, too, an unusual accumulation of excrement at the bottom of the jar. I found, later, that the last thing done by the beetles before retiring to winter quarters is to

empty the entire digestive tract. During the three weeks or more that the beetles were in my possession, I did not notice a single copulation, nor did I get an egg mass. Observations outdoors were to the same effect; not a copulation; not an egg-mass. On the new shoots put out by the trees early in August, there are now—the 13th—plenty of beetles, but neither eggs nor larvæ. When I observed this disposition to cease feeding, I dissected a number of the beetles, and in all of them I found the sexual structures undeveloped. The ovaries were minute, and could only be found by securing the large vagina to which they were attached. In the male it was almost impossible to get the testes entire, as they were mere empty tubules, which tore with the slightest strain. A number of newly-hatched beetles were secured and dissected, with the same results. Then a collection was made, selecting those with fully distended abdomen. In none was there more than a slight development of the ovaries, while in all, the digestive tract was gorged with food, and fat globules and masses were forming. I observed also that on the leaves some beetles had discharged long strings of excrement, and they were beginning to appear on the windows of my laboratory and in my house. I accepted this as an indication of a desire for retirement, and as I knew that the bell tower on the main college building was a favourite resort, I sent my assistant to investigate it, August 8. He brought back a vial filled with beetles, and reported that in a rubbish heap on the floor, covered by an old board, the beetles were to be found in large numbers. The bell tower was dark enough to make the use of a lantern necessary, and as there was no other explanation of their presence there in such large numbers, I feel justified in assuming that these beetles were in winter quarters. A number of these specimens were dissected, and in all of them the most prominent feature was the great mass of fatty tissue stored in the abdominal cavity. In all of them the entire digestive tract was free from food or excreta, and in all, the sexual organs were undeveloped.

I consider it positively proved that there is only one generation of this species annually at New Brunswick, N. J. The life of an individual beetle may extend from early in July of one year to well along in June of the following year, and the three weeks feeding time in summer is necessary to enable the insects to store a sufficient quantity of fatty tissue to help them through the nine months of lethargy. The feeding in early spring is again necessary to mature the sexual organs and develop the eggs in the ovaries of the female.

Mr. Riley accepted the facts brought forth by Mr. Smith, and remarked on the statement that the latter had found the ovaries more or less developed in some individuals. He had no doubt but that the species was normally single brooded at New Brunswick. This year the beetles had appeared at New Brunswick two weeks later than last year, which showed that the time of appearance varies greatly. One curious fact brought forth was that the beetles appeared at the same time as at Washington. He remarked also on the fact that during the month of June at New Brunswick there was no evidence of the development of larvæ, which was not the case at Washington. Life is quicker in the more northern regions, and under such conditions acceleration might be expected which was not the case with this species. There is a difference between the life at New Brunswick and that at Washington, and somewhere between these two places there must be a dividing line. Such cases of peculiar characteristics may be explained by heredity. Acquired characters which are beneficial have fixed themselves upon the species, and this, no doubt, accounts for the single or double broodedness of this or any other species.

Mr. Smith called attention to the fact that the observations recorded in the present paper were made in 1889 and the present year, while the observations of '90 and '91 were reported in the proceedings of the Club last year.

Mr. Southwick stated that in New York City spraying for this species was begun about the last of May and that he thought the species was there two, or perhaps three brooded, although Mr. Beutenmeuller of the American Museum has so far noticed but one brood.

In reply to a question by Mr. Lintner, Mr. Riley stated that at Washington the greater part of the second brood of beetles hibernated, although some doubtless laid eggs for a third generation. They disappear in August at Washington at the same time the first brood disappears at New Brunswick.

Mr. Schwarz called attention to the fact that there was a vast difference between the climate of Washington and New Brunswick, which difference he had especially noticed in the coleopterous fauna of these two places. An important investigation in this regard would be the behaviour of the species in the latitude of Baltimore and Philadelphia. The first brood did more damage at New Brunswick than did the same brood at Washington. In Washington it is the second brood that does the most damage, this brood being much more numerous.

Mr. Smith stated that as much difference as is noticed between the fauna of Washington and New Brunswick was also noticed in New Jersey itself between the red shale and the sandy plains regions, while many peculiar forms were found in the hilly north.

Mr. Riley thought that by an exchange of specimens between Washington and New Brunswick it could be easily proved that the single or double broodedness of the species was an acquired habit. He was strongly of the opinion that those received at Washington from New Brunswick would remain single brooded irrespective of climate, while those received at New Brunswick from Washington would be double brooded there.

Mr. Lintner asked if this matter of heredity was not the same in the difference noted between the thirteen and seventeen year Cicada.

Mr. Riley thought that this was the case, the seventeen year Cicada being a northern, and the thirteen year Cicada being a southern species.

In reply to a question, Mr. Smith stated that most of the larger Bombycids *(Saturniidæ)* were double brooded in New Jersey.

The Club then adjourned until the afternoon, immediately after the adjournment of Section F.

The afternoon session was called to order by President Schwarz at 4.15, eleven members present.

Mr. Hubbard read the following paper :—

THE INHABITANTS OF A FUNGUS.

BY HENRY G. HUBBARD.

In the forest-clad portions of the Pacific Coast Range, from the Columbia River northwards into British Columbia, there are frequently seen on the trunks of pine trees which have been injured and blackened by fire, small white fungi almost globular, or slightly flattened and kidney-shaped, varying much in size, but frequently attaining the dimensions of a pigeon's egg. This fungus, kindly determined for Mr. E. A. Schwarz and myself by Prof. Galloway, is *Cryptoporus (Polyporus) volvatus*, Peck., var. *obvolutus*, Peck. It is very tough and leathery, and is remarkable for the extension of the pileus, which forms a thick coriaceous veil, covering the hymeneal surface below, and entirely enclosing it in a cavity which retains the spores as they fall. A small aperture in the veil, less than one-fourth of an inch in diameter, penetrates the cavity from beneath. This opening is never in the centre of the underside, but is placed near

the base of the fungus; often so close to the bark of the tree as to escape notice. It gives ingress to a number of bark insects, and these visitors, it may readily be believed, play an important part in the dissemination of the spores and the propagation of this fungus, carrying the fructifying germs in their wanderings from the storehouse of the fungus into direct contact with the inner layers of the bark in which the mycelium lives and thrives. Other insects gaining an entrance by the same opening feed upon the substance of the fungus, and in process of time entirely disintegrate and destroy it, but probably in the process of destruction assist or hasten the ripening of the spores. If the full history of this fungus and its insect fauna could be written, many facts of great interest would undoubtedy be evolved, and it could perhaps be shown that we have in this cryptogam a peculiar structure adapted to the dissemination of the spores by insect agency, and analogous to the contrivances found in many flowering plants for the ensuring of cross-fertilization, or the economical distribution of pollen. Unfortunately, our acquaintance with this little cosmos is limited to a few desultory observations made in the field during a collecting trip to the northwest coast and the mountains of British Columbia, along the line of the Canadian Pacific Railway, during the months of May and June of the present year. Some of the insects observed are new to science or remain undetermined, and imagos were not bred from the larvæ found in the fungus. My present purpose in presenting these incomplete and imperfect notes is to call attention to an interesting association of insects that will well repay further study, and to stimulate further researches into the study of the inter-dependence of insects and fungi.

An entomologist accustomed to collect insects in our eastern woods will remark with surprise the comparative poverty of the bark fauna in the magnificent forests of the Pacific Coast. This is due partly to the thinness and tightness of the bark in many western conifers, and partly to the humidity of the climate, which favours the rapid growth of fungi, and these in fallen trunks quickly cement the bark to the wood. It is comparatively rare to find in these forests a log from which large pieces of bark can be readily removed, and which therefore swarms with bark insects as do logs of oak, elm and pine in the East. The bark insects of that region must find a welcome and often a timely refuge in the dark cavity of the Cryptoporous fungus, and as the plant is abundant on the tree trunks throughout extensive districts that have been overrun by fire, it may

readily be believed that this plant is an important factor in the distribution of certain species of Coleoptera. Thus I found lurking in this fungus *Cucujus clavipes*, a beetle that is usually rather fastidious in the selection of its abiding place, and which in regions where the basswood, with its loose, thin layers of inner bark, flourishes, will rarely be found elsewhere than in dead logs of this tree. The ubiquitous species of Trogosita are frequent visitors, as might be expected from their predatory habits, and other members of the family, as *Temnochila virescens*, *Peltis* and *Calitys*, were also seen, and in their company the tenebrionid, *Phellopsis porcata*. These, however, are genera which affect the neighborhood of coriaceous bark fungi everywhere, and their presence in this society is quite a matter of course. The rare tenebrionid, *Bius estriatus*, of which a single pair, presumably male and female, was captured in the cavity of one of these fungi, would seem to be a casual visitor only, as its attenuated, cylindrical form is adapted to threading the galleries of Scolytidæ and other bark-boring insects. Other insects, which for want of better knowledge may also be considered intruders, were an undescribed species of *Odontosphindus* in the imago, and a considerable number of unknown but probably predatory larvæ, including that of *Trogosita* and a clerid, which in the present state of our knowledge of coleopterous larvæ it would be useless to examine.

Aradus debilis, Uhler, an extremely thin and flattened hemipteron, swarms in and about the fungus, and evidently finds the cavity a favourable place of deposit for its eggs. A multitude of its young heaved and tumbled the dust within nearly every fungus. All ages were represented there, but the adult bugs seem to prefer the heat and warmth of the sun, and are found on the bark of conifers infested with the fungus. Their bodies, especially when immature, are particularly well adapted to transport the spores of a fungus. Everything in the nature of dust clings to them, and I have no doubt they constitute one of the most reliable propagators of the plant.

Perhaps the most interesting of the inhabitants is the Nitidulid beetle *Epuræa monogama*, discovered by Crotch, and described by him in 1874. He says of it: "Found in Vancouver and throughout the Sierra Nevada in the small white globular fungus which occurs on dead pines. This will be found to have a hole underneath, and if carefully detached a pair of the above insects will generally be found, unless a marauding *Trogosita*

has taken possession."* My experience was that the "marauding *Trogosita*" frequently had taken possession, so that the monogamous *Epurœa* was by no means as abundant as I could have wished, for this beetle has, I think, not been seen since Crotch's time. It is a giant of its genus, being nearly equal to *Phenolia grossa* in size, and its colour is so dark and lustrous a brown as to be almost piceus. Notwithstanding its large size and conspicuous contrast in colour with the dead white of the fungus, it is a most difficult insect to discover, by reason of the facility with which its spine-clad body attracts and retains the white dust or spores of the fungus. This gives it perfect concealment in its home within the cavity of the fungus, and when abroad and denuded of its coating of dust, its dark colour harmonizing with the charred bark of the pine tree renders it almost invisible. On the 7th of June, at North Bend, in the Fraser River canon of B. C., I found the beetle occasionally present in fungi which had recently matured and were giving off spores, and always in pairs, as indicated by Crotch. Old devitalized fungi, or those already occupied by other insects, have no attraction for this beetle. Its larva was much more common, and undoubtedly the adult beetles become abundant later in the season. The full-grown larva is half an inch long, and is a very striking object. It is always coated heavily with dust and spores, and when at rest is almost invisible, but when in motion the segments part at the sutures, showing the pale pink colour of the body, and the animal looks like a moving necklace of pearls. It feeds only upon the spores, and the cavities of the fungi occupied by them never show any signs of having been gnawed or eaten on the sides.

Another beetle, *Platydema oregonense*, was very common in the cavities of the Cryptoporus at North Bend. It is one of the largest species of the genus, and several of them crowded into one small fungus must have found themselves rather cramped for room. It is not likely that the *Platydema* is dependent on the Cryptoporus for its living. Our eastern species of the genus are indiscriminate feeders upon many kinds of fungi, although they are usually associated with the tougher coriaceous sorts. The larva of *P. oregonense* was found commonly with the imagos, occupying the natural cavity or eating holes in the hemispherical upper portion of the pileus. Whenever the larva was present in the cavity of the fungus, the latter was always more or less filled with a loose tangle of brown filaments resembling hair. The nature and origin of these filaments

*Trans. Amer. Ent. Soc., Vol. V., 1874, p. 76-77.

has not been satisfactorily made out. Peck, in his description of the fungus, refers to them as if he considered them a product of the plant. He says: "It is not unusual to find little heaps, or even masses of spores retained within the veil. These heaps of spores are generally permeated by minute filaments, which apparently aid in holding the spores together." † Observe that the author speaks of them as generally present, leaving it to be inferred that they are in some cases absent. This accords with my observations. Many of the fungi having matured and become dry retain the tangles of filaments, in which also the cast skins of the *Platydema* larvæ may be found suspended. Other specimens can easily be found which have never been occupied by this insect, and contain no filaments. Moreover, this fungus is not the only one exhibiting a similar connection between a *Platydema* and these hair-like filaments. I can recall instances in which artificial cavities made by boletophagous larvæ in the pileus of some of our eastern fungi were similarly filled with filaments, among which the larvæ of a *Platydema* passed actively back and forth. I am, in fact, of the opinion that these filaments are closely connected in some unexplained way with this beetle. If not produced directly by the *Platydema* larvæ itself, they may be a separate fungus engendered by its debris. In any case they certainly serve a purpose very useful to the active larva in providing it with a convenient scaffolding on which its lithe, elongated and exceedingly slippery body is securely supported, and by means of which it can climb about and reach any part of the interior of the cavity, the walls of which it is engaged in eating away.

It remains to mention a few other insects which attack the substance of the fungus, burrowing into the spongy pileus and piercing holes innumerable in its leathery walls, ultimately disintegrating and destroying it. These are a species of Cis or Ennearthron, and two lepidopterous larvæ which were not studied and remain entirely unknown. My field notes merely state that one of these is a larva nearly an inch long, living in the hymeneal cavity and filling it with web. The second species is a shorter and thicker larva, which eats its way into the solid base and thick upper portions of the pileus, entirely destroying the whole structure. Three or four of these larvæ are found in one large specimen of the fungus.

The work of the Cisid and its larva is too well known to require a detailed description. The beetle occupies in great numbers the cavities

†Bulletin Torrey Botanical Club, Vol. VII., 1880, p. 102.

and burrows made by larger insects, and feeds indiscriminately upon every part of the plant, while its little white larvæ bury themselves deep in the tough and spongy interior, gradually reducing it to powder. Under the combined attacks of the adult *Cis* and its larva the fungus becomes a thin, dry shell, tattered and riddled with holes. Or its hold on the tree trunk being undermined, it is beaten to the ground by rains, and becoming water-soaked is abandoned to the snails, poduras and scolopenders.

LIST OF INSECTS IN CRYPTOPOROUS VOLVATUS, VAR. OBVOLUTUS, PECK.

Cucujus clavipes, var. *puniceus*, Mann. Predatory (?) visitor.
Trogosita, sp. not determined, and larva. Predatory visitor.
Temnochila virescens. Predatory visitor.
Peltis Pippingskoeldi, Mann., and *ferruginea*, Linn. Predatory visitors.
Calitys scabra, Thunb. Predatory visitor.
Bius estriatus, Lec. Probably a fungus eater.
Phellopsis obcordata, var. *porcata*, Lec. Fungus eater.
Odontosphindus, n. sp. Fungus eater.
Epurœa monogama, Cr., and larva. Feeding on spores.
Platydema oregonense, Lec., and larva. Feeding on pileus.
Ennearthron, n. sp., larva and pupa. Feeding on the fungus.
Araclus debilis, in all stages. Predatory (?), breeding in the fungus.
Two species of lepidopterous larvæ, undetermined. Feeding on the fungus.

Unknown coleopterous larvæ of several species. Probably predatory.

In reply to a question from Mr. Weed, Mr. Hubbard stated that no dipterous larvæ were noticed, and Mr. Schwarz stated that the fungus was doubtless too dry for the larvæ of this order.

Replying to a question by Mr. Ashmead, Mr. Hubbard stated that he thought a very similar fungus was to be found upon pine logs in the South.

Mr. Schwarz hoped that this paper would bring forth other investigations of a similar character showing the intimate relations of insects and fungi.

Mr. Riley then read a paper on "The American Bean Weevil," which will be published hereafter.

In reply to a question by Mr. Fletcher, Mr. Riley stated that this species could not be definitely stated to be of American origin.

Mr. Lintner stated that Say's description of *Bruchus obsoletus* was very general, and Dr. Horn only claimed that the description "fits the species fairly well." In deference to the opinion of some of our coleopterists who thought that the name *obsoletus* should be retained, Mr. Lintner had used this name in his seventh report. Mr. Lintner also stated that he considered the species a native of Europe or Asia, probably the latter.

Mr. Schwarz thought that Say was not always correct in regard to the food plants upon which he states insects are found.

Mr. Smith thought that descriptions which fit even fairly well must be accepted, for if this was not done about ninety five per cent. of the descriptions of Lepidoptera by Walker would have to be thrown out.

Mr. Fletcher stated that when young larvæ were in peas, the radicle would be the first point attacked. It had been his experience that only from two to five per cent. of attacked peas germinated.

Mr. Lintner stated that those which germinated and gave vigorous plants had but few pods, and these but few beans. One point of interest was that *obsoletus* is not found in Canada except when directly brought in.

Mr. Webster then introduced Dr. Edward Murphy, of New Harmony, Ind., who gave the Club an interesting account of the life of the pioneer of American Entomology, Mr. Thomas Say. Dr. Murphy was intimately acquainted with Mr. Say from 1827 to the time of his death in 1834. "In boyhood Mr. Say was a great collector of all sorts of natural history specimens. He was the most perfect gentleman that I ever met in my life, and I do not believe that he had an enemy in the world. He was tall, about six feet in height, square built, but not fleshy. In winter he wore a thick buckskin overcoat. He had a peculiar lisp in his speech which was pleasant to hear. As a boy I worked in a printing office where some of his works were published. Mr. Say was a very pleasant story teller, and very studious. The colour of his eyes was gray. He always lived in a very plain manner, and his old home is still standing at New Harmony, and in fair repair. His wife often accompanied him on his collecting trips. She was a very pleasant lady. Mr. Say was induced to come to New Harmony by Mr. Maclure, an amateur naturalist."

Mr. Hubbard then read the following paper :—

THE LIFE HISTORY OF XENOS.

BY HENRY G. HUBBARD.

How often, in turning over the pages of his check-list, has the American collector of beetles allowed his eyes to rest a moment upon those lines of type which announce the existence in our fauna of the mysterious family Stylopidæ, with its two genera, *Stylops* and *Xenos*, each represented by a single species; but, recognizing in these names only the records of captures almost legendary in their antiquity, he has turned the page with a feeling that they represent to him unattainable rarities. In fact, to most minds they bring to remembrance only the remarkable bat-like figure of the male Stylops, which for generations has done duty in all the encyclopedias and text books. But why should these insects be considered unattainable rarities? Are they as rare in nature as their vacant places in our collections would seem to indicate? I do not hesitate to assert that they are not. If we question any hymenopterist of experience, he will tell us that Stylopized bees and wasps are not uncommon. By this is meant that specimens of hymenoptera are found having certain chitinous particles protruding from their hinder bodies, appearing at the sutures between the abdominal segments. These betray the presence in the wasp or bee of either the female or the pupa of the male parasite. In the first case the so-called head of the female presents only a bluntly-pointed scale, so flat and thin that it hardly raises appreciably the horny covering of its host, and, at most, barely peeps out beyond the edge of the overlapping plate. The pupa of the male, on the other hand, is a cylindrical capsule of considerable thickness, and often distorts the smoothly tapering abdomen of the hymenopteron. Its darkly chitinous, convex end projects boldly forth, and certain little tubercles upon its surface form a grotesque face, with staring goggle eyes, which are in fact faceted, and perhaps give a limited amount of vision to the nymph imprisoned within. When the winged male of the parasite issues from this capsule, the mask-like face is pushed off like a cap and falls to the ground. As a rule, when stylopized hymenoptera are captured in the field, the male parasites have long since issued, and hence their rarity in our collections. But the females never leave the bodies of their hosts, and might be readily obtained at certain seasons.

In general it has long been known that Stylops inhabits bees, and Xenos wasps of the genus *Polistes*. As far as I know the male of Stylops is not to be found in any American collection, but specimens of Xenos

have been sparingly collected in this country, and it may therefore be of interest to relate my own experience in procuring them.

In 1891, while studying the insects that attack the orange in Florida, I had occasion to examine the nests of *Polistes Americanus* (Fab.), which are very commonly found in orange trees. This species is one of the largest in the genus, and its sting is quite equal in severity to that of our white-faced hornet. It is, moreover, very active and belligerent in defending its home, so that the investigation of its social economy is attended with considerable danger and difficulty. However, it is not inclined to be irritable unless directly attacked, and with care I was able to approach sufficiently near one of their large, naked paper nests to observe all their movements without seriously alarming the colony. One of my first discoveries was that many of the adult wasps were stylopized. Sometimes eight or ten of the parasites distended the body of a single wasp, and this without destroying its life, although it could be seen that such overburdened individuals were lacking in vitality, and appeared to be on the sick list, as they rarely left the shelter of the nest. The older wasps were actively engaged in attending to the wants of the colony, and were constantly departing and returning with small caterpillars and other insects, which, after masticating into pulp, they fed to the young, both larvæ and imagos. The callow young, however, passed several days of their adult existence in a state of inactivity, and did not leave the vicinity of the nest, apparently acquiring their full powers, both mental and physical, rather slowly. I soon found that only these late comers in the colony carried about with them the undisclosed males of the parasite. The pupa cases found in the bodies of the older wasps were invariably collapsed and empty. This decided me to take possession of the nest and confine it in a vivarium, where I could study the young wasps from the time of leaving their cells in the comb. After some difficulty, and not without carrying away with me a few tokens of the vengeance of its defenders, I bore away the comb in triumph, and suspended it in a small box with sides of glass, through which I could observe everything that transpired. Through the wooden end of the box I inserted a tube filled with sweetened water and closed with a bit of sponge. I included in the box, as caretakers for the young, one or two fully adult wasps. These soon resigned themselves to their new surroundings, and not only themselves drank liberally at the feeding trough, but also attended to the wants of the larvæ and the newly disclosed wasps, which immediately began to make their appearance from

many capped cells in the comb. In about a week I had a colony in full career, and it soon became so populous that I was obliged to remove many of the adults. This was accomplished with the aid of a long pair of forceps manipulated through a trap door.

As my primary object was to secure the coveted males of Xenos, I was not a little chagrined and surprised to find that these continually escaped me, and in some mysterious manner disappeared, so that I was not even gratified with a glimpse of one of them. That they were produced within the vivarium I could not doubt. The empty capsules protruding from the bodies of many of the wasps were evidences of this, and the little mask-like lids which lay plentifully scattered about on the bottom of the box confirmed the fact. Moreover, many wasps a day or two old wandered about with the little faces of the unopened male capsules grinning at me from between the joints of their bodies, as if mocking at my discomfiture.

At last, early one morning, chancing to take a look at my captives, I observed the whole society in a state of great excitement. Wasps stood about with wings half raised or vibrating angrily, with antennæ alert and watchful, while now and again one of them would make a sudden dart with its jaws at an invisible object in the air. The whole company seemed bewitched. Steadying my eyes and watching closely I began to see several misty little objects darting with fury about the box, ever and anon dashing among the wasps, which, like cattle attacked by gad-flies, huddled together in groups and awaited the onslaught. In the dim half light of the early morning I could not follow their rapid movements with my eyes, but their whereabouts could be told, from time to time, by the commotion among the wasps whenever one of them approached very near. Finally, on the floor of the cage, a male Xenos suddenly made its appearance, spinning round and round on its back like a fly with its wings burned in a candle flame. A Polistes standing near the spot promptly pounced upon it, and, before it could be rescued, had reduced it to pulp in its jaws. In the same manner I lost, one by one, all of the four or five specimens that were abroad at that time. Such was the watchfulness of the wasps, and so great their hatred and fury against these little persecutors, that in spite of all precautions nearly all the male parasites were captured and destroyed before I could lay my hands on them. I succeeded in saving not more than half a dozen specimens out of more than a hundred that were set free in the box. As no additions were made

to the brood, and many of the youngest larvæ died in their cells, in a few weeks my vespiary came to an end, having been under observation from the 23rd of June to about the middle of July. From the study made of its habits during that time I am able to give the following review of the life history of Xenos. Many of the facts are not new, but have been so rarely observed that it will not be amiss to repeat them.

The young issue from a slit in the so-called head, which may after all be the anal extremity of the mother, after it has protruded from the body of the wasp. A single female gives birth to hundreds if not thousands of them. They are at birth six-legged triungulins, fairly active, but so small that they are barely visible to the naked eye. Under a hand-lens they bear a marked resemblance to the young of scale insects, having a similar oval form and a pair of long anal stylets. They wander over the body of the wasp, apparently giving it no inconvenience, and are also seen crawling about the nest. In some way they pass into the bodies of their hosts while the latter are very young larvæ. Within the bodies of the wasp-grubs they occupy varying positions, but always in the fatty matter near the skin. Their form now becomes very elongate and worm-like, without any organs visible under low magnifying powers. Their delicate and transparent bodies seem to be simple sacks filled with fatty matter, in which float globules of oil. When full grown the larva of Xenos is about three-eighths of an inch long. The female parasite finally acquires a chitinous plate at one end of the body and becomes adult. The male shortens to about one-half its former length, thickens and becomes cylindrical, the anterior end is chitinous and shows traces of faceted eyes and rudiments of other organs, the convex end of this chitinous portion is separated by a sutural line, and forms the mask-like cap of the puparium. While the wasp is in pupa, or at least before it has left its cell in the comb, the parasites of both sexes push their chitinous extremity out of its body, appearing at the sutures of the last four or five segments. Within a few days after the wasp has left its pupa cell, the male Xenos pushes off the lid or cap of its puparium and makes its appearance, taking flight at once. It never alights or rests in its flight from the moment of birth until it falls exhausted and dying, worn out by the incredible activity of its short existence. Its life as an active imago cannot be longer than fifteen or twenty minutes, if as long, and during this time it exhibits fiery energy; and flies so rapidly that the eye can hardly follow it. Its legs are shrunken and entirely useless organs, and I think the muscles

are atrophied, as I never saw the legs move even in the death struggles. How the fertilization of the female is accomplished I am unable to state, but that it must be the act of a moment is evident from the watchfulness of the wasps, who would certainly not permit these buzzing little whirligigs to remain more than an instant in contact with their bodies.

All the males bred by me issued very early in the morning, and most of them before daylight. I do not think its delicate wings and imperfectly chitinized body could support, even for a single minute, the light and heat of the sun. A specimen which I liberated in the day time from the body of a wasp, took flight and escaped at once when the cap of its puparium was pulled off. I found it a few minutes later quite dead on the table a short distance away.

The species of *Xenos* bred in Florida from *Polistes americanus* is probably undescribed; it is smaller and paler than *Xenos Peckii*. The latter is said by Harris to have been "discovered by Prof. Peck in the common brown wasp *(Polistes fuscata)* of this country." Judging from the numbers of stylopized specimens of this wasp which I have seen it must be far from rare in some colonies. The few specimens of *X. Peckii* which I have been able to obtain were all extracted from their puparia in the bodies of wasps taken near their nest between the walls of an old building. One specimen which I collected in the Cumberland Mountains of Virginia issued from the body of a *Polistes* found hiding under bark. I imprisoned the wasp in a glass tumbler, and several days later found the parasite dead and adhering by one wing to the side of the glass.

A good device for procuring specimens of *Xenos* from colonies of *Polistes* known to be infested with the parasite would be to enclose the nest in a box having a false bottom of wire netting through which the males of *Xenos* would fall as they die, and which would thus prevent the wasps from destroying them.

Mr. Hubbard stated that he had never seen stylopized wasps of any genus but *Polistes*.

Mr. Ashmead stated that they were quite common among the Andrenidæ.

Mr. Riley thought that these parasites could be divided into two classes, those that were carried into the cells by the female wasp, and those that were deposited by the parent of the parasite.

Mr. Kellicott stated that the case bearer, *Thyridopteryx ephemeræ-*

formis, which he had found at Columbus, Ohio, were somewhat different from those exhibited by Mr. Southwick, *i. e.*, more nearly cylindrical.

Mr. Riley stated that he knew of no other species of Thyridopteryx similar to *ephemeræformis*, although this species differed much as to the character of their cases, especially those upon pine, when compared with other trees.

Mr. Kellicott stated that the larvæ of *Pterophora melsheimeri* which he had noticed at Columbus did not have the prominent paddle-shaped appendages at the side of the head as always described; that the case was a more perfect structure than that figured by Harris; and that the moth's wings were more deeply sinuate, with the edges trimmed with white.

The Club then adjourned.

FRIDAY, August 19, 1892.

The Club met at 9.45, fourteen members present. The minutes of the morning meeting of the previous day were read, and after amendment, approved.

Mr. Lintner occupied the chair while Mr. Schwarz read a paper upon the Males of *Xyleborus*.

Mr. Schwarz stated that there was no relative proportion of numbers of the females to the number of males. In reply to a question by Mr. Lintner, Mr. Schwarz stated that the white lining found in the borings of *dispar* and other species was supposed to be a fungus, but it was not known definitely.

Mr. Smith thought it could be easily determined if it was a fungus by microscopical examination.

Mr. Osborn followed with Notes on the Species of Acanthia.

NOTE ON THE SPECIES OF ACANTHIA.

BY HERBERT OSBORN.

I desire to call attention to the species of this genus, in order to get further information, if possible, as to the occurrence of the species in this country. The species of the genus that were described by Jenyns (Annals of Natural History, 1839, III., p. 241-244) have often been considered simply as the common house-bug occurring upon the different animals which they were described as infesting—the bat, the pigeon, and the swallow. As these descriptions are quite inaccessible to most students, it will be in place to repeat them here, so that they may be compared and

used in the examination of any specimens obtained from different species of animals :—

"*Cimex hirundinis.*—This species is rather less than *C. columbarius*, and in respect to form different from both that and the *C. lectularius*.

"The antennæ are comparatively short, and the third joint is scarcely, if at all, longer than the fourth. The eyes are not so prominent, the thorax is much less hollowed out in front, the anterior angles but little produced, and the sides scarcely at all reflexed. The scutellum is wider at the base or more transverse, and does not project so far backwards. The elytra are less coarsely punctured; the abdomen is not so broad and more rounded at the apex; the sides regularly curved. The whole insect is more pubescent. The colour is ferruginous inclining to testaceous, darker than in the common bed-bug, and the head and thorax are much clouded with fuscous. In one specimen the legs are spotted at or near the joints with this last colour. There are also some fuscous spots on the abdomen.

"The young or pupæ have the abdomen much narrower than the perfect insect, inclining to oblong.

"*Cimex pipistrellæ.*—The antennæ of this species are of an intermediate length between those of the *C. lectularius* and those of the *C. columbarius*, and the third joint is obviously longer than the fourth. The eyes are prominent. The thorax has a moderately deep excavation in front, and the sides are partially reflexed. The abdomen is narrower than in either of the above named species, and much more attenuated posteriorly, the greatest breadth being rather before the middle. The thighs are more incrassated. The whole insect is more pubescent approaching to hispid, and rather coarsely punctured. The colour is dark ferruginous-ochre, glistening with a faint metallic or sub-aeneous hue, not perceptible in any of the other species. The legs and antennæ are a shade paler than the abdomen, and, as well as this last, without spots.

"*Cimex columbarius.*—On comparing this species with the common house-bug, it will be found to be smaller and of a more orbicular form. The antennæ are shorter, and the joints are not quite so slender, and the difference in length between the third and fourth joints not so considerable. The thorax is rather less hollowed out in front, the anterior angles less produced, and the sides less reflexed. The abdomen more nearly approaches to round, the lateral margins being very much curved, and the greatest breadth exactly in the middle; whereas, in the house-bug the lateral margins are at first but little curved, and the greatest breadth rather

behind the middle. The colours, as well as the punctures and the degree of pubescence, are similar in the two species."

Of these species the first named, the *hirundinis*, has been collected in large numbers by Prof. Gillette and myself at Ames, from the nests of barn-swallows, being first reported to us by workmen who were placing eavestroughs on the barn.

A short note on the species was published by Prof. Gillette in "Entomological News," under the name of *pipistrellæ*, with Mr. W. H. Ashmead cited as authority for the determination. The use of this name came from some verbal misunderstanding, we believe, and there is no question as to the specimens belonging to the form described by Jenyns as *hirundinis*. The specimens when compared with *lectularius* show very distinct differences, and these differences appear to be constant, as well as the habit of the insect, and it seems to me that the separation of the species is well founded, especially if the other forms are as distinct as this, and we would gather as much from the descriptions which have been quoted.

I should very much like to secure specimens or information as to the occurrence of the other species in this country, and the principal object of this note is to engage the attention of some one who may have the opportunity to examine the nests of bats and pigeons, where possibly they may be found.

The species found in the swallows' nests appears to remain entirely in the nests or upon the barn adjacent to them, some being observed on the sides of the barn nearly down to the ground. They were very abundant after the swallows had left, and specimens kept in a bottle corked with a rubber stopper were alive and active the following summer, so it would seem an easy matter for them to remain in the nests till the return of the swallows in the spring. The nests contained immense numbers of empty egg shells, showing that the eggs were deposited directly in the nests, and where the young bugs when hatching would at once get access to the birds.

In reply to a question by Mr. Stiles, Mr. Osborn stated that his observations were based upon the examination of several hundred specimens. He had examined what few bats he had had in the laboratory, but had had no opportunity to examine them in caves.

Mr. Lintner stated that housekeepers were generally of opinion that swallows brought *Acanthia* into houses.

Mr. Hubbard stated a case coming under his observation where a bat

had been put into an entomological case, and upon examination of the case afterwards a living *Acanthia* was found.

Mr. James Fletcher gave an entertaining account of a trip to Nepigon, north of Lake Superior, in quest of eggs of *Chionobas macounii*. No eggs of that species were obtained; but many interesting observations were made. Eggs of *Nemeophila schwynii* were secured, and the larvæ bred from them were described. *Grapta faunus* was bred from larvæ found on *Alnus viridis*, *Salix discolor* and *Betula papyrifera*, and an undescribed parasite was also reared. *Grapta progne* was also reared from larvæ on *Betula papyrifera*. The pupæ of several species of Grapta were described and outlines shown on the blackboard by which they could be distinguished. *Colias interior* was mentioned, and the food plant was stated to be willow (from the observations of Mr. T. E. Bean in the Rocky Mountains). Mr. Fletcher was of the opinion that it was also *Vaccinium*. Specimens of two western species of Argynnis, *A. cipris* and *A. electa* were taken at Nepigon, and the occurrence there commented on. *Lycæna lucia* was taken and an addition made to its food plants in the flowers and seeds of *Acer spicatum*. *Carterocephalus mandan* is not uncommon at Nepigon in roadways running through low woodlands. Eggs had been secured on grasses and several larvæ were being bred. *Nisoniades icelus*, common at Nepigon, was being bred from eggs laid on the upper side of the leaves of *Salix cordata*. The larvæ were found to exhibit different temperaments, one particular specimen being described as "very bad tempered". Some beetles had been collected, and the oviposition of *Myodites zeschii* in the unopened flowers of *Solidago canadensis* was described. An interesting Mordella had been taken on a white fungus growing on an old wharf, but the species did not seem to answer to any of those in the available literature. Species of Donacia, Leptura and some Carabidæ had been collected. *Trirhabda convergens* had been found abundantly on asters and solidagos. Of Hymenoptera many interesting species had been secured, *Abia kennicottii* amongst them, and several specimens of *Trichiosoma triangulum*.

Mr. Smith remarked upon the inactivity of Myodites. He had taken them upon solidago in New York State and had experienced no difficulty in collecting them upon the flowers at any hour of the day.

Mr. Schwarz stated that they were very active on buds, and it was somewhat difficult to collect them.

Mr. Cook then gave a few Notes on the Arthropoda of Liberia.

[TO BE CONTINUED.]

NEW NORTH AMERICAN HOMOPTERA.--No. V.

BY E. P. VAN DUZEE, BUFFALO, N. Y.

1. THAMNOTETTIX SMITHI, n. sp.

Male: Form of *Th. quadrinotata*, Fab., but with the vertex shorter and more depressed. Greenish-yellow; head yellow with a transverse black band on the anterior edge; body black the segments edged with yellow. Length 4½ mm.

Head rounded before, very little longer at the middle than next the eye. Vertex a little depressed, anterior edge subacute; apex of the front two-thirds the width of the base, sides nearly parallel below the antennæ. Clypeus strongly widened apically where the width is but slightly less than the length, edge of the cheek rectilinear either side of the prominent lateral angle. Pronotum rather long, hind edge but moderately concave, the angles obvious. Antennal setæ long and stout, dusky. Valve obtuse-triangular, its length and breadth subequal; plates irregularly ovate, shorter than the valve, sutural edges arquated, touching only at the middle, outwardly heavily fringed with long white hairs; pygofers slender, longer than the plates, viewed from beneath lanceolate with slightly diverging tips.

Colour pale greenish-yellow, lemon-yellow on the vertex and connexivum, anterior edge of the head marked with a conspicuous broad black transverse band just below the line of the ocelli; sutures of the clypeus and front slenderly black. Meso-, and meta-thorax and abdomen deep black, narrow edge of all the segments, the scutellum and the genitalia greenish-yellow, the disc of the valve and a spot on the base of the pygofers blackish. Elytra sub-hyaline, smoky at apex, with slender greenish nervures. Wings smoky, iridescent.

New Brunswick, N. J. Described from a single male example kindly given me by its captor, Prof. J. B. Smith, to whom I take pleasure in dedicating it. This is a neat little species pertaining to the group represented by the European *quadrinotata*.

2. THAMNOTETTIX LONGISETA, n. sp.

Female: Closely allied to the preceding species. Dull yellowish or dusky green. Vertex as in *Smithi*, anterior edge more obtuse, impressed line blackish at base, disc anteriorly with a small dot behind each ocellus, edge with a transverse row of four large subquadrate, approximate spots placed just below the line of the ocelli; edges of the front more deeply

excavated opposite the antennæ, disc with three or four blackish arcs interrupted on the middle; clypeus less expanded apically. Cheeks thin, discoloured exteriorly, angles more rounded than in *Smithi*, sutures of the face more heavily lined with black. Second joint of the antennæ annulated with black; seta long, as in the preceding species. Pronotum shorter, with the sides more oblique, the posterior angles more rounded, and the hind edge more deeply excavated than in *Smithi;* disc greenish, marked anteriorly by a slender, oblique black line behind the eyes, touching the lateral angles. Elytra hyaline, slightly infuscated toward the apex; nervures very distinct, pale blue-green, brownish at apex. Beneath black; narrow edges of the connexivum and abdominal segments, outer angles of the last ventral segment, and sides of the pygofers, yellow. Legs pale yellow. Last ventral segment rather long, hind edge entire, truncated, the outer angles slightly produced. Length 4 mm.

Northwestern Colorado. Described from a single female example received from Prof. C. P. Gillette. This is closely related to *Th. Smithi*, of which it may prove to be the female, but the differential characters mentioned above seem to entitle it to specific distinction.

3. THAMNOTETTIX GILLETTII, n. sp.

Form and general appearance of *Th. lætus*, Uhl.

Female: Colour yellow, tinged with greenish on the pronotum. Vertex moderately produced, apex rounded, basally with an impression either side of the middle. Front narrower than in *lætus;* clypeus widened apically, the sides arquated. Apex of the head with two large round spots, and on the vertex on either side is a smaller one placed against the middle of the inner margin of the eye. Pronotum highly polished with an impressed line parallel to the anterior edge, hind edge nearly straight. Scutellum polished, the impressed line black. Sutures of the front and the antennal pits black, the setæ dusky. Sternal and pleural pieces black, the latter edged with yellow. Abdomen yellow, disc of the tergum and the oviduct black. Legs yellow, tips of the tarsal joints dusky. Elytra hyaline, smoky at tip, nervures yellow, becoming heavier toward the inner margin. Last ventral segment rather long, outer angles rounded, apex nearly straight with a narrow linear notch. Length 5 mm.

Colorado. Described from a single female example received from Prof. C. P. Gillette, to whom I take pleasure in dedicating this pretty little species.

In Mr. Gillette's material was an example of a species I take to be Mr. Uhler's *Jassus (Thamnotettix) lætus*, but it differs from his description in wanting the minute fuscous dots at the tip of the vertex, and the black basal spots on the scutellum. In this specimen, a female, the last ventral segment is cylindrical, a little longer than the preceding and feebly arquated behind without a median notch. Clypeus slightly narrowed apically, its sides rectilinear.

4. THAMNOTETTIX MONTANUS, n. sp.

Allied to *Th. clitellaria*, Say. Smaller; dark brown or blackish, face pale. A transverse band on the pronotum and a small spot on the elytral suture yellowish-green, polished. Length 4½ mm.

Female: Head obtusely rounded before, soiled white or yellowish, base of the vertex with a transverse fulvous-brown band between the eyes covering the apical one-half of the pronotum, ocelli fulvous; front with a few short brown arcs next the edges, the sutures blackish, clypeus slightly widened apically; cheeks infuscated below the eyes. Pronotum polished, pale greenish-yellow on the posterior one-half, hind edge feebly concave. Scutellum dark brown, blackish on the base and apex, the impressed line black. Elytra blackish, costal half of the corium as far as the apical areoles hyaline, apex of the clavus and its nervures black, sutural edge with an oblong greenish spot. Beneath black. Legs whitish. Abdomen black; connexivum, a slender median line on fourth and fifth, apex of the ultimate, and the narrow edges of all the ventral segments, and the oviduct, pale yellowish. Last ventral segment deeply cleft either side of the ligulate median projection, the shorter lateral lobes rounded, retreating at the outer angles. Male: More deeply coloured, scutel and elytra black; abdomen black, connexivum and ventral segments narrowly edged with yellow. Valve half the length of the last ventral segment; plates nearly three times the length of the valve, punctured, obtuse, suture straight, outer edge feebly convex; pygofers exceeding the plates, pale, as is the apical half of the plates.

British Columbia; Mountains of northwestern Colorado. Described from a fine pair received from Prof. Gillette and one male received from Mr. W. H. Harrington and labelled "British Columbia." This latter differs from the Colorado male in being more deeply coloured, with the transverse band between the eyes black, and showing two small transverse spots on the base of the front.

Mailed October 13th.