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IMPORTANCE OF OBSERVATIONS ON APPARENTLY UNIMPORTANT INSECTS.

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In the course of the writer's somewhat extended experience in the investigations of insects, with especial reference to their economic significance, he has occasionally found himself confronted with criticisms on account of having apparently expended both time and funds in studying insects whose attacks were, or had been, so far as known, of little or no importance. It therefore seems not out of place to direct attention to a number of instances showing that such restrictions are not always warranted and that the present status of importance of a species cannot be taken as conclusive respecting its future, or indeed near future significance.

Selecting a number of instances in point from my own experience and of others working under my direction, that of *Myochrous denticollis*, the southern corn leaf beetle, which has since become better known by reason of its disastrous attacks on growing corn in Kansas and southern Ohio, may be first mentioned. The first observations made on this insect in the corn field were purely accidental.

The writer happened to be passing through a field of young corn in Tensas Parish, La., in April, 1887, and observed a few of these beetles attacking the plants by gnawing the outside of the stems. There was nothing observed at the time that would indicate the least likelihood of this ever becoming a serious pest, such as it has since proven itself. To have passed over the fact without mention would have been to fail to record the basic observation on the insect as a corn pest.

Curiously enough, during the same month in the same locality the adults of *Ceratoma caminea* were observed attacking cultivated beans in the garden of an old negro, whose cabin was located in

the midst of the Tensas swamps. Although the writer had been familiar with the beetle for years in the North, this was the first time its food plant had ever been determined by him. With this initial observation in mind, the same insect was afterwards observed to attack the leaves of the cow-pea in great numbers. At that time the two observations did not give any basis for assuming that the species would ever become a serious enemy of the bean and much less so of the cow-pea, such as has since been recorded of it.

In the same locality reports were received of peculiar injuries to growing corn which had been observed by planters in previous years. No definite information was just at the time obtainable from this source, and it was not until later, when the writer stumbled, as it were, upon the larvæ of *Diabrotica 12-punctata* in considerable numbers, attacking the growing corn in the fields, that anything definite was known. With this limited knowledge, later observations seemed to be more easily made, with the result that a damage of 75% was observed a week or ten days later in other corn fields.

When Mr. Jas. A. Hyslop made his first observations on the clover root curculio, *Sitones hispidulus*, in April, 1909, there was no indication that the species was of any particular economic importance. It happened to be convenient for Mr. V. L. Wildermuth to continue the work taken up by Mr. Hyslop, because of the latter's transfer to Pullman, Washington, so there was even yet no information obtained that could be presented as an excuse for spending much time upon it. However, the investigation was carried through to completion, and in presenting the matter for publication we found ourselves somewhat at a loss to give satisfactory reasons for asking for the publication of the completed work. The injuries of the larvæ to the roots of clover were so infrequent, and the beetles themselves were not found in any great abundance, so that the species could not be placed among those particularly destructive to the clover plant. Five years later, however, in 1914, the larvæ of the same insect were found to be seriously destructive in alfalfa fields, attacking the alfalfa roots in precisely the same way in which Mr. Wildermuth had observed them to attack the roots of clover. It now turns out that an obscure, though serious trouble, in alfalfa fields which has, up to the present time, puzzled agronomists was really due to the subter-

ranean attacks of the larvæ of this species on the roots of alfalfa. Thus, within five years, this insect has advanced from one of apparently little or no economic importance, to one of the pests of the alfalfa field that must be reckoned with by alfalfa growers in future.

In 1909 Mr. Hyslop, in his entomological investigations about Pullman, Washington, found that the larvæ of the moth *Autographa gamma californica* attacked alfalfa plants, but these injuries were encountered so rarely that there did not appear to be any good reason for paying any special attention to the species. It was, however, convenient to carry on the observations, and in doing this Mr. Hyslop became impressed with the possibility that, in the event of its natural enemies becoming so reduced as to be unable to hold the species in check, it might become an insect of much more economic importance than his observations at that time would indicate. But, here again, it was difficult to explain, clearly, the necessity for the expenditures of time and funds required to carry out the investigation of the species, or to ask for the publication of the results. During the summer of 1914 the very conditions that it was thought might possibly come to prevail, did actually develop. Something transpired to prevent the development of the natural enemies of *Autographa*, in sufficient numbers to keep the pest in check, and as a result, throughout a number of the northwestern States, the species became a veritable scourge, and many letters were received complaining of its ravages.

In June, 1884, *Toxoptera graminum*, now better known as the notorious green bug, was introduced into a breeding cage in northern Indiana, where the writer was temporarily located. Up to that time the species was not known to occur in America excepting at one point, Cabin John Bridge, Maryland, a few miles north of Washington; and while, as later examination of the old records show, that the species had probably been injurious in Virginia two years prior to that date, at the time of the accidental introduction into the writer's breeding cages, it was not known as a destructive insect at all, and therefore the investigation made at that time was barely warranted by its then economic importance. Since that time it has come to be one of the most destructive pests of the grain field, and is probably more dreaded by the grain growers of

northern Texas, Oklahoma, and southern Kansas than any other insect.

Stictocephala festina has not until within the last year or two come to be known as an insect of any economic importance. A few years ago Mr. R. A. Cushman, at that time connected with the southern field crop insect investigations, found a few individuals girdling the stems of alfalfa in Louisiana. The species was, so far as known, of so little importance that a careful investigation was hardly justifiable. Later on its capabilities for seriously injuring the alfalfa became apparent, but still there was not sufficient information at hand to indicate that it would be likely at any time to become a serious pest. It was, however, carefully studied further by Mr. Wildermuth, and suddenly, from out of a stage of obscurity, so far as its alfalfa-destroying habits are concerned, it has jumped into prominence, by becoming seriously destructive during the summer of 1914 in the alfalfa fields of Virginia and some other States.

Other similar instances might be brought forward, but the foregoing is sufficient to show the absolute necessity of carrying out, judiciously, investigations of insects likely to become injurious, whenever a favourable opportunity presents itself for doing so, regardless of what the previous record of these may have been. It has frequently happened that certain species have, to all appearances, come suddenly into prominence and become immensely destructive to crops. Because of their previous supposedly lack of importance, no one having taken the time to investigate them, all inquiries for information relative thereto coming from those who suffered from their ravages, must be given the disappointing information that nothing whatever had been learned of their habits in any of their several stages of development. There are times when an entomologist may be and is criticised for what might appear as a wasteful use of both time and funds in investigating insects not previously known to affect in any way the interests of husbandmen. But let him totally neglect these, and when one of them suddenly jumps into prominence, as is sooner or later bound to be the case with some of them, he will find himself equally, or perhaps even more, severely criticised because he thus finds himself unable to give a full explanation of the activities

of the pest and advise methods of control. All of this goes to emphasize the necessity of investigating carefully, and as thoroughly as possible, using proper judgment of course, insects and their attacks upon vegetation, regardless of whether they are at the time injurious or not. It may be that, even at that very time, the insect is seriously injurious, but its injuries are of such an obscure nature as to be overlooked entirely or perhaps confused with those of some of the older and better known pests. Entomological investigations cannot be undertaken, carried through, and completed by contract, as the erection of buildings, construction of railways, or excavating of canals, but opportunities must be judiciously seized upon, and if the problem is followed faithfully wherever it may lead, one will be surprised at the number of instances like the foregoing, when the final outcome has more than justified the investigation.

NOTES ON THE PUPATION OF THE HOUSE-FLY (*MUSCA DOMESTICA*) AND ITS MODE OF OVERWINTERING.*

BY C. GORDON HEWITT, D. SC.
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The migratory habit of the larvæ of *Musca domestica* evidenced prior to pupation has been observed by most of the investigators who have studied the insect's life history, and these observations have been collected by Hutchison (1914). Levy and Tuck (1913) appear to be the first workers to call attention to the practical value of this habit in fly control, and Hutchison has extended the work along lines that will undoubtedly provide us with an additional means of control of no little value. The principle involved is the capturing of the mature larvæ leaving the manure to pupate, in accordance with their usual custom, either in the cooler outer portions of the piles or in the subjacent soil.

The migratory habit of the larva has also another interest, namely, its relation to the suppression of flies breeding in the usual type of insanitary privy and in latrines. While a few isolated observations have been made in India and elsewhere, I do not know of any exact record of the extent to which the larvæ migrate

* Contribution from the Entomological Branch, Department of Agriculture, Ottawa.
March, 1915

from the substance in which they have been feeding. Hutchison (*l.c.*) found that the majority of the pupæ were scattered about the drier margins of the heaps of horse-manure, sheltered by the overhanging straw, and that whereas, in one heap, he found about 9000 pupæ in this position, not more than 100 were found below the soil. In this connection the following observation appears to be worthy of record.

Following the experiments which I carried out (1914) on the control of the larvæ by various insecticides, it was decided to examine the soil around and beneath the untreated and consequently natural heap of horse-manure with a view to ascertaining the distance and depth travelled by the larvæ prior to pupation. Also it was desired to discover whether any of the insects were overwintering in the pupal state; to this aspect of the question I shall return later.

The manure was removed on May 13th and the soil subjacent to and around the site of the pile was carefully removed and an approximate record was kept of the numerical abundance of the puparia at the different depths below the surface of the soil to a distance of about four feet around the site. This task was carried out for me by Mr. S. N. Lord, to whom my thanks are due. The results of this examination of the soil, which was a sandy loam, are represented diagrammatically in the accompanying figure.

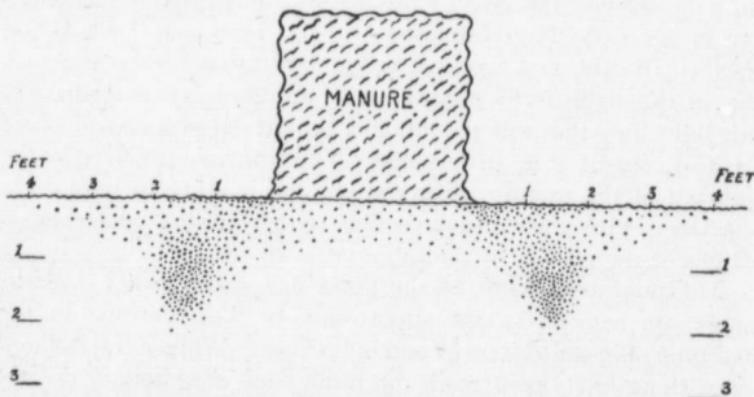


Fig. 7.—Diagrammatic section through heap of manure and subjacent soil to show the migration of the larvæ of *Musca domestica*. The drawing is to scale, distance and depth in feet being indicated. The black dots in the soil represent the puparia. (Original).

A few puparia were found directly beneath the manure pile to a depth of twelve inches. The greatest numbers occurred in the region about eighteen inches from the pile and at a depth of twelve inches to two feet from the surface; this is graphically shown in the figure; the puparia were also numerous immediately below the surface of the soil. The numbers then gradually decreased proportional to the distance from the pile and dwindled away at a distance of about four feet from its base.

This observation is of practical interest to the sanitarian as indicating the habits of the larvæ under normal conditions. It illustrates the ability of the flies to emerge from a depth of two feet, as particular attention was paid to condition of the puparia, and the flies had emerged from all the puparia other than those that had failed to develop.

The Overwintering of the House-fly

The question as to the state in which *Musca domestica* passes the winter has been discussed recently by several workers, and it seems desirable to review the subject again in so far as my experience of conditions in the most northerly temperate latitudes of England and Canada are concerned. In my monograph on the house-fly (1914) the statement is made that three causes contribute to the disappearance of the flies at the end of the summer, namely, retreat into hibernating quarters or into permanently heated places, natural death, and death from *Empusa muscæ*. I must confess that the word "hibernation" has been used in too broad a sense by me, as it has not only implied a dormant state during the winter, which is the usually accepted meaning of the term, but it has also had reference to a possible and sometimes actual state of activity during the winter months. It is in this sense that the word "hibernation" was used, as will be gathered in reading the section under that heading, in the work referred to. It would be preferable to substitute the term "overwintering," as this will adequately cover all conditions and developmental stages and will avoid a possible misuse of the term "hibernation."

Taking all the evidence that is now available, it may be stated that in northerly latitudes *Musca domestica* exists in the overwintering period in the following states:

1. *Dormant*.—In cool retreats where suitable shelter and protection may be found; here flies may truly hibernate.

2. *Periodically active*.—In premises where an increased temperature produces activity in the fly which would otherwise be inactive and dormant.

3. *Permanently active*.—The gradation between the former state, and this would be governed by temperature and the presence of food. Permanently active flies have been found by myself and other observers in every month of the winter season from November to March. I have dissected such flies from December to March and found them capable of reproduction in many instances. Such flies are found in warm bakehouses, kitchens, restaurants and stables. Jepson (1909) used such flies for breeding experiments in February.

4. *In the immature stages*.—The previous states, Nos. 1 to 3, are based on actual observations. That in northerly latitudes *M. domestica* may be found in the developmental stages (egg, larva or pupa) is a statement that has only, so far as I know, a theoretical and experimental basis. It should be possible, one would think, to find *M. domestica* breeding in permanently warm places, such as stables where larval food is present. In many stables, however, the temperatures are very variable, and this fact would lengthen the different stages very considerably. Personally, I have so far failed to discover evidence of *M. domestica* breeding under natural conditions during the winter months in the latitudes of Ottawa (Canada) and England, but observations indicate the possibility of such an occurrence in the presence of suitable conditions.

In the light of the evidence at present available, I think we are still justified in regarding the dormant and periodically active states during the overwintering period as the usual occurrence in northerly latitudes. But there is no doubt that where circumstances render state No. 3 possible, it contributes very materially to an increase in the number of available and active flies early in the spring. I have always held the same view as that suggested by Copeman and Austen (1914): "That the relative lateness of the season at which house-flies annually become abundant may be due to the smallness of the number of individuals that, in an active condition, survive the winter in houses or other buildings." This

idea was supported by my observations in the state of the reproductive organs of a portion of the flies found and dissected during the winter months.

The last contribution to our knowledge on this subject is the report of Copeman and Austen, quoted above, on the results of an examination of the species of flies collected in houses, etc., during the winter months. They state: "In conclusion, it would appear that the customary explanation of the perpetuation of the house-fly from year to year has now been fairly tested, and that the evidence obtained fails to support it. If, however, during the season of greatest fly-prevalence, a selection were made of several centres in which house-flies were present in sufficiently large numbers, it would be worth while during the following winter to endeavour to discover whether living pupæ could be found in any considerable quantity in the local breeding-places."

One serious objection prevents my agreement with their conclusion. The evidence contained in their report points to the fact that practically all the specimens of *M. domestica* that were received were caught in an active condition, and there is no evidence submitted to show that any of their correspondents found these flies as a result of searching for them in the hiding places from which Jepson and I have recorded them. In view of this objection the facts submitted by Copeman and Austen cannot be fairly considered as failing to support the explanation usually given. I may say I have repeatedly applied the test they suggest, and in no case have I been able to find either in England or Canada living pupæ of *M. domestica* under outdoor conditions during the winter. Nor has it ever been possible in my breeding experiments in Canada and in England to carry the insect through the winter in the pupal state. In the experiment described in the first part of this paper a special effort was made to find living puparia among several thousand examined, and not a single healthy puparium was discovered; all were either empty or had failed to develop. Had specimens been overwintering in the pupal condition, it is reasonable to expect that living puparia would have been found in the early part of May, as the adults could not have emerged earlier than that date under Ottawa conditions. It is a matter, however, that requires more observations in different localities, but until evidence is secured

of the insect overwintering in the pupal state we shall be justified in believing from the facts available that in northerly latitudes *Musca domestica* is accustomed normally to overwinter in the adult state.

In more southerly latitudes, where the mean temperature is much higher and where the activity of the flies is practically continuous throughout the winter months, one would expect the occurrence of the insect in an active condition and of the various stages of its development during this period, although the duration of such developmental stages would be lengthened. This has been found to be the case in New Orleans, Florida, in the valuable investigation of the Bureau of Entomology of the United States, Department of Agriculture, according to the verbal statement of Mr. F. C. Bishopp.

LITERATURE REFERRED TO:

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5. Levy, E.C., and Tuck, W.T.—“The Maggot Trap—A New Weapon in our Warfare against the Typhoid Fly.” *Amer. Journ. Public Health*, Vol. III, No. 7, pp. 657-660, 1913.
4. Hutchison, R.H.—“The Migratory Habit of the House-fly Larvæ as indicating a Favourable Remedial Measure. An Account of Progress.” *Bull. No. 14, U. S. Dept. Agric., Washington*, 11 pp., 1914.
2. Hewitt, C. G.—“Further Observations on the Breeding Habits and Control of the House-fly, *Musca domestica*.” *Journ. Econ. Ent.*, Vol. VII, No. 3, pp. 281-289, 2 pp., 1914.
3. Hewitt, C.G.—“The House-fly *Musca domestica* Linn. Its Structure, Habits, Development, Relation to Disease and Control,” pp. XVI+382, 104 figs. and map. *Cambridge Univ. Press (England)*, 1914.

PHYLLOPHILOPSIS, new name—*Phyllophila* Townsend, Proc. Biol. Soc. Wash., XXVIII, 21, is preoccupied, and *Phyllophilopsis*, new name, is hereby proposed to take its place.

CHARLES H. T. TOWNSEND.

NEW EXOTIC TIPULIDÆ (DIPTERA).

BY CHARLES P. ALEXANDER, ITHACA, N. Y.*

The following species of crane-flies have been received from various correspondents during the past year.

Genus *Dicranomyia* Stephens.

1829. *Dicranomyia* Stephens; Cat. Brit. Ins., Vol. II, p. 243.

***Dicranomyia fullowayi*, sp. n. (Fig. 8).**

Small, body coloration brown; wings hyaline with grey spots; *Sc* short, ending opposite the origin of *Rs*.

Male.—Length 3.8 mm.; wing 4.8 mm.

Rostrum and palpi dark brown. Antennæ short, dark brown. Head brownish grey.

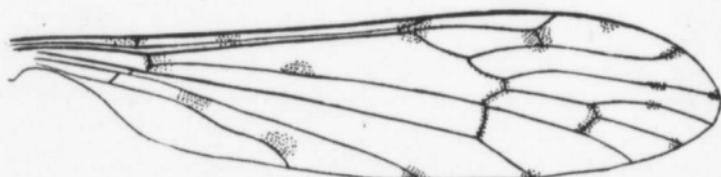


Fig. 8.—*Dicranomyia fullowayi*.

Thoracic dorsum brown without distinct stripes or markings of any kind; postnotum brownish grey. Pleuræ dark brownish black. Halteres light yellow. Legs with the coxæ and trochanters dull yellow; femora brown, paler at the base; tibiæ and tarsi brown. Wings hyaline or nearly so with grey spots as follows: At end of *Sc* and origin of *Rs* at end of *R*₁ and cross-vein *r*, along the cord and outer end of cell 1st *M*₂, a blotch in the middle of cell 2nd *R*₁ near the costa, a large blotch on vein *R*₂₊₃ clouds at the ends of most of the veins, a blotch on *M* before the middle, a blotch at the arculus, two large spots in cell 1st *A* touching vein 2nd *A*. Venation as in figure—*Sc* short ending about opposite the origin of *Rs*, *Rs* half again as long as the deflection of *R*₂₊₃ cell 1st *M*₂ very long, basal deflection of *Cu*₁ just beyond the fork of *M*.

Abdomen dark brown, the last segment and the ovipositor more yellowish.

Habitat.—Island of Guam, Ladrões.

*From the Department of Entomology, Cornell University.
March, 1915

Holotype, ♂, Guam, Ladrões, D. T. Fulloway, coll. No. 1384.

Dicranomyia guttula, sp. n. (Fig. 9.)

Brown; wings hyaline with gray spots along the veins; *Sc* short ending opposite the origin of *Rs*.

Female.—Length 4.5–5 mm; wing, 5.7–6.4 mm.

Rostrum, palpi and antennæ dark brown. Head grey.

Thoracic præscutum rich yellowish brown with indications of darker markings behind; scutum similar with an indistinct darker spot on either lobe in front; postnotum light brown with a faint whitish bloom. Pleuræ brown, the dorsal sclerites, including those of the neck, around to the halteres, dark brown. Halteres light brown, the knob darker. Legs with the coxæ and trochanters yellow, femora dull yellow, tibiæ and tarsi light brown. Wings hyaline, the veins with abundant grey spots at short intervals producing a speckled appearance. Venation as in the figure—*Sc* short ending just beyond the origin of *Rs*, *Sc*₂ being exactly opposite the origin of *Rs*, cell 1st *M*₂ long and narrow, the outer deflection of *M*₃ long and arcuated, over twice as long as cross-vein *m*, basal deflection of *Cu*₁ just beyond the fork of *M*.

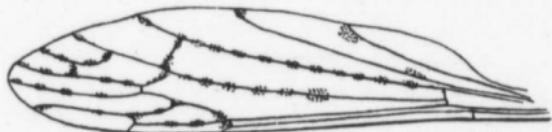


Fig. 9.—*Dicranomyia guttula*.

Abdominal tergites brown, tip of the abdomen, including ovipositor, yellowish; sternites yellowish.

Habitat.—Lor Marquez, South Africa.

Holotype, ♀, Lor Marquez, Africa, C. W. Howard, coll. No. 14.

Paratype, ♀, topotypic.

From *D. irrorata* Enderlein (Zool. Jahrb., vol. 32, pt. 1, p. 74, 75, fig. V1) this species differs in having *Sc* short and in having the spots on the wings confined to the veins.

Genus *Libnotes* Westwood.

1876. *Libnotes* Westwood; Trans. Ent. Soc. Lond., p. 505.

Libnotes picta, sp. n. (Fig. 10.)

Colour yellow, the thoracic dorsum with six rounded black

marks; wings hyaline with scanty brown spots including three along the costa; cross-vein *r* at the tip of *R*₁.

Male.—Length about 6 mm.; wing, 7.1 mm.

Rostrum yellowish, the basal segments of the palpi light brown, the apical segments dark brown. Antennæ with the basal segment brown, the remainder of the antennæ dull yellow. Head brown with a thick light grey bloom.

Thoracic dorsum light yellow, the præscutum with four black marks, a pair on either side of the middle line about midlength of the sclerite, contiguous on their inner faces; a larger mark on the sides of the sclerite near the end of the suture; scutum with a very large rounded mark on each lobe; scutellum with the caudal margin narrowly brown; postnotum with two pale brown rounded markings behind, one on either side of the median line, but separated from one another. Pleuræ yellowish white. Halteres pale, knob a little darker. Legs with the coxæ and trochanters pale yellow,

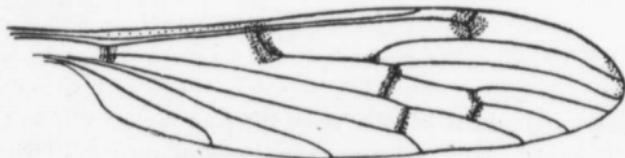


Fig. 10.—*Libnotes picta*.

femora light yellow, the tip narrowly dark brown; tibiæ dull yellow, the tip narrowly dark brown, tarsal segments 1 and 2 dull yellow, the tips narrowly darker, segments 3 to 5 brown. Wings hyaline with small brown marks as follows: a large rectangular blotch at the origin of *R*_s, a rounded stigmal spot, narrow seams along the cord and along the outer end of cell 1st *M*₂, the tip of the wing is narrowly infuscated, base of the wing in the vicinity of the arculus clouded with brown; veins yellow, brown inside the markings on the membrane. Venation as in figure.

Abdomen dull light yellow.

Habitat.—Island of Guam, Ladrões.

Holotype, ♂, Guam, Ladrões, D. T. Fulloway, coll. No. 1226.

By means of Osten Sacken's key to the species of this genus (Berl. Ent. Zeit., Vol. XXXI, pt. 2, p. 182, 183), *L. picta* would

run down to the first group of species, but runs out by its hyaline wings with spots. By de Meijere's key (*Tijd. voor Ent.*, vol. 54, p. 33, 34) it would run down to *L. notata* Wulp, a much larger insect with entirely different body-coloration.

Genus *Molophilus* Curtis.

1833. *Molophilus* Curtis; *Brit. Ent.*, p. 444.

Molophilus sirius, sp. n. (Fig. 11.)

Body coloration dark brown; hypopygium of the male with two pairs of chitinized appendages which are finely denticulate at the tip.

Male.—Length 3.5 mm.; wing, 5.4 mm.

Female.—Length 4.8 mm.; wing, 5.5 mm.

Rostrum and palpi dark brown. Antennæ broken. Head brownish grey, the occiput paler behind.

Pronotum and anterior margin of the mesonotal præscutum pale whitish yellow, remainder of the præscutum brown, the space before the pseudosutural foveæ yellow, the foveæ and tuberculate pits dark brown; lobes of the scutum dark brown; scutellum and postnotum brown. Pleuræ brown. Halteres with the knobs very large, elongate, stem brown, knobs paler. Legs with the coxæ and trochanters dull dark yellow, remainder broken. Wings hyaline or nearly so, the veins rather pale with abundant long dark brown hairs. Venation as in the figure.

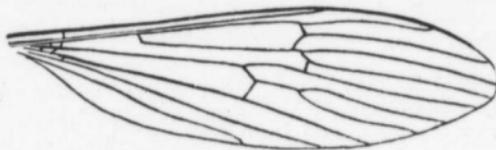


Fig. 11.—*Molophilus sirius*.

Abdomen dark brown, the valves of the ovipositor brownish yellow. Male hypopygium with the ventral-lying pleural appendages fleshy, long, slender and finger-like, clothed with long hairs; underneath these fleshy lobes are a pair of chitinized hooks, straight basally, curved ventrad and inward at their tips and on the under face with several small teeth. Dorsad of these are a pair of shorter chitinized appendages, almost straight, the dorsal face near the tip with minute teeth. Dorsal lobes, short, rounded at tip, flat,

clothed outwardly with long pale hairs, on the inner or ventral face with numerous black chitinized points.

Habitat.—Phillippine Islands.

Holotype, ♂, Phillippine Islands, July. Labelled "F. Casey, Wash. Thru Miss Ludlow."

Allotype, ♀, topotypic.

Genus *Mongoma* Westwood.

1881. *Mongoma* Westwood; Trans. Ent. Soc. Lond., p. 364.

***Mongoma guamensis*, sp. n.**

Fragillima group; colour dark brown; no white on the legs.

Male.—Length 6.8 mm.; wing, 7.1 mm.

Rostrum and palpi yellowish brown. Antennæ brownish yellow, the flagellar segments elongate, brown, clothed with abundant pale hairs. Head grey.

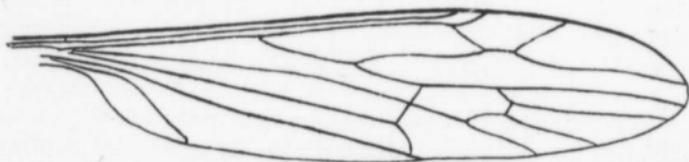


Fig. 12.—*Mongoma guamensis*.

Thoracic dorsum light brown, the pleuræ lighter coloured, more yellowish, especially ventrally. Halteres light brownish yellow, the knobs darker. Legs with the coxæ and trochanters dull yellow, femora dark brown, paler at the base, tibiae dark brown, tarsi much paler, almost yellow. Wings hyaline, the stigma indistinct; veins dark brown. Venation as in figure.

Abdominal tergites brownish grey; sternites more yellowish.

Habitat.—Island of Guam, Ladrões.

Holotype. ♂, Guam, Ladrões, D. T. Fulloway coll. No. 1385.

This species differs from all of the related regional species of the *fragillima* group by the lack of white on the legs, *pennipes* O.S., *tenera* O. S., and *pallidiventris* Brun. having the tarsi snowy-white. *M. cariniceps* End. from Sumatra is a very different insect from any of these species and is easily separated by its large size and orange colour. *M. albipennis* Meij. from Java is larger than *guamensis* and has the wings and veins whitish.

INQUILINE BUMBLE-BEES IN BRITISH COLUMBIA.

BY F. W. L. SLADEN, APICULTURIST, CENTRAL EXPERIMENTAL FARM,
OTTAWA.

Having been informed by Mr. R. C. Treherne of a nest of bumble-bees in his garden at the foot of the mountain at Agassiz, B. C., I dug it up on July 7, 1914. The nest was found at about 18 inches from the surface. It contained an old queen of *Bombus flavifrons* and about half a dozen workers of the same species; also the well-preserved body of a female of *Psithyrus insularis* Sm., and several unopened cocoons, out of one of which I extracted a male, nearly ready to hatch, of *Psithyrus consultus* Frank. The occurrence of *Psithyrus* in this nest is of considerable interest, for Franklin said in his recent monograph of the Bombidæ of North America (Trans. Am. Ent. Soc. XXXV, page 448), "There is not yet a single new world account of a *Psithyrus* having been found in a bumble-bee's nest."

Moreover, several noteworthy conclusions are indicated.

Corroboration of a new and highly convincing kind is given to the already well-founded belief (id., page 458), that *consultus* is the male of *insularis*, for the female *insularis* was in all probability the mother of the male *consultus*. It may be remarked that the name *insularis* has priority.

Second, *Ps. insularis* is evidently parasitic upon *B. flavifrons* in British Columbia. In Eastern Canada (*insularis* is common at Ottawa) it must prey upon some other species of *Bombus*, for *flavifrons* is not found in the east. Probably, however, it lives with several species in both regions.

Third, *Ps. insularis* does not apparently kill the *Bombus* queen, as I have found *Ps. vestalis* and *rupestris* do in England ("The Humble Bee," page 60), but both females seem to live together in the nest, laying eggs. (The death of the *insularis* female was evidently due to age or accident.) This seems to be in accord with Hoffer's observations on *Psithyrus campestris*, the Old World representative of *insularis*. He found *Ps. campestris* living on good terms with its hosts, *B. agrorum* and *helferanus*, both queens producing young (Die Schmarotzerhummeln Steirmarks, page 101).

March, 1915

A NEW APHID FROM FLORIDA.

BY GEORGE G. AINSLIE, WASHINGTON, D. C.

Carolinaia cyperi, n. sp.

Alate viviparous female—General colour black. Head, thorax and abdomen shining black, the latter with a greenish tinge in strong light. Eyes dark red, almost black. Antennæ black, appearing brownish in strong light, shorter than body, reaching beyond middle of abdomen, situated on very flat frontal tubercles, 6-segmented. Antennal segment VI with basal portion less than half as long as spur and shorter than IV, III about two-thirds as long as spur, five to seven, generally six, large round sensoria in a row on III, the usual ones at tip of IV and at base of spur. Rostrum dusky yellow, short, reaching just beyond first coxæ. Wings hyaline with strong black veins, stigma dusky, articulation greenish, venation of fore wings regular, hind wings with but one cross vein. Legs dusky yellow, tarsi and distal extremities of femora and tibiæ black. Cornicles dusky yellow, sometimes with reddish tinge, robust, swollen on inner side, largest about two-thirds out from base, with a sharp constriction and a flaring ring at tip which is turned slightly outward, carried closely appressed to the body pointing toward the cauda. Cauda dusky yellow, conical, retracted in life.

Measurements—Length of body 1.40 mm., width .65 mm. Length of antennal segments: I .071 mm., II .053 mm., III .212-.265, aver. .245 mm., IV .141-.177, aver. .157 mm., V .159-.194, aver. .177 mm., VI base, .123-.159, aver. .147 mm., spur, .335-.406, aver. .378 mm. (averages from ten antennæ). Total length 1.213 mm. Wings, fore wing, length 2.29 mm., width .84 mm., hind wing, length 1.21 mm., width .33 mm., total wing expanse 5.15 mm. Cornicle, length .212 mm., width .053 mm. Cauda, length .106 mm.

Apterous viviparous female—General colour black with a sepia tinge and shining with a metallic lustre. Surface of head, thorax and abdomen minutely rugose or shagreened. Body flattened, turtle-shaped, with lateral margins prominent and often furrowed. Antennæ 6-segmented, I, II, V and VI dark with yellowish tinge, III and IV paler, the articulation between III and IV though

sometimes not complete is always indicated, a single sensorium near tip of IV and the usual group at base of spur. Legs dusky yellow, tarsi and distal extremities of femora of second and third pairs darker. Cornicles and cauda as in alate form, the former closely appressed to the abdomen in life.

Measurements—Length of body 1.63 mm., width .93 mm. Length of antennal segments, I .07 mm., II .05 mm., III .14-.176, aver. .16 mm., IV .088-.124, aver. .10 mm., V .106-.124, aver. .12 mm., VI base .088-.106, aver. .10 mm., spur .212-.247, aver. .23 mm., total length .839 mm. Cornicles, length .265 mm. Cauda, length .088 mm.

Pupa—Head, thorax and abdomen dark mottled green. Antennæ dusky yellow at base, shading to almost black at tip. Eyes dark red. Wing pads pale yellow with greenish tinge. Legs pale yellow. Cornicles as in alate form, though more robust. Cauda not apparent. Length of body 1.26 mm., width .79 mm.

The young are pale yellow or greenish when born and gradually darken as they approach maturity.

The species agrees well with Wilson's definition of the genus, except that the apterous forms have indistinctly 6-segmented antennæ instead of 5-segmented as he gives it. The division between III and IV is plainly indicated in all the specimens I have seen and in many is complete.

This aphid was first found at Lakeland, Florida, in November, 1912. Further observations were made during the following winter and during the winter of 1913-14. Specimens were sent to Mr. J. J. Davis and Mr. J. T. Monell, both of whom pronounced it a new species of *Carolinaia*. I am indebted to them and especially to Mr. J. J. Davis for assistance in the preparation of this paper.

The species appears to be rather generally distributed throughout Florida, for it has been taken at a number of places throughout the state and as far north as Gainesville. *Cyperus esculentus*, which in its wild form is the pestiferous nut-grass of the south and in cultivation is known as the chufa, is its only observed food plant. It thrives on chufa in cages and colonizes it readily when available in the field. Other species of *Cyperus* growing in close proximity to infested plants of *esculentus* were examined repeatedly, but the aphid was never found on them.

Notwithstanding its dark colour, it is a very inconspicuous species, for it lives only on the under side of the leaves, where it forms large colonies, the apterous adults lying in a single regular row on each side of the midrib with the small forms crowded in among them. It is surprising how many can exist in this way on the lower side of one leaf. No matter how crowded they may be on the under surface, they never feed on the upper surface, and the leaves seem never to show the slightest effect of their presence. The alate forms are very seldom found in the larger colonies, for they leave the group as soon as matured to establish new ones on uninfested plants.

It has not been followed throughout an entire season. When first found in November the colonies, then rather small, consisted of apterous adults, young, and an occasional alate form. In January almost every plant in the field bore large colonies, but winged adults were very scarce. When, however, some of the infested plants were transferred to a cage, winged forms appeared at once, indicating that they had been developing, but leaving the parent colony as soon as mature. The large colonies persisted in the field and became very abundant until about the middle of March, when predaceous enemies began to make serious inroads upon them. Previous to this the weather, while not freezing, had been cool enough to suppress most insect activity. From this time on the colonies grew smaller and more scattered, for Coccinellids and Syrphids became so numerous that no colony long remained unmolested. Small scattering colonies were still present at the time of my last observations late in May. No sexes have been found, and it is most likely that the species can winter exposed on its food plant in any normal season. In evidence of this, I have just received a letter from Mr. R. N. Wilson from Gainesville, Florida, dated November 27, 1914, in which he states that a recent cold snap froze the nut-grass back to the ground, and that the aphids are not numerous, but at the same time he sent a good supply of them taken in the open. How they fare in summer, when the unshaded sand is heated to 130 to 150 degrees F. by the sun, I have not had opportunity to observe.

Coccinella sanguinea and *Baccha clavata* were the most common of the predaceous enemies though other species of Coccinellids

and Syrphids were present in smaller numbers. Numbers of parasites were reared from the larvæ and pupæ of these predators, among them several undescribed species of Hymenoptera. Internal parasites were not in evidence, and only a few aphids killed by them were seen. Possibly in summer they are more efficient. Aside from insect enemies, the most serious foe of the nut-grass aphid is the hard dashing rain, which becomes more frequent in May and June. The fine sand is driven against the lower surface of the leaves with such force by the splashing rain-drops that most of the aphids are beaten off or killed, and after two or three such showers it is often difficult to find more than a few scattered individuals.

Records of a few individuals more closely observed follow. On January 20 a migrant taken from the field was put on a potted nut-grass plant. While the plant remained fresh apterous adults developed, and by January 31 a number of these were producing young. February 2 the original migrant was still producing young, but the plant had begun to deteriorate. February 11 the plant was practically dead, killed by a larva of *Bactra lanceolana*, so the few aphids remaining were transferred to a fresh plant. February 19 alate forms began to appear, and between that date and April 7, when the plant finally died from neglect, 181 winged forms were removed, practically all that were produced during that period having developed wings.

An alate vivipara maturing January 22 was placed on a caged plant. Up to March 6, when she disappeared, she had given birth to 51 young at the rate of one, two or three per day.

THE SYMMETRY OF INSECTS.

BY HARRY B. WEISS, NEW BRUNSWICK, N. J.

All insects are bilaterally symmetrical, or, in other words, the two lateral halves of an insect are alike, and symmetry can be defined as a pleasing equality of parts. Bilateral symmetry is sometimes known as horizontal dual symmetry, inasmuch as bilaterally symmetrical objects are usually oriented from a middle point or portion and exploited by equal movements of the eyes to the right and to the left, which is the natural method. As a result,

the aesthetic value of dual symmetry is greater in the horizontal than in the vertical.

In addition, other forms of symmetry can be found in insects, due to the arrangement of wings, venation and colour patterns. In fact, aesthetic appreciation of insects is due to many factors, among which are symmetry, proportion, intensity and arrangement of colours and experience and familiarity with the insects in question.

In the Lepidoptera horizontal dual symmetry is quite common, but in addition the lateral halves of many members possess radiating symmetry by reason of radiating wings and veins. The repetition of certain designs or colour spots arranged in curves or lines can be called running symmetry, and at times rotating symmetry is found, as, for example, the circular spots of *Automeris io*. In a few instances lepidopterous insects are exploited by movements of the eyes above and below the horizontal line formed by the posterior edges of the first pair of wings. In many individual butterflies and moths nearly all of the above forms of symmetry can be found, and when such a multiplicity occurs the insect assumes a complexity, which may or may not, according to one's training, be viewed with æsthetic pleasure.

Members of the Diptera possess in the main horizontal dual symmetry, and at times radiating symmetry of the wing veins. Many of the Hymenoptera present radiating symmetry due to their narrow wings radiating from the thorax, although all four elements are not equal. In mounted specimens the arrangement of the legs also tends to induce divergent radiating exploitation.

In the Orthoptera the expanded hind wings of the Acridiidae contain intense radiating elements, and many of the Odonata possess a four-fold radiating symmetry due to the radiation of their narrow equal wings. In the majority of the Orthoptera and Hemiptera dual symmetry in the horizontal is most apparent. While some members are exploited in different ways, very few of such movements induce what is known as æsthetic pleasure.

Many of the Coleoptera, in addition to possessing horizontal dual symmetry, which is not very apparent at times, also exhibit proportion or a pleasing inequality of parts shown in the proportion between the length and width of the insect. To many persons

the rectangle is more pleasing than the square because of its variety. For example, the Coccinellidæ are not as pleasing as to form as the Elateridæ. Symmetry at times becomes monotonous. Some members of this order are exploited horizontally from the vertical line formed by the inner edges of the wing covers and others, vertically above and below the upper edge of the abdomen or markings on the abdomen, while still others will impress one at the first only with their pleasing or displeasing inequality of parts.

Some of the Odonata also exhibit a pleasing inequality of parts, especially those which are T-shaped when spread.

Aesthetic pleasure depends in part upon certain habitual methods of orientation and exploitation, such as the movement of the eyes and attention upwards which is preferred to a movement downwards, a movement from the eyes of left to right, which is preferred to the opposite movement, and proportion, which is more pleasing in some cases than symmetry. As mentioned before, symmetry and proportion are only two of the many factors contributing to the total result known as æsthetic appreciation of insects.

THE CADDIS-FLIES (TRICHOPTERA) OF JAPAN.—II.

BY WARO NAKAHARA, TOKYO, JAPAN.

(Continued from Vol. XLV, p. 327.)

Family Limnophilidæ.

Of this family I recognize six genera as occurring in Japan, viz., *Glyphotælius*, *Nemotælius*, *Grammotælius*, *Limnophilus*, *Nothopsyche*, and *Moropsyche*.

Genus *Glyphotælius* Steph.

1. *Glyphotælius admorsus* MacLachlan.

Glyphotælius admorsus MacLachlan—Trans. Ent. Soc. Lond. (3) V, p. 250 (1866); Hagen, Verh. zool.-bot. Ges. Wien, XXIII, p. 446 (1873); Matsumura, Thous. Ins. Jap., I, p. 167, pl. XII, fig. 4, ♂ (1904); Ulmer, Cat. Coll. Selys, VI, p. 16, figs. 24 and 25, pl. I, fig. 4 (1907); Ulmer, Deutch. Ent. Zeit., p. 340 (1908).

Habitat—Hondo (Gifu, Okayama, Tokyo, Inokashira, near Tokyo, Osaka, Teganuma, etc.); Kiushin (Yanagawa, Prov. Chikugo).

March, 1915

Time of appearance—April to June.

2. *Glyphotælius miyakei*, sp. nov.

Head lurid reddish brown, covered with minute whitish hairs; vertex blackish; narrowly yellowish around eye; palpi fuscous. Antenna fuscous, some terminal joints suffused with yellow. Eye shiny black.

Pronotum covered with whitish hairs, divided in the middle by a longitudinal line. Mesothorax fuscous. Metathorax somewhat yellowish.

Legs yellowish, tibia II and tarsi of all legs more or less suffused with fuscous; spines black or fuscous black; spurs yellow.

Fore-wing tinged with brownish yellow, rather strongly produced at apex and sinuated at apical margin; apical half of the wing slightly clouded with greyish; hyaline oblique band in the discal area of the wing entirely wanting; a few black stripes and dots along cubital and anal veins; pterostigma quite indistinct; hind marginal area of the wing not marked with special colour.

Hind-wing hyaline, colourless, excepting the apical area and pterostigma, which are slightly tinged with yellowish; venation yellowish.

Abdomen dark brown above, somewhat paler on ventral side. In the male the 9th abdominal segment is produced at its posterior margin into a triangular portion, the edge of which is directed downwards and beset with few soft hairs; superior appendage small, piceous, and subquadrate; inferior appendage very large, not parted in the middle by an impressed line; penis very long, suddenly dilated a little before its apex, with a hairy accessory process on each side.

Length of body 13 mm.; fore-wing 20 mm.; hind-wing 16 mm.

Type—A single male obtained at Matsuyama, Prov. Iyo, Shikoku, in my collection.

This species is respectfully dedicated to Dr. T. Miyake, at whose suggestion and through whose kindness I was able to take up the study of Japanese caddis-flies.

This species is very closely allied to *G. admorsus*, but can be distinguished by the markings of the fore-wing and the structure of the male genitalia.

Genus *Nemotaulius* Banks.3. *Nemotaulius brevilinea* (MacLachlan).

Grammotaulius brevilinea MacLachlan, Journ. Linn. Soc. Lond., Zool., XI, p. 107, pl. II, fig. 1, ♀ (1871); Hagen, Verh. zool.-bot. Ges. Wien., XXIII, p. 453 (1873); MacLachlan, Rev. Syn. Trichopt. Europ. Fauna, p. 34 (1894); Matsumura, Thous. Ins. Jap., I, p. 169, pl. XII, fig. 7, ♀ (1904).

Nemotaulius brevilinea Banks, Proc. Entom. Soc. Wash., VII, p. 107 (1906); Ulmer, Genera Insectorum, Trichoptera, p. 40 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Glyphotaelius subsinuatus Ulmer, Notes Lyden Mus., XXVIII, p. 5, figs. 5, 6, ♂ (1906); Ulmer, Gen. Ins., Trichopt., p. 40 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

MacLachlan's original description of this species is sufficiently precise, except in that his types were females. There is no doubt in my mind that the form described by Ulmer under the name of *Glyphotaelius subsinuatus* is the male of this species.

Habitat—Hondo (Gifu, Kangawa, Yokohama, Tsuchiura, Teganuma, Kyoto, etc.); Hokkaido (Sapporo); Shikoku (Matsuyama).

Possibly of general distribution in Japan.

Time of appearance—April to June.

Genus *Grammotaulius* Kolenati.4. *Grammotaulius ornatus*, sp. nov.

Head reddish brown, covered with hairs of pale yellow; a rather deeply impressed longitudinal line on vertex; narrowly pale yellow around eye; maxillary and labial palpi fulvous brown, apical joint of the latter blackish; antenna yellowish, with rather indistinct brownish annulations.

Prothorax reddish brown with a median impressed line above; covered with minute pale yellow hairs; beset with long fuscous hairs on both sides. Mesothorax fuscous black; median part of notum reddish brown, furnished with minute tubercles and hairs; tegulae brown, beset with long blackish hairs. Metathorax entirely dark brown. Legs yellowish; spurs and spines fuscous black.

Fore-wing semi-hyaline, slightly tinged with brownish yellow; an oblique broad hyaline band in discal area, both sides of the

band marked with large fuscous spots, several small fuscous spots in the area between radius and its sector; a large hyaline mark, with a few fuscous spots in, at the outside of discal cell; apical marginal area rather irregularly marked with fuscous.

Hind-wing hyaline and nearly colourless, slightly tinged with yellowish at apex.

Abdomen fuscous black, hind margin of most segments somewhat paler. Female with two slender, hairy processes at the apex of the abdomen.

Male unknown.

Length of body 13 mm.; fore-wing 16 mm.; hind-wing 14 mm.

The type is a single female in my collection. It was captured by Mr. Arakawa at Uwajima, Prov. Iyo, Shikoku, in May, 1913.

Genus *Limnophilus* Leach.

5. *Limnophilus correptus* MacLachlan.

Limnophilus correptus MacLachlan, Rev. Syn. Trichopt. Eur. Fauna. Suppl. II, p. 18, pl. LIII, fig. 3 (1880); MacLachlan, First add. Suppl., p. 5 (1884); Matsumura, Thous. Ins. Jap., I, p. 171, pl. XII, fig. 10, ♀ (1904); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Limnophilus borealis Ulmer, Cat. Coll. Zool. Selys, VI (1), p. 17, figs. 26, 27 (1907), nec Zetterstedt.

(?) *Limnophilus borealis* Ulmer, Deutch. Ent. Zeit., p. 341 (1908). The Japanese form recorded by Ulmer as *L. borealis* can not be that species. He could not have examined a specimen in good condition, or he would never have considered the form identical with *borealis*, from which it is in reality quite distinct.

The wing-markings of this species vary to a remarkable extent.

Habitat—Hokkaido (Sapporo, Hokodate); Shikoku (Uwajima, prov. Iyo). Outside of Japan—China, Amurland.

Time of appearance—Unknown.

6. *Limnophilus fuscovittatus* Matsumura.

Limnophilus fuscovittatus Matsumura, Thous. Ins. Jap., I, p. 171, pl. XII, fig. 13, ♀ (1904); Matsumura, Syst. Ent. (Konchu bunruigaku), I, p. 190 (1907).

Limnophilus subfuscus Ulmer—Cat. Coll. Zool. Selys, VI (1), p. 20, figs. 32-35 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

The *L. subfuscus* described by Ulmer is apparently identical with *L. fuscovittatus*, which was overlooked by him. The original description of this species, which is not a bad one and is accompanied by a figure, cannot be considered unrecognizable, though written in the Japanese language, for the latter is certainly not to be regarded as unintelligible by the workers of the western world. I was therefore compelled to make *subfuscus* a synonym of *fuscovittatus*.

Habitat—Hondo (Tokyo and Gifu).

Time of appearance—October, April—It possibly passes winter in the imago state.

7. *Limnophilus affinis* Curtis.

Limnophilus affinis Curtis, Phil. Mag., IV, p. 123 (1834).

Limnophilus stigmaticus Kolenati var. (?) *affinis* Walker, Cat. Brit. Mus. Neuropt., I, p. 27 (1852).

Limnophilus affinis MacLachlan, Rev. Syn. Trichopt. Europ. Fauna, p. 82, pl. IX, fig. 8 (1875); Matsumura, Thous. Ins. Jap., I, p. 170, pl. XII, fig. 9, ♀ (1904); Matsumura, Journ. Coll. Agr. Tohoku Imp. Univ., IV, p. 16 (1911).

Several specimens from Sapporo (H. Okamoto coll.), Gifu (S. Yamamura coll.), Uwajima, Prov. Iyo (Arakawa coll.) are in my collection. I have compared these with others from Europe (I am indebted to Mr. E. Petersen for several European specimens of this species) without discovering any difference that appears to be specific. The Japanese form is somewhat larger and occasionally has an oblique hyaline band on the disk of the forewing.

Distribution—Japan, Saghalien, Siberia, Europe.

Time of appearance—March and April.

8. *Limnophilus amurensis* Ulmer.

Limnophilus amurensis Ulmer—Stett. Ent. Zeit., Jg. 66, p. 8, taf. I, figs. 4 and 5 (1905); Ulmer, Cat. Coll. Zool. Selys, VI (1), p. 19, figs. 28, 29, taf. I, fig. 5 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Habitat—Hokkaido (Sapporo). Amurland.

Time of appearance—Unknown.

9. ***Limnophilus ornatus*** Banks (?).

Limnophilus ornatus (?) Ulmer, Cat. Coll. Zool. Selys, VI (1) p. 20, figs. 30, 31, taf. I, fig. 6 (1907); Ulmer, Deutch. Ent. Zeit., ip. 341 (1908), nec Banks.

This species is unknown to me. Ulmer recorded two female specimens from Hokkaido ("Yerse"), saying, "Die beiden Stücke stimmen gut, wie das auch meiner Figur auf Tafel I zeigt, mit der Beschreibung von Banks überein; die Appendices præanales eines amerikanischen Exemplares, das mir von C. Betten gesandt wurde (det. N. Banks) sind allerdings an der Basis etwas breiter und schwach medianwärts statt lateralwärts gekrümmt; . . ."

In any case it is very interesting to know that the same or a very closely allied species occur in such widely separated localities as North America and Hokkaido.

Genus *Nothopsyche* Banks.

10. ***Nothopsyche pallipes*** Banks.

Nothopsyche pallipes Banks, Proc. Ent. Soc. Wash., VII, p. 107, pl. III, fig. 1 (1906); Ulmer, Cat. Coll. Zool. Selys, VI (1) p. 29, figs. 48, 49 (1907); Ulmer, Deutch. Ent. Zeit., p. 341 (1908).

Habitat—Hondo (Gifu, and Numata, Prov. Kozuke).

Time of appearance—October.

11. ***Nothopsyche ruficollis*** (Ulmer).

Chilostigma ruficolle Ulmer, Stett. Ent. Zeit., Jg. 66, p. 14, taf. I, figs. 12, 13 (1905).

Nothopsyche ruficolle Banks, Proc. Ent. Soc. Wash., VII, p. 107 (1906).

Nothopsyche ruficollis Ulmer, Cat. Coll. Zool. Selys, VI (1) p. 29, figs. 46, 47 (1907); Ulmer, Deutch. Ent. Zeit., p. 342 (1908).

Habitat—Hondo (Tokyo, Gifu, Numata). Shikoku (Uwajima, Matsayama). Kiushin (Yanagawa, Prov. Chikugo).

Time of appearance—August to November.

12. ***Nothopsyche longicornis***, sp. nov.

Head fuscous black; frons with long piceous hairs; maxillary palpus greyish black; antenna black, much longer than fore-wing.

Prothorax dark orange, beset with long fuscous hairs. Meso- and metathorax black or fuscous black. Legs blackish, with many black spines; spurs black.

Fore-wing broad, semi-hyaline, nearly uniformly smoky brown, somewhat suffused with yellowish in basal area; venation fuscous; discal cell very long, twice the length of the first apical cell. Hind-wing similar to the fore-wing, but the basal area not suffused with yellow; colour of the wing lightened in inner marginal area; venation darkish.

Abdomen dark brown, ochraceous toward apex; hind margin of each segment narrowly variegated with dark yellow. In the male the posterior margin of the 9th abdominal segment produced into a quadrangular prolongation in the middle; superior appendage ochraceous, stout, and broad; inferior appendage very long, stout, with the apex furnished with numerous spiny hairs; viewed from above, between the inferior appendages, are seen two slender yellowish processes.

Length of body 5—5.5 mm.; length of fore-wing 9 mm.; length of hind-wing 7 mm.

The type is a single male specimen captured by Mr. S. Yamamura at Minakuchi, Prov. Ohmi, on November 4, 1911.

This species is closely allied to *N. ruficollis*, but can at once be distinguished from the latter by the much smaller size. The structure of the male genitalia and a certain character in wing venation also afford unmistakable distinctive criteria between the two species.

Genus *Moropsyche* Banks.

13. *Moropsyche parvula* Banks.

Moropsyche parvula Banks, Proc. Ent. Soc. Wash., VII, p. 108, pl. III, figs. 3, 8 (1906); Ulmer, Deutch. Ent. Zeit., p. 342 (1908).

This species is unknown to me. I have not yet obtained a specimen, nor have I seen any in Japan.

Habitat—Kiushiu (Hikoizan), according to Banks.

Time of appearance—March, according to Banks.

DESCRIPTION OF A NEW SEED CHALCID FROM SPRUCE

BY S. A. ROHWER, BUREAU OF ENTOMOLOGY, WASHINGTON, D. C.

The following new species has been reared from the seeds of Engelmann spruce (*Picea engelmanni*), from the Sitka spruce (*Picea sitchensis*), and from Colorado blue spruce (*Picea parryana*). It has been reared from seeds collected in Beulah and Glenwood Springs, Colorado; while the types come from Crescent City, California. The material has all been reared by Mr. J. M. Miller.

Megastigmus piceæ, new species.

In Marcovitch's correction to Crosby's table (Can. Ent., 1914, Vol. XLVI, p. 438) the female runs to *laricis* Marcovitch, but may be separated from that species as follows:

Propodeum with a median carina; face all yellow and without many long black hairs; cheeks yellow; flagellum yellow beneath; femora pale.....*laricis* Marcovitch.

Propodeum with two short carinae basally; face with median brownish spot and with many long blackish hairs; cheeks black; flagellum black; femora black basally.....*piceæ* Rohwer.

The male differs from the descriptions of *lasiocarpæ* and *laricis* in a number of characters.

Female.—Length 2.5 mm.; length of the ovipositor 2 mm. Head finely rugulose with the lines radiating from the ocelli and from the mouth parts; postocellar line one-fifth longer than the ocellocular line; intraocellar line subequal with the ocelloccipital line; pronotum and mesonotum transversely aciculate, on the prescutum the aciculations are much finer anteriorly, and they are more pronounced posteriorly; axillæ granular posteriorly; scutellum reticulate, anteriorly with a tendency towards striation;

stigmatal club as in Figure 1a. Black; palpi, mandibles, face below a line slightly above the bases of the antennæ, scape and pedicel beneath, yellow; face medianly with longish, subcircular, brownish spot; legs yellow, with the following black or brownish markings:

March, 1915

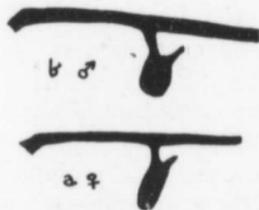


Fig. 13.—*Megastigmus piceæ*.
stigmatal club.

Bases of the four anterior coxæ, the four anterior femora posteriorly and the posterior femora except apices; wings hyaline, venation brownish.

Male.—Length 2 mm. Sculpture as in the female. Black; palpi, face below a line slightly above the bases of the antennæ, posterior orbits to the height of the yellow on the face, scape and pedicel beneath, spot on the pronotum laterally, spots on the abdomen laterally on tergites three and four, *yellow*; legs yellow, coloured as in the female except tibiæ and tarsi are slightly brownish.

Crescent City, California. Described from four females, one, type, and four males, one allotype, recorded under Bureau of Entomology Number Hopk. U. S. 10850j. Material collected by P. D. Sergent and reared by J. M. Miller in April and May, 1914, from seeds of *Picea sitchensis*.

Type.—Cat. No. 19066, U. S. N. M.

THE RATE OF HATCH OF SCALE INSECT EGGS.

BY C. W. WOODWORTH, UNIVERSITY OF CALIFORNIA, BERKELEY, CAL.

Scale insects, particularly those of the sub-family Lecaninæ, are among the most prolific insects, and evidently the normal death rate will be in the neighbourhood of 99.9%, since at least a thousand eggs is the normal reproduction and males are very rare in the two commonest species.

At what point in the life history the greater part of this reduction in numbers occurs has never been investigated fully, but we have now rather extensive data upon the rate of death before hatching.

A very large series of experiments was carried on last spring upon the effect of cyanide gas, and half the eggs from each insect experimented with were kept untreated as a check. Two hundred lots of a hundred insects each were in these experiments, and, estimating 500 untreated eggs in each, the data below gives the rate of hatch determined from observations on about 10,000,000 eggs.

These studies covered five species and twelve localities, Ontario and Santa Barbara in the South, and Anderson, about 500 miles to the north, give more than the average hatch, and the

same is true of Folsom and Merced in the center of the hot interior valley. Only at Aromas, in one series of black scale on olive and European Fruit Scale on apricot, is the percentage far below the normal, but the black scale on apricot, both there and at Watsonville a few miles away, the percentage of hatch is very high.

We are led to conclude that food plant or locality has very little to do with the rate of hatching which this year averaged 87.75% for the whole series.

SCALE	PLANT	LOCALITY	NO.	
			LOTS	HATCH
Black Scale	Apricot	Aromas	100	100 %
		Ontario	100	97 %
		Watsonville	100	76.8 %
	Grape Fruit	Santa Barbara	600	86.6 %
	Maytenus	Berkeley	100	96 %
	Olive	Aromas	100	53.6 %
		Folsom	300	81.1 %
		Merced	300	93.9 %
	Orange	Ontario	400	89.6 %
	Peach	Berkeley	300	73.2 %
Prune	San Jose	100	100 %	
	Lake County	100	100 %	
<i>Total</i>			2600	86.68 %
European Fruit Scale	Apricot	Aromas	100	52.5 %
		San Jose	100	98.3 %
		Santa Barbara	100	97 %
	Prune	Santa Clara	400	95.4 %
		San Jose	3600	89.85 %
		Lake County	2600	90.99 %
		Aromas	100	80.6 %
	Xmas Berry	Anderson	200	100 %
		Berkeley	7200	83.67 %
	<i>Total</i>			14400
Oak Scale	Oak	Berkeley	400	97.92 %
Pine Scale	Pine	Berkeley	1200	95.17 %
Peach Scale	Ivy	San Jose	1400	83.48 %
<i>Grand Total</i>			20000	87.75 %

University of California, December 31, 1914.

BOOK NOTICE.

INSECTS INJURIOUS TO THE HOUSEHOLD AND ANNOYING TO MAN.

By Glen W. Herrick, Professor of Economic Entomology, Cornell University, New York. The McMillan Company. 470 pages, price \$1.75.

Few persons realize to what extent our homes are liable to attacks by insects, though everyone may complain of those that are directly annoying to him personally. It will be somewhat of a surprise, therefore, to the average reader to learn from this book how many and how varied are the numbers and modes of attack of what may be termed domestic insects. The first hundred and fifty pages of the book are filled with the life histories and methods of control of House and Stable Flies, Mosquitoes, Bedbugs, Cockroaches and Fleas. Ants and their activities and invasions are next dealt with; then follow chapters on insects injurious to clothes and carpets, to cereals and preserved fruits, to meats, cheese and condiments; human parasites, annoying pests of man, some troublesome invaders, wood-boring insects and a chapter on insects that are poisonous and objects of dread, concluding with instructions for fumigating. The book is illustrated with 152 cuts and eight plates.

The writer has had occasion to refer to this work when replying to the enquiries of correspondents and has found it most convenient for the purpose, especially where one wishes to learn the well-tested methods of control. The lists of references to economic literature at the end of each chapter are also very useful. Those who are in charge of the entomological departments of Experiment Stations, and who are, therefore, constantly applied to for information and advice respecting insects of all kinds, will find this book a most convenient manual of reference. The ordinary householder may fail to appreciate it until his property or comfort is seriously attacked by one or more minute insect foes; when such troubles arise he will find all the information he requires in clear and plain language and full directions for waging a successful warfare against the invading enemy.

C. J. S. B.

Mailed March 10th, 1915.