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SECOND REPORT

ON

ECONOMIC ZOOLOGY

BY

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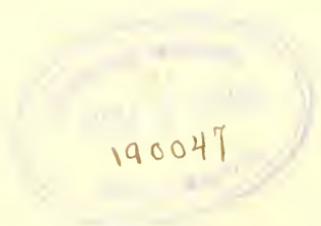
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1904.

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DUKE STREET, STAMFORD STREET, S. E., AND GREAT WINDMILL STREET, W.



## P R E F A C E.

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THE volume now issued as the Second Report on Economic Zoology contains a large part of the information furnished by the Director of the Natural History Departments of the British Museum to the Board of Agriculture and Fisheries between November, 1902, and November, 1903. It also contains the replies given by the Zoological Department to other correspondents in connection with Economic Zoology, as well as special notes and some longer papers dealing with the subject.

Mr. Frederic V. Theobald has carried on the whole of this work and drawn up the Reports now printed. He has been assisted in preparing certain replies to the Board and to other correspondents by Messrs. C. O. Waterhouse, M. R. Oldfield Thomas, F.R.S. and R. I. Pocock, of the Staff of the Zoological Department of the Museum. Mr. C. O. Waterhouse has carefully read the proof-sheets of the present volume.

Special acknowledgments are due to those naturalists not on the Staff of the Museum who have assisted Mr. Theobald in accomplishing the work set forth in these Reports. To Mr. Robert Newstead we are indebted for valuable help in naming insects of the family Coccidae, on which he is the leading authority, as also for his share in the paper on Egyptian Scale Insects (p. 185), which is mainly from his pen. Mr. Albert Michael, Mr. Distant, Dr. Nalepa, of Vienna, Professor L. O. Howard, of Washington, and Professor Neumann, of Toulouse, have also, in their several specialities, given us kind and valuable assistance.

The amount and variety of the work which it has been Mr. Theobald's duty to put through have been very large, whilst the energy and ability which he has brought to bear on the task deserve special recognition and appreciation.

The readers of the present volume, who may be in a position to present to the Museum series of specimens illustrating the Economic Zoology of any part of the world or belonging to any one of the groups recognised in our systematic classification of the subject, are requested to communicate with the Director. At present the collections, in the Museum, of forms of special economic interest require development and additional material.

E. RAY LANKESTER,

*Director.*

BRITISH MUSEUM (NATURAL HISTORY),  
LONDON, S.W.

*February 10th, 1904.*

## A Classification of Animals from the point of view of Economic Zoology.

GROUP A.—Animals *captured* or *slaughtered* by man for food, or for the use by him in other ways, of their skin, bone, fat or other products.

*Examples.*—Animals of the chase ; food-fishes ; whales ; pearl-mussels.

GROUP B.—Animals *bred* or *cultivated* by man for food or for the use of their products in industry or for their services as living things.

*Examples.*—Flocks and herds ; horses ; dogs ; poultry ; gold-fish ; bees ; silkworms and leeches.

GROUP C.—Animals which directly promote man's operations as a civilised being without being killed, captured or trained by him.

*Examples.*—Scavengers, such as vultures ; carrion-feeding insects ; earthworms and flower-fertilizing insects.

GROUP D.—Animals which concern man as causing bodily injury, sometimes death, to him, and in other cases disease, often of a deadly character.

*Examples.*—Lions ; wolves ; snakes ; stinging and parasitic insects ; disease germ-carriers, as flies and mosquitoes ; parasitic worms ; parasitic protozoa.

GROUP E.—Animals which concern man as causing bodily injury or disease (both possibly of a deadly character) to (*A*), his stock of domesticated animals ; or (*B*), to his vegetable plantations ; or (*C*), to wild animals in the preservation of which he is interested ; or (*D*), wild plants in the preservation of which he is interested.

*Examples.*—Similar to those of Group D, but also insects and worms which destroy crops, fruit and forest trees, and pests such as frugivorous birds, rabbits and voles.

GROUP F.—Animals which concern man as being destructive to his worked up products of art and industry, such as (*A*) his various works, buildings, larger constructions and habitations ; (*B*) furniture, books, drapery and clothing ; (*C*) his food and his stores.

*Examples.*—White ants ; wood-eating larvæ ; clothes moths, weevils, acari and marine borers.

GROUP G.—Animals which are known as “beneficials” on account of their being destructive to or checking the increase of the injurious animals classed under Groups D, E and F.

*Examples.*—Certain carnivorous and insectivorous birds, reptiles and amphibia ; parasitic and predaceous insects, acari, myriapoda, etc.



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\* The reader is referred to the First Report, p. xi., for a complete classification of animals from the point of view of Economic Zoology.

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PART I.

REPORTS ON ECONOMIC ZOOLOGY

SENT

IN REPLY TO VARIOUS CORRESPONDENTS.



# SECOND REPORT ON ECONOMIC ZOOLOGY.

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BRITISH (pp. 3 to 110).

## GROUP D.

Animals which concern Man as causing bodily injury, sometimes death, to him, and in other cases disease, often of a deadly character.

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### Mosquito annoyance at Woodford (Essex), and elsewhere.

During the past summer mosquitoes have been very prevalent in Essex, especially in the neighbourhood of Epping Forest, and also in Kent and Surrey, notably along the valleys of the Thames and Kennet, and in the wide stretches of marsh land in the Lea and Lower Thames Valleys.

They have also been reported to the Board of Agriculture as being most annoying near Bristol, and similar complaints have been sent me from Great Staughton, in Huntingdonshire, Weston-super-Mare, Worplesdon, Colchester, Canterbury, and Birchington.

Certainly there has been a greater amount of annoyance caused by them this year than usual, but every year complaints are made in the Thames Valley. For some unexplained reason, however, their bites have been more virulent than usual, in many cases causing a considerable amount of œdema, which has necessitated medical attendance. In many instances where people have been bitten on the face the swelling has been so great that the eyes have been closed up for some days. The medical officer for Leyton states that scores of instances of serious bites have come under his personal observation.

Numerous correspondents have written for information concerning these pests; some of their letters and the reports sent to them are here reproduced.

One personal visit has been made privately to Higham Hall, the seat of Lady Henry Somerset, on the borders of Epping Forest, and others by Mr. Lowe, who has been employed by her ladyship to superintend the treatment of the pools, tanks, etc., in which the mosquitoes were found to be breeding.

As a rule, *Anopheles maculipennis* and *A. bifurcatus* are in great abundance in the valley of the Stour, in Kent, but this year they have been comparatively scarce; *Culex pipiens* and *Theobaldia annulata*, on the other hand, have been present in great numbers, and have bred much more rapidly than usual. Although the latter species has been the cause of much annoyance elsewhere (*vide* letters re mosquitoes at Weston-super-Mare), it has not been found to bite in the Stour Valley, neither is any annoyance caused by *Culex pipiens* in that region.

Undoubtedly the most vicious biters have been *Theobaldia annulata*, *Culex nemorosus*, *Culex diversus*, *Culex morsitans*, and *Grabhamia dorsalis*.

In woodland districts of East Kent, *Culex cantans*, Meigen, bites very ravenously at dusk, especially on the ankles.

## I. Mosquito annoyance at Woodford and Epping Forest.

Towards the end of May, Lady Henry Somerset wrote from Higham Hall, Woodford Green, Essex, asking how to deal with the enormous increase of mosquitoes in that neighbourhood.

In a subsequent communication she stated that:—

“The cold weather seems to have driven them in, and I have not seen a single one to-day, but if I possibly can I will endeavour to procure one or two. They are large and extremely poisonous—so much so, that almost everybody who is stung here have their limbs swollen, and it is exceedingly painful and disfiguring. At the bottom of the meadow, probably a quarter of a mile away, there is a large lake. Of course they may breed there; I do not know.”

On the following day a large mosquito was sent, which proved to be *Culex diversus*, Theobald.

On the 12th of June I paid a private visit to Higham Hall and the surrounding area, including part of Epping Forest, which surrounds part of the estate, and in consequence sent the following report to Lady Henry Somerset:—

*Report on a visit to Higham Hall, Woodford, 12th June, 1903.*

The annoyance caused by Mosquitoes in your neighbourhood is due at present to the presence, amongst others, of one of our largest British mosquitoes, *Culex diversus*, Theobald. (Other species occurred in greater numbers later, *vide* p. 7.)

This species, previous to the last few weeks, has only been once recorded (in the neighbourhood of Tunbridge Wells). Other species will probably occur later.

During the last week complaint has reached the Board of Agriculture that this same species of *Culex* has been causing great annoyance near Bristol during the last five years.

At present nothing is known of its life-history, but from its general structure I imagine it to be a sylvan species, and not a domestic one, such as the common gnat *Culex pipiens*.

I could detect no traces of the larvæ in any of the natural pieces of water or in any of the artificial collections near your house. This is probably because the species has not yet oviposited. Nevertheless, a much more thorough search should be made.

In the immediate vicinity of the house the following possible breeding grounds were observed :—

A. *Artificial collections of water.*

1. A large overhead tank used for conservatory. (The shed in which this is placed is said by your under-gardener to be full of *Culex* at certain times.)

2. A large tank in stable yard.

3. A barrel used to receive waste water from a standpipe near stable yard and outside the garden.

4. The overflow from the above into a ditch near by.

5. Several open pieces of water in connection with the greenhouses in the garden.

6. A large tank partly open on the roof of the Hall.

B. *Natural collections of water.*

1. Two small ponds in meadow below the Hall.

2. Several small pits in the forest close to the house.

3. Several small, unhealthy pools and larger pieces of water on the common close to the main road.

4. Higham Lake at the bottom of the meadow, some distance from the Hall.

All the artificial pieces of water are likely places to find *Culex* larvæ, and also most of the natural collections.

I do not anticipate much danger from the lake, and for the present should leave that out of consideration. I should advise the following provisionally :—

(1) That the tanks referred to near and on the house, and also the open pieces of water in the garden used for greenhouse purposes be closed

over with board lids or with fine perforated zinc covers, the former in preference.

Instructions being given to the men to see they are always kept closed.

(2) The overflow (No. 4, paragraph 2) should be either allowed to flow more freely away or drained off with pipes.

(3) The small stagnant pieces of water on the borders of the Forest and just inside might easily be filled in with rubbish, and also the stagnant pieces on the Common, or the latter might be drained.

(4) The ponds in the meadow below the Hall, and the two larger clean pieces of water on the Common should be treated with paraffin as soon as any signs of the *Culex* larvæ are seen, and also any other pieces of stagnant water that cannot now be filled in.

The method of treating with paraffin is appended.

(5) Observations should either be made by some competent person or some intelligent man in the locality to find out when the larvæ occur, and then the paraffin treatment adopted.

Although there are several widely scattered places likely to prove suitable breeding-grounds for this mosquito, the cost of treatment would not be great, and if the presence of the larvæ is noted and treatment carried out then in conjunction with the recommendations I give regarding the artificial collections of water, I see no reason why this pest should not be completely stamped out.

#### DESTRUCTION OF CULICID LARVÆ.

1. The best culicicide to use is paraffin.

2. It is best applied to pools by dipping a bundle of rags attached to the end of a stick into the paraffin and dabbing the surface every here and there so as to produce a thin film all over the water.

3. The pools should be treated once a week during the time the larvæ are found in the water.

4. Do not be too sparing with the paraffin—an even thin film over the whole pool is necessary. This film needs to be applied to all the small puddles around the larger ones, as larvæ may often be found in very small collections of water.

I have examined the Mosquitoes taken around Higham Hall by Mr. Lowe and find the majority belong to two species, (1) the Common Gnat or Household Mosquito (*Culex pipiens*, L.), and (2) the Wood Mosquito (*Culex nemorosus*, L.). Both these bite, but especially the latter. The common gnat breeds in rain barrels, tanks, cisterns, etc., and can be easily destroyed; the larvæ of this species were found by Mr. Lowe in numbers in such places near your house. *Culex nemorosus* breeds in almost any water, even in lakes, so that probably fresh lots might come from the lake in the park; the smaller pools in the forest are just the pools for them to breed in, and by treating them with paraffin I think the nuisance will be abated. Should this not be so, the edges of the lake must be paraffined in still weather where the larvæ occur. It would

be advisable to have the water treated several times at a week's interval, as I find *Culex* are breeding very rapidly this month.

Three other species have occurred in the collection from this locality, namely—(1) *Culex diversus*, Theobald; (2) *Culex cantans*, Meigen; (3) *Grahamia dorsalis*, Meigen.

A single specimen of each of these species only occurred. All three are vicious biters. We know that *Culex cantans* breeds in small pools, and I expect the other two do also. The chief pests are, however, evidently *Culex pipiens* and *Culex nemorosus*, especially the latter.

Mr. F. Lowe has since been employed by Lady Henry Somerset to superintend the destruction of these pests, and the reports of his visits to Woodford are here appended.

“Acting on instructions given by Mr. F. V. Theobald after his inspection of the estate, three visits were made at intervals of three weeks from June 25th of this year to carry out in detail the plan of campaign against these flies, as arranged by Mr. Theobald.

“On the first visit—a very hot day—attention was given to the artificial collections of water in the gardens and stable-yard, tanks, rain-water butts, gullies, greenhouse tanks, ditch, etc.

“Each was examined with the utmost care for the eggs, larvæ and pupæ of mosquitoes by dipping with a wide-mouthed glass beaker, skimming and straining. In one only—a rain-water butt containing about six inches of putrid water and quite a foot of sludge—did I find any of the pests—the larvæ of the common *Culex pipiens*, in all stages of growth, and in such numbers as to blacken the surface of the water. After taking samples of these larvæ, the butt was emptied on the path, and when the water dried up the residue was shovelled into the rubbish pit. Of the larvæ taken away, one only survived the journey home, the remainder being killed, I believe, by the disturbance of the water caused by the jolting of the train.

“The large uncovered tank in the stable-yard: An exhaustive inspection of this resulted in no Culicids, but numerous ‘Blood Worms,’ the larvæ of *Chironomus*. The water was run off and sludge removed, tank scrubbed and flushed out, overhanging ivy cut away and a match-boarding tarred-lid fitted to keep out the flies. The tank is to remain empty for the present, as any water required can be obtained from the standpipe.

“Gullies were cleaned out and treated with a liberal supply of paraffin.

“Greenhouse tanks: no aquatic larval or pupal stages of the pest. Cleaned out and the water covered with a film of paraffin. No harm will arise from this when dipping for water, if the bucket or watering-can is plunged well below the surface.

“No Culicid larvæ could be found in the ditch which drains off overflow from tub in orchard, etc. Well paraffined. Recommendation—should be drained away with pipes.

“In beating the hedge at the side of the ditch in the orchard, I set up, and netted, a large female *Culex nemorosus*—which I thought at the time was a specimen of the rare *Culex diversus*, Theobald—so I continued

to beat the hedge and also the ivy on the stable-yard wall for nearly two hours, but did not see another Culicid.

“Tub in orchard for cattle to drink from, filled from standpipe: Clean—no Culicids.

“On the second visit—also a scorching hot day—I made the round of the collections of water tested and treated on the first visit, but no signs of the enemy. Afterwards, I extended my work to the shrubbery and wood, and made my first discovery of adult mosquitoes in numbers, in an earth closet close to the Hall, the roof and ceiling of which were covered with hundreds of *Culex pipiens*, all sluggish females with distended abdomens. The next capture was a female of *Grahamia dorsalis* at rest on the side of a manhole near the Hall; the male escaped.

“In the wood which adjoins the gardens and extends for about half a mile to Higham Lake, I saw first a few of the ‘Wood Mosquito’ (*Culex nemorosus*), and individuals of the ‘Banded-legged Mosquito’ (*Culex cantans*); then, as I proceeded towards the pools by the Lodge and Higham Lake, their numbers increased to such an extent that, when forcing my way through the bracken—shoulder high in places—in search of their breeding pools, the Culices rose in clouds and attacked me so viciously and persistently that I had to cover my head with my net. While testing the pools for ‘egg-rafts’ and ‘wrigglers’ of these two species, the bloodthirsty creatures bit all exposed parts, and, moreover, bit either through my flannels or crawled under to do so. Over fifty hard bumps the size and shape of a split pea marked where they had punctured. As the only inconvenience was an irritation, particularly after washing and shaving, no remedy was applied, and in the course of a week they had all disappeared.

“No traces of mosquitoes in any aquatic state could be found in either the large open pool near the Lodge or the small ones surrounded with dense undergrowth in the wood. Nevertheless, all pools were treated with a heavy dressing of paraffin. The small pools are being filled in with refuse from the Hall and Lodge.

“The two permanent ponds in the meadow for cattle to drink from were inspected—no mosquitoes in any state—many Dragon-flies on the wing.

“Higham Lake—I worked unsuccessfully all round it for the larvæ of *Culex nemorosus*, the adults of which were numerous and annoying on the banks.

“On the third visit—a sultry day—the cistern closed with two doors fitted over the servants’ entrance to the Hall was first examined—hundreds of the ‘Household Mosquito’ (*Culex pipiens*) were hanging on the ceiling, though a thorough search revealed no other than adult female forms.

“This cistern was emptied, scrubbed and flushed out, the walls and ceiling brushed down, then the doors closed and all open joints doubly papered to prevent mosquitoes entering for hibernating or egg-laying purposes.

“The large rain-water cistern on the flat leaded roof was next inspected—thousands of adults of the ‘House Mosquito,’ but none of its early stages.

“Crevices and corners were brushed out and the water thickly coated with paraffin.

“The stokehole was next inspected, and when the gardener and self entered and lit candles legions of the ‘Common Domestic Gnat’ (*Culex pipiens*) flew out. They covered the walls and roof, though the favourite resting-place seemed to be the lower half of the iron pipes, where they were actually packed, and by passing the hand quickly along after the manner in which one catches flies, a handful could be obtained.

“The water in tank overhead for supplying the small feed cistern was baled out and a quart of paraffin poured in. The stokehole being the hibernating headquarters of the pest it would be advisable to close temporarily the entrance and fumigate from time to time as they gathered there.

“In a general search round the Hall, I found what I believe to be the chief breeding-place of the ‘Common House Gnat,’ a large sink for taking the rain-water from roof of porch, &c. The gully was stopped up, and the sink contained about four inches of bad smelling water with a green scum, and three or so inches of sludge. Its sheltered position would prevent it being dried up, even in the hottest weather. The sink was crowded with larvæ and pupæ of *pipiens*, and the sides with adults of both sexes. The gully was opened, the water run off and the sludge taken away, sides of sink scraped down and the whole scrubbed out with paraffin and finally flushed.

“In a shady way between a screen of two privet hedges leading to a convenience near by, the gnats were on the wing in such numbers that I netted them in thousands and crushed them.

“While at work on the estate each day from 10 a.m. till 7:30 p.m. *Culex nemorosus* and *cantans* always bit savagely, *pipiens* never, though they were often swarming round me.

“The methods detailed above, followed up and modified or extended as occasion demands, or knowledge suggests, will undoubtedly keep down the mosquito in the immediate neighbourhood of the Hall, but the district could only be cleared by combined action by the authorities and residents.

“From observations and enquiries made, the mosquito nuisance would appear to be general in the district, also any measure to lessen it would be welcomed by the inhabitants.”

## II. Mosquito annoyance at Worplesdon.

Mrs. Malcolm Thompson, of Bridley Manor, Worplesdon, also wrote stating that a very large-sized gnat had invaded the house, and had especially pervaded two south-eastern rooms in great numbers. They have a very undulating flight and a loud buzzing noise, and their sting is very painful. The house stands high and open, but there are pinewoods and extensive commons near. There being no stagnant water near, Mrs. Thompson wished to know where they would be likely to breed.

The following note was sent in reply :—

“The insects causing you such annoyance at Bridley Manor,

Worplesdon, and invading the rooms in great numbers, are one of our common mosquitoes, formerly known as *Culex annulatus* of Meigen, now placed in a new genus—*Theobaldia* (Neveu-Lemaire). It is especially noticeable in the autumn, and occurs over the winter, hibernating in houses, cellars, sheds, and under any convenient outdoor shelter.

“This particular species of mosquito has been very prevalent in the south and south-east of England this autumn. I have found them active during the last two weeks (December 1–14), and the snow has been a foot deep on the ground all the time, and there have been hard night frosts. As you say, it is a very vicious biter, especially during the cold weather. The bite is very painful, and often causes large swellings around the point of insertion of the proboscis.

“It breeds entirely in water—I have found the larvæ and pupæ in pools, in cisterns, in water-butts, etc. It does not fly any great distance. Eggs are laid in the summer upon the water in the form of ‘rafts,’ and the larvæ mature by August and September, but many not until October. The flies causing you annoyance have probably bred close to the house. It would be well to have all rain-barrels, cisterns, etc., looked to about July (and in August), and if the large ‘wrigglers,’ as the larvæ are called, are present, have the barrels, etc., either emptied or a small quantity of paraffin put upon the surface of the water. This should be done again in August and September.

“The best way to clear them out of the rooms would be to fumigate the rooms with pyrethrum powder (Persian insect powder). You can often buy this insecticide made up into cones for burning, or you can obtain the pure powder and make it up into little cones yourself by moistening it. When dry burn them in the rooms with all windows and doors closed and leave shut up for a day. It is non-poisonous to man and animals, but deadly to insect life.”

### III. Mosquito annoyance (*Theobaldia annulata*) at Weston-super-Mare.

Another correspondent, Mr. W. Hatchett Jackson, D.Sc., Radcliffe Librarian at Oxford, wrote in January concerning this species as follows: “This mosquito is very much dreaded at my own country house. I have been badly bitten by it myself and this year it has been so exceptionally numerous that few persons have escaped and some have suffered severely. The consequence of its bite may be so

severe indeed that the patient has to go to bed. . . . I have had *Anopheles maculipennis* from the same neighbourhood, but it is relatively rare."

The following reply was sent: "The mosquitoes you send are the common European *annulata*, now the type of a new genus—*Theobaldia* (Neveu-Lemaire). It occurs in America, having recently been found there, and also in India.

"Ficalbi is wrong in saying it does not bite. It is one of our most annoying and venomous species. It has been abnormally abundant this last year and I have had several enquiries concerning it. I have taken it all through the winter at home (Kent) in numbers."

Later Mr. Hatchett Jackson wrote that, "When last at home at Pen Wartha, Weston-super-Mare, I gleaned some interesting facts as to the bite of this very venomous species." Again he gives an interesting fact, namely, that "From September, 1902, to the beginning of this year we were terribly bothered by it. In early autumn it invaded us in myriads. In a summer-house with glass windows I counted 132 ♀'s on November 8th, 1902."

The following notes were drawn up by him regarding this pest and are reproduced *in toto*:—

NOTES ON *Theobaldia annulata*.

It usually occurs in the flat country round Weston-super-Mare in large numbers during September and October, but it only invades the town of Weston itself to any appreciable extent when the wind blows from the plains, that is to say between N.E and S. It has been relatively rare round Weston and on the Glastonbury Plain the last few years owing to the ponds and the wet dividing ditches, known in Somerset as rhines, being dry or almost dry in summer. In the autumn of the past year (1902) there has been a veritable plague; there was a sufficiency of water in the warm months and a prevalence of easterly winds in autumn. Hence few persons in Weston and its neighbourhood have escaped the attack of this gnat. The consequences of its puncture may take one of three distinct lines:—

(1) It is followed by a simple, hard swelling, which, however, rises more slowly and disappears more slowly than the swelling caused by any other gnat known to me. It is also larger, and traces of it may exist for months, *e.g.* in my own case I still have a

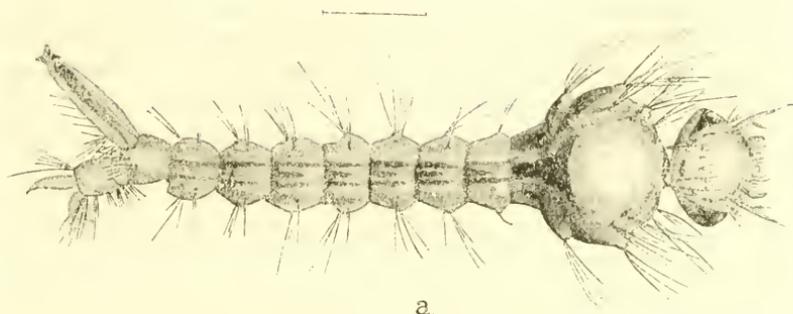
slight thickening now (5. Feb. 03) due to a puncture made Nov. 8. 02.

(2) A swelling arises as above detailed, but it is accompanied by a large reddened and puffy area of inflammation. A clear vesicle containing a yellowish lymph develops in the centre of the hard swelling. There is more or less severe itching. If opened, the vesicle drains lymph for three or four days and the inflammatory area diminishes *pari passu*. Cases have occurred, especially in women, where there have been four or five simultaneous punctures, and the patient has suffered so much malaise as to retire to bed with fever ranging up to 101° F.

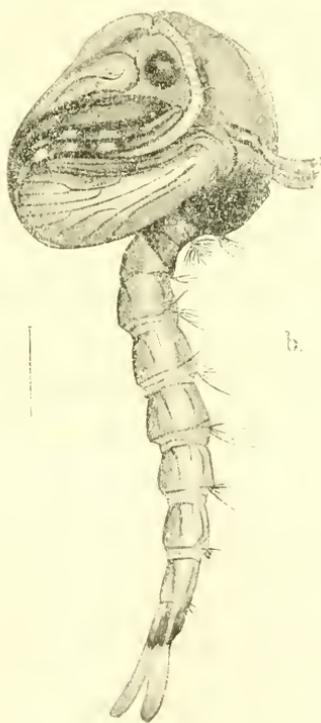
(3) The hard swelling is slight or absent, but there is great and extensive œdema. A case occurred in the practice of a friend of mine in which there was a puncture on the man's hand; the whole arm inflamed and was extremely painful, with œdematous swelling extending up to the shoulder-joint. Our own cook had a puncture this autumn on the forearm, and developed a regular attack of "water in the elbow-joint," so that the arm became almost immovable. This year I caught specimens of the ♀ of this species as late as January 13th in a summer-house with glass windows, as well as in our own house. I saw no males after the second week in November, 1902, and at that time I noticed, on a sunny day, in a warm nook of our garden, numbers of this gnat—all ♀'s—flying about and settling on the stems of plants and inserting their proboscides, apparently engaged in sucking. The two plants attacked were periwinkle (*V. major*) and young wallflowers. Most people at Weston are well acquainted with this species owing to its speckled wings, and it is usually to be met with in autumn in the woods of Worlebury Hill behind Weston on the north. Indeed, it is sometimes spoken of as the "Wood Gnat."

#### FURTHER OBSERVATIONS ON ITS LIFE-HISTORY.

During the past year this gnat has been more than usually abundant in my own neighbourhood (Wye), and like *Anopheles maculipennis* it has not been found to bite man. On the other hand, I have observed the females, just as Mr. Hatchett Jackson records, feeding upon plants. Some hundreds hatched out of a water barrel in my garden during August, commencing on the 17th and going on until the 27th. They all hatched out between 8 and 11 o'clock in the morning. The first few days ♀'s alone appeared, then for two days nothing but ♂'s and then ♀'s again. Many of



a.



b.

FIG. 1.

Larva (a) and pupa (b) of *Theobaldia annulata*. Meigen.

the ♂'s died on the water, as many as 70 being counted at one time floating on the surface. They, it seems, are very easily killed by rain when hatching out, which is not the case with the ♀'s. Another interesting feature was that the males nearly all hatched in the centre of the barrel, the females against the sides. None were found in the house or privies near. It thus seems to be a wood species until late in the autumn, when it enters buildings and remains in them all the winter, coming into activity as soon as the weather becomes warm.

The larvæ also occur in small pools and ditches, and I found some in a saucerful of water, others in a jam pot. They are quite large when mature, reaching nearly three-quarters of an inch; pale greyish-brown in colour, the head smaller than the thorax, and with a rather short thick siphon (Fig 1 (*a*)). The pupa (*b*) has the sides of the thorax, when in the water, silvery in hue, due to air, which collects at the sides; the siphons are truncated and rather curved, the anal flaps prominent and a very distinct tree-like tuft on the first abdominal segment. The eggs are laid in large boat-shaped masses.

Amongst other localities whence mosquitoes have been enquired after in Great Britain may be mentioned Canterbury. Mr. Hammond, writing on the 25th of October, enclosed specimens of *T. annulata*, stating that they were brought to him by two Canterbury people who complained of being bitten by them and of having been made very ill in consequence. Gnats, he says, have been very plentiful there this autumn.

## The Biting Stomoxys.

(*Stomoxys calcitrans*, L.)

Several enquiries have been made concerning the Storm or Biting Stomoxys—the *Stomoxys calcitrans* of Linnæus. During August and September many seemed to have entered houses in such numbers that they became quite a pest, but few reports were given of their biting man, which they do sometimes very severely, and they have been noticed giving considerable annoyance to horses. This fly is said only to approach houses and enter them previous to a storm and in late autumn. This is nearly always the case, and I have noticed that they appear hours before the storm approaches or any indication in the barometer. The bite of this fly is very sharp, and they will bite man even through thick clothing. It does not seem to be entirely sanguineous, for it may frequently be seen

sucking up the nectar from flowers. It is common to Europe and North America. Besides entering houses it also invades stables, cow-sheds, pig-styes, and fowl-houses, feeding off the blood of fowls as well as mammals. It prefers to attack horses on the legs. The bite is followed by the formation of a large papule, upon which the hairs stand erect. They may be found from late spring to late autumn, and especially worry horses near woods. In houses they are frequently taken for house flies, but a casual examination of the head reveals a distinct piercing proboscis projecting from below the head. When resting the *Stomoxys* carries its proboscis forwards, the *Musca* downwards.

The fly reaches between 10 and 12 mm. across the expanded wings, and is about 8 mm. long; it is deep brown with grey reflections, the face white between the large brown eyes; palpi and antennæ brown; thorax with two median dark stripes, two linear dark spots in front and two longer ones behind in a line with them, the paler areas of the thorax with cinereous reflections; the abdomen has a basal dark band to each segment, which spreads out in the middle, nearly across the segments, and so forms a broken dark dorsal line; each segment except the last has two deep brown apical spots; legs deep brown, almost black, except the base of the tibiæ, which are bright testaceous. The male is darker than the female, and the spots on the abdomen larger, and the dorsal stripe less interrupted. The projecting proboscis is deep brown.

The eggs are laid in horse-dung and manure of all kinds, the former by choice, where the white maggots change when mature into rather pyriform brown puparia. They appear to pass the winter in the latter stage. They may soon be cleared out of a room by opening the windows at the top as soon as the weather brightens.

### Hæmatopota causing annoyance in Kent.

Mr. Jeffreys, of Ashford, Kent, wrote asking for information concerning the fly he sent, which, he stated, bites severely. This biting fly proved to be one of the *Tabanidæ*, and belongs to the genus *Hæmatopota*, the species being *crassicornis*, Whlbg. The most common one found about Kent is *H. pluvialis*, L. The two species are very similar. A third species occurs in Great Britain, *H. italica*, Meig. I have not seen it in Kent. Walker gives it as a synonym of *pluvialis*, but it is not so. These *Hæmatopota* are locally known as "Brimps" in Kent, and as Rain Breeze Flies and Horse Breeze Flies in other parts. They are particularly abundant along roads and paths

through woods, and in the neighbourhood of water. They are most vicious of all the *Tabanidæ*, attacking both man and animals, especially horses. Their bite is very painful, and they not only draw away quite a lot of blood, but leave behind a wound from which blood continues to ooze. Many nasty wounds are caused by these flies. They undoubtedly carry poisonous germs, which pass into the system when the proboscis is inserted. To bathers in most small rivers in the south of England they are most annoying. The females only bite, the males live upon the juices of flowers. Their flight is silent, and like other species of *Tabanidæ*, they occur in greatest numbers in hot and sultry weather, delighting in the brightest sunshine.

### Dipterous Larvæ in Children.

Dr. J. K. W. Stephens forwarded in November two kinds of dipterous maggots with the following note:—

“The larvæ are of a lot passed per rectum of a child; two cases in Liverpool.”

These larvæ belong to the genera *Musca* and *Homalomyia*. The first-named is just like *Musca domestica*, but there are eight round knobs to the lateral processes, not seven, as in *domestica*. Probably it is *M. corvina*. This is the first record of the larva of *Musca* living in human beings.

The *Homalomyia* were hatched out by Dr. Stephens and proved to be *H. canicularis*, L. A paper on these two interesting cases of Myiasis is being prepared by Dr. Stephens.

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GROUP E.

Animals which concern Man as causing bodily injury or disease, both possibly of a deadly character, to (A) his stock of Domesticated Animals, or (B) his Vegetable Plantations, or (C) to Wild Animals in the preservation of which he is interested, or (D) Plants in the preservation of which he is interested.

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SUB-GROUP A. ANIMALS WHICH CAUSE BODILY INJURY OR DISEASE TO MAN'S STOCK OF DOMESTICATED ANIMALS.

Sheep Scab.

In answer to an enquiry from Mr. E. G. Wheler, Commissioner to His Grace the Duke of Northumberland, concerning the life-history of the Scab-mite, the following Report was sent.

This Report was further enlarged at the request of the Land Agents' Society, and appeared in amended form in their "Journal." \*

SHEEP SCAB.

Sheep Scab is caused by three different *Acari*, namely: (1) *Sarcoptes scabiei* (de Geer), var. *ovis*; (2) *Psoroptes communis* (Fürst), var. *ovis*; and (3) *Chorioptes communis* (Verheyen), var. *ovis*.

Of these three the *Sarcoptes* cause head scab, the *Chorioptes* foot scab, and the *Psoroptes* the common scab.

Salmon and Stiles give a fourth type, Follicula or Demodectic Scab; this I have not seen in England, and, anyhow, it is of little importance.

The foot scab produced by *Chorioptes* is rare--Zurn wrote upon it in Germany; it does little harm even when present.

The Head Scab or "Black Muzzle," due to *Sarcoptes*, appears on the lips, nostrils, ears, eyelids, and spreads to any part of the body where the wool is scanty. It is easily told from common scab: first,

\* "Journal Land Agents' Society," vol. ii., p. 156-160, May, 1903.

by its position; secondly, by being very much smaller than the common scab-mite; it is almost invisible to the naked eye. Crusts are produced like the common species, which run together. The parasites sink into the skin, grow and produce their young. The young move about and then penetrate the skin, as did the parents. The scabs later become thick, grey, and hard; the sheep rub the scabby places and the scabs get torn off, and open cracks and bleeding surfaces are caused. The mites occur in the moist layers under the scabs and so get detached.

This *Sarcoptes* also lives on the goat.

#### COMMON SCAB.

(*Psoroptes communis*, var. *ovis*.)

The life-history of all these three acari is roughly the same; the Common Scab Mite lays from fifteen to twenty or more eggs on the skin and under the scabs; now and then they appear to be fastened to the wool close to the skin. The eggs hatch in from two to five days, as far as those were concerned which I have kept under observation, but the usual time is from three to four days, according to Gerlach. The length depends on the temperature and moisture. The larvæ are six-legged, but they soon moult, for in four days they have assumed the eight-legged stage. At the end of from seven to eight or nine days the mites are ready to reproduce. After copulation the male dies, but the female casts her skin, this second stage lasting four days, sometimes five (according to Stiles); a third moult follows immediately, and eggs are laid and the adult dies. Stiles says a fourth moult may take place, but apparently without any further production of eggs.

Speaking roughly, a generation may be completed in fifteen days, allowing for variations.

The mites live under and near the edges of the scabs, and are removed with the wool and crusts when the sheep rub themselves against wattles, hedges, posts, gates, etc., or the scabs may fall off on to the ground.

The mites possess great vitality under favourable conditions, but I have not been able to keep them alive more than three weeks when detached from scab and wool under normal conditions. I think it is an exception for them at an ordinary temperature to live more than a month—more often they die in a few days. But there are cases recorded where they have lived up to from six to eight weeks away from the sheep. There are cases where sheep have become infected

in places where no sheep have been for twenty-four months. In the latter case, I feel sure the cause is due to distribution by starlings, etc. The chances of these *Acari* living over the winter is very small when detached from the sheep; and, from those I have tried to keep, I do not think, given sun, wind, and rain, they will live many weeks away from their host. Wetness is very harmful to them—a heavy drenching with cold water kills them readily, but, of course, does not affect the eggs. I have been unable to keep them alive many days on damp, sodden ground, and found the eggs then hatched out and the larvæ perished.

The way in which they live longest detached from the host is when tags of wool and scabs get torn off by the sheep on hurdles, hedges, etc.

The eggs may remain dormant up to possibly eleven days. This is the longest period recorded. I feel sure that is very exceptional, probably only in very cold, dull dry weather. I once kept some ova in a dry temperature of 30° F. for two months, and then being raised to 67° F. a few of them incubated. Varieties of *Psoroptes* occur on horses, goats, rabbits and cattle, but they will not attack sheep, nor will the sheep form attack them.

With regard to extermination, of course dipping is the main thing, and for this one must have a sulphur or tobacco dip. Dipping should be done twice at least to be completely effectual. The second dip should be about ten days after the first. I have noticed the acari become active about May, and in bad cases I should certainly say dip before the sheep are shorn, but dipping is most effectual afterwards (from four to six weeks).

Spring dipping before shearing can only be partly successful, but if the flock is bad it would be worth while. It has another point in its favour—destruction or removal of the Ticks, “Keds,” and Lice (*Trichodectes*); but for scab alone, after shearing would be best for compulsory measures. As a rule sheep are dipped from four to six weeks after shearing. The fleece has then sufficiently grown to be able to hold the dip. Sheep of course are often put back on the same land after dipping, which is foolish. All pens should be well disinfected, and also the ground where shearing has taken place, another point often overlooked. I once found fifty ticks and any number of “Keds” in a few yards around the men shearing at home.

With regard to a dye in the dip, one would have to proceed very cautiously. If one is known that will not affect in any way the wool and will disappear, it certainly would be an excellent plan, but if only used after shearing it would not matter.

*Tyroglyphidae* SENT AS SHEEP SCAB MITES.

Specimens sent from the County Chemical Laboratory, Worcester, supposed to be Scab Mites, had nothing to do with the parasite that causes Sheep Scab (*vide* p. 17.)

They were mites of the family *Tyroglyphidae*, which occur in all manner of places. A few are found as parasites on man and animals, but they do not cause marked diseases like "Sheep Scab" and the allied "Itch" in human beings.

The mites that cause Sheep Scab, *Sarcoptidæ*, present quite a different appearance.

### A true Tick (*Dermacentor*) and others attacking Poultry.

The poultryman at the Agricultural College at Wye tells me that a tick which I had received is common in some parts of the country on fowls and turkeys. The specimen sent was immature, and being unknown to me was forwarded to Mr. Wheler for determination. There are no records of any of the *Ixodidæ* living on fowls except species of *Argas*. Mr. Wheler, the chief authority on British ticks, sent the following reply:—

"The tick you send is a fully distended nymph. I am practically sure it is *Dermacentor reticulatus* (Fabricius). It is not stated to have been found on poultry, but chiefly on sheep. At Revelstoke, however, it has developed into a great pest, affecting the gardens and herbage in March and attacking human beings when gathering flowers. Being immature it is not possible to say the species. It may be another species of *Dermacentor*. If so it is new to England."

Several poultry people have talked to me of "Ticks," but when they have been sent they have always proved to be *Goniodes* or *Gonioeots*. The poultryman at the S. E. Agricultural College knows all the lice well, so there must be something in this Tick pest.

The only known British Tick parasitic on fowls, but chiefly on pigeons, is *Argas reflexus*. Other species are occasionally found on birds, but not habitually. *Argas reflexus* is flat, with a wrinkled margin all round the back. It is, however, rare in this country even amongst pigeons. It is frequent in Italy and in some parts of France; it also occurs rarely in Germany. The *Argas* in all its stages lives on blood, the larvæ being fixed for a longer time to their host than

the adults. They are nocturnal, hiding away in crevices of the fowl-house or dove-cot. Young birds are most affected by it, in fact when this pest once gets into a dove-cot it is almost impossible to raise young birds. Death may ensue, according to Neumann, in from eight to fifteen days. Amongst fowls, however, this species is rare, and I am not aware of their having caused any annoyance. Besides birds this Bordered Argas attacks man, Megnin having received specimens from Strasburg gathered from the clothes of a man. Children are frequently bitten on the Continent during sleep, especially on the hands and feet. It was probably this species that at one time caused some inconvenience to worshippers in Canterbury Cathedral, the ticks falling down from the roof, where they were evidently abundant, living upon the numerous pigeons, etc., that breed in the towers.

Other ticks of this genus are well known as attacking poultry abroad, namely, the Mauritius Argas (*Argas mauritanus*, Guér), which causes considerable loss in the poultry-yards of Mauritius, and the Tampan, Wandluis or Fowl Tick of South Africa (*Argas persicus*). Frequent instances of fowls and ducks dying from the effects of Fowl Tick attack are reported according to Mr. Lounsbury.\* This pest occurs in many countries having a warm climate. It is particularly troublesome to man in Persia, where it is known as the Miana-bug by Europeans, the Gerib-gez or Malleh by the Persians.

In America and Australia an Argas (*A. americanus*, Packard) also attacks domestic fowls and turkeys and occasionally cattle.

### **Geese Lice** (*Trinoton conspurcatum*, Nitzsch) and others.

Some lice sent by Professor Vale from geese proved to be dark-coloured specimens of *Trinoton conspurcatum*, Nitzsch. This is one of the largest of the *Mallophaga*, which is frequent on geese and swans, both wild and domesticated.

The *Trinoton conspurcatum*, Nitzsch, is according to Denny a very common parasite on domestic geese, and may, he says, be frequently seen running on that bird with great velocity, either in a progressive or retrograde direction, and owing to its polished and flat surface it is difficult to retain when caught.

Besides being found on the Domestic Goose it is recorded from the Common Gull (*Larus canus*) and Bewick's Swan (*Cygnus*

\* "Report of Cape of Good Hope Government Entomologist, 1890," p. 33.

*Bewickii*), and by Dr. Burmeister on the Domestic Swan (*Cygnus olor*).

Another smaller species (*Trinoton squalidus*, Denny) also occurs on the Domestic Goose and on the White-fronted Goose (*Anser albifrons*) and on the Shoveller (*Anas clypeata*). This last-named louse is much smaller than the former. In colour it is pale yellowish-grey, with smooth shiny coat, black head with four dark lateral spots on it, black lines on the thorax and a dull brown band near the apex of the femora, and the tibiæ fringed with long hairs. Length  $1\frac{1}{2}$  lines. It is undoubtedly the same species that Nitzsch described as *Trinoton lituratum*. Piaget records it also from *Dendrocygna arborea*, and I believe it has also been found on the Smew.

A *Lipeurus* (*Lipeurus jejunus*, Nitzsch) is also found on the Goose. This long, narrow louse is pale yellowish-white with a dark margin, the first eight segments with quadrangular bands; legs dusky. Length 1 to  $1\frac{1}{2}$  lines. It is generally distributed amongst the goose tribe both wild and domesticated. I have not seen this species, but I presume it works in a similar way to the *Lipeurus* found on fowls and pigeons.

Another *Lipeurus* (*L. anseris*) has been described, but I know nothing of it. Piaget, however, retains it as a distinct species. The specimens were taken on Domestic Geese.

### **Pig Lice** (*Hæmatopinus urius*, Nitzsch).

Specimens of lice, *Hæmatopinus urius*, of Nitzsch, affecting pigs, were received from Mr. Mitchell, of Laddingford Manor, Yalding. It is the largest of the lice belonging to the *Pediculinæ*. The pig is often attacked and inconvenienced by this pest. The skin becomes marked by red papules, and becomes inflamed and diseased. They cause intense irritation, unrest, and frequently check growth in young pigs to an alarming extent. In many cases young porkers have succumbed to their attack.

The head and abdomen are dull yellowish-grey, the thorax reddish-brown, the legs pale brown, and the abdomen has dark markings, variable in shade; the head is long and narrow. The female when ungorged is about 5 mm. long, but some sent in a very distended condition were as much as 6 mm. in length.

There is nothing like creolin for such parasites, 10 to 15 per cent. in water, two or three dressings of which are necessary. Paraffin was tried, but the lice appeared again.

*Glyciphagus domesticus* on Tortoises.

The household mite *Glyciphagus domesticus* was sent by the Rev. J. Harvey Bloom, of Whitechurch Rectory, taken from domesticated tortoises. This species is found in all manner of places, and may be found on living creatures, but it is not their habitat. They are not parasitic at all, and it is doubtful if they would do the tortoises any harm, although they may cause some irritation if present in large numbers.

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SUB-GROUP B. ANIMALS WHICH CAUSE INJURY OR DISEASE TO MAN'S VEGETABLE PLANTATIONS.

SECTION I.

ANIMALS INJURIOUS TO AGRICULTURE.

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ANIMALS INJURIOUS TO CEREAL CROPS.

**The Gout Fly of Barley.**

(*Chlorops tæniopus*, Meig.)

Some specimens of this pest were sent by Professor John Percival, Director of Reading College Agricultural Department, from Arthog, Dolgelly, N. Wales, who stated that "every one plant in ten is affected, and does not seem to be likely to send up ears."

The pest proved to be the common Gout Fly, *Chlorops tæniopus*. Certain differences in the place of pupation made it difficult to say at first, hence the doubt as to species in the following report sent:—

"The barley you send is attacked by one of the Gout Flies (*Chloropidæ*).

"It is probably the Ribbon-Footed Corn Fly (*Chlorops tæniopus*), but, as a rule, that species pupates in the groove made by the larva, and not as in the specimens you send between the sheathing leaf and the damaged ear. It is a common pest all over the country, especially on poor soil; on chalk lands it is, as a rule, most prominent. I think there is more than one species that does the damage.

"None of the plants as badly attacked as the ones you send will

be any good; the ears will not come out of many, and most were completely spoiled.

“Remedies are, of course, impracticable, even when the disease is in a much younger stage than that which you send; but when the stunted plants are noticed earlier in the year, dressings of stimulating manure have been found to push the plant on, and so save part of each ear. In districts where ‘Gout Fly’ is prevalent, early sowing has been found of the greatest benefit. In one instance the following was noticed: (1) Sown in March, practically free from injury; (2) sown April 6th, affected 2 per cent.; (3) sown May 3rd, affected 20 per cent. It always seems to be late-sown barley that is damaged.

“It is especially bad on wet, low-lying parts of fields, near grassy headlands, and along the borders of ditches and furrows; also where land is exposed to a sweeping wind.

“Grassy headlands should be cut and burnt in winter, if not at the present time (August).

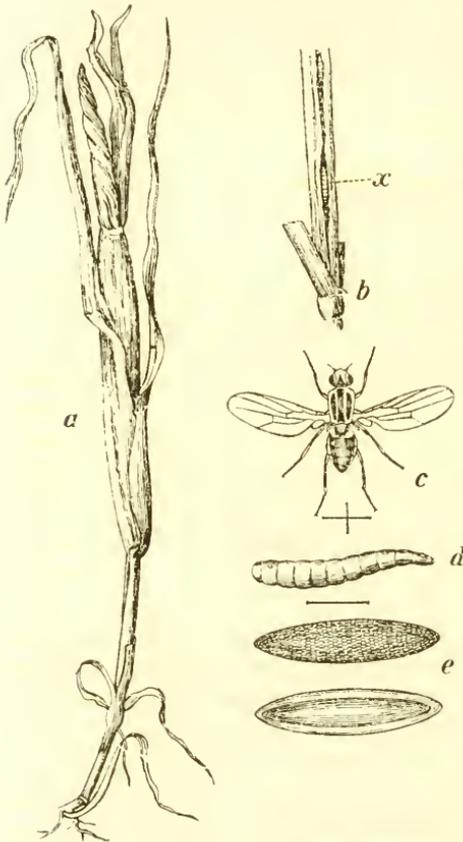


FIG. 2.—THE GOUT FLY (*Chlorops tæniopus*).  
 a. Barley deformed by the larvæ; b, stalk of same, showing larvæ at x; c, the fly; d, larva; e, eggs greatly enlarged. (Partly after Curtis and Ormerod.)

be above ground, continuing into October. If the crop is harvested this month, which I presume it will not be in North Wales, the sheaves should be well shaken before being stacked, as many of the puparia will fall out, and can be swept up and burnt. All refuse should be burnt after stacking or thrashing.”

These flies commenced to hatch out on the 27th of August, and continued until the 4th of September. They lived some two weeks;

the females deposited but few eggs, which are laid on grasses. The eggs (Fig. 2, *e*) are of a very elongated oval form, creamy-white in colour, the upper surface has a reticulate sculpturing of hexagonal depressions arranged in longitudinal rows; ventrally the surface is unadorned, but has a wide ventral groove.

They are exactly 1 mm. long.

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## ANIMALS INJURIOUS TO PULSE.

### The Pea Beetle.

(*Bruchus pisi*, L.)

A letter asking for information regarding the cause of damage to some peas was handed to me by Mr. Pocock from Mr. F. G. Aflalo, of Teignmouth. The pest was the Pea Beetle. This beetle is well known in Europe and America, and may be said to be cosmopolitan in distribution. In America it is called the "Pea Bug." The beetle is a small grayish-brown insect about one-fifth of an inch long, with two very conspicuous black spots on the end of the body. These beetles emerge from the peas in late autumn and spring. Those that emerge in the autumn hibernate under rubbish, in outhouses, barns, etc. The majority seem to pass the winter in the peas. As soon as genial spring weather occurs they become very active and fly to the fields. If the peas are up they feed first on the leaves, and in that way in Canada they have been noticed to do some damage. The real harm is caused by the larvæ, however. The beetles lay their eggs on the young pods, and the larvæ—white footless maggots—penetrate into the pods and then enter the nearest peas. There they live and mature, pupating in the autumn or winter, and the adult beetles escape from the peas, leaving behind a large round hole. Many beetles have not escaped by the time the peas are sown. It is general in shops and granaries, but most of the instances coming to my notice where it has been a very harmful pest have been traced to foreign importation. Fowler records it as feeding on *Sisymbrium* at Stretford, near Manchester.

*Treatment* consists of fumigating the peas with bisulphide of carbon as soon after harvesting as possible, 1 oz. carbon bisulphide to every 100 lbs. of seed. Place the seed in closed bins or any closed chamber and put the bisulphide in a saucer on the top of the seed and leave for forty-eight hours. The bisulphide is highly inflammable,

and the fumes as well as the actual substance are poisonous to man and animals. Seed at any time may be treated in this manner. Diseased seed should never be sown; they may be fed to stock without doing any harm to the latter. If the use of the bisulphide of carbon is objected to owing to the inflammable nature of the liquid and its poisonous fumes, the only other way is to hold the seed over until the second year. The vitality of the pea is not harmed, and by that time all weevils will have hatched out and died.

Seed peas may also be treated in the following way: put them in an air-tight box and then pour half a pound of chloroform on to a rag for every twenty-five bushels of peas and push the rag down into the peas, close up the box and leave for a week. The chloroform kills all the insects and does not harm the seed or affect the flavour in any way.

### A Remedy for the Pea Weevil.

(*Sitones lineatus*, L.)

Dr. A. H. T. de Montmorency, of Carrickmines, co. Dublin, sends the following useful note regarding the Pea Weevil and the prevention of its damage:—

“Last spring I was worried with my peas being eaten away, and I could not get any information in seed shops or elsewhere as to the circular pieces eaten out of the young shoots when coming up. I went over with tulips to the Temple Garden Flower Show, and remaining in London for a while, I went down to the Natural History Museum, and on looking at one glass case, ‘Pests of the Garden,’ I saw about the Pea Weevil, and at once saw I had the enemy that had compelled me to sow the rows a third time before I left home. When I returned home I found my third sowing also eaten away except one row. Here is the point. This row I had covered with fine earth I was removing from a house I grow potatoes and tomatoes in. They were in splendid order, and a fine row consequently. Why not put in the case as a remedy—cover with fine earth. The insects have not the hiding-places as they had in other places, as my soil was all very coarse and lumpy owing to the wet season. It was so marked that I thought it well to bring it under your notice.”

ANIMALS INJURIOUS TO ROOT CROPS.

Turnip Flea in North Wales.

Turnips were reported by Mr. A. O. Walker, F.L.S., of Ulcombe, Kent, as having been damaged by Flea Beetles in North Wales; the species proved to be *Phyllotreta consobrina* and not *P. nemorum*. This black metallic Flea Beetle occurs in greatest abundance on chalky soils, but also on light sandy soils. It is most abundant in southern and western counties. In Kent it does enormous mischief some years. This is the first record of the damage done by it, however, in North Wales.

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ANIMALS INJURIOUS TO FORAGE CROPS AND GRASS.

The Red Maggot (*Cecidomyia trifolii*, Fab.) in Clover.

In answer to the following enquiries a general report has been sent out. This clover pest seems to have been abnormally prevalent this year. Three enquiries only are mentioned as examples.

1. From Mr. Thomas Batting, bailiff for E. Ellis, Esq., Shalford, Guildford, Surrey:—

“I enclose a few roots of clover and mixed grasses affected by a small maggot.”

“The clover only was attacked, as far as I could tell, from the material. The damage was apparently entirely done by the small red maggots of a Cecid Fly, known as the Clover Gnat Midge, or Red Maggot, *Cecidomyia trifolii*, Fabricius.

2. From Cooper Wachter, Esq., Ford, Hoath, near Canterbury, Kent:—

“The field that is attacked is at Ridgeway Farm, Herne; it is 24½ acres in extent. It has gone in brown patches, mostly seen where the field slopes most.”

3. From C. Marshall, Esq., Hadres Court, Canterbury, 21 June, 1903:—

“The field in 1900 was in a poor condition. In 1901 a very good crop of swedes was grown, the ground having ten loads of manure and also some superphosphate. The swedes were fed off by sheep having plenty of cake and oats and a crop of barley put in very late (which came up thick but very short of straw) and clover was drilled.

This, after the barley was cut, looked very promising all over the field, but since has been gradually going back, and now there is hardly any on the field of eighteen acres, except in spots and one end where there is a moderate crop, but none is worth cutting. As far as I can make out the field has not grown clover for six years, and therefore it can hardly be clover-sick. Can you give any idea of the cause of failure, etc."

To this the following answer was sent with accompanying Report:—

"The clover has been destroyed by a pest that has been very prevalent in Kent this year, namely, the Clover Midge (*Cecidomyia trifolii*). A serious attack occurred near Herne, others at Gravesend, Huntingdon, etc.

"The larvæ you send in the tube (small yellow orange maggots) are the culprits. They are of the second brood referred to in the enclosed report. The small green caterpillar sent is not the cause of the damage.

"There is no remedy for such an attack. I should if the crop is worth saving give some stimulating dressing; if it is very badly damaged it would be best to plough up deeply so as to bury the larvæ many of which have now gone to earth—fresh flies will appear and the progeny of these will do damage mentioned in the report."

Clover is frequently attacked by small red maggots, which are to be found in the outer layers of the roots and amongst the tufts of young leaves, often buried deeply in the centre of the leaf tufts, at other times between the two sides of a young bent leaf.

This insect is not uncommon on clover and vetches, and is known as *Cecidomyia trifolii*, Fabricius. It may be found on wild species of vetches. The maggots are of all sizes and various tints of orange and yellow and, as in all this group of insects, quite legless. There are two closely related species known also as Clover Midges, viz., *Cecidomyia leguminicola* and *C. lathyri*. This Clover Midge can easily be told from them by the shape of the small ventral process under the head end—the "anchor process." The maggots also attack the lower leaves of the clover, fastening them together and forming really galled structures in which the larvæ change to pupæ. There are evidently two broods in the year, the larvæ found now hatching in the summer, and the flies of this generation seem to lay their eggs on the clover leaves generally, and galled structures are formed by them. The second brood live on the decaying roots and in the growing tuft of the clover and seem to cause its decay.

Another species, *C. leguminicola*, feeds in the flower heads and also lives at the roots during the winter.

The adult fly of *Cecidomyia trifolii* is a small brown midge with a reddish brown abdomen ringed with black, the two wings are yellow at the base and covered with brown hairs and are somewhat iridescent.

Little is definitely known concerning this pest.

There is no remedy, but a good dressing of artificial manure often carries the plant over the damage. As such pests may continue from year to year, I should feed off the clover and plough deeply with a skim coulter, so as to bury the larvæ and pupæ in the soil, so that when the flies hatch out they cannot come above ground. Of course this is only advised if the crop is severely damaged. Such pests when once they become plentiful may cause endless harm unless drastic measures are taken against them.

Some doubt has been expressed by Miss Ormerod of these red maggots doing damage, but I cannot agree on that point, as I have seen acres of clover ruined by them. There were no other insects present, no sign of eelworm, and not enough fungi to account for the harm done in any of the specimens sent this year.

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## ANIMALS INJURIOUS TO FRUIT AND FRUIT TREES.

### **Big-bud Mite in Black Currants.**

A number of enquiries have been received concerning the Big Bud Mite. Diseased plants have been sent from various parts of Kent, from Harpenden, and from Guildford.

Doubts have been expressed that any clean black currant stock can be obtained. As far as Kent is concerned there is very little, but in other districts a few enquiries soon revealed that such conditions do not appear everywhere. Mr. Wm. Bear, of Magham Down, Hailsham, writes that his Lee's Prolific are quite clean; some infested Baldwins he obtained were eventually destroyed and the disease reduced to a minimum. This stock of Lee's Prolific came from Preston. I applied to the grower and his answer was that he had stock of Lee's Prolific and Carter's Champion quite clean. These two kinds he had grown for years and had kept free from mites; but Black Baldwins he had given up growing, having found two or three bushes, purchased three or four years ago, with a few

“big-bud” on them. No bushes are grown more than three years, only the stools are kept for the cuttings, of course being cut back every year.

Mr. E. J. Wheler, of Alnwick, Commissioner of His Grace the Duke of Northumberland, tells me he has no “big-bud” in his garden, and states that he had little doubt that clean stock could be got in the neighbourhood if desired.

Mr. A. T. Gillanders, of the same district, writes: “I have not seen a single specimen on black currant during the five years I have been here. Further enquiry has shown Northumberland to be practically free. Mr. Wheler writes me later that the Duke of Northumberland’s forester assures him that Northumberland is practically clear of the mite.

Information obtained in Ireland has shown the “big-bud” to be comparatively scarce, particularly in Armagh and co. Down. I have seen little in Devon or Hampshire. Further enquiries have ceased *pro tem.*, owing to the Royal Agricultural Societies’ zoologist, Mr. Cecil Warburton, reporting on this subject after touring in parts of Great Britain.

### A Red Spider (*Tenuipalpus*) on Fruit Trees.

Numerous enquiries have been sent concerning a Red Spider which is very abundant on fruit trees. The round globular eggs are very noticeable in winter and spring in the axils of the buds and twigs. The eggs hatched out in March and April, and specimens were sent at once to Mr. Albert Michael for identification.

The specimens were identified by Mr. Albert Michael as species of the genus *Tenuipalpus*—probably *T. glaber* of Donnadieu—but it is not possible to be certain of the species from immature specimens.

This species can easily be hatched out from the round bright red eggs which thickly encrust the smaller stems of fruit trees. I have failed to trace any damage caused by these acari, even when they have swarmed over the trees. They reach the mature state in April and then disperse. From a series of observations I am sure they feed upon the spores of various fungi and lichens growing on the fruit trees.

### The Wood Leopard Moth.

The Wood Leopard “Borer” is the larva of the Wood Leopard Moth (*Zeuzera aesculi*). It has been sent from Eynsford and Goud-

hurst in Kent. It does a good deal of damage to a tree and is by no means uncommon in Kent, being frequently sent from orchards round Maidstone and Tonbridge. Mr. Till, of Eynsford, writes: "It is very destructive, and I find one young tree quite destroyed by the perforating action going on in the trunk—an apple. I have had the specimen I send on my desk two or three weeks papered up, but I see the destruction of the wood goes on all the same, so the grub is not dependent on living tissue." It occurs in apple, pear and cherry mostly. This pest is dealt with in the Board of Agriculture leaflet, No. 73.

### The Little Ermine Moths (*Hyponomeutidæ*).

Enquiries concerning the Little Ermine Moths which attack apple trees and hawthorn hedges are some years very numerous; in 1903, as with many other insect pests, they have been largely conspicuous by their absence. The only enquiry received has been from Mr. Wm. Bear, of Magham Down, Hailsham, who, in writing for information concerning these pests on the apple, sent the following observation, which has not I fancy been previously recorded: "Numbers of these small moths," writes Mr. Bear, "are on my apple trees (4. 8. 03), and when disturbed drop to the ground with wings folded and can be caught by hand easily." Writing five days later, he says, "Very few can be found now." They were examined, and from various descriptions I am led to believe that this apple pest is not the same as that found on the hawthorn, any more than the two are the same species on the Continent. The apple species was separated by Zeller and is known as *H. malinella*, the hawthorn species is *H. padella*, L., the name by which our apple species has been previously recorded.

An account of the two species injurious to fruit trees is given here.

#### THE APPLE ERMINE MOTH OF GREAT BRITAIN (*Hyponomeuta malinella*, Zeller), AND OTHER SPECIES.

The Small Ermine Moths or *Hyponomeutidæ*, of which there are seven species found in Great Britain, are easily known by the leaden grey or white front wings having small black spots spread over them and by the habit of their larvæ living under a nest of silk. Three of the seven species live during their caterpillar existence on the foliage of the Spindle tree (*Euonymus europæus*), namely *H. plum-*

*bella*, Fabr., *H. cognatella*, Hub. and *H. irrorella*, Hub.; both the former are very abundant some years in the South of England, where they not unfrequently defoliate the trees and even gnaw the bark off the young stems. They are often very destructive to ornamental *Euonymus* in gardens. The larvæ of both occur in destructive form in June, the adults in July and August. *H. irrorella*, Hub., also found on the same food plant, is scarce. Three species attack fruit, namely, *H. malinella*, Zell., *H. evonymella*, L., and *H. padella*, L. The former is known as a fruit tree pest attacking the apple; it has been recorded, however, as *H. padella*, which it closely resembles. *H. padella* feeds on hawthorn, and in France on plum and cherry, in Italy on plum. Although this last species is said to be found on apple, the nest made by the larvæ on hawthorn in this country certainly differs from that made on apple, being much looser. The form on the apple was named *malivorella* by Stainton, but was apparently sunk as a synonym of *padella* by him later.\* Zeller described the apple form of Europe as *malinella*. It has not been recognised in England. *H. evonymella* only occasionally does any harm, its normal food-plant being the Bird-cherry (*Prunus padus*). It has been sent to me on more than one occasion from cultivated cherries in Kent and also from apple. Whitehead says it is the species most usually met with in the north of England. *H. padella* often does much harm to hawthorn hedges, frequently quite defoliating them. In Italy it attacks the plum, being known as "tignola del pruno," in France cherry, plum and grapes. It also attacks the cherry in England.

The Apple pest (*H. malinella*) was most troublesome in 1865, 1877 and 1880. Whole orchards were entirely devastated in the two first-named years, the foliage being as bare as in midwinter. Such an attack not only ruined that year's crop, but so harmed the trees that they did not bear crops in subsequent seasons.

#### LIFE-HISTORY OF THE APPLE ERMINE.

The life-history seems to have been confused in describing this pest with that of *H. padella*. The fact that the same species was thought to attack both hawthorn and apple probably is the cause of this. I feel convinced the two are distinct.

The apple species is smaller than that found on the hawthorn, measuring about 17 mm.; the head is white and also the palpi, the thorax is snowy-white with black spots, as also are the fore wings,

\* Lep., *Tineina*, *Ins. Brit.* iii. p. 60, 1854.

which have about twenty small black spots, the cilia a similar colour to the wings; posterior wings grey, the fringe uniformly grey, thus differing from *H. padella*, in which the fringe of the posterior wings is pale grey or white with grey apex.

The moths appear in July and August. The earliest record I have of them is July 4th and the latest August 10th. Whitehead says they appear towards the end of June. I have never observed them as early as this. Those sent by Mr. Bear were taken on August 2nd. Mr. Bear's note, p. 31, being quite a new observation and by no means an unimportant one. As in all this genus the female deposits her eggs on small twigs, in circular patches about one and a half lines in diameter; these egg masses are then covered over with a glutinous substance which is at first yellow, but which gradually becomes brown, until they resemble the colour of the bark upon which they are situated. They are laid in groups of fifty to eighty; they are placed in rows which overlap one another like tiles. These eggs hatch in the autumn and the minute larvæ remain under this case, now composed of a glutinous substance and the débris of egg shells. As many as two to six dozen larvæ form each group and there they remain all through the winter. They are at first of a pale yellow colour with black head and dark succeeding segment and vary in length from one-half to two-thirds of a line. As soon as the buds begin to burst these little larvæ escape from the nest and enter the expanding buds and can then be easily found. In May they seem to disappear, but have mined their way into the soft parenchymatous tissue of the leaves, leaving the epidermis untouched. During this period they cause the leaves to become red in patches and later to become brown owing to their tunnelling into them. As a rule about a dozen occur in each group on the leaves. As soon as the miners are sufficiently strong they leave the protection of the leaves and feed upon them. They may also be found in the developing calyces of the blossoms and feed upon them. At first they retain their yellow colour, but after becoming free they gradually become a dirty ashy grey colour spotted with black, and later the ground colour becomes dull yellowish leaden-grey with more prominent black spots. Soon after they vacate the blossoms and leaves and they become gregarious and live for the rest of their larval existence beneath a nest of grey silk spun at first between the folds of a leaf or leaves and later between the twigs. The small leaf nests are found in May. By June they make large nests and are nearly mature, and towards the end of the month they spin delicate cocoons often side by side in the nest in which the larvæ pupate and from which the

moths appear in July and August. The pupal stage lasts about two weeks.

Marchal also records this species as a pest to almonds in France.\*

#### THE HAWTHORN AND CHERRY ERMINE.

(*Hyponomeuta padella*, L.)

This small Ermine Moth feeds normally on hawthorn, often quite defoliating the hedgerows. It also attacks cherry and plum. It is somewhat larger than the apple-feeding *malinella*, and differs in having the fringe of the anterior wings ash-coloured above, perfectly white below, without any dusky spot.

It measures about 22 mm. across the open wings. The head, antennæ, and palpi white; the fore wings white or grey, variable in colour, with three lines of black dots, two of which are close and parallel to the interior margin, the third along the anterior edge, with other black dots near the fringe; the wings ash-grey below, about the same colour as the upper surface of the inferior wings. A few black spots on the thorax.

They appear in July and August.

The life-history is very similar to that of the preceding. The larva is of a dirty whitish-yellow colour, with black head, and two dark spots on the first segment, forming the thoracic shield, and another the anal plate; thoracic legs black. A median dusky line along the back, and on each side two rows of eleven round spots, brown in colour and slightly hairy.

The pupa is yellow in the middle, brownish-black apically, and the same colour on the wing-cases. They live and pupate much as in the former species, but the cocoons are much lighter, so much so that the pupa can be seen within, whilst in *H. malinella* they are compact and opaque. They are placed differently also; for in *malinella* they are in group-like packets, in this species they are never found in groups, but are more or less isolated, nor is the tent nearly so compact.

#### PREVENTION AND REMEDIES.

Washing with arsenites has but little effect upon these pests, owing to their feeding between the silken nests, which protect the leaves from contact with the wash. Whether spraying with caustic alkali wash in winter would kill the young larvæ is also doubtful, if used at the strength generally employed, but it can be used at double

\* Bull. Soc. d'Études et de Vulgarisation de la Zool. Agricole, No. 4, p. 17, 1902.

that strength on dormant wood, even if 98 per cent. strength of commercial caustic soda is used. The stronger solution would, I feel sure, destroy the glutinous cover over the young caterpillars. The tents should always be collected as soon as they are seen forming, and burnt with their complement of larvæ, or collected and put in pails of quicklime. Those high up may be cut off with long-handled shears, such as are used for tree trimming.

The species on hawthorn hedges may be destroyed on a large scale by beating the hedges with supple sticks, and treading on the caterpillars as they fall down.

The Ermine Moth caterpillars are preyed upon by starlings, which greedily devour them, and I have bred an Ichneumon in numbers from specimens collected in Kent.

### The Pith Moth.

(*Laverna atra*, Haw.)

Several fresh enquiries have been received during the past summer. The pest is now known to occur in Gloucestershire, and is also doing damage in other districts in Kent. It probably has a wide range in the Southern part of England, but has been overlooked by growers.

The notes in the First Report (p. 68) were mainly from personal observations. Mr. William Bear, of Hailsham, now points out to me that the larvæ are found not only, as in the attack observed by me, in terminal shoots, but in any shoot and bud. Mr. Bear writes as follows:—"It is not only terminal shoots that are attacked, nor shoots of any class alone. I find scores of the caterpillars in buds rendered abortive by them." Mr. Bear sought for the eggs and could find none, and doubts that the caterpillars exist on the leaves in the autumn. "If the caterpillar pierces the buds there should be a hole at the base, and I have never seen one, I say, at the base, because the caterpillar is always found with its head towards the tip of the shoot."

The moths commenced hatching out this year, both from specimens received from Mr. Bear and those collected by myself, on July 12th, and continued until August the 10th. The moth is extremely variable in colour, some being almost black, others brown, and yet others with grey and white markings, as described in the First Report. Unfortunately, I was not successful in getting any to lay eggs in the breeding-cage, nor did I observe any *in copulâ*. The moths are very active, running with great energy; they usually settle on the old

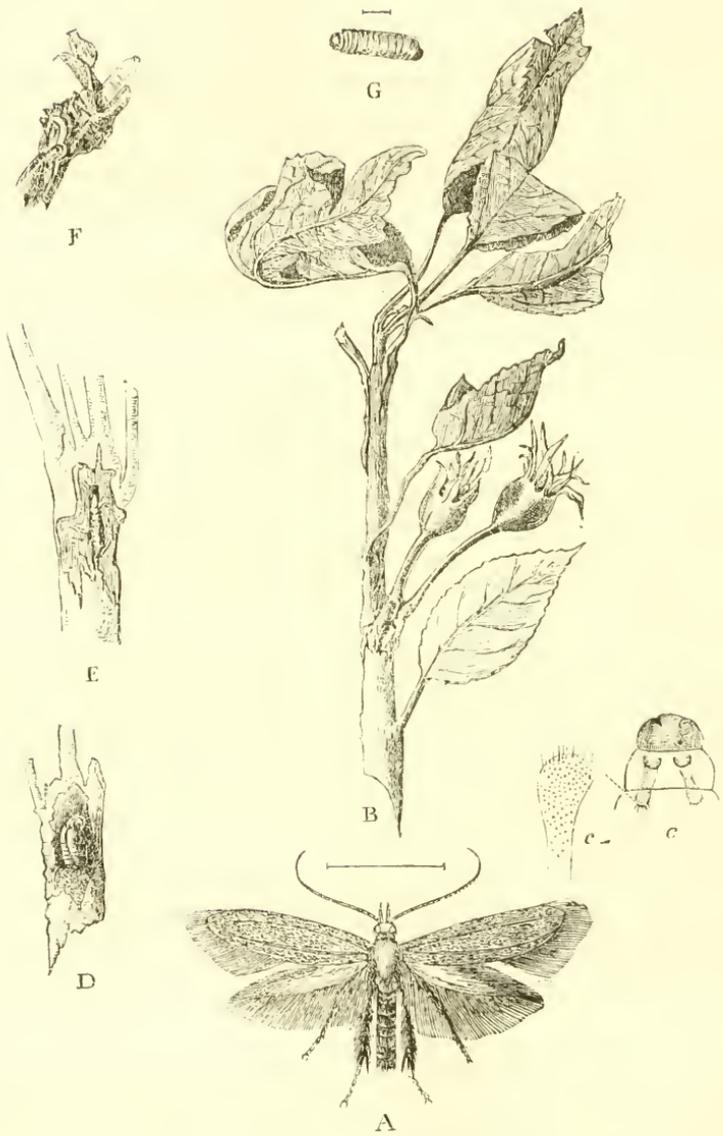


FIG. 3.—THE PITH MOTH (*Laverna atra*).

A, Imago; B, attacked apple-shoot, the upper portion shrivelling up and dying away; C, processes on pupa; D, pupa (enlarged) in situ; E, showing position of larva (natural size) in situ; F, enlarged larva in broken open bud; G, larva (enlarged).

twigs and stems, and when so situated are extremely difficult to see.

This pest seems to affect only young stock, but I have observed it on trees twelve years old.

That hand-picking the attacked shoots does much good is evident. Mr. William Bear writes on May 29th that:—"There is not so much damage from pith moth as there was last year, probably because I cut off and burnt every infested shoot that I saw, and I am doing so again this season."

### The Apple Leaf Miner.

(*Lyonetia clerckella*, L.).

An ordinarily harmless insect feeding on any of our fruit trees or other crops is always liable under certain conditions to increase abnormally and so become destructive. This has been the case with the small blister moth of the apple and pear, *Cemiosoma scitella*, Zeller, a beautiful little Tineid which did a great deal of harm in 1898 in East Lothian and Cambridge.\* In writing upon the life-history of that pest I mentioned that "another genus, *Lyonetia*, has one species—*L. clerckella*—whose larvæ form long sinuous tunnels in apple and cherry trees, but do not appear ever to be abundant enough to do any harm, although I have had enquiries concerning the economy of this species." This Apple Leaf Miner has during the past season been unusually prevalent, and, in a few cases reported has damaged the foliage of dwarf apple trees very considerably. In one instance the attack was personally investigated in Huntingdonshire and every leaf on two trees was found to be tenanted by the larvæ of this minute Tineid.

The leaves which were attacked had more or less shrivelled, and many had died away in August, the trees thus receiving a serious check, as the sap was still flowing freely. This insect also appeared in plenty in my own garden, which enabled me to keep it more or less under observation.

The presence of this leaf-miner is easily told by the long, sinuous tunnels caused by the larvæ burrowing in the leaves. As a rule a single tunnel occurs only on each leaf, but where the damage has been noticed, as many as four have been present, the greater part of the chlorophyll being thus destroyed.

This moth occurs in most parts of England; it has been especially

\* Jour. S. E. Agric. College, No. 8, p. 21, 1898.

recorded from Cambridgeshire, Huntingdonshire, Middlesex, Surrey, Kent, and from Bristol, Darlington, Manchester, and various parts of Yorkshire.

I do not know of any previous record of its doing any appreciable amount of damage to fruit foliage.

As will be seen from what we know at present of its life-history, there is no vulnerable point at which we can direct our energies when it increases sufficiently to become a pest.

#### LIFE-HISTORY.

The moth appears in April, June, August and September and again in November. It is about one-third of an inch across the expanded wings; the front wings are narrow and lanceolate, brownish-white, with a long brown line beyond the middle with a narrow fuscous fascia and three fuscous streaks, at the apex is a prominent black spot, the fringe is brownish-grey and so are the hind wings and their fringes. Some specimens have the fore wings almost bronzy, especially after death, the colours quickly darkening; the abdomen is clothed with shiny steely scales and the dusky antennæ are long and slender, the base expanded into a so-called "eye-cap"; the legs are shiny brown with pale tarsal bands and the hind ones have prominent tibial spurs.

The females (and possibly the males) hibernate in crevices, under rubbish, especially where they can keep dry. Some were found in mid-winter in box hedges in my garden. The first sign of larval life may be noticed in May. The female as a rule deposits one minute egg on each apple or sometimes cherry leaf. In (at present) an unknown period the larva hatches and bores into the leaf and there forms a twisted and serpentine tunnel (Fig. 4, *a*) in the leaf, feeding upon the soft parenchyma, although I have been unable to note the egg it is evidently laid upon, not in the leaf, as a minute hole can often be seen at one end of the tunnel through which the larva has doubtless entered. The larva gradually enlarges this tunnel as it grows; at its end it is usually one millimetre and a half across. The tunnel may be brown, black or grey, the larger end usually showing a median line of dark "frass." Inside this tunnel will be found the green caterpillar (Fig. 4, *c*), varying from pale to deep apple green. It reaches when full grown six millimetres in length: the segments are deeply constricted and more or less rounded, the head is dark and there are two dark patches on the first segment and also a hair on each segment. In general form the larva is

flattened. The six jointed-legs are brown and the eight pro-legs also brown to almost black. Larval life seems variable, for some were mature four weeks after the first signs of the tunnels were noticed,

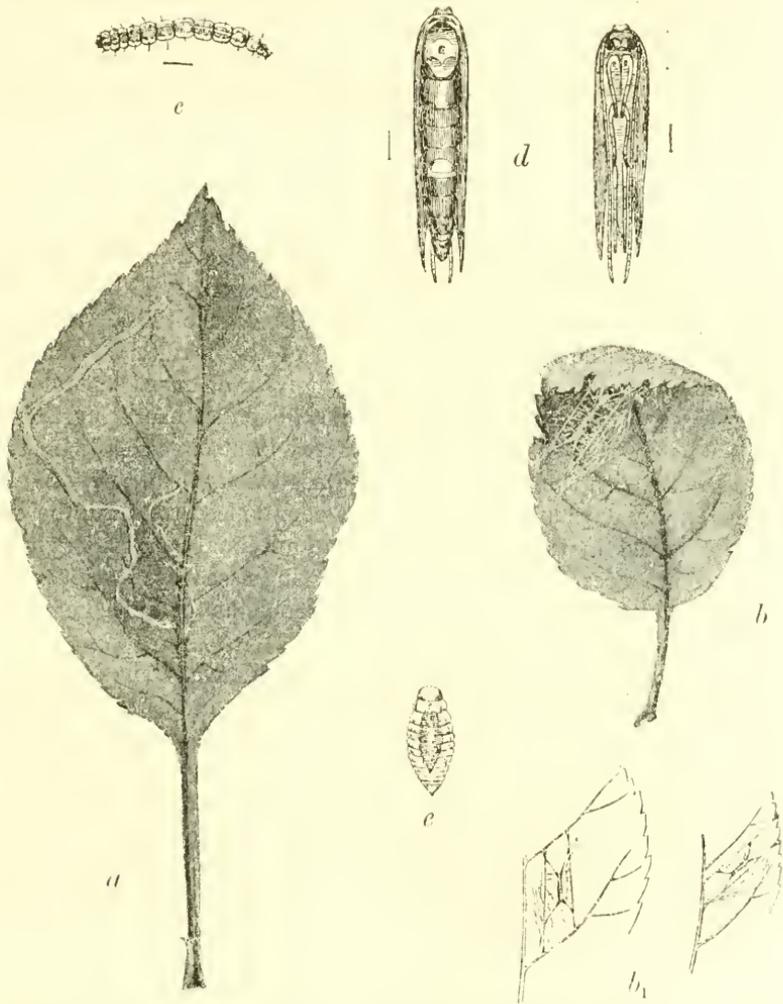


FIG. 4.—THE APPLE LEAF MINER (*Lyonetia clerkella*).

*a*, Tunnelled leaf; *b*, cocoon on upper surface of leaf; *c*, larva; *d*, pupae, dorsal and ventral views; *e*, chalcid parasite; *b*<sub>1</sub>, two cocoons on leaf.

others not until five weeks. The larva can be seen in its tunnel by holding the leaf against the light. They fit in so closely that they can scarcely move towards the end of their growth.

When mature they leave the leaf by eating their way out of the

gallery and crawl about upon the leaves for a short time. Usually in a few hours they commence to spin a cocoon on the leaf. These cocoons are generally spun on the under side of the leaves (Fig. 4, *b*<sup>1</sup>), but may occur on the upper side (Fig. 4, *b*), the latter only when they settle upon small or curled leaves. Very often the cocoon is spun on the leaf in which the larva has tunnelled, or it may be a fresh leaf. This case is formed of very fine shiny white silk, and is made in well-formed examples as follows: a thick strand extending from one branch vein to another on each side, usually parallel and about 5 mm. apart. The length of these lateral strands depends upon the distance of the ribs apart. I have measured some 30 mm. long. The cocoon is spun between these and attached to them by another strand of silk on each side. The cocoon itself is cylindrical and open at each end. They may also occur with the treads running from the mid-rib to the edge of the leaf (*b*<sup>1</sup>). The pupa (Fig. 4, *d*) is pale apple green, the front fawn-coloured and also the wing-cases. The third segment of the abdomen has a large apical yellow patch, and the base of the fourth is also yellow, the venter pale green, with the tips of the leg-cases black, also the eyes. It is formed a few days after the larva has commenced to build the nest. It is notched in front, and behind the antennal cases stick out as two prominences. The leg-cases and wing-cases are long and prominent, and there are black marks noticeable at the apices of all the legs. The pupa is 3·5 mm. long.

The pupal stage lasts from ten to twenty days. The larvæ found in April give rise to a brood of moths in June and July. These lay their eggs again, and we find the larvæ occurring in July and beginning of August. They mature and give rise to a third brood in September and October. This latter brood of moths hibernate, but those that occur early in September (some hatched out this year on the 1st) may lay eggs and produce another generation of larvæ which mature in the middle of October and join in hibernating with the late-hatched previous brood.

#### TREATMENT.

It is extremely difficult to say what to do in such an attack, but fortunately it is so far limited to a few trees, and these usually pyramids and espaliers, where hand-picking can be carried out. The whole life seems to be spent on the tree in a protected condition, the only time the larvæ are free being when they leave the tunnels and commence to spin. They then take no food, and as they hatch

out irregularly, two broods even overlapping, nothing can be done to destroy them. All we can do seems to be the rather drastic measure of destroying all the leafage in September by means of a strong arsenical wash and so killing the larvæ and pupæ, or constant spraying with paraffin emulsion in the spring to prevent egg-laying. The former will of course check to a small extent the growth of the tree *pro tem.*; the latter is only successful when rains do not come and carry away the effects of the wash.

It is certainly worth while to hand-pick trees that are attacked constantly so as to exterminate the moth which may occur under certain conditions in dangerous numbers. This is especially to be borne in mind by growers, for we can hold out less hope of combating this insect than the Pear Midge, which still to some extent baffles treatment and yet has a distinct period in its existence when we should be able to destroy it.

In examining specimens sent from Huntingdoushire I found many of the larvæ dead in their galleries. Each of the dead ones had the larva (Fig. 4, *c*) of a Chalcid parasite which had destroyed it. These natural enemies unfortunately did not hatch out.

### Caterpillars on Fruit Trees and notes on Grease-banding.

Although caterpillars were not so abundant on fruit trees during 1903, yet numerous inquiries have been made. Mr. Cecil Hooper, of Swanley, sent a selection of larvæ, asking for information, to which the following reply was sent:—

“The green- and yellow-lined larvæ are Winter Moth (*C. brunata*). There were two others in the box: (1) one dull green with dark head and the normal number of legs—this is the caterpillar of one of the Tortricids—the so-called Allied Bud Moth (*Antithesia variegana*); (2) the second specimen, reddish in colour, was the larva of the destructive Bud Moth (*Helyo ocellana*), which, by the bye, has not been so harmful this year. There are quite a number of Tortricid larvæ on fruit trees besides these two you send, but they are two of the commonest.”

Larvæ of the Mottled Umber Moth (*Hybernia defoliaria*) have also been sent from Sussex.

Several instances have been recorded of the great benefit derived by grease banding for Winter Moth, and where this pest is the chief culprit there is not the least doubt that it does an immense lot of

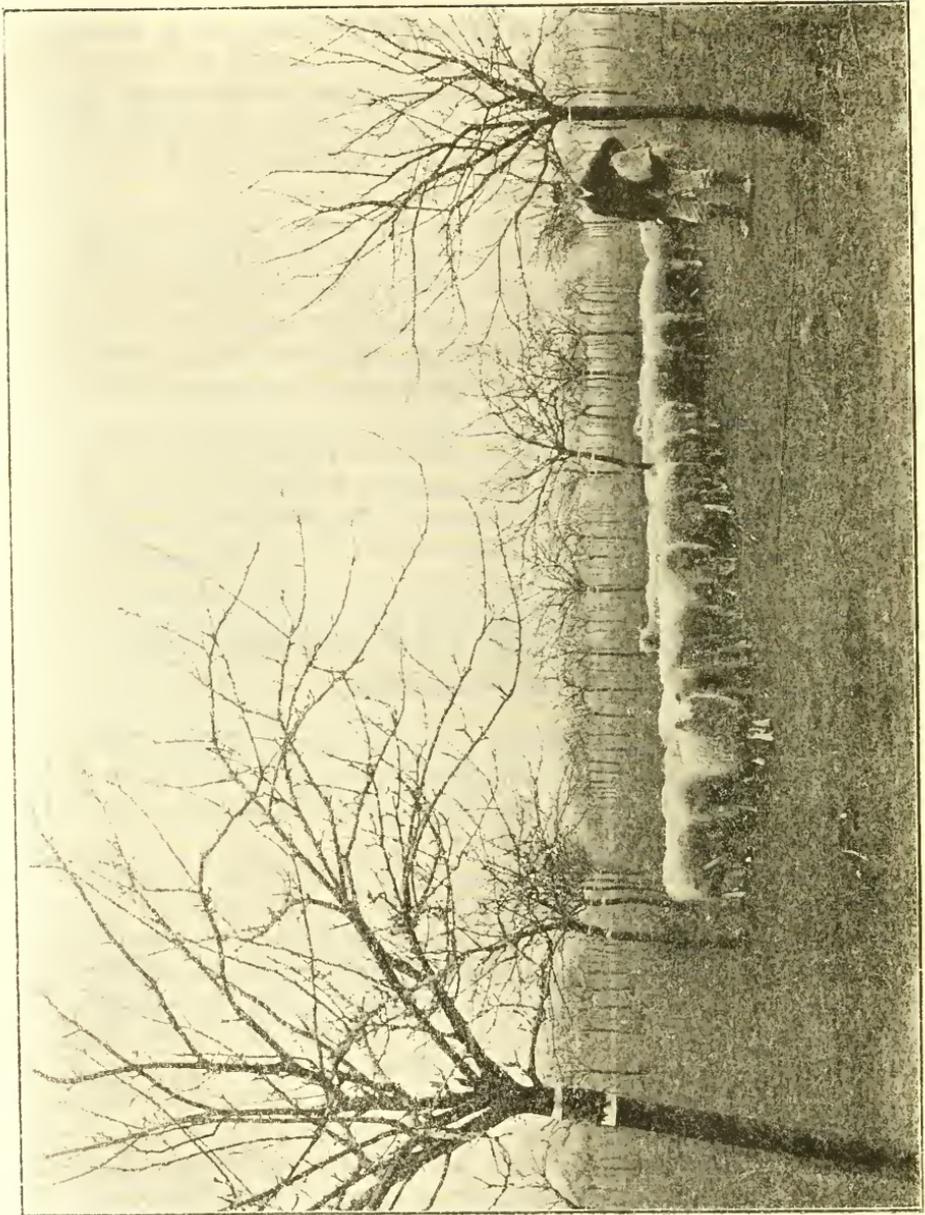


FIG. 5.—AN APPLE ORCHARD SHOWING METHOD OF GREASE-BANDING.

good. A figure is given of the best method of applying the bands (Fig. 5). On old trees this is an easy process, but in young staked stock it is necessary to either band above the stake or to band both tree and stake. Mr. Robert Amos, of Perry Court, near Ashford, writes that he had plain evidence this last year that the female moths go up the stake into the tree.

With regard to this grease-banding much depends on the quality of the grease used; some kinds sold are inferior and do not last on the bands any time. Before buying the grease it is well to find out the best firms to obtain the grease from.

Paper is another point to be looked to; the thin grease-proof paper once used, that can be bought at any grocer's, is enough, but stout papers are now made for this purpose which can undoubtedly be left on the trees for two years without the trouble of removal and replacing fresh.

Messrs. Ellis & Son, fruit growers, Bramley, Surrey, wrote in July regarding the damage done by Winter Moth larvæ and asking for any help in regard to destroying them. Their remarks regarding the effect of Paris green are given elsewhere. It was pointed out that much benefit is derived from grease-banding and the employment of poultry in the orchards.

### **Poultry and Pigs as Vermin Destroyers in Orchards.**

The immense benefit derived from keeping poultry or pigs in orchards is becoming more generally known. No one can appreciate the benefit these domesticated birds and animals do unless they keep part of their plantations with these useful and remunerative creatures doing their work and part without. The difference is so marked that no one can fail to detect it; whilst the foliage of the latter will be riddled or even cleared by "caterpillar," that of the former will be bright and sound.

Both fowls and pigs devour the grubs of the Codling Moth, the caterpillars of the Winter Moth and other pests when they fall to the ground, not to mention other subterranean enemies of minor importance. Moreover, pigs are of great benefit in cleaning a foul plantation overrun with weeds. During the present summer, Mr. Clive Murdock, of Reason Hill Farm, Linton, showed me some very foul damson and gooseberry plantations overrun with bine-weed, most difficult to destroy by cultivation. Pigs were penned on the land and could be watched burying themselves in the earth, grubbing

up this pernicious weed; although the land looks as if cut up by shell-fire, no damage is done to the gooseberry or other bush fruit, whilst it is speedily cleared of the vegetal encumbrances, not to mention the innumerable insect pests, as Gooseberry Sawfly and the others previously mentioned.

### Pear Midge.

(*Diplosis pyrivora*. Riley.)

A communication was received in February from Mr. N. D. Berry, of Scarbutts Manor, Boughton, near Faversham, as follows:—

“Our Hazel Pears were last year very badly attacked by the Pear Midge. Unfortunately, being busy, an application of Kainit at the time was overlooked. Can I check them this year before the damage is done, or must I now wait until the diseased pears are ready to fall and then destroy them?”

The following reply was sent:—

“Unfortunately we do not know any certain means of checking the Pear Midge (*Diplosis pyrivora*). Kainit does good according to one report; another says no use. Personally I have found it of great benefit if applied at the right time.

“Now (February) you are too late to use it. You might try a heavy dressing of soot put on about the second week in June. Previous to this the ground under the trees should be heavily rolled, which will prevent many of the delicate flies escaping from the soil.

“I tried last year heavy waterings with paraffin emulsion around the known affected trees, but this only met with partial success owing to the smell of the oil soon going. I think soot most likely to do good put on just before the flies escape.”

The pear crop having been almost nil in this country during the past season, this pest must surely be checked.

### Woolly Aphis.

(*Schizoneura lanigera*, Haus.)

Some apple twigs sent by Mrs. Durham, of Ellerdale Road, Fitzjohn Avenue, N.W., were attacked by the Woolly Aphis, the so-called American Blight, *Schizoneura lanigera*. The following reply was sent: “It is a serious pest in both old and young apple trees, and should be destroyed as soon as detected in an orchard. This may be done by spraying early in the year (February) with caustic

alkali wash and again in the early summer with paraffin emulsion. Encouragement of the Blue Tit and other Tits or *Paridae* in gardens and orchards should always be the aim of anyone interested in fruit culture."

Numerous other correspondents have written regarding this pest, which is fully dealt with elsewhere.

## The Apple Sucker.

(*Psylla mali*, Förster.)

During the past season there has been a serious attack of this fruit tree pest in most of the fruit centres in Great Britain. From Herefordshire Mr. F. Getting, of Ashfield Park, writes: "The Apple Sucker, with the exception of the Pear Midge, is the most difficult of the insect pests I have had to deal with. I have tried several washes, caustic alkali wash, paraffin and soft soap, quassia and soft soap, Spimo, etc., and up to the present have not found anything to materially reduce their numbers. Certainly the last two or three years they have increased more rapidly than ever, and I *have not used the caustic alkali wash regularly* (as in former winters). Whether this is merely a coincidence or not I cannot say."

Mr. Cecil Hooper, Secretary to the Kent Fruit Growers' Association, writes: "The Apple Sucker is very plentiful, and is said to be on the increase in Kent."

In Sussex it does not seem to do any harm. Mr. Bear writes he has not noticed it in his district (Hailsham).

Numerous observations have been made during the past summer upon this pest. In one instance it appeared in enormous numbers at Wye in the fruit plantation belonging to the South-Eastern Agricultural College, where it had scarcely been seen since the plantation was started. In my own garden I never remember seeing more than an occasional specimen, but this year some trees were smothered with the pest later in the season, and great numbers could be found by beating a neighbouring hawthorn hedge in July.

The action of this pest on the trees is varied. In some instances the larval and pupal *Psyllæ* destroy the developing buds entirely, both blossom and leaf buds being attacked; in other cases the leaf buds unfold, and then the trees present a very curious aspect that was entirely due to the action of these insects. The blossom buds are most attacked. The leaves of the apple, instead of being normal, presented the appearance shown in Fig. 6, *b*. They were mostly pallid, often having a frosty appearance and very much

winkled and curled up. Some died off, others gradually assumed a more normal appearance. In no case did the blossom buds open fully. The blossom was irreparably damaged. The trees recovered



FIG. 6.

*a*, Normal apple leaves; *b*, attacked by *Psyllæ*.

later in the season, partly owing to the excessive rain, but produced no fruit. The larvæ and pupæ, after the buds had well opened, lived freely on the leaves, usually choosing the under

surface, but sometimes the upper. One favourite place for them was where leaves had been united (and sometimes the blossom) by Winter Moth larvæ. From observations made it seems that a single larva entering a tender blossom bud under certain circumstances stops its proper development or may entirely destroy it. This depends on the weather. If the nights are warm and the buds open rapidly, then the damage is slight; but if frosts keep back development the larval *Psyllæ* work protected by the buds, and have so much longer time to damage the tender growth. It is therefore very important to check the entry of this pest into the bud. This action upon both blossom and leaf buds is, I am sure, frequently put down to the work of caterpillars, the small *Psyllæ* not being noticed by growers.

The larvæ were first noticed this season in the opening buds in the beginning of May, and the last I noticed were seen on the 2nd of June; by that time they had all pupated. The flat pupal forms (Fig. 7) are pale yellowish green, the rudimentary wings being the same colour; when any pupæ occurred between two leaves stuck together with silk of Winter Moth larvæ, they were much yellower than those free on the leaves. The dark markings on the tips of the antennæ are rather variable in extent. Like the larva, the pupa passes out little oily globules and waxy threads of a white colour. The first mature or winged insects appeared on the first of June, and continued to hatch out until the end of the month. They only occurred in small numbers on the apple trees, and, in spite of frequent search, I failed to obtain a supply for exhibit at the Royal Agricultural Show, but when beating a neighbouring hawthorn hedge great numbers were found, they apparently flying to the hedge for shelter, for later on a warm day I observed numbers upon the apple trees. These adults appear to take food by drawing out the sap of the leaves; but they apparently take but little, for they do no damage to the leafage. They continued upon the apple trees and hawthorn hedge without undergoing any change during the rest of the summer, and commence egg-laying in September. Whether this species normally breeds on hawthorn I do not know, but the adults certainly exist upon that plant as well as upon apple.

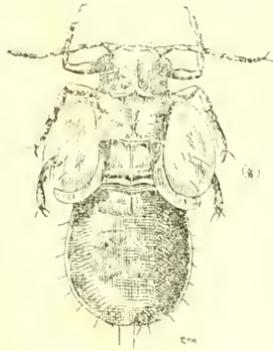


FIG. 7.  
Pupa of *Psylla mali*.

Blossom has been attacked by them during the past year, the

clusters turning brown and dying away. The pupæ, I find, require nourishment, just as much as the larvæ. The adult *Psylla* is of a general green colour, with shades of pale apple green and yellow, but previous to pairing they become variegated with red and rusty brown; the legs are yellowish green, and the antennæ, which are bifid at the tip, are dark apically. The female is about one-tenth of an inch long, the male somewhat smaller. The eggs, which appear to be spindle-shaped, have really one end prolonged into a thread-like appendage; they are mainly laid on the young wood, especially amongst the fine hairs, but now and then in cracks and crevices in the bark. Several are generally laid together in rows, but also singly. They commenced to lay them in September, but went on to November. They remain on the trees all the winter. The larvæ are flat and of a dusky yellowish-brown, with brown spots and red eyes, the legs dusky. In about ten days after they have come from the egg they moult, and a curious blue thread or threads issue from the end of the body, attached to which is a round opaque, oil-like globule. These globules frequently become detached, and remain on the leaves, as pointed out to me by Mr. Cecil Hooper during the past season. In about ten days later the larva casts its skin again, becomes green, and often is covered with fine pale blue threads, which are almost white in certain lights. Another change takes place, and the pupal stage is reached about a week later. The pupa is also flat, green in colour, with dark eyes, and the apices of the antennæ dark, and very prominent wing-buds are formed. The pupæ give rise to the adults in June, as a rule, but the change may take place later. The curious jumping habit of the adults frequently causes them to be mistaken for "frog-flies" (*Euacanthidæ*).

#### TREATMENT.

Soft soap and quassia has until this year been found effective in checking the damage caused by this pest. But, from a letter received in answer to a communication to the Herefordshire Fruit-growers' Association, it has not been so during the past season. Much benefit has been found from the use of caustic alkali wash in winter. Hard pruning and burning the shreds at once also lessens the numbers. Autumnal washing with paraffin emulsion has been found to kill the adults, and if done in time will prevent egg-laying. The wash may be made at full strength as the foliage will not then be hurt.

## The Vine Scale.

(*Pulvinaria vitis*.)

Some insects sent by Mr. J. Westlake, of Redhill, Surrey, proved to be the Cottony Cushion Scale of the Vine (*Pulvinaria vitis*). The red masses mixed up with the white wool are nests of eggs of this scale insect. They have nothing to do, as is often thought by growers, with the Red Spider.

The eggs very soon hatch into little active six-legged larvæ, which crawl about, and sooner or later settle down and produce a fresh scale, beneath which the larva gradually grows into a female, and then another red mass of eggs will be the result.

It is therefore very important that this pest should be cleared off young vines at once.

When the plants are small, the best way is to take the egg masses and wool off with a small brush, which should be constantly kept wet with methylated spirit, care being taken to destroy all those removed from the tree; the surface under each scale should be painted with the methylated spirit.

In winter, if any traces remain, the house should be fumigated with hydrocyanic acid gas; but, as a rule, hand-picking ought to do away with the scale.

## Insecticides.

### ARSENITES.

Various enquiries have been sent regarding insecticides, and some interesting notes concerning Paris green sent by correspondents are reproduced. There seems to be in many quarters failure with this insecticide and in others considerable doubt as to the benefit derived from its use. That it does kill mandibulate insects if used at the proper time and that much benefit has accrued from its use both in this country and America is well known. Its disadvantages are firstly, that it has, as mentioned by Messrs. Ellis, a burning effect upon the leaves under certain conditions even when properly mixed and properly applied, and secondly, it only kills some of the enemies, whilst, thirdly, its effects are not lasting. It is very liable to be washed at once by rain off the leaves, and thus all the good is destroyed. In the case of washing for Codling maggot this is most important.

*Arsenate of Lead* we find in many ways is much superior when we consider the above objections given against Paris green. For

instance, it has little or no burning action on the leaves; nor is it so easily washed off by rains. Moreover, I am sure it has considerably greater killing power, as is shown by the following experiments.

Two are taken from recent records by Professor Webster in America, both carried out by different people, who are practical men, in their own orchards against Codling Moth; the third was one of a series conducted by myself against Codling and Winter Moth.

## A.—IN AMERICA.

Treatment.	Percentage of fruit harvested.	
	*	†
I. { Paris Green, $\frac{1}{4}$ lb. to 50 gallons of water . . . . .	61·65	63·04
{ Paris Green, $\frac{1}{2}$ lb. to 50 gallons of water . . . . .	43·46	51·33
{ Arsenate of Lead (weaker solution) . . . . .	74·98	81·63
{ Arsenate of Lead (stronger solution) . . . . .	82·50	81·45
{ Unsprayed . . . . .	43·67	49·09

Treatment.	Percentage of picked fruit injured.	
	*	†
II. { Paris Green, $\frac{1}{4}$ lb. to 50 gallons of water . . . . .	17·48	2·02
{ Paris Green, $\frac{1}{2}$ lb. to 50 gallons of water . . . . .	12·87	3·10
{ Arsenate of Lead (single strength) . . . . .	9·26	5·88
{ Arsenate of Lead (double strength) . . . . .	8·30	3·43
{ Unsprayed . . . . .	32·78	37·82

## B.—IN ENGLAND.

Treatment.	Percentage of fruit injured by maggot.	
	‡	†
III. { Paris Green, $\frac{1}{4}$ lb. to 50 gallons of water . . . . .	37·5	29·7
{ Arsenate of Lead (single strength) . . . . .	20·5	15·5
{ Unsprayed . . . . .	62·5	71·5

\* = Grimes' Golden Apple; † Ben Davis; ‡ Worcester Pearmain.

These results show the benefit of this form of arsenical wash over Paris green for Codling Moth. At the same time I should point out that the trees sprayed by myself with the wash showed no marked symptoms of Winter Moth; the unsprayed were much eaten.

The method of mixing the arsenate of lead is given in the First Report, p. 28, but it may be pointed out that a little treacle may be added with advantage, about 1 lb. to the 16 gallons, which makes

the wash more firmly fixed to the fruitlets and foliage. This can be used at ten times the strength given on p. 28 of the previous report.

*Scorching of Foliage and non-success of Paris Green.*

Messrs. Ellis & Son wrote during June as follows:—"We spray annually as soon as the buds begin to open with Paris green (Blundell's), 1 oz. to 20 gallons of water. The first spraying may do a little good, but once the caterpillar has grown a little it is absolutely ineffectual, and this year, although we have already sprayed three times and one piece four times, the caterpillar has completely wrecked many pieces of trees (apples), eating away the hearts of the buds, and the trees are simply bare poles. The different sorts seem to be differently affected, fine foliage sorts looking just like dead trees, whilst stronger growing kinds are fairly green. Although we always add a little lime, we think that we always scorch the foliage if we use stronger wash on the apples. I enclose you sample of foliage which has just gone brown; do you consider this the result of spraying? The strength of the wash was not greater than 1 oz. in 20 gallons. In our hands, I believe, after many years' use, Paris green has been a complete failure in any effect it has had on Winter Moth caterpillar. Of course if the brown spots which generally follow the spraying are not due to the Paris green in any way, we might probably use a stronger mixture which might prove effectual."

The foliage sent certainly looked as if it had been scorched with Paris green, the brown patches at the edges of the leaves being very characteristic scorching from this arsenite. Now and then this will occur from (1) the wash not being properly mixed; (2) being put on too heavily; or (3) a bright sun on the sprayed leaves.

Damage is, however, very seldom reported. I have myself often found Paris green of little use. Several growers who have derived great benefit from spraying with it have found this year it did little good, owing to frequent and heavy rains washing the arsenic off. Such conditions we cannot control, we must either let the larvæ go on or wash again as soon as the weather clears up. With frequent heavy rains no wash will do any good—hence so often failures in this country.

You can use Paris green up to 1 lb. to 100 gallons—more is not necessary and is sure to burn the leafage—unless the arsenite is very old and has lost its properties. But 1 in 200 is really ample, and I should never advise more.

*Arsenate of Lead.*—This is much more effectual than Paris green:

if properly mixed, and it will not harm the foliage even if put on concentrated; anyhow a normal wash has not the least injurious effect on the leaves.

Another feature noticed in Paris green spraying is that it damages the leaves most readily when applied with force.

#### BORDEAUX MIXTURE AND PARIS GREEN.

Mr. K. Town Smith, of Yalding, wrote in April stating that he had been washing with Bordeaux mixture, and would be very much obliged to know if there is any danger to sheep eating the grass under apple trees sprayed with Bordeaux mixture. The mixture being made of 4 to 6 lbs. of copper sulphate, the same quantity of lime to 40 gallons of water, and "have not put in," writes Mr. Town Smith, "any Paris green at present this season. Do you consider Bordeaux mixture and Paris green any good against *Aphis*?"

The following information was sent:—

"With regard to keeping stock under trees sprayed with Bordeaux mixture, I do not think there can be any danger. You can do so with impunity when you have sprayed with Paris green.

"As no direct experiment has been conducted officially with Bordeaux mixture, I can only give my private opinion, and that is that the quantity used, just as in Paris green, is so small that it cannot hurt animals feeding below.

"Bordeaux mixture and Paris green are quite useless for all *Aphides*.

"For *Aphides* you must use soft soap—soft soap and quassia, or paraffin emulsion, or you may use soft soap alone—which I have always found sufficient for *Aphis*, but quassia undoubtedly clears the leaves of *Aphis* excrement."

#### GENERAL WASH FOR FRUIT TREES.

Later (9/5/03), Mr. K. Town Smith wrote requesting information regarding a general wash for insect pests. The following reply was sent:—

"The best general insect wash for fruit trees is made as follows:—

"A. (1) Dissolve 1 oz. of arsenate of soda in soft water, and add 16 gallons of soft water and stir.

"(2) Then dissolve 3 ozs. of acetate of lead in soft water and add it to the above; (1) still keep stirring until both are well mixed.

"B. Dissolve one quart of soft soap in two quarts of boiling soft water. Remove from fire, and when still hot add 1 pint of paraffin;

churn the whole together for ten minutes, and dilute when used with ten times the amount of soft water.

“ For combined wash that will destroy sucking and biting-mouthed insects, mix two pints of the concentrated paraffin emulsion with the arsenate of lead wash.

“ You cannot combine Bordeaux mixture with Paris green and paraffin emulsion; you can combine it with Paris green alone. Nor can you mix Paris green and liver of sulphur, or Paris green and soft soap washes.

“ Arsenate of lead you can mix with Bordeaux mixture, and paraffin emulsion and quassia washes; thus you get a good wash, combined of a fungicide and the two chief insecticides. This may also have liver of sulphur added for Red Spider and Mites, but it is not advisable to do so.

“ Paranaph may, of course, be substituted for paraffin emulsion.”

Mr. Town Smith writes that “ we have used Paris green with soft soap wash or paranaph with care—2 ozs. Paris green, 40 gallons water and soft soap wash—without marked damage to the trees.”

Mr. Cecil Hooper, of Swanley, on the other hand, writes that he has “ used soft soap and Paris green, and that he found the foliage burnt.” The mixture is certainly not good.

Mr. Hooper also writes as follows:—“ I have also used Paris green and Bordeaux mixture; but I find this mixture a good deal of trouble, but I believe it to be a good thing.” I do not think a good wash can possibly be made out of the two.

#### PAINTING FRUIT TREES.

Mr. J. Le Feaver, of Stile Bridge, Marden, wrote asking for the best paints to use for fruit trees during the winter for destroying insects.

The best mixtures to whitewash fruit trees with are the following:—

1. Lime and water made into the consistency of a fine paint, and to every ten gallons of this add one pint of paraffin.

2. Fine clay made into a thin paint. To every gallon add half a pound of liver of sulphur.

3. But best of all is washing the trees with caustic alkali wash in winter. By so doing not only is healthy bark produced, but Mussel Scale, Woolly Aphis, Codling Maggot, Thrips, and many other pests are destroyed.

### Fumigation with Hydrocyanic Acid Gas.

Mr. J. A. Richmonds, of Woodlands, Lustleigh, South Devon, wrote asking for information *re* fumigation for Mealy Bug. The following reply was sent:—

“With regard to fumigation with hydrocyanic acid gas, I can confidently say that the eggs of Mealy Bug are not all killed. In my opinion, two fumigations are necessary at ten days’ interval.

“The quantities to use are: 5 ozs. sulphuric acid, 3 ozs. cyanide of potassium, 8 ozs. water, to every 1000 cubic feet.

“If the house is more than 10,000 cubic feet another jar will be required, and for every additional 10,000 cubic feet.

“The water should be put in a jar and then the acid added to it, the cyanide in small lumps wrapped in blotting-paper; the cyanide is then dropped into the jar with the acid and water and allowed to stand for one hour.

“This must be done quickly, as the fumes are poisonous to man, and all, or nearly all, animal life.

“The cyanide should be dropped into the acid and water from outside the house.

“Temperature of house never more than 60° Fahr.

“Do not fumigate in strong light.

“Do not fumigate vines in bloom.

“Fumigate (i) before the vines bloom; and (ii) after the crop has been gathered.

“The house must be well ventilated for at least one hour after fumigation before anyone is allowed to enter.”

### Field Mice damaging Apple Trees.

Quite a new attack upon fruit trees has been recorded by Mr. Hammond, of Canterbury. On the 2nd of April Mr. Hammond wrote that “a few days ago I was looking over some apple trees in my garden, when I came upon one with the spurs right up to the very top of the tree gnawed all around by some animal. I have never seen anything like it before, but I think it must have been done either by a squirrel or field mice. The material was examined, and the following reply sent:—

“I think the damaged twigs of apple you send have been eaten by field mice, not by squirrels; the marks of the teeth do not seem large enough for the latter. I have never seen any such damage in

apple, but frequently in other trees—field mice nearly always being the culprits.”

Observations have since been made which prove this damage to be due to the mice; cobnuts and filberts were attacked in exactly the same way in my garden, and the mouse (*Mus sylvaticus*) caught in the trees.

Mr. Frederick Smith, of Loddington, informs me he has frequently noticed this damage done by mice and that he traps them beneath the trees to prevent the damage.

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## ANIMALS INJURIOUS TO HOPS.

### Slugs in Hop Gardens.

Mr. E. Callow, of Court Lodge Farm, East Farleigh, Kent, wrote in May, that “Mid-Kent, especially the Farleighs, are infested in most hop gardens by the ‘slug’—small black ones and larger brown ones. They seem to come in the gardens near fruit plantations, and we can only keep them back by continual liming, on the top of the ‘hills,’ dusting with a piece of hop sack. The bine has been eaten off twice, and will, if it comes, come very late. Anyhow, with the most favourable weather, a large crop cannot be grown in the infested gardens: Our neighbour has a garden which always is eaten off with slug for the past five years. Do they frequent poor gardens? Do they increase where the gardens are weedy? What is the life of these slugs, the best way to get rid of this pest, and when?”

The following reply was sent:—

“Slugs are abundant everywhere this year. I enclose you a paper which deals with these pests and also snails (*vide* pp. 57-64).

“They do not frequent poor gardens more than others; in fact, I think excessive manure (farmyard) encourages them.

“One can keep them down in gardens by putting heaps of oat-meal or bran (wet) about, and collecting the slugs off the heaps in wet weather, or at night. Soot and lime is better than lime alone. I am trying some experiments at Wye at present, and will let you know the results.”

Various substances were tried against slugs; soot and lime kept them off peas and beans for a time, but had to be repeatedly used, and was only successful when applied on two or three occasions at short

intervals. Soot and lime should be broadcast over the infested land in damp weather, first early in the morning, then again late in the day, a third dusting being often necessary next day. Watering with paraffin emulsion kept them away, but was not entirely successful; in any case, it could not be adopted on a large scale, such as attacks in hop gardens. Traps of various kinds were set, the most successful being heaps of bran-mash and heaps of oatmeal.

Garden borders, lettuce beds, which were being completely ruined, were soon cleared by this method. The bran seemed nearly as good as the oatmeal. It was put about in heaps every few yards and examined every day. As many as fifty slugs were taken in one day from a heap about six inches square, 1,500 being taken by this plan along a border thirty yards long and one broad. In wet weather they can be collected during the day; but when there was little moisture but few could be found during the day, numbers, however, at night. The borders and beds so treated were soon practically cleared of this pest. This could easily be done on a large scale in hop gardens, and would be sure to lessen the evil very rapidly. It would be as well to put the bran-mash between every few hills in the parts of the gardens infested.

With regard to birds, the decrease in many districts of thrushes, blackbirds, etc. is to be deplored, because they are great slug and snail destroyers. The blackbird is an acknowledged pest in bush-fruit plantations; but the fewer blackbirds we have the more molluscan and insect pests; and as we can keep birds off our fruit with ease, if slight cost is not objected to, by keeping boys in the plantations with guns or clappers to scare them away, and as slugs and snails are extremely difficult to cope with, it is surely wiser policy to encourage the birds.

The employment of ducks in orchards and hop gardens is another way in which slug attacks may be kept in check, and at the same time the ducks get much natural food, and so cost less to keep.

With regard to the attack at Farleigh, Mr. Montague Ballard, of Bydews Place, Tovil, wrote me in May as follows:—"Slugs in this locality this year are causing some trouble; the outside of the gardens seem to have the most slugs, and they come in the same places most years, and we do not know what to do with them."

To this the following reply was sent:—

"With regard to the slug attack in your hop gardens, the fact that they occur chiefly on the outside of the gardens is important, for it shows invasion comes from a limited area. As this pest occurs more or less every year, I should feel disposed to dress the land with

gas lime as soon as the bine is down, and in early spring give a dressing of salt. I do not know the effect of the latter on hops, but Mr. Hall, of Rothamsted Experiment Station, would soon tell you. I do not remember hearing this subject referred to at any of our Conferences at Wye College: I doubt if it would affect the stock early in the year in any case. I am convinced that this great outbreak of slugs in recent years is due to the insane destruction of birds—I know in my own case this is the main cause. In hop gardens, why cannot we do what is done in fruit orchards, employ poultry—especially in this case ducks—most ravenous slug killers? Not only in such cases are the pests destroyed, but we get some return in the end. We cannot well adopt such natural remedies in gardens or fields, but with fruit and hops, I think we too often neglect feeding a paying crop off the pests of another crop.”

### **A General Account of Slugs and Snails injurious to Farm and Garden Produce.**

The following paper is mainly taken from my article on this subject in the “Zoologist” for June, 1895. Fresh notes have been added, however, to bring the subject up to date. Slugs and snails have been very harmful during 1903, not only to hops, as recorded in the preceding pages, but to all plants.

Snails and slugs are great pests to the gardener, and every now and then a plague of one or the other makes its appearance and attacks our field crops, destroying wheat and, as recorded from Great Staughton this year by Mr. F. Powers, eating off crops of young cabbage. Both snails and slugs possess a head which bears tentacles, and also a pair of eyes which may be borne at the tip of these tentacles. The foot is flattened. Snails possess lips, but the organ they use for destroying plant-tissues is the curious swollen rasping tongue, the “radula,” the surface of which is covered by rows of variously arranged teeth. They breathe by means of the highly vascular inner walls of the mantle-cavity. Snails and slugs are hermaphrodite. The eggs are laid in batches in the ground and under stones. The injurious snails belong chiefly to the genus *Helix*. Almost every wood and hedge, field and garden yields some kind of *Helix*; others are partial to the sands near the sea, water-courses, and damp places. Their habits are nocturnal and crepuscular, and they are seldom seen crawling in the daytime, unless after heavy rains. This latter habit has given rise to

the popular idea that the occasional snail-plagues come in the rain-clouds. As soon as the sun shines they crawl to some shelter—under stones, moss, or beneath the leaves of the plants they attack. The eggs are generally round, white, semi-transparent bodies, and are always laid in batches in slanting galleries under ground formed by the "mother" snail. The slugs (*Limacidae*), unlike the snails, have only a rudimentary shell, or an indefinitely formed one placed under the mantle. They mostly frequent damp and shady places, and during day-time they bury themselves in tunnels under the earth. Unlike the snails, they generally deposit their eggs singly under the ground, and the eggs are very numerous. The two chief genera are *Arion* and *Limax*, the former being distinguished by having a slime-gland in the posterior extremity, and by having the respiratory orifice in front instead of behind the shield. They both feed at night, selecting the tenderest and choicest plants, but they will devour almost anything. The *Limaces* are very fond of indoor habitations, being found in cellars and outhouses. They destroy the corks in wine-cellars, and do much damage in that way: but, on the other hand, it is said they live upon the destructive "dry-rot" fungus. They all exude a glutinous kind of slime.

The following species of snails have been brought to my notice every now and then as doing much damage to farm crops and vegetables:—

The Garden Snail, *Helix aspersa*, Müller, is a large and abundant species, often doing much harm in the garden, not only to vegetables and flowering plants, but even to wall-fruit. Several instances of the total destruction of peach and apricot leaves by this snail have been brought to my notice. The years 1884 and 1889 were remarkable for the number of this snail seen about. The eggs are laid in small batches in the earth, about sixty or seventy in each heap. The ova are white, shining, globular bodies. They hatch in about fifteen days if kept in damp places. The young snails are almost colourless, and the shell is thin and transparent; they grow rapidly. Drought and cold are erroneously considered prejudicial to all snails. At the approach of winter they collect together and exude a slimy matter, which hardens on exposure and closes the aperture of the shell. They may then be found hibernating together in crevices in walls, in old trees, and under rubbish, united together by the agglutinated slime. I have notes of the damage caused by this snail in most counties of the south of England.

The Wood Snail (*H. nemoralis*, Linn.) is an extremely abundant snail in hedgerows and upland pastures, and especially in clover.

where it often does much damage. It has a handsome shell, subject to much variety in regard to colour, and is very hardy. It is one of the first to make its appearance in the spring, and often does much damage to young turnips and lettuce as well as clover. In the typical *nemoralis* the lip is black. The colour of the shell is extremely variable, being white, grey, pale yellow, pink, or brown, with 1 to 5 spiral brown bands, occasionally confluent or interrupted; whorls  $5\frac{1}{2}$ , convex, last  $\frac{2}{3}$  of shell. The body of the mollusc is dark brown, tinged with yellow, and covered with small tubercles; mantle greenish, with yellow specks; tentacles long and slender.

A well-marked variety, at one time regarded as specifically distinct, is *H. hortensis*, which has the mouth white-lipped and the rib of the same colour. A variety known as *hybrida* has the mouth and rib of a pink colour. The arrangement of the bands and markings of the shell are extremely variable, as is also the colour of the animal itself. I have seen clover and lucerne literally stripped by this snail in Wiltshire and in Wales.

The Strawberry Snail (*H. rufescens*, Pennant) is a constant source of annoyance to strawberry growers, preferring those plants, violets and iris to all others. I have seen beds of strawberries in Surrey and Cambridgeshire quite spoilt by this snail. The fruit is attacked as well as the young leaves. These snails are seldom seen in the day-time, unless after a shower of rain, when they at once become active. They may often be seen in summer under the straw which is sometimes placed between the plants. They deposit their eggs from September to November, each snail depositing about sixty eggs. In my breeding-case the eggs were on the ground in heaps, but I think naturally they place them below the surface of the ground. The ova hatch in about three weeks, but a few remain undeveloped until the spring. The small snails do not grow very rapidly, as is the case with *Helix aspersa*. The shell is compressed above, and angularly rounded below, opaque pale dirty 'grey, often with a reddish-brown hue, sometimes transversely streaked with brown and marked with a white spiral band which passes round the last whorl; whorls 6—7; last whorl =  $\frac{1}{2}$ -shell; mouth obliquely semilunar, furnished inside with a broad white rib. The body of the snail is yellowish-brown with dark brown stripes running along the neck and on the tentacles; foot pale, narrow and slender.

*H. virgata*, Da Costa, often does much harm to root crops and on grass lands. During the year 1894 it appeared in large numbers in parts of Kent, where it is well known on account of its destructive habits. At Wye, on the farm belonging to the South Eastern

Agricultural College, this and another snail caused much loss amongst mustard plants, coming down, whenever there was any moisture, from the chalk downs above the farm. *H. virgata* is one of the species that has given rise to the popular notion that snails come down in the rain. It is an extremely abundant and gregarious species, and may be seen in damp weather in vast numbers clinging to the plants. Directly the air becomes dry it retires into the ground amongst the herbage, and there remains hidden until fresh rain comes, when it suddenly reappears. In dry weather it becomes dispersed by the wind, particularly on the downs and sandy heaths, and especially along the sea-coast. Although, as above shown, it sometimes does much harm it is said to have the redeeming quality of imparting a fine flavour to our south-country mutton, being taken up by the sheep when grazing, and considered to be very nutritious. There is no doubt of that, though it is certainly doubtful if they flavour the meat. *H. virgata* is active in the coldest weather and does not hibernate. During the cold winter of 1894 I found, on the downs at Wye, many specimens of this species quite active. Eggs are laid in clusters of three or four from September to November and even in December. The shell is conical, with a broad and convex base, white or creamy, with a single purplish-brown band above the periphery, and sometimes as many as six or seven below it, more often two or three: the colour is very variable, sometimes plain white, brown, or grey, with white bands; occasionally the dark bands are broken, so as to make the shell appear spotted; whorls 6, last =  $\frac{1}{2}$ -shell; mouth purplish inside, with a strong rib, sometimes purple, sometimes white. Several varieties are known. The body of this snail is dusky grey, and coarsely tubercled; mantle, dark violet, speckled with white and brown.

*H. caperata* is a sluggish species which seldom moves except after rain. It is found generally under stones and wood, and on grass stalks in dry places. It is very abundant often in corn-fields. The ova, round, white, and opaque, are laid in September and October, each snail depositing about forty, which hatch in three weeks. The young are quite transparent. I have seen it doing much harm in France. *H. caperata* differs from *H. virgata* in its much smaller size, its flattened spire, its larger umbilicus, and the rib-like striæ which encircle each whorl. There are other snails which now and then become superabundant and do harm, but so far they are of exceptional occurrence.

Of slugs the three most destructive species are *Arion ater*, *Limax agrestis*, and *L. maximus*.

*Arion ater* (Linn.), or the Black Slug, is found in damp woods, gardens, and hedges, and during the day under stones, logs of wood, and even tunnelling under ground. It reappears, however, directly after rain, and attacks all kinds of soft succulent leaves. It is a great pest in gardens and fields. At the same time it acts as a scavenger. This species has a variety of names on account of its variable colour. Férussac named it *A. empiricorum*, on account of the calcareous matter found under the shield having been used in medicines. It is also now identified with *A. flavus*, though at one time considered to be a distinct species. The shell of *A. ater* consists of small separate calcareous grains of unequal size. The colour of the body varies from black to red, yellow, green, brown, and occasionally a dirty yellowish-white, covered with large prominent tubercles, often much contracted and rounded in front and somewhat pointed behind. The mantle is paler than the rest of the body, the tentacles much swollen distally, foot with yellowish border, slime of a yellowish colour. The eggs, which are oval, white, opaque bodies, take about a month to develop. The young grow slowly, and apparently do not attain the adult condition until they are a year old.

*Limax agrestis*, Linn., the Grey Field Slug, is by far the most injurious to vegetation of all the land Mollusca. It may be found in almost every garden and field throughout this country and most parts of Europe, as well as in Siberia, Madeira, and Algeria. It is the slug that has been so harmful in 1903. Like all slugs, its life is dependent on moisture. In dry weather we find it rolled up under a stone, coming out to feed by night and during wet weather. According to one authority, this mollusc feeds upon earthworms. In this case it has been probably mistaken for *Testacella haliotidea*, which preys almost exclusively on earthworms. The body is spindle-shaped, ashy grey, with reddish or yellowish tinge, and sometimes mottled. Early in the year it is of a much paler colour. The shield is large, the foot has pale sides, and it exudes an abundant viscous slime. The shell is oval and concave on under side, very thin, marked with indistinct lines of growth, with a broad membranous margin, obliquely striated.

This species is most prolific; as a rule seven or eight distinct batches are annually produced of fifty ova each. The breeding-season is from May to November. The ova are deposited in heaps of six to fifteen, in the ground and amongst moss. August, September, and October are the chief breeding months. A single snail will lay as many as 500 ova in the season. The eggs take three or four

weeks to develop, the young being about one-twelfth of an inch long. Some that I kept reached the adult state in about two months, but they more often take much longer to reach maturity. These slugs live many years. The ova have great resistive powers as regards temperature and drought. Directly cold dry weather comes, they shrivel up and appear spoilt; but with moisture they are again distended. In this way they may be dried time after time for days and yet the ova will retain their vitality. Spring and autumn are the seasons when they appear most numerous. They attack cabbage, rape, wheat, clover, lettuce, turnips, and most vegetation. They eat the young turnips off just above the ground. In the winter months this slug may be found in large numbers under stones, decaying logs, and rubbish, in a semi-torpid condition.

Another very destructive species is *L. maximus*, L., the Black-striped Slug, the largest of its kind; it often reaches a length of seven inches. Although not very prolific it does much harm. It is very inactive, and exudes a thick gummy iridescent slime. The ova are deposited in little clusters, agglutinated by mucus, during the autumn, and in about four weeks they give rise to young snails. The young at once commence to devour the nearest vegetation. This species will live for some years; one I kept for five years continued to grow all the time. Its shell is somewhat rectangular, elongated and convex above, crystalline and glossy, with distinct lines of growth. The body is slender, variable in colour. Some are black; others yellowish-grey and spotted with black and white; numerous tubercles cover the skin; tentacles long and yellowish-brown; back very much rounded; foot edged with white. Slime iridescent when dry, white when fresh.

There are other slugs less destructive in their habits, but the above-mentioned are the most noteworthy pests to the farmer and gardener.

METHODS OF DESTROYING SLUGS AND SNAILS.—Economically, the most important points in the natural history of slugs and snails are, first, that they chiefly live and flourish in damp places; drainage, therefore, must have a good effect in lessening their numbers. In cases where this has been properly carried out, success has attended the experiments. Secondly, it should be noted that slugs have the power of expelling a great quantity of slime, which would naturally take up any poison in the form of powder that may be laid down in their way; and although they have the power to crawl as it were out of this slimy covering, and so leave the poison behind them, they cannot long continue to supply this mucous

matter, so that if two or more dressings are applied soon after each other, the cuticle of the slug may be reached. Dressings of salt and lime are successful in destroying these pests, two or three dressings being given, the second one some ten to fifteen minutes after the first. Salt applied at the rate of four or five bushels per acre, and lime at the rate of ten to twelve bushels per acre, will often destroy these noxious creatures, if done over *twice* in succession, salt especially having an injurious effect on the mucous membrane. It is useless, of course, to dress a field in the hot part of the day, or in very dry weather. The dressings should be applied when the slugs and snails are active, that is after heavy rains, and in the *evening* and *early* morning, before the sun is up; for as the sun rises the slugs, &c., disappear. Slacked lime has no effect upon them, but soot and lime, the latter fresh, soon destroys them if applied two or three times. The best substance of all seems, however, to be *white hydro-oxide of calcium* in a 1 to 2 per cent. solution. Snails are more difficult to destroy, owing to their retracting their bodies into the shell and closing the aperture; and as they can live for several years without food, they offer many difficulties in the methods of destruction. Dressings of soot seem to be the most beneficial; the soot making the plant and ground obnoxious to the snails, drives them from the land. Nitrate of soda is likewise a very good dressing, both for slugs and snails, as well as for stimulating plant-growth. Snails have many natural enemies in birds. Thrushes and Black-birds especially do much good in keeping them in check. Ducks, Starlings, Rooks, and Pigeons also eat them greedily; Moles, Shrews, and Toads eat slugs. Several species of mites are parasitic on slugs, but do not seem to affect them injuriously. In gardens, slugs and snails may be destroyed by various traps: pieces of turnip and cabbage-leaves, spread upon the ground, collected at night, will be found to have attracted numbers from the surrounding soil; they can then be easily put into a pail of lime and so destroyed. Bran made into a mash placed here and there attracts large numbers, which can then be collected and destroyed. Brewers' grains or oatmeal also answer well. But in the fields the most practicable way of destroying them is by dressings, as above stated, of white hydro-oxide of calcium or of lime and soot or lime and salt, applied especially in damp weather, when these pests are most active. As invasion of slugs frequently comes from adjoining woods or fields a trench should be dug around the dressed field with gas lime in it to stop fresh invasion. Several gardeners have told me they have experienced very successful results by using ordinary wood-ash, dusted over the

infected plant when the dew is on the leaf. In places where the snails come from neighbouring downs or woods a small trench may also be dug along the border of the field and filled with soot and lime, or better still, with gas lime, a precaution which will prevent them reaching the crop; and if the trench be about a foot wide many of the snails, as with slugs, will be killed in it. Much good may also be done by destroying rubbish heaps and removing stones which protect them from the heat and dryness of the air. Many ova are deposited in heaps of leaf-mould. If these heaps are dressed with quicklime all the ova will be destroyed, as well as many other vermin certain to be present. Rockeries and ferneries in and near gardens are often centres from which numberless snails proceed. All rough herbage should be cleared off these in the winter, and in the spring a good dressing of soot put over them to kill the vermin that have hibernated there. During the springs of 1894 and 1895 the South of England was visited by large numbers of snails and slugs. In many districts it was found almost impossible to keep the hordes of *L. agrestis* off the early peas and other early garden produce. Sprinkling ash soaked in paraffin did some good. Barley-awns soaked in the same I found kept off the slugs to a great extent, the sharp points making progress difficult for them. The employment of ducks and fowls has been referred to on p. 56.

### Wireworm in Hops.

Year after year enquiries are made as to how to clean a hop-garden of these pertinacious insect pests, but during the past year they have not been so evident as usual in most districts. In the field there is really no remedy or even good means of certain prevention, but in hop and garden cultivation much can be done. Amongst hops they form one of the three most serious and widely distributed pests.

In parts of Kent they are very harmful. In May Mr. Montague Ballard, of Bydews Place, Tovil, wrote to inquire "what is the best thing to do to them with regard to hop gardens, and what is their life-history?"

The life-history is given in general outline in the Board Leaflet No. 10 revised in 1902. The following information dealing with this pest in hops was also sent to Mr. Ballard:—

With regard to wireworm in hops, "trapping" is the best thing not only for the "wireworms," but also for the adult "click-beetles." My experiments have been only on a small scale regarding the latter point, but I have found it so successful I venture to

mention it to you. It is to place from now (May) on to July heaps of green stuff (lucerne or clover) about the gardens under any rough boards. The beetles may be found there during the day and collected. This means trouble, but I believe if we collect the green stuff, say, every week, burn it and replace new, we shall kill the eggs laid by these beetles, for they always seek shelter to deposit their eggs in preference, so if the land is clear and cultivated they fly there to lay their eggs, and so the wireworm are prevented.

I have known gardens cleared of wireworm by persistent trapping of the larvæ by placing "baits" near each "hill." Of all baits there is no doubt beetroot is the best.

One reason why wireworm are so bad in hops is that much rape cake, nibs or dust is used. This attracts the beetles to the gardens, and only draws the larvæ away *pro tem*. I am sure it does more harm by encouraging this pest than good as a manure.

The use of bisulphide of carbon comes in for wireworm in hops. A quarter of an ounce each side of a hill will kill all grubs, but no one tries to use it because it is highly inflammable, and except used with care may do harm. It has cleared out *Phylloxera* on vines, and would do just as well for hops for such pests as wireworm and Otter or Ghost moth grubs (*Hepialus humuli*).

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## ANIMALS INJURIOUS TO HORTICULTURE.

### ANIMALS INJURIOUS TO CULINARY PLANTS.

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#### The Cabbage Moth.

(*Mamestra brassicæ*, Linn.)

Some caterpillars sent by a correspondent from St. John's Wood, N.W., to the Museum, were recorded as doing much damage, they were those of the so-called Cabbage Moth (*Mamestra brassicæ* of Linnæus).

These larvæ are great pests in gardens all over Great Britain and Ireland. It has been one of the notable pests this year in parts of the South of England and has done much harm. Every year it is reported as doing damage, but some years more so than others. It is

chiefly a cabbage pest, but it attacks a great variety of plants such as turnips, radishes, strawberries, lettuce, currants, dahlias, melons, marigolds, bush roses, geraniums, tobacco plants, and they are fond of maize, feeding amongst the male flowers and also attacking the female spikes, destroying the brush crowning them. In fact nearly all plants are devoured by this pest.

The Cabbage Moth appears on the wing in May, June and July. The moth has dark grey fore wings varied with black, having many blackish streaks upon the costal edge, a large ear-shaped spot margined with white and surrounded by a dark line; the ends of the wings are festooned with black, and along this runs a sinuous white line, two more or less distinct black circles between the white spots and the base of the wings; the hind wings are brown, pale at the base, and have a whitish fringe; thorax the same colour as the fore wings; the abdomen brown with more or less distinct tufts down the back, the apex is distinctly tufted; the legs are brown and very hairy at the base, the tarsi with ochreous bands. The wing expanse reaches about one and three-fourths of an inch, the length of the body being nearly to quite three-fourths of an inch. They fly at dusk and at night; remaining at rest upon tree trunks, palings, etc., during the day. They may also be found nestling against the sides of clods, stones, etc., in fields.

The eggs are laid on the leaves of the plants, especially on cabbages, and hatch in six or seven days. The caterpillars, like the moth, are very varied in colour, depending, it seems, upon the plants upon which they feed; when young they are always green, but as they grow they mostly change in colour, some remain green, others are greyish-green, also almost black dorsally and yellowish above the feet, below greenish-grey; there is sometimes a prominent dusky dorsal line; the head is ochreous and horny and the first segment is blackish; the legs and prolegs are all green and the spiracles pure white. When full grown they reach an inch and a quarter in length.

The method of feeding varies according to the plant attacked. When on cabbages they eat their way into the heart of the cabbage, no matter how solid, and defile it with moist green "frass," giving the cabbage a most disgusting appearance; plants may be completely riddled by them; when attacking turnips, etc., they devour the leaves down to their midribs. When mature they either enter the ground to pupate or may change on the surface or under a stone or tile. The pupa is chestnut brown with occasionally darker areas. It may be placed in a cell of earth, or it may be naked in the soil

Most of the caterpillars have pupated by the late autumn, but some do not do so until the spring. They may even be found in cabbages during the winter.

PREVENTION AND REMEDIES.

1. Destroy all chrysalids when digging the ground in winter—if large areas of cabbage have been attacked it would be well to turn poultry on the land.

2. Cabbages may be dusted with gas lime that has been exposed to the air for three months or so; the lime runs down into the cabbages and makes them obnoxious to the larvæ and does not harm the plants.

**Cabbage Root Fly.**

(*Phorbia brassicæ*, Bouché.)

Broccoli plants sent by the Rev. S. N. Tebbs, of Hillside, Westbury-on-Trym, were badly attacked by the Cabbage Root Fly, the maggots of which tunnel in all *brassicæ* in various ways. Mr. Tebbs writes that “some of the plants have been blown out of the ground by the late winds, so much have their roots been weakened by this pest.”

In a further letter, Mr. Tebbs states that they had tried soaking the infected plants in paraffin and tobacco for hours, but these seemed only to make the grubs livelier.

Specimens were also received from the Board of Agriculture (*vide* page 182).

Growers of cabbages, cauliflowers, early kale, etc. frequently complain of the presence of white grubs or maggots destroying their plants. That these grubs are of more than one species is well known, but the greatest injury is done by a single species, the *Phorbia brassicæ* of Bouché (Fig. 9).

Where cabbages are frequently grown on the same land this pest is nearly always present, and in many cases has steadily increased under such favourable circumstances that the growth of the plant and its allies has had to be entirely given up. It is no new pest, for Bouché, who described it in 1833, wrote that “it often destroys whole cabbage fields.” In fact, since the beginning of the last century, it has been recognised as a serious pest in many European countries. In recent years it has also caused much harm in North America, where its life-history has been worked out in detail by Professor M. V. Slingerland.

There are not only records of its attacking cabbage and its allies,

but also radishes. In 1872 it did much harm to them in the Netherlands; it is also recorded as spoiling them in Great Britain and in North America (Slingerland). The larvæ also live in turnips (Fig. 8, *a*) and swedes, and even in horse-radish. In some cases they have been recorded from beans, clover (Ormerod), etc., but in all such cases there has undoubtedly been some error in determination; for instance, the Bean Root-maggot has been shown to be *Phorbia fusciceps*, Zett.

The Cabbage Root-maggot confines its attention to *Cruciferæ* alone, as far as all accurate information and records go (but one exception, viz., Dr. Lintner bred this pest from maggots mining the leaves of beetroots). This is an important point in dealing with the treatment of this pest. As would be imagined, *Phorbia brassicæ* does not confine itself to cultivated *Cruciferæ* only, but attacks various wild kinds, as Shepherd's Purse, Charlock, Jack-by-the-Hedge, Wall Mustard, etc. As an instance of its attacking ornamental plants, the Stock (*Mathiola*) may be named.

Although this insect is looked upon essentially as a cabbage pest, the damage it does to the turnip crop is often as great as that done to the cabbage. In 1901 swedes were badly injured in Tyrone and County Down, and in County Clare the turnip crop was so badly injured as to be, to a large extent, abandoned ("Journ. Dept. Agriculture," vol. iii. No. 1, p. 109, Dr. Carpenter, 1902).

Miss Ormerod ("Manual Inj. Insects," p. 26, 1890) says the maggots are found in dung, but she gives no direct evidence; none have been seen in dung, and under such circumstances such reports need confirmation before being accepted. I have tried to hatch these larvæ when kept in rank manure, but in all cases they speedily died. That they have frequently been worse where the fields have been heavily manured is no proof that they come with the manure.

#### METHODS OF MAGGOT ATTACK.

The larvæ of the Cabbage Root Fly, as the name implies, mainly live in the roots of plants, but this, as will be pointed out later, is not invariably the rule.

The first invasion is often upon the seedling plants before they are set out; in such cases the maggots simply gnaw the young roots, and the plants are killed right away. But usually it is not until the plants are set out that the pest commences its ravages. After feeding *pro tem.* on the surface of the roots they gnaw their way into the substance of the roots and tunnel in all directions. The tunnels allow moisture to get into the root and soon cause decay. They will

even burrow right up the stem (Fig. 8, *b*), as seen in some specimens sent by a correspondent of the Board of Agriculture from Cornwall. In turnips they burrow into the root and may cause (and also to some extent in cabbages) swellings, somewhat after the manner of the Turnip Gall Weevil (*Ceuthorhynchus sulcicollis*). I know of no records in this country of their attacking the leaves, but Dr. Riley found them in America burrowing into the stout midribs of cabbage-leaves in the summer; a similar habit having been noticed by Mr. Fletcher, in

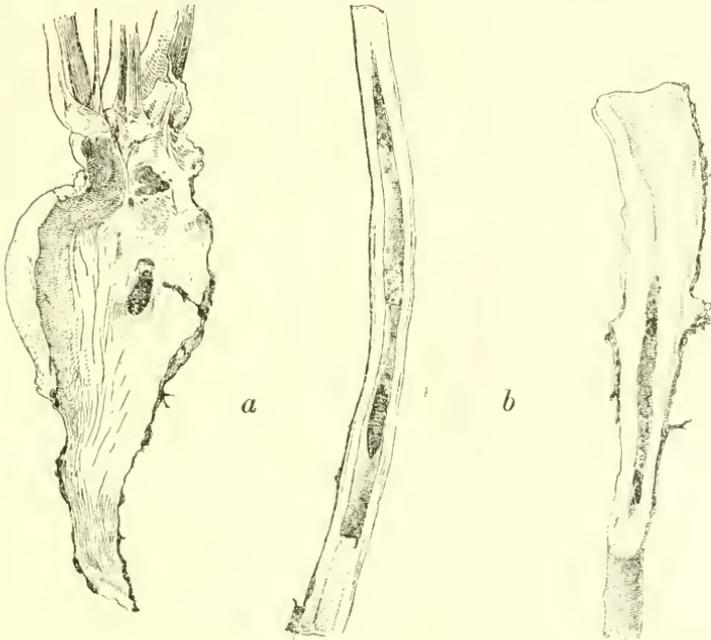


FIG. 8.

*a*, Young turnip attacked and deformed by cabbage maggot; *b*, young cabbage roots tunnelled by maggots.

1891, who at the same time observed them boring through the heads of winter cabbages in storehouses.

The outer layers of the cabbage root are most attacked, the inner core being too hard low down, but when they work to the upper part they enter the interior of the stem as seen in the specimen figured here. Sometimes so many larvæ occur that they live upon the outside of the decaying root as well as within; in nearly all cases the moisture and slime in their galleries lead to rapid decay. Young plants that are affected can usually be at once detected by their leaves wilting.

## LIFE-HISTORY OF THE CABBAGE ROOT FLY.

The fly *Phorbia brassicæ* (Fig. 9, *a*), the parent of the Cabbage Root-maggot, belongs to the family of two-winged insects (or *Diptera*) known as *Anthomyidæ*. It in general resembles a "house-fly," but is rather smaller in size; its body is about a fourth of an inch long. The male is dark ashy-grey with three broad dark stripes on the surface of the thorax and a wide dark dorsal stripe on the abdomen, dilated at the upper margin of each segment, which is marked with a narrow transverse dark stripe; the whole body is bristly and the eyes nearly meet in the middle of the head; the legs are black and very bristly, with a prominent tuft of bristles at the base of each hind femur below. The female is paler ashy-grey, with very indistinct thoracic and abdominal stripes, often absent, and the eyes are widely separate, and the apex of the abdomen is pointed. The female has not such

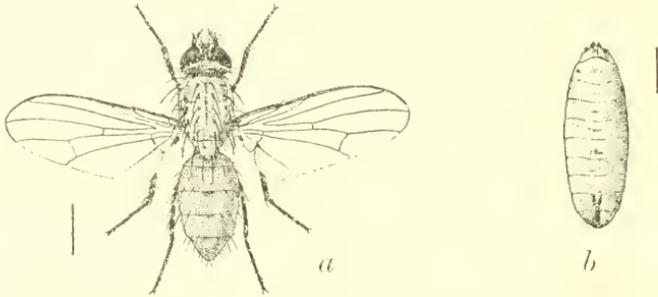


FIG. 9.

*a*, The Cabbage Root Fly (*Phorbia brassica*, Bouché); *b*, the puparium.

marked characters as the male, and can only be identified by the specialist.

The flies appear first of all at the end of April and on to May. I have seen them in warm weather as early as April 20th. They also occur in June, and successive broods appear later. Certainly two and probably three generations occur during the year. If there are no cabbages to oviposit on then they place their eggs on wild crucifer roots.

The female creeps down into the earth around the plants and places her eggs in clusters close to or upon the roots, using the extensile ovipositor to aid her in this process. At other times they are laid (if the ground is firm and close) on the soil close to the plants. Apparently fifty-five is the normal number of eggs laid by each female (Slingerland).

The eggs are very minute, oval, white, with an irregular ridged appearance; they hatch out in about a week, some as soon as four days. Taschenberg states that they take as long as ten days. The maggots which work on and in the roots as previously described are dirty white in colour, fleshy and footless as in all *Diptera*, the segments are provided with rows of minute tubercles by means of which the maggots move; the head end is pointed and provided with two mouth hooks; the anal end is truncated with ten conical processes, the two ventral central ones being bifid when the grub is full grown, a character which scarcely shows in a young larva; in the centre of this truncated area are the two spiracles, each composed of a brown area with three narrow curved slits; on each side of the third segment is a fan-shaped spiracle with twelve lobes, which appears to be functionless. When full grown the larva is the fourth of an inch long. This period lasts about three weeks: Slingerland says less than three weeks; Whitehead, twenty-four to twenty-eight days; Bouché from three to four weeks; Carpenter, three weeks; all those I have kept matured within a day or so of the latter date, most in twenty-one days.

As soon as the maggots are mature they leave the roots and enter the soil, and there at a depth of from two to three inches the larval skin hardens and forms a case or puparium (Fig. 9, *b*) in which the pupal condition is passed. They do not all, however, enter the earth, some pupate in the stems of the cabbages.

This puparium is at first much the same colour as the larva, but soon turns brown; it is barrel-shaped in form with two prominent processes in front, the front spiracles are present seen in the maggot and traces of the two bifid spines behind. This stage lasts from two to three weeks in summer, whilst in winter it may last from October to April. There is often to be noticed great variation in size in these puparia. Under favourable circumstances this pest may continue to work all the year round, for Dr. Carpenter records the presence of maggots in the North of Ireland in January.

The majority of maggots are mature by November, according to my observation, and have entered the puparium stage in which they pass the winter either in the ground or in the cabbage stalks. In some cases it also seems probable that some of the adult flies hibernate, so that we have this pest passing the winter in three different ways; but I am not aware of any authentic record of the adult hibernating.

## NATURAL ENEMIES.

I have never come across a single natural enemy of this pest in England, but Dr. Carpenter records a small insect belonging to the Gall Flies (*Eucela*) as having been reared from cabbage maggots found in County Down some years ago. Slingerland refers to *Eucela anthomyiæ* working in a similar way in America and also to a small Rove Beetle (*Aleochara nitida*) preying upon them. This latter occurs commonly in dung, haystack refuse, etc., all over Great Britain, and may do the same good work, but has not been observed to do so. I have found several mites (*Acari*) in company with these maggots.

## PREVENTION AND TREATMENT.

This pest is undoubtedly worst where cabbage, etc., are grown year after year on the same land. When land becomes fouled by this pest it can to some extent be cleaned by the application of gas lime, but so uncertain is this substance in its action that it is scarcely advisable to recommend it. In some cases it works admirably, in others it is a complete failure. If it is used it must be allowed to stand on the land after being spread for at least a month. The quantity depends on the nature of the soil, but from 3 to 6 cwts. to the acre may safely be used anywhere.

It would be far better to deeply plough or dig two spits deep land that had been infested and grow no cabbage on it for two years, but some crop other than of a cruciferous nature.

All cabbage stumps and other roots after an attack should be burnt. This is seldom done, and as many larvæ pupate in the stalks which are left about in heaps, they can only tend to help forward the advances of the pest.

Broadcasting soot and lime after planting out has met with some success, but I have seen fields and gardens badly attacked later in the year when this has been done. A small amount of soot and lime may also be put in with the plants when dibbled out. In America a plan which is the best we have is being adopted by growers of "discing" the plants when they are set out. It is not very troublesome, nor costly, and it is certainly very successful. It consists of placing discs of tarred paper or card around each plant. They can be cut out by machinery at little cost, and are so easily applied to the plant that no objection can be raised in regard to cost of extra labour.

The disc (Fig. 10) should be about three inches across with a star-shaped hole in the centre (A) and a slit cut from this to one side (B). The disc is then slipped around the stem and pressed firmly on to the soil so that the flies cannot crawl beneath. They are thus prevented laying their eggs upon the roots, and the young larvæ cannot crawl far, and so die.

The next best method was found by Professor Slingerland to be injecting bisulphide of carbon into the soil, but I think this would be too costly a process to answer in this country.

In gardens good has resulted from watering the plants with

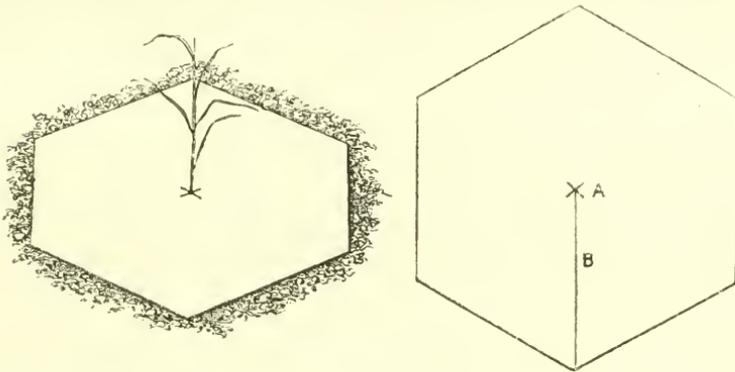


FIG. 10.

Stem of plant passing through card disc lying close on the ground.

A, Star-shaped slit so as to allow stem to pass through card; B, slit to push stem up to A.

a mixture of carbolic and soft soap, and this was found to be a successful preventive and remedy in Professor Slingerland's experiments.

The mixture is made as follows: 1 lb. hard soap, 1 qt. soft soap dissolved in 1 gallon of boiling water, 1 pt. crude carbolic mixed well together; dilute with thirty times its bulk of water, and pour with a can and rose around the plants.

On the Continent a dressing of superphosphate of lime has been found beneficial. Sand soaked in paraffin spread around each plant will also keep the flies off for some little time and so prevent egg-laying.

## ANIMALS INJURIOUS TO ORNAMENTAL PLANTS.

**Acari attacking Canariensis.**

Some Canariensis, one of the most useful rapid creepers, has been observed to be killed by *Bryobia* mites. They killed the plants in one night. Mr. Albert Michael identified them as *Bryobia pretiosa*. This species often does a good deal of harm to fruit trees. It is found on ivy, and the attack on the Canariensis was soon traced to the ivy close by, which was swarming with them. The mites also swarmed on the wall of the house up which the plants were growing. Spraying with soft soap and liver of sulphur soon destroyed them.

**Narcissus Bulb Pests.**

Amongst the larvae sent by Mr. T. J. Leney from Chertsey damaging narcissus bulbs were not only those of the Narcissus Fly (*Merodon equestris*, Fab.) recorded in the First Report (p. 107), but many smaller ones which have proved to be those of *Eumerus strigatus*, Fln. The *Merodon* larvæ pupated from November to February. The flies commenced to hatch out on April 29th and continued until May 15th, when the last appeared. The small *Eumerus* larvæ were very numerous, as many as ten occurring in one bulb; they were found both in company with *Merodon* and separately. They evidently were just as much the cause of damage as the larger *Merodons*. These *Syrphidæ* all feed in their larval state in bulbous roots, but I am not aware of their having been previously recorded as injurious to cultivated bulbs.

The common species is *Eumerus strigatus*, Fln. (*lunulatus*, Mg.) Verrall records two other species—*E. sabulonum*, Fln., and *E. ornatus*, Mg.

Walker mentions two other species as British, namely, *E. ruficornis*, Mg., and *E. scelene*, Mg. The former is in the British Museum and is not an *Eumerus* but a *Chrysochlamys*. The small Narcissus Flies hatched out about the same time as the *Merodons*. The larvæ mostly feed at the lower part of the bulbs, but bore their way up between the scales, and were also found outside the bulbs in the earth in which they all apparently pupated.

The adult *Eumerus* seem to mimic in habits small aculeate Hymenoptera such as *Halictus*; the habits of the larvæ are similar to *Merodon*.

Bouché (Stett. Ent. Zeit., 1847, p. 145) bred *E. wencus* and *E. strigatus* (which are now considered the same species) from bulbs of the common onion which they destroyed just as the larvæ of *Merodon do narcissi*, and sometimes, he says, they destroy a whole crop; the larvæ occurred in July and pupated in the bulbs and in the earth. These larvæ have not so far, I believe, been found in onions in this country. The grubs or maggots of onions are those of *Phorbia cepetorum*, Meade.

### Swarms of *Luffia* "Case-Bearers" on Garden Wall.

During May Mr. William Bear sent a number of little case-bearers, with the following note:—

"In another packet I send some little lichen-encased larvæ. An old garden wall was thickly covered with them this morning, after a shower. As the sun got out, most of them got into the holes or cracks of the wall. With them early in the morning were numbers of little brown bugs; they had also all disappeared after breakfast."

The case-bearers sent belong to the Psychid family *Luffiidae*, and to the genus *Luffia*.\*

Mr. J. Hartley Durrant has examined them and says they most probably are *Luffia lapidella*. There are two species of this genus in Britain, viz., *Luffia lapidella* and *L. ferehaultella*. The latter species is parthenogenetic. The larvæ of these moths live in cases, and also the pupæ. The females are nearly apterous and crawl out on to the larval cases. Males when they occur are winged. No male is at present known of *ferehaultella*, but that of *lapidella* is well known. The male *lapidella* is 9 to 12·25 mm. long in wing expanse; forewings dark grey, a black line on the hind margin, a curved discoidal mark and two others basal to it; posterior wings of a dull leaden-grey, paler than the anterior. They vary considerably. The adult female is almost apterous, but there are thread-like winglets; the anterior wing is in the form of a black filament ten times as long as broad, longer and narrower than the first tibia; the posterior wings are parallel to the anterior and about one-third of the length. The insect appears grey to the naked eye. The female moves very little, she sits on her case and chances being fertilised by the winged male. Her body becomes full of eggs, which she places in the case; to do this she is provided with a long three-jointed ovipositor. If

\* A full account may be seen in Tutt's "British Lepidoptera," Vol. II, p. 229.

the female of *lapidella* is not fertilised she dies, but the female *ferchaultella* lays fertile eggs without connection with any male. The eggs are placed in the empty pupa skin inside the case. As many as fifty may be placed in one case; they are pale yellowish white in colour and irregularly oval in form. The case varies much in colour, depending upon the lichens upon which the larva feeds; it is made of lichen, silk, etc., including grains of sand and mortar. The larva which lives in the case crawls freely about. They especially inhabit old walls and rocks, and spin a good deal of silk as they move about (only at certain times however). When the larva is nearly ready to pupate it fastens the wide open end of the case to the surface of the lichens or wall and covers the opening with silk. The larva mainly feeds on the whitish lichen known as *Pleurococcus vulgaris*, etc. The larva pupates in the case and hatches into the adult in June and July.

### The Common Footman Moth.

(*Lithosia complanula*.)

The Common Footman Moth (*Lithosia complanula*) is sometimes sent by fruit-growers with enquiries as to its economy. As the larvæ feed only on lichens on walls and poplar trees, they are of no great economic importance. The larvæ occur in May and June; they are black in colour, unspotted, with a narrow reddish-yellow stripe from the fifth to the eleventh segments just above the feet. They are found in old fruit orchards, where they probably have been feeding on the lichens on old apple trees, or else on the same lichens that frequently grow on garden walls.

### Another Orchid Pest.

Some orchid pests sent to the Museum proved to be *Collembola*; they were too poor in condition to make out definitely, but they were species of *Orchesella*. A correspondent referred to by the sender was probably Mr. Coleman, of Gatton Park, whose orchids have been attacked by these spring-tails (of more than one genus); notes on this appeared in the First Report on Economic Zoology. It is the only record of orchids being damaged by *Collembola*, but lots of other hothouse plants are infested by them.

## ANIMALS INJURIOUS TO FORESTRY.

**The Holly-leaf Miner.**

Holly trees, especially holly hedges, are often disfigured by blistering of the leaves. Specimens of this damage were received from Upper Deal with the following note :—" I have a hedge of this shrub very badly affected ; will you kindly tell me the cause of and the cure for the disease ? "

The trees were attacked by the maggots of a fly known as *Chromatomyia ilicis*, Curtis, a very common insect. Although hollies are frequently attacked by these insects, they seem to do very little harm.

The insect is one of the *Phytomyzidæ*, a family of leaf-mining flies, and has been described by Walker as *Phytomyza aquifolii*. The fly appears in May. The hedge might then be sprayed with paraffin emulsion now and again—this might keep the flies away. Nothing has been tried to check this insect, so anything done can only be by way of experiment.

**The Goat Moth.**

(*Cossus ligniperda*, Fabricius.)

The Goat Moth is one of the largest of British moths, and although really very common is seldom seen in its mature state. This is because the dull colours of the moth resemble so closely the bark of the trees upon which they rest. Although the moth is not well known, nevertheless, in its larval or caterpillar state it is a common and well-known object ; whilst the damage the larvæ do is so very marked that there are few people who cannot recognise the ravages of this pest.

The Goat Moth (*Cossus ligniperda*) is found in most wooded parts of Great Britain, and is especially common in and around towns, where ornamental and park trees are frequently ruined by them. I have seen great numbers of trees killed in and around London, whilst in the suburbs the damage is still more frequent.

Similarly in France, in Paris frequent damage is done by them ; the elms in the Bois de Boulogne have suffered severely. It is also a pest in Germany and other parts of Europe. In Great Britain it is perhaps most abundant in the south and east, but its attacks are frequent even up to the extreme North of Scotland.

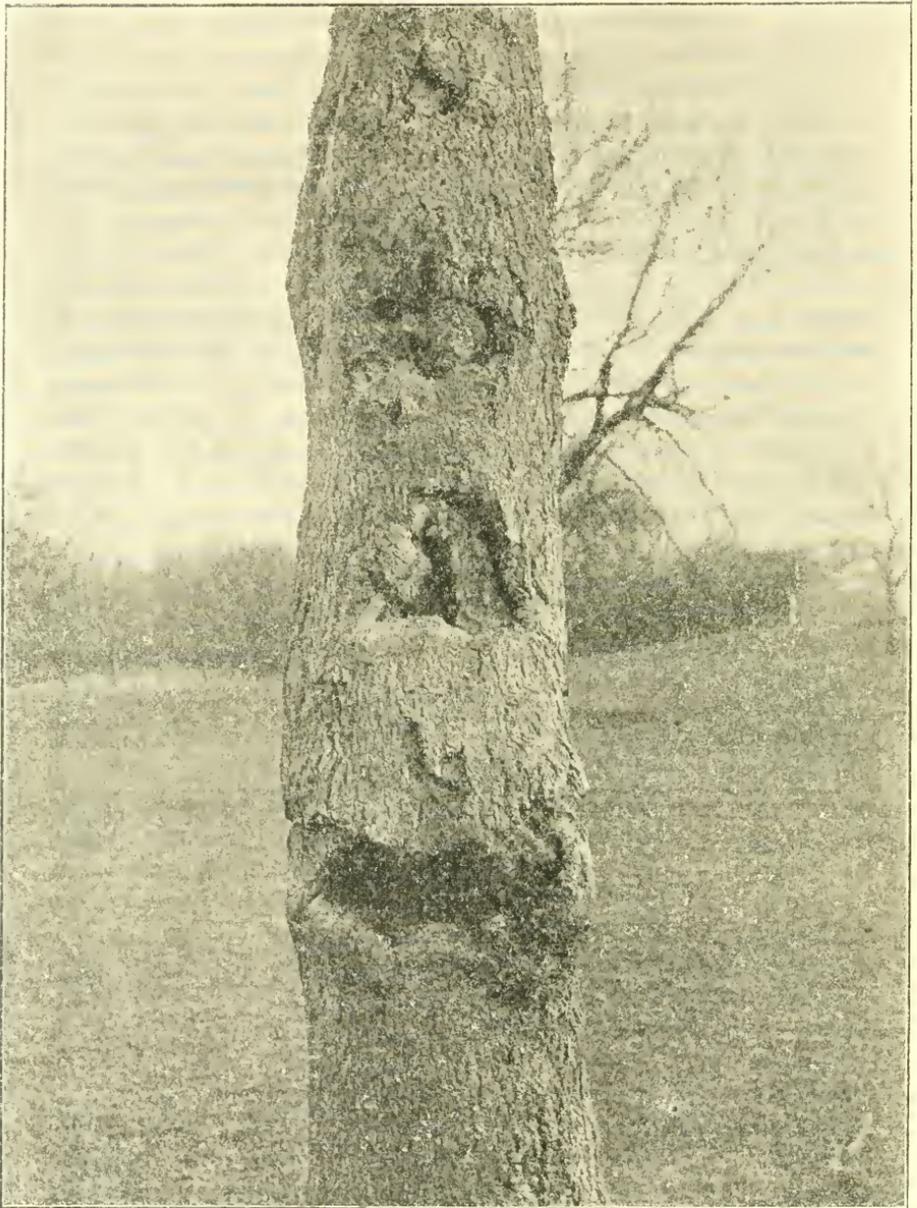


FIG. 11.—ASH TREE ATTACKED BY GOAT MOTH LARVÆ.

The damage is done to the trees (Fig. 11) by the caterpillars eating tunnels and galleries into the very heart of the trunks. Unlike many forest-tree pests, they do not pick out unhealthy trees only, perfectly sound ones often being invaded. As a rule, when once a tree is "struck," unless remedial measures are employed, it will be killed sooner or later, according to the number of these pests attacking it. Some observations as to the rapidity of their work are here recorded.

As a rule, the Goat Moth prefers to lay her eggs upon isolated trees; but this is by no means the only position, for it is not unfrequent that large trees in woods die under their attack. Avenues are also infested by this pest, and trees both in high and low positions, sheltered and exposed.

The forest and park trees which suffer from the Goat Moth larvæ are elm, ash, poplar, beech, lime, willow, oak, alder, and birch, and I have twice noticed them in maple. Not unfrequently reports are sent from orchardists as to their damaging apple and pear trees, and I have seen them once attacking the walnut. The damage done in orchards is slight, however. It is also recorded as attacking apple and pear in France, and also in Germany, Taschenberg recording that two hundred and sixty-six larvæ were taken from one pear tree. The number found in a tree varies from one or more up to the number recorded above by Taschenberg. As a rule, not more than twenty or thirty are found in a tree of the largest size in this country. The wood eventually becomes completely honeycombed, and it is not until the tree is really dead that they stop their work, the caterpillars, if not mature, leaving the dead tree and crawl to a neighbouring one, or even feed on roots in the ground.

Their presence can be told, even in small numbers, by the holes in the trunk, often as big round as a man's finger; later, boughs begin to die and break off during gales, even when they are still sufficiently healthy to have foliage upon them. In a few years the damage becomes more noticeable, both in regard to decaying and dead boughs, and especially in the trunk, which becomes perforated with innumerable holes up to about eight feet from the ground, and if still growing becomes much deformed, as shown in the Figs. 11 and 12.

They cause the death of a tree much more rapidly than is generally supposed. The ash figured on page 80 was first attacked in 1891; the tree was left alone, and for eight years struggled on, not only not growing, but gradually dying, until during the present year it put out a few stunted leaves as a dying effort, and now (1903), as seen in the photograph taken in August, it is quite dead. A healthy

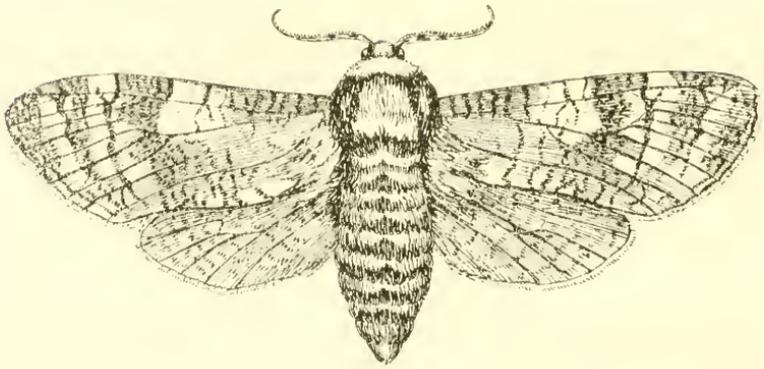


FIG. 12.—ASH TREE IN FOREGROUND ATTACKED AND KILLED BY GOAT MOTH; ANOTHER ON THE RIGHT UNAFFECTED.

ash is seen behind in full leaf. This tree was 36 feet high and four feet in circumference six feet from the ground. Two trees, large ashes, 50 feet high, in a neighbouring wood were attacked in the same year, and were so damaged that only one or two boughs had leaves this year. On being cut down, the trunks were honeycombed right through the centres. Of trees that are attacked, the elm, the ash, and the willow suffer most.

#### LIFE-HISTORY.

The Goat Moth (Fig. 13, *a*) varies to some extent in size, the female being from 3 to 3½ inches in expanse of wings, the male from 2¾ to 3. In build it is stout and clumsy; the head clothed with dense grey hairs; the thorax greyish-brown; the large hairy abdomen has darker transverse bands, and the apical borders of the segments grey; the broad wings are dark grey and brown with dusky transverse streaks, the hind wings ashy-grey to greyish-brown, with some indistinct brown marks, and the antennæ are fringed with grey in both sexes. They occur during June and July, and fly at dusk, but are very inactive, usually depositing their eggs on the trees from which they come. The female has a horny extensile ovipositor, by means of which she places her eggs far in crevices, etc., of the bark of the trees. It is said that one female may lay as many as a thousand eggs (Kollar). Boisduval says as many as seven hundred. Three females kept under observation each deposited between two and three hundred. They were laid in groups varying from fifteen to fifty. On the tree here figured it was observed that the moths always placed their eggs somewhere near the ground, never more than six feet up the trunk. They were always laid at night. In colour the eggs are brown, round, convex above, flattened below, and ribbed; about 1.5 mm. across. In ten days they give rise to the larvæ, which at once burrow under the bark and soon into the wood. The entry of the young larvæ can often be detected by moisture (sap) and small fragments of wood appearing in crevices of the bark. The young caterpillar is pink all over, but when mature it is dirty deep ochre-yellow with a broad stripe of rich mahogany red down the back, sometimes rather broken, giving the appearance of large mahogany spots; the head is deep blackish-brown, and there are two deep brown spots on the first segment, with a few hairs of a pallid colour; brown legs and yellow prolegs with brown hooks. When full grown they reach from three to three and a half inches in length. They feed for three years, in the tunnels in the wood most of



a



b



c



d

FIG. 13.—THE GOAT MOTH (*Cossus ligniperda*).  
a, Adult; b, larva; c, pupa in cocoon in piece of ash wood; d, pupa.

the time. Now and then they leave the trees and wander about; some never return. It is probably some of these that are found in the ground; numbers of cases have been reported to me of these larvæ being found in the earth devouring and burrowing into the roots of plants, such as dahlias. Normally in the spring of the third year the larva (Fig. 13, *b*) comes to the entrance of the tunnel and close to it forms a cocoon lined with silk and coated outside with wood chips. The pupation takes place as a rule in May. The pupa (Fig. 13, *d*) is rich brown with rings of sharp spines on the abdominal segments. The moth emerges in three or four weeks after pupation. Previous to the emergence the pupa forces its way out of the cocoon and partly out of the opening in the tree; the empty pupal skins may frequently be seen in that position. When kept under unnatural conditions the caterpillars have taken four years to mature.

#### PREVENTION AND REMEDIES.

Trees in close proximity to others that are attacked may be protected by thickly smearing the trunks over in May with a mixture of clay and paraffin and soft soap. This should be made into a thick paint and smeared all over the trunk up to eight feet and a thick layer put around the base and the ground. Clay and cow-dung has been found to answer the purpose, but is not nearly as good as the former mixture. This will prevent the eggs being deposited on the trunk and roots where exposed. It is quite useless to scrub the bark as suggested by Miss Ormerod, for the eggs are laid deep in crevices and would not be reached in the majority of cases, neither can many be rubbed off as suggested. For killing the caterpillars in the trees the best plan is to place lumps of stick cyanide in each hole and smear the whole trunk over with clay, the entrances to the holes being firmly plugged up with the same.

Paraffin emulsion squirted into the holes is said to be a good remedy, but where the tunnels are very long and tortuous it is very doubtful if many are killed by it. Sulphur and tobacco fumes blown in by means of bee-bellows have also produced good results, but no plan is as successful as the cyanide treatment and stopping up the holes with clay.

A correspondent writes that he has saved some valuable trees by injecting about 2 c.c. of carbon bisulphide into the tunnel and closing the hole with wet clay. This almost invariably killed the caterpillars.

All dead timber should be burnt in the winter or spring when possible before the caterpillars escape.

## NATURAL ENEMIES.

Bats, Goat-suckers and Owls eat the moths, and the Green Woodpecker the caterpillars and pupæ. The various Tits (*Paridæ*) devour the eggs, according to Taschenberg, and probably the same good is done by the Tree-creeper, Wryneck and Nuthatch.

The pupæ are sometimes killed by Ichneumon Fly larvæ.

**The Resin Gall Moth.**

(*Retinia resinella*, L.)

Specimens of the galls or rather chambers or nests formed by the *Retinia resinella* were received from Mr. J. E. Fraser, of Dores, Inverness, with the following notes. The specimens were taken from a fir plantation in the neighbourhood of Inverness, where this injurious insect (not previously seen in the district or in Highland forests) has made a serious invasion. "There is," writes Mr. Fraser, "scarcely a single tree in a young plantation in this neighbourhood but is infested, and they have been noticed on the branches of a fir tree, 120 years old, that was blown down in one of the recent gales." Later he writes (10.4.03), "that there are traces hereabouts that its attacks are now pretty general."

The moth that produces these gall-like chambers of resin is fairly common in a few localities in Scotland, chiefly in Perthshire, where it is found amongst the Scotch firs.

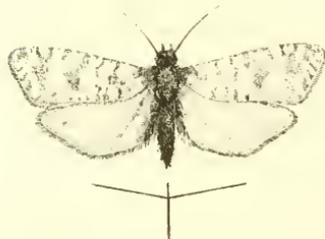


FIG. 14.—THE RESIN GALL MOTH  
(*Retinia resinella*).

As a rule if the trees are healthy this insect does no harm, but if they are not so the attacked shoots die. This is especially noticeable where the soil does not suit the trees or where the wind and weather have been unfavourable.

The moth (Fig. 14) appears in May and June, and varies in size from three-quarters to nearly an inch in expanse of wings, the front wings are dark blackish grey, with numerous irregular silvery-grey transverse streaks, and the costa beyond the middle spotted with white; the hind wings greyish-brown and the fringes grey; a fine silvery line forms the boundary above the fringes. The eggs are laid by the female, on recent shoots, especially the lateral ones of young pines; they are generally placed under the whorl of buds. The caterpillar on

coming from the egg in about eight days at once bores into the shoot and causes the resin to exude, which forms the nest in which it lives. This nest is at first very small, but becomes as large as a pea or even a hazel nut by the winter, and is quite hollow; in this the caterpillar passes the winter. In the spring it commences to feed again, and the nest continues to grow. This nest eventually may reach the size of a walnut, the resinous walls being irregular outside. The nest may be on the underside of the shoot, or may, as in most of the specimens sent from Dores completely surround the shoot. At first it consists of only one chamber, but the mature nest is found to be divided into two compartments or rooms, as Mr. Fraser describes them. One, the larger, is used as the dwelling-place of the caterpillar, the smaller one is used for the excrement or "frass." The larva is rather more than two-thirds of an inch long, orange-brown in colour, with brown head and thoracic shield. They attain their full size in October, and then pass the winter in a thick white web in the nest. The larva pupates in April and May of the third year. The pupæ are black when mature, but at first are dull white, gradually changing to brown; but some of the mature ones had brown abdomens. When the larvæ are in danger, according to Kollar, they let themselves down to the ground by a thread and ascend again at leisure.

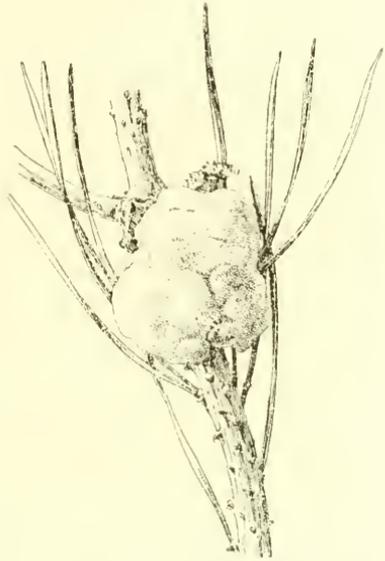


FIG. 15.—NEST OF *Retinia resinella*.

The resin that forms the nest exudes from the hole formed by the young larva, and this continues to flow for a long time, probably through the continued action of the grub. The shoot above the nest often dies right away, numerous side shoots being thrown out below the nest.

The only method of treatment is to cut off and burn the nests during the second year.

## The Larch and Spruce Aphis.

(*Chermes abietis-laricis*.)

The larch is very frequently damaged by this pest in different parts of the country. Buckton records in 1871, that "the woods in some parts of Surrey were so covered with the myriads of white tufts spun by these insects that they appeared as if starch had been dusted over them. Many boughs died back, and in the autumn the trees looked as if they had been scorched."

The presence of this pest (*laricis*) is very easily detected when on the larch by the white wool excreted by them, and by the galls when on the spruce (*abietis*); larch in some cases looking as if covered with snow. Trees of all ages are attacked by this pest, which sucks out the sap from the leaves, and also the young bark. Schlich figures a characteristic way of damage in the larch, the needles bending over where the *Chermes* is feeding, and the area around it turning pale. This elbowing of the needles is not, however, always noticeable. I have frequently seen trees quite white from this pest, and yet not a single leaf bent; this was the case in a specimen sent from Northampton during the past year. This larch pest is also known as the Larch Bug and Larch Blight. According to Buckton,\* *Chermes laricis* is confined to the larch, but Dreyfus and others have almost conclusively shown that this species and the Spruce Gall Aphis (*Chermes abietis*) are alternating forms of one and the same species. The form on the larch (*C. laricis*) is agamic only, but on the spruce there is always one annual sexual generation (*C. abietis*), separated from the preceding sexual generation by a series of agamic forms, which it appears may remain on the spruce or may migrate to the larch.

### LIFE-HISTORY OF *C. abietis-laricis*.

The female *Chermes laricis* pass the winter under the bark of the trees and appear in spring. This so-called "queen aphid" hibernates under the leaf scales, often several together, and presents a curious shrivelled, almost dead appearance, and generally resembles the colour of the bark. As soon as the buds begin to swell and the spring approaches, they also swell and then throw off their skin, which is retained by the *Aphis* some days, being attached by three long spirally-coiled hairs. Later, after another moult, the queen becomes silvery white with pale brown tubercles. When fully grown

\* Mono. Brit. Aphides, iv., p. 38.

the queen is dusky brown, with six rows of tubercles, the whole body being dusted with meal and the apical portion covered with long white flocculent wool. These females commence to lay their eggs as early as the first week in March and continue to do so until the middle or end of April. I have even found them in May.

The eggs (Fig. 16) are deposited in groups, each egg attached to the plant by a long pedicle. As many as sixty may be laid together, but more often I have counted between twenty and thirty; the colour varies from yellow to green, dusky green, brown to black; when each patch of eggs is finished they are covered with a peculiar silky substance. The female remains by these eggs until they hatch, which usually takes place towards the end of May



FIG. 16.—EGGS OF *C. laricis*.  
(Greatly enlarged.)

and in the early part of June. The larch leaves will then be seen to be covered in places with small black moving specks; these are the lice, or young *Chermes*. These lice wander about on the tender needles; they vary much in colour, for some are almost green in hue. They grow rapidly in warm weather and puncture the tender

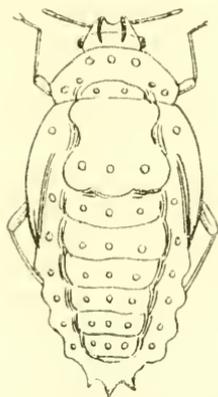


FIG. 17.—ROUGH SKETCH OF A PUPA of *Chermes laricis*.  
(Greatly enlarged.)

needles and so let out the resinous sap. Very often the presence of this pest is told by the needles bending or elbowing where the lice have been sucking, but this is not always so; I have frequently seen the needles perfectly straight in spite of their repeated attacks. The lice can also produce a white silky substance which forms a covering to their bodies; some years this white wool is produced much more plentifully than others.

Towards the end of May a few lice have changed to pupæ (Fig. 17), and by the middle of June most have done so. The pupal stage is dark slaty-grey, with tubercles from which numerous white threads appear. From the beginning of June into August the pupæ give rise to imagines, which are all winged females—there being no male known. This winged generation (Fig. 18) is not as in most *Aphides* viviparous, but it is oviparous. The head and thorax are dark brown, the eyes bright red; the abdomen varies from orange to brown, densely clothed with long white wavy fibres; the wings are large and greenish. These females lay eggs which they cover with down and then die, their dried skins forming a covering over the ova.

No male is known to occur, and yet we get successive generations not only going on through the summer, but the asexual reproduction carried on from year to year. The Larch Bug or Aphis (*Chermes laricis*) (Figs. 17, 18) is thus agamic; but it is now thought that this larch pest is only a form of another species, the Spruce Gall Aphis (*Chermes abietis*). These two previously supposed distinct species are, I feel sure, one and the same—merely different forms which can migrate between two food-plants; certain stages being passed on the spruce, other



FIG. 18.—*Chermes laricis*  
(WINGED FEMALE). × 20.

stages on the larch. The true sexual form is the Spruce Gall Aphis (*Chermes abietis*) (Fig. 19). This form, so well known on account of the beautiful pineapple-shaped galls (Fig. 19, *a*) they produce, attacks the spruce only. It occurs on the White Spruce (*Picea alba*), the Norway Spruce (*P. excelsa*), the Blue Spruce (*P. pungens*), the Black Spruce (*P. nigra*), and the Hemlock Spruce (*P. canadensis*). They are first noticed on the spruce as small, oval, wingless, ochreous yellow lice; the apterous viviparous females. These creatures (*b*) have passed the winter hidden under some bud scale or bark crevice, like the *laricis* form. They soon settle down near the base of a young leaf, and shortly small swellings appear, within which they encircle themselves. These females lay masses of eggs (Fig. 19, *d*) which soon hatch into lice. The lice at once puncture the twig and cause it to swell; at the same time the needles also swell, especially their bases, and so the curious fir-cone, or pineapple-like gall, grows.

As the swollen needles unite at their bases, there are formed chambers in which the lice live and grow and by their constant irritation increase their size until each chamber may hold as many as fifty larvæ. Each chamber is lined with a dense mealy substance and also contains numerous opaque or semi-opaque globules, often coated with the meal. The cones are at first pale green and pink, but as they grow they become brown and often an inch in length; each may contain as many as two thousand inhabitants. From the middle of June into July the scales of the gall split, each having a little semicircular opening; previous to this taking place the larvæ have entered the pupal stage, the pupa (Fig. 19, *f*) being reddish-brown with a slight mealy coating, with green wing-cases and thoracic markings. Like the *laricis* they vary in colour, some being pale slaty-grey, others pinkish. From early June to July these pupæ hatch into the winged females, which crawl out of the galls, if

the pupæ have not already done so, and fly from tree to tree. This winged female (Fig. 20) is of a golden-brown colour with short green legs, and the short shiny oval abdomen with a few waxy wavy white filaments; the wings when mature are slightly tinged with green. This winged brood lays eggs (Fig. 19, *e*) towards autumn on the

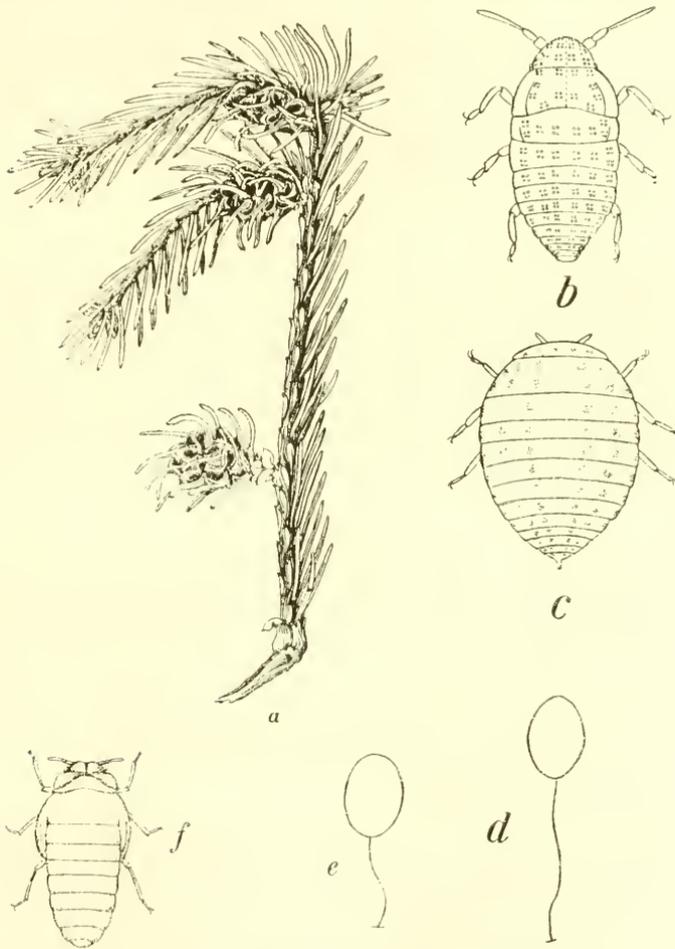


FIG. 19.—SPRUCE GALL APHIS (*Chermes abietis*).

*a*, Infested spruce shoot (half natural size); *b*, young ♀ of winter generation; *c*, adult ♀ winter generation; *d*, egg laid by ♀ of winter generation; *e*, egg of summer generation; *f*, nymph of summer generation. (*b* to *f* partly after Fernald.)

apices of the leaves, and covers them with white wool. These eggs soon hatch into larvæ, generally in two weeks. Some of these minute brown larvæ rest on the leaves and die in the winter,

others in the base of the buds survive. The male is apterous, very minute, blind, and yellow in colour; they were found by Buckton under a scale when examining the contents of a number of galls. Thus



FIG. 20.—WINGS OF A ♀ OF SUMMER GENERATION.

in this species we get a sexual generation, which does not as far as we know occur in *luricis*.

The sexually produced egg is always laid on the spruce, which is the primary food plant of the Aphis, which must now apparently stand as *Chermes abietis-luricis*. How far these two races can live upon one tree only is a matter at present unsettled.

Dreyfus gives the following life-cycle :—

#### *First Year.*

GENERATION I. passes winter on spruce as *C. abietis* and there lays eggs.

GENERATION II. develops in spruce galls and forms winged *abietis* in August. Part of these migrate to the larch and become *luricis* and lay their eggs on the needles.

GENERATION III. hatches on the larch and passes the winter under bark scales and in crevices.

#### *Second Year.*

GENERATION IV. These come from the eggs laid on the larch, the product of III., which acquire wings at the end of May and mostly return to the spruce, and their eggs produce generation V.

GENERATION V. consists of males and females. From the sexually produced eggs there then hatch and develop the mother queens, which live throughout the winter and correspond to Generation I.

Whether or not each race can live entirely on either the spruce or the larch or whether a migration is necessary does not seem to be as yet settled. I am confident that the *abietis* can go on year after year on the spruce. One under observation became infected with the *Chermes* in 1895, and since then the *Chermes* have steadily increased year by year. The nearest larch tree is more than half a mile away in a straight line. This larch is annually covered with *luricis*. That the spruce in question was quite free a few years ago I know, and the first signs of *Aphides* I saw upon it were winged forms that I could not separate from the winged larch species.

The apparent connection between the two is of some economic importance if, as seems essential, larch can only be infected from spruce. Should this actually be so, and I see no reason to doubt it, then it would be as well to give up mixed spruce and larch plantations, the two trees being grown apart and separated by intervening non-coniferous plantations.

The Spruce Gall Aphis occurs in N. America. It is said to have been introduced with N. European and Norway spruces. It was described as *Chermes abieticolens* by Dr. Thomas in his Report for Illinois for 1879, p. 156, but was proved by Cholodkowski to be *C. abietis*. It is common in Continental Europe, occurring as far south as Parma.

#### TREATMENT.

With regard to treatment, all we can do is to wash the affected trees with paraffin emulsion for larch attack whenever we see the pest present, and for spruce when we observe the winged forms issuing from the galls, and in the spring just before the galls are beginning to form. Small trees should be gone over before the galls open and all such growths picked off and destroyed. These galls stunt and deform the trees when young, and should certainly be collected if we wish the plantation to develop into a good growth.

#### NATURAL ENEMIES.

Various Lady-birds feed upon the Spruce Gall Aphis (*Scymnus*, *Coccinella*) and also the larvæ of Lace Wing Flies (*Chrysopa*). Numerous Spiders also feed upon them.

### The Ash and Willow Scale.

(*Chionaspis salicis*, Linnæus = *C. fraxini*, Signoret.)

Frequent enquiries have been received lately concerning a scale on ash saplings. This scale is certainly very harmful to the saplings, but in no case can I find that they have caused the death of them. Some under observation close to my own house were literally covered with the scales, and yet kept alive. On the other hand their growth was decidedly checked. Certain clean saplings growing side by side with those smothered in scale were an inch more in diameter than the affected ones.

This scale is said to inhabit the willow as well as the ash, and also to occur on alder, hawthorn, privet and lilac. To osiers it is

said to do much harm. It breeds with great rapidity, but is largely held in check by numerous parasites, notably two bugs referred to below, and also by one of the *Thysanura*.\* The male and female scales are usually found on separate trees, but close together. The female scale is grey in colour and pear-shaped, the female insect is deep crimson. At one end of the scale may be seen a trace of the yellow larval skin, but this soon fades and becomes grey; it is placed at the narrow end of the scale. The male scales occur in enormous numbers, in many cases making the bark look quite grey; they are much smaller than those of the females, and are strongly ridged. The perfect males are orange-red in colour, and have long genitalia. The eggs laid under the female scales are crimson, and are deposited in August. They remain under the scales until the spring, when they hatch out into little yellow larvæ. The males are recorded by Newstead as hatching in June and July. In those kept under observation, they nearly all came out in the latter month and a few in August.

Willows growing with ash have been found to be perfectly free from this scale, although the ashes were smothered. It looks, therefore, as if once settled on a host they do not change, and, possibly, it is only when the ash fails that the other trees are invaded. There are two forms of males.

#### NATURAL ENEMIES.

Great numbers of "bugs" have been observed feeding on this scale. The most abundant being a small black species identified by Mr. Distant as *Tennostellus pusillus*, H.-Sch. I have taken as many as six on one small tree, all busily engaged in sucking the bodies of the scale insects, and I find they puncture through the scales, leaving a small hole, much as is formed by the exit of a Chalcid parasite.

A larger species, *Phytocoris dimidiatus*, Rbm., which is very difficult to see owing to its being similarly adorned to the lichens and scales, also feeds upon them, but in fewer numbers, and occasionally I found *Lyctocoris campestris*, Fabr., devouring them. This latter also attacks man.

A large black springtail, with shiny body, was also seen in numbers grazing off these pests.

\* I have been unable to get this identified.

## GROUP F.

## A. ANIMALS WHICH CONCERN MAN AS BEING DESTRUCTIVE TO HIS VARIOUS WORKS, BUILDINGS, LARGER CONSTRUCTIONS AND HABITATIONS.

**Leather-jacket Grubs causing damage at Rye Golf Links.**

The following communication was received in May from the Secretary of Rye Golf Club:—

“Professor A. D. Hall tells me that you will probably be able to recommend us what to do to prevent the ravages of a grub which has eaten the grass at two of the holes here. In hopes that you will help us, I am sending a few of the grubs in a tin box. I am told they are the grubs of the Daddy Long-Legs, and that we ought to put down rape dust or ‘Homco.’ I have put down a small quantity of both as an experiment. The soil is very thin, on shingle, and of the nature of black sand. Two months ago the grass was very good, and now about six acres are nearly bare.”

Professor A. D. Hall, writing on the same subject, suggests the possibility of corrosive sublimate worm-killer doing good.

The following reply was sent to the Secretary, Rye Golf Club:—

“The larvæ you send, that are eating off the grass at two of the holes at Rye Golf Links and which have bared six acres of grass, are those of one of the Daddy-Long-Legs (*Tipulidæ*), one of our worst grass land pests owing to the difficulty in fighting them. They have now pretty well done the harm for this year.

“In this special case, I think rape dust will do good in drawing the larvæ away from the grass roots, but of course it does not harm the grubs. As soon as the ‘Daddy-Long-Legs’ commence to appear I should heavily roll the land and bush-harrow it repeatedly; by so doing many of the flies are unable to escape from the soil by the compression of the land, and many of those that do escape are killed and their eggs are destroyed by bush-harrowing. Around the holes you might make use of bisulphide of carbon. This may be injected into the soil at the rate of half an ounce to every four square yards for grass land. It will kill the grass just where it is put in but the fumes spread out around and soon kill subterranean insects and the *funes* do not damage the roots; except where the actual stuff comes

in contact with them, no harm is done. On the rest of the land I should give a dressing of nitrate of soda at the rate of  $2\frac{1}{2}$  cwt. to the acre.

“I am not quite certain as to the species attacking your land, until I hatch out some of the flies, but in two of our commonest kinds it is noticed that the grubs come on to the surface at night, especially on warm damp nights. When this takes place much benefit to grass land has been derived by rolling of a night. Of course this means extra expense, but it has often amply repaid the extra cost of labour in attacks on grass land. Certainly try rolling and bush-harrowing when the flies appear and use nitrate of soda.

“Although rape meal (or dust) keeps the grubs away from the roots, it nevertheless does harm in the end, for it, undoubtedly, attracts the insects wherever it is placed.

“Bisulphide of carbon is highly inflammable and the fumes are poisonous to man, so must be used with care.”

Corrosive sublimate was experimented with and where the land was thoroughly soaked with a solution of 1 oz. in 6 gallons of water, many, but not all, of the leather-jackets were killed. As these larvæ feed on roots, not earth, we must not expect the same benefit to be derived from its use as in earthworms.

The worm-killer referred to by Professor Hall is made as follows:—

Mercury perchloride . . . . .	10 lbs.
Hydrochloric Acid . . . . .	4 lbs.
Water . . . . .	6 lbs.

To dilute for use, use  $\frac{1}{2}$  oz. fluid to three gallons of water (= 1 in 1000). For worms on lawns it is an excellent remedy.

The secretary of the club wrote again in May and in this communication stated as follows:—

“We had thought of trying a small piece of ground with lime and gas water. The ground where the damage was done is undulating and we find that the higher parts have still some grass left whilst the lower parts are bare.”

Lime, unless put on hot, would not do much good.

These pests are always worse in damp low-lying parts of fields, etc. In some cases, damp areas which are, or rather were, always infested have been freed from these pests by drainage alone. The flies seek moist soil in preference, so fly to low-lying patches where the moisture collects.

### The Fire-brat (*Thermobia furnorum*) in an Hotel in London.

Information was asked by a correspondent regarding a pest at an hotel in London, identified by Mr. C. O. Waterhouse as *Thermobia furnorum*. This pest had been very troublesome and had got from the bakery to the upper floor. Steps were, however, soon taken by the management. The floor was taken up and spaces filled in with cement, woodwork painted with muriatic acid and sulphur burned in the bakery.

This was satisfactory treatment, for the secretary of the hotel wrote in January that "the steps taken to exterminate this pest, by sulphur, acids and live steam, and by filling up every nook and cranny in the basement with cement, appear to have been, at any rate for the present, efficacious."

*Thermobia furnorum* is one of the two British Lepismids; the common species being *Lepisma saccharina* or the Silver Fish.

The *Thermobia* is popularly called the "fire-brat" by bakers. It was recently found in bakeries at Cambridge and other places.

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### B. ANIMALS DESTRUCTIVE TO FURNITURE, BOOKS, DRAPERY AND CLOTHING.

#### The Larder Beetles damaging Hosiery sent to Japan.

A communication was received from a large firm of hosiers regarding the damage done to some goods that had been spoilt by insects and returned to them from Japan.

The insects that had damaged the parcels of underclothing sent to Japan and returned on account of the damage were beetles of two species, viz., (1) *Dermestes lardarius*, and (2) *Dermestes vulpinus*.

They are known under a variety of popular names, such as Bacon Beetles, Carpet Beetles, Store Beetles, etc.

They are both common warehouse pests in England and are frequently inquired about. These two *Dermestes* are found all over the world, being carried from place to place with merchandise.

They do most harm in their larval stage, but the beetles also cause serious loss. Almost all dry goods seem subject to their

depredations. They may exist almost anywhere, where they can find food.

In answer to another communication, in which the pest was stated to have been found in the warehouse belonging to the firm, the following answer was sent:—

The beetles (*Dermestes lardarius* and *D. vulpinus*) will breed and live amongst any organic substances. They certainly may feed upon paste, but I do not think it likely. It is almost impossible to say where they breed without seeing the surroundings. Thorough washing down with paraffin emulsion and then whitewashing would probably do good, but for store pests I think fumigation most successful.

“Three methods are employed, (1) Burning Sulphur, (2) Hydrocyanic Acid Gas, (3) Bisulphide of Carbon. The second is most successful, but has to be done carefully, the substances and fumes being deadly poisons to man.

“I enclose cutting from my report just appearing on this fumigation. Should you object to use it, then fall back on burning Sulphur.”

The beetles and larvæ sent were kept with the underclothing returned from Japan and it was found that they eat small areas of the woollen goods in the larval stage, but I could trace no damage done by the adults. As a rule the damage was caused by the larvæ eating small elongated patches, which disfigured the material. They bred readily in the articles sent.

### Furniture and Clothes Moths.

A correspondent at Clapton, N.E., wrote that “a sofa covered with a woollen fabric known as ‘saddle-bags’ has had for some year or so past certain bare patches, and only the other day I discovered on the surface of the sofa some larvæ of the Clothes Moths, which of course I immediately destroyed. In spite of all due precautions I have taken from time to time, viz., overhauling, brushing and placing insect powder in the crevices, the effects of the moth are gradually showing in other parts, and I am afraid of the covering of other articles of furniture in the room being attacked by this pest.”

To certain questions the following reply was sent:—

“With regard to the Clothes Moth larvæ that are damaging your furniture, I imagine them to be the *Tincola biselliella*, of Hummel; in any case the treatment would be much the same for all three species. With regard to your questions, I should advise spraying the

cloth of the furniture with benzine and soaking the parts where the larvæ are with the same every now and then. The benzine if good will do no harm to tapestry, but you must not put it on polished woodwork as it removes the polish.\* The benzine will keep the moths off for some time. For furs and fabrics in drawers and boxes naphthalene (lumps) put with the objects will keep the moth off. Furs, etc., should be frequently shaken and exposed to sunlight in May and June.

“Nothing but fumigating the rooms with sulphur, or bisulphide of carbon, will destroy the moths. The former will damage the gilt of picture frames, etc., and metal work; the latter is highly inflammable and must be used with care. I should advise in your case the use of benzine, which you can obtain from any chemists.”

### The Household Mite.

(*Glyciphagus domesticus*.)

This pest (Fig. 21) referred to in the First Report (p. 120) and the allied *G. spinipes*, seem to be widely distributed both in private houses and warehouses. A correspondent living at Kensington

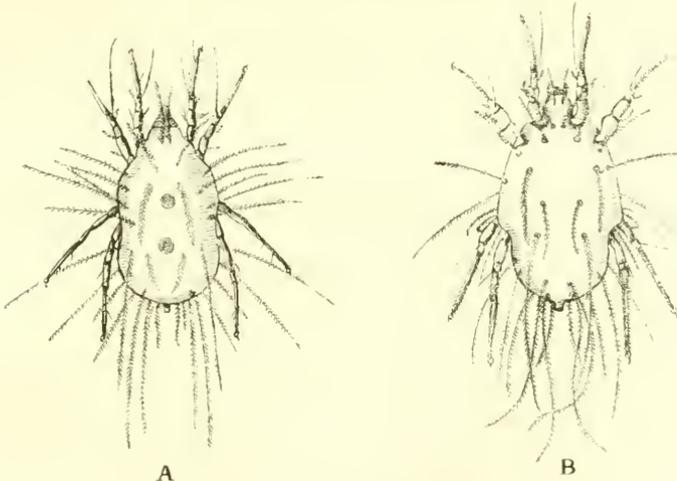


FIG. 21.—HOUSEHOLD MITES.

A, *Glyciphagus domesticus*, De Geer.

(After Albert Michael.)

B, *G. spinipes*, Koch.

Crescent, W., came to the Museum for information concerning this pest, which had been introduced into his house in some rush-bottom

\* Mr. C. O. Waterhouse tells me good benzine will not harm French polish.

chairs, and from them had invaded the sateen hangings on the walls. He stated that he had got rid of the chairs and had several times burnt sulphur in the room, but still found them in smaller numbers. He was informed that sulphur fumigation clears them out, and this has been found to be successful by many people, but it must be done as follows, namely (1) with complete air-tightness; (2) in a dry room; (3) the sulphur must be burnt twice or even three times at intervals of ten days, as the sulphur fumes do not affect the eggs of the mites, which must be allowed to hatch out.

Another gentleman left materials used in upholstering in November that were much infested with small mites. The various substances were examined, and I found the pest to be the Common Household Mite (*Glyciphagus domesticus*). There is little doubt that this mite lives mainly in the horsehair used in upholstery, feeding upon the unextracted juices. In this way we find they get into furniture—but the mites will feed on both dried animal and vegetable matter. Although they were found in braiding, canvas, wool, etc., left at the Museum, the horsehair had most.

It is now found that sulphur fumes alone do any good in killing mites. Rooms in which the mites are should be well fumigated with sulphur, the material infested baked or similarly fumigated and then the room cleared out. Two fumigations are necessary, the second ten days after the first, so as to kill those that come from the eggs.

### C. ANIMALS INJURIOUS TO FOOD AND STORES.

#### The Mediterranean Flour Moth.

(*Ephestia kuhniella*, Zeller.)

Information was sent regarding the damage caused by the above-named moth in a mill at Stratford-on-Avon. The correspondent stated that the pest was a great nuisance, clogging the rolls by spinning its cocoons and sometimes stopping them. The webbing of the elevators gets covered with them also and stops working. "I have two mills," writes the correspondent, "and they will not live in one that is damp." The insects causing the annoyance in the mill were the Mediterranean Flour Moth (*Ephestia kuhniella* of Zeller). This insect is a great scourge when it once gets into a mill, frequently clogging the rollers and blocking up the machinery altogether. It invaded England in 1886, and has since spread considerably, being

distributed over England and Scotland and to some extent Ireland. It is found in North America and Canada, in Chili, Australia and all over Europe. The larvæ block up the machinery by their habit of matting the flour or meal together with silk and forming when mature cylindrical silken cocoons in which they pupate. The larvæ prefer flour and meal and bran, but will attack grain and most cereals. It takes two months to complete its life-cycle in this country, but in America it seems to develop more rapidly, thirty-eight days being sufficient. Breeding keeps on all the year in mills—in well-heated mills as many as six generations may occur.

The only plan which is quite successful is fumigation of the whole mill with bisulphide of carbon. It is best to get a chemist to undertake this, as the substance is poisonous and inflammable, and to make a notification to the insurance company. Turning steam from the engines over the walls, machinery, etc., has been found to be beneficial, followed by whitewashing the walls and well scrubbing down the floors, all damaged stuff being burnt previously. The steam can of course easily be applied by means of a long hose. Flour, of course, must be moved and the machinery examined, latter to prevent rusting. Sulphur is not much good to use for fumigating and spoils all flour.

Cleanliness is said to prevent it; so it does, but constant fresh importations occur—coming in in sacks and bags used in the transport of the flour. Sacks and bags should be cleansed in some easy way, such as steeping in boiling water every time the pinkish white larvæ are noticed. It is almost necessary to shut down the mill for a few days and have everything cleaned out and burnt and then either apply the fumigation or steam. It is a troublesome and costly pest to cope with and half-hearted remedies are waste of time.

### **Diseases of Wine Corks.**

Little or nothing is known of the insect or other animal enemies of corks, and as will be seen by Mr. Masee's letter (p. 106), nothing regarding the fungi which also attack them. An enquiry was sent to the Museum concerning this subject from Dr. G. Newton Pitt, Renter Warden of the Armourers' Company, as follows:—

“I have been attempting, somewhat unsuccessfully, to learn something about the disease of corks in bottles which leads to the ullaging of wine. I presume the disease is due to the inroads of the maggot of some beetle. I should be glad to learn (1) what is the name of the creature, and also whether the corks are

infected before they are put into the bottle or afterwards; (2) what is the duration of life of the larva; (3) whether dipping the cork in wax is sufficient to kill the creature, or whether it is essential to recork the wine; (4) whether infection spreads through a cellar by the beetle laying eggs in the various corks, and if so, whether it is of any use disinfecting the cellar either by means of formalin or burning sulphur. I rather gather that the latter is no use, but I cannot find that anyone has ever tried the former.

"I should be very much obliged if you could inform me what is the proper treatment to adopt, as I find wine merchants differ considerably, and also if you could refer me to any books where I could learn more of what is really known.

"Possibly I am quite wrong and the whole process is due to development of fungus, because it seems to me that the wine becomes musty, and is evidently infested with fungus, and I suppose it is a question whether the fungus develops along the track of the insect or whether the whole disease is fungus *ab initio*."

To this the following reply was sent:—

I regret to say there is but little known concerning cork pests. The chief pest is the caterpillar of a small moth, *Oinophila V-flava*, one of the Tineid moths. This larva eats into the corks. The only records I can find concerning it are in the Transactions of the Entomological Soc. Lond., Proceedings, v., p. xxxv., and again, p. xli. The one is as follows: "Mr. Doubleday exhibited some larvæ of one of the *Tineidæ* which had destroyed the corks of a stock of wine so as to render it necessary to recork all the bottles." Again, "Specimens of *Gracilaria V-flava*, bred from the larvæ found in the wine corks previously exhibited by Mr. E. Doubleday. This insect, he remarks, until within a few years was very rare in collections, but had lately been found in plenty by Mr. Bedell in wine cellars. As it differs considerably from the other species of the genus *Gracilaria*, he proposed to separate it under the name of *Oinophila*."

Stainton, in his "Insecta Britannica," Lepidoptera, Tineina, p. 231, says it "inhabits wine cellars and wine vaults. The larva has been reputed to feed on the fungus which grows in wine vaults and also on the corks in the bottles, but further investigations are still wanted to fully elucidate the natural history of this singular insect."

This small moth occurs in cellars, etc., in July and August. It is from one-third to five-twelfths of an inch in length. The fore wings are fuscous, with an angulated yellow fascia in the middle and two yellow marginal spots beyond the middle.

The larva is dull whitish with a brownish dorsal line and pale reddish-brown head. The larva is found in May and June. It is recorded from Birkenhead, Bristol, Newcastle-on-Tyne, and London. I have found it in port wine corks at Wye. It probably occurs in most large cellars and vaults over the country, and is thus spread to the cellars in houses. I have noticed that the "frass" (*i.e.*, débris) collects around the top of the neck of the bottles where the corks are not properly sealed over. The moth undoubtedly lays eggs on the parts of the corks exposed, and will go on breeding in the cellar year after year. They will also lay the eggs on corks left about and apparently on fungi in the cellars as well, so a cellar should be disinfected to check them.

Although this is the chief cork pest, other insects are found in corks. Numerous beetles also occur, but it is not known how many go to devour the cork or to eat fungi or the larvæ of the Tineid Moth. Various species of *Cryptophagus* occur in cellars and feed on fungi, and sometimes occur in corks in plenty in company with the Tineid larvæ.

The beetles may be in the corks and eat their way out even through the wax. They may be in the corks before they are used for bottling or they may attack them afterwards.

With regard to your questions, all I can answer is as follows:—

(1). The name of the chief cork pest is *Oinophila V-flava*; corks may or may not be infected before being used.

(2). I do not know the length of life of the larva.

(3). The wine should be recorked.

(4). Infection spreads through a cellar by the pests laying eggs in the various corks.

I should disinfect the cellars when the moth appears in July and August now and again with sulphur. It is no good, of course, except when the moth is out. I do not know the effect of formalin. Corks should be well sealed over the neck of the bottles, and nothing but sound corks should be used. What part fungi play I do not know; I have written to Kew, and am told nothing is known on the subject of fungi attacking corks, nor what species the fungi are.

Dr. Newton Pitt replied as follows:—"I am much obliged to you for your kind answers to my inquiries concerning the diseases of corks which are the cause of *spoiling many thousand pounds worth of wine in London every year*. I am astonished to learn from you that really no one has ever taken sufficient interest in the question to study the matter and to decide what should be done. I learn that there is hardly a large wine cellar in London which is not troubled

with the disease, and that the cellars at Buckingham Palace are also infected.”

The following insects besides the Cork Moth have since been found either to attack or to be present, living on the devastating insects in corks.

The beetles or *Coleoptera* found are:—

I. *Rhizophagus bipustulatus*, F.

This has been found in corks brought from Burgundy. These beetles, of which there are sixteen European species, normally feed under the bark of trees and at sap, and mostly prey upon other larvæ. Some species seem to feed upon fungi. I fancy the one recorded here as attacking corks (which is normally found under bark) was in the corks, either feeding upon the moth caterpillars (*O. V-flava*) or fungi that attack the cork.

The larvæ of this genus are depressed and the head is narrow. Head and prothorax are usually reddish and the other segments are reddish on their basal half, whitish on their apical half except the last segment, which is entirely ferruginous, and furnished on its upper surface with two tubercles. Behind, the last segment is divided into two lobes, each of which terminates in three strong teeth variously arranged in the different species; on the upper side is a small anal appendage, which is used for progression. Most of these larvæ apparently prey upon other larvæ.

The pupæ are long and narrow, white in colour and have long silky hairs on the vertex and at the sides.

II. *Dermestes vulpinus* (The Larder Beetle)

Cork is frequently attacked by this species. A whole ship's cargo was destroyed by vast numbers of this beetle and its larvæ.

III. *Tenebrio molitor* and *T. obscurus* (Mealworms).

Both these beetles have been accused of devouring corks.

IV. *Mycetæa hirta*, Marsh.

This small beetle is common in cellars, especially old wine-cellars, where it feeds upon fungoid growths on the walls, etc. It is accused of attacks on corks in bottles. Its length is one-sixteenth of an inch, pale chestnut to reddish-brown, with rows of large deep punctures on the elytra, the whole surface is clothed with scanty long coarse hairs; the thorax with the sides rounded, with a curved

line on each side extending from the base to the apex. Antennæ with distinct three-jointed club; legs reddish, testaceous. The accusations against it are quite correct, for it frequently does much harm in its larval stage by tunnelling into wine corks. It is also found in refuse heaps, especially of hay and straw, in dung, especially stable dung, and in corn bins. Although it occasionally does much harm by tunnelling into corks, its normal food seems to be fungi, especially the fungus that grows round beer drippings on the floors of cellars.

It is recorded from most localities in the south and midland counties, and is especially abundant in the London district; in the north it is scarcer, gradually becoming more so in Scotland. It also occurs in Ireland at Dublin, Belfast, Waterford, etc.

V. *Atomaria nigripennis*, Payk.

This small beetle occurs in cellars; feeding on fungi; it is scarce and local, rare in the London district. It was taken in abundance in a cellar at Gloucester. It is  $1\frac{1}{3}$  to  $1\frac{1}{2}$  mm. long, with head and thorax bright red and the elytra black; antennæ red, a deep fold on each side of the thorax; the elytra are strongly widened before the middle, finely punctured, black, with the extreme apex and shoulder dull yellow; legs testaceous. It does not attack corks.

VI. *Orthoperus atomarius*, Heer.

A very small beetle,  $\frac{1}{2}$  mm. long, found with the previous species at Gloucester. It evidently feeds on mycelia, as one dissected by Professor Harker has the cesophagus full of chopped mycelium. It is pale testaceous, the sides and apex of the elytra rather darker.

It feeds on the fungus *Zasmidium cellare*, according to Professor Harker, and cannot be looked upon as otherwise than beneficial.

VII. *Cryptophagus cellaris*, Scop.; *C. erenatus*, Herbst.

Often abundant in cellars amongst refuse, fungi and heaps of corks; it also occurs in haystack and flood refuse. It is a small beetle varying from 2 to  $2\frac{3}{4}$  mm. long, ferruginous in colour, finely punctured and clothed with thick dense grey pubescence; on the elytra it is longer and arranged in rows; the rather long elytra are widened a little in the middle, thickly and finely punctured; legs testaceous. I feel sure it feeds only on débris and fungi and does not attack the corks in bottles.

Undoubtedly certain beetles lay their eggs in corks before they are used, because the wax has been seen perforated by the exit holes of some Coleopterous insect.

MOTHS OR *Lepidoptera*.

Besides the species mentioned on p. 100, two other small moth larvæ occur, namely, *Tinea cloacella* and *Laverna lacteella*, but not to any extent.

As seen in the following extract from the Transactions of the Entomological Society of London (vol. i., p. 55 of the Proceedings, 1835), an *Acarus* (sp.?), *Atropus lignarius*, Termites and Blattidæ, or Cockroaches, also attack corks.

*Account of the Attacks of Various Insects upon Wine Corks.*

By S. S. SAUNDERS, Esq., M.E.S.

The author states that a friend having occasion to remove his stock of wine from one cellar to another, found the corks of many of the bottles injured so that the wine had leaked, occasionally so much only remaining as was retained in the hollow of the bottles when lying down. The damage was confined to the bottles containing Shiraz (a Persian wine), and some Hock, which had been twenty years in the cellar. The corks of these bottles, although placed apart, were injured, the intervening descriptions of wine being untouched. On examining the corks, four species of insects were found in them, *Mycetæa hirta*, *Cryptophagus cellaris*, a minute *Acarus*, and *Atropus lignarius*.

The *Acarus* was found in some abundance within the crevices of the corks of both wines, and one specimen, which the author observed undisturbed for a length of time under a microscope, appeared to be engaged in burrowing into the cork, for which purpose the recurved claw at the extremity of the anterior legs appears adapted. The *Atropus lignarius* was not in any great abundance, and was observed running about the outside of the corks, none being found within them. Of the *Cryptophagus cellaris* a single specimen was alone observed among some corks which had been extracted and placed in a box during several months. A single specimen of *Mycetæa hirta* was likewise only observed, although in the account which Mr. Curtis has published of this genus (to which the author refers) it is stated that they were found in considerable abundance, and were also accompanied by a minute *Acarus*; the damage to the corks being supposed by Mr. Curtis to be caused by the larvæ of a moth.

It was further mentioned that the tops of the hock corks were covered with a coating of wax; but, as this did not extend down to the bottle, serving only as a mark, it was not serviceable in

defending the corks against the attacks of the insects. No larvæ of any kind were observed in the corks. The author then questions the correctness of Mr. Curtis's suggestions as to the introduction of the *Mycetæa* into the cellar with hay and sawdust, in consequence of a circumstance mentioned in the original letters of Dr. Henderson to Mr. Curtis coinciding in a singular manner with the observations of Mr. Saunders, namely, that the attacks noticed by Dr. Henderson were confined exclusively to Rhenish wines and the rare Shiraz, and consequently that it may be inferred that the *Mycetæa* has a peculiar taste for these kinds of wines. Kirby and Spence (Introduction, vol. i. p. 246) mention the attack of White Ants upon a pipe of fine old Madeira for the sake of the staves, which were probably strongly imbued with the wine, and perhaps thus rendered more agreeable to the taste of the Termites, and hence it is probable that the saturation of the corks by these two peculiar wines rendered them more palatable to the insects, whilst, for some reason, the corks of the other wines remained untouched. Indeed, the corks of a large stock of claret were injured, but only as far as that point where they remained free from all tincturing of the wine. These bottles were placed in the lowest range of bins in the cellars, and from the manner in which they were eaten, it appeared evident that the injury was caused by *Blattæ*, which, however, evidently did not relish the tincture of the claret, although they will attack almost everything. An instance is mentioned where they devoured the whole inside of a lemon after a thin slice of the peel had been taken off, leaving only the pips and fibrous particles untouched.

It was stated, in conclusion, that it was the intention of Mr. Saunders's friend to try the effect of successive fumigation of the cellar, by sulphur, for the purpose of destroying the insects which might still remain in the corks.

In reference to Mr. Saunders's paper, Colonel Sykes mentioned that the corks in his wine-cellar in London were, at the present time, attacked by the common Cockroach, and that it appeared that the insects preferred the corks of those wines which contained most saccharine matter. In India the *Blattæ* had especially attacked the corks of his Malmsey and Constantia wine-bottles.

Mr. Quickett, who was present as a visitor, mentioned that in Somersetshire *Blaps mortisuga* attacked the corks of sweet currant wine-bottles.

Mr. Sells noticed that the *Blattæ* will also eat the corks in porter-bottles; and Mr. Babington stated that he had found the larva (evidently that of a small Lepidopterous insect) in the cork of a port

wine bottle, which it had completely eaten so as to cause the wine to escape; and that it had made a small case for itself of bits of cork.

Mr. Hope mentioned that in India it was well-known that the *Blattæ* will not attack anything coated with *resin animé*, and which is accordingly employed as a defence against their attacks in covering the corks of bottles, etc.

The Lepidopteron referred to by Babiington was evidently the *Oi. V-flava*.

[Since first going to press, Dr. Newton Pitt has sent me the necks of some champagne bottles from the Armourers' Hall, all of which had leaked and become spoilt owing to infection of the corks. All five sent were of different brands of champagne, showing probably a common source of origin, which, evidently, was in the cellars of the company at Armourers' Hall. These specimens clearly showed the damage to be due to *Oinophila V-flava*, and, in one, I found the cocoon of the moth embedded between the cork and the upper part of the neck of the bottle. In all there was a distinct hole to the exterior.

There were also enclosed a number of *Psocidæ*, the so-called Death Watch and Book Mite Insects. These proved to be another species than that mentioned on p. 104—the common *Clothilla pulsatoria*. They feed upon cork, but do not do very much harm.]

#### OTHER ANIMAL PESTS.

##### *Crustacea.*

A single species of Woodlouse now and then occurs in cellars and devours corks, both when in bottles and loose; this species is known as *Oniscus murarius*.

##### *Mollusca.*

The large slug *Limax flavus* occurs in cellars and will feed on any refuse. It is accused, sometimes, of devouring corks and eating into those in bottles. Jeffreys, on the other hand, says, "they are sometimes useful in eating that kind of fungus which causes dry rot and another kind which infests cellars and makes choice port wine what is termed 'corked' ('British Conchology,' vol. i., p. 130, 1862) I have recently found numbers of this large species feeding upon the fungus formed round beer drippings."

Mr. George Masee writes from the Royal Gardens at Kew, that he "knows of no literature whatever on the subject of fungi attacking corks, and I have," he says, "no personal experience. Some years ago a similar question was asked at Kew by a wine merchant, but, although I asked for material, I did not receive any."

## The Cheese Fly.

(*Piophilæ casci*, L.)

In answer to a request for information concerning the Cheese Fly (*Piophilæ casci*) from Mr. C. W. Walker-Tisdale, of the Dairy Department, University College, Reading, the following Report was drawn up:—

The so-called Cheese Skippers or Jumpers are the larvæ of a small fly known as *Piophilæ casci*, Linn. Like most household animals, it is cosmopolitan.

The Cheese Fly is a small black glistening fly, about three-sixteenths of an inch in length, with transparent wings.

It lays its eggs in compact masses of 100 or more, and also singly. Often as many as twenty may, however, be found together. Exactly how many each female may deposit is not known; Miss M. E. Musfeld, the American authority, says thirty was the average number deposited by the females in her breeding-jars. The egg is white, slender, and oblong, and about one-twenty-fifth of an inch long. It may be deposited not only in cracks and crevices of cheese and in the curd, but also upon hams and bacon. The period of incubation seems to vary between thirty-six hours and four days, according to the climate and time of year.

The maggot or larva is creamy-white, cylindrical, narrowed to a point towards the front end and bluntly truncated posteriorly, with two fleshy filaments and two horny stigmata. The larvæ skip with considerable agility; this is done by bringing the two ends of the body together and then suddenly releasing them.

The maggot lives from seven to fourteen days, according to the time of year. When full-grown, the maggots reach from 7 to 9 mm. They then find some dry crack in the cheese, and become converted into a golden brown puparium, 4 to 5 mm. long. In about ten days the fly emerges, and starts a fresh generation. There are as many as three generations during the year. As a rule, the winter is passed by the maggot in the puparium stage, the larva changing into the pupa in the spring. It also seems that a certain number of flies hibernate in pantries, sheds, etc.

All windows where cheeses are kept should be closely screened, and made to prevent the flies from entering.

Mr. Walker-Tisdale pointed out "that the time it took the eggs to hatch out was very variable, and also the other stages of larva to fly."

## FUNGOID PESTS MISTAKEN FOR INSECT DAMAGE.

**Canker in Fruit-trees.**

The common disease "canker" (*Nectria ditissima*), in apple and other fruit trees, has recently been much on the increase, and several peculiar symptoms do not seem to be known by fruit-growers, or recorded in the literature. The symptoms so much resemble insect work that it is advisable to point them out here. The cases recorded were referred to the chief authority on the fungoid diseases of fruit trees, Professor Percival, Director of the Agricultural Department of Reading College. Mr. Neame's letter, reproduced here, gives an excellent idea of the symptoms:—"After the bud has started growing, it withers off and dies. This complaint seems to occur on spurs. The wood dies back for a small area around each spur affected. A few spurs were affected last year, still more this; three trees of 'Strumer Pippins' are affected at the corner of a small plot of thirty trees or so, those adjoining not. In another plot several trees are touched; it is not, I think, due to the frost. The sap fails right round the branch when a spur is attacked. The infection of the twigs seems to have taken place shortly after the blossoms were fully out."

There is a very decided resemblance between this attack of "canker" and the working of the Pith Moth; but a casual examination will show the presence of the caterpillar in the shoot when Pith Moth is present.

Regarding the "canker," Professor Percival advises as follows:—

It is important that all cankered shoots should be cut off and burnt, especially in young plantations. In old trees the cankered branches are often large, and it is difficult to recommend wholesale amputation in these cases; but, even in these cases, it is advisable to get rid of the most useless branches; they are a source of infection.

Some varieties are much more liable to the disease than others, and these varieties I have found are sorts which ripen wood very late in the season, and hence are liable to be damaged by frost during the winter.

In valuable trees it is advisable to cut away the dead cankered portions of the bark to healthy wood and bark, and paint the wound with Stockholm tar. But when the dead patch encircles, or nearly encircles the branch, cut it off altogether and burn, as a proper circulation of sap in the branch cannot go on long, and death takes place very soon after growth has begun in summer.

OTHER SHORT REPORTS SENT ON THE FOLLOWING SUBJECTS.

GROUP E.

*Sub-Group B (Section I). Agriculture: Fruit.*

- The Currant Aphis (*Myzus ribis*). Some diseased currant shoots were left by Mr. W. J. Hughes at the Museum from Hornsey, N. The following reply was sent:—"The currant foliage left by you last week was attacked by one of the Currant Aphides (*Myzus ribis*). These pests were being destroyed wholesale by minute flies (*Hymenoptera*) that act as a great check against Aphis increase. A pamphlet is enclosed dealing with this currant pest."
- Slugworm in Pear and Cherry (*Eriocampa limacina*). Insects sent by Mrs. Knight from Sittingbourne were the larvæ of one of the Sawflies, the so-called Slugworm of the pear and cherry. They were ruining the foliage of the cherries at Sittingbourne in August.
- Bud Moth (*Hedya ocellana*). Note sent by correspondent stating that he thinks some of the larvæ must hatch late in the year or in spring. (H. E. Getting, Esq., Ashfield Park, Ross.)
- Big-bud Mite (*Eriophyes ribis*) in Currants. Remedy asked for. (W. H. Hunt, Lingfield, Surrey.)
- Mite-free Stock. (J. Saul, South Meadow Lane Nurseries, Preston.)
- The Employment of Caustic Soda and Pearlash. (H. J. Stobart, Esq., Belbroughton, Stourbridge.)
- Beetle Mites (*Oribatidæ*) and Mussel Scale on Fruit Trees. (The Director, Royal Gardens, Kew.)
- Raspberry Moth (*Lampronia rubicella*). Information sent *re* remedy for same. This pest was abundant at West Malling. (J. B. Brooks, Esq., Ryarsh, West Malling, Kent.)
- Mottled Umber Moth (*Hybernia defoliaria*) on Fruit Trees. (Wm. Bear, Esq., Hailsham.)
- Grease-banding for Winter Moth. Regarding time to keep bands on. (R. Amos, Esq., Perry Court, near Ashford.)

*Sub-Group B (Section II). Horticulture.*

- Carrot Fly (*Psila rosæ*). The Carrot Fly has been most destructive this year owing partly to the excessive moisture; several enquiries have been received from different parts. The leaves very soon turned prematurely to the autumnal colour, a sure sign of the attack, and the excessive moisture soon caused them to decay, whole beds having been destroyed during the latter part of the summer. Such beds should be heavily trenched in winter and dressed with gas lime.
- Tomato Diseases. (Wm. Bear, Esq., Hailsham.)
- Injectors for using Bisulphide of Carbon in hops. (M. Ballard, Esq., Byden Place, Tovil, Kent.)

## MEALY BUG IN VINE.

A correspondent wrote from Great Staughton, stating that Mealy Bug has got on to the vines from imported plants, and asking advice. The following was sent:—

“The best thing your gardener can do is to go carefully over the vine and paint the patches where the Mealy Bug has taken up its abode with a fine brush dipped in turpentine, which soon kills them. It should be done at once, and again when all the grapes are cut.

The best plan is to fumigate the house with hydrocyanic acid gas, but it is a trouble and wants doing very carefully, and in a small vinery I think going over by hand will be just as successful.”

## DISEASE IN BEGONIAS AND GLOXINIAS.

Some Begonia and Gloxinia leaves sent from Milford, near Godalming, were blotched and diseased; the correspondent stated many were thus attacked and spoilt.

The damage was evidently due to insects, as the punctured tissue is plainly noticeable. Two insects were present, but only very few specimens: viz. (1) a yellow *Thrips* with black wings; and (2) a single *Aphis* in larval state.

I fancy the damage is due to the *Thrips*, which is a very small species not known.

Under the circumstances it is well to syringe with plenty of water with a little tobacco extract in it, and an ounce of soft soap to every two gallons of water.

*Sub-Group B (Section III). Forestry.*

Oak Gall Fly (*Andricus sieboldii*) reported on thorn. (H. F. Getting, Esq., Ashfield Park, Ross.)

Ermine Moth (*Hyponomeuta evonymella*) attacking Euonymus. (F. Kirby, Esq.)

EXTRA-BRITISH (pp. 111 to 122).

GROUP A.

Animals captured or slaughtered by Man for Food, or for the use by him in other ways of their skin, bone, fat, or other products.

Suhleah and Mango Fish (*Polynemus*).

In response to a request from the Calcutta Museum for any additional information for their Report on the "Chief Indian Animal Products and Industries" compiled by the Reporter on Economic Products to the Government of India (Dr. George Watts), the following information was sent on the Mango Fish:—

Reference, "Parbury's Oriental Herald," December, 1838, letter on the Suleah Fish of Bengal.

*Polynemus selo*, and the isinglass it affords. The letter states that this fish attains about four feet in length. Meat coarse, converted, when salted, by the natives into "burtah," a piquant relish well known at the breakfast table in Bengal. The bladder may be considered the most valuable part; it varies in weight from  $\frac{1}{2}$  to  $\frac{3}{4}$  of a pound when dried. This fish abounds in the channel creek off Sangor and in the mouths of all the rivers which intersect the Sunderbuns.

This fish is the *Polynemus selo* of Hamilton's "Fishes of the Ganges." An individual weighing two pounds would yield 65 grains of pure isinglass. When this was written the price of isinglass in India was £1 12s. per pound.

*P. risna*. Another species is the "Tupsee" or Mango Fish. The name used for this fish by Hamilton, in his "Fishes of the Ganges," is *P. risna*—the *P. longifilis* of Cuvier. Presumably this is the *P. paradiscus*, Day, referred to in the list.

## GROUP D.

Animals which concern Man as causing bodily injury, sometimes death, to him, and in other cases disease, often of a deadly character.

### The Natal Maggot Fly.

(*Bengalia depressa*).

The following information has been received from Mr. F. P. Mennell, of the Rhodesian Museum, Buluwayo:—

“Like so many other undesirable insects, *Bengalia depressa* seems to have its headquarters in Rhodesia, and its attacks have lately attracted considerable attention. It also ranges into British Central Africa and Uganda. Round Buluwayo, 4500 feet above sea level and 400 miles from the nearest point on the coast, it is common and has a special native name which I cannot at the moment put my hands on, while at Salisbury (5000 feet) it is an even more serious nuisance.”

Particulars regarding this noxious fly may be found in the Proceedings of the Rhodesia Scientific Association, vol. iv., pt. i., pp. 7–9. The fly attacks dogs and other animals, but its attacks on man are frequent, children, especially infants, being usually the sufferers. The fly deposits its eggs in the hair or the clothing, the latter being apparently often selected when hanging out to dry, so much so that in certain parts of tropical Africa it is dangerous to wear woollen clothing next the skin.

The eggs appear to hatch out almost immediately and the larvæ then bury themselves under the skin, where they give rise first to swellings and then to inflammation, which become so painful, owing to the movements and excreta of the creatures, as to throw the patient into a violent fever. I believe that, if undisturbed, the larvæ emerge in the course of about a fortnight and that pupation takes place on the ground. The fly itself is very sluggish and does not move about on windy days. It has, indeed, been suggested that their attacks take place at night, but I have had them settle on me in the day-time and have found them very difficult to drive away, but easily killed when they settle.”

## Human Ticks in Uganda.

Dr. Aubrey Hodges forwarded some Ticks (*Ixodidae*) from Uganda that are undoubtedly connected with a violent form of fever in natives which is usually fatal, and which was noticed some time ago by Dr. Hodges.

The tick was identified by Mr. Pocock as *Ornithodoros monbata*, Murray.\*

Its connection with the fever has also been noticed by Dr. Christy.

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## G R O U P E.

### SUB-GROUP A. ANIMALS WHICH CAUSE BODILY INJURY OR DISEASE TO MAN'S STOCK OF DOMESTICATED ANIMALS.

#### Biting Horse Flies in Central Africa.

Some biting Diptera which were great pests to horses were brought to the Museum by Lieut.-Col. Griffiths, D.S.O., Chief Veterinary Officer of the Sudan. Two of these flies were identified as (i) *Glossina morsitans*, the Tsetse Fly, and (ii) the Scrut Fly, *Tabanus dorsovittus*, Walker. The third species was much damaged, but was evidently a *Stomoxys*. The Tsetse Flies were taken on the Pongo River, the *Tabanus* at Fashoda, and also the *Stomoxys*. The biting Diptera are a cause of great annoyance and loss amongst transport animals in the Sudan, especially attacking the animals around the eyes and nostrils, often making transport impossible.

Sponging the animals with paraffin not having met with success, a further experiment is being carried out.

Several drivers in the Bernese Oberland told me bruised walnut leaves rubbed over the horses kept the flies from biting, including the large Gad Flies. In one or two cases observed this certainly seemed to be the case. At Colonel Griffiths' request, I offered to send five sacks of walnut leaves for him to take back to the Sudan with him.

The leaves, owing to incessant rains, were so moist that they

\* Professor Neumann informs me the right name for this tick is *O. Savignyi* (Andouin). Numerous living specimens have been received from Dr. Milne from Uganda, which severely attack man there, and are connected with a fever, which belong to variety (*cæca*, Neumann) of this species.

could not be sent in sacks. They were therefore boiled down (three sacks), after being crushed, and produced a rich, brown, acrid extract amounting to 18 gallons of fluid, which was dispatched in two nine-gallon sweet beer barrels, with a hope that some benefit may result from the acrid property it contains. A similar extract, I find, can be obtained from the dry leaves just as in tobacco, and a still stronger one from the shucks of the fruit.

Should this primary experiment be in any way successful, it will be given a fresh trial under more favourable circumstances, the extract having been made hurriedly in an old brewing copper in twelve hours.

### A Fowl Tick in Western Australia.

The Acting Director of Agriculture of Western Australia forwarded some ticks that were doing considerable harm to poultry in that region.

The species is probably the American Fowl Tick (*Argas americanus*, Packard), but owing to being dried up they could not be definitely identified.

An account of this Fowl Tick (*Argas americanus*) is given by Mr. Froggatt ("Agricultural Gazette," New South Wales, November, 1901, Miscellaneous Publications, No. 520).

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## SUB-GROUP B. ANIMALS WHICH CAUSE INJURY OR DISEASE TO MAN'S VEGETABLE PLANTATIONS.

### The Cotton-Boll Worm.

(*Heliothis armiger*, Huebner.)

Information has been sent to the United States Department of Agriculture on the Cotton-Boll Worm (*Heliothis armiger*, Huebner) in India and Australia in answer to the following communication:—

"In view of the recent serious injury by the Cotton-Boll Worm (*Heliothis armiger*, Huebner) in certain sections of the cotton belt of the United States, the Division of Entomology of this Department has undertaken a renewed investigation of this pest. In this connection it has appeared desirable to learn as much as possible concerning the status of the insect in other countries, particularly with reference to its economic importance and of the methods employed in its control.

“Several topics are presented on the enclosed sheet about which information is especially desired, and I shall be very grateful if you will have the kindness to give them your consideration and answer as fully as possible, etc.”

The following records were forwarded to Professor Howard:—

#### IN INDIA.

Occurrence recorded from Chingleput district, Janjore district, Azamgarh, N.W.P., Cawnpore, Bengal, Kersari in Patna, Ceylon.

Food plants: Rice, poppy, paddy, ganja, in safflower, cotton, Cape gooseberry, hemp, grain and rabi.

Seedling paddy plants, stems of rice; cotton is attacked at Cawnpore, hemp in Ceylon.

The damage in India seems to be done to immature cotton plants.

#### IN AUSTRALIA.

Occurrence: Western Australia and Victoria.

Food plants: Cereals, tomatoes, peas and *Acroelinum roscum*.

#### *Methods used to prevent Injury.*

Trenches dug round wheat and oat fields. Poisonous compounds are placed in these trenches in Western Australia. Poison baits are used as for “Cut-worms” and Paris green wash.

## The Mexican Cotton Boll Weevil.

(*Anthonomus grandis*.)

This Weevil was forwarded by Col. Sanderson, to whom specimens had been sent asking for information, owing to the great damage it has been doing in South-west Mexico. Col. Sanderson says in his letter that it gets into the “boll” of the cotton, and is destroying hundreds of thousands of acres.

This Weevil is one of the worst cotton pests. It is found in cotton fields throughout the season, and punctures and lays its eggs in both the “squares” and “bolls.” The eggs hatch into larvæ, which are creamy-white and footless, and which reach when mature three-eighths of an inch in length. The maggots feed inside the buds and bolls. The squares attacked usually drop, but most of the damaged bolls remain upon the plant and are always stunted, except late in the season, when they either dry or rot.

The insect passes the winter in the Weevil stage. It can be

found upon the cotton plant until late in December. It is found most abundantly in the early winter hidden between the involucre and the boll, and later in the dry and open bolls. When the plants are cut, or when the bolls rot and decay, the Weevils seek shelter amongst rubbish on the surface of the ground, and amongst weeds, etc., and remain there until the warm days of spring, when they fly to such volunteer plants as may be up; upon these they feed and lay their eggs upon the early squares. They then attack the young cotton crop, and by their punctures, either for feeding or egg-laying, cause a wholesale shedding of the young squares. The life-cycle takes, it seems, four weeks. When the bolls form, the Weevils also attack them and oviposit in them, and the larvæ live in the interior just as they do in the "squares," but the bolls do not drop. There is a constant succession of generations from spring until frost sets in. A single larva usually occurs in a "square"; as many as twelve may occur in a "boll." The punctures made by the Weevil are comparatively characteristic, and where a boll is discoloured and has begun to crack at the tip the larva or pupa can be seen. Later the Weevils can be found between the involucre and the boll; when no Weevils are present, the yellow granular excrement which collects at the base of the boll is a good indication of their presence.

#### REMEDIES.

(1) Trapping overwintered beetles by means of a few early planted rows of cotton plants, a row or two across the middle of every twenty acres.

(2) Destruction of volunteer plants in corn-fields or abandoned fields.

(3) Picking fallen squares as fast as possible, from the time the squares are formed in the plant.

(4) Cutting and burning the cotton stalks as early in the fall as practicable, and, if possible, ploughing the fields at the same time.

(5) Trapping the last Weevils in the field by means of a few plants left standing.

(6) Spraying is effectual if the nozzles of the spraying-machines are distributed vertically, not, as usual, horizontally.

The spray recommended is (No. 1) for trap rows:—Two gallons cane molasses; 2 ozs. arsenic (90 per cent.) boiled in one gallon of water until dissolved; 4 ozs. arsenate of lead dissolved in a gallon of water; 46 gallons water.

(No. 2) Main crop or midsummer formula to be used as soon as

the squares are forming freely:—One gallon cane or sorghum molasses; 1 oz. arsenic (90 per cent.) boiled in one gallon of water until dissolved; 6 ozs. of arsenate of lead dissolved in a gallon of water; 47 gallons of water, and mix well.

The times to spray are as follows:—Once before the squares are formed upon trap rows with No. 1 solution; then the main crop, first with No. 1 solution; then every week up to midsummer with No. 2 solution; later once in every two weeks is sufficient.

Spraying and trapping combined will probably soon check the ravages of this pest.

### Cockchafers (*Lachnosterna*) damaging Mulberry Trees in China.

Some beetles sent by Mr. F. W. Slynan to Mr. C. E. Fagan reported as damaging the mulberry trees in the silk district, Shanghai, proved to be one of the family of Cockchafers (*Melolonthidae*) and belong to the genus *Lachnosterna*. The species cannot be identified at the Museum. It is probably a new species. Most likely the larvæ feed upon the roots of trees, shrubs, etc., just as do those of the Cockchafer found elsewhere.

The leaflet (No. 25) on Cockchafers issued by the Board of Agriculture was sent to Mr. Slynan, as the methods of collecting the beetles would be the same in China as in this country.

### The Melon Bug.

(*Aspongopus viduatus*, Fabr.)

Some bugs (*Aspongopus viduatus*, Fabricius), attacking melons, etc., at Khartoum, have been sent from Dr. Balfour, Director of the Wellcome Laboratories, Khartoum.\*

This is a very variable hemipteron, and is found all over Africa, and in the island of Sokotra, according to Mr. Distant, but Kirkaldy says ("Natural History, Sokotra," p. 389) that the Sokotran *Aspongopus* is *A. assar*, Kirkaldy.

Another species, *A. nubilis*, Burm., attacks melons in Bechuana-land and Orange River Colony.

The remedy is shaking off the bugs into pans of paraffin or tar early in the year, when they first make their appearance. The females (gravid) that have wintered are then destroyed, and so the hosts of young that they give rise to are prevented from appearing.

\* This bug is also recorded as spoiling the leaves of batikle and gaûn at Luxor.

Land that has been infested with these bugs should have all litter burnt in the hibernating season, and all infested plants should be pulled up and burned.

Paris green, which has been used, is quite useless for sucking-mouthed insects, and these bugs are too powerful to be affected by paraffin emulsion, but they can soon be cleared out by shaking into pails, if this is done when they first make their appearance.

### Insect Pests of Egypt.

Little is known regarding the insect pests of Egypt. Mr. F. Fletcher, of the School of Agriculture, Gizeh, has collected many, and will issue a report on the same.

Numerous specimens have arrived and been identified at this Museum, some too damaged to identify, but the following have been named:—

<i>Agrotis ypsilon</i> , Rott.	<i>Trilobium confusum</i> .
<i>Chaerocampa celerio</i> , L.	<i>Calundra oryzae</i> .
<i>Nomophila noctuella</i> , Sch.	<i>Tenebrioidea mauritanicus</i> .
<i>Euzophora ossatella</i> , Hübn.	<i>Sitones lineatus</i> .
<i>Heteronychia</i> sp. ?	<i>Dactylobius</i> , sp.
<i>Agrypnus notodontæ</i> , Latr.	<i>Otiorynchus alutaceus</i> .
<i>Hopatum famelicum</i> , Oliv.	<i>Ichneumon</i> sp.
<i>Aulacophora foveicollis</i> , Küster.	<i>Euzophora ossatella</i> , Fr.
<i>Plusia circumflexa</i> , L.	<i>Leucanium lorenzi</i> , Dup.
<i>Earias insulana</i> var., Beisd.	<i>Laphygma exigua</i> , Hübn.
<i>Lixus nubilosus</i> , Bohem.	<i>Oxycarenus hyalinipennis</i> , Costa.
<i>Gonia vulpinus</i> , Walk.	<i>Hypera variabilis</i> , Herbst.
<i>Hippobosca equina</i> , L.	<i>Himatismus villosus</i> , Haag.
<i>Pieris rapæ</i> , L.	<i>Pedinus</i> sp.
A Chalcid Fly (sp. ?).	<i>Coccinella undecimpunctata</i> , L.
<i>Laphygma exigua</i> , Hübn.	<i>Crossotus phillipsi</i> , Gahan.
<i>Chrysope perla</i> , L.	<i>Plusia gamma</i> , L.
<i>Euxoa spinifera</i> , Hübn.	<i>Prodenia littoralis</i> .
<i>Colias edusa</i> , L.	<i>Chloridia nubigera</i> .
<i>Sesia myopiiformis</i> , L.	<i>H. canis</i> , Leach.
<i>Acrotylus insubricus</i> , Scop.	<i>Aspongopus viduatus</i> , Fab.
<i>Ephemeræ</i> sp. ?	<i>Nezara viridula</i> , Linn.
<i>Xystroceræ globosa</i> , Oliv.	<i>Ptosima undecimmaculata</i> , Herbst.
Aphides not yet determined.	<i>Phyllotreta crucifera</i> , Goeze.
<i>Bruchus pisi</i> , F.	<i>Plutella maculipennis</i> , Fab.

There are thus seen to be several European pests found as such in Egypt, including the Cabbage White (*Pieris rapæ*); the Clouded Yellow (*Colias edusa*); the Cabbage Flea (*Phyllotreta*

*cruciferae*); the Diamond-back Moth (*Plutella maculipennis*) and the Silvery-Y Moth (*Plusia gamma*).

The Aphides are in the hands of the Department of Agriculture of the United States. The Coccidæ, which are dealt with separately, have been examined by Mr. Robert Newstead, and a new species is described (*vide* Appendix). Mr. Fletcher is issuing an account of the life-history of the Egyptian pests.

### Insect Pests of the West Indies.

Further names of insects of economic importance in the West Indies have been sent since the First Report on Economic Zoology was issued as follows:—

*Chrysopa* sp. (being examined).  
*Megilla maculata* var., de Geer.  
*Dilophonota ello*, Linn.  
*Tomarus bituberculatus*, Bean.  
 Three sp. ? of Platypus.

*Exochomus nitidulus*, Fab.  
*Chetocnema amazonicus*, Baly.  
*Epitrix parvula*, Fab.  
*Corythaica monarcha*, Stal.  
*Scymnus ochroderus*, Muls.

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## GROUP F.

SUB-GROUP A. ANIMALS WHICH CONCERN MAN AS BEING DESTRUCTIVE TO HIS WORKED-UP PRODUCTS OF ART AND INDUSTRY, SUCH AS HIS VARIOUS WORKS, BUILDINGS, LARGER CONSTRUCTIONS AND HABITATIONS.

### Termites destroying Houses in the Basses-Pyrénées.

Information has been sent to C. Drummond Wolff, Esq., of Caplanne, Billère, Pau, Basses-Pyrénées, who wrote regarding the best plans to adopt to save certain of his houses that were being destroyed by White Ants. "I have," he says, "three houses here standing in about 18 acres of ground. We have recently discovered that one of them is infested with Termites (White Ants), and all the woodwork is so much dust. We are advised to pull down the house, but that would mean losing some £300 a year. Nobody seems to know how to destroy them. I suggested corrosive sublimate, but I do not know how to make it penetrate throughout, if, indeed, that is efficacious."

In answer to this and further correspondence the following report was sent :—

“ There are two species of White Ants found in Southern Europe, namely, *Calotermes flavicollis* and *Termes lucifugus*. The former inhabits the neighbourhood of the Mediterranean Sea. They dwell in the branches and stems of decaying and dead trees and obtain their nourishment from the wood where the decay is not far advanced; they live inside the stems. No special habitation is made by this species.

“ The species damaging your houses is probably *Termes lucifugus*. This species also burrows into wood of various kinds and is well known to attack furniture and habitations. It excavates the woodwork it attacks and also makes galleries, beneath which it can move from place to place without being exposed.

“ With regard to destroying them, the first thing to do is to find out the nests and galleries. These may be actually within the house or may be in old stumps or trees outside. If you can find out their abodes then they are easily killed by putting into their galleries every here and there arsenic mixed up with syrup; they feed upon it and are soon killed, others come along and eat the dead bodies and are thus also killed and so on again and again until the colony is destroyed.

“ Another plan recommended is to pour kerosene or carbolic down crevices in woodwork, etc., where they are working, but, I believe, this only drives them elsewhere. Riley suggested injecting steam or boiling water wherever an opening seems to lead into their burrows in timber. Ground woodwork through which they commence their attack should be soaked in arsenious soda dissolved in mineral oil. Houses where these pests occur should never have wood nearer than two feet from the ground and no creepers up them or they are sure to be attacked. All dead stumps of trees and decaying timber around houses should be burnt, as the attack often originates from such sources.

“ It is impossible to tell where White Ants are at work in wood if it is hidden, such as underground work, but one can usually tell where wood is exposed both by tapping and listening with the ear close against the woodwork. A thin steel would easily penetrate attacked wood and a small hole made and arsenic and syrup squirted in with a syringe would destroy them.

“ If the house is not very badly damaged the spoilt woodwork could of course be replaced, and, if this is done, I would certainly treat it first with arsenious soda.

"I feel confident if you locate the nests and galleries (and probably only a few exist), that with the arsenic syrup you will get rid of the pest."

A Report on these pests in the Sudan has been published in the "First Report on Economic Zoology" (pp. 158-163).

#### OTHER SHORT REPORTS SENT.

INSECT DESTROYING TELEGRAPH POLE.—The piece of telegraph pole brought by Lady Thiselton Dyer from Mentone and sent to the Director of the Museum was tunnelled by the Carpenter Bee (*Xylocopa violacea*, Scop.), a large black bee with iridescent violet wings, common in Southern and parts of Central Europe.

PARASITES IN THE CABBAGE WHITE BUTTERFLY IN CYPRUS.—A specimen of the larva of the Large Cabbage White was sent to Miss Bate attacked by hymenopterous parasites. They had killed the larva and proved to be *Microgaster glomeratus*. The maggots of the latter live in the butterfly caterpillar until mature; then they work their way out and spin the little yellow cocoons so commonly seen surrounding the dead cabbage white butterflies in this country. This parasite does a great deal of good in keeping those destructive creatures down.

AN AMERICAN ROSE CECID.—A minute *Cecid*, found on the rose in Illinois, U.S.A., was sent for identification by Professor F. M. Webster. The *Cecid* answers to those I have bred from roses over here and what I identified as the *Cecidomyia rosarum* of Hardy, the *C. rosæ* of Macquart and Bremi. The larvæ of this species live in small swellings on the back of the leaves of cultivated and wild roses. The American pest is a different species (*Neocerata rhodophaga*, Coq.), and attacks the rose-buds. A report with coloured plate is being prepared by Professor Webster.

LADY-BIRD ENEMIES OF THE DHURRA APHIS IN SUDAN.—Two Lady-birds prey upon the Dhurra Aphis in the Sudan—(I.) *Chilomenes vicina*, Muls; (II.) *Coccinella undecimpunctata*. The larvæ feed upon Aphis as well as the adults. These specimens were sent by Dr. Balfour, Director of the Wellcome Laboratories, Khartoum.

PARASITIC COCKROACHES (*Hemimerus hauseni*, Sharpe).—Some parasitic Cockroaches were sent by Dr. Dutton, which were taken by him on *Cricetomys gambianus*. The curious Cockroach-like insects which he found on the large rat-like *Cricetomys gambianus*, in

Senegal, are species of the Orthopterus family, *Hemimeridæ*, of which little is known. They come near the *Blattidæ* or Cockroaches, and form a connecting link between them and the *Forficulidæ* or Earwigs. There are only two species known, and both are apterous insects.

Walker described one species from West Africa as *Hemimerus talpoides*. Hagen, the most recent observer, undoubtedly describes another, which Sharpe calls *H. hanseni*. The ones taken by Dr. Dutton are that species. Hansen's species was found on the rat-like *Cricetomys gambianus* in Equatorial West Africa. It occurred on a few specimens only of the mammal, but when found was present in considerable numbers. It is recorded as running rapidly amongst the hairs, and it is said to spring. The young are born inside the mother, six at a time. What they feed on, their structure and economy, require working out. They may be parasitic on other animals as well.

WORMS SP. IN THE HEAD OF THE COMMON FLY IN INDIA.—(Col. A. Sanderson, Jersey.)

EXPERT ADVICE ON FORESTRY IN THE ORANGE RIVER COLONY.—(Mrs. H. F. Tylden, Chillham.) Advice was given to refer to Mr. F. B. Smith, Administrator of Agriculture for the Transvaal.

WINDOW FLIES AND OTHER HOUSEHOLD DIPTERA FROM NIGERIA AND THE LIFE-HISTORY OF *Simulium*.—(Dr. Annett, School of Pathology, University College, Liverpool.) A general account sent.

DHURRA APHIS IN THE SUDAN.—A serious attack still under investigation. (Dr. Balfour, Gordon Laboratories, Khartoum.)

*Phylloxera corticalis* ATTACKING AND KILLING OAKS IN THE VAAL, SOUTH AFRICA.—(Mr. Lounsbury, Government Entomologist, Cape Colony.) (Under investigation.)

AN EUROPEAN APHIS (*Callipterus quercus*, Kalt.) ATTACKING OAKS IN CAPE COLONY.—(Mr. Lounsbury, Government Entomologist, Cape Colony.)

PART II.

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REPORTS ON AGRICULTURAL ZOOLOGY

TO THE

BOARD OF AGRICULTURE.



## BRITISH.

## GROUP D.

Animals which concern Man as causing bodily injury, sometimes death, to him, and in other cases disease, often of a deadly character.

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## Mosquito annoyance near Bristol.

An insect, sent by Mr. W. B. Royce, of Bristol, that has caused annoyance near that place for the last five years is a true Mosquito — one of the *Culicidæ*. It was the *Culex diversus* (Theobald), so far only recorded from Tunbridge Wells and Great Staughton (and recently from Epping Forest). (*Vide* p. 4.)

Nothing is known of its life-history, but we may safely assume that it is now about to deposit its eggs. The larvæ will most likely be found in small collections of water. These so-called “wrigglers” should be searched for during the next few weeks, and all pools found to contain them should be treated with paraffin to kill the larvæ. It may be pointed out that mosquitoes breed only in water, and therefore cannot have been carried to the locality in the manure shipped to Avonmouth, as supposed.

## Swarms of Flies bred in House Refuse.

An enquiry was sent to the Board, asking for information as to how to destroy the swarms of flies that are breeding in the huge masses of dust-bin refuse in certain London suburbs.

“The annoyance caused in houses by flies which breed in large heaps of ‘house’ and ‘dust-bin’ refuse in certain of the suburbs of London, referred to by Mr. Wain, may possibly be lessened, as he suggests, by applying some soluble repellent.

“Nothing has actually been recorded on this subject; but in the case of the House Fly (*Musca domestica*), which breeds mainly in horse manure, lime spread over the heaps of manure has stopped the fly depositing its eggs.

“In any measures taken to stop the annoyance caused by these flies, it would be well to use creolin: in the crude form it is very cheap, and its effects are more lasting than any other substance that can be employed on a large scale. It should be sprayed over the refuse-heaps twice at intervals of a few days.

“It will probably act not only as a repellent of the flies and so stop them depositing their ova, but will destroy the larvæ it comes in contact with.”

## G R O U P E.

### SUB-GROUP A. ANIMALS WHICH CAUSE BODILY INJURY OR DISEASE TO MAN'S STOCK OF DOMESTICATED ANIMALS.

#### Ox Warble Flies.

(*Hypoderma lineata*, Villers, and *H. bovis*, de Geer.)

The following information was sent to the Board concerning Ox Warble Flies:—

“For some time past the Ox Warble Fly has been recognised as a serious pest in Great Britain. The enormous losses, estimated by Miss Ormerod at £700,000 per annum in some years, have been now much reduced, owing to the measures taken by farmers and graziers.

“The exact amount of loss cannot be gauged; but it still must be considerable, judging from the number of ‘Warbled’ beasts one sees in some parts of Great Britain.

“The Warble Fly that was supposed to occasion all this loss was said to be the *Hypoderma bovis* of de Geer. Although this species occurs in this country, it is not the chief culprit. The commoner *Hypoderma* is undoubtedly *H. lineata*, Villers, and from observations made during the past year the greatest amount of damage seems to be done by this species; in some districts entirely by it, but in others both may occur in the same beast. In most collections we find *lineata* and not *bovis*, and most (94 per cent.) of the larvæ examined by me during the past few years have proved to be that species.

“*H. bovis* does not occur in America, at least, it has not so far been recorded. Probably it occurs in small numbers; at least, it will be strange to find that one has been introduced and not the other, for

both are apparently European. It may be, however, that *H. lineata* is natural to both Continents."

The differences between the two species are pointed out later.

The life-history of *H. bovis* is, I feel sure, not completely known, but that of *H. lineata* is, and it is probable that the various phases of development are the same in both species.

The *Æstridæ* to which the Warble Flies belong are two-winged flies or Diptera, which are all parasitic in their larval stage upon and within mammals (*H. lineata*, *Æ. bovis*, *Æ. equi*, etc.) and man (*D. novialis*).

#### DAMAGE CAUSED BY OX WARBLER.

The damage caused by these pests is due both to the imagines or adult flies and to their larvæ or "bots." The flies, by frightening stock when on the wing and on the look out for a host on which to deposit their eggs, frequently cause loss amongst "in-calf" cows by making them stampede about the fields, as also in other ways.

The maggots or "bots" living beneath the skin perforate the hide, and so ruin it when present, as they often are, in considerable numbers. They also cause loss to the butcher, who often finds the flesh beneath the "warbled" areas so altered by the inflammation set up by the parasites that the beef in that region is spoiled. This so-called "licked beef" has a straw-coloured, jelly-like appearance in a newly-slaughtered carcase, but it turns to a dirty green in a few hours.

Lastly the farmer and grazier may suffer direct loss by the actual death of the affected stock, from inflammation set up by the parasites when present in large numbers.

#### LIFE-HISTORY OF *H. lineata*.

The life-history of this species is now well known.

The fly deposits her eggs upon the hair of the beast, particularly on the legs, just above the hoofs, hence a common name for this fly in America, the "heel-fly," but they are also placed elsewhere. The eggs are fastened to the hairs, usually several together. The egg is of a peculiar shape (fig. 22, *e*), and is about one-twelfth of an inch long; each egg immediately it is laid by the female is firmly attached to the hair by a process which clasps the hair. The animal licks the place where these eggs are placed, and the larvæ hatched from them are carried by the tongue into the mouth.

The maggots pass into the gullet or œsophagus and soon penetrate its walls; then they moult their skins, become smooth, and wander

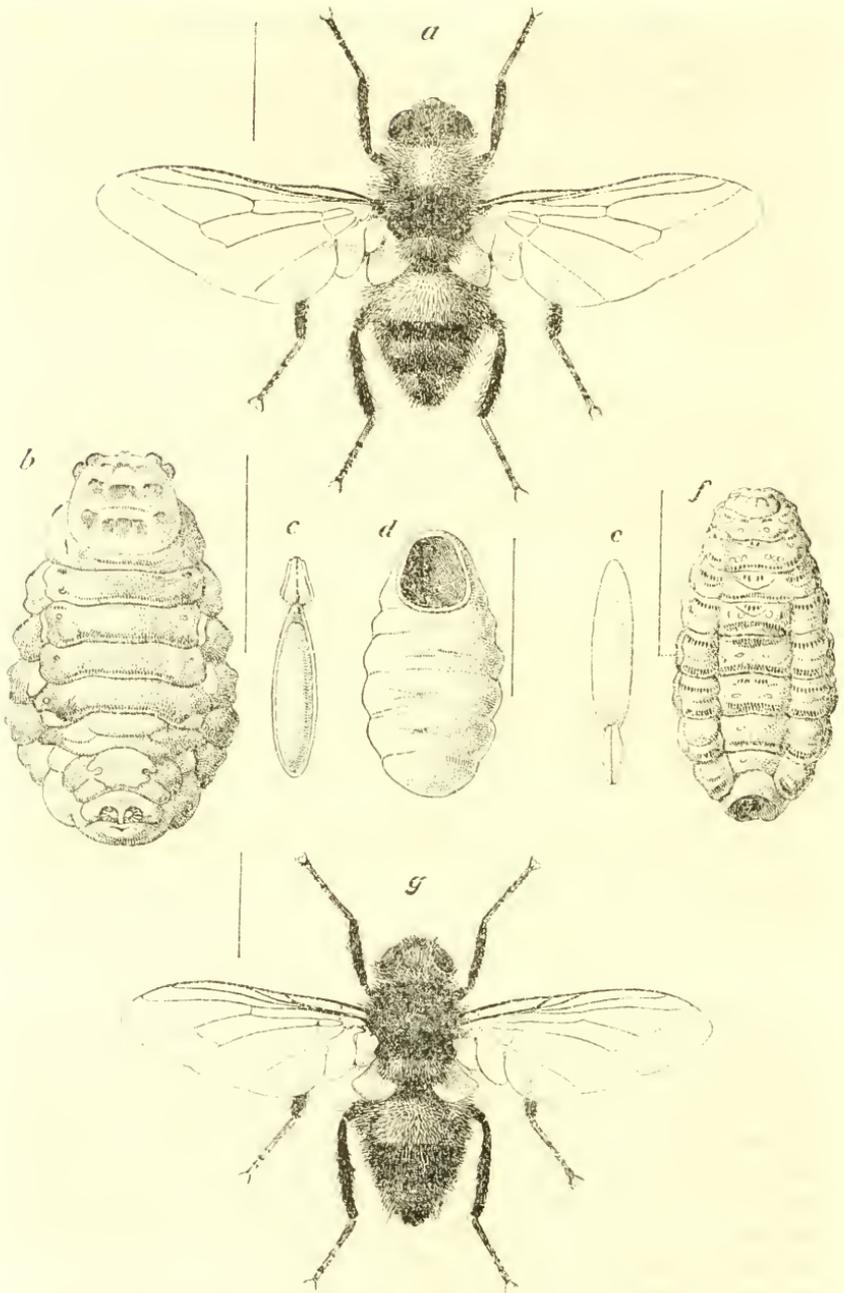


FIG. 22.—OX WARBLE FLY (*Hypoderma bovis* and *lineata*).  
a, Adult of *Hypoderma bovis*; b, lot of *H. bovis*; c, ovum of *H. bovis*; d, puparium of *H. bovis*;  
e, egg of *H. lineata*; f, lot of *H. lineata*; g, adult of *Hypoderma lineata*.

about through the connective tissues of the host and between the skin and flesh. They finally take up their position along the back, just under the hide, and then moult again, when they become spiny. At this stage they commence to produce considerable irritation, a swelling arises over them—the “warble”—which soon becomes perforated by a hole at the summit. The tail end is directed towards this aperture, the two spiracles or breathing pores situated on it being placed close to the opening. There is now formed much pus, upon which, together with blood, the larva or bot feeds and rapidly develops, and then moults for the last time. When mature the yellowish-white bot turns greyish-brown with grey stripes, and is about an inch in length, the body being very spiny. By means of these spines the maggot makes its way out of the warble-cells and falls to the ground.

The larva then enters the puparium stage (Fig. 22, *d*), which may take place either in the ground or under some stone or foreign body lying on the ground.

This puparium is formed by the bot's old skin, which hardens and gradually becomes almost black in colour. In from three to six weeks the fly escapes from this case through a more or less circular opening or cap in the puparium.

The perfect insect is half an inch long, very hairy, black, clothed with almost white, reddish-brown and black hairs; there are white hairs on the head and thorax, and forming a band at the base of the abdomen. There are also blackish-brown hairs on the upper part of the head, the thorax, the legs, and the middle region of the abdomen.

This fly appears in Great Britain from the middle of May until the beginning of September.

#### LIFE-HISTORY OF *H. bovis*.

The life-history of this species is not, I feel sure, properly known. Probably it is the same as *lineata*. It is said to lay its eggs on or in the skin, but there is no evidence to show this. According to Miss Ormerod's notes it appears that the bots develop directly under the hide, appearing first as small blood-red maggots between the hide and flesh. These grow into the mature bots and cause warbles similar to the former species.

The “bots” of *bovis* are easily told from those of *lineata* by the two last segments of the body being free from spines, whilst in *lineata* the last segment only is nude. The mature bot of *lineata*

when it leaves the host is greyish-brown, striped with grey or white; in *bovis* it is brownish and much more contracted and roundish in form. The adult *H. bovis* differs in regard to colour and size, being slightly larger than *H. lineata*, and banded with yellow and velvety-black hairs, not brownish-black as in *H. lineata*.

Like the former it appears from May to September.

#### SOME IMPORTANT HABITS.

All these *Æstridæ* are found on the wing during hot, bright weather. They not only appear during hot weather, but are most active during the hottest part of the day, usually between noon and three o'clock. They do not fly in dull cold weather, but become torpid, sheltering in crevices of sheds, hurdles, under leaves, etc. So susceptible are they to temperature that they will not fly into shade or over water. The adults have generally no proper mouth, and at most a rudimentary one, and hence they take little or no nourishment. They produce when flying a low audible hum, which causes the animals to stampede and to seek shelter.

#### PREVENTION AND TREATMENT.

Much good may be done by allowing stock to have plenty of shelter during hot weather, either natural shelter of trees or artificial shelter formed by rough lodges or sheds. Water to which stock may run and enter also wards off these pests.

The flies may be deterred from laying their eggs by dressing the beasts every now and then with some strong smelling oil or grease. Cart grease and paraffin may be used for this purpose. Another mixture found of benefit is one quart of train oil, 4 ozs. of oil of tar, and 4 ozs. of flower of sulphur. Pure kerosene applied to the legs, back and flanks with a rag is also successful. This must be done every now and then when the flies are on the wing, *i.e.*, from May to September.

By far the most important method of coping with these pests is the old way of squeezing the "bots" out of the warbles and killing them. This should be done in February and March when the warbles are most noticeable. The maggots may very easily be extracted by squeezing the warbles with both thumbs and then squashing them underfoot. This is a far better plan than covering the opening of the warble with grease or mercurial ointment, so as to suffocate the bot within.

FURTHER INFORMATION *re* WARBLE FLIES.

In answer to the query of a correspondent the following was sent to the Board:—

“*Hypoderma lineata* (Villers) has long been known to occur in this country, and always seems to occur in collections in excess of *H. bovis*. That *H. lineata* was probably the commonest Warble Fly in this country was pointed out to me some time ago. The bots sent me were all examined, and I found them mostly *lineata*. Again, one finds in referring to local lists such as “The Natural History of Hastings and District” *H. lineata* recorded, not *H. bovis*. The differences between these two species are very slight and would be easily overlooked. *H. bovis*, for instance, was thought to be the common American bot until the error was discovered. *H. bovis*, after all, does not seem to occur in North America. It is certainly strange that the closely-allied *bovis* has a different life-history, as it has according to Miss Ormerod’s publications.

“*H. lineata* is common in Europe from Norway to Italy and the Caucasus as well as in America.

“*H. bovis* has a much wider range, for it also occurs in Asia and Africa. Although it does not, it seems, occur in America, yet cattle present the same symptoms of fright as in England, *lineata* being their sole enemy. Curtice, Marlatt and others have traced the life-history of *lineata* so clearly we certainly cannot doubt its accuracy. It is much more likely that the remarks are wrong over *bovis*. Riley was wrong in regard to the species, for *bovis* is now thought not to occur in America.

“The statement that no observations have been made as to the fly attacking the legs is wrong, for one has only to turn to one of Miss Ormerod’s Reports to see that such is not the case, the following observation being recorded: ‘This one flew at the legs and flanks of a young Guernsey bull.’

“The dressing of beasts along the back I do not think can do very much good, but the smell of the oil might keep the fly off.

“I know of no definite observation regarding the eggs of *bovis* being laid on cows’ backs beyond Neumann’s general remarks, and he states no one had seen them there. There is no reason why cattle should be in more dread of having the eggs laid on their backs than on their legs.”

### Notes on the Sheep Nasal Fly (*Estrus ovis*).

The following information has also been sent the Board concerning the Sheep Nasal Fly, which is more or less prevalent all over Great Britain:—

“This fly is sometimes erroneously called the Sheep Gad Fly. Bracey Clarke, Steel and others wrote upon it under this name, and hence, except by Miss Ormerod, the name has been carried on in print. The Gad or Breeze Flies are *Tabanidæ*, a perfectly distinct family from the *Æstridæ* or Warble Flies. The Gad Flies, Breeze Flies or Brimps cause annoyance by ‘biting’ animals. Their larvæ are harmless. In the Warble Flies or *Æstridæ* it is *vice versâ*. The name Sheep Gad Fly is wrong both scientifically and in popular parlance.

“The adult has also been wrongly described as being ‘something like an overgrown House Fly.’ This statement was made undoubtedly as a slip by Riley thirty-five years ago, and should not be copied, as there are flies which are found in connection with sheep that have an appearance something like the ‘House Fly,’ whereas the Sheep ‘Nasal Fly’ has not. The *Æstridæ* and the *Muscidæ* have nothing in common.

“The description of the Sheep Nasal Fly (*Estrus ovis*) is as follows: ‘Head, pale brown; thorax, pale brown to ashy grey, mottled and spotted with black spot-like tubercles; abdomen, dull brownish to slaty grey, sometimes appearing ash-grey with dusky spots and with a dull silvery sheen when alive; legs, pale tawny to yellowish brown. The wings are quite colourless and transparent, the poisers or halteres almost white and covered by the large basal alula or winglet, a flap-like structure at the base of the wings.’ Both males and females fly about on warm sunny days for the purposes of copulation, etc.

“On two occasions ‘maggotty heads’ have been sent me in which the larvæ were found in March varying from 4 mm. up to the mature size. This clearly points to parthenogenetic reproduction.

“The Sheep Nasal Fly certainly deposits its eggs on the nostrils of the sheep, for I have on several occasions observed the curved ova in and around the nostrils. Brauer, however, was inclined to believe that the young were hatched alive, so probably both eggs and young are produced.

“The larvæ use their hooks and ventral suckers to aid their progress, and also their two anal papillæ. Miss Ormerod pointed

out that these processes are called into play, and it is largely by their means that the maggots move.

“Maggots are nearly always found in the various sinus or spaces of the head, and from personal experience I should say that it is in such places that they cause the greatest harm to the host. The larvæ live in the head for at least nine months. The larvæ do not all pupate ‘an inch or two under the ground,’ as sometimes stated. The most favourite place seems to be just under a tuft of grass, or, where obtainable, a stone.

“With regard to prevention, two very important things are: (*a*) removal of sheep from infected meadows when the flies are hatching out—the adults will not fly any distance (they appear in June and July); (*b*) placing salt about in small boxes smeared all over with tar, or (*c*) salt in closed boxes (Walker’s method) with round holes above, also smeared with tar. The sheep thus get the tar on their noses, and this wards off the fly. It would be quite impossible to dress large flocks every two or three days over a period of three months—at least, no large flockmaster would be likely to employ such a tedious process; (*d*) all diseased sheep should be penned.

### **Preventive against Liver Fluke (*Distomum hepaticum*) in Sheep.**

In connection with the Board Leaflet (No. 89), on Liver Fluke, the following information was sent:—

Sulphate of iron is one of the two substances said to be best suited to the treatment of sheep with rot and to act as a preventative, especially when mixed with food-stuffs.

Professor Simonds’ receipt is one most usually recorded, viz.:—Linseed oil cake, 1 bushel; pea meal, 1 bushel; salt, 4 lbs.; sulphate of iron, 1 lb. Well ground together,  $\frac{1}{2}$  to 1 pint to each sheep per diem.

Another receipt is:—1 drachm sulphate of iron;  $\frac{1}{2}$  oz. salt. Mixed with bran, crushed oats or cake for each sheep per diem.

I certainly do not think any great benefit (as a preventative of Fluke) will be found in salt applied to the land.

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## PARASITIC FUNGOID DISEASES OF ANIMALS.

**Favus** (*Achorion schænleini*) in Poultry.

Information was asked concerning the advisability of eating fowls suffering from "Favus."

"It is scarcely advisable to eat diseased fowls, but the chances of any harm arising from 'Favus'-diseased birds when cooked would be very slight.

"This parasite that causes the white-comb is only, I believe, found on the skin, nails, etc., of man and does not attack him internally.

"Birds in the early stages of the disease frequently do remarkably well, but as it increases they lose condition and may eventually be killed by it.

"Young birds are frequently affected and might easily contract the disease from the parent; but eggs from the affected birds would not give rise to 'favic' young. Unless they came in contact after hatching with the diseased parents or other afflicted birds or animals the young would not be diseased."

**Ringworm** (*Tinea tonsurans*) in Calves.

Concerning this disease in stock advice was sought by the Board. The following notes were despatched:—

1. With regard to Ringworm in cattle it is well known that it is fairly general in parts of this country.

2. A number of attacks have recently been noticed, and when pointed out, the owners in all cases said that unless the disease became very general over the beasts they took no notice but let it die out. If the diseased areas spread very rapidly, smearing with sulphur and lard or sulphur and soft soap soon destroyed it. Several cases kept under observation certainly rapidly disappeared with this treatment.

## TREATMENT.

Two substances that could be used upon animals which act well in treating human subjects are iodine and oleate of copper.

The iodine is used as an ointment, also the oleate of copper (1 part to 5 parts of lard). Oleate of copper can be obtained from chemists; it is often recommended for human ringworm, but is not an official medical remedy.

As a lotion, sulphurous acid and glycerine may be used with advantage at the rate of one fluid drachm of acid to three fluid drachms of glycerine.

G R O U P E.

SUB-GROUP B. ANIMALS WHICH CAUSE INJURY OR DISEASE TO MAN'S VEGETABLE PLANTATIONS.

SECTION I.

ANIMALS INJURIOUS TO AGRICULTURE.

**Wireworm.**

PREVENTION AND REMEDIES.

The following notes are regarding the treatment to be adopted against Wireworm:—

“Numerous experiments both in the field and laboratory have been made to find out some way by means of which Wireworm may be killed in the ground. At present all experiments have failed except with bisulphide of carbon, which is too expensive to use over large areas as in field cultivation.\*

“There are nevertheless certain measures we can take which will prevent and materially lessen these ground pests.

“Much good may be done in hop yards, gardens and nurseries by trapping the Click beetles. This may be done by laying small heaps of lucern, clover or sainfoin about on the ground, covering them over with tiles or pieces of board during May and June, and as long as the beetles are noticeable. They fly to these shelters, particularly if the ground is clean, and deposit their eggs, as well as shelter beneath the green material. These traps must be examined as often as possible, the beetles collected and the green stuff destroyed every ten days, and the ground beneath well beaten down so as to destroy any eggs that might be present. Boards and tiles might be placed beneath the bait so as to save any eggs from getting on the soil. As many as one hundred Click beetles have been taken from a single trap in a week.

\* Certain patented substances are said to kill Wireworm in the soil, but they have yet to be found successful.

“Clover ley and grass lands are always full of these larvæ, and the result is that when the land is broken up the first few crops are generally a complete failure, unless proper steps are taken to free the land from the Wireworm.

“Land previous to being ploughed up should be fed off by sheep, the sheep being penned and fed so that not only all surface vegetation goes, but the land becomes well trodden down and saturated with their urine, etc. It should then be ploughed up and a crop of mustard grown. This should be allowed to live to half its growth, and should then be ploughed in green. Wireworm will not feed on growing mustard, and when ploughed in green it seems to have a very marked effect in decreasing their numbers.

“In young crops where Wireworm are working, such as wheat, heavy rollings with a ring-roller do much good, consolidating the soil and so preventing the Wireworm from moving rapidly from plant to plant.

“Mustard and rape cake and dust (nibs) have been much employed as a Wireworm remedy. It is thought that these substances get rid of the pests; no such thing, for they form a palatable food for *Elater* larvæ.

“They act by drawing the Wireworm away from the plants, and in young crops good is no doubt done *pro tem.* by allowing the plants to grow away from the Wireworm. It has no lasting effect, and moreover probably encourages Wireworm in the land. There is no doubt that the use of such (rape dust) as manures in hop gardens has tended to the great increase of these pests there.

“Neither gas-lime, lime, nor salt, so often recommended, have any definite effect upon the young larvæ in the ground, but the first-named now and then seems to act as a deterrent, and may be used to advantage on [Wirewormy] land prior to its being broken up. Gas-lime must be left for at least four weeks before it is worked into the land. The quantity depends entirely upon local conditions, soil, etc.

“Stimulating manures should always be given when the crop is seen to be attacked by Wireworm. Soot has been found to answer well, and under certain conditions seems to have even a definite effect upon the insects.

“In districts where seaweed is used as a manure, it is said Wireworm do very little harm.

“Trapping the larvæ may also be carried out with marked success. This is done by placing pieces of mangold, potatoes, or, best of all, beetroot under the earth near hop-hills, garden borders, and so

forth, and examining them every few days. Great numbers of Wireworm may be found buried in the baits, and may then be collected and destroyed.

“ In flower-beds and borders where these pests do much harm to tender plants, we can easily destroy them by injecting bisulphide of carbon into the soil. This may be done as follows:—Pour a quarter of an ounce of bisulphide of carbon into a small hole made in the ground, and cover over with a piece of tile, and then put earth over it at once; this is enough for every square yard. Care must be taken not to let the bisulphide touch the roots of any plants, and it must be remembered that the substance is both poisonous and highly inflammable. This is best done in the spring and early summer.

Heaps of leaf mould and manure heaps should never be allowed to have weeds growing on them, and are best covered with a coating of gas-lime, which prevents not only Click beetles but also Daddy-Long-Legs from laying their eggs there. Gardens are frequently infested in this way, unless proper precautions are taken.

Rooks, Starlings, Jaekdaws and Plover should be protected in fields, but not encouraged in gardens and orchards. The Plover does the greatest amount of good of all birds in this respect; the recent great increase in the Wireworm undoubtedly is partly due to the decrease of the Green Plover, by the ruthless destruction of eggs. Rooks do inestimable good, and can be kept off seed corn in various ways, also in other cases where they do damage. The same with the Starling, which is a great Wireworm and Leather-Jacket destroyer; the damage it does in orchards and gardens can be easily prevented by men and boys with clappers and guns keeping them away when the cherries are ripening. They should not be encouraged near habitations, but should be nevertheless protected generally.

Clean farming is one of the best preventatives.

### Fever Fly Grubs (*Bibionidæ*) in Soil.

Some larvæ or “grubs” sent by a correspondent from Grays, Essex, were a species of so-called Fever Fly (*Bibionidæ*); they were probably *Bibio hortulanus*,\* which occurs in great numbers in the soil in the way described by the sender. There is no doubt they do some harm in the roots of various plants, but the damage is not great. They will soon be entering the pupal stage, and no further damage is likely to be done by them.

\* These hatched out and proved to be this species.

The best way to clear them out of the soil is to turn chickens on to the land when it is being dug in the spring; they devour the larvæ greedily. Neither soot nor lime have any effect on these insects.

They may be killed in garden borders by injecting bisulphide of carbon into the ground.

The adult flies appear in May and June; sometimes as early as the middle of April.

### The Mustard Beetle or Black Jack.

(*Phædon betulæ.*)

The beetles referred to by the correspondent from Downham Market under the name of "Black Jack" are the Mustard Beetle (*Phædon betulæ*).

An account of this pest will be found in the "Journal of the Board of Agriculture," vol. ix, no. 4, p. 524, 1903.

The pest should be attacked by either collecting the beetles with tarred cloths or wooden scoops drawn between the rows as described on p. 525, or if a "strawsoniser" is available, by spraying with Paris green.

All necessary information is given in the paper referred to.

(Since this report was written the specimens of attacked plants have been received; leaves and stalks were covered with *Phædon* larvæ of two kinds, *P. cochleariæ* and *P. betulæ*. These could only be destroyed by washing.)

In answer to another communication, the correspondent was informed that the larvæ of the Mustard Beetle which he forwarded would soon be mature; they then enter the ground to pupate, and in fourteen days or so, the summer brood of beetles appears, and these beetles spread devastation over the advanced mustard crop.

The larvæ should have been previously attacked; they are in all stages—some nearly mature, others only a week old. Unfortunately mustard is grown so close that more damage might be done by getting at the larvæ than the latter do themselves, but with long spraying rods large areas could be sprayed with a small amount of damage to the crop by the washers.

Some plan should be adopted by growers so as to allow a free passage between the plants.

### Beetles (*Pterostichus madidus*) damaging Mangold.

The beetles damaging mangolds sent by a correspondent were one of the ground beetles or *Curculidæ*, called *Pterostichus madidus*, in some works *Steropus madidus*. It is well known as a mangold pest.

The ground beetles were at one time thought to be only carnivorous, and, therefore, beneficial. Although the majority are carnivorous we now know certain species are very destructive. Three at least, besides the one mentioned here, do a great deal of harm to strawberries. *Steropus madidus*, besides attacking mangold and strawberries, is also found eating swedes and kohlrabi.

Miss Ormerod records this species as damaging mangolds as follows: "*Steropus* beetles were forwarded, which had been caught also early in the morning in the act of eating mangolds. The injury was just at the ground level, sometimes all round, what may be termed the shoulders of the root. The beetles did not eat the leaves and the damage was noticed as being done in the very early morning, or, in fact, almost in the night."

They usually attack plants just under the ground or level with it generally where the root begins. The whole root may be eaten right away or may be only partly damaged, as the one sent. When pieces only are eaten out of the root the plant never properly develops; deformed and stunted wurzel result.

The leaves never seem to be harmed. Like most *Curculidæ*, this pest works almost entirely at night and hides away during the day. One favourite hiding-place is under stones. Several attacks have been noticed in fields where flints are abundant. Curtis records this beetle as attacking and feeding upon Wireworm.

As far as is known, the female lays her eggs either in the earth or under stones. The larvæ hatch from the eggs in eight days and appear to be solely carnivorous. They are dark brown with large head and jaws and six jointed-legs in front; when mature they are about two-thirds of an inch long; the end of the body has two long bristly processes. When mature they pupate in the ground and remain as pupæ during the winter months. The beetle is common generally in Great Britain, and also occurs in Germany, Belgium, France and Switzerland.

#### PREVENTION AND REMEDIES.

After an attack of this pest, land should be deeply ploughed and wurzel should not be grown in neighbouring fields *when it is possible to*

*avoid doing so.* The beetles have no wings, so cannot travel far, and, although carnivorous, they would probably be checked increasing, as wurzel undoubtedly now form one of their favourite foods.

When young plants are attacked frequent side- and horse-hoeing would disturb them and so do some good. The best plan to adopt is to trap the beetles in the fields. This, I fancy, would be best done by putting down here and there sheepskins, beneath which they will shelter during the day and can then be collected. Sacking or other material would also answer the purpose. I do not think any dressings would affect this pest.

#### FRUIT PESTS.

### Some Notes and Communications on Big-bud in Currants.

#### I. CURRANT BUSHES FREE FROM BLACK CURRANT MITE.

The following information has been sent to the Board:—

Regarding this subject it is well-known that this pest is still absent in many districts of Great Britain. It is almost unknown in the greater part of the North of Ireland. I have been unable to find it in districts in North Wales; it does not appear to occur in Northumberland. Mr. A. T. Gillanders has been unable to find it in the latter district. Mr. Wheler tells me it does not occur around Alnwick. A few years ago it was scarcely known in Devon (I do not know if it has been carried there now). I am also told it is comparatively rare in Hampshire.

Certain varieties, like the Baldwin, are infested all over the country, but others are not. Mr. Bear informs me he has eight acres of Lea's Prolific obtained from Preston that were quite free—and so on with innumerable cases to show there is plenty of clean stock. I do not think, however, there is much clean Baldwin stock, if any.

[For other information on this subject, *vide* p. 29.]

#### II. CURRANT BUD MITE.

Many growers state that they have found that repeated hand-picking does good and also hard pruning.

But as stated in Leaflet No. 1, it seems that little good can be done in regard to remedies.

Numerous other enquiries have been received, but do not call for any special comment.

## Spots on Black Currant Buds, etc.

Black currant cuttings have frequently been sent to the Board and to the Museum and myself, with notes asking if the normal glands in the buds were eggs or galls of the mite of the Black Currant. These yellow bodies are normal plant glands. The following communications have been sent to the Board:—

### *I.—Supposed Aphis Eggs on Black Currant twigs.*

The piece of currant twig sent by your correspondent, of the Retreat, York, has no insect eggs upon it.

The yellow spots to which he refers are normal plant glands. They occur on all black currants, but on some varieties more so than on others.

The eggs of the currant *Aphides* are longer and spindle-shaped, with a hard dark shell.

### *II.—Spots on Black Currant Leaves.*

The leaves of the black currant sent by a correspondent from Sundridge, Kent, and several others did not show any traces of the Black Currant Mite (*Eriophyes ribis*). They are certainly not galls of the Big-bud Mite.

The spots on the leaves referred to are glands on the leaf, of normal appearance. The only gall formed by this pest is the swollen bud.

### *III.—Notification to the Board of Agriculture.*

As currant leaves are frequently being sent with enquiries as to whether the yellow spots on them are eggs of *Aphis*, or galls or eggs of *Phytoptidæ*, it might be well to call attention to these structures in the "Journal."

These glands, which secrete a volatile pungent oily material, are well-known normal plant glands.\*

## Red Spiders.

The following notes have been sent regarding Red Spiders:—

The species of Red Spiders found on hops has not been

\* A note was prepared by the Board and issued in the Journal in accordance with this information (*vide* vol. x., no. 1, p. 85, June, 1903).

satisfactorily determined.\* As I have no specimens on hand, the scientific name had best be omitted in the Board leaflet.

Fruit trees and bushes are frequently seriously damaged by Red Spiders, the leaves being attacked just as in hops. Red Spiders are also very harmful under glass. *Tetranychus telarius* is one of the most serious pests in vineries; melons and cucumbers are similarly attacked by *T. cucumeris*. The different species can only be identified by specialists. They have very similar habits, however, and may be killed by the same wash.

The Red Spiders of fruit trees belong to two genera, *Bryobia* and *Tenuipalpus*. The former are most destructive, especially to the gooseberry and currant.

The commonest species (*B. speciosa*) is found on the ivy, and invades the fruit bushes from these centres.

These *Bryobia* Mites have very long front legs, and spin but a scanty webbing. The *Bryobius* hibernate as adults, not in the egg state, as previously supposed. The eggs of the *Tenuipalpus* may be found on the bushes all the winter. When present in numbers, the Mites soon cause the leaves to become unhealthy and fall off.

The colour of the *Bryobia* is invariably like that of the Red Spider on hops, chiefly various shades of grey, green and red, darkened at the sides. They are active from March onwards, and lay eggs in May and June. The eggs are placed in the axils of twigs, and between the remains of old bud scales.

The genus *Tenuipalpus* live on plants in a similar way, but their work is not so evident. The common species (*spinosus*) is very bright red, and the legs are shorter than in *Bryobia*. The bright red eggs are very noticeable and occur on the trees all the winter.

The larvæ or young of all the Mites are six-legged.

### Strawberry Beetles.

An enquiry from Norfolk was sent to the Board regarding beetles attacking strawberries.

Several species of Ground Beetles attack strawberries, including the following:—*Harpalus ruficornis*, Fabr.; *Omascus vulgaris*, Linn.; *Steropus madidus* and *Calathus cisteloides*, Panzer.

These beetles attack the berries at night, usually just when the

\* The Hop Red Spider is now known to be *Tetranychus althææ*. It is also found on Hollyhock and French Beans. It is larger than *T. telarius*, greenish-brown, the females becoming red from August to the following spring.

fruit is ripening. The insects remain under the earth, straw, or grass, between the rows during the day, making holes in the soil, and having regular runs opening through the litter. Green fruit is also attacked, the skin being eaten away, the seeds usually being left intact. There are, nevertheless, records of the seeds also being eaten; the ground is described as covered with a powdery deposit, caused by the seeds eaten off the berries.

The most destructive species appears to be *Harpalus ruficornis*, which is winged, and which evidently migrates in large numbers.

These beetles will feed on other substances, such as live worms, and meat, both cooked and uncooked. *Harpalus ruficornis* and others have been recorded before in Norfolk.

#### TREATMENT.

The only successful plan is that adopted by Messrs. Laxton Brothers, namely, of sinking small pudding-basins in the soil between the plants every few yards and baiting them with "lights" and sugar-water; the beetles swarm to this, and are unable to crawl back up the sides of the basins. Similar good results have been gained by using ordinary jam pots or glass jars.

Probably poisoned baits would act well; but trapping, as given above, is a well-tried and most successful plan.

### The Raspberry Beetle.

(*Byturus tomentosus*, Fab.)

This beetle was reported to the Board as eating the blossom of the raspberries at West Malling in Kent. It is one of the regular raspberry pests, occurring in greater or less abundance every year in this country. Besides the raspberry, it also attacks in a similar way the cultivated blackberry. Some years it entirely devours the blossom, and later on the larvæ attack the fruit.

The beetles generally attack the opened blossoms, eating their way right through them, but now and then when the blossom is backward they will eat the unopened buds. They may commence their work as early as the middle of May; they were noticed in Kent this year on the 17th eating the unopened blossoms. As the fruit is ripening they are noticeable again in the maggot stage, living in the receptacle (Fig. 23, *e*) and sometimes crawling over the fruit; the berries so attacked are usually deformed or stunted, and often shrivel right up. This pest occurs practically all over England, and is also

abundant in parts of Scotland, and I have observed it in raspberries in North Wales.

## LIFE-HISTORY.

The life-history of this beetle is as follows:—The beetle (Fig. 23, *a*) is dark brown in colour, with dense golden-brown pubescence, which may assume a dull greyish hue; the legs are reddish-yellow to reddish-brown; there are two ample wings with which the beetles fly readily in bright weather; in length the mature beetle is about one-sixth of an inch. The Raspberry Beetles belong to the family *Nitidulidæ*. They are first noticed in May, the date depending upon the locality and the weather. I have found them as early as May 2nd, but the majority are not noticed until the middle of the month on into June. As soon as the blossoms open the beetles not only feed upon them,

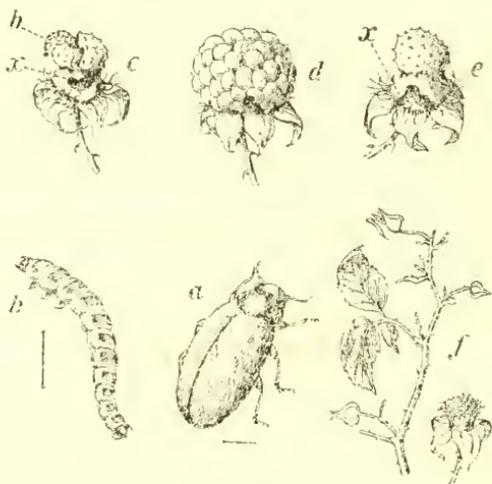


FIG. 23.—THE RASPBERRY BEETLE  
(*Byturus tomentosus*, Fab.).

*a*, The mature beetle; *b*, the larva; *c*, damaged receptacle (*b*, larva; *x*, damaged receptacle); *d*, damaged fruitlet; *e*, receptacle; *f*, damaged blossoms.

but they also deposit their eggs deep in a blossom. I have frequently found them ovipositing in the buds just as they are opening. The larvæ live inside the receptacle of the fruit and also devour the fruit itself, causing the whole berry to shrivel up. At other times the fruit is only stunted or deformed on one side. The larva (*b*) is dull yellowish, with brown markings in the middle of the segments; it has six jointed-legs in front, and two pointed curved spines behind. Maturity is reached about the time the fruit is ripe, the maggot then is about one-third of an inch long, and beneath its anal segment is

noticeable a cylindrical process, acting as a proleg. The colour varies somewhat; dull, almost grey specimens may sometimes be seen. As soon as they are full grown they leave the fruit and crawl to some shelter, such as crevices in the poles, under the rough rind of the canes, or may enter the earth around the stocks. There they pupate and remain all the winter, the beetles hatching out in the spring about the time the blossom-buds are bursting.

Wild blackberries are also attacked by this beetle, and from this source gardens may become invaded, as the beetles are very active on the wing in warm bright weather.

#### PREVENTION AND REMEDIES.

When we notice numbers of beetles about on the raspberries in May and early in June we should go over the beds holding a tarred sack or boards on each side of the rows and jar the beetles off on to them. This should be done on dull days, as the beetles are very active in bright sunshine and would fly away some distance.

All prunings and débris should be burnt in the winter, as this will destroy numbers of the pupæ. The old bearing wood should always be burnt.

In the early spring paraffin and ashes may be hoed into the ground near the stocks.

### **Prevalence of Codling Moth in Foreign and Colonial Apples.**

Numerous larvæ sent from imported apples proved to be those of the Codling Moth.

The danger of the constant and great importation of this pest into Great Britain in American fruit (both from the United States and Canada) is in the parcels of fruit being sent out into our villages. Cases have been recently investigated where Portuguese apples have been brought to Kent villages teeming with this pest; we also get, especially as during the present year, when there is no local fruit, great numbers of American apples in the country. In the country the moths when they hatch out can easily get into gardens and in many cases orchards close by. That they do so in very large numbers is beyond doubt, and as long as this is allowed it is quite useless to advise any fruit grower to adopt any preventives in his orchard, as it is merely waste of time.\*

\* In Natal all cases of Portuguese and other apples infested with this pest are destroyed; during 1903 large quantities were burnt (*vide* "The Natal Journal Agri. and Mines," Dec. 1903).

Regarding the insect enemies in imported Portuguese apples the following communication was sent to the Board:—

“It would be advisable to have samples of Lisbon apples attacked by maggots examined, as it is not known what pests attack the apple in Portugal.

The pests may prove to be one of the fruit-eating *Trypetidae*. I believe the Mediterranean Fruit Fly (*Halterophora capitata*, Wied.), so abundant in the Azores, now and then attacks apples as well as oranges and green peaches. “The maggots in Lisbon apples might be this or the American *Trypeta pomonella*.”

Samples of Portuguese apples were received and examined. Only two of one parcel of apples imported from Portugal were found to have been infested by maggot (exclusive of one previously opened). There is no doubt that the work was done by the Codling Moth (*Carpocapsa pomonella*).

Subsequent investigations showed the Codling Moth to be the pest, and in many samples the maggots were very common. American and Canadian apples were also found to be badly attacked.

### Insect damage to Apple Trees.

Some apple trees referred to by a correspondent at Kyrewood, Tenbury, Worcestershire, were found to be suffering from the combined attack of (1) Apple Sucker (*Psylla mali*) and (2) Winter Moth larvæ (*Cheimatobia brumata*), and (3) to a small extent from the ravages of larvæ belonging to the *Tortricidae*.

The latter may, however, be left out of consideration in this instance, as they only accounted for a very small percentage of the damage.

The attack of Apple Sucker is often the cause of the blossom dying off; this was certainly the chief culprit in the sample of Warner's King and other sorts of apples damaged at Kyrewood. The leafage of these was also devoured by Winter Moth larvæ.

Eight acres of Ecklinvilles were also attacked by both pests, but amongst them Winter Moth seemed to be the chief culprit.

The Golden Noble is attacked almost exclusively by the Apple Sucker. This latter pest seems to be very abundant this season, and has appeared at Wye in great numbers where it was previously quite a rare species. The attack seems to be very general over the south and west of England.

The enquirer was informed that he should spray at once with, first,

quassia and soft soap wash to kill the Apple Suckers before they become winged. Many were in the pupal stage in May. Two days later the trees should be sprayed with Paris green to clear off the Winter Moth larvæ, which are of various sizes. Poultry should at once be turned into the orchard and kept there until July, as they devour many of the larvæ as they fall to pupate in the earth beneath the trees.

The Apple Suckers and also the larvæ may keep on damaging the leafage for some time, and will check the growth of the trees unless remedies are applied. The spraying must be very thorough when the pests are well established upon the foliage. The best Chiswick Soft Soap should be used for the quassia wash.

The two washes cannot be applied together. Caution must also be given regarding the burning effect of Paris green unless lime is added to the wash.

### Diseased Apple and Plum Trees.

Some specimens of apple sent by a correspondent from Cottenham, Cambridge, were damaged by the Apple Sucker (*Psylla mali*), a number of which were found on the specimens.

Samples of plum were ruined by the Plum Aphis (*Aphis pruni*). I was unable, from the material sent, to detect any insect damage to the cherry leaves also forwarded. There is no doubt the *Psylla* and *Aphis* of various kinds were chiefly accountable for the damage done in the Cottenham district, but the cherry trees were suffering from a fungoid disease.

The correspondent was advised to spray with caustic alkali wash in winter, quassia and soft soap wash in the spring several times. To check the fungus, Bordeaux mixture may be used at the same time as the quassia and soft soap.

The specimens of the diseased cherry branches and some apple leaves were examined by the Kew authorities.

The cherry branches were damaged by a fungus, *Sclerotinia fructigena*, Schröter.

The apple leaves sent had fallen in great numbers from the trees. The fungus *Cladosporium epiphyllum*, Fries., was present, but did not account for the premature decay and fall of the leaves.

The fungus attacking the cherry is described in Leaflet No. 86, the Apple Sucker in No. 16. The cause of the fallen apple leaves is at present unknown.

## TREATMENT OF THE ORCHARD.

1. The cherry trees should be sprayed in January or February with the wash recommended in Leaflet 86, and later with Bordeaux mixture.

2. All the trees should be sprayed with soft soap and quassia wash as soon as the buds commence to burst and again whenever lice (*Aphides*) are noticeable.

3. It would also be well to spray all the trees with caustic alkali wash in winter.

4. All diseased and dead wood should be cut away and burnt.

**Aphis Blight (*Aphis pruni*) on Plum Trees.**

Some plum trees referred to by a correspondent from near Crewe were suffering from the combined attack of (1) Plum Aphis (*Aphis pruni*), and (2) to a small extent from the larvæ of Tortricid Moths (*Tortrix ribeana*, *Antithesia pruniana*, and probably others).

The Plum Aphis (*Aphis pruni*, Reaumur) is one of the most destructive plum pests, and has been unusually severe in its attack this year. Complaints have come to hand from all parts of the country regarding the harm done by this Aphis. Its attack is very characteristic, the leaves shrivelling up, the edges gradually rolling around and forming nests for the rapidly increasing insects; the fruitlets soon commence to fall and the leaves die right off. During the present season I observed that the young leaves that were attacked fell prematurely when still green, but, as a rule, they hang on and the tree presents a strikingly characteristic appearance.

Damson plantations often suffer most severely from this blight. A good show of blossom may be seen in May, and by June scarcely a fruitlet or leaf will be seen on the trees. Plums of all kinds and greengages suffer nearly as severely. The same species may be seen on peach, apricot, apple and, according to Buckton, on the aster. It is subject to considerable variation in size and colour and probably occurs on other plants, amongst which have been mentioned chrysanthemums and the gooseberry. Wild prunes, as the sloe, afford a constant means of invasion of our plantations. This species must not be confused with the Hop-damson Aphis (*Phorodon humuli*, var. *mahaleb*), easily told by the frontal tubercles, which are absent in this species.

LIFE-HISTORY.

This aphid first makes its appearance in the early spring, when we observe small green lice here and there on the young leaves. These have come from eggs that have remained all the winter upon the plum trees. These lice rapidly grow into the wingless viviparous females, large Aphides, varying in hue from green to olive brown, and the abdomen with three faint green stripes; antennæ olive brown, cornicles brown; the whole body above and below is covered with a mealy down.

These apterous females soon commence to produce living young, which rapidly mature and produce other young. This asexual reproduction of wingless forms goes on for some time and under favourable conditions to such an extent that the leaves which have gradually curled up die off. As food supply commences to fail, these lice, instead of turning to wingless viviparous females, enter a pupal stage—rudiments of wings—"wing-buds" appearing.

The pupa is shining green and dull yellowish, the wing-cases tipped with dark brown; green cornicles also tipped with black. I have observed the pupal form in the first week in June, and again in July. Sometimes all on a tree enter this stage at once, at others only a few.

The winged female coming from the pupa is also viviparous; in colour she is apple green, with black head, thorax and antennæ; on the green abdomen is a dark patch and dark lateral spots; the wings are iridescent with brown veins.

These winged viviparous females fly about and settle upon other trees and set up fresh colonies, producing living young, which grow into apterous viviparous females which carry on rapid reproduction like the first series.

In the autumn the pupal stage is assumed again, but from the pupæ now come winged males and wingless oviparous females.

The winged male is small, and with a dusky ochreous body with dark brown head, markings on the thorax, and three on the abdomen. The colour varies considerably, some males being almost black, some wholly black, according to Buckton.

The apterous oviparous female is pale yellowish-green, almost transparent, with brown cornicles. This female, after being fertilised by the male, deposits little shiny black eggs at the base of the buds and on the twigs. Egg-laying may commence early in October and goes on till November. These eggs usually hatch at the beginning of April, but I have observed the lice as early as March.

Not only are they laid on prunes, but also on the apple, and probably on peach and nectarine. They are firmly attached by a gummy excretion formed by the parent, and are too thick-shelled to be affected by caustic alkali wash.

#### TREATMENT.

This pest can easily be kept in hand if attacked in its early stages. When once the females commence that remarkable and rapid production of living young and the leaves begin to curl up they are difficult to destroy; not only do the curled leaves protect them, but they are also covered with mealy powder, which helps repel the insecticide.

Washing should begin as soon as the leaves unfold, and must be continued every now and then, at intervals of a week.

Some good will be done by spraying, even when the leaves are curled up, but not so much; to be successful the lice must be killed before they enter the breeding stage.

Quassia and soft soap, or paraffin emulsion, may be used for this purpose.

Another green aphid, the *Hyalopterus pruni*, Fabr., also infests plums, swarming under the leaves and producing white hoary masses, but which do not seem to curl up the leaves in the characteristic way done by the common plum aphid.

This apterous viviparous female is flat, pale green with dark green mottlings and a dark dorsal stripe, and dusted with white meal. The winged viviparous female is bright pale yellowish-green, with red eyes and dark green thoracic lobes; cornicles green, very small; legs pale green; the wings with a yellow base and stigma.

The oviparous female lays her eggs near a leaf bud; the eggs are covered with a mealy coat.

It may frequently be found doing damage, but not nearly to the same extent as the former species.

### Gas Treatment of Nursery Stock before Planting.

Information has been asked regarding the fumigation of nursery stock. All nursery stock should certainly be fumigated.

The bushes or young trees should be placed in a box or canvas tent of known capacity and subjected to the fumes of hydrocyanic acid gas for one hour. Large numbers can be treated at once at little expense. After the stock is stacked under the tent or in the box a

jar should be placed on the floor and the water placed in it. Sulphuric acid is added to the water and then the cyanide of potassium wrapped in blotting paper dropped into the acid and water. The proportions are as follows:— $\frac{1}{4}$  oz. of cyanide of potassium; 1 oz. of sulphuric acid;  $1\frac{3}{4}$  oz. of water, for 250 cubic feet of space.

This can of course be reduced according to the size of the fumigating box or tent.

It must be remembered that the gas is deadly poisonous to man and that the cyanide of potassium is also a deadly poison. The fumes must not be breathed. The cyanide should be in small lumps, wrapped in blotting paper and then dropped into the acid and water and the box or tent rapidly closed. When opened at the end of an hour, it should be opened so that the wind blows the fumes away from the operator and the box or tent left for half an hour before the stock is removed.

Scale, Aphis, Thrips, etc., all die under this treatment and much future trouble may be saved.

### **“Gumming” in Cherry Trees.**

The cause of this disease is certainly not understood.

Mr. A. J. Prior, who sent specimens, was informed that the surgical treatment of trees suffering from this disease has met with great success.

I do not know any published accounts of this treatment, but a large grower in Kent follows it, and I believe invented it.

The trees are cut down to the cambium with a sharp knife on each side, near the “gumming” areas, in July—a long slice, about six to eight inches long. New bark forms, and the gumming is then relieved.

## SECTION II.

## ANIMALS INJURIOUS TO HORTICULTURE.

## ANIMALS INJURIOUS TO CULINARY PLANTS.

**Enchytræus Worms.**

Specimens of *Enchytræus* worms were sent by a correspondent from Nottingham, where they were doing damage in the soil to roots of garden plants.

The family known as *Enchytræidæ* belong to the section of *Oligochæte* worms known as *Microdrili*.

The *Microdrili* are mostly small in size, and usually aquatic in habits. They oviposit at fixed periods; the egg sacs are large, and the clitellum is only one cell thick.

In all these characters they differ from *Macrodrili*—the section which includes the Earth-worms.

The family *Enchytræidæ* contains fifty species and eleven genera. They are all small (many minute); they never exceed an inch or so in length. Some live in salt water, others in fresh water, and some in earth; some are parasitic in plants and do much harm.

The Aster Worm (*E. parvulus*) lodges under the epidermis of the roots, and feeds on the juices and tender vegetable substances. They are gregarious, quite a colony often being found at one plant. The plants are soon destroyed by them. The specimens sent from Nottingham belong to an allied species, *E. agricola* (Friend), which also damages roots of plants.

They may easily be destroyed by watering with either (1) lime water, or, better still, (2) a solution of corrosive sublimate.

Lime water may be prepared by mixing a pound of quicklime to a gallon of water; well mix, and strain off the clear liquid, and water well with the same. Corrosive sublimate, at the rate of 1 oz. to twenty gallons of water, was suggested to destroy them.

This quantity did not destroy them all.

Fresh information was sent—to try 1 oz. of sublimate in six gallons of water (1-1000). This will kill the ordinary Earth Worms (*Lumbrici*). The *Enchytræus* worms are much more delicate creatures, and it is surprising that 1 in 3000 did not destroy them all.

The difference is probably due to the *Enchytræus* taking plant food as well as soil, whilst the *Lumbrici* take in mostly earth.

The worm-killer made under Professor A. D. Hall's advice, by Harrington Brothers, is composed of the following:—Mercury perchloride, 10 lbs. ; hydrochloric acid, 4 lbs. ; water, 6 lbs.

To dilute for use, add  $\frac{1}{2}$  oz. fluid to three gallons of water.

The corrosive sublimate should be watered over the ground when it is moist, preferably after rain.

Dr. Carpenter, in his last Report, states that these worms were almost all cleared out by a very heavy dressing (one ton to acre) of rough agricultural salt.

### **The Mermis Worm (*Mermis nigrescens*).**

A nematode worm, *Mermis nigrescens*, was sent by a correspondent from Cirencester, who wished to know if it was injurious.

The sexual form of this worm lives in damp earth and may be found at the roots of plants. It also crawls up the stalks of plants, grasses, etc., especially in the morning. The male is unknown. The female lays her eggs in the ground, and the young, which are soon hatched out, bore their way into the bodies of young grasshoppers, in which they undergo part of their development.

It was pointed out that this worm is certainly non-injurious.

### **Mites (*Gamasidæ*) in Cucumber Beds.**

Specimens of mites were sent by Dr. W. Makeig Jones, M.D., J.P., from Torquay from cucumber houses.

Cucumber houses, mushroom pits, etc., are frequently invaded by Acari of all kinds.

They are often injurious, but, in this case, the species sent were carnivorous.

Dr. Jones was informed that the Acari sent were harmless, but that the injurious kinds, a few of which exist in cucumber and mushroom houses, may be destroyed by dusting flowers of sulphur over the hot beds and spraying the plants with liver of sulphur and cold water.

Liver of sulphur is best used at the rate of 1 oz. of liver of sulphur to 3 gallons of soft water, in which  $\frac{1}{4}$  lb. of soft soap has been dissolved.

The plants should of course be sprayed late in the afternoon.

Four different species of *Gamasida* were found belonging to four distinct genera.

Mr. Albert Michael says that they not only do no harm but are beneficial, as they destroy other mites and insects.

They are all found either on the ground, in damp places, or parasitic on some animal or bird.

### Millipedes and Centipedes.

The following notes on Millipedes and Centipedes have been prepared for the Board\* :—

Millipedes and Centipedes belong to a group of the animal kingdom known as the *Myriopoda*. These animals are known by their having legs on every ring or segment of the body. In the Millipedes there are two pairs of legs to each segment, in the Centipedes one pair only. These differences are important to notice, as the Millipedes are injurious and the Centipedes are beneficial to the agriculturalist and horticulturalist.

They are found in all manner of places, both in the field and in the garden, and are especially attracted by decaying vegetation, such as heaps of leaf-mould, rotting stalks, etc. They are also found crawling about under the bark of trees and in the soil. The difference in structure is also accompanied by a difference in habits, for Centipedes are very active and carnivorous. Millipedes are mostly herbivorous, living also upon sound and decaying vegetable matter. The bite of some Centipedes in the tropics is very poisonous to man, but none are so in this country. Millipedes are very often known as "false wireworm," but can easily be told from true wireworm by the great number of legs the former have. The Millipedes have the mouth formed for chewing, there being two powerful biting mandibles with which they devour the roots of plants. Centipedes are provided with poison-claws.

The life-history of the Snake Millipede (*Julus terrestris*) is as follows: The female deposits her eggs from May to July in a nest made of pieces of earth fastened together with saliva, rounded in form, and with a small hole at the top through which the eggs are dropped. The eggs vary in number from sixty to a hundred. The hole is stopped up, and they mature in ten to fourteen days. The young Millipedes have only three pairs of legs. The other legs appear in groups by degrees.

\* These notes have appeared as Leaflet No. 94 of the Board of Agriculture.

The growth of a Millipede takes place by lengthening posteriorly, the growth evidently being between the penultimate and last segments. Millipedes, according to Miss Ormerod, lay their eggs from December to May. As this does not agree with Sinclair's observations, it possibly applies to some other species of Millipede.

The most injurious Millipedes belong to the *Julidæ* and *Polydesmidæ*. The latter are the flattened Snake Millipedes. The species most usually sent is *Julus pulchellus*. It is nearly half an inch long, slender, about the thickness of a fair-sized pin, pale yellowish-pink in colour, with a double row of purple spots on it.

*Julus terrestris*, another common species, is black, and has a pointed tail.

Young *Juli* have three pairs of legs on the second, third and fifth segments. These *Juli* feed upon all manner of roots. The smaller *Julus pulchellus* eats into potatoes, lilies, and often hollows them completely out. The larger species also feed upon snails, slugs, and some insects, according to some observers.

The flattened Millipedes, or *Polydesmi*, develop in the same way as the *Juli*. The common species, *Polydesmus complanatus*, is pale purplish-white to a dull rosy tint, nearly an inch long, with the sides notched. The young have their legs on the second, fourth and fifth segments.

Centipedes or *Chilopoda* are beneficial, the food consisting of snails, slugs and ground insects. The eggs in *Lithobius* are laid from June to August. They are about the size of a No. 5 shot, spherical in form, and covered with a sticky slime. The female rolls them about in the earth until they are all covered with soil and resemble grains of earth. A small number only are laid by each female. The males frequently devour the eggs before the female coats them with earth. The earthy coat serves to protect them from the ravages of the male. In the other genera the habits vary to some extent. *Geophilus* are said to lay their eggs in an earthen cell, whilst *Scolopendra* bring forth living young.

#### PREVENTIVE AND REMEDIAL MEASURES AGAINST MILLIPEDES.

These pests are frequently distributed with leaf-mould, which should therefore be examined before being used, and if found to contain them should be mixed with lime. Their numbers in the field may also be lessened by broadcasting lime over the surface and working it into the soil. Soot and water in the proportion of a handful of soot to half a gallon of water is found to drive them

away from the roots of garden plants for a time. They may be collected in numbers by placing pieces of scooped out mangels just under the ground near the plants they are attacking. They swarm over the baits, and may then be collected and destroyed. Another certain way of killing them is by injecting bisulphide of carbon into the soil. They may also be trapped by soaking leaves of cabbage in Paris green and putting them about gardens. The Millipedes feed upon the green stuff and either get poisoned or can be collected.

### The Dot Moth.

(*Mamestra persicaria*, Linn.)

Caterpillars of the Dot Moth, which were causing damage in London gardens, were sent to the Board by Mr. W. C. Barnard.

The Dot Moth caterpillars are very frequently recorded as pests. Their food-plants vary much; as a rule garden flowers, such as dahlias, marguerites, marigolds, pansies, geums, etc., suffer most; vegetables are also eaten by these larvæ, including cabbages of all kinds, lettuce, mint, parsley; fruit trees and bushes are also attacked; there are numerous accounts of their feeding on gooseberry and now and again on apple, plum, raspberry, currant. Other plants upon which they feed are lilac, poplar, clematis, ivy, etc.

They are ravenous feeders, stripping the plants in a very short time.

This insect is found all over Great Britain and in most parts of Europe.

The caterpillars are subject to great variation in colour, apparently influenced to some extent by their food-plant, the colouring rendering them often extremely difficult to find when at rest upon their food-plant.

#### LIFE-HISTORY.

The moth appears in June and July. In size it varies from an inch and a half to an inch and three-quarters; the front wings are blackish (with a dull purplish gloss when fresh) marked with rusty brown marks, with small pale spots at the tips and the hindermost edge, often, however, indistinct and with a large white kidney-shaped dot, often very pronounced; the hind wings are dusky-grey shading into dull whitish at the base. They fly at night and deposit their eggs upon the food-plants; as many as thirty are laid by each female. The larvæ appear from the beginning of July, until the latter part of August, the last hatched ones not maturing until the end of September, and some even being found as late as

the middle of October; the majority have reached maturity by the end of September.

The larva varies in colour from pale green to grey or deep green and even reddish-grey; it has a pale dorsal line and semi-lozenge-shaped darker marks along the back from the fourth to the eleventh segments; the spiracular line is somewhat paler and there are five dark oblique bands below; the twelfth segment is distinctly humped; the first two pairs of the dorsal markings are always deepest in hue, the head is green and the thoracic shield has two dark green to brown patches. That they vary in colour according not only to the plant upon which they live, but also upon the same plant according to the part of the plant attacked, is well known. Buckler figures ("Larv. Brit. Butt. & Moths," vol. iv., pl. lxvi.) four larvæ from *Pteris aquilina*; the green ones occurred on the green parts of the leaves, the brown on the brown parts.

When mature the larvæ reach about an inch and a half in length, fall to the ground and change into a brown pupa in the earth beneath where they have been feeding and remain in that condition until the following summer.

#### PREVENTION AND REMEDIES.

In gardens hand-picking is advisable; it is a sure means of lessening attack. Where they occur in large numbers on gooseberry and fruit bushes it would be best to spray with some arsenical wash. It is said that if they are shaken off the plants, and then the ground drenched with cold water, especially if the weather is hot, violent purging is brought on, and the caterpillars are reduced to mere skins (Ormerod).

Gardens that have been attacked by Dot-Moth larvæ should be lightly forked over so as to expose the pupæ and so place them where they can be devoured by birds. It would be worth while to let ducks run over the infested ground, or if an orchard, fowls; both ducks and fowls devour the pupæ readily.

### A Plague of Earwigs.

A lady wrote to the Board concerning a plague of Earwigs in a garden.

The only way to get rid of Earwigs appears to be by trapping the insects, and the destruction of rubbish, old bark on trees, etc., during the winter.

The best way of trapping them is to place some baskets filled

with straw or dry moss upside down, either upon the ground or upon stakes; in the latter case the straw must be tied in. They may be caught on rose trees, dahlias, etc., as mentioned by Mr. Whitehead, by placing pots, bottom upwards, on sticks, close to the flowers, filled with hay. These traps must be frequently examined during the day-time and the insects collected and destroyed.

They may frequently be taken in large numbers by placing pots filled also with hay along window sills. Fruit placed in these traps is advisable.

They may be lessened by destroying those that hibernate in the winter. This can be done by examining the rough bark of any trees in the gardens, and killing the insects, and by burning all rubbish in which they are found to winter.

Fruit trees against walls should have the cloth used for fastening removed and burnt, as they are often found in such places during the cold part of the year. Walls much damaged by nail holes harbour numbers; these can only be destroyed by pointing the brickwork before the insects come out in the spring.

The only substance likely to destroy Earwigs in the cracks and crevices in which they shelter is pure paraffin.

There do not seem to have been any experiments in connection with this subject.

### **Springtails on the Roots of Cauliflower and Celery.**

Some Aptera sent by Colonel R. O. Lloyd, of Treffgarne Hall, Pembrokeshire, that were damaging the roots of cauliflowers and celery belonged to the genus *Lipura*.

These insects frequently swarm in the ground, especially in cucumber frames and hot-beds. They attack the roots of almost all plants. Carrots may frequently be found covered with them, especially when suffering from "rust." Celery also is severely attacked, especially when other insects have mined the outer bleached stalks. These *Lipura* and other species and genera of *Collembola* feed upon the sound tissue of plants just as much as where the plants are diseased. Little is known regarding the economy of this *Lipura*—they breed in the soil, however, and the young forms resemble the adults. They are always most abundant in damp soil and in wet seasons.

Soot and lime worked into the soil with a prong hoe has been found beneficial in attacks of this and allied species of *Collembola*.

If they are doing very much harm, only in a small area, it would be worth while to inject bisulphide of carbon into the ground where the cauliflowers are growing and along the rows of celery. For the cauliflowers an ounce to every four square yards and for the celery half an ounce every three yards, alternately on each side of the rows, care being taken to put it about six inches away from the plants and under the sloping earth, so that it will descend down to the roots.

Soot and lime were tried by Colonel Lloyd, and he reported as follows:—

“We mixed soot and lime with the soil, and put some Apteris in it, with the result that they were all killed; so I hope we shall be able to get rid of them, as they live in the soil.”

#### ANIMALS INJURIOUS TO ORNAMENTAL PLANTS.

### Grubs of *Phytomyzidæ* in Marguerite and Cineraria Leaves.

Some Marguerite and Cineraria leaves attacked by the larvæ of a fly, generally called the Marguerite fly, were sent by a correspondent from Manchester.

This insect belongs to the family *Phytomyzidæ*. The species that was attacking the leaves sent was *Napomyza lateralis*. These flies are all “miners” when in their larval stage, and pupate in the tunnels they make. A species called *Phytomyza chrysanthemi* does much harm in America, and also probably occurs in Europe. There is great difficulty in identifying the species of these miners—the adults only can be named with any degree of certainty.

#### TREATMENT.

On a small scale there is nothing like hand-picking; if that fails, it is owing to the work not being done thoroughly or the leaves not being destroyed afterwards. When plants are young, paraffin emulsion spraying has met with success.

There is no known remedy, but it may be pointed out that fumigation with hydrocyanic acid gas has not been tried and would be worth a simple experiment, as the larvæ lie close to the surface of the leaves.

## The Vine Weevil in Ferns and other Pot Plants.

Some insects sent by a correspondent from Forest Gate, E., that were attacking pot plants and ferns just below the surface of the ground, were the so-called Vine or Black Weevil (*Otiorhynchus sulcatus*). This and allied pests are dealt with in Leaflet No. 2 (revised).

The best way to destroy weevil and other maggots on the roots of pot plants is to water the plants with the following mixture:—One quart of soft soap dissolved in one gallon of boiling soft water, to which add one pint of crude carbolic acid. Mix the whole by means of a force pump into an emulsion. This will keep some time if bottled off and kept air-tight. When used add thirty times the amount of water to each part of the emulsion.

It is best to slightly remove the earth round the roots before watering with this mixture. The emulsion may become semi-solid, if so dissolve in some warm water first.

This has been found most successful in treating weevil and fly larvæ attacking roots of plants, and is better than the use of crude carbolic acid and water alone.

## The Rose Aphis.

(*Siphonophora rosæ*, Reaumur).

The Rose Aphis is an annual pest all over Great Britain, and is frequently enquired after. It was very harmful in 1903.

The Rose Aphis infests several kinds of wild and all cultivated roses. It is subject to great variation in colour and form and shows undoubtedly dimorphism. A distinct variety exists called variety *glauca*, Buckton; both type and variety readily mix together.

The apterous viviparous female is shining green or ferruginous red, with very long curved black cornicles; legs yellowish-green with black knees, and tarsi and the eyes deep red.

A very distinct red variety exists, particularly in the autumn. The apterous viviparous female may live in the open right through the winter, even when snow is on the ground. The lice or larvæ produced by these females every now and then give rise to pupæ, which are reddish green above, with brown wing-cases and four spots on the lateral edges. The winged viviparous females seem to appear both in winter and summer; in the open air they are green with

black head, thorax and thoracic lobes with three broad dark brown marks on each abdominal edge, a black mark over each honey-tube, and a dark patch on the last abdominal ring; the cornicles are black, legs yellow, with black knees and tarsi. These winged females occur at all times of the year, even in mid-winter, on half evergreen roses. In the autumn a male appears now and again, and even in summer, but its exact appearance has not been described. The oviparous female is apterous and ferruginous-red with dark olive or black coloured legs. The eggs are at first yellow, but gradually become black; they are glued to the base of buds and on to the shoots.

The variety of this aphid, described by Buckton as var. *glauca*, has the following characters: the winged female is bright green, the thorax with dark olive green markings, abdomen with four large dark spots on each side; honey-tubes dark; legs green. The apterous viviparous female is oval and light green, covered with a mealy coating, and with two dark spots on the thorax. In the pupæ the wing-cases are dark olive. These aphides occur both on the shoots and on the leaves, all stages occurring at once.

Numerous parasites prey upon the Rose Aphid, especially *Chalcididæ*. These parasites deposit their eggs inside the bodies of the aphides, and the larvæ devour the internal organs of the aphides, leaving the dry brown skins behind, from which the *Chalcids* have escaped. Lady-bird larvæ and the adult Lady-birds also feed upon these pests, as well as the larvæ of the Lacewing Flies (*Chrysopidæ*).

#### *Treatment for Rose Aphid.*

The best wash for Rose Aphid is soft soap and quassia alone; paraffin is not well to use, as it checks the growth of the roses.

In winter, spraying with caustic alkali wash would do some good in checking the pest. Spraying with quassia and soft soap has to be done repeatedly, for even if only a few are left they are enough to cover the bushes again in a week or so.

## **Correspondence on the Importation of Foreign Lady-birds.**

A large consignment of Lady-birds, introduced by a grower from California, were kept back at the Docks and examined, owing to there being some idea that Colorado Beetles were included. Specimens of the beetles were sent by the Board for identification. The following was reported to the Board:—

"The Lady-birds introduced by Mr. Norbury, from California, are known as *Hippodamia convergens*, Guérin.

"They are very well-known beneficial species, and their importation should be encouraged by the Board of Agriculture, as it is by the various Colonial Departments of Agriculture, or carried out under their supervision, as is done by the Department of Agriculture of the United States.

"The species introduced by Mr. Norbury is likely to thrive well in this country, and is sure to do much good.

"The Board may be interested to learn that the Tasmanian Lady-birds—*Leis conformis*—have now passed two winters in this country, specimens having been seen during the present month (April) in fruit gardens near Wye."

It was said that this species of Mr. Norbury's was a *Chilocorus*, introduced into America from China. A further communication was then sent to the Board, as follows:—

"The Board may be informed that the Lady-birds sent to Mr. Norbury belong to the species *Hippodamia convergens*, Guérin, as previously stated.

"They do not present the least resemblance to *Chilocorus similis*—perhaps the Board will inform Mr. Norbury of this fact. The latter is a Chinese species which is a scale feeder. The ones Mr. Norbury has obtained are aphid feeders, and are especially ravenous after Woolly Aphid."

#### A FURTHER NOTE SENT TO THE BOARD ON THE IMPORTATION AND BREEDING OF NATURAL ENEMIES OF NOXIOUS INSECTS.

"The importation of these and other beneficial insects should be supported and encouraged in every way by the Board.

Both fruit and hop-growers are much interested in the subject. I have had a large number of requests sent me for Tasmanian Lady-birds supplied to me by the Government Entomologist of Tasmania.

No notice need be taken of the remarks made in the "Daily News" (29. 4. 03).

There is no more danger in introducing these useful creatures here than into America, the Cape, or Australia. In all these places the subject is being thoroughly undertaken by competent Government officials, and not only meets with general approval, but in several instances has already proved of great value.

\* None were seen after, and I fear it has died out. They can withstand the winter, however, and will flourish here. Not enough were turned out in each locality to start a strong colony, hence the failure in this case.

COLLECTING AND DISTRIBUTING LADY-BIRDS.

Another correspondent wrote asking if quantities of Lady-birds could be obtained here for distribution in *Aphis*-affected gardens:—

There is at present no way of obtaining quantities of British Lady-birds.

*Coccinella septempunctata* occurs in numbers some years, and is especially noticed in the larval stage. The correspondent might have them collected by boys in any locality.

It would be best to advise him to obtain some foreign species as done by Mr. Norbury.

The *Hippodamia* or the *Leis* previously mentioned may be pointed out as being good species likely to do well in this country.

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SECTION III.

ANIMALS INJURIOUS TO FORESTRY.

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**The Brassy Willow Beetle.**

(*Phyllodecta vitellinæ*, Linn.).

Some beetles that have been troubling a grower of osiers at Leicester proved to be the Willow Beetle, *Phyllodecta* (*Phratora*) *vitellinæ*.

This is a well-known willow and osier pest and is the frequent cause of considerable loss. All the specimens sent belong to this species; but an allied one frequently does considerable harm as well, namely, *P. vulgatissima*, Linn. This latter species is metallic or greenish-blue, and the lines of punctures on the wing-cases irregular: *P. vitellinæ* is bronze and the punctures on the wing-cases are regular.

Both these beetles are found in most parts of Great Britain, the Brassy Willow Beetle being often very abundant. Both species feed upon poplars, as well as sallows and willows. They damage the plants both in their larval and adult stages by eating the underside of the leaf right through to the upper epidermis. The leaves then become torn, the upper epidermis breaking away after first turning brown. I have also noticed the beetles gnawing the young shoots.

## LIFE-HISTORY.

The adult beetles hibernate during the winter in the following places:—

(1) Under old stones and loose willow bark; (2) amongst the leaves, rubbish, etc., collected in the old willow stumps; (3) on the ground amongst fallen leaves; (4) amongst the heaps of osier peel; (5) in the hollow stem of herbaceous plants; (6) amongst the rubbish brought by winter floods; (7) amongst the thatch of willow peelings used for huts in osier beds, etc.; (8) between boards that overlap of any shed or building near; and (9) amongst the terminal shoots of young pine trees.

From these shelters they emerge in spring and lay their eggs in small groups on the under surface of the leaves. The eggs are grey and spindle-shaped, and are covered with a thin irregular transparent coating. From these eggs the larvae hatch in a few days and at once commence to eat away the lower layers of the leaves. They feed together in irregular rows as a rule, but now and then isolated specimens may be found. The larva is dirty yellow in colour; when full grown they reach half an inch in length, with four prominent brown spots on each segment dorsally, the head and legs deep brown; they resemble somewhat in form the larvae of lady-birds, being enlarged anteriorly and narrowed posteriorly. The brown spots vary somewhat, and in addition to those on the back there are lateral ones, and on the last two segments a squarish black mark. The markings of the three thoracic segments are the most pronounced. When mature they drop to the ground and pupate in the soil. From these pupae the beetles hatch out in the autumn and feed upon the leaves as long as they can get any sustenance and then hibernate in the places previously mentioned.

## PROTECTIVE AND REMEDIAL MEASURES.

(1) As far as possible all such places as mentioned as winter quarters should be removed or done away with during winter. Huts, etc., in and around osier beds should be built with due regard to the fact that beetles hibernate there. The use of osier peelings for roofing should be abolished.

(2) Traps may be laid towards the end of summer to draw away the beetles; birch bark, planks or the peelings may be put in heaps above flood level and burnt during the winter together with the beetles collected in the traps.

(3) Flood refuse should be burnt before spring.

(4) The young osiers may be sprayed with Paris green to kill beetles or larvæ early in the year.

(5) In small beds the beetles can be collected early in the year by shaking them off the shoots, on to tarred sacks or boards.

(6) It is said benefit is derived from dragging a rope weighted in the middle across osier beds and thus knocking the beetles off. It is doubtful if any permanent good could be the result of this method.

(7) The stocks may be dressed with finely-powdered lime and soot in the spring.

The chief things to do are the destruction of winter quarters, spraying with Paris green, and jarring the beetles off into pails or on to tarred sacks.

The following communication was received from the Board's correspondent :—

“ We are much obliged for your favour of the 23rd inst., enclosing copy of memorandum supplied by the Natural History Museum regarding the beetles we sent to your Department. We can confirm practically everything contained in that memorandum regarding the life-history of these pests, and the suggested remedies are in accordance with the lines upon which we have been working. We find the most expeditious manner is to put boys on to brush each head or willow plant separately. The beetles fall off into a tray covered with an adhesive substance not quite so thick as tar and are then drowned in paraffin and water. We destroyed some millions last winter in their winter quarters, and as they have confined themselves to two varieties of willows we are hopeful that we have practically exterminated them. They attacked us very severely nine or ten years ago, but after a couple of seasons disappeared entirely.

### The Pine Sawflies.

(*Lophyrus pini*, Linn., and *L. rufus*, Linn.).

Some of the following notes have been sent to the Board on the Pine Sawfly, and will appear in leaflet form. Other notes have since been added.

Pine trees of all kinds are frequently seriously damaged by the larvæ or grubs of Sawflies throughout Great Britain. The chief culprit is the Pine Sawfly (*Lophyrus pini*), but several other species do considerable harm now and again (*L. rufus* and *Nematus abietis*).

The Pine Sawfly attacks chiefly the Scotch pine, but all kinds of conifers are liable to its invasion. It prefers trees with a sunny aspect, and hence it will be noticed in greatest abundance at the borders of plantations or around clearings. Trees from twenty to thirty years old are most subject to the ravages of this pest, but young trees may sometimes be seen covered with the larvæ. The damage they do is soon noticeable owing to the larvæ feeding in companies. These colonies number sometimes as many as a hundred individuals. As the larvæ grow they disperse, however. The damage is caused in several ways—first by the larvæ eating the needles; this they do in two ways, by eating notches out of the sides of the needles and later by eating the whole needles down to their base. There are two broods during the year, the first of which devour the one-year-old needles and the second those of the current year. There are also records of the larvæ eating the young bark. I have recently found *L. rufus* attacking the spruce (*vide* Fig. 24).



FIG. 24.—SPRUCE  
ATTACKED BY  
*Lophyrus rufus*.

#### LIFE-HISTORY.

The parent or adult Pine Sawfly (Fig. 26, *a*) is nearly three-fifths of an inch across the wings in the male, and about four-fifths in the female. The male is black, with the apex of the abdomen reddish, with white spots on the underside of the first segment; in the female the body is dull yellow, with three dark areas on the thorax, and the middle of the abdomen black; legs yellow, and the wings with dusky borders, not so noticeable in the forewings of the male. The sexes can most easily be told by the male having doubly pectinate antennæ.

The adults appear usually early in May; Schlich says "in April and May," and again as a second brood in August.

The female, who seldom flies owing to her heavy build, lays her eggs on the needles in slits cut by the saw-like processes common to the Sawflies. As many as from ten to twenty may be placed in each needle, but as a rule not more than six or seven. Numbers of eggs are usually laid in close proximity, each one being covered over with a gummy or resinous secretion, and so protected from various enemies. This resinous material is scraped from the leaves. It is

said that one female may lay as many as one hundred and twenty eggs.

The larvæ hatch in from two to three weeks and appear towards the end of May and in June; by the end of June or in July they reach their full-fed stage and then pupate.

The larvæ (Fig. 25, *b*) are nearly an inch long when full fed, and like all the larvæ of this genus they have twenty-two legs. They are at first pale green, almost whitish beneath, and with black sucker-feet, but as they mature they become dull brownish-green, with dusky marks above the pro-legs, and with a dark brown head; the sucker-feet are yellow, with a brown line at the base. The first brood feed for from five to seven weeks, and then pupate amongst the needles or in cracks and crevices of the bark, the pupa lying in a cocoon of compact brown silk. These cocoons are very variable in colour,

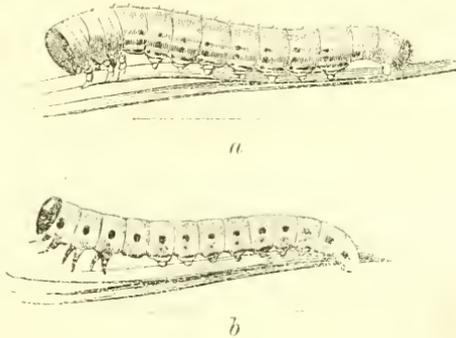


FIG. 25.

*a*, Larva of *Lophyrus rufus*; *b*, of *L. pini*.

some being almost black, others dull brownish-grey. They are about a quarter of an inch long, hard and compact. In many cases these cocoons remain over the winter, but they may give rise to a second brood of flies in July and August; the progeny of the second brood spin their cocoons mainly amongst the fallen needles, moss and heather beneath the trees. These ground cocoons often occur in bunches, and like those of the first brood are very variable in colour. The larvæ which form these cocoons do not enter the pupal stage until the spring. As many as seventy have been found together beneath moss and heather.

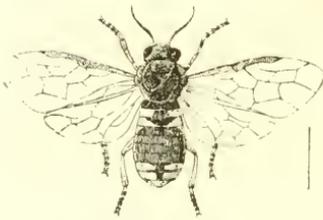
When the Sawfly is ready to emerge it cuts a large circular slit in the top of the cocoon and escapes; the top opening like a lid of a box on hinges,

This forest pest often attacks large areas at the same time; in one instance 2,000 acres were invaded. They often disappear suddenly; this is due to their being so susceptible to climatic changes, cold and wet weather being very prejudicial to them.

Several other Sawflies attack the conifers in this country, but the only one recorded as doing damage is the Fox-coloured Sawfly (*Lophyrus rufus*), which did considerable harm in Argyleshire to Scotch pines in 1890. It prefers young to old plants, trees from ten to fifteen or twenty years old being most sought after. Miss Ormerod found in the Argyleshire outbreak that plants two to six feet high were most subject to attack.



a



b

FIG. 26.—TWO PINE SAWFLIES.  
a, *Lophyrus rufus*; b, *L. pinii*.

The adult female (Fig. 26, a) is reddish-brown, with black spots on the thorax and with yellow to reddish-brown legs. They occur in August and September. One brood only appears to exist and occurs in larval form from the end of May until the middle or end of June. The larvæ (Fig. 25, a) are dusky greenish-grey with black heads, a pale line along the back and a dusky line with a pale one on each side of it above and below; the spiracles are placed in the lower pale line. The sucker feet and venter are pale green. When full grown they reach rather more than half an inch in length, and then form an oval pale yellowish-brown parchment-like cocoon both amongst the needles and amongst heather and in the

earth, etc., beneath the trees. They are also social, two usually feeding on each needle. They pupate in June, those kept under observation going into this stage the third week in June. Although needles and other "cover" lay on the ground in the breeding-cage in which I kept specimens they pupated in the earth just as described by Kollar. The females which come from these cocoons lay their eggs in August and September in the needles just as is done by *L. pinii*. Apparently the eggs remain in the needles all the winter and hatch out in early May.

PROTECTIVE AND REMEDIAL MEASURES.

It does not appear certain that sickly trees are more attacked than healthy ones, but it is as well to keep up healthy and well-stocked plantations where these pests frequently occur. All the pine sawflies have many enemies, which should be protected. Amongst these must be mentioned mice and squirrels, which devour large numbers of the larvæ hibernating in the cocoons during the winter, the cuckoo, goat-sucker, starling, which also devour numbers of the larvæ and adults.

When trees are invaded the larvæ may be collected by shaking them from the trees on to cloths spread on the ground. Trees that have been attacked should have the ground around their trunks examined in winter, when the heaps of cocoons may be collected and destroyed. Ground beneath such trees may be deeply ploughed in winter so as to bury the stray cocoons. Ornamental trees in parks and gardens may be speedily cleared by spraying with hellebore wash or arsenate of lead.

Another plan is to place fresh pine boughs beneath the trees and then jar the larvæ off; all those that fall to the ground collect on the boughs strewn about and can then easily be burnt.

An invaded tree should always be isolated, for the larvæ will migrate to another as soon as the food begins to fail. This may be done by placing a ring of tar on the ground around the base of the tree and by sticky-banding the trees just around the attacked one.

Deep trenches, two or more feet deep may be dug also around infested trees, with perpendicular or inwardly sloping sides so as to catch the larvæ when migrating.

### Larvæ of the Lime Hawk-Moth on an Ash Tree.

The large caterpillar of the Lime Hawk-Moth (*Smerinthus tilivæ*) was sent by a correspondent at Kensal Rise that was feeding on an ash tree.

The moth appears in May and June and lays her eggs upon lime and elm as a rule. The eggs are oval and plump in form, shiny pale green, about 1-75 mm. long. The larvæ appear in about three weeks after the eggs are laid; when mature they usually bury themselves under the ground in the autumn and then pupate. The pupa is one and a-quarter inches long, dark brown with a reddish tinge, the abdomen terminating in an abrupt triangular strong spine, ending

in two little hooks. The pupa is sometimes found in rough chinks in elm bark as high as six feet above the ground. The pupal stage lasts all the winter and gives rise to the moth in May and June.

They are never sufficiently common to do any damage to the foliage of the trees upon which the larvæ live. Ash is an uncommon food-plant.

### **The Felted Beech Coccus.**

(*Cryptococcus fagi*, Barensprung.)\*

Specimens of this pest have been sent from Derwent Hill, Stamford Bridge, Yorkshire.

It is a pest which may spread with great rapidity, the insects being readily blown about by the wind.

A suggestion is made that it would be advisable to have the trees sprayed with strong paraffin emulsion or caustic alkali wash. It appears from the specimen sent that the smaller boughs are attacked as well as the main trunk, so that it is necessary to spray the whole tree.

An account dealing more fully with this very destructive and rapidly increasing scale is appended.

This Beech Coccus has been greatly on the increase in recent years, and is causing great damage to beech trees in many parts of the county. It is as abundant in Northumberland as in Surrey, and in all parts it seems to be sooner or later fatal to the trees. Owing to the whiteness of the ovisacs it is a very conspicuous pest, the sacs uniting and forming white felted areas, often covering the whole trunk of large trees, making them look as if whitewashed. Many of the finest beech trees in Surrey have been destroyed by this pest; the bark peels off and the tree gradually dies unless remedies are adopted. Besides Northumberland and Durham, it is found as recorded above in Yorkshire, and Mr. Newstead records it in Cheshire and the Forest of Dean.

Abroad it is common near Prague, in Bohemia.

The larvæ hatch in September. Those sent from Yorkshire this autumn were hatched by August 28th, and kept on coming out until September 4th.

Many of these larvæ never see light, as they work their way under the old felted sacs and there set up an independent existence. They plunge their beaks into the bark and form a white wool over

\* For full information *vide* Mr. Newstead's "British Coccidae," vol. ii. p. 215, (Ray Society, 1903).

their bodies, and then soon cast their skin. As in all this group of insects, they lose their legs and antennæ, and become apodal females. These females are minute yellow egg-shaped masses which become covered with a dense matting of white wool.

This wool is soon removed by rains, but is rapidly formed again. A correspondent writing from Yorkshire evidently noticed this feature, for he says, "The extraordinary heavy rains of the last few days have killed the creatures."

This insect mainly attacks the trunk, but may ascend into the boughs. Specimens of it on small boughs have recently been received from Surrey. The trunks, however, are mainly affected. A specimen sent to the Museum by Mr. R. Burdon, of the Castle, Castle Eden, Durham, has the thick incrustation of this pest all over it. Mr. Burdon, as previously reported (First Report, p. 39), mentions a previous outbreak of this pest in Northumberland some fifty years ago, during which a lot of fine beeches were lost.

Another correspondent also records the loss of a beech in Gloucestershire (p. 39), and points out that the trees at Longwillow Hall, Morpeth, are attacked on the east side. This has been generally noticed.

I find a note in the *Journal of the Land Agents' Society*, no. 5, vol. ii., 1903, p. 167, to the following effect:—"I observed the above (Blight on Beech Trees) on some trees, so I wrote to Mr. Warburton, the entomologist of the Royal Agricultural Society, and he tells me it is 'a special beech scale called *Cryptococcus fagi*...' It is to be found everywhere, but never makes any headway unless the tree is dying from other causes. In fact, it seems to be a symptom, and not a cause of ill-health, and clearing off the scale has no very marked effect in improving the tree.—(F. N.)" This is obviously wrong, as any one who is acquainted with this disease knows. Again, in the same paper an anonymous writer, "C.," states that "the scale shoots off wet and rain, and prevents any curative wash or spray being used with any effect." This again is wrong, for it is speedily cleared by paraffin emulsion, or better still, caustic alkali wash and soft soap in winter. A heavy spraying with either kills the pest; the soft soap sticks the wash to the insect débris just as it does to Woolly Aphids or other Dolphins.

This coccus occurs in greatest numbers on light soil, and increases most rapidly as in all scales and Aphides in dry weather. Nevertheless perfectly healthy trees are attacked on heavy soils and killed by this pest.

Observations of such skilled foresters as Mr. A. T. Gillanders

should bear their full weight, and I need only quote one extract from his paper:—"When thickly covered, the bark separates from the stem, and the tree ultimately dies in consequence."

An observation was made with regard to wind distributing this pest; glass slips with grease were hung in trees neighbouring the one infested, and were found to contain fragments of the wool and the larvæ of the coccus.

#### TREATMENT.

The great increase and loss from this coccus makes the subject of treatment a very important one, especially as erroneous statements have been made as to the impossibility of washes doing any good.

An observer in Gloucestershire states that he had saved several trees in parks and gardens by "scrubbing the trees with a hard scrubber in dry weather and spraying the trees with a mixture of petroleum, soft soap, quassia and water."

Mr. Gillanders destroyed the coccus by the following mixture:—"Take about half a gallon of soft water, boil and dissolve about 1 lb. of soft soap and 1 lb. of common soap, add a handful of sulphur and a pint of paraffin and about the same quantity of turpentine. Then add about four gallons of soft water to this mixture. Churn well together, and apply with a whitewash brush just as the larvæ are hatching out."

Another plan adopted some years ago, said to be successful, is to bore three holes with an inch auger at about equal distance right into the centre of the trunk, about three feet from the ground and sloping slightly towards the root of the tree. Into these holes place as much flowers of sulphur as can be conveniently got in, and fill up the holes with soft wood. This should be done in autumn. How this acts I fail to see, unless the sulphur permeates the sap and so kills the insects. Mr. Gillanders tried this with *Chermes* on Silver Firs with considerable success.

From experiments I made I found paraffin emulsion destroyed the pest, especially when used early in September when the larvæ were moving about. Better results still were obtained by caustic alkali washing in winter and early spring. The emulsion if applied with warm water is most effective. The trees should be sprayed twice at intervals of two days.

This pest is not attacked by birds, and rarely by insect parasites, according to Mr. Newstead.

All trees cut down should be barked at once and the bark burnt.

## The Canker Caterpillar of the Oak.

(*Tortrix viridana*.)

The term "Canker" or "Blight" caterpillar is sometimes used by foresters and labourers when speaking of the Green Oak Tortrix (*Tortrix viridana*).

The Green Oak Tortrix occurs in great numbers some years, and its ravages are often persistent, lasting, as in Windsor Forest, for four years (1890-1894). The moth that gives rise to this so-called Canker worm or Oak-leaf Roller is about four-fifths of an inch across the expanded wings, but varies in size; the fore wings are uniformly pale apple-green, with the costal edge sulphur coloured, the hind wings whitish grey, and all the wings have white fringes. They appear on the wing in June and July and fly during the day-time. They lay their eggs singly or in groups on the buds and pass the winter in this stage. The larvæ hatch in April and May, and at once commence to feed upon the buds and leafage. When mature they are about three-fifths of an inch long, grey or greyish-green in colour, yellowish-green posteriorly, with blackish-brown head, and small black spots on the back. They not only devour leaf and bud, but also the inflorescence. When full fed they roll a leaf up and pupate inside the tube, usually in the early part of June; the pupa is two-fifths of an inch long, black in colour. The pupæ are also found in crevices in the bark. A habit very noticeable in the caterpillars is that of lowering themselves from the leaves by threads of silk, and by means of these silken cords they regain the foliage.

Small trees in parks and gardens can be cleared by arsenical washing. No remedies can be applied in forests. The great thing is to protect natural enemies, namely, rooks, jackdaws and starlings, which feed upon the caterpillars; tits devour the eggs.

The caterpillars of the Dunbar Moth (*Cosmia trapezina*) feed upon this grub.

Besides oak, hornbeam is also attacked by *T. viridana*.

## GROUP E.

## SUB-GROUP C. ANIMALS WHICH CONCERN MAN AS CAUSING BODILY INJURY OR DISEASE TO WILD ANIMALS IN THE PRESERVATION OF WHICH HE IS INTERESTED.

## Grouse Disease.

A communication was received from Mr. R. Munro Ferguson, M.P., regarding the great loss of money due to the disease in grouse. The following communication was sent to the Board on this subject.

Regarding this subject Mr. R. Munro Ferguson may be informed that it is extremely improbable that Tapeworms are the usual cause of grouse disease.

This was pointed out by Cobbold in 1869; he stated as follows: "The idea of the grouse disease being due to the prevalence of cestoid entozoa was manifestly erroneous; not only were the symptoms exhibited by the infested birds entirely at variance with such a notion, but the post-mortem appearances distinctly proved that the disorder was due to other causes."

Now and again there is no doubt, however, that birds succumb to these parasites when present, as they often are, in very large numbers.

It is possible that certain Nematode worms cause still greater mortality, but both kinds do not seem to account for the death rate entirely as far as our scanty information tells us.

Very little is known concerning the internal parasites of game birds; for instance, six worms only are recorded from black and red grouse, whilst over forty occur amongst domesticated poultry.

The species found in the two kinds of grouse are the following:—

NEMATODA.—*Ascaris compar*, Schrank (in both kinds).

„ *Ascaris vesicularis*, Froelich, in Red Grouse.

„ *Trichosoma longicolle*, Rudolph, in Black Grouse.

CESTODA.—\**Drepanidotaenia infundibuliformis*.

„ \**Fimbriaria calva*, Baird.

„ *Davainea urogalli*, Modeer. *Tenia tuncus*, Mehlis? *Tenia microps*, Diesing?

„ *Davainea circumvallata*, Krabbe. *Tenia linca*, Rud. *Tenia pluriuncinata*?

„ *Davainea calva*, Baird.

The two species marked with an asterisk are doubtful.

We do not know the life-history of any of the three definite Grouse Cestodes.

Mr. Munro Ferguson should be informed that it is not at all necessary to kill off all his rabbits because of grouse disease, as there is no connection between Avian and Rabbit tapeworms, which was thought to be the case owing to curious *Darainca*-like cysticeroid forms being found in rabbits.

In all cases where the life-history of Avian tapeworms have been traced out, the intermediate host has proved to be a slug (*Limnaea*), snail (*Helix*), insect or earthworm for land birds, water insects, or Crustacea for ducks and other water fowl. Probably the Grouse Cestodes have a similar life-history. The same applies to sheep; there can be no connecting the *Moniezia*s of sheep and the *Darainca*, etc., of birds.

The Nematode parasites of grouse should be investigated both in diseased and healthy birds. As an example of the different effect of these two groups of parasites upon their host, the rabbit may be mentioned. This rodent is frequently heavily infested with tapeworms, and yet lives on apparently unharmed; now and then cases of great mortality amongst rabbits have been investigated, and the cause readily traced to *Strongylidae* (vide Report Journ. S. E. Agri. Coll., no. 8, p. 60, etc.).

Dr. Cobbold believed grouse disease to be due, anyhow, in part to a small intestinal *Strongyle*, but this matter does not seem to have been definitely worked out.

On certain moors there are undoubtedly epidemics of tapeworm which, by virtue of their numbers, do kill off the young birds.

Probably there are several factors which are the cause of grouse disease—entozoa, bacteria, degenerated stock.

The disease or diseases are encouraged by (1) destruction of animals and birds of prey, and (2) overstocking.

## GROUP F.

**Insects in Furniture.**

The furniture and household pests sent by a correspondent from Whitechurch, Glamorganshire, belong to two, not three, species as mentioned in his letter.

They are (1) the so-called "Death Watch" (*Atropos divinatoria*), (the same name is given to certain furniture beetles—*Anobium tessellatum*, etc.), and (2) mites belonging to the genus *Glyciophagus*, and are probably *Glyciophagus cursor*, de Geer, and *G. domesticus*, de Geer. (Specimens were sent to A. Michael, Esq., for identification. They proved to be *G. domesticus*, de Geer.)

They are both best destroyed by fumigation. Sulphur is usually employed, but if both the pests are particularly abundant, the rooms should be fumigated with hydrocyanic acid gas as well. Rooms should be well brushed down and the floors washed with soap and water. Books, etc., which harbour the *Atropos* should be subjected to the fumes of benzine in closed boxes. Fumigation with sulphur answers best for the mites, but is not so effective upon the *Atropos*, hence hydrocyanic acid gas is mentioned.

**The Saw-Toothed Grain Weevil.**

(*Sitona surinamensis*, Linn.).

Some insects sent by a correspondent of the Board as abundant pests in all kinds of corn and meal, in a meal room, were—(1) The Saw-toothed Grain-Beetle (*Sitona surinamensis*, Linn.), and a few of the Corn Weevil (*Calandra granaria*). The latter pest has been mentioned in previous Reports and a note upon it will be found in the Journal (Vol. VIII., No. 3, p. 358, Dec. 1901).

The Saw-Toothed Grain Weevil (Fig. 27) is one of the commonest pests in grain, groceries, meal, and almost all edible stores. Although it is mainly omnivorous, it has a strong liking for cereals and farinaceous substances. It is recorded as attacking amongst other things red pepper, mace, yeast, tobacco, and preserved fruits. Bags in which meal flour, etc., are kept may be perforated by them, and in one instance

this beetle has been recorded as annoying people of a night by nipping them when in bed (Taschenberg). Both larva and adult do the damage. They occur all the year round, but are most abundant in warm weather. The beetle is about one-tenth of an inch long, rich deep brown in colour, rather flattened and can easily be told by the curiously notched thorax, there being six distinct spines on each side and two more or less prominent median grooves above. The female lays her eggs amongst the meal, and from them come very active little larvæ (Fig. 28), nearly white in colour, rather flattened, each segment having a darker median area; the six jointed-legs, in front, are brown, and there is an anal proleg; each segment has a few rather

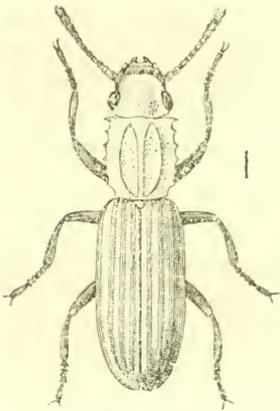


FIG. 27.—THE SAW-TOOTHED GRAIN WEEVIL (*Silvanus surinamensis*, Linn.).

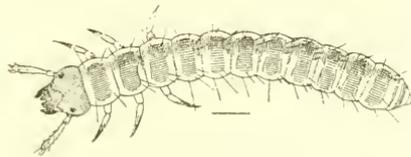


FIG. 28.—LARVA OF THE SAW-TOOTHED GRAIN WEEVIL.

long pale hairs. When mature the larva reaches about one-fifth of an inch and then turns into the pupal stage where it has been feeding; sometimes a cocoon is formed of coarse meal and grain, at other times the pupa is naked, as usually occurs, when this pest invades and lives in flour and meal.

In this country, it appears that the winter is passed in the mature condition, and reproduction ceases. The life-cycle varies in this country from five weeks to ten weeks. In America it is recorded as passing through all its stages in twenty-four days.

The variation in time taken by them to mature depends upon temperature and the amount of food supply.

They may be treated in the same way as the Corn Weevil.

OTHER SHORT REPORTS SENT ON THE FOLLOWING  
SUBJECTS.

SWARMS OF FLIES.—A correspondent of the Board wrote that great numbers of flies are hibernating under shelter, and asked how he could destroy them. The following reply was sent to the Board:—

“Without knowing what kind of ‘flies’ are referred to, it is scarcely possible to say how to get rid of them.

“If they are hibernating under the roof, or if they are now hatching out from maggots and are merely sheltering during the day or night, they can easily be killed by fumigating with burning sulphur.

“More definite information can be given if specimens of the flies are forwarded.”

No specimens were received.

SUPPOSED COLORADO BEETLE.—Some eggs sent from Tilbury suspected of being those of the Colorado Beetle arrived much shrivelled and damaged. Those that were perfect were eggs of a Lady-bird and not those of the potato pest. (This pest seems to have been effectually stamped out.)

PEA AND BEAN WEEVILS.—Some insects sent on May 27th by a correspondent from Wolfscastle, Pembrokeshire, that were attacking Broad Beans were the Pea and Bean Weevils (*Sitones lineatus*).

Information concerning this pest is given in Leaflet No. 19.

Another correspondent wrote asking if certain manure was likely to encourage them. He was informed that it is not at all likely that manure made by mixing w.-c. refuse, grass, salt and lime encourages the Pea and Bean Weevils.

Not as much damage as usual has been done by this pest this year. Comparatively few instances of the damage caused by them have been recorded.

INSECTS ON APPLE TREES.—The insects sent by a correspondent of Rickling, Bishop’s Stortford, reported as doing damage, were as follows:—

(1) Winter Moth Larvæ (*Cheimatobia brumata*).

(2) *Aeari* known as *Trombidium holosericeum*—the supposed adult

stage of the Harvest Bug (*Leptus autumnalis*). These mites do not (as far as personal observations go) damage plants. They are frequently found on soil.

These large red mites shelter under the bark of trees.

If any damage is being done to the apple trees otherwise than that caused by the green Winter Moth larvæ it must be done by some other creature than the *Acarus* referred to here.

INSECTS IN RASPBERRY BUDS.—The larvæ of the Raspberry Moth (*Lampronia rubiella*) were sent by a correspondent from Ryarsh, West Malling, where they were doing much harm in his plantations. All necessary information can be found in the revised Leaflet No. 14.

CANKER DISEASE IN PEAR TREES (CONFUSED WITH BEETLE MITES).—An examination of some pear wood sent by a correspondent of the Board has been made.

There were present great numbers of Beetle Mites (*Oribatidæ*). As mentioned in previous reports, these *Acari* do no harm. Albert Michael endorses this statement. *Oribatidæ* are extremely abundant.

Trees may be seen covered with them on which the bark is unharmed.

Trees may frequently be seen showing the diseased appearance presented by the sample sent which have no *Oribatidæ* or any mites or insects upon them. Certain trees under observation never have had any arthropod pests for fifteen years, and yet show all the symptoms present in the specimen sent which are well known to anyone connected with fruit culture to be sure signs of canker. This was the cause of the disease in this case.

GREASE-BANDING.—Information regarding grease-banding for Winter Moth was sent to a correspondent, as follows:—

There is no other substance known than cart grease for banding trees. Various kinds are made and sold for this purpose and probably some of these contain other substances in combination.

If the grease is good it lasts a long time.

The best I know is that sold by Messrs. W. Horne & Son, Perry Hill, Cliffe, nr. Rochester.

[Special thick papers are now sold for this purpose, which will remain on the trees more than a year. The importance of grease-banding has been shown more than ever during the last year or so where Winter Moth is the main pest. The plate given on page 42 shows an orchard so treated and the best height to band the trees. The effect in this orchard has been marvellous. Previously the foliage

was destroyed year by year, but two years grease-banding has lessened the pest to such an extent that but little harm is now done. Hundreds of females and males were caught in each band.]

TORTRIX LARVÆ.—A number of Tortrix larvæ were received from a correspondent, who stated they were damaging his fruit trees.

Several larvæ of Tortricid moths do much harm to fruit trees. These can easily be destroyed by arsenical spraying. They are now (July) nearly all full fed, and it would not be worth doing so now.

Trees should be washed as follows :—

(1) With caustic alkali wash in winter.

(2) With arsenate of lead and paraffin emulsion in early spring; again when the leaves are well out, and again when the blossom has fallen.

Recent results show that arsenate of lead is far superior to Paris green, and should be advised in place of the latter for all mandibulate fruit pests (*vide* article, p. 50).

APHIS (*Myzus cerasi*) ON CHERRY TREES.—The cherry trees belonging to a correspondent near Cirencester were reported as suffering from an attack of the Cherry Aphis (*Myzus cerasi*) and a remedy asked for.

When the fruit is backward the trees should be washed with soft soap and quassia, but if the fruit is maturing, with soft soap and water alone.

This species, the "black fly" of the cherry, produces much honey-dew, and this, mixed with the "frass," falls down and spoils the fruit. Fungoid diseases and subsequent decay follow upon this black débris.

About 10 lbs. of soft soap to the 100 gallons should be used, unless quassia is added, then 6 lbs., but under the circumstances plain soft soap is best.

TERMS USED IN REGARD TO THE WINTER WASHING OF FRUIT TREES.—The Organising Secretary of the Warwickshire Farmers' Association asked for information as to whether washing and spraying are the same :—

When dealing with insecticides and fungicides, the term "washing" means also "spraying"; it does not mean scrubbing with a brush, or applying with a sponge. The term usually employed in this country for the proper application of liquid insecticides by farmers is "washing"; some, however, use the American term, "spraying." Syringing is quite different; it simply means throwing

a quantity of liquid over trees or plants by means of an ordinary syringe. In the so-called "washing or spraying," the insecticides are sent out by means of special apparatus, which distribute the fluid in a fine mist or spray.

The caustic alkali wash could not well be applied with a brush, and certainly not with a sponge.

It might be applied with a garden syringe, but much of the liquid would be wasted; proper spraying machines should be used.

CANKER DISEASE IN APPLE AND PEAR TREES.—The bark of apple and pear, sent by a correspondent from Studington, near Cheltenham, supposed to be insect damaged, shows no trace of any insect damage, nor insects.

It presented all the typical symptoms of Canker Fungus (*Nectria ditissima*), described in certain stages in Leaflet No. 56.

(The working of canker in varied ways is often taken to be insect damage, but when the latter cause harm the pests can be easily detected.)

THRIPS ON CUCUMBERS.—A correspondent wrote asking for a remedy for Thrips in cucumbers. The following reply was sent:—

Thrips on cucumbers may be destroyed in many ways.

A common plan is simply to syringe with cold water.

Quassia wash has been used with success and also fumigation with tobacco.

I think that the pyrethrum wash is best, however.

The pyrethrum should be quite fresh, as it soon loses its strength.

CELERY FLY (*Acidia heraclei*).—The diseased Celery leaves sent by the Crown Trading Company, Limited, from Cottenham, near Cambridge, were found to be badly attacked by the Celery Fly (*Acidia heraclei*).

All necessary information is given in Leaflet No. 35. It has been very harmful in many districts this season.

CABBAGE AND CAULIFLOWER MAGGOT.—Two enquiries concerning the Cabbage Root Maggot have been received. A report on this pest is given on p. 67.

One correspondent sent some Centipedes with them and various notes.

There is of course no connection between the maggots and the centipedes, but it is very probable the centipedes are preying upon the grubs.

The Cabbage Root Fly is very general in Great Britain.

The centipedes were *Geophilus subterraneus*.

Another correspondent sent young cabbage plants badly attacked by maggot from Mellion, Cornwall. These plants arrived on the 15th of August, and I found larva of all sizes and pupæ in them. The flies commenced to hatch out on the 25th of August.

LOCUSTS (*Acridium ægyptium*, Linn.) IN CAULIFLOWERS FROM ITALY.—The insect forwarded to the Board by Mr. John W. Gunn, found in a cauliflower from Italy, is a common and destructive Locust—*Acridium ægyptium*, Linn.

This pest is frequently imported into this country. It has been taken flying in England on several occasions.

Another species, *Locusta danica*, Z., now and then occurs, having actually migrated from the Continent, but never in large numbers.

There appear to be a considerable number of locusts being now imported in foreign vegetables to this country.

PREVALENCE OF LONG-HORNED LOCUSTS AT HERNE BAY.—Locusts were sent by Mr. W. H. Eldridge from Herne Bay; they were the well-known British species *Locusta viridissima*, Linn. It can be told from all other British Locustidæ by its large size. It occurs in many places around the South Coast, especially, it seems, in parts of Kent. It extends down to Land's End, where it appeared in large numbers in 1889. It has seemingly been very abundant this year.

Its distribution is very wide, occurring in North Africa, Asia Minor, and in the Amur district, as well as all over Europe.

*Trombidium holosericeum* IN GARDENS.—Some specimens sent by a correspondent from Charmouth, Dorset, as American Blight or Woolly Aphis were Acari or Mites known as *Trombidium holosericeum*, sometimes called Red Harvest Mites. As far as personal observations go I should say they are quite harmless, and probably do some good by feeding upon small insects and also, it seems, decaying animal matter. They frequently swarm in the spring and early summer along the rows of young peas and do them no harm. (Numbers of this *Acarus* are sent every year.)

A REMEDY FOR APHIDES.—A correspondent of the Board writes that "the vapour of bisulphide of carbon liquid used in the bee-keeper's 'smoker' is a very good remedy for green fly, and does not injure the most delicate flowers."

BETLE LARVÆ DAMAGING HORSE CHESTNUTS.—Information was sent the Board that beetles were damaging the shoots of horse-chestnuts in Surrey in the same way that the Pine Beetle does the pine.

It was not possible to say what beetle had done the damage; the piece of damaged shoot was not sufficient to identify the culprit by, as no beetle is known to work in the way shown in the specimen.

GIANT WOOD WASP (*Sirex gigas*).—Mr. Jonathan Davies, of Bryn Eirian, Portmadoc, North Wales, forwarded an insect from Wales, the common Giant Wood Wasp or Sirex (*Sirex gigas*).

The larvae of this insect and the allied species—the Steel Blue Sirex (*S. juveneus*)—are very harmful to pines and almost all conifers in many quarters, but damage has not been reported from North Wales.

LARCH APHIS (*Chermes laricis*).—Specimens of diseased Larch were sent by a correspondent from Harlestone, Northampton, covered with Larch Aphis (*Chermes laricis*).

Judging from the amount of Aphis débris on not only the remaining needles, but also on the stems, I should say the cause of disease was the presence of this pest; in any case, I have seen trees, no worse affected, looking as if burnt owing to this *Chermes*.

The specimens were sent to Kew to see if any fungoid disease was also present, and none was found.

A full account of the life-history of the Larch Aphis is given on page 86.

DAMAGE TO INDIAN CORN BY WEEVILS IN BRITISH EAST AFRICA.—Information was sought by the Foreign Office regarding the treatment of East African corn to clear it of Weevil damage.

The information sent was too meagre to enable advice to be given. The following communication was thus sent to the Board:—

“It would be advisable to obtain some definite information regarding this Weevil damage to Indian corn in East Africa.

“Does it attack the standing corn, or only when harvested?”

“Is this pest the usual Corn Weevil (*Calandra* sp.)?”

“If either *Calandra oryzae* or *C. granaria*, then some plan could be advised at once to remedy the evil.

“Bisulphide of carbon for large masses in bulk would probably be too costly. But until more definite information is given by the Foreign Office nothing can be advised.”

LIST OF LEAFLETS PREPARED AND REVISED FOR THE  
BOARD OF AGRICULTURE DURING 1903.*Prepared.*

- No. 94. Millipedes and Centipedes.  
Mussel Scale.  
Cabbage Moth.  
No. 60. Goat Moth and Wood Leopard Moth.  
No. 90. Pith Moth.  
Aphides or Plant Lice.

*Revised.*

- No. 68. Currant Aphides. (Figure added.)  
No. 60. Wood Leopard Moth.  
No. 44. Common Lapwing, Plover, or Peewit.  
No. 50. Water Wagtails, or "Dishwashers." (New figure prepared.)  
No. 42. Short-Eared Owl. (New figure prepared.)  
No. 11. Daddy-Longlegs or Crane Fly.  
No. 5. Mangold Fly.  
No. 35. Celery Fly.  
No. 30. Codling Moth.  
No. 6. Voles and their Enemies.  
No. 25. Chafer-Beetles, or White-Grubs.  
No. 20. Tent Caterpillars. (Figure added.)  
No. 57. External Parasites of Poultry.  
No. 58. Internal Parasites of Poultry.  
No. 89. Fluke, or Liver Rot in Sheep. (Figure prepared.)  
No. 4. Caterpillars on Fruit Trees.  
No. 34. Woolly Aphis or Apple Root Louse.  
No. 45. Starling.  
No. 41. Red Spider.  
No. 21. Warble Fly. (Rewritten.)  
No. 10. Wireworms.  
No. 31. Onion Fly.  
No. 12. Gooseberry Sawfly.  
No. 3. Turnip Fly or Flea. (Rewritten.)  
No. 24. Ribbon-Footed Corn Fly.  
No. 67. Favus in Poultry.

ARTICLES AND NOTES IN THE JOURNAL OF THE BOARD  
OF AGRICULTURE (1903).

Carrion Beetles.  
Rosy Rustic Moth.  
The Green Rose Chafer.  
The Red Bud-Caterpillar.  
The Apple-shoot Borer.  
Destruction of Mustard Beetle.  
Destruction of Weevils on the Roots of Pot Plants.  
Ground Beetles and Strawberries.  
The Raspberry Beetle.  
Yellow Spots on Black Currant Buds and Leaves.  
Ground Beetles in Mangolds.  
The Saw-Toothed Grain Weevil.  
Millipedes and Centipedes.  
The Pine Saw Fly.

## APPENDIX.

## EGYPTIAN COCCIDÆ.

Several scale insects or *Coccidæ* have been received from Egypt during the past year, collected by Mr. Frederic Fletcher. These have all been examined by Mr. Robert Newstead. One species proves to be new, and is described here. Twelve species are so far known in Egypt, six collected by Mr. Fletcher. The others are recorded by Mr. Newstead, who has sent most of the notes given here.

It is hoped to issue a further list based on material now being collected in Egypt and the Sudan in next year's Report.

I. *Diaspis squamosus*, n. sp., Newstead and Theobald.

Female puparium irregularly circular, rather highly convex, thick, opaque. Colour of specimens in spirit white or greyish white, but on drying they change to ochreous grey and are paler towards the margins. Exuviae placed on one side towards the anterior margin; both pellicles are shining dark brown, the thin secretory covering of the second pellicle being of the same colour as the supplementary secretion. Average diameter 1.25 mm.

Adult female broadly ovate with the anal extremity slightly produced. The two free abdominal segments not strongly defined; lateral margins (Fig. 29<sup>1</sup>.) armed with prominent tuberculate plates or squames, each furnished at the apex with an extremely fine short hair-like process. Pygidium not very strongly produced and evenly rounded; margin (Fig. 29,<sup>2</sup>) with three pairs of prominent lobes, each with a deep notch or emargination on the outer lateral side; second pair of lobes slightly smaller than the median pair. There is a rather stout spine arising from the base of the outer lateral margin of each lobe, and one about midway between the third lobes and the first free abdominal segment. Squames or plates between the lobes narrow, tapering, and finely divided at the tips; there are two in the space between the median and second lobes, and three between the

latter and the third lobes, and usually four much broader ones beyond them. following which are three or four tuberculate plates resembling



FIG. 29.—*Diaspis squamosus*, n. sp.

1. Lateral margin of abdominal segment. 2. Margin of pygidium.

those on the abdominal segment. but they are smaller. Margin finely crenulated. Circumgenital glands in five groups; formula of three examples:—

$$\begin{pmatrix} & 6 & \\ 17 & & 16 \\ 20 & & 16 \end{pmatrix} \quad \begin{pmatrix} & 3 & \\ 16 & & 18 \\ 14 & & 13 \end{pmatrix} \quad \begin{pmatrix} & ? & \\ 14 & & 17 \\ 17 & & 14 \end{pmatrix}$$

Dorsal tubular spinnerets short, numerous, broadly and irregularly scattered along the margins.

Margin of lower portion of the thoracic area and also the unarticulate abdominal area with many short, capitate, tubular spinnerets, minute hairs and short tubercular processes. Rudimentary antennæ placed near the margin in front, each with a short slender curved spine. Below the antennæ, and towards the margin on each side, is a small and rather scattered group of minute tubercles (? spine bearing). Rostrum normal; mentum extremely small; filamentous loop scarcely extending beyond the latter. Length 0.75–1 mm.

*Habitat*.—on peach and pear (Fletcher), Gizch, Egypt, 1903.

*Notes*.—The salient characteristics of this species are the prominent plates or squames at the upper part of the margin of the pygidium in the ♀, and the strong thick ventral scale or pellicle of the puparium.

In the absence of the male puparia it has been rather difficult to fix the generic position of this species, but the arrangement and character of

the dorsal tubular spinnerets are quite characteristic of the genus *Diaspis*, and we think that it has been correctly placed.

Mr. Fletcher sent this species to the Museum, but gives no notes upon it save that it occurs on peach and pear.

II. *Aspidiotus (Chrysomphalus) aonidum*, Linn., Syst. Nat., Ed. x., i., p. 455 (1758).

*Chrysomphalus ficus*, Ashmead, American Ent., iii., p. 267 (1880).

♀s and ♂ puparia.

Common on *Jambosa vulgaris* and orange, Alexandria and Cairo, Egypt (Newst.); on orange (Fletcher). The Egyptian specimens, like the English, are very dark. This species also occurs abundantly in the United States, West Indies, Australia, Ceylon and Japan. Berlese has found it in Italy, and it has occurred at Kew. It also occurs on oleander, rose and orchids.

III. *Aspidiotus (Chrysomphalus) aurantii*, Maskell, Trans. New Zealand Inst., xi., p. 199 (1878).

On cultivated orange, Alexandria, Egypt (Newst.). ♀s only.

IV. *Mytilaspis pomorum*,\* var. *vitis*, Goethe, Jahrbücher des Nassauischen Vereins für Nat., p. 118 (1884).

♀s and ♂ puparia.

Not hitherto recorded from Egypt. The "puparia" or ovisacs of the females are smaller and of a somewhat paler colour than typical examples found in Great Britain on apple and other trees, but the structural details of the females are specifically identical with typical specimens. There are quite a number of male puparia present, and they are interesting as being the first recorded examples of this variety.

Mr. Fletcher found this mussel scale encrusting a vine in the open air.

V. *Lichtensia ephedræ*, Newst., Ent. Mo. Mag., s.s. vol. xii., p. 83, fig. 5 (1901).

♀s and ♂ puparia.

Discovered by Dr. George Schweinfurth in the Waddy Gerrawy, Helonan, 15' south of Cairo, and forwarded to this country for identification by Admiral R. W. Bloomfield.

*Habitat* on *Ephedra alte*, C. A. Meg.

This interesting species is at present not recorded from any other part of the world.

VI. *Ceroplastes mimosæ*, Signoret; Ann. Soc. Ent. Fr. (5), ii., p. 46 (1872); Bull. Soc. Ent. Fr., p. xlvii (1872).

Egypt. On *Mimosa nilotica*.

It is just possible that this insect may be an immature form of the next species.

\* Mrs. Fernald gives priority to *Lepidosaphes ulmi*, Linn., "Cat. Coccidæ of the World," p. 314, no. 1431, 1903.

VII. *Ceroplastes africanus*, Green, on *Acacia* (ex-collection Brit. Museum).

These specimens are undoubtedly referable to *Ceroplastes africanus*, Green [Ann. and Mag. Nat. Hist., ser. 7, vol. iv., p. 188. Types Coll. Brit. Mus.]. In drawing up his diagnosis of this species (*l.c.* p. 190), Mr. Green refers to the examples from Egypt, and says that they agree with those from the Cape in general appearance and structure, including the characters of the anal tubercle and stigmatic clefts. But as he was unable to make a critical examination of the antennæ, he could not decide. Examples with perfect antennæ have now been examined, and as the structural details of these organs are found to agree with Mr. Green's ample description, there can be no further doubt as to their identity with the types from Cape Colony.

It is evidently a not uncommon species in Egypt, as Newstead has received it in some numbers from Luxor on young branches of *Acacia nilotica*, and also from Cairo and Assuan on the same plant or a species closely allied to it. The specimens from the first-named locality were collected in 1899 by Prof. Schweinfurth, the others by Dr. L. A. Jagerskiöld. The cereous test or covering in all the examples are in an imperfect condition, and may be slightly "weathered," having lost all trace of the sculpture noted by Mr. Green in his types. The most salient character, and one by which it may readily be distinguished from all other known species of the genus, is the strongly defined cephalic extension, or "trowel-shaped projection," in which respect it closely resembles the ♀ of *Vinsonia stellifera*, Westw.

VIII. *Gossyparia mannifera*, Hardw., "Asiatic Researches," xiv., pp. 182-186 (1822).

Mrs. Fernald records this from Egypt on *Tamarix mannifera*.

IX. *Asterolecanium pustulans*, Cockerell, Journ. Inst. Jamaica, i., p. 143 (1892), *nom. nuda*; "Science Gossip," xxix., p. 77 (1893).

♀s only.

The outline of the puparium of the female is nearly circular, with a slight inclination to be triangular. Fresh examples are described as being greenish-yellow in colour, with a sparse covering on the dorsum and a fringe of pinkish hair-like rods of secretion. It infests a number of plants, upon which it produces pustules or swellings. It is most destructive to the fig and oleander, but is said to be rarely so on other plants. It is a pest in the West Indies, and is found also in Brazil, Mexico, Florida, California, S. Carolina, Antigua, Trinidad, Australia, New Zealand, and in France. Mr. Maxwell Lefroy\* says that "it is a curiously destructive species, a few only being sometimes sufficient to kill a twig or small branch. A small pustule is formed below the insect, suggesting the injection by the insect of some poison which not only leads to the formation of the pustule, but to the speedier death of the infested twig, leaf or stalk." As a remedy he suggests the use of the kerosine emulsion.

Mr. Fletcher sent this species from Egypt on *Ficus sycomorus* and *Ficus cardica*. They also attack *Pelargoniums* and other ornamental plants in Egypt, writes Mr. Fletcher.

\* West Indian Bull., vol. iii. p. 268.

X. *Asterolecanium bambusæ*, Boisduval ; Insectologie Agricole (1869).

Specimens sent by Mr. Fletcher from Egypt on *Bambusa arundinacea*. Mr. Newstead says it is common at Assouan on *Bambusa* sp. He also gives the following localities elsewhere: Algeria, West Indies, Brazil, Ceylon, Britain ("Cocc. Brit. Isles," ii., p. 153), and now adds as additional localities Grenada and Mauritius. Its habitat seems to be the various species of bamboo. Their presence on the leaves is marked by yellow stains.

XI. *Icerya ægyptica*, Douglas (= *Crossotosoma ægypticum*, Douglas).

The so-called Fluted Scale is most harmful in Egypt, feeding upon banyan, fig, orange, and many other trees. At Alexandria it infested most of the gardens and killed the trees right off in 1889 and 1890. It is also known as the Egyptian Mealy Bug. Cairo has also suffered from this pest.

This pest also occurs in India, where it is much parasitised, and hence possibly indigenous to that continent. It also occurs in Australia, where it has been found at Sydney on *Goodenia ovata*. The white waxy excretions of this species are absolutely pure wax, and as the excretions readily fall without the insects, it has been suggested that this wax might be used for economic purposes such as making fine wax candles ("Insect Life," iii., p. 424). This wax is said to be quite as fine as the white Chinese wax secreted by *Ericerus pé-la*, which lives on the so-called Insect Tree, *Ligustrum lucidum*. The white wax industry of the Plain of Chien-Chang is described in "Garden and Forest" for January 28, 1891.

XII. *Dactylopius* sp?

A specimen was sent by Mr. Fletcher too imperfect to identify, but is thought by Mr. Newstead to be probably a species of *Dactylopius*.

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LONDON:  
PRINTED BY WILLIAM CLOWES AND SONS, LIMITED,  
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